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3RD GENERATION PARTNERSHIP PROJECT 2 "3GPP2"

Application Layer for Ultra Mobile Broadband (UMB) Air Interface Specification

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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 the Application Layer part of the Ultra Mobile Broadband™ (UMB™)[1] air interface. Other parts of this Standard are:

- Overview for Ultra Mobile Broadband (UMB) Air Interface Specification
- Physical Layer for Ultra Mobile Broadband (UMB) Air Interface Specification
- MAC Layer for Ultra Mobile Broadband (UMB) Air Interface Specification
- Radio Link Layer for Ultra Mobile Broadband (UMB) Air Interface Specification
- Security Functions for Ultra Mobile Broadband (UMB) Air Interface Specification
- Connection Control Plane for Ultra Mobile Broadband (UMB) Air Interface Specification
- Session Control Plane for Ultra Mobile Broadband (UMB) Air Interface Specification
- Route Control Plane for Ultra Mobile Broadband (UMB) Air Interface Specification
- Broadcast-Multicast Upper Layers for Ultra Mobile Broadband (UMB) Air Interface Specification

Other Standards may be required to implement this system and are listed in the References section of each part.

This standard provides a specification for land mobile wireless systems based upon cellular principles. This Standard is one part of the IMT-2000 CDMA Multi-Carrier, IMT-2000 CDMA MC, also known as cdma2000®[2].

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[1] Ultra Mobile Broadband™ and (UMB™) are trade and service marks owned by the CDMA Development Group (CDG).

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

FOREWORD

1 No text.

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] C.S0084-000-0, Overview for Ultra Mobile Broadband (UMB) Air Interface Specification.

[2] C.S0084-001-0, Physical Layer for Ultra Mobile Broadband (UMB) Air Interface Specification.

[3] C.S0084-002-0, MAC Layer for Ultra Mobile Broadband (UMB) Air Interface Specification.

[4] C.S0084-003-0, Radio Link Layer for Ultra Mobile Broadband (UMB) Air Interface Specification.

[5] Reserved.

[6] C.S0084-005-0, Security Functions for Ultra Mobile Broadband (UMB) Air Interface Specification.

[7] C.S0084-006-0, Connection Control Plane for Ultra Mobile Broadband (UMB) Air Interface Specification.

[8] C.S0084-007-0, Session Control Plane for Ultra Mobile Broadband (UMB) Air Interface Specification.

[9] C.S0084-008-0, Route Control Plane for Ultra Mobile Broadband (UMB) Air Interface Specification.

[10] C.S0084-009-0, Broadcast-Multicast Upper Layer for Ultra Mobile Broadband (UMB) Air Interface Specification.

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

REFERENCES

1 No text.

1 INTRODUCTION

Application Layer consists of following protocols:

- Basic Signaling Protocol
- Basic Inter-Route Tunneling Protocol

No text.

2 BASIC SIGNALING PROTOCOL

2.1 General Overview

Protocols in each layer use Basic Signaling Protocol (BSP) to exchange messages.

BSP provides a one or two octet header that defines the Type of the protocol and the protocol instance (i.e., InConfiguration or InUse) with which the message is associated. The BSP uses the header to route the message to the appropriate protocol instance.

BSP is a message-routing protocol, and routes messages to protocols specified by the <InConfigurationProtocol, Type> pair of fields provided in the BSP header.

The InConfigurationProtocol field in the BSP header determines whether the encapsulated message corresponds to the InUse protocol instance or the InConfiguration protocol instance.

The actual protocol indicated by the Type is negotiated during session set-up. For example, Type 0x05 is associated with the Reverse Control Channel MAC Protocol. The specific Reverse Control Channel MAC Protocol used (and, therefore, the Reverse Control Channel MAC protocol generating and processing the messages delivered by BSP) is negotiated when the session is setup.

The remainder of the message following the Type field (BSP header) is processed by the protocol specified by the Type.

2.2 Primitives and Public Data

2.2.1 Commands

This protocol does not define any commands.

