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

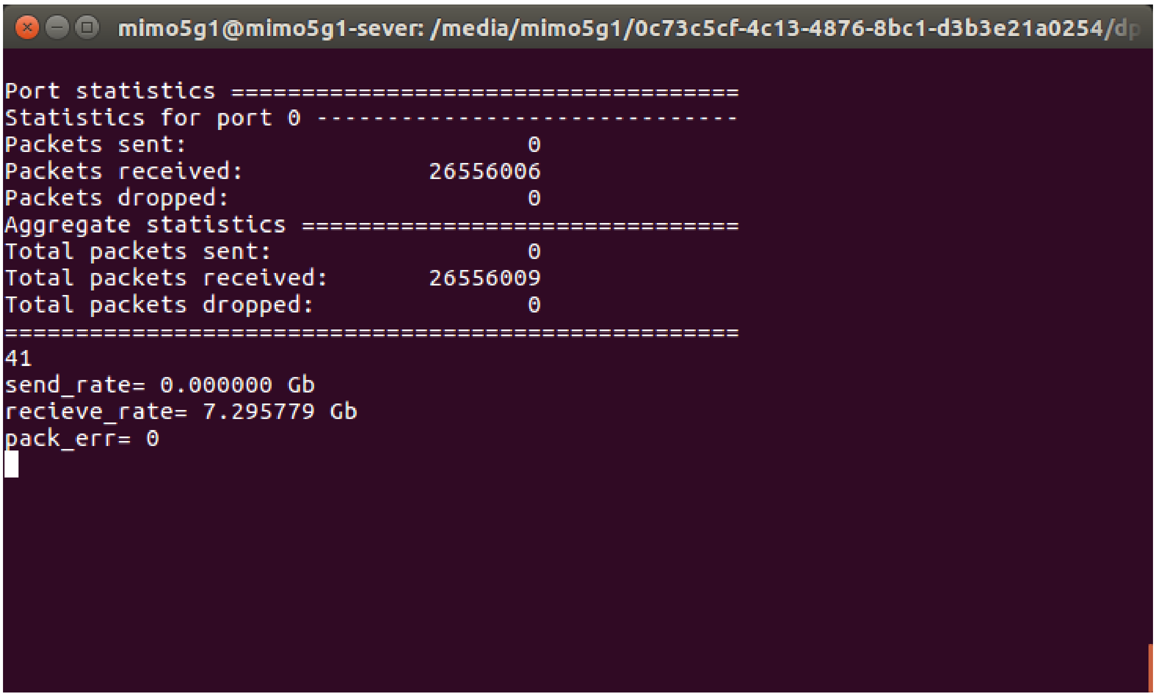

图 1: 不进行写入操作时的速率

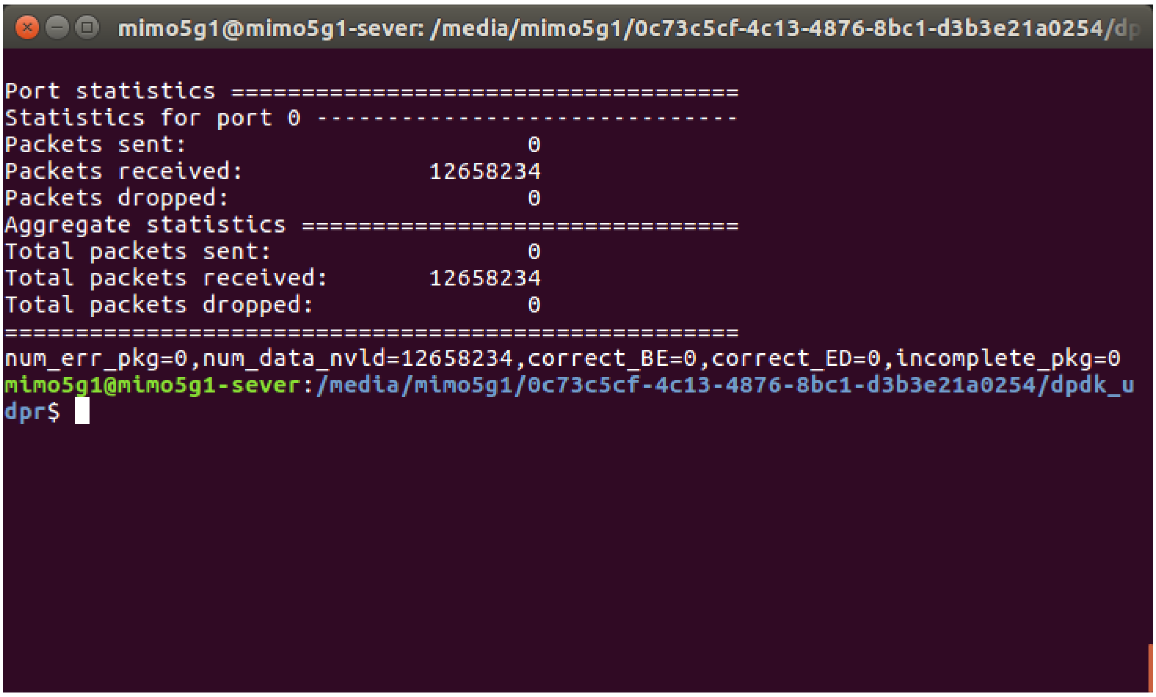

图 2: 不进行写入操作时的结果

3.2 通过 fprintf 写入

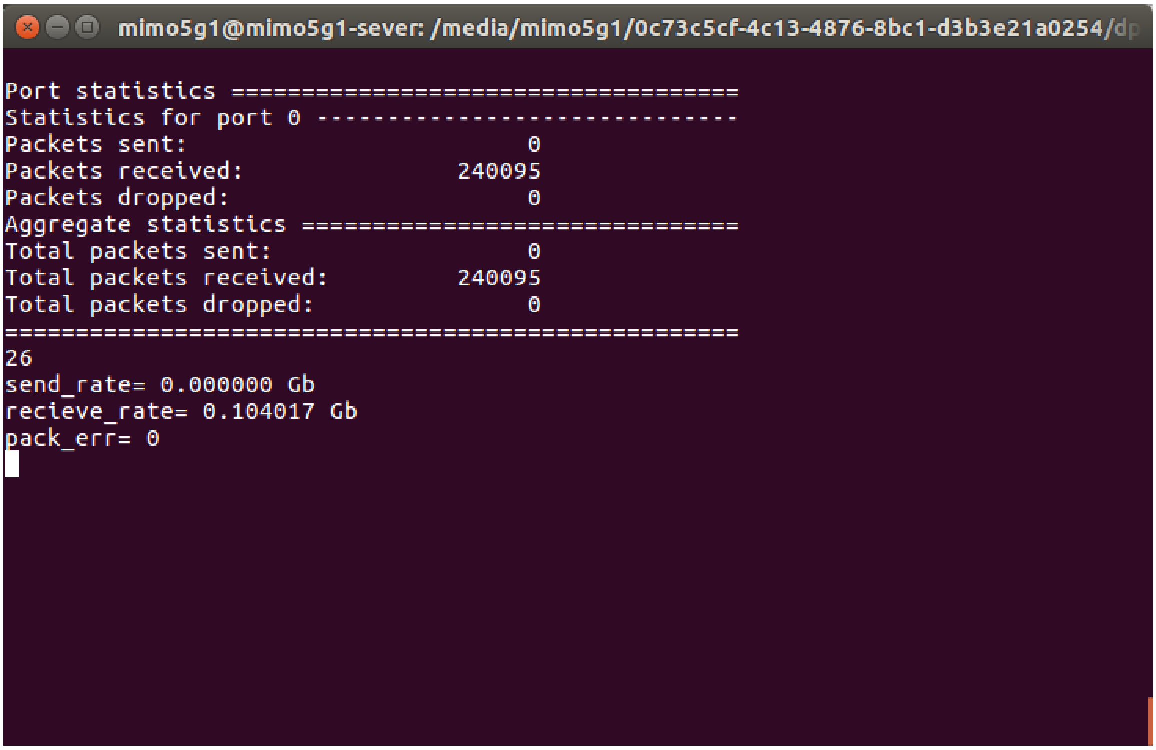

图 3: 通过 fprintf 写入时的速率

3.3 通过 fwrite 写入

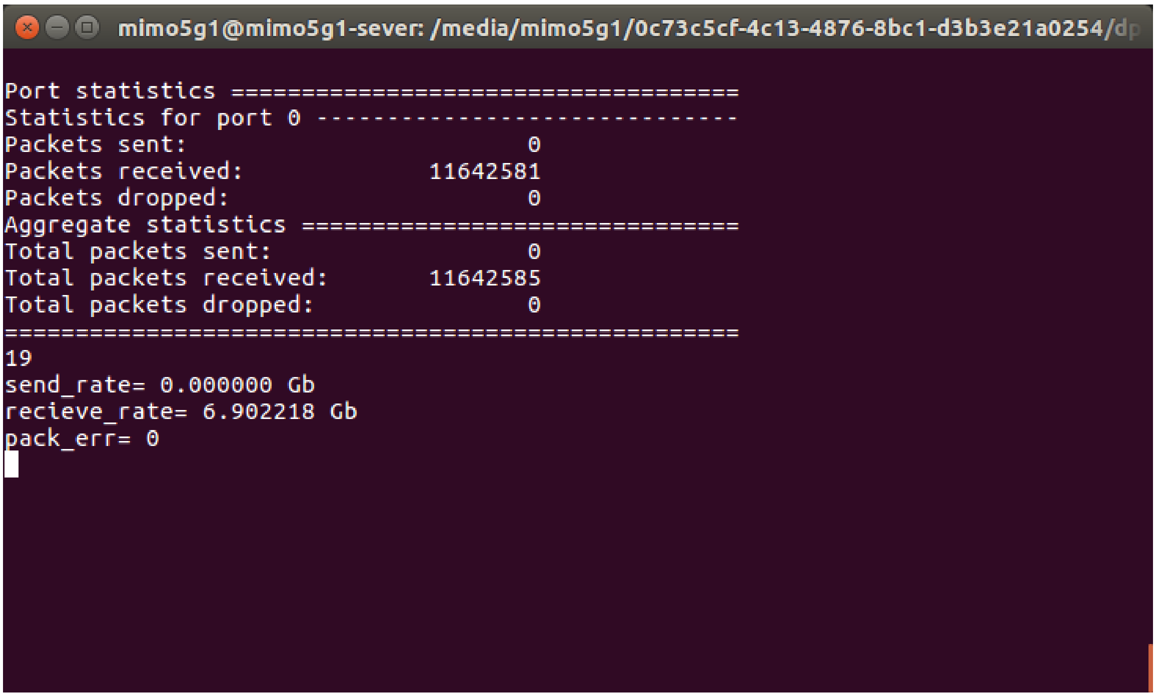

图 4: 通过 fwrite 写入时的速率

