CSE322: Computer Networks Sessional

NS-2 ASSIGNEMNT

SUBMITTED BY

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Specification

Wireless MAC type: Wireless 802.11
Routing Protocol : AODV
Agent : TCP Reno
Application: FTP
Node Positinoing : Random
Flow : Random source and destination

Wireless 802.11 :

Mainly known as WIFI

- Operates between 2.4Ghz to 5Hz
- Date rates up to 600 mbps
- Operates in crowdy place and susceptible to interference

AODV (Ad-hoc On Demand Distance Vector)

- is a reactive routing protocol used in mobile ad hoc networks (MANETs).
- is a dynamic routing protocol,
- it calculates and updates routes only when they are needed, When a device needs to send a packet to another device, it broadcasts a route request (RREQ) message. The RREQ is propagated through the network until it reaches the destination or an intermediate node that knows the route to the destination. The intermediate node sends a route reply (RREP) message back to the source, which contains the route information..

TCP-Reno(Congesion Control)

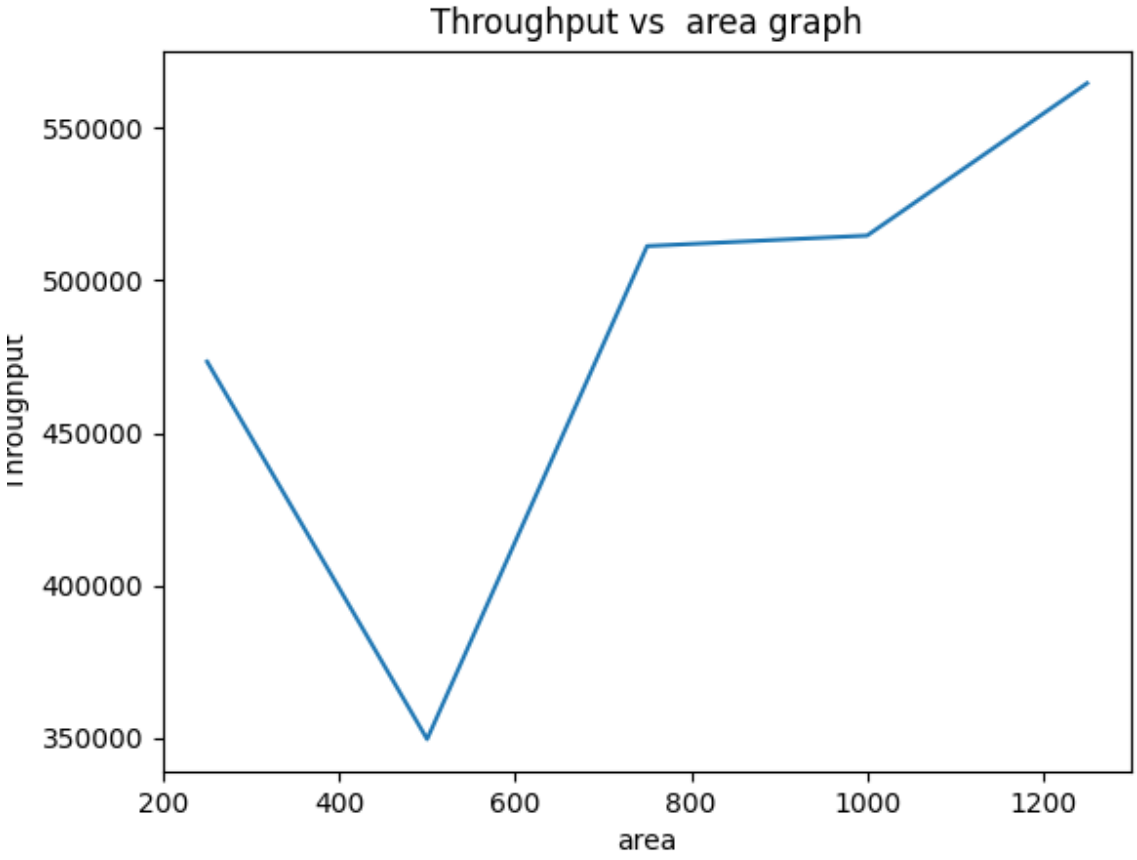
- the sender monitors the number of unacknowledged packets and adjusts its sending rate accordingly
- When the number of unacknowledged packets reaches a certain threshold, it indicates that the network is congested and the sender reduces its sending rate
- The sender then increases its sending rate again as the number of unacknowledged packets decreases. This process is known as slow start and fast recovery.

FTP

standard network protocol used for transferring files between a client and a server

