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Reviews on Wireless Sensor Network

[1]Manjot Kaur Bhatia, [2]Dharya Mittal ,[3]Vishnukant
[1]Professor, [2]Student, [3]Student
[1]Department of Information Technology,
[1]Jagan Institute of Management Studies, Rohini, India

Abstract: The basic idea of wireless sensor network which are capable enough to sense changes or incidents with other devices. Some of the major roles of these sensors are to monitor environment or geographic zone. These senor techniques are combined with some processing power and wireless communication to provide security and information related to the various activities happening around . So this paper begins with the brief description/information about the architecture and application of wireless sensor network and then focus on the challenges of wireless sensor network.

I. Introduction:

Wireless sensor network is economical and simple route to control different devices. These types of networks can easily sense any type of sensor in their surroundings. Wireless sensor networks are usually self-organized and self-healing which maintain a communication between the various nodes of the network. WSNs have some parameters to sense the sensors some of them are temperature, humidity, pressure. Low computing capacity and finite battery power of the sensors makes the protocols which performs computing with very much less energy.

WSN have various number of nodes which are basically battery driven devices which means they perform certain tasks such as they sense process the data acquired or transfer the data through without any physical medium they use different wireless communication so that data can be get collected at a point which is basically known as destinations or sink nodes. These nodes act as an interface or gateway between source and destination. These nodes are known as multi-hop networks. Security is a main complication at different levels in WSN. Over here wireless mode plays an important role in energy consumption which are significant parts of wireless communication.

II.Literature Survey

This paper mainly is a review of WSN architecture and their challenges and it also describes the layers of the architecture. It also tells the use of wireless sensor network and the area in which wireless sensors can be used with its drawbacks and challenges.

Author	Year	Description
Bonato	2010	Introduced about biomedical sensors.
Feng	2011	Introduced the sensors for monitoring.
Srivastava	2010	Provided real time and long term monitoring on health.
Adel et al.	2010	Proposed a protocol known as energy aware geographic routing protocol.
Weng et.al	2013	Proposed an energy efficient routing algorithm.
Horacio et.al	2014	Proposed an algorithm in which data packets are forward to node close to the sink.

III. Proposed Work

Architecture of Wireless Sensor Network

In this section we will discuss about the architecture of Wireless Sensor Network as there are multiple architecture of WSN. The architecture of WSN's are basically developed on the basis of existing communication architecture and their adaptability as per the user need. The architecture categories of WSN are as follow: Tiered architecture, Layered architecture and cross-layer architectures.

Tiered Architecture

Layered architecture consists of mainly two type that is two tier architecture and three tier architectures.

Two-tier Architecture:

In wireless sensor network are consist of the application nodes, gateway, and sensor nodes. In two-tier application node and sensor node communicate with each other while in the same cluster where sensor nodes collect the data from various location/environment and whereas the application node shares the data to the cluster head then the cluster head communicates with other cluster heads so that they can share the collected data to the specific gateway/base terminal. As there are many faults in this transmission so that's the reason data are not transmitted to the different heads of the clusters.

Hence, a link of communication is required to recollect the various data from the other cluster heads. Below there is figure1 demonstrating two-tier architecture.

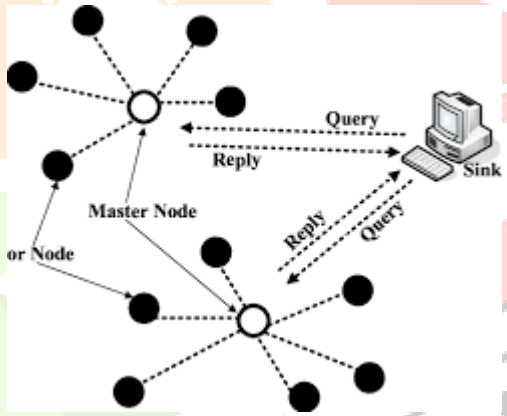

Figure 1 : Two-tier Architecture

Three-tier Architecture:

When the coverage zone is increased two-tier architecture is not suitable for sending data to different heads of the clusters. If large sensor nodes are used, then the midrange communication modules are required to connect the local sensor to the central stage so that they can cover the large quarter. So, to solve multiple problems three-tier architecture was developed by "HAN20" because this architecture supports the long-range communication between the different establishment. There are three types of communication in three-tier architecture which are as follows: LRCN (Long-range communication network, MRN (Midrange network), LWSN(Linear wireless sensor network).Below there is a figure2 of Three-tier architecture.

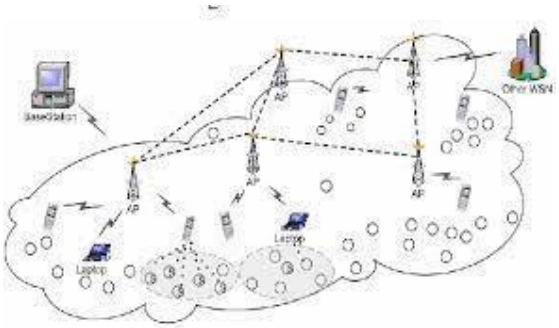

Figure 2: Three-tier Architecture

Layered Architecture

The layered architecture works on the principle of OSI model that means it also consist of five layers (application layer, transport layer, network layer, data link layer and physical layer) and three cross-planes(power management, mobility management, task management). In this the power management always deals with the power consumption of the node. Mobility management always maintain the information shared by the neighboring nodes and the task management is scheduled for sensing the various tasks as per the allotted quater and as per the sensing task multiple software are developed in the application layer. Below there is a figure3 demonstrating Layered Architecture.