图 5: 通过 fwrite 写入时的结果

3.4 降低速率后通过 fwrite 写入

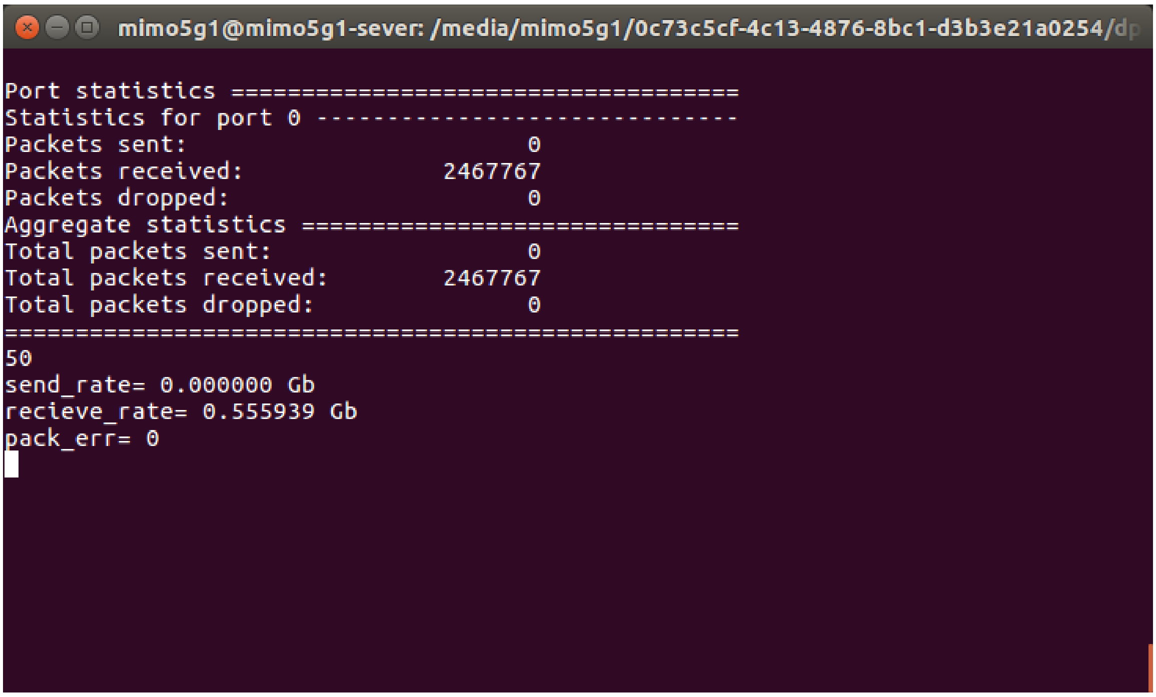

图 6: 降低速率后通过 fwrite 写入时的速率

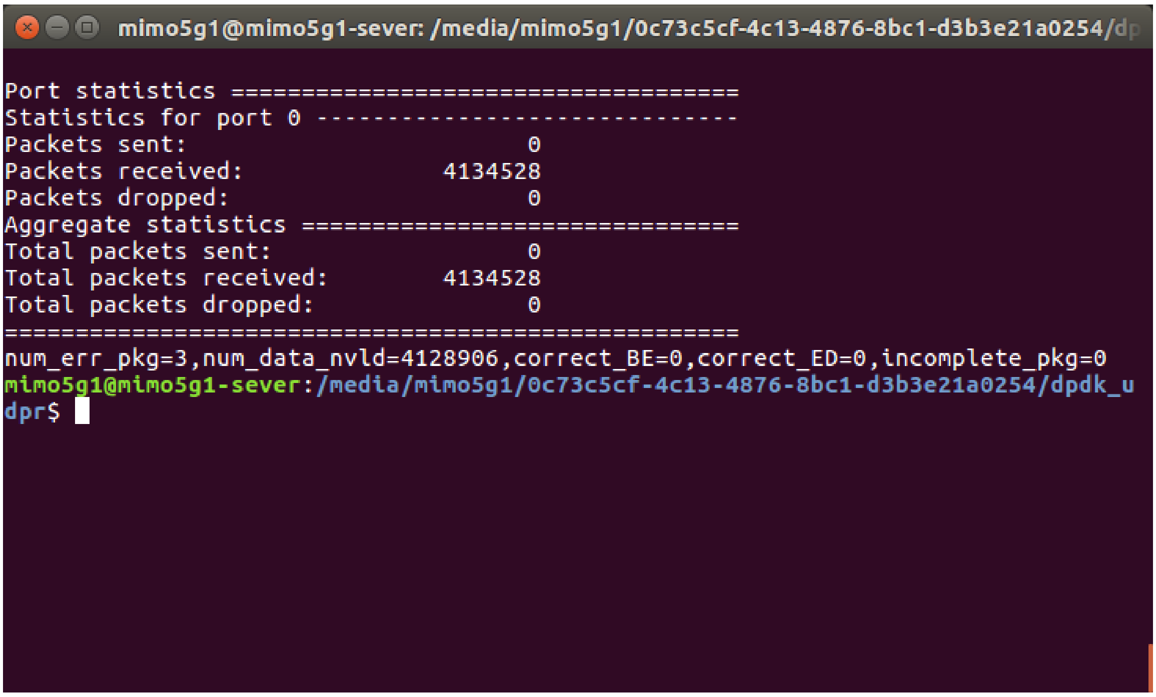

图 7: 降低速率后通过 fwrite 写入时的结果

4 学习 LDPC 低时延译码方案

Algorithm 1. Horizontal TDMP Min-Sum algorithm

Kernel 1: Initialization
for all $m \in C, n \in \Psi(m)$ **do**
  $L^{(0)}_{mn} = 0$
