

# ZigBee Technology

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**Abstract:** ZigBee is an open global standard providing wireless networking based on the IEEE 802.15.4 standard and taking full advantage of a powerful physical radio this standard specifies. ZigBee is the result of collaborative efforts by a global consortium of companies known as the ZigBee Alliance. ZigBee Alliance is an organization with a mission to define reliable, cost effective, low-power, wirelessly networked, monitoring and control products based on an open global standard. Alliance provides interoperability, certification testing, and branding.

**Index Terms:** ZigBee, IEEE 802.15.4, ZigBee Alliance.

## I. INTRODUCTION

ZigBee is a specification for a suite of high level communication protocols used to create personal area networks built from small, low-power digital radios. ZigBee is based on an IEEE 802.15 standard. Though low-powered, ZigBee devices can transmit data over long distances by passing data through intermediate devices to reach more distant ones, creating a mesh network; i.e., a network with no centralized control or high-power transmitter/receiver able to reach all of the networked devices. The decentralized nature of such wireless ad hoc networks make them suitable for applications where a central node can't be relied upon.

**ZigBee includes the following key features:**

- low cost,
- long battery life (months to years)
- accommodate large sensor nodes (Max. 65,535)
- provides high security using 128 bits AES
- high reliability

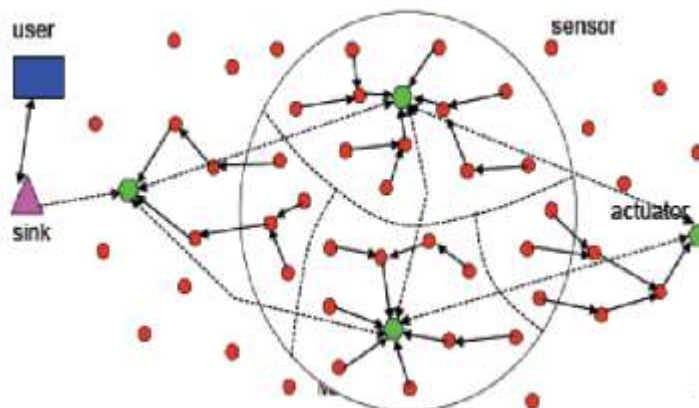
## II. ZIGBEE TOPOLOGIES

ZigBee is named after HoneyBee which uses zigzag type of dance to communicate information like food to other hive members. By dancing in a zig-zag pattern, the bee is able to share critical information, such as the location, distance, and direction of a newly discovered food source to its fellow hive members. ZigBee uses following topologies:

- Star
- Cluster Tree : minimum routing overhead, uses multi-hop routing
- Mesh: Mesh network allows any node to transmit to any other node in the network within radio transmission range



Star Mesh Topology



**Cluster Tree Topology**

#### **Coordinator:**

All ZigBee networks must have only one Coordinator, irrespective of the network topology.

#### **Routers:**

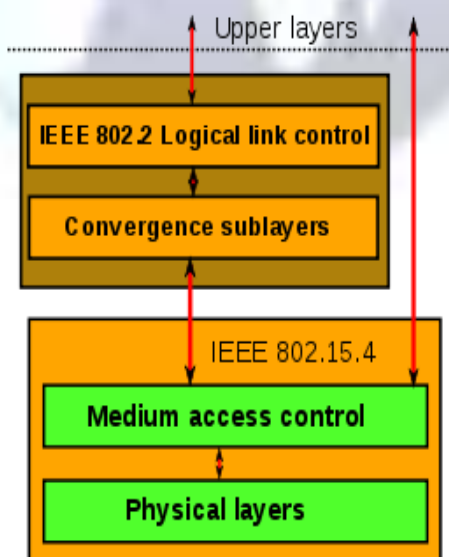
The task of Routers are to relay messages from one node to another, allow child nodes to connect to it, and talk to the coordinator, to other routers, and to reduced-function end devices (RFD)

#### **End- devices:**

The main task of an End-device at the network level is sending and receiving messages.

### **III. PROTOCOL ARCHITECTURE**

Devices are conceived to interact with each other over a conceptually simple wireless network. The definition of the network layers is based on the OSI model; although only the lower layers are defined in the standard, interaction with upper layers is intended, possibly using an IEEE 802.2 logical link control sublayer accessing the MAC through a convergence sublayer. Implementations may rely on external devices or be purely embedded, self-functioning devices.



#### **IV. FUTURE ANALYSIS**

Zigbee has a very promising future in front of it. Research claims that fuelled by rapid rise in home networking, Zigbee would provide revolutionizing statistics in the upcoming years which would entirely change the wireless world.

- Zigbee revenues would increase by astonishing 3400% in next four years.
- Zigbee will be in every home Within next two to three years, a minimum of 100 – 150 Zigbee chips would be present in every home.
- It would cost only \$5 for a single chip .But the smaller memory size of protocol stack will further lower the prize of Zigbee to around \$2 per chip.

#### **V. CONCLUSIONS**

It is likely that ZigBee will increasingly play an vital role in the future of computer and communication technology. In terms of protocol stack size, ZigBee's 32 KB is about one third of the stack size necessary in other wireless technologies. The IEEE 802.15.4– based ZigBee is designed for remote controls and sensors, which are very many in number, but need only small data packets and, extremely low power consumption for longer life. Therefore they are naturally different in their approach to their respective application arenas. The ZigBee Alliance targets applications across consumer, commercial, industrial and government markets worldwide. Unwired applications are extremely sought after in many networks that are characterized by copious nodes consuming minimum power and enjoying long battery lives. ZigBee technology is designed to best suit these applications, for the reason that it enables lesser costs of development and very swift market adoption.

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