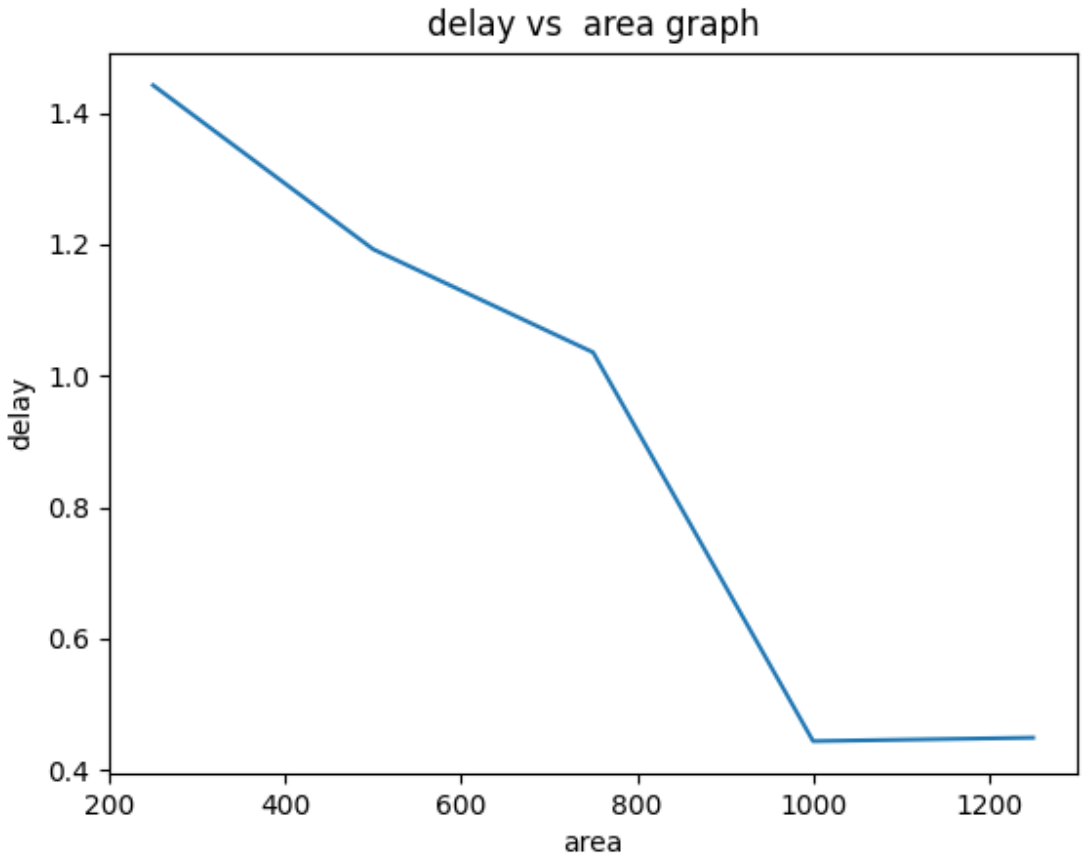
Graphs

Throughput vs Area Size



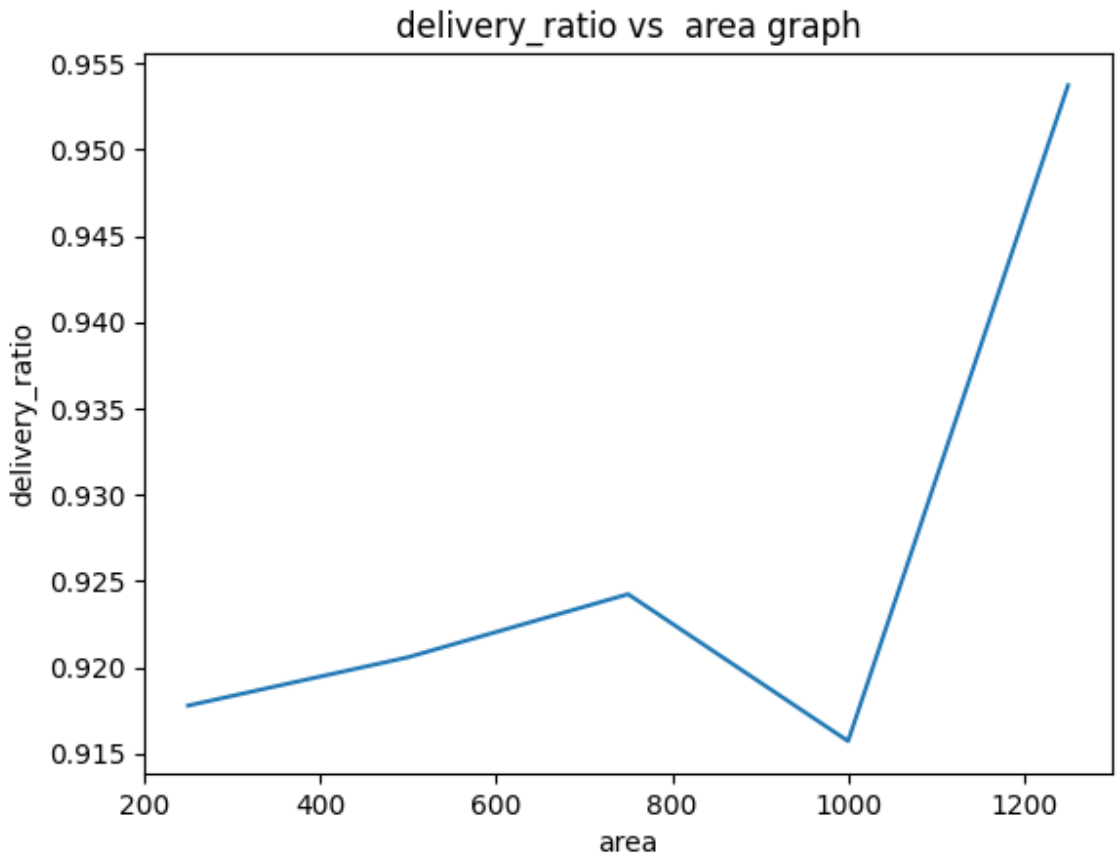
As increase in the area increases the available bandwidth thus increases the throughput.
But The change of Throughput can not be specified based on area only as depends on a lot of other factors. Here we have nodes with different mobility. Also the source and destination of each flow is fully randomized

