3GPP2 C.S0063-B

Version 0.2

Date: March 2010

3RD GENERATION PARTNERSHIP PROJECT 2 "3GPP2"

cdma2000 High Rate Packet Data Supplemental Services

This page intentionally left blank.

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

This page intentionally left blank.

FIGURES

FIGURES

TABLES

TABLES

This page intentionally left blank.

FOREWARD

(This foreword is not part of this Standard)

This standard was prepared by Technical Specification Group C of the Third Generation Partnership Project 2 (3GPP2). This standard is evolved from and is a companion to the cdma2000®[1] standards. This air interface standard provides high rate packet data supplemental services.

[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."*

FOREWORD

This page intentionally left blank.

REFERENCES

The following documents contain provisions, which, through reference in this text, constitute provisions of this document. References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific. For a specific reference, subsequent revisions do not apply. For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP2 document, a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] X.S0011-001, cdma2000 Wireless IP Network Standard: Introduction.

[2] C.S0005-D, Upper Layer (Layer 3) Signaling Specification for cdma2000 Spread Spectrum Systems.

[3] C.R1001, Administration of Parameter Value Assignments for cdma2000 Spread Spectrum Standards. (Informative Reference)

[4] IETF RFC 1662, PPP in HDLC-like Framing.

[5] IETF RFC 791, Internet Protocol.

[6] IETF RFC 3095, Robust Header Compression (ROHC): Framework and four profiles: RTP, UDP, ESP, and uncompressed.

[7] Reserved.

[8] C.S0024, cdma2000 High Rate Packet Data Air Interface Specification.

[9] C.S0002-D, Physical Layer standard for cdma2000 Spread Spectrum Systems.

[10] IETF RFC 2460, Internet Protocol, Version 6 (IPv6) Specification.

[11] A.S0008, Inter-Operability Specification (IOS) for High Rate Packet Data (HRPD) Access Network Interfaces with Session Control in the Access Network.

[12] RObust Header Compression (ROHC) Profile Identifiers [http://www.iana.org/assignments/rohc-pro-ids]

[13] A.S0009, Inter-Operability Specification (IOS) for High Rate Packet Data (HRPD) Access Network Interfaces with Session Control in the Packet Control Function.

REFERENCES

This page intentionally left blank.

1 OVERVIEW

1.1 Scope of This Document

These technical requirements form a compatibility standard for supplemental services on cdma2000 high rate packet data systems. These requirements ensure that a compliant access terminal can obtain service through any access network conforming to this standard. These requirements do not address the quality or reliability of that service, nor do they cover equipment performance or measurement procedures.

This specification is primarily oriented toward requirements necessary for the design and implementation of access terminals. As a result, detailed procedures are specified for access terminals to ensure a uniform response to all access networks. Access network procedures, however, are specified only to the extent necessary for compatibility with those specified for the access terminal.

This specification includes provisions for future service additions and expansion of system capabilities. The architecture defined by this specification permits such expansion without the loss of backward compatibility to older access terminals.

1.2 Requirements Language

Compatibility, as used in connection with this standard, is understood to mean: Any access terminal can obtain service through any access network conforming to this standard. Conversely, all access networks conforming to this standard can service access terminals.

"Shall" and "shall not" identify requirements to be followed strictly to conform to the standard and from which no deviation is permitted. "Should" and "should not" indicate that one of several possibilities is recommended as particularly suitable, without mentioning or excluding others, that a certain course of action is preferred but not necessarily required, or that (in the negative form) a certain possibility or course of action is discouraged but not prohibited. "May" and "need not" indicate a course of action permissible within the limits of the standard. "Can" and "cannot" are used for statements of possibility and capability, whether material, physical, or causal.

1.3 Architecture Reference Model

The architecture reference model is presented in Figure 1.3-1. The reference model consists of the following functional units:

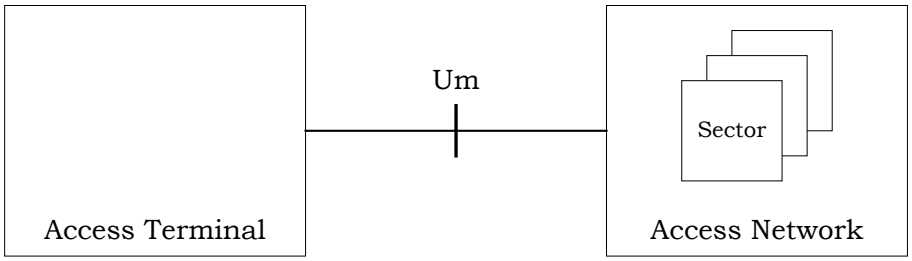

Figure 1.3-1. Architecture Reference Model

The access terminal, the access network, and the sector are formally defined in Section 1.5.

The reference model includes the air interface between the access terminal and the access network. The protocols used over the air interface are defined in this document.

1.4 Protocols

1.4.1 Interfaces

This standard defines a set of interfaces for communications between protocols in the same entity and between a protocol executing in one entity and the same protocol executing in the other entity.

In the following the generic term "entity" is used to refer to the access terminal and the access network.

Protocols in this specification have four types of interfaces:

- Headers and messages are used for communications between a protocol executing in one entity and the same protocol executing in the other entity.
- Commands are used by a protocol to obtain a service from another protocol within the same access network or access terminal.
- Indications are used by a protocol to convey information regarding the occurrence of an event to another protocol within the same access network or access terminal. Any protocol can register to receive these indications.
- Public Data is used to share information in a controlled way between protocols/applications. Public data is shared between protocols/applications in the same layer, as well as between protocols/applications in different layers. The public data of the InUse protocol/application is created when an InUse instance of a protocol/application is created. All configurable attributes of the InConfiguration instance of a protocol or application are also public data of that protocol or application.

Commands and indications are written in the form of *Protocol.Command* and *Protocol.Indication*. When the context is clear, the *Protocol* part is dropped.

Commands are always written in the imperative form, since they direct an action. Indications are always written in the past tense since they notify of events that happened.

Headers and messages are binding on all implementations. Commands, indications, and public data are used as a device for a clear and precise specification. Access terminals and access networks can be compliant with this specification while choosing a different implementation that exhibits identical behavior.

1.4.2 States

When protocols exhibit different behavior as a function of the environment, this behavior is captured in a set of states and the events leading to a transition between states.

Unless otherwise specifically mentioned, the state of the access network refers to the state of a protocol engine in the access network as it applies to a particular access terminal. Since the access network communicates with multiple access terminals, multiple independent instantiations of a protocol will exist in the access network, each with its own independent state machine.

Unless otherwise specifically shown, the state transitions due to failure are not shown in the figures.

Typical events leading to a transition from one state to another are the receipt of a message, a command from a higher layer protocol, an indication from a lower layer protocol, or the expiration of a timer.

When a protocol is not functional at a particular time the protocol is placed in a state called the Inactive state. This state is common for most protocols.

Other common states are Open, indicating that the session or connection (as applicable to the protocol) is open and Close, indicating that the session or connection is closed.

If a protocol has a single state other than the Inactive state, that state is always called the Active state. If a protocol has more than one state other than the Inactive state, all of these states are considered active, and are given individual names.

1.5 Terms

Access Network (AN). The network equipment providing data connectivity between a packet switched data network (typically the Internet) and the access terminals. An access network is equivalent to a base station in [9].

Access Terminal (AT). A device providing data connectivity to a user. An access terminal may be connected to a computing device such as a laptop personal computer or it may be a self-contained data device such as a personal digital assistant. An access terminal is equivalent to a mobile station in [9].

Channel. The set of channels transmitted between the access network and the access terminals within a given frequency assignment. A Channel consists of a Forward Link and a Reverse Link.

Forward Channel. The portion of the Channel consisting of those Physical Layer Channels transmitted from the access network to the access terminal.

Forward Control Channel. The channel that carries data to be received by all access terminals monitoring the Forward Channel.

Forward Traffic Channel. The portion of the Forward Channel that carries information for a specific access terminal. The Forward Traffic Channel can be used as either a Dedicated Resource or a non-Dedicated Resource. Prior to successful access terminal authentication, the Forward Traffic Channel serves as a non-Dedicated Resource. Only after successful access terminal authentication can the Forward Traffic Channel be used as a Dedicated Resource for the specific access terminal.

FCS. Frame Check Sequence.

NULL. A value which is not in the specified range of the field.

Reservation. Air interface resources set up by the access network to carry a higher layer flow. A Reservation is identified by its ReservationLabel. ReservationLabels are bound to Link Flows that carry higher layer flows. A Reservation can be either in the Open or Close state.

Reverse Access Channel. The portion of the Reverse Channel that is used by access terminals to communicate with the access network when they do not have a traffic channel assigned. There is a separate Reverse Access Channel for each sector of the access network.

Reverse Channel. The portion of the Channel consisting of those Physical Layer Channels transmitted from the access terminal to the access network.

Reverse Traffic Channel. The portion of the Reverse Channel that carries information from a specific access terminal to the access network. The Reverse Traffic Channel can be used as either a Dedicated Resource or a non-Dedicated Resource. Prior to successful access terminal authentication, the Reverse Traffic Channel serves as a non-Dedicated Resource. Only after successful access terminal authentication can the Reverse Traffic Channel be used as a Dedicated Resource for the specific access terminal.

RLP. Radio Link Protocol provides reliable delivery if needed, in-order delivery if needed, and duplicate detection for a higher layer data stream.

Rx. Receive.

Sector. The part of the access network that provides one CDMA channel.

SNP. Signaling Network Protocol provides message transmission services for signaling messages. The protocols that control each layer use SNP to deliver their messages to their peer protocols. SNP is defined in [8].

Stream Layer. The Stream Layer provides multiplexing of distinct streams. Stream 0 is dedicated to signaling and defaults to the default signaling stream (SNP / SLP). Stream 1, Stream 2 and Stream 3 are not used by default. The Stream Layer is defined in [8].

Tx. Transmit.

1.6 Notation

A[i]	The i^{th} element of array A. The zeroeth element of the array is A[0].
<e_1, e_2, …, e_n>	A *structure* with elements 'e1', 'e2', …, 'en'. Two structures E = <e_1, e_2, …, e_n> and F = <f_1, f_2, …, f_m> are equal if

	and only if 'm' is equal to 'n' and e_i is equal to f_i for i=1, …n. Given E = <e_1, e_2, …, e_n> and F = <f_1, f_2, …, f_m>, the assignment "E = F" denotes the following set of assignments: $e_i = f_i$, for i=1, …n.
S.e	The member of the structure 'S' that is identified by 'e'.
M[i:j]	Bits i^{th} through j^{th} inclusive (i≥ j) of the binary representation of variable M. M[0:0] denotes the least significant bit of M.
|	Concatenation operator. (A | B) denotes variable A concatenated with variable B.
×	Indicates multiplication.
⌊x⌋	Indicates the largest integer less than or equal to x: ⌊1.1⌋ = 1, ⌊1.0⌋ = 1.
⌈x⌉	Indicates the smallest integer greater or equal to x: ⌈1.1⌉ = 2, ⌈2.0⌉ = 2.
|x|	Indicates the absolute value of x: |–17|=17, |17|=17.
⊕	Indicates exclusive OR (modulo-2 addition).
min (x, y)	Indicates the minimum of x and y.
max (x, y)	Indicates the maximum of x and y.
x mod y	Indicates the remainder after dividing x by y: x mod y = x – (y × ⌊x/y⌋).

Unless otherwise specified, the format of field values is unsigned binary.

Unless indicated otherwise, this standard presents numbers in decimal form. Binary numbers are distinguished in the text by the use of single quotation marks. Hexadecimal numbers are distinguished by the prefix '0x'.

Unless specified otherwise, each field of a packet shall be transmitted in sequence such that the most significant bit (MSB) is transmitted first and the least significant bit (LSB) is transmitted last. The MSB is the left-most bit in the figures in this document. If there are multiple rows in a table, the top-most row is transmitted first. If a table is used to show the sub-fields of a particular field or variable, the top-most row consists of the MSBs of the field. Within a row in a table, the left-most bit is transmitted first. Notations of the form "repetition factor of N" or "repeated N times" mean that a total of N versions of the item are used.

When a procedure, consisting of a set of steps, is normatively defined as a sequence of bullet list items, it is assumed that the steps are performed in the indicated order unless specified otherwise.

This page intentionally left blank.

2 ENHANCED MULTI-FLOW PACKET APPLICATION

2.1 Introduction

2.1.1 General Overview

The Enhanced Multi-Flow Packet Application provides multiple octet or packet streams that can be used to carry octets or packets between the access terminal and the access network. Each octet or packet stream is called a Link Flow. Each Link Flow provides two routes for transmission and reception of payloads from the higher layer. These routes are named Route A and Route B and can be carried using a single receiver-transmitter pair. Each route is associated with a transmitter-receiver pair. Figure 2.1.1-1 shows the association between a forward Link Flow and the transmitters and receivers for its two routes. Figure 2.1.1-2 shows the reference architecture for a reverse Link Flow.

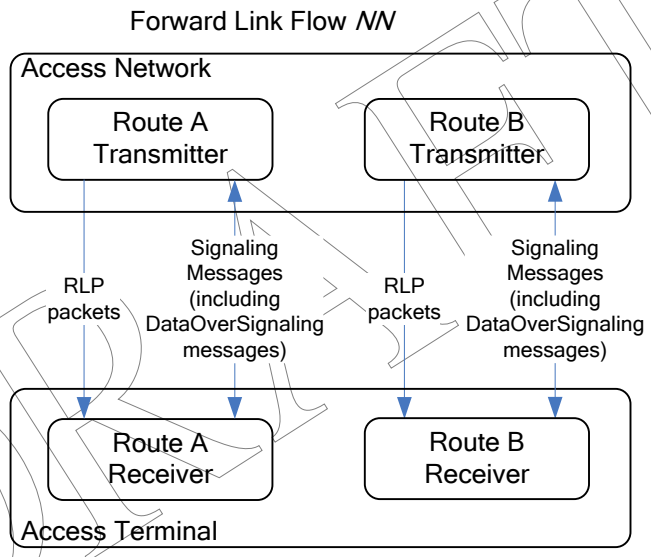

Figure 2.1.1-1. Reference Architecture for a Forward Link Flow

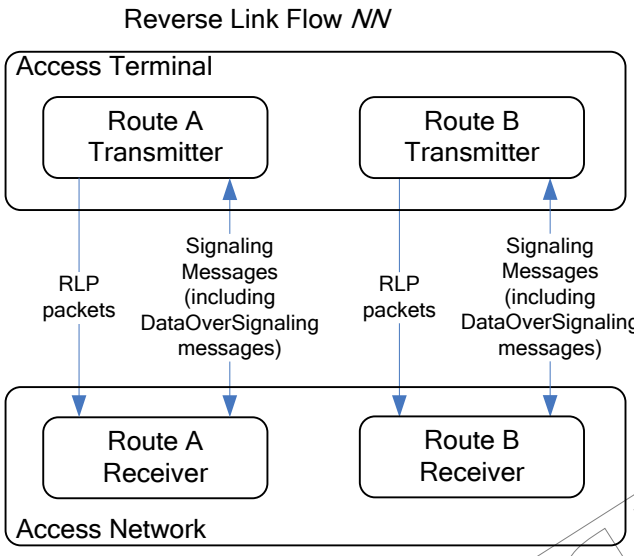

Figure 2.1.1-2. Reference Architecture for a Reverse Link Flow

The relationship between the Enhanced Multi-Flow Packet Application protocols is illustrated in Figure 2.1.1-3.

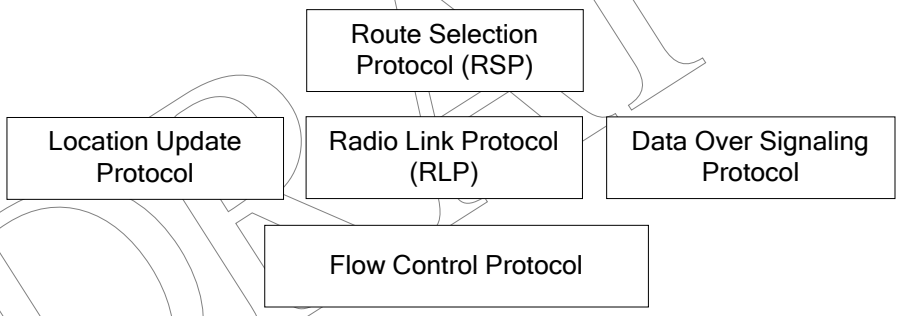

Figure 2.1.1-3. Enhanced Multi-Flow Packet Application Protocols

Figure 2.1.1-4 illustrates the relationship for each Link Flow between the Enhanced Multi-flow Packet Application and the higher layer protocols supported by the Enhanced Multi-flow Packet Application. The Flow Protocol and the Route Protocol are referred to as higher layer protocols. The protocols defined in the Enhanced Multi-flow Packet Application are shown shaded. The Route Selection Protocol routes Flow Protocol PDUs to either instance A or instance B of the Route Protocol. Instance A of the Route Protocol is bound to Route A of the Link Flow. Instance B of the Route Protocol is bound to Route B of the Link Flow.

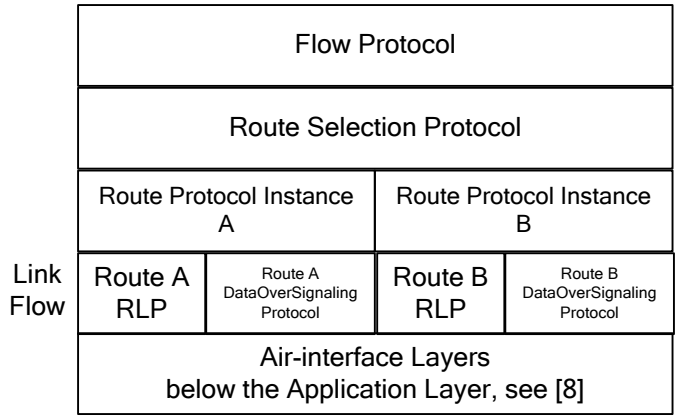

Figure 2.1.1-4. Relationship for each Link Flow between Enhanced Multi-Flow Packet Application and Higher Layer Protocols

The Enhanced Multi-Flow Packet Application provides:

- the functionality defined in [1],
- the Route Selection Protocol, which routes Flow Protocol PDUs over either Route A or Route B of a Link Flow.
- the Radio Link Protocol (RLP), which provides retransmission (if needed) and duplicate detection of higher layer octets or packets transmitted on each route,
- the Data Over Signaling Protocol, which provides transmission and duplicate detection of higher layer data packets transmitted on each route using signaling messages,
- the Location Update Protocol, which defines location update procedures and messages in support of mobility management for the Packet Application,
- the Flow Control Protocol, which provides flow control for the Enhanced Multi-Flow Packet Application, and
- ability to negotiate Route Protocol and Flow Protocol parameters.

This application uses the Signaling Application to transmit and receive messages.

2.1.2 Public Data

- Subtype for this application

2.1.3 Data Encapsulation for the InUse Instance of the Application

Figure 2.1.3-1 illustrates the relationship between octets from the Route Protocol, RLP packets, and Stream Layer payload for the case when the Link Flow carries an octet stream.

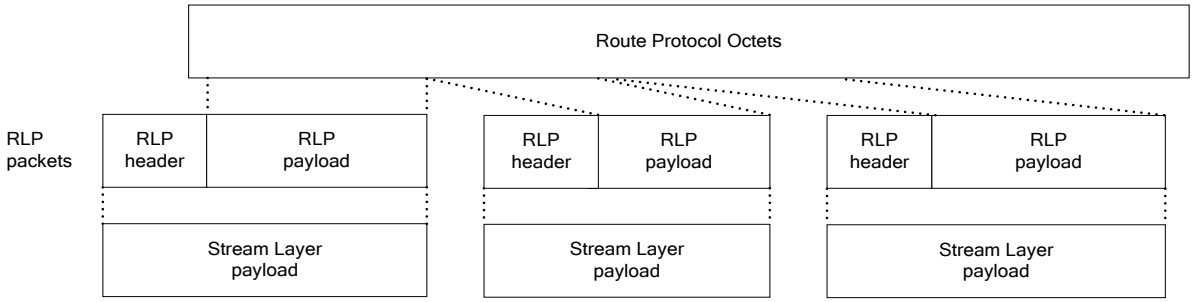

Figure 2.1.3-1. Enhanced Multi-Flow Packet Application Encapsulation when the Link Flow carries an Octet Stream

Figure 2.1.3-2 illustrates the relationship between packets from the Route Protocol, RLP packets, and Stream Layer payload for the case when the Link Flow carries a packet stream.

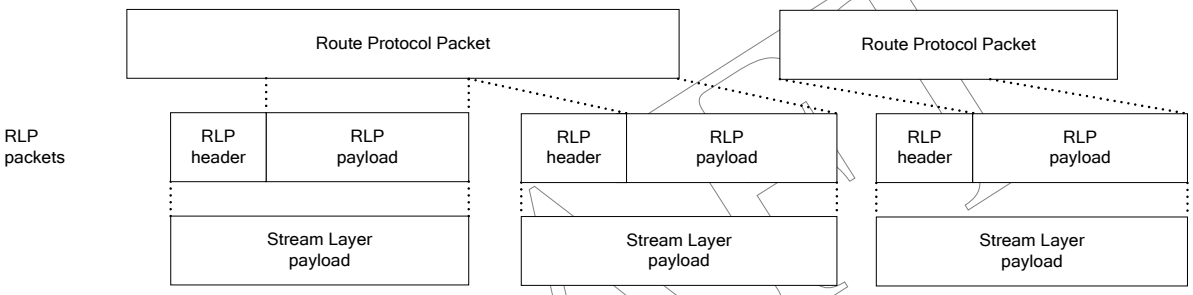

Figure 2.1.3-2. Enhanced Multi-Flow Packet Application Encapsulation when the Link Flow carries a Packet Stream

2.2 Protocol Initialization

2.2.1 Protocol Initialization for the InConfiguration Application Instance

Upon creation, the InConfiguration instance of this application in the access terminal and the access network shall perform the following in the order specified:

- The fall-back values of the attributes for this application instance shall be set to the default values specified for each attribute.
- If the InUse instance of this application (i.e., corresponding to the stream to which this application is bound) has the same application subtype as this InConfiguration application instance, then the fall-back values of the attributes defined by the InConfiguration application instance shall be set to the corresponding attribute values for the InUse application instance.
- The value for each attribute for this application instance shall be set to the fall-back value for that attribute.
- The value of the InConfiguration application instance public data shall be set to the value of the corresponding InUse application instance public data.

- The value of the application subtype associated with the InConfiguration application instance shall be set to the application subtype that identifies this application.

2.3 Procedures and Messages for the InConfiguration Instance of the Packet Application

2.3.1 Procedures

This protocol uses the Generic Configuration Protocol (see [8]) to define the processing of the configuration messages.

The Enhanced Multi-Flow Packet Application shall not be bound to a virtual stream.

The access terminal shall not send a ConfigurationRequest message containing the Reservation*KK*QoSResponseFwd attribute. The access network shall not send a ConfigurationRequest message containing the Reservation*KK*QoSRequestFwd attribute. The access terminal shall not send a ConfigurationRequest message containing the Reservation*KK*QoSResponseRev attribute. The access network shall not send a ConfigurationRequest message containing the Reservation*KK*QoSRequestRev attribute.

The access terminal shall not initiate negotiation of the ANSupportedQoSProfiles attribute. The access network shall not initiate negotiation of the ATSupportedQoSProfiles attribute. The access terminal should include supported values of ProfileValue with ProfileType equal to 0x04 in the ATSupportedQoSProfiles attribute during the AT Initiated state of the Session Configuration Protocol. The access network shall include all supported values of ProfileValue with ProfileType equal to 0x04 in the ANSupportedQoSProfiles attribute during the AN Initiated state of the Session Configuration Protocol. The access terminal shall use the ProfileType 0x00, 0x01, or 0x02 in the Reservation*KK*QoSRequestFwd or the Reservation*KK*QoSRequestRev attributes. The access network shall use ProfileType 0x00 or 0x03 in the Reservation*KK*QoSResponseFwd or the Reservation*KK*QoSResponseRev attributes.

The access network shall not initiate negotiation of the ATSupportedFlowProtocolParameters*PP* attribute. The access network shall not initiate negotiation of the ATSupportedRouteProtocolParameters*PP* attribute.

The access network shall not initiate negotiation of the MaxLinkFlows attribute.

The access network and access terminal shall not propose value of MaxAbortTimer that is less than any of the AbortTimer values in Flow*NN*TimersFwd and Flow*NN*TimersRev Attributes.

2.3.2 Commit Procedures

The access terminal and the access network shall perform the procedures specified in this section, in the order specified, when directed by the InUse instance of the Session Configuration Protocol to execute the Commit procedures:

- All the public data that are defined by this application, but are not defined by the InUse application instance shall be added to the public data of the InUse application.

- If the InUse instance of this application (corresponding to the stream to which this application is bound) has the same subtype as this application instance, then
  - The access terminal and the access network shall set the attribute values associated with the InUse instance of this application to the attribute values associated with the InConfiguration instance of this application, and
  - The access terminal and the access network shall purge the InConfiguration instance of the application.
- If the InUse instance of this application (corresponding to the stream to which this application is bound) does not have the same subtype as this application instance, then:
  - The access terminal and the access network shall initialize a receive pointer for DataOverSignaling message validation on Route A, $V(R_A)$, to 63.
  - The access terminal and the access network shall initialize a receive pointer for DataOverSignaling message validation on Route B, $V(R_B)$, to 63.
  - The access terminal and the access network shall initialize a transmit pointer for DataOverSignaling message validation on Route A, $V(S_A)$, to zero.
  - The access terminal and the access network shall initialize a transmit pointer for DataOverSignaling message validation on Route B, $V(S_B)$, to zero.
  - The access terminal and the access network shall set the StorageBLOB parameter of the Location Update Protocol to NULL.
  - The initial state of the Flow Control Protocol associated with the InConfiguration instance of the Packet Application at the access terminal and access network shall be set to the Close State.
  - The access network shall set the Forward Reservations with ReservationLabel 0xff and 0xfe to the Open state.[2]
  - The access terminal shall set the Reverse Reservations with ReservationLabel 0xff and 0xfe to the Open state.
  - The access network shall set the Forward Reservations with ReservationLabel not equal to 0xff or 0xfe to the Close state.
  - The access terminal shall set the Reverse Reservations with ReservationLabel not equal to 0xff or 0xfe to the Close state.
  - The Route Selection Protocol at the access terminal shall enter the A Open B Setting state (See Figure 2.4.4.1.2-1).
  - The InConfiguration instance of the Packet Application at the access terminal and access network shall become the InUse instance for the Packet Application (corresponding to the stream to which this application is bound).

[2] Forward and reverse link Reservations 0xff initialized in the Open state so that data can be sent without having to perform a state transition.

- All the public data not defined by this application shall be removed from the public data of the InUse application.

2.3.3 Message Formats

2.3.3.1 ConfigurationRequest

The ConfigurationRequest message format is as follows:

Field	Length (bits)
MessageID	8
TransactionID	8
Zero or more instances of the following record	
AttributeRecord	Attribute dependent

MessageID — The sender shall set this field to 0x50.

TransactionID — The sender shall increment this value for each new ConfigurationRequest message sent.

AttributeRecord — The format of this record is specified in [8].

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

2.3.3.2 ConfigurationResponse

The ConfigurationResponse message format is as follows:

Field	Length (bits)
MessageID	8
TransactionID	8
Zero or more instances of the following record	
AttributeRecord	Attribute dependent

MessageID — The sender shall set this field to 0x51.

TransactionID — The sender shall set this value to the TransactionID field of the corresponding ConfigurationRequest message.

AttributeRecord — An attribute record containing a single attribute value. If this message selects a complex attribute, only the ValueID field of the complex attribute shall be included in the message. The format of the

AttributeRecord is given in [8]. The sender shall not include more than one attribute record with the same attribute identifier.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

2.4 Route Selection Protocol

2.4.1 Overview

The Route Selection Protocol provides means to select either instance A or instance B of the Route Protocol. The Route Selection Protocol routes Flow Protocol PDUs to the selected instance of the Route Protocol. Instance A of the Route Protocol is bound to Route A of the Link Flow. Instance B of the Route Protocol is bound to Route B of the Link Flow. The Route Selection Protocol is a protocol associated with the Enhanced Multi-Flow Packet Application. The application subtype for this application is defined in [3].

2.4.2 Primitives and Public Data

2.4.2.1 Commands

This protocol does not define any commands.

2.4.2.2 Return Indications

This protocol does not return any indications.

2.4.3 Protocol Data Unit

The Route Selection Protocol routes Flow Protocol PDUs to the Route Protocol without modifying them. Hence, the transmission unit of this protocol is the same as a Flow Protocol PDU. The Flow Protocol for a forward Link Flow *NN* is identified by the ProtocolID field of the Flow*NN*FlowProtocolParametersFwd attribute. The Flow Protocol for a reverse Link Flow *NN* is identified by the ProtocolID field of the Flow*NN*FlowProtocolParametersRev attribute.

2.4.4 Procedures and Messages for the InUse Instance of the Protocol

2.4.4.1 Procedures

2.4.4.1.1 General Requirements

If the Flow*NN*FlowProtocolPDUFwd attribute of forward Link Flow *NN* is 0x00, then forward Link Flow *NN* provides an octet stream to the Flow Protocol. If the Flow*NN*FlowProtocolPDUFwd attribute of forward Link Flow *NN* is 0x01, then forward Link Flow *NN* provides a packet stream to the Flow Protocol.

If the Flow*NN*FlowProtocolPDURev attribute of reverse Link Flow *NN* is 0x00, then reverse Link Flow *NN* provides an octet stream to the Flow Protocol. If the Flow*NN*FlowProtocolPDURev attribute of reverse Link Flow *NN* is 0x01, then reverse Link Flow *NN* provides a packet stream to the Flow Protocol.

2.4.4.1.2 Access Terminal Requirements

The Route Selection Protocol associated with an activated Link Flow can be in one of four states: A Open B Setting, A Open B Rising, A Setting B Open, or A Rising B Open. The

Route Selection Protocol instance associated with all activated Link Flows shall be in the same state at any time. When a Link Flow is activated, the Route Selection Protocol shall enter the state that the Route Selection Protocols of other activated Link Flows are in. If no other Link Flows are activated when a Link Flow is activated, then the Route Selection Protocol shall enter the A Open B Setting state. If the Route Selection Protocol receives a *ConnectedState.ConnectionClosed* indication or *RouteUpdate.ConnectionLost* indication, it shall enter the A Open B Setting state. Figure 2.4.4.1.2-1 shows the state diagram for the Route Selection Protocol at the access terminal.

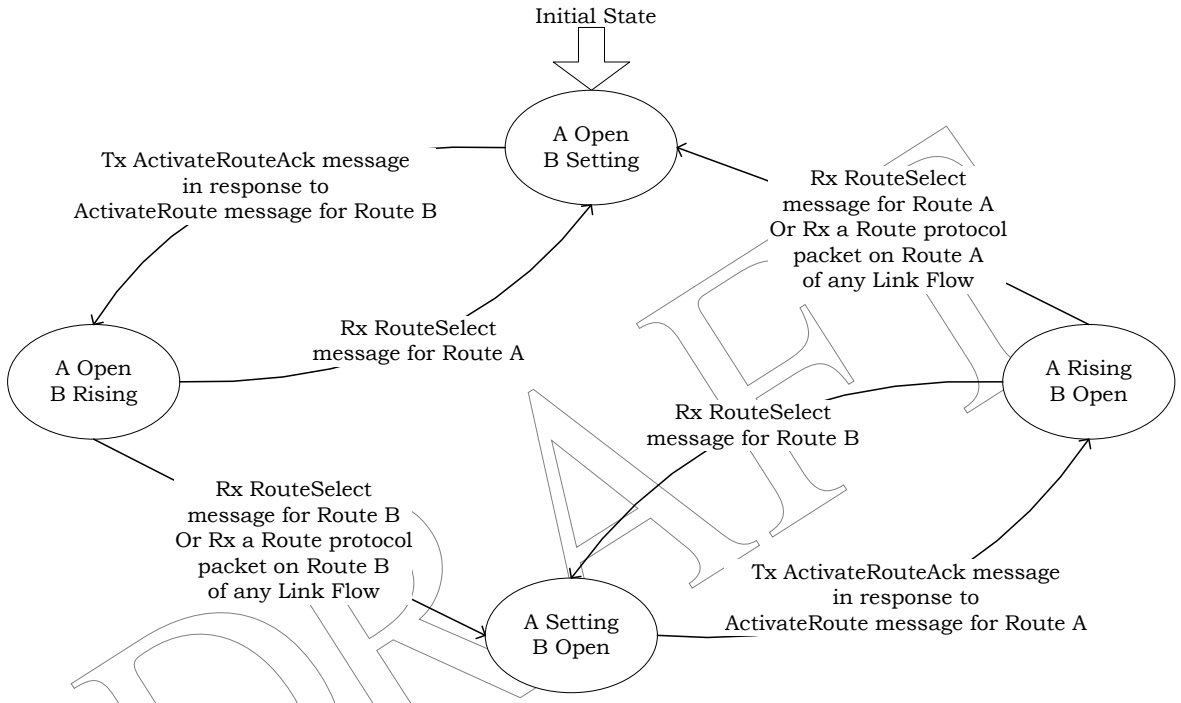

Figure 2.4.4.1.2-1. Route Selection Protocol State Diagram (Access Terminal)

2.4.4.1.2.1 A Open B Setting State

2.4.4.1.2.1.1 State Transitions

Upon receiving an ActivateRoute message requesting to activate Route B, the access terminal shall perform the following:

- If TwoRoutesSupported is 0x01, the access terminal shall perform the following:
  - The Route Selection Protocol shall issue a *RadioLinkProtocol.InitializeRoute* command with Route B as the argument.
  - The access terminal shall initialize the Route Protocol bound to Route B.
  - After the Radio Link Protocol and the Route Protocol are initialized, the access terminal shall send an ActivateRouteAck message, and shall transition to the A Open B Rising state.
- Otherwise, the access terminal shall ignore the ActivateRoute message.

Upon receiving a RouteSelect message for Route A, the access terminal shall respond with a RouteSelectAck message.

2.4.4.1.2.1.2 Transmitter Requirements

The access terminal shall route Flow Protocol PDUs to Route A. The access terminal shall not route Flow Protocol PDUs to Route B.

2.4.4.1.2.1.3 Receiver Requirements if TwoRoutesSupported is 0x00

The access terminal shall pass Flow Protocol PDUs received on Route A to the Flow Protocol. The access terminal shall discard Flow Protocol PDUs received on Route B.

2.4.4.1.2.1.4 Receiver Requirements if TwoRoutesSupported is 0x01

The access terminal shall pass Flow Protocol PDUs received on Route A to the Flow Protocol.

If the Flow*NN*SimultaneousDeliveryOnBothRoutesFwd attribute for Link Flow *NN* is 0x01, the access terminal shall perform the following: the access terminal shall pass Flow Protocol PDUs received on Route B of the Link Flow to the Flow Protocol if the access terminal has not received an ActivateRoute message requesting to activate Route B since the last time it entered this state; otherwise, the access terminal shall discard Flow Protocol PDUs received on Route B.

If the Flow*NN*SimultaneousDeliveryOnBothRoutesFwd attribute for Link Flow *NN* is 0x00, the access terminal shall perform the following: the access terminal shall pass Flow Protocol PDUs received on Route B of the Link Flow to the Flow Protocol if the access terminal has not passed Flow Protocol PDUs received on Route A of the Link Flow to the Flow Protocol since the last time the access terminal entered this state and if the access terminal has not received an ActivateRoute message requesting to activate Route B since the last time it entered this state; otherwise, the access terminal shall discard Flow Protocol PDUs received on Route B of the Link Flow.

2.4.4.1.2.2 A Open B Rising State

2.4.4.1.2.2.1 State Transitions

Upon receiving a RouteSelect message requesting to select Route B[3], the access terminal shall respond with a RouteSelectAck message, and shall transition to the A Setting B Open state. Upon receiving Flow Protocol PDU on Route B of any Link Flow[4], the access terminal shall store the Flow Protocol PDU received from Route B for processing in the A Setting B Open state and shall transition to the A Setting B Open state.

[3] The access terminal could wait to send RouteSelectAck message and transition state until the next Flow protocol packet boundary.

[4] The access terminal could wait to transition state until the next Flow protocol packet boundary.

Upon receiving a RouteSelect message requesting to select Route A, the access terminal shall respond with a RouteSelectAck message, and shall transition to the A Open B Setting state.

If the access terminal receives an ActivateRoute message, the message shall be ignored.

2.4.4.1.2.2.2 Transmitter Requirements

The access terminal shall route Flow Protocol PDUs to Route A. The access terminal shall not route Flow Protocol PDUs to Route B.

2.4.4.1.2.2.3 Receiver Requirements

The access terminal shall pass Flow Protocol PDUs received on Route A to the Flow Protocol.

2.4.4.1.2.3 A Setting B Open State

2.4.4.1.2.3.1 State Transitions

Upon receiving an ActivateRoute message requesting to activate Route A, the access terminal shall perform the following:

- The Route Selection Protocol shall issue a *RadioLinkProtocol.InitializeRoute* command with Route A as the argument.
- The access terminal shall initialize the Route Protocol bound to Route A.
- After the Radio Link Protocol and the Route Protocol are initialized, the access terminal shall send an ActivateRouteAck message, and shall transition to the A Rising B Open state.

Upon receiving a RouteSelect message for Route B, the access terminal shall respond with a RouteSelectAck message.

2.4.4.1.2.3.2 Transmitter Requirements

The access terminal shall route Flow Protocol PDUs to Route B. The access terminal shall not route Flow Protocol PDUs to Route A.

2.4.4.1.2.3.3 Receiver Requirements

The access terminal shall pass Flow Protocol PDUs received on Route B to the Flow Protocol.

If the Flow*NN*SimultaneousDeliveryOnBothRoutesFwd attribute for Link Flow *NN* is 0x01, the access terminal shall perform the following: the access terminal shall pass Flow Protocol PDUs received on Route A of the Link Flow to the Flow Protocol if the access terminal has not received an ActivateRoute message requesting to activate Route A since the last time it entered this state; otherwise, the access terminal shall discard Flow Protocol PDUs received on Route A.

If the Flow*NN*SimultaneousDeliveryOnBothRoutesFwd attribute for Link Flow *NN* is 0x00, the access terminal shall perform the following: the access terminal shall pass Flow Protocol PDUs received on Route A of the Link Flow to the Flow Protocol if the access terminal has not passed Flow Protocol PDUs received on Route B of the Link Flow to the Flow Protocol since the last time the access terminal entered this state and if the access terminal has not received an ActivateRoute message requesting to activate Route A since the last time it entered this state; otherwise, the access terminal shall discard Flow Protocol PDUs received on Route A of the Link Flow.

2.4.4.1.2.4 A Rising B Open State

2.4.4.1.2.4.1 State Transitions

Upon receiving a RouteSelect message requesting to select Route A[5], the access terminal shall respond with a RouteSelectAck message, and shall transition to the A Open B Setting state. Upon receiving Flow Protocol PDU on Route A of any Link Flow[6], the access terminal shall store the Flow Protocol PDU received on Route A for processing in the A Open B Setting state and shall transition to the A Open B Setting state.

Upon receiving a RouteSelect message requesting to select Route B, the access terminal shall respond with a RouteSelectAck message, and shall transition to the A Setting B Open state.

If the access terminal receives an ActivateRoute message, the message shall be ignored.

2.4.4.1.2.4.2 Transmitter Requirements

The access terminal shall route Flow Protocol PDUs to Route B. The access terminal shall not route Flow Protocol PDUs to Route A.

2.4.4.1.2.4.3 Receiver Requirements

The access terminal shall pass Flow Protocol PDUs received on Route B to the Flow Protocol.

2.4.4.1.3 Access Network Requirements

If TwoRoutesSupported attribute is 0x00, then the access network shall not send ActivateRoute or RouteSelect messages.

Upon sending an ActivateRoute message requesting to activate Route A, the access network shall issue a *RadioLinkProtocol.InitializeRoute* command with Route A as the argument and initialize the Route Protocol bound to Route A.

---

[5] The access terminal could wait to send RouteSelectAck message and transition state until the next Flow protocol packet boundary.

[6] The access terminal could wait to transition state until the next Flow protocol packet boundary.

Upon sending an ActivateRoute message requesting to activate Route B, the access network shall issue a *RadioLinkProtocol.InitializeRoute* command with Route B as the argument and initialize the Route Protocol bound to Route B.

2.4.4.2 Message Formats

2.4.4.2.1 RouteSelect

The access network sends this message to transition the access terminal to the A Open B Setting or the A Setting B Open state.

Field	Length (bits)
MessageID	8
TransactionID	8
Route	1
Reserved	7

MessageID — The access network shall set this field to 0x1e.

TransactionID — The access network shall set this field to one more (modulo 256) than the TransactionID field of the last RouteSelect message sent by the access network.

Route — The access network shall set this field to '0' to transition the access terminal to the A Open B Setting state. The access network shall set this field to '1' to transition the access terminal to the A Setting B Open state.

Reserved — The access network shall set this field to '0000000'. The access terminal shall ignore this field.

Channels	FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.4.4.2.2 RouteSelectAck

The access terminal sends this message to acknowledge the receipt of a RouteSelect message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID — The access terminal shall set this field to 0x1f.

TransactionID — The access terminal shall set this field to the TransactionID field of the RouteSelect message whose receipt is being acknowledged by this message.

Channels	RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.4.4.2.3 ActivateRoute

The access network sends this message to transition the access terminal to the A Rising B Open state or the A Open B Rising state.

Field	Length (bits)
MessageID	8
TransactionID	8
Route	1
Reserved	7

MessageID — The access network shall set this field to 0x20.

TransactionID — The access network shall set this field to one more (modulo 256) than the TransactionID field of the last ActivateRoute message sent by the access network.

Route — The access network shall set this field to '0' to transition the access terminal to the A Rising B Open state. The access network shall set this field to '1' to transition the access terminal to the A Open B Rising state.

Reserved — The access network shall set this field to '0000000'. The access terminal shall ignore this field.

Channels	FTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

2.4.4.2.4 ActivateRouteAck

The access terminal sends this message to acknowledge the receipt of an ActivateRoute message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access terminal shall set this field to 0x21.

TransactionID The access terminal shall set this field to the TransactionID field of the ActivateRoute message whose receipt is being acknowledged by this message.

Channels	RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

2.4.4.3 Interface to Other Protocols

2.4.4.3.1 Commands

This protocol issue the following commands:

- *RadioLinkProtocol.InitializeRoute* with argument indicating which Route is to be initialized.

2.4.4.3.2 Indications

This protocol registers to receive the following indications:

- *ConnectedState.ConnectionClosed*
- *RouteUpdate.ConnectionLost*

2.4.5 Protocol Numeric Constants

This protocol does not define any protocol numeric constants.

2.5 Radio Link Protocol

2.5.1 Overview

The Radio Link Protocol (RLP) provides one or more octet or packet streams with an acceptably low erasure rate for efficient operation of higher layer protocols (e.g., TCP). When used as part of the Enhanced Multi-Flow Packet Application, the protocol carries one or more octet or packet streams from the higher layer. RLP is a protocol associated with the Enhanced Multi-Flow Packet Application. The application subtype for this application is defined in [3].

2.5.2 Primitives and Public Data

2.5.2.1 Commands

This protocol defines the following commands:

- *InitializeRoute* with argument indicating which Route is to be initialized.

2.5.2.2 Return Indications

This protocol does not return any indications.

2.5.3 Protocol Data Unit

The transmission unit of this protocol is an RLP packet.

2.5.4 Procedures and Messages for the InUse Instance of the Protocol

A forward Link Flow *NN* is defined to be activated if the Flow*NN*ActivatedFwd attribute is set to 0x01, where *NN* is the hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive. The number of activated Link Flows on the forward link shall not exceed the value of the MaxActivatedLinkFlowsFwd attribute.

A reverse Link Flow *NN* is defined to be activated if the Flow*NN*ActivatedRev attribute is set to 0x01, where *NN* is the hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive. The number of activated Link Flows on the reverse link shall not exceed the value of the MaxActivatedLinkFlowsRev attribute.

A Link Flow is defined to be deactivated if it is not activated.

This section defines the procedures and messages for the in-use instance of each forward or reverse Link Flow.

2.5.4.1 Procedures

Each Route of the Link Flow receives octets or packets for transmission from the corresponding instance of the Route Protocol and forms an RLP packet by prepending the RLP packet header defined in 2.5.4.3 with a number of received contiguous octets.

The Route Protocol for a forward Link Flow *NN* is identified by the ProtocolID field of Flow*NN*RouteProtocolParametersFwd attribute. The Route Protocol for a reverse Link Flow *NN* is identified by the ProtocolID field of Flow*NN*RouteProtocolParametersRev attribute.

