

TSG-RAN Working Group 2 (Radio layer 2 and Radio layer 3) TSGR2#R2-99747

Source: Silicon Automation Systems.
Title: Proposal for change in RLC control pdu
Document for: Decision

1. Introduction

This document is a proposal to modify the present format of the control pdu and add to the SUFI types

2. Current Scenario

In the present specifications for RLC, The Control PDU format is given as.

<i>FIELD</i>	D/C	PDU_TYPE	PA	F1
<i>BITS</i>	1	3	1	3

if PDU_TYPE is STATUS F1 : SUFI Type
else F1 : Padded bits .

SUFI field can come in the data part of the PDU and because it has 3 bits, the packing of the bits becomes very much complicated .

For Example,

First SUFI is say "ACK"
so the sufi ends at Octet 2 and bit 3. (2,3).
Next SUFI, say "LIST", starts at Octet 2 bit 4, (2,4),
and it ends at Octet 5 bit 2, (5,2). And so on.

This makes processing for packing (for each STATUS PDU) high.

3. Proposal

To overcome this, bits for each field can be redefined which makes each SUFI to start at bit 4 or bit 0 of an Octet. This will make packing very much simpler.

Shown in the figure below is, how the New Format would look like.

Please Note that SUFI type field is defined by 4 bits.

<i>FIELD</i>	<i>D/C</i>	<i>PDU_TYPE</i>	<i>PA</i>	<i>F1</i>
<i>BITS</i>	1	2	1	4

Changed Fields:

PDU_TYPE is 2 bits

00 : STATUS

01 : Reserved

10 : Reserved

11 : F1 indicates PDU TYPE

F1: its length is 4 bits

if PDU_TYPE Field is 00

F1 is SUFI type

if PDU_TYPE is 11

F1: indicated PDU_TYPE

0000 : RESET PDU

0001 : RESET_ACK PDU

0010 through 1111 : Reserved

As per the above format,

1. No Extra bits are required for RESET/RESET_ACK PDU.
2. If STATUS PDU contains n "SUFI"s $n - 1$ extra bits are required. n as defined today is less than 5, maximum of 4 extra bits are required.

This can very well be afforded as this makes packing algorithm general and very much simpler.

Below, Need for some more SUFIs is presented.

4.2 Requirement of new SUFI types

4.2.1 LIST_2:

Currently LIST field is defined as "Sequence Number" and "Li" making it 2 bytes.

(Excluding SUFI TYPE (3 bits) and LENGTH (4 bits), total 7 bits).

But this means if consecutive PU losses are more than 16 PUs, we need to indicate it through 4 bytes. (2 + 2 bytes).

If PU size is \ll PDU Size in AM mode, this can happen very often.

A new SUFI type can be added. Details are as follows.

It will indicate First Sequence Number (FSN) and

Last Sequence Number (LSN).

This will make this type to be 3 bytes irrespective of number of consecutive losses of PUs. This SUFI will be used if losses are > 16 . Thus saving at least 1 byte in such cases

4.2.2 BITMAP_2:

New format

FSN: 12 bits.

LENGTH: 8 bits

The size of the bitmap in octets is $\text{ceiling}(\text{LENGTH}/8)$ octets where the bitmap represents status of only LENGTH amount of pu's.

As length in the current BITMAP SUFI is number of Octets, in bitmap indication of bitmap length = $(8*n + k)$ bits is difficult where n and k are integers and k is in [1,7].

Sequence numbers till $8*n$ has to be sent in a bitmap and the rest through list .

Due to the format defined for list , this will occupy maximum $3(\text{sufi type}) + 4(\text{length}) + k/2*(12 + 4)$ bits which is an unwanted load on airinterface.

The modified bitmap sufi makes it easy to represent such sequence numbers.

This SUFI with additional 4 bits will be used when the number of bits to be represented in this bitmap is not a multiple of 8.

5. Conclusion

1. Change the current control PDU structure to reduce the processing complexity.
2. Introduce LIST_2 and BITMAP_2 types of SUFI to make status PDUs on airinterface more efficient.

6 .References

TS RAN S25.322, Description of the RLC Protocol, V.1.1.0