Report on

Network Simulator 2 Offline

Course Code: CSE 322

Course Title: Computer Networks Sessional

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Configurations:

MAC-Address: Wireless 802.15.4

Routing Protocol: DSDV

Agent Type: TCP Tahoe

Application: Telnet

Node Positioning: Random

Flow: 1 Sink, Random Source

Wireless 802.15.4

This MAC protocol is also known as wireless personal area networks. This has very low power consumption and very low bandwidth speed (around 50 kbps application data rate.) As it consumes very less power, it is suitable for establishing communication between IOT devices. Every 802.15.4 supported IOT device has a unique EUI-64 address.

Destination Sequenced Distance Vector (DSDV):

This is a hop-by-hop vector routing protocol requiring each node to periodically broadcast routing updates. This is a table driven algorithm based on modifications made to Bellman-Ford routing mechanism. Each node in the network maintains a routing table that has entries for each of the destinations in the network and the number of hops required to reach each of them. Each entry has a sequence number associated with it that helps in identifying state entries. This mechanism allows the protocol to avoid the formation of routing loops.

TCP Tahoe:

TCP is known as a connection oriented protocol which ensures reliability and is also responsible for congestion control mechanisms in the network.

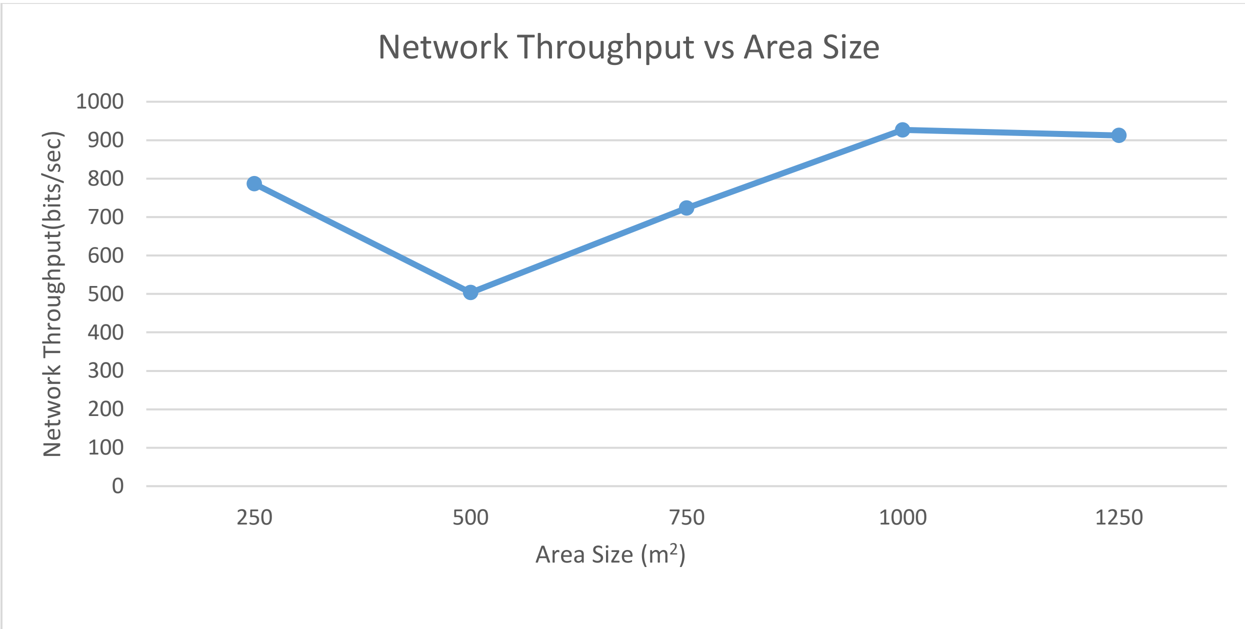
TCP Tahoe implements the basic go-back-N with slow start and congestion avoidance. It uses two variables cwnd(congestion window) and ssthresh(slow-start threshold).