end for
$\triangleright$ *Process iter_max decoding iterations*
for all $t = 1 \to (iter\_max)$ **do**
  Kernel 2: For each check node in the code
  for all $m \in C$ **do** $m / Z \times \lceil Z / Q \rceil$
    $\triangleright$ *Compute L_{nm} message*
    for all $n \in \Psi(m)$ **do**
      $L^{(t)}_{nm} = E_n - L^{(t-1)}_{mn}$
    end for
    $\triangleright$ *Compute L_{mn} message*
    for all $n \in \Psi(m)$ **do**
      $sign(L^t_{mn}) = \left[\prod_{(n' \in \Psi(m)/n)} sign(L^{(t)}_{n'm})\right]$
      $|L^t_{mn}| = \left[\min_{(n' \in \Psi(m)/n)} |L^{(t)}_{n'm}|\right]$
    end for
    $\triangleright$ *Immediately update E_n*
    for all $n \in \Psi(m)$ **do**
      $E_n = L^t_{nm} + L^t_{mn}$
    end for
  end for
end for
Kernel 3: Hard decision
for all $n \in V$ **do**
  $\hat{c}_n = \begin{cases} 0 & \text{if } E_n \le 0 \\ 1 & \text{if } E_n > 0 \end{cases}$
end for

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.

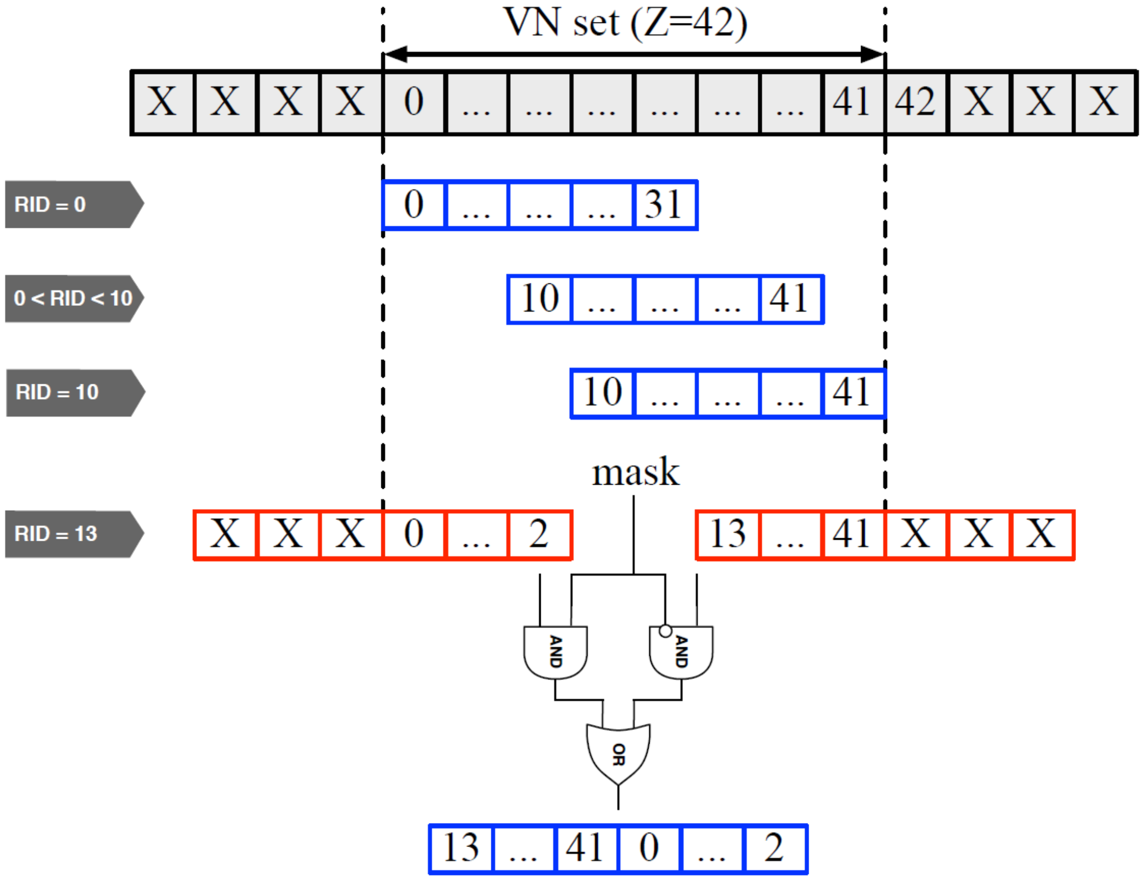

图 10: VN 接入方式 ($Z_c = 42, Q = 32$)