If the Route Protocol is NULL[7], then the transmitter shall set Route Protocols octets or packets to Flow Protocol octets or packets routed along the Route. If the Route Protocol is NULL, then the receiver shall set Flow Protocols octets or packets to Route Protocol packets or octets received on the Route.

If the Flow*NN*RouteProtocolPDUFwd attribute of forward Link Flow *NN* is 0x00, then each Route of forward Link Flow *NN* provides an octet stream to the corresponding instance of the Route Protocol. If the Flow*NN*RouteProtocolPDUFwd attribute of forward Link Flow *NN* is 0x01, then each Route of forward Link Flow *NN* provides a packet stream to the corresponding instance of the Route Protocol.

If the Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd attribute of forward Link Flow *NN* is 0x00, then each Route of forward Link Flow *NN* delivers payload to the corresponding instance of the Route Protocol in order. If the Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd attribute of forward Link Flow *NN* is 0x01, then each Route of forward Link Flow *NN* may deliver payload to the corresponding instance of the Route Protocol out of order.

If the Flow*NN*RouteProtocolPDURev attribute of reverse Link Flow *NN* is 0x00, then each Route of reverse Link Flow *NN* provides an octet stream to the corresponding instance of the Route Protocol. If the Flow*NN*RouteProtocolPDURev attribute of reverse Link Flow *NN* is 0x01, then each Route of reverse Link Flow *NN* provides a packet stream to the corresponding instance of the Route Protocol.

The policy RLP follows in determining the number of octets to send in an RLP packet is beyond the scope of this specification. It is subject to the following requirements:

- The size of an RLP packet shall not exceed the maximum payload length that can be carried by a Stream Layer packet given the target channel and current transmission rate on that channel.
- If the Link Flow is carrying a packet stream, then an RLP packet shall contain octets from no more than one Route Protocol packet.
- The RLP packet should contain all octets of the Route Protocol packet if all of the following conditions are true:
  - The size of the RLP packet carrying all octets of the Route Protocol packet does not exceed the maximum payload length that can be carried by a Stream Layer packet given the target channel and the current transmission rate on that channel.
  - The Link flow is carrying a packet stream.
  - The data unit for the Link Flow is RLP packet payloads.

---

[7] [7] Route Protocol being NULL means that a Route Protocol has not been negotiated.

- If all of the following conditions are true, the size of the RLP packet shall be such that it could be re-transmitted in a lower layer packet with same or higher payload:
  - The data unit for the Link Flow is RLP packet payloads.
  - If the RLP transmitter is the access terminal, Flow*NN*NakEnableRev attribute is set to 0x01 for this Link Flow or Flow*NN*PhysicalLayerNakEnableRev is set to 0x01 for this Link Flow.
  - If the RLP transmitter is the access network, Flow*NN*NakEnableFwd attribute is set to 0x01 for this Link Flow.

For the purpose of binding Link Flows to lower layer flows (such as MAC flows in the Subtype 3 Reverse Traffic Channel MAC Protocol specified in [8]), each Link Flow shall be treated as a substream with the substream number set to the Link Flow number.

RLP makes use of the ResetTxIndication, ResetRxIndication, ResetTxIndicationAck, ResetTxComplete, ResetRxComplete, and Nak messages to perform control related operations.

When sending an AttributeUpdateRequest message containing requests to set one or more Reservation*KK*QoSRequestFwd or the Reservation*KK*QoSRequestRev attribute to their default value, the access terminal shall not include other types of requests in the same AttributeUpdateRequest message.

The access network shall not initiate modification of the Reservation*KK*QoSRequestFwd or the Reservation*KK*QoSRequestRev attributes. If the access network receives an AttributeUpdateRequest message requesting to set the Reservation*KK*QoSRequestFwd or the Reservation*KK*QoSRequestRev attribute to its default value, then the access network shall respond with an AttributeUpdateAccept message. The access terminal shall not initiate modification of the Reservation*KK*QoSResponseFwd or the Reservation*KK*QoSResponseRev attributes. The access terminal shall use the ProfileType 0x00, 0x01, or 0x02 in the Reservation*KK*QoSRequestFwd or the Reservation*KK*QoSRequestRev attributes. The access network shall use ProfileType 0x00 or 0x03 in the Reservation*KK*QoSResponseFwd or the Reservation*KK*QoSResponseRev attributes.

When forward Link Flow *NN* is activated, the access network and the access terminal shall not update the following attributes:

- Flow*NN*FlowProtocolParametersFwd,
- Flow*NN*RouteProtocolParametersFwd,
- Flow*NN*SequenceLengthFwd,
- Flow*NN*FlowProtocolPDUFwd,
- Flow*NN*RouteProtocolPDUFwd,
- Flow*NN*DataUnitFwd,
- Flow*NN*SimultaneousDeliveryOnBothRoutesFwd, and
- Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd.

The access terminal shall not initiate re-activation of a deactivated forward Link Flow *NN* unless the access terminal initiated deactivation of forward Link Flow *NN* since the last time the Link Flow was activated, and the deactivation was successful. The access network shall not initiate re-activation of a deactivated forward Link Flow *NN* unless the access network initiated deactivation of forward Link Flow *NN* since the last time the Link Flow was activated, and the deactivation was successful.

When reverse Link Flow *NN* is activated, the access network and the access terminal shall not update the following attributes:

- Flow*NN*FlowProtocolParametersRev,
- Flow*NN*RouteProtocolParametersRev,
- Flow*NN*SequenceLengthRev,
- Flow*NN*FlowProtocolPDURev,
- Flow*NN*RouteProtocolPDURev, and,
- Flow*NN*DataUnitRev

The access terminal shall not initiate re-activation of a deactivated reverse Link Flow *NN* unless the access terminal initiated deactivation of reverse Link Flow *NN* since the last time the Link Flow was activated, and the deactivation was successful. The access network shall not initiate re-activation of a deactivated reverse Link Flow *NN* unless the access network initiated deactivation of reverse Link Flow *NN* since the last time the Link Flow was activated, and the deactivation was successful.

The ProtocolID field of the Flow*NN*FlowProtocolParametersFwd attribute shall be set to a value that is supported by the access terminal as indicated in the ATSupportedFlowProtocolParameters*PP* attribute. The ProtocolID field of the Flow*NN*FlowProtocolParametersRev attribute shall be set to a value that is supported by the access terminal as indicated in the ATSupportedFlowProtocolParameters*PP* attribute. The ProtocolID field of the Flow*NN*RouteProtocolParametersFwd attribute shall be set to a value that is supported by the access terminal as indicated in the ATSupportedRouteProtocolParameters*PP* attribute. The ProtocolID field of the Flow*NN*RouteProtocolParametersRev attribute shall be set to a value that is supported by the access terminal as indicated in the ATSupportedRouteProtocolParameters*PP* attribute.

The fields of the ProtocolParameters record of the Flow*NN*FlowProtocolParametersFwd attribute shall be set to values that are in accordance with those supported by the AT as indicated in the SupportedProtocolParametersValues record of the ATSupportedFlowProtocolParameters*PP* attribute. The fields of the ProtocolParameters record of the Flow*NN*FlowProtocolParametersRev attribute shall be set to values that are in accordance with those supported by the AT as indicated in the SupportedProtocolParametersValues record of the ATSupportedFlowProtocolParameters*PP* attribute. The fields of the ProtocolParameters record of the Flow*NN*RouteProtocolParametersFwd attribute shall be set to values that are in accordance with those supported by the AT as indicated in the SupportedProtocolParametersValues record of the ATSupportedRouteProtocolParameters*PP* attribute. The fields of the

ProtocolParameters record of the Flow*NN*RouteProtocolParametersRev attribute shall be set to values that are in accordance with those supported by the AT as indicated in the SupportedProtocolParametersValues record of the ATSupportedRouteProtocolParameters*PP* attribute.

If the Flow*NN*DataUnitFwd attribute of forward Link Flow *NN* is 0x00, then the data unit for the Link Flow shall be octets. Otherwise the data unit for the Link Flow shall be RLP packet payloads. If the Flow*NN*DataUnitRev attribute reverse Link Flow *NN* is 0x00, then the data unit for the Link Flow shall be octets. Otherwise the data unit for the Link Flow shall be RLP packet payloads.

If the access terminal wishes to associate one or more BCMCS flow IDs to a reservation KK, and if the BCMCSOverRLPAllowed is set to '1', then the access terminal may send AttributeUpdateRequest message containing Reservation*KK*BCMCSFlowIDAssociation attribute. If the access network receives an AttributeUpdateRequest message containing Reservation*KK*BCMCSFlowIDAssociation attribute, and if the access network accepts the BCMCS Flow ID(s) association to the reservation, then the access network shall respond with an AttributeUpdateAccept message. The access network shall not send AttributeUpdateRequest message containing Reservation*KK*BCMCSFlowIDAssociation attribute.

If the access terminal wishes to associate one or more BCMCS Programs to a reservation KK, and if the BCMCSOverRLPAllowed is set to '1', then the access terminal may send AttributeUpdateRequest message containing Reservation*KK*BCMCSProgramIDAssociation attribute. If the access network receives an AttributeUpdateRequest message containing Reservation*KK*BCMCSProgramIDAssociation attribute, and if the access network accepts the BCMCS Program(s) association to the reservation, then the access network shall respond with an AttributeUpdateAccept message. The access network shall not send AttributeUpdateRequest message containing Reservation*KK*BCMCSProgramIDAssociation attribute.

2.5.4.1.1 Initialization and Reset

The RLP initialization procedure initializes the RLP variables and data structures in one end of the link. The RLP reset procedure guarantees that RLP state variables on both sides are synchronized. The reset procedure includes initialization.

The access terminal and the access network shall perform the initialization procedures defined in 2.5.4.1.1.1.1 and 2.5.4.1.1.1.2 for both routes of all activated Link Flows if the protocol receives an *IdleState.ConnectionOpened* indication. The access network shall perform the initialization procedure defined in 2.5.4.1.1.1.1 for both routes of forward Link Flow *NN* when forward Link Flow *NN* is activated. The access terminal shall perform the initialization procedure defined in 2.5.4.1.1.1.2 for both routes of forward Link Flow *NN* when forward Link Flow *NN* is activated. The access terminal shall perform the initialization procedure defined in 2.5.4.1.1.1.1 for both routes of reverse Link Flow *NN* when reverse Link Flow *NN* is activated. The access network shall perform the initialization procedure defined in 2.5.4.1.1.1.2 for both routes of reverse Link Flow *NN* when reverse Link Flow *NN* is activated. Upon receiving an *InitializeRoute* command, the access terminal shall perform the initialization procedures defined in 2.5.4.1.1.1 for the specified Route of all activated

Link Flows. Upon receiving an *InitializeRoute* command, the access network shall perform the initialization procedures defined in 2.5.4.1.1.1 for the specified Route of all activated Link Flows.

2.5.4.1.1.1 Initialization Procedure

2.5.4.1.1.1.1 Initialization Procedure for the RLP Transmitter

When RLP transmitter performs the initialization procedure it shall:

- Reset the send state variable $V(S)_{NN,P}$ to zero, where *NN* indicates the Link Flow, and *P* indicates the Route which is being initialized, and
- clear the retransmission queues.

2.5.4.1.1.1.2 Initialization Procedure for the RLP Receiver

When RLP receiver performs the initialization procedure it shall:

- Reset the receive state variables $V(R)_{NN,P}$ and $V(N)_{NN,P}$ to zero, and
- clear the resequencing buffer.

2.5.4.1.1.2 Reset Procedure

2.5.4.1.1.2.1 Reset Procedure for the Initiating Side when it is an RLP Transmitter

If the side initiating a reset procedure is an RLP transmitter for the Route of the Link Flow (or of all Link Flows) being reset, then it shall send a ResetTxIndication message and enter the RLP Reset State.

Upon entering the RLP Reset state RLP transmitter shall:

- Perform the RLP transmitter initialization procedure defined in 2.5.4.1.1.1.1 for the Route being reset.
- If a Nak message is received for the Route of the Link Flow being reset while in the RLP Reset state, the message shall be ignored.
- If the RLP transmitter that initiated the reset procedure is an access terminal, and if a *PhysicalLayer.ReverseTrafficPacketsMissed* indication is received for the Route of the Link Flow being reset while RLP is in the Reset state, then the indication shall be ignored.
- The RLP transmitter should not transmit RLP packets while in the RLP Reset state.
- If RLP receives a ResetTxIndicationAck message for the Route of the Link Flow being reset while in the RLP Reset state, it shall send a ResetTxComplete message back and leave the RLP Reset state.
- If RLP receives an *IdleState.ConnectionOpened* indication while in the RLP Reset state, it shall leave the RLP Reset state.

If a ResetTxIndicationAck message is received for a Route while that Route is not in the RLP Reset state, the message shall be ignored.

2.5.4.1.1.2.2 Reset Procedure for Initiating Side when it is an RLP Receiver

If the side initiating a reset procedure is an RLP receiver for the Route of the Link Flow being reset, then it shall send a ResetRxIndication message and enter the RLP Reset State. Upon entering the RLP Reset state, the RLP receiver shall:

- Perform the RLP receiver initialization procedure defined in 2.5.4.1.1.1.2 for the Route being reset.
- Ignore all RLP data units received for the Route of the Link Flow being reset while in the RLP Reset state.
- When RLP receives a ResetRxComplete message for the Route of the Link Flow being reset, it shall leave the RLP Reset state.
- If RLP receives an *IdleState.ConnectionOpened* indication while in the RLP Reset state, it shall leave the RLP Reset state.

If a ResetRxComplete is received for a Route while the Route is not in the RLP Reset state, the message shall be ignored.

2.5.4.1.1.2.3 Reset Procedure for the Responding Side when it is an RLP Receiver

If the side responding to a reset procedure is an RLP receiver for the Route of the Link Flow being reset, then it shall respond with a ResetTxIndicationAck message upon receiving a ResetTxIndication message. After sending the message it shall enter the RLP Reset state for the Route being reset, if it was not already in the RLP Reset state. Upon entering the RLP Reset state RLP shall:

- Perform the RLP receiver initialization procedure defined in 2.5.4.1.1.1.2 for the Route being reset.
- Ignore all RLP data units received for the Route of the Link Flow being reset while in the RLP Reset state.
- When RLP receives a ResetTxComplete message for the Route of the Link Flow being reset, it shall leave the RLP Reset state.
- If RLP receives an *IdleState.ConnectionOpened* indication while in the RLP Reset state, it shall leave the RLP Reset state.

If a ResetTxComplete message is received for a Route while the Route is not in the RLP Reset state, the message shall be ignored.

2.5.4.1.1.2.4 Reset Procedure for the Responding Side when it is an RLP transmitter

If the side responding to a reset procedure is an RLP transmitter for the Route being reset, then it shall respond with a ResetRxComplete message upon receiving a ResetRxIndication message. After sending the message, it shall perform the RLP transmitter initialization procedure defined in 2.5.4.1.1.1.1 for the Route being reset.

2.5.4.1.1.2.5 RLP Reset Message Flows

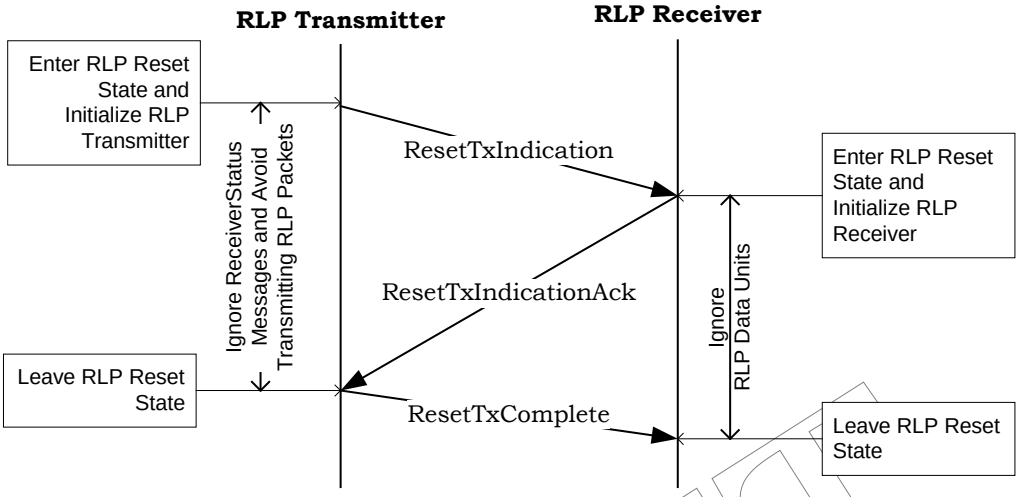

Figure 2.5.4.1.1.2.5-1. RLP Reset Procedure Initiated by RLP Transmitter

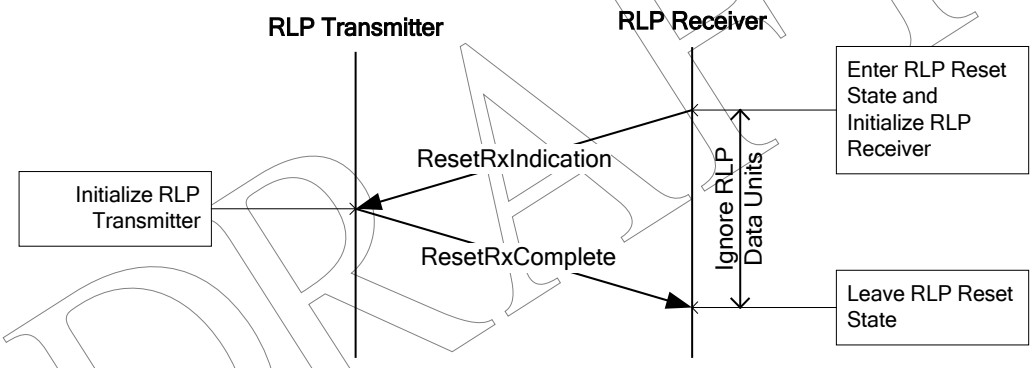

Figure 2.5.4.1.1.2.5-2. RLP Reset Procedure Initiated by RLP Receiver

2.5.4.2 Data Transfer

RLP is a Nak-based protocol with a sequence space of SequenceLength bits, where SequenceLength is indicated by the Flow*NN*SequenceLengthFwd and Flow*NN*SequenceLengthRev attribute for forward and reverse Link Flow *NN*, respectively.

All operations and comparisons performed on RLP packet sequence numbers shall be carried out in unsigned modulo 2^S arithmetic, where S represents the value of SequenceLength. For any RLP sequence number *N*, the sequence numbers in the range [$N+1$, $N+2^{S-1}-1$] shall be considered greater than *N* and the sequence numbers in the range [$N-2^{S-1}$, $N-1$] shall be considered smaller than *N*.

2.5.4.2.1 RLP Transmit Procedures

The RLP transmitter shall maintain a SequenceLength-bit variable $V(S)_{NN,P}$ for all transmitted RLP data units (see Figure 2.5.4.2.1-1), where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to *M*-1 inclusive, *P* is the Route indicator that takes

values of either A or B, and *M* is MaxNumLinkFlowsFwd or MaxNumLinkFlowsRev for a forward Link Flow or reverse Link Flow, respectively. $V(S)_{NN,P}$ is the sequence number of the next RLP data unit to be sent on Route *P* of Link Flow *NN*. The sequence number field (SEQ) in each new RLP packet transmitted shall be set to $V(S)_{NN,P}$, corresponding to the sequence number of the first data unit in the packet. If the data unit is octets, then the sequence number of the i^{th} octet in the packet (with the first octet being octet 0) is implicitly given by SEQ+*i*. $V(S)_{NN,P}$ shall be incremented for each data unit contained in the packet.

The RLP transmitter should allow sufficient time before deleting an RLP packet payload transmitted for the first time.

Upon receiving a Nak message, RLP shall transmit the missing data unit(s) (if any) conveyed by the Nak message if all of the following conditions are satisfied:

- the requested data units are available,
- the requested data units have not been retransmitted before in response to a Nak message, and
- if the data unit for the Link Flow is RLP packet payloads, the payload carrying capacity of the lower layer packet is not smaller than the size of the packet to be re-transmitted.

If the RLP transmitter is the access network, and the Nak message includes any sequence number greater than or equal to $V(S)_{NN,P}$, RLP shall perform the reset procedures specified in 2.5.4.1.1.2.1 for Route *P* of forward Link Flow *NN*. If the RLP transmitter is the access terminal, and the Nak message includes any sequence number greater than or equal to $V(S)_{NN,P}$, RLP shall perform the reset procedures specified in 2.5.4.1.1.2.1 for Route *P* of reverse Link Flow *NN*. If the Nak message does not include any sequence number greater than or equal to $V(S)_{NN,P}$ but the requested data units are not available for retransmissions, RLP shall ignore the Nak message for data units that are not available.

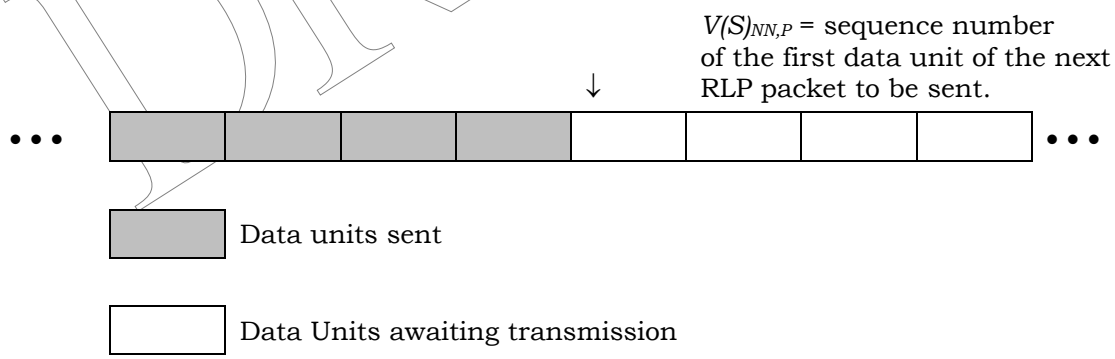

Figure 2.5.4.2.1-1. RLP Transmit Sequence Number Variable

Upon receiving a *PhysicalLayer.ReverseTrafficPacketsMissed* indication for reverse Link Flow *NN*, the RLP transmitter in the access terminal shall retransmit the requested data units(s) if and only if all of the following conditions are satisfied:

- Flow*NN*PhysicalLayerNakEnableRev attribute is set to 0x01,
- if the data unit for the Link Flow is RLP packet payloads, the payload carrying capacity of the lower layer packet is not smaller than the size of the packet to be re-transmitted,

- the requested data units have not been retransmitted before, and
- the requested data units are available.

If Flow*NN*NakEnableFwd is 0x01, then the transmitter at the access network for each Route of Link Flow *NN* shall meet the following requirements:

- After transmitting a packet, the RLP transmitter shall start an RLP flush timer for time FlushTimer, where FlushTimer is a parameter of the Flow*NN*TimersFwd attribute.
- If the RLP transmitter sends another packet before the RLP flush timer expires, the RLP transmitter shall reset and restart the timer.
- If the timer expires, the RLP transmitter shall disable the flush timer and the RLP transmitter should send an RLP packet that contains at least the data unit with sequence number $V(S)_{NN,P}$-1.

If Flow*NN*NakEnableRev is 0x01, then the transmitter at the access terminal for each Route of Link Flow *NN* shall meet the following requirements:

- After transmitting a packet, the RLP transmitter shall start an RLP flush timer for time FlushTimer, where FlushTimer is a parameter of the Flow*NN*TimersRev attribute.
- If the RLP transmitter sends another packet before the RLP flush timer expires, the RLP transmitter shall reset and restart the timer.
- If the timer expires, the RLP transmitter shall disable the flush timer and the RLP transmitter should send an RLP packet that contains at least the data unit with sequence number $V(S)_{NN,P}$-1.

The RLP transmitter should not transmit more than $2^{\text{SequenceLength}-1}$ first-time data units in any AbortTimer interval, where SequenceLength is the length of the SEQ field in the RLP header for the corresponding Link Flow.

2.5.4.2.1.1 Reservation State Maintenance

The ReservationLabel parameter of the Flow*NN*ReservationFwd or Flow*NN*ReservationRev attribute indicates the higher layer flows associated with Link Flow *NN*. Each ReservationLabel shall be associated with no more than one forward Link Flow. Each ReservationLabel shall be associated with no more than one reverse Link Flow.

Each Reservation can be in one of the following two states:

- Close State
- Open State

The transmitter should transmit higher layer octets[8] or packets using the Link Flow associated with the higher layer flow if the associated Link Flow is activated and if the Reservation is in the Open state. The transmitter should transmit higher layer octets

[8] Higher layer is represented by ProtocolID field of the Flow*NN*FlowProtocolParametersFwd/Flow*NN*FlowProtocolParametersRev attribute of the respective link flow *NN*.

belonging to a higher layer flow that is not associated with any Link Flow using the Link Flow with ReservationLabel 0xff if the higher layer flow provides an octet stream with octet-based HDLC-like framing to the Enhanced Multi-flow Packet Application. The transmitter may transmit higher layer octets belonging to a higher layer flow identified by a Reservation that is in the Close state using the Link Flow with ReservationLabel 0xff if the higher layer flow provides an octet stream with octet-based HDLC-like framing to the Enhanced Multi-flow Packet Application. The transmitter may transmit higher layer octets belonging to a higher layer flow identified by a Reservation that is bound to a de-activated Link Flow using the Link Flow with ReservationLabel 0xff if the higher layer flow provides an octet stream with octet-based HDLC-like framing to the Enhanced Multi-flow Packet Application. The transmitter should transmit higher layer packets belonging to a higher layer flow that is not associated with any Link Flow using the Link Flow with ReservationLabel 0xfe if the higher layer flow provides an IP packet stream to the Enhanced Multi-flow Packet Application. The transmitter may transmit higher layer packets belonging to a higher layer flow identified by a Reservation that is in the Close state using the Link Flow with ReservationLabel 0xfe if the higher layer flow provides an IP packet stream to the Enhanced Multi-flow Packet Application. The transmitter may transmit higher layer packets belonging to a higher layer flow identified by a Reservation that is bound to a de-activated Link Flow using the Link Flow with ReservationLabel 0xfe if the higher layer flow provides an IP packet stream to the Enhanced Multi-flow Packet Application.

If the ReservationLabel is associated with BCMCS flow(s), and if the Reservation is in the Open state, then the transmitter shall transmit the octets or packets of the BCMCS flow using the Link Flow associated with the BCMCS FlowID or BCMCS ProgramID. Otherwise the transmitter shall not transmit the octets or packets of the BCMCS flow.

The access terminal and the access network shall not perform any actions that will result in the number of Reverse Link Reservations in the Open state to exceed the value specified by MaxNumOpenReservationsRev. The access terminal and the access network shall not perform any actions that will result in the number of Forward Link Reservations in the Open state to exceed the value specified by MaxNumOpenReservationsFwd.

Figure 2.5.4.2.1-2 and Figure 2.5.4.2.1-3show the state transition diagram at the access terminal and the access network. State transitions that may be caused by *ConnectedState.ConnectionClosed* and *RouteUpdate.ConnectionLost* indications are not shown.

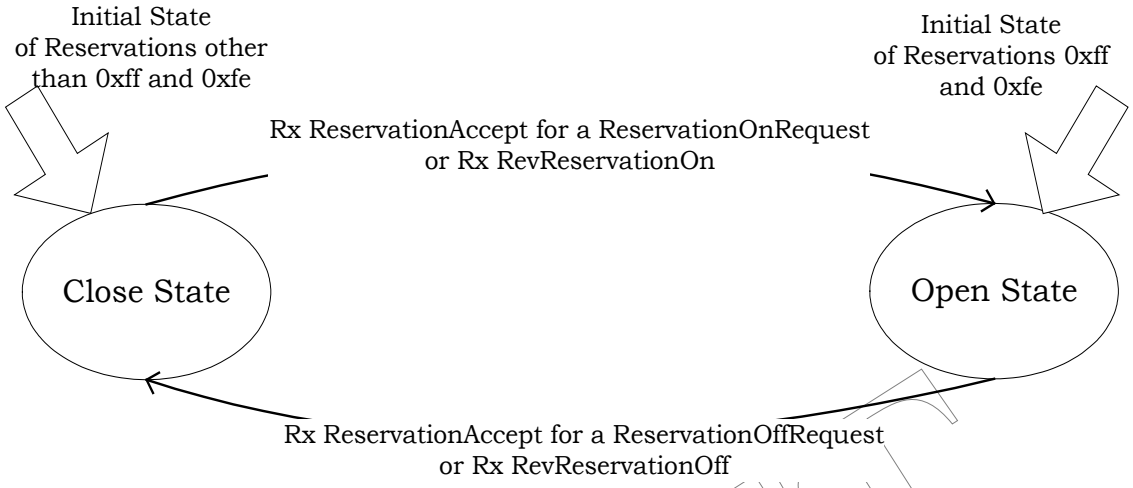

Figure 2.5.4.2.1-2. Reverse Link Reservation State Diagram (Access Terminal)

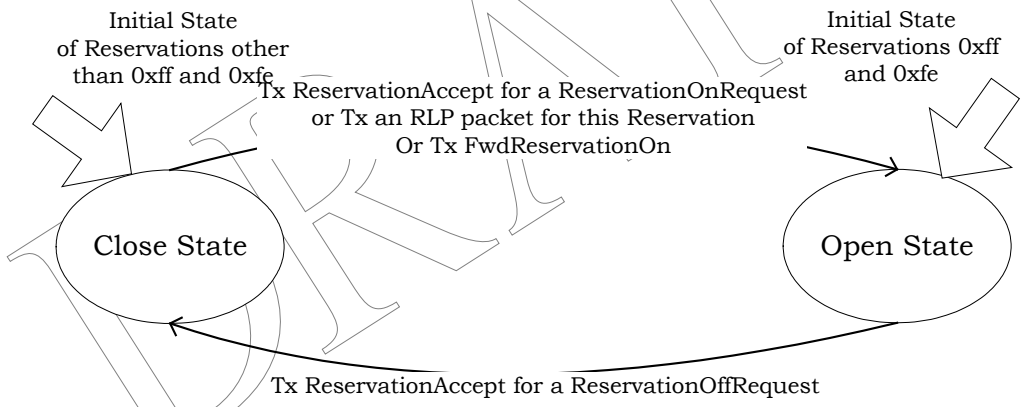

Figure 2.5.4.2.1-3. Forward Link Reservation State Diagram (Access Network)

2.5.4.2.1.1.1 State-independent Requirements

2.5.4.2.1.1.1.1 Access Terminal Requirements

Upon receiving a RevReservationOn message, the access terminal shall

- Respond with a ReservationAccept message within the time period specified by $T_{RLPResponse}$ of receiving the RevReservationOn message.
- Set the TransactionID field of the ReservationAccept message to that of the RevReservationOn message.

Upon receiving a RevReservationOff message, the access terminal shall

- Respond with a ReservationAccept message within the time period specified by $T_{RLPResponse}$ of receiving the RevReservationOff message.
- Set the TransactionID field of the ReservationAccept message to that of the RevReservationOff message.

Upon receiving a FwdReservationOn message, the access terminal shall

- Respond with a FwdReservationAck message within the time period specified by $T_{RLPResponse}$ of reception of the FwdReservationOn message.
- Set the TransactionID field of the FwdReservationAck message to that of the FwdReservationOn message.

Upon receiving a FwdReservationOff message, the access terminal shall

- Respond with a FwdReservationAck message within the time period specified by $T_{RLPResponse}$ of receiving the FwdReservationOff message.
- Set the TransactionID field of the FwdReservationAck message to that of the FwdReservationOff message.

If the access terminal receives a ReservationReject message from the access network with the RejectCode set to ReservationPending, the access terminal shall not send ReservationOnRequest for a PendingDuration period of time to the same access network. The access terminal shall stay in the monitor state until it receives the FwdReservationOn/ RevReservationOn message or the PendingDuration period is over.

2.5.4.2.1.1.1.2 Access Network Requirements

The access network may re-send a FwdReservationOn message if it does not receive a FwdReservationAck message containing the same TransactionID within the time period specified by $T_{RLPResponse}$ of sending the FwdReservationOn message.

The access network may re-send a FwdReservationOff message if it does not receive a FwdReservationAck message containing the same TransactionID within the time period specified by $T_{RLPResponse}$ of sending the FwdReservationOff message.

The access network may send a RevReservationOn message to transition the state of the reverse link Reservation of the access terminal to the Open state. The access network may re-send a RevReservationOn message if it does not receive a ReservationAccept message containing the same TransactionID within the time period specified by $T_{RLPResponse}$ of sending the RevReservationOn message.

The access network may send a RevReservationOff message to transition the state of the reverse link Reservation of the access terminal to the Close state. The access network may re-send a RevReservationOff message if it does not receive a ReservationAccept message containing the same TransactionID within the time period specified by $T_{RLPResponse}$ of sending the RevReservationOff message.

If the access network receives a ReservationOnRequest message, it shall

- Send either a ReservationAccept message or a ReservationReject message within the time period specified by $T_{RLPResponse}$ of reception of the ReservationOnRequest message. If the resources required for the Reservation *KK* are not available, the access network determines that queuing is required for the Reservation *KK*, and if one or both of the following conditions are satisfied:
  - Reservation*KK*ReservationQueuingSupported attribute is set to '0x01', or
  - Access network has received ReservationOnRequest message from the access terminal with the ReservationQueuingReq field for the Reservation *KK* set to '1'

  then the access network should send ReservationReject message with the RejectCode for the Reservation *KK* set to ReservationPending (0x01). Otherwise, the access network shall not send ReservationReject message with the RejectCode for the Reservation *KK* set to ReservationPending (0x01).
- If the access network sent a ReservationReject message with the RejectCode set to ReservationPending (0x01), then the access network shall queue the ReservationOnRequest up to PendingDuration period of time. During this time, the access network should send FwdReservationOn/ RevReservationOn message to transition the state of the forward link/reverse link Reservation of the access terminal to the Open state.
- Set the TransactionID field of the ReservationAccept or ReservationReject message to that of the ReservationOnRequest message.

If the access network receives a ReservationOffRequest message, it shall

- Send a ReservationAccept or a ReservationReject message within the time period specified by $T_{RLPResponse}$ of reception of the ReservationOffRequest message.
- Set the TransactionID field of the ReservationAccept or ReservationReject message to that of the ReservationOffRequest message.

2.5.4.2.1.1.2 Close State

2.5.4.2.1.1.2.1 Access Terminal Requirements

The access terminal shall not transmit PDUs from higher layer flows belonging to this Reservation using any Link Flow other than the Link Flow associated with ReservationLabel 0xff if the higher layer flow provides an octet stream with octet-based HDLC-like framing to the Enhanced Multi-flow Packet Application. The access terminal shall not transmit PDUs from higher layer flows belonging to this Reservation using any Link Flow other than the Link Flow associated with ReservationLabel 0xfe if the higher layer flow provides an IP packet stream to the Enhanced Multi-flow Packet Application. The access terminal may send a ReservationOnRequest message to request transition of the Reservation to the Open state[9]. The access terminal may re-send a ReservationOnRequest message if it does not

[9] Note that the ReservationOnRequest message supports requests for multiple Reservations on both the forward and reverse links. This arrangement allows requests for groups of Reservations (e.g., for

receive a corresponding ReservationAccept or ReservationReject message within the time period specified by $T_{RLPResponse}$ of sending the ReservationOnRequest message. If the ReservationOnRequest message contains a reverse Reservation, then the Reservation shall transition to the Open state when the access terminal receives the corresponding ReservationAccept message.

Upon receiving a RevReservationOn message, the access terminal shall transition the Reservation to the Open state. Upon receiving an *IdleState.ConnectionOpened* indication, the access terminal shall transition the Reservations to the Open State whose corresponding Reservation*KK*IdleStateRev attribute is 0x02, where *KK* is the two-digit hexadecimal ReservationLabel in the range 0x00 to 0xff inclusive.

2.5.4.2.1.1.2.2 Access Network Requirements

If the Reservation entered this state as a result of any condition other than the following conditions, then the access network shall send a FwdReservationOff message upon entering this state:

- the access network transmitted a ReservationAccept message in response to a ReservationOffRequest message requesting to transition the Reservation to the Close state, or
- Reservation*KK*IdleStateFwd attribute of the Reservation is 0x01 or 0x02, and the Reservation transitioned to the Close state because the Connection was closed or lost.

Upon sending a ReservationAccept message for a forward Reservation in response to a ReservationOnRequest message, the access network shall transition the Reservation to the Open state.

Upon sending a FwdReservationOn message, the access network shall transition the Reservation to the Open state. Upon receiving an *IdleState.ConnectionOpened* indication, the access network shall transition the Reservations to the Open state whose corresponding Reservation*KK*IdleStateFwd attribute is 0x02, where *KK* is the two-digit hexadecimal ReservationLabel in the range 0x00 to 0xff inclusive.

The access network may transmit SDUs from higher layer flows belonging to this Reservation using the Link Flow to which the Reservation is bound. Upon doing so, the access network shall transition the Reservation to the Open State.

2.5.4.2.1.1.3 Open State

2.5.4.2.1.1.3.1 Access Terminal Requirements

The access terminal may transmit PDUs from higher layer flows belonging to this Reservation using the Link Flow to which the Reservation is bound.

The access terminal may send a ReservationOffRequest message to request the transition of a Reservation to the Close state. The access terminal may re-send a ReservationOffRequest

---

bidirectional higher layer application flows) to be combined in the same ReservationOnRequest message.

message if it does not receive a ReservationAccept or ReservationReject message within the time period specified by $T_{RLPResponse}$ of sending the ReservationOffRequest message. If the ReservationOffRequest message contains a reverse Reservation, then the access terminal shall transition the Reservation to the Close state when the access terminal receives a ReservationAccept message.

Upon receiving a RevReservationOff message, the access terminal shall transition the Reservation to the Close state. Upon receiving a *ConnectedState.ConnectionClosed* indication, the access terminal shall transition to the Close state Reservations whose corresponding Reservation*KK*IdleStateRev attribute is 0x01 or 0x02 unless an access network initiated Connection is being opened at the same time[10], where *KK* is the two-digit hexadecimal ReservationLabel. Upon receiving an *IdleState.ConnectionFailed* indication, the access terminal shall transition to the Close state Reservations whose corresponding Reservation*KK*IdleStateRev attribute is 0x01 or 0x02, where *KK* is the two-digit hexadecimal ReservationLabel.

2.5.4.2.1.1.3.2 Access Network Requirements

The access network may transmit PDUs from higher layer flows belonging to this Reservation using the Link Flow to which the Reservation is bound.

- Upon sending a ReservationAccept message for a forward Reservation in response to a ReservationOffRequest message, the access network shall transition the Reservation to the Close state.

Upon receiving a *ConnectedState.ConnectionClosed* indication, the access network shall transition to the Close state Reservations whose corresponding Reservation*KK*IdleStateFwd attribute is 0x01 or 0x02 unless an access network initiated Connection is being opened at the same time[10], where *KK* is the two-digit hexadecimal ReservationLabel. Upon receiving a *RouteUpdate.ConnectionLost* or *IdleState.ConnectionFailed* indication, the access network shall transition to the Close state Reservations whose corresponding Reservation*KK*IdleStateFwd attribute is 0x01 or 0x02, where *KK* is the two-digit hexadecimal ReservationLabel.

If, for any *KK*, all of the following conditions are true, the access network shall take action within $T_{Turnaround}$, where $T_{Turnaround}$ is equal to 2 seconds, such that at least one of the following conditions would no longer be true (e.g., by modifying the value of Reservation*KK*QoSResponseFwd or by transitioning forward Reservation *KK* to the Close state):

- Reservation*KK*QoSRequestFwd is set to a non-default value.
- Forward Reservation *KK* is in the Open state.

[10] An access network can send ConnectionClose message of Connected State Protocol and TrafficChannelAssignment message of Route Update Protocol in the same security layer packet.

- Reservation*KK*QoSResponseFwd is set to the default value or the QoS_ATTRIBUTE_SET_ID field in Reservation*KK*QoSResponseFwd is not equal to the value of any QoS_ATTRIBUTE_SET_ID field in the corresponding Reservation*KK*QoSRequestFwd attribute (see [1]).

If, for any *KK*, all of the following conditions are true, the access network shall take action within $T_{Turnaround}$, where $T_{Turnaround}$ is equal to 2 seconds, such that at least one of the following conditions would no longer be true (e.g., by modifying the value of Reservation*KK*QoSResponseRev or by transitioning reverse Reservation *KK* to the Close state):

- Reservation*KK*QoSRequestRev is set to a non-default value.
- Reverse Reservation *KK* is in the Open state.
- Reservation*KK*QoSResponseRev is set to the default value or the QoS_ATTRIBUTE_SET_ID field in Reservation*KK*QoSResponseRev is not equal to the value of any QoS_ATTRIBUTE_SET_ID field in the corresponding Reservation*KK*QoSRequestRev attribute (see [1]).

2.5.4.2.2 RLP Receive Procedures

The RLP receiver shall maintain two SequenceLength-bit variables for receiving, $V(R)_{NN,P}$ and $V(N)_{NN,P}$ (see Figure 2.5.4.2.2-1), where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to *M*-1 inclusive, and *P* is the Route indicator that takes values of either A or B. *M* is the MaxNumLinkFlowsFwd or MaxNumLinkFlowsRev for a forward Link Flow or reverse Link Flow, respectively. $V(R)_{NN,P}$ contains the sequence number of the next data unit expected to arrive. $V(N)_{NN,P}$ contains the sequence number of the first missing data unit, as described below.

In addition, the RLP receiver shall keep track of the status of each data unit in its resequencing buffer indicating whether the data unit was received or not. Use of this status is implied in the following procedures. The RLP receiver informs the RLP transmitter of the status of data units in its receive buffer by sending a Nak message. The Nak message shall not convey status of data units with sequence number less than $V(N)_{NN,P}$.

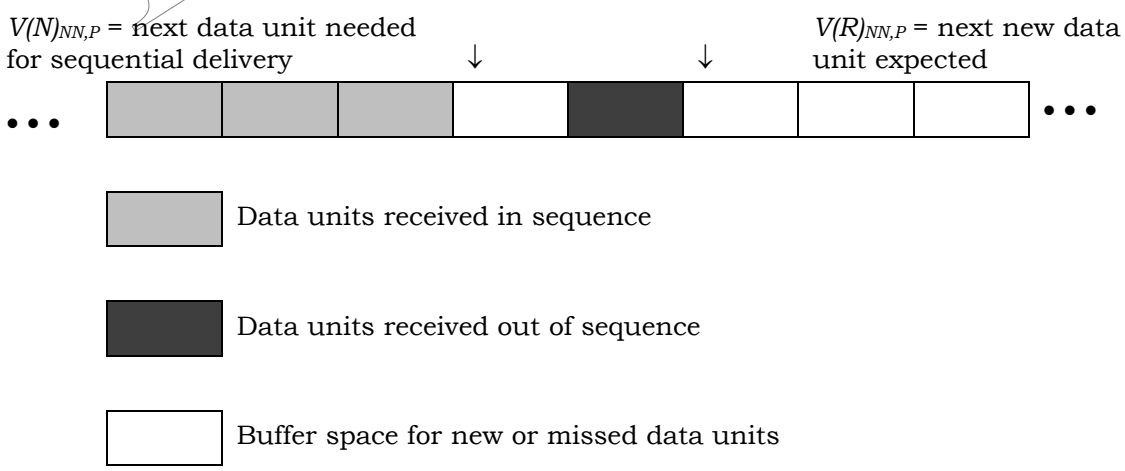

Figure 2.5.4.2.2-1. RLP Receive Sequence Number Variables

In the following, *X* denotes the sequence number of a received data unit. For each received data unit, RLP shall perform the following procedures:

- If $X < V(N)_{NN,P}$, the data unit shall be discarded as a duplicate.
- If $V(N)_{NN,P} \leq X < V(R)_{NN,P}$, and the data unit is not already stored in the resequencing buffer nor has been passed up to the Route Protocol, then:
  - RLP shall store the received data unit in the resequencing buffer.
  - If $X = V(N)_{NN,P}$, and if the Link Flow is carrying an octet stream, then RLP shall pass all contiguous octets in the resequencing buffer, from $V(N)_{NN,P}$ upward, to the Route Protocol. RLP shall then set $V(N)_{NN,P}$ to (LAST+1) where LAST is the sequence number of the last contiguous octet (i.e., the octet with the highest sequence number) received by the resequencing buffer.
  - If $X = V(N)_{NN,P}$, and if the Link Flow is carrying a packet stream, and if in-order delivery of Route Protocol packets is required, then RLP shall pass all contiguous complete Route Protocol packets in the resequencing buffer, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward, to the Route Protocol. RLP shall then set $V(N)_{NN,P}$ to (LAST+1) where LAST is the sequence number of the last contiguous data unit received by the resequencing buffer.
  - If the Link Flow is carrying a packet stream, and if in-order delivery of Route Protocol packets is not required, then RLP shall pass all complete Route Protocol packets in the resequencing buffer, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward, to the Route Protocol. RLP shall then set $V(N)_{NN,P}$ to (LAST+1) where LAST is the sequence number of the last contiguous data unit received by the resequencing buffer.
- If $V(N)_{NN,P} < X < V(R)_{NN,P}$, and the data unit is already stored in the resequencing buffer or has already been passed up to the Route Protocol, then the data unit shall be discarded as a duplicate.
- If $X = V(R)_{NN,P}$, then:
  - If $V(R)_{NN,P} = V(N)_{NN,P}$ and if the Link Flow is carrying an octet stream, then RLP shall increment $V(N)_{NN,P}$ and $V(R)_{NN,P}$ and shall pass the data unit to the Route Protocol.
  - If $V(R)_{NN,P} = V(N)_{NN,P}$, and if the Link Flow is carrying a packet stream, then RLP shall increment $V(N)_{NN,P}$ and $V(R)_{NN,P}$, shall store the data unit in the resequencing buffer, and shall pass all complete Route Protocol packets in the resequencing buffer, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward, to the Route Protocol.

