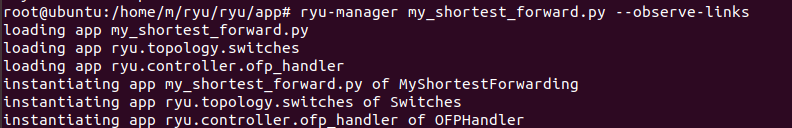
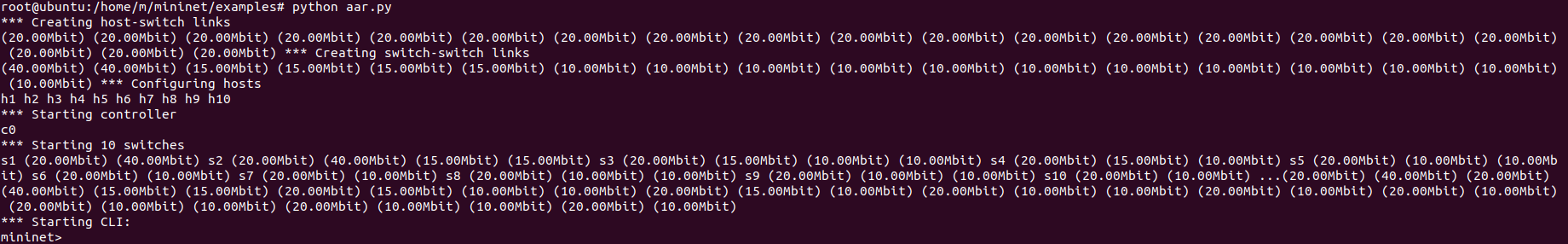
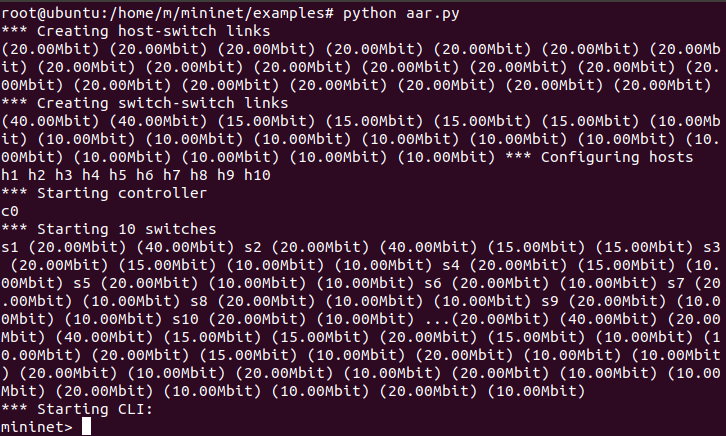
**最短路径路由**

