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cdma2000 High Rate Packet Data Supplemental Services

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FOREWORD

(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."*

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.

[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] IETF draft-ietf-pana-pana-04, Protocol for Carrying Authentication for Network Access (PANA).

[8] C.S0024-A, 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.S0007, Inter-Operability Specification (IOS) for High Rate Packet Data (HRPD) Access Network Interfaces.

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:

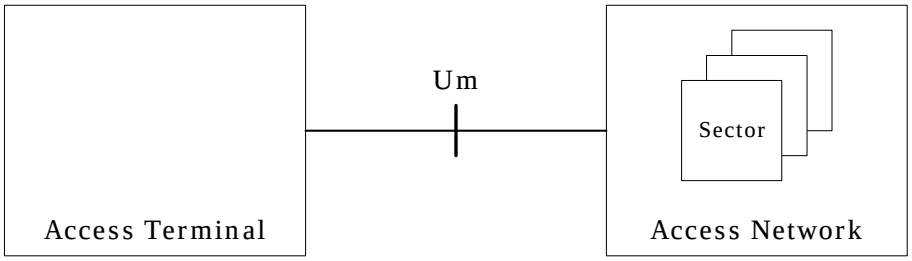

Figure 1.3-1. Architecture Reference Model

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.
$\lfloor x \rfloor$	Indicates the largest integer less than or equal to x: $\lfloor 1.1 \rfloor = 1$, $\lfloor 1.0 \rfloor = 1$.
$\lceil x \rceil$	Indicates the smallest integer greater or equal to x: $\lceil 1.1 \rceil = 2$, $\lceil 2.0 \rceil = 2$.
$\|x\|$	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: $x \bmod y = x - (y \times \lfloor x/y \rfloor)$.

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.

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.

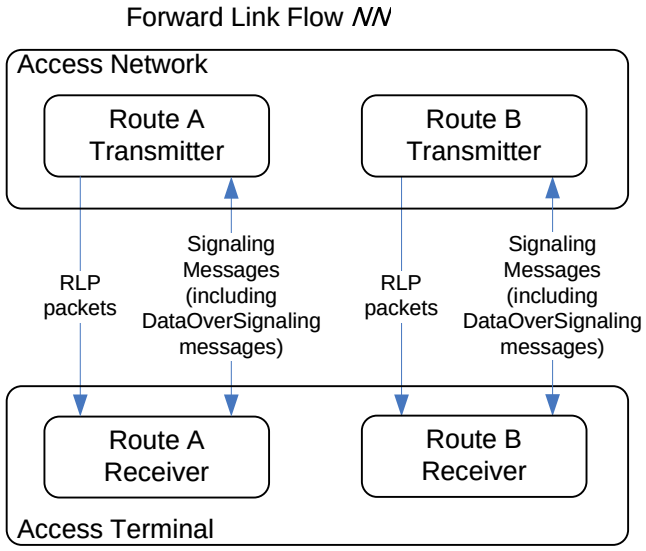

Figure 2.1.1-1. Reference Architecture for a Forward Link Flow

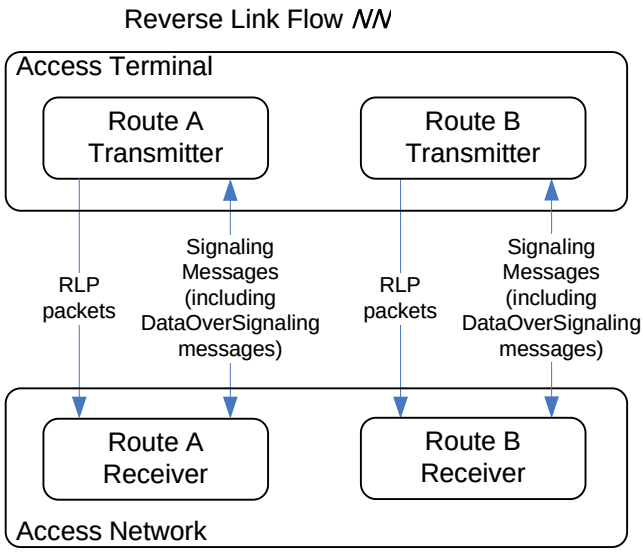

Figure 2.1.1-2. Reference Architecture for a Reverse Link Flow

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

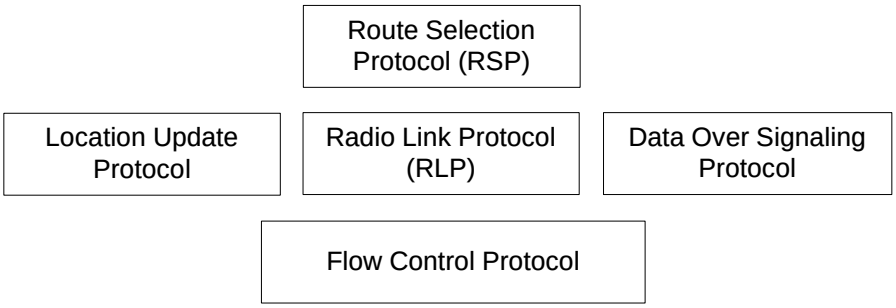

Figure 2.1.1-3. Enhanced Multi-Flow Packet Application Protocols

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 SDUs 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.

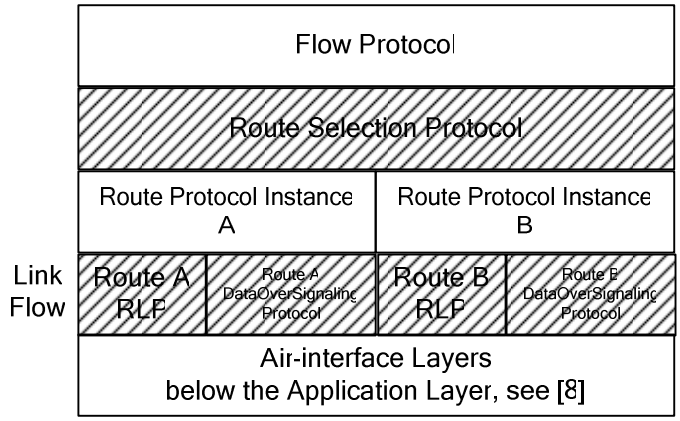

Figure 2.1.1-4. Relationship for each Link Flow between Enhanced Multi-Flow Packet Application and Higher Layer Protocols

The Enhanced Multi-Flow Packet Application provides:

- the functionality defined in [1],
- the Route Selection Protocol, which routes Flow Protocol SDUs 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.

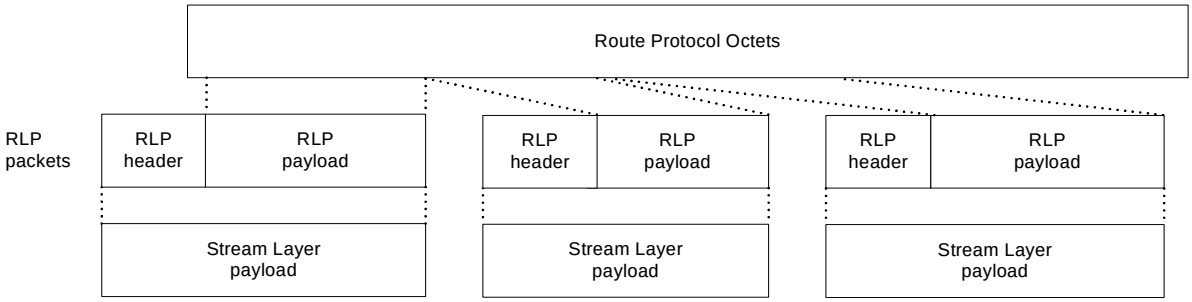

Figure 2.1.3-1. Enhanced Multi-Flow Packet Application Encapsulation when the Link Flow carries an Octet Stream

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.