- If $V(R)_{NN,P} \neq V(N)_{NN,P}$, RLP shall increment $V(R)_{NN,P}$ and shall store the data unit in the resequencing buffer. If the Link Flow is carrying a packet stream, and if in-order delivery of Route Protocol packets is not required, then RLP shall pass all complete Route Protocol packets in the resequencing buffer, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward, to the Route Protocol.

- If $X > V(R)_{NN,P}$, then:
  - RLP shall store the data unit in the resequencing buffer.
  - If the Link Flow is carrying a packet stream, and if in-order delivery of Route Protocol packets is not required, then RLP shall pass all complete Route Protocol packets in the resequencing buffer, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward, to the Route Protocol.
  - If the RLP receiver is an access network, then RLP shall set an RLP abort timer to AbortTimer, where AbortTimer is a parameter of the Flow*NN*TimersRev attribute, for each missing RLP data unit from $V(R)_{NN,P}$ to X-1, inclusive. If the RLP receiver is an access terminal, then RLP shall set an RLP abort timer to AbortTimer, where AbortTimer is a parameter of the Flow*NN*TimersFwd attribute, for each missing RLP data unit from $V(R)_{NN,P}$ to X-1, inclusive.
  - If the RLP receiver is an access terminal, and if the Flow*NN*NakEnableFwd attribute is set to 0x01, then RLP shall set a Nak delay timer to Flow*NN*NakDelayTimeFwd for each missing RLP data unit from $V(R)_{NN,P}$ to X-1, inclusive.
  - If the RLP receiver is an access network, and if the Flow*NN*NakEnableRev attribute is set to 0x01, then RLP shall send a Nak message.
  - RLP shall set $V(R)_{NN,P}$ to X+1.
  - If a missing data unit has not been received when its Nak delay timer expires, then the access terminal shall send a Nak message reporting this missing data unit.

For each missing data unit from $V(N)_{NN,P}$ upward up to $V(R)_{NN,P}$-1, inclusive, RLP shall perform the following in the order specified, if the RLP abort timer of the missing data unit has expired:

- If the Link Flow is carrying an octet stream, RLP shall pass all octets in the resequencing buffer up to the next missing octet, in order of sequence number, to the Route Protocol. RLP shall skip any missing octets.
- If the Link Flow is carrying a packet stream, and if in-order delivery of Route Protocol packets is required, then RLP shall pass all complete Route Protocol packets, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward up to the next missing data unit, to the Route Protocol. RLP may pass to the Route Protocol partially received packets with an indication of partial packet delivery.

- RLP shall set $V(N)_{NN,P}$ to the sequence number of the next missing data unit, or to $V(R)_{NN,P}$ if there are no remaining missing data units.

Further recovery is the responsibility of higher layer protocols.

2.5.4.3 RLP Packet Header

The RLP packet header, which precedes the RLP payload, has the following format:

Field	Length (bits)
LinkFlowNumber	5
Route	1
SEQ	6, 14, or 22
FirstDataUnit	1
LastDataUnit	1

LinkFlowNumber — The identifier for this Link Flow.

Route — If this RLP packet is sent on Route A, then the sender shall set this field to '0'. Otherwise, the sender shall set this field to '1'.

SEQ — The RLP sequence number of the first data unit in the RLP payload[11]. If this RLP packet is being sent on the forward link, the length of this field is indicated by the Flow*NN*SequenceLengthFwd attribute corresponding to this flow. If this RLP packet is being sent on the reverse link, the length of this field is indicated by the Flow*NN*SequenceLengthRev attribute corresponding to this flow.

FirstDataUnit — If the Link Flow is carrying an octet stream, then the sender shall set this field to '0'. Otherwise, the sender shall set this field as follows:

If the payload of this RLP packet is the first segment of a Route Protocol packet, then the sender shall set this field to '1'. Otherwise, the sender shall set this field to '0'.

LastDataUnit — If the Link Flow is carrying an octet stream, then the sender shall set this field to '0'. Otherwise, the sender shall set this field as follows:

If the payload of this RLP packet is the last segment of a Route Protocol packet, then the sender shall set this field to '1'. Otherwise, the sender shall set this field to '0'.

[11] When data unit is set to RLP payload, the RLP packet contains one data unit.

2.5.4.4 Message Formats

The messages described in this section control the function of the RLP. These messages are exchanged between the access terminal and the access network using the SNP.

2.5.4.4.1 ResetTxIndication

The RLP transmitter in the access terminal or the access network sends the ResetTxIndication message to reset its peer RLP receiver.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved	2

MessageID The sender shall set this field to 0x00.

LinkFlowNumber The sender shall set this field to the Link Flow that is reset. The sender shall set this field to '11111' to reset all Link Flows.

Route If Route A is reset, then the sender shall set this field to '0'. If Route B is reset, then the sender shall set this field to '1'.

Reserved The sender shall set this field to '00'. The receiver shall ignore this field.

Channels	FTC RTC
Addressing	unicast

SLP	Reliable
Priority	50

2.5.4.4.2 ResetRxIndication

The RLP receiver in the access terminal or the access network sends the ResetRxIndication message to reset its peer RLP transmitter.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved	2

MessageID The sender shall set this field to 0x01.

LinkFlowNumber The sender shall set this field to the Link Flow that is reset. The sender shall set this field to '11111' to reset all Link Flows.

Route If Route A is reset, then the sender shall set this field to '0'. If Route B is reset, then the sender shall set this field to '1'.

Reserved The sender shall set this field to '00'. The receiver shall ignore this field.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	50

2.5.4.4.3 ResetTxIndicationAck

The RLP receiver in the access terminal or the access network sends the ResetTxIndicationAck message in response to a ResetTxIndication message.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved	2

MessageID The sender shall set this field to 0x0d.

LinkFlowNumber The sender shall set this field to the Link Flow that is reset. If this message is being sent in response to a ResetTxIndication message that required reset of all Link Flows, then the sender shall set this field to '11111'.

Route If Route A is reset, then the sender shall set this field to '0'. If Route B is reset, then the sender shall set this field to '1'.

Reserved The sender shall set this field to '00'. The receiver shall ignore this field.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	50

2.5.4.4.4 ResetTxComplete

The RLP transmitter in the access terminal or the access network sends the ResetTxComplete message to complete the RLP reset procedure.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved	2

MessageID The sender shall set this field to 0x0e.

LinkFlowNumber The sender shall set this field to the Link Flow that is reset. If all Link Flows were reset, then the sender shall set this field to ''11111'.

Route If Route A is reset, then the sender shall set this field to '0'. If Route B is reset, then the sender shall set this field to '1'.

Reserved The sender shall set this field to '00'. The receiver shall ignore this field.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	50

2.5.4.4.5 ResetRxComplete

The RLP transmitter in the access terminal or the access network sends the ResetRxComplete message to complete the RLP reset procedure.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved	2

MessageID The sender shall set this field to 0x0f.

LinkFlowNumber The sender shall set this field to the Link Flow that is reset. If all Link Flows were reset, then the sender shall set this field to '11111'.

Route If Route A is reset, then the sender shall set this field to '0'. If Route B is reset, then the sender shall set this field to '1'.

Reserved The sender shall set this field to '00'. The receiver shall ignore this field.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	50

2.5.4.4.6 Nak

The access terminal and the access network send the Nak message to request the retransmission of one or more RLP data units.

Field	**Length (bits)**
MessageID	8
LinkFlowNumber	5
Route	1
Reserved1	2
SequenceLength	8
ReportCount	8
ReportCount occurrences of the following two fields:	
FirstErasedDataUnit	SequenceLength
WindowLen	SequenceLength
VR	SequenceLength
Reserved2	0 – 7 (as needed)

MessageID The sender shall set this field to 0x02.

LinkFlowNumber The sender shall set this field to the Link Flow for which this Nak is being sent.

Route If this Nak is being sent for Route A, then the sender shall set this field to '0'. Otherwise, the sender shall set this field to '1'.

Reserved1 The sender shall set this field to '00'. The receiver shall ignore this field.

SequenceLength The sender shall set this field to the length of the sequence number as indicated by the Flow*NN*SequenceLengthFwd or Flow*NN*SequenceLengthRev attribute for forward or reverse Link Flow *NN*, respectively.

ReportCount The sender shall set this field to the number of Report records included in this message. The sender shall include ReportCount occurrences of the following two fields with the message.

Sequences of erased data units shall be listed in the ascending order of RLP sequence number associated with FirstErasedDataUnit.

FirstErasedDataUnit The sender shall set this field to the sequence number of the first RLP data unit erased in a sequence of erased data units.

WindowLen The sender shall set this field to the length of the erased window in units of data units.

VR The sender shall set this field to $V(R)_{NN,P.}$

Reserved2 The sender shall add reserved bits to make the length of the entire message an integer number of octets. The sender shall set these bits to '0'. The receiver shall ignore this field.

Channels	FTC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	50

2.5.4.4.7 ReservationOnRequest

The access terminal sends this message to request transition of one or more Reservations to the Open State.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8
ReservationCount occurrences of the following two fields:	
Link	1
ReservationLabel	8
EmergencyIndication	0 or 1
ReservationQueuingReq	0 or 1
Reserved	0 – 7 (as needed)

MessageID The access terminal shall set this field to 0x16.

TransactionID — The access terminal shall set this field to one more (modulo 256) than the TransactionID field of the last ReservationOnRequest or ReservationOffRequest message sent by the access terminal. If this is the first ReservationOnRequest or ReservationOffRequest message sent by the access terminal, then the access terminal shall set this field to zero.

ReservationCount — The access terminal shall set this field to the number of the following two fields in this message.

Link — If this request is for a forward Reservation, then the access terminal shall set this field to '1'. If this request is for a reverse Reservation, then the access terminal shall set this field to '0'.

ReservationLabel — The access terminal shall set this field to the ReservationLabel for which this request is generated.

EmergencyIndication

The access terminal shall include this field if any of the non-reserved fields that follow this field are included in the message.
If included, the access terminal shall set this field as follows: If this is an emergency ReservationOnRequest, then the access terminal shall set this field to '1'. Otherwise, the access terminal shall set this field to '0'.

ReservationQueuingReq

The access terminal shall include this field if any of the non-reserved fields that follow this field are included in the message or if the access terminal wants to request queuing. If this field is included, the access terminal shall set this field as follows: If the access terminal requests that the queuing treatment be enabled in the access network for this ReservationOnRequest message, then the access terminal shall set this field to '1'. Otherwise, the access terminal shall set this field to '0'.

Reserved — The access terminal shall add reserved bits to make the length of the entire message an integer number of octets. The access terminal shall set these bits to zero. The access network shall ignore this field.

Channels	AC RTC
Addressing	unicast

SLP	Best Effort
Priority	40

2.5.4.4.8 ReservationOffRequest

The access terminal sends this message to request transition of one or more Reservations to the Close State.

Field	**Length (bits)**
MessageID	8
TransactionID	8
ReservationCount	8
ReservationCount occurrences of the following two fields:	
Link	1
ReservationLabel	8
Reserved	0 – 7 (as needed)

MessageID — The access terminal shall set this field to 0x17.

TransactionID — The access terminal shall set this field to one more (modulo 256) than the TransactionID field of the last ReservationOnRequest or ReservationOffRequest message sent by the access terminal. If this is the first ReservationOnRequest or ReservationOffRequest message sent by the access terminal, then the access terminal shall set this field to zero.

ReservationCount — The access terminal shall set this field to the number of the following two fields in this message.

Link — If this request is for a forward Reservation, then the access terminal shall set this field to '1'. If this request is for a reverse Reservation, then the access terminal shall set this field to '0'.

ReservationLabel — The access terminal shall set this field to the Reservation for which this request is generated.

Reserved — The access terminal shall add reserved bits to make the length of the entire message an integer number of octets. The access terminal shall set these bits to zero. The access network shall ignore this field.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.5.4.4.9 ReservationAccept

The access network sends this message to acknowledge reception of and allow the state transition requested by a ReservationOnRequest or ReservationOffRequest message. The access terminal sends this message to acknowledge reception of and accept the state transition requested by a RevReservationOn or RevReservationOff message.

Field	**Length (bits)**
MessageID	8
TransactionID	8

MessageID The sender shall set this field to 0x18.

TransactionID The access network shall set this field to the TransactionID field of the ReservationOnRequest or ReservationOffRequest message to which the access network is responding. The access terminal shall set this field to the TransactionID field of the RevReservationOn or RevReservationOff message to which the access terminal is responding.

Channels	CC FTC RTC AC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.5.4.4.10 ReservationReject

The access network sends this message to acknowledge reception of and deny the state transition requested by a ReservationOnRequest or ReservationOffRequest message.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8

ReservationCount occurrences of the following two fields:

AllowableLink	1
AllowableReservationLabel	8

ReservationCount occurrences of the following two fields:

RejectCode	0 or 4
PendingDuration	0 or 5

Reserved	0 – 7 (as needed)

MessageID The access network shall set this field to 0x19.

TransactionID The access network shall set this field to the TransactionID field of the ReservationOnRequest or ReservationOffRequest message to which the access network is responding.

ReservationCount The access network shall set this field to the number of the following two fields in this message.

AllowableLink If the Reservation for which the access network would have allowed the state transition requested in the ReservationOnRequest or ReservationOffRequest message is a forward Reservation, then the access network shall set this field to '1'. If the Reservation for which the access network would have allowed the state transition requested in the ReservationOnRequest or ReservationOffRequest message is a reverse Reservation, then the access network shall set this field to '0'.

AllowableReservationLabel
The access network shall set this field to the ReservationLabel for which the access network would have allowed the state transition requested in the ReservationOnRequest or ReservationOffRequest message.

RejectCode If included, the access network shall set this field as follows: The access network shall set the RejectCode to indicate the Reject Code.

Field value	Description
0x0	General
0x1	ReservationPending
All other values are reserved	

PendingDuration — The access network shall include this field if RejectCode is included and is set to ReservationPending. If this field is included, the access network shall set this field to the pending duration in units of seconds for this reservation.

Reserved — The access network shall add reserved bits to make the length of the entire message an integer number of octets. The access network shall set these bits to zero. The access terminal shall ignore this field.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.5.4.4.11 RevReservationOn

The access network sends this message to transition a reverse Reservation to the Open state.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8
ReservationCount occurrences of the following field:	
ReservationLabel	8

MessageID — The access network shall set this field to 0x1a.

TransactionID — The access network shall set this field to one more (modulo 256) than the TransactionID field of the last RevReservationOn or RevReservationOff message sent by the access network. If this is the first RevReservationOn or RevReservationOff message sent by the access network, then the access network shall set this field to zero.

ReservationCount — The access network shall set this field to the number of ReservationLabel fields in this message.

ReservationLabel — The access network shall set this field to the Reservation which is to be transitioned to the Open state.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.5.4.4.12 RevReservationOff

The access network sends this message to transition a reverse Reservation to the Close state.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8
ReservationCount occurrences of the following field:	
ReservationLabel	8

MessageID The access network shall set this field to 0x1b.

TransactionID The access network shall set this field to one more (modulo 256) than the TransactionID field of the last RevReservationOn or RevReservationOff message sent by the access network. If this is the first RevReservationOn or RevReservationOff message sent by the access network, then the access network shall set this field to zero.

ReservationCount The access network shall set this field to the number of ReservationLabel fields in this message.

ReservationLabel The access network shall set this field to the Reservation that is to be transitioned to the Close state.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.5.4.4.13 FwdReservationOff

The access network sends this message to inform the access terminal when a forward Reservation transitions to the Close state.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8

ReservationCount occurrences of the following field:

ReservationLabel	8

MessageID The access network shall set this field to 0x22.

TransactionID The access network shall set this field to one more (modulo 256) than the TransactionID field of the last FwdReservationOn or FwdReservationOff message sent by the access network. If this is the first FwdReservationOn or FwdReservationOff message sent by the access network, then the access network shall set this field to zero.

ReservationCount The access network shall set this field to the number of ReservationLabel fields in this message.

ReservationLabel The access network shall set this field to the Reservation transitioned to the Close state.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.5.4.4.14 FwdReservationOn

The access network sends this message to inform the access terminal when a forward Reservation transitions to the Open state.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8

ReservationCount occurrences of the following field:

ReservationLabel	8

MessageID The access network shall set this field to 0x23.

TransactionID The access network shall set this field to one more (modulo 256) than the TransactionID field of the last FwdReservationOn or FwdReservationOff message sent by the access network. If this is the first FwdReservationOn or FwdReservationOff message sent by the access network, then the access network shall set this field to zero.

ReservationCount The access network shall set this field to the number of ReservationLabel fields in this message.

ReservationLabel The access network shall set this field to the Reservation that transitioned to the Open state.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.5.4.4.15 FwdReservationAck

The access terminal sends this message to acknowledge reception of the FwdReservationOn or the FwdReservationOff message and to accept the related state transition.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access terminal shall set this field to 0x24.

TransactionID The access terminal shall set this field to the TransactionID field of the FwdReservationOn or FwdReservationOff message to which the access terminal is responding.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.5.4.4.16 AttributeUpdateRequest

The sender sends an AttributeUpdateRequest message to offer an attribute value for a given attribute.

Field	Length (bits)
MessageID	8
TransactionID	8
One or more instances of the following record	
AttributeRecord	Attribute dependent

MessageID The sender shall set this field to 0x52.

TransactionID The sender shall increment this value for each new AttributeUpdateRequest message sent.

AttributeRecord The format of this record is specified in [8].

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

2.5.4.4.17 AttributeUpdateAccept

The sender sends an AttributeUpdateAccept message in response to an AttributeUpdateRequest message to accept the offered attribute values.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The sender shall set this field to 0x53.

TransactionID The sender shall set this value to the TransactionID field of the corresponding AttributeUpdateRequest message.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

2.5.4.4.18 AttributeUpdateReject

The access network sends an AttributeUpdateReject message in response to an AttributeUpdateRequest message to reject the offered attribute values.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access network shall set this field to 0x54.

TransactionID The sender shall set this value to the TransactionID field of the corresponding AttributeUpdateRequest message.

Channels	FTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

2.5.4.5 Interface to Other Protocols

2.5.4.5.1 Commands

This protocol does not issue any commands.

2.5.4.5.2 Indications

This protocol registers to receive the following indications:

- *IdleState.ConnectionOpened*
- *IdleState.ConnectionFailed*
- *PhysicalLayer.ReverseTrafficPacketsMissed* along with parameters indicating the Link Flow number and missing data units.
- *ConnectedState.ConnectionClosed*
- *RouteUpdate.ConnectionLost*

2.5.4.6 RLP Packet Priorities

The sender shall assign priority between 60 and 70 inclusive to RLP packets. For a given Link Flow, the sender shall assign higher priority (lower number) to packets containing retransmitted application traffic than packets containing only first time transmissions. If Flow*NN*TransmitAbortTimerRev is not set to 0x00, then the access terminal should transmit a higher layer data unit within Flow*NN*TransmitAbortTimerRev time of the higher layer data unit being received by the Enhanced Multi-flow Packet Application. The access terminal may use the Flow*NN*TransmitAbortTimerRev attribute to determine the priority of reverse RLP packets.

Type of RLP Packet	Channel	Addressing	Priority
Packet containing only First Time Transmissions	FTC, RTC	unicast	Between 60 and 70 inclusive
Packet containing re-transmitted application traffic	FTC, RTC	unicast	Between 60 and 70 inclusive

2.5.5 Protocol Numeric Constants

Constant	Meaning	Value
$T_{RLPResponse}$	Time period within which the access network is to respond to ReservationOnRequest and ReservationOffRequest messages.	1 second

1

2.6 Data Over Signaling Protocol

2.6.1 Overview

The Data Over Signaling Protocol provides transmission and duplicate detection of higher layer packets using signaling messages. Each Link flow provides two instances of the Data Over Signaling Protocol, one associated with Route A of the Link flow, and the other associated with Route B[12]. A higher layer packet is carried in a DataOverSignaling message. The Data Over Signaling Protocol uses message sequence numbers in the DataOverSignaling message to provide duplicate detection. Data Over Signaling Protocol is associated with the Enhanced Multi-Flow Packet Application. The application subtype for this application is defined in [3].

2.6.2 Primitives and Public Data

2.6.2.1 Commands

This protocol does not define any commands.

2.6.2.2 Return Indications

This protocol does not return any indications.

2.6.3 Protocol Data Unit

The transmission unit of this protocol is a DataOverSignaling message. The DataOverSignaling message carries payload on behalf of the higher layer. This protocol uses the Signaling Application to transmit and receive messages.

2.6.4 Procedures and Messages for the InUse Instance of the Protocol

2.6.4.1 Procedures

If Flow*NN*DataOverSignalingAllowedRev is set to 0x00, the access terminal shall not send a DataOverSignaling message for Link Flow *NN*. The sender shall set the MessageSequence field of a DataOverSignaling message to $V(S_P)$ value maintained by the sender for the Route *P* on which the DataOverSignaling message was sent. Each time the sender sends a new DataOverSignaling message, it shall increment the value of $V(S_P)$. If the sender does not receive a DataOverSignalingAck message within an implementation specific time interval in response to a DataOverSignaling message requiring an acknowledgment, then the sender may retransmit the DataOverSignaling message containing the same higher layer packet and the same MessageSequence an implementation specific number of times.

[12] Note that the all instances of the Data Over Signaling Protocol associated with a Route share the same MessageSequence space.

The access terminal or the access network shall not send a DataOverSignaling message if the associated Link Flow for which the DataOverSignaling message is carrying payload is deactivated, or if the associated Reservation is in the Close state.

Upon receiving a DataOverSignaling message, the receiver shall perform the following:

- If Reset is set to '1' and the receiver is the access terminal, the receiver shall perform the following:
  - If Route is set to '0', the receiver shall set $V(R_A)$ to (MessageSequence – 1) mod 64.
  - If Route is set to '1', the receiver shall set $V(R_B)$ to (MessageSequence – 1) mod 64.
- The receiver shall validate the message using the procedure defined in the Sequence Number Validation Procedure of [8] by setting the variable V(R) defined in [8] to the $V(R_P)$ value maintained by the receiver for the Route *P* on which the DataOverSignaling message was received, and by setting S = 6.
- The receiver shall discard the DataOverSignaling message if it is invalid. If the DataOverSignaling message is valid, then the receiver shall pass the HigherLayerPacket field of the DataOverSignaling message to the higher layer. If the receiver is an access terminal, then the higher layer is indicated by the ProtocolID field of the Flow*NN*RouteProtocolParametersFwd attribute, where *NN* is the Link Flow with which the DataOverSignaling message is associated. If the receiver is an access network, then the higher layer is indicated by the ProtocolID field of the Flow*NN*RouteProtocolParametersRev attribute, where *NN* is the Link Flow with which the DataOverSignaling message is associated.
- If the AckRequired field of the DataOverSignaling message is '1', then the receiver shall respond with a DataOverSignalingAck message with AckSequence field set to the MessageSequence field of the DataOverSignaling message.

2.6.4.2 Message Formats

The messages described in this section are exchanged between the access terminal and the access network using the Signaling Application.

2.6.4.2.1 DataOverSignaling

The access network or the access terminal sends the DataOverSignaling message to transmit a higher layer packet.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
AckRequired	1
Reset	1
Reserved	2
MessageSequence	6
HigherLayerPacket	Variable Length

MessageID The sender shall set this field to 0x14.

LinkFlowNumber The sender shall set this field to the Link Flow with which this DataOverSignaling message is associated.

Route If this DataOverSignaling message is associated with Route A, then the sender shall set this field to '0'. If this DataOverSignaling message is associated with Route B, then the sender shall set this field to '1'.

AckRequired The sender shall set this field to '1' if the receiver is required to acknowledge the receipt of this message. Otherwise, the sender shall set this field to '0'.

Reset The access terminal shall set this field to '0'. The access network may set this field to '1' to indicate that the access terminal is to reset its V(R) for the indicated route. The access network may set this field to '0' to indicate that the access terminal is not required to reset its V(R).

Reserved The sender shall set this field to '00'. The receiver shall ignore this field.

MessageSequence The sender shall set this field to the $V(S_P)$ value maintained by the sender for the Route *P* on which the DataOverSignaling message was sent.

HigherLayerPacket The sender shall set this field to an entire higher layer packet[13]. The length of the higher layer packet shall be an integer number of octets.

Channels	CC AC FTC

SLP	Best Effort

[13] For example, if the higher layer packet is an HDLC frame, then the entire HDLC frame is included.

Addressing	unicast	**Priority**	20 to 50 (inclusive)

The sender shall assign message priority in the range 20 to 50, inclusive, depending on the priority of the higher layer packet carried as payload in this message.

2.6.4.2.2 DataOverSignalingAck

The access network or the access terminal sends a DataOverSignalingAck message to acknowledge receipt of a DataOverSignaling message.

Field	Length (bits)
MessageID	8
Route	1
AckSequence	6
Reserved	1

MessageID — The sender shall set this field to 0x15.

Route — If this message is acknowledging a DataOverSignaling received on Route A, then the sender shall set this field to '0'. Otherwise the sender shall set this field to '1'.

AckSequence — The sender shall set this field to the MessageSequence field of the DataOverSignaling message whose receipt is being acknowledged.

Reserved — The sender shall set this field to '0'. The receiver shall ignore this field.

Channels	CC AC FTC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.6.4.3 Interface to Other Protocols

2.6.4.3.1 Commands

This protocol does not issue any commands.

2.6.4.3.2 Indications

This protocol does not register to receive any indications.

2.7 Location Update Protocol

2.7.1 Overview

The Location Update Protocol defines location update procedures and messages for mobility management for the Enhanced Multi-Flow Packet Application.

The Location Update Protocol is a protocol associated with the Enhanced Multi-Flow Packet Application. The application subtype for this application is defined in [3].

2.7.2 Primitives and Public Data

2.7.2.1 Commands

This protocol does not define any commands.

2.7.2.2 Return Indications

This protocol does not return any indications.

2.7.3 Protocol Data Unit

The transmission unit of this protocol is a message. This is a control protocol; and, therefore, it does not carry payload on behalf of other layers or protocols.

2.7.4 Procedures and Messages for the InUse Instance of the Protocol

2.7.4.1 Procedures

2.7.4.1.1 Access Network Requirements

If the protocol receives an *AddressManagement.SubnetChanged* indication, the access network:

- May send a LocationRequest message to query the Location information.
- May send a LocationAssignment message to update the Location information.
- May send a StorageBLOBRequest message to query the stored BLOB.
- May send a StorageBLOBAssignment message to update the stored BLOB.

2.7.4.1.2 Access Terminal Requirements

If the access terminal receives a LocationRequest message, it shall send a LocationNotification message. If the access terminal has a stored value for the LocationValue parameter, the access terminal shall set the LocationType, LocationLength, and LocationValue fields in this message to its stored values of these fields. If the access terminal does not have a stored value for the LocationValue parameter, the access terminal shall omit the LocationLength and LocationValue fields in this message.

If the access terminal receives a LocationAssignment message, it shall send a LocationComplete message and the access terminal shall store the value of the

LocationType, LocationLength, and LocationValue fields of the LocationAssignment message in LocationType, LocationLength, and LocationValue variables, respectively.

If the access terminal receives a StorageBLOBRequest message, it shall send a StorageBLOBNotification message. If the access terminal has a stored value for the StorageBLOB parameter, the access terminal shall set the StorageBLOBLength and StorageBLOB fields in this message to its stored values of these fields. If the access terminal does not have a stored value for the StorageBLOB parameter, the access terminal shall set the StorageBLOBLength field to zero and shall omit the StorageBLOB fields in this message.

If the access terminal receives a StorageBLOBAssignment message, it shall send a StorageBLOBComplete message and the access terminal shall store the value of the StorageBLOBLength and StorageBLOB fields of the StorageBLOBAssignment message in StorageBLOBLength and StorageBLOB variables, respectively.

2.7.4.2 Message Formats

2.7.4.2.1 LocationRequest

The access network uses this message to query the access terminal of its Location information.

Field	Length (bits)
MessageID	8

MessageID The access network shall set this field to 0x03.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.7.4.2.2 LocationNotification

The access terminal sends the LocationNotification message either in response to the LocationRequest message or in an unsolicited manner as specified in [11] or [13] if the configured value of the RANHandoff attribute is 0x01.

Field	Length (bits)
MessageID	8
LocationType	8
LocationLength	0 or 8
LocationValue	0 or 8 × LocationLength

MessageID The access terminal shall set this field to 0x04.

LocationType — The access terminal shall set this field to zero if the value of its stored LocationValue is NULL; otherwise, the access terminal shall set this field to the stored value of LocationType.

LocationLength — The access terminal shall not include this field if the value of its stored LocationValue is NULL; otherwise, the access terminal shall set this field to the stored value of LocationLength.

LocationValue — The access terminal shall not include this field if the value of its stored LocationValue is NULL; otherwise, the access terminal shall set this field to the stored value of LocationValue.

Channels	AC RTC
Addressing	unicast

SLP	Reliable[14] Best Effort
Priority	40

2.7.4.2.3 LocationAssignment

The access network uses this message to update the Location information of the access terminal.

Field	**Length (bits)**
MessageID	8
TransactionID	8
LocationType	8
LocationLength	8
LocationValue	8 × LocationLength

MessageID — The access network shall set this field to 0x05.

TransactionID — The access network shall increment this value for each new LocationAssignment message sent.

LocationType — The access network shall set this field to the type of the location as specified in Table 2.7.4.2-1.

[14] This message is sent reliably when it is sent over the Reverse Traffic Channel.

Table 2.7.4.2-1. LocationType Encoding

LocationType	LocationLength	Meaning
0x00	N/A	No location is stored
0x01	0x05	Location compatible with [2] (see Table 2.7.4.2-2)
All other values	N/A	Reserved

LocationLength — The access network shall set this field to the length of the LocationValue field in octets as specified in Table 2.7.4.2-1.

LocationValue — The access network shall set this field to the Location of type specified by LocationType. If LocationType is set to 0x01, the access network shall set this field as shown in Table 2.7.4.2-2, where SID, NID, and PACKET_ZONE_ID correspond to the current access network.

Table 2.7.4.2-2. Subfields of LocationValue when LocationType = 0x01

Sub-fields of LocationValue	# of bits
SID	15
Reserved	1
NID	16
PACKET_ZONE_ID	8

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.7.4.2.4 LocationComplete

The access terminal sends this message in response to the LocationAssignment message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID — The access terminal shall set this field to 0x06.

TransactionID — The access terminal shall set this field the TransactionID field of the corresponding LocationAssignment message.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.7.4.2.5 StorageBLOBRequest

The access network uses this message to query the access terminal of its StorageBLOB information.

Field	Length (bits)
MessageID	8

MessageID The access network shall set this field to 0x10.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.7.4.2.6 StorageBLOBNotification

The access terminal sends the StorageBLOBNotification message in response to the StorageBLOBRequest message.

Field	Length (bits)
MessageID	8
StorageBLOBType	16
StorageBLOBLength	8
StorageBLOB	0 or 8 × StorageBLOBLength

MessageID The access terminal shall set this field to 0x11.

StorageBLOBType The access terminal shall set this field to zero if the value of its stored StorageBLOB is NULL; otherwise, the access terminal shall set this field to the stored value of StorageBLOBType.

StorageBLOBLength

The access terminal shall set this field to zero if the value of its stored StorageBLOB is NULL; otherwise, the access terminal shall set this field to the stored value of StorageBLOBLength.

StorageBLOB The access terminal shall not include this field if the value of its stored StorageBLOB is NULL; otherwise, the access terminal shall set this field to the stored value of StorageBLOB.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.7.4.2.7 StorageBLOBAssignment

The access network uses this message to update the StorageBLOB information of the access terminal.

Field	Length (bits)
MessageID	8
TransactionID	8
StorageBLOBType	16
StorageBLOBLength	8
StorageBLOB	8 × StorageBLOBLength

MessageID The access network shall set this field to 0x12.

TransactionID The access network shall increment this value for each new StorageBLOBAssignment message sent.

StorageBLOBType The access network shall set this field to the StorageBLOBType. The access network shall set this field to zero if StorageBLOB is NULL. Otherwise, the access network shall set this field as defined in [3].

StorageBLOBLength

The access network shall set this field to the length of the StorageBLOB field in octets. The access network shall set this field to zero if the value of its stored StorageBLOB is NULL.

StorageBLOB The access network shall not include this field if the value of its stored StorageBLOB is NULL. Otherwise, the access network shall set this field to the StorageBLOB.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.7.4.2.8 StorageBLOBComplete

The access terminal sends this message in response to the StorageBLOBAssignment message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access terminal shall set this field to 0x13.

TransactionID The access terminal shall set this field the TransactionID field of the corresponding StorageBLOBAssignment message.

Channels	AC RTC	SLP	Best Effort
Addressing	unicast	Priority	40

2.7.4.3 Interface to Other Protocols

2.7.4.3.1 Commands

This protocol does not issue any commands.

2.7.4.3.2 Indications

This protocol registers to receive the following indications:

- *AddressManagement.SubnetChanged* (access network only)

2.8 Flow Control Protocol

2.8.1 Overview

The Flow Control Protocol provides procedures and messages used by the access terminal and the access network to perform flow control for the Enhanced Multi-Flow Packet Application.

This protocol can be in one of the following states:

- Close State: in this state the Enhanced Multi-Flow Packet Application does not send or receive any RLP packets or DataOverSignaling messages.
- Open State: in this state the Enhanced Multi-Flow Packet Application can send and receive RLP packets and DataOverSignaling messages.

Figure 2.8.1-1 and Figure 2.8.1-2 show the state transition diagram at the access terminal and the access network.

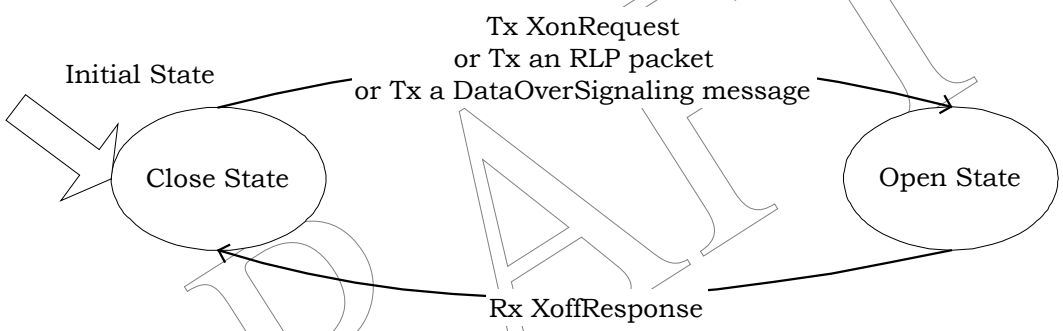

Figure 2.8.1-1. Flow Control Protocol State Diagram (Access Terminal)

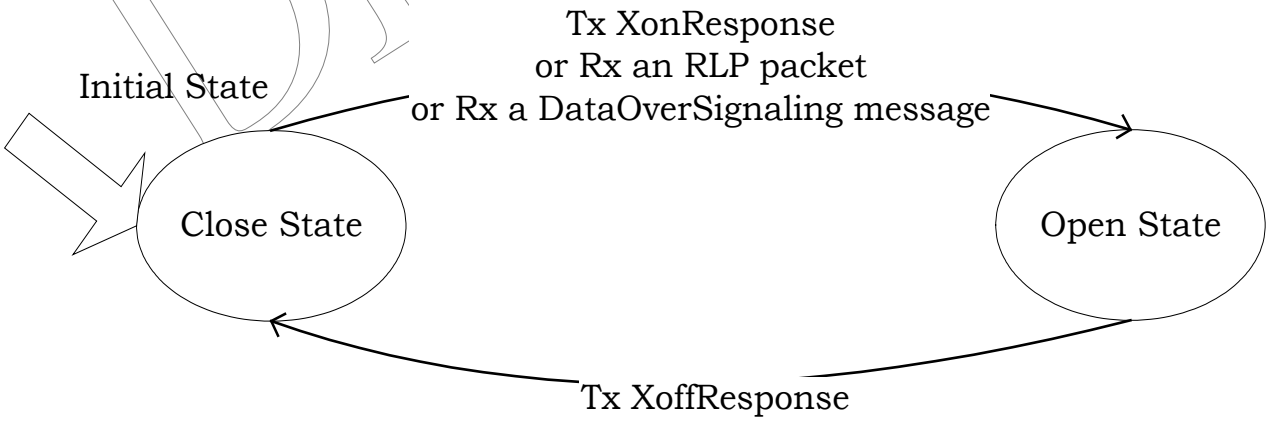

Figure 2.8.1-2. Flow Control Protocol State Diagram (Access Network)

The flow control protocol is a protocol associated with the Enhanced Multi-Flow Packet Application. The application subtype for this application is defined in [3].

2.8.2 Primitives and Public Data

2.8.2.1 Commands

This protocol does not define any commands.

2.8.2.2 Return Indications

This protocol does not return any indications.

2.8.3 Protocol Data Unit

The transmission unit of this protocol is a message. This is a control protocol and, therefore, it does not carry payload on behalf of other layers or protocols.

2.8.4 Procedures and Messages for the InUse Instance of the Protocol

2.8.4.1 Procedures

2.8.4.1.1 Transmission and Processing of DataReady Message

The access network may send a DataReady message to indicate that there is data corresponding to this packet application waiting to be transmitted.

The access terminal shall send a DataReadyAck within the time period specified by $T_{FCResponse}$ after reception of the DataReady message to acknowledge reception of the message.

2.8.4.1.2 Transmission and Processing of RestartNetworkInterface Message

The access network may send a RestartNetworkInterface message to direct the access terminal to restart the interface between the packet application and the higher layer.

Upon receiving a RestartNetworkInterface message, the access terminal shall send a RestartNetworkInterfaceAck message and shall restart the interface between the packet application and the higher layer. The access terminal may also restart higher layer protocols.

2.8.4.1.3 Close State

2.8.4.1.3.1 Access Terminal Requirements

The access terminal shall send an XonRequest message or an RLP packet (corresponding to this instance of the Enhanced Multi-Flow Packet Application) or a DataOverSignaling message (corresponding to this instance of the Enhanced Multi-Flow Packet Application) when it is ready to exchange RLP packets or DataOverSignaling messages with the access network. The access terminal should send an XonRequest message or an RLP packet (corresponding to this instance of the Enhanced Multi-Flow Packet Application) or a DataOverSignaling message (corresponding to this instance of the Enhanced Multi-Flow Packet Application) when it receives a DataReady from the access network.

The access terminal shall transition to the Open State when it sends an XonRequest message or when it sends an RLP packet (corresponding to this instance of the Enhanced Multi-Flow Packet Application) or when it sends a DataOverSignaling message (corresponding to this instance of the Enhanced Multi-Flow Packet Application).

2.8.4.1.3.2 Access Network Requirements

The access network shall not send any RLP packets or DataOverSignaling messages in this state.

If the access network receives an XonRequest message, it shall

- Send an XonResponse message within the time period specified by $T_{FCResponse}$ after reception of the XonRequest message to acknowledge reception of the message.
- Transition to the Open State.

The access network shall also transition to the Open State if it receives an RLP packet (corresponding to this instance of the Enhanced Multi-Flow Packet Application) or a DataOverSignaling message (corresponding to this instance of the Enhanced Multi-Flow Packet Application).

If the access network receives an XoffRequest message, it shall send an XoffResponse message within the time period specified by $T_{FCResponse}$ after reception of the XoffRequest message to acknowledge reception of the message.

2.8.4.1.4 Open State

In this state, the access terminal and the access network may send or receive any RLP packets or DataOverSignaling messages.

2.8.4.1.4.1 Access Terminal Requirements

The access terminal may re-send an XonRequest message if it does not receive an XonResponse message or an RLP packet (corresponding to this instance of the Enhanced Multi-Flow Packet Application) or a DataOverSignaling message (corresponding to this instance of the Enhanced Multi-Flow Packet Application) within the time period specified by $T_{FCResponse}$ after sending the XonRequest message.

The access terminal should send an XonRequest message if it receives a DataReady message.

The access terminal may send an XoffRequest message to request the access network to stop sending RLP packets and DataOverSignaling messages. The access terminal shall transition to the Close state when it receives an XoffResponse message.

The access terminal may re-send an XoffRequest message if it does not receive an XoffResponse message within the time period specified by $T_{FCResponse}$ after sending the XoffRequest message.

2.8.4.1.4.2 Access Network Requirements

If the access network receives an XoffRequest message, it shall

- Send an XoffResponse message within the time period specified by $T_{FCResponse}$ after reception of the XoffRequest message to acknowledge reception of the message.
- Transition to the Close State.

If the access network receives an XonRequest message, it shall send an XonResponse message within the time period specified by $T_{FCResponse}$ after reception of the XonRequest message to acknowledge reception of the message.

2.8.4.2 Message Formats

2.8.4.2.1 XonRequest

The access terminal sends this message to request transition to the Open State.

Field	Length (bits)
MessageID	8

MessageID The access terminal shall set this field to 0x07.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.8.4.2.2 XonResponse

The access network sends this message to acknowledge reception of the XonRequest message.

Field	Length (bits)
MessageID	8

MessageID The access network shall set this field to 0x08.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.8.4.2.3 XoffRequest

The access terminal sends this message to request transition to the Close State.

Field	Length (bits)
MessageID	8

MessageID The access terminal shall set this field to 0x09.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.8.4.2.4 XoffResponse

The access network sends this message to acknowledge reception of the XoffRequest message.

Field	Length (bits)
MessageID	8

MessageID The access network shall set this field to 0x0a.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.8.4.2.5 DataReady

The access network sends this message to indicate that there is data corresponding to this packet application awaiting to be transmitted.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access network shall set this field to 0x0b.

TransactionID The access network shall increment this value for each new DataReady message sent.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.8.4.2.6 DataReadyAck

The access terminal sends this message to acknowledge reception of a DataReady message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access terminal shall set this field to 0x0c.

TransactionID The access terminal shall set this value to the value of the TransactionID field of the corresponding DataReady message.

Channels	AC RTC	SLP	Best Effort
Addressing	unicast	Priority	40

2.8.4.2.7 RestartNetworkInterface

The access network sends this message to request the access terminal to restart the network interface.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access network shall set this field to 0x1c.

TransactionID The access network shall increment this value for each new RestartNetworkInterface message sent.

Channels	CC FTC	SLP	Best Effort
Addressing	unicast	Priority	40

2.8.4.2.8 RestartNetworkInterfaceAck

The access terminal sends this message to acknowledge reception of a RestartNetworkInterface message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access terminal shall set this field to 0x1d.

TransactionID — The access terminal shall set this value to the value of the TransactionID field of the corresponding RestartNetworkInterface message.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

2.8.5 Interface to Other Protocols

2.8.5.1 Commands

This protocol does not issue any commands.

2.8.5.2 Indications

This protocol does not register to receive any indications.

2.8.6 Protocol Numeric Constants

Constant	**Meaning**	**Value**
$T_{FCResponse}$	Time period within which the access terminal and access network are to respond to flow control messages.	1 second

2.9 Configuration Attributes for the Enhanced Multi-Flow Packet Application

The access terminal shall support default values of all attributes.

