

# Computer Networks

## **Assignment 5**

### **Group 12**

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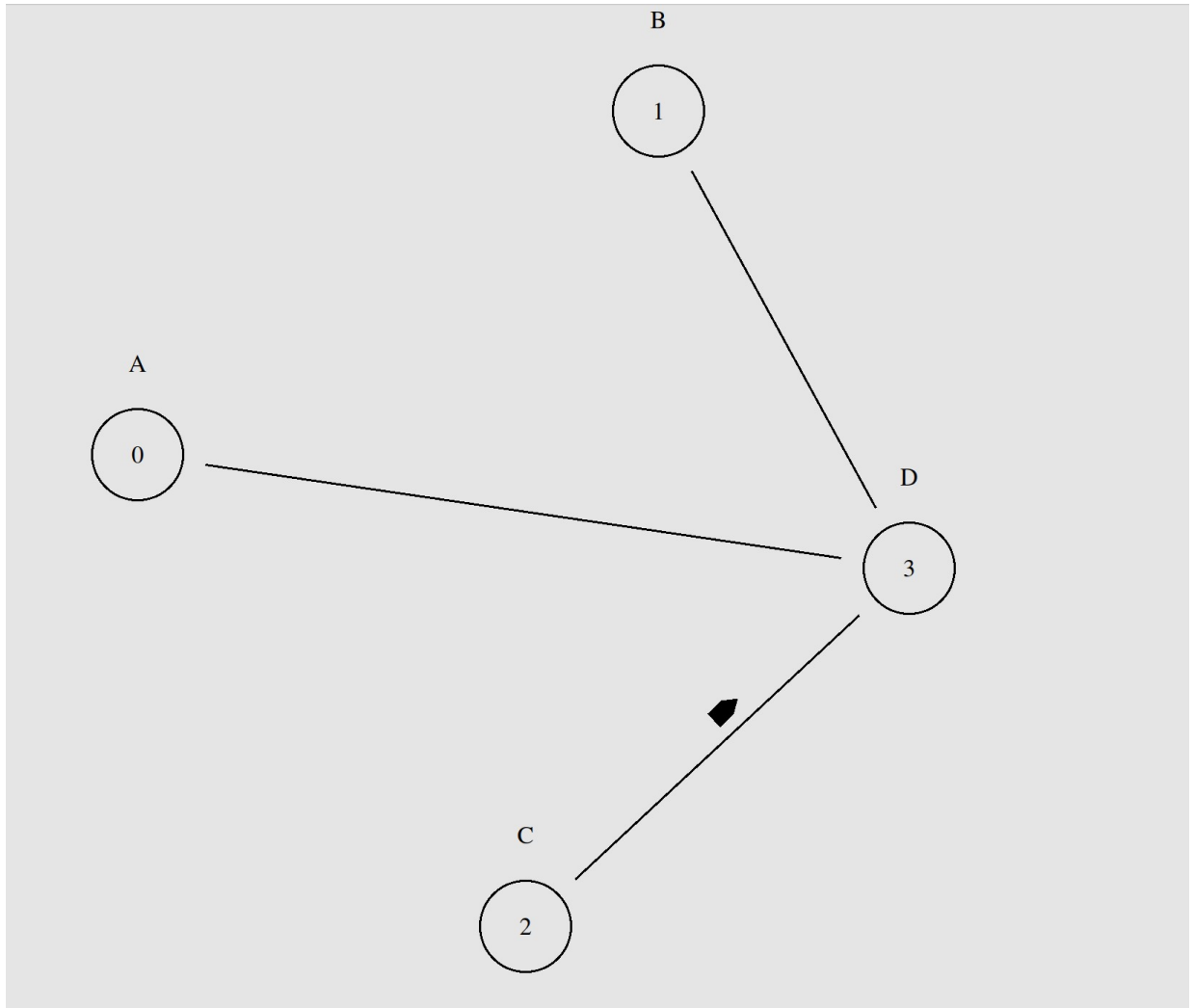
# Q1

In order to execute the TCL script, do the following:

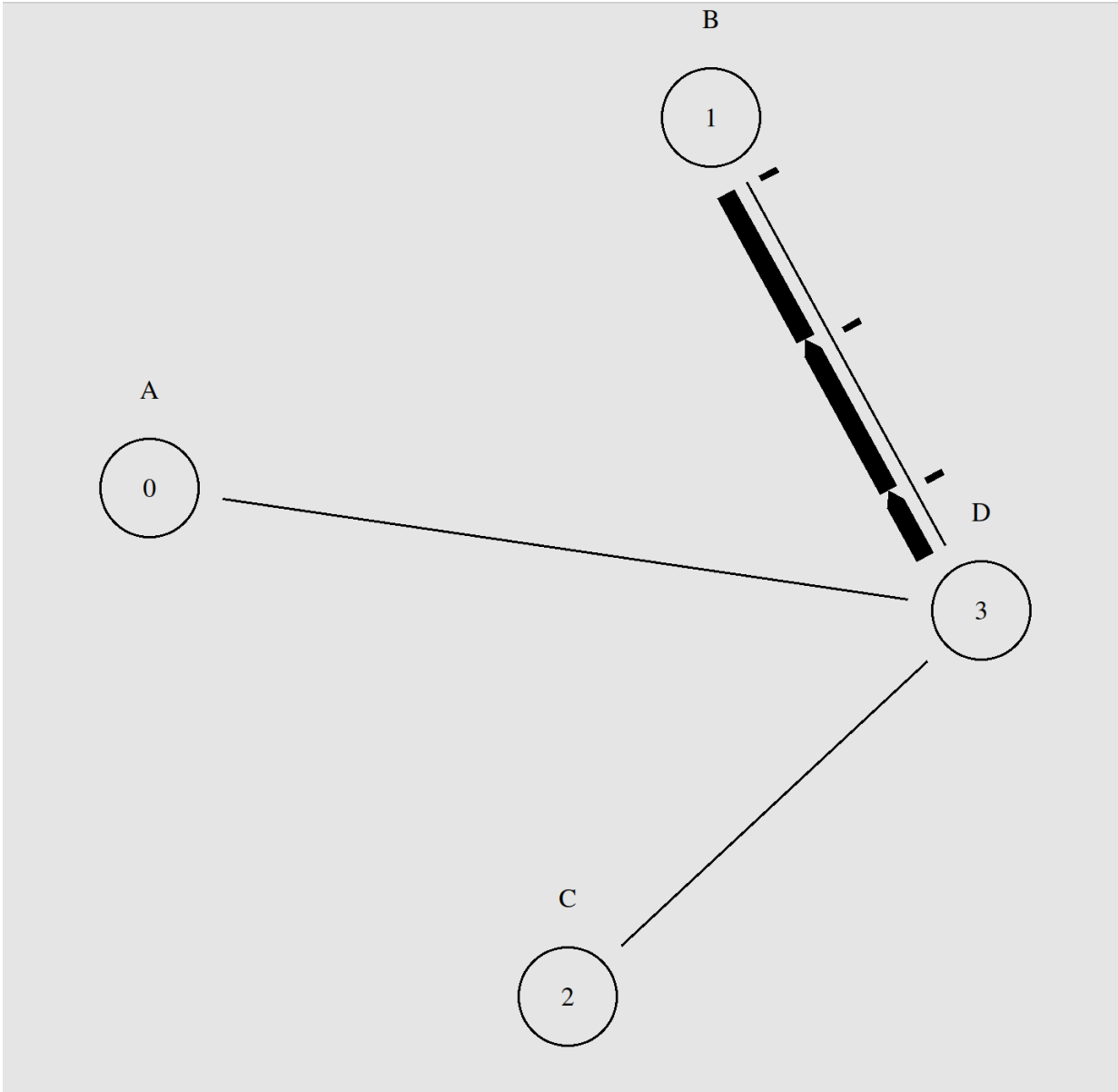
- a) Ensure that NS2 and NAM are installed on your PC and run the script in the directory of the file.
- b) Use the following command to execute: ns Q1.tcl