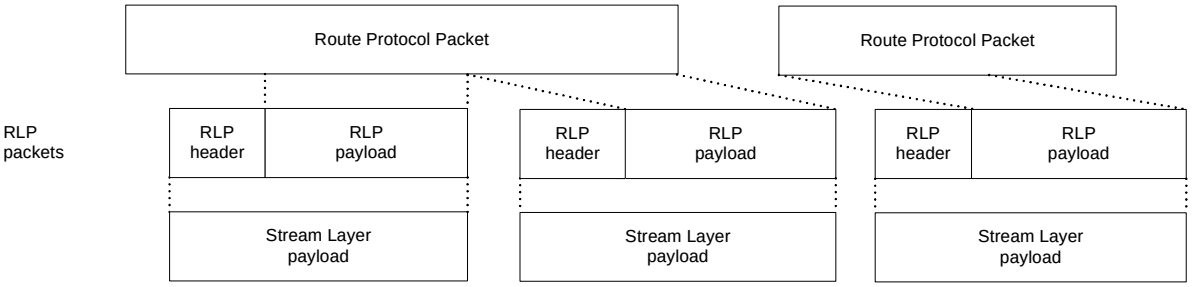

Figure 2.1.3-2. Enhanced Multi-Flow Packet Application Encapsulation when the Link Flow carries a Packet Stream

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 or virtual 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.

2.2.2 Protocol Initialization for the InUse Application Instance

Upon creation, the InUse instance of the Packet Application (i.e., corresponding to the stream or virtual stream to which this application is bound) in the access terminal and access network shall perform the following:

- The value of the attributes for this application instance shall be set to the default values specified for each attribute.

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.

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 or virtual 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 or virtual 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 perform the following in the order specified:
  - 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 receive pointer for DataOverSignaling message validation on Route A, $V(R_A)$, shall be initialized to 127.

- The receive pointer for DataOverSignaling message validation on Route B, $V(R_B)$, shall be initialized to 127.
- The transmit pointer for DataOverSignaling message validation on Route A, $V(S_A)$, shall be initialized to zero.
- The transmit pointer for DataOverSignaling message validation on Route B, $V(S_B)$, shall be initialized to zero.
- Forward and reverse link Reservations with ReservationLabel 0xff shall enter the Open state. All other Reservations shall enter the Close state.[2]
- The ServiceNetworkID parameter of the Flow Control Protocol shall be initialized to NULL.
- The Route Selection Protocol 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 or virtual 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.

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].

[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.

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 SDUs 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 SDUs to the Route Protocol without modifying them. Hence, the transmission unit of this protocol is a Flow Protocol SDU. The Flow Protocol for a forward Link Flow *NN* is identified by the ProtocolID field of the Flow*NN*FlowProtocolFwd attribute. The Flow Protocol for a reverse Link Flow *NN* is identified by the ProtocolID field of the Flow*NN*FlowProtocolRev 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*FlowProtocolSDUFwd attribute of forward Link Flow *NN* is 0x0000, then forward Link Flow *NN* provides an octet stream to the Flow Protocol. If the Flow*NN*FlowProtocolSDUFwd attribute of forward Link Flow *NN* is 0x0001, then forward Link Flow *NN* provides a packet stream to the Flow Protocol.

If the Flow*NN*OutOfOrderDeliveryToFlowProtocolFwd attribute of forward Link Flow *NN* is 0x0000, then forward Link Flow *NN* delivers Flow Protocol SDUs in order. If the Flow*NN*OutOfOrderDeliveryToFlowProtocolFwd attribute of forward Link Flow *NN* is 0x0001, then forward Link Flow *NN* may deliver Flow Protocol SDUs out of order.

If the Flow*NN*FlowProtocolSDURev attribute of reverse Link Flow *NN* is 0x0000, then reverse Link Flow *NN* provides an octet stream to the Flow Protocol. If the Flow*NN*FlowProtocolSDURev attribute of reverse Link Flow *NN* is 0x0001, 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. Figure 2.4.4.1.2-1 shows the state diagram for the Route Selection Protocol at the access terminal.

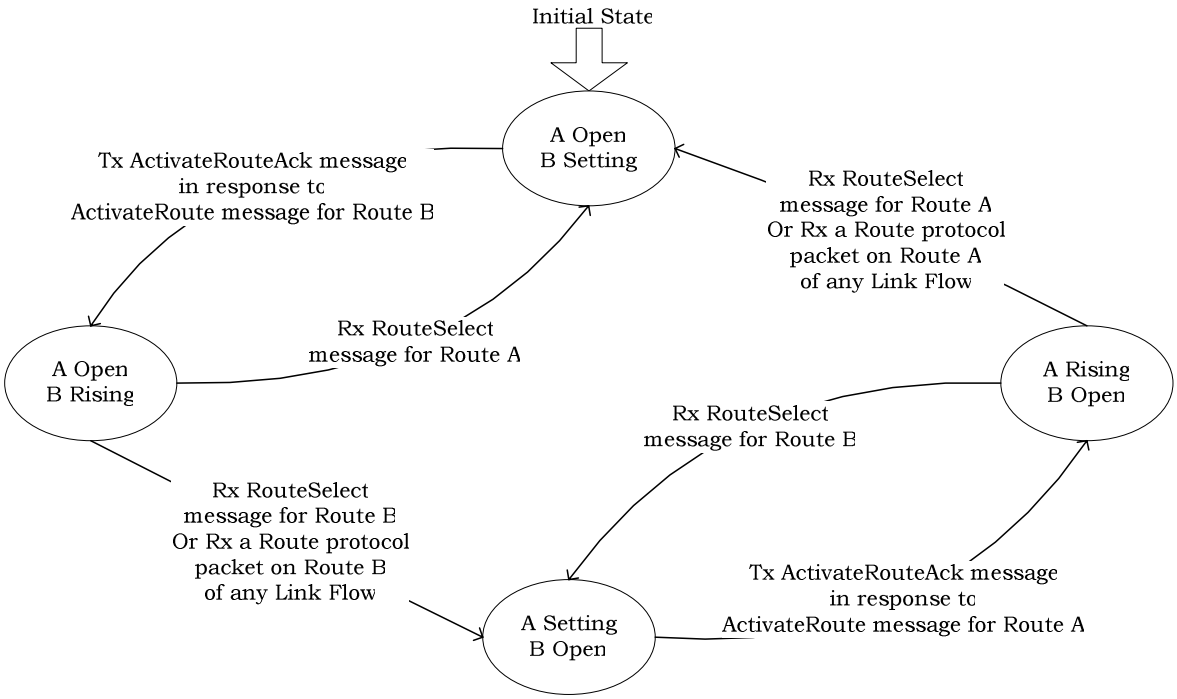

Figure 2.4.4.1.2-1. Route Selection Protocol State Diagram (Access Terminal)

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:

- 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.

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

2.4.4.1.2.1.3 Receiver Requirements

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

If the FlowNNOutOfOrderDeliveryToFlowProtocolFwd attribute for Link Flow *NN* is 0x0001, then the access terminal shall pass Flow Protocol SDUs 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.

If the FlowNNOutOfOrderDeliveryToFlowProtocolFwd attribute for Link Flow *NN* is 0x0000, then the access terminal shall pass Flow Protocol SDUs received on Route B of the Link Flow to the Flow Protocol if the access terminal has not passed Flow Protocol SDUs 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. If the FlowNNOutOfOrderDeliveryToFlowProtocolFwd attribute for Link Flow *NN* is 0x0000, then the access terminal shall discard Flow Protocol SDUs received on Route B of the Link Flow if the access terminal has passed Flow Protocol SDUs received on Route A of the Link Flow to the Flow Protocol since the last time the access terminal entered this state.

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, the access terminal shall respond with a RouteSelectAck message, and shall transition to the A Setting B Open state. Upon receiving Flow Protocol SDU on Route B of any Link Flow, the access terminal shall store the Flow Protocol SDU received from Route B for processing in the A Setting B Open state and shall transition to the A Setting B Open state.

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.

2.4.4.1.2.2.2 Transmitter Requirements

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

2.4.4.1.2.2.3 Receiver Requirements

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

2.4.4.1.2.3.3 Receiver Requirements

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

If the FlowNNOutOfOrderDeliveryToFlowProtocolFwd attribute for Link Flow *NN* is 0x0001, then the access terminal shall pass Flow Protocol SDUs 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.