Average Delay vs Area size



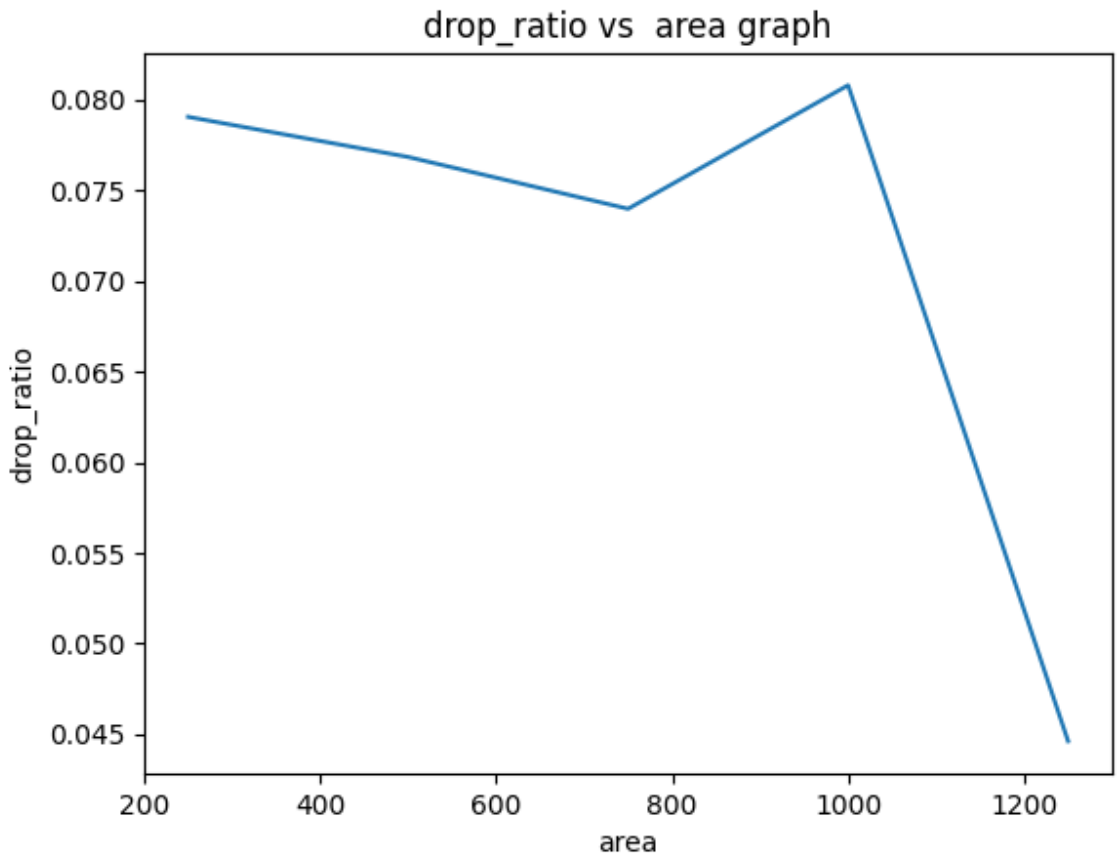
The relationship between delay and area is not complex. Depends on specific network condition. But in ranomized manner it seems like it is decreasing

