

NS3 PROJECT REPORT

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Lab Group – A1
LEVEL-3 TERM-2

Network Topology Under Simulation

- Wireless high-rate (e.g., 802.11) (static)
- Wireless low-rate (e.g., 802.15.4) (mobile)

Topology Under Modified Algorithm

Wireless high-rate (802.11b) (mobile)

Wireless 802.11(static)

Parameters Under Variation

- Number of nodes
- Number of flows
- Number of Packets/Sec
- Coverage Area

Metric Variation Observed for Each Parameter

- Throughput
- End-to-End Delay
- Delivery Ratio
- Drop Ratio

Wireless 802.15.4(mobile)

Parameters Under Variation

- Number of nodes
- Number of flows
- Number of Packets/Sec
- Node Speed

Metric Variation Observed for Each Parameter

- Throughput
- End-to-End Delay
- Delivery Ratio
- Drop Ratio

Overview of Proposed Algorithm R-AODV(Modified AODV protocol)

- As AODV broadcasts RREQ packets to all its neighbour while required a route from source to destination,there might be some redundant RREQ packets which may lead to increase dropratio of the network & decrease the throughput as well
- My algorithm makes a decision while forwarding RREQ packets
- Algorithm drops some redundant RREQ packets thus improves network congestion mechanism
- Before forwarding a RREQ packet,every node computes a drop factor which is a function of the inverse of the number of hop counts traversed by the RREQ packet.

Modifications Made in Simulator

- Affected Network
 - Wireless 802.11b
- Modified Files
 - aodv-routing-protocol.h
 - aodv-routing-protocol.cc

- Here the implementation is done inside the recvRequest Function
- Before forwarding the packet in recvRequest function we check its redundancy using the proposed algorithm
- Expected Outputs
 - Increase in Throughput
 - Decrease in End-to-End Delay
 - Increase in Delivery Ratio
 - Decrease in Drop Ratio

Network Topology for 802.11(static)

- Propagation Model -> ConstantSpeedPropagationDelayModel
- Propagation Loss Model -> RangePropagationLossModel
- Mac -> AdhocWifiMac
- Mac Standard ->WIFI_STANDARD_80211b

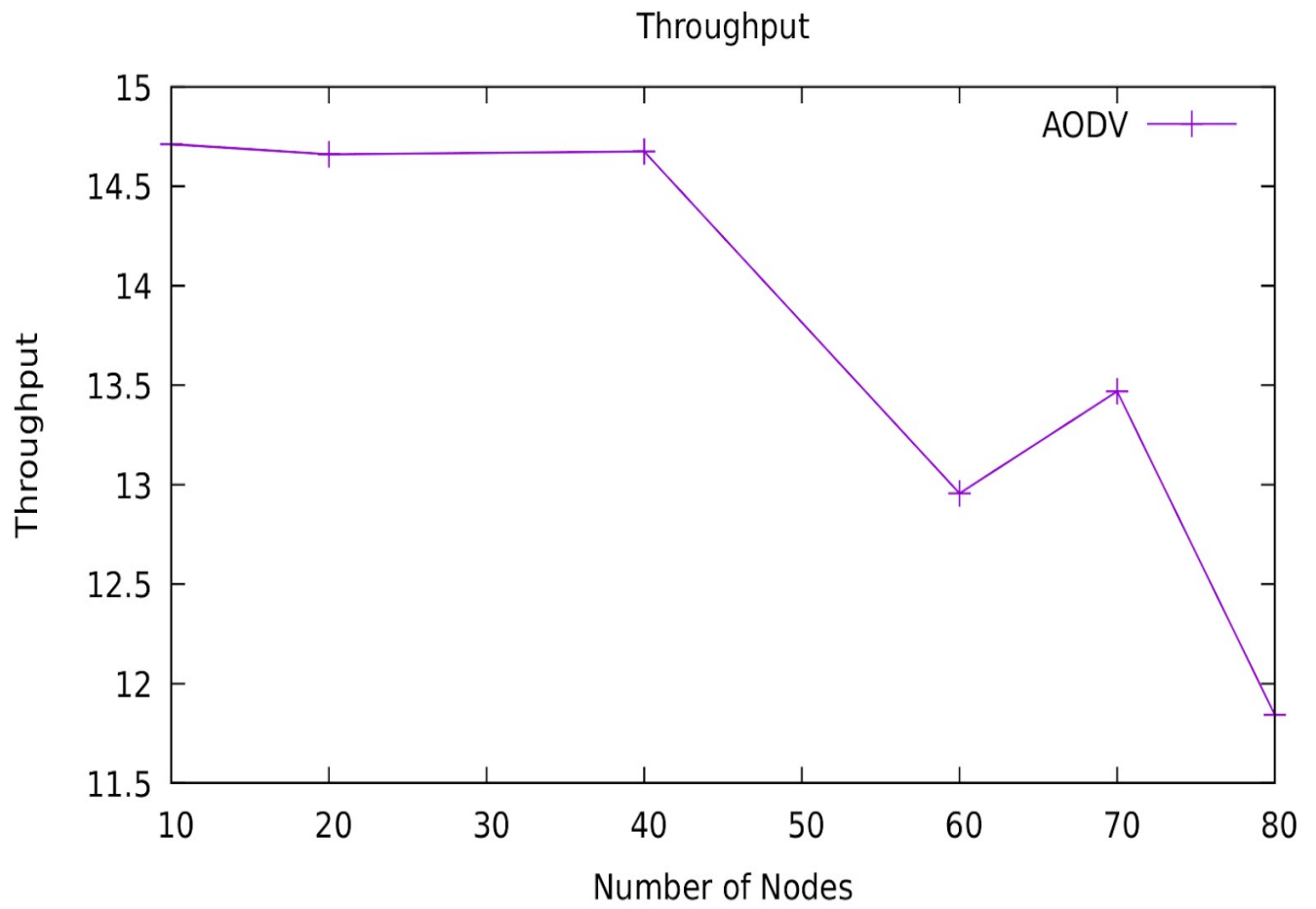
- Routing Protocol -> AODV
- Application Layer -> OnoffHelper/ns3::UdpSocketFactory
- Mobility Model -> ConstantPositionMobilityModel

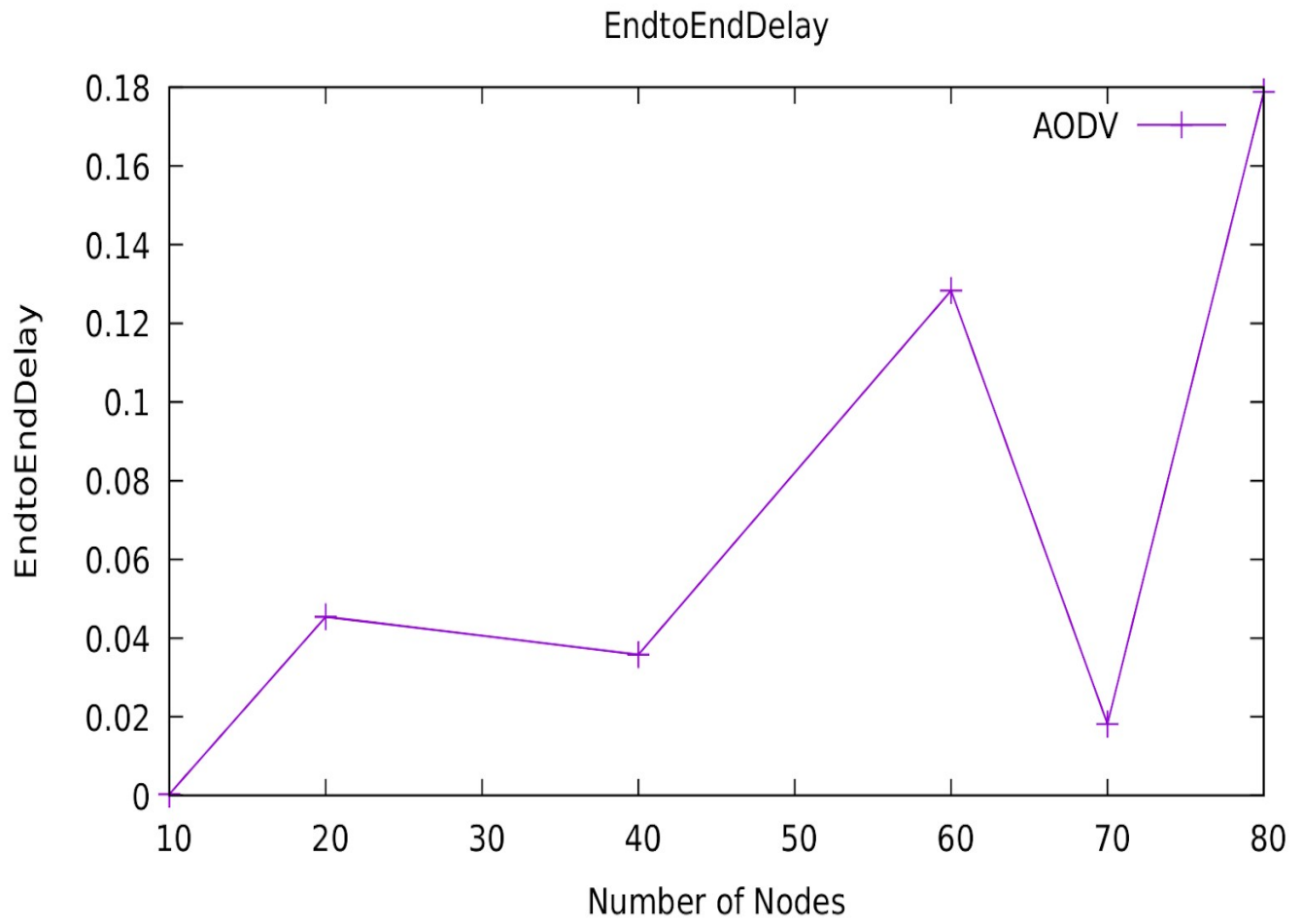
Results with Graphs(802.11)(static)

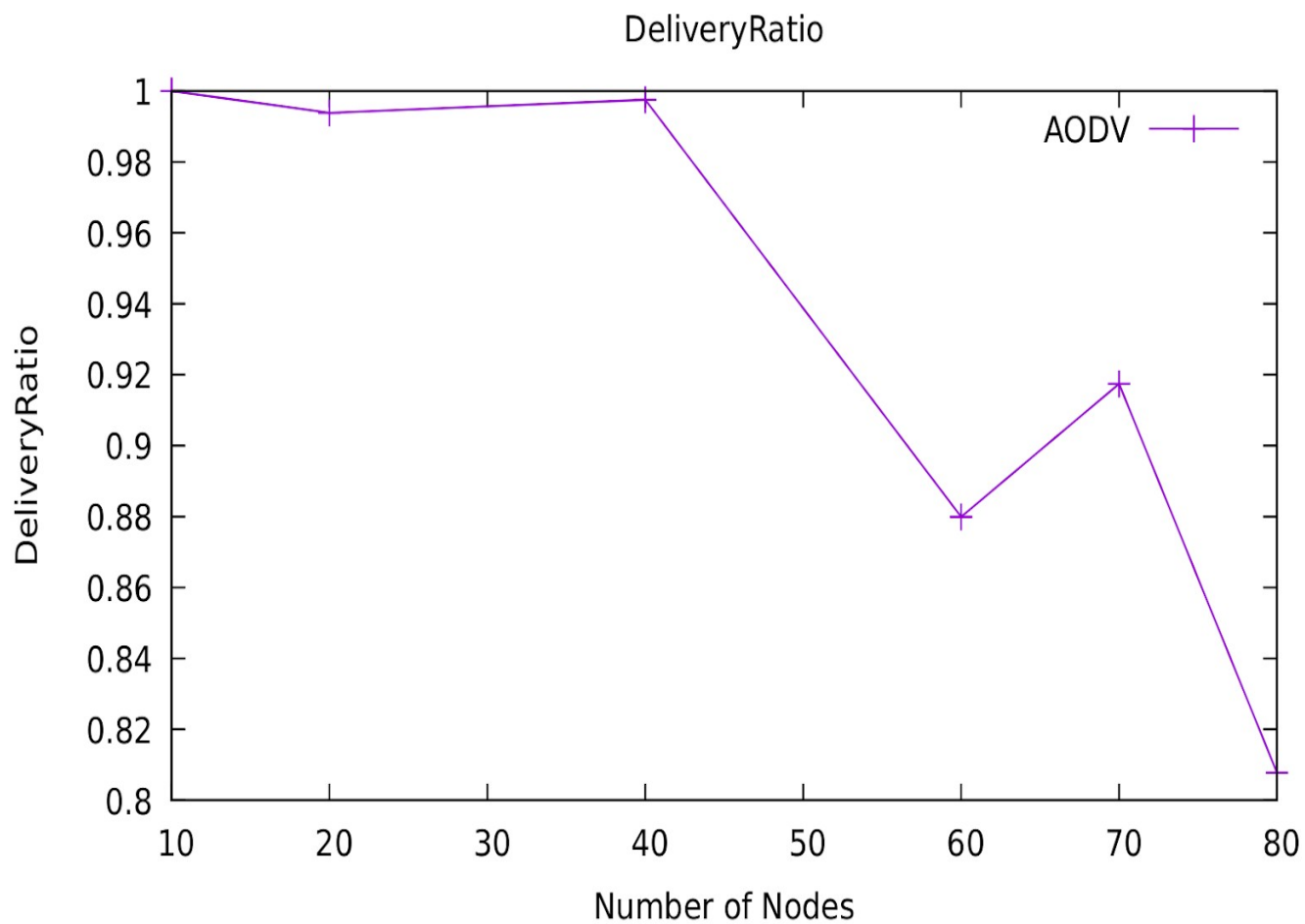
➤ Varying Number of Nodes

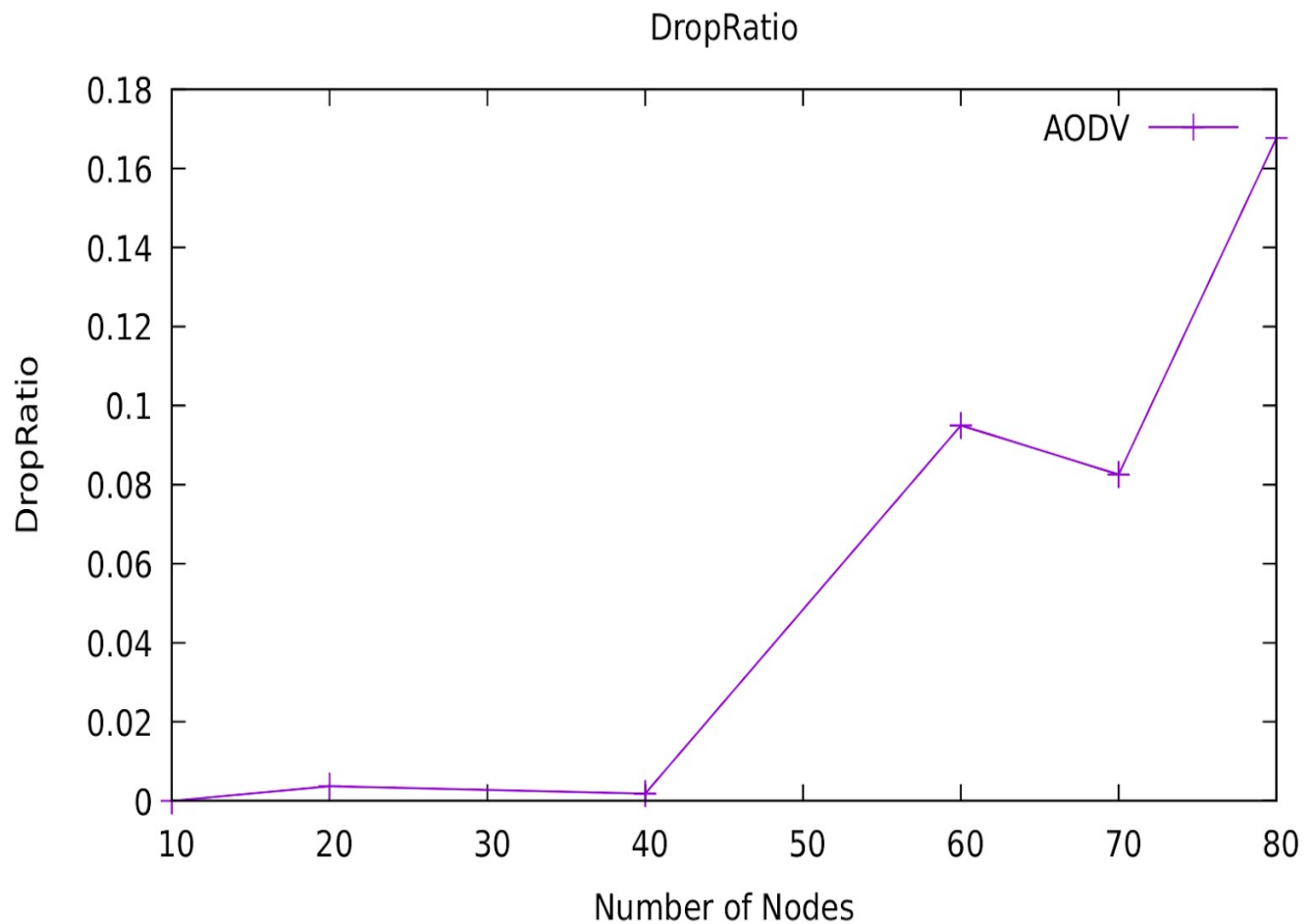
Fixed Parameters:

1. Number of Flows = 5
2. Number of Packets/Sec = 4
3. Coverage Area = 1000





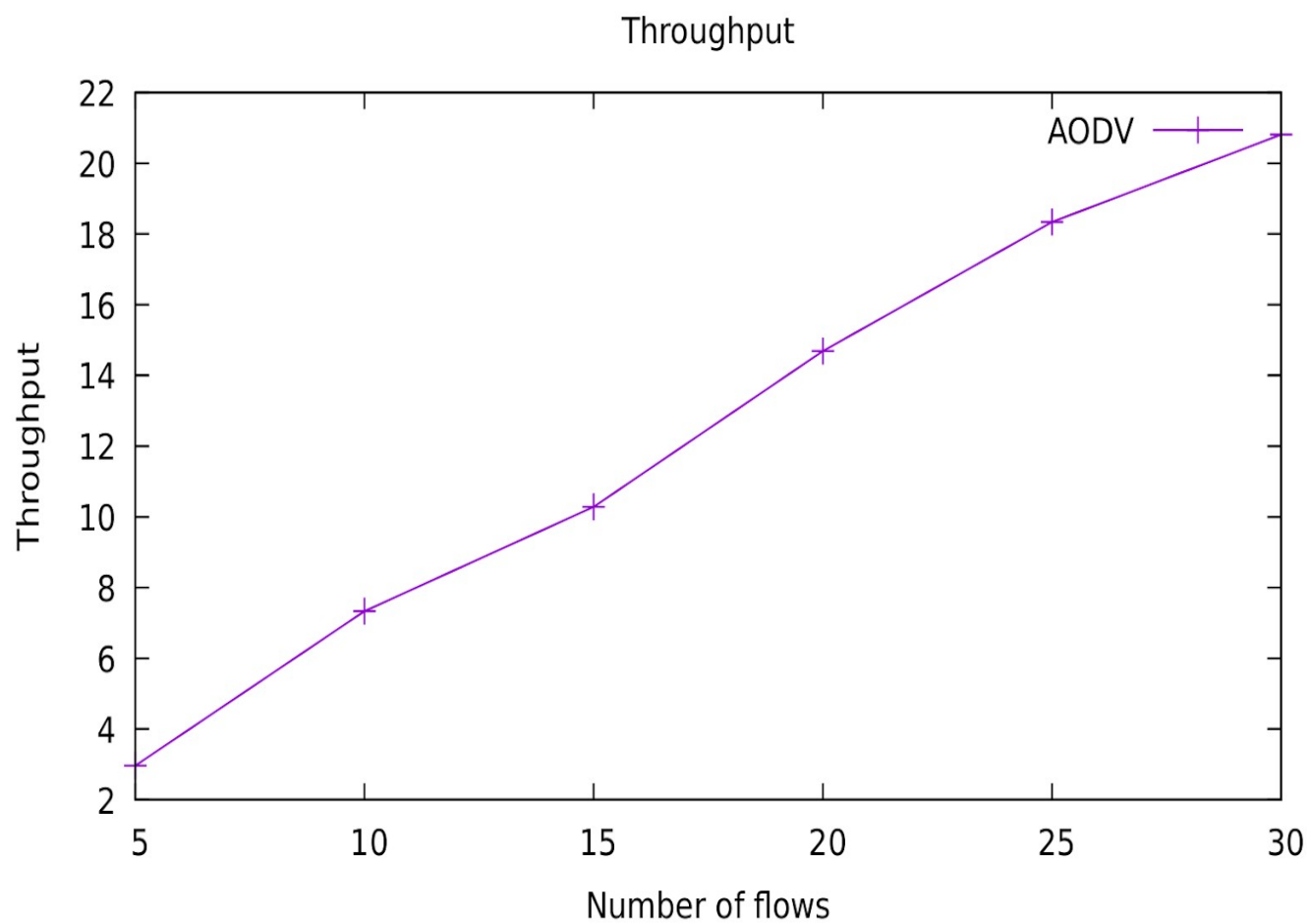


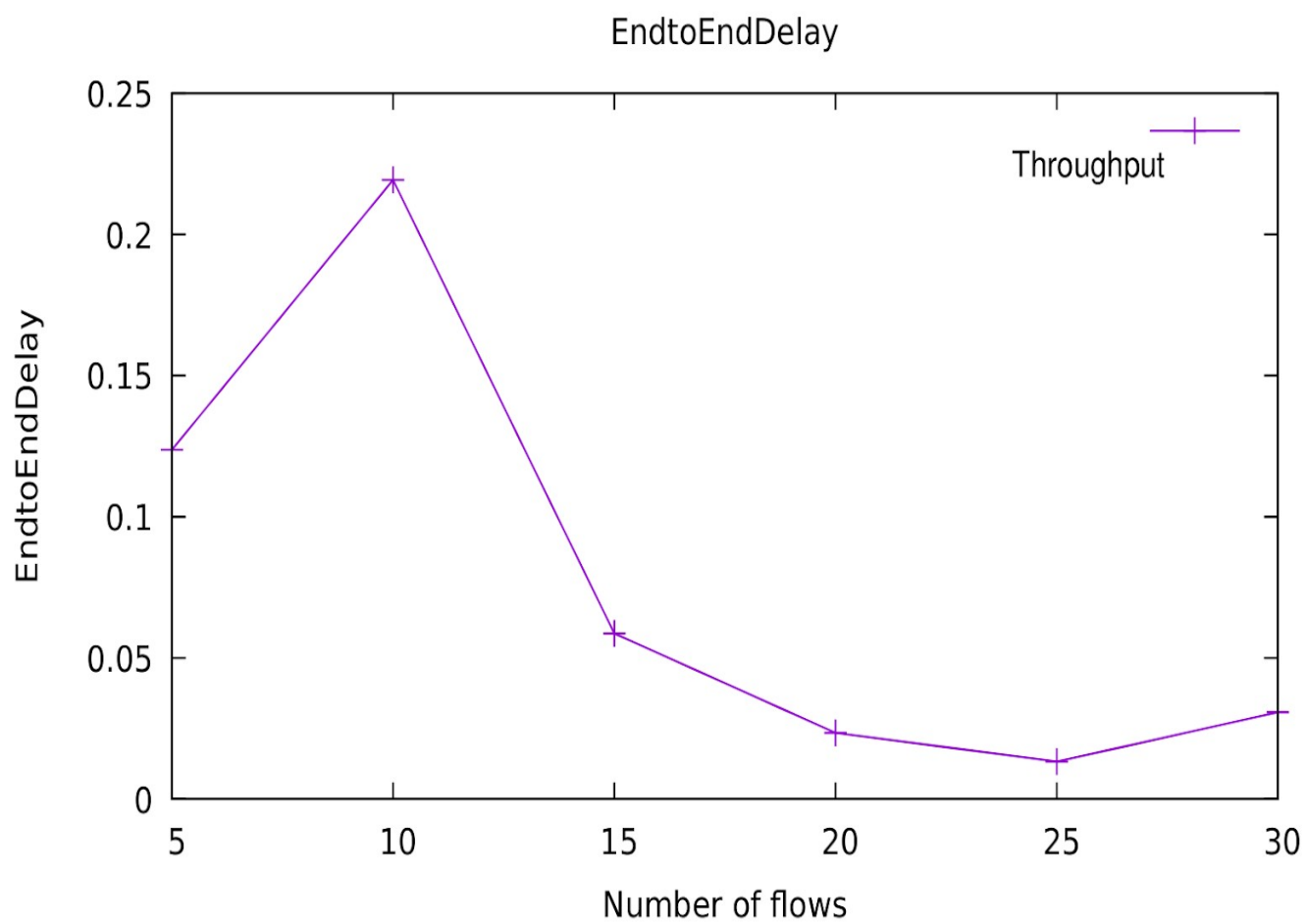


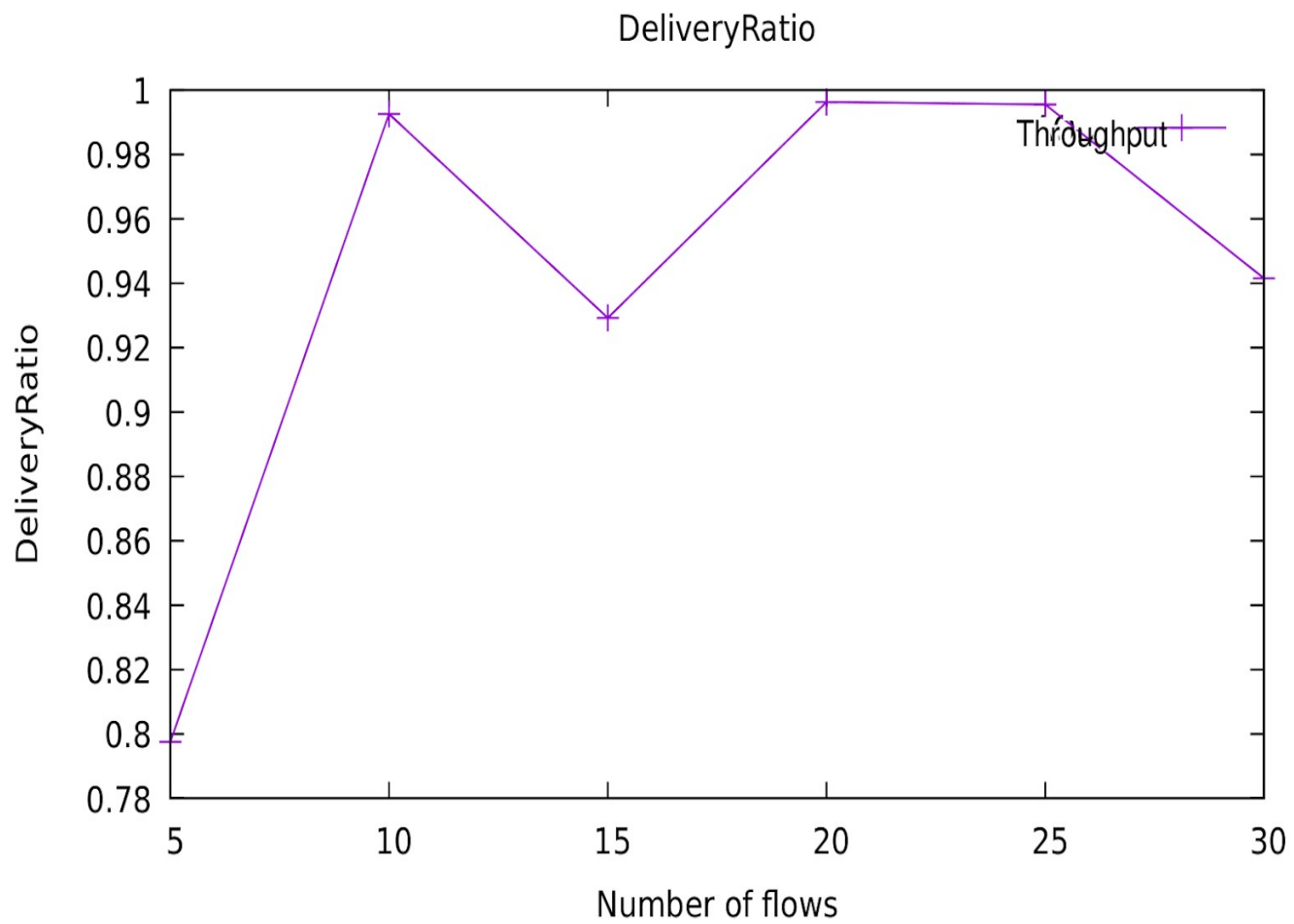
➤ Varying Number of Flows

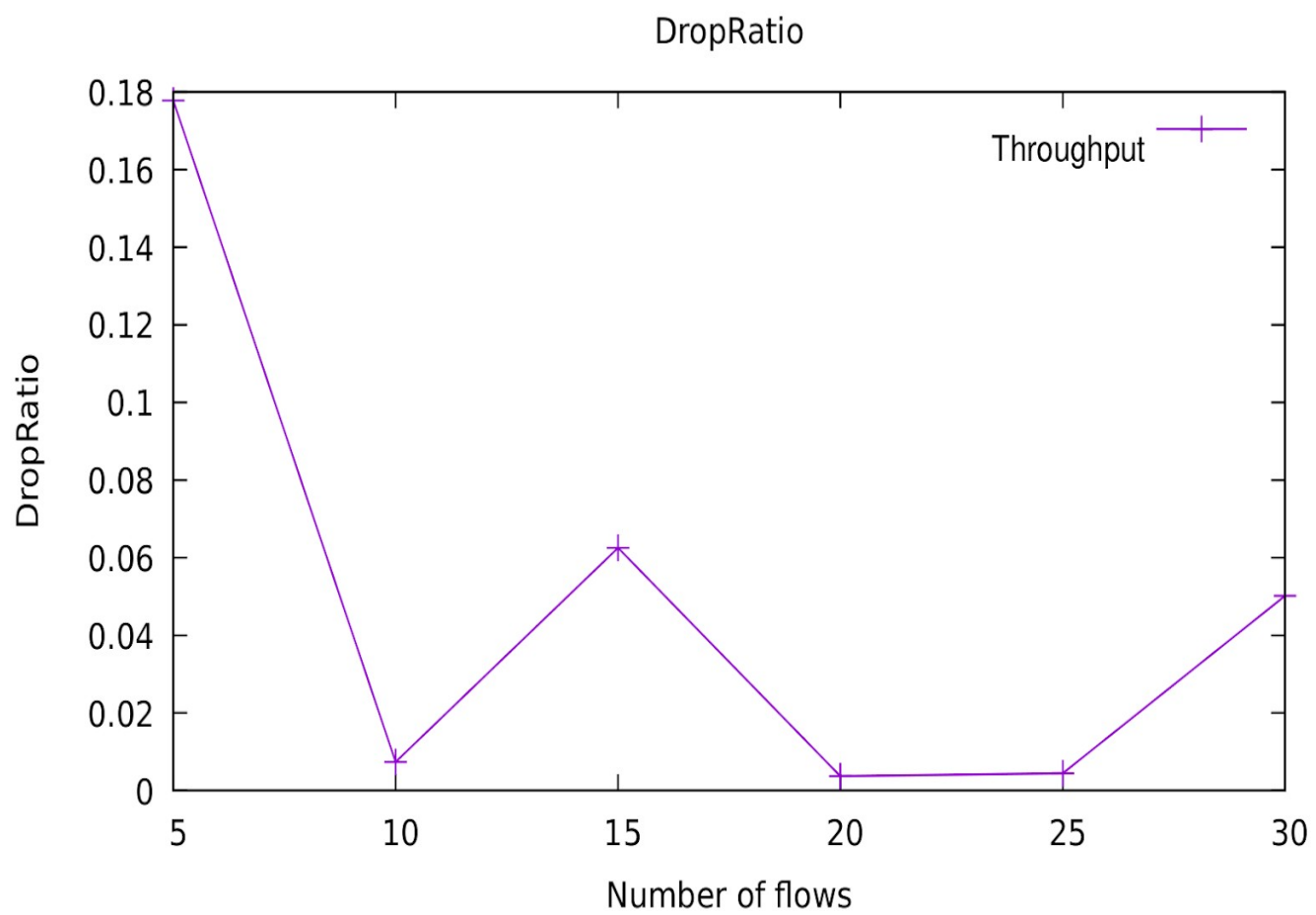
Fixed Parameters:

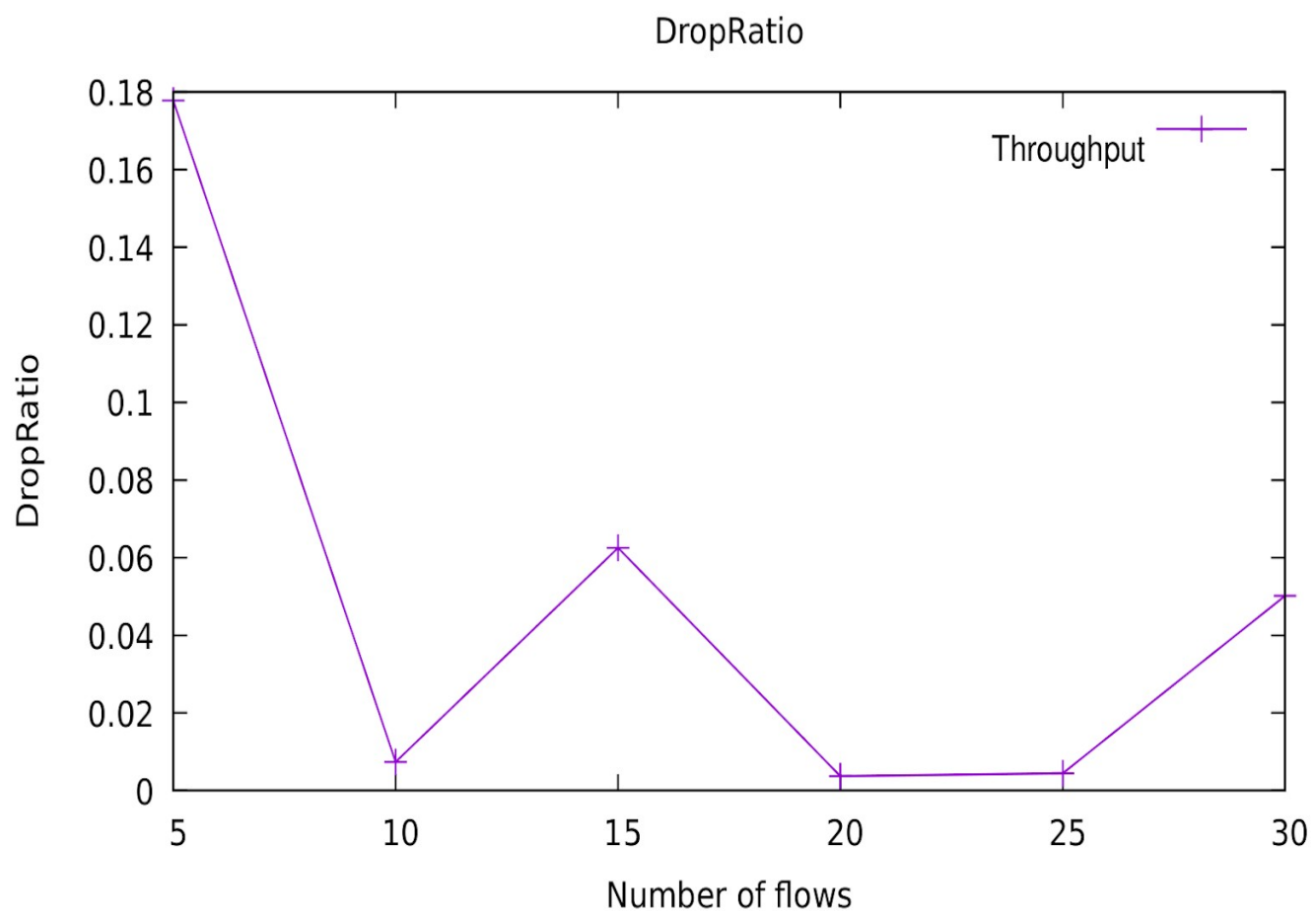
1. Number of Nodes = 60
2. Number of Packets/Sec = 1
3. Coverage Area = 1000