If the FlowNNOutOfOrderDeliveryToFlowProtocolFwd attribute for Link Flow *NN* is 0x0000, then the access terminal shall pass Flow Protocol SDUs received on Route A of the Link Flow to the Flow Protocol if the access terminal has not passed Flow Protocol SDUs 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. If the FlowNNOutOfOrderDeliveryToFlowProtocolFwd attribute for Link Flow *NN* is 0x0000, then the access terminal shall discard Flow Protocol SDUs received on Route A of the Link Flow if the access terminal has passed Flow Protocol SDUs received on Route B of the Link Flow to the Flow Protocol since the last time the access terminal entered this state.

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, the access terminal shall respond with a RouteSelectAck message, and shall transition to the A Open B Setting state. Upon receiving Flow Protocol SDU on Route A of any Link Flow, the access terminal shall store the Flow Protocol SDU 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.

2.4.4.1.2.4.2 Transmitter Requirements

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

2.4.4.1.2.4.3 Receiver Requirements

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

2.4.4.1.3 Access Network Requirements

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.

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 does not register to receive any indications.

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 0x0001, where *NN* is the hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive. The number of activated Link Flows on the forward link shall not exceed the value of the LinkFlowCountMaxFwd attribute.

A reverse Link Flow *NN* is defined to be activated if the Flow*NN*ActivatedRev attribute is set to 0x0001. The number of activated Link Flows on the reverse link shall not exceed the value of the LinkFlowCountMaxRev 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 Flow*NN*RouteProtocolIDFwd attribute. The Route Protocol for a reverse Link Flow *NN* is identified by the Flow*NN*RouteProtocolIDRev attribute.

If the Route Protocol is NULL[3], 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*RouteProtocolSDUFwd attribute of forward Link Flow *NN* is 0x0000, then each Route of forward Link Flow *NN* provides an octet stream to the corresponding instance of the Route Protocol. If the Flow*NN*RouteProtocolSDUFwd attribute of forward Link Flow *NN* is 0x0001, 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 0x0000, 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 0x0001, 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*RouteProtocolSDURev attribute of reverse Link Flow *NN* is 0x0000, then each Route of reverse Link Flow *NN* provides an octet stream to the corresponding instance of the Route Protocol. If the Flow*NN*RouteProtocolSDURev attribute of reverse Link Flow *NN* is 0x0001, then each Route of reverse Link Flow *NN* provides a packet stream to the corresponding instance of the Route Protocol.

If the Flow*NN*OutOfOrderDeliveryToRouteProtocolRev attribute of reverse Link Flow *NN* is 0x0000, then each Route of reverse Link Flow *NN* delivers payload to the corresponding instance of the Route Protocol in order. If the Flow*NN*OutOfOrderDeliveryToRouteProtocolRev attribute of reverse Link Flow *NN* is 0x0001, then each Route of reverse Link Flow *NN* may deliver payload to the corresponding instance of the Route Protocol out of order.

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 the Stream Layer 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, and
- the RLP packet shall 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 the Stream Layer given the target channel and the current transmission rate on that channel,

[3] [3] Route Protocol being NULL means that a Route Protocol has not been negotiated.

- the Link flow is carrying a packet stream, and
- the data unit for the Link Flow is RLP packet payloads.

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.

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

- Flow*NN*FlowProtocolFwd,
- Flow*NN*RouteProtocolFwd,
- Flow*NN*SequenceLengthFwd,
- Flow*NN*FlowProtocolSDUFwd,
- Flow*NN*RouteProtocolSDUFwd,
- Flow*NN*DataUnitFwd,
- Flow*NN*OutOfOrderDeliveryToFlowProtocolFwd, and
- Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd.

The access terminal shall not initiate 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 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*FlowProtocolRev,
- Flow*NN*RouteProtocolRev,
- Flow*NN*SequenceLengthRev,
- Flow*NN*FlowProtocolSDURev,
- Flow*NN*RouteProtocolSDURev,
- Flow*NN*DataUnitRev, and
- Flow*NN*OutOfOrderDeliveryToRouteProtocolRev.

The access terminal shall not initiate 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 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*FlowProtocolFwd attribute shall be set to a value that is included as ProtocolIdentifier in the SupportedFlowProtocolIDs attribute. The ProtocolID field of the Flow*NN*FlowProtocolRev attribute shall be set to a value that is included as ProtocolIdentifier in the SupportedFlowProtocolIDs attribute. The ProtocolID field of the Flow*NN*RouteProtocolFwd attribute shall be set to a value that is included as ProtocolIdentifier in the SupportedRouteProtocolIDs attribute. The ProtocolID field of the Flow*NN*RouteProtocolRev attribute shall be set to a value that is included as ProtocolIdentifier in the SupportedRouteProtocolIDs 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 shall include all supported values of ProfileValue with ProfileType equal to 0x01 in the ATSupportedQoSProfiles attribute during the AT Initiated state of the Session Configuration Protocol.

If the Flow*NN*DataUnitFwd attribute of forward Link Flow *NN* is 0x0000, 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 0x0000, then the data unit for the Link Flow shall be octets. Otherwise the data unit for the Link Flow shall be RLP packet payloads.

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 ReceiverStatus 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 the RLP transmitter receives a ResetTxIndicationAck message for the Route of the Link Flow being reset while in the RLP Reset state, the RLP transmitter shall send a ResetTxComplete message back and 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 the RLP receiver receives a ResetRxComplete message for the Route of the Link Flow being reset, the RLP receiver 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 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

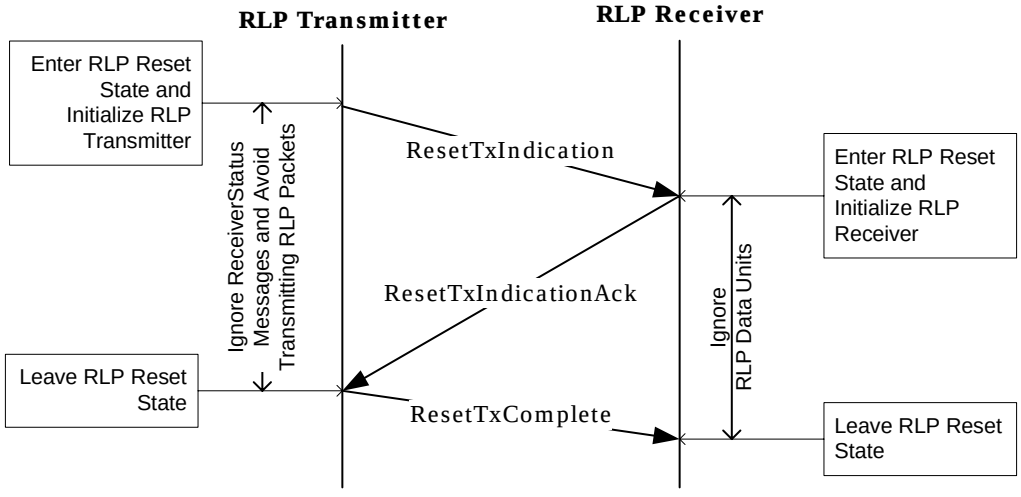

Figure 2.5.4.1.1.2.5-1. RLP Reset Procedure Initiated by RLP Transmitter

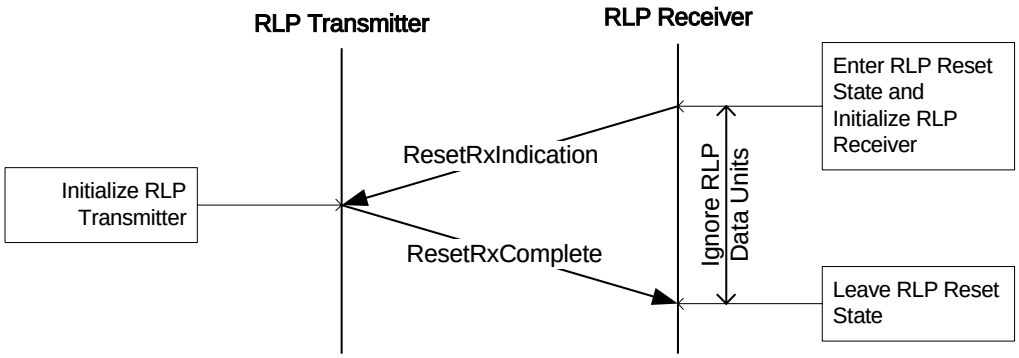

Figure 2.5.4.1.1.2.5-2. RLP Reset Procedure Initiated by RLP Receiver

2.5.4.2 Data Transfer

RLP is an Ack and/or 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 $N_{LinkFlowMax}$-1 inclusive, and *P* is the Route indicator that takes values of either A or B. $V(S)_{NN,P}$ 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 ReceiverStatus message, RLP shall transmit the missing data unit(s) (if any) conveyed by the ReceiverStatus message if those data units are available and if those data units have not been retransmitted before in response to a ReceiverStatus message.