Delivery Ratio vs Area Size



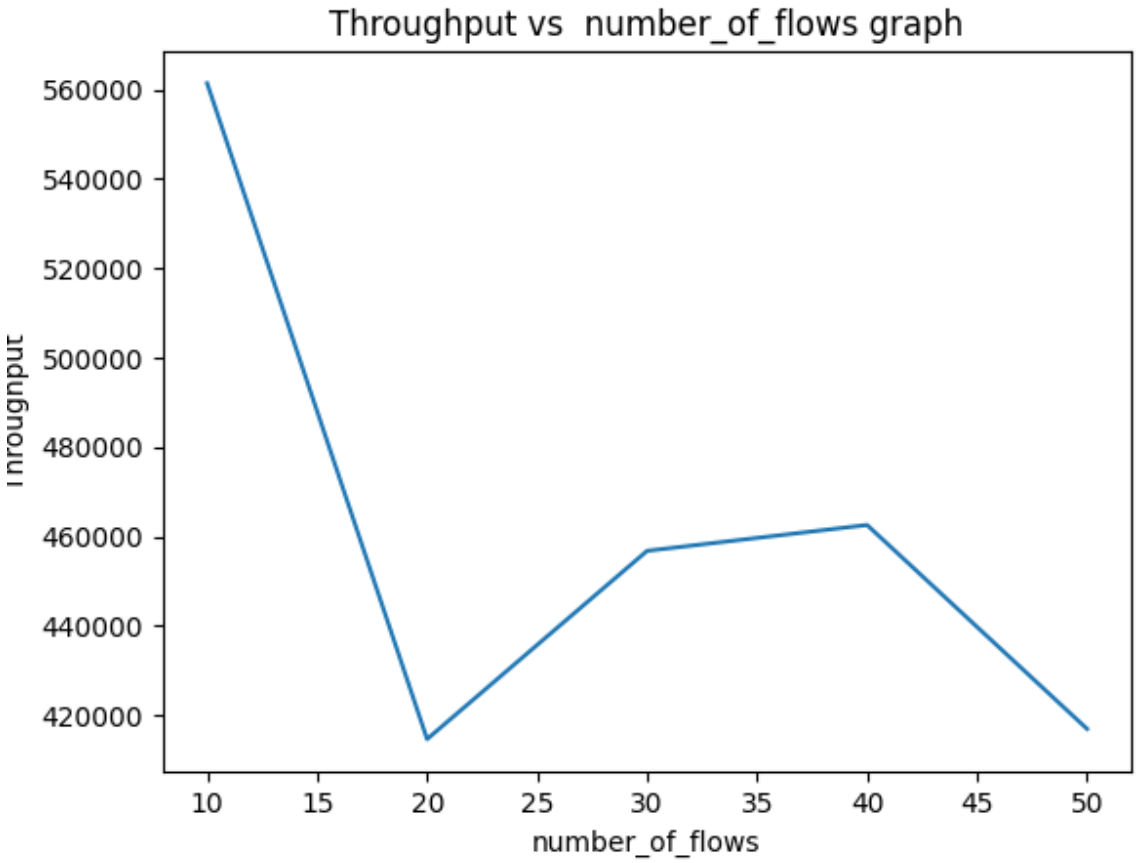
Same observation. No specific behavior

Drop Ratio vs Area Size

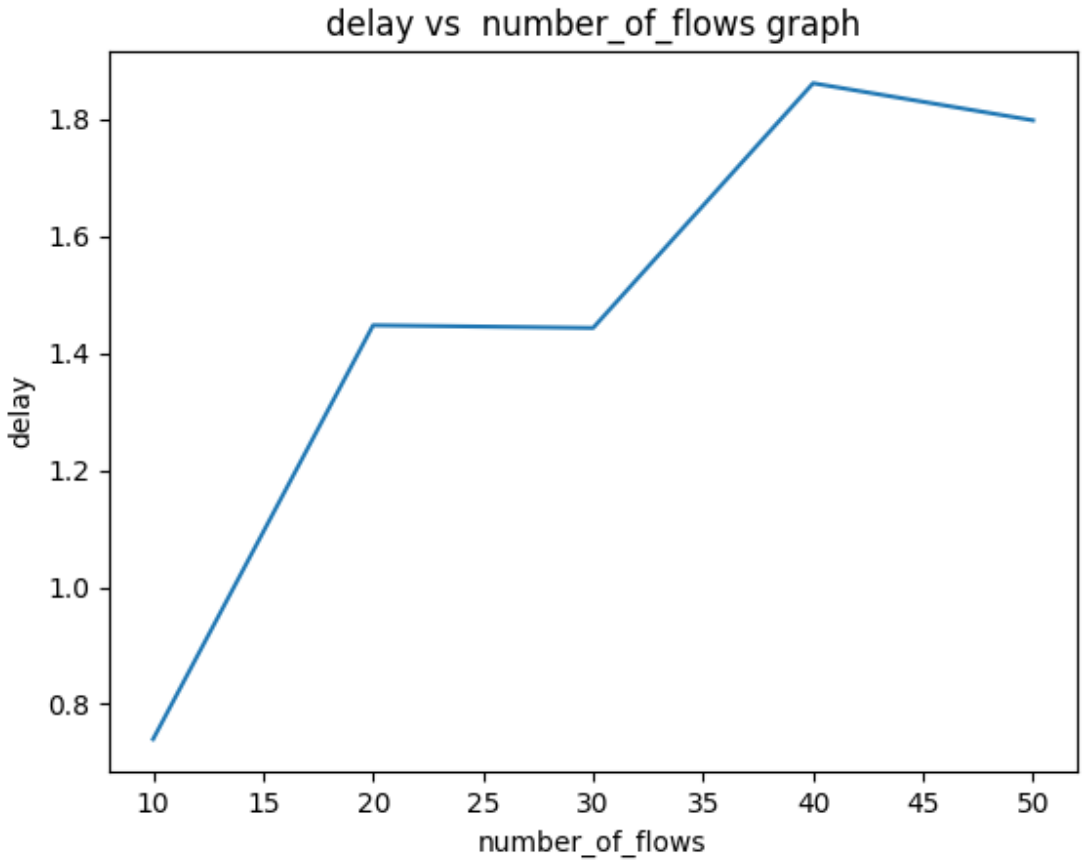


Same as before.

