Lab3 Qos

姓名：胡昊源

学号：518021910269

优化目标

1、flow0 达到指定带宽

flow0 指定带宽 1.28Gbps = 160,000,000Bps

模拟总时间为10 * 1,000,000ns = 0.01s

所以输出结果中 flow0 的 pass 要接近1,600,000，

2、每个 flow 的带宽分配达到指定比例

其他 flow 要与 flow0 达成 8：4：2：1 的比例

针对 srTCM 的测试

大的 cbs 和 ebs

参数如下所示：

flow_id	cir	cbs	ebs
0	160000000	640000	1728000
1	80000000	320000	864000
2	40000000	160000	432000
3	20000000	80000	216000

cir 最大为 1280000000 / 8 = 160000000，

flow_id[0] = 160000000，

flow_id[n] 按照 8：4：2：1 的比例依次减少，

结果如下所示：

```
os@ubuntu:~/NetWorkTool/dpdk/examples/lab3/build$ sudo ./qos-lab
EAL: Detected 2 lcore(s)
EAL: Detected 1 NUMA nodes
EAL: Detected shared linkage of DPDK
EAL: Multi-process socket /var/run/dpdk/rte/mp_socket
EAL: Selected IOVA mode 'PA'
EAL: No available 1048576 kB hugepages reported
EAL: Probing VFIO support...
EAL: VFIO support initialized
EAL:   Invalid NUMA socket, default to 0
EAL:   Invalid NUMA socket, default to 0
EAL: No legacy callbacks, legacy socket not created
fid: 0, send: 1727823, pass: 410259
fid: 1, send: 1621032, pass: 985848
fid: 2, send: 1632324, pass: 833453
fid: 3, send: 1659307, pass: 442443
```

结论：cbs 和 ebs 成倍减少，其通过个数也成相应的倍数减少，例 fid2 和 fid3 相比，前者通过个数大约是后者两倍。

小的 cbs 和 ebs

参数如下所示：

flow_id	cir	cbs	ebs
0	160000000	64000	172800
1	80000000	32000	86400
2	40000000	16000	43200
3	20000000	8000	21600

结果如下所示：

```
os@ubuntu:~/NetWorkTool/dpdk/examples/lab3/build$ sudo ./qos-lab
EAL: Detected 2 lcore(s)
EAL: Detected 1 NUMA nodes
EAL: Detected shared linkage of DPDK
EAL: Multi-process socket /var/run/dpdk/rte/mp_socket
EAL: Selected IOVA mode 'PA'
EAL: No available 1048576 kB hugepages reported
EAL: Probing VFIO support...
EAL: VFIO support initialized
EAL:   Invalid NUMA socket, default to 0
EAL:   Invalid NUMA socket, default to 0
EAL: No legacy callbacks, legacy socket not created
fid: 0, send: 1558016, pass: 1233853
fid: 1, send: 1643452, pass: 850833
fid: 2, send: 1593058, pass: 426176
fid: 3, send: 1589065, pass: 217774
```

结论：cbs 和 ebs 被调低一个数量级，在 fid1 丢包更多，可能是因为 cbs 和 ebs 的降低，使得被标记为红色的包数量增多，从而丢包变多。

针对 WRED 的测试

策略一：绿色、黄色包全部进入队列，红色包全部丢掉

参数如下所示：

color	min_th	max_th	mxp_inv
GREEN	1022	1023	10
YELLOW	1022	1023	10
RED	0	1	10

结果如下所示：

```
os@ubuntu:~/NetWorkTool/dpdk/examples/lab3/build$ sudo ./qos-lab
[sudo] os 的密码：
EAL: Detected 2 lcore(s)
EAL: Detected 1 NUMA nodes
EAL: Detected shared linkage of DPDK
EAL: Multi-process socket /var/run/dpdk/rte/mp_socket
EAL: Selected IOVA mode 'PA'
EAL: No available 1048576 kB hugepages reported
EAL: Probing VFIO support...
EAL: VFIO support initialized
EAL:   Invalid NUMA socket, default to 0
EAL:   Invalid NUMA socket, default to 0
EAL: No legacy callbacks, legacy socket not created
fid: 0, send: 1348681, pass: 1122630
fid: 1, send: 1357605, pass: 848796
fid: 2, send: 1339953, pass: 426792
fid: 3, send: 1356249, pass: 220134
```

策略二：绿色、黄色包部分进入队列，红色包全部丢掉

参数如下所示：

color	min_th	max_th	mxp_inv
GREEN	62	63	10
YELLOW	62	63	10
RED	0	1	10

结果如下所示：

```
os@ubuntu:~/NetWorkTool/dpdk/examples/lab3/build$ sudo ./qos-lab
EAL: Detected 2 lcore(s)
EAL: Detected 1 NUMA nodes
EAL: Detected shared linkage of DPDK
EAL: Multi-process socket /var/run/dpdk/rte/mp_socket
EAL: Selected IOVA mode 'PA'
EAL: No available 1048576 kB hugepages reported
EAL: Probing VFIO support...
EAL: VFIO support initialized
EAL:   Invalid NUMA socket, default to 0
EAL:   Invalid NUMA socket, default to 0
EAL: No legacy callbacks, legacy socket not created
fid: 0, send: 1566995, pass: 419097
fid: 1, send: 1564614, pass: 688762
fid: 2, send: 1619944, pass: 525488
fid: 3, send: 1684207, pass: 322990
```