2.2.2 Return Indications

This protocol does not return any indications.

2.2.3 Local Common Data

This protocol does not define any Local Common Data.

2.2.4 Public Data

This protocol shall make the following data public:

- All data defined as Static Attribute, Static Non-Attribute Data, and Local Common Data

2.3 Protocol Data Unit

The protocol data unit for this protocol is an BSP packet. Each BSP packet consists of one message sent by a protocol using BSP.

The protocol constructs an BSP packet by adding the BSP header (see 2.7.6) in front of the payload. The structure of the BSP packet is shown in Figure 2-1.

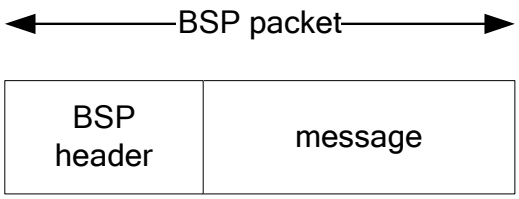

Figure 2-1. BSP Packet Structure

2.4 Protocol Initialization

2.4.1 Protocol Initialization for the InConfiguration Protocol Instance

Upon creation, the InConfiguration instance of this protocol in the access terminal and the access network shall perform the procedures specified in [8].

2.4.2 Protocol Initialization for the InUse Protocol Instance

Upon creation, the InUse instance of this protocol in the access terminal and access network shall perform the procedures specified in [8].

2.5 General Signaling Requirements

2.5.1 General Requirements

The following requirements are common to all protocols that carry messages using BSP and that provide for message extensibility. The access terminal and the access network shall abide by the following rules when generating and processing any signaling message carried by BSP.

- Messages are always an integer number of octets in length; and, if necessary, include a Reserved field in the message to make them so. The receiver shall ignore the value of the Reserved fields.
- The first field of the message shall be transmitted first. Within each field, the most significant bit of the field shall be transmitted first.
- Message identifiers shall be unambiguous for each protocol Type and for each Subtype for all protocols compatible with the Air Interface.
- For future revisions, the transmitter shall add new fields only at the end of a message (excluding any Reserved field). The transmitter shall not add fields if their addition makes the parsing of previous fields ambiguous for receivers.
- The receiver shall discard all unrecognized messages.
- The receiver shall discard all unrecognized fields.

- The receiver shall discard a message if any of the fields in the message is set to a value outside of the defined field range, unless the receiver is specifically directed to ignore this field. A field value is outside of the allowed range if a range was specified with the field and the value is not in this range, or the field is set to a value that is defined as invalid. Values that are designated as reserved are considered to be outside of the allowed range.

2.5.2 Message Information

Each message definition contains information regarding channels on which the message can be transmitted, whether the message requires RLP reliable or best-effort delivery, and the addressing modes applicable to the message. This information is provided in the form of a table, an example of which is given in Figure 2-2.

Channels	FTC RTC
Addressing	Unicast

RLP	Best Effort

Figure 2-2. Sample Message Information

The following values are defined:

- Channels: This information field indicates the Physical Layer Channels on which this message can be transmitted. The sender of the message shall send the message only on the Physical Layer channel(s) indicated by this information field. Values are:
  - FTC for Forward Unicast Traffic Channel,
  - F-BCMCSCH for Forward Broadcast Multicast Services Channel
  - RTC for Reverse Traffic Channel,
- RLP: Radio Link Protocol requirements. The sender of the message shall send the message only using the RLP in the mode(s) indicated by this information field. Values are:
  - Best Effort: the message is sent once and is subject to erasure, and
  - Reliable: erasures are detected and the message is retransmitted one or more times, if necessary.
- Addressing: Addressing modes for the message. The sender of the message shall send the message only with an address type(s) indicated by this information field. Values are:
  - Broadcast if a broadcast address can be used with this message,
  - Manycast if a manycast address can be used with this message, and
  - Unicast if a unicast address can be used with this message.