## Output -

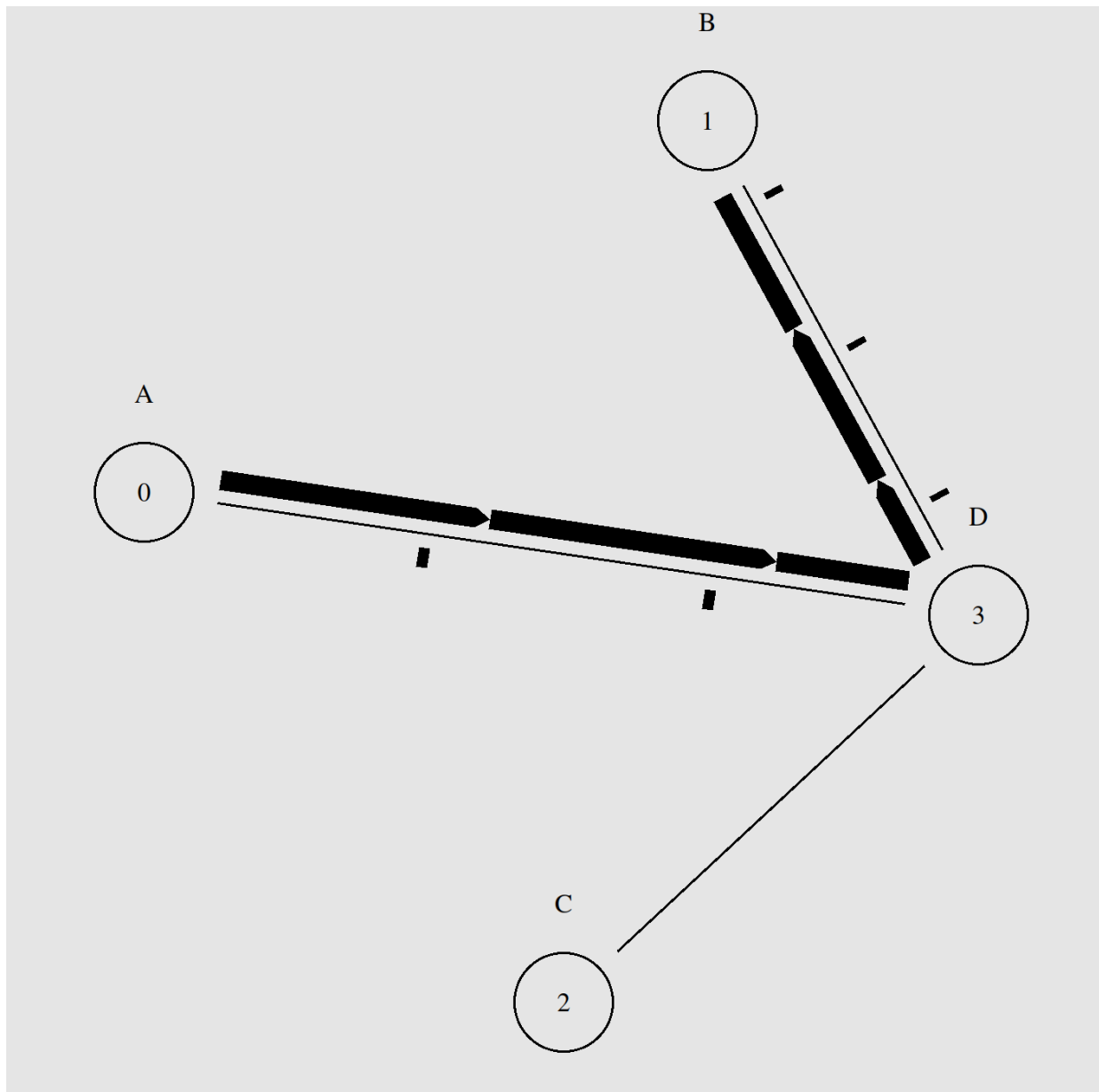
1. Unreliable connection between C to D.



