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ZIGBEE WIRELESS SENSOR NETWORK

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Abstract: *In current years, an attention on a world level have achieved by Wireless Sensor Networks. These consist of small sensors with limited resources and limited power. Wireless sensor standards developed with the special need for consuming low power. The effectiveness of WPAN (Wireless Personal Area Network) with low-cost communication is improved by Zigbee. In this paper we discuss about wireless sensor networks, Zigbee technology, topologies.*

Key Words: *Zigbee Technology, Wireless Sensor Network.*

1. INTRODUCTION

Wireless Sensor Networks (WSNs) consists of multiple sensor nodes that sense environmental phenomena and generate sensor readings that are forked over, typically, through multi-hop paths, to a specific node (called the sink node) for collection.

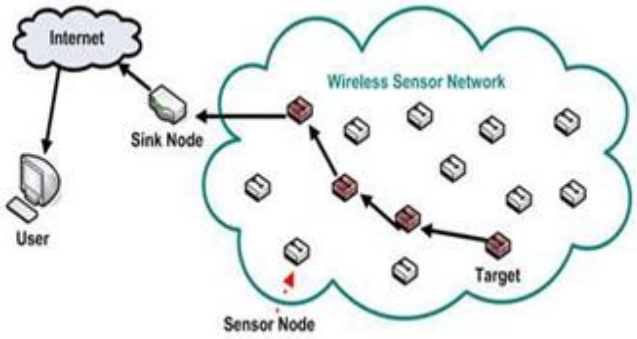

Fig 1: Wireless Sensor Networks

Zigbee is the most popular industry wireless mesh networking standard for linking sensors, instrumentation and control systems. Zigbee is known as the "Internet of things", is a specification for communication in a Wireless Personal Area Network (WPAN). Theoretically, Zigbee-enabled coffee maker can communicate with a Zigbee-enabled toaster. Zigbee is a global, open, packet-based protocol designed to offer an easy-to-use architecture for a reliable, safe, low power wireless networks. Zigbee devices intercommunicate with one another by using the digital radios. A typical Zigbee network consists of several types of gimmicks. Every Zigbee network must include a network coordinator. A network coordinator knows about every one of the nodes inside its network, and oversees both the information about every node and also the data that receives/transmits within the network. Every Zigbee network consists of a network coordinator. Other Full Function Devices (FFD's) is found in the web, and these devices bolster all the 802.15.4 functions. They can serve as network routers, network coordinators, or as devices that interact with the physical cosmos. The Reduced Function Device (RFD) is the last device found in these networks, which normally and only serve as device that interact with the physical world. Zigbee supports several topologies like star, cluster tree, and mesh. A new technology Zigbee is now being deployed for wireless sensor networks. A sensor network that allow the administrator to instrument, watch over and react to events and phenomena in a specified environment, is an infrastructure composed of sensing, computing and communication elements.

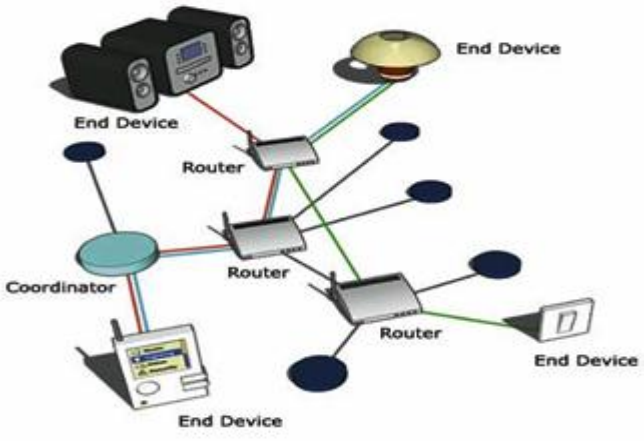

Fig 2: Zigbee Network

2. ZIGBEE TECHNOLOGY

Zigbee is based on IEEE 802.15.4 Standard with capacity coordinating mutual communication among thousands of tiny sensors is a new wireless communication technology with short length, low complexity, low energy consumption, slow data rate and low-cost. The sensors can send the data from single sensor to another with small energy cost and high-efficiency through the radio waves. Zigbee technology has the lowest energy consumption and price when compared with various existing wireless communication technologies. Zigbee technology is extremely suited for agricultural field which has a small amount of data flows because of the slow data rate and the small range of communication. Zigbee makes it as the best choice for the wireless sensor networks because of the technical characteristics in its technology. Hence, it has the practical significance when applied in the crop environmental monitoring system.

