COMP9331 Computer Network and Applications

Assessment 2 Report

Topic : RoutingPerformance

Student ID :   z5123906   z5110172

Student Name : Zhi He   Weitao Wang

COMP 3331/9331 Assessment 2

Zhi He   z5123906

Weitao Wang z5110172

1.Explanation on the data structure(s)

Essentially, three object oriented classes , graph , vertex and edge, are implemented to represent the internal network topology.

Data structure details:

class **graph** {numVertices, [vertex]},

class **vertex** {name, [connected ,neighbor]}

class **edge** attribute: delay, capacity, used capacity, finishing time of current connections

2.A tabulated summary of the comparison of the performance metrics

Performance Metrics(CIRCUIT)	SHP	SDP	LLP
Packet Rate	1	1	1
total number of virtual circuit requests	5884	5884	5884
total number of packets	181951	181951	181951
number of successfully routed packets	161579	165267	178867
percentage of successfully routed packets	88.80	90.83	98.31
number of blocked packets	20372	16684	3084
percentage of blocked packets	11.20	9.17	1.69
average number of hops per circuit	2.65	3.31	4.03
average cumulative propagation delay per circuit	168.93	140.21	248.61
Running time (s)	0.40	0.54	0.94

Performance Metrics(PACKET)	SHP	SDP	LLP
Packet Rate	1	1	1
total number of virtual circuit requests	181951	181951	181951
total number of packets	181951	181951	181951
number of successfully routed packets	181272	181884	181951
percentage of successfully routed packets	99.63	99.96	100
number of blocked packets	679	67	0
percentage of blocked packets	0.37	0.04	0.00
average number of hops per circuit	2.69	3.43	4.18
average cumulative propagation delay per circuit	172.89	140.62	243.36
Running time (s)	11.35	14.60	23.43

The used test files in this case are: **topology.txt** and **workload.txt**, which can found them on open learning platform.

Routing Scheme analysis:

Performance assessment and summary:

As the above tables demonstrate, obviously, the percentage of successfully routed packets in **LLP** is the **highest**, which followed by **SDP,** then, SHP has the lowest successful rate in this case.

Evaluation and conclusion:

SDP,SHP and LLP in **Virtual Circuit** have different link weights. Specifically, in **SDP** routing scheme, the weight of every link depends how many routers in this link.In essence this is Dijkstra's algorithm with the cost of each link set to **1**.

And in **SHP** routing scheme, the weight of every link depends on the **cumulative propagation delay** for traversing the chosen links in the path.I other words, this is Dijkstra's algorithm with the cost of each link set to the propagation delay.

However,In **LLP** routing scheme, the weight of every link depends on the **currently available loads** from source to the destination, where the load of a path is defined to be the maximum load on any link in path.The Dijkstra's Algorithm is

