## 组会报告

徐益

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## 1 工作内容

- 1. Debug 连调程序并测试;
- 2. 阅读协议并修改资源映射结构。
- 3. 根据新的资源映射结构修改程序

### 2 Debug 连调程序并测试

#### 2.1 Debug 结果

MAC 层接收端读参数标识早于 PHY 层接收端写参数标识最终导致读写冲突。

#### 2.2 HARQ 测试结果

```
00006c130000
                                                                                00006c130000
4973 00006d130000
                                                                               00006d130000
4974 00006e130000
4975 00006f130000
                                                                          4975 00006f130000
                                                                          4976 000070130000
4976 000070130000
4977 000071130000
                                                                               000071130000
4978 000072130000
4979 000073130000
                                                                               000073130000
4980 000074130000
                                                                               000074130000
4981 000075130000
                                                                               000075130000
4982 000076130000
                                                                                000076130000
4984 000078130000
                                                                               000078130000
4985 000079130000
                                                                               000079130000
4986 00007a130000
                                                                               00007a130000
4988 00007c130000
                                                                                00007c130000
4989 00007d130000
                                                                               00007d130000
4990 00007e130000
                                                                               00007e130000
4991 00007f130000
                                                                                00007f130000
4992 000080130000
4993 000081130000
                                                                               000081130000
4994 000082130000
                                                                               000082130000
4995 000083130000
                                                                               000083130000
4996 000084130000
4997 000085130000
                                                                                000085130000
4998 000086130000
                                                                          4998 000086130000
4999 000087130000
                                                                               000087130000
5000 000088130000
问题 输出 调试控制台 终端
check_result:
check_result:
sem_debug get!
                ==== Test No.2850 =========
check_result:
check_result:
check_result:
check_result:
mimo5g1@mimo5g1-sever:~/5gmimo_x86/master/5gmimo/examples/mac_phy_sgl_thrd$ [
```

图 1: HARQ 测试结果

# 3 阅读协议并修改程序结构

# 3.1 正确的层映射关系

| Number of layers | Number of codewords | Codeword-to-layer mapping $i = 0,1,,M_{\text{symb}}^{\text{layer}} - 1$   |
|------------------|---------------------|---|
| 1                | 1                   | $x^{(0)}(i) = d^{(0)}(i)$ $M_{\text{symb}}^{\text{layer}} = M_{\text{symb}}^{(0)}$  |
| 2                | 1                   | $x^{(0)}(i) = d^{(0)}(2i)$<br>$x^{(1)}(i) = d^{(0)}(2i+1)$ $M_{\text{symb}}^{\text{layer}} = M_{\text{symb}}^{(0)}/2$   |
| 3                | 1                   | $x^{(0)}(i) = d^{(0)}(3i)$<br>$x^{(1)}(i) = d^{(0)}(3i+1)$ $M_{\text{symb}}^{\text{layer}} = M_{\text{symb}}^{(0)} / 3$<br>$x^{(2)}(i) = d^{(0)}(3i+2)$   |
| 4                | 1                   | $x^{(0)}(i) = d^{(0)}(4i)$<br>$x^{(1)}(i) = d^{(0)}(4i+1)$<br>$x^{(2)}(i) = d^{(0)}(4i+2)$<br>$x^{(3)}(i) = d^{(0)}(4i+3)$ $M_{\text{symb}}^{\text{layer}} = M_{\text{symb}}^{(0)} / 4$   |
| 5                | 2                   | $x^{(0)}(i) = d^{(0)}(2i)$<br>$x^{(1)}(i) = d^{(0)}(2i+1)$<br>$x^{(2)}(i) = d^{(1)}(3i)$ $M_{\text{symb}}^{\text{layer}} = M_{\text{symb}}^{(0)} / 2 = M_{\text{symb}}^{(1)} / 3$<br>$x^{(3)}(i) = d^{(1)}(3i+1)$<br>$x^{(4)}(i) = d^{(1)}(3i+2)$   |
| 6                | 2                   | $x^{(0)}(i) = d^{(0)}(3i)$<br>$x^{(1)}(i) = d^{(0)}(3i+1)$<br>$x^{(2)}(i) = d^{(0)}(3i+2)$<br>$x^{(3)}(i) = d^{(1)}(3i)$<br>$x^{(4)}(i) = d^{(1)}(3i+1)$<br>$x^{(5)}(i) = d^{(1)}(3i+2)$<br>$M_{\text{symb}}^{\text{layer}} = M_{\text{symb}}^{(0)}/3 = M_{\text{symb}}^{(1)}/3$                |
| 7                | 2                   | $x^{(0)}(i) = d^{(0)}(3i)$ $x^{(1)}(i) = d^{(0)}(3i+1)$ $x^{(2)}(i) = d^{(0)}(3i+2)$ $x^{(3)}(i) = d^{(1)}(4i)$ $x^{(4)}(i) = d^{(1)}(4i+1)$ $x^{(5)}(i) = d^{(1)}(4i+2)$ $x^{(6)}(i) = d^{(1)}(4i+3)$ $M_{\text{symb}}^{\text{layer}} = M_{\text{symb}}^{(0)} / 3 = M_{\text{symb}}^{(1)} / 4$ |
| 8                | 2                   | $x^{(0)}(i) = d^{(0)}(4i)$ $x^{(1)}(i) = d^{(0)}(4i+1)$ $x^{(2)}(i) = d^{(0)}(4i+2)$ $x^{(3)}(i) = d^{(0)}(4i+3)$ $x^{(4)}(i) = d^{(1)}(4i)$ $x^{(5)}(i) = d^{(1)}(4i+1)$ $x^{(6)}(i) = d^{(1)}(4i+2)$ $x^{(7)}(i) = d^{(1)}(4i+3)$ $x^{(1)}(4i+3)$ $x^{(1)}(4i+3)$                             |