1. Ryu连接拓扑网络正常：

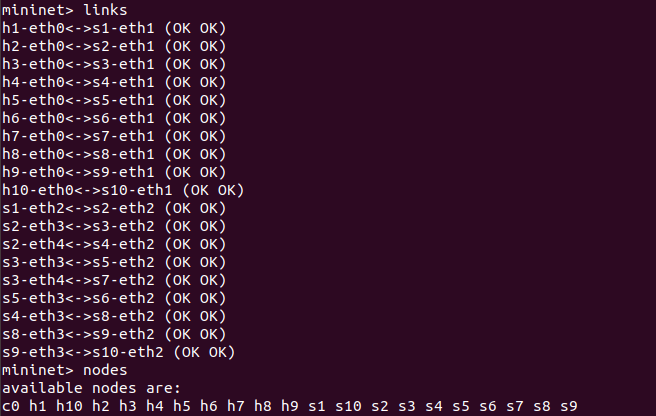


2、aar.py 拓扑创建成功：





1. 查看链路中状态信息：



3、根据3，模拟链路中用户随机信息：

xterm s1 进入到终端：



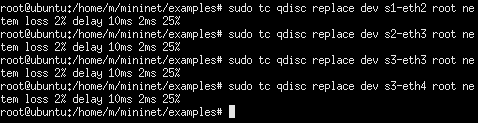
运行如下命令：

sudo tc qdisc replace dev s1-eth2 root netem loss 2% delay 10ms 2ms 25%

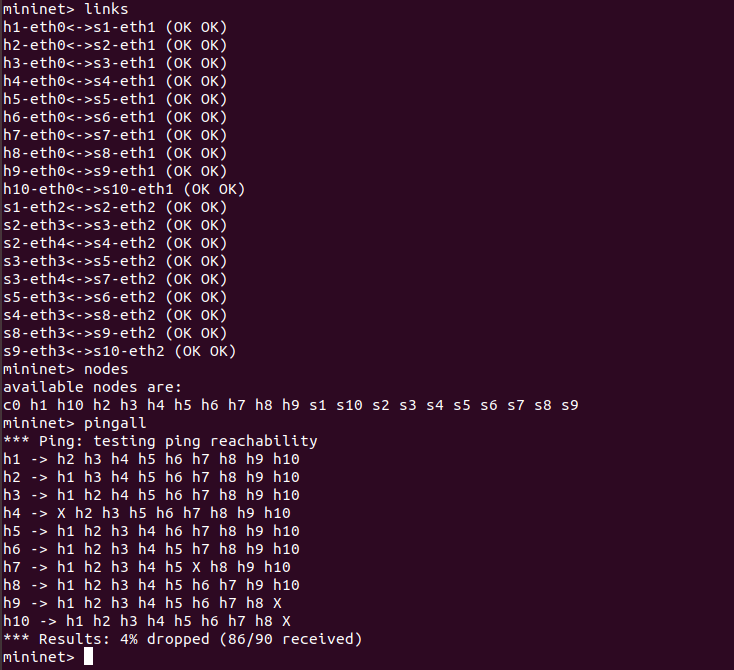
