CSE 322 ASSIGNMENT 3
Network Simulator 2

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Chapter 1

802.11(Static) Without Modification

We simulate ns2 for 802.11 with statics nodes.We run separate simulator for UDP and TCP. For TCP(without modification)

For UDP(without modification)

Figure 1.1: Flow vs Delay

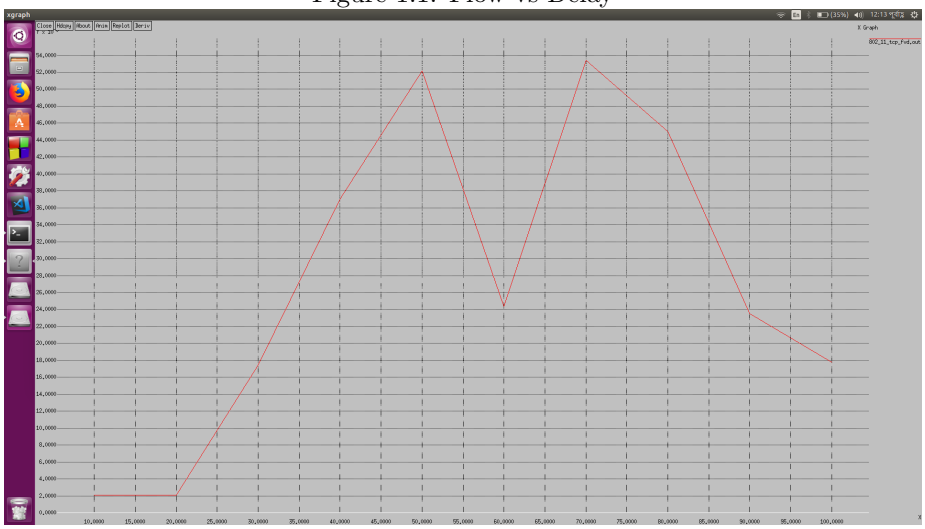


Figure 1.2: Flow vs Drop Ratio

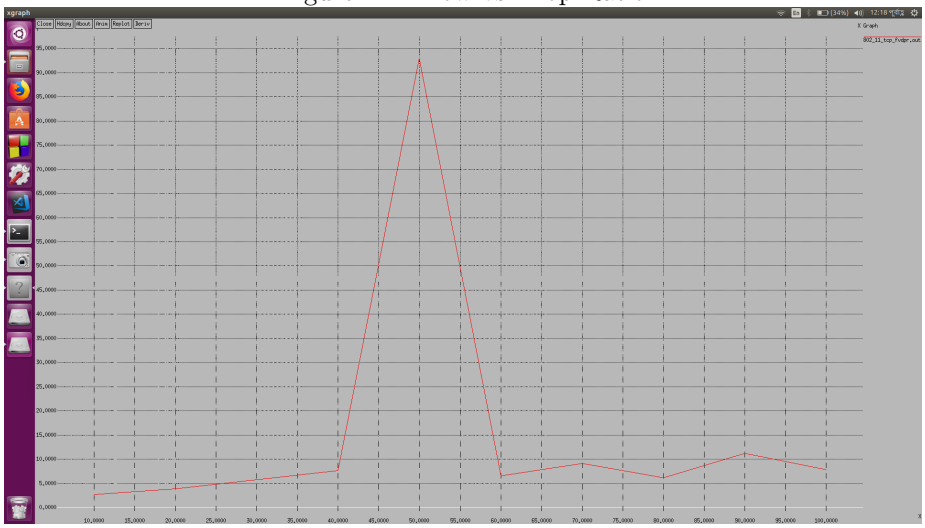


Figure 1.3: Flow vs Delivary Ratio

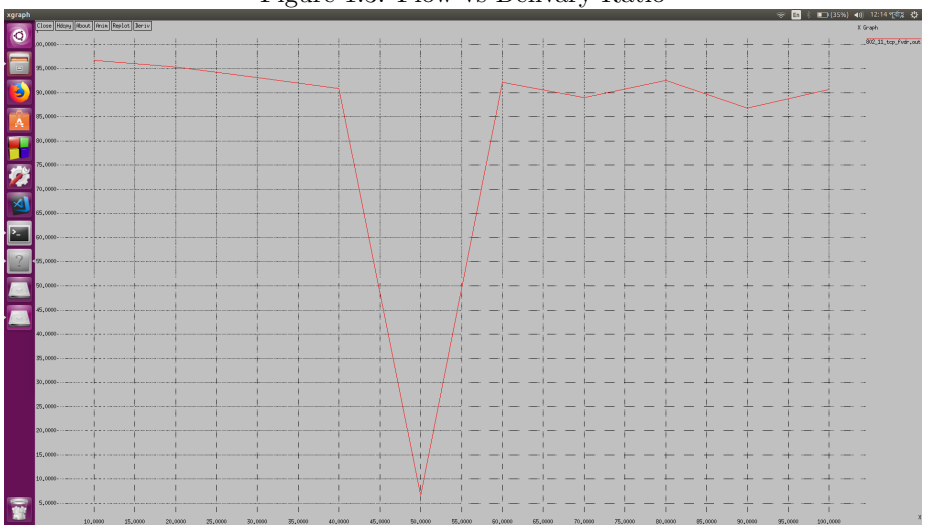


Figure 1.4: Flow vs Energy consumption

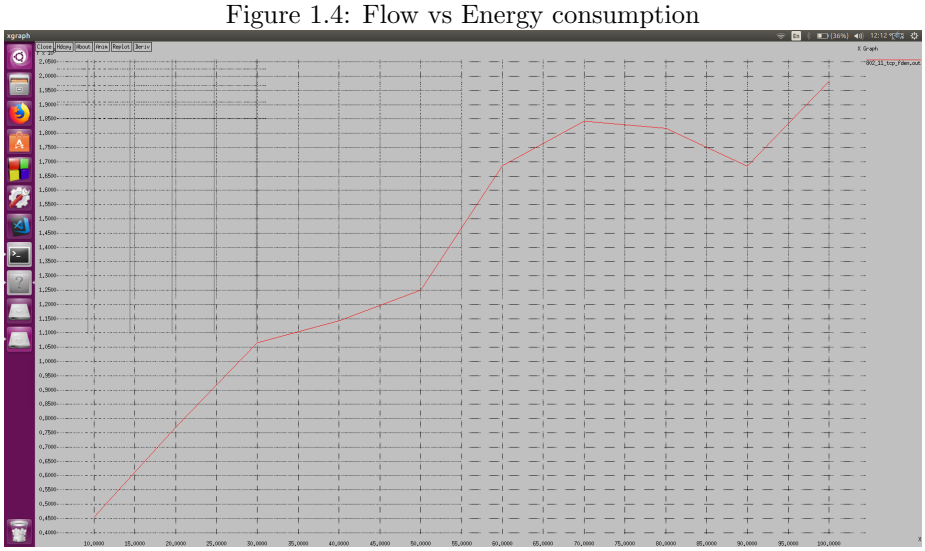


Figure 1.5: Flow vs Throughput

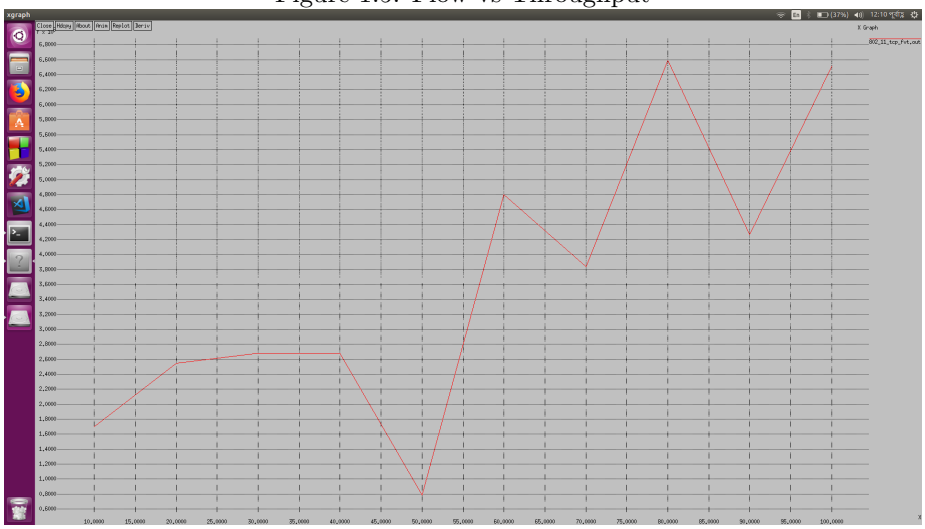


Figure 1.6: Node vs Delay

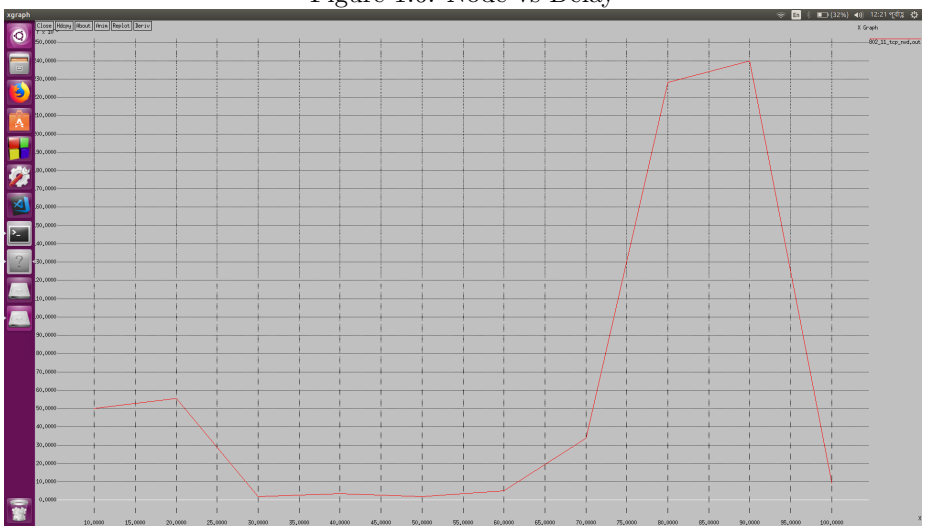


Figure 1.7: Node vs Delivary Ratio

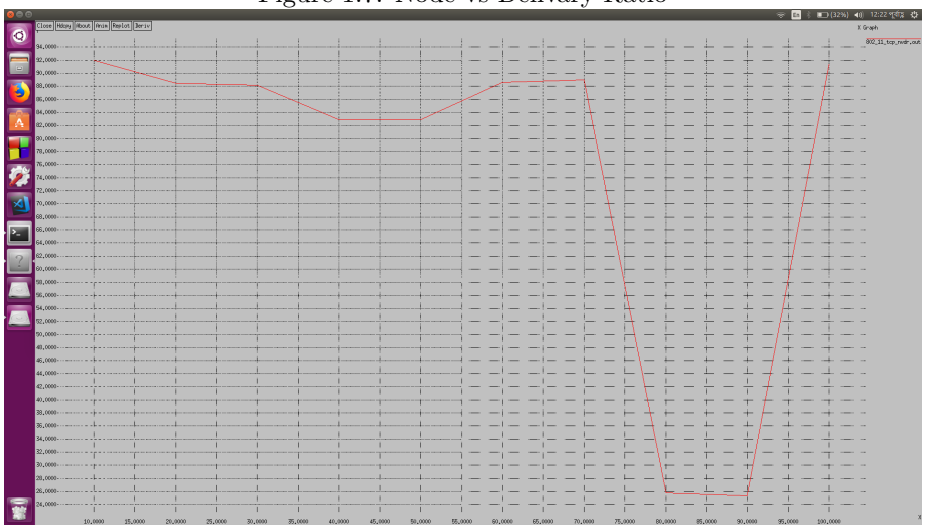


Figure 1.8: Node vs Drop Ratio

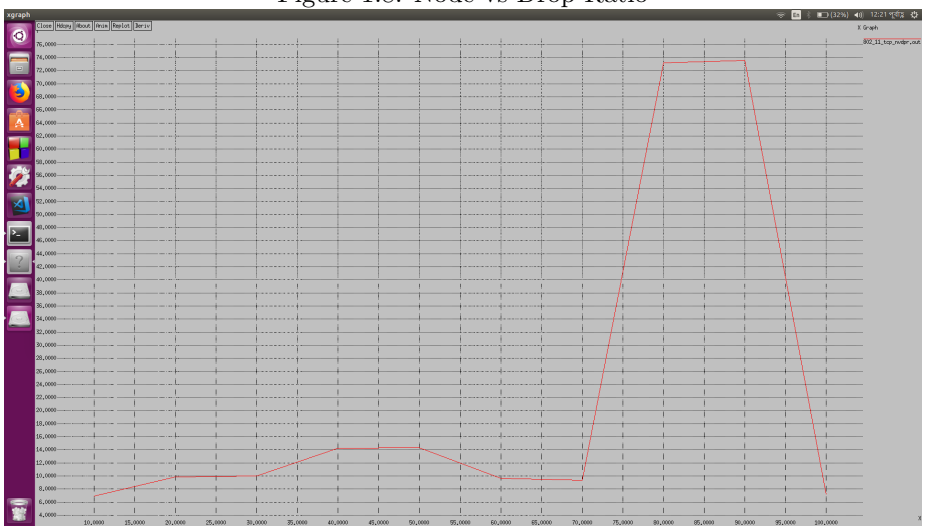


Figure 1.9: Node vs Energy consumption

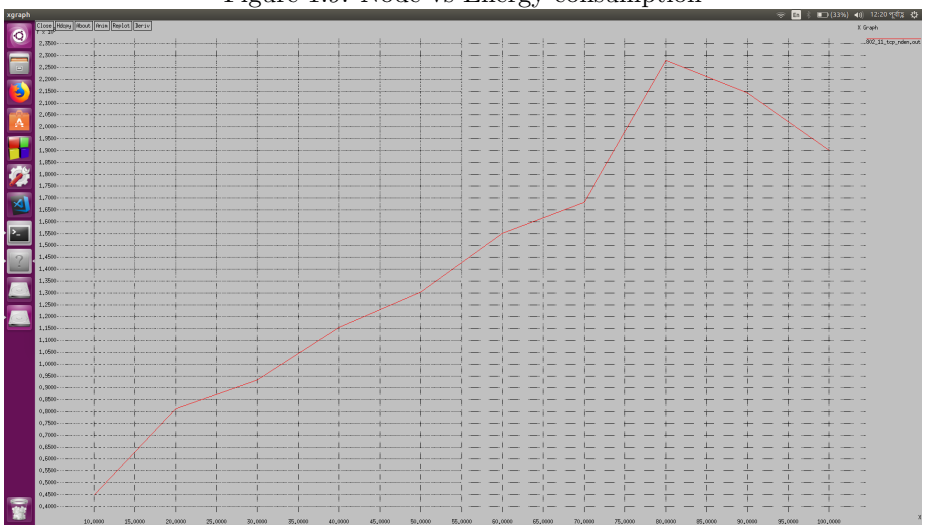


Figure 1.10: Node vs Throughput

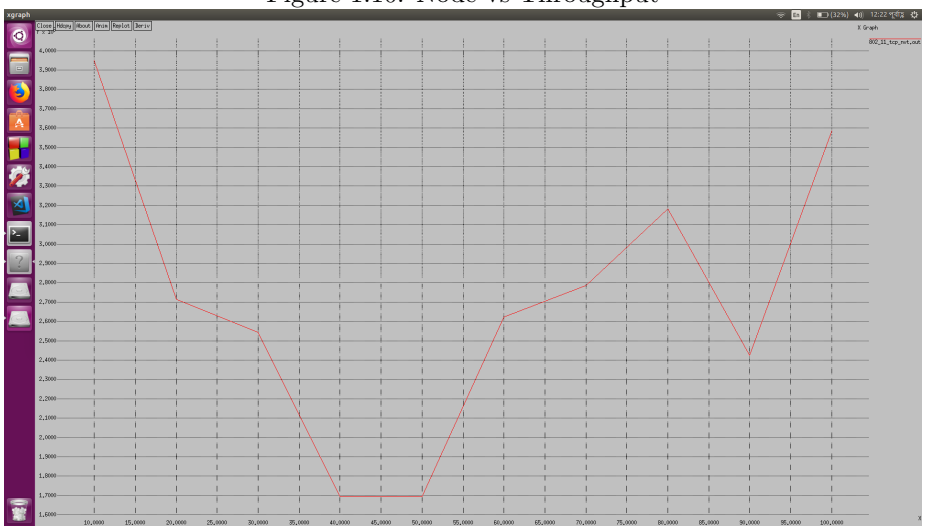


Figure 1.11: Packet vs Delay

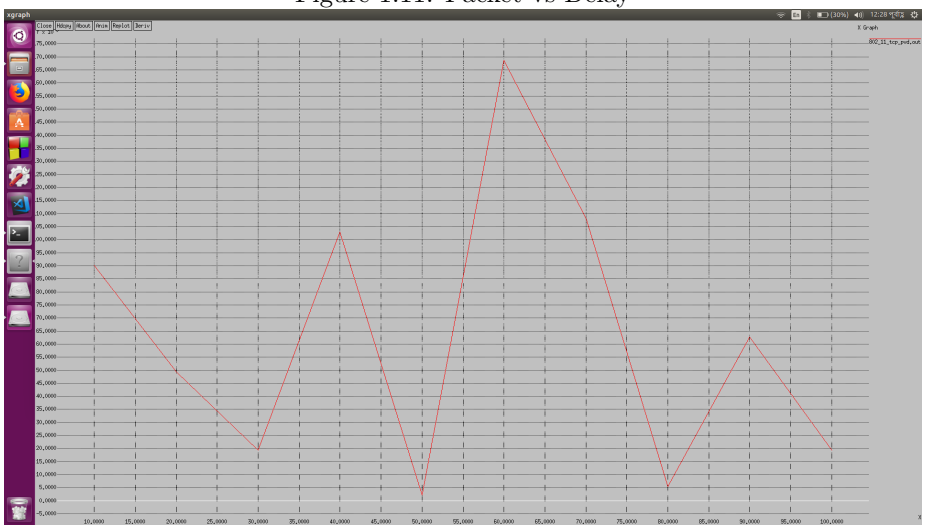


Figure 1.12: Packet vs Delivary Ratio

