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,throughput and packet loss of following topolgies
    - ▶ Edge computing topology
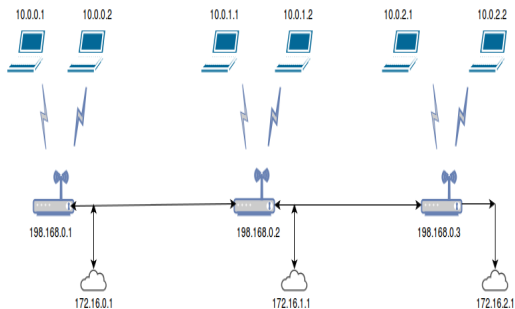   - ▶ Cloud computing topology
    - ▶ Edge plus cloud computing topology

System Specification

- Used following system to test and evaluate the given task
  - Linux System
  - Memory:15.5 G B
  - Processor: Intel CoreTM i3-6100 CPU @ 3.70GHz $\times$ 4
  - OS Type :64 bit
- Software Specification
  - NS3 Network Simulator
  - Wireshark-Packet Analyser
  - Eclipse IDE

Configuration of three topologies

- ▶ Used csma channel in between the WI-FI access points(Network address:192.168.0.x)
- ▶ Used point to point connection between WI-FI AP and dedicated servers(Network address:172.16.x.x) and wireless connection between wifi station points and wifi ap(Network address:10.0.x.x)
- ▶ Used UDP stream
- ▶ Csma channel
  - ▶ Data Rate:1000 Mbps
  - ▶ Channel Delay:65 600 ns
- ▶ P2P channel
  - ▶ Data Rate:1000 Mbps
  - ▶ Channel Delay:25 000 ns
- ▶ Wireless channel(802.11ac)
  - ▶ Data Rate:1040 Mbps
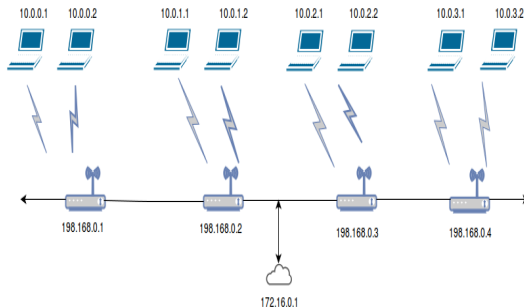
Edge Computing Topology

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

Edge Cloud Topology
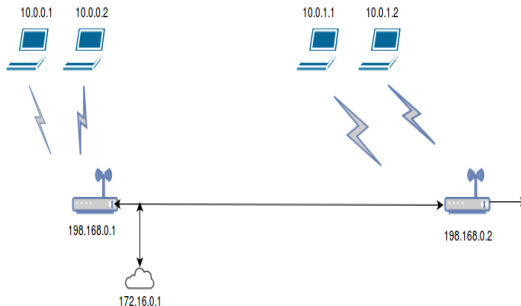
- ▶ Here stations belong to two different wireless networks share a common cloud

Cloud Computing Topology

- ▶ Here all stations belong to different wireless networks share a common cloud
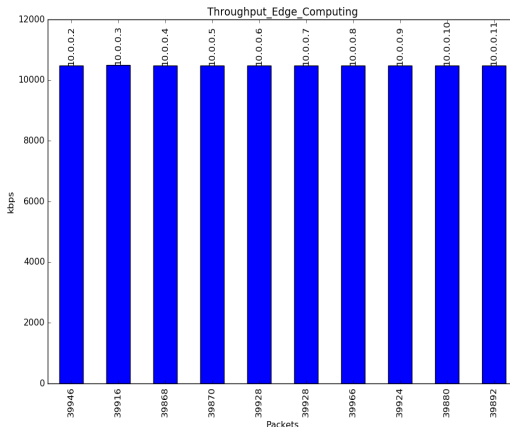
Experiment and Results

- Sent the UDP stream at the rate of 10 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
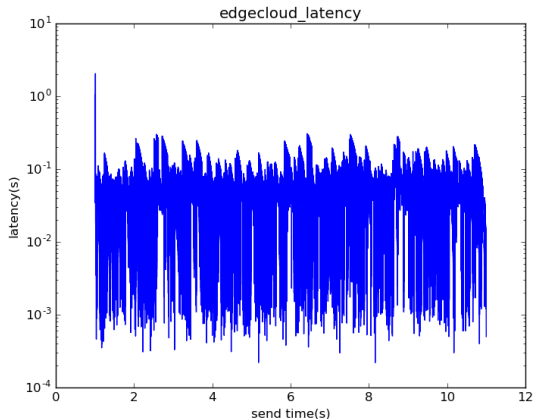- Time duration:10 s