2.6 Procedures and Messages for the InConfiguration Instance of the Protocol

2.6.1 Procedures

This protocol uses the services of the Session Configuration Protocol to perform negotiation of attribute values.

2.6.2 Message Formats

This protocol does not define any messages.

2.7 Procedures and Messages for the InUse Instance of the Protocol

2.7.1 Hard Commit Procedures

The access terminal and the access network shall perform the procedures specified in [8] when directed by the InUse instance of the Session Configuration Protocol to execute the Hard Commit procedures.

2.7.2 Soft Commit Procedures

The access terminal and the access network shall perform the procedures specified in [8], in the order specified, when directed by the InUse instance of the Session Configuration Protocol to execute the Soft Commit procedures.

2.7.3 Procedures

BSP receives messages for transmission from multiple protocols. BSP shall add the BSP header to each message and forward it for transmission to RLP.

BSP receives messages from RLP. BSP shall route these messages to their associated protocols according to the value of the InConfigurationProtocol and Type field in the BSP header. If InConfigurationProtocol field in the BSP header is set to '1', the BSP shall route the message to the InConfiguration instance of the protocol identified by the Type field, otherwise the BSP shall route the message to the InUse instance of the protocol identified by the Type field.

2.7.4 Type Definitions

Protocol Type values assigned to protocols are specified in [11].

2.7.5 Messages

No messages are defined for the InUse instance of the protocol.

2.7.6 BSP Header

The BSP shall place the following header in front of every message that it sends:

Field	Length (bits)
InConfigurationProtocol	1
Type	7 or 15

InConfigurationProtocol

InConfiguration or InUse protocol instance flag. The sender shall set this flag to '1' to indicate that the encapsulated message is destined for the InConfiguration instance of the protocol that is identified by the Type field. The sender shall set this flag to '0' to indicate that the encapsulated message is destined for the InUse instance of the protocol that is identified by the Type field.

Type

Protocol Type. If length of this field is 7 bits, then the sender shall set MSB of this field to '0'; otherwise, the sender shall set MSB of this field to '1'. This field shall be set to the Type value for the protocol (as defined in [11]) associated with the encapsulated message.

2.8 Interface to Other Protocols

2.8.1 Commands

This protocol does not issue any commands.

2.8.2 Indications

This protocol does not register to receive any indications.

2.9 Configuration Attributes

This protocol does not define any simple attributes or complex attributes.

2.10 Non-Attribute Data

This protocol does not define any non-attribute data.

2.11 Session State Information

The Session State Information record (see [8]) consists of parameter records. All configuration attributes are Session State Information records. This protocol does not define additional parameter records in addition to the configuration attributes for this protocol.

No text.

3 BASIC INTER-ROUTE TUNNELING PROTOCOL

3.1 Overview

The Inter-Route Tunneling Protocol performs the following functions:

- Tunneling of data belonging to different Routes. The Inter-Route Tunneling Protocol Header indicates the Route to which the payload belongs. The Inter-Route Tunneling Protocol allows one Route to carry payload bound for another Route, including payload bound for its Route.

A Route consists of an InUse protocol stack associated with an access network.

At the transmitter, the Inter-Route Tunneling Protocol receives packets for transmission from the Route Protocol of another Route or from the Route Protocol of the same Route (see Figure 3-1). The Inter-Route Tunneling Protocol adds an Inter-Route Tunneling Protocol Header to the received packet to identify the destination Route and delivers this packet to the Radio Link Protocol.

