Performance comparison of different topologies

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Introduction

- Focus on the reliability comparison of different topologies through a quantitative study
- Compare the data latency and packet loss of following topologies
  - Edge computing topology
  - Cloud computing topology
  - Edge plus cloud computing topology

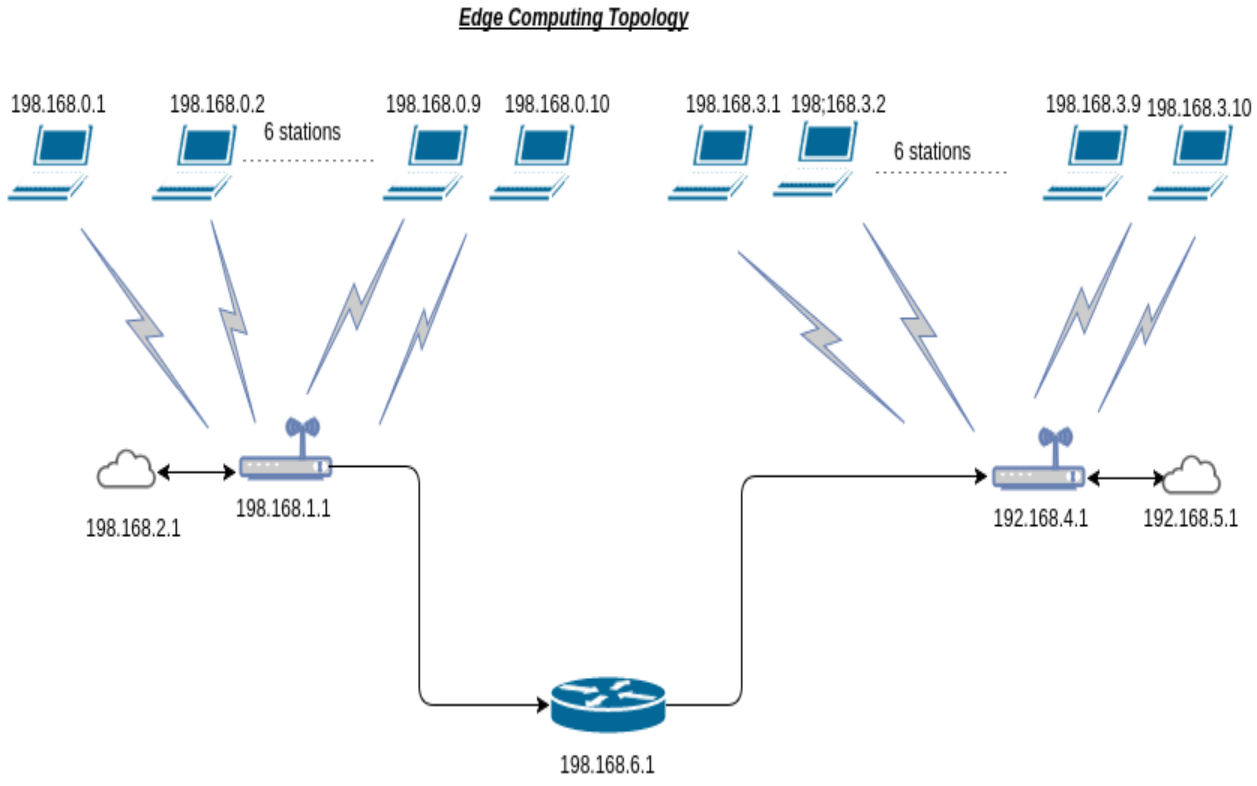
System Specification

- Used following system to test and evaluate the given task
  - Linux System
  - Memory:3.8 GB
  - Processor: Intel CoreTM i5-4210U CPU @ 1.70GHz
  - OS Type : 64-bit
- Software Specification
  - NS3 Network Simulator
  - Wireshark-Packet Analyser
  - Eclipse IDE