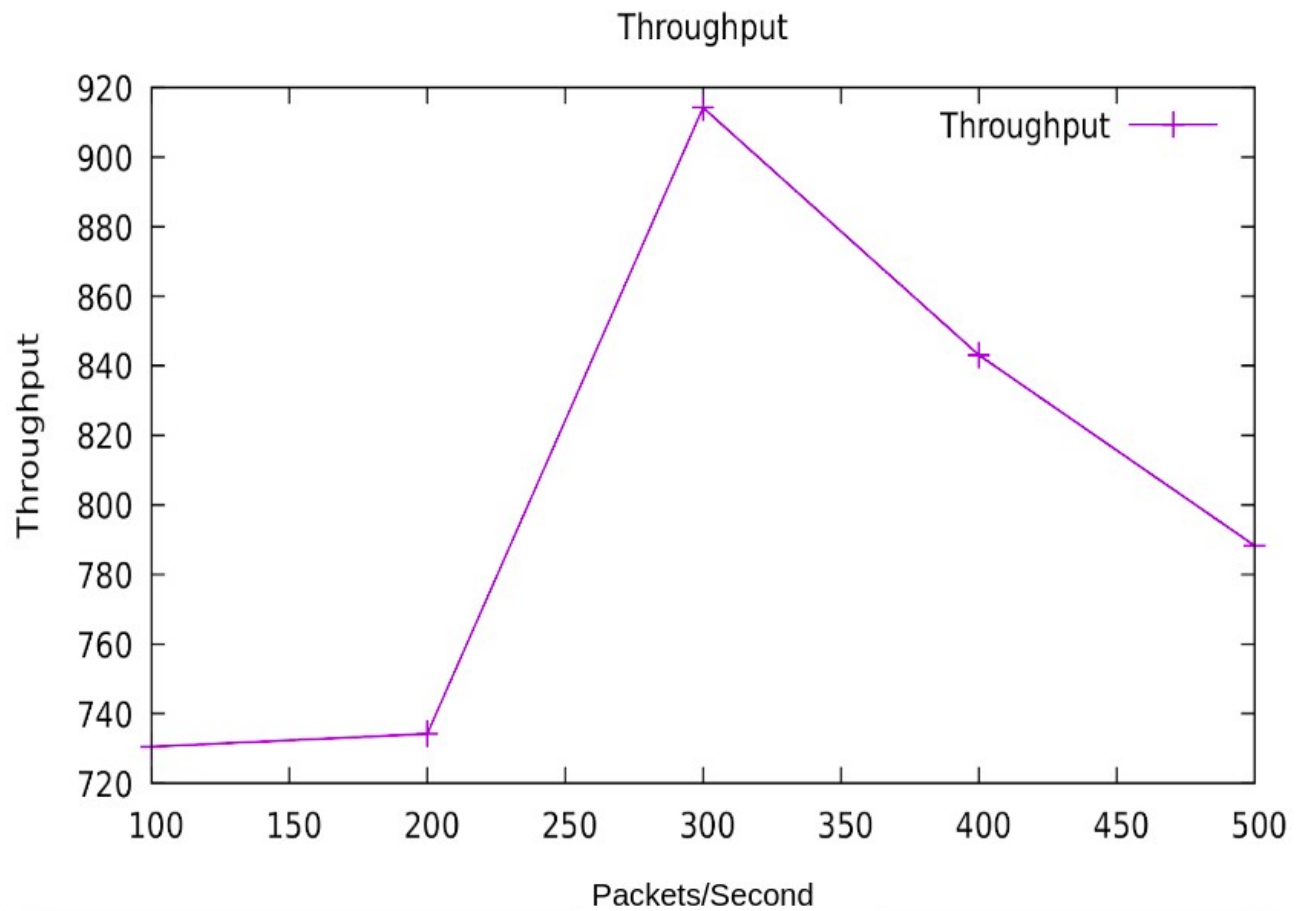


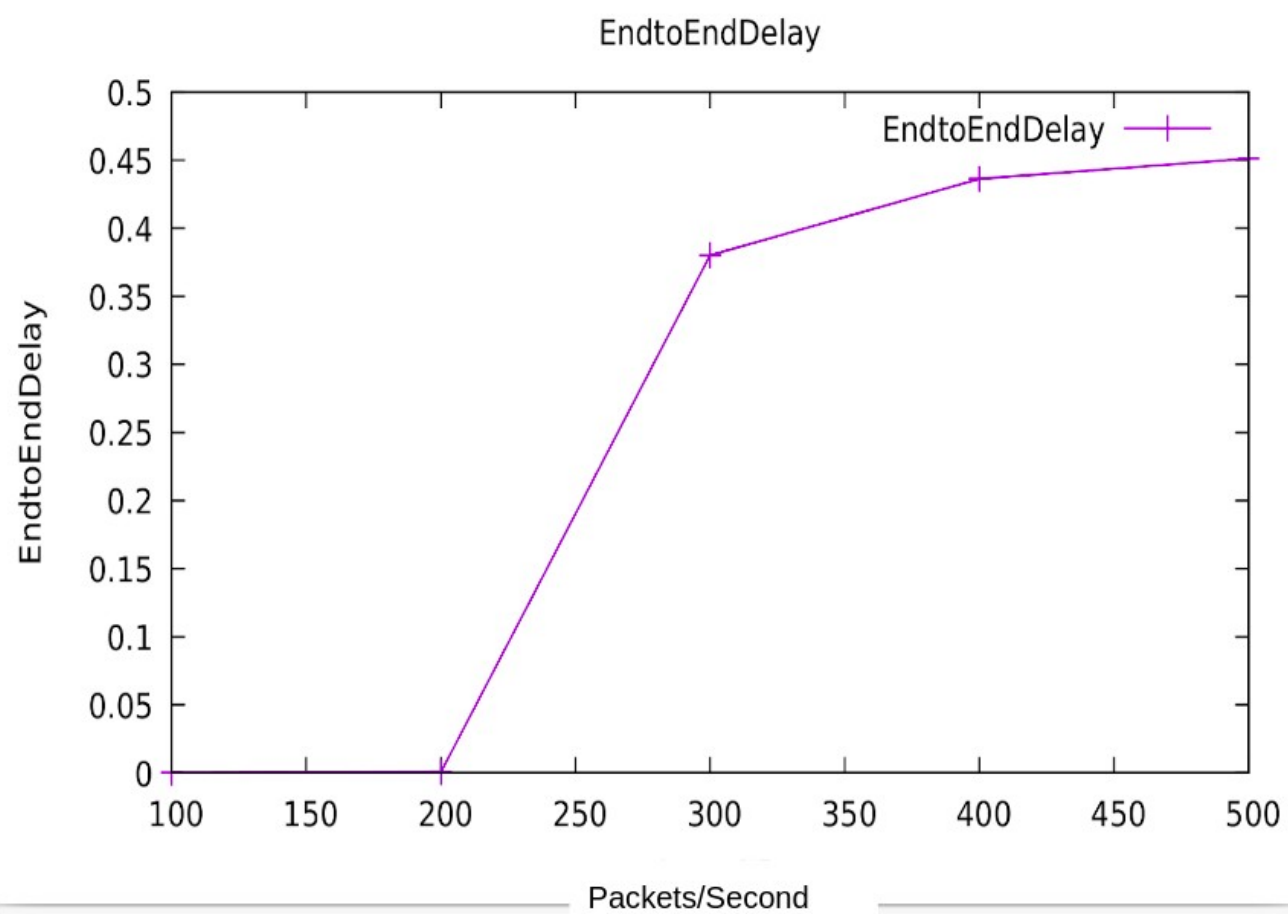


□ Varying Number of packets/Sec

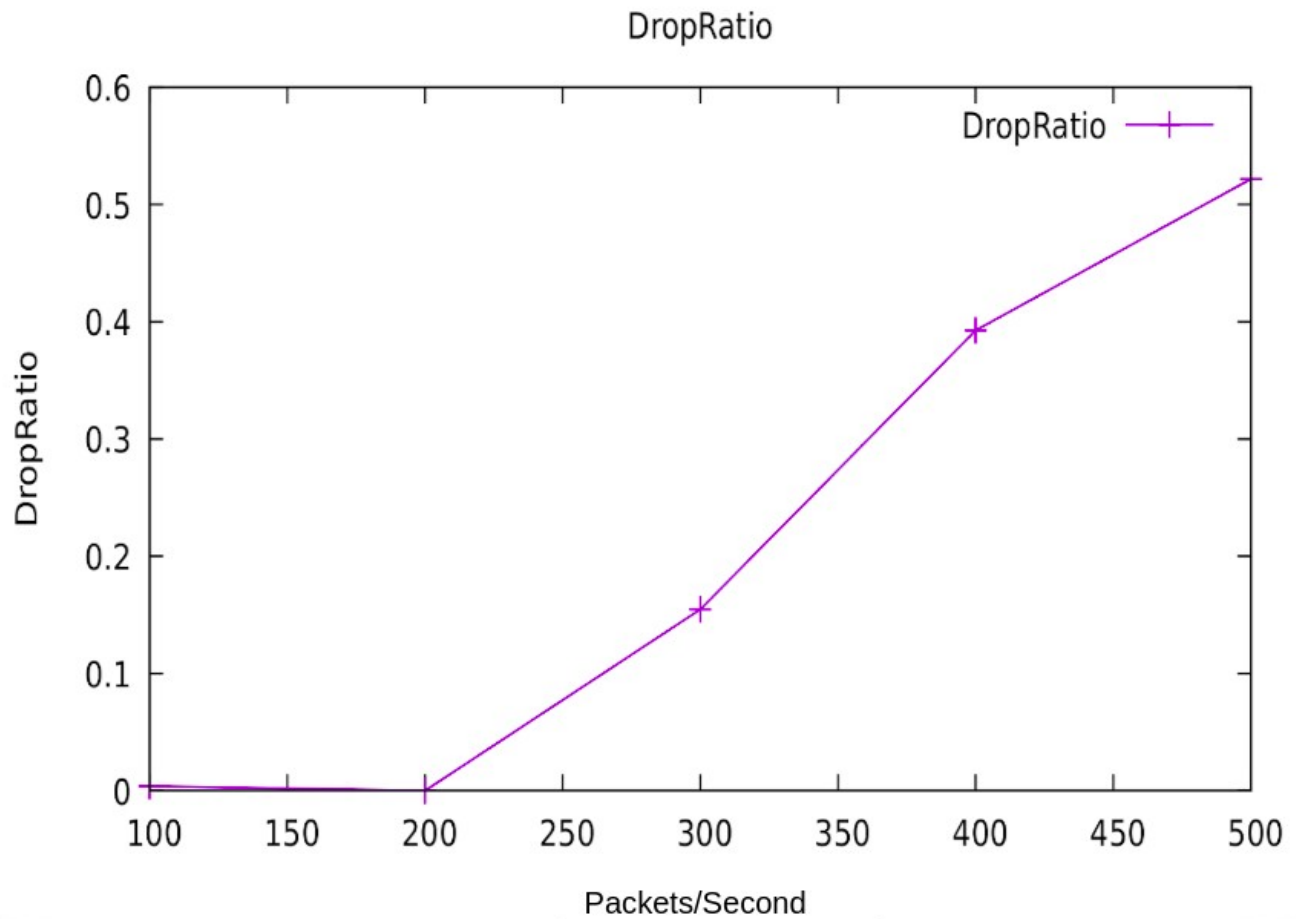
Fixed Parameters:

1. Number of Nodes = 50
2. Number of Flows = 10
3. Coverage Area = 1000





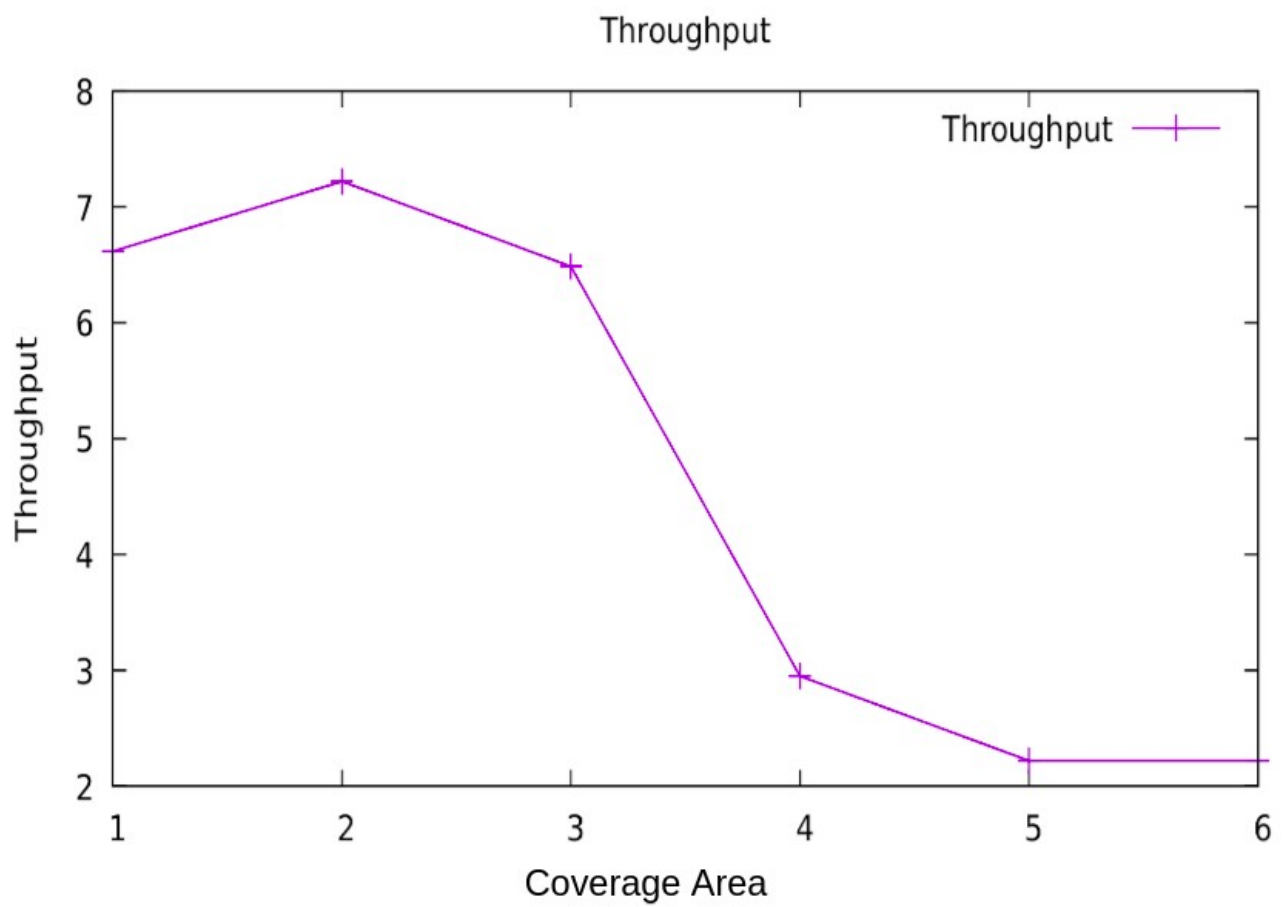


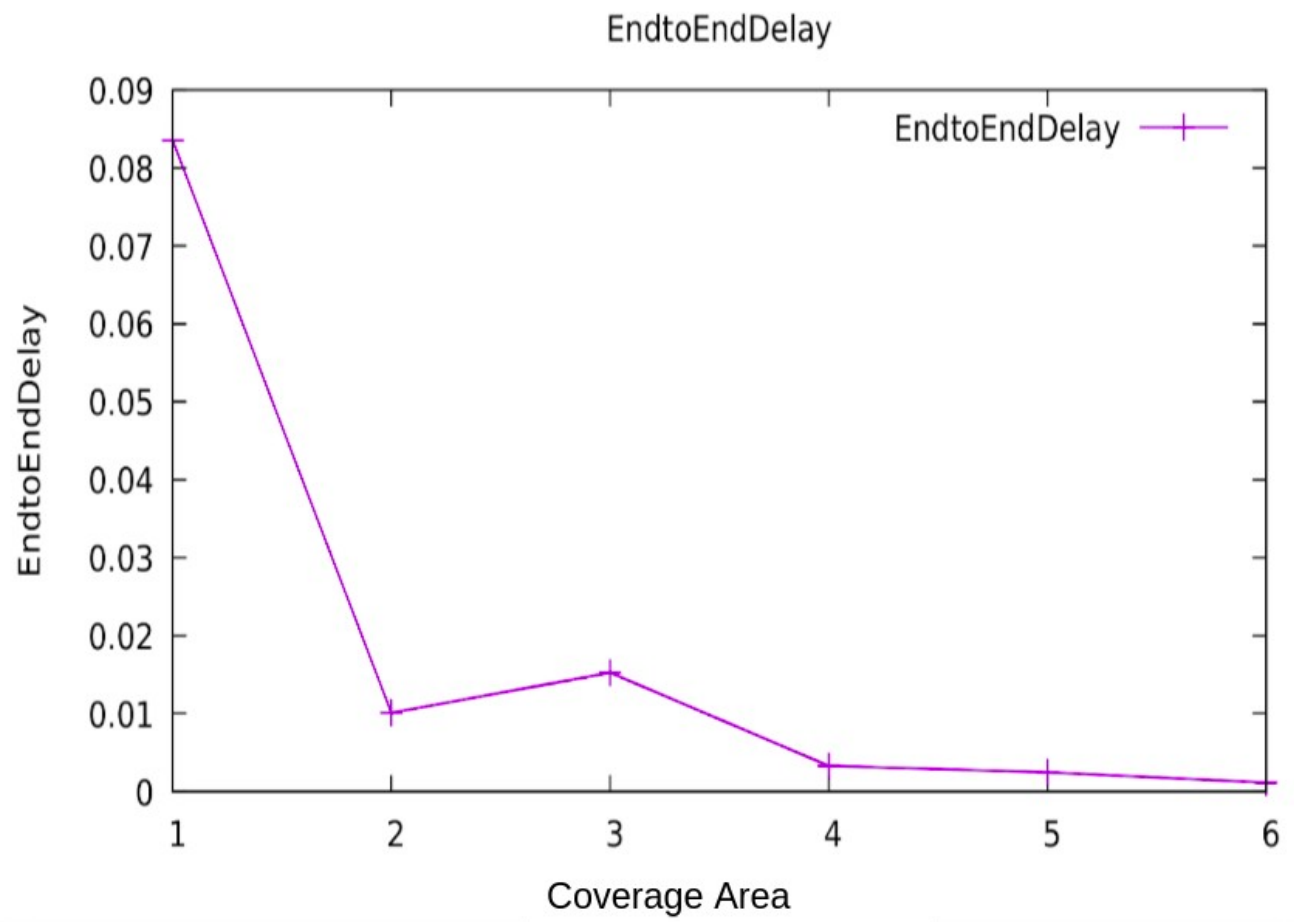


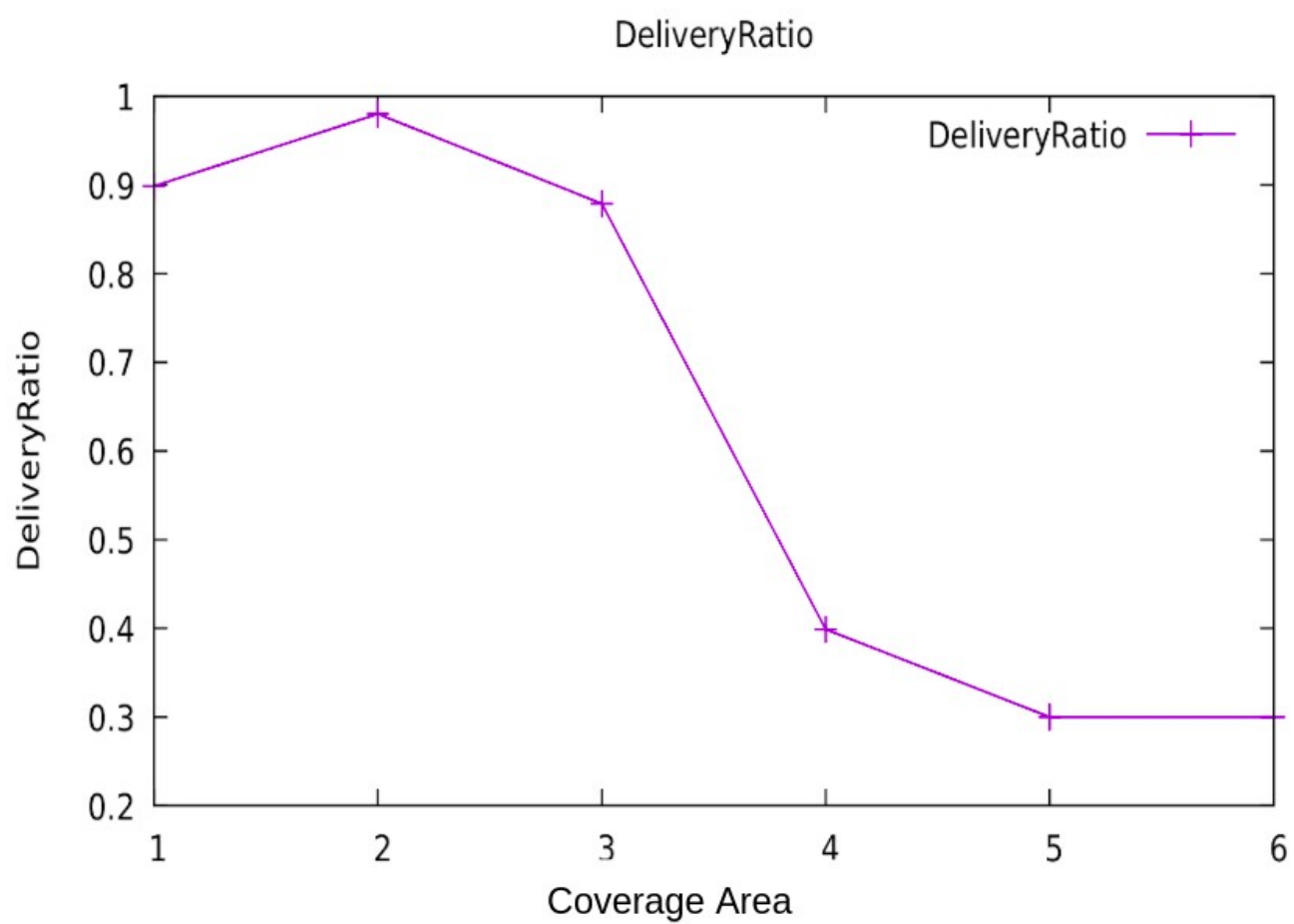
□ Varying Coverage Area

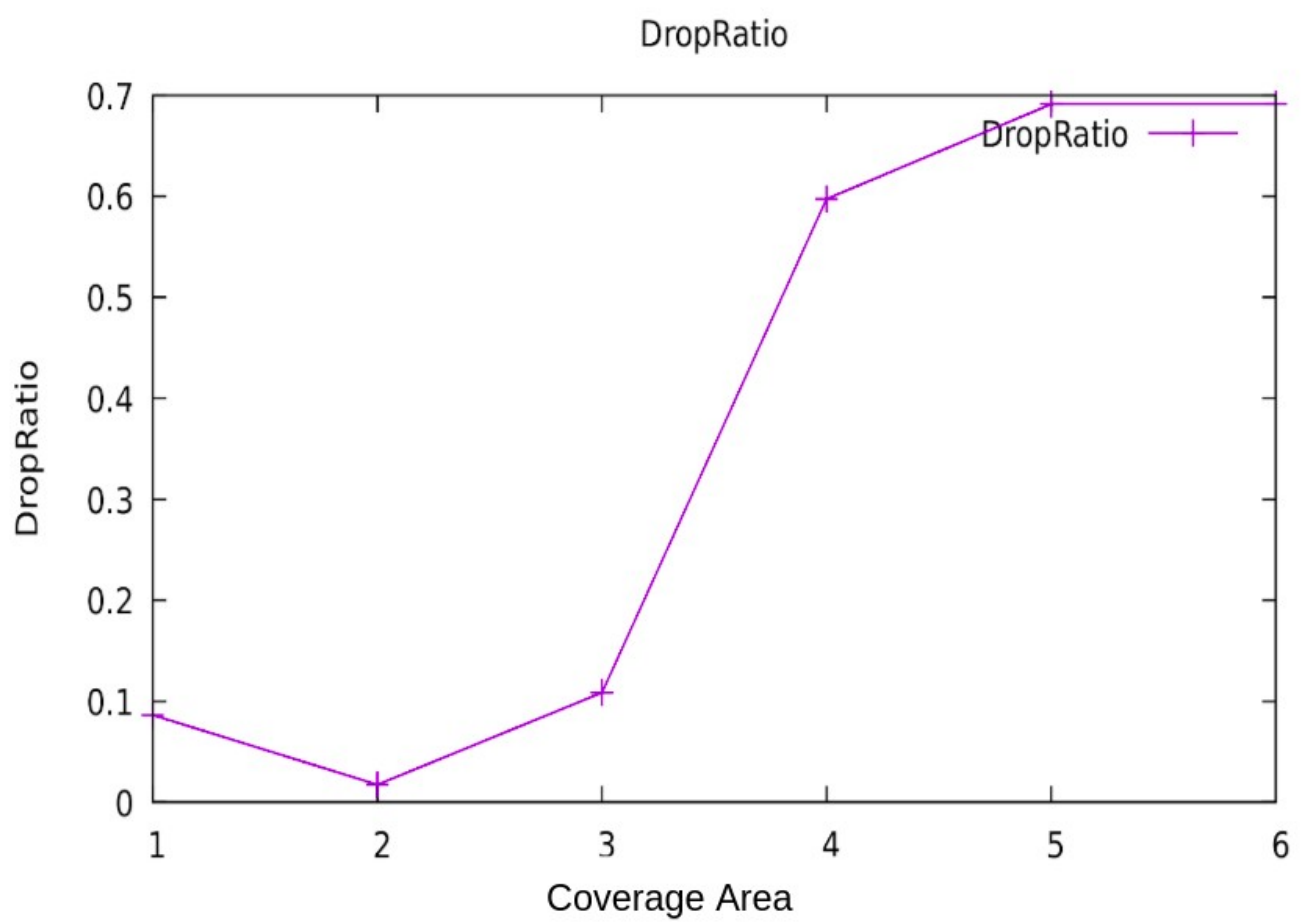
Fixed Parameters:

1. Number of Nodes = 80
2. Number of Flows = 20
3. Number of Packets/Sec = 10









Network Topology for 802.15.4(mobile)

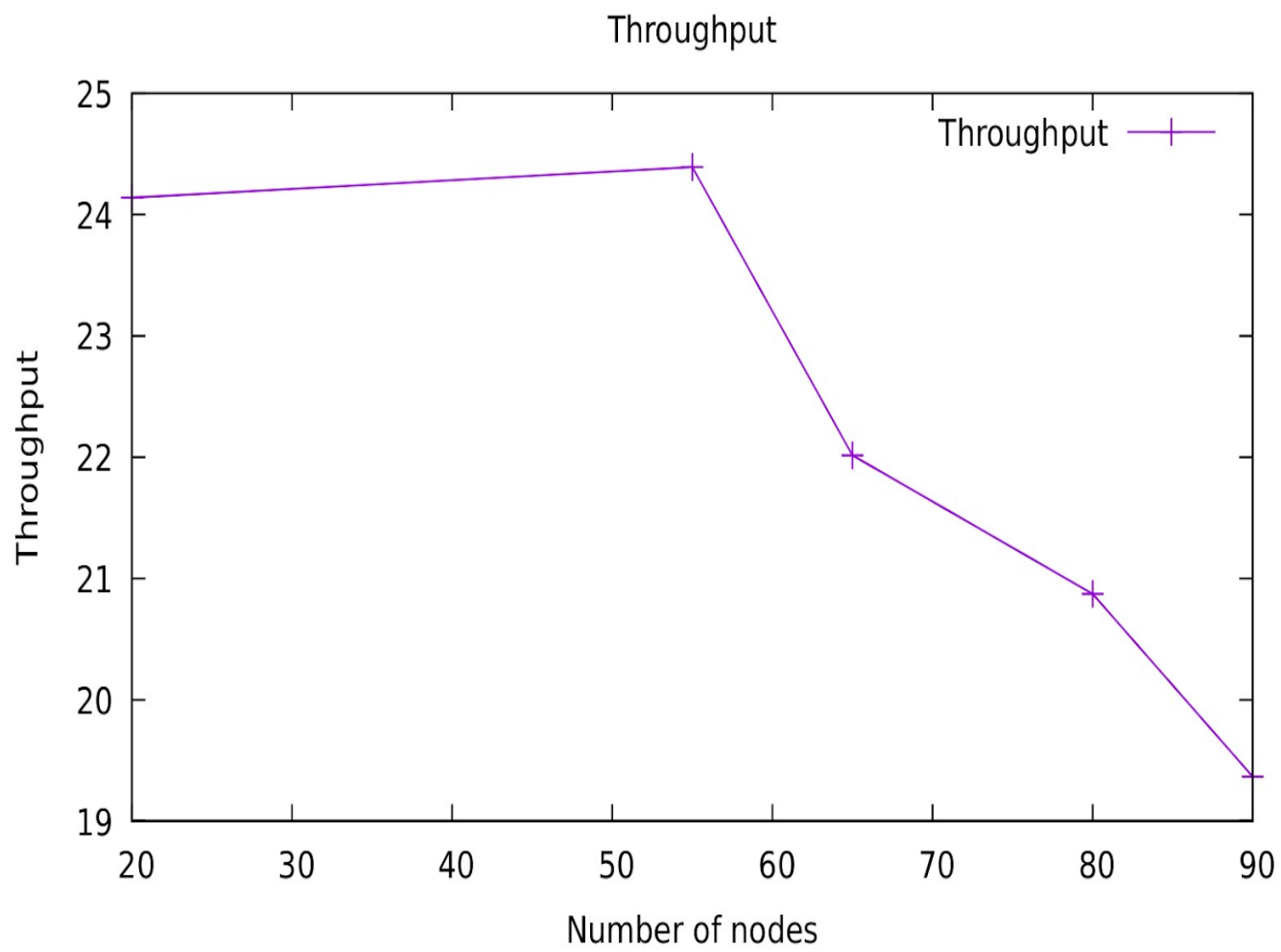
- Propagation Model -> ConstantSpeedPropagationDelayModel
- Propagation Loss Model -> RangePropagationLossModel
- Channel -> LrwpanHelper
- Used **6LoWPAN** group that allows IPv6 packets to be sent and received over **IEEE 802.15.4** based networks
- Routing Protocol -> Default Global Routing
- Application Layer → OnoffHelper/ns3::UdpSocketFactory
- Mobility Model -> RandomWaypointMobilityModel

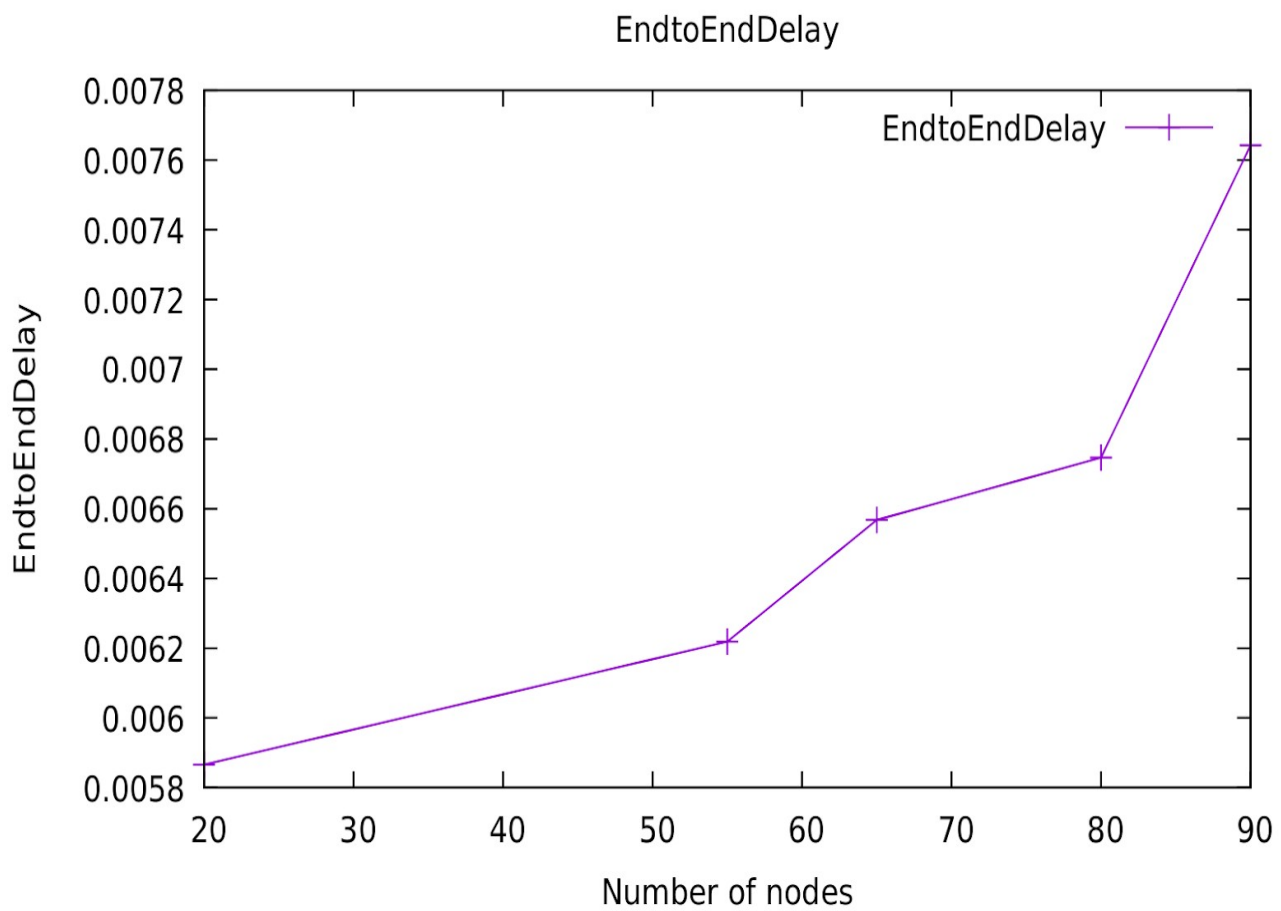
Results With Graph(802.15.4) (mobile)

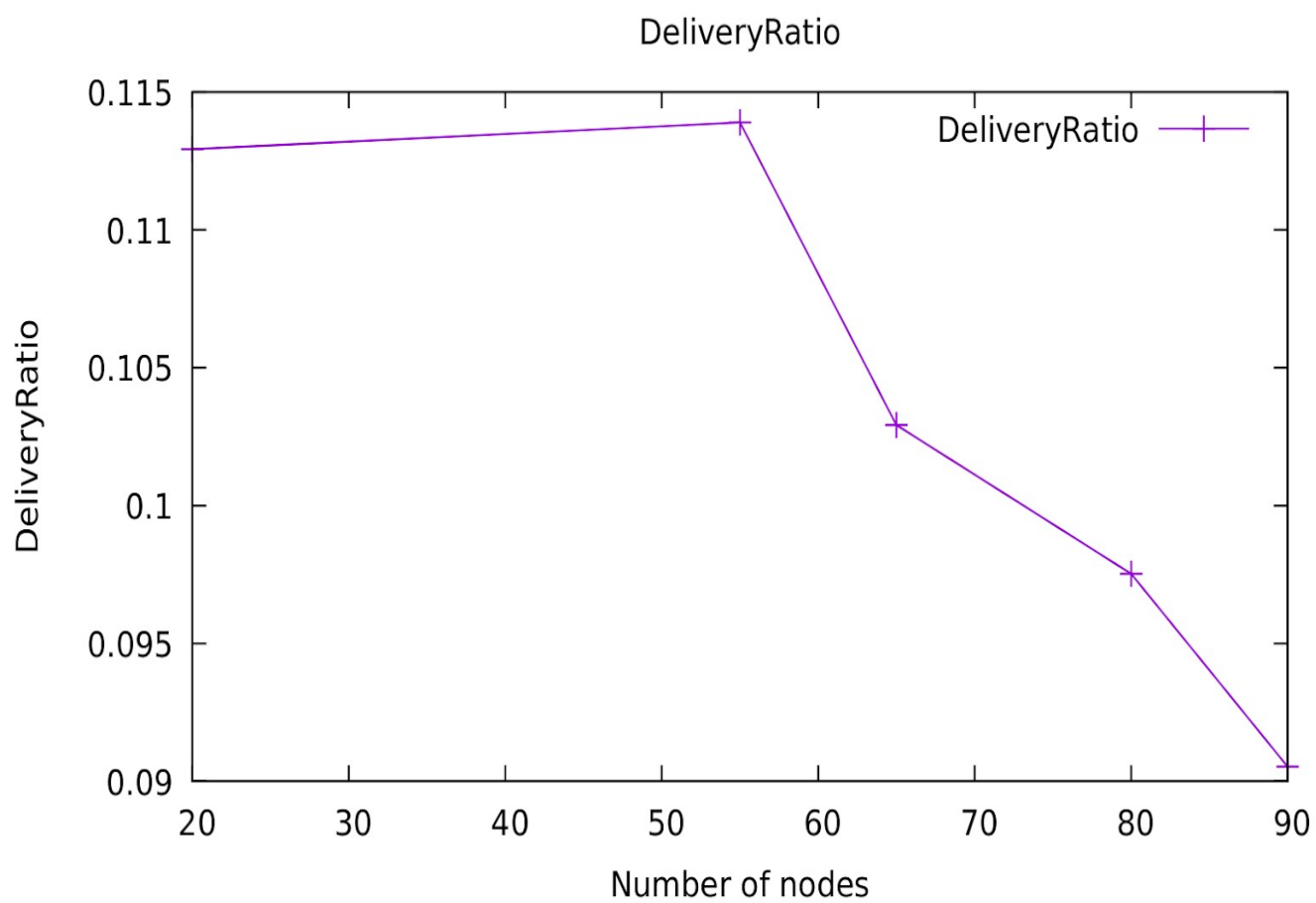
☐ Varying Number of nodes

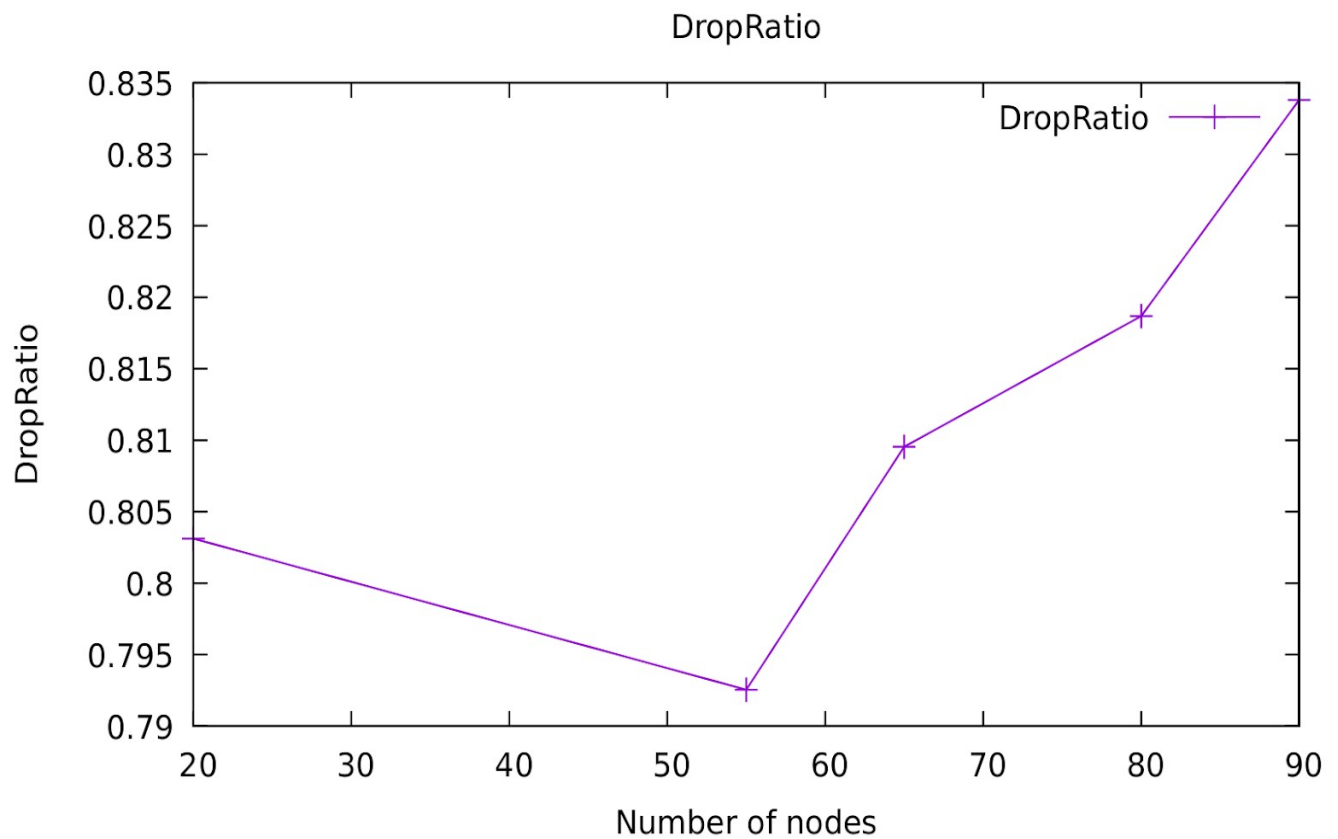
Fixed Parameters:

1. Number of Flows = 6
2. Number of packets/Sec = 40
3. Node Speed = 20





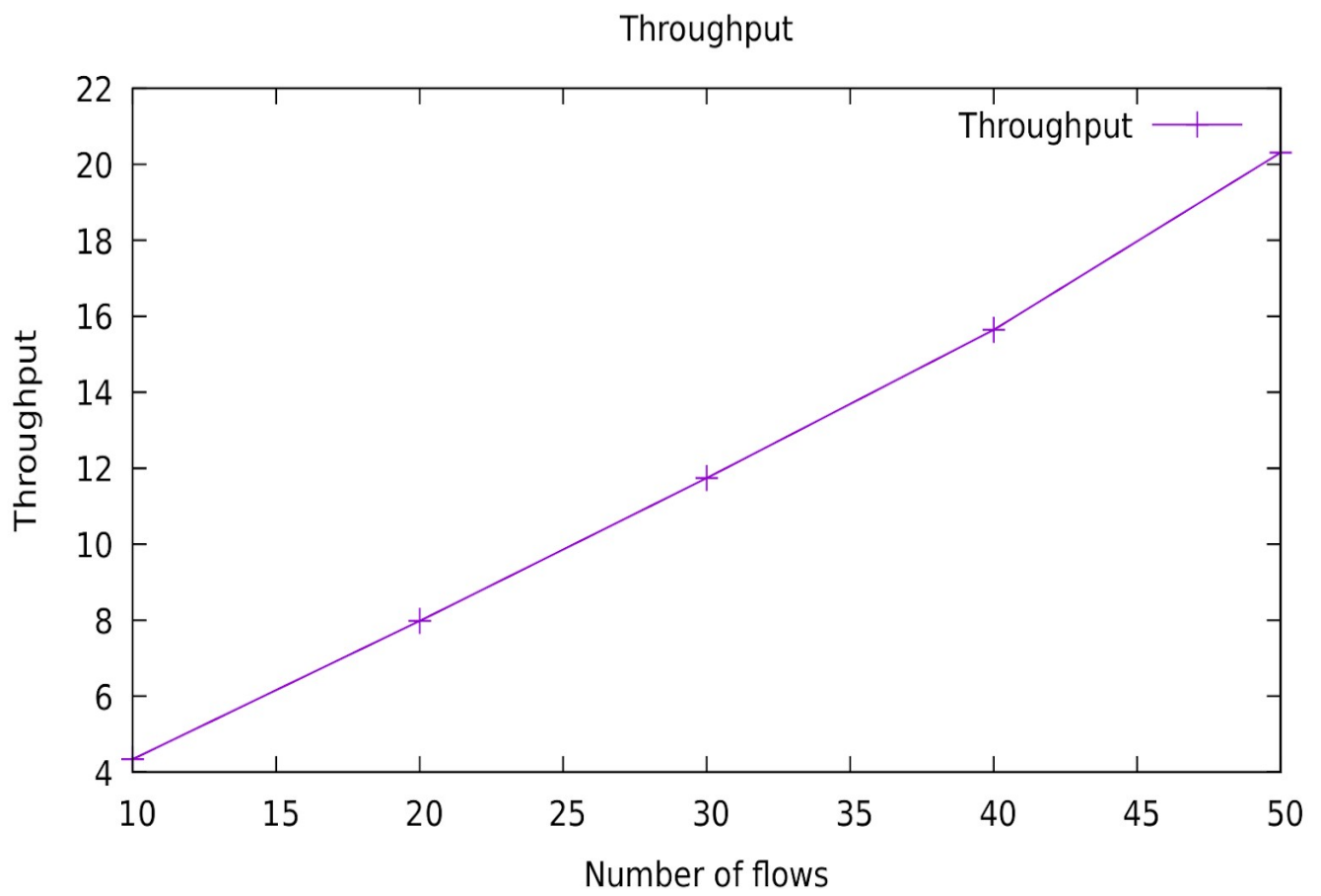


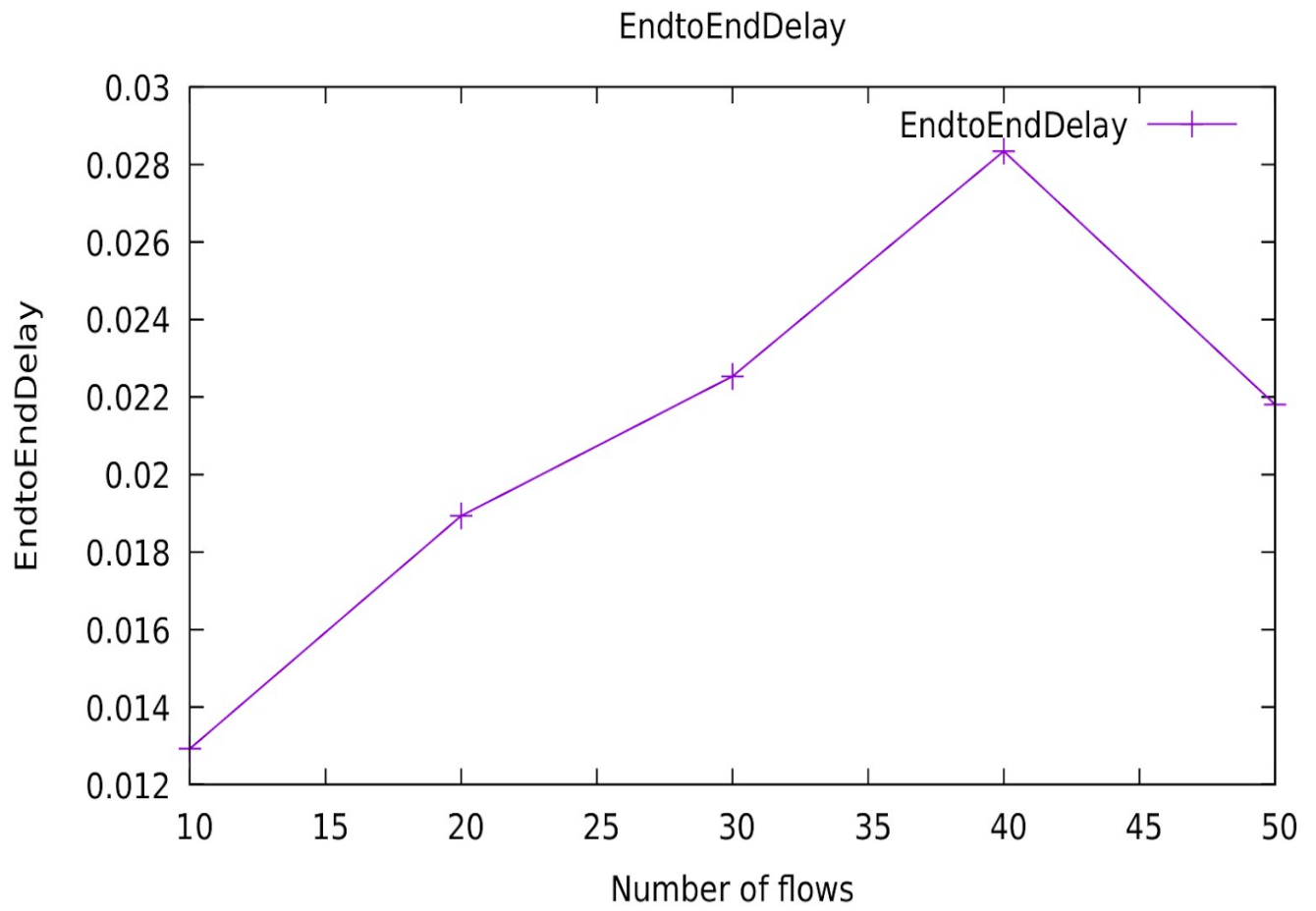


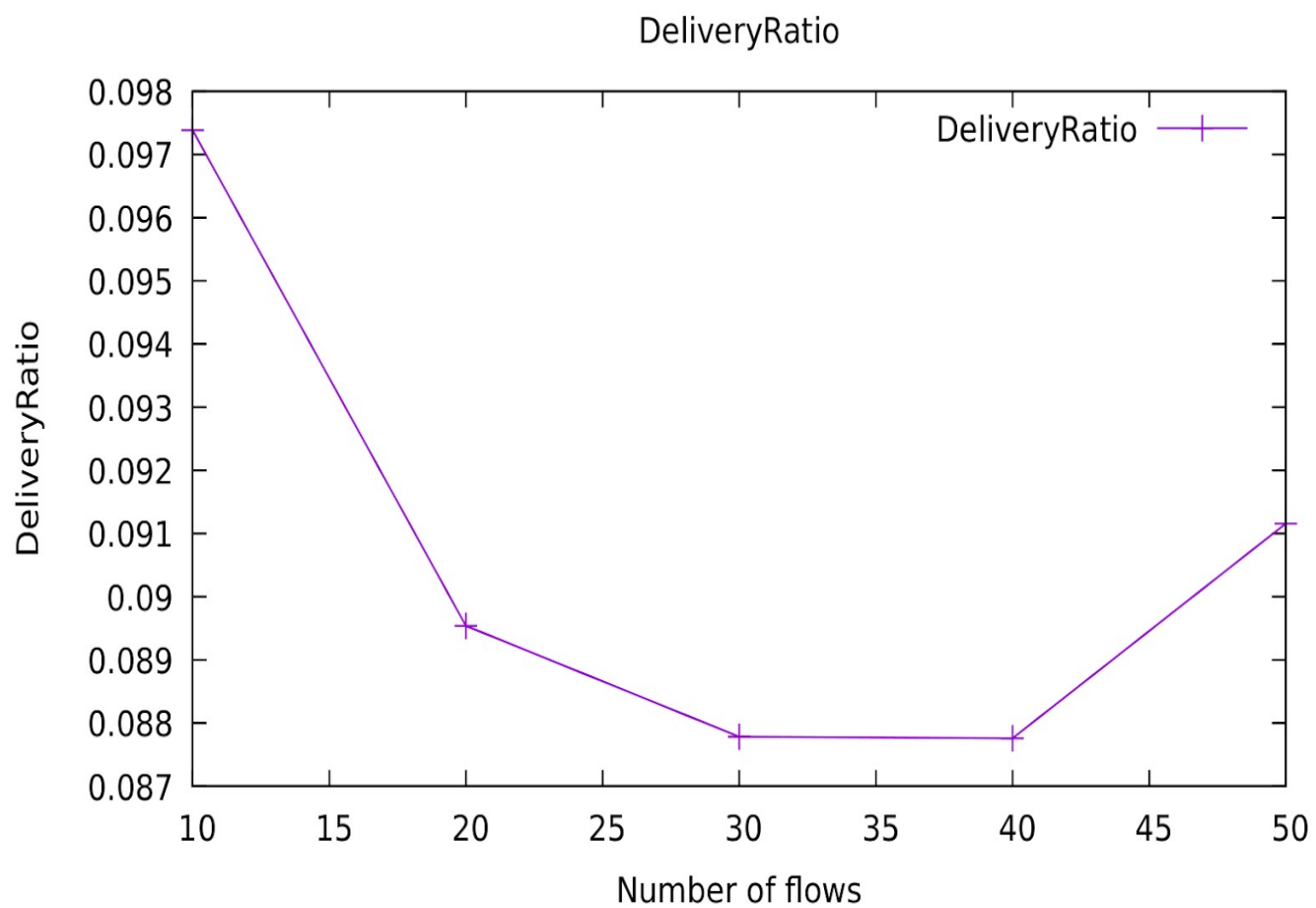
□ Varying Number of Flows

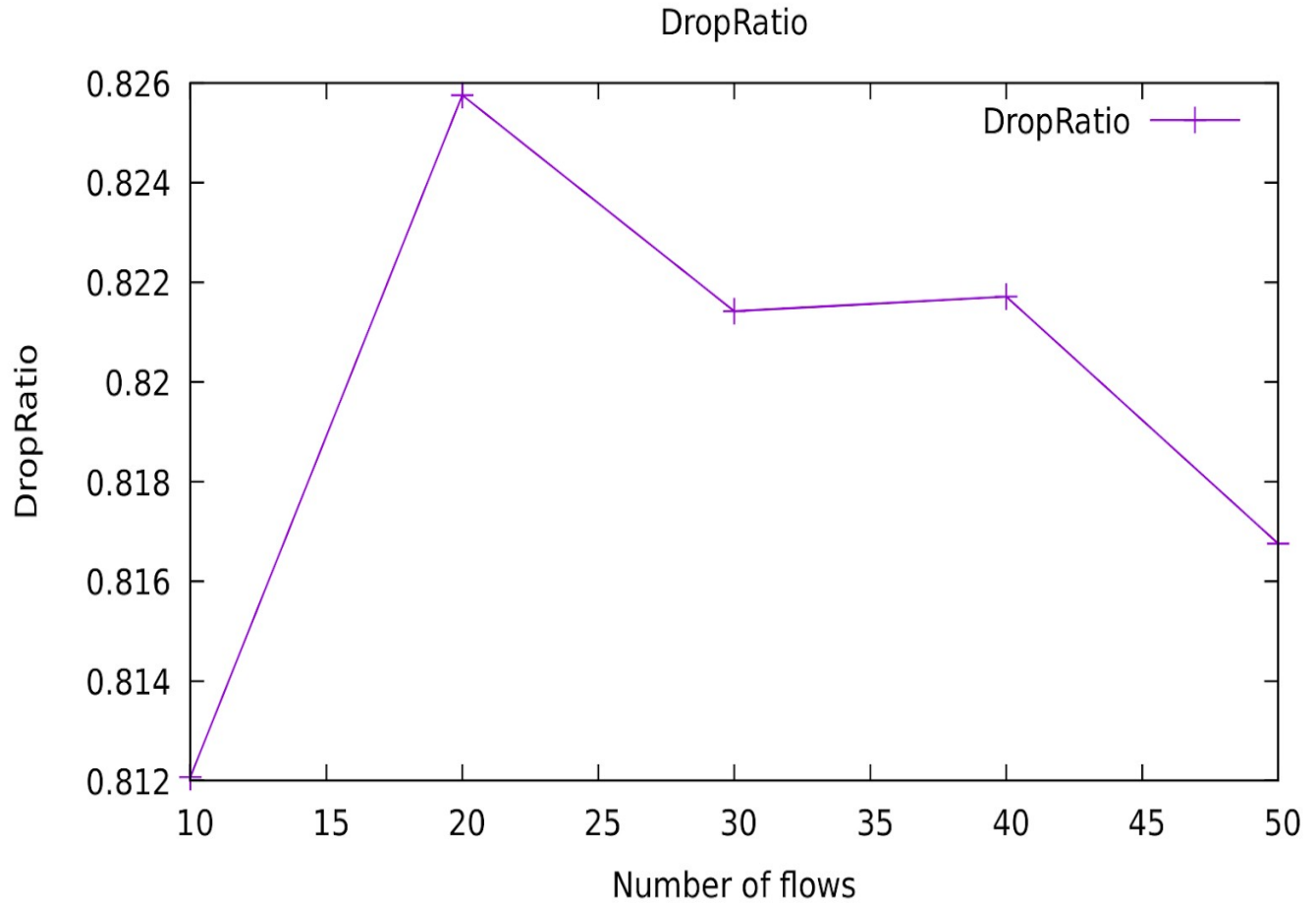
Fixed Parameters:

1. Number of Nodes = 110
2. Number of Packets/Sec = 5
3. Node Speed = 30





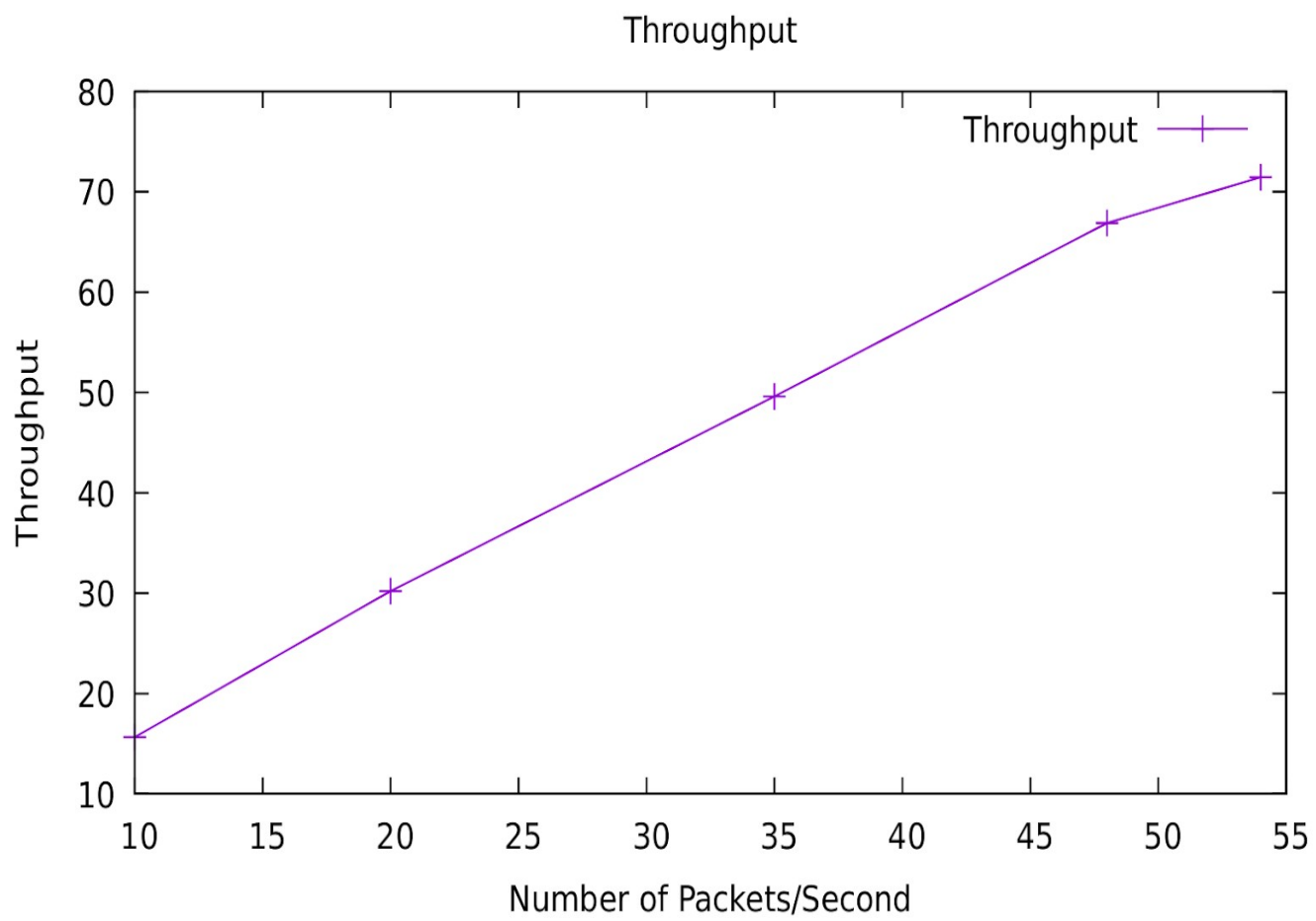


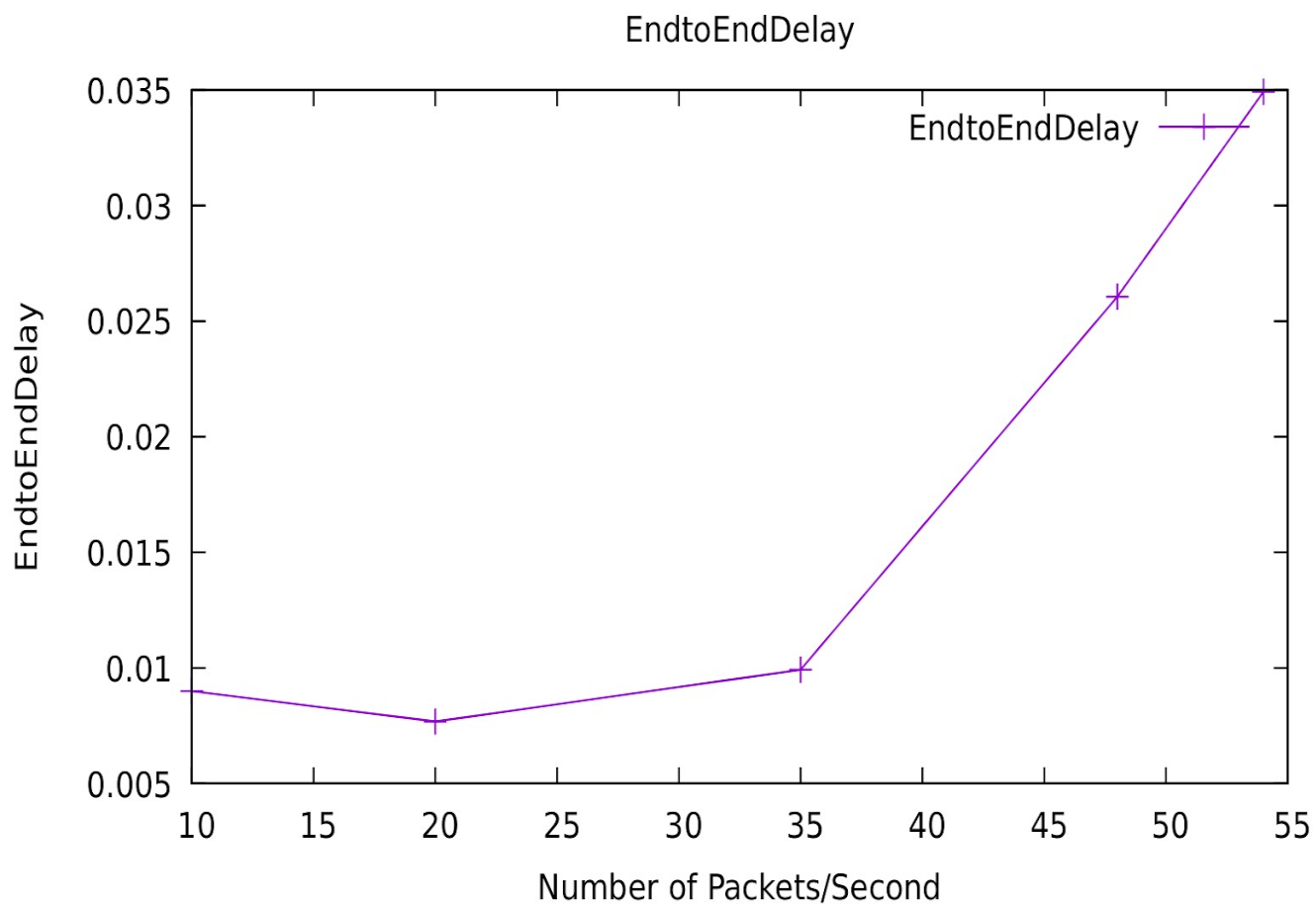


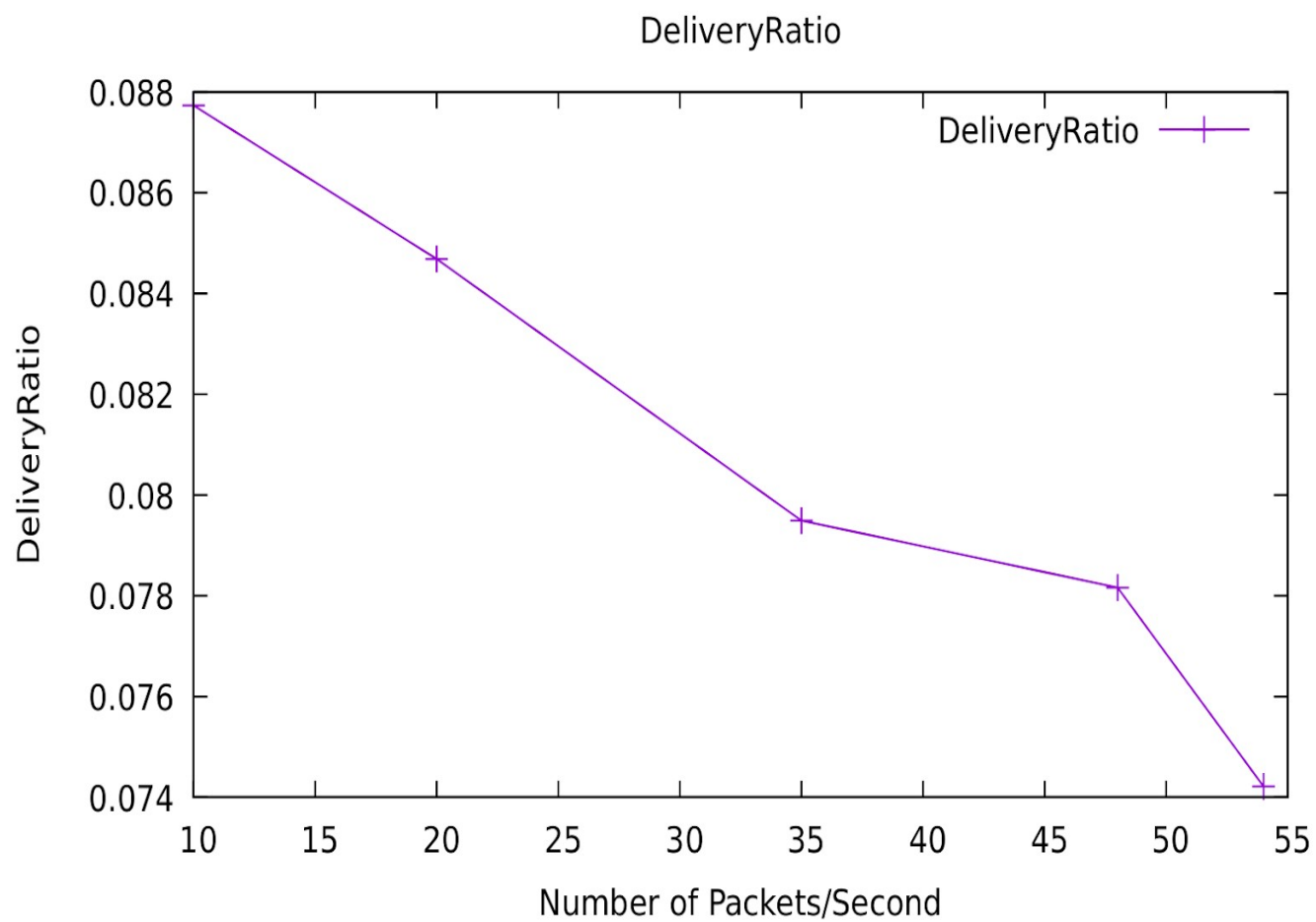
□ Varying Number of Packets/Sec

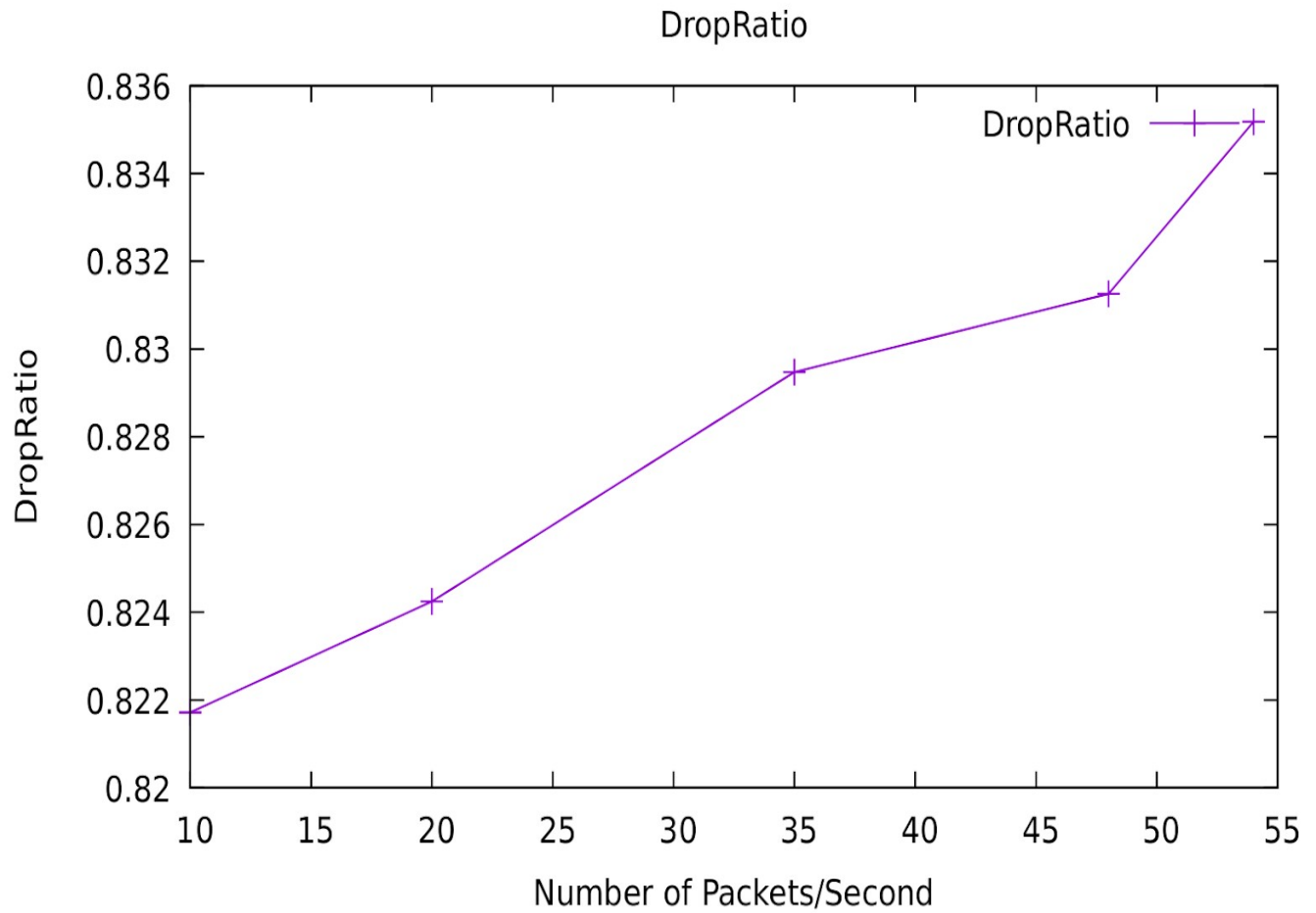
Fixed Parameters:

1. Number of Nodes = 70
2. Number of Flows = 20
3. Node Speed = 20





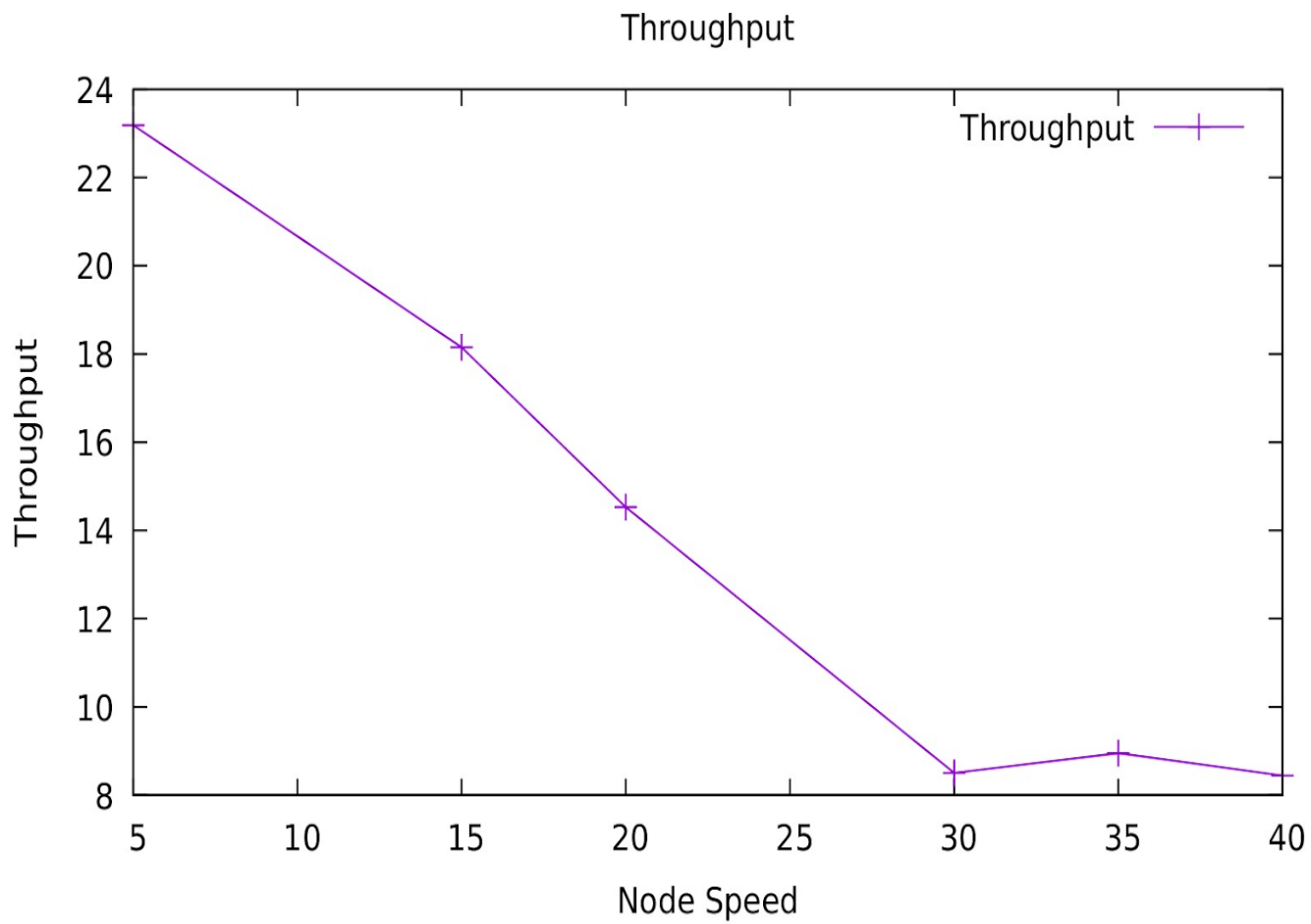


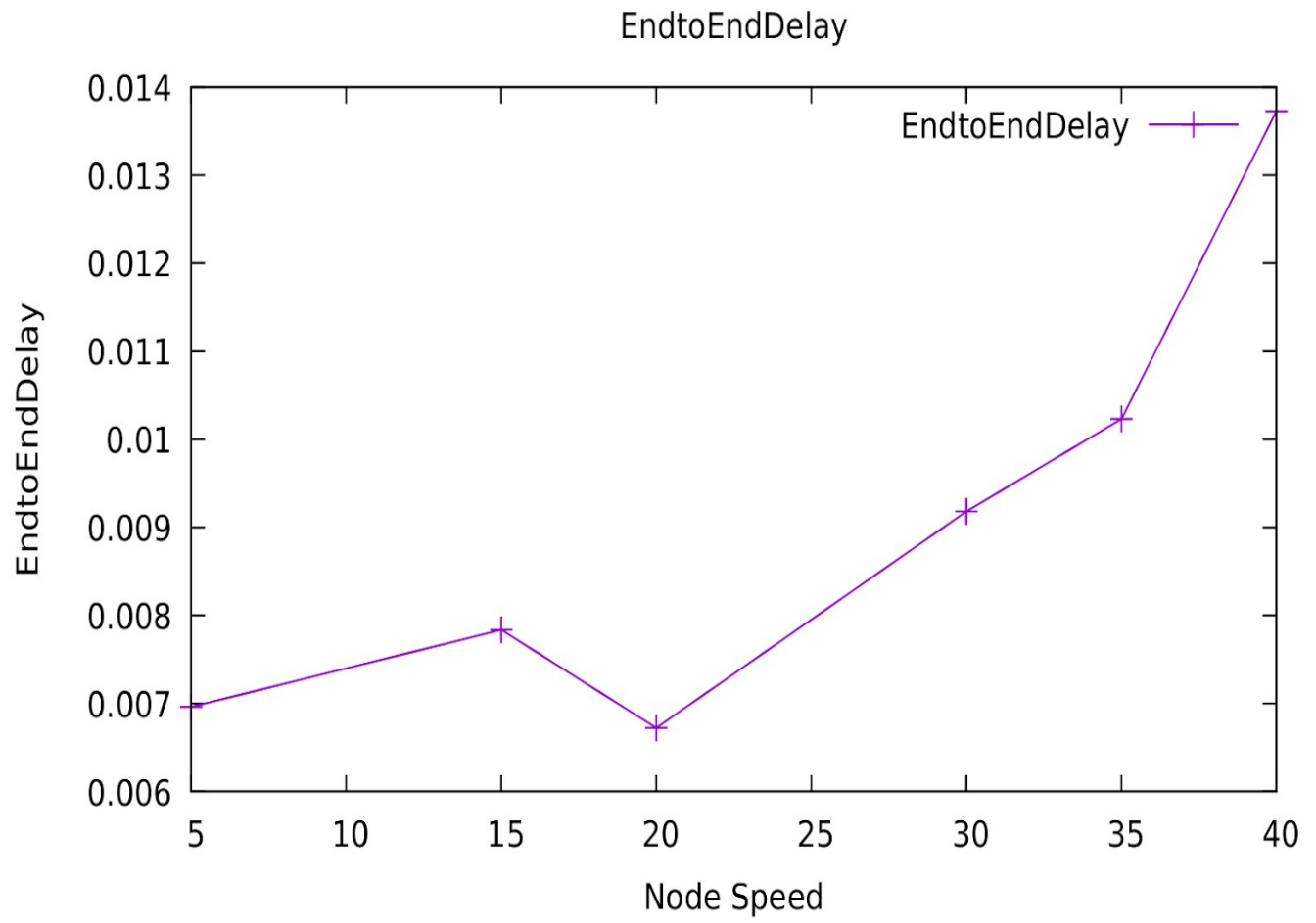


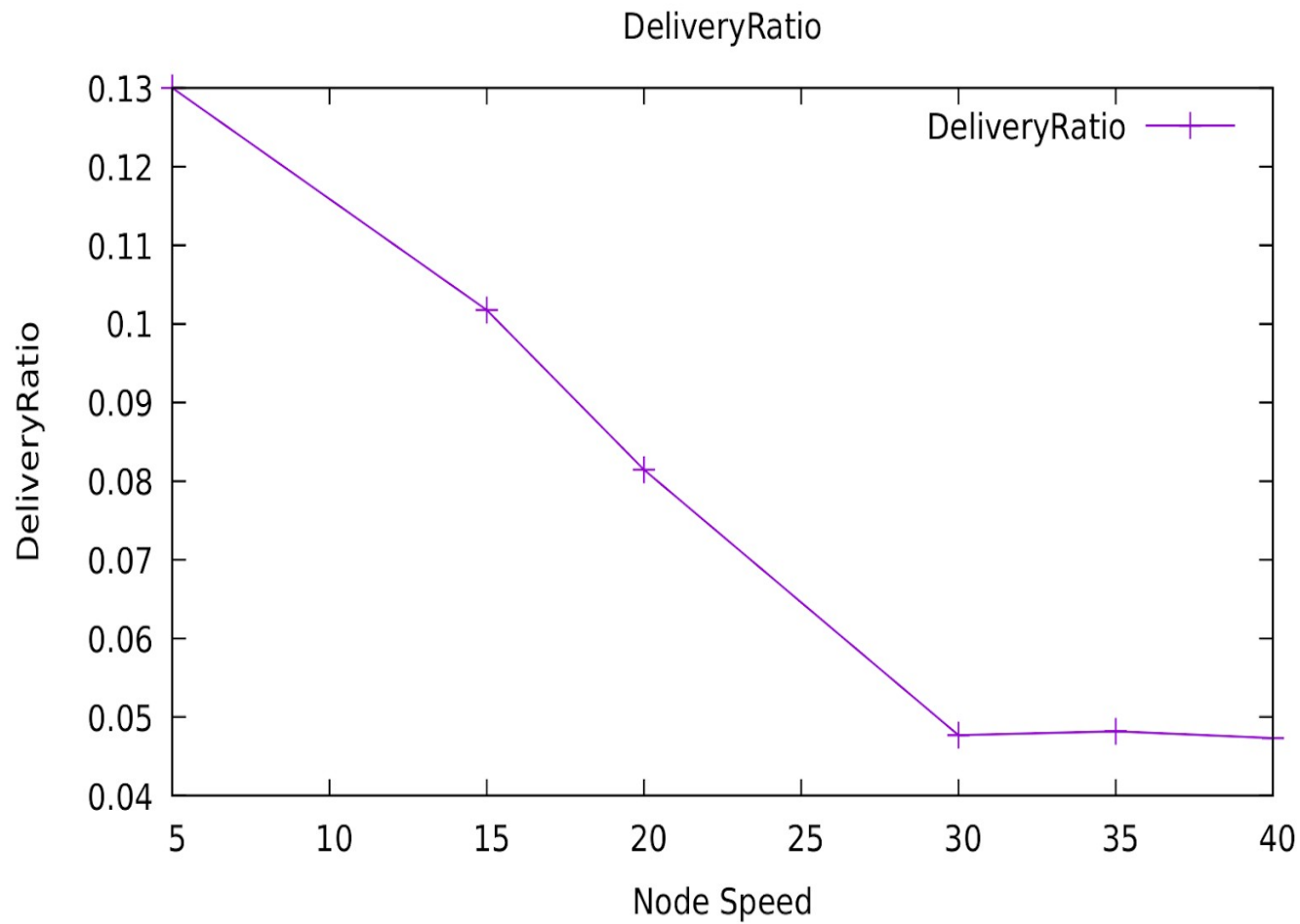
☐ Varying Node Speed

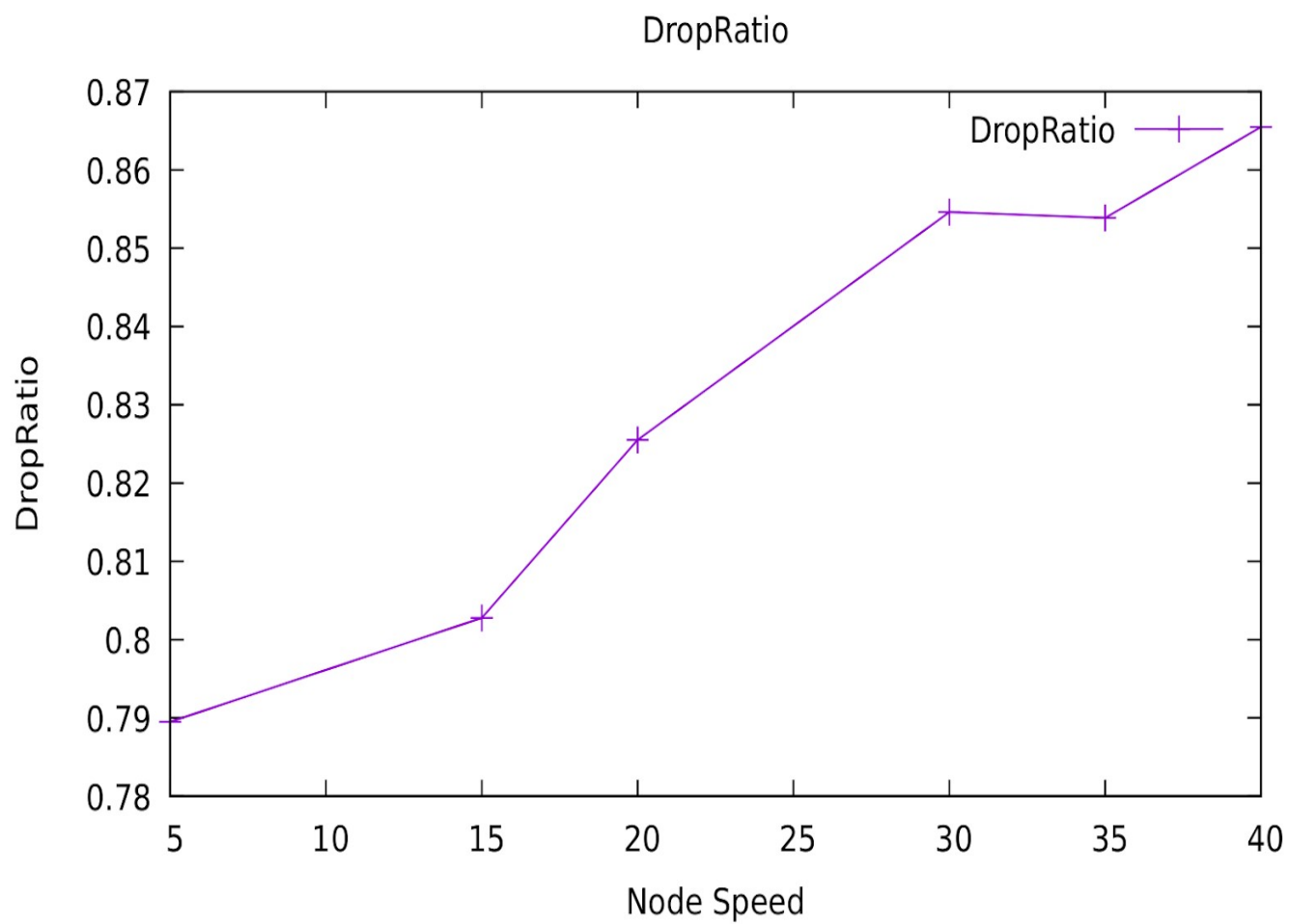
Fixed Parameters:

1. Number of Nodes = 80
2. Number of Flows = 20
3. Number of Packets/Sec = 10









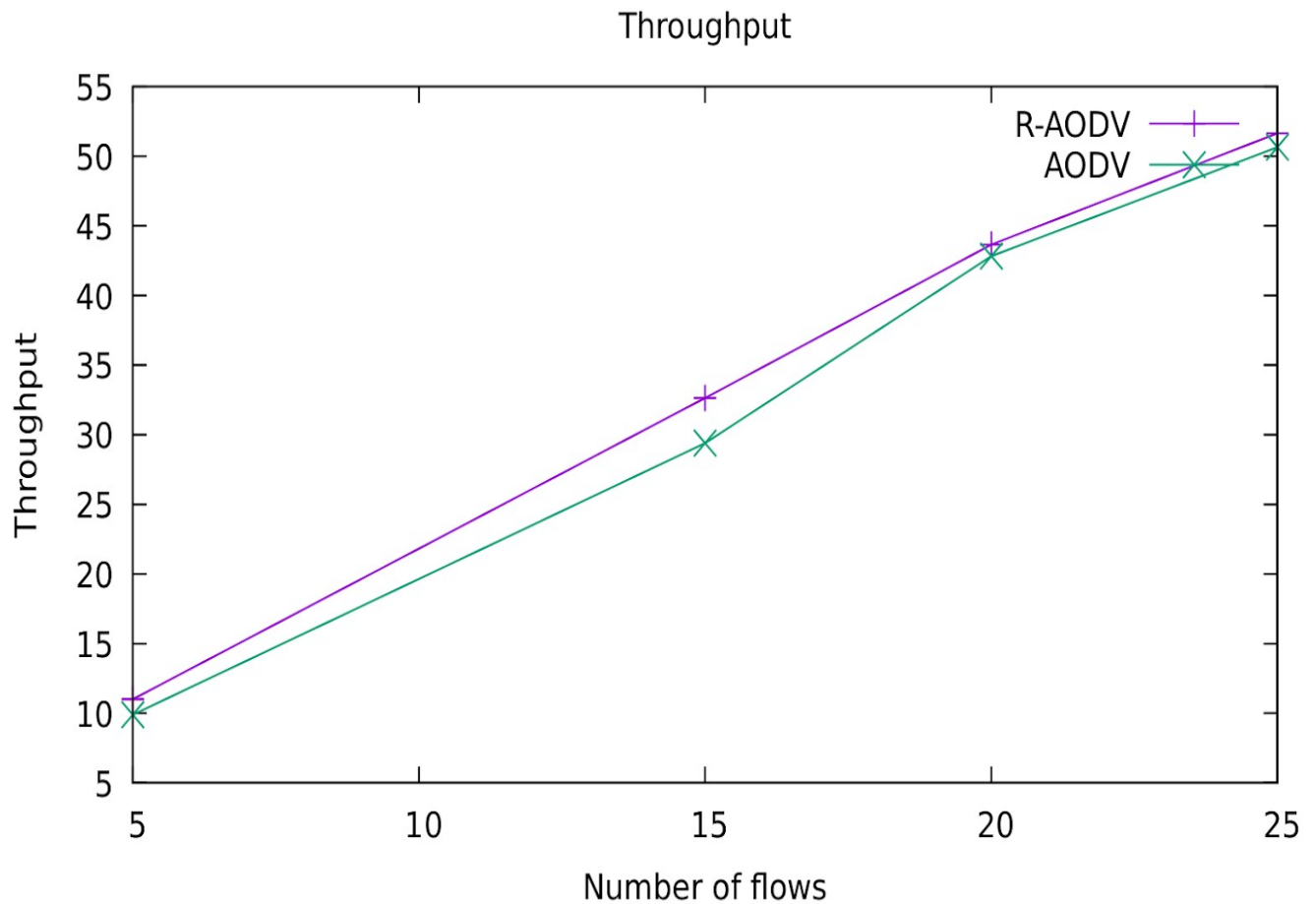
Comparison Between AODV & R-AODV

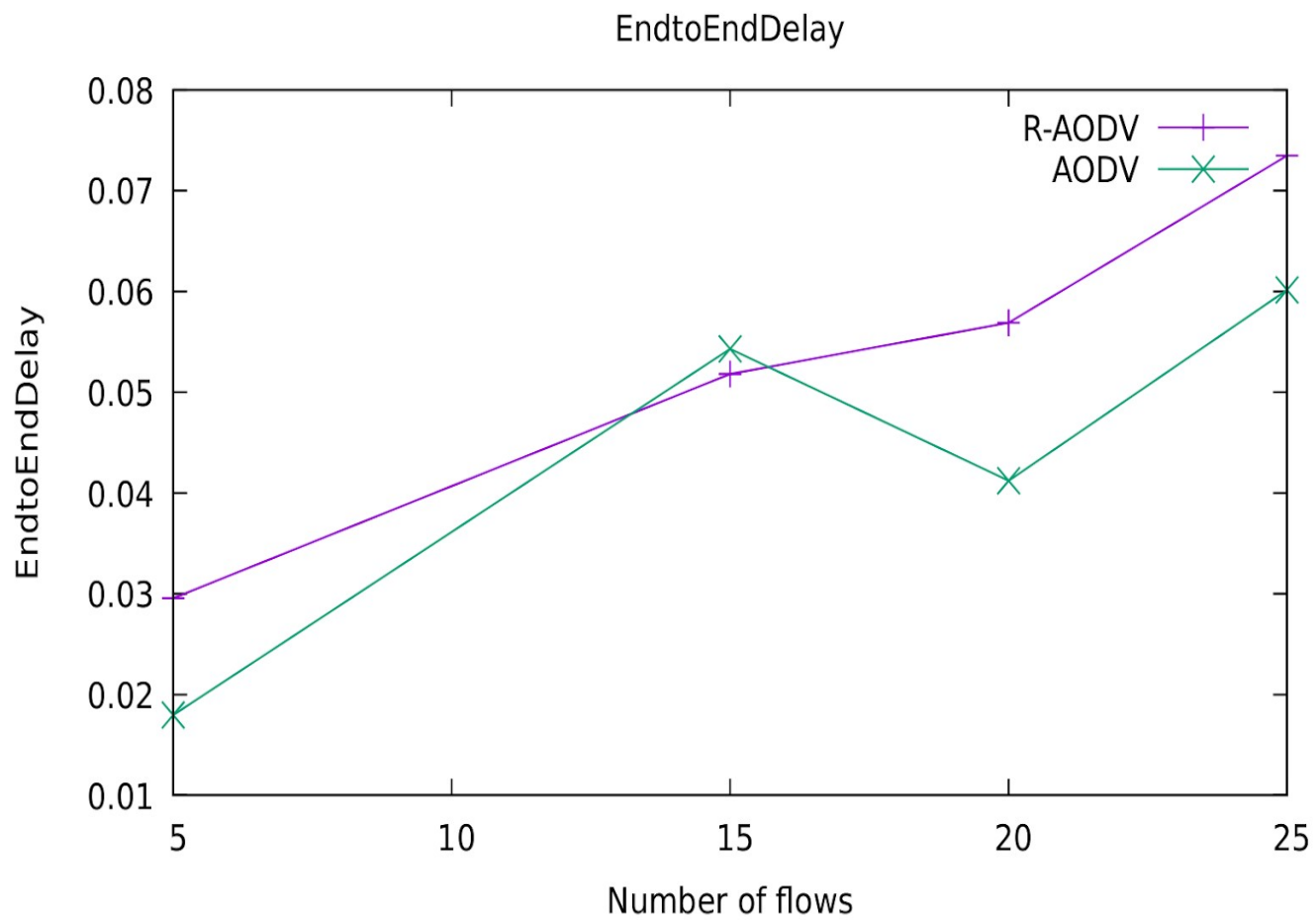
Network Topology for 802.11(static)

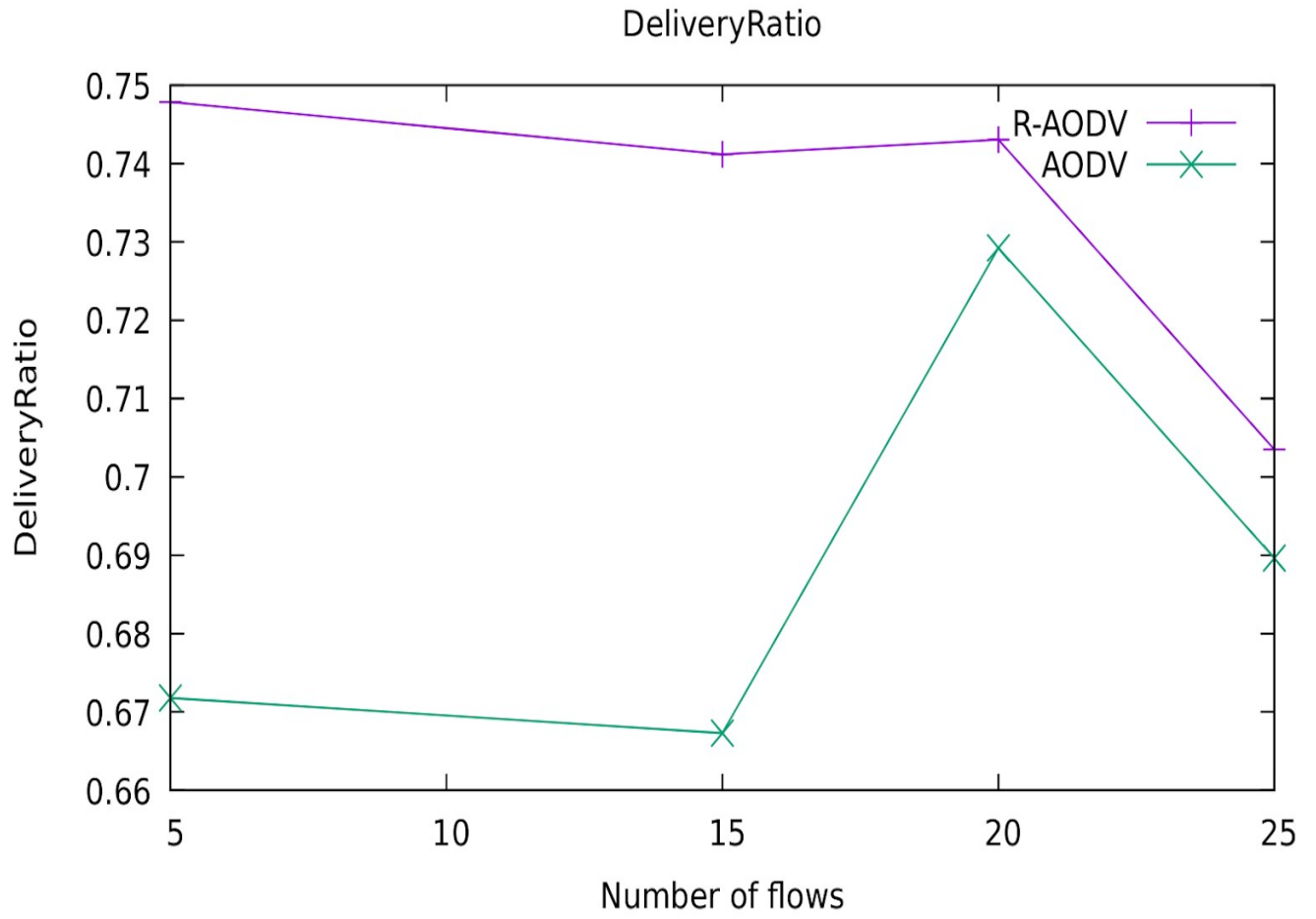
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- Propagation Loss Model -> RangePropagationLossModel
- Mac -> AdhocWifiMac
- Mac Standard -> WIFI_STANDARD_80211b
- Routing Protocol -> AODV
- Application Layer -> OnoffHelper/ns3::UdpSocketFactory
- Mobility Model -> RandomWaypointMobilityModel