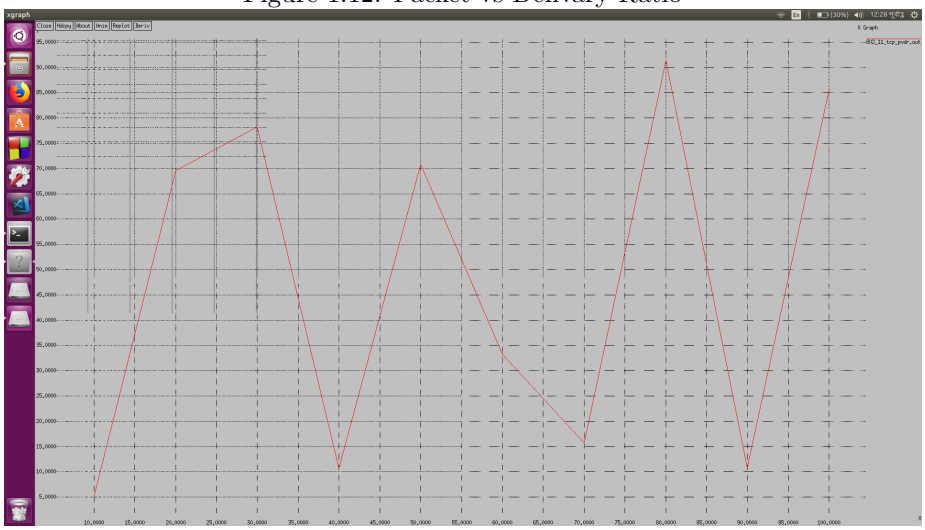


Figure 1.13: Packet vs Drop Ratio

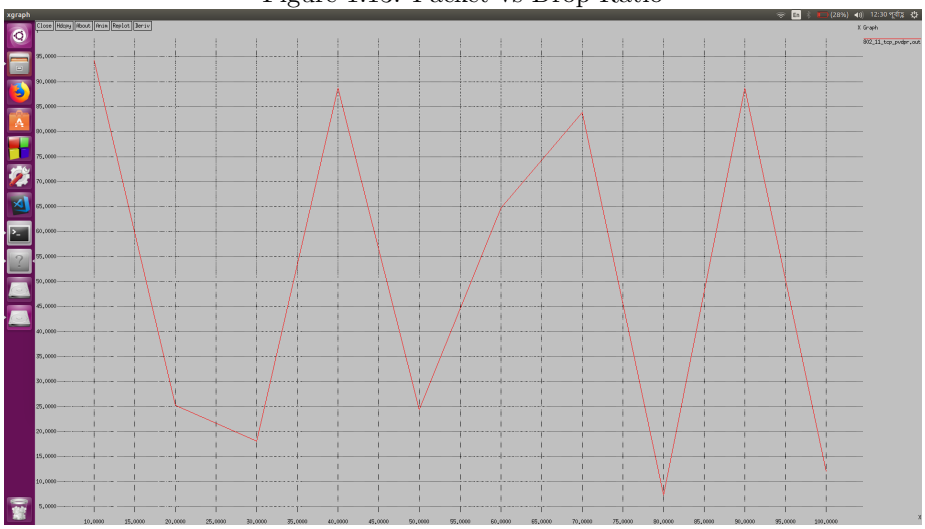


Figure 1.14: Packet vs Energy consumption

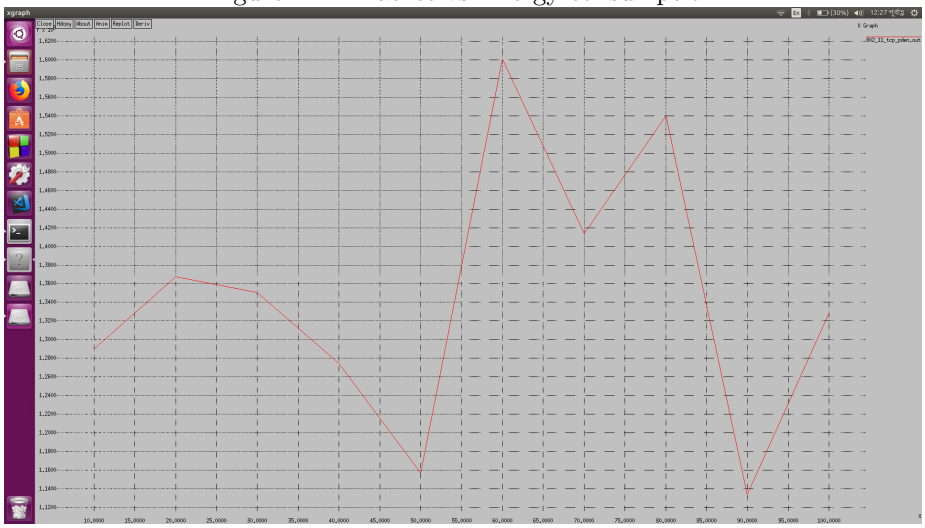


Figure 1.15: Packet vs Throughput

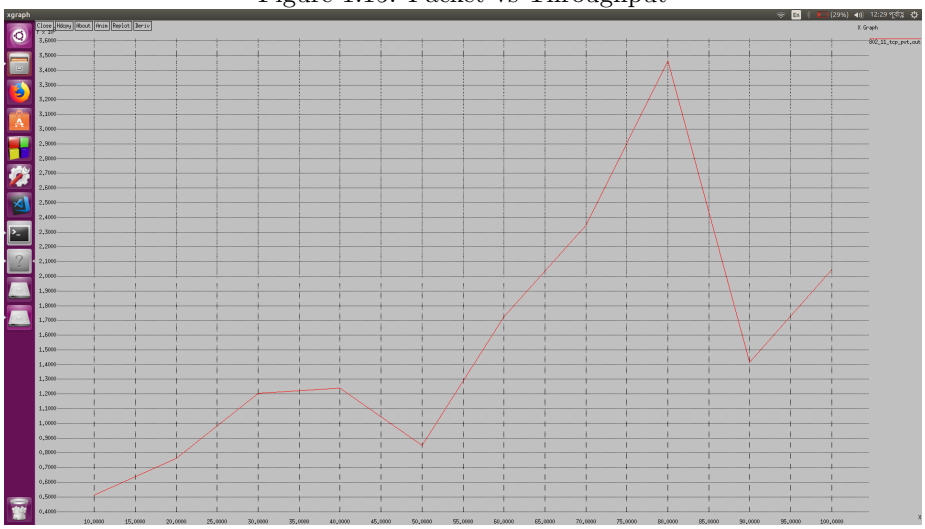


Figure 1.16: Range vs Delay

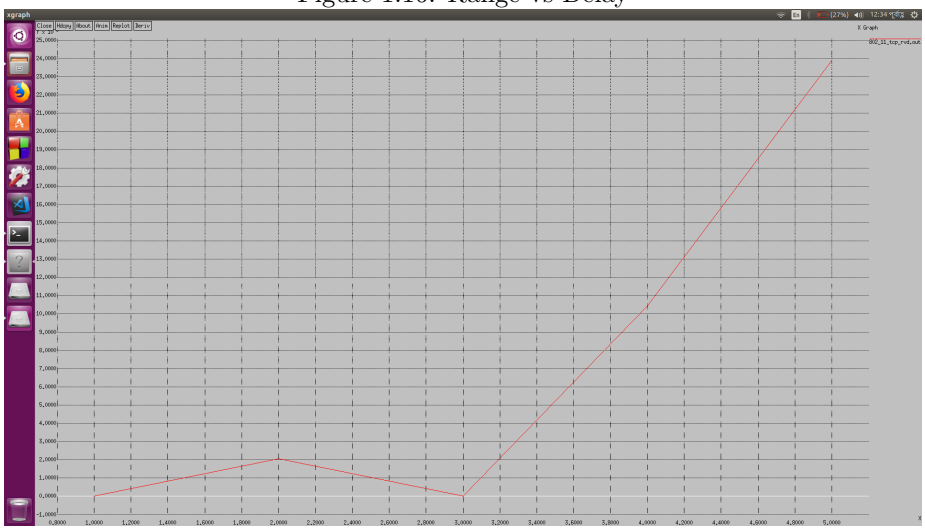


Figure 1.17: Range vs Delivary Ratio

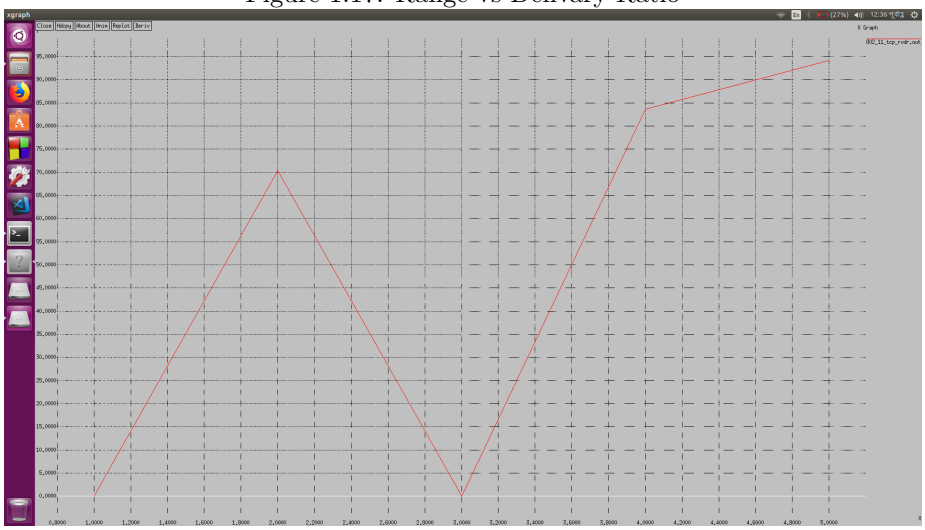


Figure 1.18: Range vs Drop Ratio

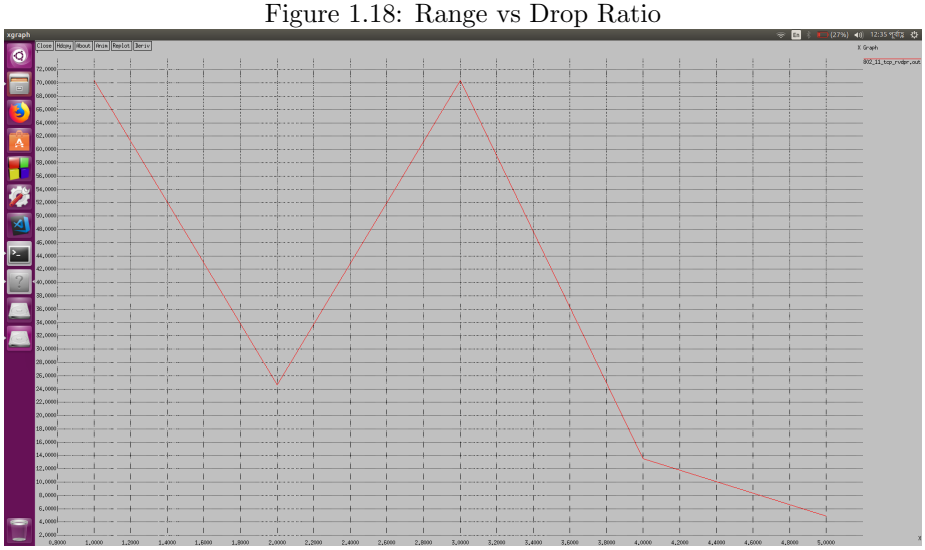


Figure 1.19: Range vs Energy consumption

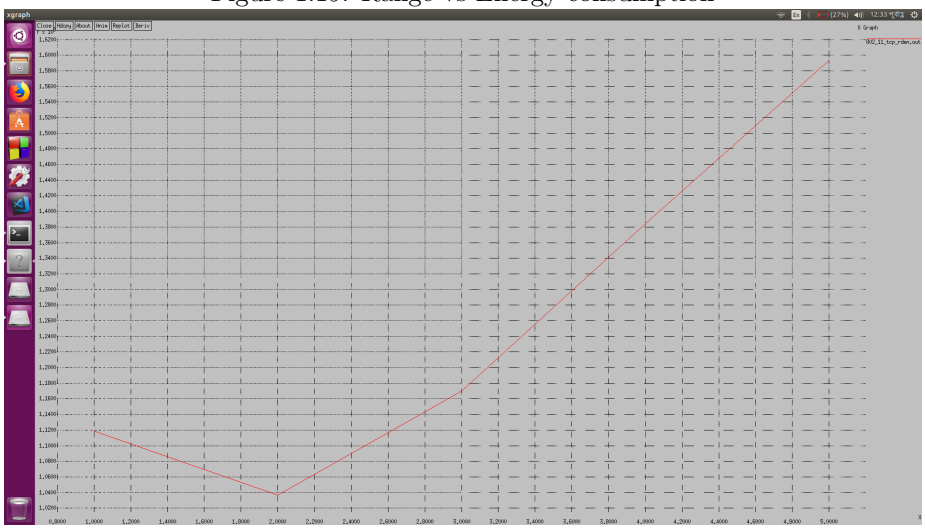


Figure 1.20: Range vs Throughput

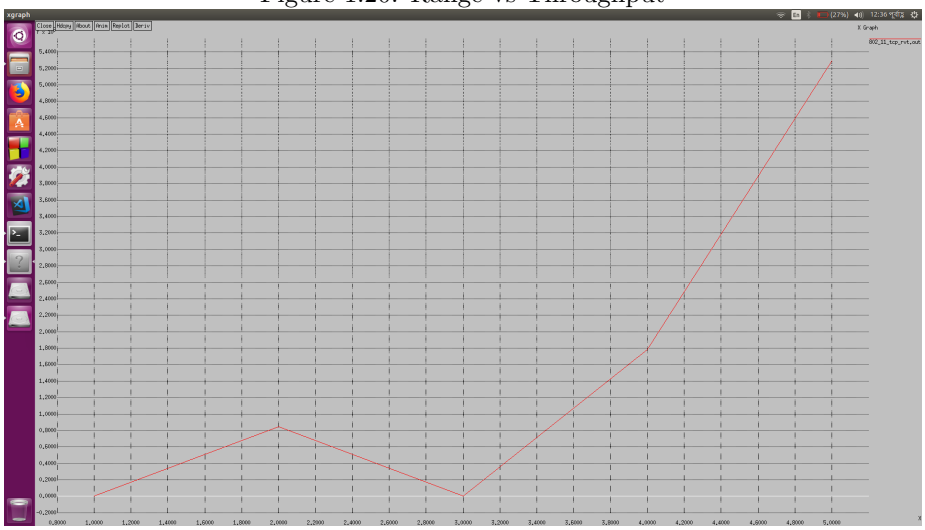


Figure 1.21: Flow vs Delay

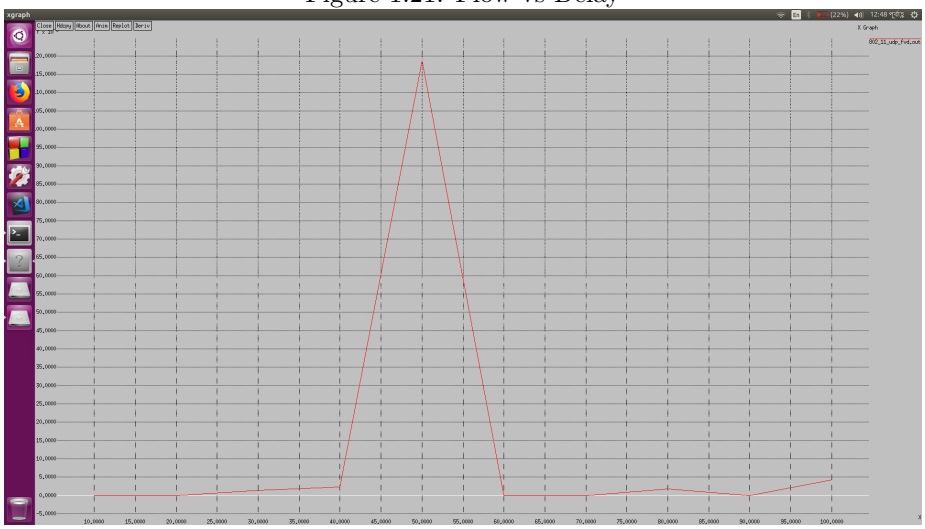


Figure 1.22: Flow vs Drop Ratio

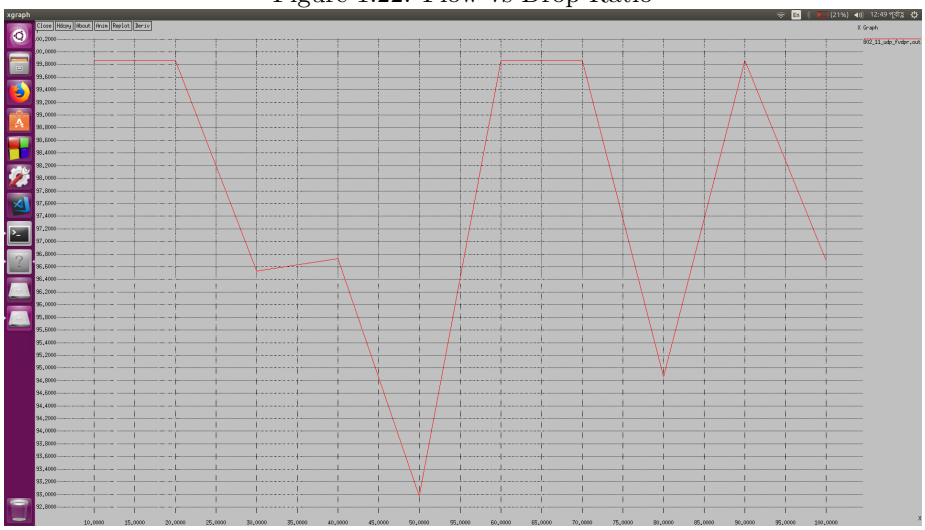


Figure 1.23: Flow vs Delivary Ratio

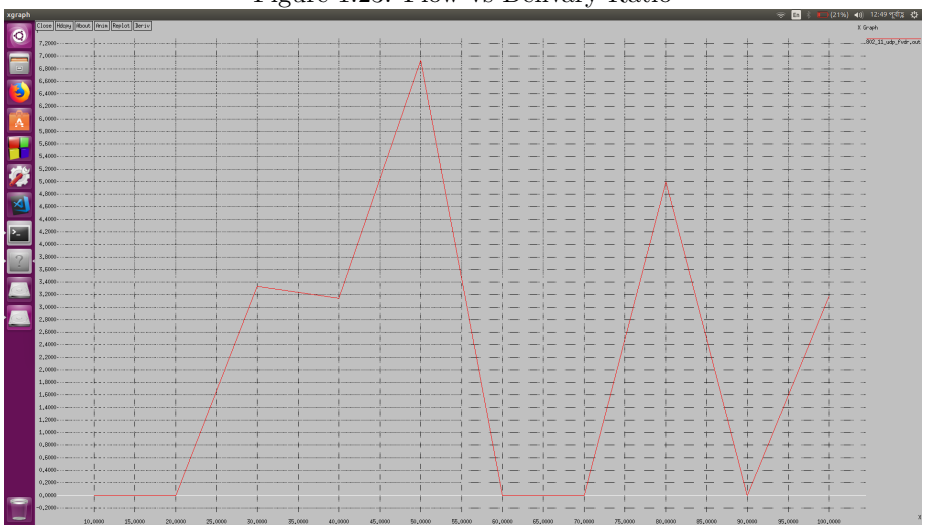


Figure 1.24: Flow vs Energy consumption

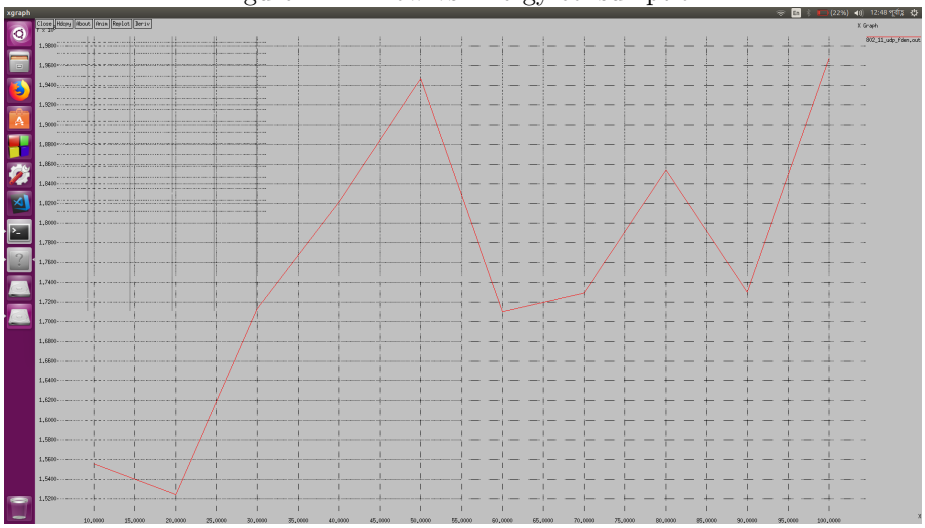


Figure 1.25: Flow vs Throughput

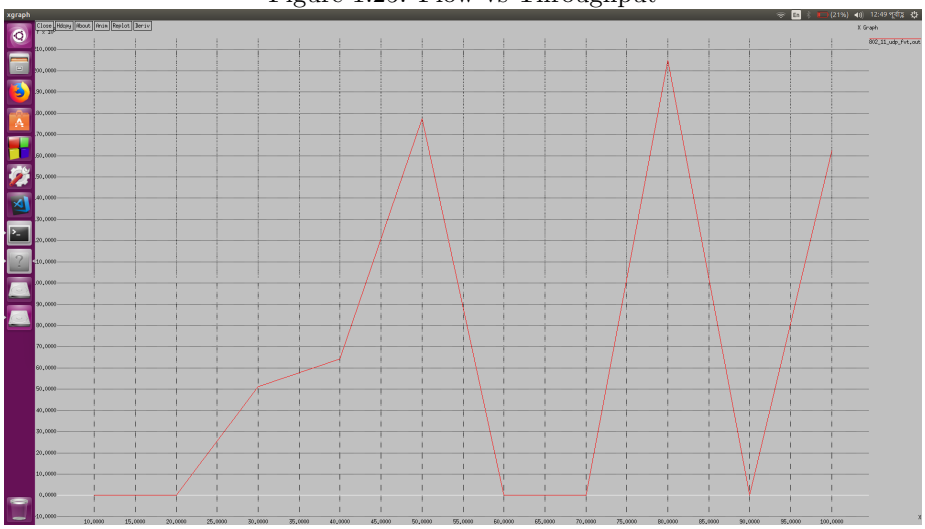


Figure 1.26: Node vs Delay

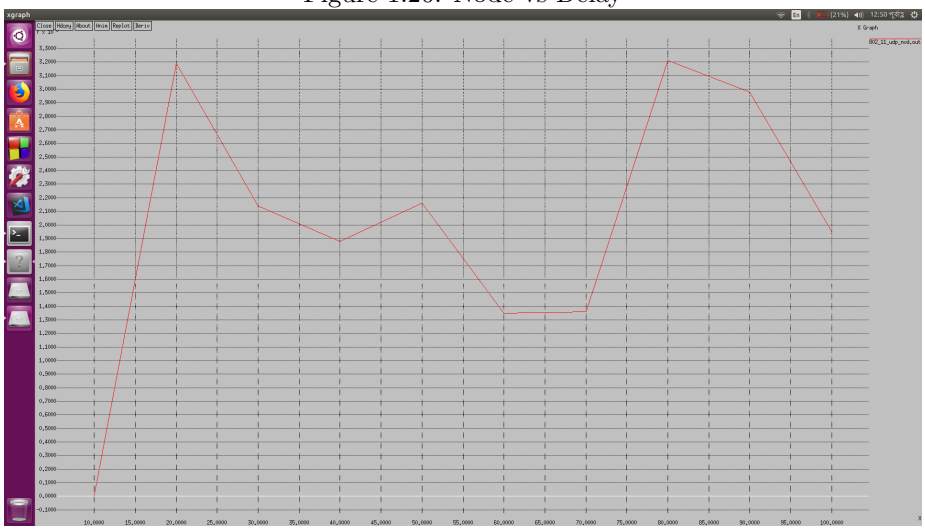


Figure 1.27: Node vs Delivary Ratio

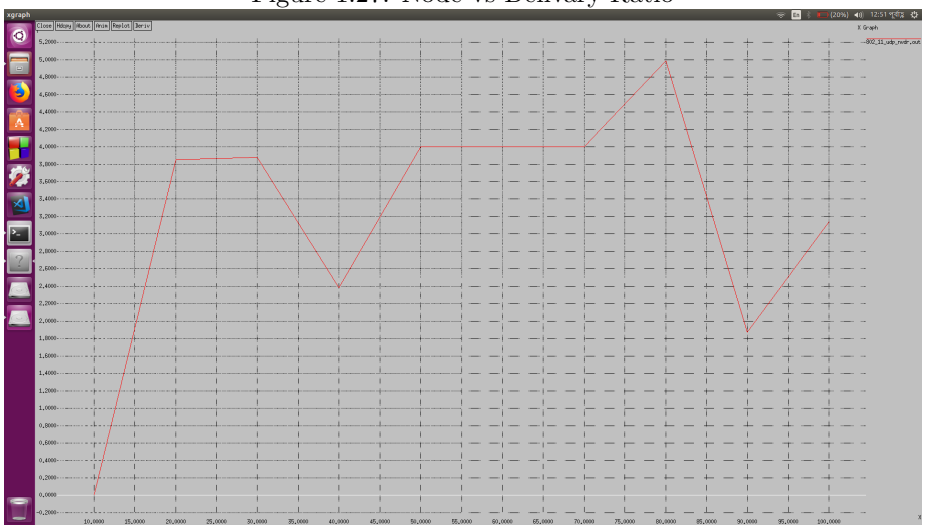