2. Reliable connection between D to B.



3. FTP connection between A to B via D.



The **parameters** regarding the following program are:

- a) From C->D : Duplex Link, Data Rate: 10 Mb, Time: 2 ms
- b) From B->D : Duplex Link, Data Rate: 10 Mb, Time: 2 ms
- c) From A->D : Duplex Link, Data Rate: 10 Mb, Time: 2 ms

Also, between C and D, an unreliable connection is present. We have taken traffic type of UDP along with CBR. C is the source and D is the sink.

Also, between D and B, a reliable connection is present. We have taken the traffic type of TCP along with FTP. D is the source and B is the sink.

Also, between A and B (via D), we have taken the traffic type of TCP along with FTP. A is the source and B is the sink.

### End-to-end Delay Calculation:

Average end-to-end delay for node 0 is 0.0

Average end-to-end delay for node 1 is 0.005725180671649381

Average end-to-end delay for node 2 is 0.0

Average end-to-end delay for node 3 is 0.004581611527782843

### Conclusion:

There is no delay in node 0 and node 2 as they are the sending packets. The code has been attached below for reference. A library called traceanalyzer has been used for the calculation of delay time.

```
import traceanalyzer as tr

#end-to-end delay
eedelay0=tr.Eedelay('Q1/first.tr','0')
eedelay1=tr.Eedelay('Q1/first.tr','1')
eedelay2=tr.Eedelay('Q1/first.tr','2')
eedelay3=tr.Eedelay('Q1/first.tr','3')

#Calculate the averages arr0
= eedelay0.eedelay_array
arr1 =
eedelay1.eedelay_array arr2
= eedelay2.eedelay_array
arr3 =
eedelay3.eedelay_array

print("Average end-to-end delay for node 0 is " , sum (arr0) / len (arr0))
print("Average end-to-end delay for node 1 is " , sum (arr1) / len (arr1))
print("Average end-to-end delay for node 2 is " , sum (arr2) / len (arr2))
print("Average end-to-end delay for node 3 is " , sum (arr3) / len (arr3))
```

