



Throughput Analysis of Highly Dense Terahertz Communication Network

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Background

- While the deployment of 5G is being done, people are also searching for Beyond 5G (B5G) system for enhanced network performance.
- Moving the operations into Terahertz domain (0.1 THz to 10 THz) can meet up the growing needs for bandwidth in future.
- But coverage area of THz network base station is very small.
- What will be the throughput if this coverage area becomes highly dense?

Motivation and Problem Formulation

- Node density is a major factor of throughput but the coverage area also plays a vital role.
- Highly densed network can be used in vehicle monitoring,online gaming etc.

We used Terasim [1], an ns-3 extension for simulating.

- To the best of our knowledge, no work has been done to analyze the output results found from Terasim.
- We have experimented on macro scale scenario which is based on centralized network architecture
- In our experiment, one server node was considered, which covered a circular area.
- We calculated the average throughput of each client node and then used them to calculate the average throughput of the whole network.
- We continued this for different number of nodes and different radius of the circular area. But we tried keep the node density same for all cases to analyse the result easily.
- Using the results, we plotted a graph to observe the changes.

Proposed Methodology

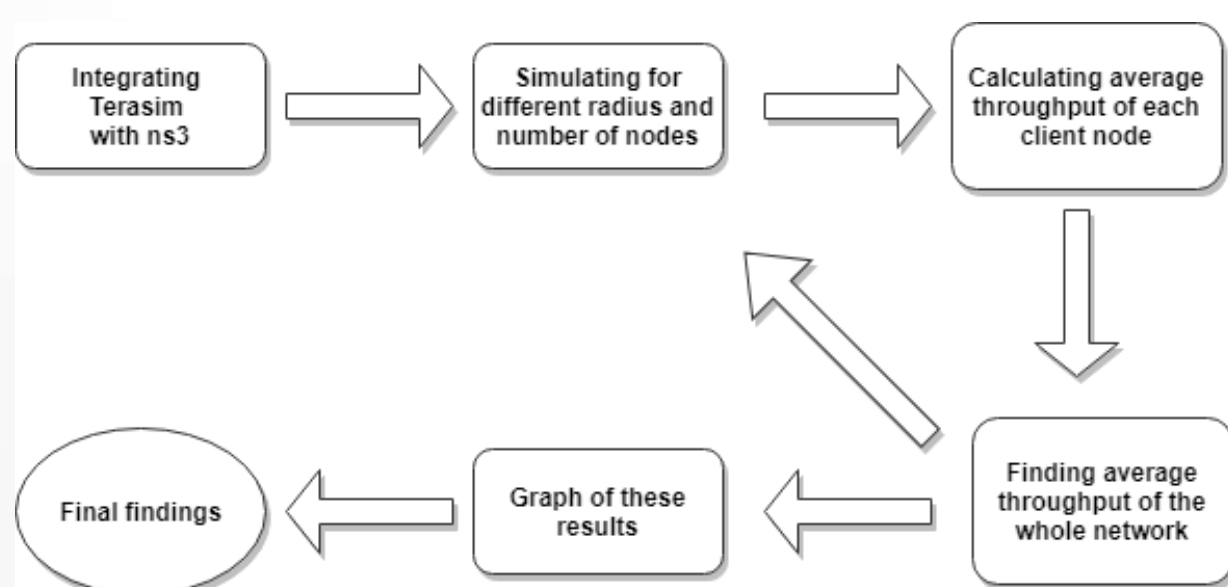


Figure 1: Proposed methodology of our work

Experimentation and/or Theoretical Proof

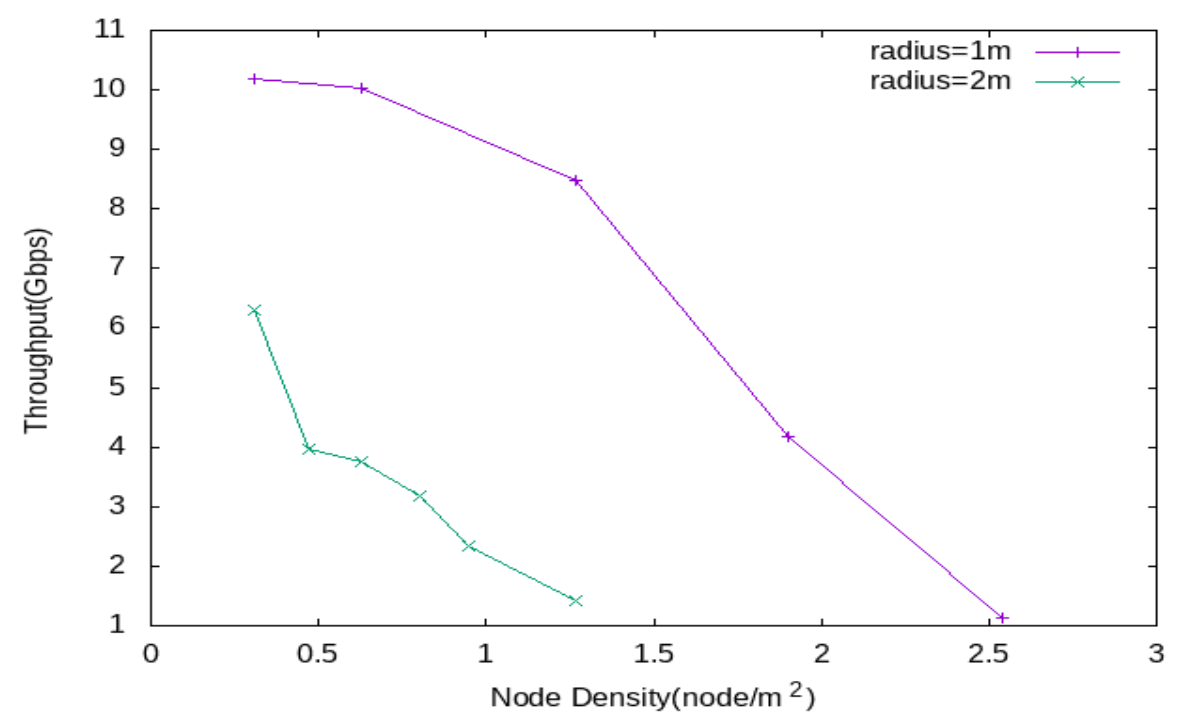


Figure 2: Network throughput for different node density in terahertz communication

Findings

- The graph is plotted for two different coverage area, 1m and 2m.
- We can observe that for the same node density there are significant difference in the throughput of the network. The throughput of the coverage area of 1m is much higher than than of the coverage area of 2m. This indicates that if the coverage area decreases, the network throughput increase even if they have the same node density.
- Another observstion is the drastic decrease of network throughput of 2m coverage area. But this decrease is much steadier for the 1m coverage area.

Conclusion and Future Work

- We showed the vast dependence of the coverage area of the base station on the network throughput.
- In future, we will optimize the MAC protocols used in this simulation to improve the network simulation.
- Also we will try to formulate new algorithm to gain more throughput.

References

- [1] Zahed Hossain, Qing Xia, and Josep Miquel Jornet. "TeraSim: An ns-3extension to simulate Terahertz-band communication networks". In: NanoCommunication Networks17 (2018), pp. 36–44.