Configuration of three topologies

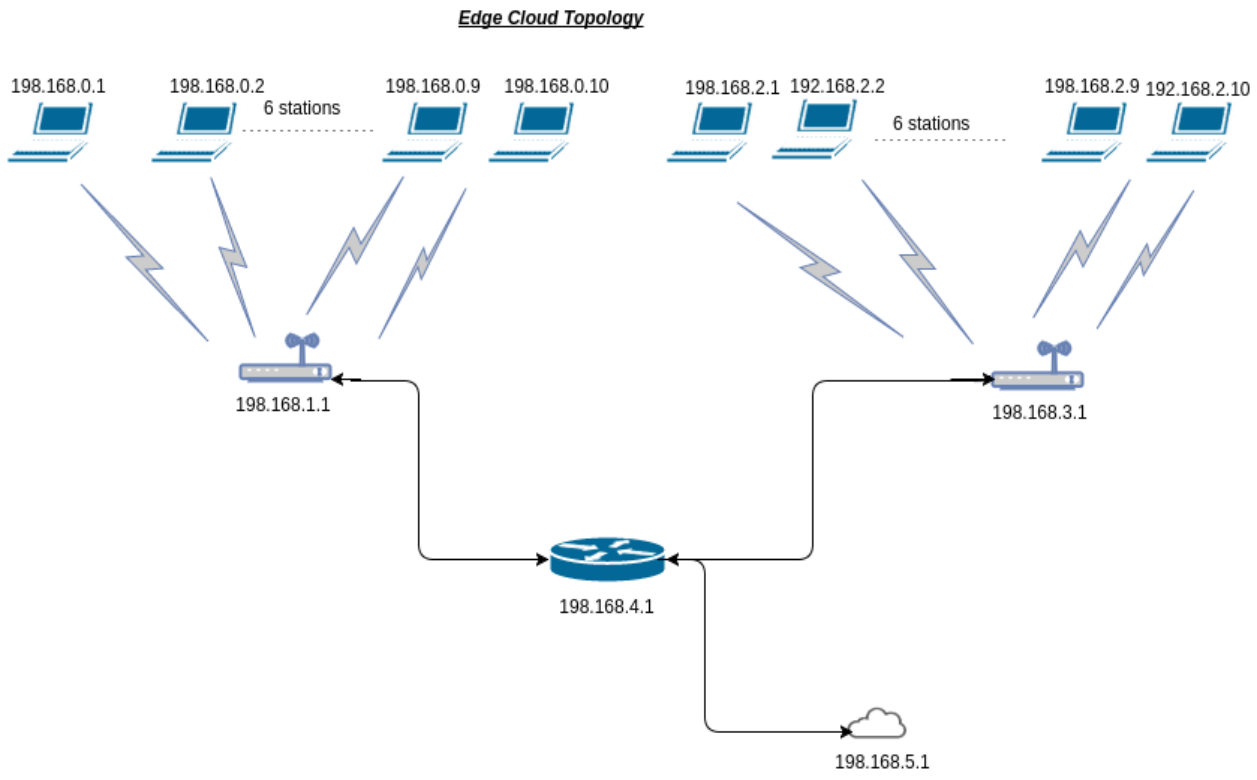
- Used csma channel in between the wifi access points
- Used point to point connection between wifi ap and dedicated servers and wireless connection between wifi station points and wifi ap
- Used UDP Stream
- Csma channel
  - Data Rate:1500Mbps
  - Channel Delay :6560ns
- P2P channel
  - Data Rate:1000Mbps
  - Channel Delay :2500ns
- Wireless channel(802.11ac)
  - Data Rate:1040Mbps

Edge Computing Topology



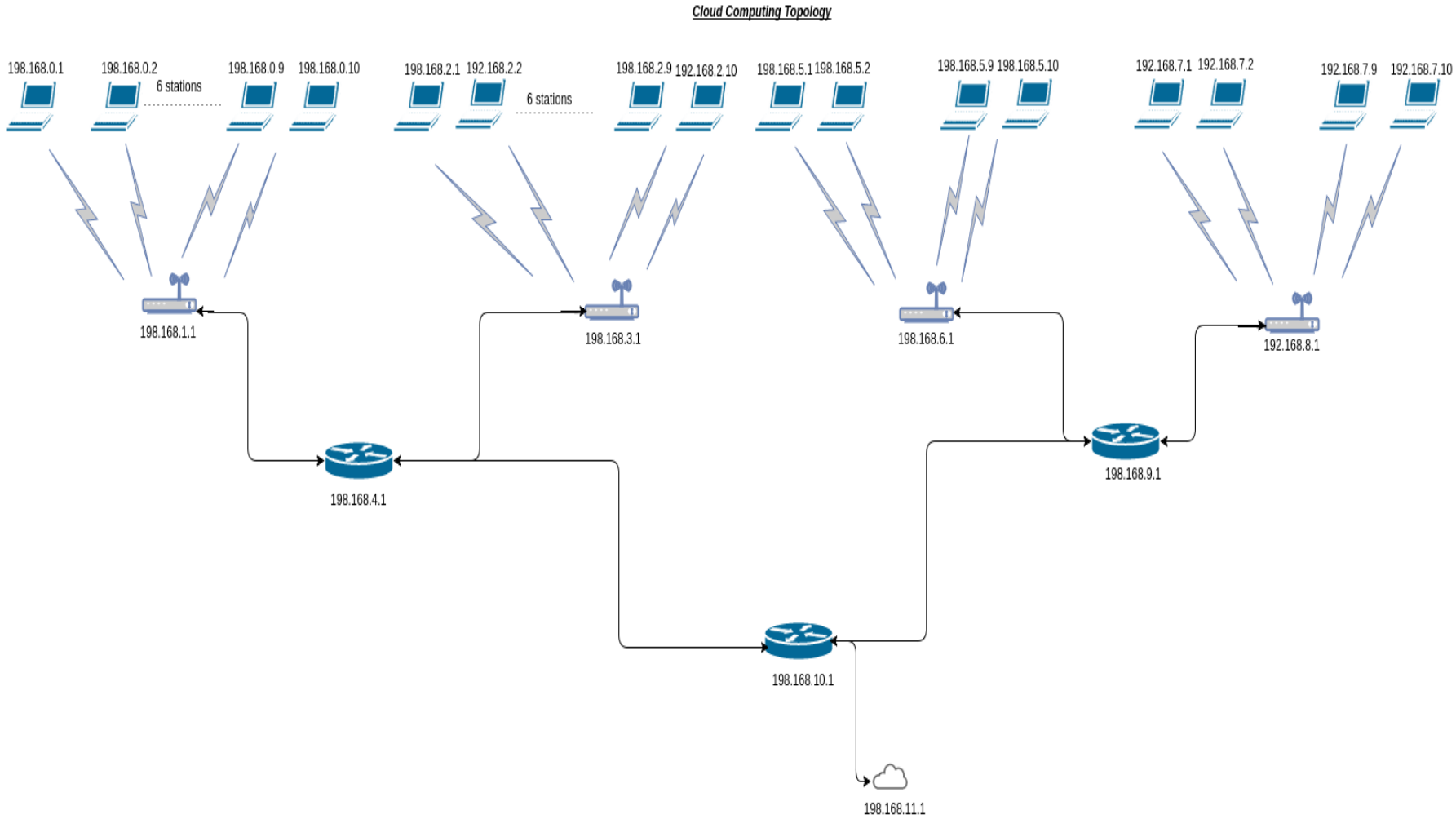
- Stations belong to a wireless network communicate to the corresponding local server attached near to the wireless access