Fig 3: Zigbee

A. Features of Zigbee Technology

i. Zigbee uses a kind of power-saving modes to guarantee that it could be used for 6 months to two years powered by two AA batteries.

ii. The avoidance collision mechanism in CSMACA is used by Zigbee and pre-set a prior particular time slot for a fixed bandwidth communications service in order to ward off competition and conflict when sending data. MAC layer adopts a fully confirmed the data transport mechanism, and each packet sent by the recipient must wait for confirmation.

iii. Zigbee has self-supported features that one node can sense other ones without any human interventions, and connect with each other automatically to produce a completed network. It also obtains self-recovery function that the network can repair itself when a node is added or deleted, then the place of a node been changed, or a breakdown occurred

iv. It also can adjust the topology structure to guarantee that the system can work normally without any human interventions.

v. Zigbee is a fresh open-standard wireless protocol developed by the Zigbee Alliance (consisting of over 270 companies).

vi. Zigbee is particularly targeted at low-power, low-cost and low data rate wireless sensor and control networks, for interoperability, it is easy to make and can hold up to 65,000 nodes depending on the type of topologies used.

B. Architecture of Zigbee Wireless Network

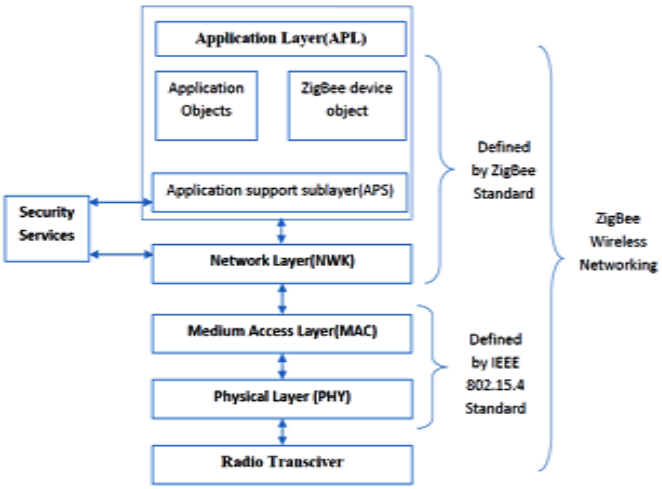

Fig 4: Architecture of Zigbee

3. ZIGBEE NETWORK TOPOLOGIES

A Zigbee network consists of three topologies and are as follows

- Star
- Tree
- Mesh

A. Star Topology: A Star network topology has a central node, which links to all other nodes in the mesh. All messages go through the central node.

Fig 5: Star Topology

B. Tree Topology: A Tree network has a top node which is known as the root node with a branch/leaf structure to a lower place. To progress to its destination, a message travels up the tree as far as it can and jumps to the next tree and then jump down.

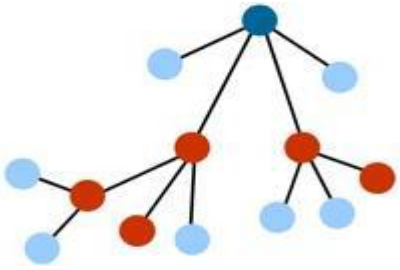

Fig 6: Tree Topology

C. Mesh Topology: A Mesh network has a treelike structure in which some leaves linked immediately. This topology is a multi hop network, the packets that pass through multi hops to reach the destination.

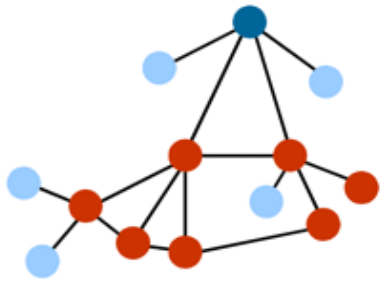

Fig 7: Mesh Topology

4. APPLICATIONS OF ZIGBEE

It is of greater use in many areas like

- Lighting & Energy Management
- Smart Home
- Healthcare
- Intelligent Transport
- Manufacturing
- Telecom Services
- Environmental Monitoring and
- Retail Stores

Fig 8: Zigbee Applications

5. CONCLUSION

In this paper, a Zigbee interface aimed to reset the control system for resetting network devices to their original settings. Zigbee is used in several applications such as monitoring, sensor interconnecting, and automating different systems at manufactories, home, hospitals, and agriculture as a new attractive wireless technology.

6. FUTURE SCOPE OF ZIGBEE

ZigBee®
Control your world

Zigbee has a really promising future in front of it. Research guarantees that Zigbee fuelled by the fast ascent in home networking administration. In the forthcoming years Zigbee would give reforming statistics which would absolutely change the wireless world.

A. Revenue: In next four years Zigbee revenues would increase by astonishing 3400%.

B. Sales: In 2008 Zigbee sales would reach a remarkable figure of 700m$.

C. Zigbee in every home: A minimum of 100-150 Zigbee chips would present in every family within the next two to three years.

D. Cost: Zigbee would cost only $5 for a single chip. But the small storage size of protocol stack Zigbee chip will further lower the price to around $2 per chip.

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