Routing Protocols and Network Topologies

The network layer of a wireless sensor network (WSN) is responsible for the routing of data between the sensor nodes. The network layer is responsible for finding the most efficient routes for data transmission, and for ensuring that data is delivered reliably and efficiently. The choice of routing protocol used in the network can have a significant impact on the performance, energy consumption, and scalability of the network. In this chapter, we will discuss the most commonly used routing protocols in WSNs and their key characteristics.

One of the most widely used routing protocols in WSNs is the proactive protocol. Proactive protocols, such as link state routing (LSR) and distance vector routing (DVR), maintain up-to-date routing information at all times. This means that each node in the network periodically broadcasts its routing information to its neighbors, and that each node updates its routing table based on the information received from its neighbors. Proactive protocols are well-suited for networks where the topology is relatively stable and where the energy consumption of the nodes is not a major concern.

Another popular routing protocol in WSNs is the reactive protocol. Reactive protocols, such as ad-hoc on-demand distance vector (AODV) and dynamic source routing (DSR), establish routes only when they are needed. This means that a node initiates a route discovery process only when it needs to send data to a destination that it does not already have a route to. Reactive protocols are well-suited for networks where the topology is highly dynamic and where the energy consumption of the nodes is a major concern.

A Hybrid routing protocol is a combination of both proactive and reactive protocols, which tries to combine the advantages of both. For example, the Hybrid protocol can maintain the routing table and periodically update it, but also can initiate a route discovery process on demand.

Another routing protocol that is increasingly being used in WSNs is the geographic routing protocol. Geographic routing protocols are based on the idea that each node in the network knows its own location and the location of its neighbors. This information is used to determine the next hop for a packet based on the location of the destination. Geographic routing protocols are well-suited for networks where the nodes are equipped with GPS or other location-determining technology and where the energy consumption of the nodes is a major concern.

In conclusion, the network layer of a WSN is responsible for the routing of data between the sensor nodes. The choice of routing protocol used in the network can have a significant impact on the performance, energy consumption, and scalability of the network. Proactive, Reactive, Hybrid and Geographic routing protocols are some of the most commonly used routing protocols in WSNs, and each one of them have their own characteristics and suitable applications. This chapter has covered the key features of each protocol and highlighted their strengths and weaknesses, which can help in choosing the right routing protocol for a specific WSN application.