If the RLP transmitter is the access network and if Flow*NN*AckEnableFwd is not 0x0000, then the access network may determine that transmitted data units have been lost if it does not receive a ReceiverStatus message acknowledging the receipt of the data units within an implementation dependent time interval based on the AckTimer and an estimate of the round-trip delay. If the RLP transmitter is the access network and if Flow*NN*AckEnableFwd is not 0x0000 and the access network determines that transmitted data units were lost,

then the access network shall re-transmit the data units if they have not been re-transmitted in response to a ReceiverStatus message.

If the RLP transmitter is the access terminal and if Flow*NN*AckEnableRev is not 0x0000, then the access terminal may determine that transmitted data units have been lost if it does not receive a ReceiverStatus message acknowledging the receipt of the data units within an implementation dependent time interval based on the AckTimer and an estimate of the round-trip delay. If the RLP transmitter is the access terminal and if Flow*NN*AckEnableRev is not 0x0000 and the access terminal determines that transmitted data units were lost, then the access terminal shall re-transmit the data units if they have not been re-transmitted in response to a ReceiverStatus message.

If the RLP transmitter is the access network, and the ReceiverStatus 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 ReceiverStatus 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 ReceiverStatus 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 ReceiverStatus message for data units that are not available.

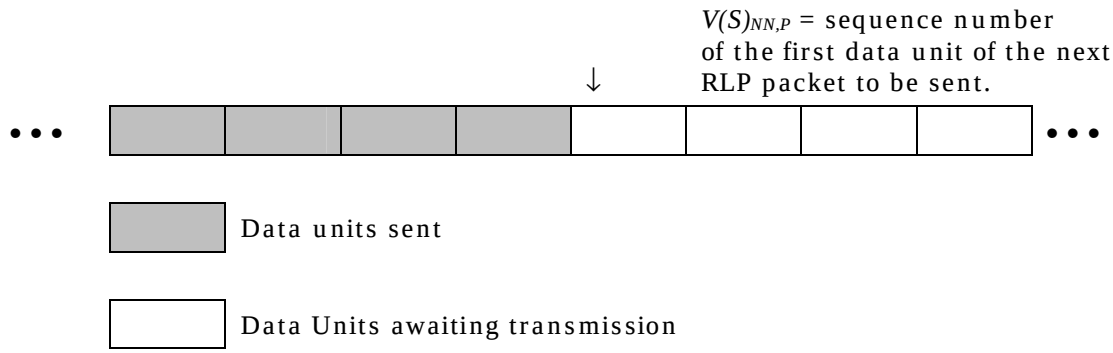

Figure 2.5.4.2.1-1. RLP Transmit Sequence Number Variable

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

- FlowNNPhysicalLayerNakEnableRev attribute is set to 0x01,
- the requested data units have not been retransmitted before, and
- the requested data units are available.

If Flow*NN*NakEnableFwd is 0x0001, 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 0x0001, 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.

The ReservationLabel parameter of the Flow*NN*ReservationFwd or Flow*NN*ReservationRev attribute identifies 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 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 or packets belonging to a higher layer flow that is not associated with any Link Flow using the Link Flow with ReservationLabel 0xff. The transmitter may transmit higher layer octets or packets belonging to a higher layer flow identified by a Reservation that is in the Close state using the Link Flow with ReservationLabel 0xff.

Figure 2.5.4.2.1-2 and Figure 2.5.4.2.1-3 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.

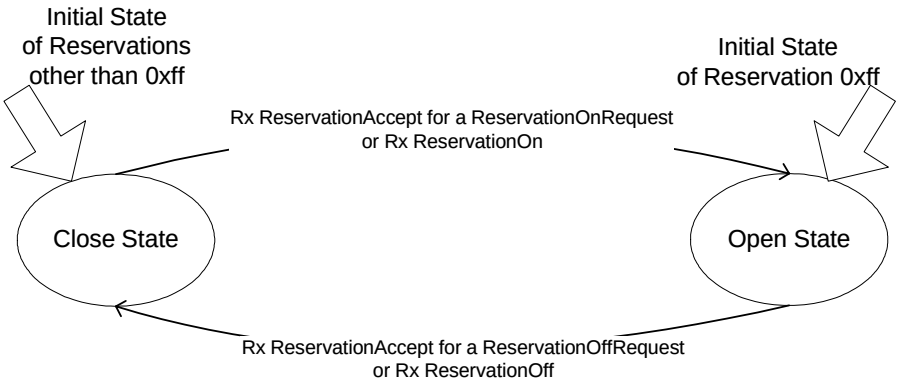

Figure 2.5.4.2.1-2. Reverse Link Reservation State Diagram (Access Terminal)

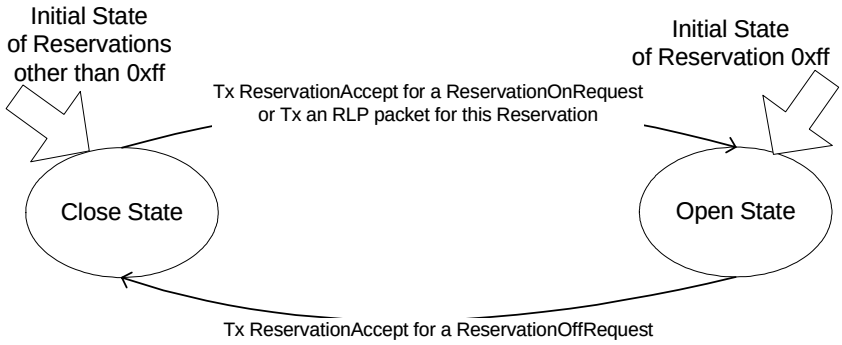

Figure 2.5.4.2.1-3. Forward Link Reservation State Diagram (Access Network)

2.5.4.2.1.1 Close State

2.5.4.2.1.1.1 Access Terminal Requirements

The access terminal shall not transmit SDUs from higher layer flows belonging to the Reservation in Close state using any Link Flow other than the Link Flow associated with ReservationLabel 0xff. The access terminal may send a ReservationOnRequest message to request transition of the Reservation to the Open state. 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 $T_{Response}$ of sending the ReservationOnRequest message. If the ReservationOnRequest message contains a Reservation bound to a reverse Link Flow, then the Reservation shall transition to the Open state when the access terminal receives the corresponding ReservationAccept message.

Upon receiving a ReservationOn message, the access terminal shall respond with a ReservationAccept message and transition the Reservation to the Open state.

2.5.4.2.1.1.2 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
- ReservationKKIdleState attribute of the Reservation is 0x01, and the Reservation transitioned to the Close state because the Connection was closed or lost.

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 $T_{Response}$ of reception of the ReservationOnRequest message.
- Set the TransactionID field of the ReservationAccept or ReservationReject message to that of the ReservationOnRequest message.
- Transition the Reservation to the Open State if the access network sent a ReservationAccept message for a Reservation bound to a forward Link flow in response to a ReservationOnRequest message.

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.

2.5.4.2.1.2 Open State

2.5.4.2.1.2.1 Access Terminal Requirements

The access terminal may transmit SDUs from higher layer flows belonging to the Reservation in Open state 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 $T_{Response}$ of sending the ReservationOffRequest message. If the ReservationOffRequest message contains a Reservation bound to a reverse Link Flow, then the access terminal shall transition the Reservation to the Close state when the access terminal receives a ReservationAccept message.

Upon receiving a ReservationOff message, the access terminal shall respond with a ReservationAccept message and transition the Reservation to the Close state. Upon receiving a *ConnectedState.ConnectionClosed* or *RouteUpdate.ConnectionLost* indication, the access terminal shall transition to the Close state Reservations whose corresponding Reservation*KK*IdleStateRev attribute is 0x01, where *KK* is the two-digit hexadecimal ReservationLabel.