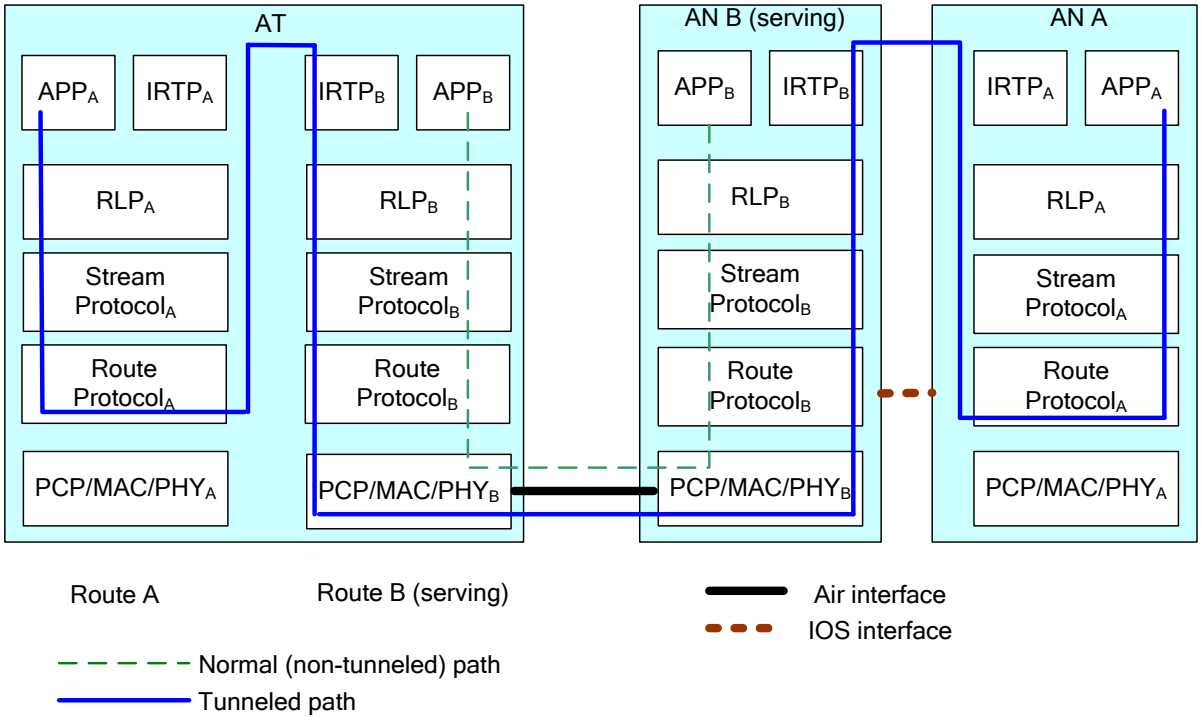

Figure 3-1. Data Path for Normal and Tunneled Packets

At the receiver, the Inter-Route Tunneling Protocol receives packets from the Radio Link Protocol. The Inter-Route Tunneling Protocol removes the Inter-Route Tunneling Protocol Header and delivers the packet to the Route Protocol of the corresponding Route.

When multiple Routes generate identical Route Protocol Packet for transmission on the reverse link, it is possible to transmit these packets in a many-cast fashion. Many-cast

packets are transmitted on reserved streams (see Stream Protocol) in the reverse link. In many-cast transmission, multiple Inter-Route Tunneling Protocol Headers are added to a single Route Protocol Packet, one for each Route to which the Route Protocol Packet must be delivered at the access network (See Figure 3-2); Alternatively, a single Inter-Route Tunneling Protocol Header specifying the RouteID reserved for All-Routes can be used. When a many-cast packet is received at the Inter-Route Tunneling Protocol of the serving access network, the Inter-Route Tunneling Protocol reads the Inter-Route Tunneling Protocol Header(s) present, and delivers a copy of the payload to each of the intended Routes.

Inter-Route Tunneling Protocol may receive packets from the Route Protocol of its Route either for many-cast transmission or for further fragmentation at RLP.

