

SENSOR NETWORKS AND PROTOCOL STRUCTURES

Chemical, biological, or solar sensors can be networked together as a sensor network to strengthen the power of sensing. A sensor network is controlled through a software core engine. The network is typically wireless but may also be wired. Sensor networks are designed to be self-configuring such that they can gather information about a large geographical area or about movements of an object for surveillance purposes.

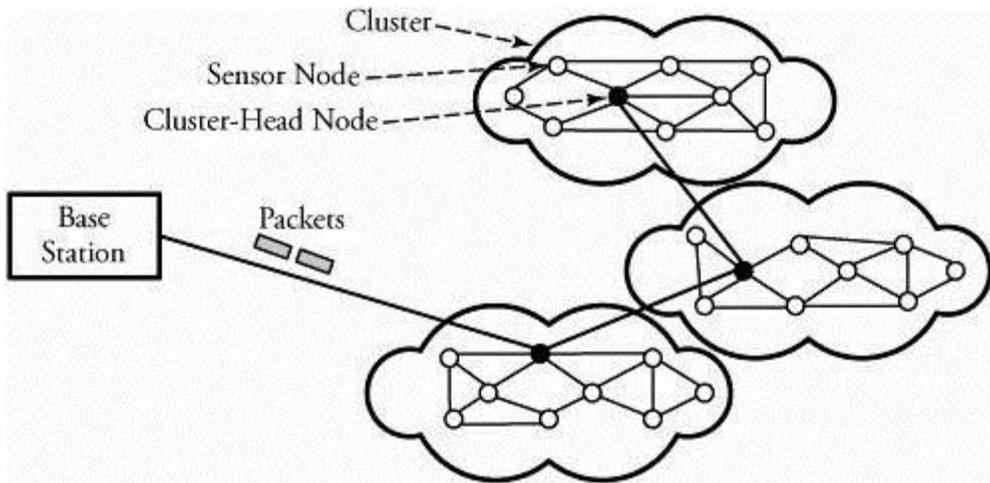
Sensor networks can be used for target tracking, environmental monitoring, system control, and chemical or biological detection. In military applications, sensor networks can enable soldiers to see around corners and to detect chemical and biological weapons long before they get close enough to cause harm. Civilian uses include environmental monitoring, traffic control, and providing health care monitoring for the elderly while allowing them more freedom to move about.

Clustering in Sensor Networks

The region being sensed is normally partitioned into equally loaded clusters of sensor nodes, as shown in [Figure 8.1](#). A cluster in a sensor network resembles a domain in a computer network. In other words, nodes are inserted in the vicinity of a certain predefined region, forming a cluster. Different types of sensors can also be deployed in a region. Thus, a sensor network is typically cluster based and has irregular topology. The most effective routing scheme in sensor networks is normally based on the energy (battery level) of nodes. In such

routing schemes, the best path has the highest amount of total energy. The network of such sensing nodes is constructed with identical sensor nodes, regardless of the size of the network. In [Figure 8.1](#), three clusters are interconnected to the main base station, each cluster contains a cluster head responsible for routing data from its corresponding cluster to a base station.

Figure 8.1. A sensor network and its clusters



Communicating nodes are normally linked by a wireless medium, such as radio. The wireless sensor node is equipped with a limited power source, such as a battery or even a solar cell, where there is enough sunlight exposure on the node. However, a solar cell may not be the best choice as a power supply, owing to its weight, volume, and expense. In some application scenarios, sensor-node lifetime depends on the battery lifetime. Removal of dead nodes can cause significant topological changes and may require packet rerouting. As a result, power management is a key issue in system design, node design, and communication protocol development. In summary, efficient energy-conscious clustering and routing algorithms can potentially prolong the network lifetime.