2.5.4.2.1.2.2 Access Network Requirements

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

If the access network receives a ReservationOffRequest message, it shall

- Send a ReservationAccept or a ReservationReject message within the time period specified by $T_{Response}$ of reception of the ReservationOffRequest message.
- Set the TransactionID field of the ReservationAccept or ReservationReject message to that of the ReservationOffRequest message.
- Transition the Reservation to the Close State if it sent a ReservationAccept message for a Reservation bound to a forward Link Flow in response to a ReservationOffRequest message.

Upon receiving a *ConnectedState.ConnectionClosed* or *RouteUpdate.ConnectionLost* indication, the access network shall transition to the Close state Reservations whose corresponding Reservation*KK*IdleStateFwd attribute is 0x01, where *KK* is the two-digit hexadecimal ReservationLabel.

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 $N_{LinkFlowMax}$-1 inclusive, and *P* is the Route indicator that takes values of either A or B. $V(R)_{NN,P}$ 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 ReceiverStatus message. The ReceiverStatus message shall convey status of all missing data units from $V(N)_{NN,P}$ onwards for which the status has not been conveyed in a previous ReceiverStatus message and $V(R)_{NN,P}$. The ReceiverStatus message may convey status of missing data units for which status has been conveyed in previous ReceiverStatus messages. The ReceiverStatus message shall not convey status of data units with sequence number less than $V(N)_{NN,P}$.

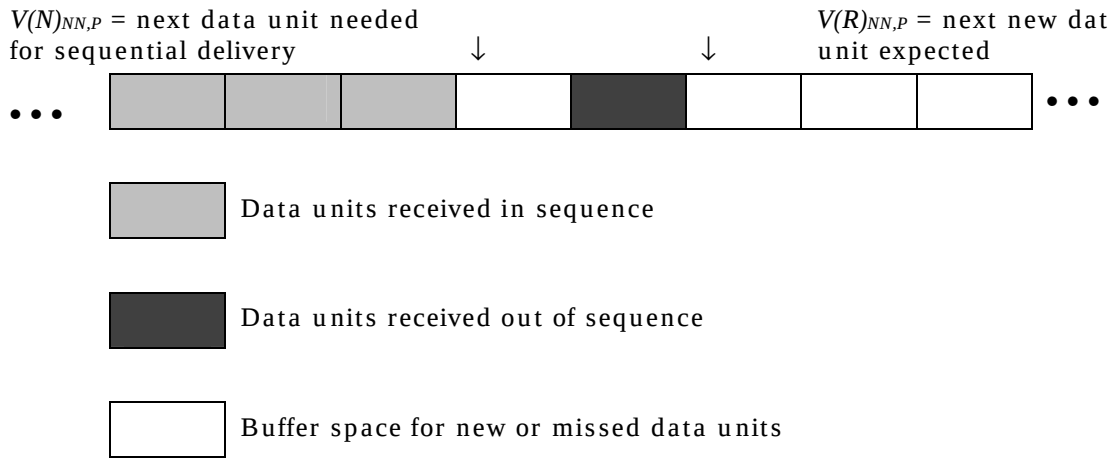

Figure 2.5.4.2.2-1. RLP Receive Sequence Number Variables

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 the RLP receiver is an access terminal and Flow*NN*AckEnableFwd is 0x0002 and the LastDataUnit field of the RLP header is '1', then RLP shall send a ReceiverStatus message upon receiving the data unit.
- If the RLP receiver is an access terminal and Flow*NN*AckEnableFwd is 0x0002 and the LastDataUnit field of the RLP header is '0', then RLP shall send a ReceiverStatus message within an interval specified by AckTimer of receiving the data unit.
- If the RLP receiver is an access terminal and Flow*NN*AckEnableFwd is 0x0001, then RLP shall send a ReceiverStatus message within AckTimer interval of receiving the data unit.
- If the RLP receiver is an access network and Flow*NN*AckEnableRev is 0x0002 and the LastDataUnit field of the RLP header is '1', then RLP shall send a ReceiverStatus message upon receiving the data unit.
- If the RLP receiver is an access network and Flow*NN*AckEnableRev is 0x0002 and the LastDataUnit field of the RLP header is '0', then RLP shall send a ReceiverStatus message within AckTimer interval of receiving the data unit.
- If the RLP receiver is an access network and Flow*NN*AckEnableRev is 0x0001, then RLP shall send a ReceiverStatus message within AckTimer interval of receiving the data unit.
- 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, 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) passed to the Route Protocol from 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 in 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 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 in the resequencing buffer.

- If $V(N)_{NN,P} < X < V(R)_{NN,P}$, and the data unit has already been stored in the resequencing buffer, 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 octet 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 $V(R)_{NN,P}$ 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.
  - RLP shall set $V(R)_{NN,P}$ to X+1.
  - If the RLP receiver is an access terminal, and if the Flow*NN*NakEnableFwd attribute is set to 0x0001, then RLP shall send a ReceiverStatus message. If the RLP receiver is an access network, and if the Flow*NN*NakEnableRev attribute is set to 0x0001, then RLP shall send a ReceiverStatus message.

If a missing data unit has not arrived when its RLP abort timer expires and 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 a missing data unit has not arrived when its RLP abort timer expires 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 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 $V(R)_{NN}$ 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)
LinkFlowID	5
Route	1
FirstDataUnit	1
LastDataUnit	1
SEQ	SequenceLength

LinkFlowID — 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'.

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'.

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

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
LinkFlowID	5
Route	1
Reserved	2

MessageID — The sender shall set this field to 0x00.

LinkFlowID — 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
LinkFlowID	5
Route	1
Reserved	2

MessageID — The sender shall set this field to 0x01.

LinkFlowID — 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
LinkFlowID	5
Route	1
Reserved	2

MessageID — The sender shall set this field to 0x0d.

LinkFlowID — 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
LinkFlowID	5
Route	1
Reserved	2

MessageID — The sender shall set this field to 0x0e.

LinkFlowID — 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
Addressing	Unicast

SLP	Reliable
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
LinkFlowID	5
Route	1
Reserved	2

MessageID — The sender shall set this field to 0x0f.

LinkFlowID — 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 ReceiverStatus

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

Field	Length (bits)
MessageID	8
LinkFlowID	5
Route	1
LatestDataUnit	1
TimeStampIncluded	1
TimeStamp	0 or 12
SequenceLength	8
ReportCount	8

ReportCount occurrences of the following two fields:

FirstErasedDataUnit	SequenceLength
WindowLen	SequenceLength

VR	SequenceLength

Reserved	0 – 7 (as needed)

MessageID The sender shall set this field to 0x02.

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

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

LatestDataUnit If the latest data unit in the receive buffer is the data unit with sequence number V(R) − 1, then the sender shall set this field to '1'. Otherwise, the sender shall set this field to '0'.

TimeStampIncluded If the value of the Flow*NN*AckEnableFwd attribute is 0x0001, then the access terminal shall set this field to '1'. Otherwise, the access

terminal shall set this field to '0'. If the value of the Flow*NN*AckEnableRev attribute is 0x0001, then the access network shall set this field to '1'. Otherwise, the access network shall set this field to '0'. *NN* is the two-digit hexadecimal Link Flow number.

TimeStamp — If TimeStampIncluded is '0', then the sender shall omit this field. Otherwise, the sender shall set this field to the 12 least significant bits of the CDMA system time, in units of slots, when the latest data unit (in order or receive time) in the receive buffer was received.

SequenceLength — The sender shall set this field to the size of the sequence number for this Link Flow in units of bits.

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.

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 $V(R)_{NN,P.}$

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 '0'. The receiver shall ignore this field.

Channels	FTC RTC
Addressing	unicast

SLP	Best Effort
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

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 ReservationLabel fields in this message.

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

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

2.5.4.4.8 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 ReservationLabel fields in this message.

Link If this request is for a forward link Reservation, then the access terminal shall set this field to '1'. If this request is for a reverse link 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 ReservationOn or ReservationOff 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 ReservationOn or ReservationOff message to which the access terminal is responding.

Channels	CC FTC RTC AC
Addressing	unicast

SLP	Best Effort
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

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 ReservationLabel 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 link 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 link 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.