Unless specified otherwise, the access terminal and the access network shall not use the Generic Attribute Update Protocol to update configurable attributes belonging to the Enhanced Multi-Flow Packet Application. The access terminal and the access network shall support the use of the Generic Attribute Update Protocol to update values of the following configurable attributes belonging to the Enhanced Multi-Flow Packet Application:

- Flow*NN*TimersFwd,
- Flow*NN*TimersRev,
- Flow*NN*NakEnableFwd,
- Flow*NN*NakEnableRev,
- Flow*NN*PhysicalLayerNakEnableRev,
- Flow*NN*FlowProtocolParametersFwd,
- Flow*NN*FlowProtocolParametersRev,
- Flow*NN*RouteProtocolParametersFwd,
- Flow*NN*RouteProtocolParametersRev,
- Flow*NN*ActivatedFwd,
- Flow*NN*ActivatedRev,
- Flow*NN*SequenceLengthFwd,
- Flow*NN*SequenceLengthRev,
- Flow*NN*FlowProtocolPDUFwd,
- Flow*NN*FlowProtocolPDURev,
- Flow*NN*RouteProtocolPDUFwd,
- Flow*NN*RouteProtocolPDURev,
- Flow*NN*SimultaneousDeliveryOnBothRoutesFwd,
- Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd,
- Flow*NN*DataUnitFwd,
- Flow*NN*DataUnitRev,
- Flow*NN*ReservationFwd,
- Flow*NN*ReservationRev,
- Flow*NN*TransmitAbortTimerRev,
- Flow*NN*DataOverSignalingAllowedRev,
- Reservation*KK*IdleStateFwd,

- Reservation*KK*IdleStateRev,
- Reservation*KK*QoSRequestFwd,
- Reservation*KK*QoSRequestRev,
- Reservation*KK*QoSResponseFwd,
- Reservation*KK*QoSResponseRev,
- ANSupportedQoSProfiles,
- Reservation*KK*BCMCSFlowIDAssociation,
- Reservation*KK*BCMCSProgramIDAssociation, and
- Reservation*KK*ReservationQueuingSupported

If the value of the ATNAKDelaySupported attribute is 0x01, then the access terminal and the access network shall support the use of the Generic Attribute Update Protocol to update values of the following attribute:

– Flow*NN*NakDelayTimeFwd

where *NN* is the hexadecimal Link Flow number in the range 0x00 to *M* -1 inclusive, where M is MaxNumLinkFlowsFwd or MaxNumLinkFlowsRev for a Link Flow on the forward link or reverse link respectively and *KK* is the two-digit hexadecimal ReservationLabel.

The updated values of the attributes shall be consistent with the value of the MaxActivatedLinkFlowsFwd and MaxActivatedLinkFlowsRev attributes.

The number of Forward Link Reservations that satisfy at least one of the following conditions shall not exceed one plus the value of the MaxNumReservationsFwd field of MaxReservations attribute:

- The Reservation is in Open state.
- The Reservation is bound to a link flow.
- The Reservation*KK*QoSRequestFwd corresponding to the Reservation is set to a non-default value.

The number of Reverse Link Reservations that satisfy at least one of the following conditions shall not exceed one plus the value of the MaxNumReservationsRev field of MaxReservations attribute:

- The Reservation is in Open state.
- The Reservation is bound to a link flow.
- The Reservation*KK*QoSRequestRev corresponding to the Reservation is set to a non-default value.

The access terminal shall not send an AttributeUpdateRequest message proposing to update the value of the ANSupportedQoSProfiles attribute.

The access network shall not send an AttributeUpdateRequest message proposing to update the value of the Reservation*KK*ReservationQueuingSupported attribute.

The value of the Nak delay timer shall be less than or equal to that of the corresponding abort timer.

2.9.1 Simple Attributes

The negotiable simple attribute for this protocol is listed in Table 2.9-1. The access terminal and the access network shall use as defaults the values in Table 2.9-1 typed in ***bold italics***.

Table 2.9-1. Configurable Values

Attribute ID	Attribute	Values	Meaning
0xffff	RANHandoff	***0x00***	The access terminal shall not send an unsolicited LocationNotification message. The access network does not switch between the radio access technologies (E.g. specified in [2]) in a manner that preserves the state of all protocol layers at or above the data link layer (PPP).
		0x01	The access terminal shall send an unsolicited LocationNotification message. The access network switches between the radio access technologies (E.g specified in [2]) in a manner that preserves the state of all protocol layers at or above the data link layer (PPP).
		All other values	Reserved
0xfffc	MaxAbortTimer	***0x05***	Maximum abort timer is 500 ms.
		0x06 to 0x64	Maximum abort timer in units of 100 ms.
		All other values	Reserved
0xfffb	PPPFreeAuthenticationSupport	***0x00***	PPP free authentication as specified in [1] is not supported.
		0x01	PPP free authentication as specified in [1] is supported
		All other values	Reserved
0xfffa	TwoRoutesSupported	***0x00***	Two Routes are not supported
		0x01	Two Routes are supported
		All other values	Reserved
0xfff9	ATNAKDelaySupported	***0x00***	The access terminal does not support a non-zero value for Flow*NN*NakDelayTimeFwd.
		0x01	The access terminal does support non-zero values for Flow*NN*NakDelayTimeFwd.
		All other values	Reserved
0xfe*NN* *NN* is the two-	Flow*NN*NakEnableFwd *NN* is the two-digit	0x00	RLP receivers associated with forward Link Flow *NN* do not transmit Nak messages when missing data units are detected.

Attribute ID	Attribute	Values	Meaning
digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd -1 inclusive.	hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd - 1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x01***	RLP receivers associated with forward Link Flow *NN* transmit a Nak message when missing data units are detected.
		All other values	Reserved.
0xfd*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev -1 inclusive.	Flow*NN*NakEnableRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev - 1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x00	RLP receivers associated with reverse Link Flow *NN* do not transmit Nak messages when missing data units are detected.
		0x01	RLP receivers associated with reverse Link Flow *NN* transmit a Nak message when missing data units are detected.
		All other values	Reserved.
0xfa*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev -1 inclusive.	Flow*NN*PhysicalLayerNakEnableRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev - 1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x01***	RLP is to retransmit data units when a *PhysicalLayer.ReverseTrafficPacketsMissed* indication is received.
		0x00	RLP is to ignore *PhysicalLayer.ReverseTrafficPacketsMissed* indication.
		All other values	Reserved
0xf9*KK* *KK* is the two-digit hexadecimal ReservationLabel.	Reservation*KK*IdleStateFwd *KK* is the two-digit hexadecimal forward link ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Reservation does not change states when a Connection is closed.
		0x01	Reservation transitions to the Close state when a Connection is closed unless an access network initiated Connection is being opened at the same time.
		0x02	Reservation transitions to the Open state when a Connection is opened and transitions to the Close state when a Connection is closed unless an access network initiated Connection is being opened at the same time.
		All other values	Reserved

Attribute ID	Attribute	Values	Meaning
0xf8*KK* *KK* is the two-digit hexadecimal ReservationLabel.	Reservation*KK*IdleStateRev *KK* is the two-digit hexadecimal reverse link ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Reservation does not change states when a Connection is closed.
		0x01	Reservation transitions to the Close state when a Connection is closed unless an access network initiated Connection is being opened at the same time.
		0x02	Reservation transitions to the Open state when a Connection is opened and transitions to the Close state when a Connection is closed unless an access network initiated Connection is being opened at the same time.
		All other values	Reserved
0xf7*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev -1 inclusive.	Flow*NN*TransmitAbortTimerRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev - 1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Maximum delay for transmission of a higher layer data unit for Link Flow *NN* is not specified.
		0x0001 – 0x03e8	Maximum delay for transmission of a higher layer data unit for Link Flow *NN* in units of 5 ms.
		All other values	Reserved
0xf6*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev -1 inclusive.	Flow*NN*DataOverSignalingAllowedRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev - 1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Access terminal is not allowed to send DataOverSignaling messages for this Link Flow.
		0x01	Access terminal is allowed to send DataOverSignaling messages for this Link Flow.
		All other values	Reserved
0xf300	Flow00ActivatedFwd	***0x01***	Forward Link Flow 0x00 is activated.
		0x00	Forward Link Flow 0x00 is not activated.
		All other values	Reserved
0xf301	Flow01ActivatedFwd	***0x01***	Forward Link Flow 0x01 is activated.
		0x00	Forward Link Flow 0x01 is not activated.

Attribute ID	Attribute	Values	Meaning
		All other values	Reserved
0xf3*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x02 to MaxNumLinkFlowsFwd -1 inclusive.	Flow*NN*ActivatedFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x02 to MaxNumLinkFlowsFwd - 1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Forward Link Flow *NN* is not activated.
		0x01	Forward Link Flow *NN* is activated.
		All other values	Reserved
0xf200	Flow00ActivatedRev	***0x01***	Reverse Link Flow 0x00 is activated.
		0x00	Reverse Link Flow 0x00 is not activated.
		All other values	Reserved
0xf201	Flow01ActivatedRev	***0x01***	Reverse Link Flow 0x01 is activated.
		0x00	Reverse Link Flow 0x01 is not activated.
		All other values	Reserved
0xf2*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x02 to MaxNumLinkFlowsRev -1 inclusive.	Flow*NN*ActivatedRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x02 to MaxNumLinkFlowsRev - 1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Reverse Link Flow *NN* is not activated.
		0x0001	Reverse Link Flow *NN* is activated.
		All other values	Reserved
0xf1*NN* *NN* is the two-digit hexadecimal Link Flow number of the	Flow*NN*SequenceLengthFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd -	0x00	RLP of Forward Link Flow *NN* has a 6-bit sequence number.
		0x01	RLP of Forward Link Flow *NN* has a 14-bit sequence number.
		0x02	RLP of Forward Link Flow *NN* has a 22-bit sequence number.

Attribute ID	Attribute	Values	Meaning
forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd -1 inclusive.	1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	All other values	Reserved
0xf0*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev -1 inclusive.	Flow*NN*SequenceLengthRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev -1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x00	RLP of Reverse Link Flow *NN* has a 6-bit sequence number.
		0x01	RLP of Reverse Link Flow *NN* has a 14-bit sequence number.
		0x02	RLP of Reverse Link Flow *NN* has a 22-bit sequence number.
		All other values	Reserved
0xef*01*	Flow*01*FlowProtocolPDUFwd	0x00	Forward Link Flow 0x01 provides an octet stream to the Flow Protocol.
		0x01	Forward Link Flow 0x01 provides a packet stream to the Flow Protocol.
		All other values	Reserved.
0xef*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00, and 0x02 to MaxNumLinkFlowsFwd-1 inclusive.	Flow*NN*FlowProtocolPDUFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00, and 0x02 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Forward Link Flow *NN* provides an octet stream to the Flow Protocol.
		0x01	Forward Link Flow *NN* provides a packet stream to the Flow Protocol.
		All other values	Reserved.
0xee01	Flow*01*FlowProtocolPDURev	0x00	Reverse Link Flow 0x01 provides an octet stream to the Flow Protocol.
		0x01	Reverse Link Flow 0x01 provides a packet stream to the Flow Protocol.
		All other values	Reserved.
0xee*NN* *NN* is the two-digit	Flow*NN*FlowProtocolPDURev	***0x00***	Reverse Link Flow *NN* provides an octet stream to the Flow Protocol.

Attribute ID	Attribute	Values	Meaning
hexadecimal Link Flow number of the reverse Link Flow in the range 0x00, and 0x02 to MaxNumLinkFlowsRev-1 inclusive.	*NN* is the two-digit hexadecimal Link Flow number in the range 0x00, and 0x02 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x01	Reverse Link Flow *NN* provides a packet stream to the Flow Protocol.
		All other values	Reserved.
0xed*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.	Flow*NN*DataUnitFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Data unit for forward Link Flow *NN* is octets.
		0x01	Data unit for forward Link Flow *NN* is RLP packet payload.
		All other values	Reserved.
0xec*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive.	Flow*NN*DataUnitRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Data unit for reverse Link Flow *NN* is octets.
		0x01	Data unit for reverse Link Flow *NN* is RLP packet payload.
		All other values	Reserved.
0xeb*01*	Flow*01*RouteProtocolPDUFwd	0x00	Each Route of Forward Link Flow 0x01 provides an octet stream to the Route Protocol.
		0x01	Each Route of Forward Link Flow 0x01 provides a packet stream to the Route Protocol.
		All other values	Reserved.
0xeb*NN* *NN* is the two-digit hexadecimal Link Flow number of the	Flow*NN*RouteProtocolPDUFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00, and 0x02 to	***0x00***	Each Route of Forward Link Flow *NN* provides an octet stream to the Route Protocol.
		0x01	Each Route of Forward Link Flow *NN* provides a packet stream to the Route Protocol.

Attribute ID	Attribute	Values	Meaning
forward Link Flow in the range 0x00, and 0x02 to MaxNumLinkFlowsFwd-1 inclusive.	MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	All other values	Reserved.
0xea*01*	Flow*01*RouteProtocolPDURev	0x00	Each Route of Reverse Link Flow 0x01 provides an octet stream to the Route Protocol.
		0x01	Each Route of Reverse Link Flow 0x01 provides a packet stream to the Route Protocol.
		All other values	Reserved.
0xea*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00, and 0x02 to MaxNumLinkFlowsRev-1 inclusive.	Flow*NN*RouteProtocolPDURev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00, and 0x02 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Each Route of Reverse Link Flow *NN* provides an octet stream to the Route Protocol.
		0x01	Each Route of Reverse Link Flow *NN* provides a packet stream to the Route Protocol.
		All other values	Reserved.
0xe9*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.	Flow*NN*SimultaneousDeliveryOnBothRoutesFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Simultaneous delivery of Flow Protocol payload on both routes of Forward Link Flow *NN* is not allowed.
		0x01	Simultaneous delivery of Flow Protocol payload on both routes of Forward Link Flow *NN* is allowed.
		All other values	Reserved.
0xe8*NN* *NN* is the two-digit hexadecimal Link Flow	Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00	***0x00***	Each Route of Forward Link Flow *NN* delivers Route Protocol payload in-order.
		0x01	Each Route of Forward Link Flow *NN* may deliver Route Protocol payload out-of-order.

Attribute ID	Attribute	Values	Meaning
number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.	to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	All other values	Reserved.
0xe7*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd -1 inclusive.	Flow*NN*NakDelayTimeFwd	***0x00***	The values of the NAK Delay Time for flow *NN* is zero.
		0x01 – 0xff	The values of the NAK Delay Time for flow *NN* is specified by the value of this attribute in units of 10 ms.
0xfff8	BCMCSOverRLPAllowed	***0x00***	Transmission of BCMCS packets over RLP is not allowed
		0x01	Transmission of BCMCS packets over RLP is allowed
		All other values	Reserved.
0xe6*KK* *KK* is the two-digit hexadecimal ReservationLabel.	Reservation*KK*ReservationQueuingSupported *KK* is the two-digit hexadecimal reverse link ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Access terminal does not support Priority Queuing for the Reservation *KK*.
		0x01	Access terminal supports Priority Queuing for the Reservation *KK*.
		All other values	Reserved.

2.9.2 Complex Attributes

The following complex attributes and default values are defined (see [8] for attribute record definition).

2.9.2.1 Flow*NN*TimersFwd Attribute

NN is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
AbortTimer	16	0x01f4
FlushTimer	16	0x012c

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x03*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

AbortTimer — The sender shall set this field to the value of the RLP abort timer for this forward Link Flow in units of ms. The sender shall not set this field to a value greater than MaxAbortTimer.

FlushTimer — The sender shall set this field to the value of the RLP flush timer for this forward Link Flow in units of ms. The value of the RLP flush timer shall be less than or equal to that of the corresponding abort timer.

2.9.2.2 Flow*NN*TimersRev Attribute

NN is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
AbortTimer	16	0x01f4
FlushTimer	16	0x012c

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x04*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

AbortTimer — The sender shall set this field to the value of the RLP abort timer for this reverse Link Flow in units of ms. The sender shall not set this field to a value greater than MaxAbortTimer.

FlushTimer — The sender shall set this field to the value of the RLP flush timer for this reverse Link Flow in units of ms. The value of the RLP flush timer shall be less than or equal to that of the corresponding abort timer.

2.9.2.3 Flow*NN*ReservationFwd Attribute

NN is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.

Field	**Length (bits)**	**Default for *NN* = 0x00**	**Default for *NN* = 0x01**	**Default for *NN* > *0x01***
Length	8	N/A	N/A	N/A
AttributeID	16	N/A	N/A	N/A
One or more occurrences of the following record:				
ValueID	8	N/A	N/A	N/A
ReservationCount	8	0x01	0x01	0x00
ReservationCount occurrences of the following field:				
ReservationLabel	8	0xff	0xfe	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x05*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ReservationCount — The sender shall set this field to the number of reservations associated with this Link Flow.

ReservationLabel The sender shall set this field to the ReservationLabel of the reservation associated with this Link Flow.

2.9.2.4 Flow*NN*ReservationRev Attribute

NN is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.

Field	**Length (bits)**	**Default for *NN* = 0x00**	**Default for *NN*= 0x01**	**Default for *NN* > 0x01**
Length	8	N/A	N/A	N/A
AttributeID	16	N/A	N/A	N/A
One or more occurrences of the following record:				
ValueID	8	N/A	N/A	N/A
ReservationCount	8	0x01	0x01	0x00
ReservationCount occurrences of the following field:				
ReservationLabel	8	0xff	0xfe	N/A

Length Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID The sender shall set this field to 0x06*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive.

ValueID The sender shall set this field to an identifier assigned to this complex value.

ReservationCount The sender shall set this field to the number of reservations associated with this Link Flow.

ReservationLabel The sender shall set this field to the ReservationLabel of the reservation associated with this Link Flow.

2.9.2.5 ATSupportedFlowProtocolParameters*PP* Attribute

PP is the two-digit hexadecimal ProtocolID number for the Flow Protocol as specified in [3], where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default for *PP* = 0x00, 0x01, 0x05	Default for *PP* other than 0x00, 0x01, 0x05
Length	8	N/A	N/A
AttributeID	16	N/A	N/A

One occurrence of the following record:

ValueID	8	N/A	N/A
ProtocolSupported	8	0x01	0x00
SupportedProtocolParametersValuesLength	8	0x00	0x00
SupportedProtocolParametersValues	SupportedProtocolParametersValuesLength × 8	N/A	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0f*PP*.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProtocolSupported — The sender shall set this field to 0x00 if the Flow Protocol *PP* is not supported. Otherwise, the sender shall set this field to 0x01 if the Flow Protocol *PP* is supported. All other values are reserved.

SupportedProtocolParametersValuesLength

If the SupportedProtocolParametersValues record is not included, the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the SupportedProtocolParametersValues record in units of octets.

SupportedProtocolParametersValues

Unless specified otherwise by [3], the sender shall omit this record. If *PP* is 0x04 and ProtocolSupported is 0x01, then the sender shall set this record as defined in 2.9.2.5.1. If *PP* is less than 0x04 or equal to 0x05, the sender shall omit this record.

2.9.2.5.1 Definition of SupportedProtocolParametersValues record when the Flow Protocol or Route Protocol is ROHC

Field	Length (bits)
MaxSupportedMaxCID	16
LargeCIDSupported	1
MaxSupportedMRRU	16
TimerBasedCompressionSupported	1
SupportedProfileCount	8

SupportedProfileCount occurrences of the following field:

SupportedProfile	16

Reserved	0 - 7 (as needed)

MaxSupportedMaxCID

The sender shall set this field to the maximum MAX_CID parameter supported.

LargeCIDSupported The sender shall set this field to '0' if large CID representation is not supported according to [6]. Otherwise, the sender shall set this field to '1' if large CID representation is supported.

MaxSupportedMRRU

The sender shall set this field to the MRRU supported by the decompressor according to [6]. Default value is 0x0000 (no segmentation).

TimerBasedCompressionSupported

The sender shall set this field to '1' if the compressor at the access terminal supports timer based compression mode. Otherwise, the sender shall set this field to '0'.

SupportedProfileCount

The sender shall set this field to the number of ROHC profiles supported.

SupportedProfile The sender shall set this field to the ROHC profile supported by the compressor and decompressor. IANA ROHC profile identifier definitions can be found at [12].

Reserved The sender shall add reserved bits to make the length of the entire record an integer number of octets. The sender shall set these bits to '0'. The receiver shall ignore this field.

2.9.2.6 ATSupportedRouteProtocolParameters*PP* Attribute

PP is the two-digit hexadecimal ProtocolID number for the Route Protocol as specified in [3], where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default for *PP* = 0x00	Default for *PP* > 0x00
Length	8	N/A	N/A
AttributeID	16	N/A	N/A
One occurrence of the following record:			
ValueID	8	N/A	N/A
ProtocolSupported	8	0x01	0x00
SupportedProtocolParametersValuesLength	8	0x00	0x00
SupportedProtocolParametersValues	SupportedProtocolParametersValuesLength × 8	N/A	N/A

Length Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID The sender shall set this field to 0x10*PP*.

ValueID The sender shall set this field to an identifier assigned to this complex value.

ProtocolSupported The sender shall set this field to 0x00 if the Route Protocol *PP* is not supported. Otherwise, the sender shall set this field to 0x01 if the Route Protocol *PP* is supported. All other values are reserved.

SupportedProtocolParametersValuesLength

If the SupportedProtocolParametersValues record is not included, the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the SupportedProtocolParametersValues record in units of octets.

SupportedProtocolParametersValues

Unless specified otherwise by [3], the sender shall omit this record. If *PP* is 0x04 and ProtocolSupported is 0x01, then the sender shall set this record as defined in 2.9.2.5.1. If *PP* is less than 0x04, the sender shall omit this record.

2.9.2.7 ATSupportedQoSProfiles Attribute

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One occurrence of the following record:		
ValueID	8	N/A
QoSProfileCount	8	0
QoSProfileCount of the following record:		
ProfileType	8	N/A
ProfileLength	8	N/A
ProfileValue	ProfileLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0002.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

QoSProfileCount — The sender shall set this field to the number of QoS Profiles that are included in this message.

ProfileType — The sender shall set this field to indicate the profile type. The sender shall set this field according to [3].

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets.

ProfileValue — The sender shall set this field to the profile according to [3].

1 2.9.2.8 ANSupportedQoSProfiles Attribute
2

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One occurrence of the following record:		
ValueID	8	N/A
QoSProfileCount	8	0
QoSProfileCount of the following record:		
ProfileType	8	N/A
ProfileLength	8	N/A
ProfileValue	ProfileLength × 8	N/A

3 Length Length of the complex attribute in octets. The sender shall set this
4 field to the length of the complex attribute excluding the Length field.

5 AttributeID The sender shall set this field to 0x0003.

6 ValueID The sender shall set this field to an identifier assigned to this complex
7 value.

8 QoSProfileCount The sender shall set this field to the number of QoS Profiles that are
9 included in this message.

10 ProfileType The sender shall set this field to indicate the profile type. The sender
11 shall set this field according to [3].

12 ProfileLength The sender shall set this field to length of the ProfileValue field in
13 units of octets.

14 ProfileValue The sender shall set this field to the profile according to [3].

15 2.9.2.9 MaxLinkFlows Attribute
16

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A

One or more occurrences of the following record:

ValueID	8	N/A
MaxNumLinkFlowsFwd	8	***0x06***
MaxNumLinkFlowsRev	8	***0x06***
MaxActivatedLinkFlowsFwd	8	***0x03***
MaxActivatedLinkFlowsRev	8	***0x03***

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0004.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

MaxNumLinkFlowsFwd

The sender shall set this field to indicate the maximum total number of activated and deactivated forward Link Flows supported. The value shall be in the range of 0x06 to 0x1f, inclusive

MaxNumLinkFlowsRev

The sender shall set this field to indicate the maximum total number of activated and deactivated reverse Link Flows supported. The value shall be in the range of 0x06 to 0x1f, inclusive.

MaxActivatedLinkFlowsFwd

The sender shall set this field to indicate the maximum number of simultaneous activated forward Link Flows supported. The value shall be in the range of 0x03 to MaxNumLinkFlowsFwd, inclusive.

MaxActivatedLinkFlowsRev

The sender shall set this field to indicate the maximum number of simultaneous activated reverse Link Flows supported. The value shall be in the range of 0x03 to MaxNumLinkFlowsRev, inclusive.

2.9.2.10 Reservation*KK*QoSRequestFwd Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProfileType	8	***0x00***
ProfileLength	16	***0x0000***
ProfileValue	ProfileLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x07*KK*, where *KK* is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProfileType — The sender shall set this field to indicate the profile type. The sender shall set this field as defined in [3].

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets. If ProfileType is equal to 0x00, then the sender shall set this field to 0x0000.

ProfileValue — The sender shall set this field to the Profile Value corresponding to the Profile Type according to [3]. If ProfileType is equal to 0x00, then the sender shall omit this field. If ProfileType is equal to 0x01, if the ANSupportedQoSProfiles attribute does not have a default value, and if this attribute is included in an AttributeUpdateRequest then the requested Flow Profile IDs shall be a subset of the Flow Profile IDs in the ProfileValue fields of the ANSupportedQoSProfiles attribute.

2.9.2.11 Reservation*KK*QoSRequestRev Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A

One or more of the following record:

ValueID	8	N/A
ProfileType	8	***0x00***
ProfileLength	16	***0x0000***
ProfileValue	ProfileLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x08*KK*, where *KK* is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProfileType — The sender shall set this field to indicate the profile type. The sender shall set this field as defined in [3].

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets. If ProfileType is equal to 0x00, then the sender shall set this field to 0x0000.

ProfileValue — The sender shall set this field to the Profile Value corresponding to the Profile Type according to [3]. If ProfileType is equal to 0x00, then the sender shall omit this field. If ProfileType is equal to 0x01, if the ANSupportedQoSProfiles attribute does not have a default value, and if this attribute is included in an AttributeUpdateRequest, then the requested Flow Profile IDs shall be a subset of the Flow Profile IDs in the ProfileValue fields of the ANSupportedQoSProfiles attribute.

2.9.2.12 Reservation*KK*QoSResponseFwd Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProfileType	8	***0x00***
ProfileLength	16	***0x0000***
ProfileValue	ProfileLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x09*KK*, where *KK* is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProfileType — The sender shall set this field to indicate the profile type. The sender shall set this field as defined in [3].

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets. If ProfileType is equal to 0x00, then the sender shall set this field to 0x0000.

ProfileValue — The sender shall set this field to the Profile Value corresponding to the Profile Type according to [3]. If ProfileType is equal to 0x00, then the sender shall omit this field.

2.9.2.13 Reservation*KK*QoSResponseRev Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProfileType	8	***0x00***
ProfileLength	16	***0x0000***
ProfileValue	ProfileLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0a*KK*, where *KK* is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProfileType — The sender shall set this field to indicate the profile type. The sender shall set this field as defined in [3].

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets. If ProfileType is equal to 0x00, then the sender shall set this field to 0x0000.

ProfileValue — The sender shall set this field to the Profile Value corresponding to the Profile Type according to [3]. If ProfileType is equal to 0x00, then the sender shall omit this field.

2.9.2.14 MaxReservations Attribute

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A

One or more occurrences of the following record:

ValueID	8	N/A
MaxNumReservationsFwd	8	0xff
MaxNumReservationsRev	8	0xff
MaxNumOpenReservationsFwd	8	0x0f
MaxNumOpenReservationsRev	8	0x0f

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0005.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

MaxNumReservationsFwd

The sender shall set this field to indicate one less than the maximum total number of Forward Link Reservations supported that satisfy at least one of the following conditions:

- The Reservation is in Open state.
- The Reservation is bound to a link flow.
- The Reservation*KK*QoSRequestFwd corresponding to the Reservation is set to a non-default value.

The value shall be in the range of 0x00 to 0xff, inclusive

MaxNumReservationsRev

The sender shall set this field to indicate one less than the maximum total number of Reverse Link Reservations supported that satisfy at least one of the following conditions:

- The Reservation is in Open state.
- The Reservation is bound to a link flow.
- The Reservation*KK*QoSRequestRev corresponding to the Reservation is set to a non-default value.

The value shall be in the range of 0x00 to 0xff, inclusive.

MaxNumOpenReservationsFwd

The sender shall set this field to indicate one less than the maximum number of simultaneous activated Forward Link Reservations supported. The value shall be in the range of 0x00 to MaxNumReservationsFwd, inclusive.

MaxNumOpenReservationsRev

The sender shall set this field to indicate one less than the maximum number of simultaneous activated Reverse Link Reservations supported. The value shall be in the range of 0x00 to MaxNumReservationsRev, inclusive.

2.9.2.15 Flow*NN*FlowProtocolParametersFwd Attribute

NN is the two-digit hexadecimal forward Link flow identifier, where hexadecimal digits A through F are specified in upper case letters.

Field	**Length (bits)**	**Default for *NN* = 0x00**	**Default for *NN* = 0x01**	**Default for *NN* > 0x01**
Length	8	N/A	N/A	N/A
AttributeID	16	N/A	N/A	N/A
One or more occurrences of the following record:				
ValueID	8	N/A	N/A	N/A
ProtocolID	8	0x01	0x05	0x00
ProtocolParametersLength	8	0x00	0x00	0x00
ProtocolParameters	ProtocolParametersLength × 8	N/A	N/A	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0b*NN*, where *NN* is the two-digit hexadecimal forward Link flow number.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProtocolID — The sender shall set this field to n identifier for the Flow Protocol as specified in [3] ProtocolParametersLength
If the ProtocolParameters record is not included, then the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters — Unless specified otherwise by [3], the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this record as defined in

2.9.2.15.1. If ProtocolID is less than 0x04 or equal to 0x05, the sender shall omit this record.

2.9.2.15.1 Definition of ProtocolParameters record when the Flow Protocol or Route Protocol is ROHC

Field	Length (bits)
MaxCID	16
LargeCIDs	1
FeedbackForIncluded	1
FeedbackFor	0 or 5
MRRU	16
ProfileCount	8

ProfileCount occurrences of the following field:

Profile	16

Reserved	0 – 7 (as needed)

MaxCID — The sender shall set this field to the MAX_CID parameter for this ROHC Channel. The sender shall not set this field to a value greater than MaxSupportedMaxCID.

LargeCIDs — If the LARGE_CIDS parameter for this ROHC Channel is false, then the sender shall set this field to '0'. Otherwise, the sender shall set this field to '1'. The sender shall not set this field to '1' if LargeCIDSupported is not set to '1'.

FeedbackForIncluded — If ROHC feedback associated with another Link flow (ROHC channel) is sent on this Link flow (ROHC channel), then this field shall be set to '1'. Otherwise, this field shall be set to '0'.

FeedbackFor — If FeedbackForIncluded is set to '0', then the sender shall omit this field. Otherwise, the sender shall set this field to the Link flow number (ROHC channel) to which ROHC feedback sent on this Link flow (ROHC channel) refers.

MRRU — The sender shall set this field to the MRRU parameter for this ROHC channel. The sender shall not set this field to a value larger than MaxSupportedMRRU.

ProfileCount — The sender shall set this field to the number of ROHC profiles supported by the decompressor.

Profile — The sender shall set this field to the ROHC profile supported by the decompressor according to [6]. The sender shall not set this field to a value that is not included in the list of supported Profiles.

Reserved — The sender shall add reserved bits to make the length of the entire record an integer number of octets. The sender shall set these bits to '0'. The receiver shall ignore this field.

2.9.2.16 Flow*NN*FlowProtocolParametersRev Attribute

NN is the two-digit hexadecimal reverse Link flow number, where hexadecimal digits A through F are specified in upper case letters.

Field	**Length (bits)**	**Default for *NN* = 0x00**	**Default for *NN* = 0x01**	**Default for *NN* > 0x01**
Length	8	N/A	N/A	N/A
AttributeID	16	N/A	N/A	N/A
One or more of the following record:				
ValueID	8	N/A	N/A	N/A
ProtocolID	8	0x01	0x05	0x00
ProtocolParametersLength	8	0x00	0x00	0x00
ProtocolParameters	ProtocolParametersLength × 8	N/A	N/A	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0c*NN*, where *NN* is a two-digit hexadecimal reverse Link flow number.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProtocolID — The sender shall set this field to an identifier for the Flow Protocol as specified in [3].

ProtocolParametersLength — If the ProtocolParameters record is not included, then the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters — Unless specified otherwise by [3], the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this record as defined in 2.9.2.16.1. If ProtocolID is less than 0x04 or equal to 0x05, the sender shall omit this record.

2.9.2.16.1 Definition of ProtocolParameters record attribute when the Flow Protocol or Route Protocol is ROHC

Field	Length (bits)
MaxCID	16
LargeCIDs	1
FeedbackForIncluded	1
FeedbackFor	0 or 5
MRRU	16
TimerBasedCompression	1
ProfileCount	8
ProfileCount occurrences of the following field:	
Profile	16
Reserved	0 – 7 (as needed)

MaxCID — The sender shall set this field to the MAX_CID parameter for this ROHC Channel. The sender shall not set this field to a value greater than MaxSupportedMaxCID.

LargeCIDs — If the LARGE_CIDS parameter for this ROHC Channel is false, then the sender shall set this field to '0'. Otherwise, the sender shall set this field to '1'. If LargeCIDSupported is '0', then the sender shall not set this field to '1'.

FeedbackForIncluded — If ROHC feedback associated with another Link flow (ROHC channel) is sent on this Link flow (ROHC channel), then this field shall be set to '1'. Otherwise, this field shall be set to '0'.

FeedbackFor — If FeedbackForIncluded is set to '0', then the sender shall omit this field. Otherwise, the sender shall set this field to the Link flow number (ROHC channel) to which ROHC feedback sent on this Link flow (ROHC channel) refers.

MRRU — The sender shall set this field to the MRRU parameter for this ROHC channel. The sender shall not set this field to a value greater than MaxSupportedMRRU.

TimerBasedCompression — The sender shall set this field to '0' if timer based compression according to [6] is not enabled for this ROHC channel. The sender shall set this field to '1' if timer based compression according to [6] is

enabled for this ROHC channel. If TimerBasedCompressionSupported is set to '0', then the sender shall not set this field to '1'.

ProfileCount — The sender shall set this field to the number of ROHC profiles supported by the decompressor.

Profile — The sender shall set this field to the ROHC profile supported by the decompressor according to [6]. The sender shall not set this field to a value that is not included in the list of supported profiles.

Reserved — The sender shall add reserved bits to make the length of the entire record an integer number of octets. The sender shall set these bits to '0'. The receiver shall ignore this field.

2.9.2.17 Flow*NN*RouteProtocolParametersFwd Attribute

NN is the two-digit hexadecimal forward Link flow number, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProtocolID	8	0x00
ProtocolParametersLength	8	0x00
ProtocolParameters	ProtocolParametersLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0d*NN*, where *NN* is a two-digit hexadecimal forward Link flow number.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProtocolID — The sender shall set this field to an identifier for the Route Protocol as specified in [3].

ProtocolParametersLength

If the ProtocolParameters record is omitted, then the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters — Unless specified otherwise by [3], the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this field as defined in 2.9.2.15.1. If ProtocolID is less than 0x04, the sender shall omit this record.

2.9.2.18 Flow*NN*RouteProtocolParametersRev Attribute

NN is the two-digit hexadecimal reverse Link flow number, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProtocolID	8	0x00
ProtocolParametersLength	8	0x00
ProtocolParameters	ProtocolParametersLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0e*NN*, where *NN* is a two-digit hexadecimal reverse Link flow number.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProtocolID — The sender shall set this field to an identifier for the Route Protocol as specified in [3].

ProtocolParametersLength — If the ProtocolParameters field is omitted, then the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters — Unless specified otherwise by [3], the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this field as defined in 2.9.2.16.1.

2.9.2.19 Reservation*KK*BCMCSFlowIDAssociation Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One occurrence of the following record:		
ValueID	8	N/A
BCMCSFlowCount	8	***0x00***
BCMCSFlowCount occurrences of the following record:		
BCMCSFlowID	32	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x11KK, where KK is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

BCMCSFlowCount — The sender shall set this field to the number of BCMCS Flow identifiers associated with this reservation.

BCMCSFlowID — The sender shall set this field to the BCMCS Flow identifier(s) of the BCMCS Flow(s) that are associated with this reservation.

2.9.2.20 Reservation*KK*BCMCSProgramIDAssociation Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One occurrence of the following record:		
ValueID	8	N/A
ProgramCount	8	***0x00***
ProgramCount occurrences of the following record:		
ProgramIDLSBLength	8	N/A
ProgramIDLSBs	32	N/A
FlowDiscriminatorCount	8	N/A
FlowDiscriminatorCount occurrences of the following record:		
FlowDiscriminator	8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x12KK, where KK is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProgramCount — The sender shall set this field to the number of BCMCS Programs that is associated with this reservation.

ProgramIDLSBLength — The sender shall set this field to the valid number of the least significant bits of the ProgramID of the BCMCS Program that is associated with this reservation.

ProgramIDLSBs — The sender shall set this field to the ProgramIDLSBLength least significant bits of Program ID of the BCMCS Program that is associated with this reservation.

FlowDiscriminatorCount — The sender shall set this field to the number of Flow Discriminators for the Program that is associated with this reservation. If all the Flow Discriminators for this ProgramID is associated with this reservation, then the sender shall set this field to 0.

FlowDiscriminator — The sender shall set this field to the Flow Discriminator that is associated with this reservation.

2.10 Session State Information

The Session State Information record (see [8]) consists of parameter records.

This application defines the following parameter records in addition to the configuration attributes for this application.

2.10.1 Location Parameter

Table 2.10.1-1. The Format of the Parameter Record for the Location Parameter

Field	Length (bits)
ParameterType	8
Length	8
LocationType	8
LocationValue	8 × (Length – 2)

ParameterType — This field shall be set to 0x01 for this parameter record.

Length — This field shall be set to the length of this parameter record in units of octets excluding the Length field.

LocationType — This field shall be set to the value of LocationType associated with the access terminal's session.

LocationValue — This field shall be set to the stored value of LocationValue associated with the access terminal's session.

2.10.2 FlowControlState Parameter

Table 2.10.2-1. The Format of the Parameter Record for the FlowControlState Parameter

Field	Length (bits)
ParameterType	8
Length	8
FlowControlState	8

ParameterType — This field shall be set to 0x02 for this parameter record.

Length — This field shall be set to the length of this parameter record in units of octets excluding the Length field.

FlowControlState — This field shall be set to 0x00 if the state of the Flow Control Protocol associated with the access terminal's session is Close. Otherwise, this field shall be set to 0x01. All the other values for this field are reserved.

2.10.3 DataOverSignalingMessageSequence Parameter

Table 2.10.3-1. The Format of the Parameter Record for the DataOverSignalingMessageSequence Parameter

Field	Length (bits)
ParameterType	8
Length	8
Reserved1	2
ReceivePointerA	6
Reserved2	2
TransmitPointerA	6
Reserved3	2
ReceivePointerB	6
Reserved4	2
TransmitPointerB	6

ParameterType This field shall be set to 0x03 for this parameter record.

Length This field shall be set to the length of this parameter record in units of octets excluding the Length field.

Reserved1 The sender shall set this field to '00'. The receiver shall ignore this field.

ReceivePointerA This field shall be set to the value of the receive pointer for DataOverSignaling message validation on Route A, $V(R_A)$.

Reserved2 The sender shall set this field to '00'. The receiver shall ignore this field.

TransmitPointerA This field shall be set to the value of the transmit pointer for DataOverSignaling message validation on Route A, $V(S_A)$.

Reserved3 The sender shall set this field to '00'. The receiver shall ignore this field.

ReceivePointerB This field shall be set to the value of the receive pointer for DataOverSignaling message validation on Route B, $V(R_B)$.

Reserved4 The sender shall set this field to '00'. The receiver shall ignore this field.

TransmitPointerB This field shall be set to the value of the transmit pointer for DataOverSignaling message validation on Route B, $V(S_B)$.

2.10.4 StorageBLOB Parameter

Table 2.10.4-1. The Format of the Parameter Record for the StorageBLOB Parameter

Field	Length (bits)
ParameterType	8
Length	8
StorageBLOBType	16
StorageBLOBLength	8
StorageBLOB	0 or 8 × StorageBLOBLength

ParameterType This field shall be set to 0x04 for this parameter record.

Length This field shall be set to the length of this parameter record in units of octets excluding the Length field.

StorageBLOBType This field shall be set to zero if the value of its stored StorageBLOB is NULL; otherwise, this field shall be set to the stored value of StorageBLOBType.

StorageBLOB Length This field shall be set to zero if the value of its stored StorageBLOB is NULL; otherwise, this field shall be set to the stored value of StorageBLOB Length.

StorageBLOB This field shall be omitted if the value of the stored StorageBLOB is NULL; otherwise, this field shall be set to the stored value of StorageBLOB.

2.10.5 ReservationState Parameter

Table 2.10.5-1. The Format of the Parameter Record for the ReservationState Parameter

Field	Length (bits)
ParameterType	8
Length	8
OpenReservationCount	8
OpenReservationCount occurrences of the following record:	
Link	1
ReservationLabel	8
Reserved	0 – 7 (as needed)

ParameterType This field shall be set to 0x05 for this parameter record.

Length This field shall be set to the length of this parameter record in units of octets excluding the Length field.

OpenReservationCount

This field shall be set to the number of Reservations that are in the Open state.

Link This field shall be set to '1' for a forward link Reservation, and to '0' for a reverse link Reservation.

ReservationLabel This field shall be set to the ReservationLabel.

Reserved The sender shall add reserved bits to make the length of the entire parameter an integer number of octets. The sender shall set these bits to zero. The receiver shall ignore this field

2.10.6 RouteState Parameter

Table 2.10.6-1. The Format of the Parameter Record for the RouteState Parameter

Field	Length (bits)
ParameterType	8
Length	8
RouteSelectionProtocolState	2
NextRouteSelectTransactionID	8
NextActivateRouteTransactionID	8
Reserved	6

ParameterType This field shall be set to 0x06 for this parameter record.

Length This field shall be set to the length of this parameter record in units of octets excluding the Length field.

RouteSelectionProtocolState

This field shall be set to indicate the state of Route Selection Protocol according to Table 2.10.6-2.

Table 2.10.6-2. RouteSelectionProtocolState Encoding

State	Value
A Open B Setting	'00'
A Open B Rising	'01'
A Setting B Open	'10'
A Rising B Open	'11'

NextRouteSelectTransactionID

This field shall be set to the TransactionID field of the next RouteSelect message that will be sent.

NextActivateRouteTransactionID

This field shall be set to the TransactionID field of the next ActivateRoute message that will be sent.

Reserved This field shall be set to '000000'. The receiver shall ignore this field.

3 MULTI-LINK MULTI-FLOW PACKET APPLICATION

3.1 Introduction

3.1.1 General Overview

The Multi-link Multi-flow Packet Application provides multiple octet or packet streams that can be used to carry octets or packets between the access terminal and the access network. Each octet or packet stream is called a Link Flow. Each Link Flow provides two routes for transmission and reception of payloads from the higher layer. These routes are named Route A and Route B and can be carried using a single receiver-transmitter pair. Each route is associated with a transmitter-receiver pair. Figure 3.1.1-1 shows the association between a forward Link Flow and the transmitters and receivers for its two routes. Figure 3.1.1-2 shows the reference architecture for a reverse Link Flow.

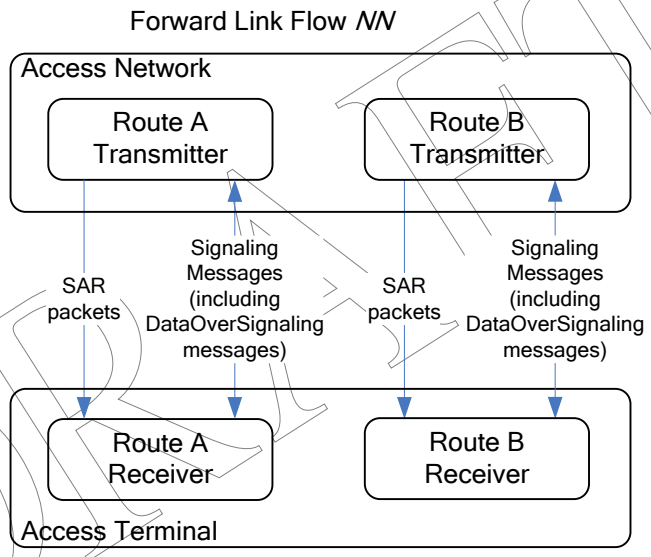

Figure 3.1.1-1. Reference Architecture for a Forward Link Flow

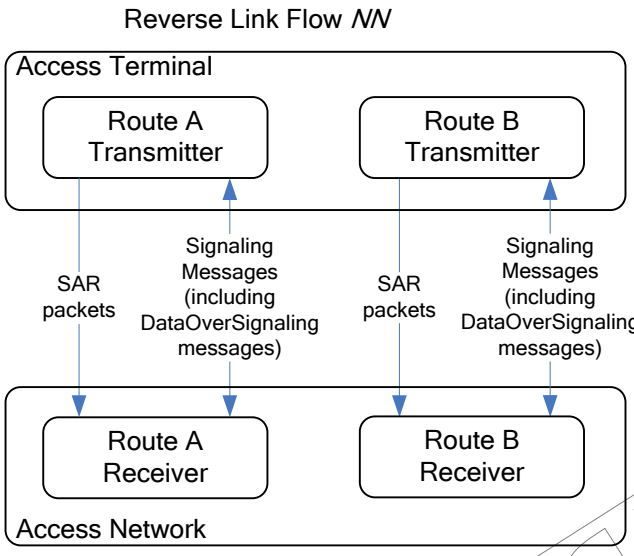

Figure 3.1.1-2. Reference Architecture for a Reverse Link Flow

The relationship between the Multi-link Multi-flow Packet Application protocols is illustrated in Figure 3.1.1-3.

