Report

Assignment 2

Language: python 3.5.3

1. Explanation of data structure:

We consider weighted undirected graph to represent the network topology.

- For single link information.

we create a dictionary `self.TOPOLOGY_FILE_DICT = {}` to restore the delay, capacity, active virtual circuits to the capacity, and the ratio of its current number of active virtual circuits to the capacity in both ways.

For example:

```
A B 30 20          ('AB', [30, 20, 0, 0])
                   ('BA', [30, 20, 0, 0])
```

- For the relationships between each hop

We create a dictionary `self.Graph = defaultdict(list)` to restore linked successors of each hops like:
```
('A', ['B', 'C', 'H'])
('B', ['A', 'C', 'I'])
```
.

In conclusion, we define two python dictionaries to compose a weighted undirected graph. It is the best and efficient way to represent network topology in python.

2. Comparison of the performance for three routing protocols

Default packet rate: 2

| Network scheme	Routing scheme	Number of virtual connection requests	Number of packets	Number of Successfully routed packets	Percentage of Successfully routed packets	Number of blocked packets	Percentage of blocked packets	Average number of hops	Average Propagation delay (ms)
packet	SHP	5884	355091	336663	94.81	18428	5.19	2.63	163.87
	SDP	5884	355091	337318	94.99	17773	5.01	3.36	139.53
	LLP	5884	355091	355055	99.99	36	0.01	3.29	202.13
circuit	SHP	5884	355091	323865	91.21	31228	8.79	2.66	166.58
	SDP	5884	355091	322553	90.84	32538	9.16	3.31	140.21
	LLP	5884	355091	349444	98.41	5647	1.59	4.03	249.08

3. Explanation of the performance results

- No matter what network scheme we selected:
1. The SHP protocol will cost the least average number of hops.
2. The SDP protocol will have the shortest average propagation delay.
3. The LLP protocol will emerge the smallest percentage of blocked requests.

- Virtual packet network take a better performance than virtual circuit network because in VP network all the packets were transmitted independently while in VC network, they keep the same path according to the routing algorithms.

4. Explanation, Plots for performance evaluation of VP network

Percentage of Successfully routed packets

	1	2	3	4	5
SHP	94.86	94.78	94.78	94.81	94.95
SDP	95.08	94.99	94.97	94.96	94.96
LLP	99.99	99.99	99.99	99.99	99.99
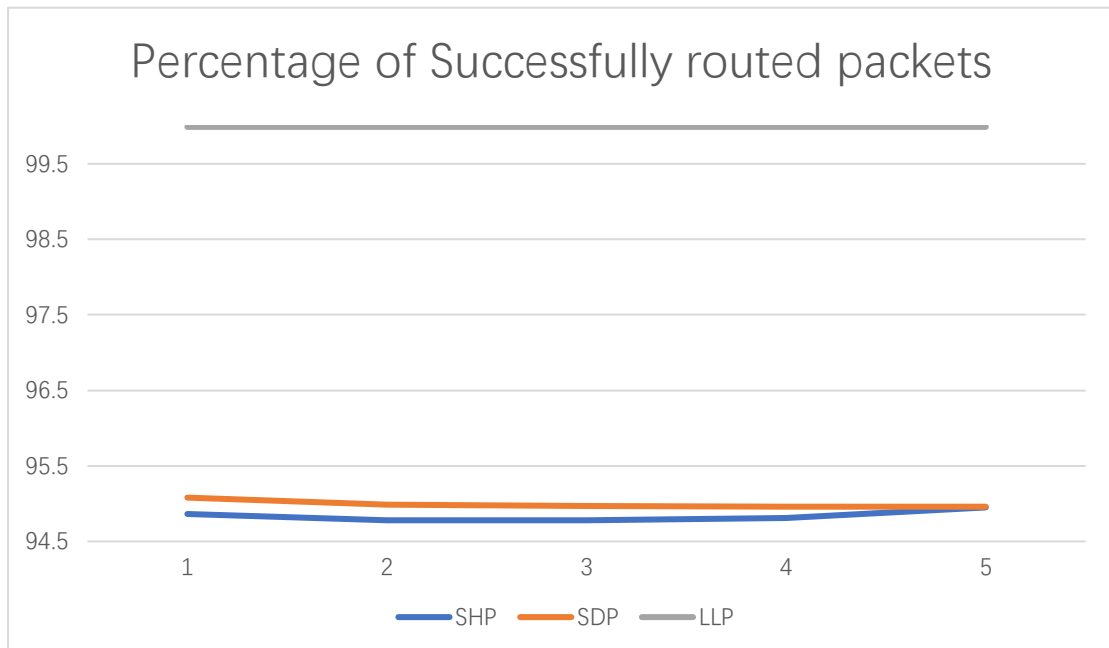
As we can observe from the plots above, with the increasing of the packet rate, the percentage of successfully routed packets of SHP, SDP, LLP remain unchanged and change can be ignored.