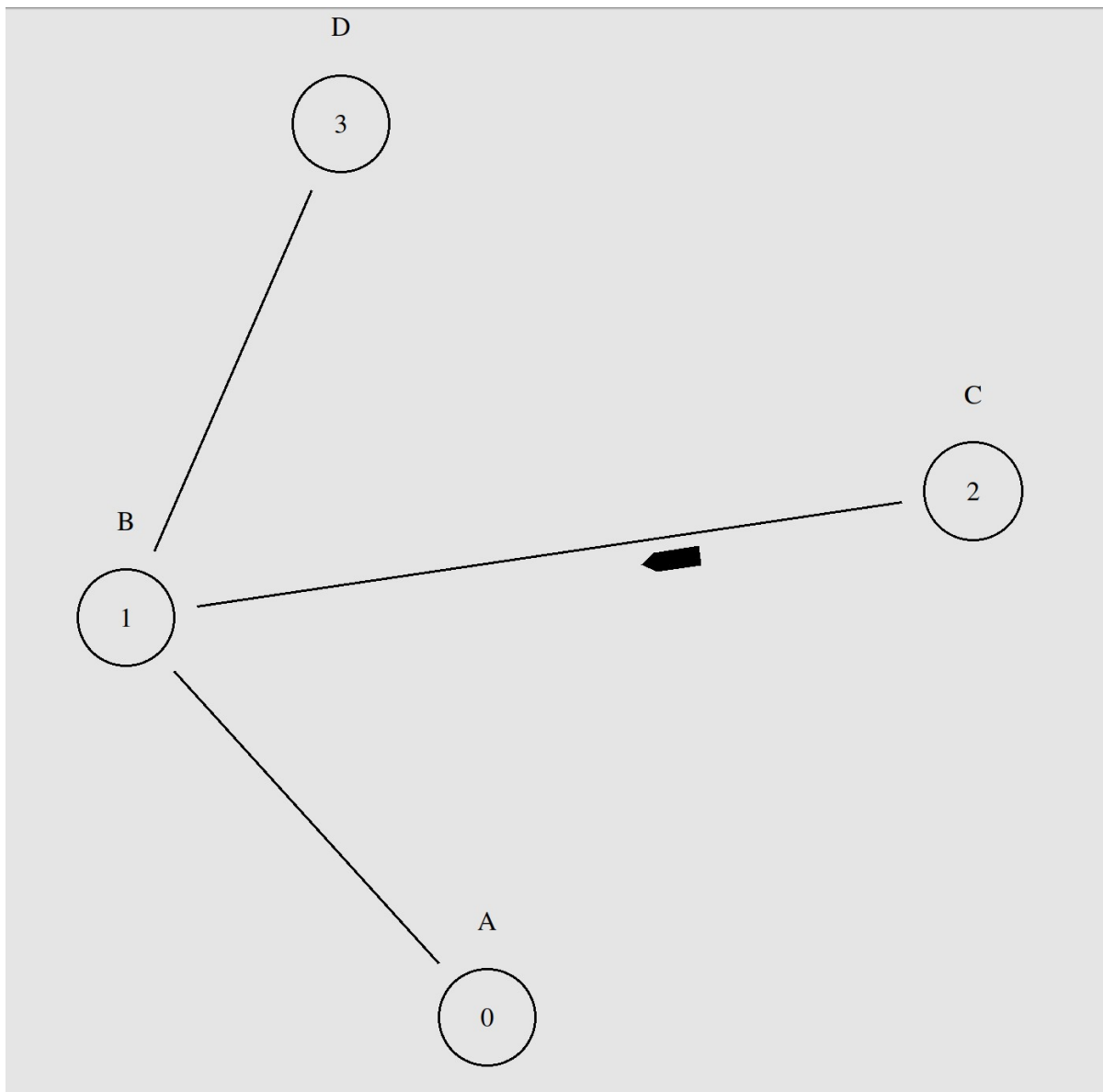
## Q2

In order to execute the TCL script, do the following:

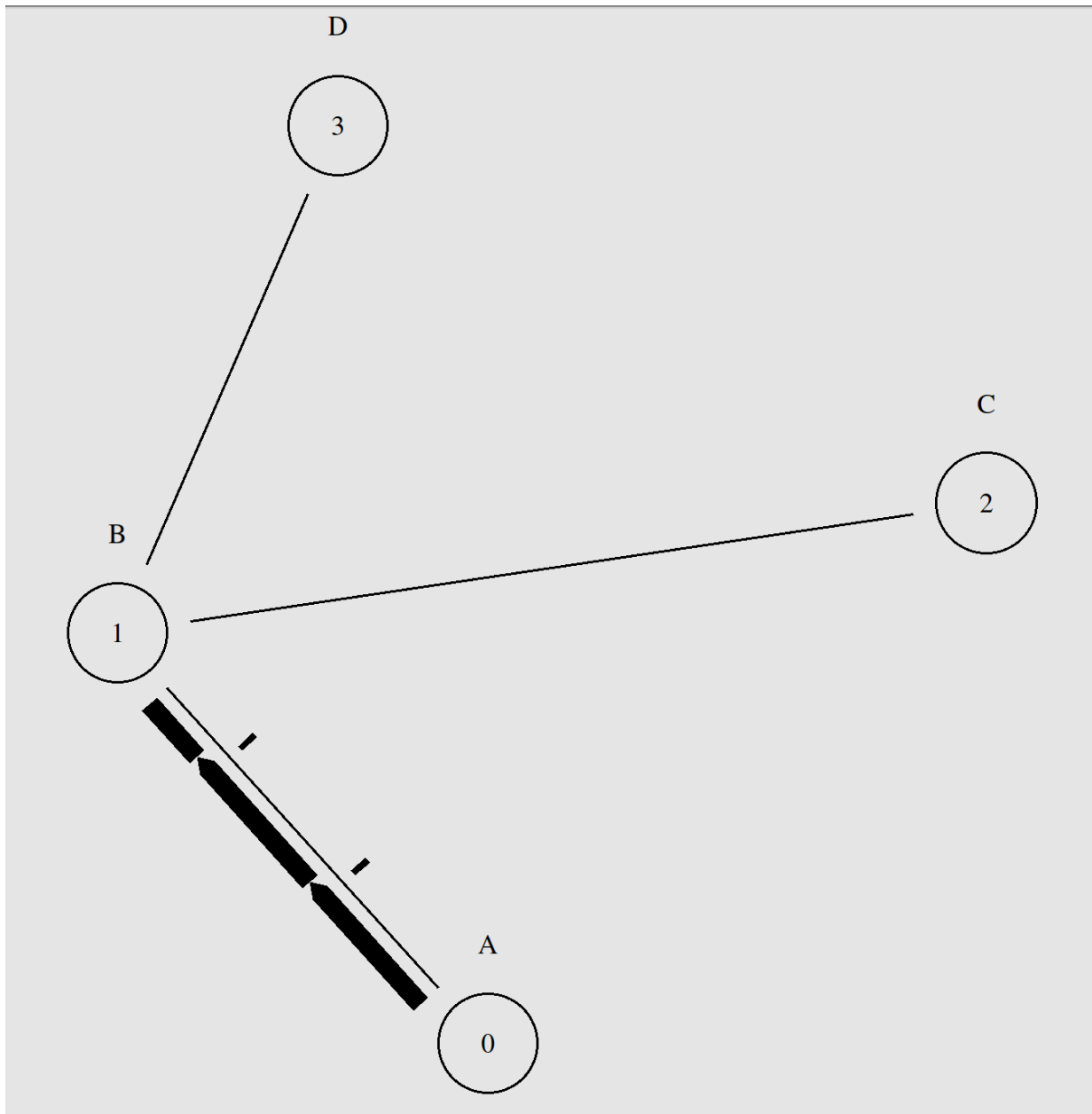
- c) Ensure that NS2 and NAM are installed on your PC and run the script in the directory of the file.
- d) Use the following command to execute: ns Q2.tcl