sudo tc qdisc replace dev s2-eth3 root netem loss 2% delay 10ms 2ms 25%

sudo tc qdisc replace dev s3-eth3 root netem loss 2% delay 10ms 2ms 25%

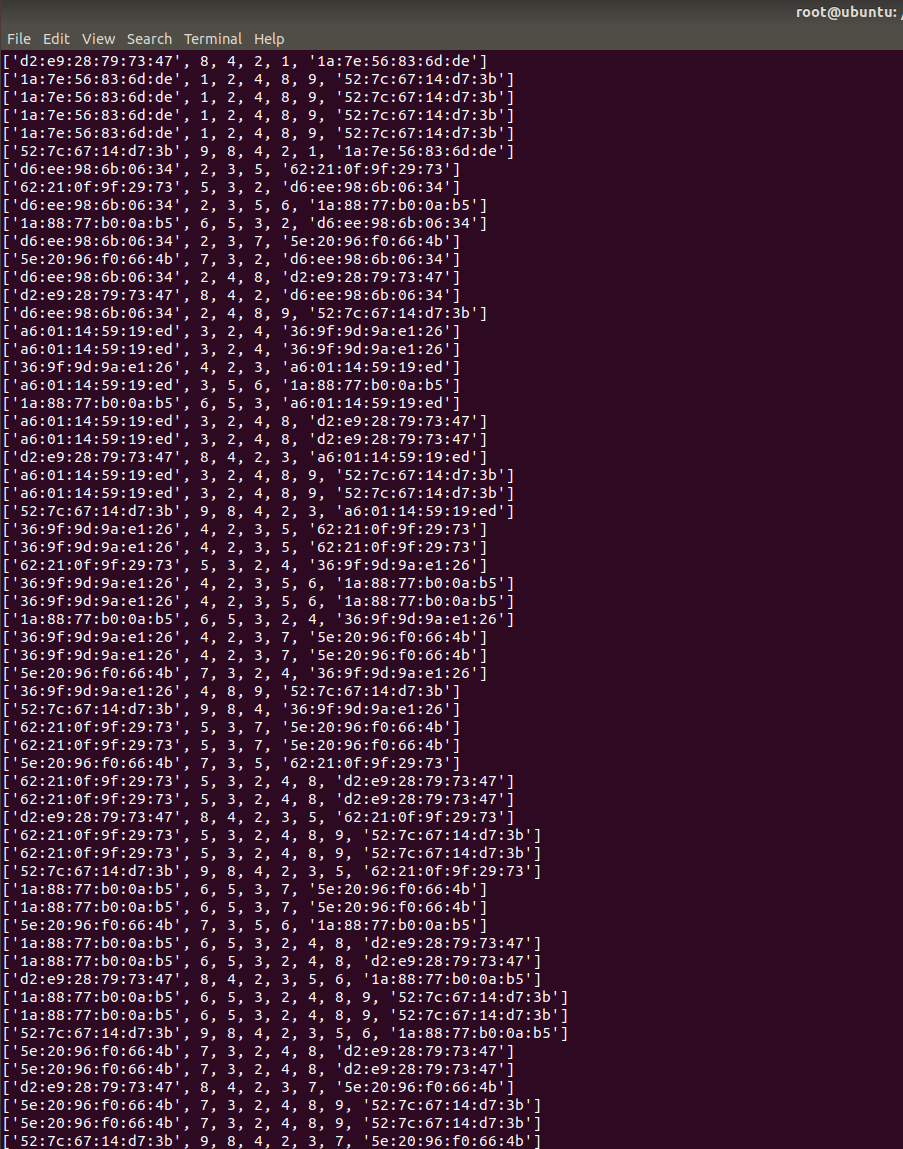
sudo tc qdisc replace dev s3-eth4 root netem loss 2% delay 10ms 2ms 25%