Throughput vs Number of Flows

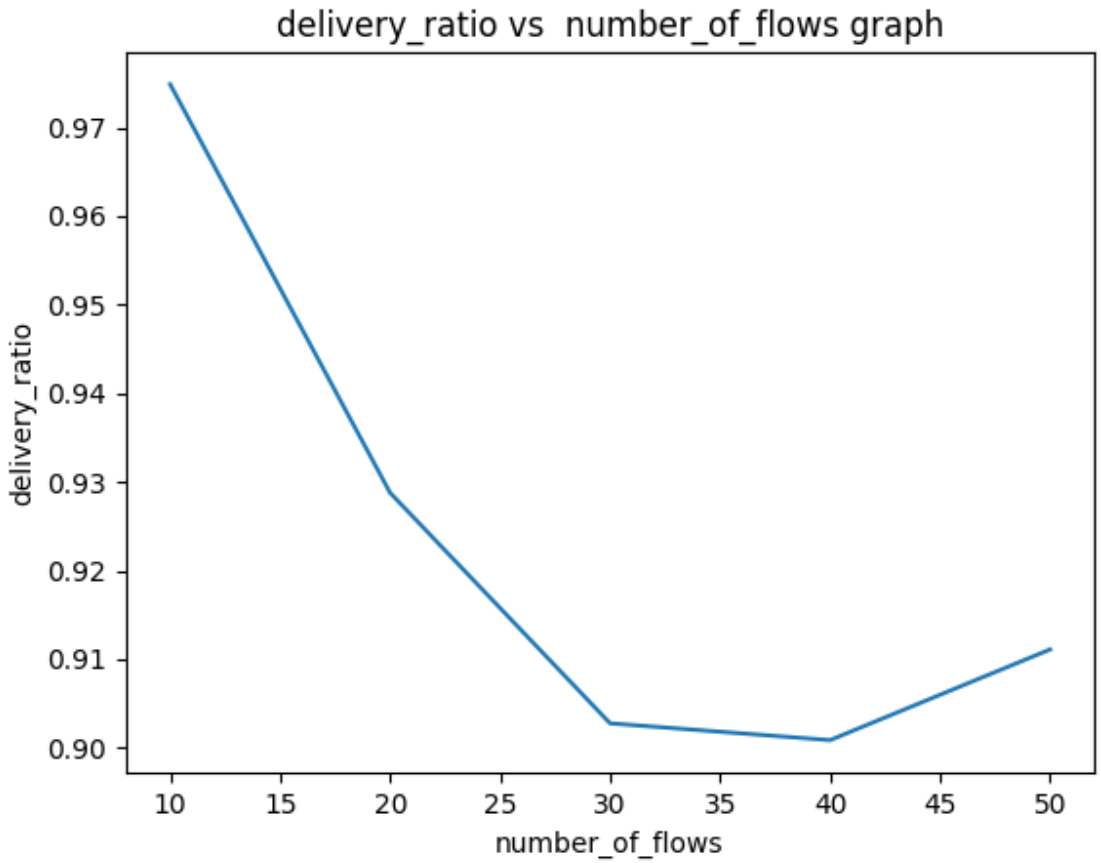


Average Delay vs Number of Flows



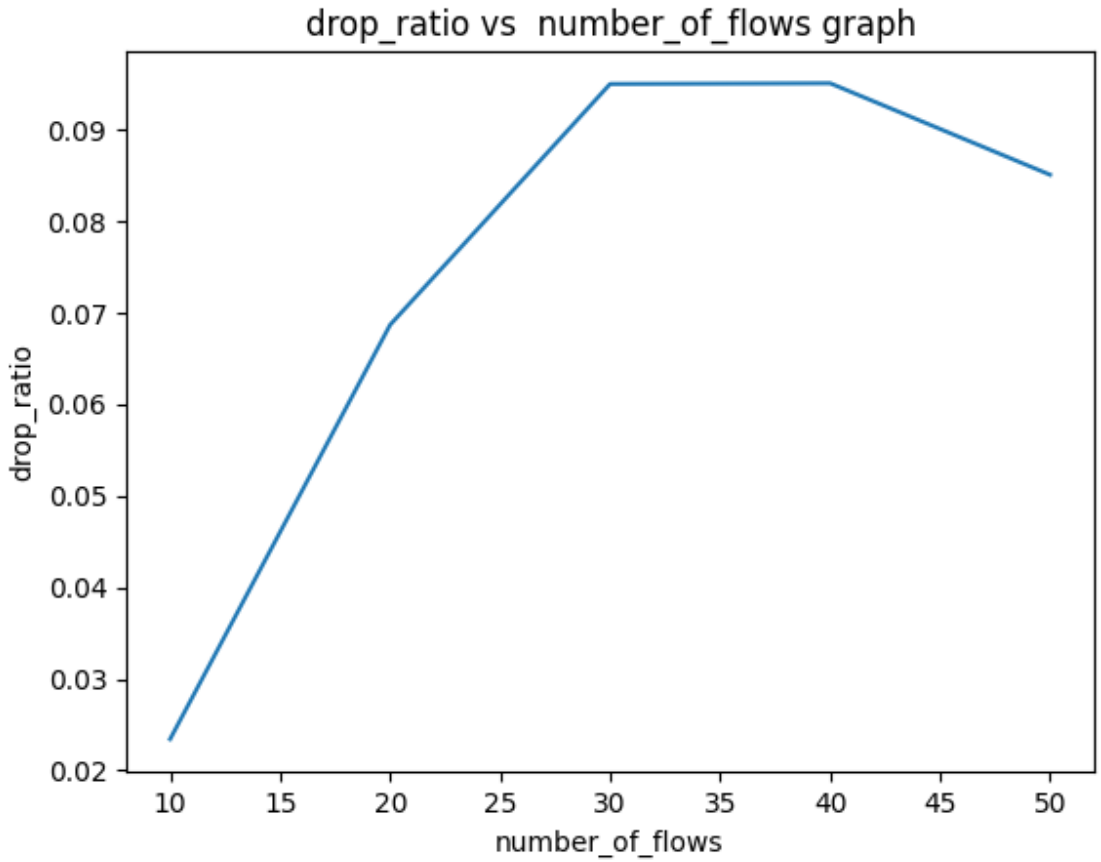
When there are more flows in the network, there are more congestion, which cause the average delay to grow