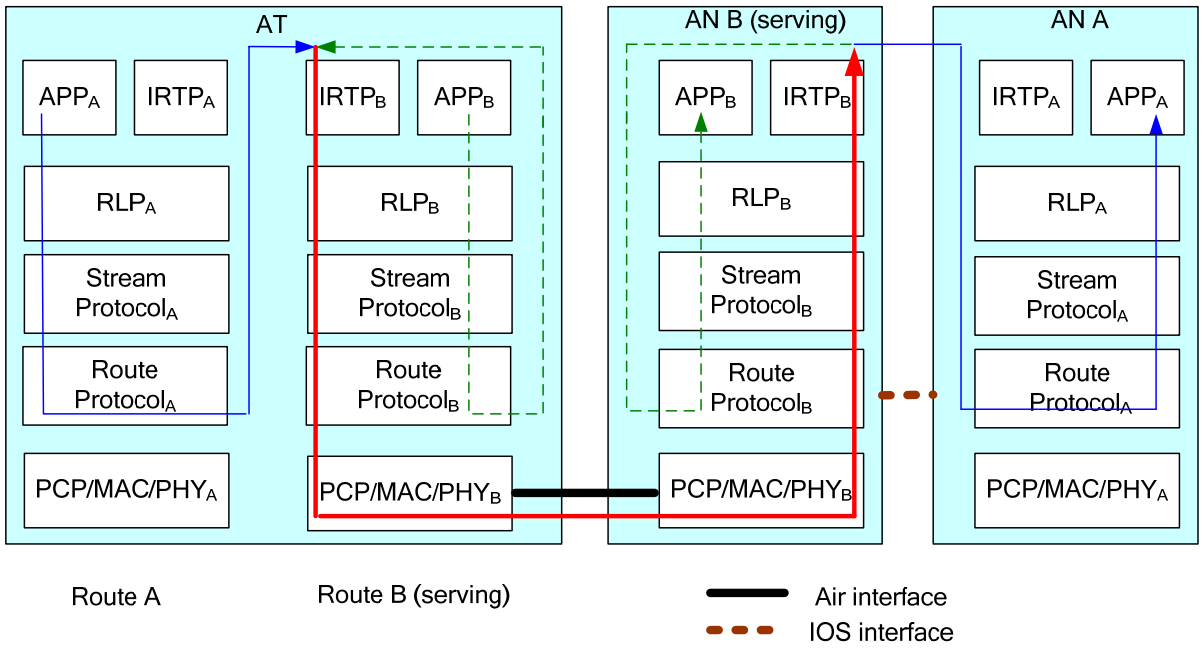

Figure 3-2. Data Path for Many-cast Packets

In order to achieve all of the above functionality, the Inter-Route Tunneling Protocol adds one or more Inter-Route Tunneling Protocol Headers. Figure 3-3 illustrates various configurations of the Inter-Route Tunneling Protocol Headers.