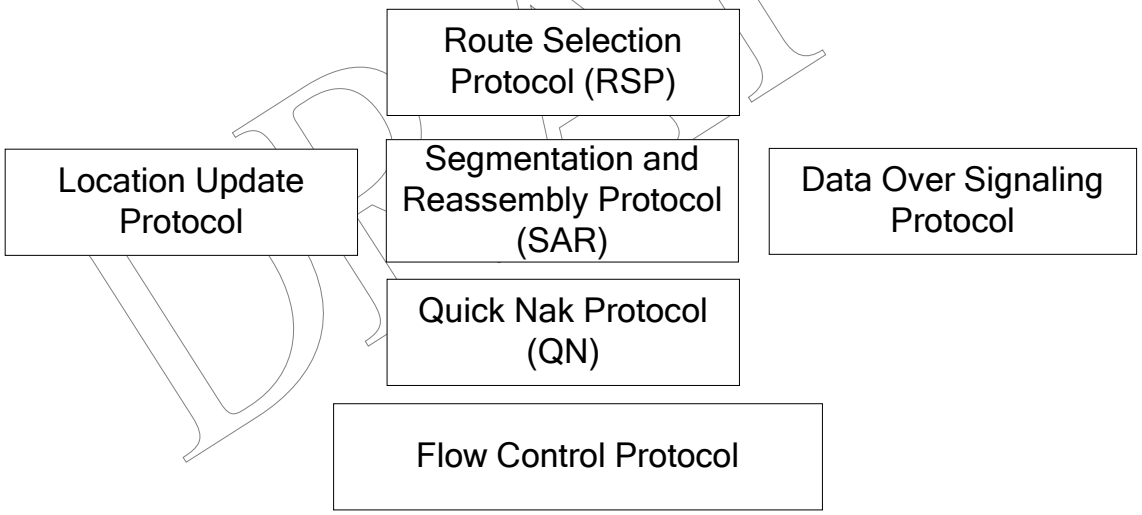

Figure 3.1.1-3. Multi-link Multi-flow Packet Application Protocols

Figure 3.1.1-4 illustrates the relationship for each Link Flow between the Multi-link Multi-flow Packet Application and the higher layer protocols supported by the Multi-link Multi-flow Packet Application. The Flow Protocol and the Route Protocol are referred to as higher layer protocols. The protocols defined in the Multi-link Multi-flow Packet Application are shown shaded. The Route Selection Protocol routes Flow Protocol PDUs to either instance A or instance B of the Route Protocol. Instance A of the Route Protocol is bound to Route A of the Link Flow. Instance B of the Route Protocol is bound to Route B of the Link Flow.

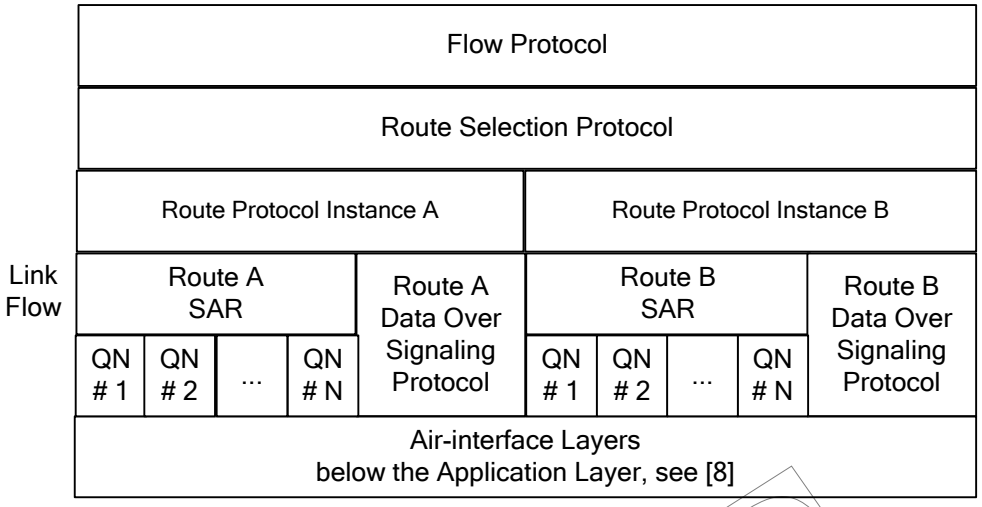

Figure 3.1.1-4. Relationship for each Link Flow between Multi-link Multi-flow Packet Application and Higher Layer Protocols

The Multi-link Multi-flow Packet Application provides:

- the functionality defined in **[1]**,
- the Route Selection Protocol, which routes Flow Protocol PDUs over either Route A or Route B of a Link Flow.
- the Segmentation and Reassembly (SAR) Protocol, which provides retransmission (if needed) and duplicate detection of higher layer octets or packets transmitted on each route,
- the Quick Nak Protocol, which provides indication of erased higher layer octets or packets,
- the Data Over Signaling Protocol, which provides transmission and duplicate detection of higher layer data packets transmitted on each route using signaling messages,
- the Location Update Protocol, which defines location update procedures and messages in support of mobility management for the Packet Application,
- the Flow Control Protocol, which provides flow control for the Multi-link Multi-flow Packet Application, and
- ability to negotiate Route Protocol and Flow Protocol parameters.

This application uses the Signaling Application to transmit and receive messages.

3.1.2 Public Data

- Subtype for this application

3.1.3 Data Encapsulation for the InUse Instance of the Application

Figure 3.1.3-1 illustrates the relationship between octets from the Route Protocol, SAR packets, QN packets, and Stream Layer payload for the case when the Link Flow carries an octet stream.

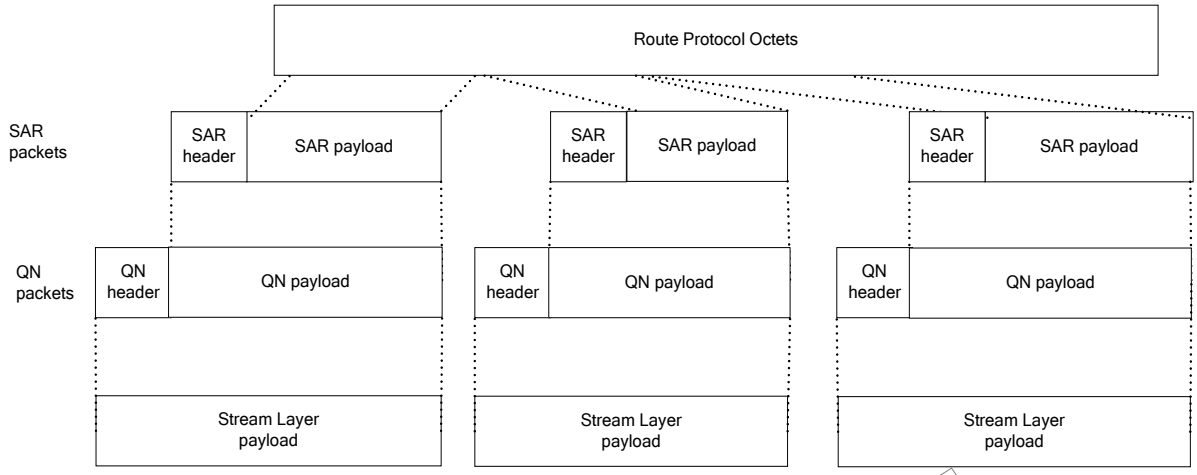

Figure 3.1.3-1. Multi-link Multi-flow Packet Application Encapsulation when the Link Flow carries an Octet Stream

Figure 3.1.3-2 illustrates the relationship between packets from the Route Protocol, SAR packets, QN packets, and Stream Layer payload for the case when the Link Flow carries a packet stream.

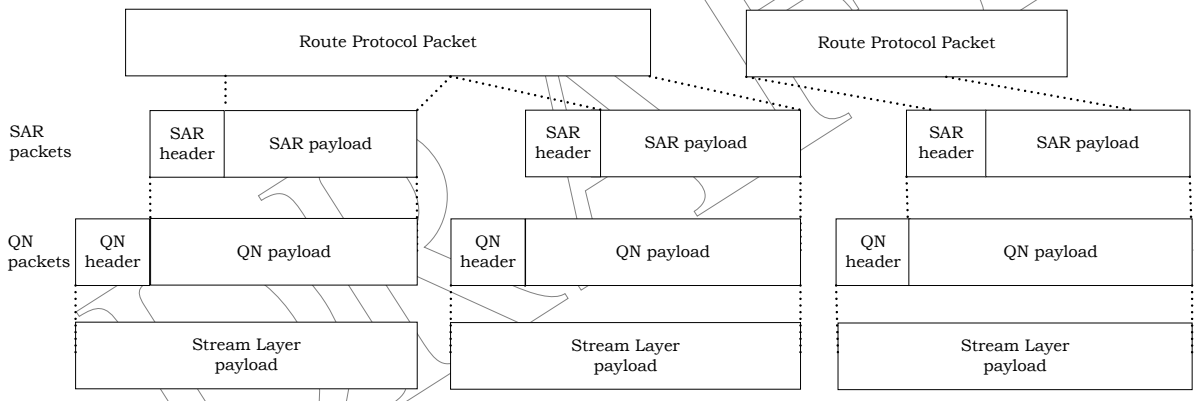

Figure 3.1.3-2. Multi-link Multi-flow Packet Application Encapsulation when the Link Flow carries a Packet Stream

3.2 Protocol Initialization

3.2.1 Protocol Initialization for the InConfiguration Application Instance

Upon creation, the InConfiguration instance of this application in the access terminal and the access network shall perform the following in the order specified:

- The fall-back values of the attributes for this application instance shall be set to the default values specified for each attribute.

- If the InUse instance of this application (i.e., corresponding to the stream to which this application is bound) has the same application subtype as this InConfiguration application instance, then the fall-back values of the attributes defined by the InConfiguration application instance shall be set to the corresponding attribute values for the InUse application instance.
- The value for each attribute for this application instance shall be set to the fall-back value for that attribute.
- The value of the InConfiguration application instance public data shall be set to the value of the corresponding InUse application instance public data.
- The value of the application subtype associated with the InConfiguration application instance shall be set to the application subtype that identifies this application.

3.3 Procedures and Messages for the InConfiguration Instance of the Packet Application

3.3.1 Procedures

This protocol uses the Generic Configuration Protocol (see [8]) to define the processing of the configuration messages.

The Multi-link Multi-Flow Packet Application shall not be bound to a virtual stream.

The access terminal shall not send a ConfigurationRequest message containing the Reservation*KK*QoSResponseFwd attribute. The access network shall not send a ConfigurationRequest message containing the Reservation*KK*QoSRequestFwd attribute. The access terminal shall not send a ConfigurationRequest message containing the Reservation*KK*QoSResponseRev attribute. The access network shall not send a ConfigurationRequest message containing the Reservation*KK*QoSRequestRev attribute.

The access terminal shall not initiate negotiation of the ANSupportedQoSProfiles attribute. The access network shall not initiate negotiation of the ATSupportedQoSProfiles attribute. The access terminal should include supported values of ProfileValue with ProfileType equal to 0x04 in the ATSupportedQoSProfiles attribute during the AT Initiated state of the Session Configuration Protocol. The access network shall include all supported values of ProfileValue with ProfileType equal to 0x04 in the ANSupportedQoSProfiles attribute during the AN Initiated state of the Session Configuration Protocol. The access terminal shall use the ProfileType 0x00, 0x01, or 0x02 in the Reservation*KK*QoSRequestFwd or the Reservation*KK*QoSRequestRev attributes. The access network shall use ProfileType 0x00 or 0x03 in the Reservation*KK*QoSResponseFwd or the Reservation*KK*QoSResponseRev attributes.

The access network shall not initiate negotiation of the ATSupportedFlowProtocolParameters*PP* attribute. The access network shall not initiate negotiation of the ATSupportedRouteProtocolParameters*PP* attribute.

The access network shall not initiate negotiation of the MaxLinkFlows attribute.

The access network and access terminal shall not propose value of MaxAbortTimer that is less than any of the AbortTimer values in Flow*NN*TimersFwd and Flow*NN*TimersRev Attributes.

3.3.2 Commit Procedures

The access terminal and the access network shall perform the procedures specified in this section, in the order specified, when directed by the InUse instance of the Session Configuration Protocol to execute the Commit procedures:

- All the public data that are defined by this application, but are not defined by the InUse application instance shall be added to the public data of the InUse application.
- If the InUse instance of this application (corresponding to the stream to which this application is bound) has the same subtype as this application instance, then
  - The access terminal and the access network shall set the attribute values associated with the InUse instance of this application to the attribute values associated with the InConfiguration instance of this application, and
  - The access terminal and the access network shall purge the InConfiguration instance of the application.
- If the InUse instance of this application (corresponding to the stream to which this application is bound) does not have the same subtype as this application instance, then:
  - The access terminal and the access network shall initialize a receive pointer for DataOverSignaling message validation on Route A, $V(R_A)$, to 63.
  - The access terminal and the access network shall initialize a receive pointer for DataOverSignaling message validation on Route B, $V(R_B)$, to 63.
  - The access terminal and the access network shall initialize a transmit pointer for DataOverSignaling message validation on Route A, $V(S_A)$, to zero.
  - The access terminal and the access network shall initialize a transmit pointer for DataOverSignaling message validation on Route B, $V(S_B)$, to zero.
  - The access terminal and the access network shall set the StorageBLOB parameter of the Location Update Protocol to NULL.
  - The initial state of the Flow Control Protocol associated with the InConfiguration instance of the Packet Application at the access terminal and access network shall be set to the Close State.
  - The access network shall set the Forward Reservations with ReservationLabel 0xff and 0xfe to the Open state.[15]
  - The access terminal shall set the Reverse Reservations with ReservationLabel 0xff and 0xfe to the Open state.

[15] Forward and reverse link Reservations 0xff initialized in the Open state so that data can be sent without having to perform a state transition.

- The access network shall set the Forward Reservations with ReservationLabel not equal to 0xff or 0xfe to the Close state.
- The access terminal shall set the Reverse Reservations with ReservationLabel not equal to 0xff or 0xfe to the Close state.
- The Route Selection Protocol at the access terminal shall enter the A Open B Setting state (See Figure 3.4.4.1.2-1).
- The InConfiguration instance of the Packet Application at the access terminal and access network shall become the InUse instance for the Packet Application (corresponding to the stream to which this application is bound).

- All the public data not defined by this application shall be removed from the public data of the InUse application.

3.3.3 Message Formats

3.3.3.1 ConfigurationRequest

The ConfigurationRequest message format is as follows:

Field	Length (bits)
MessageID	8
TransactionID	8
Zero or more instances of the following record	
AttributeRecord	Attribute dependent

MessageID The sender shall set this field to 0x50.

TransactionID The sender shall increment this value for each new ConfigurationRequest message sent.

AttributeRecord The format of this record is specified in **[8]**.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

3.3.3.2 ConfigurationResponse

The ConfigurationResponse message format is as follows:

Field	Length (bits)
MessageID	8
TransactionID	8
Zero or more instances of the following record	
AttributeRecord	Attribute dependent

MessageID — The sender shall set this field to 0x51.

TransactionID — The sender shall set this value to the TransactionID field of the corresponding ConfigurationRequest message.

AttributeRecord — An attribute record containing a single attribute value. If this message selects a complex attribute, only the ValueID field of the complex attribute shall be included in the message. The format of the AttributeRecord is given in **[8]**. The sender shall not include more than one attribute record with the same attribute identifier.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

3.4 Route Selection Protocol

3.4.1 Overview

The Route Selection Protocol provides means to select either instance A or instance B of the Route Protocol. The Route Selection Protocol routes Flow Protocol PDUs to the selected instance of the Route Protocol. Instance A of the Route Protocol is bound to Route A of the Link Flow. Instance B of the Route Protocol is bound to Route B of the Link Flow. The Route Selection Protocol is a protocol associated with the Multi-link Multi-flow Packet Application. The application subtype for this application is defined in **[3]**.

3.4.2 Primitives and Public Data

3.4.2.1 Commands

This protocol does not define any commands.

3.4.2.2 Return Indications

This protocol does not return any indications.

3.4.3 Protocol Data Unit

The Route Selection Protocol routes Flow Protocol PDUs to the Route Protocol without modifying them. Hence, the transmission unit of this protocol is the same as a Flow Protocol PDU. The Flow Protocol for a forward Link Flow *NN* is identified by the ProtocolID field of the Flow*NN*FlowProtocolParametersFwd attribute. The Flow Protocol for a reverse Link Flow *NN* is identified by the ProtocolID field of the Flow*NN*FlowProtocolParametersRev attribute.

3.4.4 Procedures and Messages for the InUse Instance of the Protocol

3.4.4.1 Procedures

3.4.4.1.1 General Requirements

If the Flow*NN*FlowProtocolPDUFwd attribute of forward Link Flow *NN* is 0x00, then forward Link Flow *NN* provides an octet stream to the Flow Protocol. If the Flow*NN*FlowProtocolPDUFwd attribute of forward Link Flow *NN* is 0x01, then forward Link Flow *NN* provides a packet stream to the Flow Protocol.

If the Flow*NN*FlowProtocolPDURev attribute of reverse Link Flow *NN* is 0x00, then reverse Link Flow *NN* provides an octet stream to the Flow Protocol. If the Flow*NN*FlowProtocolPDURev attribute of reverse Link Flow *NN* is 0x01, then reverse Link Flow *NN* provides a packet stream to the Flow Protocol.

3.4.4.1.2 Access Terminal Requirements

The Route Selection Protocol associated with an activated Link Flow can be in one of four states: A Open B Setting, A Open B Rising, A Setting B Open, or A Rising B Open. The

Route Selection Protocol instance associated with all activated Link Flows shall be in the same state at any time. When a Link Flow is activated, the Route Selection Protocol shall enter the state that the Route Selection Protocols of other activated Link Flows are in. If no other Link Flows are activated when a Link Flow is activated, then the Route Selection Protocol shall enter the A Open B Setting state. If the Route Selection Protocol receives a *ConnectedState.ConnectionClosed* indication or *RouteUpdate.ConnectionLost* indication, it shall enter the A Open B Setting state. Figure 3.4.4.1.2-1 shows the state diagram for the Route Selection Protocol at the access terminal.

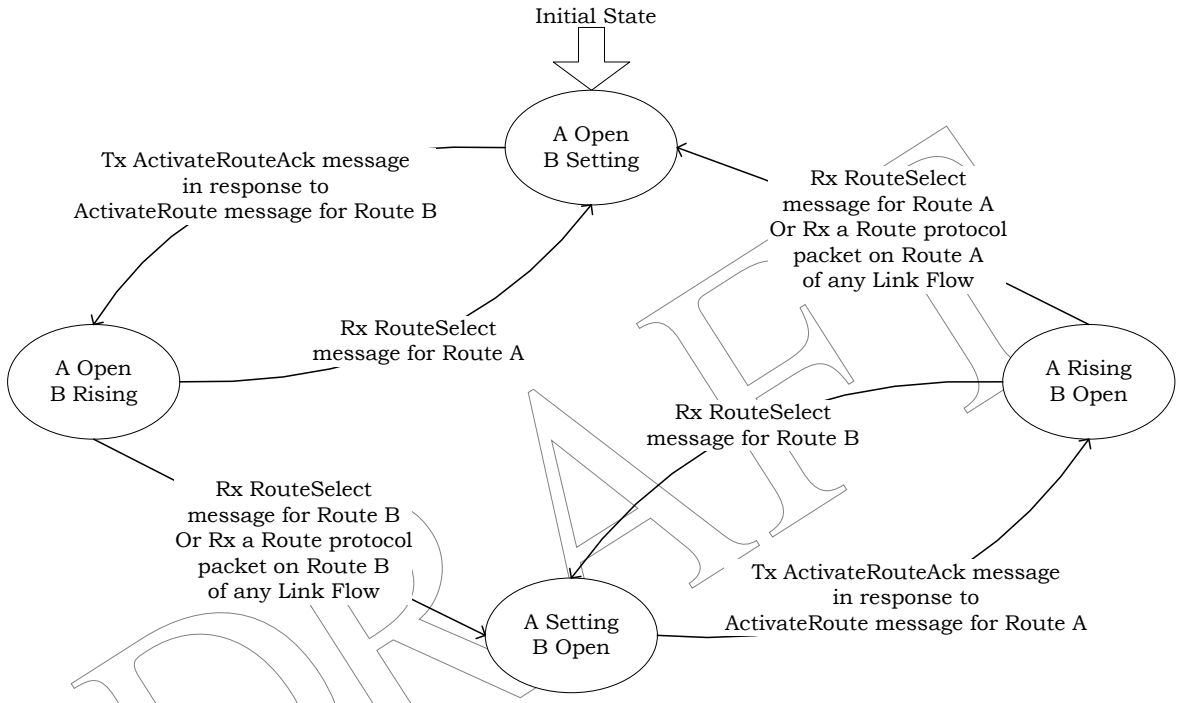

Figure 3.4.4.1.2-1. Route Selection Protocol State Diagram (Access Terminal)

3.4.4.1.2.1 A Open B Setting State

3.4.4.1.2.1.1 State Transitions

Upon receiving an ActivateRoute message requesting to activate Route B, the access terminal shall perform the following:

- If TwoRoutesSupported is 0x01, the access terminal shall perform the following:
  - The Route Selection Protocol shall issue a *SAR.InitializeRoute* command with Route B as the argument.
  - The access terminal shall initialize the Route Protocol bound to Route B.
  - After the Segmentation and Reassembly Protocol and the Route Protocol are initialized, the access terminal shall send an ActivateRouteAck message, and shall transition to the A Open B Rising state.
- Otherwise, the access terminal shall ignore the ActivateRoute message.

Upon receiving a RouteSelect message for Route A, the access terminal shall respond with a RouteSelectAck message.

3.4.4.1.2.1.2 Transmitter Requirements

The access terminal shall route Flow Protocol PDUs to Route A. The access terminal shall not route Flow Protocol PDUs to Route B.

3.4.4.1.2.1.3 Receiver Requirements if TwoRoutesSupported is 0x00

The access terminal shall pass Flow Protocol PDUs received on Route A to the Flow Protocol. The access terminal shall discard Flow Protocol PDUs received on Route B.

3.4.4.1.2.1.4 Receiver Requirements if TwoRoutesSupported is 0x01

The access terminal shall pass Flow Protocol PDUs received on Route A to the Flow Protocol.

If the Flow*NN*SimultaneousDeliveryOnBothRoutesFwd attribute for Link Flow *NN* is 0x01, the access terminal shall perform the following: the access terminal shall pass Flow Protocol PDUs received on Route B of the Link Flow to the Flow Protocol if the access terminal has not received an ActivateRoute message requesting to activate Route B since the last time it entered this state; otherwise, the access terminal shall discard Flow Protocol PDUs received on Route B.

If the Flow*NN*SimultaneousDeliveryOnBothRoutesFwd attribute for Link Flow *NN* is 0x00, the access terminal shall perform the following: the access terminal shall pass Flow Protocol PDUs received on Route B of the Link Flow to the Flow Protocol if the access terminal has not passed Flow Protocol PDUs received on Route A of the Link Flow to the Flow Protocol since the last time the access terminal entered this state and if the access terminal has not received an ActivateRoute message requesting to activate Route B since the last time it entered this state; otherwise, the access terminal shall discard Flow Protocol PDUs received on Route B of the Link Flow.

3.4.4.1.2.2 A Open B Rising State

3.4.4.1.2.2.1 State Transitions

Upon receiving a RouteSelect message requesting to select Route B[16], the access terminal shall respond with a RouteSelectAck message, and shall transition to the A Setting B Open state. Upon receiving Flow Protocol PDU on Route B of any Link Flow[17], the access terminal shall store the Flow Protocol PDU received from Route B for processing in the A Setting B Open state and shall transition to the A Setting B Open state.

[16] The access terminal could wait to send RouteSelectAck message and transition state until the next Flow protocol packet boundary

[17] The access terminal could wait to transition state until the next Flow protocol packet boundary.

Upon receiving a RouteSelect message requesting to select Route A, the access terminal shall respond with a RouteSelectAck message, and shall transition to the A Open B Setting state.

If the access terminal receives an ActivateRoute message, the message shall be ignored.

3.4.4.1.2.2.2 Transmitter Requirements

The access terminal shall route Flow Protocol PDUs to Route A. The access terminal shall not route Flow Protocol PDUs to Route B.

3.4.4.1.2.2.3 Receiver Requirements

The access terminal shall pass Flow Protocol PDUs received on Route A to the Flow Protocol.

3.4.4.1.2.3 A Setting B Open State

3.4.4.1.2.3.1 State Transitions

Upon receiving an ActivateRoute message requesting to activate Route A, the access terminal shall perform the following:

- The Route Selection Protocol shall issue a *SAR.InitializeRoute* command with Route A as the argument.
- The access terminal shall initialize the Route Protocol bound to Route A.
- After the Segmentation and Reassembly Protocol and the Route Protocol are initialized, the access terminal shall send an ActivateRouteAck message, and shall transition to the A Rising B Open state.

Upon receiving a RouteSelect message for Route B, the access terminal shall respond with a RouteSelectAck message.

3.4.4.1.2.3.2 Transmitter Requirements

The access terminal shall route Flow Protocol PDUs to Route B. The access terminal shall not route Flow Protocol PDUs to Route A.

3.4.4.1.2.3.3 Receiver Requirements

The access terminal shall pass Flow Protocol PDUs received on Route B to the Flow Protocol.

If the Flow*NN*SimultaneousDeliveryOnBothRoutesFwd attribute for Link Flow *NN* is 0x01, the access terminal shall perform the following: the access terminal shall pass Flow Protocol PDUs received on Route A of the Link Flow to the Flow Protocol if the access terminal has not received an ActivateRoute message requesting to activate Route A since the last time it entered this state; otherwise, the access terminal shall discard Flow Protocol PDUs received on Route A.

If the Flow*NN*SimultaneousDeliveryOnBothRoutesFwd attribute for Link Flow *NN* is 0x00, the access terminal shall perform the following: the access terminal shall pass Flow Protocol PDUs received on Route A of the Link Flow to the Flow Protocol if the access terminal has not passed Flow Protocol PDUs received on Route B of the Link Flow to the Flow Protocol since the last time the access terminal entered this state and if the access terminal has not received an ActivateRoute message requesting to activate Route A since the last time it entered this state; otherwise, the access terminal shall discard Flow Protocol PDUs received on Route A of the Link Flow.

3.4.4.1.2.4 A Rising B Open State

3.4.4.1.2.4.1 State Transitions

Upon receiving a RouteSelect message requesting to select Route A[18], the access terminal shall respond with a RouteSelectAck message, and shall transition to the A Open B Setting state. Upon receiving Flow Protocol PDU on Route A of any Link Flow[19], the access terminal shall store the Flow Protocol PDU received on Route A for processing in the A Open B Setting state and shall transition to the A Open B Setting state.

Upon receiving a RouteSelect message requesting to select Route B, the access terminal shall respond with a RouteSelectAck message, and shall transition to the A Setting B Open state.

If the access terminal receives an ActivateRoute message, the message shall be ignored.

3.4.4.1.2.4.2 Transmitter Requirements

The access terminal shall route Flow Protocol PDUs to Route B. The access terminal shall not route Flow Protocol PDUs to Route A.

3.4.4.1.2.4.3 Receiver Requirements

The access terminal shall pass Flow Protocol PDUs received on Route B to the Flow Protocol.

3.4.4.1.3 Access Network Requirements

If TwoRoutesSupported attribute is 0x00, then the access network shall not send ActivateRoute or RouteSelect messages.

Upon sending an ActivateRoute message requesting to activate Route A, the access network shall issue a *SAR.InitializeRoute* command with Route A as the argument and initialize the Route Protocol bound to Route A.

---

[18] The access terminal could wait to send RouteSelectAck message and transition state until the next Flow protocol packet boundary.

[19] The access terminal could wait to transition state until the next Flow protocol packet boundary.

Upon sending an ActivateRoute message requesting to activate Route B, the access network shall issue a *SAR.InitializeRoute* command with Route B as the argument and initialize the Route Protocol bound to Route B.

3.4.4.2 Message Formats

3.4.4.2.1 RouteSelect

The access network sends this message to transition the access terminal to the A Open B Setting or the A Setting B Open state.

Field	Length (bits)
MessageID	8
TransactionID	8
Route	1
Reserved	7

MessageID — The access network shall set this field to 0x1e.

TransactionID — The access network shall set this field to one more (modulo 256) than the TransactionID field of the last RouteSelect message sent by the access network.

Route — The access network shall set this field to '0' to transition the access terminal to the A Open B Setting state. The access network shall set this field to '1' to transition the access terminal to the A Setting B Open state.

Reserved — The access network shall set this field to '0000000'. The access terminal shall ignore this field.

Channels	FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.4.4.2.2 RouteSelectAck

The access terminal sends this message to acknowledge the receipt of a RouteSelect message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID — The access terminal shall set this field to 0x1f.

TransactionID — The access terminal shall set this field to the TransactionID field of the RouteSelect message whose receipt is being acknowledged by this message.

Channels	RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.4.4.2.3 ActivateRoute

The access network sends this message to transition the access terminal to the A Rising B Open state or the A Open B Rising state.

Field	Length (bits)
MessageID	8
TransactionID	8
Route	1
Reserved	7

MessageID — The access network shall set this field to 0x20.

TransactionID — The access network shall set this field to one more (modulo 256) than the TransactionID field of the last ActivateRoute message sent by the access network.

Route — The access network shall set this field to '0' to transition the access terminal to the A Rising B Open state. The access network shall set this field to '1' to transition the access terminal to the A Open B Rising state.

Reserved — The access network shall set this field to '0000000'. The access terminal shall ignore this field.

Channels	FTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

3.4.4.2.4 ActivateRouteAck

The access terminal sends this message to acknowledge the receipt of an ActivateRoute message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access terminal shall set this field to 0x21.

TransactionID The access terminal shall set this field to the TransactionID field of the ActivateRoute message whose receipt is being acknowledged by this message.

Channels	RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

3.4.4.3 Interface to Other Protocols

3.4.4.3.1 Commands

This protocol issue the following commands:

- *SAR.InitializeRoute* with argument indicating which Route is to be initialized.

3.4.4.3.2 Indications

This protocol registers to receive the following indications:

- *ConnectedState.ConnectionClosed*
- *RouteUpdate.ConnectionLost*

3.4.5 Protocol Numeric Constants

This protocol does not define any protocol numeric constants.

3.5 Segmentation and Reassembly Protocol

3.5.1 Overview

The Segmentation and Reassembly Protocol (SAR) provides one or more octet or packet streams with an acceptably low erasure rate for efficient operation of higher layer protocols (e.g., TCP). When used as part of the Multi-link Multi-flow Packet Application, the protocol carries one or more octet or packet streams from the higher layer. SAR is a protocol associated with the Multi-link Multi-flow Packet Application. The application subtype for this application is defined in [3].

3.5.2 Primitives and Public Data

3.5.2.1 Commands

This protocol defines the following commands:

- *InitializeRoute* with argument indicating which Route is to be initialized.

3.5.2.2 Return Indications

This protocol does not return any indications.

3.5.3 Protocol Data Unit

The transmission unit of this protocol is a SAR packet.

3.5.4 Procedures and Messages for the InUse Instance of the Protocol

A forward Link Flow *NN* is defined to be activated if the Flow*NN*ActivatedFwd attribute is set to 0x01, where *NN* is the hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd -1 inclusive. The number of activated Link Flows on the forward link shall not exceed the value of the MaxActivatedLinkFlowsFwd attribute.

A reverse Link Flow *NN* is defined to be activated if the Flow*NN*ActivatedRev attribute is set to 0x01, where *NN* is the hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive. The number of activated Link Flows on the reverse link shall not exceed the value of the MaxActivatedLinkFlowsRev attribute.

A Link Flow is defined to be deactivated if it is not activated.

This section defines the procedures and messages for the in-use instance of each forward or reverse Link Flow.

3.5.4.1 Procedures

Each Route of the Link Flow receives octets or packets for transmission from the corresponding instance of the Route Protocol and forms a SAR packet by prepending the SAR packet header defined in 3.5.4.3 with a number of received contiguous octets.

The Route Protocol for a forward Link Flow *NN* is identified by the ProtocolID field of Flow*NN*RouteProtocolParametersFwd attribute. The Route Protocol for a reverse Link Flow *NN* is identified by the ProtocolID field of Flow*NN*RouteProtocolParametersRev attribute.

If the Route Protocol is NULL[20], then the transmitter shall set Route Protocols octets or packets to Flow Protocol octets or packets routed along the Route. If the Route Protocol is NULL, then the receiver shall set Flow Protocols octets or packets to Route Protocol packets or octets received on the Route.

If the Flow*NN*RouteProtocolPDUFwd attribute of forward Link Flow *NN* is 0x00, then each Route of forward Link Flow *NN* provides an octet stream to the corresponding instance of the Route Protocol. If the Flow*NN*RouteProtocolPDUFwd attribute of forward Link Flow *NN* is 0x01, then each Route of forward Link Flow *NN* provides a packet stream to the corresponding instance of the Route Protocol.

If the Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd attribute of forward Link Flow *NN* is 0x00, then each Route of forward Link Flow *NN* delivers payload to the corresponding instance of the Route Protocol in order. If the Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd attribute of forward Link Flow *NN* is 0x01, then each Route of forward Link Flow *NN* may deliver payload to the corresponding instance of the Route Protocol out of order.

If the Flow*NN*RouteProtocolPDURev attribute of reverse Link Flow *NN* is 0x00, then each Route of reverse Link Flow *NN* provides an octet stream to the corresponding instance of the Route Protocol. If the Flow*NN*RouteProtocolPDURev attribute of reverse Link Flow *NN* is 0x01, then each Route of reverse Link Flow *NN* provides a packet stream to the corresponding instance of the Route Protocol.

The policy SAR follows in determining the number of octets to send in a SAR packet is beyond the scope of this specification. It is subject to the following requirements:

- The size of a SAR packet shall not exceed the maximum payload length that can be carried by a Stream Layer packet given the target channel and current transmission rate on that channel.
- If the Link Flow is carrying a packet stream, then a SAR packet shall contain octets from no more than one Route Protocol packet.
- The SAR packet should contain all octets of the Route Protocol packet if all of the following conditions are true:
  - The size of the SAR packet carrying all octets of the Route Protocol packet does not exceed the maximum payload length that can be carried by a Stream Layer packet given the target channel and the current transmission rate on that channel.
  - The Link flow is carrying a packet stream.
  - The data unit for the Link Flow is SAR packet payloads.

[20] [20] Route Protocol being NULL means that a Route Protocol has not been negotiated.

- If all of the following conditions are true, the size of the SAR packet shall be such that it could be re-transmitted in a lower layer packet with same or higher payload:
  - The data unit for the Link Flow is SAR packet payloads.
  - If the SAR transmitter is the access terminal, Flow*NN*NakEnableRev attribute is set to 0x01 for this Link Flow or Flow*NN*PhysicalLayerNakEnableRev is set to 0x01 for this Link Flow.
  - If the SAR transmitter is the access network, Flow*NN*NakEnableFwd attribute is set to 0x01 for this Link Flow.

For the purpose of binding Link Flows to lower layer flows (such as MAC flows in the Subtype 3 Reverse Traffic Channel MAC Protocol specified in **[8]**), each Link Flow shall be treated as a substream with the substream number set to the Link Flow number.

SAR makes use of the ResetTxIndication, ResetRxIndication, ResetTxIndicationAck, ResetTxComplete, ResetRxComplete, Flush, MultiLinkNak, and Nak messages to perform control related operations.

When sending an AttributeUpdateRequest message containing requests to set one or more Reservation*KK*QoSRequestFwd or the Reservation*KK*QoSRequestRev attribute to their default value, the access terminal shall not include other types of requests in the same AttributeUpdateRequest message.

The access network shall not initiate modification of the Reservation*KK*QoSRequestFwd or the Reservation*KK*QoSRequestRev attributes. If the access network receives an AttributeUpdateRequest message requesting to set the Reservation*KK*QoSRequestFwd or the Reservation*KK*QoSRequestRev attribute to its default value, then the access network shall respond with an AttributeUpdateAccept message. The access terminal shall not initiate modification of the Reservation*KK*QoSResponseFwd or the Reservation*KK*QoSResponseRev attributes. The access terminal shall use the ProfileType 0x00, 0x01, or 0x02 in the Reservation*KK*QoSRequestFwd or the Reservation*KK*QoSRequestRev attributes. The access network shall use ProfileType 0x00 or 0x03 in the Reservation*KK*QoSResponseFwd or the Reservation*KK*QoSResponseRev attributes.

When forward Link Flow *NN* is activated, the access network and the access terminal shall not update the following attributes:

- Flow*NN*FlowProtocolParametersFwd,
- Flow*NN*RouteProtocolParametersFwd,
- Flow*NN*SequenceLengthFwd,
- Flow*NN*FlowProtocolPDUFwd,
- Flow*NN*RouteProtocolPDUFwd,
- Flow*NN*DataUnitFwd,
- Flow*NN*SimultaneousDeliveryOnBothRoutesFwd, and
- Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd.

The access terminal shall not initiate re-activation of a deactivated forward Link Flow *NN* unless the access terminal initiated deactivation of forward Link Flow *NN* since the last time the Link Flow was activated, and the deactivation was successful. The access network shall not initiate re-activation of a deactivated forward Link Flow *NN* unless the access network initiated deactivation of forward Link Flow *NN* since the last time the Link Flow was activated, and the deactivation was successful.

When reverse Link Flow *NN* is activated, the access network and the access terminal shall not update the following attributes:

- Flow*NN*FlowProtocolParametersRev,
- Flow*NN*RouteProtocolParametersRev,
- Flow*NN*SequenceLengthRev,
- Flow*NN*FlowProtocolPDURev,
- Flow*NN*RouteProtocolPDURev, and
- Flow*NN*DataUnitRev

The access terminal shall not initiate re-activation of a deactivated reverse Link Flow *NN* unless the access terminal initiated deactivation of reverse Link Flow *NN* since the last time the Link Flow was activated, and the deactivation was successful. The access network shall not initiate re-activation of a deactivated reverse Link Flow *NN* unless the access network initiated deactivation of reverse Link Flow *NN* since the last time the Link Flow was activated, and the deactivation was successful.

The ProtocolID field of the Flow*NN*FlowProtocolParametersFwd attribute shall be set to a value that is supported by the access terminal as indicated in the ATSupportedFlowProtocolParameters*PP* attribute. The ProtocolID field of the Flow*NN*FlowProtocolParametersRev attribute shall be set to a value that is supported by the access terminal as indicated in the ATSupportedFlowProtocolParameters*PP* attribute. The ProtocolID field of the Flow*NN*RouteProtocolParametersFwd attribute shall be set to a value that is supported by the access terminal as indicated in the ATSupportedRouteProtocolParameters*PP* attribute. The ProtocolID field of the Flow*NN*RouteProtocolParametersRev attribute shall be set to a value that is supported by the access terminal as indicated in the ATSupportedRouteProtocolParameters*PP* attribute.

The fields of the ProtocolParameters record of the Flow*NN*FlowProtocolParametersFwd attribute shall be set to values that are in accordance with those supported by the AT as indicated in the SupportedProtocolParametersValues record of the ATSupportedFlowProtocolParameters*PP* attribute. The fields of the ProtocolParameters record of the Flow*NN*FlowProtocolParametersRev attribute shall be set to values that are in accordance with those supported by the AT as indicated in the SupportedProtocolParametersValues record of the ATSupportedFlowProtocolParameters*PP* attribute. The fields of the ProtocolParameters record of the Flow*NN*RouteProtocolParametersFwd attribute shall be set to values that are in accordance with those supported by the AT as indicated in the SupportedProtocolParametersValues record of the ATSupportedRouteProtocolParameters*PP* attribute. The fields of the

ProtocolParameters record of the Flow*NN*RouteProtocolParametersRev attribute shall be set to values that are in accordance with those supported by the AT as indicated in the SupportedProtocolParametersValues record of the ATSupportedRouteProtocolParameters*PP* attribute.

If the Flow*NN*DataUnitFwd attribute of forward Link Flow *NN* is 0x00, then the data unit for the Link Flow shall be octets. Otherwise the data unit for the Link Flow shall be SAR packet payloads. If the Flow*NN*DataUnitRev attribute of reverse Link Flow *NN* is 0x00, then the data unit for the Link Flow shall be octets. Otherwise the data unit for the Link Flow shall be SAR packet payloads.

If the access terminal wishes to associate one or more BCMCS flow IDs to a reservation KK, and if the BCMCSOverRLPAllowed is set to '1', then the access terminal may send AttributeUpdateRequest message containing Reservation*KK*BCMCSFlowIDAssociation attribute. If the access network receives an AttributeUpdateRequest message containing Reservation*KK*BCMCSFlowIDAssociation attribute, and if the access network accepts the BCMCS Flow ID(s) association to the reservation, then the access network shall respond with an AttributeUpdateAccept message. The access network shall not send AttributeUpdateRequest message containing Reservation*KK*BCMCSFlowIDAssociation attribute.

If the access terminal wishes to associate one or more BCMCS Programs to a reservation KK, and if the BCMCSOverRLPAllowed is set to '1', then the access terminal may send AttributeUpdateRequest message containing Reservation*KK*BCMCSProgramIDAssociation attribute. If the access network receives an AttributeUpdateRequest message containing Reservation*KK*BCMCSProgramIDAssociation attribute, and if the access network accepts the BCMCS Program(s) association to the reservation, then the access network shall respond with an AttributeUpdateAccept message. The access network shall not send AttributeUpdateRequest message containing Reservation*KK*BCMCSProgramIDAssociation attribute.

3.5.4.1.1 Initialization and Reset

The SAR initialization procedure initializes the SAR variables and data structures in one end of the link. The SAR reset procedure guarantees that SAR state variables on both sides are synchronized. The reset procedure includes initialization.

The access terminal and the access network shall perform the initialization procedures defined in 3.5.4.1.1.1.1 and 0 for both routes of all activated Link Flows if the protocol receives an *IdleState.ConnectionOpened* indication. The access network shall perform the initialization procedure defined in 3.5.4.1.1.1.1 for both routes of forward Link Flow *NN* when forward Link Flow *NN* is activated. The access terminal shall perform the initialization procedure defined in 3.5.4.1.1.1.2 for both routes of forward Link Flow *NN* when forward Link Flow *NN* is activated. The access terminal shall perform the initialization procedure defined in 3.5.4.1.1.1.1 for both routes of reverse Link Flow *NN* when reverse Link Flow *NN* is activated. The access network shall perform the initialization procedure defined in 3.5.4.1.1.1.2 for both routes of reverse Link Flow *NN* when reverse Link Flow *NN* is activated. Upon receiving an *InitializeRoute* command, the access terminal shall perform the initialization procedures defined in 3.5.4.1.1.1 for the specified Route of all activated Link

Flows. Upon receiving an *InitializeRoute* command, the access network shall perform the initialization procedures defined in 3.5.4.1.1.1 for the specified Route of all activated Link Flows.

3.5.4.1.1.1 Initialization Procedure

3.5.4.1.1.1.1 Initialization Procedure for the SAR Transmitter

When SAR transmitter performs the initialization procedure it shall:

- Reset the send state variable $V(S)_{NN,P}$ to zero, where *NN* indicates the Link Flow, and *P* indicates the Route which is being initialized,
- send a *QN.Initialize* command to all instances of the QN transmitter of Route *P* of Link Flow *NN*, and
- clear the retransmission queues.

3.5.4.1.1.1.2 Initialization Procedure for the SAR Receiver

When SAR receiver performs the initialization procedure it shall:

- Reset the receive state variables $V(R)_{NN,P}$ and $V(N)_{NN,P}$ to zero,
- Send a *QN.Initialize* command to all instances of the QN receiver of Route *P* of Link Flow *NN*, and
- clear the resequencing buffer.

3.5.4.1.1.2 Reset Procedure

3.5.4.1.1.2.1 Reset Procedure for the Initiating Side when it is a SAR Transmitter

If the side initiating a reset procedure is a SAR transmitter for the Route of the Link Flow (or of all Link Flows) being reset, then it shall send a ResetTxIndication message and enter the SAR Reset State.

Upon entering the SAR Reset state SAR transmitter shall:

- Perform the SAR transmitter initialization procedure defined in 3.5.4.1.1.1.1 for the Route being reset.
- If a MultiLinkNak or Nak message is received for the Route of the Link Flow being reset while in the SAR Reset state, the message shall be ignored.
- If the SAR transmitter that initiated the reset procedure is an access terminal, and if a *PhysicalLayer.ReverseTrafficPacketsMissed* indication is received for the Route of the Link Flow being reset while SAR is in the Reset state, then the indication shall be ignored.
- The SAR transmitter should not transmit SAR packets while in the SAR Reset state.
- If SAR receives a ResetTxIndicationAck message for the Route of the Link Flow being reset while in the SAR Reset state, it shall send a ResetTxComplete message back and leave the SAR Reset state.

