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# Modified Protocols of Aggressive Packet Combining scheme with Consideration of Physical Level Representation for better and smooth data Transmission

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***Abstract***— In this paper, a few schemes are presented to improve the performance of aggressive packet combining scheme (APC). In APC three copies of each packet is transmitted from source to the destination and receiver performs majority logic on the received erroneous copies to extract the correct version. However one of the major drawback of this scheme lies in the fact that it fails to correct the error when erroneous bits are present in two or more transmitted copies or at the same bit location. To overcome these limitations of conventional APC we proposed a new modified version of APC by considering the physical signal through which the transmitted copy can be more efficiently and coherently received by the receiver. Discuss clearly reveals that the proposed scheme is indeed superior to that of conventional APC.

***Keywords***— Aggressive Packet Combining, Correction capability,Third bits left/right shift, circular Left shift, MSB,LSB,Physical level.

## I. INTRODUCTION

To transmit data reliably from a source to a destination is indeed a research challenge for the scientists and researchers for many years.. For this purpose Backward Error Correction (BEC) and Forward Error Correction (FEC) are the two methods that are extensively used in this regard. BEC has found its application in wired transmission and FEC in wireless transmission[1-2]. BEC technique is found to be cost effective and due to this many researchers are trying to implement BEC for wireless **transmission** of data. In the traditional error correction technique, an erroneous packet is dropped. But the erroneous packet may have both correct and erroneous information. Chakraborty[3] proposed Packet Combining scheme, a simple technique to explore the information present in erroneous packet. In PC scheme bit errors are located by XORing two erroneous copies of the packet. Leung[4] proposed APC. APC is a low latency error correction scheme, so it is important transport whereas FEC is for wireless transmission. The packet combining scheme and its modifications that have got wide applications in variant BEC and FEC are elaborately studies elsewhere [3–10]. Aggressive Packet Combining (APC) is an important modification of packet combining scheme [3]. In this paper, we have proposed and reviewed different schemes of APC with physical level representation and analyzed to get throughput of APC instead of logical bit recognitions of the packet.

## II. REVIEW OF AGGRESSIVE PACKET COMBINING SCHEME

APC is a modified form of Packet Combing (PC) scheme and has found its applications in wireless networks. Here three copies of packet are sent at a time during transmission. At the receiver side all the three copies are received erroneously.

Receiver then applies majority logic bit by bit on the received three erroneous copies.

For Example:

| | |
|---|---|
| Original Copy: | 01011000 |
| First copy: | 010**0**1000 |
| Second Copy: | 01011**1**00 |
| Third Copy: | 010**0**1000 |
| Majority Logic: | 01001000 |

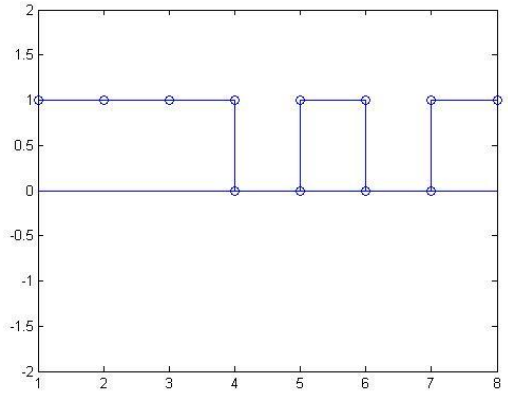
After that, the receiver applies the error detection scheme to find out whether there is an error in the generated copy or not. In this case, as it is not correct, the receiver selects the least reliable bit from the majority logic. Here in the given example the 4th and the 6th bit from left are the least reliable bit. After selecting the least reliable bit, the receiver applies brute force correction to the 4th and the 6th bit, followed by error detection.

Although is it generally useful to look at the avergae latency of packets it can also be informative to study the distribution over all packets, it can of packets for example with virtual-channel flow control

## III. PHYSICAL LEVEL REPRESENTATIONS OF DIFFERENT PROTOCOLS

*A. Protocol 1:*

Suppose original data as "1 1 1 0 1 0 0 1" then physical level representation is



As per proposed new protocol, 1st and 3rd copy will be sent as it is between sender as receiver but 2nd copy will be send as "10010111" (as per PRPC) moreover, assume that error places will be (-) error at 3rd place from MSB in 1st and 2nd copy and (+) error at 3rd place from MSB in 3rd copy in the environment of non-repeated error syndrome.

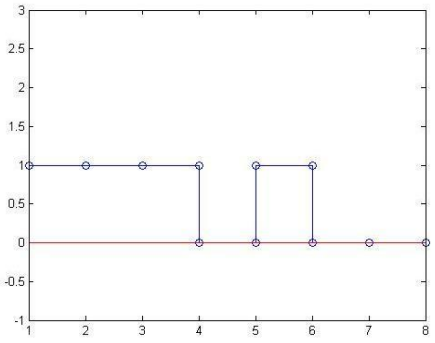
At receiver end:

1 1 1 **1** 1 0 0 1
1 1 1 0 1 0 **1** 1(Reverse of PRPC)
1 **0** 1 0 1 0 0 0
---

*1 1 1 0 1 0 0 1: original data stream*

*B. Protocol2:*

Another example we like to draw in the environment of repeated error syndrome- suppose original data stream is "1 0 0 1 1 1 1 0"(Fig. 2a.) and we represent this data stream in physical level as:



Also we are assuming that we will be transferring 1st and 3rd copies as it is from sender to receiver and 2nd copy by shifting one bit circular right. In this transmission error places are (+) error in 3rd bit and (-) error in 5th bit from MSB

At receiver end:

1 0 **1** 1 1 1 1 0
0 0 **0** 1 1 1 0 1(one bit circular right shift)
1 0 **1** 1 1 1 1 0
---
1 0 1 1 1 1 1 0 unable to generate original packet.