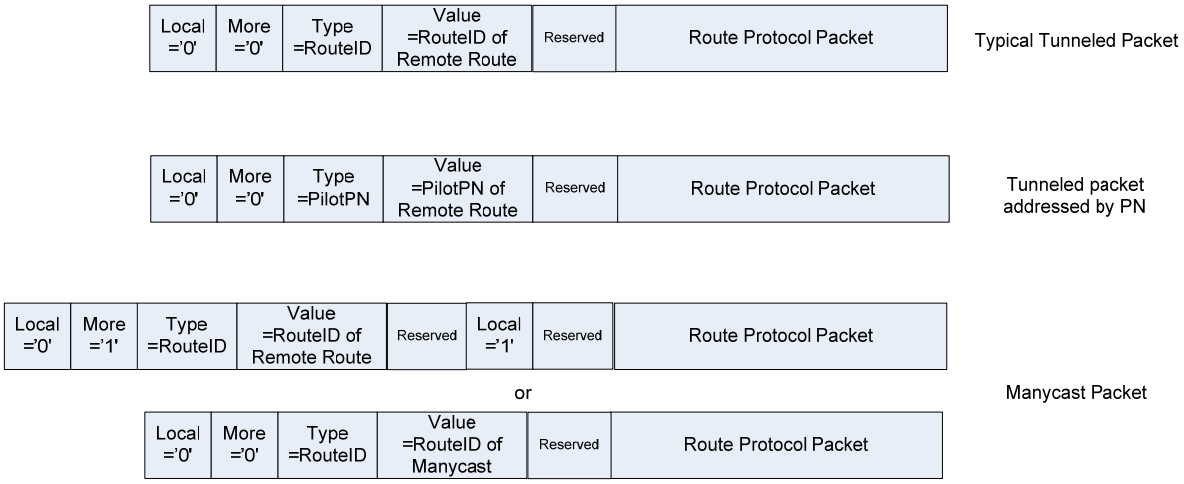

Figure 3-3. Example Inter-Route Tunneling Protocol Headers

3.2 Primitives, Local Common Data, and Public Data

3.2.1 Commands

This protocol does not define any commands.

3.2.2 Return Indications

This protocol does not return any indications.

3.2.3 Local Common Data

This protocol does not define any Local Common Data.

3.2.4 Public Data

This protocol shall make the following data public:

- All data defined as Static Attribute, Static Non-Attribute Data, and Local Common Data

3.3 Protocol Data Unit

The protocol data unit for this protocol is an Inter-Route Tunneling Protocol Packet. An Inter-Route Tunneling Protocol Packet consists of an Inter-Route Tunneling Protocol Payload and one or more Inter-Route Tunneling Protocol Headers.

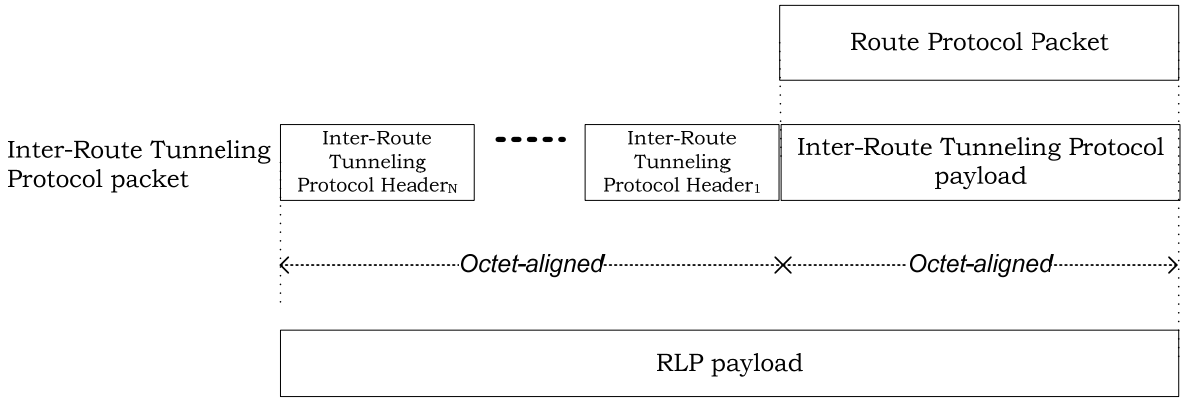

Figure 3-4. Inter-Route Tunneling Protocol Packet

3.4 Protocol Initialization

3.4.1 Protocol Initialization for the InConfiguration Protocol Instance

Upon creation, the InConfiguration instance of this protocol in the access terminal and the access network shall perform the procedures specified in [8].

3.4.2 Protocol Initialization for the InUse Protocol Instance

Upon creation, the InUse instance of this protocol in the access terminal and access network shall perform the procedures specified in [8].

3.5 Procedures and Messages for the InConfiguration Instance of the Protocol

3.5.1 Procedures

This protocol uses the Session Configuration Protocol to define the processing of the configuration messages.

3.5.2 Message Formats

This protocol uses the following Session Configuration Protocol messages to perform attribute negotiation: ConfigurationRequest, ConfigurationResponse, FastConfigurationRequest, FastConfigurationAccept, FastConfigurationReject, ConfigurationCopyRequest, ConfigurationCopyAccept, ConfigurationCopyReject.

3.6 Procedures and Messages for the InUse Instance of the Protocol

3.6.1 Procedures

3.6.1.1 Hard Commit Procedures

The access terminal and the access network shall perform the procedures specified in [8] when directed by the InUse instance of the Session Configuration Protocol to execute the Hard Commit procedures.