结论：由于限制了绿色和黄色包的长度，使得较长的绿色和黄色包也被丢掉，所以整体的通过率降低了。

策略三：所有颜色包全部进入队列

参数如下所示：

color	min_th	max_th	mxp_inv
GREEN	1022	1023	10
YELLOW	1022	1023	10
RED	1022	1023	10

结果如下所示：

```
os@ubuntu:~/NetWorkTool/dpdk/examples/lab3/build$ sudo ./qos-lab
EAL: Detected 2 lcore(s)
EAL: Detected 1 NUMA nodes
EAL: Detected shared linkage of DPDK
EAL: Multi-process socket /var/run/dpdk/rte/mp_socket
EAL: Selected IOVA mode 'PA'
EAL: No available 1048576 kB hugepages reported
EAL: Probing VFIO support...
EAL: VFIO support initialized
EAL:   Invalid NUMA socket, default to 0
EAL:   Invalid NUMA socket, default to 0
EAL: No legacy callbacks, legacy socket not created
fid: 0, send: 1481273, pass: 1481273
fid: 1, send: 1455896, pass: 1455896
fid: 2, send: 1516723, pass: 1516723
fid: 3, send: 1480323, pass: 1480323
```

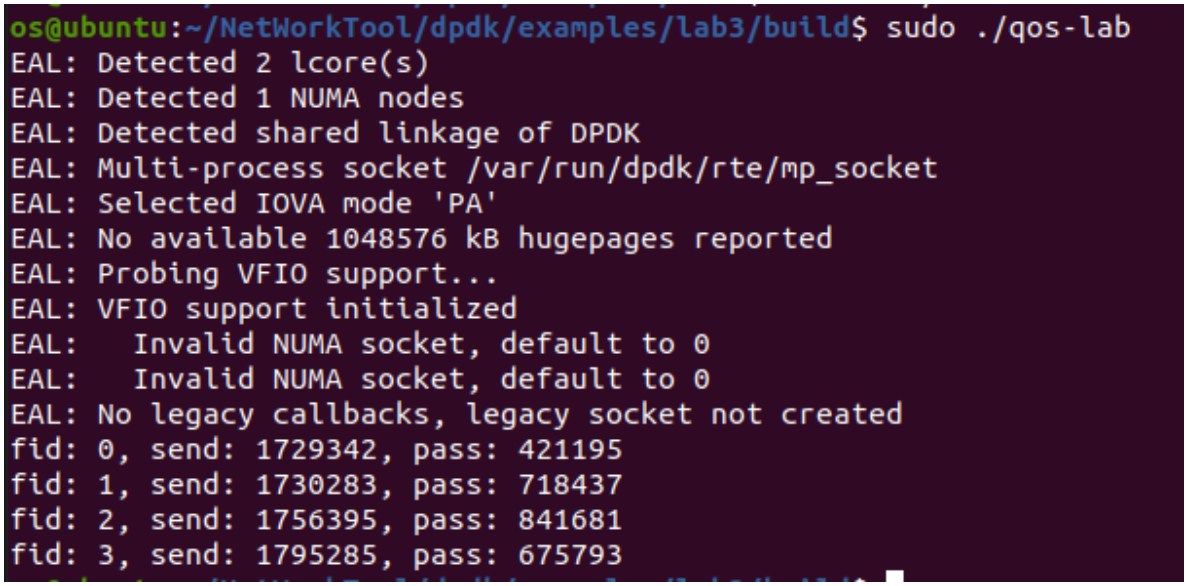
结论：由于没有丢包，所以全部通过。

策略四：所有包部分进入队列

参数如下所示：

color	min_th	max_th	mxp_inv
GREEN	62	63	10
YELLOW	62	63	10
RED	62	63	10

结果如下所示：



结论：由于所有包都依据包长度进入队列，所以包通过率只和包的长度有关，和其标记的颜色无关

我用到的 DPDK API

- `rte_panic`: 检测到错误时报错并终止程序
- `rte_meter_srtcm_config`: 用参数初始化srtcm配置，其余参数分别为带宽,突发尺寸，额外突发尺寸
- `rte_red_config_init`: 用参数初始化red配置，其余参数分别为过滤器权重的对数，最小队列阈值，最大队列阈值,最大标记概率倒数
- `rte_red_rt_data_init`: 用参数初始化red数据
- `rte_meter_srtcm_color_blind_check`: 根据srtcm的配置标记包的颜色,以CBS和EBS作为阈值
- `rte_red_mark_queue_empty`: 清空red算法的包队列
- `rte_red_enqueue`: 根据red的配置决定是进队还是丢包
- `rte_get_tsc_hz`:获得时钟频率
- `rte_get_tsc_cycles`:获得当前的时钟周期