

组会报告

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1 工作内容

1. 修改仿真报告;
2. 编写数据采集程序并测试;
3. 学习 LDPC 低时延译码方案。

2 改写仿真报告

3 数据采集程序测试结果

3.1 不进行写入操作



```
mimo5g1@mimo5g1-sever: /media/mimo5g1/0c73c5cf-4c13-4876-8bc1-d3b3e21a0254/dp
Port statistics =====
Statistics for port 0 -----
Packets sent:                0
Packets received:            26556006
Packets dropped:              0
Aggregate statistics =====
Total packets sent:          0
Total packets received:      26556009
Total packets dropped:       0
=====
41
send_rate= 0.000000 Gb
recieve_rate= 7.295779 Gb
pack_err= 0
```

图 1: 不进行写入操作时的速率

```
mimo5g1@mimo5g1-sever: /media/mimo5g1/0c73c5cf-4c13-4876-8bc1-d3b3e21a0254/dp
Port statistics =====
Statistics for port 0 -----
Packets sent:                                0
Packets received:                            12658234
Packets dropped:                             0
Aggregate statistics =====
Total packets sent:                          0
Total packets received:                      12658234
Total packets dropped:                       0
=====
num_err_pkg=0,num_data_nvld=12658234,correct_BE=0,correct_ED=0,incomplete_pkg=0
mimo5g1@mimo5g1-sever:/media/mimo5g1/0c73c5cf-4c13-4876-8bc1-d3b3e21a0254/dpdk_u
dpr$
```

图 2: 不进行写入操作时的结果

3.2 通过 fprintf 写入

```
mimo5g1@mimo5g1-sever: /media/mimo5g1/0c73c5cf-4c13-4876-8bc1-d3b3e21a0254/dp
Port statistics =====
Statistics for port 0 -----
Packets sent:                                0
Packets received:                            240095
Packets dropped:                             0
Aggregate statistics =====
Total packets sent:                          0
Total packets received:                      240095
Total packets dropped:                       0
=====
26
send_rate= 0.000000 Gb
recieve_rate= 0.104017 Gb
pack_err= 0

```

图 3: 通过 fprintf 写入时的速率

3.3 通过 fwrite 写入

```
mimo5g1@mimo5g1-sever: /media/mimo5g1/0c73c5cf-4c13-4876-8bc1-d3b3e21a0254/dp
Port statistics =====
Statistics for port 0 -----
Packets sent:                0
Packets received:            11642581
Packets dropped:              0
Aggregate statistics =====
Total packets sent:          0
Total packets received:      11642585
Total packets dropped:        0
=====
19
send_rate= 0.000000 Gb
recieve_rate= 6.902218 Gb
pack_err= 0
█
```

图 4: 通过 fwrite 写入时的速率

```
mimo5g1@mimo5g1-sever: /media/mimo5g1/0c73c5cf-4c13-4876-8bc1-d3b3e21a0254/dp
Port statistics =====
Statistics for port 0 -----
Packets sent:                0
Packets received:            17314304
Packets dropped:              0
Aggregate statistics =====
Total packets sent:          0
Total packets received:      17314304
Total packets dropped:        0
=====
num_err_pkg=7327,num_data_nvld=17307550,correct_BE=0,correct_ED=0,incomplete_pkg
=0
mimo5g1@mimo5g1-sever: /media/mimo5g1/0c73c5cf-4c13-4876-8bc1-d3b3e21a0254/dpdk_u
dpr$ █
```

图 5: 通过 fwrite 写入时的结果

3.4 降低速率后通过 fwrite 写入

```
mimo5g1@mimo5g1-sever: /media/mimo5g1/0c73c5cf-4c13-4876-8bc1-d3b3e21a0254/dp
Port statistics =====
Statistics for port 0 -----
Packets sent:                0
Packets received:            2467767
Packets dropped:              0
Aggregate statistics =====
Total packets sent:          0
Total packets received:      2467767
Total packets dropped:        0
=====
50
send_rate= 0.000000 Gb
recieve_rate= 0.555939 Gb
pack_err= 0
█
```

图 6: 降低速率后通过 fwrite 写入时的速率

```
mimo5g1@mimo5g1-sever: /media/mimo5g1/0c73c5cf-4c13-4876-8bc1-d3b3e21a0254/dp
Port statistics =====
Statistics for port 0 -----
Packets sent:                0
Packets received:            4134528
Packets dropped:              0
Aggregate statistics =====
Total packets sent:          0
Total packets received:      4134528
Total packets dropped:        0
=====
num_err_pkg=3,num_data_nvld=4128906,correct_BE=0,correct_ED=0,incomplete_pkg=0
mimo5g1@mimo5g1-sever: /media/mimo5g1/0c73c5cf-4c13-4876-8bc1-d3b3e21a0254/dpdk_u
dpr$ █
```

