International Civil Aviation Organization

Fifth Meeting of Aeronautical Telecommunication Network (ATN) Transition Task Force of APANPIRG

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Agenda Item 9: Review ATN implementation activities/issues

SUPPLEMENT TO HEADER COMPRESSION IN MOBILE SUBNETWORK

SUMMARY

This paper analyzes the header compression in mobile SNDCF, dicusses the two modes of inter-domain routing via mobile subnetwork. At last ISH PDU compression is suggested to save the mobile subnetwork bandwidth further.

(Presented by China)

1. Introduction

1.1 In low speed data link, data compression is employed for saving the limited bandwidth resource. Header compression is an important part of data compression, and plays an important role in it.

1.2 In ATN, CLNP header is compressed when the CLNP PDU is transmitted over mobile subnetwork. The CLNP header is compressed by SNDCF sublayer that is part of ATN network layer. Because the address part of the header is 40 bytes (including source address and destination address), the total header of the CLNP is no less than 50 bytes. After compression, the header will become 4 to 11 bytes.

1.3 After analyzing the NPDUs that are frequently transmitted on the mobile subnetwork, this paper proposed that the ISH PDUs should be compressed when non-IDRP inter-domain routing mode is used between airborne BIS and air-ground BIS.

2. Origin of the supplement and CLNP header compression

2.1 Connection establishment

2.1.1 ISO8208 protocol is employed by ATN mobile subnetworks to establish a connection between the calling SNDCF and the called SNDCF. The selection of compression algorithms which include header compression and data stream mode compression will be negotiated during the connection establishment period.

2.1.2 When a new connection is to be established, the calling SNDCF should send an ISO/IEC8208 CALL REQUEST packet. Compression information is included in the packet.

2.1.3 The format of the packet is illustrated in figure 1. The general format identifier which is four bits in length should be XX01 (modulo8) or XX10 (modulo128). The logical channel identifier indicates which logical channel the connection occupies. Packet type identifier value indicates the packet is a CALL REQUEST packet. The Address Block should be mobile subnetwork addresses. The Facility Block should include Priority facility, Non-standard default packet size facility, and Fast select facility. The User Data Block should be set according to ATN SNDCF.

General Format	Logical Channel
Logical Channel Identifier	
Packet Type Identifier	
Address Block …… ……	
Facility Block …… ……	
User Data Block …… ……	

Figure 1

2.1.4 In ATN mobile subnetwork, the User Data Block should be set as the format in figure 2. The first octet is the Protocol Identifier, this ATN mobile subnetwork SNDCF Protocol Identifier is 1100 0001. The second octet is the length of SNDCF parameter Block. The third octet is the protocol version number and should be 0000 0010. The fourth octet and fifth octet are the Subnetwork Connection Group number. The sixth octet indicates the compression algorithm supported by the SNDCF, and is illustrated in figure 3. For header compression, LREF should be set to 1. The seventh and eighth octets indicate the maximum number of directory entries. Extension Block includes parameters that are used for Data Stream Mode compression. The user data is after the Extension Block.

The user data may be NPDU, for example, the ISH9542 ISH PDU.

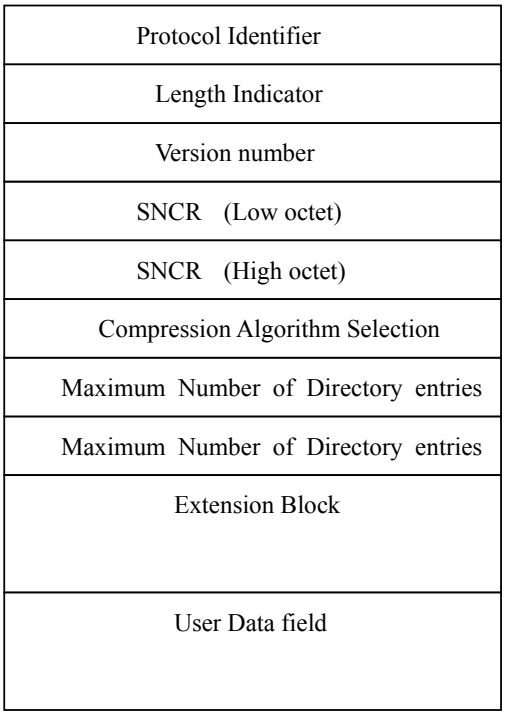

Figure 2

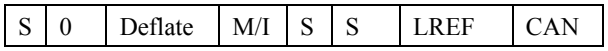

Figure 3

2.1.5 On receipt of Call Request Packet, the called SNDCF should send back to the calling SNDCF a Call Accept Packet. The Call Accept Packet has the same compression algorithm selection octet as the Call Request Packet and the user data part is illustrate in figure 4.

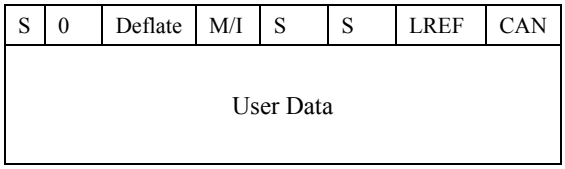

Figure 4

2.2 Local Reference establishment and maintenance

2.2.1 Both calling and called SNDCF should establish a Local Reference Directory. The Maximum Number of Directories is specified in Call Request Packet. The Local Reference Directory should be established according to the priority of the virtual circuit and the compression algorithm

selected. Each entry should include an entry number, protocol version number (for example, ISO/IEC8473 protocol version number), source NSAP address and destination NSAP address, and security option parameter of a CLNP PDU. Figure 5 illustrates a Local Reference Directory of a Calling SNDCF.