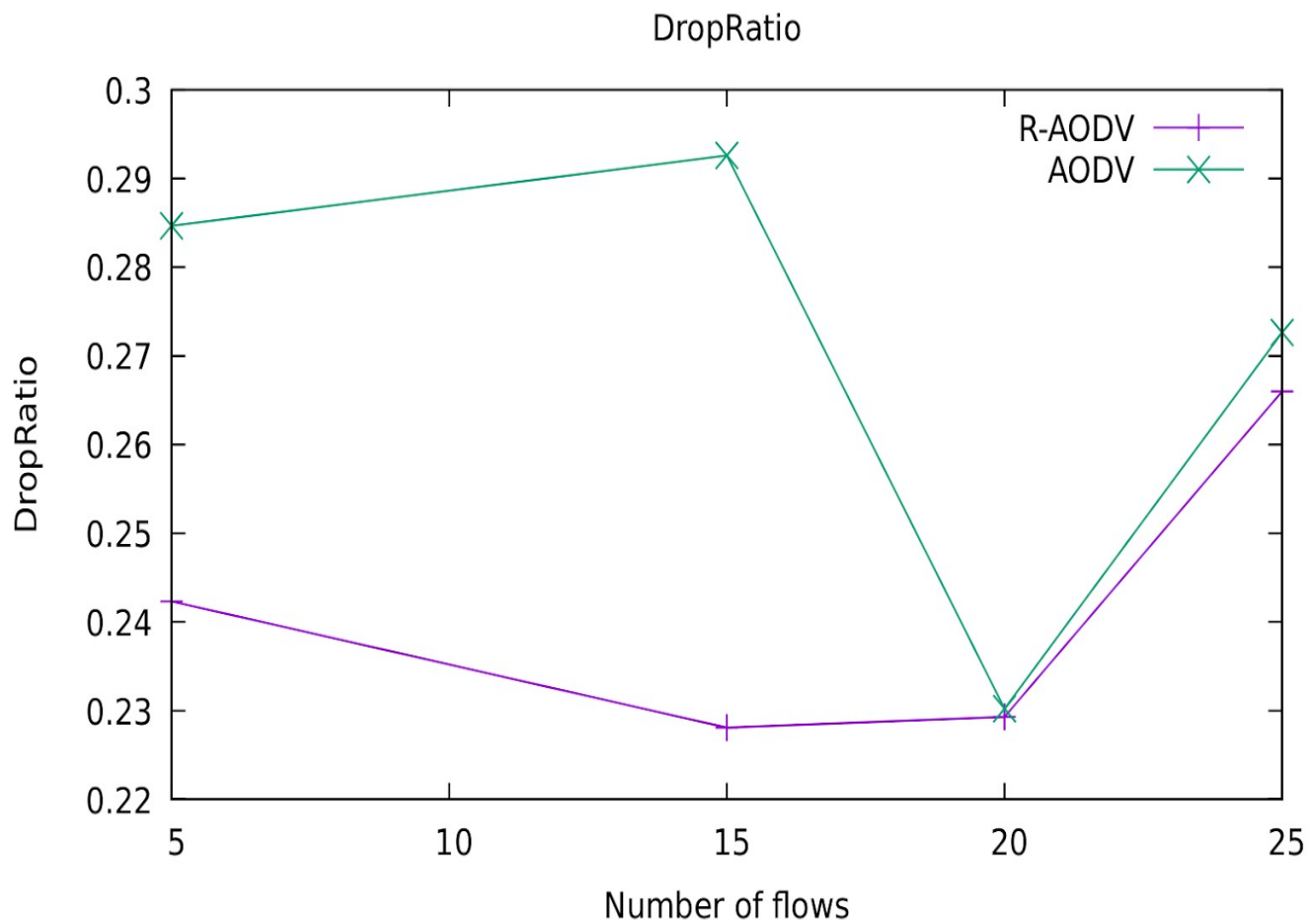
Results With Graph

Varying Number of Flow

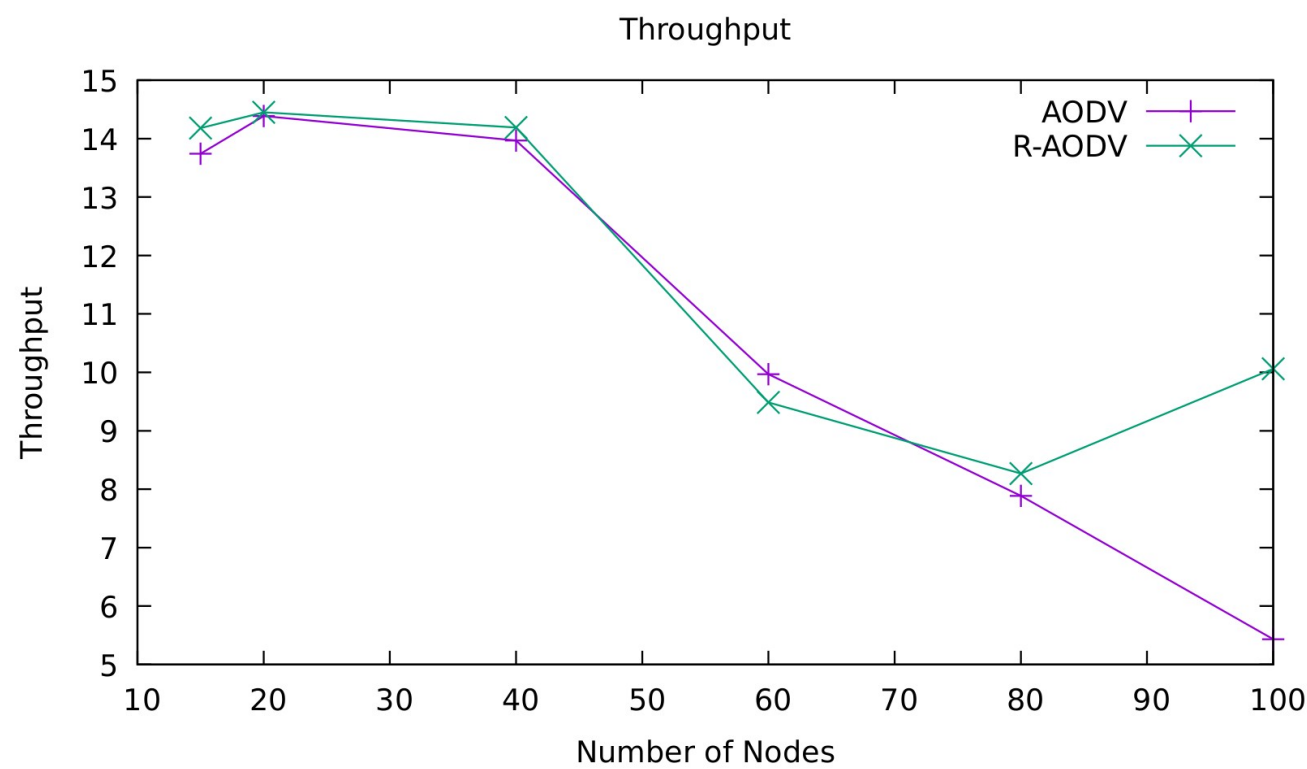


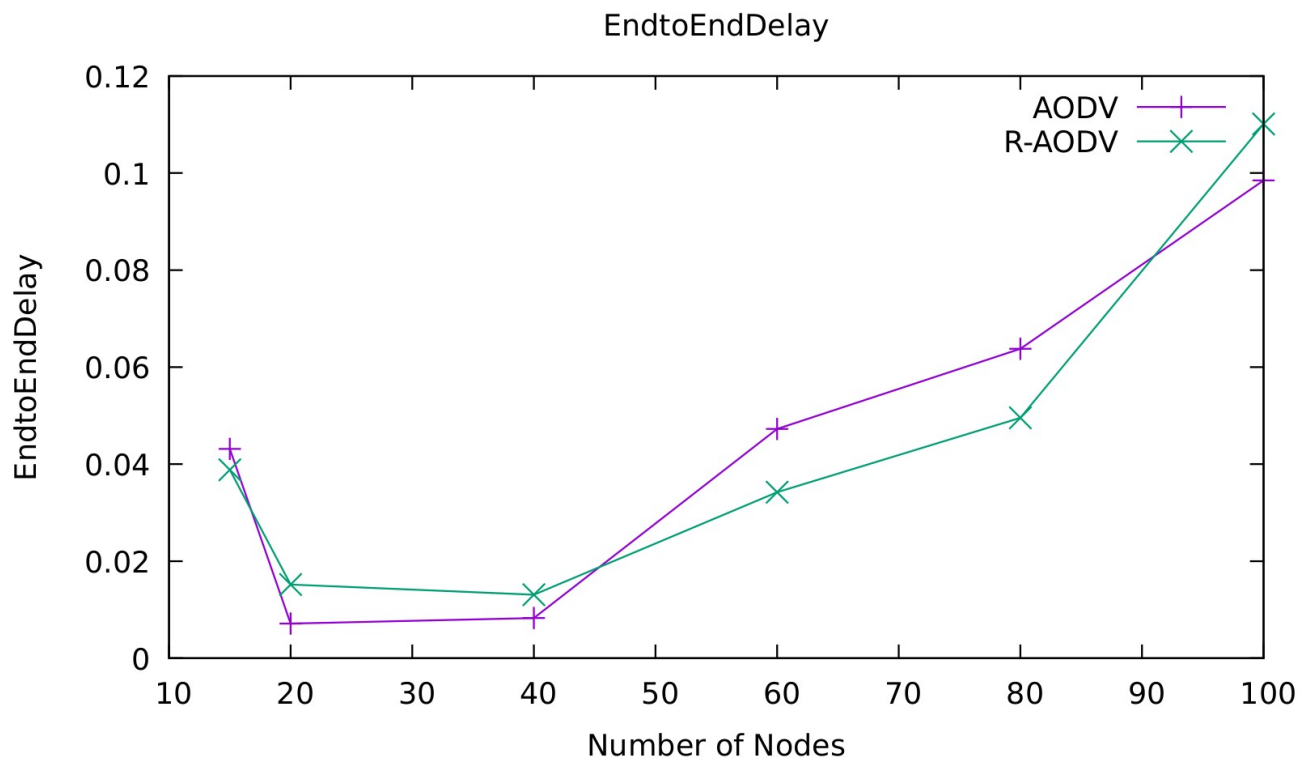


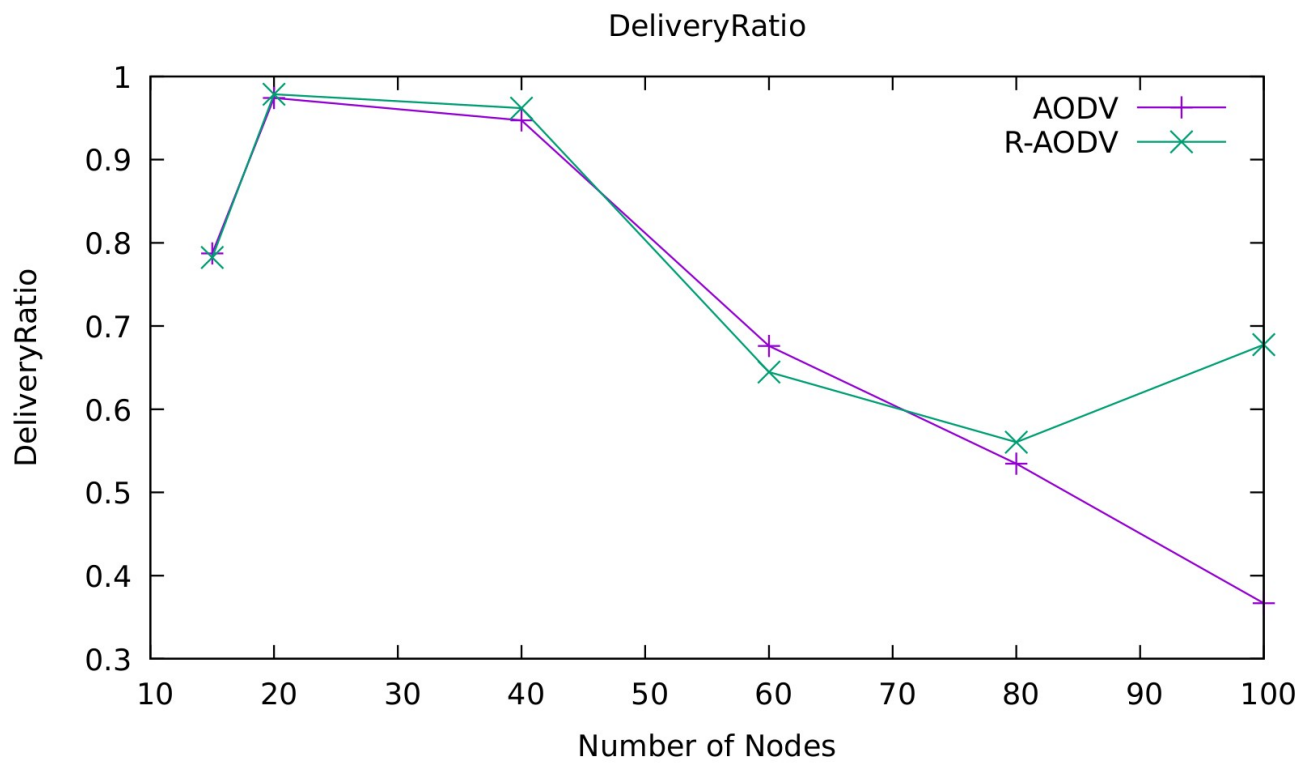


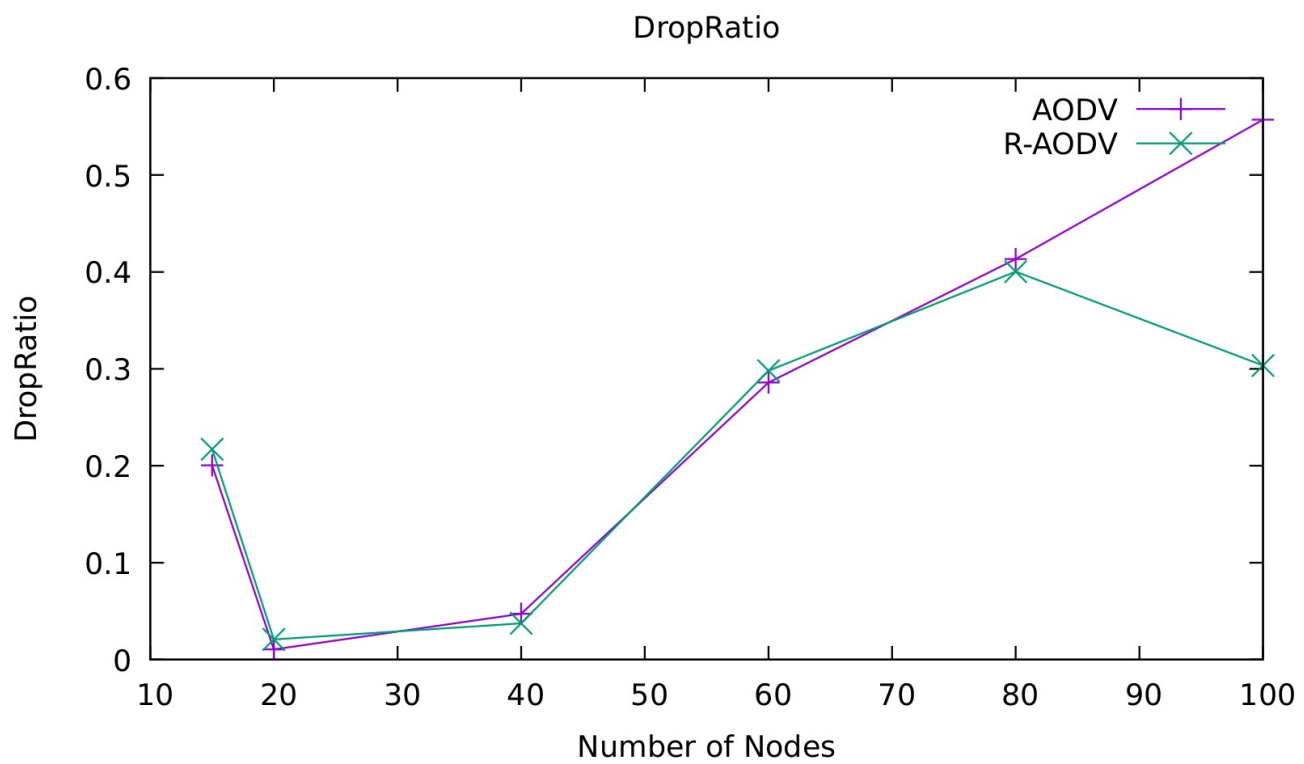


Varying Number of Nodes









Summary Explaining Results Found in Task A(802.11) (static)

Varying Number of Nodes

Throughput

- Decreases as increase of node congesting the network flow more

End-to-End Delay

- Increases because of more congested network

DeliveryRatio

- Decreases with increase of more nodes congested in same network

DropRatio

- Increases as network becomes more congested

Varying Number of Flows

Throughput

- Increases with more data transmission

End-to-End Delay

- Decreases with the increase of total received packets

DeliveryRatio

- Increases with more transmission rate.

DropRatio

- Decreases as packets are more successfully transmitting with a higher rate

Varying Number of Packets/Sec

Throughput

- Decreases as more packets are sent

End-to-End Delay

- Increases because network gets congested

DeliveryRatio

- Decreases with increase of more packets in the network

DropRatio

- Increases as network becomes more congested

Varying Coverage Area

Throughput

- Decreases as nodes are widely distributed

End-to-End Delay

- Increases as packets travel-time increases

DeliveryRatio

- Decreases as packets might drop in long distance between two nodes

DropRatio

- Increases as more coverage area between two nodes

Summary Explaining Results Found in Task A(802.15.4) (mobile)

Varying Number of Nodes

Throughput

- Decreases as increase of node congesting the network flow more

End-to-End Delay

- Increases because of more congested network

DeliveryRatio

- Decreases with increase of more nodes congested in same network

DropRatio

- Increases as network becomes more congested

Varying Number of Flows

Throughput

- Increases with more data transmission

End-to-End Delay

- Increases at first as more flow creates the network more congested but eventually decreases as for more flow more packets are received

DeliveryRatio

- Decreases as network becomes congested

DropRatio

- Increases as more packets flowing end-to-end and causing the network more congested,so packet drop probability increases

Varying Number of Packets/Sec

Throughput

- Increases as more packets are transmitted

End-to-End Delay

- Increases because network gets congested

DeliveryRatio

- Decreases with increase of more packets in the network

DropRatio

- Increases as network becomes more congested

Varying Node Speed

Throughput

- Decreases as nodes mobility increases

End-to-End Delay

- Increases for frequent node displacement changes

DeliveryRatio

- Decreases as packets might drop because of frequent change in node's position

DropRatio

- Increases as more packet drops due to frequent displacements of nodes

Summary Explaining Results Found in Task B

Varying Number of Flows

Throughput

- When flow increases the increase in throughput has occurred as dropping redundant RREQ packets improves congestion control in network. So R-AODV works better in terms of throughput than AODV. But also if we change the number of nodes, the result is almost same with the normal AODV protocol at first but when the number of nodes is increased above 80-90, the modified algorithm gives more throughput. The reason behind this is, in less number of nodes the amount of redundant RREQ packets are less. With the increase of node number, redundancy occurs more and the effect of dropping redundant packets are then visible. In the paper the improvement is shown on the basis of 100 nodes. Also in my output when the number of nodes is 100, a significant increase in throughput has occurred.

End-to-End Delay

- Didn't get the expected less delay in R-AODV. The reason might be we are dropping RREQ packet in the intermediate nodes which can cause more time to find a routing path between nodes

DeliveryRatio

- Increases as network is less congested now when there's more flow and the number of nodes are higher

DropRatio

- Decreases as amount of received packets increases due to less congested network .