Delivery Ratio vs Number of Flows



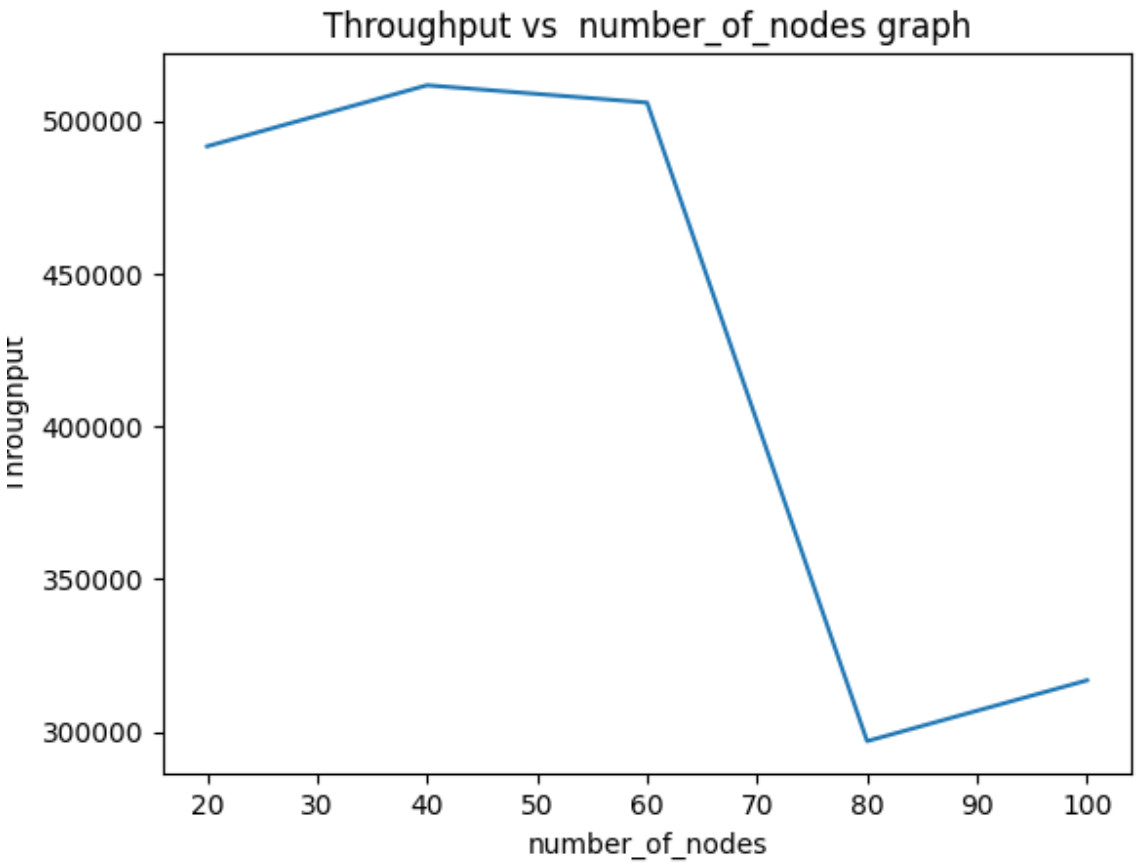
Similarly here also performance decreases but duto coping mechanism of AODV and TCP Reno better performance is seen even after increase in flow