Figure 1.28: Node vs Drop Ratio

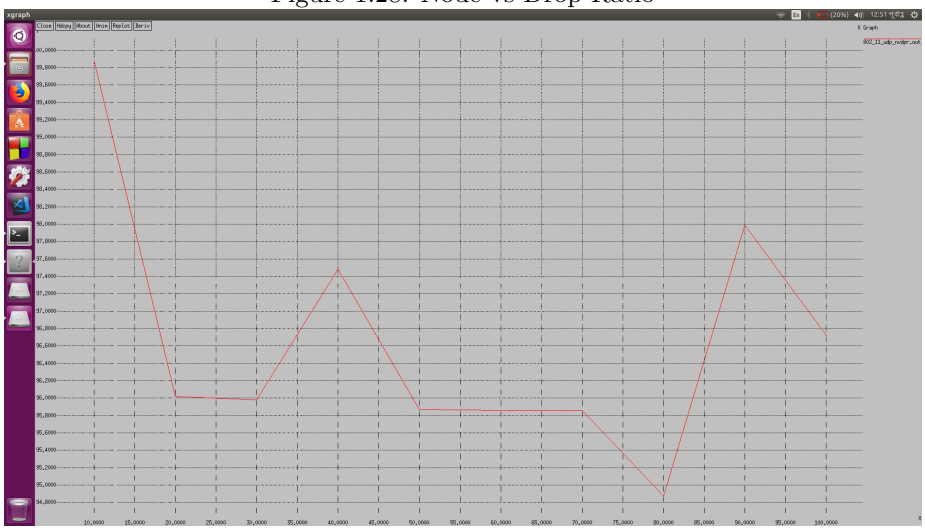


Figure 1.29: Node vs Energy consumption

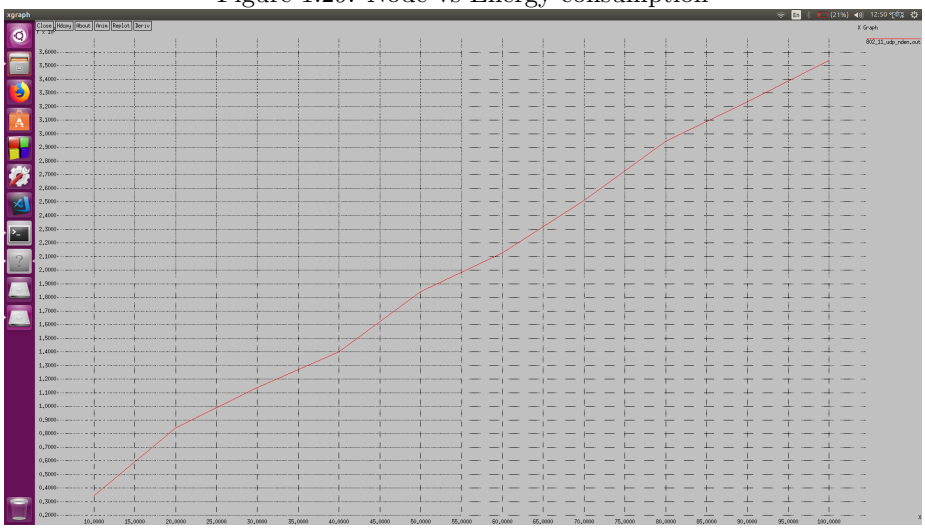


Figure 1.30: Node vs Throughput

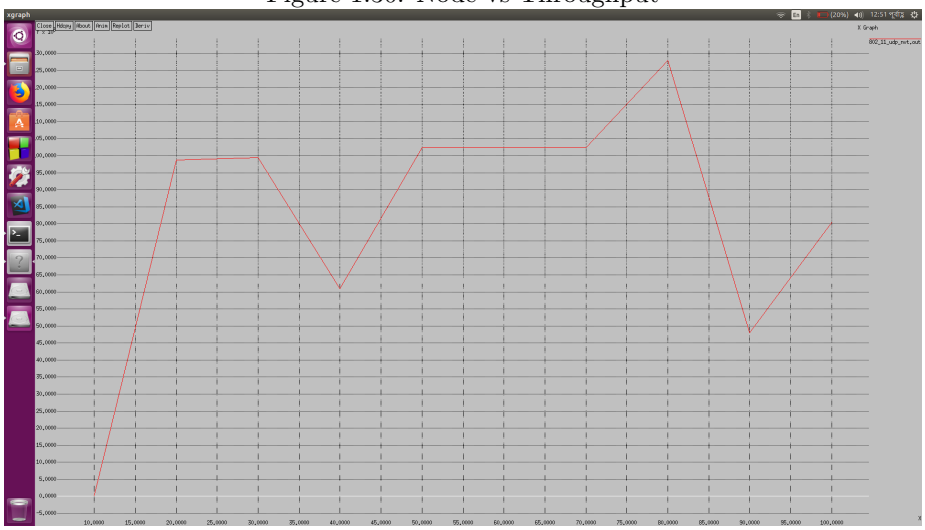


Figure 1.31: Packet vs Delay

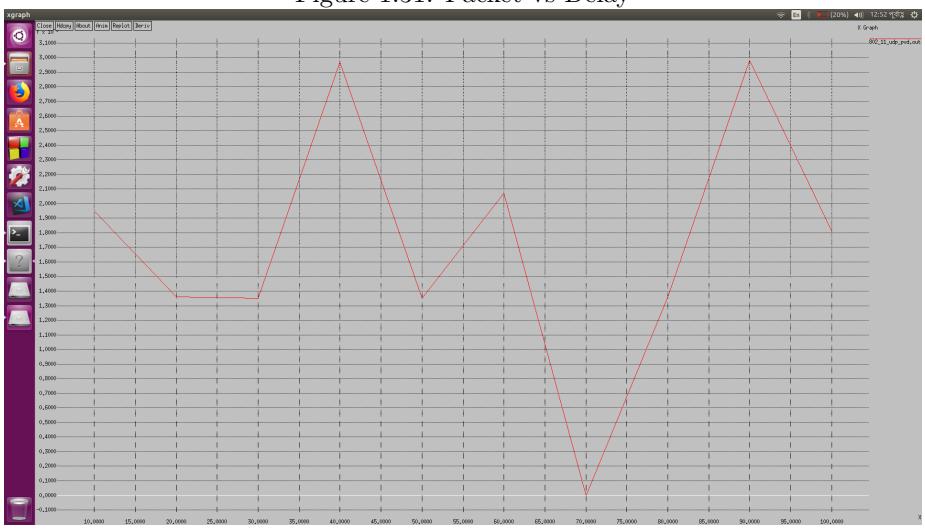


Figure 1.32: Packet vs Delivary Ratio

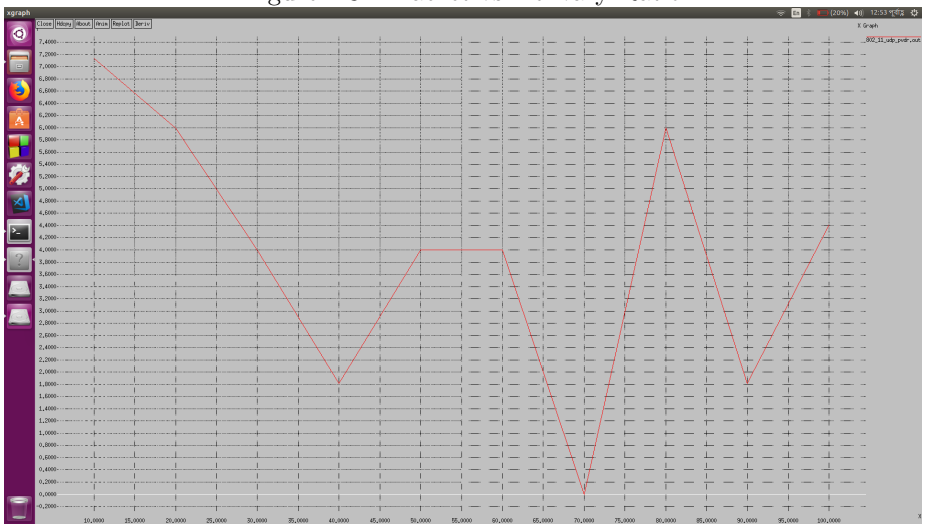


Figure 1.33: Packet vs Drop Ratio

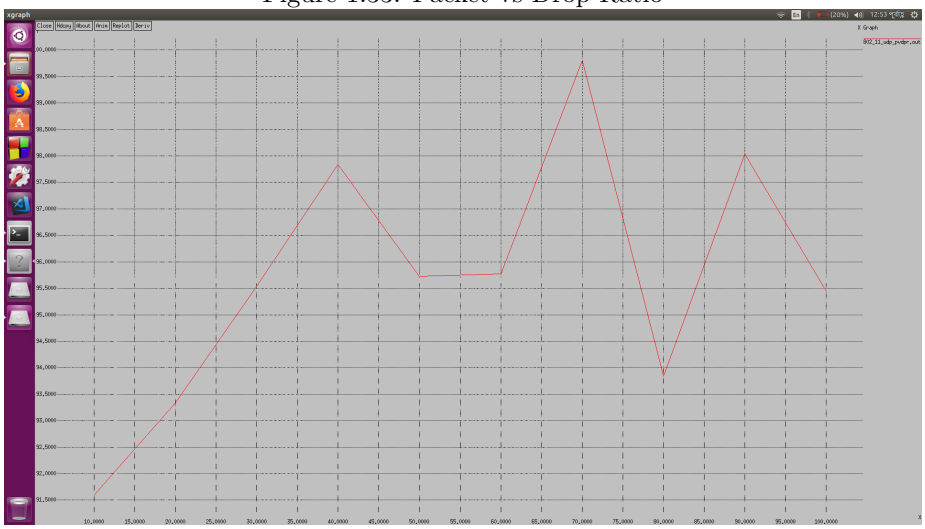


Figure 1.34: Packet vs Energy consumption

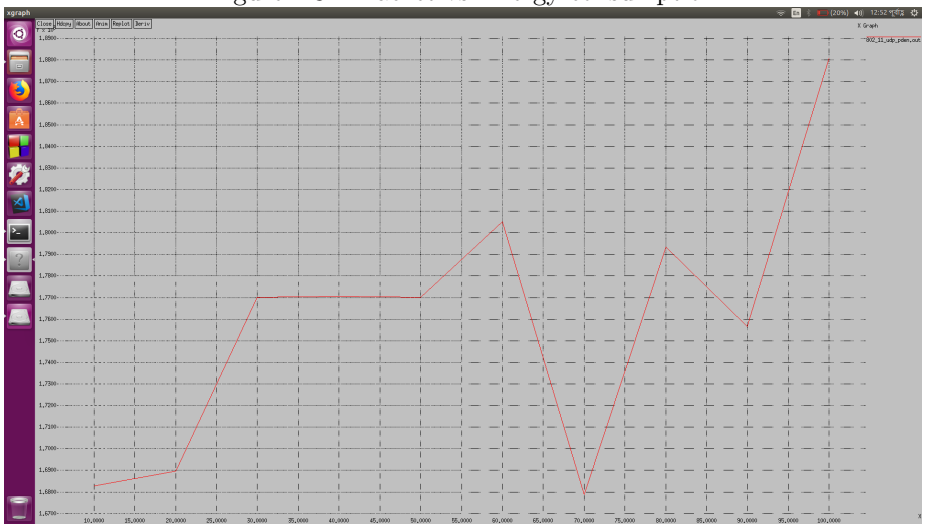


Figure 1.35: Packet vs Throughput

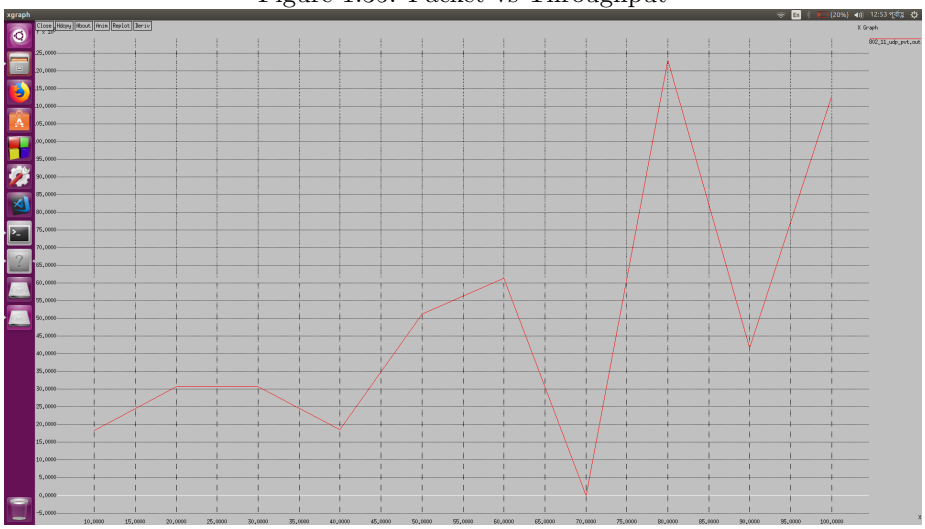


Figure 1.36: Range vs Delay

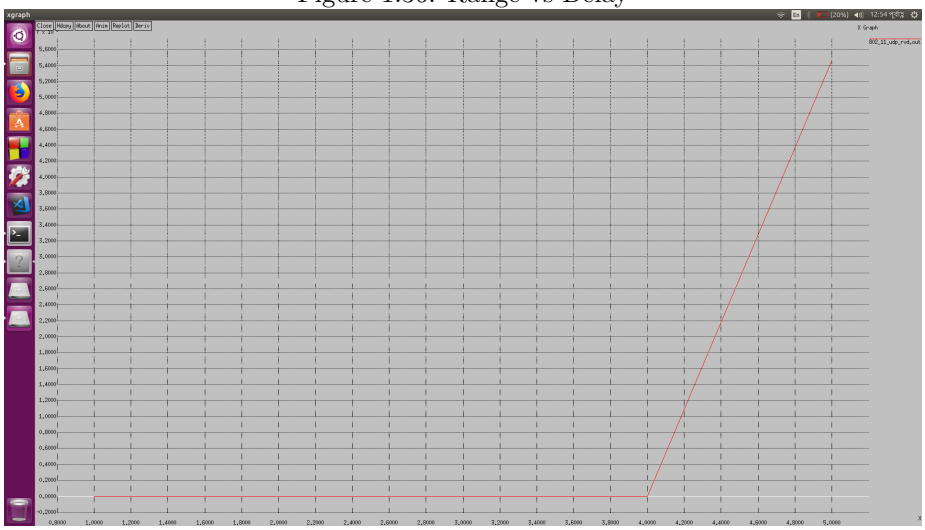


Figure 1.37: Node vs Delivary Ratio

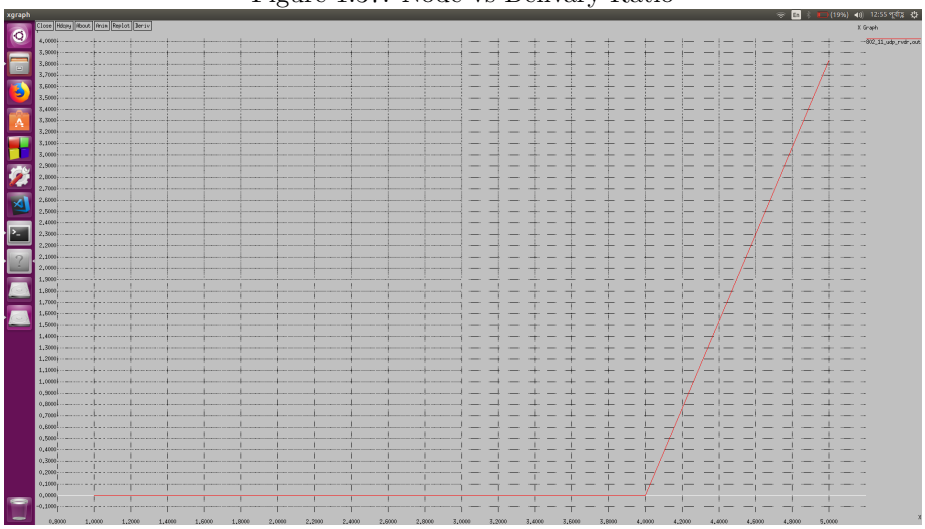


Figure 1.38: Node vs Drop Ratio

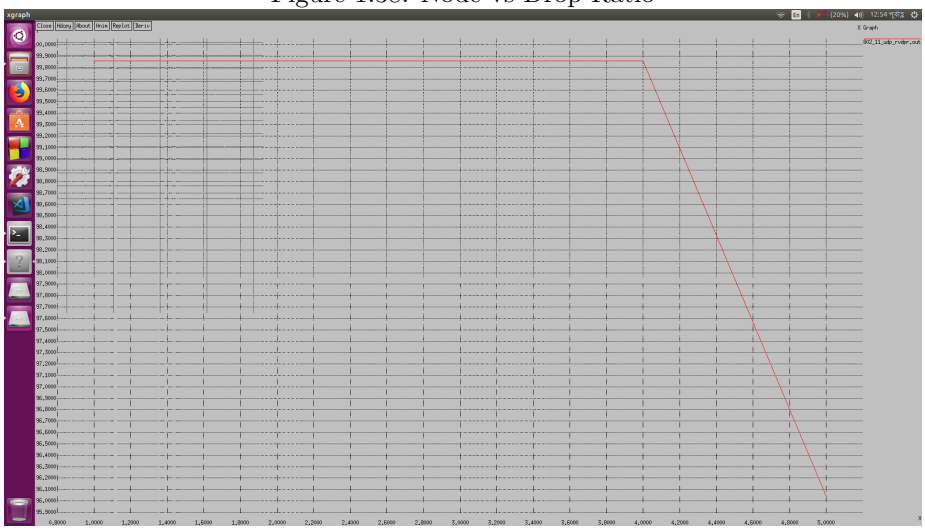


Figure 1.39: Node vs Energy consumption

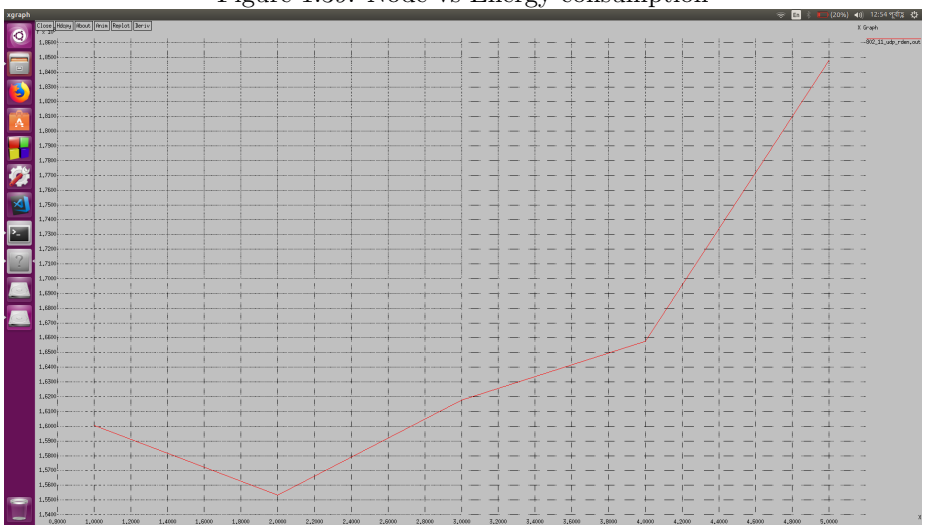
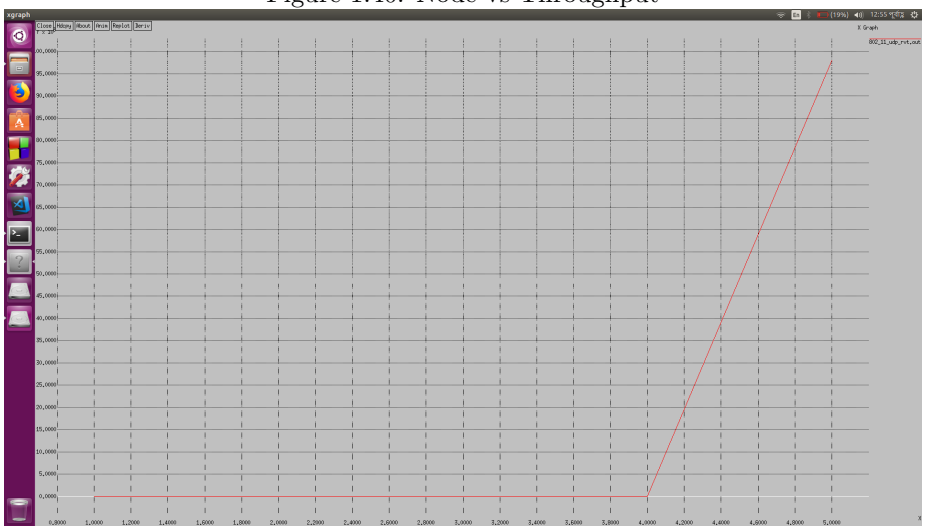


Figure 1.40: Node vs Throughput



Chapter 2

802-11 (static) Modification

We modified mechanism for congestion control in TCP. We use random value instead of constent wnd.