Edge Cloud Topology



- Here stations belong to two different wireless networks share a common cloud

Cloud Computing Topology

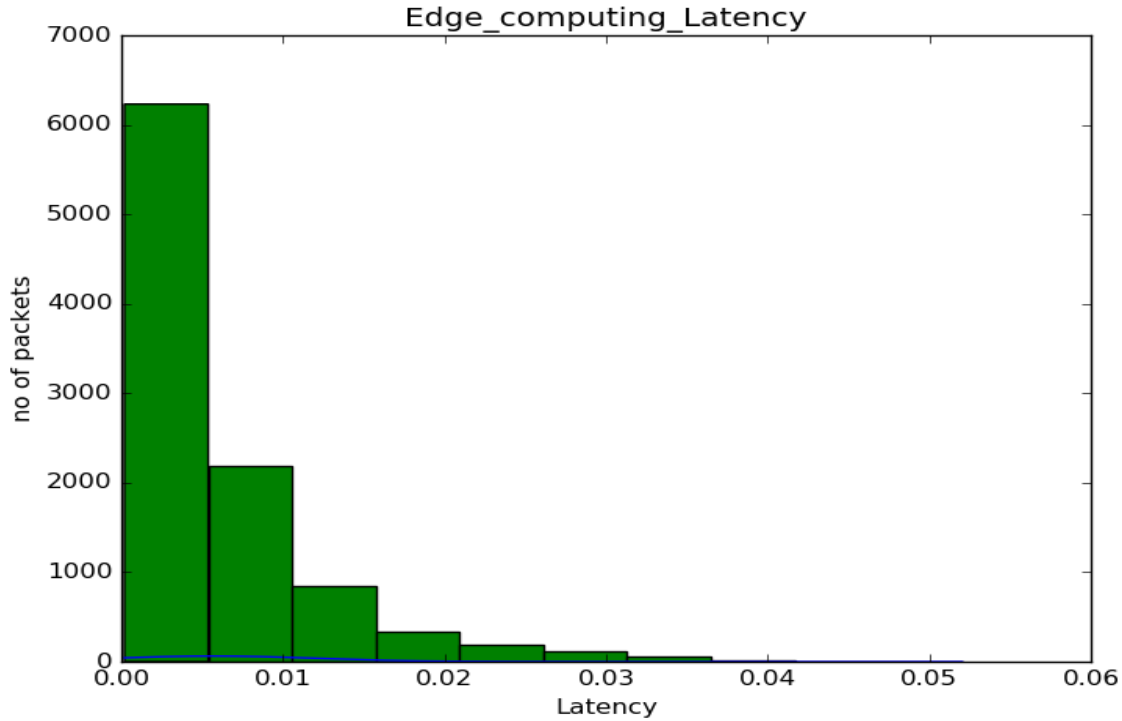


- Here all stations belong to different wireless networks share a common cloud

Experiments and Results

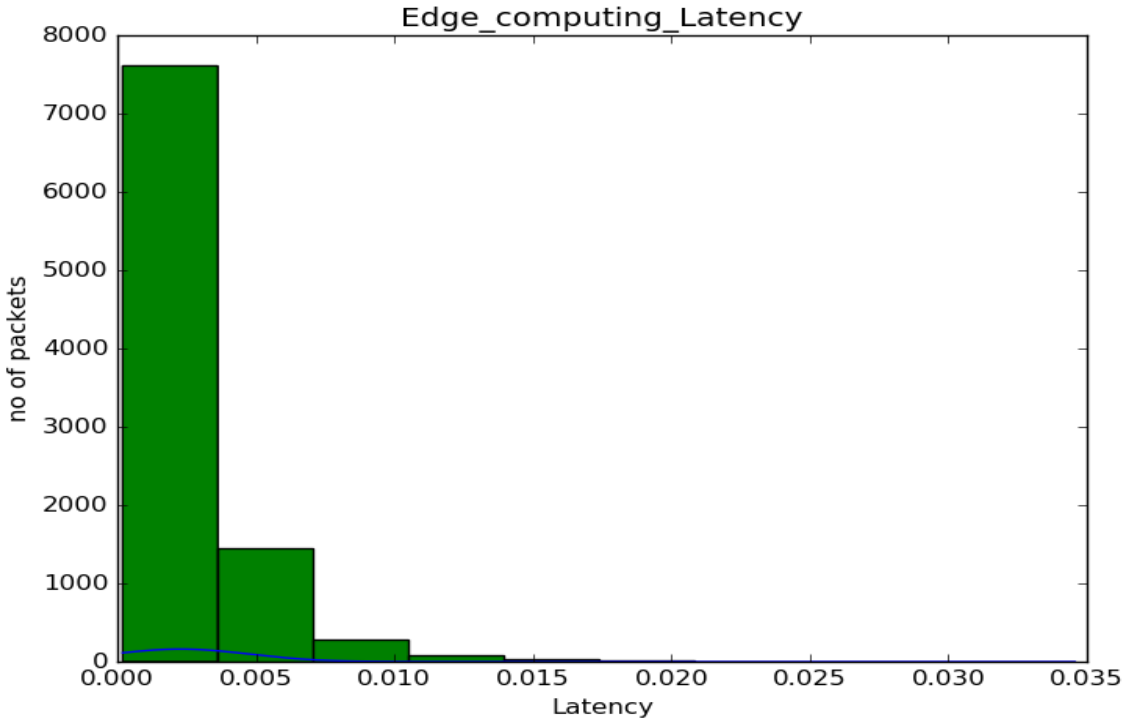
- Sent the UDP stream at the rate of 10 Mbps and 5 Mbps from each station to the corresponding local servers and server sent back the stream at the same data rate to stations