Drop Ratio vs Number of Flows



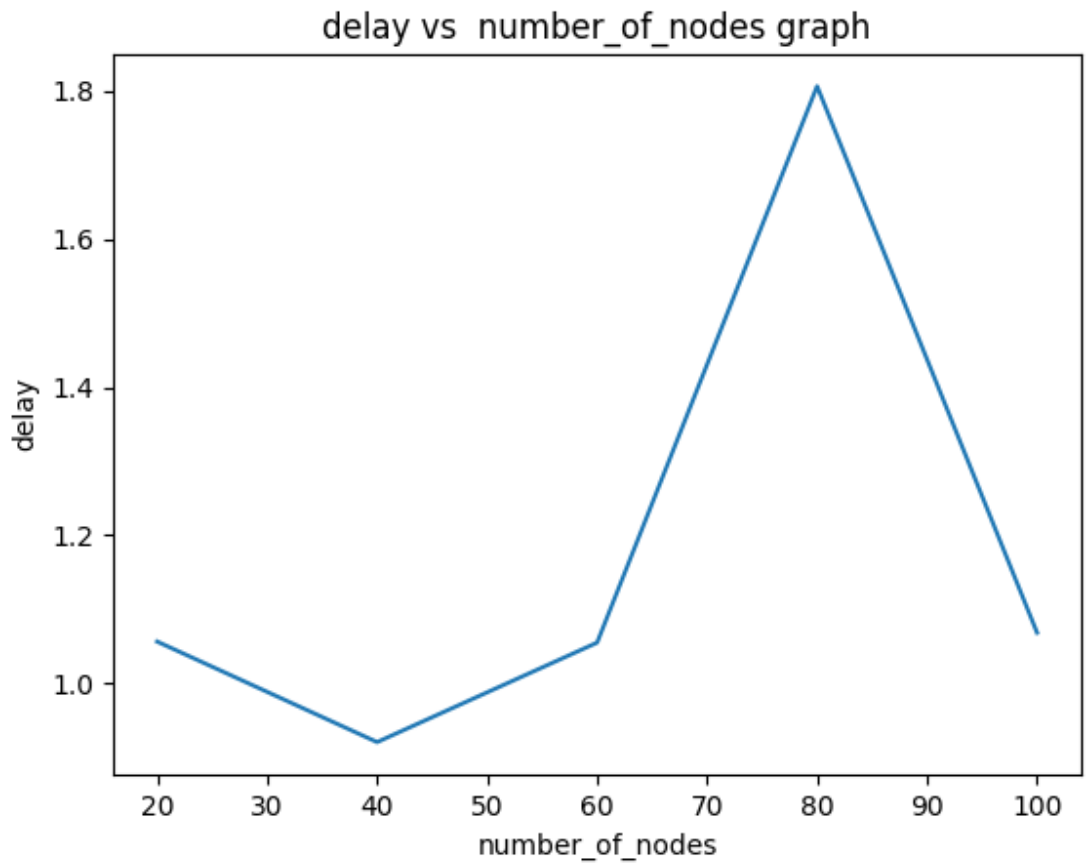
Same as before

Throughput vs Number of Nodes

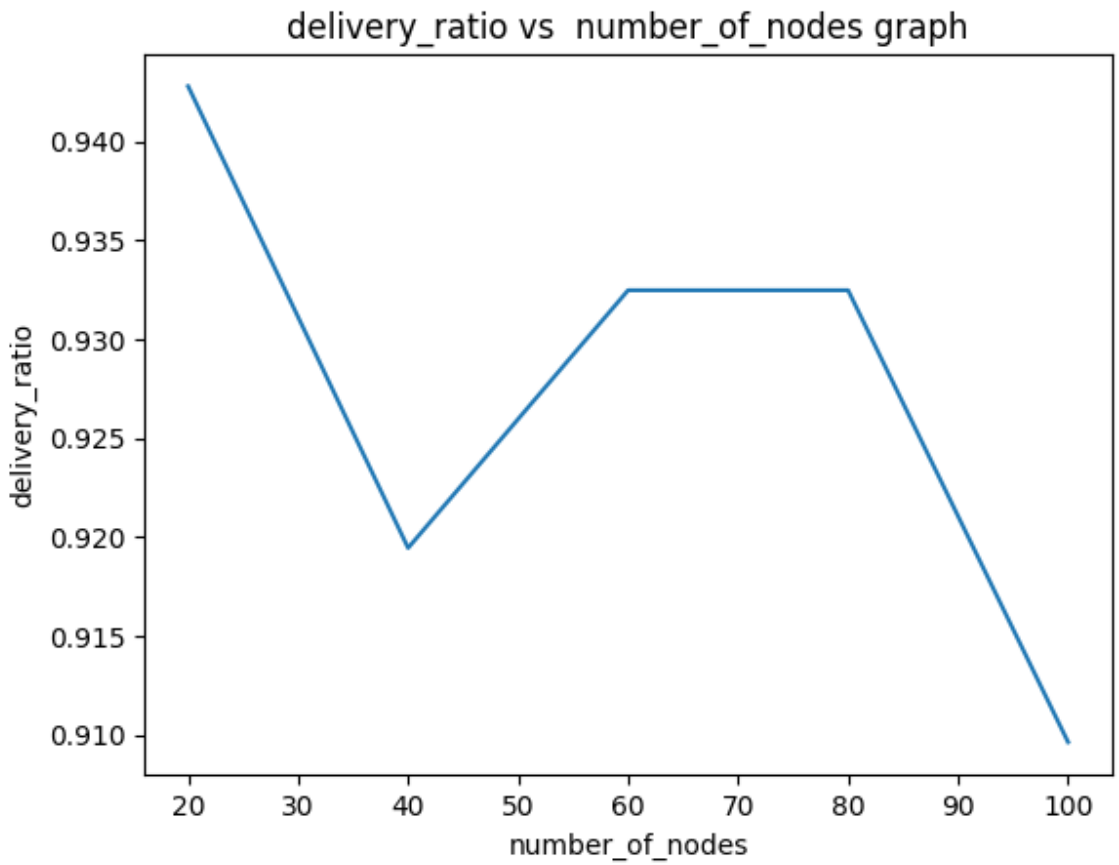


No specific behavior. Sudden fall of throughput after a certain threshold. But could not figure out why.