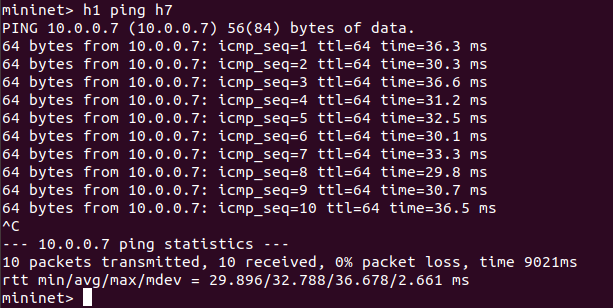
4、拓扑链路、节点以及pingall信息：



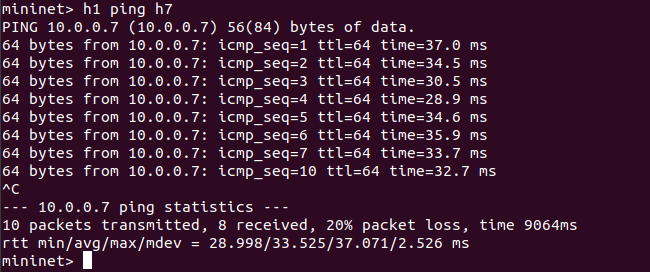
5、Ryu控制器中链路路径信息：



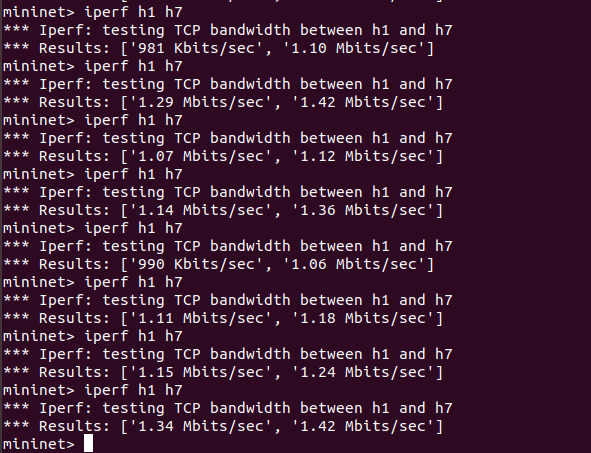
6、h1 ping h7 测时延：



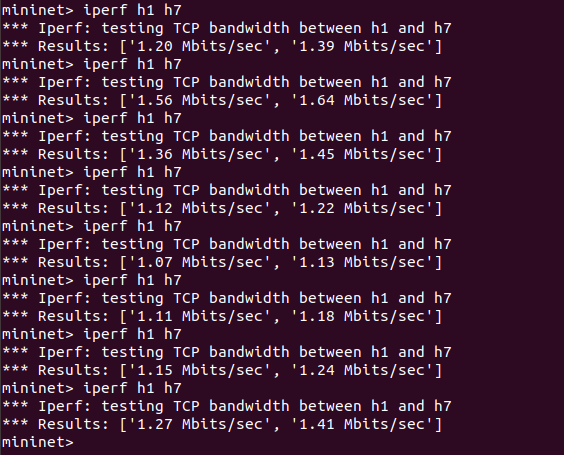
再ping一次：



7、iperf h1 h7 测吞吐量：

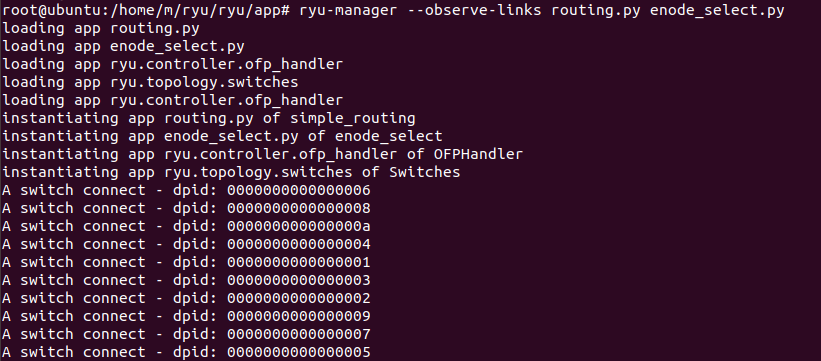


再测一次：

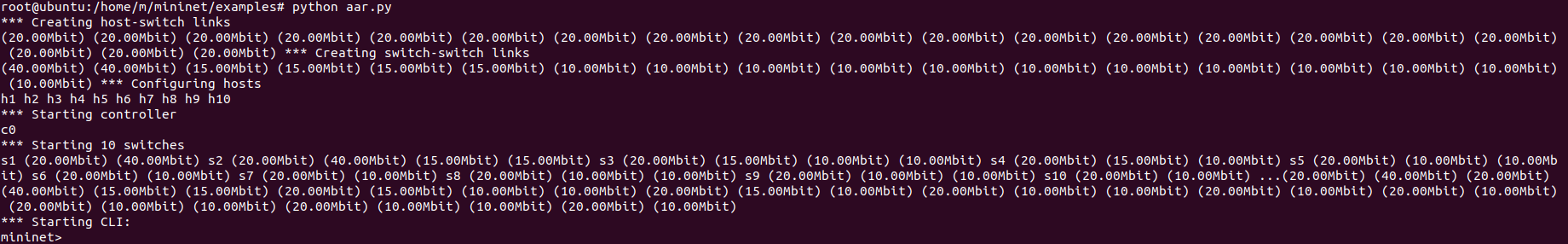