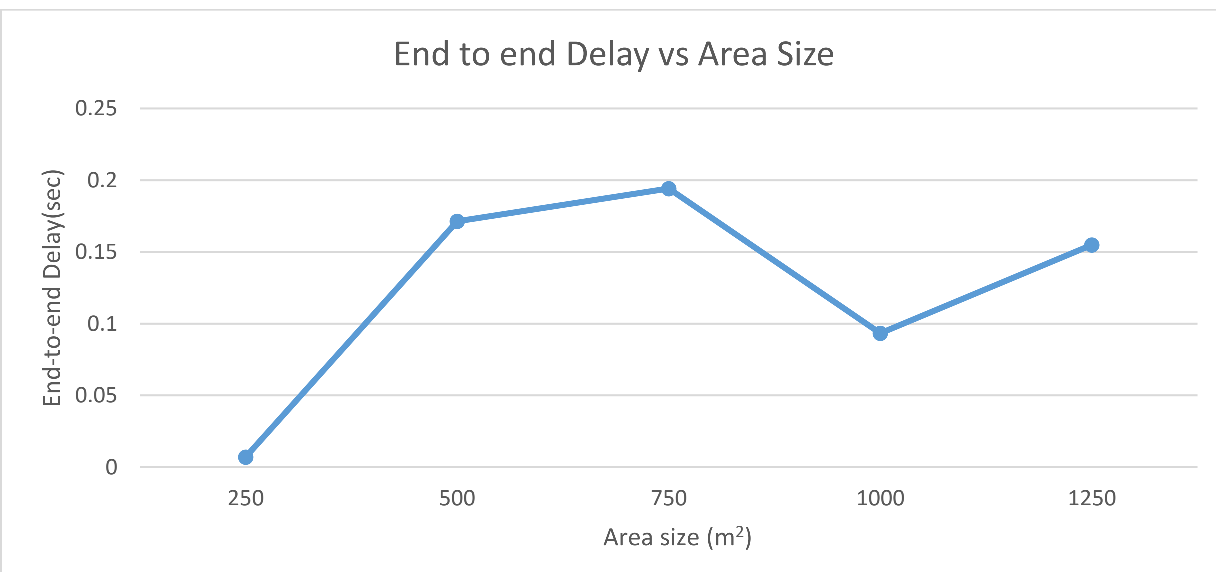
Telnet:

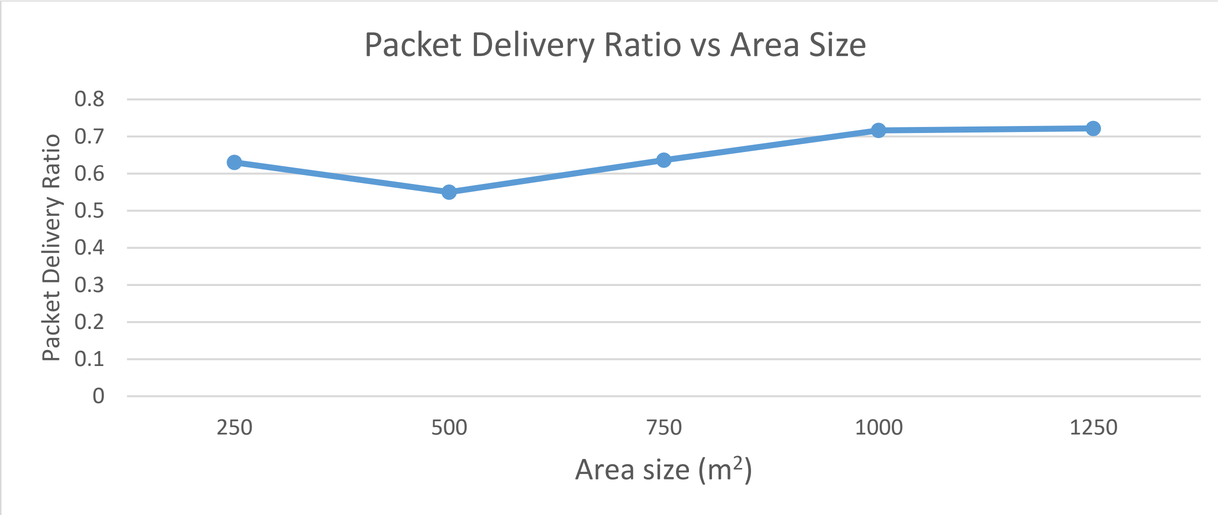
Telnet is a network protocol used to virtually access a computer and to provide a two-way, collaborative and text based communication channel between two machines. As it is a command line tool, it does not send any graphics, so it is extremely fast.