Figure 2.1: Flow vs Delay

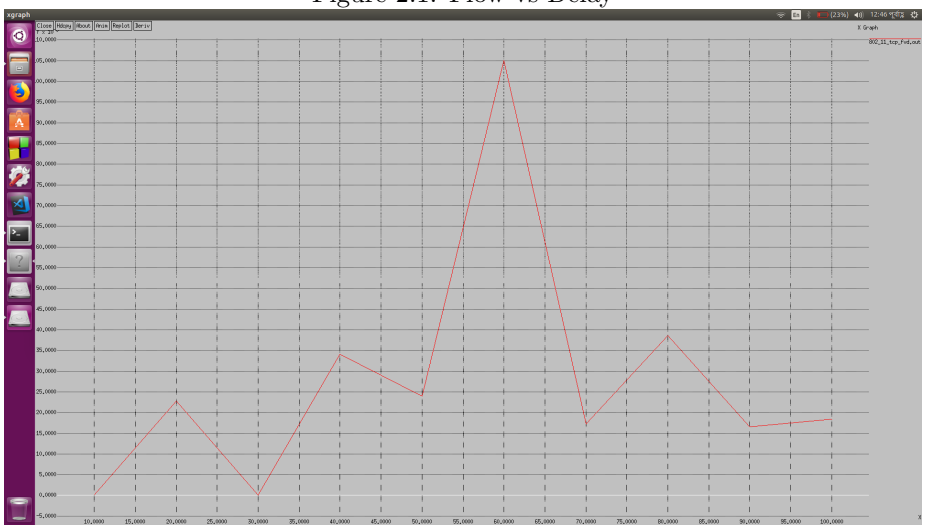


Figure 2.2: Flow vs Drop Ratio

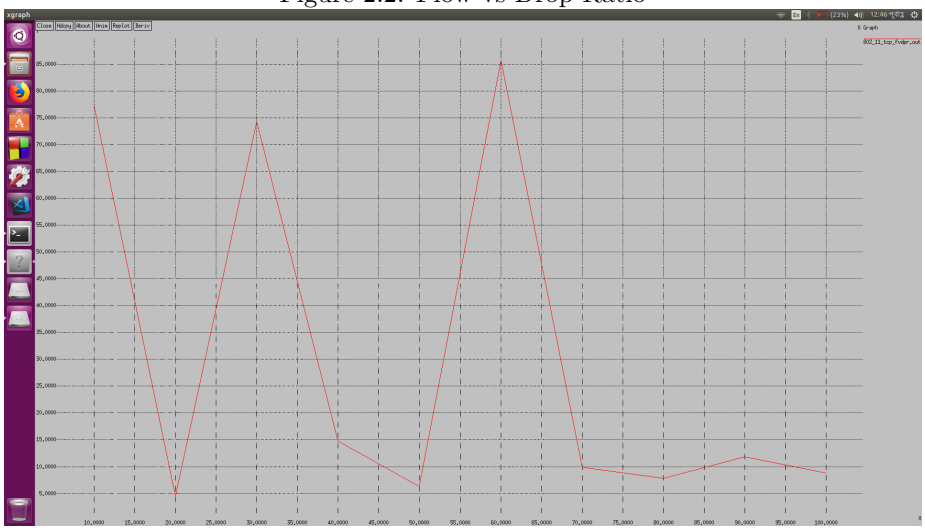


Figure 2.3: Flow vs Delivary Ratio

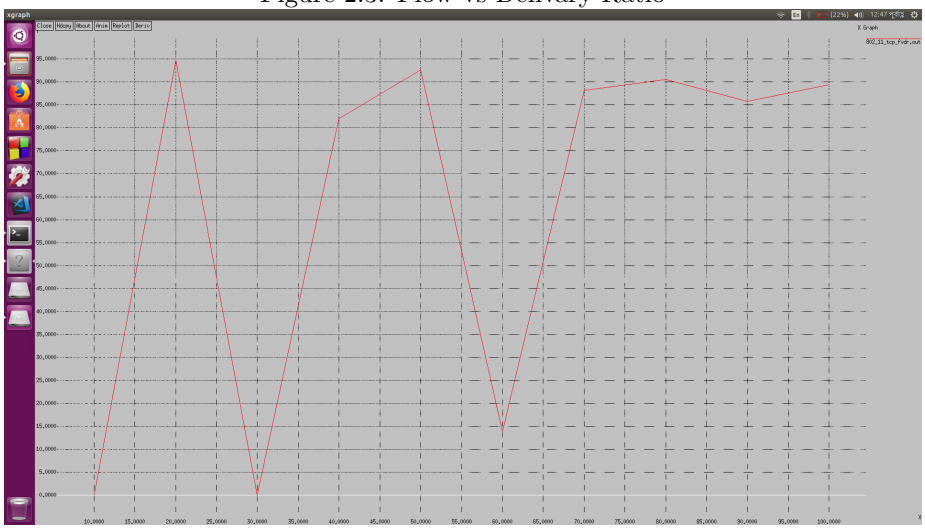


Figure 2.4: Flow vs Energy consumption

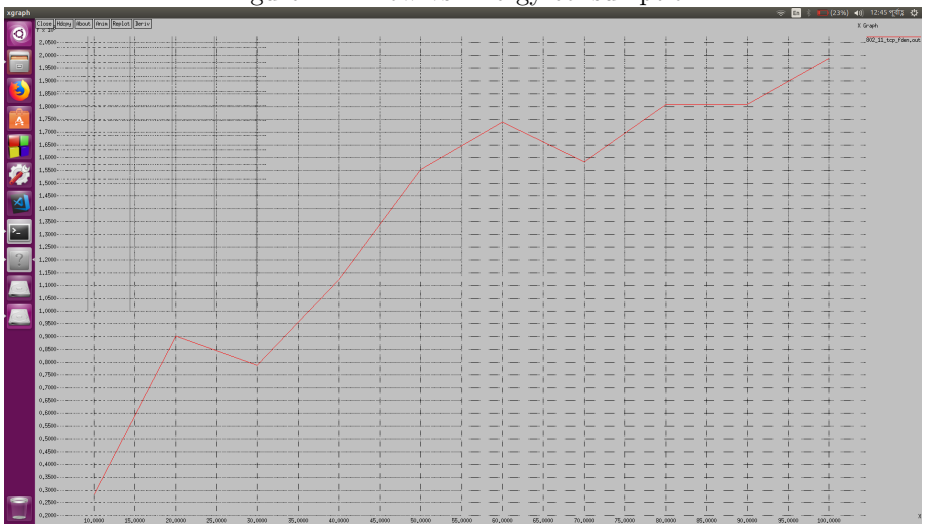


Figure 2.5: Flow vs Throughput

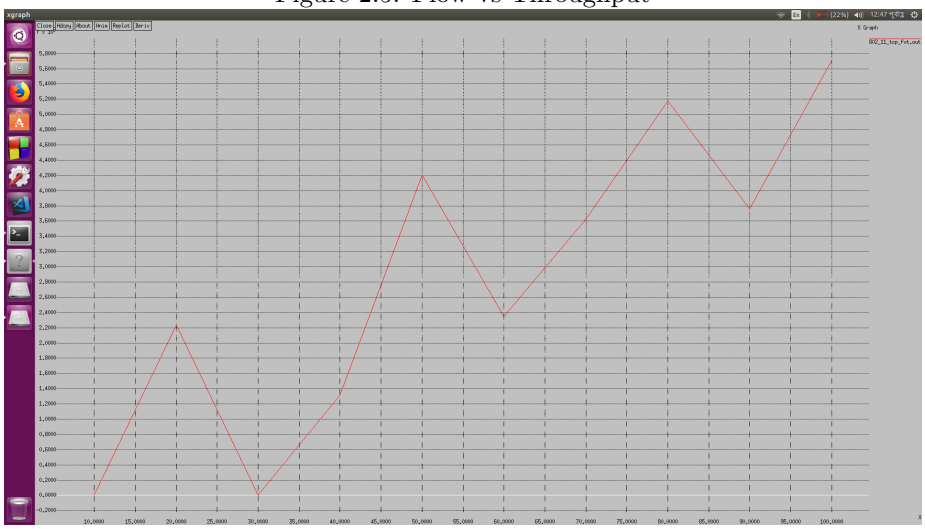


Figure 2.6: Node vs Delay

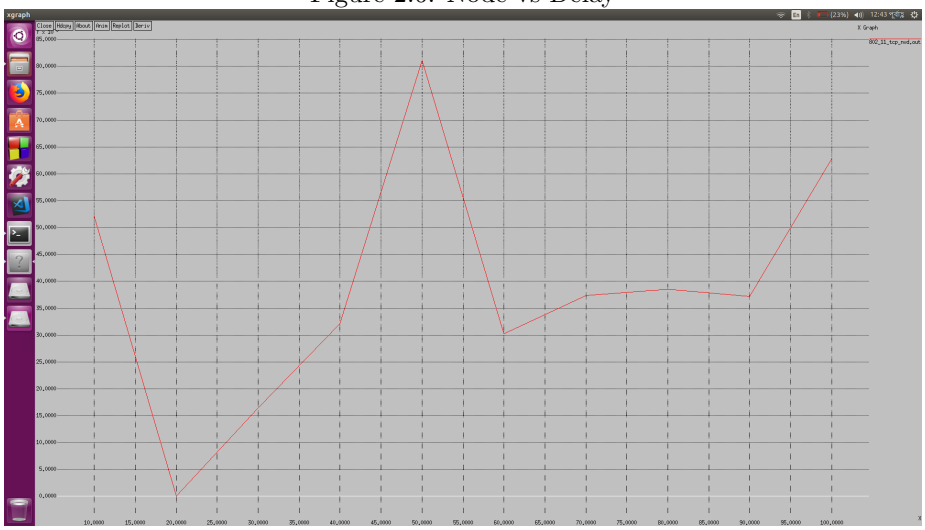


Figure 2.7: Node vs Delivary Ratio

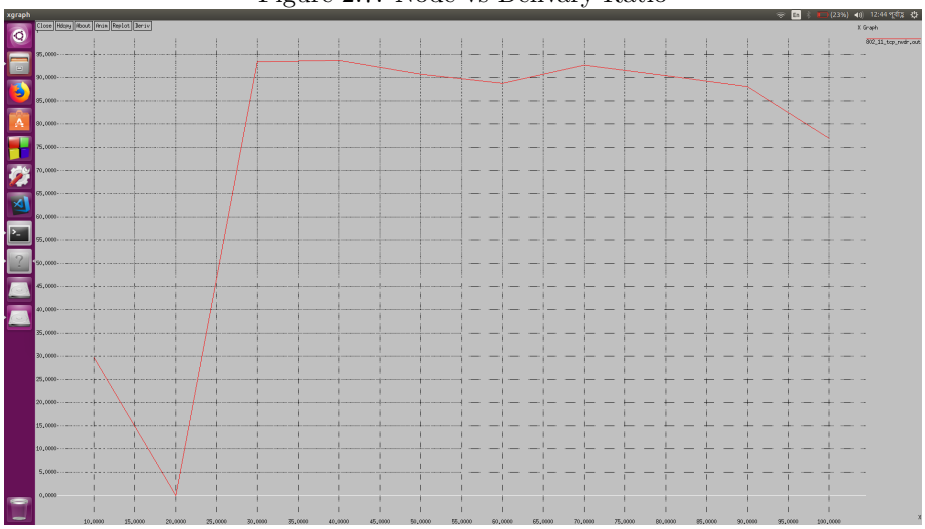


Figure 2.8: Node vs Drop Ratio

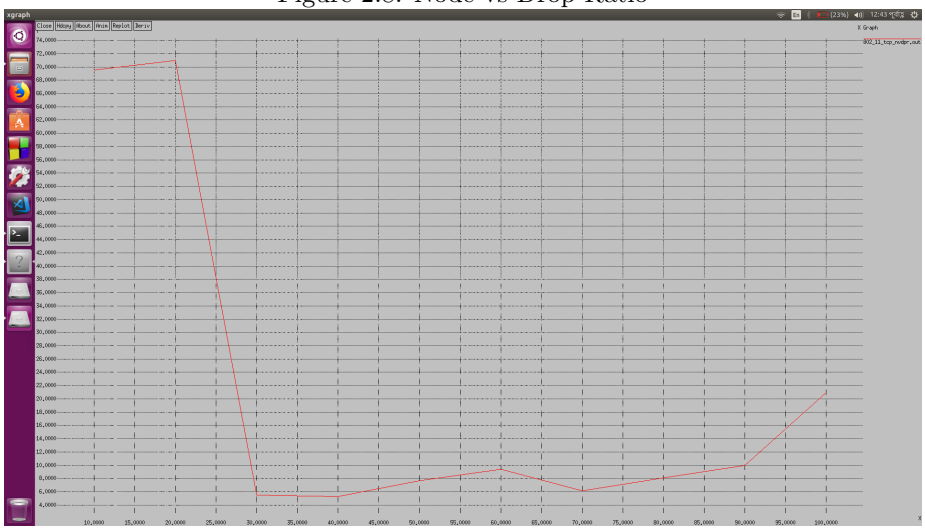


Figure 2.9: Node vs Energy consumption

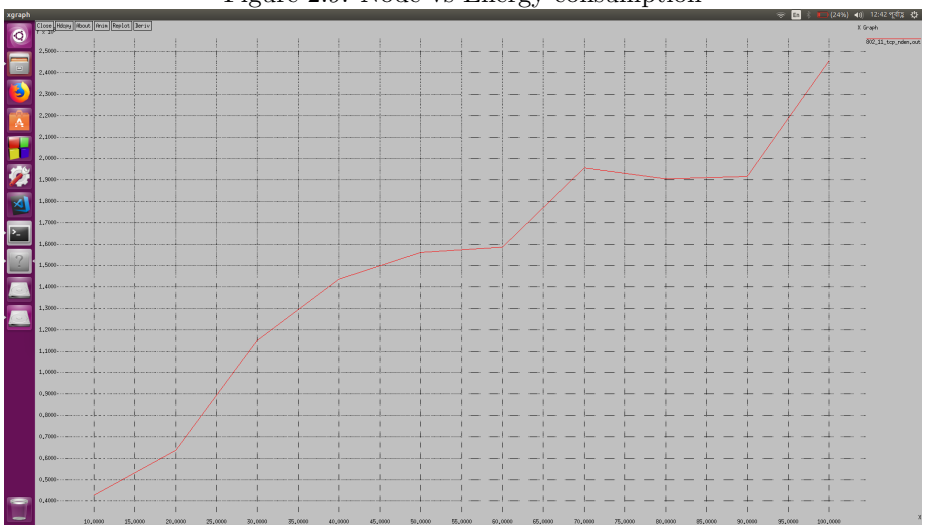


Figure 2.10: Node vs Throughput

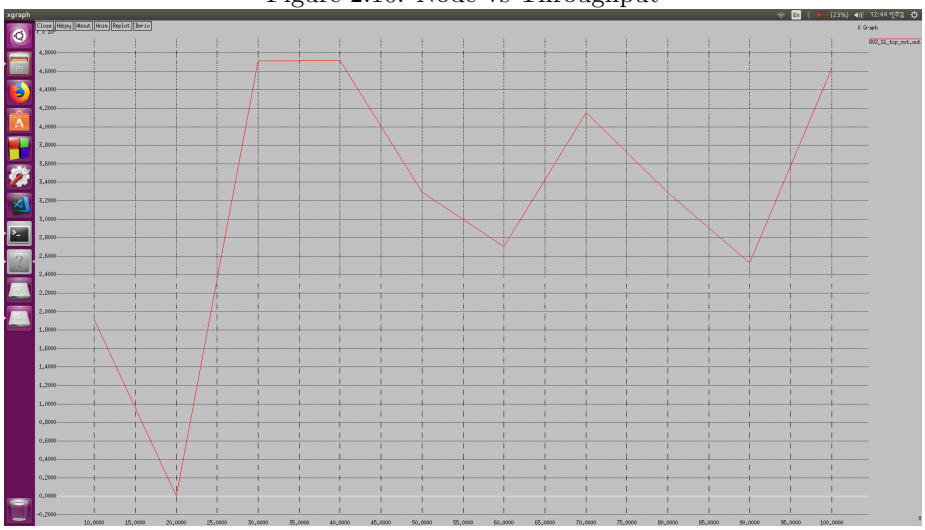


Figure 2.11: Packet vs Delay