3.6.1.2 Soft Commit Procedures

The access terminal and the access network shall perform the procedures specified in [8] when directed by the InUse instance of the Session Configuration Protocol to execute the Soft Commit procedures.

3.6.1.3 Inter-Route Tunneling Protocol Header

The Inter-Route Tunneling Protocol Header has the following format:

Field	Length (bits)
Local	1
MoreHeader	0 or 1
HeaderType	0 or 2

If HeaderType= '00'

RouteID	4

If HeaderType= '01'

PilotPN	9

If HeaderType= '10'

ANID	64

Reserved	0-7 (as needed)

Local — The sender shall set this field to '1' if there are no additional Inter-Route Tunneling Protocol Header fields in this packet other than the Reserved field; otherwise, the sender shall set this field to '0'.

MoreHeader — The sender shall omit this field if the Local field is set to '1'; otherwise, the sender shall include this field and set it as follows:

The sender shall set this field to '1' if there is another Inter-Route Tunneling Protocol Header following this Inter-Route Tunneling Protocol Header; otherwise, the sender shall set this field to '0'.

HeaderType — The sender shall omit this field if the Local field is set to '1'; otherwise, the sender shall include this field and set it as specified in Table 3-1 to indicate the type of Inter-Route Tunneling Protocol Header. The access network shall not set this field to '10'.

Table 3-1. HeaderType Values

HeaderType (binary)	Type of Inter-Route Tunneling Protocol Header
00	Short Header (RouteID)
01	PilotPN Header
10	Long Header (ANID)
Other values	Reserved

RouteID

The sender shall omit this field if the HeaderType field is not included or is included and is not set to '00'; otherwise, the sender shall include this field and set it as follows:

The sender shall set this field to the RouteID assigned to the Route to which this packet is destined as specified in Table 3-2.

Table 3-2. RouteID Values

RouteID (binary)	RouteID usage
0000-0110	Can be assigned for Routes created by the access terminal
0111	BCMC Route
1000	All-Routes
1001	Session Anchor Route
1010-1111	Reserved

PilotPN

The sender shall omit this field if the HeaderType field is not included or is included and is not set to '01'; otherwise, the sender shall include this field and set it as follows:

The sender shall set this field to the PilotPN of the sector belonging to the access network to which this packet is destined.

ANID

The sender shall omit this field if the HeaderType field is not included or is included and is not set to '10'; otherwise, the sender shall include this field and set it as follows:

The sender shall set this field to the access network identifier of the access network to which this packet is destined.

Reserved	The sender shall include zero to seven bits to make this Inter-Route Tunneling Protocol Header octet-aligned. The sender shall set these bits to 0. The receiver shall ignore these bits.

3.6.1.4 Command Processing

3.6.1.4.1 Activate

None.

3.6.1.4.2 Deactivate

None.

3.6.1.5 Transmission Procedures

3.6.1.5.1 Access Terminal Procedure

If the Inter-Route Tunneling Protocol receives a Route Protocol Packet from the Route Protocol of a Route, it shall perform the following:

- The Inter-Route Tunneling Protocol shall add an Inter-Route Tunneling Protocol Header to identify the destination Route. If the received Route Protocol Packet is intended for transmission in a many-cast manner, the Inter-Route Tunneling Protocol shall do one of the following:
  - Inter-Route Tunneling Protocol shall add one Inter-Route Tunneling Protocol Header for each destination Route, or
  - Inter-Route Tunneling Protocol shall add a single Inter-Route Tunneling Protocol Header with the RouteID field set to '1000' (i.e. All-Routes RouteID)
- The Inter-Route Tunneling Protocol shall deliver the Inter-Route Tunneling Protocol Packet to the Radio Link Protocol of its Route.