- Measured the latency,throughput
- Latency: Difference between the time at which source send the packet and received the packet

Experiment and Results(Edge Computing)



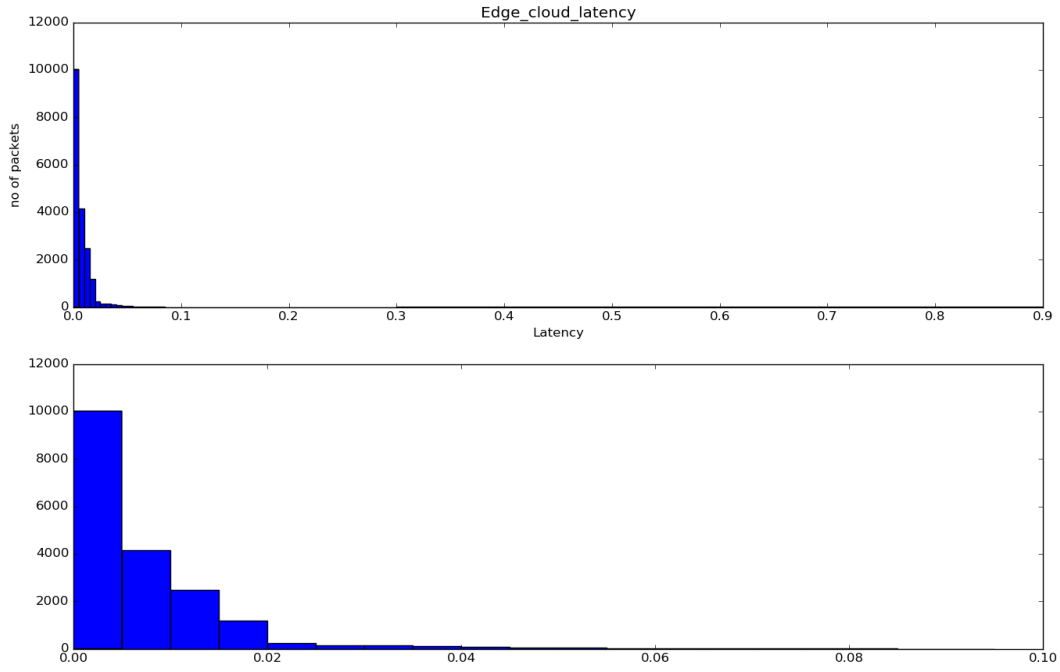
- Data Rate:10 Mbps and Channel Bandwidth:1500 Mbps
- maximum latency experienced is 0.052 04 s
- maximum latency experienced is 0.006 23 s
- minimum latency experienced is 0.000 19 s
- Packet loss:0.81 %