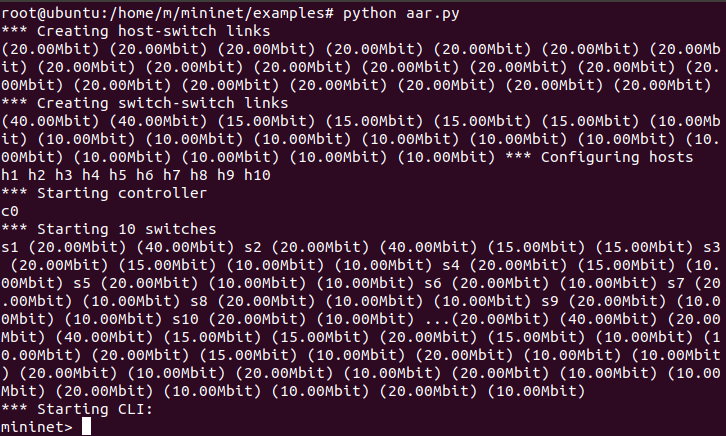
**强化学习路由**

1、Ryu连接拓扑网络正常：

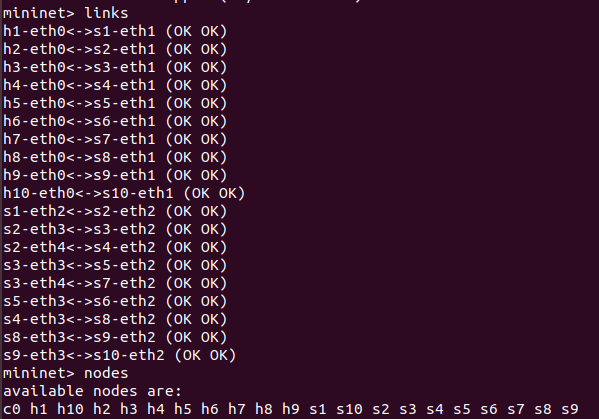


1. aar.py 拓扑创建成功：





3、查看链路中状态信息：



1. 根据3，模拟链路中用户随机信息：

xterm s1 进入到终端：



运行如下命令：

sudo tc qdisc replace dev s1-eth2 root netem loss 2% delay 10ms 2ms 25%

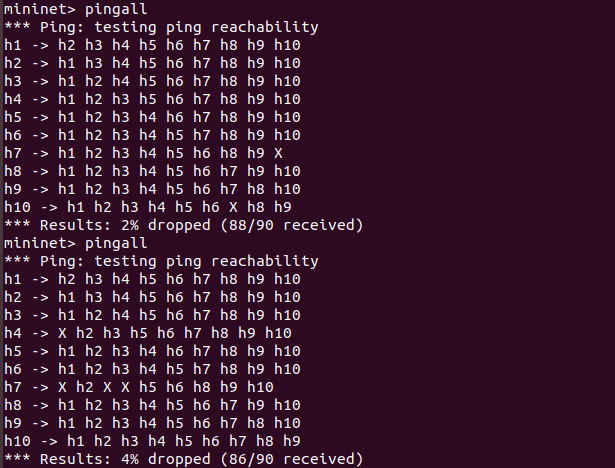
sudo tc qdisc replace dev s2-eth3 root netem loss 2% delay 10ms 2ms 25%

