LETTER

New Sequence Number for AAL 3/4 in ATM Networks

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SUMMARY We propose a method to make new sequence number (SN*) for AAL 3/4 in ATM networks. This method observes the segment type (ST) and length indicator (LI) fields with sequence number (SN) to make the SN*. Our proposal also includes an example of the method.

key words: *ATM, AAL, sequence number*

1. Introduction

The 4-bit SN field in ATM adaptation layer (AAL) allows the SAR-PDUs to be numbered in a repeatedly 0-to-15 cycle. The field has been used as an important field in many error control techniques such as forward error correction (FEC)[1]. However, it has the limitation that the field is incremented modulo 16. If a message consisted of 34 AAL-PDUs is sent, the SN values must be reused due to the limitation. In this case, 3 PDUs of the message have its SN set to 1. During the reassembly process in AAL, if any PDU is not received correctly, then all associated PDUs must be dropped. If one PDU is lost, none are retained at the receiver. If 20 successive PDUs of the message are lost, the 4-bit SN alone will not identify the lost PDUs. So, we propose the SN* to solve this problem.

2. Proposed Method

Here we propose the SN* which can be applied to AAL 3/4 sublayer. Figure 1 depicts the SAR-PDU for AAL 3/4, which is used for service classes C and D[2]. The

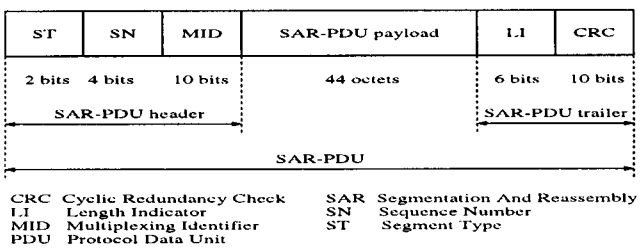

Fig. 1 SAR-PDU format for AAL3/4.

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SN field in AAL is a 4-bit field that allows the SAR-PDUs to be numbered in a repeatedly 0-to-15. This gives the receiver a means of detecting lost or misinserted cells. The 2-bit ST field indicates whether the SAR-PDU is a beginning of message (BOM), a continuation of message (COM), an end of message (EOM), or a single segment message (SSM). The 6-bit LI specifies the number of octets from the Convergence Sublayer PDU (CS-PDU) which are included in the SAR-PDU payload field (with a maximum of 44 octets). Note that when ST field of a cell indicates COM, the LI value of the cell indicates always 44 as shown in Table 1 because the cell is at the middle of the message[2]. Also, the LI value of the cell whose ST field indicates BOM is always 44. That is, the LI field of the cell whose ST field indicates COM or BOM is meaningless because we know the value is always 44. We employ the LI field together with SN and ST fields to consider the SN* up to the maximum of 80 (from 0) as shown in Table 2. Thus, the SN* is numbered in a repeatedly 0-to-80 cycle. In our proposal we set the SN to zero for BOM to consider the SN*. But, it is free to set the SN to other value for BOM, then the sequence number for each of other entries in Table 2 should be changed appropriately. The only task at the sending side is to modify the LI value. The modified LI values of the PDUs whose ST value is COM are adjusted to 44 at the receiving side to preserve

Table 1 LI values.

Segment Type	Permissible Value
BOM	44
COM	44
EOM	4-44, 63*
SSM	8-44

(* 63 is used in the ABORT-SAR-PDU)

Table 2 New cell SN (SN*).

SN	ST	LI	SN*	LI value modified?
0	BOM	44	0	no
1-15	COM	44	1-15	no
0	COM	44	16	no
X	COM	0-43	17-60	yes
X	COM	45-63	61-79	yes
X	EOM	X	80 (last cell no.)	no

(X : don't care)

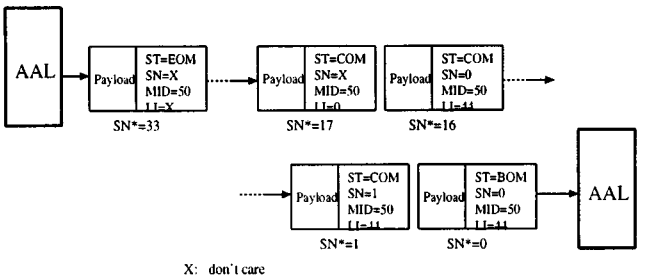

Fig. 2 Sequencing for proposed method.

AAL standard.

3. Example

Figure 2 shows a PDU-sequencing of the proposed method. In this example, 34 AAL-PDUs are sent, so SN* numbered 0 through 33 is placed in the PDUs. The MID is set to 50 in this example to uniquely identify all associated PDUs. So, even if all successive PDUs are lost, the SN* can identify the lost PDUs and recover the PDUs using error correcting techniques. Thus, the SN* can identify the maximum of 81 successive lost PDUs.

4. Conclusion

We have proposed a method to make a new sequence number for AAL 3/4 in ATM networks. This method uses the ST and LI fields with SN to consider the SN*. The SN* is numbered in a repeatedly 0-to-80 cycle and can be used efficiently in various error control techniques. Actually, the extension of the matrix row length by SN* in the cell loss recovery method proposed in [1] can improve cell loss recovery ability substantially.

References

[1] H. Ohta and T. Kitami, "A cell Loss Recovery Method Using FEC in ATM Networks," IEEE Journal on Selected Areas in Communications, vol.9, no.9, pp.1471-1483, Dec. 1991.
[2] ITU-T, "Recommendation I.363, B-ISDN ATM Adaptation Layer (AAL) Specification," 1993.