Experiment and Results(Edge Computing)
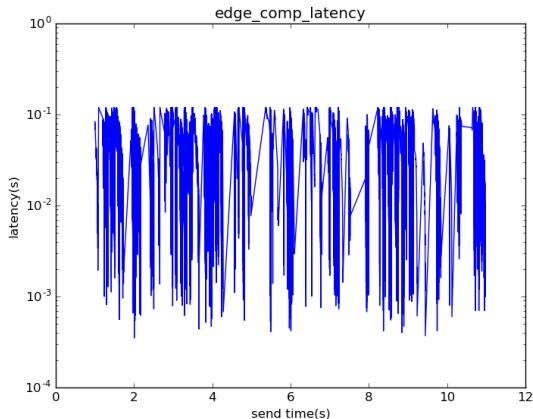
- maximum latency experienced is 0.1182 s
- minimum latency experienced is 0.000 26 s
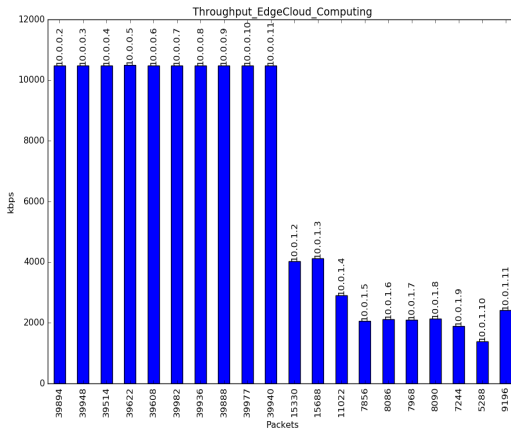
Experiment and Results(Edge Computing)

- maximum throughput achieved is 10.59 Mbps
- minimum throughput achieved is 10.47 Mbps
- Average throughput achieved is 10.48 Mbps
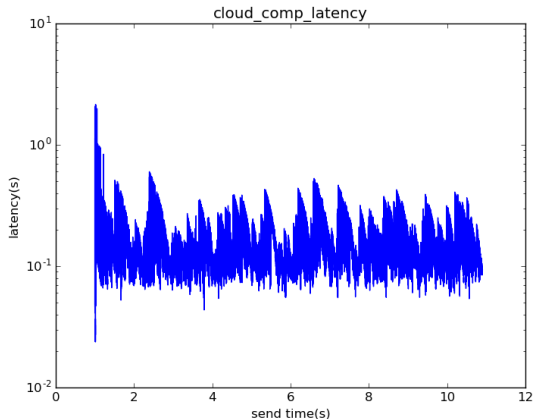
Experiment and Results(Edge Cloud)

- maximum latency experienced is 1.854 s
- minimum latency experienced is 0.000 43 s
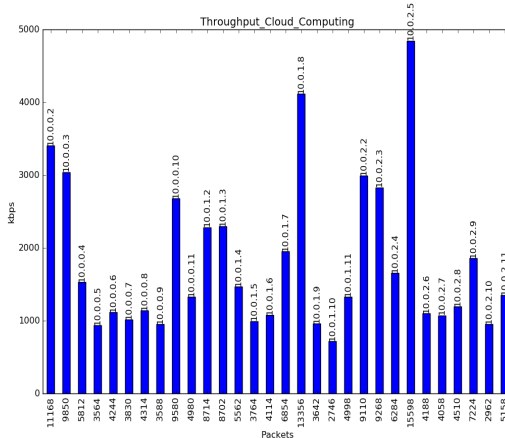
Experiment and Results(Edge Cloud)

- maximum throughput achieved is 10.50 Mbps
- minimum throughput achieved is 1.78 Mbps
- Average throughput achieved is 6.51 Mbps

Experiment and Results(Cloud Computing)

- maximum latency experienced is 2.145 s
- minimum latency experienced is 0.0237 s

Experiment and Results(Cloud Computing)

Throughput_Cloud_Computing

- maximum throughput achieved is 4.87 Mbps
- minimum throughput achieved is 0.721 Mbps
- Average throughput achieved is 1.80 Mbps

Experiment and Results

Table 1:   Comparison of different attributes

Parameters	Edge computing	Edge Cloud	Cloud Computing
Max Packets sent & received	39966	39982	15598
Min Packets sent & received	39868	9973	2746
Avg Packets sent & received	39911	28703	6391
Max Throughput(Mbps)	10.59	10.50	4.87
Minimum Throughput(Mbps)	10.47	1.78	0.721
Average Throughput(Mbps)	10.48	6.51	1.80

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, less throughput