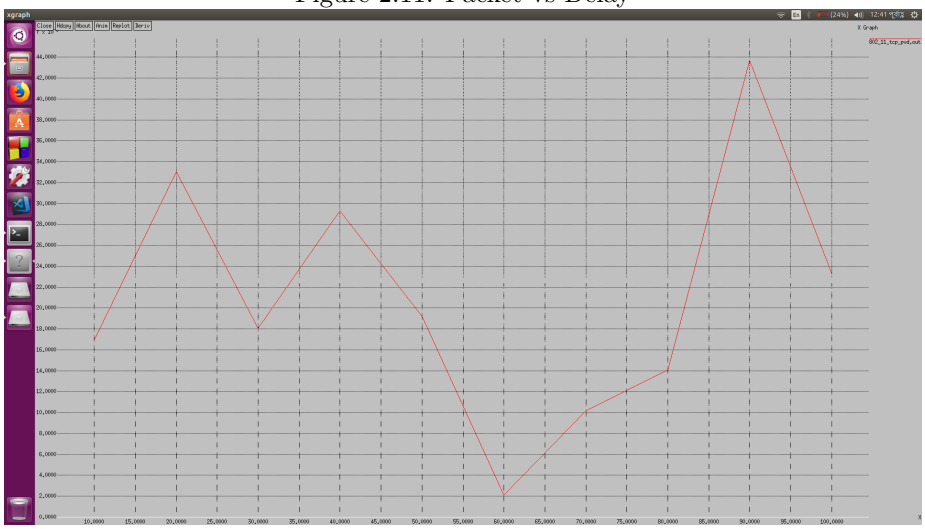


Figure 2.12: Packet vs Delivary Ratio

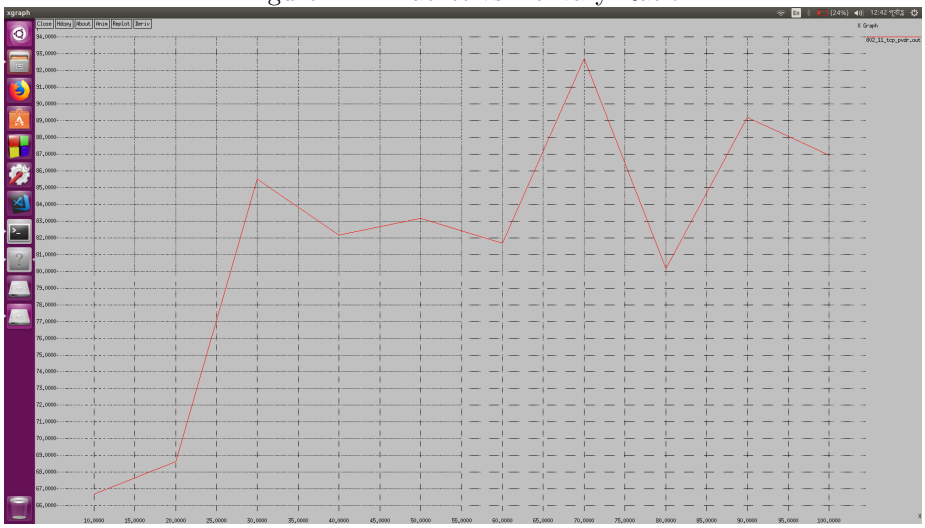


Figure 2.13: Packet vs Drop Ratio

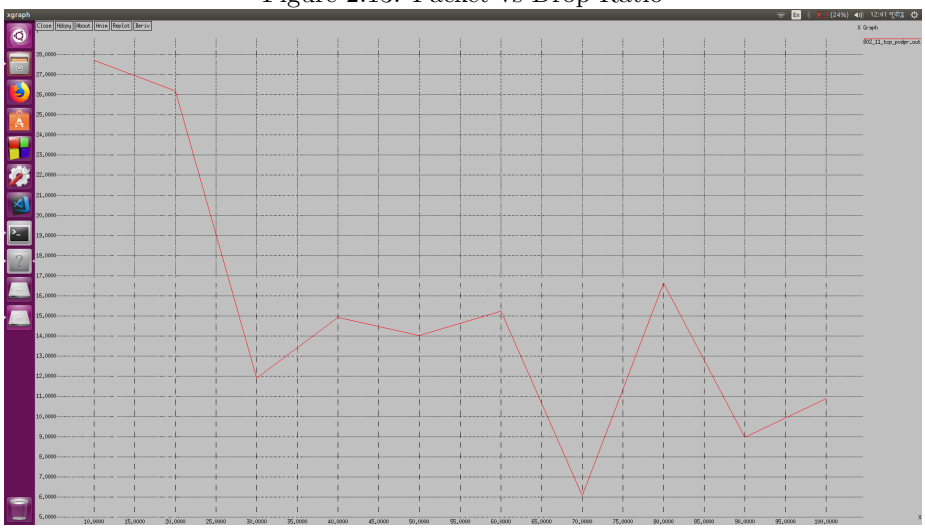


Figure 2.14: Packet vs Energy consumption

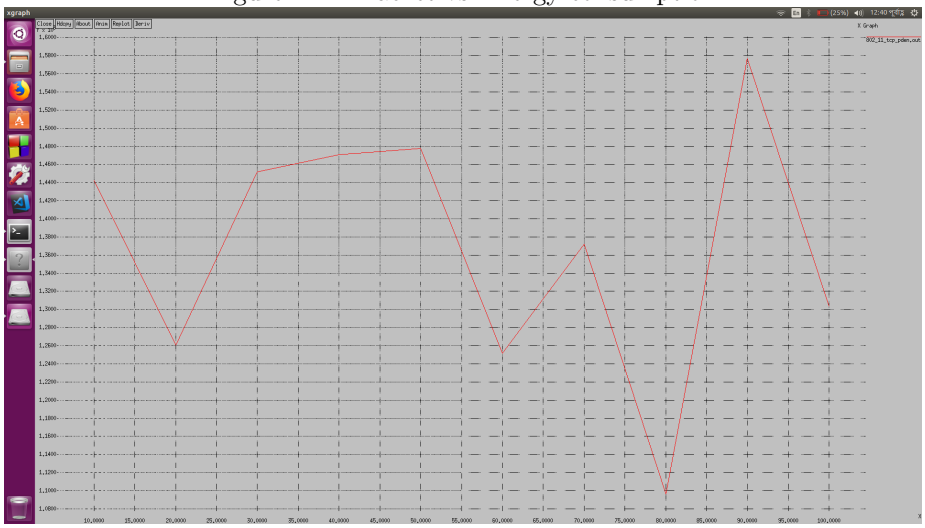


Figure 2.15: Packet vs Throughput

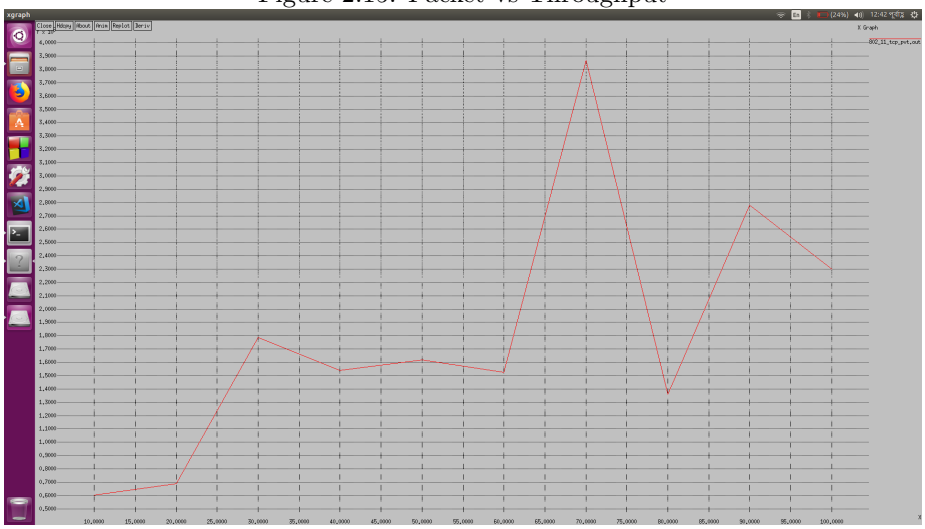


Figure 2.16: Range vs Delay

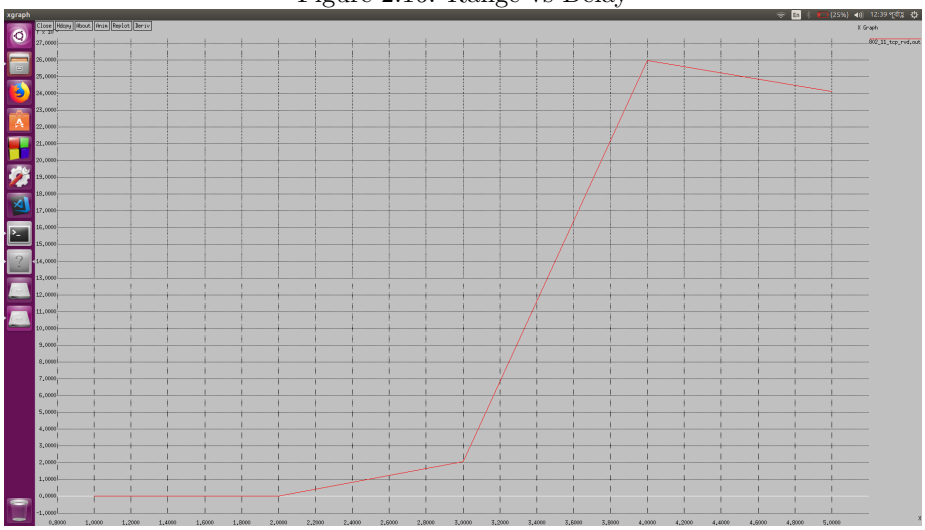


Figure 2.17: Node vs Delivary Ratio

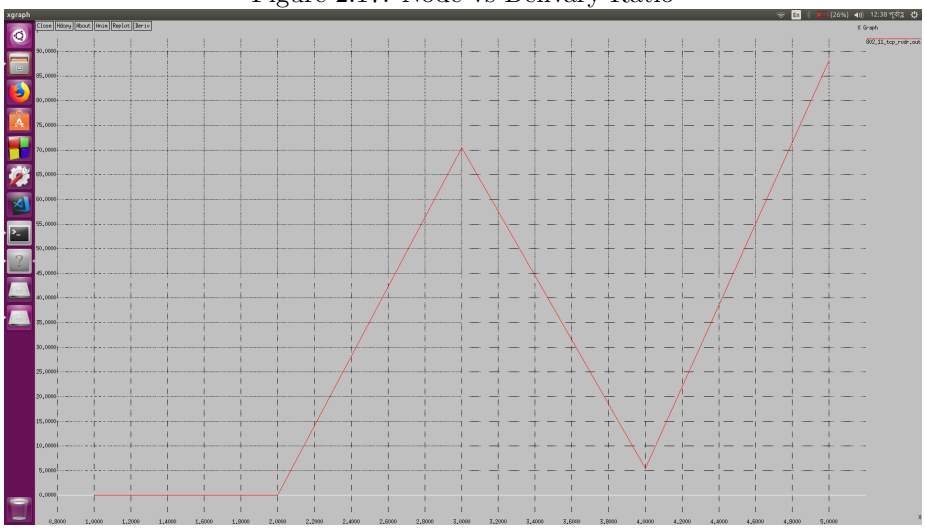


Figure 2.18: Node vs Drop Ratio

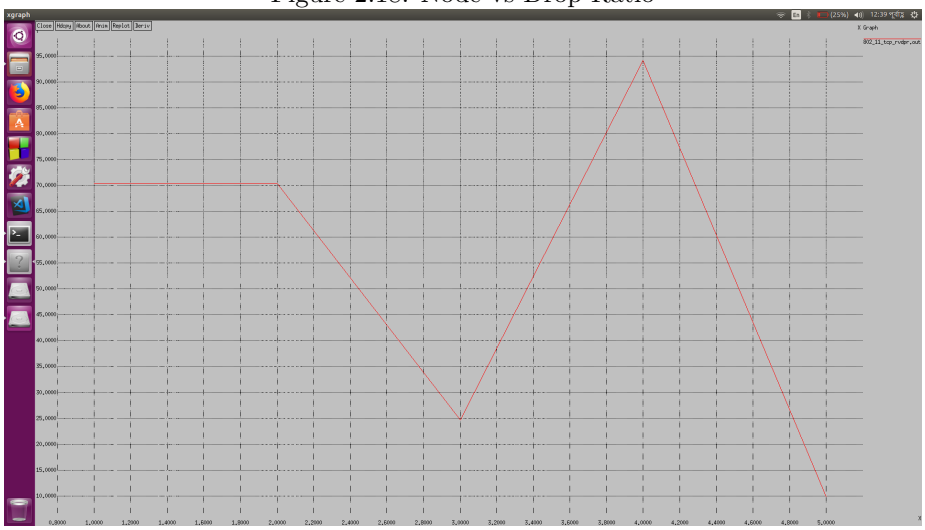


Figure 2.19: Node vs Energy consumption

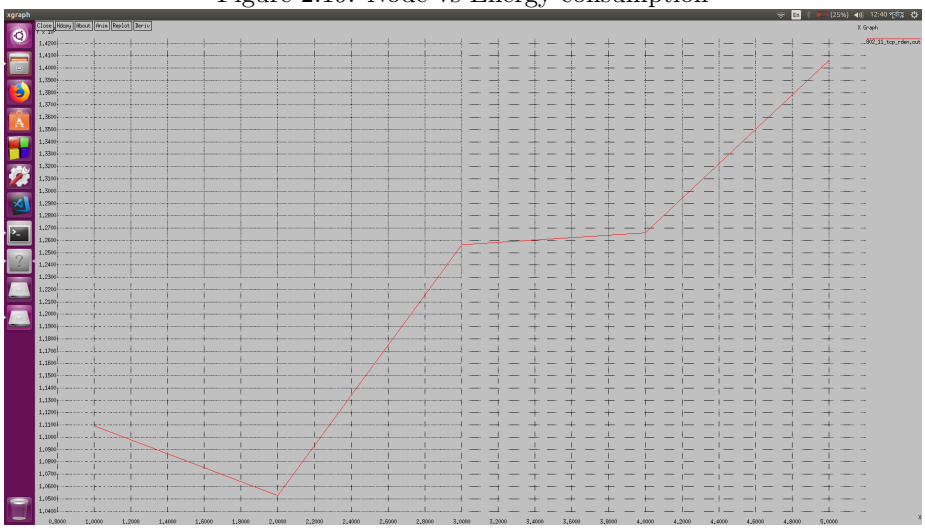
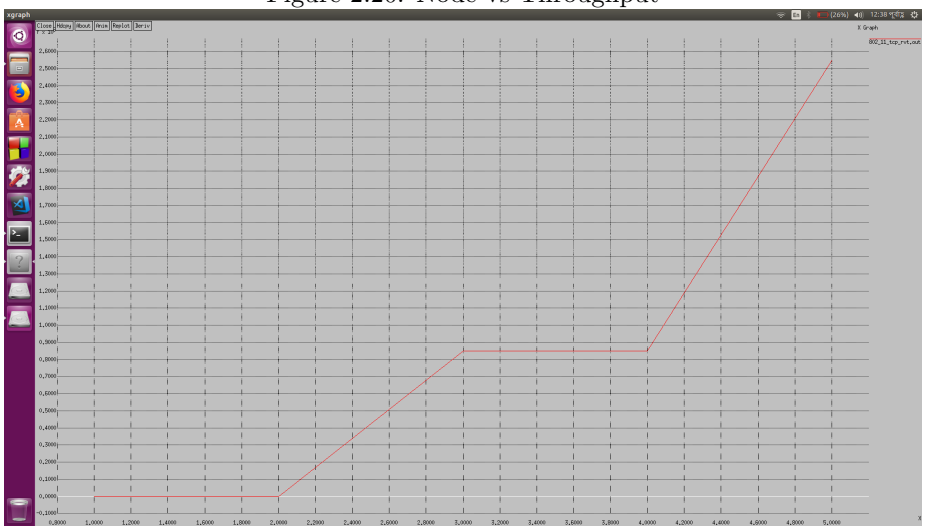


Figure 2.20: Node vs Throughput



Chapter 3

802-15-4 (Mobile) without Modification

For udp:

Figure 3.1: Flow vs Delay

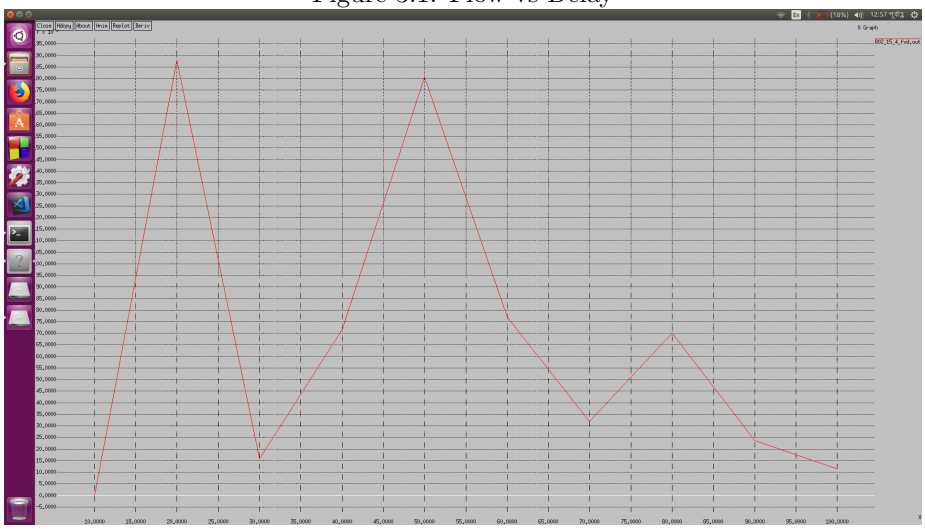


Figure 3.2: Flow vs Drop Ratio

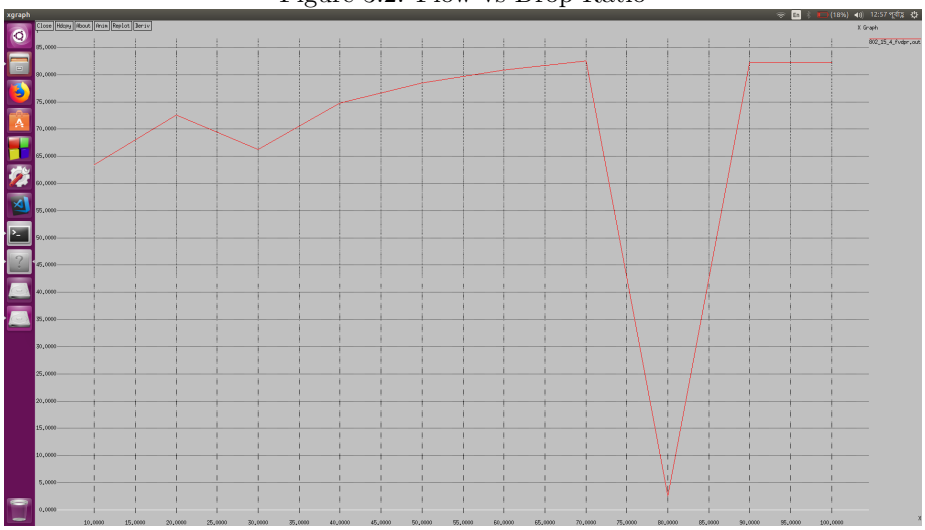


Figure 3.3: Flow vs Delivary Ratio

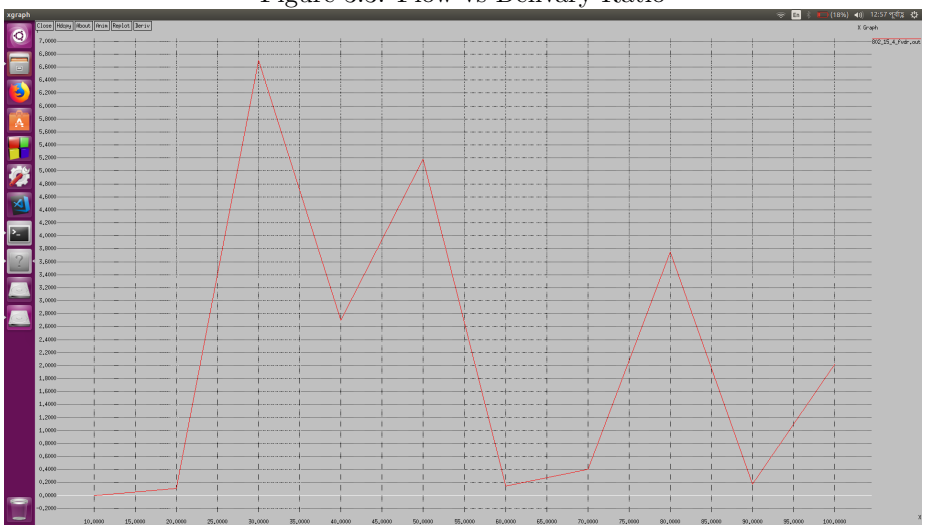


Figure 3.4: Flow vs Energy consumption

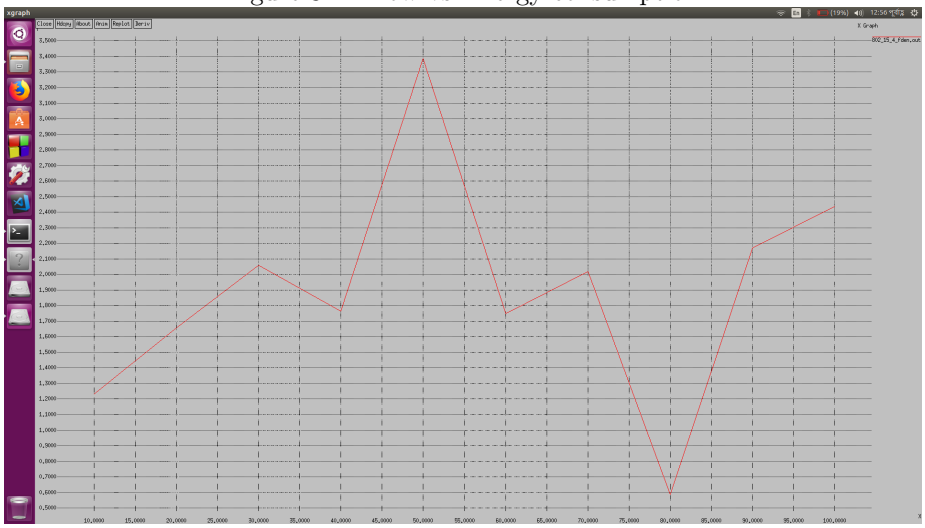


Figure 3.5: Flow vs Throughput

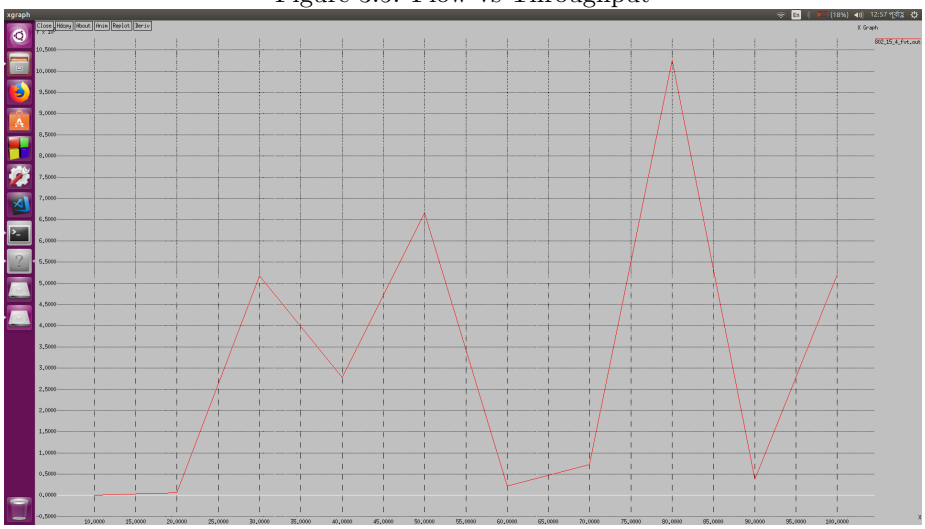


Figure 3.6: Node vs Delay

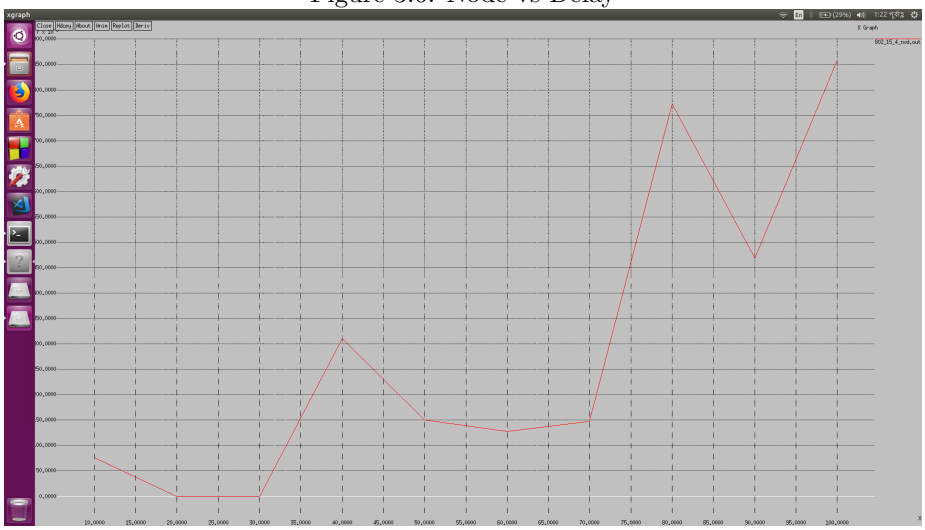


Figure 3.7: Node vs Delivary Ratio

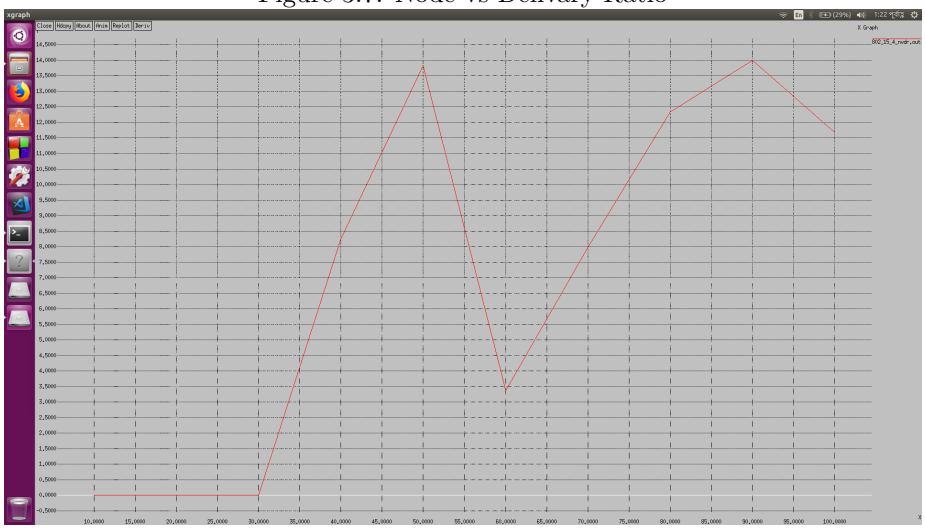


Figure 3.8: Node vs Drop Ratio

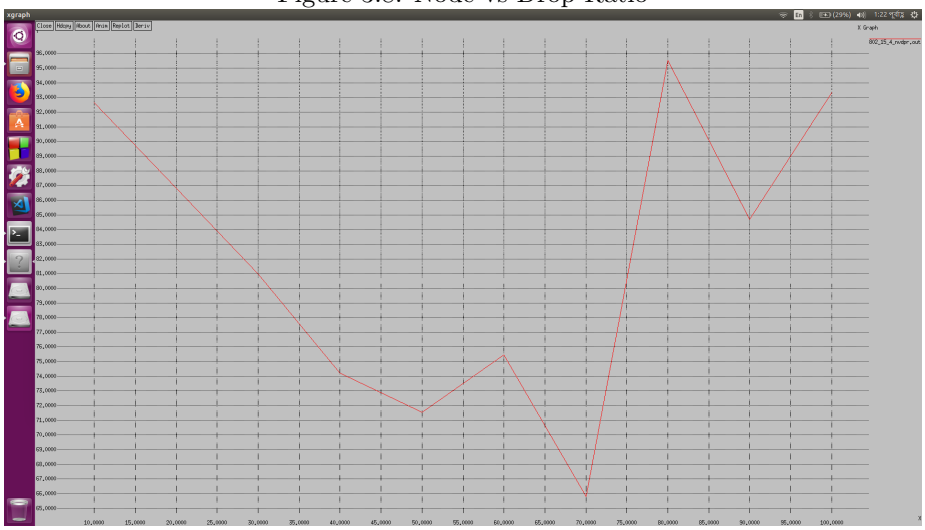


Figure 3.9: Node vs Energy consumption

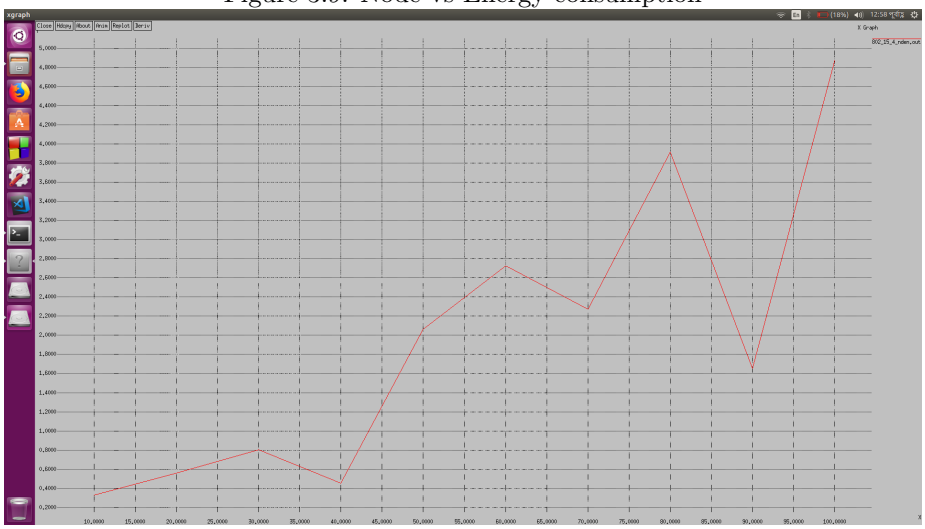


Figure 3.10: Node vs Throughput

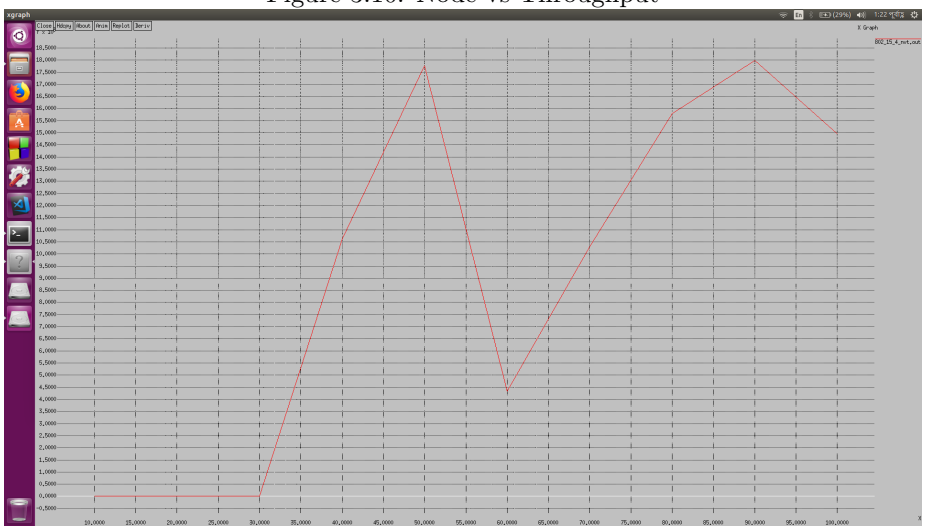


Figure 3.11: Packet vs Delay

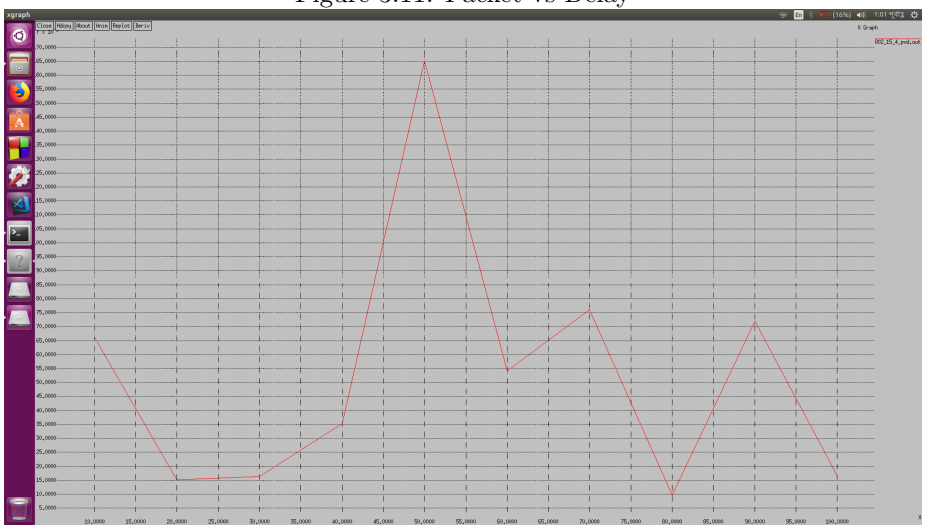


Figure 3.12: Packet vs Delivary Ratio

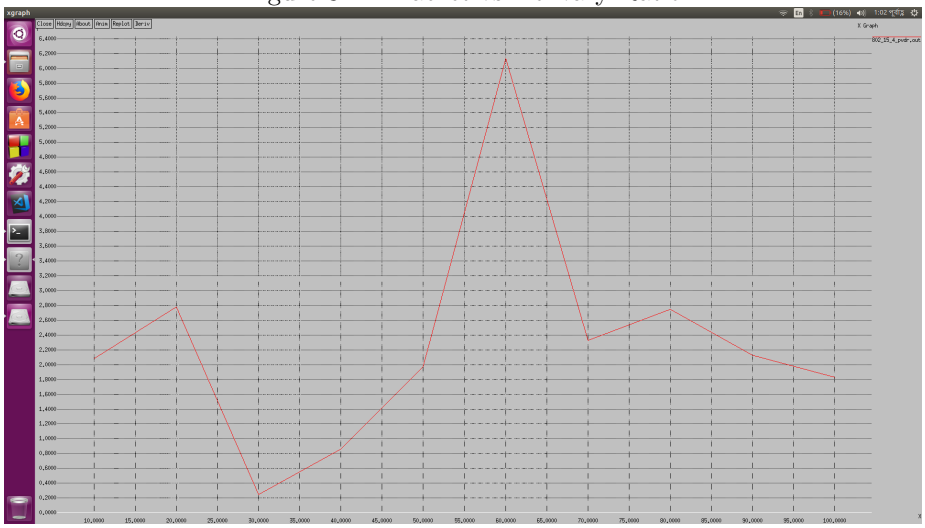


Figure 3.13: Packet vs Drop Ratio

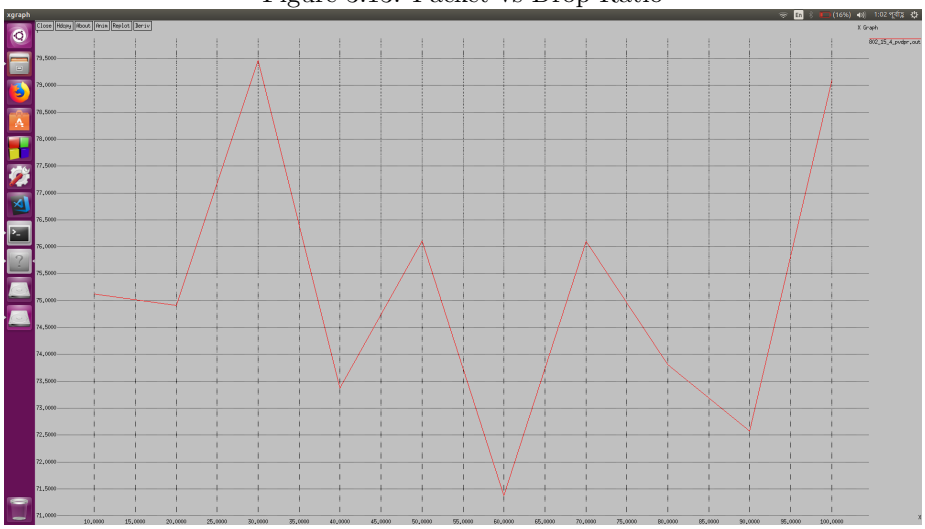


Figure 3.14: Packet vs Energy consumption

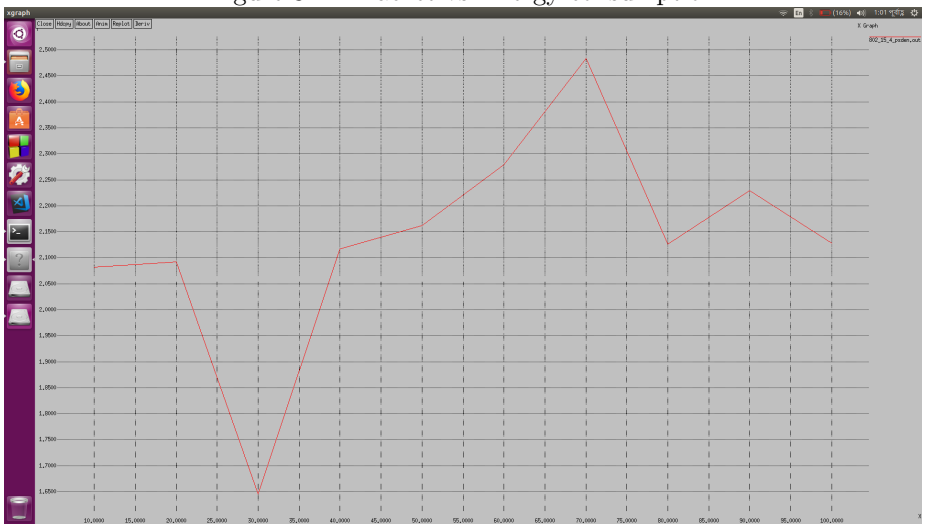


Figure 3.15: Packet vs Throughput

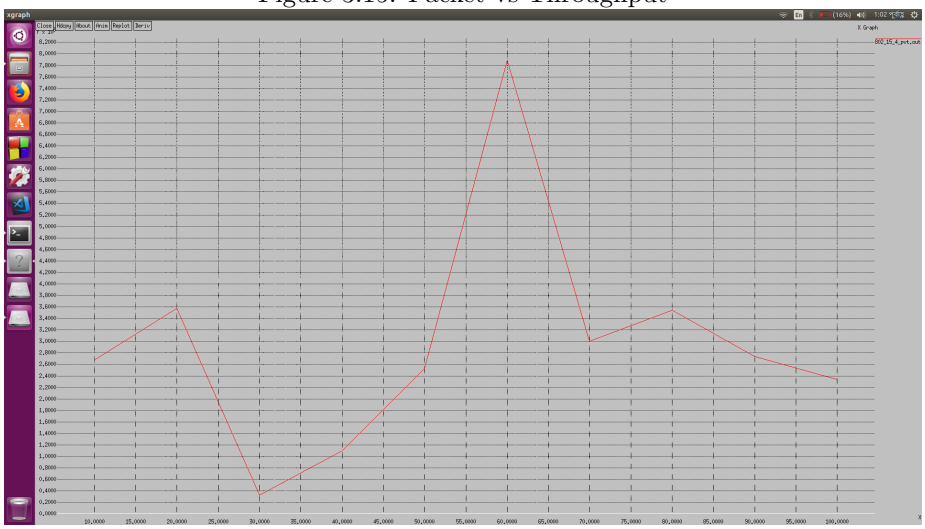


Figure 3.16: Speed vs Delay

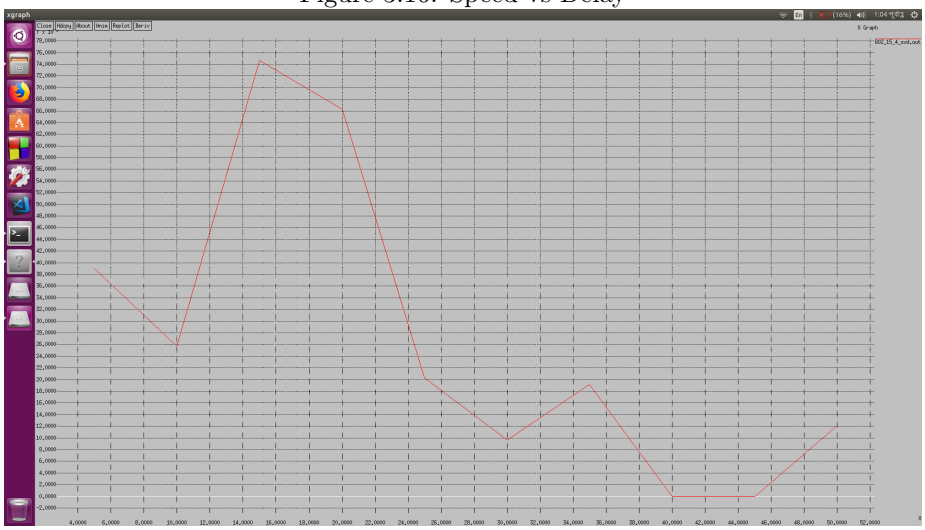


Figure 3.17: Speed vs Delivary Ratio

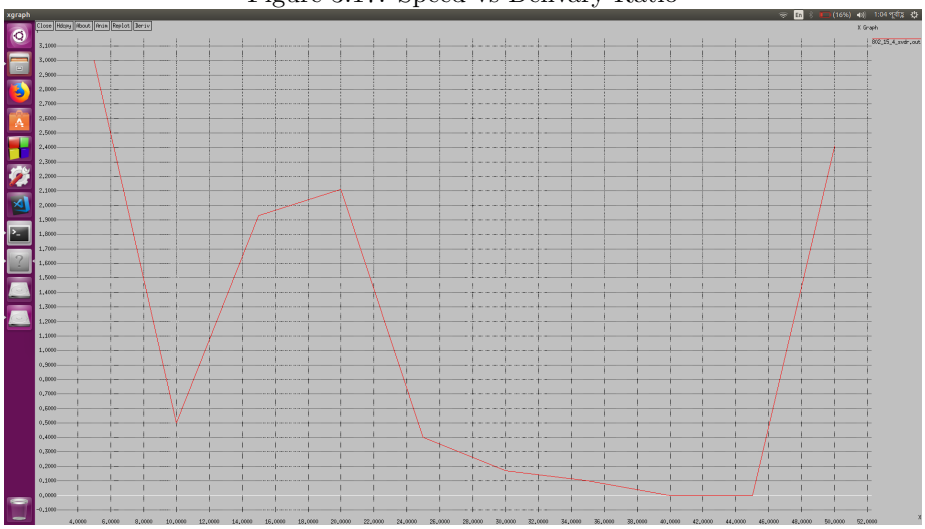


Figure 3.18: Speed vs Drop Ratio

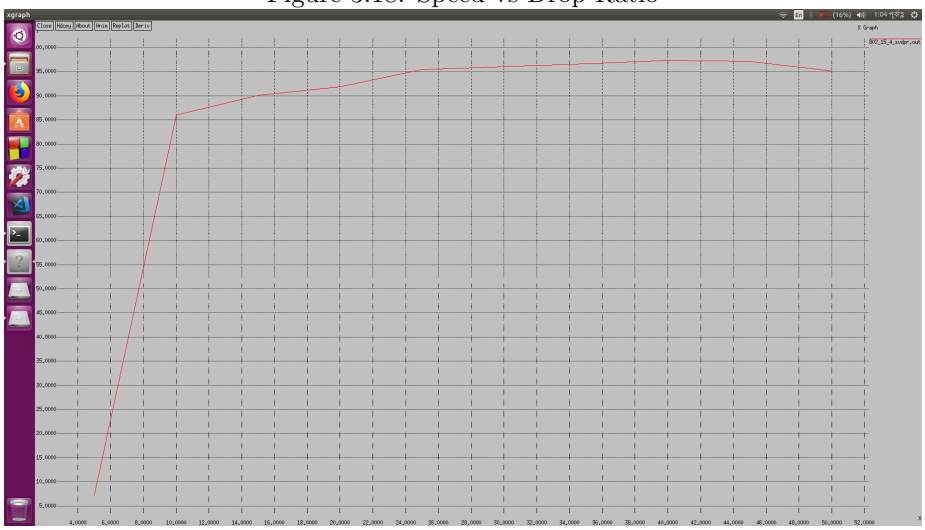


Figure 3.19: Speed vs Energy consumption

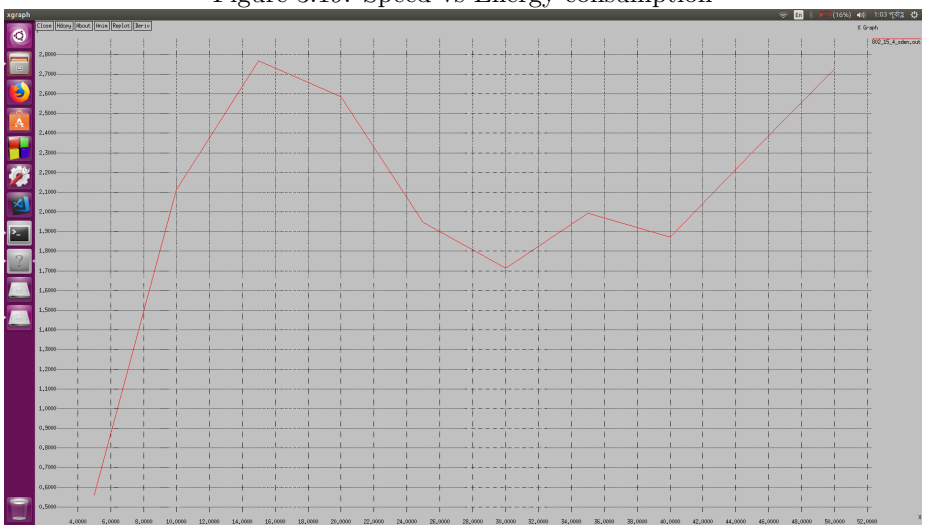
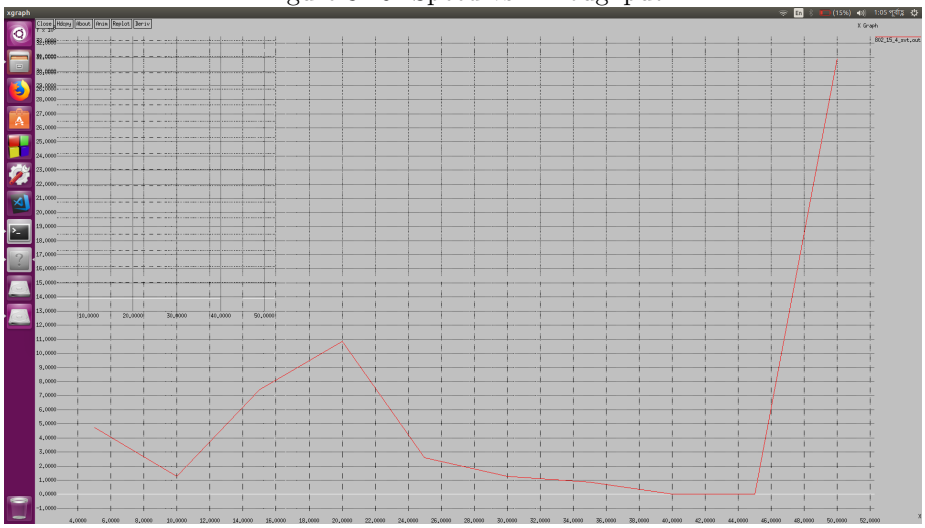


Figure 3.20: Speed vs Throughput



Chapter 4

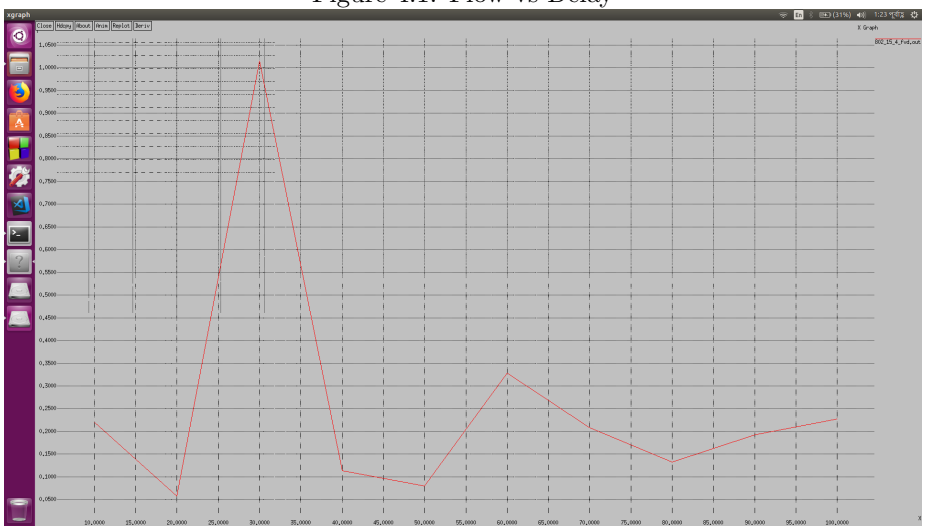
802-15-4 (Mobile) with Modification

We modified in routing protocol : **AODV**

The modified mechanism:

AODV protocol is extended with a **drop factor** that induces a **randomness** feature to result in Randomized Ad-Hoc On-Demand Routing (**R-AODV**) protocol. During the route discovery process, every intermediary or router nodes between the source and the destination nodes makes a decision to either broadcast/forward the **RREQ** packet further towards the destination or drop it. Before forwarding a RREQ packet, every node computes the drop factorwhich is a function of the inverse of the number