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 ReservationOn

The access network sends this message to transition a reverse link 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 ReservationOn or ReservationOff message sent by the access network. If this is the first ReservationOn or ReservationOff 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 ReservationOff

The access network sends this message to transition a reverse link 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 ReservationOn or ReservationOff message sent by the access network. If this is the first ReservationOn or ReservationOff 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
ReservationCount	8
ReservationCount occurrences of the following field:	
ReservationLabel	8

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

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 AttributeUpdateRequest

The sender sends an AttributeUpdateRequest message to offer a set of attribute values 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	CC AC FTC RTC	**SLP**	Reliable on FTC and RTC Best Effort on CC and AC
Addressing	unicast	**Priority**	40

2.5.4.4.15 AttributeUpdateAccept

The sender sends an AttributeUpdateAccept message in response to an AttributeUpdateRequest message to select an attribute value from a list of offered 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	CC AC FTC RTC	**SLP**	Reliable on FTC and RTC Best Effort on CC and AC
Addressing	unicast	**Priority**	40

2.5.4.4.16 AttributeUpdateReject

The access network sends an AttributeUpdateReject message to reject the set of attribute values proposed by the access terminal in the corresponding AttributeUpdateRequest message.

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 CC	**SLP**	Reliable on FTC Best Effort on CC
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*

- *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.

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
$N_{LinkFlowMax}$	Maximum total number of activated and deactivated Link Flows.	31
$T_{Response}$	Time period within which the access network is to respond to ReservationOnRequest and ReservationOffRequest messages.	1 second

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. 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

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 DataOverSignalng 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.

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 128.
  - If Route is set to '1', the receiver shall set $V(R_B)$ to (MessageSequence – 1) mod 128.

- The receiver shall validate the message using the procedure defined in the Sequence Number Validation Procedure of [8] by setting the variable V(S) defined in [8] to the MessageSequence field $V(S_P)$ of the DataOverSignaling message, 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 S = 7.
- 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*RouteProtocolFwd 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*FlowRouteRev 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
LinkFlowID	5
Route	1
AckRequired	1
Reset	1
Reserved	1
MessageSequence	7
HigherLayerPacket	Variable Length

MessageID The sender shall set this field to 0x14.

LinkFlowID — 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 '0'. 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[4]. The length of the higher layer packet shall be an integer number of octets.

Channels	CC AC FTC
Addressing	unicast

SLP	Best Effort
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.

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

Field	Length (bits)
MessageID	8
Route	1
AckSequence	7

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.

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 ServiceNetworkIDRequest message to query the service network identifier.
- May send a ServiceNetworkIDAssignment message to update the service network identifier.

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 ServiceNetworkIDRequest message, it shall send a ServiceNetworkIDNotification message. If the access terminal has a stored value for the ServiceNetworkID parameter, the access terminal shall set the ServiceNetworkIDLength and ServiceNetworkID fields in this message to its stored values of these fields. If the access terminal does not have a stored value for the ServiceNetworkID parameter, the access terminal shall set the ServiceNetworkIDLength field to zero and shall omit the ServiceNetworkID fields in this message.

If the access terminal receives a ServiceNetworkIDAssignment message, it shall send a ServiceNetworkIDComplete message and the access terminal shall store the value of the ServiceNetworkIDLength and ServiceNetworkID fields of the ServiceNetworkIDAssignment message in ServiceNetworkIDLength and ServiceNetworkID 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] 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[5] 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.

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

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

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
Addressing	unicast	

SLP	Reliable[6]	Best Effort
Priority	40	

2.7.4.2.5 ServiceNetworkIDRequest

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

Field	Length (bits)
MessageID	8

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

Channels	CC	FTC
Addressing	unicast	

SLP	Best Effort
Priority	40

2.7.4.2.6 ServiceNetworkIDNotification

The access terminal sends the ServiceNetworkIDNotification message in response to the ServiceNetworkIDRequest message.

Field	Length (bits)
MessageID	8
ServiceNetworkIDLength	8
ServiceNetworkID	0 or 8 × ServiceNetworkIDLength

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

ServiceNetworkIDLength

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

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

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

Channels	AC	RTC	**SLP**	Reliable[7]	Best Effort
Addressing	unicast		**Priority**	40	

2.7.4.2.7 ServiceNetworkIDAssignment

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

Field	Length (bits)
MessageID	8
TransactionID	8
ServiceNetworkIDLength	8
ServiceNetworkID	8 × ServiceNetworkIDLength

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

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

ServiceNetworkIDLength

The access network shall set this field to the length of the ServiceNetworkID field in octets. The access network shall set this field to zero if ServiceNetworkID is NULL.

ServiceNetworkID The access network shall not include this field if the ServiceNetworkID is NULL. Otherwise, the access network shall set this field to the ServiceNetworkID.

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

2.7.4.2.8 ServiceNetworkIDComplete

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

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

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 ServiceNetworkIDAssignment message.

Channels	AC RTC
Addressing	unicast

SLP	Reliable[8] Best Effort
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:

- *SessionManagement.SessionClosed*
- *AddressManagement.SubnetChanged*

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

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 or 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.

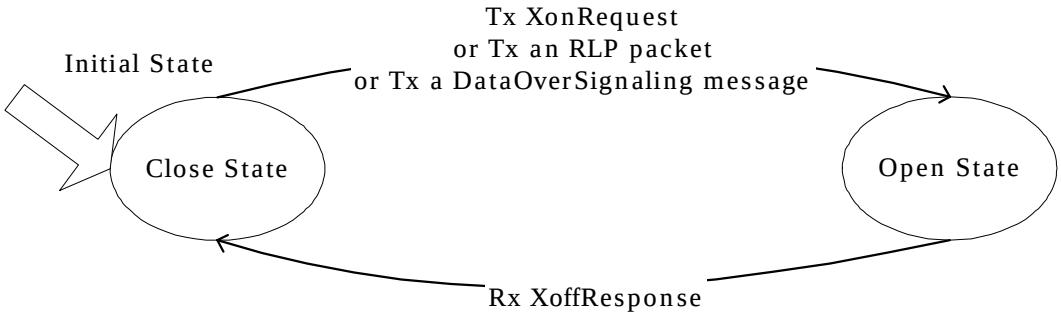

Figure 2.8.1-1. Flow Control Protocol State Diagram (Access Terminal)

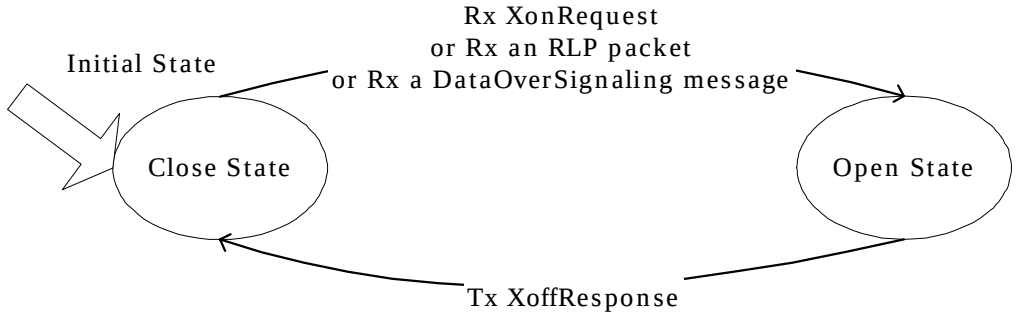

Figure 2.8.1-2. Flow Control Protocol State Diagram (Access Network)

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

In this state, the access terminal and the access network shall not send or receive any RLP packets or DataOverSignaling messages.

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

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).

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 may send an XoffRequest message to request the access network to stop sending RLP packets and DataOverSignaling messsages. 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.