图 7: 降低速率后通过 fwrite 写入时的结果

4 学习 LDPC 低时延译码方案

Algorithm 1. Horizontal TDMP Min-Sum algorithm

```

1: Kernel 1: Initialization
2: for all  $m \in C, n \in \Psi(m)$  do
3:    $L_{mn}^{(0)} = 0$ 
4: end for
5:  $\triangleright$  Process iter_max decoding iterations
6: for all  $t = 1 \rightarrow (\text{iter\_max})$  do
7:   Kernel 2: For each check node in the code
8:   for all  $m \in C$  do
9:      $\triangleright$  Compute  $L_{nm}$  message
10:    for all  $n \in \Psi(m)$  do
11:       $L_{nm}^{(t)} = E_n - L_{mn}^{(t-1)}$ 
12:    end for
13:     $\triangleright$  Compute  $L_{mn}$  message
14:    for all  $n \in \Psi(m)$  do
15:       $\text{sign}(L_{mn}^t) = \left[ \prod_{(n' \in \Psi(m)/n)} \text{sign}(L_{n'm}^{(t)}) \right]$ 
16:       $|L_{mn}^t| = \left[ \min_{(n' \in \Psi(m)/n)} |L_{n'm}^{(t)}| \right]$ 
17:    end for
18:     $\triangleright$  Immediately update  $E_n$ 
19:    for all  $n \in \Psi(m)$  do
20:       $E_n = L_{nm}^t + L_{mn}^t$ 
21:    end for
22:  end for
23: end for
24: Kernel 3: Hard decision
25: for all  $n \in V$  do
26:    $\hat{c}_n = \begin{cases} 0 & \text{if } E_n \leq 0 \\ 1 & \text{if } E_n > 0 \end{cases}$ 
27: end for

```

$$m / Z \times \lceil Z / Q \rceil$$

图 8: 原算法

两个问题:

1. the processor has Q SIMD processing units whereas QC-LDPC code has a Z CN structure organization;
若 $Q = 32, Z = 42$, 则利用率为 $42/64$ 。

Set index (i_{LS})	Set of lifting sizes (Z)
0	{2, 4, 8, 16, 32, 64, 128, 256}
1	{3, 6, 12, 24, 48, 96, 192, 384}
2	{5, 10, 20, 40, 80, 160, 320}
3	{7, 14, 28, 56, 112, 224}
4	{9, 18, 36, 72, 144, 288}
5	{11, 22, 44, 88, 176, 352}
6	{13, 26, 52, 104, 208}
7	{15, 30, 60, 120, 240}

图 9: 5GNRZc 取值

2. SIMD logical rotate feature and scatter & gather memory operations are unavailable to access to the Z VN elements.

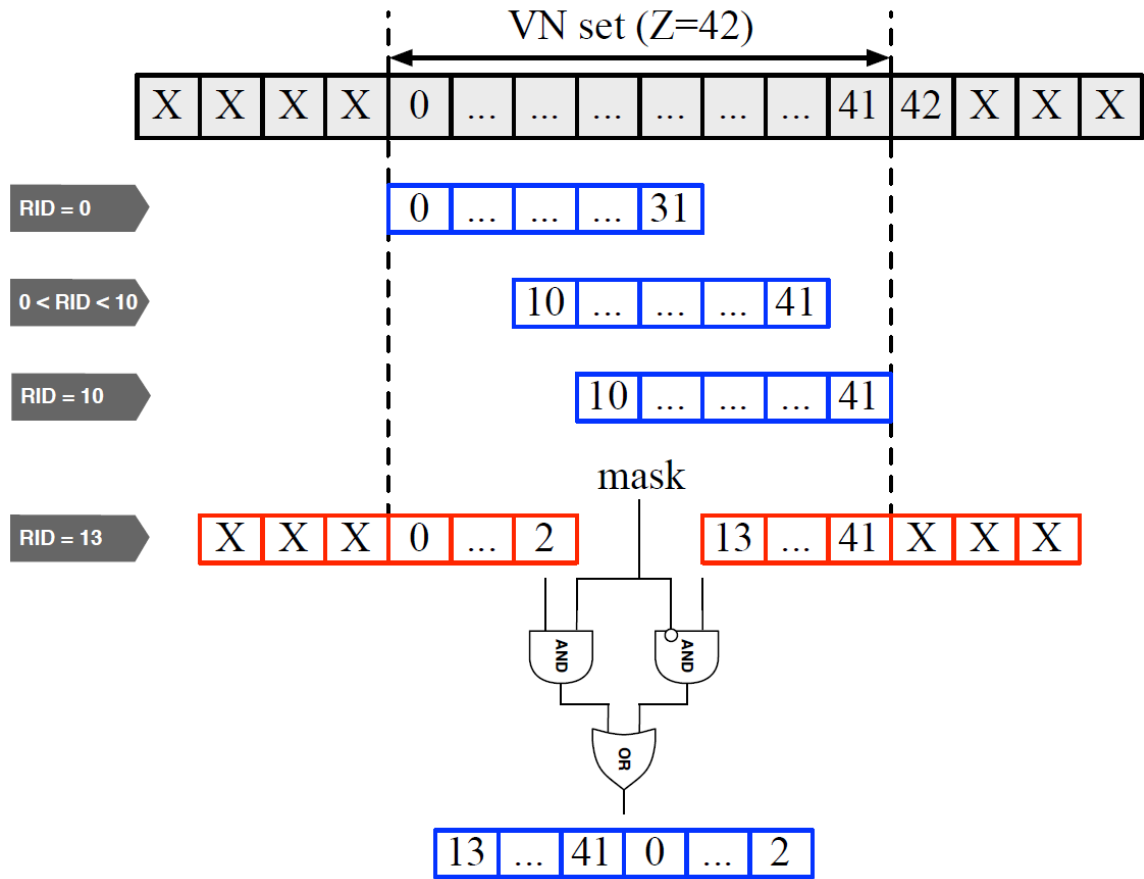


图 10: VN 接入方式 ($Z_c = 42, Q = 32$)