### Output -

1. Unreliable connection between C to B.

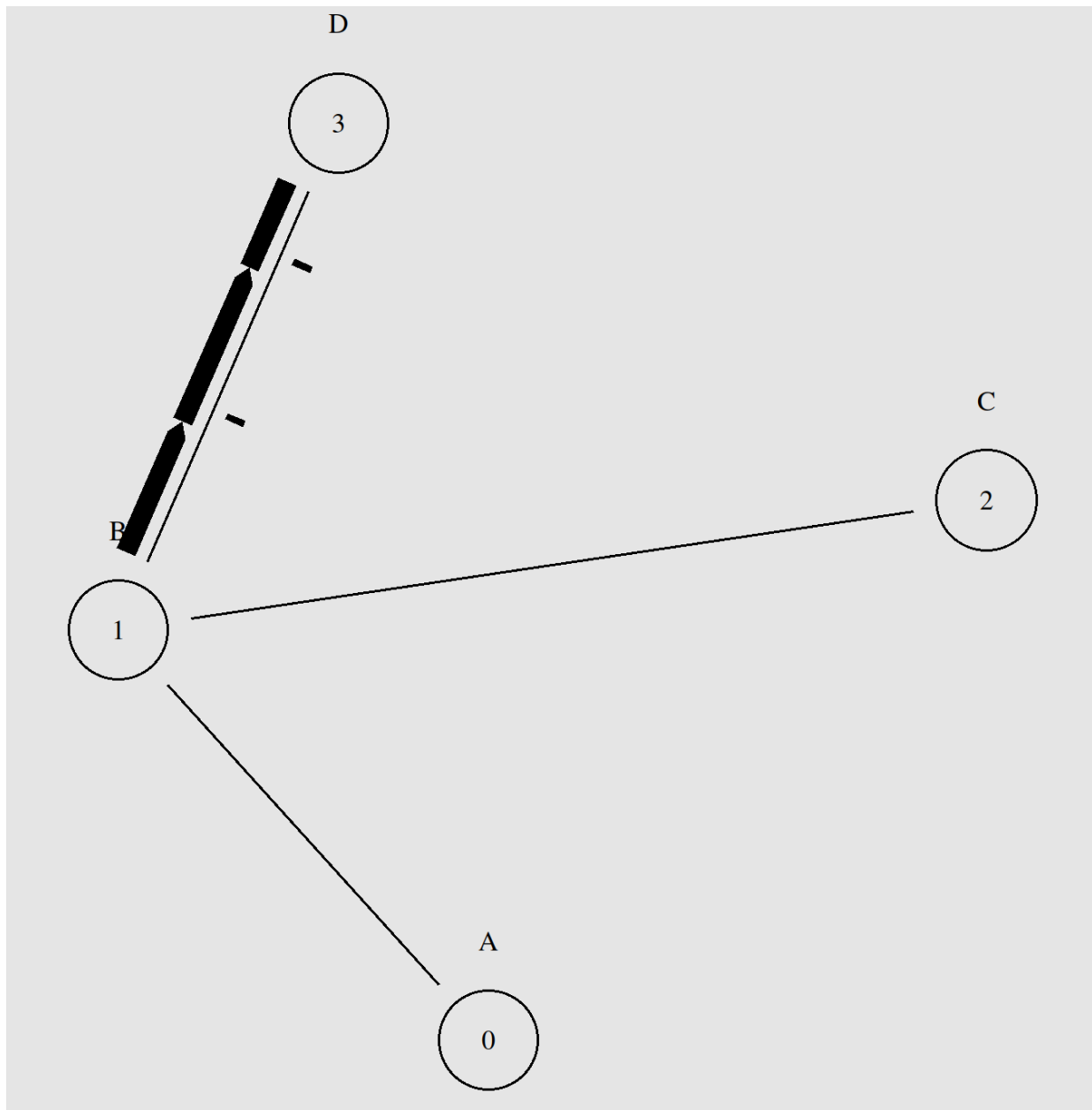


2. FTP connection between A to B.





3. Reliable connection between B to D.



The **parameters** regarding the following program are:

- a) From C->B : Duplex Link, Data Rate: 10 Mb, Time: 2 ms
- b) From A->B : Duplex Link, Data Rate: 10 Mb, Time: 2 ms
- c) From B->D : Duplex Link, Data Rate: 10 Mb, Time: 2 ms

Also, between C and B, an unreliable connection is present. We have taken traffic type of UDP along with CBR. C is the source and D is the sink.

Also, between A and B, a reliable connection is present. We have taken the traffic type of TCP along with FTP. D is the source and B is the sink.

Also, between B and D (via D), we have taken the traffic type of TCP along with FTP. A is the source and B is the sink.

### End-to-end Delay Calculation:

Average end-to-end delay for node 0 is 0.0

Average end-to-end delay for node 1 is 0.004932347886719936

Average end-to-end delay for node 2 is 0.0

Average end-to-end delay for node 3 is 0.013755222454672013

### Conclusion:

There is no delay in node 0 and node 2 as they are the sending packets. The code has been attached below for reference. A library called traceanalyzer has been used for the calculation of delay time.

```
import traceanalyzer as tr

eedelay0=tr.Eedelay('Q2/second.tr','0')
eedelay1=tr.Eedelay('Q2/second.tr','1')
eedelay2=tr.Eedelay('Q2/second.tr','2')
eedelay3=tr.Eedelay('Q2/second.tr','3')

arr0 = eedelay0.eedelay_array
arr1 = eedelay1.eedelay_array
arr2 = eedelay2.eedelay_array
arr3 = eedelay3.eedelay_array

print("\nFor Q2")
print("Average end-to-end delay for node 0 is " , sum (arr0) / len (arr0))
print("Average end-to-end delay for node 1 is " , sum (arr1) / len (arr1))
print("Average end-to-end delay for node 2 is " , sum (arr2) / len (arr2))
print("Average end-to-end delay for node 3 is " , sum (arr3) / len (arr3))
```