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 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*AckEnableFwd,
- Flow*NN*AckEnableRev,
- Flow*NN*FlowProtocolFwd,
- Flow*NN*FlowProtocolRev,
- Flow*NN*RouteProtocolFwd,
- Flow*NN*RouteProtocolRev,
- Flow*NN*ActivatedFwd,
- Flow*NN*ActivatedRev,
- Flow*NN*SequenceLengthFwd,
- Flow*NN*SequenceLengthRev,
- Flow*NN*FlowProtocolSDUFwd,
- Flow*NN*FlowProtocolSDURev,
- Flow*NN*RouteProtocolSDUFwd,
- Flow*NN*RouteProtocolSDURev,
- Flow*NN*OutOfOrderDeliveryToFlowProtocolFwd,
- Flow*NN*OutOfOrderDeliveryToRouteProtocolFwd,
- Flow*NN*OutOfOrderDeliveryToRouteProtocolRev,
- Flow*NN*DataUnitFwd,
- Flow*NN*DataUnitRev,
- Flow*NN*ReservationFwd,
- Flow*NN*ReservationRev,

- Reservation*KK*IdleStateFwd,
- Reservation*KK*IdleStateRev,
- Reservation*KK*QoSRequestFwd,
- Reservation*KK*QoSRequestRev,
- Reservation*KK*QoSResponseFwd,
- Reservation*KK*QoSResponseRev, and
- ANSupportedQoSProfiles,

where *NN* is the hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, and *KK* is the hexadecimal Reservation number in the range from 0x00 to 0xff, inclusive. The updated values of the attributes shall be consistent with the value of the LinkFlowCountMaxFwd and LinkFlowCountMaxRev attributes.

The access network shall not initiate modification of the Reservation*KK*QoSRequest attribute. The access terminal shall not initiate modification of the Reservation*KK*QoSResponse attribute.

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***.

1 **Table 2.9-1. Configurable Values**

Attribute ID	Attribute	Values	Meaning
0xffff	RANHandoff	***0x0000***	The access terminal shall not send an unsolicited LocationNotification message. The access network does not switch between the radio access technologies as specified in [2] in a manner that preserves the state of all protocol layers at or above the data link layer (PPP) specified in [2].
		0x0001	The access terminal shall send an unsolicited LocationNotification message as specified in [2]. The access network switches between the radio access technologies specified in [2] in a manner that preserves the state of all protocol layers at or above the data link layer (PPP) specified in [2].
		All other values	Reserved
0xfffe	LinkFlowCountMaxFwd	***0x0003***	Maximum 3 simultaneous activated forward Link Flows supported.
		0x0003 to $N_{LinkFlowMax}$	Maximum number of simultaneous activated forward Link Flows supported.
		0x0000 to 0x0002	Reserved
		($N_{LinkFlowMax}$ + 1) to 0xffff	Reserved
0xfffd	LinkFlowCountMaxRev	***0x0003***	Maximum 3 simultaneous activated reverse Link Flows supported.
		0x0003 to $N_{LinkFlowMax}$	Maximum number of simultaneous activated reverse Link Flows supported.
		0x0000 to 0x0002	Reserved
		($N_{LinkFlowMax}$ + 1) to 0xffff	Reserved
0xfffc	MaxAbortTimer	***0x0005***	Maximum abort timer is 500 ms.

Attribute ID	Attribute	Values	Meaning
		0x0000 to 0x0064	Maximum abort timer in units of 100 ms.
		All other values	Reserved
0xfffb	PANASupport	***0x0000***	Protocol for carrying Authentication for Network Access (PANA) [7] is not supported.
		0x0001	PANA is 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 $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*NakEnableFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x0000	RLP receivers associated with forward Link Flow *NN* do not transmit ReceiverStatus messages when missing data units are detected.
		0x0001	RLP receivers associated with forward Link Flow *NN* transmit a ReceiverStatus 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 $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*NakEnableRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x0000	RLP receivers associated with reverse Link Flow *NN* do not transmit ReceiverStatus messages when missing data units are detected.
		0x0001	RLP receivers associated with reverse Link Flow *NN* transmit a ReceiverStatus message when missing data units are detected.
		All other values	Reserved.
0xfc*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*PhysicalLayerNakEnableRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0001***	RLP is to retransmit data units when a *PhysicalLayer.ReverseTrafficPacketsMissed* indication is received.
		0x0000	RLP is to ignore *PhysicalLayer.ReverseTrafficPacketsMissed* indication.
		All other values	Reserved
0xfb*KK*	Reservation*KK*IdleStateFwd	***0x0000***	Reservation does not change states when a Connection is closed.

Attribute ID	Attribute	Values	Meaning
KK is the two-digit hexadecimal ReservationLabel.	*KK* is the two-digit hexadecimal forward link ReservationLabel, where hexadecimal digits A through F are specified in upper case letters.	0x0001	Reservation transitions to the Close state when a Connection is closed.
		All other values	Reserved
0xfa*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.	***0x0000***	Reservation does not change states when a Connection is closed.
		0x0001	Reservation transitions to the Close state when a Connection is closed.
		All other values	Reserved
0xf900	Flow00ActivatedFwd	***0x0001***	Forward Link Flow 0x00 is activated.
		0x0000	Forward Link Flow 0x00 is not activated.
		All other values	Reserved
0xf8*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x01 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*ActivatedFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x01 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Forward Link Flow *NN* is not activated.
		0x0001	Forward Link Flow *NN* is activated.
		All other values	Reserved
0xf700	Flow00ActivatedRev	***0x0001***	Reverse Link Flow 0x00 is activated.
		0x0000	Reverse Link Flow 0x00 is not activated.
		All other values	Reserved
0xf7*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x01 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*ActivatedRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x01 to $N_{LinkFlowMax}$-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

Attribute ID	Attribute	Values	Meaning
0xf6*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*SequenceLengthFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x0000	Forward Link Flow *NN* has a 6-bit sequence number.
		0x0001	Forward Link Flow *NN* has a 14-bit sequence number.
		0x0002	Forward Link Flow *NN* has a 22-bit sequence number.
		All other values	Reserved
0xf5*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*SequenceLengthRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x0000	Reverse Link Flow *NN* has a 6-bit sequence number.
		0x0001	Reverse Link Flow *NN* has a 14-bit sequence number.
		0x0002	Reverse Link Flow *NN* has a 22-bit sequence number.
		All other values	Reserved
0xf4*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*FlowProtocolSDUFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Forward Link Flow *NN* provides an octet stream to the Flow Protocol.
		0x0001	Forward Link Flow *NN* provides a packet stream to the Flow Protocol.
		All other values	Reserved.
0xf3*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*FlowProtocolSDURev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Reverse Link Flow *NN* provides an octet stream to the Flow Protocol.
		0x0001	Reverse Link Flow *NN* provides a packet stream to the Flow Protocol.
		All other values	Reserved.
0xf2*NN*	Flow*NN*DataUnitFwd	***0x0000***	Data unit for forward Link Flow *NN* is octets.

Attribute ID	Attribute	Values	Meaning
NN is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	*NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x0001	Data unit for forward Link Flow *NN* is RLP packet payload.
		All other values	Reserved.
0xf1*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*DataUnitRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Data unit for reverse Link Flow *NN* is octets.
		0x0001	Data unit for reverse Link Flow *NN* is RLP packet payload.
		All other values	Reserved.
0xf0*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*RouteProtocolSDUFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Each Route of Forward Link Flow *NN* provides an octet stream to the Route Protocol.
		0x0001	Each Route of Forward Link Flow *NN* provides a packet stream to the Route Protocol.
		All other values	Reserved.
0xef*NN* *NN* is the two-digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*RouteProtocolSDURev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Each Route of Reverse Link Flow *NN* provides an octet stream to the Route Protocol.
		0x0001	Each Route of Reverse Link Flow *NN* provides a packet stream to the Route Protocol.
		All other values	Reserved.
0xee*NN* *NN* is the two-digit hexadecimal	FlowNNOutOfOrderDeliveryToFlowProtocolFwd *NN* is the two-digit hexadecimal Link Flow	***0x0000***	Forward Link Flow *NN* delivers Flow Protocol payload in-order.
		0x0001	Forward Link Flow *NN* may deliver Flow Protocol payload out-of-order.