- If SAR receives an *IdleState.ConnectionOpened* indication while in the SAR Reset state, it shall leave the SAR Reset state.

If a ResetTxIndicationAck message is received for a Route while that Route is not in the SAR Reset state, the message shall be ignored.

3.5.4.1.1.2.2 Reset Procedure for Initiating Side when it is a SAR Receiver

If the side initiating a reset procedure is a SAR receiver for the Route of the Link Flow being reset, then it shall send a ResetRxIndication message and enter the SAR Reset State. Upon entering the SAR Reset state, the SAR receiver shall:

- Perform the SAR receiver initialization procedure defined in 3.5.4.1.1.1.2 for the Route being reset.
- Ignore all SAR data units received for the Route of the Link Flow being reset while in the SAR Reset state.
- When SAR receives a ResetRxComplete message for the Route of the Link Flow being reset, it shall leave the SAR Reset state.
- If SAR receives an *IdleState.ConnectionOpened* indication while in the SAR Reset state, it shall leave the SAR Reset state.

If a ResetRxComplete is received for a Route while the Route is not in the SAR Reset state, the message shall be ignored.

3.5.4.1.1.2.3 Reset Procedure for the Responding Side when it is a SAR Receiver

If the side responding to a reset procedure is a SAR receiver for the Route of the Link Flow being reset, then it shall respond with a ResetTxIndicationAck message upon receiving a ResetTxIndication message. After sending the message it shall enter the SAR Reset state for the Route being reset, if it was not already in the SAR Reset state. Upon entering the SAR Reset state SAR shall:

- Perform the SAR receiver initialization procedure defined in 3.5.4.1.1.1.2 for the Route being reset.
- Ignore all SAR data units received for the Route of the Link Flow being reset while in the SAR Reset state.
- When SAR receives a ResetTxComplete message for the Route of the Link Flow being reset, it shall leave the SAR Reset state.
- If SAR receives an *IdleState.ConnectionOpened* indication while in the SAR Reset state, it shall leave the SAR Reset state.

If a ResetTxComplete message is received for a Route while the Route is not in the SAR Reset state, the message shall be ignored.

3.5.4.1.1.2.4 Reset Procedure for the Responding Side when it is a SAR transmitter

If the side responding to a reset procedure is a SAR transmitter for the Route being reset, then it shall respond with a ResetRxComplete message upon receiving a ResetRxIndication

message. After sending the message, it shall perform the SAR transmitter initialization procedure defined in 3.5.4.1.1.1.1 for the Route being reset.

3.5.4.1.1.2.5 SAR Reset Message Flows

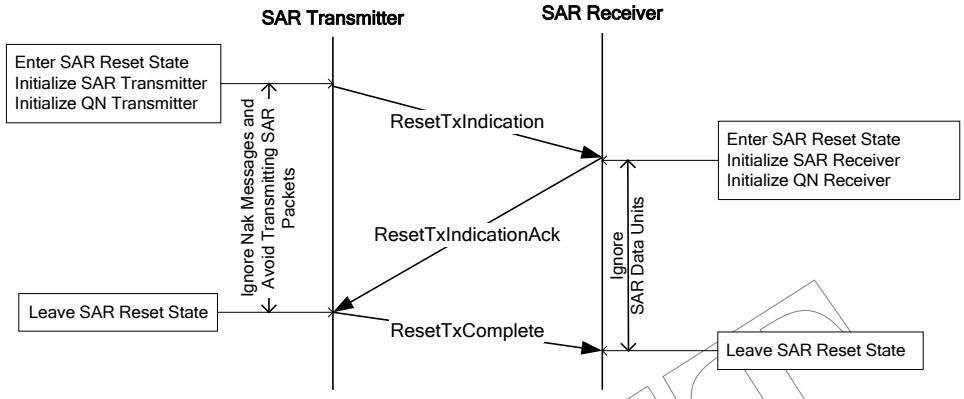

Figure 3.5.4.1.1.2.5-1. SAR Reset Procedure Initiated by SAR Transmitter

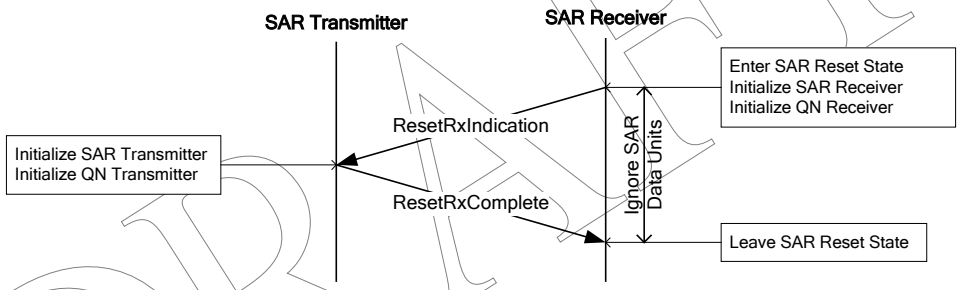

Figure 3.5.4.1.1.2.5-2. SAR Reset Procedure Initiated by SAR Receiver

3.5.4.2 Data Transfer

SAR is a Nak-based protocol with a sequence space of SARSequenceLength bits, where SARSequenceLength is indicated by the SARSequenceLength field of the Flow*NN*SequenceLengthFwd for forward Link Flow *NN* and the Flow*NN*SequenceLengthRev attribute for reverse Link Flow *NN*.

All operations and comparisons performed on SAR packet sequence numbers shall be carried out in unsigned modulo 2^S arithmetic, where S represents the value of SARSequenceLength. For any SAR sequence number *N*, the sequence numbers in the range [$N+1$, $N+2^{S-1}-1$] shall be considered greater than *N* and the sequence numbers in the range [$N-2^{S-1}$, $N-1$] shall be considered smaller than *N*.

3.5.4.2.1 SAR Transmit Procedures

The SAR transmitter shall maintain a SARSequenceLength-bit variable $V(S)_{NN,P}$ for all transmitted SAR data units (see Figure 3.5.4.2.1-1), where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to M-1 inclusive, *P* is the Route indicator that takes values of either A or B, and *M* is MaxNumLinkFlowsFwd or MaxNumLinkFlowsRev for a

forward Link Flow or reverse Link Flow, respectively. $V(S)_{NN,P}$ is the sequence number of the next SAR data unit to be sent on Route *P* of Link Flow *NN*. The sequence number field (SEQ) in each new SAR packet transmitted shall be set to $V(S)_{NN,P}$, corresponding to the sequence number of the first data unit in the packet. If the data unit is octets, then the sequence number of the i^{th} octet in the packet (with the first octet being octet 0) is implicitly given by SEQ+*i*. $V(S)_{NN,P}$ shall be incremented for each data unit contained in the packet.

The SAR transmitter should allow sufficient time before deleting a SAR packet payload transmitted for the first time.

Upon receiving a Nak message, SAR transmitter at the access terminal shall transmit the missing data unit(s) (if any) conveyed by the Nak message if all of the following conditions are satisfied:

- the requested data units are available,
- the requested data units have not been retransmitted before in response to a Nak message, and
- if the data unit for the Link Flow is SAR packet payloads, the payload carrying capacity of the lower layer packet is not smaller than the size of the packet to be re-transmitted.

Upon receiving a MultiLinkNak message, SAR transmitter at the access network shall transmit the missing data unit(s) (if any) conveyed by the MultiLinkNak message if all of the following conditions are satisfied:

- the requested data unit is available,
- the requested data unit has not been retransmitted before in response to a MultiLinkNak message,
- if the data unit for the Link Flow is SAR packet payloads, the payload carrying capacity of the lower layer packet is not smaller than the size of the packet to be re-transmitted, and
- one of the following conditions is true:
  - the DelayedNak field corresponding to the missing data units in the MultiLinkNak message is set to '1', or
  - the DelayedNak field corresponding to the missing data units in the MultiLinkNak message is not set to '1', the LeadingEdgeIncluded field corresponding to the missing data units in the MultiLinkNak message is set to '1', and the missing data unit was transmitted on the QN instance on which data units whose SAR sequence numbers are equal to the LeadingEdge and TrailingEdge fields of the MultiLinkNak message were transmitted, or

– the DelayedNak field corresponding to the missing data units in the MultiLinkNak message is not set to '1', the LeadingEdgeIncluded field corresponding to the missing data units in the MultiLinkNak message is set to '0', the missing data unit was transmitted on the QN instance on which data unit whose SAR sequence number is equal to the TrailingEdge field of the MultiLinkNak message was transmitted, and the missing data unit was transmitted since the last time (before transmission of data unit with sequence number TrailingEdge on the QN instance) that the QN instance became the serving QN instance.

If the SAR transmitter is the access network, and the MultiLinkNak message includes any sequence number greater than or equal to $V(S)_{NN,P}$, SAR shall perform the reset procedures specified in 3.5.4.1.1.2.1 for Route *P* of forward Link Flow *NN*. If the SAR transmitter is the access terminal, and the Nak message includes any sequence number greater than or equal to $V(S)_{NN,P}$, SAR shall perform the reset procedures specified in 3.5.4.1.1.2.1 for Route *P* of reverse Link Flow *NN*. If the MultiLinkNak or Nak message does not include any sequence number greater than or equal to $V(S)_{NN,P}$ but the requested data units are not available for retransmissions, SAR shall ignore the MultiLinkNak or Nak message for data units that are not available.

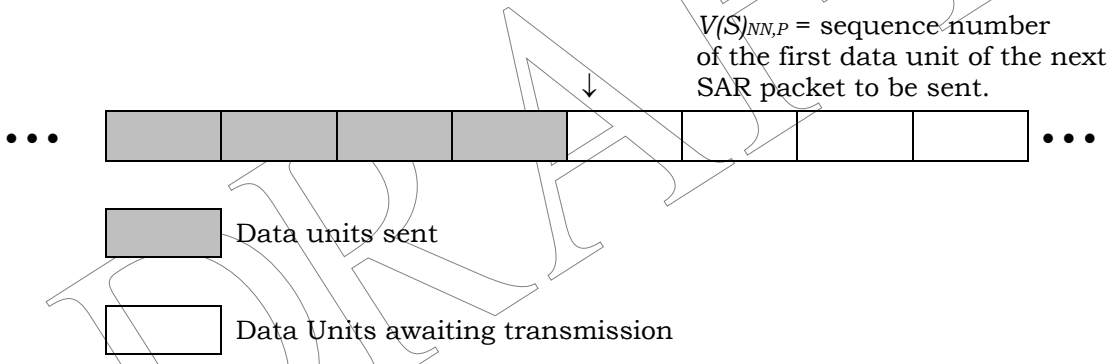

Figure 3.5.4.2.1-1. SAR Transmit Sequence Number Variable

Upon receiving a *PhysicalLayer.ReverseTrafficPacketsMissed* indication for reverse Link Flow *NN*, the SAR transmitter in the access terminal shall retransmit the requested data units(s) if and only if all of the following conditions are satisfied:

- Flow*NN*PhysicalLayerNakEnableRev attribute is set to 0x01,
- if the data unit for the Link Flow is SAR packet payloads, the payload carrying capacity of the lower layer packet is not smaller than the size of the packet to be re-transmitted
- the requested data units have not been retransmitted before, and
- the requested data units are available.

If Flow*NN*NakEnableFwd is 0x01, then the transmitter at the access network for each Route of Link Flow *NN* shall meet the following requirements:

- After transmitting a packet that contains first-time data unit(s), the SAR transmitter shall start a SAR flush timer for time FlushTimer, where FlushTimer is a parameter of the Flow*NN*TimersFwd attribute.
- If the SAR transmitter sends another packet that contains first-time data unit(s) before the SAR flush timer expires, the SAR transmitter shall reset and restart the timer.
- If the timer expires, the SAR transmitter shall disable the flush timer and the SAR transmitter should send a Flush message containing $V(S)_{NN,P}$-1.

If Flow*NN*NakEnableRev is 0x01, then the transmitter at the access terminal for each Route of Link Flow *NN* shall meet the following requirements:

- After transmitting a packet that contains first-time data unit(s), the SAR transmitter shall start a SAR flush timer for time FlushTimer, where FlushTimer is a parameter of the Flow*NN*TimersRev attribute.
- If the SAR transmitter sends another packet that contains first-time data unit(s) before the SAR flush timer expires, the SAR transmitter shall reset and restart the timer.
- If the timer expires, the SAR transmitter shall disable the flush timer and the SAR transmitter should perform the following:
  - If the data unit for this Link Flow is octets, then the SAR transmitter should send a SAR packet that contains at least the data unit with sequence number $V(S)_{NN,P}$-1.
  - Otherwise, the SAR transmitter should either send a SAR packet that contains at least the data unit with sequence number $V(S)_{NN,P}$-1 or send a Flush message containing $V(S)_{NN,P}$-1.

The SAR transmitter should not transmit more than $2^{\text{SARSequenceLength-1}}$ first-time data units in any AbortTimer interval.

3.5.4.2.1.1 Reservation State Maintenance

The ReservationLabel parameter of the Flow*NN*ReservationFwd or Flow*NN*ReservationRev attribute indicates the higher layer flows associated with Link Flow *NN*. Each ReservationLabel shall be associated with no more than one forward Link Flow. Each ReservationLabel shall be associated with no more than one reverse Link Flow.

Each Reservation can be in one of the following two states:

- Close State
- Open State

The transmitter should transmit higher layer octets[21] or packets using the Link Flow associated with the higher layer flow if the associated Link Flow is activated and if the Reservation is in the Open state. The transmitter should transmit higher layer octets

[21] Higher layer is represented by ProtocolID field of the Flow*NN*FlowProtocolParametersFwd/Flow*NN*FlowProtocolParametersRev attribute of the respective link flow *NN*.

belonging to a higher layer flow that is not associated with any Link Flow using the Link Flow with ReservationLabel 0xff if the higher layer flow provides an octet stream with octet-based HDLC-like framing to the Multi-link Multi-flow Packet Application. The transmitter may transmit higher layer octets belonging to a higher layer flow identified by a Reservation that is in the Close state using the Link Flow with ReservationLabel 0xff if the higher layer flow provides an octet stream with octet-based HDLC-like framing to the Multi-link Multi-flow Packet Application. The transmitter may transmit higher layer octets belonging to a higher layer flow identified by a Reservation that is bound to a de-activated Link Flow using the Link Flow with ReservationLabel 0xff if the higher layer flow provides an octet stream with octet-based HDLC-like framing to the Multi-link Multi-flow Packet Application. The transmitter should transmit higher layer packets belonging to a higher layer flow that is not associated with any Link Flow using the Link Flow with ReservationLabel 0xfe if the higher layer flow provides an IP packet stream to the Multi-link Multi-flow Packet Application. The transmitter may transmit higher layer packets belonging to a higher layer flow identified by a Reservation that is in the Close state using the Link Flow with ReservationLabel 0xfe if the higher layer flow provides an IP packet stream to the Multi-link Multi-flow Packet Application. The transmitter may transmit higher layer packets belonging to a higher layer flow identified by a Reservation that is bound to a de-activated Link Flow using the Link Flow with ReservationLabel 0xfe if the higher layer flow provides an IP packet stream to the Multi-link Multi-flow Packet Application.

If the ReservationLabel is associated with BCMCS flow(s), and if the Reservation is in the Open state, then the transmitter shall transmit the octets or packets of the BCMCS flow using the Link Flow associated with the BCMCS FlowID or BCMCS ProgramID. Otherwise the transmitter shall not transmit the octets or packets of the BCMCS flow.

The access terminal and the access network shall not perform any actions that will result in the number of Reverse Link Reservations in the Open state to exceed the value specified by MaxNumOpenReservationsRev. The access terminal and the access network shall not perform any actions that will result in the number of Forward Link Reservations in the Open state to exceed the value specified by MaxNumOpenReservationsFwd.

Figure 3.5.4.2.1-2 and Figure 3.5.4.2.1-3 show the state transition diagram at the access terminal and the access network. State transitions that may be caused by *ConnectedState.ConnectionClosed* and *RouteUpdate.ConnectionLost* indications are not shown.

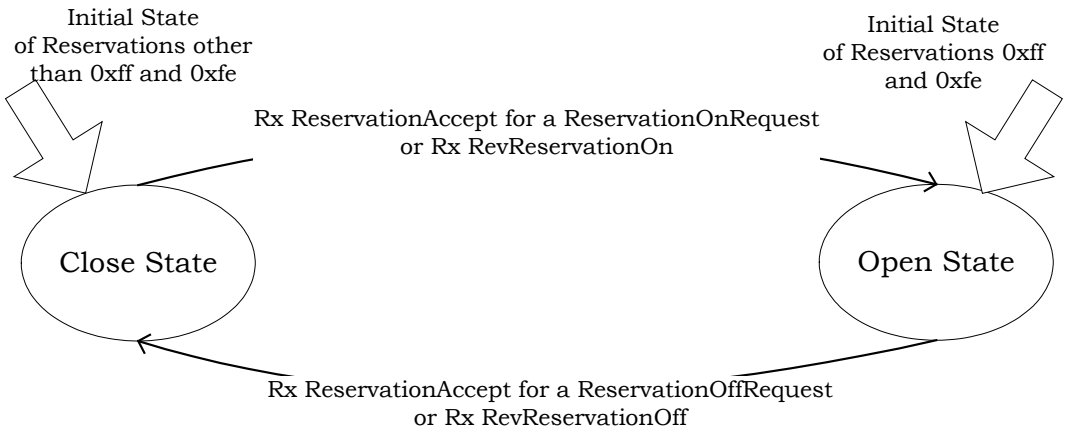

Figure 3.5.4.2.1-2. Reverse Link Reservation State Diagram (Access Terminal)

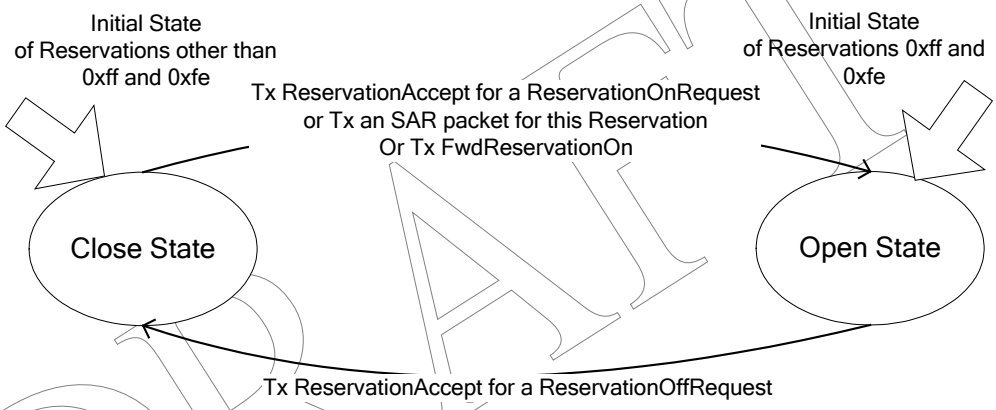

Figure 3.5.4.2.1-3. Forward Link Reservation State Diagram (Access Network)

3.5.4.2.1.1.1 State-independent Requirements

3.5.4.2.1.1.1.1 Access Terminal Requirements

Upon receiving a RevReservationOn message, the access terminal shall

- Respond with a ReservationAccept message within the time period specified by $T_{SARResponse}$ of receiving the RevReservationOn message.
- Set the TransactionID field of the ReservationAccept message to that of the RevReservationOn message.

Upon receiving a RevReservationOff message, the access terminal shall

- Respond with a ReservationAccept message within the time period specified by $T_{SARResponse}$ of receiving the RevReservationOff message.
- Set the TransactionID field of the ReservationAccept message to that of the RevReservationOff message.

Upon receiving a FwdReservationOn message, the access terminal shall

- Respond with a FwdReservationAck message within the time period specified by $T_{SARResponse}$ of reception of the FwdReservationOn message.
- Set the TransactionID field of the FwdReservationAck message to that of the FwdReservationOn message.

Upon receiving a FwdReservationOff message, the access terminal shall

- Respond with a FwdReservationAck message within the time period specified by $T_{SARResponse}$ of receiving the FwdReservationOff message.
- Set the TransactionID field of the FwdReservationAck message to that of the FwdReservationOff message.

Upon receiving a ReservationReject message with the RejectCode set to ReservationPending, the access terminal shall not send ReservationOnRequest for a PendingDuration period of time to the same access network. The access terminal shall stay in the monitor state until it receives the FwdReservationOn/ RevReservationOn message or the PendingDuration period is over.

3.5.4.2.1.1.1.2 Access Network Requirements

The access network may re-send a FwdReservationOn message if it does not receive a FwdReservationAck message containing the same TransactionID within the time period specified by $T_{SARResponse}$ of sending the FwdReservationOn message.

The access network may re-send a FwdReservationOff message if it does not receive a FwdReservationAck message containing the same TransactionID within the time period specified by $T_{SARResponse}$ of sending the FwdReservationOff message.

The access network may send a RevReservationOn message to transition the state of the reverse link Reservation of the access terminal to the Open state. The access network may re-send a RevReservationOn message if it does not receive a ReservationAccept message containing the same TransactionID within the time period specified by $T_{SARResponse}$ of sending the RevReservationOn message.

The access network may send a RevReservationOff message to transition the state of the reverse link Reservation of the access terminal to the Close state. The access network may re-send a RevReservationOff message if it does not receive a ReservationAccept message containing the same TransactionID within the time period specified by $T_{SARResponse}$ of sending the RevReservationOff message.

If the access network receives a ReservationOnRequest message, it shall

- Send either a ReservationAccept message or a ReservationReject message within the time period specified by $T_{SARResponse}$ of reception of the ReservationOnRequest message. If the resources required for the Reservation *KK* are not available, the access network determines that queuing is required for the Reservation *KK*, and if one or both of the following conditions are satisfied:
  - Reservation*KK*ReservationQueuingSupported attribute is set to '0x01', or

– Access network has received ReservationOnRequest message from the access terminal with the ReservationQueuingReq field for the Reservation *KK* set to '1'

then the access network should send ReservationReject message with the RejectCode for the Reservation *KK* set to ReservationPending (0x01). Otherwise, the access network shall not send ReservationReject message with the RejectCode for the Reservation *KK* set to ReservationPending (0x01).

- If the access network sent a ReservationReject message with the RejectCode set to ReservationPending (0x01), then the access network shall queue the ReservationOnRequest up to PendingDuration period of time. During this time, the access network should send FwdReservationOn/ RevReservationOn message to transition the state of the forward link/reverse link Reservation of the access terminal to the Open state.
- Set the TransactionID field of the ReservationAccept or ReservationReject message to that of the ReservationOnRequest message.

If the access network receives a ReservationOffRequest message, it shall

- Send a ReservationAccept or a ReservationReject message within the time period specified by $T_{SARResponse}$ of reception of the ReservationOffRequest message.
- Set the TransactionID field of the ReservationAccept or ReservationReject message to that of the ReservationOffRequest message.

3.5.4.2.1.2 Close State

3.5.4.2.1.2.1 Access Terminal Requirements

The access terminal shall not transmit PDUs from higher layer flows belonging to this Reservation using any Link Flow other than the Link Flow associated with ReservationLabel 0xff if the higher layer flow provides an octet stream with octet-based HDLC-like framing to the Multi-link Multi-flow Packet Application. The access terminal shall not transmit PDUs from higher layer flows belonging to this Reservation using any Link Flow other than the Link Flow associated with ReservationLabel 0xfe if the higher layer flow provides an IP packet stream to the Multi-link Multi-flow Packet Application. The access terminal may send a ReservationOnRequest message to request transition of the Reservation to the Open state[22]. The access terminal may re-send a ReservationOnRequest message if it does not receive a corresponding ReservationAccept or ReservationReject message within the time period specified by $T_{SARResponse}$ of sending the ReservationOnRequest message. If the ReservationOnRequest message contains a reverse Reservation, then the Reservation shall transition to the Open state when the access terminal receives the corresponding ReservationAccept message.

[22] Note that the ReservationOnRequest message supports requests for multiple Reservations on both the forward and reverse links. This arrangement allows requests for groups of Reservations (e.g., for bidirectional higher layer application flows) to be combined in the same ReservationOnRequest message.

Upon receiving a RevReservationOn message, the access terminal shall transition the Reservation to the Open state. Upon receiving an *IdleState.ConnectionOpened* indication, the access terminal shall transition the Reservations to the Open State whose corresponding Reservation*KK*IdleStateRev attribute is 0x02, where *KK* is the two-digit hexadecimal ReservationLabel in the range 0x00 to 0xff inclusive.

3.5.4.2.1.2.2 Access Network Requirements

If the Reservation entered this state as a result of any condition other than the following conditions, then the access network shall send a FwdReservationOff message upon entering this state:

- the access network transmitted a ReservationAccept message in response to a ReservationOffRequest message requesting to transition the Reservation to the Close state, or
- Reservation*KK*IdleStateFwd attribute of the Reservation is 0x01 or 0x02, and the Reservation transitioned to the Close state because the Connection was closed or lost.

Upon sending a ReservationAccept message for a forward Reservation in response to a ReservationOnRequest message, the access network shall transition the Reservation to the Open state.

Upon sending a FwdReservationOn message, the access network shall transition the Reservation to the Open state. Upon receiving an *IdleState.ConnectionOpened* indication, the access network shall transition the Reservations to the Open state whose corresponding Reservation*KK*IdleStateFwd attribute is 0x02, where *KK* is the two-digit hexadecimal ReservationLabel in the range 0x00 to 0xff inclusive. The access network may transmit SDUs from higher layer flows belonging to this Reservation using the Link Flow to which the Reservation is bound. Upon doing so, the access network shall transition the Reservation to the Open State.

3.5.4.2.1.3 Open State

3.5.4.2.1.3.1 Access Terminal Requirements

The access terminal may transmit PDUs from higher layer flows belonging to this Reservation using the Link Flow to which the Reservation is bound.

The access terminal may send a ReservationOffRequest message to request the transition of a Reservation to the Close state. The access terminal may re-send a ReservationOffRequest message if it does not receive a ReservationAccept or ReservationReject message within the time period specified by $T_{SARResponse}$ of sending the ReservationOffRequest message. If the ReservationOffRequest message contains a reverse Reservation, then the access terminal shall transition the Reservation to the Close state when the access terminal receives a ReservationAccept message.

Upon receiving a RevReservationOff message, the access terminal shall transition the Reservation to the Close state. Upon receiving a *ConnectedState.ConnectionClosed* indication, the access terminal shall transition to the Close state Reservations whose corresponding Reservation*KK*IdleStateRev attribute is 0x01 or 0x02 unless an access

network initiated Connection is being opened at the same time[23], where *KK* is the two-digit hexadecimal ReservationLabel. Upon receiving an *IdleState.ConnectionFailed* indication, the access terminal shall transition to the Close state Reservations whose corresponding Reservation*KK*IdleStateRev attribute is 0x01 or 0x02, where *KK* is the two-digit hexadecimal ReservationLabel.

3.5.4.2.1.3.2 Access Network Requirements

The access network may transmit PDUs from higher layer flows belonging to this Reservation using the Link Flow to which the Reservation is bound.

Upon sending a ReservationAccept message for a forward Reservation in response to a ReservationOffRequest message, the access network shall transition the Reservation to the Close state.

Upon receiving a *ConnectedState.ConnectionClosed* indication, the access network shall transition to the Close state Reservations whose corresponding Reservation*KK*IdleStateFwd attribute is 0x01 or 0x02 unless an access network initiated Connection is being opened at the same time[23], where *KK* is the two-digit hexadecimal ReservationLabel. Upon receiving a *RouteUpdate.ConnectionLost* or *IdleState.ConnectionFailed* indication, the access network shall transition to the Close state Reservations whose corresponding Reservation*KK*IdleStateFwd attribute is 0x01 or 0x02, where *KK* is the two-digit hexadecimal ReservationLabel.

If, for any *KK*, all of the following conditions are true, the access network shall take action within $T_{Turnaround}$, where $T_{Turnaround}$ is equal to 2 seconds, such that at least one of the following conditions would no longer be true (e.g., by modifying the value of Reservation*KK*QoSResponseFwd or by transitioning forward Reservation *KK* to the Close state):

- Reservation*KK*QoSRequestFwd is set to a non-default value.
- Forward Reservation *KK* is in the Open state.
- Reservation*KK*QoSResponseFwd is set to the default value or the QoS_ATTRIBUTE_SET_ID field in Reservation*KK*QoSResponseFwd is not equal to the value of any QoS_ATTRIBUTE_SET_ID field in the corresponding Reservation*KK*QoSRequestFwd attribute (see [1]).

If, for any *KK*, all of the following conditions are true, the access network shall take action within $T_{Turnaround}$, where $T_{Turnaround}$ is equal to 2 seconds, such that at least one of the following conditions would no longer be true (e.g., by modifying the value of Reservation*KK*QoSResponseRev or by transitioning reverse Reservation *KK* to the Close state):

- Reservation*KK*QoSRequestRev is set to a non-default value.
- Reverse Reservation *KK* is in the Open state.

[23] An access network can send ConnectionClose message of Connected State Protocol and TrafficChannelAssignment message of Route Update Protocol in the same security layer packet.

- Reservation*KK*QoSResponseRev is set to the default value or the QoS_ATTRIBUTE_SET_ID field in Reservation*KK*QoSResponseRev is not equal to the value of any QoS_ATTRIBUTE_SET_ID field in the corresponding Reservation*KK*QoSRequestRev attribute (see [1]).

3.5.4.2.2 SAR Receive Procedures

The SAR receiver shall maintain two SARSequenceLength-bit variables for receiving, $V(R)_{NN,P}$ and $V(N)_{NN,P}$ (see Figure 3.5.4.2.2-1), where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to M-1 inclusive, and *P* is the Route indicator that takes values of either A or B. *M* is the MaxNumLinkFlowsFwd or MaxNumLinkFlowsRev for a forward Link Flow or reverse Link Flow, respectively. $V(R)_{NN,P}$ contains the sequence number of the next data unit expected to arrive. $V(N)_{NN,P}$ contains the sequence number of the first missing data unit, as described below.

In addition, the SAR receiver shall keep track of the status of each data unit in its resequencing buffer indicating whether the data unit was received or not. Use of this status is implied in the following procedures.

The SAR receiver informs the SAR transmitter of the status of data units in its receive buffer by sending a MultiLinkNak or Nak message. The Nak message shall not convey status of data units with sequence number less than $V(N)_{NN,P}$.

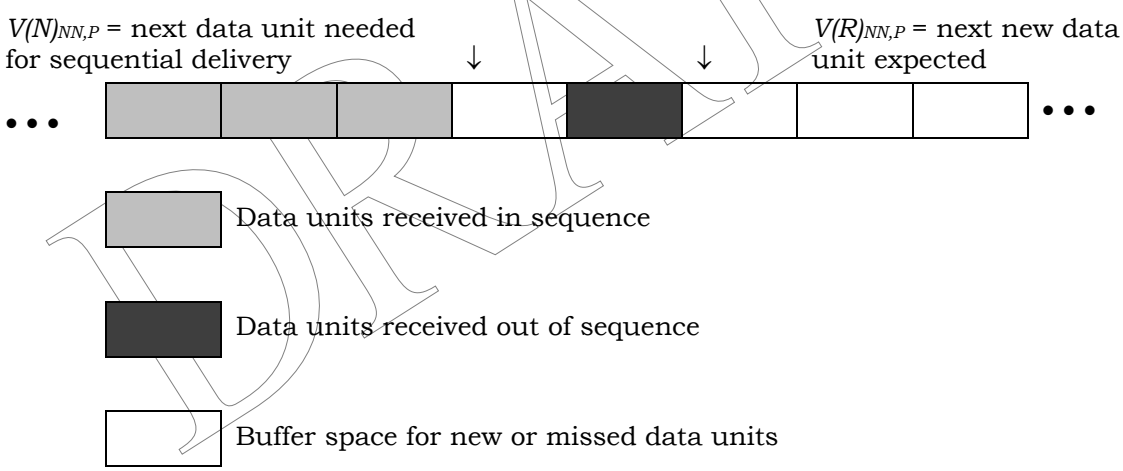

Figure 3.5.4.2.2-1. SAR Receive Sequence Number Variables

The access terminal shall send a MultiLinkNak message upon receiving a *QuickNak.QuickNak* indication if $V(N)_{NN,P}$ is not equal to $V(R)_{NN,P}$ and if the NAKDelayTimer is not set to zero.

Upon receiving a Flush message, the SAR receiver shall perform the following if LastSARSequence is greater than or equal to $V(R)_{NN,P}$:

- If the SAR receiver is an access network, SAR receiver shall send a Nak message; if the SAR receiver is an access terminal, SAR receiver shall send a MultiLinkNak message.

- If the SAR receiver is an access network, then SAR shall set a SAR abort timer to AbortTimer, where AbortTimer is a parameter of the Flow*NN*TimersRev attribute, for each missing SAR data unit from $V(R)_{NN,P}$ to LastSARSequence, inclusive. If the SAR receiver is an access terminal, then SAR shall set a SAR abort timer to AbortTimer, where AbortTimer is a parameter of the Flow*NN*TimersFwd attribute, for each missing SAR data unit from $V(R)_{NN,P}$ to LastSARSequence, inclusive.
- SAR receiver shall set $V(R)_{NN,P}$ to LastSARSequence+1

For each received data unit, SAR shall perform the following procedures:

- If the SAR receiver is an access network, then SAR shall set *X* to the SAR sequence number of the received data unit.
- If the SAR receiver is an access terminal, then SAR shall set *X* as follows:
  - If the QNSEQIncluded field of the QN packet in which this data unit was received is set to '0', then the access terminal shall set *X* to the SAR sequence number of the received data unit.
  - Otherwise, the access terminal shall perform the following to determine the value of X:
    - Define the interpretation interval of size $2^{\text{SARSequenceLengthShort}}$ around $V(R)_{NN,P}$ as follows:

      $$[V(R)_{NN,P} - 2^{\text{SARSequenceLengthShort-1}}+1, \ldots, V(R)_{NN,P} + 2^{\text{SARSequenceLengthShort-1}}]$$

    - Set X to the SARSequenceLength-bit value in the interpretation interval around $V(R)_{NN,P}$ whose SARSequenceLengthShort least significant bits match the value of the SEQ field of the received SAR Packet Header.
- If $X < V(N)_{NN,P}$, the data unit shall be discarded as a duplicate.
- If $V(N)_{NN,P} \le X < V(R)_{NN,P}$, and the data unit is not already stored in the resequencing buffer nor has been passed up to the Route Protocol, then:
  - SAR shall store the received data unit in the resequencing buffer.
  - If $X = V(N)_{NN,P}$, and if the Link Flow is carrying an octet stream, then SAR shall pass all contiguous octets in the resequencing buffer, from $V(N)_{NN,P}$ upward, to the Route Protocol. SAR shall then set $V(N)_{NN,P}$ to (LAST+1) where LAST is the sequence number of the last contiguous octet (i.e., the octet with the highest sequence number) received by the resequencing buffer.
  - If $X = V(N)_{NN,P}$, and if the Link Flow is carrying a packet stream, and if in-order delivery of Route Protocol packets is required, then SAR shall pass all contiguous complete Route Protocol packets in the resequencing buffer, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward, to the Route Protocol. SAR shall then set $V(N)_{NN,P}$ to (LAST+1) where LAST is the sequence number of the last contiguous data unit received by the resequencing buffer.

- If the Link Flow is carrying a packet stream, and if in-order delivery of Route Protocol packets is not required, then SAR shall pass all complete Route Protocol packets in the resequencing buffer, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward, to the Route Protocol. SAR shall then set $V(N)_{NN,P}$ to (LAST+1) where LAST is the sequence number of the last contiguous data unit received by the resequencing buffer.

- If $V(N)_{NN,P} < X < V(R)_{NN,P}$, and the data unit is already stored in the resequencing buffer or has already been passed up to the Route Protocol, then the data unit shall be discarded as a duplicate.

- If $X = V(R)_{NN,P}$, then:
  - If $V(R)_{NN,P} = V(N)_{NN,P}$ and if the Link Flow is carrying an octet stream, then SAR shall increment $V(N)_{NN,P}$ and $V(R)_{NN,P}$ and shall pass the data unit to the Route Protocol.
  - If $V(R)_{NN,P} = V(N)_{NN,P}$, and if the Link Flow is carrying a packet stream, then SAR shall increment $V(N)_{NN,P}$ and $V(R)_{NN,P}$, shall store the data unit in the resequencing buffer, and shall pass all complete Route Protocol packets in the resequencing buffer, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward, to the Route Protocol.
  - If $V(R)_{NN,P} \neq V(N)_{NN,P}$, SAR shall increment $V(R)_{NN,P}$ and shall store the data unit in the resequencing buffer. If the Link Flow is carrying a packet stream, and if in-order delivery of Route Protocol packets is not required, then SAR shall pass all complete Route Protocol packets in the resequencing buffer, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward, to the Route Protocol.

- If $X > V(R)_{NN,P}$, then:
  - SAR shall store the data unit in the resequencing buffer.
  - If the Link Flow is carrying a packet stream, and if in-order delivery of Route Protocol packets is not required, then SAR shall pass all complete Route Protocol packets in the resequencing buffer, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward, to the Route Protocol.
  - If the SAR receiver is an access network, then SAR shall set a SAR abort timer to AbortTimer, where AbortTimer is a parameter of the Flow*NN*TimersRev attribute, for each missing SAR data unit from $V(R)_{NN,P}$ to X-1, inclusive. If the SAR receiver is an access terminal, then SAR shall set a SAR abort timer to AbortTimer, where AbortTimer is a parameter of the Flow*NN*TimersFwd attribute, for each missing SAR data unit from $V(R)_{NN,P}$ to X-1, inclusive.

- If the SAR receiver is an access terminal, and if the Flow*NN*NakEnableFwd attribute is set to 0x01, then SAR shall set a Nak delay timer to NakDelayTimer, where NakDelayTimer is a parameter of the Flow*NN*TimersFwd attribute, for each missing SAR data unit from $V(R)_{NN,P}$ to *X*-1, inclusive.
- If the SAR receiver is an access network, and if the Flow*NN*NakEnableRev attribute is set to 0x01, then SAR shall send a Nak message.
- SAR shall set $V(R)_{NN,P}$ to *X*+1.
- If a missing data unit has not been received when its Nak delay timer expires, then the access terminal shall send a MultiLinkNak message reporting this missing data unit

For each missing data unit from $V(N)_{NN,P}$ upward up to $V(R)_{NN,P}$-1, inclusive, SAR shall perform the following in the order specified, if the SAR abort timer of the missing data unit has expired:

- If the Link Flow is carrying an octet stream, SAR shall pass all octets in the resequencing buffer up to the next missing octet, in order of sequence number, to the Route Protocol. SAR shall skip any missing octets.If the Link Flow is carrying a packet stream, and if in-order delivery of Route Protocol packets is required, then SAR shall pass all complete Route Protocol packets, that have not been passed to the Route Protocol, from the beginning of the resequencing buffer upward up to the next missing data unit, to the Route Protocol. SAR may pass to the Route Protocol partially received packets with an indication of partial packet delivery.SAR shall set $V(N)_{NN,P}$ to the sequence number of the next missing data unit, or to $V(R)_{NN,P}$ if there are no remaining missing data units.

Further recovery is the responsibility of higher layer protocols.

3.5.4.3 SAR Packet Header

The SAR packet header, which precedes the SAR payload, has the following format:

Field	Length (bits)
SEQ	SARSequenceLength, SARSequenceLengthShort, or Flow*NN*SequenceLengthRev
FirstDataUnit	1
LastDataUnit	1

SEQ — The SAR sequence number of the first data unit in the SAR payload. If this SAR packet is being sent on the forward link, and if the payload of this SAR packet is being transmitted for the first time, then the access network should set the length of this field according to the SARSequenceLengthShort field in the Flow*NN*SequenceLengthFwd attribute corresponding to this flow, but may set the length of this field according to the SARSequenceLength

field in the Flow*NN*SequenceLengthFwd attribute corresponding to this flow. If this SAR packet is being sent on the forward link, and if the payload of this SAR packet is being re-transmitted, then the access network shall set the length of this field according to the SARSequenceLength field in the Flow*NN*SequenceLengthFwd attribute corresponding to this flow. If this SAR packet is being sent on the reverse link, the access terminal shall set the length of this field according to the Flow*NN*SequenceLengthRev attribute corresponding to this flow.

FirstDataUnit — If the Link Flow is carrying an octet stream, then the sender shall set this field to '0'. Otherwise, the sender shall set this field as follows:

If the payload of this SAR packet is the first segment of a Route Protocol packet, then the sender shall set this field to '1'. Otherwise, the sender shall set this field to '0'.

LastDataUnit — If the Link Flow is carrying an octet stream, then the sender shall set this field to '0'. Otherwise, the sender shall set this field as follows:

If the payload of this SAR packet is the last segment of a Route Protocol packet, then the sender shall set this field to '1'. Otherwise, the sender shall set this field to '0'.

3.5.4.4 Message Formats

The messages described in this section control the function of the SAR. These messages are exchanged between the access terminal and the access network using the SNP.

3.5.4.4.1 ResetTxIndication

The SAR transmitter in the access terminal or the access network sends the ResetTxIndication message to reset its peer SAR receiver.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved	2

MessageID — The sender shall set this field to 0x00.

LinkFlowNumber — The sender shall set this field to the Link Flow that is reset. The sender shall set this field to '11111' to reset all Link Flows.

Route — If Route A is reset, then the sender shall set this field to '0'. If Route B is reset, then the sender shall set this field to '1'.

Reserved — The sender shall set this field to '00'. The receiver shall ignore this field.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	50

3.5.4.4.2 ResetRxIndication

The SAR receiver in the access terminal or the access network sends the ResetRxIndication message to reset its peer SAR transmitter.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved	2

MessageID — The sender shall set this field to 0x01.

LinkFlowNumber — The sender shall set this field to the Link Flow that is reset. The sender shall set this field to '11111' to reset all Link Flows.

Route — If Route A is reset, then the sender shall set this field to '0'. If Route B is reset, then the sender shall set this field to '1'.

Reserved — The sender shall set this field to '00'. The receiver shall ignore this field.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	50

3.5.4.4.3 ResetTxIndicationAck

The SAR receiver in the access terminal or the access network sends the ResetTxIndicationAck message in response to a ResetTxIndication message.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved	2

MessageID — The sender shall set this field to 0x0d.

LinkFlowNumber — The sender shall set this field to the Link Flow that is reset. If this message is being sent in response to a ResetTxIndication message that required reset of all Link Flows, then the sender shall set this field to '11111'.

Route — If Route A is reset, then the sender shall set this field to '0'. If Route B is reset, then the sender shall set this field to '1'.

Reserved — The sender shall set this field to '00'. The receiver shall ignore this field.

Channels	FTC RTC
Addressing	unicast

SLP	Reliable
Priority	50

3.5.4.4.4 ResetTxComplete

The SAR transmitter in the access terminal or the access network sends the ResetTxComplete message to complete the SAR reset procedure.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved	2

MessageID — The sender shall set this field to 0x0e.

LinkFlowNumber — The sender shall set this field to the Link Flow that is reset. If all Link Flows were reset, then the sender shall set this field to ''11111'.

Route — If Route A is reset, then the sender shall set this field to '0'. If Route B is reset, then the sender shall set this field to '1'.

Reserved — The sender shall set this field to '00'. The receiver shall ignore this field.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	50

3.5.4.4.5 ResetRxComplete

The SAR transmitter in the access terminal or the access network sends the ResetRxComplete message to complete the SAR reset procedure.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved	2

MessageID The sender shall set this field to 0x0f.

LinkFlowNumber The sender shall set this field to the Link Flow that is reset. If all Link Flows were reset, then the sender shall set this field to '11111'.

Route If Route A is reset, then the sender shall set this field to '0'. If Route B is reset, then the sender shall set this field to '1'.

Reserved The sender shall set this field to '00'. The receiver shall ignore this field.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	50

3.5.4.4.6 MultiLinkNak

The access terminal sends the MultiLinkNak message to request the retransmission of one or more SAR data units.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
Reserved1	2
SARSequenceLength	8
ReportCount	8

ReportCount occurrences of the following four fields:

DelayedNak	1
LeadingEdgeIncluded	1
LeadingEdge	0 or SARSequenceLength
TrailingEdge	SARSequenceLength

OtherQNCount	0 or 8

OtherQNCount occurrences of the following field:

LargestSAR	0 or SARSequenceLength

VR	0 or SARSequenceLength

Reserved2	0 – 7 (as needed)

MessageID The access terminal shall set this field to 0x25.

LinkFlowNumber The access terminal shall set this field to the Link Flow for which this MultiLinkNak is being sent.

Route If this MultiLinkNak is being sent for Route A, then the access terminal shall set this field to '0'. Otherwise, the access terminal shall set this field to '1'.