Experiment and Results(Edge Computing)



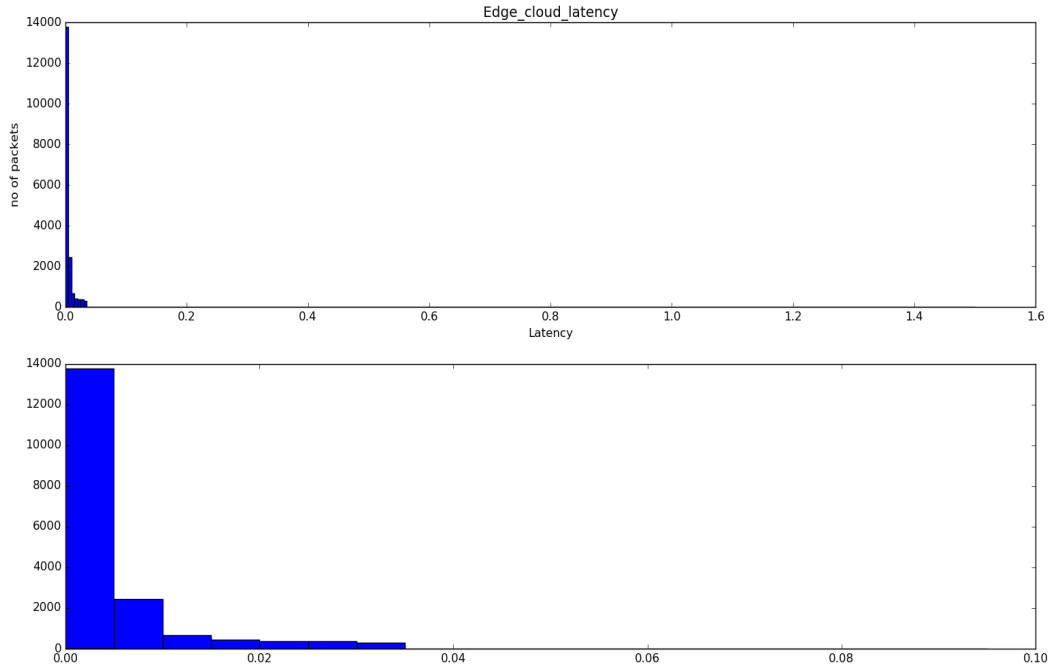
- Data Rate: 5 Mbps and Channel Bandwidth:1500 Mbps
- maximum latency experienced is 0.034 57 s
- maximum latency experienced is 0.002 47 s
- minimum latency experienced is 0.000 19 s
- Packet loss:0.46 %

Experiment and Results(Edge Cloud Computing)



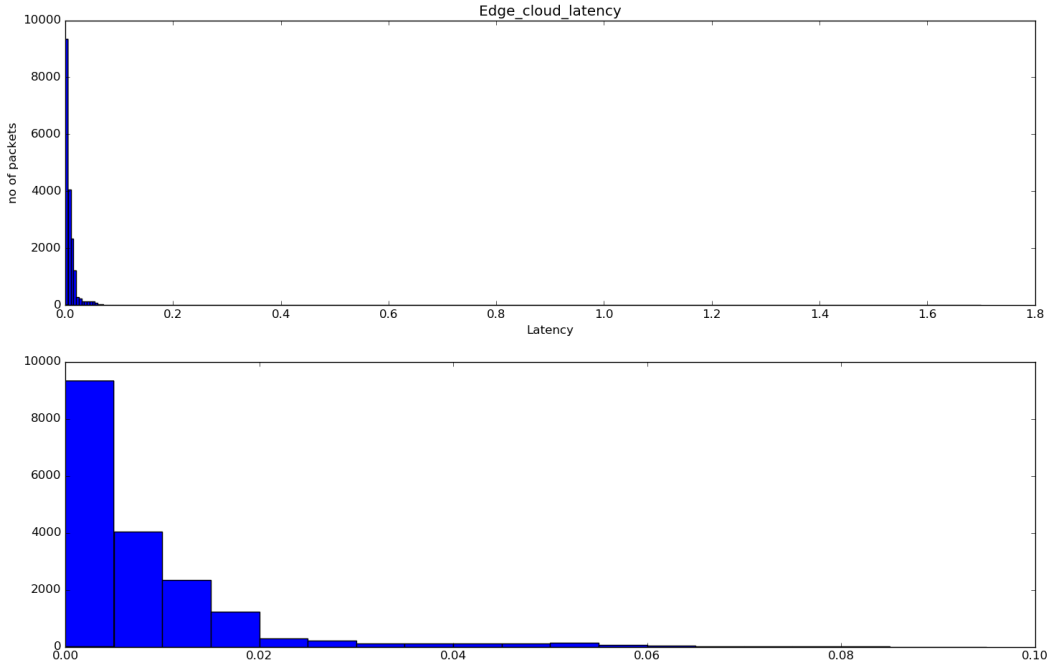
- Data Rate: 10 Mbps and Channel Bandwidth:1500 Mbps
- maximum latency experienced is 0.838 07 s
- maximum latency experienced is 0.007 48 s
- minimum latency experienced is 0.000 31 s
- Packet loss:2.1 %