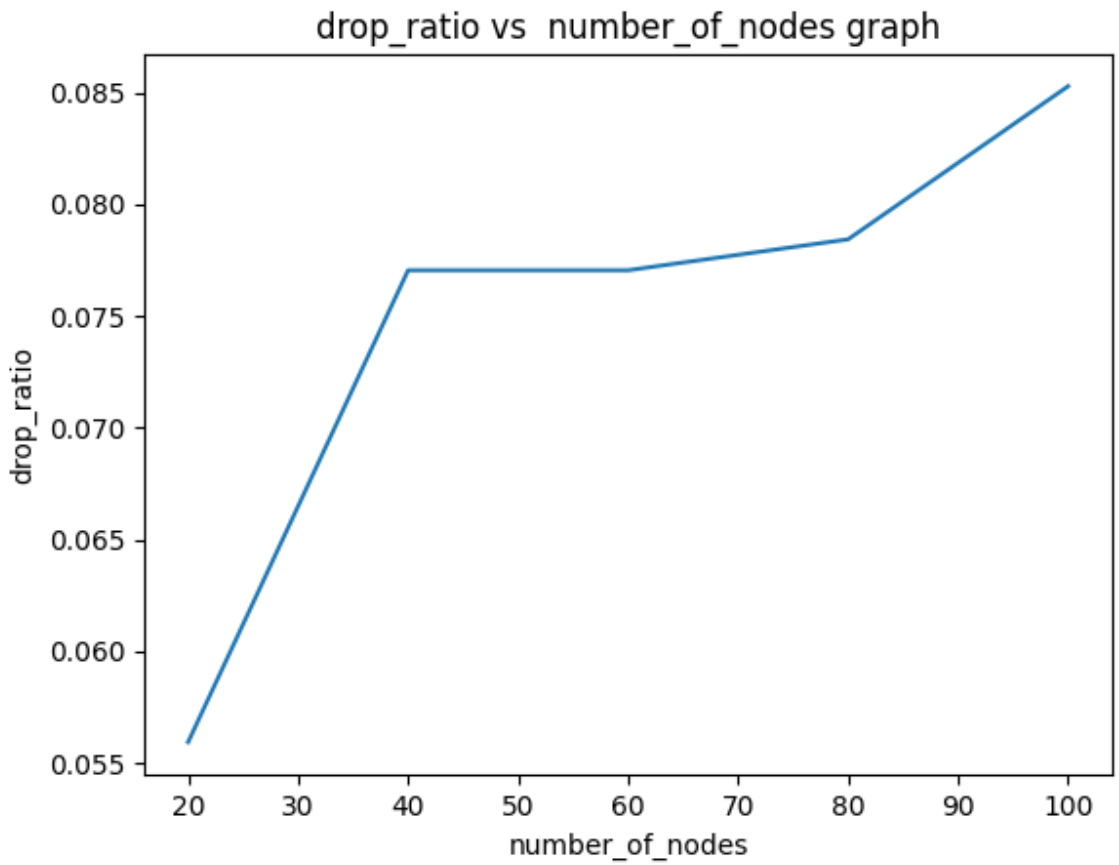
Average Delay vs Number of Nodes



Delivery Ratio vs Number of Nodes



Drop Ratio vs Number of Nodes



Detailed and more elaborative study is required to analyze the behavior of throughput, delay , drop ration and delivery ration.

Detailed DATA Sheet

Num of nodes 40
Number of flows 20
Varying area
250 X 250

Sent Packets: 3187
Dropped Packets: 252
Received Packets: 2925
Throughput: 473360 bits/sec
Average Delay: 1.4423 seconds
Delivery ratio: 0.917791
Drop ratio: 0.0790712

500X500

Sent Packets: 2355
Dropped Packets: 181
Received Packets: 2168
Throughput: 349658 bits/sec
Average Delay: 1.19274 seconds
Delivery ratio: 0.920594
Drop ratio: 0.0768577

750X750

Sent Packets: 3419
Dropped Packets: 253
Received Packets: 3160
Throughput: 511232 bits/sec
Average Delay: 1.0357 seconds
Delivery ratio: 0.924247
Drop ratio: 0.0739982

1000 X 1000

Sent Packets: 3477
Dropped Packets: 281
Received Packets: 3184
Throughput: 514669 bits/sec
Average Delay: 0.443957 seconds
Delivery ratio: 0.915732
Drop ratio: 0.0808168

1250 X 1250

Sent Packets: 3653
Dropped Packets: 163
Received Packets: 3484
Throughput: 564589 bits/sec
Average Delay: 0.449214 seconds
Delivery ratio: 0.953737
Drop ratio: 0.0446209

Area 500X500
Number of nodes 40
Varying flows

10
Sent Packets: 3542
Dropped Packets: 83
Received Packets: 3453
Throughput: 561450 bits/sec
Average Delay: 0.740124 seconds
Delivery ratio: 0.974873
Drop ratio: 0.0234331

20

Sent Packets: 2766
Dropped Packets: 190
Received Packets: 2569
Throughput: 414621 bits/sec
Average Delay: 1.4479 seconds
Delivery ratio: 0.928778
Drop ratio: 0.0686913

30
Sent Packets: 3147
Dropped Packets: 299
Received Packets: 2841
Throughput: 456771 bits/sec
Average Delay: 1.44335 seconds
Delivery ratio: 0.902765
Drop ratio: 0.0950111

40
Sent Packets: 3218
Dropped Packets: 306
Received Packets: 2899
Throughput: 462557 bits/sec
Average Delay: 1.86182 seconds
Delivery ratio: 0.90087
Drop ratio: 0.0950901

50
Sent Packets: 2891
Dropped Packets: 246
Received Packets: 2634
Throughput: 416909 bits/sec
Average Delay: 1.79838 seconds
Delivery ratio: 0.911103
Drop ratio: 0.0850917

Number of flows 20
Area 500 X 500
Varying number of nodes
20
Sent Packets: 3164
Dropped Packets: 177
Received Packets: 2983
Throughput: 491863 bits/sec
Average Delay: 1.05646 seconds
Delivery ratio: 0.942794
Drop ratio: 0.0559418

40
Sent Packets: 3439
Dropped Packets: 265
Received Packets: 3162
Throughput: 511878 bits/sec
Average Delay: 0.92071 seconds
Delivery ratio: 0.919453
Drop ratio: 0.0770573

60

Sent Packets: 3362
Dropped Packets: 218
Received Packets: 3135
Throughput: 506192 bits/sec
Average Delay: 1.05502 seconds
Delivery ratio: 0.932481
Drop ratio: 0.0770573

80

Sent Packets: 2027
Dropped Packets: 159
Received Packets: 1847
Throughput: 296950 bits/sec
Average Delay: 1.80606 seconds
Delivery ratio: 0.932481
Drop ratio: 0.078441

100

Sent Packets: 2169
Dropped Packets: 185
Received Packets: 1973
Throughput: 316874 bits/sec
Average Delay: 1.06833 seconds
Delivery ratio: 0.909636
Drop ratio: 0.0852928