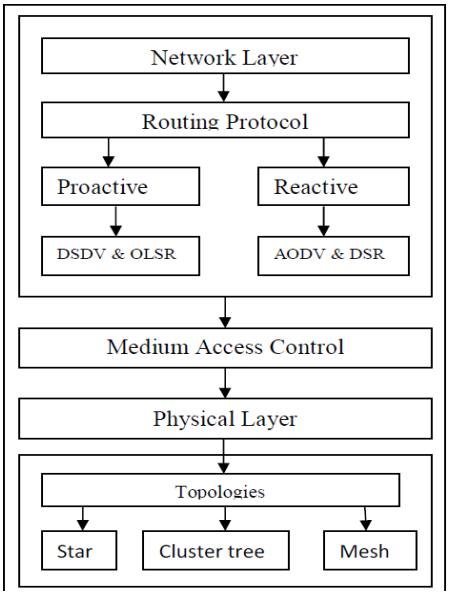

Figure 1: IEEE 802.15.4 Architecture

In above architecture, the physical layer is responsible for data transmission and reception using a certain radio channel according to a specific modulation and spreading techniques. This layer supports the three types of topologies are cluster tree, mesh, star topology and IEEE 802.15.4 having three nodes are PAN coordinator, Router and EndDevice. PAN coordinator is a network master and it's controlled by network communication. Routers are mediator to two nodes and communication directly to PANC and EndDevices. EndDevices are cannot communicate directly, but they communication through PANC. Mesh topology is robust and flexible; it is decentralized network all devices can communicate directly with each other within its range. Cluster tree is formed by parent-child relationship, each coordinator as a cluster head and multiple devices as leaf nodes. In star topology, communication controlled by PANC in the network [1] [2].

Mac Layer forwarding of MAC frames through physical channel and manages accessing of physical channel and network beaconing. MAC layer provides time synchronization and frame validation. The MAC protocol supports two operational modes that can be selected by a central controller of the Person Area Network (PAN), called PAN Coordinator and two modes are Beacon-enabled mode andNon Beacon-enabled mode. It controls frame validation, guarantees time slots and handle node associations. Here we are using network layer for packet forwarding and routing. Here using two types of routing protocols are proactive and reactive, AODV and DSR are reactive routing protocols, on the other hand invoke a route determination procedure on demand only. Thus when a route is needed, some sort of global search procedure is employed. DSDV and OLSR are proactive routing protocol attempts to continuously the route within the network, so that when a packet needs to be forward the route is already known and can be immediately used[1][2].

4. Performance Evaluation

Network Simulator (NS2) is an open-source event-driven simulator designed specifically for research areas in computer communication networks. Network Simulator (NS2) now contains modules for numerous network components such as transport layer protocol, routing, application, etc. Researchers can simply use an easy-to-use scripting language to configure a network environment;to investigate network performance and observe results generated by NS2. It is simply an event driven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulation of wireless as well as wired network functions and protocols (e.g., routing algorithms, TCP, UDP) can be done using NS2. The main aim of our project using network simulator to analyse performance of IEEE 802.15.4 topologies are mesh, star, cluster tree of WPAN using different performance metrics like good put, throughput, end-to-end delay with respect to routing protocol AODV, DSR, OLSR and DSDV. Figure 2 show the design of the simulation.

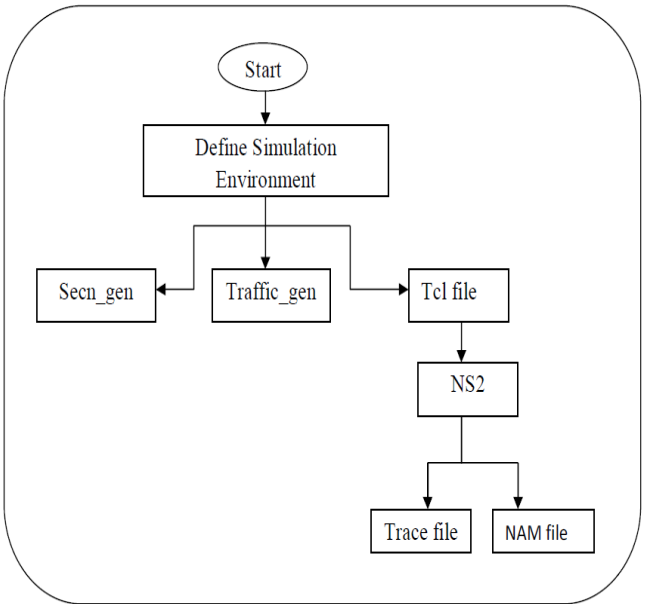

Figure 2: Simulation Design.

In this project consider IEEE 802.15.4 topologies of WPAN using maximum data rate 250kbps in operating frequency of 2.4GHz. Here using Omni directional antenna for communication, two-ray ground propagation model and the queuing model used is drop tail queue. The routing is based on AODV, DSR, OLSR and DSDV. In this project consider the following three parameters metrics to compare IEEE 802.15.4 topologies with four routing protocol.