of **hop counts** traversed by the RREQ packet. This drop factor lies in the range of 0 to 1. Also, the node generates a random number from 0 to 1. If this random number is higher than the drop factor, the node forwards the RREQ packet. Otherwise, the RREQ packet is dropped. Dropping of RREQ packets does not necessarily result in a new route discovery process by the source node. This is due to the fact that the original broadcast by the source node results in multiple RREQ packets via the neighbors and this diffusing wave results quickly in a large number of RREQ packets traversing the network in search of the destination. A major proportion of these packets are redundant due to the fact that in the ideal case, a single RREQ packet can find the best route. Also, a number of these packets diffusing in directions away from the destination shall eventually timeout. Hence, in R-AODV, the aim is to minimize on these redundant RREQ packets, or alternatively, drop as much as possible of these redundant RREQ packets. The drop policy is conservative and its value becomes lesser with higher number of hops. As RREQ packets get near the destination node, the chances of survival of RREQ packets is higher. Hence, the first phase of the route discovering process, that is, finding the destination node, is completed as soon as possible and a RREP packet can be transmitted from the destination node back to the source node. In R-AODV, the dropping of redundant RREQ packets reduces

Figure 4.1: Flow vs Delay



a proportion of RREQ packets that shall never reach the destination node, resulting in a decrease of network congestion. Hence, the ratio of the number of packets received by the nodes to the number of packets sent by the nodes, namely, throughput, should be higher in R-AODV compared to AODV. The following algorithm is used in the decision making process of whether to drop the RREQ packets by the intermediary or routing nodes.

$Step\,1: Calculate\, drop_factor\, drop_factor = \frac{1}{Hop_count_of_RREQ_packet + 1}$

$Step\,2:$ Calculate a random value in the range of 0 to 1.

$Step\,3: If\ (random_value > drop_factor)\ then\ broadcast\ or$
$forward\ RREQ_packet\ else\ drop\ RREQ_packet$

