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 delta time of following topolgies
  - Edge computing topology
  - Cloud computing topology
  - Edge plus cloud computing topology

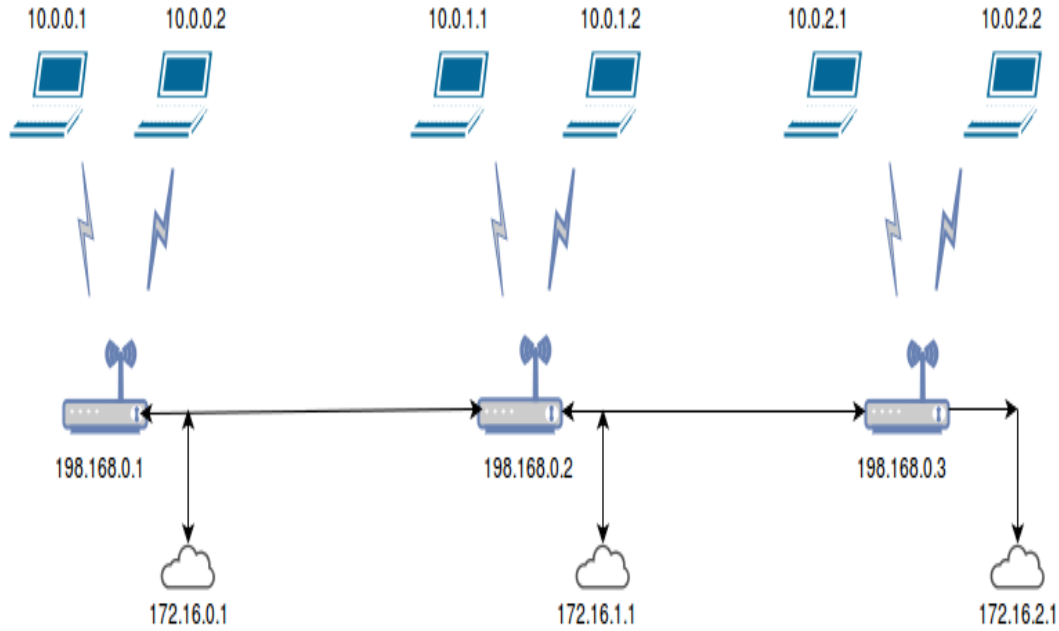
System Specification

- Used following system to test and evaluate the given task
  - Linux System
  - Memory: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(Network address:192.168.0.x)
- Used point to point connection between wifi 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 of 3.584Mb file(number of packets:3500) and echo the stream between the stations and servers
- Csma channel
  - Data Rate:10Mbps
  - Channel Delay :5ms
- P2P channel
  - Data Rate:5Mbps
  - Channel Delay :5ms

Edge Computing Topology

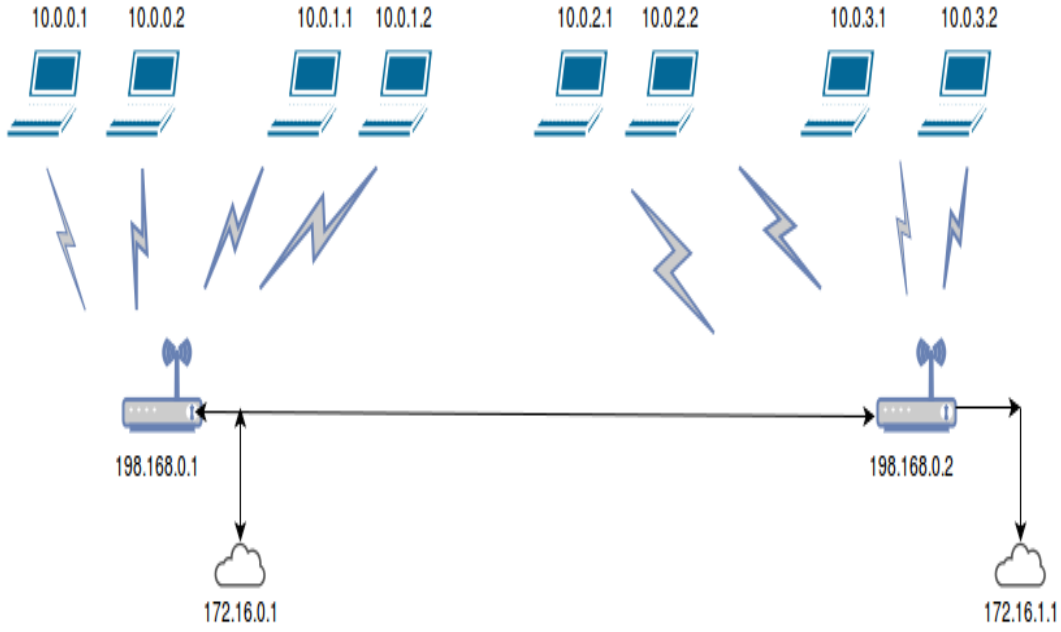


- Implemented 3 wireless networks(each contains 6 stations) and 3 local servers.
- Sent the udp stream from each station to the corresponding local servers and measured the round trip time,delta time and maximum packets it sent
- Round trip time: Time taken between the source and destination to complete its communication