1. Throughput: It is the rate of data packets successfully transmitted in a unit of time in the network during the simulation.
2. Goodput: It is a ratio between total delivery time and the delivered amount of information.
3. End-to-end delay: It is defined as propagate from source to destination the average time taken by the data packets.

Simulation parameters are Simulator is NS2.35, Simulation area is 50X50, MAC model is IEEE 802.15.4, Simulation time 100 milliseconds, Channel frequency is 2.4Ghz, Traffic type is FTP,and Packet size is 50 bytes, Propagation model is Two-Ray model.

5. Simulation Results

We consider the results by using Network Simulator (Ns2.35) software simulation. We calculate the Performance metrics by using "trace file", with help of AWK program.The simulation results are shown figures in the form of bar graphs. Graph show the comparison between routing protocols with IEEE 802.15.4 topologies of WPAN.

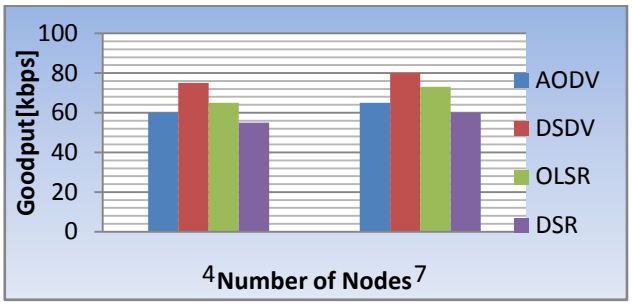

Figure 3: Goodput of Star topology

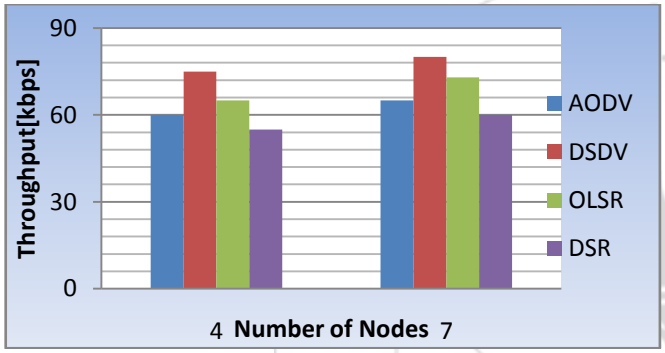

Figure 4: Throughput of Star topology

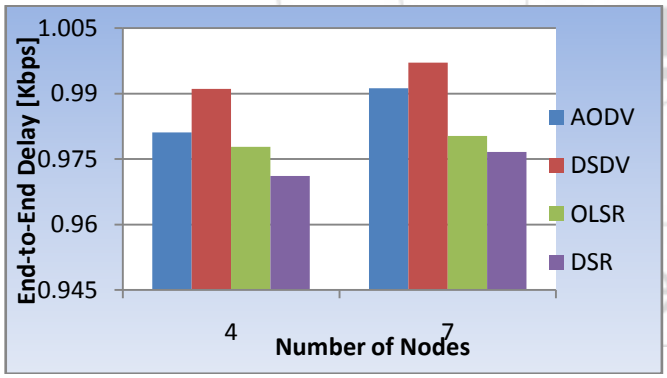

Figure 5: End-to-End Delay of Star topology

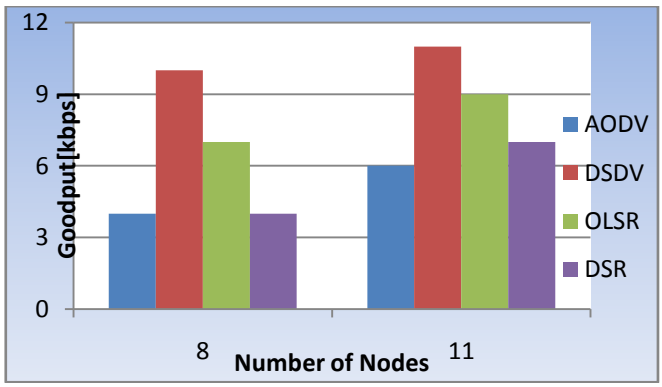

Figure 6: Goodput of Cluster tree topology

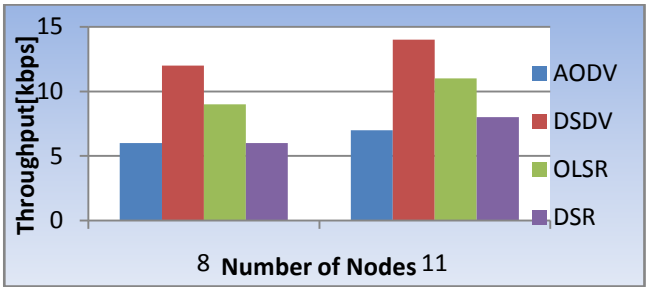

Figure 7: Throughput of Cluster tree topology

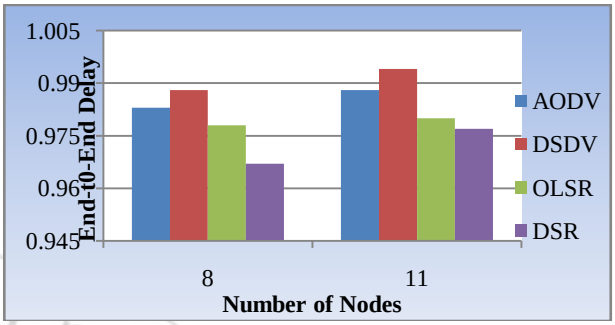

Figure 8: End-to-End Delay of Cluster tree topology