Experiment and Results(Edge Cloud Computing)



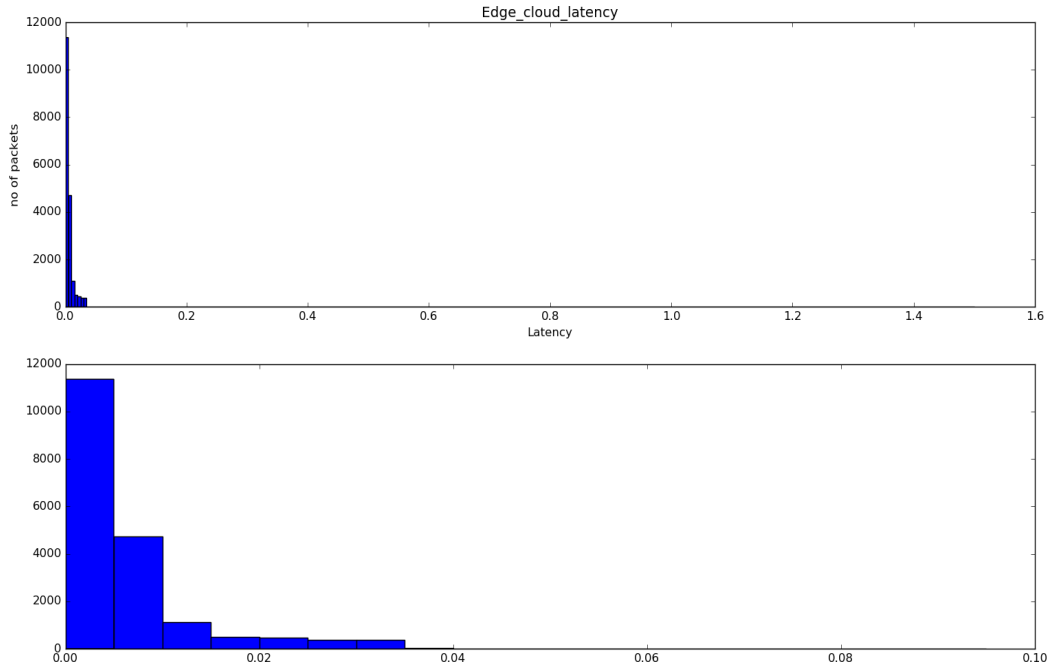
- Data Rate: 5 Mbps and Channel Bandwidth:1500 Mbps
- maximum latency experienced is 1.407 26 s
- maximum latency experienced is 0.005 47 s
- minimum latency experienced is 0.000 31 s
- Packet loss:0.72 %

Experiment and Results(Edge Cloud Computing)



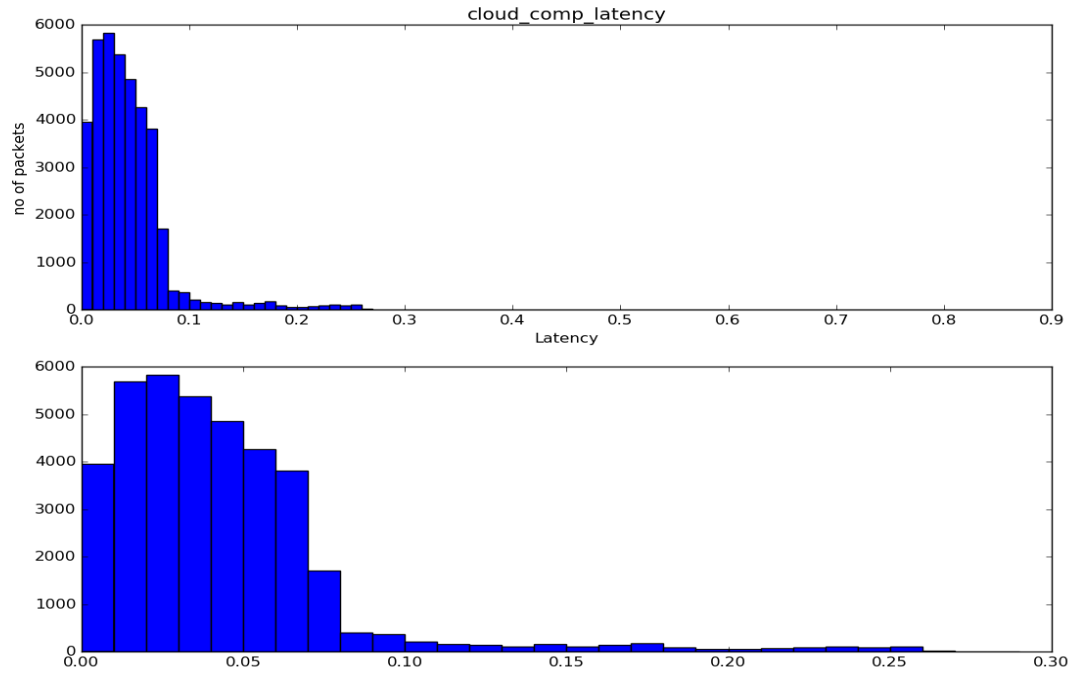
- Data Rate: 10 Mbps and Channel Bandwidth:350 Mbps
- maximum latency experienced is 1.608 21 s
- maximum latency experienced is 0.009 07 s
- minimum latency experienced is 0.000 36 s
- Packet loss:3.16 %