Entry	Version	Source NSAP	Destination NSAP	Security
1	first entry			
2	second entry			
… … …	… …	… …	… …	…

Figure 5

2.2.2 When the sending SNDCF receives a CLNP DT PDU, it will first find a Local Reference Directory that has the same priority as the CLNP DT PDU. Then, it will look up an entry that has the same protocol version number, source NSAP address, destination NSAP address, and security option parameter as the CLNP DT PUD does in that Local Reference Directory.

2.3.3 If such an entry is not found, the sending SNDCF will record the protocol version number, source NSAP address, destination NSAP address, and security option parameter, and create a new entry. At the same time, an option called the Local Reference option should be inserted into the CLNP DT PDU. The Local Reference option has the following format:

Parameter	Parameter length	Parameter Value

Figure 6

2.3.4 The parameter code is 0000 0101. The parameter length is variable. The parameter value is the new entry number. Then the changed CLNP PDU header will be send uncompressed.

2.3.5 The receiving SNDCF should first check the option field. If a Local Reference option is found, a new entry will be created according to the parameter value in the Local Reference option. Then the Local Reference option will be canceled and the remaining NPDU will be passed to the upper layer.

2.3 CLNP PDU header compression

2.3.1 If the sending SNDCF receives from the upper layer a CLNP PDU and can find an entry that has the same address and parameter, the CLNP header will be compressed into the following format:

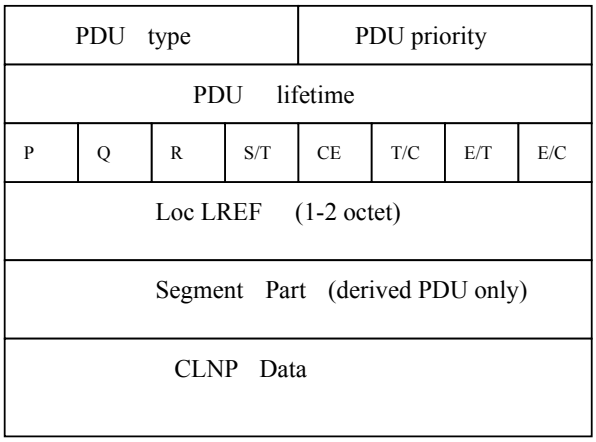

Figure 7

2.3.2 PDU type is half byte. It contains the CLNP header information and SP, MS, E/R bits information. PDU priority is the low four bits of the priority value. PDU lifetime is the lifetime of the CLNP PDU. P is the priority bit, Q bit is used for QoS, R is the checksum indicator. The remaining 5 bits are set according to QoS parameter. LREF is the entry number. The segment part and the CLNP Data part is the same as CLNP PDU.

2.3.3 When the receiving SNDCF received a compressed PDU, it should decompress the PDU according to the Local Reference Directory. Then the decompressed PDU should be passed to the upper layer.

3. Description of the ISH compression

3.1 Network layer protocols used in ATN are CLNP, ESIS, ISIS, IDRP. Because airplane is a mobile RD in ATN, ISIS is not used between airborne router and air-ground router. When IDRP is chosen for inter-domain routing protocol between airborn and air-ground routers, IDRP PDUs will be transfered as data part of CLNP PDUs. All the NPDUs that are transmitted over the mobile subnetwork may be CLNP PDUs, ISH PDUs. When the optional non-use of IDRP is chosen, ISH PDUs are transmitted frenquently over the mobile subnetwork. In order to save the limited bandwidth further, this paper proposed ISH compression in case of non-use of IDRP.

3.2 The format of ISH PDU is illustrated as follows:

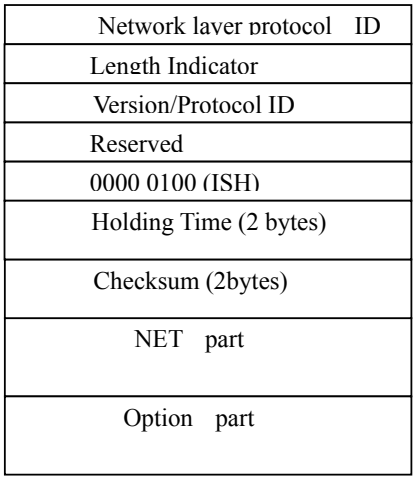

Figure 8 ISH PDU

3.3 In order to simplify the compression process, ISH PDUs use the same Local Reference Directory as the CLNP PDUs do. The compressed ISHs have the following format:

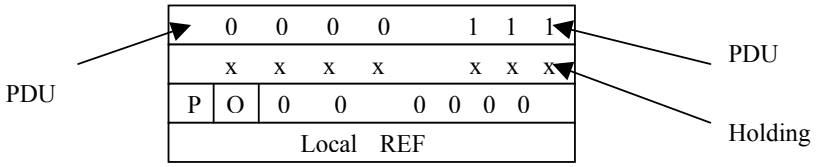

Figure 9

3.4 The mobile subnetwork capability parameter fills in the Security Option part of the local reference directory.

3.5 Therefore, after compression, the total ISH PDU can be compressed into 4 bytes. In the condition that non-IDRP is chosen, ISH compression can be helpful to save the mobile subnetwork resource.

4. Results and conclusion

4.1 Many routing protocol PDUs are transferred between airborne and air-ground BISs. By now, there are no specific compression algorithms for routing protocol. The routing protocols used upon air-ground subnetwork are ESIS protocol and IDRP protocol. IDRP BIS PDUs are transferred using the underlying services provided by CLNP and compressed as CLNP DT PDU automatically. Yet, ISH PDUs have to be transferred unmodified, which occupies the costly bandwidth resources unnecessarily. In the case that non-IDRP is chosen, ISHs are retransmitted between airborne router and air-ground router periodically. Obviously, compressing these ISH PDUs would save the costly bandwidth resource and lessen the burden of air-ground subnetwork further.