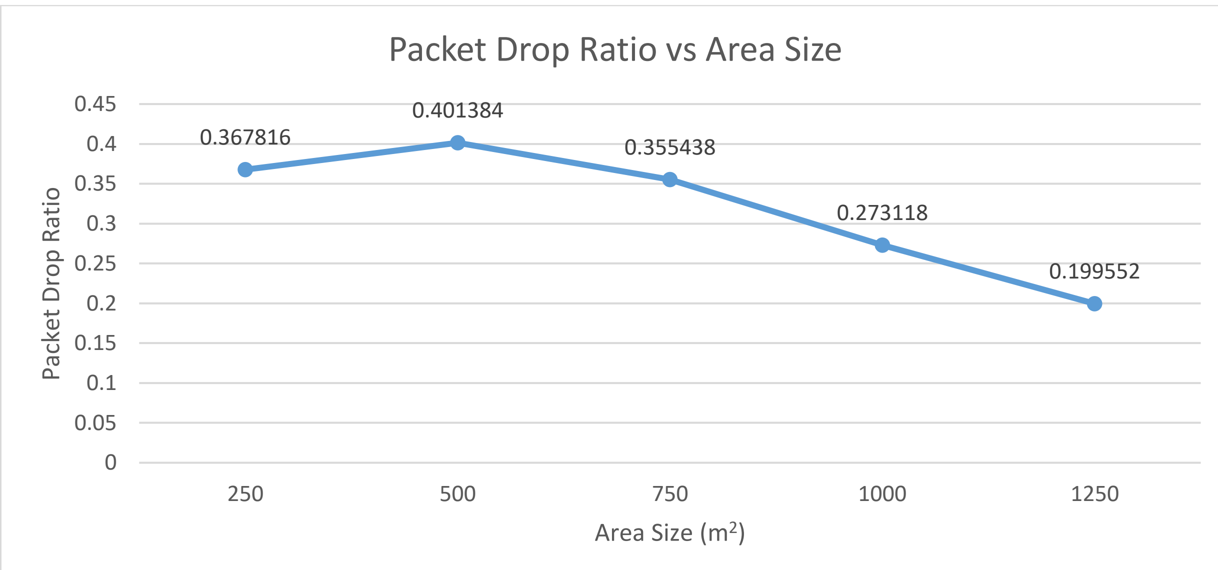
Telnet was used to configure servers. But as Telnet does not support encryption protocol, it is not safe to use it to access databases over public network. Nowadays, it is mainly used in PAN. Instead of Telnet, SSH is now used globally as it supports encryption.

Discussion with Plots:







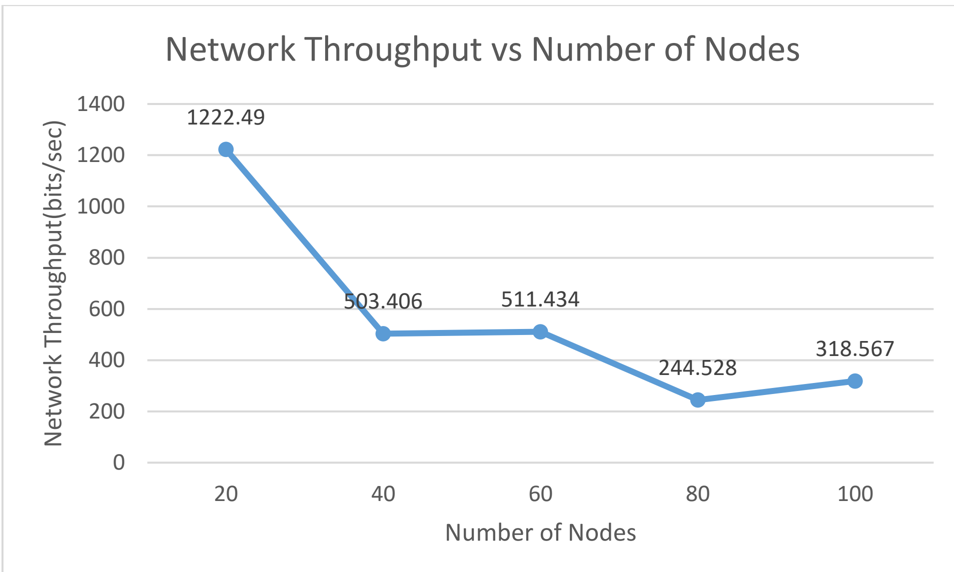


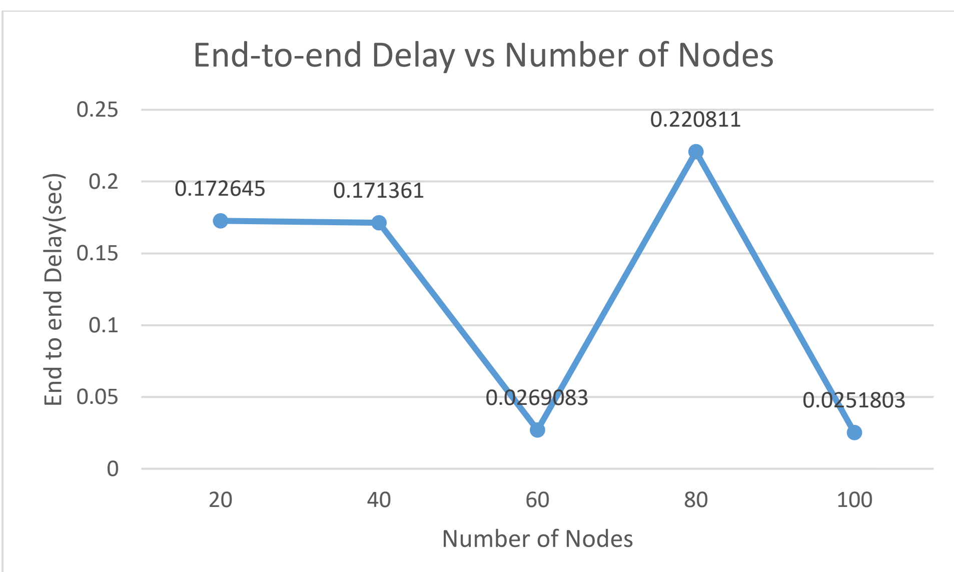
Observation on the change of Area Size:

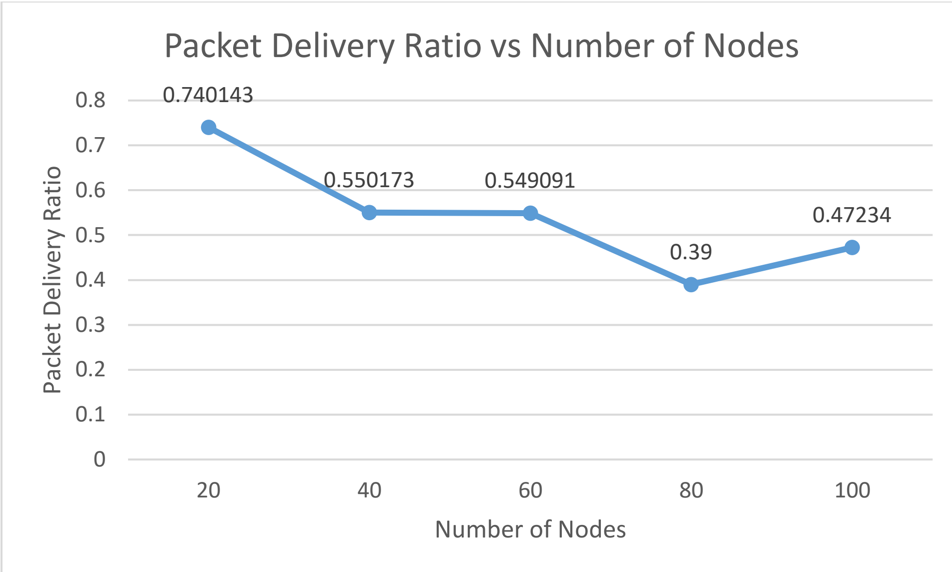
As DSDV periodically broadcasts routing updates, if source node has a lot of neighbors then broadcast packet grows with the number of neighbors which wastes a lot of bandwidth. As area size increases, the number of nearby neighbors decreases and hence the network bandwidth is less wasted. Therefore, network throughput increases as it can utilize the bandwidth to deliver data packets. So increasing in area size, increases throughput, packet delivery ratio and decreases packet drop ratio as we can see from the plot.