sudo tc qdisc replace dev s3-eth3 root netem loss 2% delay 10ms 2ms 25%

sudo tc qdisc replace dev s3-eth4 root netem loss 2% delay 10ms 2ms 25%

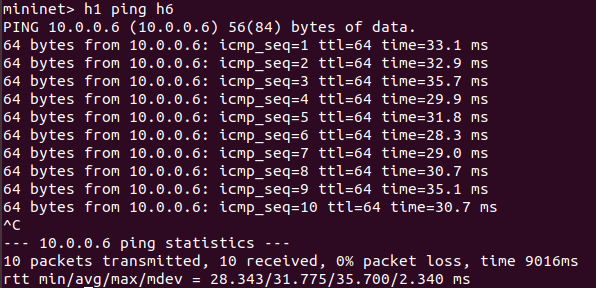


1. pingall

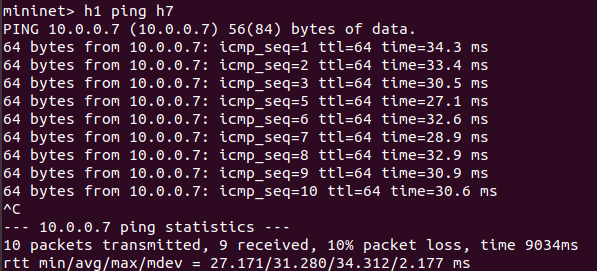


5、RL时延

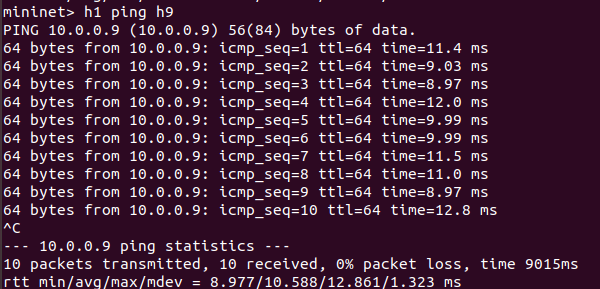
h6



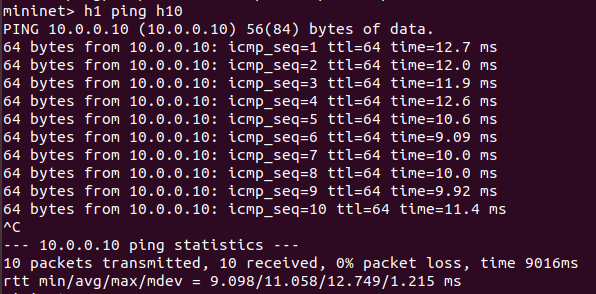
h7



h9



h10

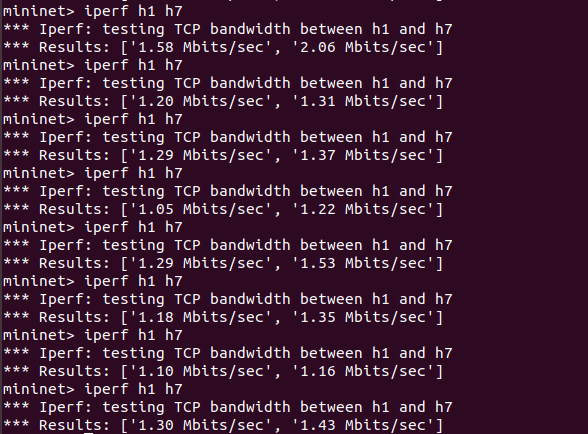


6、RL带宽

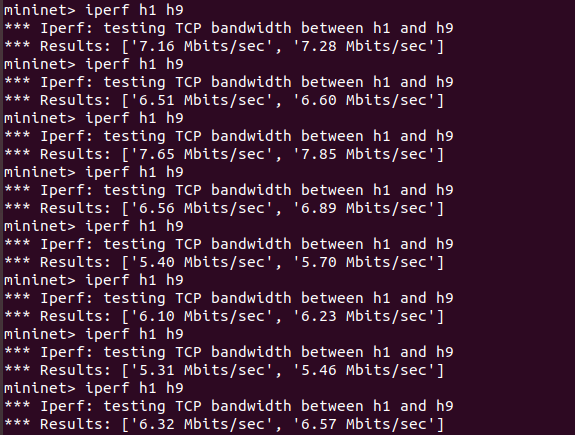
h6



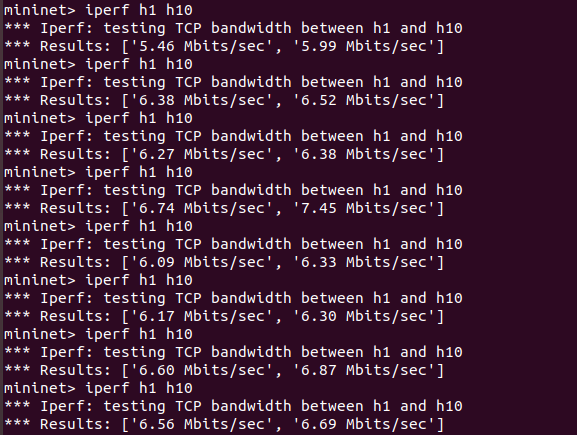
h7



h9

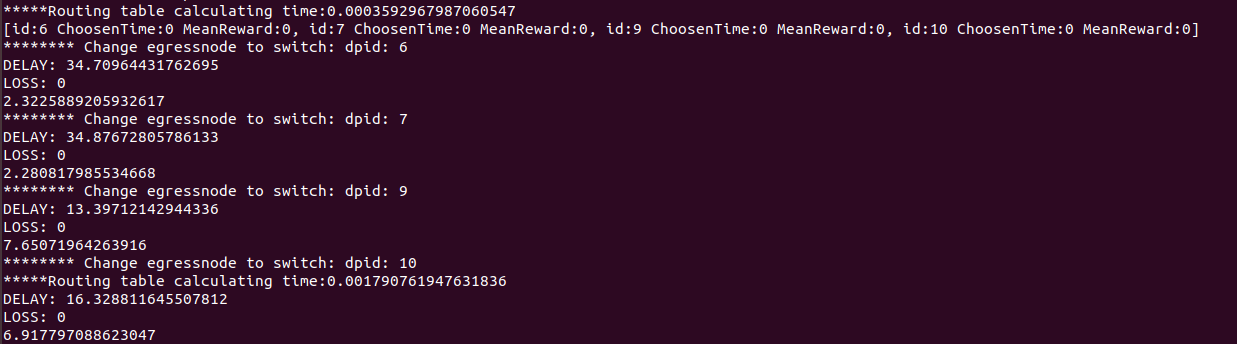


h10



7、运行时ryu

前期工作：



最后两轮循环：