Edge Computing Topology

- Maximum round trip time taken by node with ip address(10.0.0.7) is 35.243sec
- Round trip time taken by nodes ranges from 34.97sec(ip address:10.0.0.5) to 35.293(ip address:10.0.2.6)
- Delta time: time difference between the previous and current frames
- Maximum delta time is .0532sec
- Total Packets(Packets A $\rightarrow$ B and Packets B $\rightarrow$ A) sent and received ranges from 5698(2849 in one direction) to 7000(3500 in one direction)
- Throughput ranges from 570k bps to 843k bps
- Average Throughput is 776k

Edge Cloud Topology

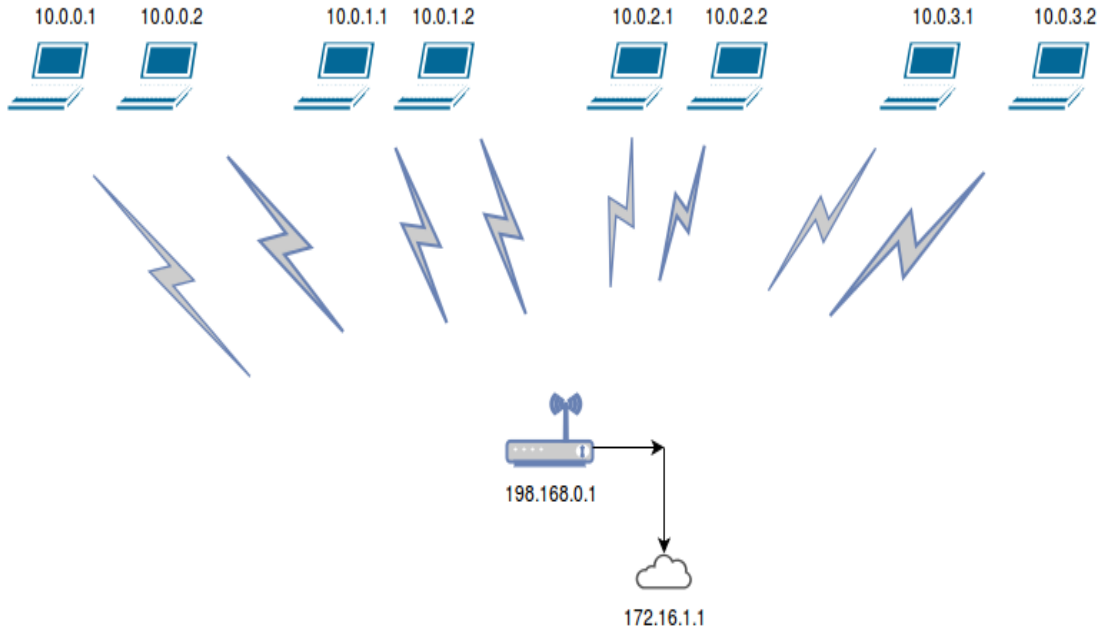


- Here stations belong to two different wireless networks share a common cloud
- Implemented six wireless networks(each contains 4 stations) and 3 local servers.
- Maximum round trip time taken by node with ip address(10.0.0.7) is 38.137sec

Edge Cloud Topology

- Round trip time taken by nodes ranges from 34.99sec(ip address:10.0.0.1) to 38.137(ip address:10.0.3.5)
- Maximum delta time is .1032sec
- Total Packets(Packets A $\rightarrow$ B and Packets B $\rightarrow$ A) sent and received ranges from 632(316 in one direction) to 7000(3500 in one direction)
- Throughput ranges from 70k bps to 843k bps
- Average Throughput is 454k

Cloud Computing Topology



- Here all stations share a common cloud
- Implemented 3 wireless networks(each contains 6 stations) and a main server.
- Maximum round trip time taken by node with ip address(10.0.0.4) is 40.311sec

Cloud Computing Topology

- Round trip time taken by nodes ranges from 38.06sec(ip address:10.0.2.7) to 40.311(ip address:10.0.0.4)
- Maximum delta time is .832sec
- Total Packets(Packets A $\rightarrow$ B and Packets B $\rightarrow$ A) sent and received ranges from 698(349 in one direction) to 6276(3138 in one direction)
- Throughput ranges from 79k bps to 758k bps
- Average Throughput is 283k

Conclusion

- As expected,edge computing topology showed better throughput,less round trip time and delta time
- Cloud computing could not perform well since the limitations of the channel bandwidth and high number of stations