图 2: Codeword-to-layer mapping for spatial multiplexing

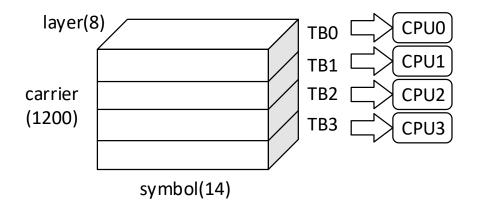


图 3: 原结构

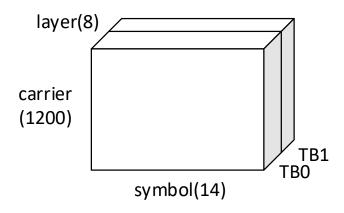


图 4: 协议要求结构

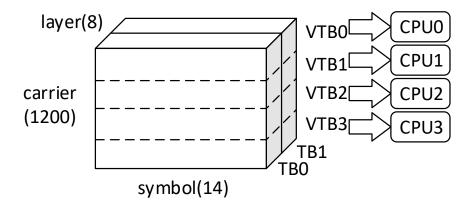


图 5: 修改后结果

#### 4 根据新的资源映射结构修改程序

#### 4.1 用多线程数据结构编写单线程程序

```
(indx tb = 0; indx tb < tb num; indx tb++)
for (indx vtb = 0; indx vtb < MAX VTB NUM; indx vtb++)
    for (indx cb = 0; indx cb < encoder t[indx tb][indx vtb].C; indx cb++)
        gettimeofday(&tbin, NULL);
        nr15 ldpc simd t *he = &encoder t[indx tb][indx vtb];
        nr15 fec ldpc simd decbs scb(tx data[indx tb][indx vtb], he, he->cbs bits, indx cb);
        gettimeofday(&tend, NULL);
        time_filter.tx_cbs += (tend.tv_sec - tbin.tv_sec) + (tend.tv_usec - tbin.tv_usec) / le6;
        gettimeofday(&tbin, NULL);
        nr15 fec ldpc simd encoder scb(he->cbs bits + indx cb * he->K, he,
                                       he->coded bits + indx cb * (he->N + 2 * he->Z c));
        gettimeofday(&tend, NULL);
        time filter.tx encode += (tend.tv sec - tbin.tv sec) + (tend.tv usec - tbin.tv usec) / le6;
        gettimeofday(&tbin, NULL);
        nr15 fec ldpc simd rate matching scb(he->coded bits, he, rmed bits[indx tb][indx vtb], indx cb);
        gettimeofday(&tend, NULL);
        time_filter.tx_rm += (tend.tv_sec - tbin.tv_sec) + (tend.tv_usec - tbin.tv_usec) / le6;
```

图 6: 发送端的单线程模块

```
(indx vtb = 0; indx vtb < MAX VTB NUM; indx vtb++)
if (indx \ vtb == 0)
   start sb = (CARR NUM - vld carr num) / SB CARR NUM;
for (indx sb = start sb; indx sb < VTB SB NUM; indx sb++)
    nr5g_get_sb_sig(rx_sb_sig[indx_vtb][indx_sb], packed_rx_sig, SYM_NUM, CARR_NUM, RX_ANT_NUM,
                    indx vtb * VTB SB NUM + indx sb, MAX VTB NUM * VTB SB NUM);
    gettimeofday(&tbin, NULL);
    est_sigma2[indx_vtb][indx_sb] = ChannelEstimator_LS(rx_sb_sig[indx_vtb][indx_sb],
                                                       pilot_sb_sym[total_layer_num - 1][indx_vtb * VTB_SB_NUM + indx_s
                                                       pilot symb indx, total layer num, RX ANT NUM, SB CARR NUM,
                                                       PILOT SYM NUM, SYM NUM, inter freq[total layer num - 1],
                                                       est ch[indx vtb][indx sb]);
    gettimeofday(&tend, NULL);
    time_filter.rx_chest += (tend.tv_sec - tbin.tv_sec) + (tend.tv_usec - tbin.tv_usec) / 1e6;
    gettimeofday(&tbin, NULL);
    CalSymb mmse(est ch[indx vtb][indx sb], rx sb sig[indx vtb][indx sb], RX ANT NUM, SB CARR NUM,
                 total layer num, SYM NUM, sqrt(est sigma2[indx vtb][indx sb]), 1, 1,
                 detected sig[indx vtb][indx sb], symb var[indx vtb][indx sb],
                 detected_sinr[indx_vtb][indx_sb]);
    gettimeofday(&tend, NULL);
    time_filter.rx_sigdtct += (tend.tv_sec - tbin.tv_sec) + (tend.tv_usec - tbin.tv_usec) / 1e6;
```

图 7: 接收端的单线程模块