Reserved1 The access terminal shall set this field to '00'. The access network shall ignore this field.

SARSequenceLength The access terminal shall set this field to the length of the SAR sequence number as indicated by the SARSequenceLength field of the Flow*NN*SequenceLengthFwd attribute for forward Link Flow *NN*.

ReportCount The access terminal shall set this field to the number of Report records included in this message. The access terminal shall include

ReportCount occurrences of the following four fields with the message.

DelayedNak — The access terminal shall set this field to '0' if this report is triggered by a *QuickNak.QuickNak* indication. Otherwise, the access terminal shall set this field to '1'.

LeadingEdgeIncluded — If DelayedNak is set '1', the access terminal shall set this field to '1'.

If DelayedNak is set '0':

- If the access terminal has received more than one QN packet on the corresponding QN instance in the last abort time interval, the access terminal shall set this field to '1'
- Otherwise, the access terminal shall set this field to '0'.

LeadingEdge — The access terminal shall omit this field if LeadingEdgeIncluded is set to '0'; otherwise, the access terminal shall include this field and set it as follows:

If this report is triggered by a *QuickNak.QuickNak* indication, then the access terminal sender shall set this field to the largest SAR sequence number received on the QN instance that triggered this message before the *QuickNak.QuickNak* indication was received. If this report is triggered by a Flush message, then the access terminal shall set this field to the value of $V(R)_{NN,P}$ - 1. Otherwise, the access terminal shall set this field to one less than the SAR sequence number of the first SAR data unit erased in a sequence of erased data units.

TrailingEdge — If this report is triggered by a *QuickNak.QuickNak* indication, then the access terminal shall set this field to the SAR sequence number of the first data unit in the payload received on the QN instance that triggered this report at the time that the *QuickNak.QuickNak* indication was received. If this report is triggered by a Flush message, then the access terminal shall set this field to LastSARSequence+1, where LastSARSequence is the value of the field included in the Flush message. Otherwise, the access terminal shall set this field to one more than the SAR sequence number of the last SAR data unit erased in a sequence of erased data units.

OtherQNCount — The access terminal shall set this field as follows:
If this MultiLinkNak message reports any erased data units for which the corresponding DelayedNak field is set to '0', then the access terminal shall include this field and set it to the number of QN instances such that SAR packets have been received on the QN instance and LeadingEdge and TrailingEdge with corresponding

DelayedNak field set to '0' have not been reported in this message corresponding to SAR packets received on that QN instance. Otherwise, the access terminal shall omit this field.

LargestSAR — If the OtherQNCount field is omitted, then the access terminal shall omit this field. Otherwise, the access terminal shall set this field to the largest SAR sequence number received on this QN instance.

VR — If OtherQNCount is included and is not zero, then the access terminal shall omit this field. Otherwise, the access terminal shall set this field to $V(R)_{NN,P}$.

Reserved2 — The access terminal shall add reserved bits to make the length of the entire message an integer number of octets. The access terminal shall set these bits to '0'. The access network shall ignore this field.

Channels	RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	50

3.5.4.4.7 ReservationOnRequest

The access terminal sends this message to request transition of one or more Reservations to the Open State.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8
ReservationCount occurrences of the following two fields:	
Link	1
ReservationLabel	8
EmergencyIndication	0 or 1
ReservationQueuingReq	0 or 1
Reserved	0 – 7 (as needed)

MessageID — The access terminal shall set this field to 0x16.

TransactionID — The access terminal shall set this field to one more (modulo 256) than the TransactionID field of the last ReservationOnRequest or ReservationOffRequest message sent by the access terminal. If this is

the first ReservationOnRequest or ReservationOffRequest message sent by the access terminal, then the access terminal shall set this field to zero.

ReservationCount — The access terminal shall set this field to the number of the following two fields in this message.

Link — If this request is for a forward Reservation, then the access terminal shall set this field to '1'. If this request is for a reverse Reservation, then the access terminal shall set this field to '0'.

ReservationLabel — The access terminal shall set this field to the ReservationLabel for which this request is generated.

EmergencyIndication

The access terminal shall include this field if any of the non-reserved fields that follow this field are included in the message.
If included, the access terminal shall set this field as follows: If this is an emergency ReservationOnRequest, then the access terminal shall set this field to '1'. Otherwise, the access terminal shall set this field to '0'.

ReservationQueuingReq

The access terminal shall include this field if any of the non-reserved fields that follow this field are included in the message or if the access terminal wants to request queuing. If this field is included, the access terminal shall set this field as follows: If the access terminal requests that the queuing treatment be enabled in the access network for this ReservationOnRequest message, then the access terminal shall set this field to '1'. Otherwise, the access terminal shall set this field to '0'.

Reserved — The access terminal shall add reserved bits to make the length of the entire message an integer number of octets. The access terminal shall set these bits to zero. The access network shall ignore this field.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.5.4.4.8 ReservationOffRequest

The access terminal sends this message to request transition of one or more Reservations to the Close State.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8

ReservationCount occurrences of the following two fields:

Link	1
ReservationLabel	8

Reserved	0 – 7 (as needed)

MessageID The access terminal shall set this field to 0x17.

TransactionID The access terminal shall set this field to one more (modulo 256) than the TransactionID field of the last ReservationOnRequest or ReservationOffRequest message sent by the access terminal. If this is the first ReservationOnRequest or ReservationOffRequest message sent by the access terminal, then the access terminal shall set this field to zero.

ReservationCount The access terminal shall set this field to the number of the following two fields in this message.

Link If this request is for a forward Reservation, then the access terminal shall set this field to '1'. If this request is for a reverse Reservation, then the access terminal shall set this field to '0'.

ReservationLabel The access terminal shall set this field to the Reservation for which this request is generated.

Reserved The access terminal shall add reserved bits to make the length of the entire message an integer number of octets. The access terminal shall set these bits to zero. The access network shall ignore this field.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.5.4.4.9 ReservationAccept

The access network sends this message to acknowledge reception of and allow the state transition requested by a ReservationOnRequest or ReservationOffRequest message. The access terminal sends this message to acknowledge reception of and accept the state transition requested by a RevReservationOn or RevReservationOff message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The sender shall set this field to 0x18.

TransactionID The access network shall set this field to the TransactionID field of the ReservationOnRequest or ReservationOffRequest message to which the access network is responding. The access terminal shall set this field to the TransactionID field of the RevReservationOn or RevReservationOff message to which the access terminal is responding.

Channels	CC FTC RTC AC
Addressing	unicast

SLP	Best Effort
Priority	40

3.5.4.4.10 ReservationReject

The access network sends this message to acknowledge reception of and deny the state transition requested by a ReservationOnRequest or ReservationOffRequest message.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8
ReservationCount occurrences of the following two fields:	
AllowableLink	1
AllowableReservationLabel	8
ReservationCount occurrences of the following two fields:	
RejectCode	0 or 4
PendingDuration	0 or 5
Reserved	0 – 7 (as needed)

MessageID The access network shall set this field to 0x19.

TransactionID The access network shall set this field to the TransactionID field of the ReservationOnRequest or ReservationOffRequest message to which the access network is responding.

ReservationCount — The access network shall set this field to the number of the following two fields in this message.

AllowableLink — If the Reservation for which the access network would have allowed the state transition requested in the ReservationOnRequest or ReservationOffRequest message is a forward Reservation, then the access network shall set this field to '1'. If the Reservation for which the access network would have allowed the state transition requested in the ReservationOnRequest or ReservationOffRequest message is a reverse Reservation, then the access network shall set this field to '0'.

AllowableReservationLabel — The access network shall set this field to the ReservationLabel for which the access network would have allowed the state transition requested in the ReservationOnRequest or ReservationOffRequest message.

RejectCode — If included, the access network shall set this field as follows: The access network shall set the RejectCode to indicate the Reject Code.

Field value	Description
0x0	General
0x1	ReservationPending
All other values are reserved	

PendingDuration — The access network shall include this field if RejectCode field is included and is set to ReservationPending. If this field is included, the access network shall set this field to the pending duration in units of seconds

Reserved — The access network shall add reserved bits to make the length of the entire message an integer number of octets. The access network shall set these bits to zero. The access terminal shall ignore this field.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.5.4.4.11 RevReservationOn

The access network sends this message to transition a reverse Reservation to the Open state.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8
ReservationCount occurrences of the following field:	
ReservationLabel	8

MessageID The access network shall set this field to 0x1a.

TransactionID The access network shall set this field to one more (modulo 256) than the TransactionID field of the last RevReservationOn or RevReservationOff message sent by the access network. If this is the first RevReservationOn or RevReservationOff message sent by the access network, then the access network shall set this field to zero.

ReservationCount The access network shall set this field to the number of ReservationLabel fields in this message.

ReservationLabel The access network shall set this field to the Reservation which is to be transitioned to the Open state.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.5.4.4.12 RevReservationOff

The access network sends this message to transition a reverse Reservation to the Close state.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8
ReservationCount occurrences of the following field:	
ReservationLabel	8

MessageID The access network shall set this field to 0x1b.

TransactionID The access network shall set this field to one more (modulo 256) than the TransactionID field of the last RevReservationOn or RevReservationOff message sent by the access network. If this is the first RevReservationOn or RevReservationOff message sent by the access network, then the access network shall set this field to zero.

ReservationCount The access network shall set this field to the number of ReservationLabel fields in this message.

ReservationLabel The access network shall set this field to the Reservation that is to be transitioned to the Close state.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.5.4.4.13 FwdReservationOff

The access network sends this message to inform the access terminal when a forward Reservation transitions to the Close state.

Field	**Length (bits)**
MessageID	8
TransactionID	8
ReservationCount	8
ReservationCount occurrences of the following field:	
ReservationLabel	8

MessageID The access network shall set this field to 0x22.

TransactionID The access network shall set this field to one more (modulo 256) than the TransactionID field of the last FwdReservationOn or FwdReservationOff message sent by the access network. If this is the first FwdReservationOn or FwdReservationOff message sent by the access network, then the access network shall set this field to zero.

ReservationCount The access network shall set this field to the number of ReservationLabel fields in this message.

ReservationLabel The access network shall set this field to the Reservation transitioned to the Close state.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.5.4.4.14 FwdReservationOn

The access network sends this message to inform the access terminal when a forward Reservation transitions to the Open state.

Field	Length (bits)
MessageID	8
TransactionID	8
ReservationCount	8
ReservationCount occurrences of the following field:	
ReservationLabel	8

MessageID The access network shall set this field to 0x23.

TransactionID The access network shall set this field to one more (modulo 256) than the TransactionID field of the last FwdReservationOn or FwdReservationOff message sent by the access network. If this is the first FwdReservationOn or FwdReservationOff message sent by the access network, then the access network shall set this field to zero.

ReservationCount The access network shall set this field to the number of ReservationLabel fields in this message.

ReservationLabel The access network shall set this field to the Reservation that transitioned to the Open state.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.5.4.4.15 FwdReservationAck

The access terminal sends this message to acknowledge reception of the FwdReservationOn or the FwdReservationOff message and to accept the related state transition.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access terminal shall set this field to 0x24.

TransactionID The access terminal shall set this field to the TransactionID field of the FwdReservationOn or FwdReservationOff message to which the access terminal is responding.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.5.4.4.16 AttributeUpdateRequest

The sender sends an AttributeUpdateRequest message to offer an attribute value for a given attribute.

Field	**Length (bits)**
MessageID	8
TransactionID	8
One or more instances of the following record	
AttributeRecord	Attribute dependent

MessageID The sender shall set this field to 0x52.

TransactionID The sender shall increment this value for each new AttributeUpdateRequest message sent.

AttributeRecord The format of this record is specified in **[8]**.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

3.5.4.4.17 AttributeUpdateAccept

The sender sends an AttributeUpdateAccept message in response to an AttributeUpdateRequest message to accept the offered attribute values.

Field	**Length (bits)**
MessageID	8
TransactionID	8

MessageID The sender shall set this field to 0x53.

TransactionID The sender shall set this value to the TransactionID field of the corresponding AttributeUpdateRequest message.

Channels	FTC RTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

3.5.4.4.18 AttributeUpdateReject

The access network sends an AttributeUpdateReject message in response to an AttributeUpdateRequest message to reject the offered attribute values.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access network shall set this field to 0x54.

TransactionID The sender shall set this value to the TransactionID field of the corresponding AttributeUpdateRequest message.

Channels	FTC	**SLP**	Reliable
Addressing	unicast	**Priority**	40

3.5.4.4.19 Flush

The access terminal and the access network send the Flush message to indicate the end of a data burst.

Field	**Length (bits)**
MessageID	8
LinkFlowNumber	5
Route	1
SARSequenceLength	8
LastSARSequence	SARSequenceLength
Reserved	0-7 (as needed)

MessageID The sender shall set this field to 0x26.

LinkFlowNumber The sender shall set this field to the Link Flow for which this Flush is being sent.

Route If this Flush is being sent for Route A, then the sender shall set this field to '0'. Otherwise, the sender shall set this field to '1'.

SARSequenceLength — The sender shall set this field to the size of the SAR sequence number for this Link Flow in units of bits.

LastSARSequence — The sender shall set this field to $V(S)_{NN,P}$-1.

Reserved — The sender shall add reserved bits to make the length of the entire message an integer number of octets. The sender shall set these bits to zero. The receiver shall ignore this field.

Channels	RTC FTC
Addressing	unicast

SLP	Best Effort
Priority	50

3.5.4.4.20 Nak

The access network sends the Nak message to request the retransmission of one or more SAR data units.

Field	**Length (bits)**
MessageID	8
LinkFlowNumber	5
Route	1
Reserved1	2
SARSequenceLength	8
ReportCount	8

ReportCount occurrences of the following two fields:

FirstErasedDataUnit	SARSequenceLength
WindowLen	SARSequenceLength

VR	SARSequenceLength

Reserved2	0 – 7 (as needed)

MessageID — The access network shall set this field to 0x02.

LinkFlowNumber — The access network shall set this field to the Link Flow for which this Nak is being sent.

Route — If this Nak is being sent for Route A, then the access network shall set this field to '0'. Otherwise, the access network shall set this field to '1'.

Reserved1 The access network shall set this field to '00'. The access terminal shall ignore this field.

SARSequenceLength The access network shall set this field to the length of the sequence number as indicated by the Flow*NN*SequenceLengthRev attribute for this reverse Link Flow *NN*.

ReportCount The access network shall set this field to the number of Report records included in this message. The access network shall include ReportCount occurrences of the following two fields with the message.

Sequences of erased data units shall be listed in the ascending order of SAR sequence number associated with FirstErasedDataUnit.

FirstErasedDataUnit The access network shall set this field to the sequence number of the first SAR data unit erased in a sequence of erased data units.

WindowLen The access network shall set this field to the length of the erased window in units of data units.

VR The access network shall set this field to $V(R)_{NN,P}$.

Reserved2 The access network shall add reserved bits to make the length of the entire message an integer number of octets. The access network shall set these bits to '0'. The access terminal shall ignore this field.

Channels	FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	50

3.5.4.5 Interface to Other Protocols

3.5.4.5.1 Commands

This protocol does not issue any commands.

3.5.4.5.2 Indications

This protocol registers to receive the following indications:

- *IdleState.ConnectionOpened*
- *IdleState.ConnectionFailed*
- *PhysicalLayer.ReverseTrafficPacketsMissed* along with parameters indicating the Link Flow number and missing data units.
- *ConnectedState.ConnectionClosed*

- *RouteUpdate.ConnectionLost*
- *QuickNak.QuickNak* (access terminal only)

3.5.5 Protocol Numeric Constants

Constant	Meaning	Value
$T_{SARResponse}$	Time period within which the access network is to respond to ReservationOnRequest and ReservationOffRequest messages.	1 second

3.6 Quick Nak Protocol

3.6.1 Overview

The Quick Nak Protocol (QN) is used to detect erased forward link SAR packets. There may be one or more instances of the QN for each Route of a Link Flow. SAR may deliver SAR packets for transmission to any instance of the QN protocol associated with that Link Flow and Route. Each instance of the QN protocol detects loss of packets delivered by the SAR transmitter to that QN instance. QN is a protocol associated with the Multi-link Multi-flow Packet Application. The application subtype for this application is defined in **[3]**.

3.6.2 Primitives and Public Data

3.6.2.1 Commands

This protocol defines the following commands:

- *Initialize*

3.6.2.2 Return Indications

This protocol returns the following indications:

- *QuickNak* (access terminal only)

3.6.3 Protocol Data Unit

The transmission unit of this protocol is a QN packet.

3.6.4 Procedures and Messages for the InUse Instance of the Protocol

This section defines the procedures and messages for each instance of QN.

3.6.4.1 Procedures

The access network and the access terminal shall have one instance of the QN protocol for each (Link Flow, Route, QNGroup) tuple. The QNGroup indicates Active Set pilots that share the same QN instance for a given Route of a given Link Flow. Information about which Active Set pilot belong to a QNGroup is provided by Scheduler Group public data of the Route Update Protocol.

The procedures in this section apply to each instance of the QN protocol. If the public data of the Route Update Protocol does not provide QNGroup information, then all pilots in the Active Set shall be considered to be part of one QNGroup.

The access network and the access terminal shall set QNSequenceLength for a forward Link flow to SARSequenceLength - SARSequenceLengthShort corresponding to that forward Link flow.

Upon receiving a *RouteUpdate.ActiveSetUpdated* indication, the access network and the access terminal shall perform the following:

- The access network and the access terminal shall delete QN instances corresponding to QNGroups that have been deleted from the Active Set.
- The access network and access terminal shall create a new QN instance for each new QNGroup in the Active Set.

3.6.4.1.1 Initialization

Upon creation of a QN instance, the QN receiver at the access terminal shall set $V(R)_{QN}$ to zero. Upon creation of a QN instance, the QN transmitter at the access network shall set $V(S)_{QN}$ to zero. The QN transmitter at the access terminal shall ignore an *Initialize* command. The QN receiver at the access network shall ignore an *Initialize* command.

Upon receiving an *Initialize* command, the access terminal shall set $V(R)_{QN}$ to zero. Upon receiving an *Initialize* command, the access network shall set $V(S)_{QN}$ to zero.

3.6.4.1.2 Data Transfer

QN is an erasure detection protocol with a sequence space of QNSequenceLength bits, where QNSequenceLength is equal to (SARSequenceLength – SARSequenceLengthShort) as indicated by the corresponding fields of the Flow*NN*SequenceLengthFwd attribute for forward Link Flow *NN*. All operations and comparisons performed on QN packet sequence numbers shall be carried out in unsigned modulo 2^S arithmetic, where S represents the value of QNSequenceLength.

3.6.4.1.2.1 QN Transmit Procedures

The SAR protocol associated with each Route of a Link Flow provides SAR packets for transmission to the instance of QN associated with that (Route, Link Flow, QNGroup), where QNGroup is the QNGroup associated with the pilot on which the SAR packet is to be transmitted.

The sender forms a QN packet by prepending the QN packet header defined in 3.6.4.1.3 to a SAR packet.

The access network shall maintain a QNSequenceLength-bit variable $V(S)_{QN}$ that indicates the sequence number of the next QN packet to be sent using this QN instance. $V(S)_{QN}$ shall be incremented each time a QN packet containing first-time payload is transmitted.

3.6.4.1.2.2 QN Receive Procedures

The access network shall pass the payload of the QN packet along with the contents of the QN header to SAR.

The access terminal shall maintain a QNSequenceLength-bit variable $V(R)_{QN}$ for each QN instance. $V(R)_{QN}$ contains the sequence number of the next QN packet expected to arrive.

If the QN packet does not contain a sequence number, then the access terminal shall pass the payload of the QN packet to SAR.

In the following, *X* denotes the sequence number of a received QN packet. For each received QN packet, the access terminal shall perform the following procedures in the order specified:

- QN shall pass the payload of the QN packet along with the contents of the QN header to SAR.
- If X ≠ V(R)QN, then QN shall generate a QuickNak indication.
- QN shall set V(R)QN to X + 1.

3.6.4.1.3 QN Packet Header

The QN packet header, which precedes a SAR payload, has the following format:

Field	Length (bits)
LinkFlowNumber	5
Route	1
QNSEQIncluded	0 or 1
QNSEQ	0 or QNSequenceLength

LinkFlowNumber — The sender shall set this field to the identifier for the Link Flow that this QN instance is associated with.

Route — If this QN instance is associated with Route A of the Link Flow, then the sender shall set this field to '0'. Otherwise, the sender shall set this field to '1'.

QNSEQIncluded — The access terminal shall omit this field. If this QN packet contains a SAR packet with a SEQ field of length SARSequenceLength, then the access network shall set this field to '0'. Otherwise, the access network shall set this field to '1' .

QNSEQ — The access terminal shall omit this field. If QNSEQIncluded is set to '0', then the access network shall omit this field. Otherwise, the access network shall set this field to $V(S)_{QN}$.

3.6.4.2 Message Formats

No messages are defined in this protocol.

3.6.5 Interface to Other Protocols

3.6.5.1 Commands

This protocol does not issue any commands.

3.6.5.2 Indications

This protocol registers to receive the following indications:

- *RouteUpdate.ActiveSetUpdated*

3.6.6 QN Packet Priorities

The sender shall assign priority between 60 and 70 inclusive to QN packets. For a given Link Flow, the sender shall assign higher priority (lower number) to packets containing retransmitted application traffic than packets containing only first time transmissions. If Flow*NN*TransmitAbortTimerRev is not set to 0x00, then the access terminal should transmit a higher layer data unit within Flow*NN*TransmitAbortTimerRev time of the higher layer data unit being received by the Multi-link Multi-flow Packet Application. The access terminal may use the Flow*NN*TransmitAbortTimerRev attribute to determine the priority of reverse QN packets.

Type of QN Packet	**Channel**	**Addressing**	**Priority**
Packet containing only first-time transmissions	FTC, RTC	unicast	Between 60 and 70 inclusive
Packet containing re-transmitted application traffic	FTC, RTC	unicast	Between 60 and 70 inclusive

3.6.7 Protocol Numeric Constants

No numeric constants are defined in this protocol.

3.7 Data Over Signaling Protocol

3.7.1 Overview

The Data Over Signaling Protocol provides transmission and duplicate detection of higher layer packets using signaling messages. Each Link flow provides two instances of the Data Over Signaling Protocol, one associated with Route A of the Link flow, and the other associated with Route B[24]. A higher layer packet is carried in a DataOverSignaling message. The Data Over Signaling Protocol uses message sequence numbers in the DataOverSignaling message to provide duplicate detection. Data Over Signaling Protocol is associated with the Multi-link Multi-flow Packet Application. The application subtype for this application is defined in **[3]**.

3.7.2 Primitives and Public Data

3.7.2.1 Commands

This protocol does not define any commands.

3.7.2.2 Return Indications

This protocol does not return any indications.

3.7.3 Protocol Data Unit

The transmission unit of this protocol is a DataOverSignaling message. The DataOverSignaling message carries payload on behalf of the higher layer. This protocol uses the Signaling Application to transmit and receive messages.

3.7.4 Procedures and Messages for the InUse Instance of the Protocol

3.7.4.1 Procedures

If Flow*NN*DataOverSignalingAllowedRev is set to 0x00, the access terminal shall not send a DataOverSignaling message for Link Flow *NN*. The sender shall set the MessageSequence field of a DataOverSignaling message to $V(S_P)$ value maintained by the sender for the Route *P* on which the DataOverSignaling message was sent. Each time the sender sends a new DataOverSignaling message, it shall increment the value of $V(S_P)$. If the sender does not receive a DataOverSignalingAck message within an implementation specific time interval in response to a DataOverSignaling message requiring an acknowledgment, then the sender may retransmit the DataOverSignaling message containing the same higher layer packet and the same MessageSequence an implementation specific number of times.

[24] Note that the all instances of the Data Over Signaling Protocol associated with a Route share the same MessageSequence space.

The access terminal or the access network shall not send a DataOverSignaling message if the associated Link Flow for which the DataOverSignaling message is carrying payload is deactivated, or if the associated Reservation is in the Close state.

Upon receiving a DataOverSignaling message, the receiver shall perform the following:

- If Reset is set to '1' and the receiver is the access terminal, the receiver shall perform the following:
  - If Route is set to '0', the receiver shall set $V(R_A)$ to (MessageSequence – 1) mod 64.
  - If Route is set to '1', the receiver shall set $V(R_B)$ to (MessageSequence – 1) mod 64.
- The receiver shall validate the message using the procedure defined in the Sequence Number Validation Procedure of **[8]** by setting the variable V(R) defined in **[8]** to the $V(R_P)$ value maintained by the receiver for the Route *P* on which the DataOverSignaling message was received, and by setting S = 6.
- The receiver shall discard the DataOverSignaling message if it is invalid. If the DataOverSignaling message is valid, then the receiver shall pass the HigherLayerPacket field of the DataOverSignaling message to the higher layer. If the receiver is an access terminal, then the higher layer is indicated by the ProtocolID field of the Flow*NN*RouteProtocolParametersFwd attribute, where *NN* is the Link Flow with which the DataOverSignaling message is associated. If the receiver is an access network, then the higher layer is indicated by the ProtocolID field of the Flow*NN*RouteProtocolParametersRev attribute, where *NN* is the Link Flow with which the DataOverSignaling message is associated.
- If the AckRequired field of the DataOverSignaling message is '1', then the receiver shall respond with a DataOverSignalingAck message with AckSequence field set to the MessageSequence field of the DataOverSignaling message.

3.7.4.2 Message Formats

The messages described in this section are exchanged between the access terminal and the access network using the Signaling Application.

3.7.4.2.1 DataOverSignaling

The access network or the access terminal sends the DataOverSignaling message to transmit a higher layer packet.

Field	Length (bits)
MessageID	8
LinkFlowNumber	5
Route	1
AckRequired	1
Reset	1
Reserved	2
MessageSequence	6
HigherLayerPacket	Variable Length

MessageID The sender shall set this field to 0x14.

LinkFlowNumber The sender shall set this field to the Link Flow with which this DataOverSignaling message is associated.

Route If this DataOverSignaling message is associated with Route A, then the sender shall set this field to '0'. If this DataOverSignaling message is associated with Route B, then the sender shall set this field to '1'.

AckRequired The sender shall set this field to '1' if the receiver is required to acknowledge the receipt of this message. Otherwise, the sender shall set this field to '0'.

Reset The access terminal shall set this field to '0'. The access network may set this field to '1' to indicate that the access terminal is to reset its V(R) for the indicated route. The access network may set this field to '0' to indicate that the access terminal is not required to reset its V(R).

Reserved The sender shall set this field to '00'. The receiver shall ignore this field.

MessageSequence The sender shall set this field to the $V(S_P)$ value maintained by the sender for the Route *P* on which the DataOverSignaling message was sent.

HigherLayerPacket The sender shall set this field to an entire higher layer packet[25]. The length of the higher layer packet shall be an integer number of octets.

Channels	CC AC FTC

SLP	Best Effort

[25] For example, if the higher layer packet is an HDLC frame, then the entire HDLC frame is included.

Addressing	unicast	**Priority**	20 to 50 (inclusive)

The sender shall assign message priority in the range 20 to 50, inclusive, depending on the priority of the higher layer packet carried as payload in this message.

3.7.4.2.2 DataOverSignalingAck

The access network or the access terminal sends a DataOverSignalingAck message to acknowledge receipt of a DataOverSignaling message.

Field	Length (bits)
MessageID	8
Route	1
AckSequence	6
Reserved	1

MessageID — The sender shall set this field to 0x15.

Route — If this message is acknowledging a DataOverSignaling received on Route A, then the sender shall set this field to '0'. Otherwise the sender shall set this field to '1'.

AckSequence — The sender shall set this field to the MessageSequence field of the DataOverSignaling message whose receipt is being acknowledged.

Reserved — The sender shall set this field to '0'. The receiver shall ignore this field.

Channels	CC AC FTC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.7.4.3 Interface to Other Protocols

3.7.4.3.1 Commands

This protocol does not issue any commands.

3.7.4.3.2 Indications

This protocol does not register to receive any indications.

3.8 Location Update Protocol

3.8.1 Overview

The Location Update Protocol defines location update procedures and messages for mobility management for the Multi-link Multi-flow Packet Application.

The Location Update Protocol is a protocol associated with the Multi-link Multi-flow Packet Application. The application subtype for this application is defined in **[3]**.

3.8.2 Primitives and Public Data

3.8.2.1 Commands

This protocol does not define any commands.

3.8.2.2 Return Indications

This protocol does not return any indications.

3.8.3 Protocol Data Unit

The transmission unit of this protocol is a message. This is a control protocol; and, therefore, it does not carry payload on behalf of other layers or protocols.

3.8.4 Procedures and Messages for the InUse Instance of the Protocol

3.8.4.1 Procedures

3.8.4.1.1 Access Network Requirements

If the protocol receives an *AddressManagement.SubnetChanged* indication, the access network:

- May send a LocationRequest message to query the Location information.
- May send a LocationAssignment message to update the Location information.
- May send a StorageBLOBRequest message to query the stored BLOB.
- May send a StorageBLOBAssignment message to update stored BLOB.

3.8.4.1.2 Access Terminal Requirements

If the access terminal receives a LocationRequest message, it shall send a LocationNotification message. If the access terminal has a stored value for the LocationValue parameter, the access terminal shall set the LocationType, LocationLength, and LocationValue fields in this message to its stored values of these fields. If the access terminal does not have a stored value for the LocationValue parameter, the access terminal shall omit the LocationLength and LocationValue fields in this message.

If the access terminal receives a LocationAssignment message, it shall send a LocationComplete message and the access terminal shall store the value of the

LocationType, LocationLength, and LocationValue fields of the LocationAssignment message in LocationType, LocationLength, and LocationValue variables, respectively.

If the access terminal receives a StorageBLOBRequest message, it shall send a StorageBLOBNotification message. If the access terminal has a stored value for the StorageBLOB parameter, the access terminal shall set the StorageBLOBType, StorageBLOBLength and StorageBLOB fields in this message to its stored values of these fields. If the access terminal does not have a stored value for the StorageBLOB parameter, the access terminal shall set the StorageBLOBType, StorageBLOBLength fields to zero and shall omit the StorageBLOB fields in this message.

If the access terminal receives a StorageBLOBAssignment message, it shall send a StorageBLOBComplete message and the access terminal shall store the value of the StorageBLOBType, StorageBLOBLength and StorageBLOB fields of the StorageBLOBAssignment message in StorageBLOBType, StorageBLOBLength and StorageBLOB variables, respectively.

3.8.4.2 Message Formats

3.8.4.2.1 LocationRequest

The access network uses this message to query the access terminal of its Location information.

Field	Length (bits)
MessageID	8

MessageID The access network shall set this field to 0x03.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.8.4.2.2 LocationNotification

The access terminal sends the LocationNotification message either in response to the LocationRequest message or in an unsolicited manner as specified in [11] or [13] if the configured value of the RANHandoff attribute is 0x01.

Field	Length (bits)
MessageID	8
LocationType	8
LocationLength	0 or 8
LocationValue	0 or 8 × LocationLength

MessageID The access terminal shall set this field to 0x04.

LocationType — The access terminal shall set this field to zero if the value of its stored LocationValue is NULL; otherwise, the access terminal shall set this field to the stored value of LocationType.

LocationLength — The access terminal shall not include this field if the value of its stored LocationValue is NULL; otherwise, the access terminal shall set this field to the stored value of LocationLength.

LocationValue — The access terminal shall not include this field if the value of its stored LocationValue is NULL; otherwise, the access terminal shall set this field to the stored value of LocationValue.

Channels	AC RTC
Addressing	unicast

SLP	Reliable[26] Best Effort
Priority	40

3.8.4.2.3 LocationAssignment

The access network uses this message to update the Location information of the access terminal.

Field	**Length (bits)**
MessageID	8
TransactionID	8
LocationType	8
LocationLength	8
LocationValue	8 × LocationLength

MessageID — The access network shall set this field to 0x05.

TransactionID — The access network shall increment this value for each new LocationAssignment message sent.

LocationType — The access network shall set this field to the type of the location as specified in Table 3.8.4.2-1.

[26] This message is sent reliably when it is sent over the Reverse Traffic Channel.

Table 3.8.4.2-1. LocationType Encoding

LocationType	LocationLength	Meaning
0x00	N/A	No location is stored
0x01	0x05	Location compatible with **[2]** (see Table 3.8.4.2-2)
All other values	N/A	Reserved

LocationLength — The access network shall set this field to the length of the LocationValue field in octets as specified in Table 3.8.4.2-1.

LocationValue — The access network shall set this field to the Location of type specified by LocationType. If LocationType is set to 0x01, the access network shall set this field as shown in Table 3.8.4.2-2, where SID, NID, and PACKET_ZONE_ID correspond to the current access network.

Table 3.8.4.2-2. Subfields of LocationValue when LocationType = 0x01

Sub-fields of LocationValue	# of bits
SID	15
Reserved	1
NID	16
PACKET_ZONE_ID	8

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.8.4.2.4 LocationComplete

The access terminal sends this message in response to the LocationAssignment message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID — The access terminal shall set this field to 0x06.

TransactionID — The access terminal shall set this field the TransactionID field of the corresponding LocationAssignment message.

Channels	AC RTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.8.4.2.5 StorageBLOBRequest

The access network uses this message to query the access terminal of its StorageBLOB information.

Field	Length (bits)
MessageID	8

MessageID The access network shall set this field to 0x10.

Channels	CC FTC	**SLP**	Best Effort
Addressing	unicast	**Priority**	40

3.8.4.2.6 StorageBLOBNotification

The access terminal sends the StorageBLOBNotification message in response to the StorageBLOBRequest message.

Field	Length (bits)
MessageID	8
StorageBLOBType	16
StorageBLOBLength	8
StorageBLOB	0 or 8 × StorageBLOBLength

MessageID The access terminal shall set this field to 0x11.

StorageBLOBType The access terminal shall set this field to zero if the value of its stored StorageBLOB is NULL; otherwise, the access terminal shall set this field to the stored value of StorageBLOBType.

StorageBLOBLength

The access terminal shall set this field to zero if the value of its stored StorageBLOB is NULL; otherwise, the access terminal shall set this field to the stored value of StorageBLOBLength.

StorageBLOB The access terminal shall not include this field if the value of its stored StorageBLOB is NULL; otherwise, the access terminal shall set this field to the stored value of StorageBLOB.

Channels	AC RTC
Addressing	unicast

SLP	Best Effort
Priority	40

3.8.4.2.7 StorageBLOBAssignment

The access network uses this message to update the StorageBLOB information of the access terminal.

Field	Length (bits)
MessageID	8
TransactionID	8
StorageBLOBType	16
StorageBLOBLength	8
StorageBLOB	8 × StorageBLOBLength

MessageID The access network shall set this field to 0x12.

TransactionID The access network shall increment this value for each new StorageBLOBAssignment message sent.

StorageBLOBType The access network shall set this field to the StorageBLOBType. The access network shall set this field to zero if StorageBLOB is NULL. Otherwise, the access network shall set this field as defined in [3].

StorageBLOBLength

The access network shall set this field to the length of the StorageBLOB field in octets. The access network shall set this field to zero if StorageBLOB is NULL.

StorageBLOB The access network shall not include this field if the StorageBLOB is NULL. Otherwise, the access network shall set this field to the StorageBLOB.

Channels	CC FTC
Addressing	unicast

SLP	Best Effort
Priority	40

3.8.4.2.8 StorageBLOBComplete

The access terminal sends this message in response to the StorageBLOBAssignment message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access terminal shall set this field to 0x13.

TransactionID The access terminal shall set this field the TransactionID field of the corresponding StorageBLOBAssignment message.

Channels	AC RTC
Addressing	unicast

SLP	Best Effort
Priority	40

3.8.4.3 Interface to Other Protocols

3.8.4.3.1 Commands

This protocol does not issue any commands.

3.8.4.3.2 Indications

This protocol registers to receive the following indications:

- *AddressManagement.SubnetChanged* (access network only)

3.9 Flow Control Protocol

3.9.1 Overview

The Flow Control Protocol provides procedures and messages used by the access terminal and the access network to perform flow control for the Multi-link Multi-flow Packet Application.

This protocol can be in one of the following states:

- Close State: in this state the Multi-link Multi-flow Packet Application does not send or receive any SAR packets or DataOverSignaling messages.
- Open State: in this state the Multi-link Multi-flow Packet Application can send and receive SAR packets and DataOverSignaling messages.

Figure 3.9.1-1 and Figure 3.9.1-2 show the state transition diagram at the access terminal and the access network.

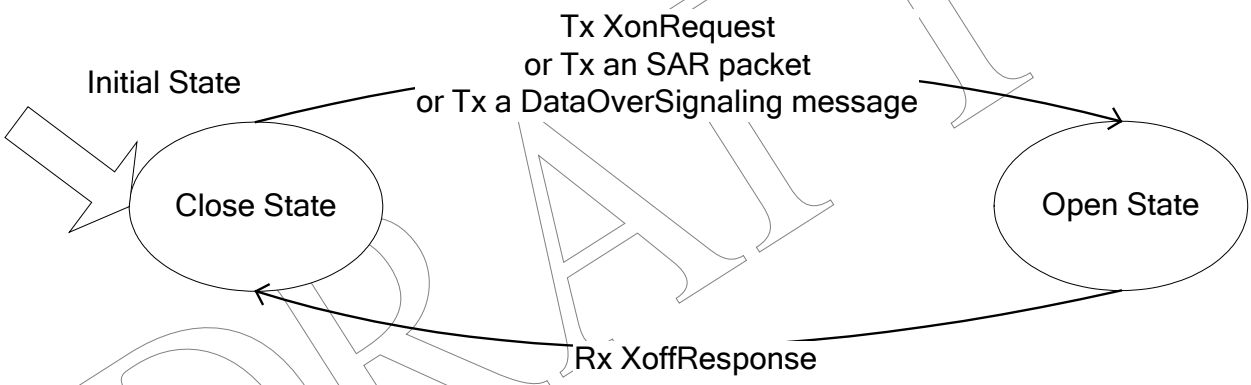

Figure 3.9.1-1. Flow Control Protocol State Diagram (Access Terminal)

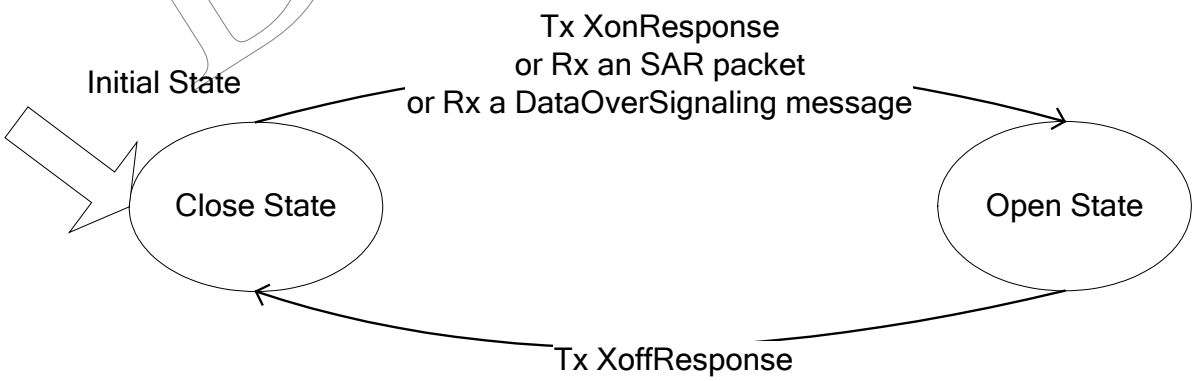

Figure 3.9.1-2. Flow Control Protocol State Diagram (Access Network)

The flow control protocol is a protocol associated with the Multi-link Multi-flow Packet Application. The application subtype for this application is defined in **[3]**.

3.9.2 Primitives and Public Data

3.9.2.1 Commands

This protocol does not define any commands.

3.9.2.2 Return Indications

This protocol does not return any indications.

3.9.3 Protocol Data Unit

The transmission unit of this protocol is a message. This is a control protocol and, therefore, it does not carry payload on behalf of other layers or protocols.

3.9.4 Procedures and Messages for the InUse Instance of the Protocol

3.9.4.1 Procedures

3.9.4.1.1 Transmission and Processing of DataReady Message

The access network may send a DataReady message to indicate that there is data corresponding to this packet application waiting to be transmitted.

The access terminal shall send a DataReadyAck within the time period specified by $T_{FCResponse}$ after reception of the DataReady message to acknowledge reception of the message.

3.9.4.1.2 Transmission and Processing of RestartNetworkInterface Message

The access network may send a RestartNetworkInterface message to direct the access terminal to restart the interface between the packet application and the higher layer.

Upon receiving a RestartNetworkInterface message, the access terminal shall send a RestartNetworkInterfaceAck message and shall restart the interface between the packet application and the higher layer. The access terminal may also restart higher layer protocols.

3.9.4.1.3 Close State

3.9.4.1.3.1 Access Terminal Requirements

The access terminal shall send an XonRequest message or a SAR packet (corresponding to this instance of the Multi-link Multi-flow Packet Application) or a DataOverSignaling message (corresponding to this instance of the Multi-link Multi-flow Packet Application) when it is ready to exchange SAR packets or DataOverSignaling messages with the access network. The access terminal should send an XonRequest message or a SAR packet (corresponding to this instance of the Multi-link Multi-flow Packet Application) or a

DataOverSignaling message (corresponding to this instance of the Multi-link Multi-flow Packet Application) when it receives a DataReady from the access network.

The access terminal shall transition to the Open State when it sends an XonRequest message or when it sends a SAR packet (corresponding to this instance of the Multi-link Multi-flow Packet Application) or when it sends a DataOverSignaling message (corresponding to this instance of the Multi-link Multi-flow Packet Application).

3.9.4.1.3.2 Access Network Requirements

The access network shall not send any SAR packets or DataOverSignaling messages in this state.

If the access network receives an XonRequest message, it shall

- Send an XonResponse message within the time period specified by $T_{FCResponse}$ after reception of the XonRequest message to acknowledge reception of the message.
- Transition to the Open State.

The access network shall also transition to the Open State if it receives a SAR packet (corresponding to this instance of the Multi-link Multi-flow Packet Application) or a DataOverSignaling message (corresponding to this instance of the Multi-link Multi-flow Packet Application).

If the access network receives an XoffRequest message, it shall send an XoffResponse message within the time period specified by $T_{FCResponse}$ after reception of the XoffRequest message to acknowledge reception of the message.

3.9.4.1.4 Open State

In this state, the access terminal and the access network may send or receive any SAR packets or DataOverSignaling messages.

3.9.4.1.4.1 Access Terminal Requirements

The access terminal may re-send an XonRequest message if it does not receive an XonResponse message or a SAR packet (corresponding to this instance of the Multi-link Multi-flow Packet Application) or a DataOverSignaling message (corresponding to this instance of the Multi-link Multi-flow Packet Application) within the time period specified by $T_{FCResponse}$ after sending the XonRequest message.

The access terminal should send an XonRequest message if it receives a DataReady message.

The access terminal may send an XoffRequest message to request the access network to stop sending SAR packets and DataOverSignaling messages. The access terminal shall transition to the Close state when it receives an XoffResponse message.

The access terminal may re-send an XoffRequest message if it does not receive an XoffResponse message within the time period specified by $T_{FCResponse}$ after sending the XoffRequest message.

3.9.4.1.4.2 Access Network Requirements

If the access network receives an XoffRequest message, it shall

- Send an XoffResponse message within the time period specified by $T_{FCResponse}$ after reception of the XoffRequest message to acknowledge reception of the message.
- Transition to the Close State.

If the access network receives an XonRequest message, it shall send an XonResponse message within the time period specified by $T_{FCResponse}$ after reception of the XonRequest message to acknowledge reception of the message.

3.9.4.2 Message Formats

3.9.4.2.1 XonRequest

The access terminal sends this message to request transition to the Open State.

Field	Length (bits)
MessageID	8

MessageID The access terminal shall set this field to 0x07.

Channels	AC	RTC		**SLP**	Best Effort
Addressing		unicast		**Priority**	40

3.9.4.2.2 XonResponse

The access network sends this message to acknowledge reception of the XonRequest message.

Field	Length (bits)
MessageID	8

MessageID The access network shall set this field to 0x08.

Channels	CC	FTC		**SLP**	Best Effort
Addressing		unicast		**Priority**	40

3.9.4.2.3 XoffRequest

The access terminal sends this message to request transition to the Close State.

Field	Length (bits)
MessageID	8

MessageID The access terminal shall set this field to 0x09.

Channels	AC	RTC	SLP	Best Effort
Addressing	unicast		Priority	40

3.9.4.2.4 XoffResponse

The access network sends this message to acknowledge reception of the XoffRequest message.

Field	Length (bits)
MessageID	8

MessageID The access network shall set this field to 0x0a.

Channels	CC	FTC	SLP	Best Effort
Addressing	unicast		Priority	40

3.9.4.2.5 DataReady

The access network sends this message to indicate that there is data corresponding to this packet application awaiting to be transmitted.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access network shall set this field to 0x0b.