invoked when the moment of link is active to compute the minimal workload path. Moreover, link cost(workload) **changes with time,** which is the biggest difference from the others routing scheme(SHP and SDP).
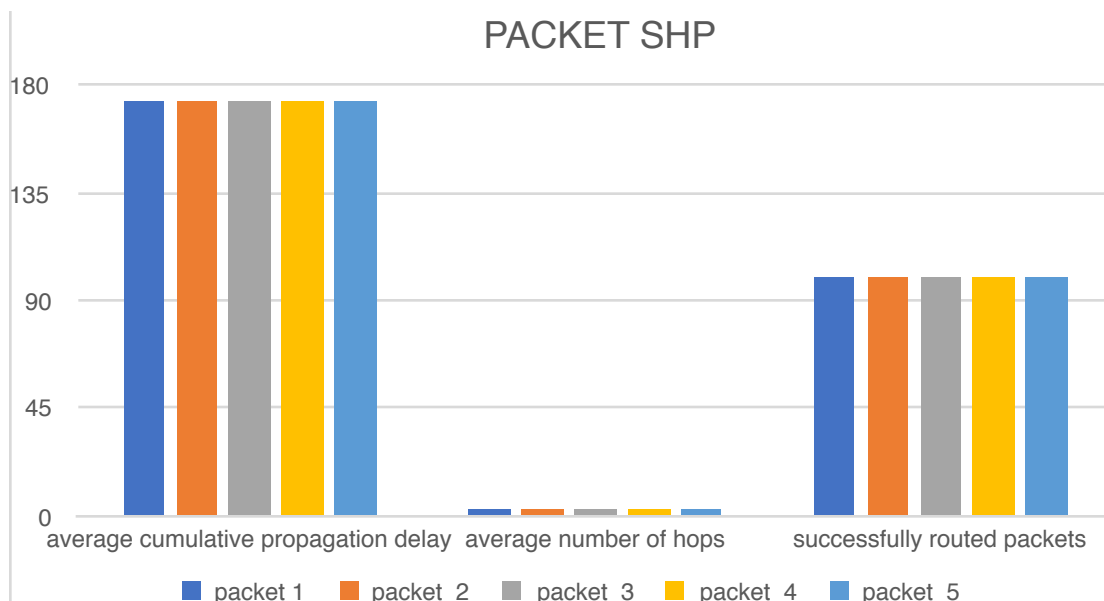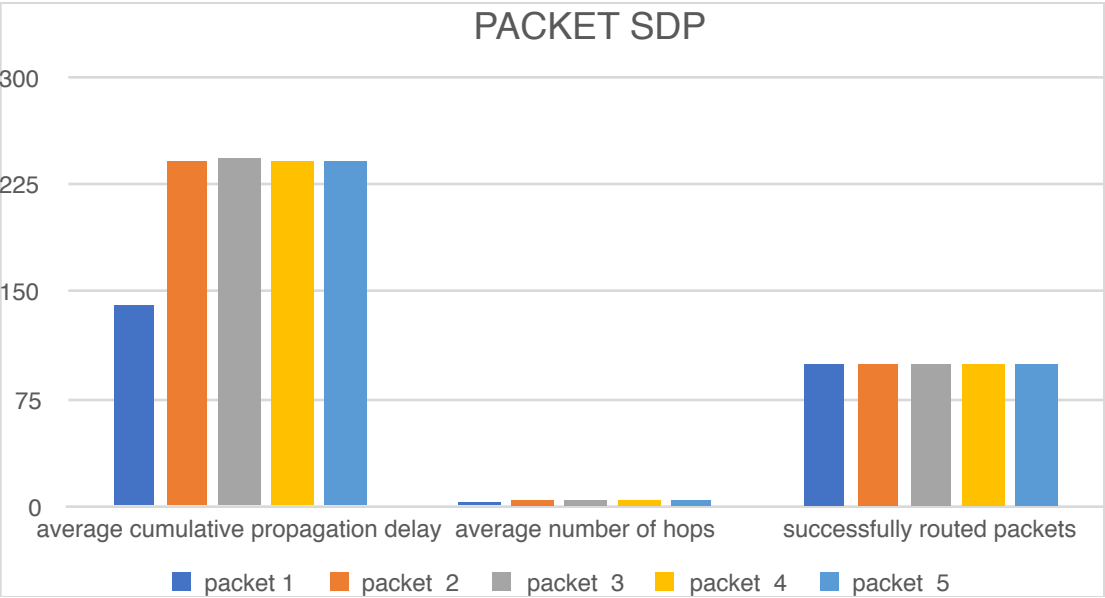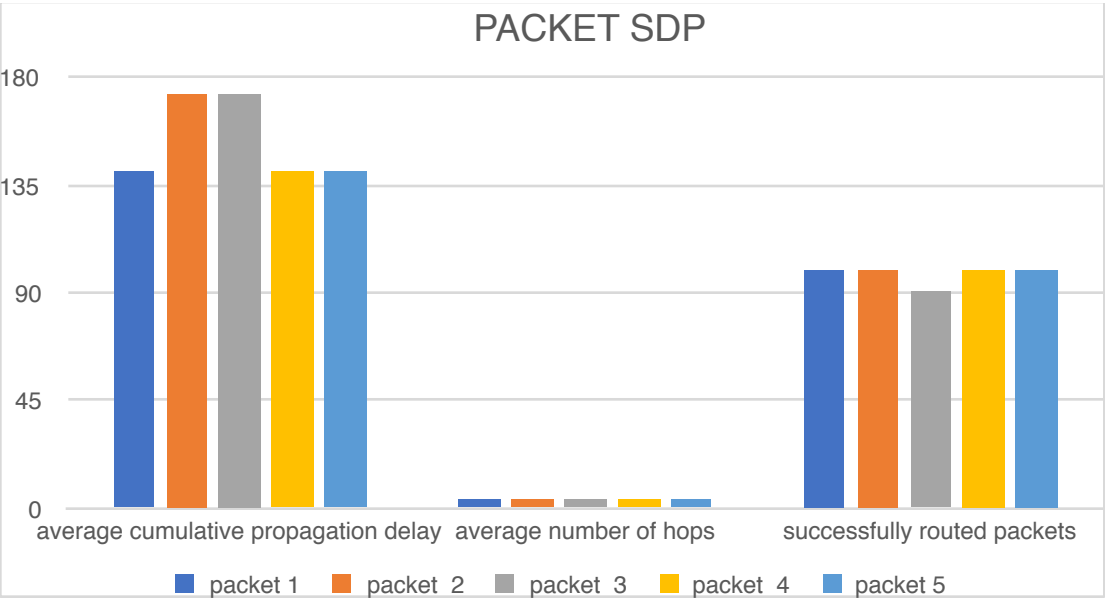
Network Scheme analysis:

Difference comparison:

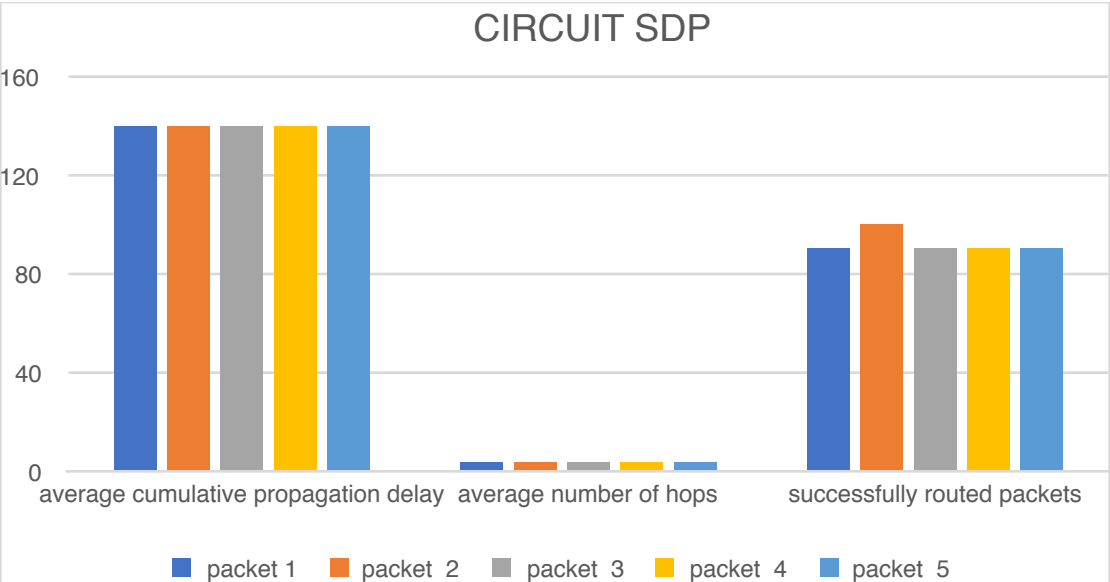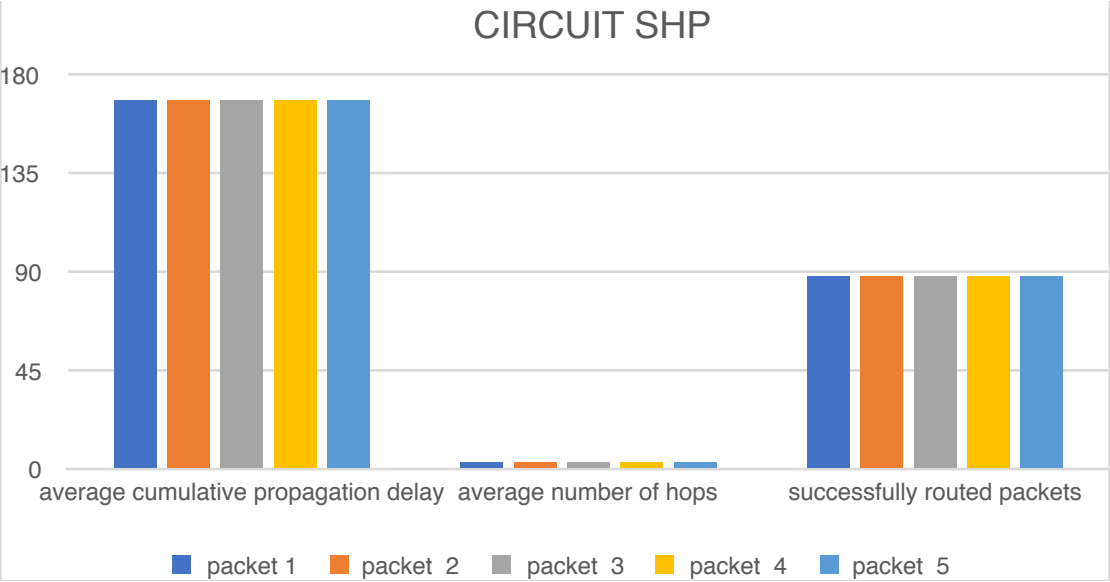Essentially, the difference between Virtual Circuit and Virtual Packet is,**"how end-to-end path is determined".** Furthermore, one virtual connection in the **virtual circuit** network follows the **same path** for transmitting all packets.However, a virtual connection in the **virtual packet** network uses the routing protocol to determine the path for each packet independently. Actually, the Dijkstra's algorithm is invoked **once** in **virtua**l **circuit mode**, however, the Dijkstra's algorithm is called **N times** for **transmitting N packets**
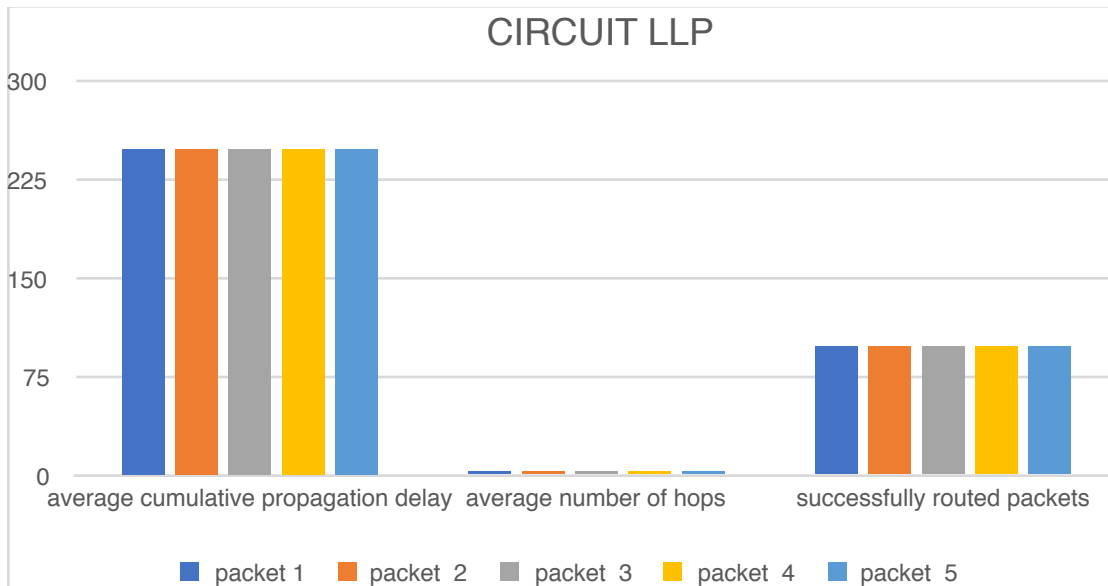
3.Describe the plots and the reason of the results by one paragraph for each plot.

In general, by changing the **packet rate** from **1 to 5**, in the same network and routing, statistical performance indicators are **basically the same**. Specifically, for the **CIRCUIT case**, all three metrics for the different packet rates are the same, and the **PACKET** case is almost the same, indicating that the program is implemented correctly. For the **CIRCUIT** case, there is **no change** to the **packet number** except when the **packet rate** is changed, so the performance indicators **should be exactly the same**.

PACKET SHP

PACKET SDP

(Chart with categories: average cumulative propagation delay, average number of hops, successfully routed packets)

Legend: packet 1, packet 2, packet 3, packet 4, packet 5

PACKET SDP

(Chart with categories: average cumulative propagation delay, average number of hops, successfully routed packets)

Legend: packet 1, packet 2, packet 3, packet 4, packet 5

CIRCUIT SHP

average cumulative propagation delay — average number of hops — successfully routed packets

packet 1 | packet 2 | packet 3 | packet 4 | packet 5

CIRCUIT SDP

average cumulative propagation delay — average number of hops — successfully routed packets

packet 1 | packet 2 | packet 3 | packet 4 | packet 5

CIRCUIT LLP

4.The Screencase Demo link

link:

https://www.youtube.com/watch?v=8gnALBjkhns&feature=youtu.be