Attribute ID	Attribute	Values	Meaning
Link Flow number of the forward Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	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 $N_{LinkFlowMax}$-1 inclusive.	FlowNNOutOfOrderDeliveryToRouteProtocolFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Each Route of Forward Link Flow *NN* delivers Route Protocol payload in-order.
		0x0001	Each Route of Forward Link Flow *NN* may deliver Route Protocol payload out-of-order.
		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 $N_{LinkFlowMax}$-1 inclusive.	FlowNNOutOfOrderDeliveryToRouteProtocolRev *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	Each Route of Reverse Link Flow *NN* delivers Route Protocol payload in-order.
		0x0001	Each Route of Reverse Link Flow *NN* may deliver Route Protocol payload out-of-order.
		All other values	Reserved.
0xeb*NN* *NN* is the two-digit hexadecimal Link Flow number of the forward Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	Flow*NN*AckEnableFwd *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	***0x0000***	RLP receivers associated with forward Link Flow *NN* do not transmit ReceiverStatus messages when data units are received.
		0x0001	RLP receivers associated with forward Link Flow *NN* send ReceiverStatus messages within Acktimer interval of receiving a data unit.
		0x0002	RLP receivers associated with forward Link Flow *NN* send ReceiverStatus messages within Acktimer interval of receiving a data unit. The receivers are required to send a ReceiverStatus message immediately upon receiving an RLP packet carrying the last segment of a higher layer packet.
		All other values	Reserved
0xea*NN* *NN* is the two-	Flow*NN*AckEnableRev *NN* is the two-digit	***0x0000***	RLP receivers associated with reverse Link Flow *NN* do not transmit ReceiverStatus messages when data units are received.

Attribute ID	Attribute	Values	Meaning
digit hexadecimal Link Flow number of the reverse Link Flow in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive.	hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.	0x0001	RLP receivers associated with reverse Link Flow *NN* send ReceiverStatus messages within Acktimer interval of receiving a data unit.
		0x0002	RLP receivers associated with reverse Link Flow *NN* send ReceiverStatus messages within Acktimer interval of receiving a data unit. The receivers are required to send a ReceiverStatus message immediately upon receiving an RLP packet carrying the last segment of a higher layer packet.
		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 $N_{LinkFlowMax}$-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
AckTimer	16	0x0064

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 0x01*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-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.

AckTimer — The sender shall set this field to the value to the RLP Ack timer for this forward Link Flow in units of ms.

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 $N_{LinkFlowMax}$-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
AckTimer	16	0x0064

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 the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-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.

AckTimer — The sender shall set this field to the value to the RLP Ack timer for this reverse Link Flow in units of ms.

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 $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default for *NN* = 0x00	Default for *NN* > *0x00*
Length	8	N/A	N/A
AttributeID	16	N/A	N/A
One or more of the following record:			
ValueID	8	N/A	N/A
ReservationCount	8	0x01	0x00
ReservationCount occurrences of the following field:			
ReservationLabel	8	0xff	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 0x03*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-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 $N_{LinkFlowMax}$-1 inclusive, where hexadecimal digits A through F are specified in upper case letters.

Field	Length (bits)	Default for *NN* = 0x00	Default for *NN* >= 0x00
Length	8	N/A	N/A
AttributeID	16	N/A	N/A
One or more of the following record:			
ValueID	8	N/A	N/A
ReservationCount	8	0x01	0x00
ReservationCount occurrences of the following field:			
ReservationLabel	8	0xff	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 0x04*NN*, where *NN* is the two-digit hexadecimal Link Flow number in the range 0x00 to $N_{LinkFlowMax}$-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 SupportedFlowProtocolIDs Attribute

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProtocolCount	8	0x02
ProtocolCount occurrences of the following field:		
ProtocolIdentifier	8	See Table 2.9.2.5-1.

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 0x0000.

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

ProtocolCount — The sender shall set this field to the number of occurrences of the ProtocolIdentifier field in this record.

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

Table 2.9.2.5-1. Default Values of ProtocolIdentifier in SupportedFlowProtocolIDs Attribute

Profile	Description
0x0000	NULL
0x0001	Octet-based HDLC-like framing

2.9.2.6 SupportedRouteProtocolIDs Attribute

Field	Length (bits)	Default
Length	8	N/A
AttributeID	16	N/A
One or more of the following record:		
ValueID	8	N/A
ProtocolCount	8	0x01
ProtocolCount occurrences of the following field:		
ProtocolIdentifier	8	0x0000 (NULL)

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 0x0001.

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

ProtocolCount — The sender shall set this field to the number of occurrences of the ProtocolIdentifier field in this record.

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

1 2.9.2.7 ATSupportedQoSProfiles 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 0x0002.

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 not set this field to 0x00. The sender shall set this field
12 according to [3].

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

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

2.9.2.8 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 not set this field to 0x00. 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].

2.9.2.9 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 0x05*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. If the profile type is NULL, then the sender shall set this field to 0x00. Otherwise, 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. If ProfileType is equal to 0x00, then the sender shall omit this field. If the corresponding ProfileType is set to 0x01 and this attribute is included in an AttributeUpdateRequest message, the sender shall set this field to a ProfileValue that is included in the ANSupportedQoSProfiles attribute.

2.9.2.10 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 0x06*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. If the profile type is NULL, then the sender shall set this field to 0x00. Otherwise, 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. If ProfileType is equal to 0x00, then the sender shall omit this field. If the corresponding ProfileType is set to 0x01 and this attribute is included in an AttributeUpdateRequest message, the sender shall set this field to a ProfileValue that is included in the ANSupportedQoSProfiles attribute.

2.9.2.11 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 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. If the profile type is NULL, then the sender shall set this field to 0x00. Otherwise, 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. If ProfileType is equal to 0x00, then the sender shall omit this field.

2.9.2.12 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 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. If the profile type is NULL, then the sender shall set this field to 0x00. Otherwise, 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. If ProfileType is equal to 0x00, then the sender shall omit this field.

2.9.2.13 Flow*NN*FlowProtocolFwd 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
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 0x09*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 according to Table 2.9.2.13-1.

Table 2.9.2.13-1. ProtocolID for Flow Protocol

Value	Protocol
0x00	NULL
0x01	Octet-based HDLC-like framing [4]
0x02	Internet Protocol (IP) version 4 [5]
0x03	IP version 6 [10]
0x04	The Flow Protocol is Robust Header Compression (ROHC) [6]
All other values	Defined in [3]

ProtocolParametersLength — The sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters

Unless specified otherwise by the document that defines the correspondence between the ProtocolID and the associated Flow Protocol, the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this record as defined in 2.9.2.13.1..

2.9.2.13.1 Definition of ProtocolParameters record when the Flow 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.

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’.

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.

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].

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.

2.9.2.14 Flow*NN*FlowProtocolRev 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 0x0a*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 according to Table 2.9.2.13-1.

ProtocolParametersLength — The sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters — Unless specified otherwise by the document that defines the correspondence between the ProtocolID and the associated Flow Protocol, the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this record as defined in as defined in 2.9.2.13.1.

2.9.2.15 Flow*NN*RouteProtocolFwd 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	ProtocolParameters Length × 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 0x0b*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 according to Table 2.9.2.15-1.

Table 2.9.2.15-1. ProtocolID for Route Protocol

Value	Protocol
0x00	NULL
0x01 to 0x03	Reserved
0x04	The Flow Protocol is Robust Header Compression (ROHC) [6]
All other values	Defined in [3]

ProtocolParametersLength — The sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters — Unless specified otherwise by the document that defines the correspondence between the ProtocolID and the associated Route Protocol, the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this field as defined in as defined in 2.9.2.13.1.

2.9.2.16 Flow*NN*RouteProtocolRev 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 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 Route Protocol according to Table 2.9.2.15-1.

ProtocolParametersLength — The sender shall set this field to the length of the ProtocolParameters record in units of octets.

ProtocolParameters — Unless specified otherwise by the document that defines the correspondence between the ProtocolID and the associated Route Protocol, the sender shall omit this record. If ProtocolID is 0x04, then the sender shall set this field as defined in as defined in 2.9.2.13.1.

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	1
ReceivePointerA	7
Reserved2	1
TransmitPointerA	7
Reserved3	1
ReceivePointerB	7
Reserved4	1
TransmitPointerB	7

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 '0'. 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 '0'. 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 '0'. 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 '0'. 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 ServiceNetworkID Parameter

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

Field	Length (bits)
ParameterType	8
Length	8
ServiceNetworkIDLength	8
ServiceNetworkID	0 or 8 × ServiceNetworkIDLength

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.

ServiceNetworkIDLength

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

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

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
OpenReservationCountoccurrences 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 of the Open Reservation.

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.