3.6.1.5.2 Access Network Procedures

If the Inter-Route Tunneling Protocol receives a Route Protocol Packet from the Route Protocol of a Route, it shall perform the following:

- The Inter-Route Tunneling Protocol shall add an Inter-Route Tunneling Protocol Header to identify the destination Route.
- The Inter-Route Tunneling Protocol shall deliver the Inter-Route Tunneling Protocol Packet to the Radio Link Protocol of its Route.

3.6.1.6 Reception Procedures

3.6.1.6.1 Access Terminal Procedures

If the Inter-Route Tunneling Protocol receives an Inter-Route Tunneling Protocol Packet from the Radio Link Protocol of its Route, it shall perform the following:

- The Inter-Route Tunneling Protocol shall remove the Inter-Route Tunneling Protocol Header to produce an Inter-Route Tunneling Protocol Payload.

- The Inter-Route Tunneling Protocol shall perform the following:
  - If the Local field of the header is set to '1', the Inter-Route Tunneling Protocol shall deliver the Inter-Route Tunneling Protocol Payload to the Route Protocol of its Route.
  - If the HeaderType field of the header is set to '00', the Inter-Route Tunneling Protocol shall deliver the Inter-Route Tunneling Protocol Payload to the Route Protocol of the Route identified in the RouteID field of the header.
  - If the HeaderType field of the header is set to '01', the Inter-Route Tunneling Protocol shall deliver the Inter-Route Tunneling Protocol Payload to the Route Protocol associated with the pilot identified in the PilotPN field of the header, along with the PilotPN value[3].

3.6.1.6.2 Access Network Procedures

If the Inter-Route Tunneling Protocol receives an Inter-Route Tunneling Protocol Packet from the Radio Link Protocol of its Route, it shall perform the following:

- The Inter-Route Tunneling Protocol shall remove all Inter-Route Tunneling Protocol Headers present to produce an Inter-Route Tunneling Protocol Payload.
- For each Inter-Route Tunneling Protocol Header removed, the Inter-Route Tunneling Protocol shall perform the following:
  - If the Local field of the header is set to '1', the Inter-Route Tunneling Protocol shall deliver the Inter-Route Tunneling Protocol Payload to the Route Protocol of its Route.
  - If the HeaderType field of the header is set to '00', the Inter-Route Tunneling Protocol shall perform the following:
    + If the RouteID field is set to '1000' (i.e. All-Routes RouteID), the Inter-Route Tunneling Protocol shall deliver a copy of the Inter-Route Tunneling Protocol Payload to each of the Route contained in the RouteMap public data of Route Control Protocol.
    + Otherwise, the Inter-Route Tunneling Protocol shall deliver a copy of the Inter-Route Tunneling Protocol Payload to the Route Protocol of the Route identified in the RouteID field of the header.
  - If the HeaderType field of the header is set to '01', the Inter-Route Tunneling Protocol shall deliver the Inter-Route Tunneling Protocol Payload to the Route Protocol of the access network to which the pilot identified in the PilotPN field of the header belongs to.

[3] Since separate RLP queue is maintained for each sector of a Route, the PilotPN information is necessary to deliver this packet to the correct RLP queue

– If the HeaderType field of the header is set to ‘10’, the Inter-Route Tunneling Protocol shall deliver the Inter-Route Tunneling Protocol Payload to the Route Protocol of the access network corresponding to the received accesss network identifier.

3.6.2 Type Definitions

Protocol Type values assigned to protocols are specified in [11].

3.6.3 Message Formats

This protocol does not define any messages.

3.7 Interface to Other Protocols

3.7.1 Commands Sent

This protocol does not issue any commands.

3.7.2 Indications

This protocol does not register to receive any indications.

3.8 Configuration Attributes

This protocol does not define any simple attributes or complex attributes.

3.9 Non-Attribute Data

This protocol does not define any non-attribute data.

3.10 Session State Information

The Session State Information record (see [8]) consists of parameter records. All configuration attributes are Session State Information records. This protocol does not define additional parameter records in addition to the configuration attributes for this protocol.

No text.