Average number of hops

	1	2	3	4	5
SHP	2.63	2.63	2.63	2.63	2.63
SDP	3.36	3.36	3.36	3.36	3.36
LLP	3.35	3.29	3.28	3.26	3.25

Average number of hops
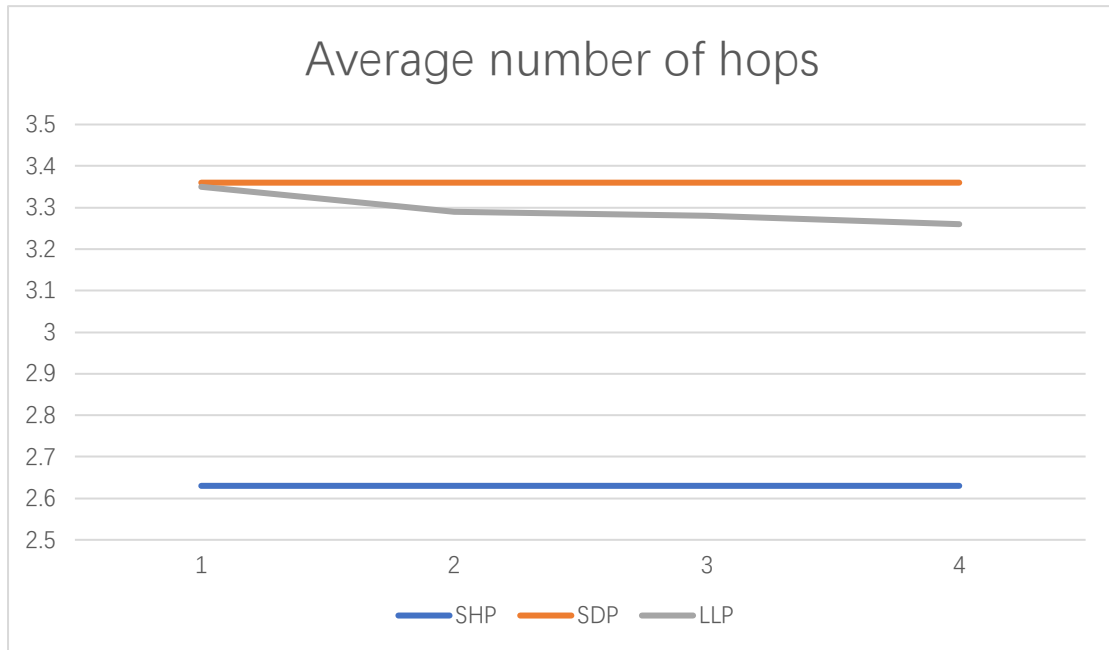
As we can observe from the plots above, with the increasing of the packet rate, the average number of hops of SHP, SDP remain constant, however, the average number of hops of LLP take a slightly decrease.

Average Propagation delay

	1	2	3	4	5
SHP	164.38	163.84	163.76	163.68	164.63
SDP	139.55	139.53	139.48	139.55	139.61
LLP	205.75	201.94	201.31	199.92	199.65

Average Propagation delay
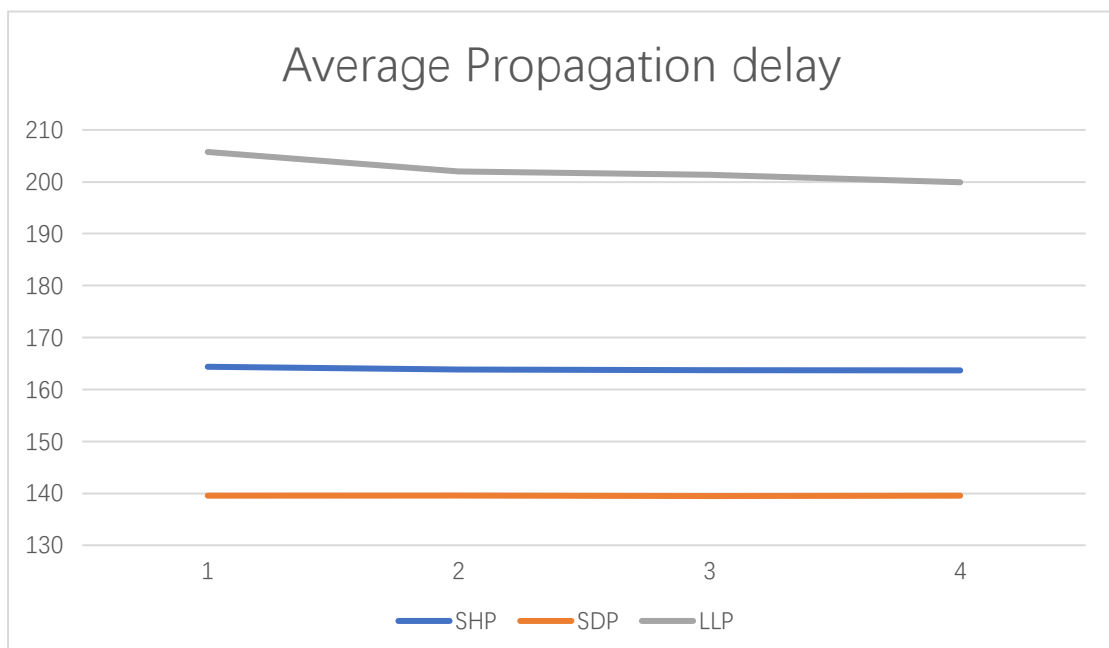
As we can observe from the plots above, with the increasing of the packet rate, the average propagation delay of SHP, SDP remain unchanged, however, the average propagation delay of LLP take a slightly decrease.

In conclusion, the packet rate does not have some obvious effect on packet transmission of three routing protocols since it has a little influence of link conditions.

5. Mandatory screencast Demo
   https://www.youtube.com/watch?v=opiybaLWwEQ&feature=youtu.be