Experiment and Results(Edge Cloud Computing)



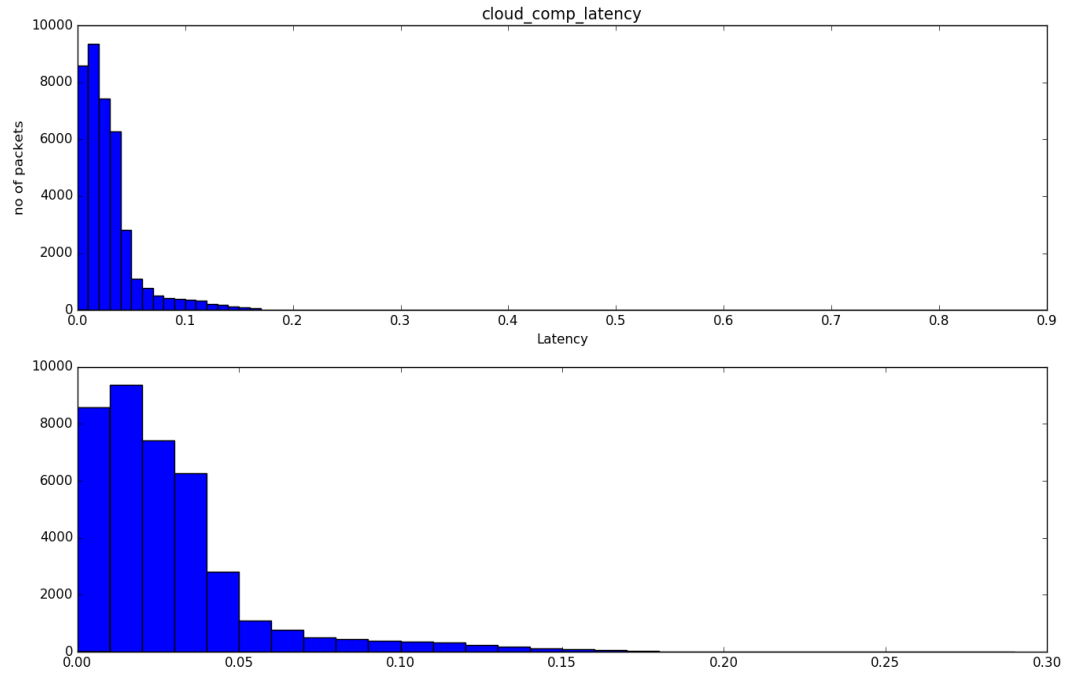
- Data Rate: 5 Mbps and Channel Bandwidth:350 Mbps
- maximum latency experienced is 1.4090 s
- maximum latency experienced is 0.007 28 s
- minimum latency experienced is 0.000 21 s
- Packet loss:0.89 %

Experiment and Results(Cloud Computing)



