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Summary of the Study and Evaluation of Different Topologies in Wireless Sensor Network

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Lately, one of the trending topics for many researchers has been about wireless sensor networks. These networks comprise of a many set of sensor devices geographically distributed in a given environment (indoor/outdoor).

Topics such as efficiency, selection of sensor location within a given premise, robustness, consumption of energy, routing algorithm and many more have stood out as challenging areas for research. In spite of all these challenges, there are a high number of applications available. One of the main objectives is to keep the wireless sensor network active and functional as long as possible. One of the key factors is the way the network is designed. This is normally dependent on the application area and how the data will be collected and transmitted to a base station (sink).

Some advantages and disadvantages of these topologies have been listed and addressed below.

The star topology focus on a more centralized management approach. Which allows more efficient energy management of sensor nodes, it is scalable and easy to implement. One major disadvantage is the central point which represents a single point of failure and this will in turn collapse the network. The energy in the sink node gets depleted as the network grows.

In a bus topology, all the nodes are connected to a single backbone with data distributed to all the nodes via multiple hops on the network within a particular distance range. Which makes it expensive to manage with high network traffic and decreased network performance due to loss of considerable amount of packet. One advantage is that it is less expensive to implement with a single backbone.

Ring topology has nodes connected in a ring shape with every node having two neighbours. Nodes use limited power when communicating with other nodes. Although a break in the ring can cause a failure in the entire network. Concerns of scalability have also been raised.

A topology control algorithm was proposed to increase the lifespan of the network while balancing the consumption of energy in a node. Adjusting the power of the node can also increase the lifespan of a wireless sensor network.

In conclusion, star topology is the dominantly used network topology because it is easy to manage from a central point, scalable to implement, and easy to setup and manage over the long term.

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