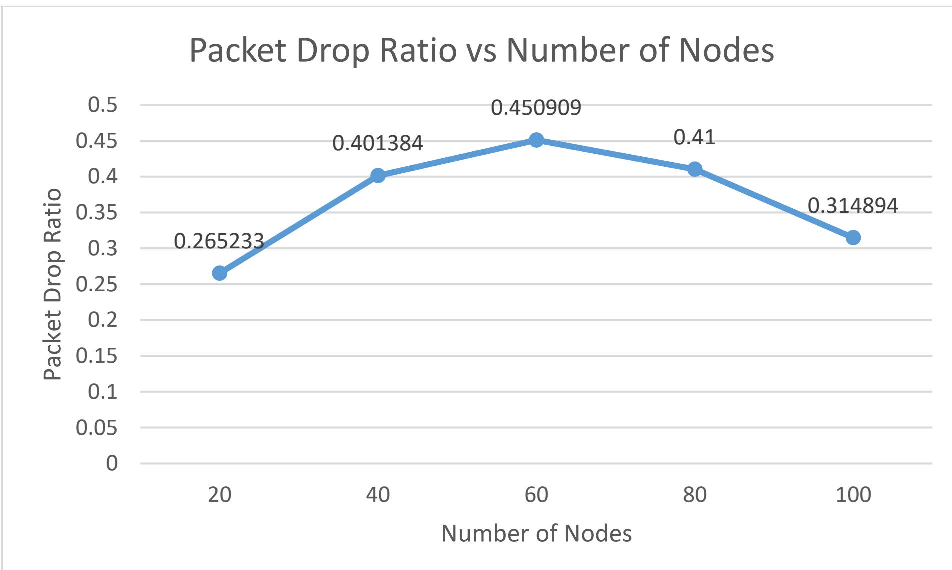
However, as the nodes are randomly placed, the network throughput and packet delivery ratio has not always increased with increase in area size (as we can see for area size 500 x 500 m^2).

As area size increases the distance between each node, it increases the average delay but it has not always increased due to random positioning of nodes.