TransactionID The access network shall increment this value for each new DataReady message sent.

Channels	CC	FTC	SLP	Best Effort
Addressing	unicast		Priority	40

3.9.4.2.6 DataReadyAck

The access terminal sends this message to acknowledge reception of a DataReady message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access terminal shall set this field to 0x0c.

TransactionID The access terminal shall set this value to the value of the TransactionID field of the corresponding DataReady message.

Channels	AC RTC	SLP	Best Effort
Addressing	unicast	Priority	40

3.9.4.2.7 RestartNetworkInterface

The access network sends this message to request the access terminal to restart the network interface.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access network shall set this field to 0x1c.

TransactionID The access network shall increment this value for each new RestartNetworkInterface message sent.

Channels	CC FTC	SLP	Best Effort
Addressing	unicast	Priority	40

3.9.4.2.8 RestartNetworkInterfaceAck

The access terminal sends this message to acknowledge reception of a RestartNetworkInterface message.

Field	Length (bits)
MessageID	8
TransactionID	8

MessageID The access terminal shall set this field to 0x1d.

TransactionID — The access terminal shall set this value to the value of the TransactionID field of the corresponding RestartNetworkInterface message.

Channels	AC RTC
Addressing	unicast

SLP	Best Effort
Priority	40

3.9.5 Interface to Other Protocols

3.9.5.1 Commands

This protocol does not issue any commands.

3.9.5.2 Indications

This protocol does not register to receive any indications.

3.9.6 Protocol Numeric Constants

Constant	**Meaning**	**Value**
$T_{FCResponse}$	Time period within which the access terminal and access network are to respond to flow control messages.	1 second

3.10 Configuration Attributes for the Multi-link Multi-flow Packet Application

The access terminal shall support default values of all attributes.

Unless specified otherwise, the access terminal and the access network shall not use the Generic Attribute Update Protocol to update configurable attributes belonging to the Multi-link Multi-flow Packet Application. The access terminal and the access network shall support the use of the Generic Attribute Update Protocol to update values of the following configurable attributes belonging to the Multi-link Multi-flow Packet Application:

- Flow*NN*TimersFwd,
- Flow*NN*TimersRev,
- Flow*NN*NakEnableFwd,
- Flow*NN*NakEnableRev,
- Flow*NN*PhysicalLayerNakEnableRev,
- Flow*NN*FlowProtocolParametersFwd,
- Flow*NN*FlowProtocolParametersRev,
- Flow*NN*RouteProtocolParametersFwd,
- Flow*NN*RouteProtocolParametersRev,
- Flow*NN*ActivatedFwd,
- Flow*NN*ActivatedRev,
- Flow*NN*SequenceLengthFwd,
- Flow*NN*SequenceLengthRev,
- Flow*NN*FlowProtocolPDUFwd,
- Flow*NN*FlowProtocolPDURev,
- Flow*NN*RouteProtocolPDUFwd,
- Flow*NN*RouteProtocolPDURev,
- Flow*NN*SimultaneousDeliveryOnBothRoutesFwd,
- Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd,
- Flow*NN*DataUnitFwd,
- Flow*NN*DataUnitRev,
- Flow*NN*ReservationFwd,
- Flow*NN*ReservationRev,
- Flow*NN*TransmitAbortTimerRev,
- Flow*NN*DataOverSignalingAllowedRev,
- Reservation*KK*IdleStateFwd,

- Reservation*KK*IdleStateRev,
- Reservation*KK*QoSRequestFwd,
- Reservation*KK*QoSRequestRev,
- Reservation*KK*QoSResponseFwd,
- Reservation*KK*QoSResponseRev,
- ANSupportedQoSProfiles,
- Reservation*KK*BCMCSFlowIDAssociation,
- Reservation*KK*BCMCSProgramIDAssociation, and
- Reservation*KK*ReservationQueuingSupported

where *NN* is the hexadecimal Link Flow number in the range 0x00 to *M* -1 inclusive, where M is MaxNumLinkFlowsFwd or MaxNumLinkFlowsRev for a Link Flow on the forward link or reverse link respectively and *KK* is the two-digit hexadecimal ReservationLabel.

The updated values of the attributes shall be consistent with the value of the MaxActivatedLinkFlowsFwd and MaxActivatedLinkFlowsRev attributes.

The number of Forward Link Reservations that satisfy at least one of the following conditions shall not exceed one plus the value of the MaxNumReservationsFwd field of MaxReservations attribute:

- The Reservation is in Open state.
- The Reservation is bound to a link flow.
- The Reservation*KK*QoSRequestFwd corresponding to the Reservation is set to a non-default value.

The number of Reverse Link Reservations that satisfy at least one of the following conditions shall not exceed one plus the value of the MaxNumReservationsRev field of MaxReservations attribute:

- The Reservation is in Open state.
- The Reservation is bound to a link flow.
- The Reservation*KK*QoSRequestRev corresponding to the Reservation is set to a non-default value.

The access terminal shall not send an AttributeUpdateRequest message proposing to update the value of the ANSupportedQoSProfiles attribute.

The access network shall not send an AttributeUpdateRequest message proposing to update the value of the Reservation*KK*ReservationQueuingSupported attribute.

3.10.1 Simple Attributes

The negotiable simple attribute for this protocol is listed in Table 3.10-1. The access terminal and the access network shall use as defaults the values in Table 3.10-1 typed in ***bold italics***.

1

1 **Table 3.10-1. Configurable Values**

Attribute ID	Attribute	Values	Meaning
0xffff	RANHandoff	***0x00***	The access terminal shall not send an unsolicited LocationNotification message. The access network does not switch between the radio access technologies (E.g. specified in **[2]**) in a manner that preserves the state of all protocol layers at or above the data link layer (PPP).
		0x01	The access terminal shall send an unsolicited LocationNotification message. The access network switches between the radio access technologies (E.g specified in **[2]**) in a manner that preserves the state of all protocol layers at or above the data link layer (PPP).
		All other values	Reserved
0xfffc	MaxAbortTimer	***0x05***	Maximum abort timer is 500 ms.
		0x06 to 0x64	Maximum abort timer in units of 100 ms.
		All other values	Reserved
0xfffb	PPPFreeAuthenticationSupport	***0x00***	PPP free authentication as specified in [1] is not supported.
		0x01	PPP free authentication as specified in [1] is supported
		All other values	Reserved
0xfffa	TwoRoutesSupported	***0x00***	Two Routes are not supported
		0x01	Two Routes are supported
		All other values	Reserved
0xfe*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.	Flow*NN*NakEnableFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x00	SAR receivers associated with forward Link Flow *NN* do not transmit MultiLinkNak messages when missing data units are detected.
		0x01	SAR receivers associated with forward Link Flow *NN* transmit a MultiLinkNak message when missing data units are detected.
		All other values	Reserved.

Attribute ID	Attribute	Values	Meaning
0xfd*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive.	Flow*NN*NakEnableRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x00	SAR receivers associated with reverse Link Flow *NN* do not transmit Nak messages when missing data units are detected.
		0x01	SAR receivers associated with reverse Link Flow *NN* transmit a Nak message when missing data units are detected.
		All other values	Reserved.
0xfa*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive.	Flow*NN*PhysicalLayerNakEnableRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x01***	SAR is to retransmit data units when a *PhysicalLayer.ReverseTrafficPacketsMissed* indication is received.
		0x00	SAR is to ignore *PhysicalLayer.ReverseTrafficPacketsMissed* indication.
		All other values	Reserved
0xf9*KK* *KK* is the two-digit hexadecimal ReservationLabel.	Reservation*KK*IdleStateFwd *KK* is the two-digit hexadecimal forward link ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Reservation does not change states when a Connection is closed.
		0x01	Reservation transitions to the Close state when a Connection is closed unless an access network initiated Connection is being opened at the same time.
		0x02	Reservation transitions to the Open state when a Connection is opened and transitions to the Close state when a Connection is closed unless an access network initiated Connection is being opened at the same time.
		All other values	Reserved
0xf8*KK* *KK* is the two-digit hexadecimal ReservationLab	Reservation*KK*IdleStateRev *KK* is the two-digit hexadecimal reverse link ReservationLabel, where hexadecimal digits A through F are specified in	***0x00***	Reservation does not change states when a Connection is closed.
		0x01	Reservation transitions to the Close state when a Connection is closed unless an access network initiated Connection is being opened at the same time.

Attribute ID	Attribute	Values	Meaning
el.	upper case letters.	0x02	Reservation transitions to the Open state when a Connection is opened and transitions to the Close state when a Connection is closed unless an access network initiated Connection is being opened at the same time.
		All other values	Reserved
0xf7*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev -1 inclusive.	Flow*NN*TransmitAbortTimerRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev -1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Maximum delay for transmission of a higher layer data unit for Link Flow *NN* is not specified.
		0x0001 – 0x03e8	Maximum delay for transmission of a higher layer data unit for Link Flow *NN* in units of 5 ms.
		All other values	Reserved
0xf6*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev -1 inclusive.	Flow*NN*DataOverSignalingAllowedRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev -1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Access terminal is not allowed to send DataOverSignaling messages for this Link Flow.
		0x01	Access terminal is allowed to send DataOverSignaling messages for this Link Flow.
		All other values	Reserved
0xf300	Flow00ActivatedFwd	***0x01***	Forward Link Flow 0x00 is activated.
		0x00	Forward Link Flow 0x00 is not activated.
		All other values	Reserved
0xf301	Flow01ActivatedFwd	***0x01***	Forward Link Flow 0x01 is activated.
		0x00	Forward Link Flow 0x01 is not activated.
		All other values	Reserved
0xf3*NN* *NN* is the two-digit	Flow*NN*ActivatedFwd *NN* is the two-digit hexadecimal Link Flow	***0x00***	Forward Link Flow *NN* is not activated.
		0x01	Forward Link Flow *NN* is activated.

Attribute ID	Attribute	Values	Meaning
hexadecimal Link Flow number of the forward Link Flow in the range 0x02 to MaxNumLinkFlowsFwd-1 inclusive.	number in the range 0x02 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	All other values	Reserved
0xf200	Flow00ActivatedRev	***0x01***	Reverse Link Flow 0x00 is activated.
		0x00	Reverse Link Flow 0x00 is not activated.
		All other values	Reserved
0xf201	Flow01ActivatedRev	***0x01***	Reverse Link Flow 0x01 is activated.
		0x00	Reverse Link Flow 0x01 is not activated.
		All other values	Reserved
0xf2*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x02 to MaxNumLinkFlowsRev-1 inclusive.	Flow*NN*ActivatedRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x02 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Reverse Link Flow *NN* is not activated.
		0x01	Reverse Link Flow *NN* is activated.
		All other values	Reserved
0xf0*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive.	Flow*NN*SequenceLengthRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x00	SAR of Reverse Link Flow *NN* has a 6-bit sequence number.
		0x01	SAR of Reverse Link Flow *NN* has a 14-bit sequence number.
		0x02	SAR of Reverse Link Flow *NN* has a 22-bit sequence number.
		0x03	SAR of Reverse Link Flow *NN* has a30-bit sequence number. This value shall not be used unless $\lceil \log_2 [R \times (AbortTimer)] \rceil + 1 > 22$, where R is the maximum data rate in units of higher layer octets per second that can be achieved by the lower layers, and abort timer is in units of seconds.

Attribute ID	Attribute	Values	Meaning
		All other values	Reserved
0xef*01*	Flow*01*FlowProtocolPDUFwd	0x00	Forward Link Flow 0x01 provides an octet stream to the Flow Protocol.
		0x01	Forward Link Flow 0x01 provides a packet stream to the Flow Protocol.
		All other values	Reserved.
0xef*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00, and 0x02 to MaxNumLinkFlowsFwd-1 inclusive.	Flow*NN*FlowProtocolPDUFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00, and 0x02 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Forward Link Flow *NN* provides an octet stream to the Flow Protocol.
		0x01	Forward Link Flow *NN* provides a packet stream to the Flow Protocol.
		All other values	Reserved.
0xee01	Flow*01*FlowProtocolPDURev	0x00	Reverse Link Flow 0x01 provides an octet stream to the Flow Protocol.
		0x01	Reverse Link Flow 0x01 provides a packet stream to the Flow Protocol.
		All other values	Reserved.
0xee*NN NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00, and 0x02 to MaxNumLinkFlowsRev-1 inclusive.	Flow*NN*FlowProtocolPDURev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00, and 0x02 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Reverse Link Flow *NN* provides an octet stream to the Flow Protocol.
		0x01	Reverse Link Flow *NN* provides a packet stream to the Flow Protocol.
		All other values	Reserved.
0xed*NN* *NN* is the two-digit hexadecimal	Flow*NN*DataUnitFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00	***0x00***	Data unit for forward Link Flow *NN* is octets.
		0x01	Data unit for forward Link Flow *NN* is SAR packet payload.

Attribute ID	Attribute	Values	Meaning
Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.	to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	All other values	Reserved.
0xec*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive.	Flow*NN*DataUnitRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Data unit for reverse Link Flow *NN* is octets.
		0x01	Data unit for reverse Link Flow *NN* is SAR packet payload.
		All other values	Reserved.
0xeb*01*	Flow*01*RouteProtocolPDUFwd	0x00	Each Route of Forward Link Flow 0x01 provides an octet stream to the Route Protocol.
		0x01	Each Route of Forward Link Flow 0x01 provides a packet stream to the Route Protocol.
		All other values	Reserved.
0xeb*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00, and 0x02 to MaxNumLinkFlowsFwd-1 inclusive.	Flow*NN*RouteProtocolPDUFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00, and 0x02 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Each Route of Forward Link Flow *NN* provides an octet stream to the Route Protocol.
		0x01	Each Route of Forward Link Flow *NN* provides a packet stream to the Route Protocol.
		All other values	Reserved.
0xea*01*	Flow*01*RouteProtocolPDURev	0x00	Each Route of Reverse Link Flow 0x01 provides an octet stream to the Route Protocol.
		0x01	Each Route of Reverse Link Flow 0x01 provides a packet stream to the Route Protocol.
		All other values	Reserved.

Attribute ID	Attribute	Values	Meaning
0xea*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00, and 0x02 to MaxNumLinkFlowsRev-1 inclusive.	Flow*NN*RouteProtocolPDURev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00, and 0x02 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Each Route of Reverse Link Flow *NN* provides an octet stream to the Route Protocol.
		0x01	Each Route of Reverse Link Flow *NN* provides a packet stream to the Route Protocol.
		All other values	Reserved.
0xe9*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.	Flow*NN*SimultaneousDeliveryOnBothRoutesFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Simultaneous delivery of Flow Protocol payload on both routes of Forward Link Flow *NN* is not allowed.
		0x01	Simultaneous delivery of Flow Protocol payload on both routes of Forward Link Flow *NN* is allowed.
		All other values	Reserved.
0xe8*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.	Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x00***	Each Route of Forward Link Flow *NN* delivers Route Protocol payload in-order.
		0x01	Each Route of Forward Link Flow *NN* may deliver Route Protocol payload out-of-order.
		All other values	Reserved.
0xfff8	BCMCSOverRLPAllowed	***0x00***	Transmission of BCMCS packets over RLP is not allowed
		0x01	Transmission of BCMCS packets over RLP is allowed
		All other values	Reserved.
0xe6*KK* *KK* is the two-digit hexadecimal	Reservation*KK*ReservationQueuingSupported *KK* is the two-digit hexadecimal reverse link	***0x00***	Access terminal does not support Priority Queuing for the Reservation *KK*.
		0x01	Access terminal supports Priority Queuing for the Reservation *KK*.

Attribute ID	Attribute	Values	Meaning
ReservationLabel.	ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.	All other values	Reserved.

3.10.2 Complex Attributes

The following complex attributes and default values are defined (see **[8]** for attribute record definition).

3.10.2.1 Flow*NN*TimersFwd Attribute

NN is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
AbortTimer	16	0x01f4
FlushTimer	16	0x012c
NakDelayTimer	16	0x0000

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x03*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

AbortTimer — The sender shall set this field to the value of the SAR abort timer for this forward Link Flow in units of ms. The sender shall not set this field to a value greater than MaxAbortTimer.

FlushTimer — The sender shall set this field to the value of the SAR flush timer for this forward Link Flow in units of ms. The value of the SAR flush timer shall be less than or equal to that of the corresponding abort timer.

NakDelayTimer — The sender shall set this field to the value of the Nak delay timer for this forward Link Flow in units of ms. The value of the Nak delay timer shall be less than or equal to that of the corresponding abort timer.

3.10.2.2 Flow*NN*TimersRev Attribute

NN is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
AbortTimer	16	0x01f4
FlushTimer	16	0x012c

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x04*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

AbortTimer — The sender shall set this field to the value of the SAR abort timer for this reverse Link Flow in units of ms. The sender shall not set this field to a value greater than MaxAbortTimer.

FlushTimer — The sender shall set this field to the value of the SAR flush timer for this reverse Link Flow in units of ms. The value of the SAR flush timer shall be less than or equal to that of the corresponding abort timer.

3.10.2.3 Flow*NN*ReservationFwd Attribute

NN is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default for *NN* = 0x00	Default for *NN* = 0x01	Default for *NN* > *0x01*
Length	8	N/A	N/A	N/A
AttributeID	16	N/A	N/A	N/A
One or more occurrences of the following record:				
ValueID	8	N/A	N/A	N/A
ReservationCount	8	0x01	0x01	0x00
ReservationCount occurrences of the following field:				
ReservationLabel	8	0xff	0xfe	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x05*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsFwd-1 inclusive.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ReservationCount — The sender shall set this field to the number of reservations associated with this Link Flow.

ReservationLabel — The sender shall set this field to the ReservationLabel of the reservation associated with this Link Flow.

3.10.2.4 Flow*NN*ReservationRev Attribute

NN is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default for *NN* = 0x00	Default for *NN*= 0x01	Default for *NN* > 0x01
Length	8	N/A	N/A	N/A
AttributeID	16	N/A	N/A	N/A
One or more occurrences of the following record:				
ValueID	8	N/A	N/A	N/A
ReservationCount	8	0x01	0x01	0x00
ReservationCount occurrences of the following field:				
ReservationLabel	8	0xff	0xfe	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x06*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to MaxNumLinkFlowsRev-1 inclusive.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ReservationCount — The sender shall set this field to the number of reservations associated with this Link Flow.

ReservationLabel — The sender shall set this field to the ReservationLabel of the reservation associated with this Link Flow.

3.10.2.5 ATSupportedFlowProtocolParameters*PP* Attribute

PP is the two-digit hexadecimal ProtocolID number for the Flow Protocol as specified in [3], where hexadecimal digits A through F are specified in upper case letters.

Field	**Length (bits)**	**Default for *PP* = 0x00, 0x01, 0x05**	**Default for *PP* other than 0x00, 0x01, 0x05**
Length	8	N/A	N/A
AttributeID	16	N/A	N/A
One occurrence of the following record:			
ValueID	8	N/A	N/A
ProtocolSupported	8	0x01	0x00
SupportedProtocolParametersValuesLength	8	0x00	0x00
SupportedProtocolParametersValues	SupportedProtocolParametersValuesLength × 8	N/A	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0f*PP*.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProtocolSupported The sender shall set this field to 0x00 if the Flow Protocol *PP* is not supported. Otherwise, the sender shall set this field to 0x01 if the Flow Protocol *PP* is supported. All other values are reserved.

SupportedProtocolParametersValuesLength
If the SupportedProtocolParametersValues record is not included, the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the SupportedProtocolParametersValues record in units of octets.

SupportedProtocolParametersValues
Unless specified otherwise by [3], the sender shall omit this record. If *PP* is 0x04 and ProtocolSupported is 0x01, then the sender shall set this record as defined in 3.10.2.5.1. If *PP* is less than 0x04 or equal to 0x05, the sender shall omit this record.

3.10.2.5.1 Definition of SupportedProtocolParametersValues record when the Flow Protocol or Route Protocol is ROHC

Field	Length (bits)
MaxSupportedMaxCID	16
LargeCIDSupported	1
MaxSupportedMRRU	16
TimerBasedCompressionSupported	1
SupportedProfileCount	8
SupportedProfileCount occurrences of the following field:	
SupportedProfile	16
Reserved	0 - 7 (as needed)

MaxSupportedMaxCID
The sender shall set this field to the maximum MAX_CID parameter supported.

LargeCIDSupported The sender shall set this field to '0' if large CID representation is not supported according to [6]. Otherwise, the sender shall set this field to '1' if large CID representation is supported.

MaxSupportedMRRU
The sender shall set this field to the MRRU supported by the decompressor according to [6]. Default value is 0x0000 (no segmentation).

TimerBasedCompressionSupported

The sender shall set this field to '1' if the compressor at the access terminal supports timer based compression mode. Otherwise, the sender shall set this field to '0'.

SupportedProfileCount

The sender shall set this field to the number of ROHC profiles supported.

SupportedProfile The sender shall set this field to the ROHC profile supported by the compressor and decompressor. IANA ROHC profile identifier definitions can be found at [12].

Reserved The sender shall add reserved bits to make the length of the entire record an integer number of octets. The sender shall set these bits to '0'. The receiver shall ignore this field.

3.10.2.6 ATSupportedRouteProtocolParameters*PP* Attribute

PP is the two-digit hexadecimal ProtocolID number for the Route Protocol as specified in [3], where hexadecimal digits A through F are specified in upper case letters.

Field	**Length (bits)**	**Default for *PP* = 0x00**	**Default for *PP* > 0x00**
Length	8	N/A	N/A
AttributeID	16	N/A	N/A
One occurrence of the following record:			
ValueID	8	N/A	N/A
ProtocolSupported	8	0x01	0x00
SupportedProtocolParametersValuesLength	8	0x00	0x00
SupportedProtocolParametersValues	SupportedProtocolParametersValuesLength × 8	N/A	N/A

Length Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID The sender shall set this field to 0x10*PP*.

ValueID The sender shall set this field to an identifier assigned to this complex value.

ProtocolSupported The sender shall set this field to 0x00 if the Route Protocol *PP* is not supported. Otherwise, the sender shall set this field to 0x01 if the Route Protocol *PP* is supported. All other values are reserved.

SupportedProtocolParametersValuesLength
If the SupportedProtocolParametersValues record is not included, the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the SupportedProtocolParametersValues record in units of octets.

SupportedProtocolParametersValues
Unless specified otherwise by [3], the sender shall omit this record. If *PP* is 0x04 and ProtocolSupported is 0x01, then the sender shall set this record as defined in 3.10.2.5.1. If *PP* is less than 0x04, the sender shall omit this record.

3.10.2.7 ATSupportedQoSProfiles Attribute

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One occurrence of the following record:		
ValueID	8	N/A
QoSProfileCount	8	0
QoSProfileCount of the following record:		
ProfileType	8	N/A
ProfileLength	8	N/A
ProfileValue	ProfileLength × 8	N/A

Length Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID The sender shall set this field to 0x0002.

ValueID The sender shall set this field to an identifier assigned to this complex value.

QoSProfileCount The sender shall set this field to the number of QoS Profiles that are included in this message.

ProfileType The sender shall set this field to indicate the profile type. The sender shall set this field according to **[3]**.

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets.

ProfileValue — The sender shall set this field to the profile according to **[3]**.

3.10.2.8 ANSupportedQoSProfiles Attribute

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One occurrence of the following record:		
ValueID	8	N/A
QoSProfileCount	8	0
QoSProfileCount of the following record:		
ProfileType	8	N/A
ProfileLength	8	N/A
ProfileValue	ProfileLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0003.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

QoSProfileCount — The sender shall set this field to the number of QoS Profiles that are included in this message.

ProfileType — The sender shall set this field to indicate the profile type. The sender shall set this field according to **[3]**.

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets.

ProfileValue — The sender shall set this field to the profile according to **[3]**.

3.10.2.9 MaxLinkFlows Attribute

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A

One or more occurrences of the following record:

ValueID	8	N/A
MaxNumLinkFlowsFwd	8	***0x06***
MaxNumLinkFlowsRev	8	***0x06***
MaxActivatedLinkFlowsFwd	8	***0x03***
MaxActivatedLinkFlowsRev	8	***0x03***

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0004.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

MaxNumLinkFlowsFwd

The sender shall set this field to indicate the maximum total number of activated and deactivated forward Link Flows supported. The value shall be in the range of 0x06 to 0x1f, inclusive

MaxNumLinkFlowsRev

The sender shall set this field to indicate the maximum total number of activated and deactivated reverse Link Flows supported. The value shall be in the range of 0x06 to 0x1f, inclusive.

MaxActivatedLinkFlowsFwd

The sender shall set this field to indicate the maximum number of simultaneous activated forward Link Flows supported. The value shall be in the range of 0x03 to MaxNumLinkFlowsFwd, inclusive.

MaxActivatedLinkFlowsRev

The sender shall set this field to indicate the maximum number of simultaneous activated reverse Link Flows supported. The value shall be in the range of 0x03 to MaxNumLinkFlowsRev, inclusive.

3.10.2.10 Reservation*KK*QoSRequestFwd Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A

One or more of the following record:

ValueID	8	N/A
ProfileType	8	***0x00***
ProfileLength	16	***0x0000***
ProfileValue	ProfileLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x07*KK*, where *KK* is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProfileType — The sender shall set this field to indicate the profile type.The sender shall set this field as defined in **[3]**.

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets. If ProfileType is equal to 0x00, then the sender shall set this field to 0x0000.

ProfileValue — The sender shall set this field to the Profile Value corresponding to the Profile Type according to [3]. If ProfileType is equal to 0x00, then the sender shall omit this field. If ProfileType is equal to 0x01, if the ANSupportedQoSProfiles attribute does not have a default value, and if this attribute is included in an AttributeUpdateRequest then the requested Flow Profile IDs shall be a subset of the Flow Profile IDs in the ProfileValue fields of the ANSupportedQoSProfiles attribute.

3.10.2.11 Reservation*KK*QoSRequestRev Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProfileType	8	***0x00***
ProfileLength	16	***0x0000***
ProfileValue	ProfileLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x08*KK*, where *KK* is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProfileType — The sender shall set this field to indicate the profile type. The sender shall set this field as defined in **[3]**.

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets. If ProfileType is equal to 0x00, then the sender shall set this field to 0x0000.

ProfileValue — The sender shall set this field to the Profile Value corresponding to the Profile Type according to [3]. If ProfileType is equal to 0x00, then the sender shall omit this field. If ProfileType is equal to 0x01, if the ANSupportedQoSProfiles attribute does not have a default value, and if this attribute is included in an AttributeUpdateRequest, then the requested Flow Profile IDs shall be a subset of the Flow Profile IDs in the ProfileValue fields of the ANSupportedQoSProfiles attribute.

3.10.2.12 Reservation*KK*QoSResponseFwd Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProfileType	8	***0x00***
ProfileLength	16	***0x0000***
ProfileValue	ProfileLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x09*KK*, where *KK* is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProfileType — The sender shall set this field to indicate the profile type. The sender shall set this field as defined in **[3]**.

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets. If ProfileType is equal to 0x00, then the sender shall set this field to 0x0000.

ProfileValue — The sender shall set this field to the Profile Value corresponding to the Profile Type according to [3]. If ProfileType is equal to 0x00, then the sender shall omit this field.

3.10.2.13 Reservation*KK*QoSResponseRev Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A

One or more of the following record:

ValueID	8	N/A
ProfileType	8	***0x00***
ProfileLength	16	***0x0000***
ProfileValue	ProfileLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0a*KK*, where *KK* is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProfileType — The sender shall set this field to indicate the profile type. The sender shall set this field as defined in **[3]**.

ProfileLength — The sender shall set this field to length of the ProfileValue field in units of octets. If ProfileType is equal to 0x00, then the sender shall set this field to 0x0000.

ProfileValue — The sender shall set this field to the Profile Value corresponding to the Profile Type according to [3]. If ProfileType is equal to 0x00, then the sender shall omit this field.

3.10.2.14 MaxReservations Attribute

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A

One or more occurrences of the following record:

ValueID	8	N/A
MaxNumReservationsFwd	8	0xff
MaxNumReservationsRev	8	0xff
MaxNumOpenReservationsFwd	8	0x0f
MaxNumOpenReservationsRev	8	0x0f

Length Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID The sender shall set this field to 0x0005.

ValueID The sender shall set this field to an identifier assigned to this complex value.

MaxNumReservationsFwd

The sender shall set this field to indicate one less than the maximum total number of Forward Link Reservations supported that satisfy at least one of the following conditions:

- The Reservation is in Open state.
- The Reservation is bound to a link flow.
- The Reservation*KK*QoSRequestFwd corresponding to the Reservation is set to a non-default value.

The value shall be in the range of 0x00 to 0xff, inclusive

MaxNumReservationsRev

The sender shall set this field to indicate one less than the maximum total number of Reverse Link Reservations supported that satisfy at least one of the following conditions:

- The Reservation is in Open state.
- The Reservation is bound to a link flow.
- The Reservation*KK*QoSRequestRev corresponding to the Reservation is set to a non-default value.

The value shall be in the range of 0x00 to 0xff, inclusive.

MaxNumOpenReservationsFwd

The sender shall set this field to indicate one less than the maximum number of simultaneous activated Forward Link Reservations supported. The value shall be in the range of 0x00 to MaxNumReservationsFwd, inclusive.

MaxNumOpenReservationsRev

The sender shall set this field to indicate one less than the maximum number of simultaneous activated Reverse Link Reservations supported. The value shall be in the range of 0x00 to MaxNumReservationsRev, inclusive.

3.10.2.15 Flow*NN*FlowProtocolParametersFwd Attribute

NN is the two-digit hexadecimal forward Link flow identifier, where hexadecimal digits A through F are specified in upper case letters.

Field	**Length (bits)**	**Default for *NN* = 0x00**	**Default for *NN* = 0x01**	**Default for *NN* > 0x01**
Length	8	N/A	N/A	N/A
AttributeID	16	N/A	N/A	N/A
One or more occurrences of the following record:				
ValueID	8	N/A	N/A	N/A
ProtocolID	8	0x01	0x05	0x00
ProtocolParametersLength	8	0x00	0x00	0x00
ProtocolParameters	ProtocolParametersLength × 8	N/A	N/A	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0b*NN*, where *NN* is the two-digit hexadecimal forward Link flow number.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProtocolID — The sender shall set this field to n identifier for the Flow Protocol as specified in [3].

ProtocolParametersLength

If the ProtocolParameters record is not included, then the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters Unless specified otherwise by [3], the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this record as defined in 3.10.2.15.1. If ProtocolID is less than 0x04 or equal to 0x05, the sender shall omit this record.

3.10.2.15.1 Definition of ProtocolParameters record when the Flow Protocol or Route Protocol is ROHC

Field	Length (bits)
MaxCID	16
LargeCIDs	1
FeedbackForIncluded	1
FeedbackFor	0 or 5
MRRU	16
ProfileCount	8
ProfileCount occurrences of the following field:	
Profile	16
Reserved	0 – 7 (as needed)

MaxCID The sender shall set this field to the MAX_CID parameter for this ROHC Channel. The sender shall not set this field to a value greater than MaxSupportedMaxCID.

LargeCIDs If the LARGE_CIDS parameter for this ROHC Channel is false, then the sender shall set this field to '0'. Otherwise, the sender shall set this field to '1'. The sender shall not set this field to '1' if LargeCIDSupported is not set to '1'.

FeedbackForIncluded If ROHC feedback associated with another Link flow (ROHC channel) is sent on this Link flow (ROHC channel), then this field shall be set to '1'. Otherwise, this field shall be set to '0'.

FeedbackFor If FeedbackForIncluded is set to '0', then the sender shall omit this field. Otherwise, the sender shall set this field to the Link flow number (ROHC channel) to which ROHC feedback sent on this Link flow (ROHC channel) refers.

MRRU The sender shall set this field to the MRRU parameter for this ROHC channel. The sender shall not set this field to a value larger than MaxSupportedMRRU.

ProfileCount — The sender shall set this field to the number of ROHC profiles supported by the decompressor.

Profile — The sender shall set this field to the ROHC profile supported by the decompressor according to **[6]**. The sender shall not set this field to a value that is not included in the list of supported Profiles.

Reserved — The sender shall add reserved bits to make the length of the entire record an integer number of octets. The sender shall set these bits to '0'. The receiver shall ignore this field.

3.10.2.16 Flow*NN*FlowProtocolParametersRev Attribute

NN is the two-digit hexadecimal reverse Link flow number, where hexadecimal digits A through F are specified in upper case letters.

Field	**Length (bits)**	**Default for *NN* = 0x00**	**Default for *NN* = 0x01**	**Default for *NN* > 0x01**
Length	8	N/A	N/A	N/A
AttributeID	16	N/A	N/A	N/A
One or more of the following record:				
ValueID	8	N/A	N/A	N/A
ProtocolID	8	0x01	0x05	0x00
ProtocolParametersLength	8	0x00	0x00	0x00
ProtocolParameters	ProtocolParametersLength × 8	N/A	N/A	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0c*NN*, where *NN* is a two-digit hexadecimal reverse Link flow number.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProtocolID — The sender shall set this field to an identifier for the Flow Protocol as specified in [3].

ProtocolParametersLength — If the ProtocolParameters record is not included, then the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters — Unless specified otherwise by [3], the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this record as defined in

3.10.2.16.1. If ProtocolID is less than 0x04 or equal to 0x05, the sender shall omit this record.

3.10.2.16.1 Definition of ProtocolParameters record attribute when the Flow Protocol or Route Protocol is ROHC

Field	Length (bits)
MaxCID	16
LargeCIDs	1
FeedbackForIncluded	1
FeedbackFor	0 or 5
MRRU	16
TimerBasedCompression	1
ProfileCount	8
ProfileCount occurrences of the following field:	
Profile	16
Reserved	0 – 7 (as needed)

MaxCID The sender shall set this field to the MAX_CID parameter for this ROHC Channel. The sender shall not set this field to a value greater than MaxSupportedMaxCID.

LargeCIDs If the LARGE_CIDS parameter for this ROHC Channel is false, then the sender shall set this field to '0'. Otherwise, the sender shall set this field to '1'. If LargeCIDSupported is '0', then the sender shall not set this field to '1'.

FeedbackForIncluded If ROHC feedback associated with another Link flow (ROHC channel) is sent on this Link flow (ROHC channel), then this field shall be set to '1'. Otherwise, this field shall be set to '0'.

FeedbackFor If FeedbackForIncluded is set to '0', then the sender shall omit this field. Otherwise, the sender shall set this field to the Link flow number (ROHC channel) to which ROHC feedback sent on this Link flow (ROHC channel) refers.

MRRU The sender shall set this field to the MRRU parameter for this ROHC channel. The sender shall not set this field to a value greater than MaxSupportedMRRU.

TimerBasedCompression

The sender shall set this field to '0' if timer based compression according to [6] is not enabled for this ROHC channel. The sender shall set this field to '1' if timer based compression according to [6] is enabled for this ROHC channel. If TimerBasedCompressionSupported is set to '0', then the sender shall not set this field to '1'.

ProfileCount — The sender shall set this field to the number of ROHC profiles supported by the decompressor.

Profile — The sender shall set this field to the ROHC profile supported by the decompressor according to [6]. The sender shall not set this field to a value that is not included in the list of supported profiles.

Reserved — The sender shall add reserved bits to make the length of the entire record an integer number of octets. The sender shall set these bits to '0'. The receiver shall ignore this field.

3.10.2.17 Flow*NN*RouteProtocolParametersFwd Attribute

NN is the two-digit hexadecimal forward Link flow number, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProtocolID	8	0x00
ProtocolParametersLength	8	0x00
ProtocolParameters	ProtocolParametersLength × 8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x0d*NN*, where *NN* is a two-digit hexadecimal forward Link flow number.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProtocolID — The sender shall set this field to an identifier for the Route Protocol as specified in [3].

ProtocolParametersLength

If the ProtocolParameters record is omitted, then the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters Unless specified otherwise by [3], the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this field as defined in 3.10.2.15.1. If ProtocolID is less than 0x04, the sender shall omit this record.

3.10.2.18 Flow*NN*RouteProtocolParametersRev Attribute

NN is the two-digit hexadecimal reverse Link flow number, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProtocolID	8	0x00
ProtocolParametersLength	8	0x00
ProtocolParameters	ProtocolParametersLength × 8	N/A

Length Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID The sender shall set this field to 0x0e*NN*, where *NN* is a two-digit hexadecimal reverse Link flow number.

ValueID The sender shall set this field to an identifier assigned to this complex value.

ProtocolID The sender shall set this field to an identifier for the Route Protocol as specified in [3].

ProtocolParametersLength

If the ProtocolParameters field is omitted, then the sender shall set this field to 0x00. Otherwise, the sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters Unless specified otherwise by [3], the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this field as defined in 3.10.2.16.1.

3.10.2.19 Flow*NN*SequenceLengthFwd Attribute

NN is the two-digit hexadecimal forward Link flow number, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
SARSequenceLength	8	21
SARSequenceLengthShort	8	21

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x02*NN*, where *NN* is a two-digit hexadecimal forward Link flow number.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

SARSequenceLength — The sender shall set this field to the length of the SAR sequence number in units of bits. The sender shall not set this field to any value other than 5, 13, 21, or 29. The sender shall set this field to 29 only if $\lceil \log_2 \lceil R \times AbortTimer \rceil \rceil + 1 > 21$, where R is the maximum data rate in units of higher layer octets per second that can be achieved by the lower layers, and abort timer is in units of seconds.

SARSequenceLengthShort — The sender shall set this field to the length of the sequence number included in the header of a SAR packet that does not carry re-transmitted data units. SARSequenceLengthShort shall be less than or equal to SARSequenceLength.

3.10.2.20 Reservation*KK*BCMCSFlowIDAssociation Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One occurrence of the following record:		
ValueID	8	N/A
BCMCSFlowCount	8	***0x00***
BCMCSFlowCount occurrences of the following record:		
BCMCSFlowID	32	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x11KK, where KK is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

BCMCSFlowCount — The sender shall set this field to the number of BCMCS Flow identifiers associated with this reservation.

BCMCSFlowID — The sender shall set this field to the BCMCS Flow identifier(s) of the BCMCS Flow(s) that are associated with this reservation.

3.10.2.21 Reservation*KK*BCMCSProgramIDAssociation Attribute

KK is the two-digit hexadecimal ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A

One occurrence of the following record:

ValueID	8	N/A
ProgramCount	8	***0x00***

ProgramCount occurrences of the following record:

ProgramIDLSBLength	8	N/A
ProgramIDLSBs	32	N/A
FlowDiscriminatorCount	8	N/A

FlowDiscriminatorCount occurrences of the following record:

FlowDiscriminator	8	N/A

Length — Length of the complex attribute in octets. The sender shall set this field to the length of the complex attribute excluding the Length field.

AttributeID — The sender shall set this field to 0x12KK, where KK is the two-digit hexadecimal ReservationLabel.

ValueID — The sender shall set this field to an identifier assigned to this complex value.

ProgramCount — The sender shall set this field to the number of BCMCS Programs that is associated with this reservation.

ProgramIDLSBLength — The sender shall set this field to the valid number of the least significant bits of the ProgramID of the BCMCS Program that is associated with this reservation.

ProgramIDLSBs — The sender shall set this field to the ProgramIDLSBLength least significant bits of Program ID of the BCMCS Program that is associated with this reservation.

FlowDiscriminatorCount — The sender shall set this field to the number of Flow Discriminators for the Program that is associated with this reservation. If all the Flow Discriminators for this ProgramID is associated with this reservation, then the sender shall set this field to 0.

FlowDiscriminator — The sender shall set this field to the Flow Discriminator that is associated with this reservation.

3.11 Session State Information

The Session State Information record (see **[8]**) consists of parameter records.

This application defines the following parameter records in addition to the configuration attributes for this application.

3.11.1 Location Parameter

Table 3.11.1-1. The Format of the Parameter Record for the Location Parameter

Field	Length (bits)
ParameterType	8
Length	8
LocationType	8
LocationValue	8 × (Length – 2)

ParameterType — This field shall be set to 0x01 for this parameter record.

Length — This field shall be set to the length of this parameter record in units of octets excluding the Length field.

LocationType — This field shall be set to the value of LocationType associated with the access terminal's session.

LocationValue — This field shall be set to the stored value of LocationValue associated with the access terminal's session.

3.11.2 FlowControlState Parameter

Table 3.11.2-1. The Format of the Parameter Record for the FlowControlState Parameter

Field	Length (bits)
ParameterType	8
Length	8
FlowControlState	8

ParameterType — This field shall be set to 0x02 for this parameter record.

Length — This field shall be set to the length of this parameter record in units of octets excluding the Length field.

FlowControlState — This field shall be set to 0x00 if the state of the Flow Control Protocol associated with the access terminal's session is Close. Otherwise, this field shall be set to 0x01. All the other values for this field are reserved.

3.11.3 DataOverSignalingMessageSequence Parameter

Table 3.11.3-1. The Format of the Parameter Record for the DataOverSignalingMessageSequence Parameter

Field	Length (bits)
ParameterType	8
Length	8
Reserved1	2
ReceivePointerA	6
Reserved2	2
TransmitPointerA	6
Reserved3	2
ReceivePointerB	6
Reserved4	2
TransmitPointerB	6

ParameterType This field shall be set to 0x03 for this parameter record.

Length This field shall be set to the length of this parameter record in units of octets excluding the Length field.

Reserved1 The sender shall set this field to '00'. The receiver shall ignore this field.

ReceivePointerA This field shall be set to the value of the receive pointer for DataOverSignaling message validation on Route A, $V(R_A)$.

Reserved2 The sender shall set this field to '00'. The receiver shall ignore this field.

TransmitPointerA This field shall be set to the value of the transmit pointer for DataOverSignaling message validation on Route A, $V(S_A)$.

Reserved3 The sender shall set this field to '00'. The receiver shall ignore this field.

ReceivePointerB This field shall be set to the value of the receive pointer for DataOverSignaling message validation on Route B, $V(R_B)$.

Reserved4 The sender shall set this field to '00'. The receiver shall ignore this field.

TransmitPointerB This field shall be set to the value of the transmit pointer for DataOverSignaling message validation on Route B, $V(S_B)$.

3.11.4 StorageBLOB Parameter

Table 3.11.4-1. The Format of the Parameter Record for the StorageBLOB Parameter

Field	Length (bits)
ParameterType	8
Length	8
StorageBLOBType	16
StorageBLOBLength	8
StorageBLOB	0 or 8 × StorageBLOBLength

ParameterType This field shall be set to 0x04 for this parameter record.

Length This field shall be set to the length of this parameter record in units of octets excluding the Length field.

StorageBLOBType This field shall be set to zero if the value of its stored StorageBLOB is NULL; otherwise, this field shall be set to the stored value of StorageBLOBType.

StorageBLOBLength

This field shall be set to zero if the value of its stored StorageBLOB is NULL; otherwise, this field shall be set to the stored value of StorageBLOBLength.

StorageBLOB This field shall be omitted if the value of the stored StorageBLOB is NULL; otherwise, this field shall be set to the stored value of StorageBLOB.

3.11.5 ReservationState Parameter

Table 3.11.5-1. The Format of the Parameter Record for the ReservationState Parameter

Field	Length (bits)
ParameterType	8
Length	8
OpenReservationCount	8
OpenReservationCount occurrences of the following record:	
Link	1
ReservationLabel	8
Reserved	0 – 7 (as needed)

ParameterType This field shall be set to 0x05 for this parameter record.

Length This field shall be set to the length of this parameter record in units of octets excluding the Length field.

OpenReservationCount

This field shall be set to the number of Reservations that are in the Open state.

Link This field shall be set to '1' for a forward link Reservation, and to '0' for a reverse link Reservation.

ReservationLabel This field shall be set to the ReservationLabel.

Reserved The sender shall add reserved bits to make the length of the entire parameter an integer number of octets. The sender shall set these bits to zero. The receiver shall ignore this field

3.11.6 RouteState Parameter

Table 3.11.6-1. The Format of the Parameter Record for the RouteState Parameter

Field	Length (bits)
ParameterType	8
Length	8
RouteSelectionProtocolState	2
NextRouteSelectTransactionID	8
NextActivateRouteTransactionID	8
Reserved	6

ParameterType This field shall be set to 0x06 for this parameter record.

Length This field shall be set to the length of this parameter record in units of octets excluding the Length field.

RouteSelectionProtocolState

This field shall be set to indicate the state of Route Selection Protocol according to Table 3.11.6-2.

Table 3.11.6-2. RouteSelectionProtocolState Encoding

State	Value
A Open B Setting	'00'
A Open B Rising	'01'
A Setting B Open	'10'
A Rising B Open	'11'

NextRouteSelectTransactionID

This field shall be set to the TransactionID field of the next RouteSelect message that will be sent.

NextActivateRouteTransactionID

This field shall be set to the TransactionID field of the next ActivateRoute message that will be sent.

Reserved This field shall be set to '000000'. The receiver shall ignore this field.