Figure 4.2: Flow vs Drop Ratio

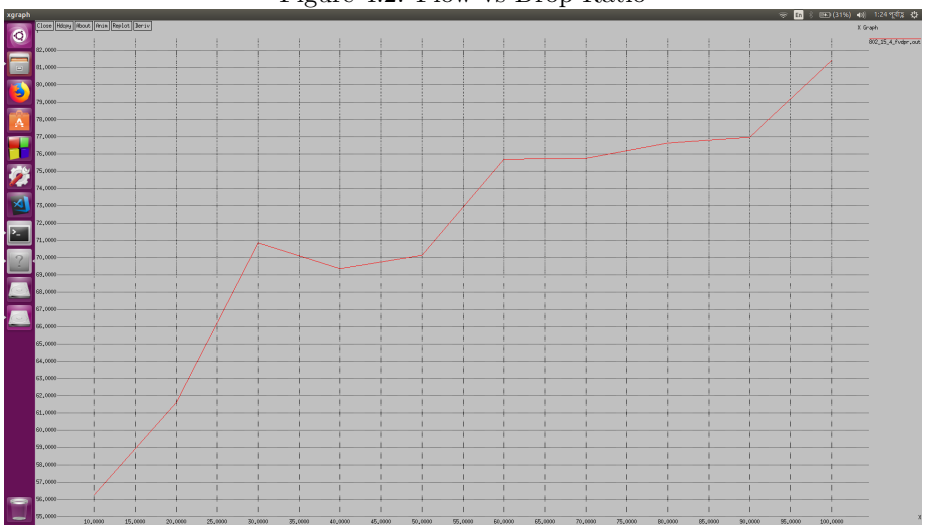


Figure 4.3: Flow vs Delivary Ratio

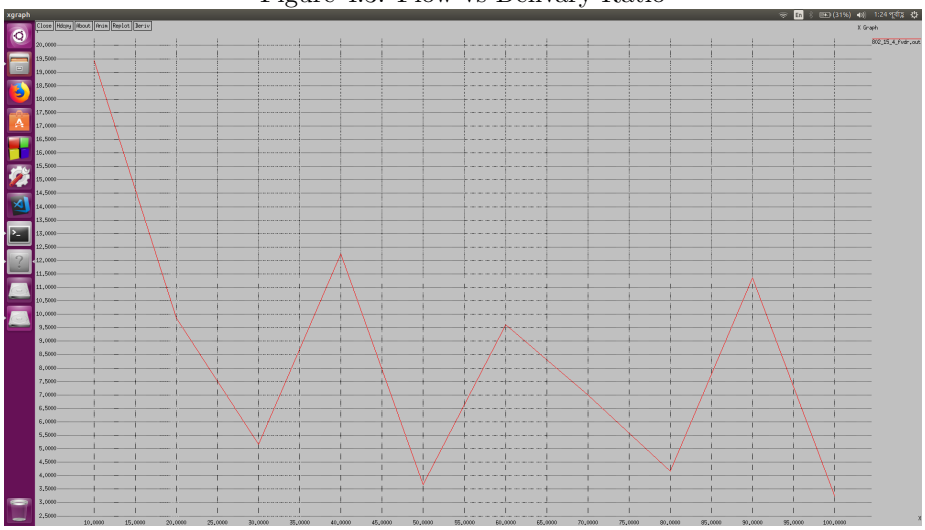


Figure 4.4: Flow vs Energy consumption

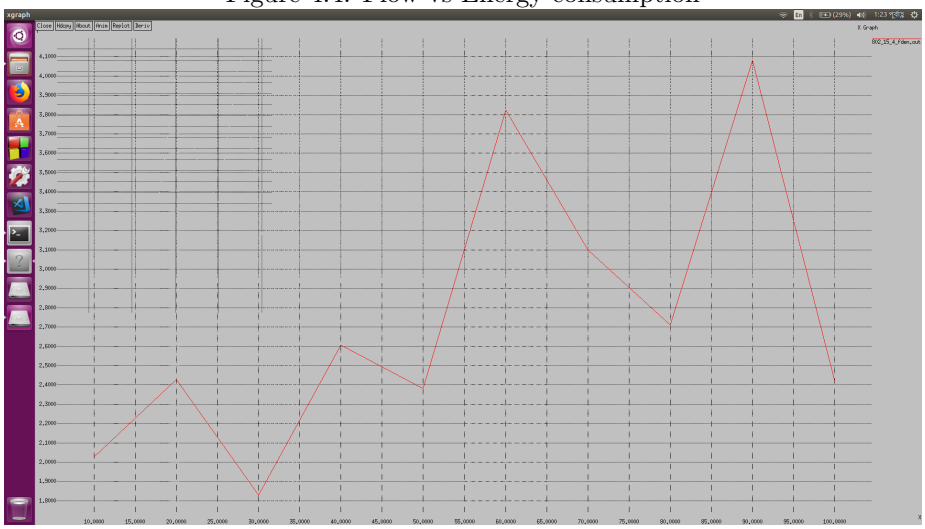


Figure 4.5: Flow vs Throughput

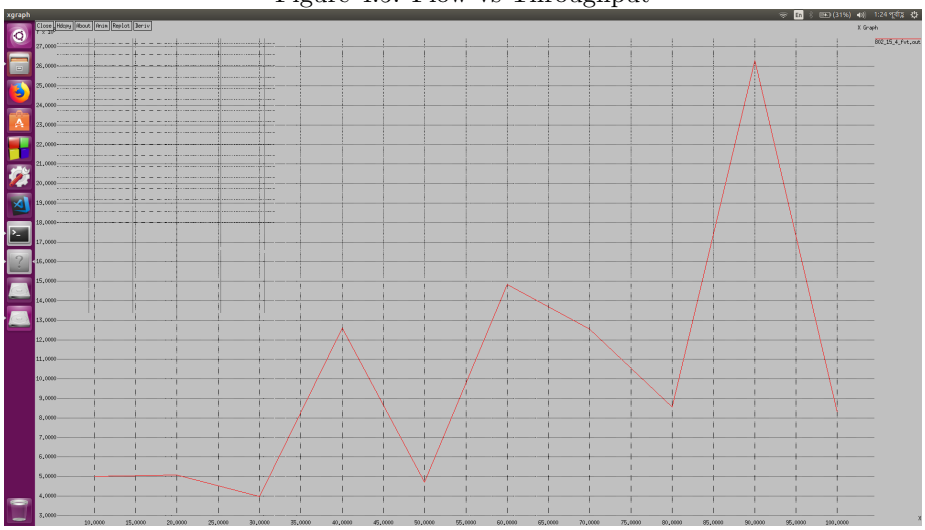


Figure 4.6: Node vs Delay

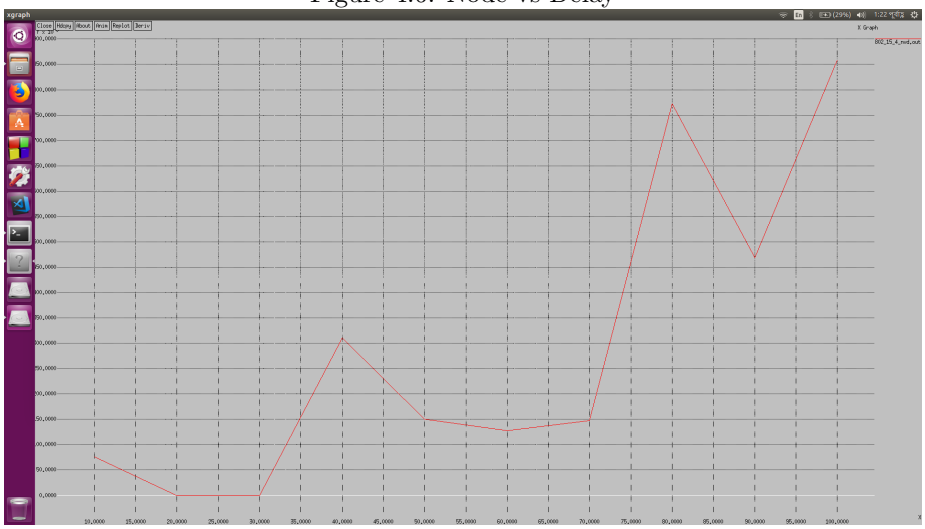


Figure 4.7: Node vs Delivary Ratio

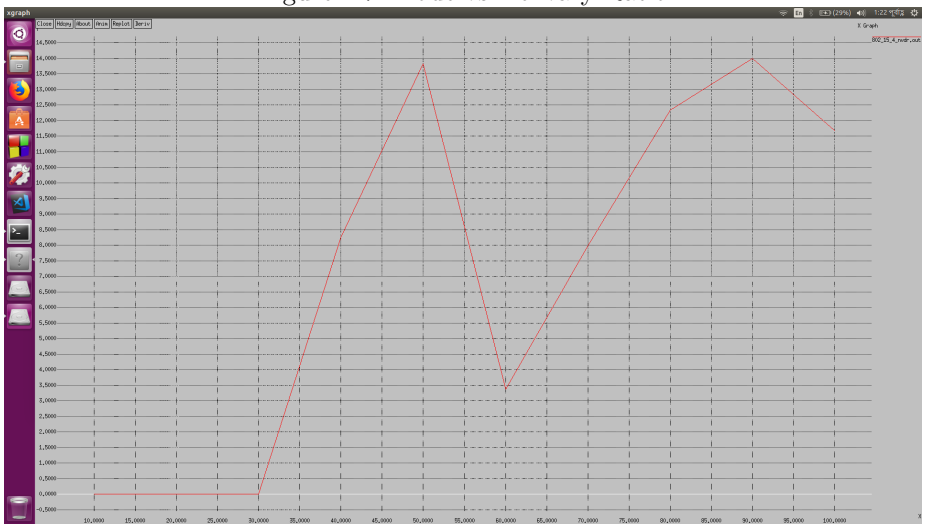


Figure 4.8: Node vs Drop Ratio

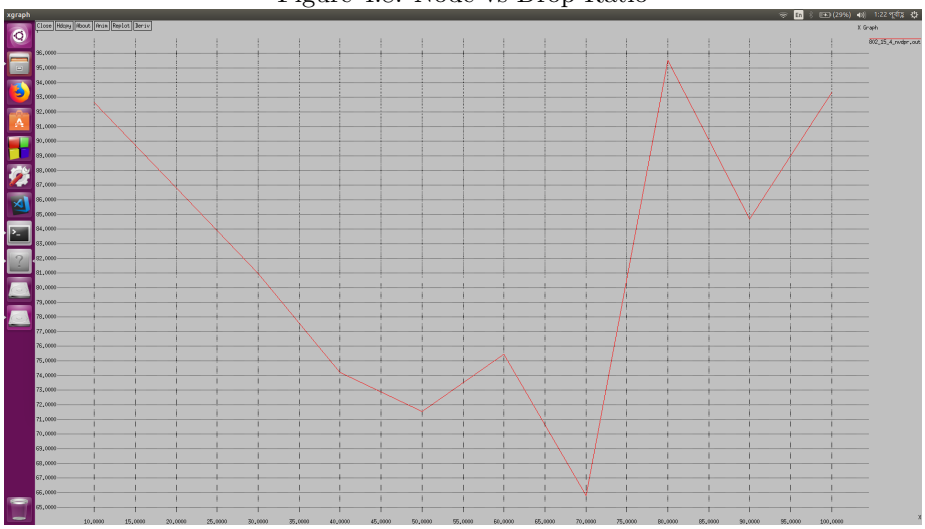


Figure 4.9: Node vs Energy consumption

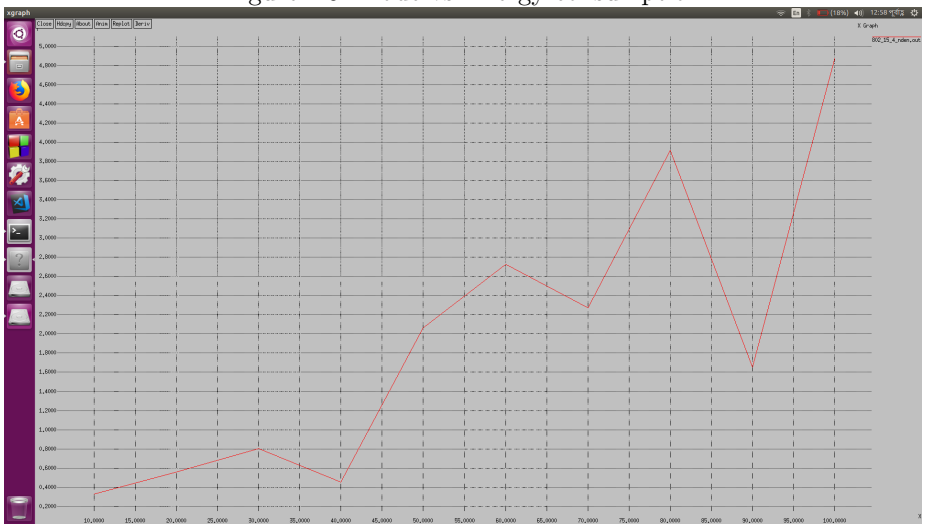


Figure 4.10: Node vs Throughput

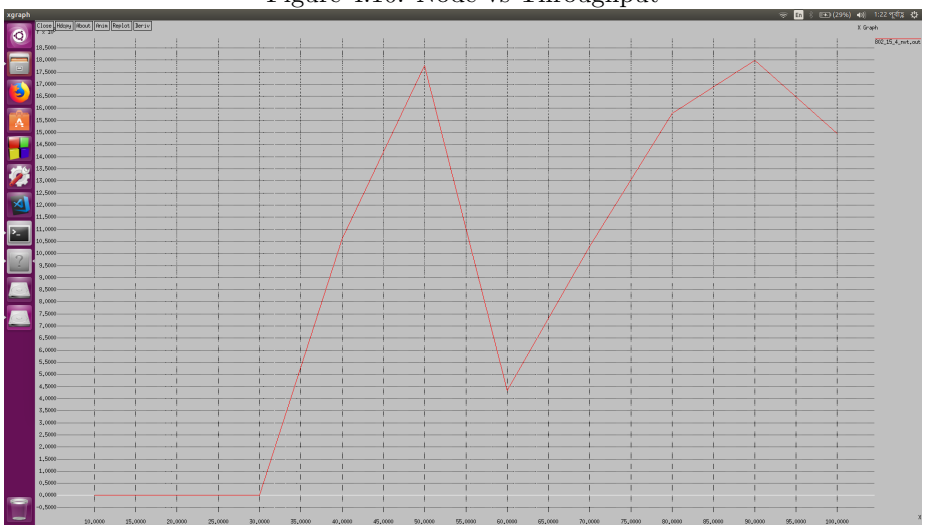


Figure 4.11: Packet vs Delay

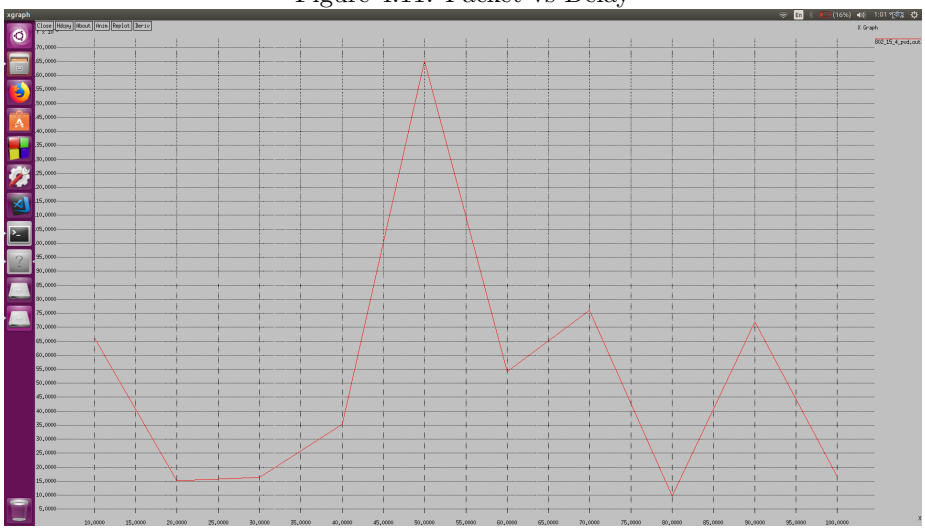


Figure 4.12: Packet vs Delivary Ratio

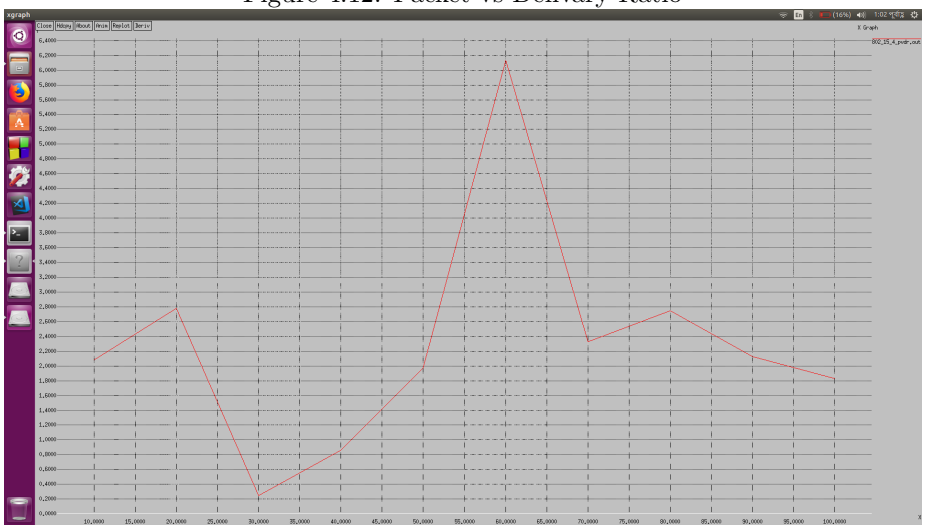


Figure 4.13: Packet vs Drop Ratio

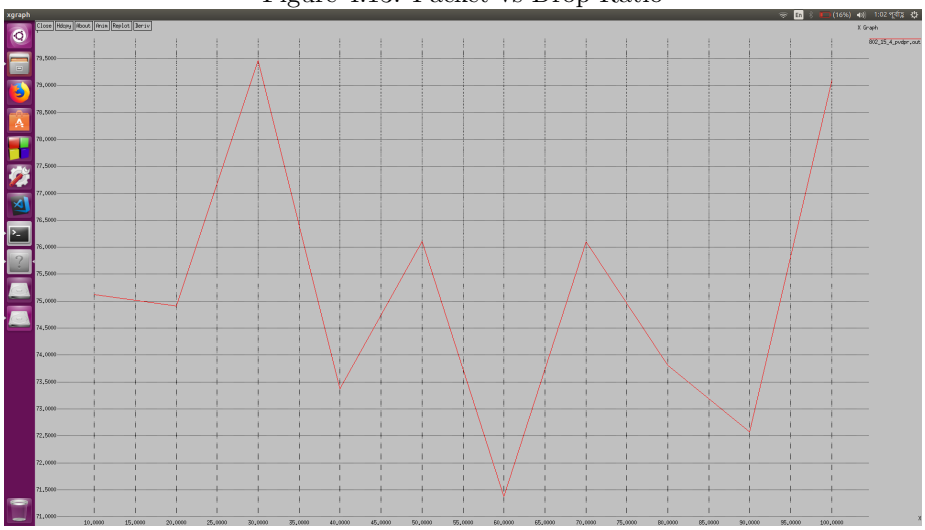


Figure 4.14: Packet vs Energy consumption

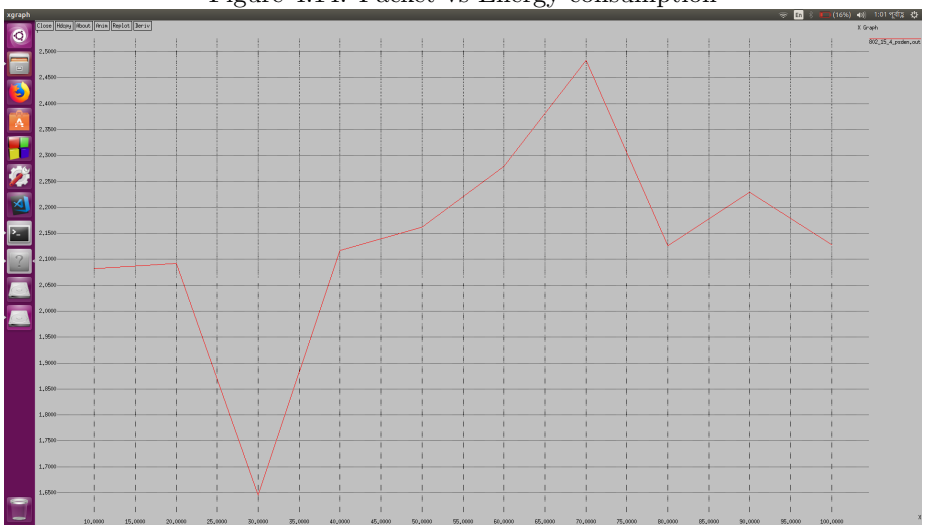


Figure 4.15: Packet vs Throughput

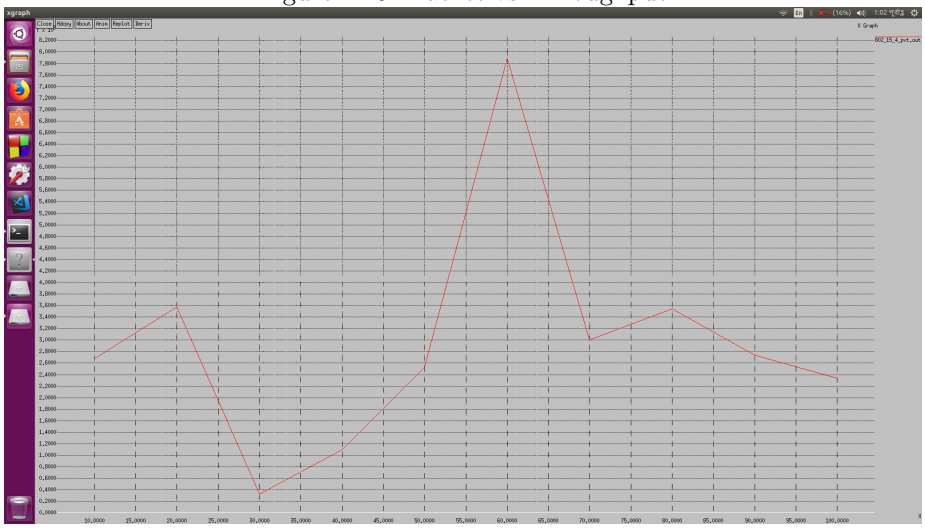


Figure 4.16: Speed vs Delay

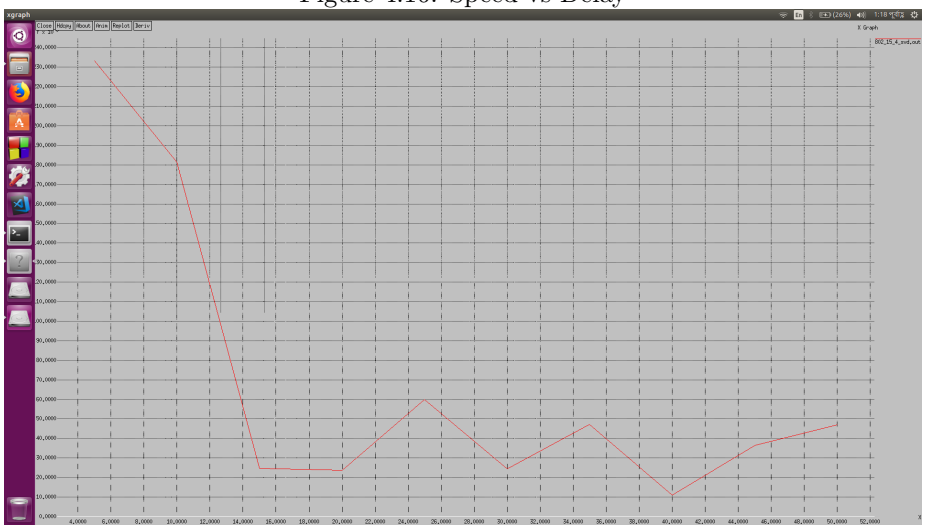


Figure 4.17: Speed vs Delivary Ratio

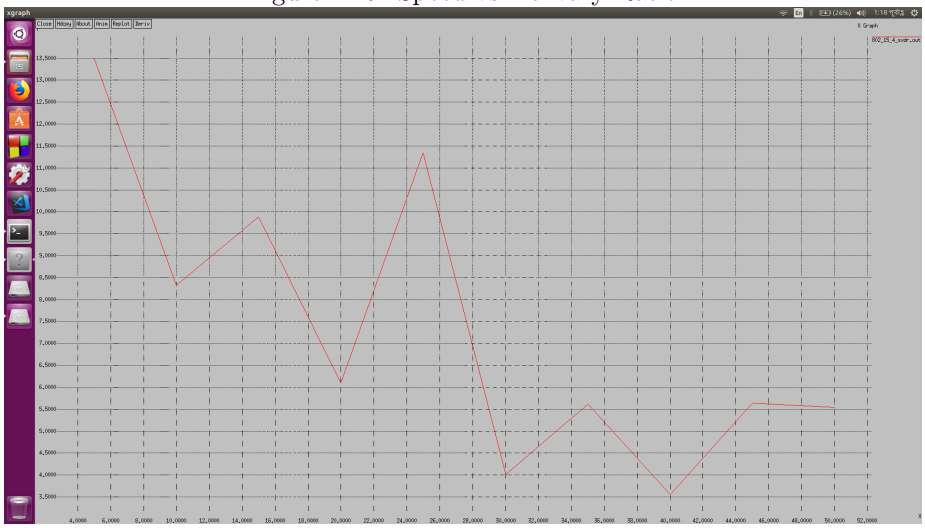


Figure 4.18: Speed vs Drop Ratio

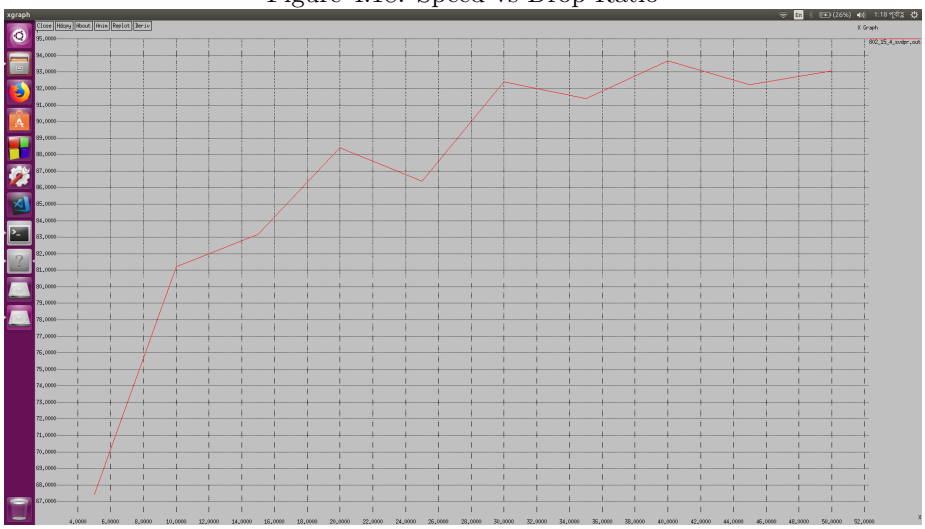


Figure 4.19: Speed vs Energy consumption

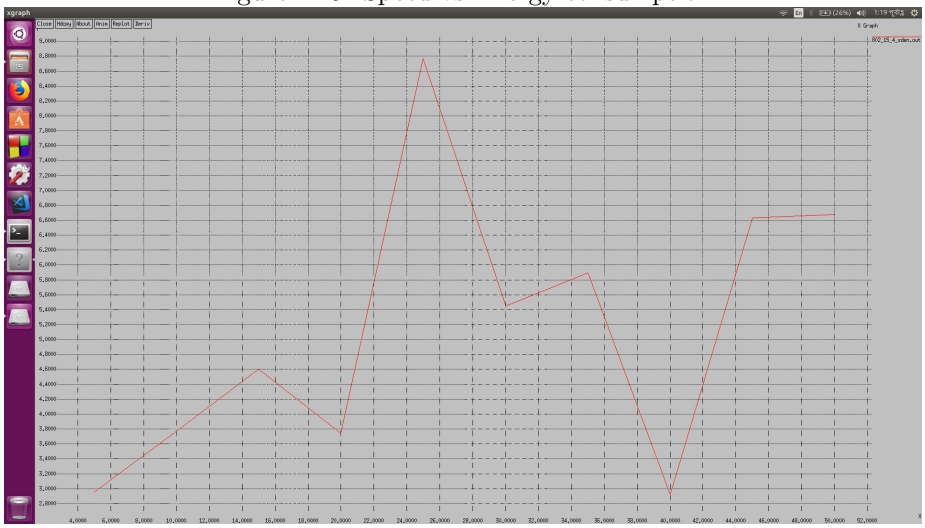
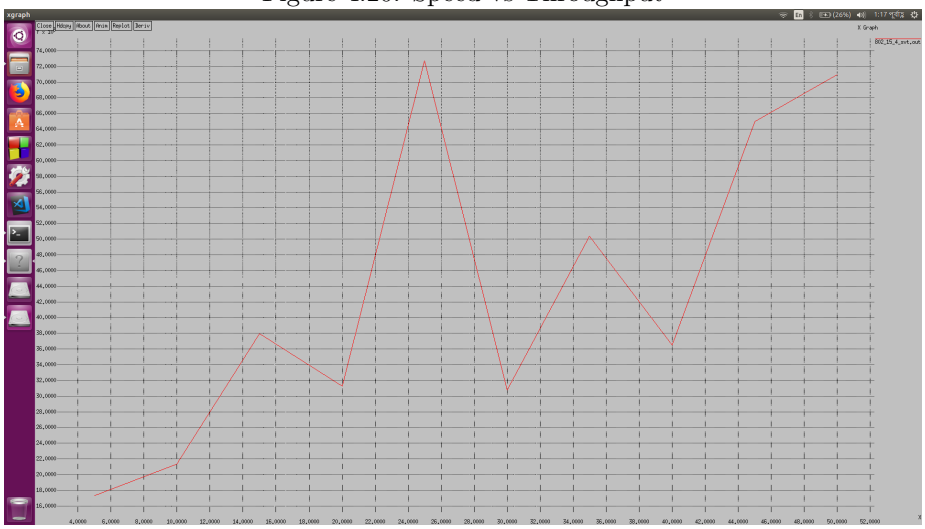


Figure 4.20: Speed vs Throughput



Chapter 5

Summery Findings

- Packet delivery ratio is much higher in 802.11 than 802.15.4
- Energy consumption is very low in 802.15.4
- Throughput increased in modified AODV protocol