- Physical Layer:
  This physical layer provides the interface so that the data can be transmitted through the channel. The main task of the physical layer is to generate frequency, detection, selection as described by the WSNs. In physical layer low power consumption and data rate is used to increase the battery life as well as the communication range.
- Data-link Layer:
  Data-link layer is responsible for the access of the multiple data and for framing detection. This layer is reliable for the connection between multiple points. It also performs some basic tasks like maximization of the throughput and self-organizing capability. Data-link layer basically communicate between the sensor nodes as required by the user or by the application.
- Network Layer:
  The network layer is designed for some basic assumptions i.e for sensor location awareness or attribute-based addressing and data aggregation. These layers also have various routing methods for minimum power available route and maximum power available route. Network layer is also responsible for connecting to the external network.
- Transport Layer:
  Transport layer design are made challenging because of the limited power and memory so that there is enough storage to store the data and acknowledge the sensor or the multiple nodes. Hence the communication in this network is divided into two different parts to avoid the traffic within the network. These networks are basically divided into UDP (User Datagram Protocol, TCP/IP (and Transmission Control Protocol/Internet Protocol).
- Application Layer:
  Application layer usually provides the level of functionality as per required by the users or by the application. It also handles the issue of time synchronization or task management. As there is already a high level application layer therefore it is always a challenge for other developers to deal with this layer.

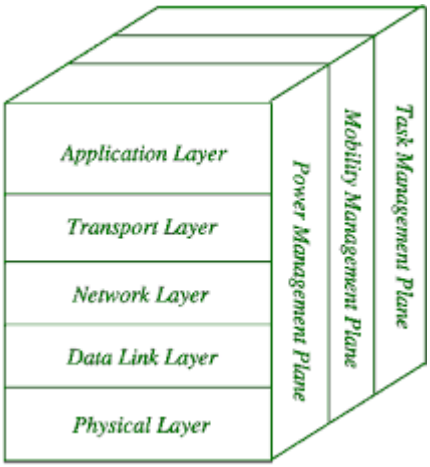

Figure 3 : Layered Architecture

Cross-Layer Architecture

Cross-layer architecture is a traditional communication model as it splits the tasks into each layer as this architecture prevents the direct communication between the adjacent layers. To avoid the direct communication between the layers protocols are created so that the restriction can be fulfilled so the developers designed a protocol in which non-adjacent layer can shared resources among themselves this is known as CLD. Basically CLD is a paradigm of network architecture in which the functionalities of the layers dependent to each other work with optimization. The motive to design cross-layer architecture is to cross the designed boundaries to expand the wireless communication so that it can become reliable and efficient.

Below there is a figure demonstrating Cross-Layered architecture.

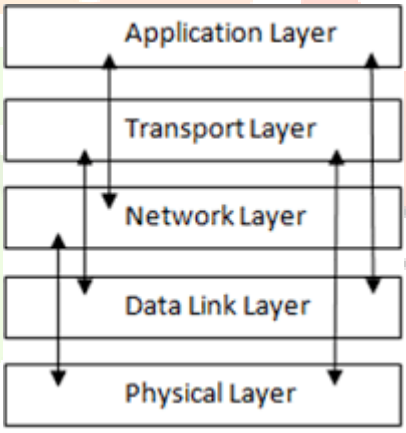

Figure 4 : Cross-Layered Architecture

Application of Wireless Sensor Networks

Wireless Sensor Network have some application so of them are:

- Military Application: Wireless sensor network plays a critical part in military command as it control communication between the soldiers it also help them in surveillance and intelligence.
- Environmental applications: Some of the environment related factors are also there to track the motion of birds and small animals even some of the unwell animals. Which are used for research work.
- Home Application: Many home application run on the sensors which includes domestic devices like fridges, microwave etc.
- Fitness application: Most of the fitness devices have interfaces using sensors for tracking calories, heartbeat and steps.

Challenges of WSN

- Challenges in real time:

WSN basically trades in the real world. In the maximum cases data sensors that should be delivered in the required time for the proper observation or for the actions taken. In WSN there are very few results that meet the real time requirements as most of the protocols ignore the real time or simply try to even process the data as fast as possible. It also hopes that the speed is sufficient to meet the deadlines. There are very limited results that appeared regarding the real time issue.

- Challenges in power managements:

Low-cost deployment of the sensor networks is very helpful in the power management. Limited processors bandwidth with small memory plays an important role in the constraints of the sensors which sometimes disappear with the development of the various techniques. It is also questionable because of the slow progress in the battery capacity.

- Network Scale and Time-Varying Characteristics of WSN:

The density of the WSN differs from light to dense depending on the applications. In these, the behavior of the sensor nodes are dynamic with the high adaptive way which need to self-organize and conserve the energy sensor nodes to fit the behavior constantly in response to their current level of activity.

- Management at a Distance:

In the distance management sensor nodes deployed to our field in the sub-station. It is difficult to manage the network for the managers or operators. So, this framework must provide an indirect remote control.

Solution of architecture issue:

WSNs have a support for heterogeneous applications with diversified requirements. So, we need to design flexible and extensible architectures to accommodate the diversified requirements. Modular clustering systems can enhance the system flexibility, robustness, and reliability. In addition, WSNs network architecture must be interoperable with existing conventional networks such as Ethernet-based systems and other wireless networks. As WSN are early-stage development but have proposed many efficient algorithms to work efficiently. The solutions of these challenges are built up on testing and evaluating various algorithms. In this analysis are needed to provide confidence in various work that the system meets its requirements.

Conclusion

Wireless sensor network will not be completely dependent until its security issues are full proof or been solved as even now these sensors can't handle the attacks on its security. Some of the hardware issues are also there to solve for the better working of the sensors with it's improve designs. These summaries the challenges of wireless sensor network with its brief description of architecture and applications.

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