The figure3,figure4 and figure5 show the Star topologyof performance metrics, and thefigure6, figure7and figure8 show the Cluster topology of performance metrics respectively, throughput, goodput and end-to-end delay with the values of AODV, DSR, OLSR and DSDV routing protocols compared. Here throughput and goodput wasmaximum amount of TCP packets are sent and receive from source to destination in terms of DSDV routing protocol. The advantage of these protocols is that a path to a destination is immediately available, because it is a proactive protocol, so here no delay for route discovery.Here DSDV gives the better performance than other protocols.

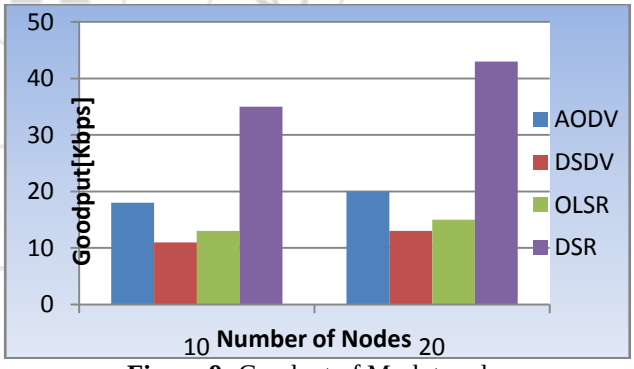

Figure 9: Goodput of Mesh topology

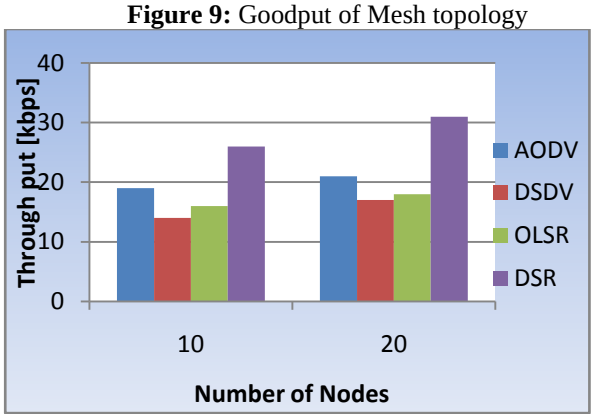

Figure 10: Throughput of Mesh topology

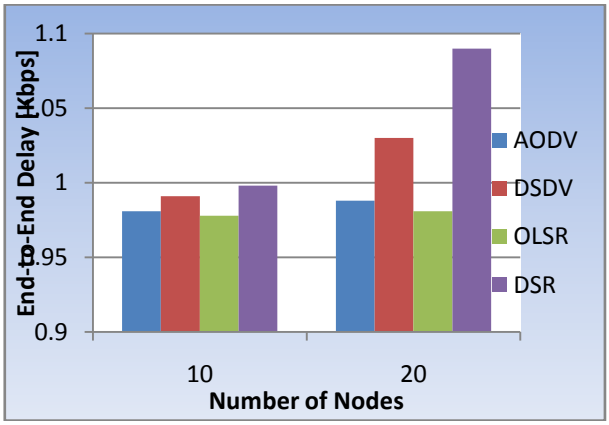

Figure 11: End- to- End Delay of Mesh topology

The figure9, figure10 and figure11 show the mesh topology of performance metrics respectively goodput, throughput and end-to-end delay with values of AODV, DSR, OLSR, and DSDV routing protocols compared. Here goodput and throughput was maximum amount of TCP packets are sent and receive from source to destination in terms of DSR routing protocol, because of less traffic, node density and free of channel. Here DSR gives better performance than other protocols.

6. Conclusion

We have analyzed and simulated using different performance metrics and using AODV, DSR, OLSR and DSDV routing protocol with IEEE 802.15.4 topologies of WPAN. Finally we conclude that we got good performance in cluster tree and star topology with DSDV routing protocol and mesh topology with DSR routing protocol.

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