**Proposed new Protocols**

**PROTOCOL –I :**

Suppose original packet: "11101000 ".As per proposed new protocol 1st and 3rd copy will be send as it is sender as receiver but second copy will be send as "00010111" also we are assuming that error places will be (-) error from MSB in 1st and 2nd copy and positive error at 3rd place from MSB in 3rd copy in the environment of non-repeated error syndrome.

| | |
|---|---|
| First copy: | 11001000 |
| Second Copy | 11101000 |
| Third Copy | 11101000 |

11101000

Applying majority logic: 11101000 original copy of the packet that we have sent at sender side.

On the other hand 1st copy 10101011 and 2nd copy 01010111 and 3rd copy 10101011 here 1st and 3rd copy as it is transmitted and 2copy 1bit left shift:

So it is the part of sender copy

| | |
|---|---|
| 1st copy | 10101011 |
| 2nd copy | 010110111 |
| 3rd Copy | 10101011 |

**10101011**

The receiving side receive easily able to collect the sender copy :

The Receiving side will be

| | |
|---|---|
| 1st copy | 10101011 |
| 2nd copy | 10101011 |
| 3rd copy | 10101011 |

10101011

On the other hand with error

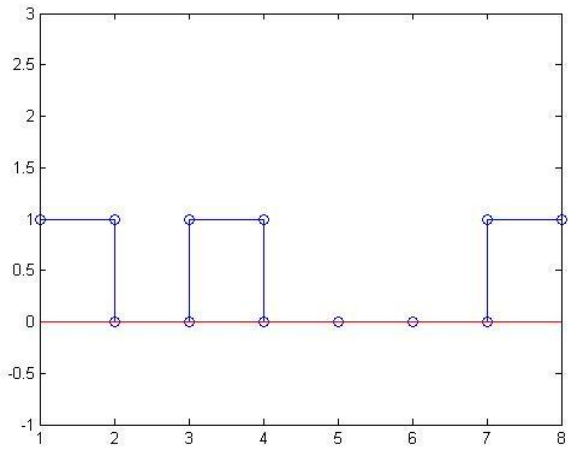
| | |
|---|---|
| 1st copy | 10100011 |
| 2nd copy | 01110111 |
| 3rd copy | 10100011 |

10100011

Receiver of this receive the sender information

| | |
|---|---|
| 1st copy | 10100011 |
| 2nd copy | 10111011 |
| 3rd copy | 10100011 |

10100011



**PROTOCOL-II**

Protocol consistency is checked to ensure to for example that there is at least one tail flit between one head flit and next head flit.

Another example we like to describe in the environment of repeated error syndrome, suppose original data stream is 11011100.

| | |
|---|---|
| First copy: | 11101000 |
| Second Copy | 00010111 |
| Third Copy | 11101000 |

11101000

Sender side 11101000 bit

Receiver side receive the information:-

| | |
|---|---|
| First copy: | 11001000 |
| Second Copy | 11101000 |
| Third Copy | 11101000 |

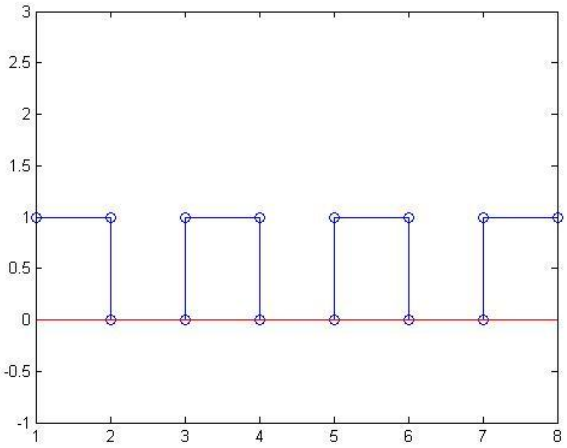
11101000

Without error of this information.

The Receiving side will be

| | |
|---|---|
| 1st copy | 11101000 |
| 2nd copy | 00010111 |
| 3rd copy | 11101000 |

11101000



Throughput is the rate at which packets are delivered by the packets for a particular traffic pattern. It is measured by counting the packets that arrive at destinations over a time interval for each flow (Source-destination pair) in the traffic pattern delivered. Throughput or accepted traffic is to be contrasted with demand or offered traffic which is the rate at which packets are generated by the packet source. Latency is the time required for a packet to traverse the network from source to destination. Our evaluations of latency until this point have mainly focused on the zero load latency of the network.

## IV. CONCLUSION

In this paper we have depicted physical level representation of different aggressive packet combining scheme theoretically. Numerical and simulation studies may carry out in future research.

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