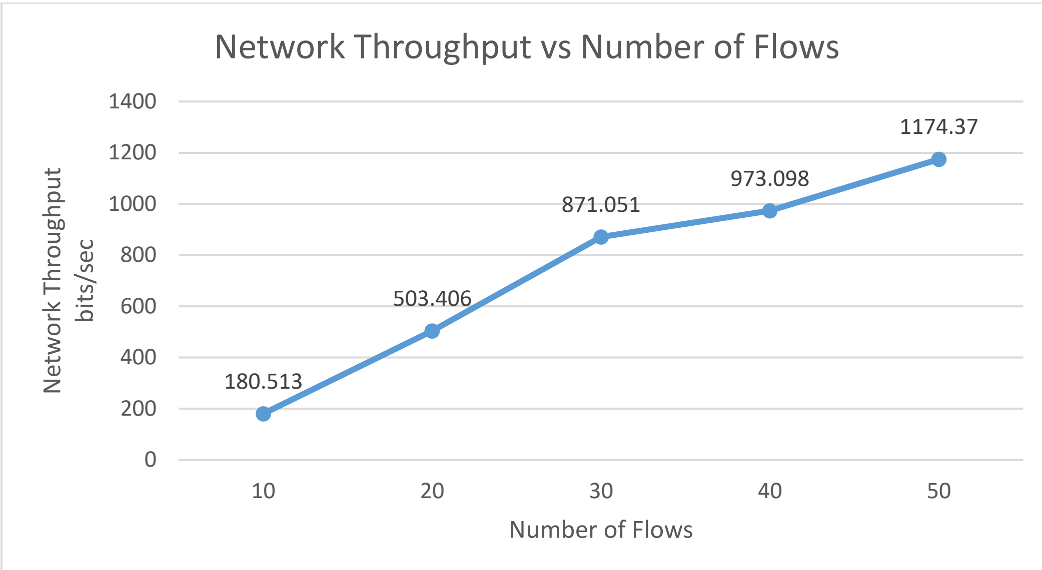


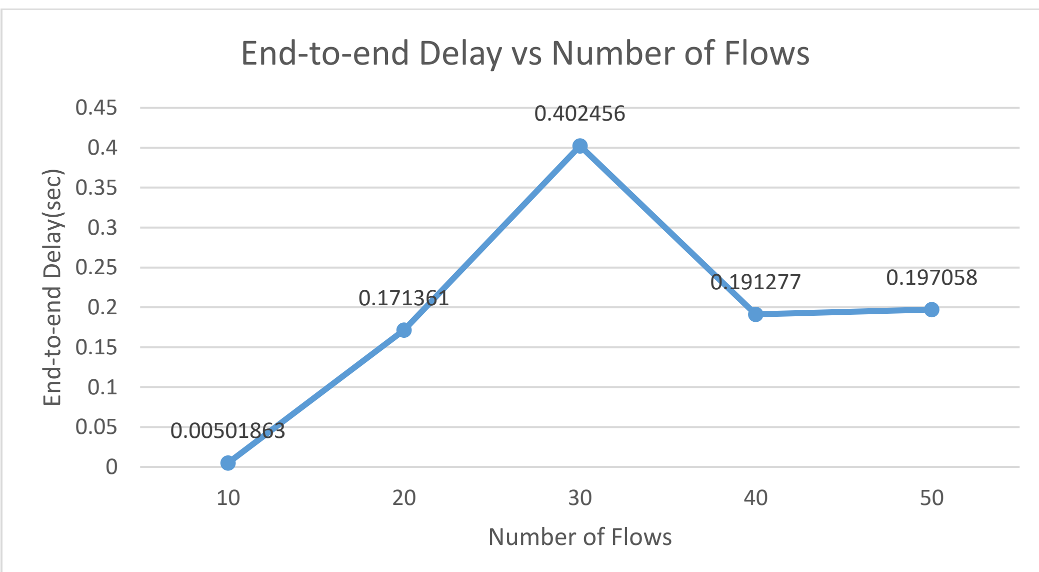


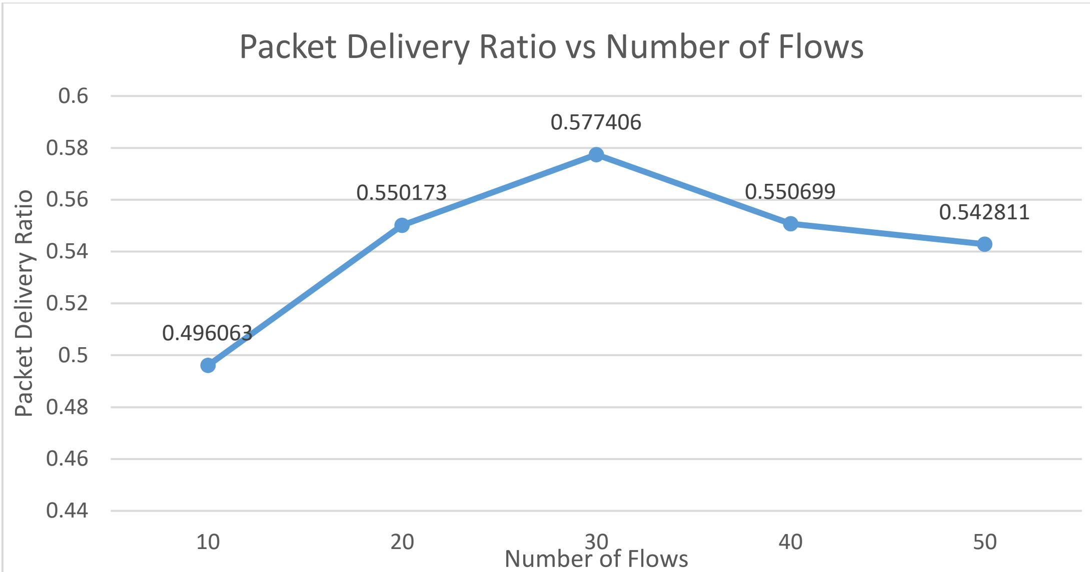
Observation on the change of Number of Nodes:

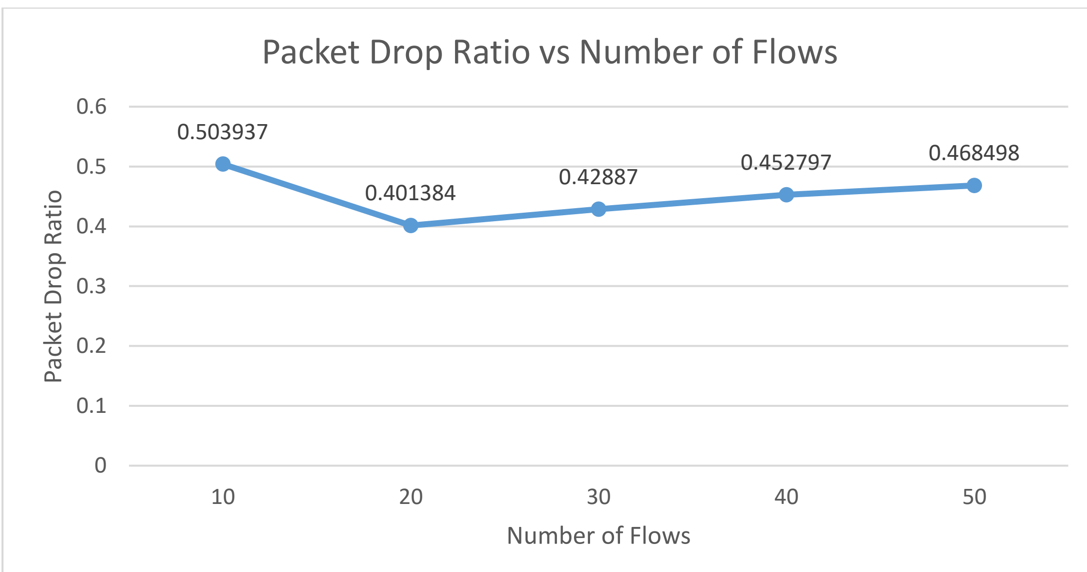
With fixed area size, increase in amount of nodes increases average number of neighbors for each node. Therefore, the network gets flooded more periodically as the route request packets enters the network by DSDV protocol. Therefore the network throughput decreases as TCP layer faces serious congestion due to so much route request packets which also increases the packet drop ratio.

The end-to-end delay curve changes the direction because the peak total number of data packet sent decreases a lot and only a few packet can be transferred from source to destination which are very nearby. Any packet that needs more hop gets dropped, hence, delay is less and packet drop ratio is at its peak.









Observation on the change of Number of Flows:

Increasing the number of flows, increases network throughput as DSDV can cache packets while the routing queries are sent out. End-to-end delay increases as with increasing flows, average queue waiting time is increased.

The delivery ratio first rises with increasing number of flows as the network was underutilized. But as the network gets saturated after introducing more flow, the delivery ratio falls and the packet drop rate rises.