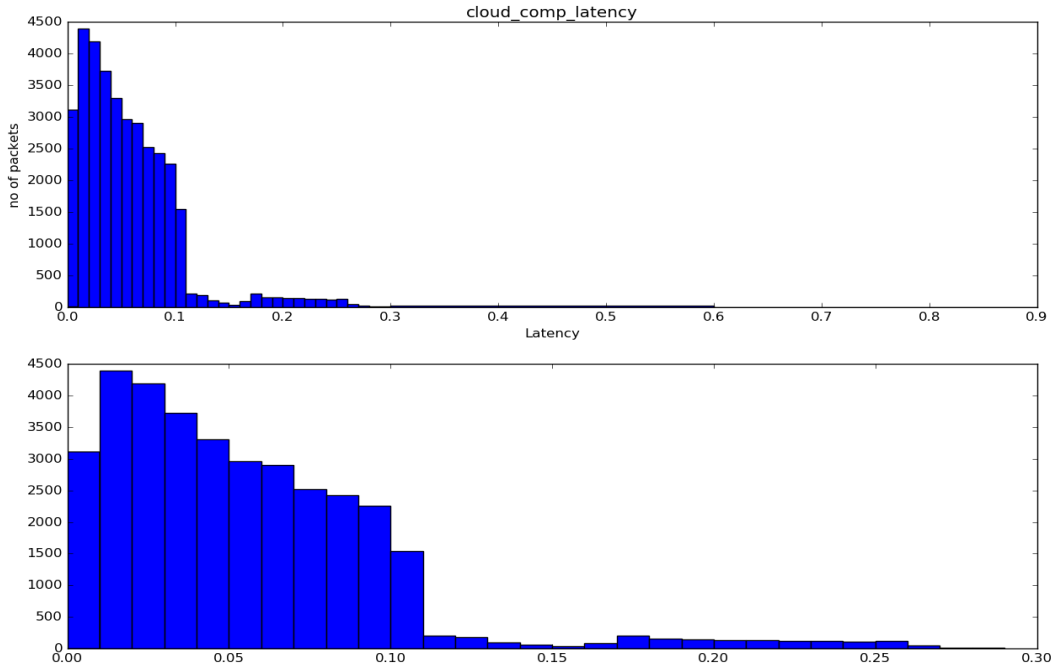
- Data Rate: 10 Mbps and Channel Bandwidth:1500 Mbps
- maximum latency experienced is 1.843 14 s
- maximum latency experienced is 0.042 88 s
- minimum latency experienced is 0.000 54 s
- Packet loss:2.36 %

Experiment and Results(Cloud Computing)



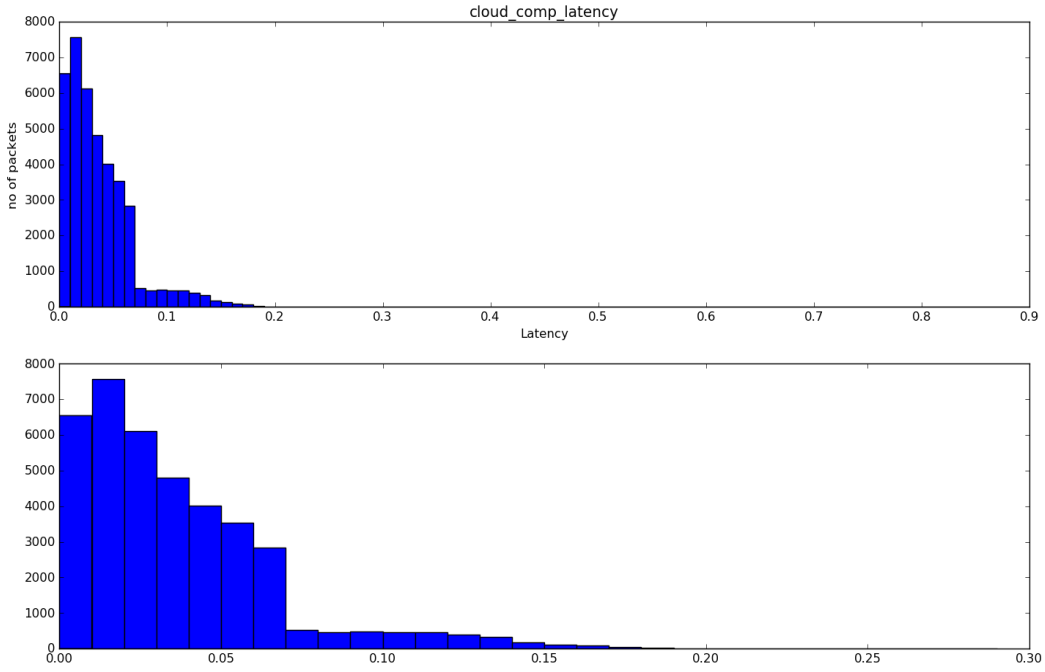
- Data Rate: 5 Mbps and Channel Bandwidth:1500 Mbps
- maximum latency experienced is 1.000 15 s
- maximum latency experienced is 0.025 33 s
- minimum latency experienced is 0.000 61 s
- Packet loss:1.37 %

Experiment and Results(Cloud Computing)



- Data Rate: 10 Mbps and Channel Bandwidth:750 Mbps
- maximum latency experienced is 2.002 59 s
- maximum latency experienced is 0.061 851 s
- minimum latency experienced is 0.001 s
- Packet loss:3.94 %

Experiment and Results(Cloud Computing)



- Data Rate: 5 Mbps and Channel Bandwidth:750 Mbps
- maximum latency experienced is 1.009 06 s
- maximum latency experienced is 0.034 19 s
- minimum latency experienced is 0.000 49 s
- Packet loss:1.502 %

Conclusion

- As expected,edge computing topology showed better results because of the dedicated servers for each wireless network
- Most of the stations in the cloud computing topology experienced high latency and packet loss