Zigbee Technology

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Abstract --**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 devices can transmit data over a long distances by passing data through a mesh network of intermediate devices to reach more distant ones. It is typically used in low data rate applications that require long battery life and secure networking. ZigBee specification is intended to be simpler and less expensive than other wireless personal area networks, such as Bluetooth or Wi-Fi. Application include wireless light switches, electrical meters with in home displays, traffic management systems, and other equipment. Network simulators like NS2, OPNET and NetSim can be used to simulate ZigBee networks. These simulators come with open source C and C++ libraries for users to modify. This way users can determine the validity of new algorithms prior to hardware implementation. [1]**

Keywords - ZigBee, NS2,OPNET,MAC,AODV,ZigBee PRO.

Fig 1: ZigBee- wireless control

I. INTRODUCTION

ZigBee is a low cost, low power, wireless mesh network standard targeted at wide development of long battery life devices in wireless control and monitoring applications. ZigBee has low latency, which further reduces average current. ZigBee is based on an IEEE 802.15.4 standard. Its low power consumption limits transmission distances to 10-100 meters line-of-sight, depending on power output and environment characteristics.

ZigBee is one of the global standards of communication protocol formulated by relevant task force. [1] For non-

Fig 2: ZigBee module

commercial purposes the ZigBee specification is available free to the general public. It has few analogue stages and uses digital circuits where possible. ZigBee radios have very tight constraints on power and bandwidth.

II. DEVICE TYPES AND OPERATING MODES

ZigBee devices are of three types:

A. *ZigBee coordinator*

The Coordinator forms the root of the network tree and might bridge to other networks. There is exactly one ZigBee Coordinator in each network. It stores the information about the network, including acting in trust center and repository for security keys. [2]

B. *ZigBee Router*

A router can act as as an intermediate router, passing on data from other devices.

C. *ZigBee End Device*

It cannot relay data from other devices and requires the least amount of memory and therefore can be less expensive to manufacture.
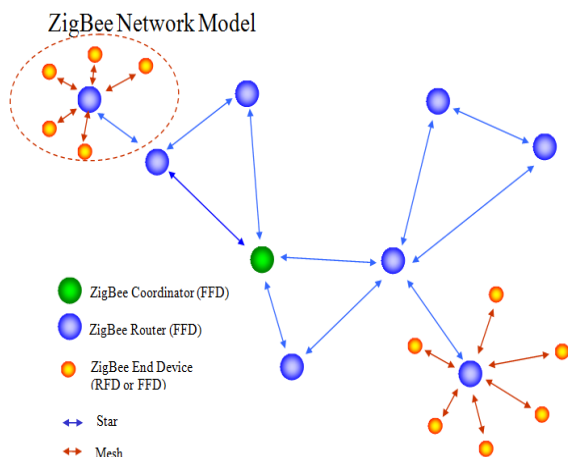
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Fig 3: ZigBee network model

III. DATA TRANSFER

The data is being transferred in packets and have a maximum size of 128 bytes, allowing for a maximum payload of 104 bytes. The 64 bit

addresses uniquely identify every device in the

same way that device have a unique IP address. Once a network is setup the short addresses can be used and this enables over 65000 nodes to be supported. The use of cluster identifiers enforces the binding of complementary entities by means of binding tables, which are maintained by ZigBee coordinators, and are most likely to have a permanent power supply. Communication can happen right after the association. It has an optional superframe structure with a method for time synchronisation. A guaranteed time slot mechanism has been incorporated into the specification.

IV. ZIGBEE PRO

ZigBee PRO provides standardized networking designed to connect the widest range of devices, in any industry, into a single control network. ZigBee PRO provides an innovative feature, Green Power to connect energy harvesting or self –powered devices into ZigBee PRO networks.

A. GREEN POWER FEATURE

The Green Power feature allows battery-less devices to securely join ZigBee PRO networks and is the most eco-friendly way to power sensors, switches, dimmers, and many other devices. The proxy interfaces with the green power device and is typically part of an always powered on devices that serves as a ZigBee PRO

router. ZigBee lets battery powered devices can sleep for hours or even days, reducing battery use. The duty cycle of battery powered nodes within a ZigBee network is designed to be very low. Once associated with a network, a ZigBee node can wake up and communicate with other ZigBee devices and return to sleep.

Fig 4: ZigBee tools tech

B. ATMEL: PACKET ANALYSIS WITH SNIFFER

In ZigBee networking, a sniffing tool is important during development and testing for the capture and analysis of frames exchanged in the network. It is more significant in networks that have ZigBee products from different vendors to test and verify that they inter-operate with one another. The sniffing tool shall be capable of real-time capture of frame formats supported by the ZigBee protocol and the IEEE 802.15.4 standard. The sniffer shall also provide parsed information of different fields and sub-fields of the frame, which shall aid the user in quick analysis. A visual view of the network topology, time stamping, multi-channel capture and saving of the capture files are some of the features of sniffers that the user can benefit from, to gain a complete picture of the wireless environment that is being monitored. For easier viewing and analysis, sniffers GUIs provide multiple filtering options. With the appropriate settings, a complete snapshot of the wireless network can be obtained.Common interaction in ZigBee PRO networks that shall aid the user to look closely into various fields of the frame and is not aimed at covering all scenarios that fall under ZigBee specification. Explaining the meaning of all the fields used in a ZigBee frame is outside the scope of this application note and shall be looked up in the ZigBee specification.

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V. CONCLUSION

There is an increasing number of wireless standards that are appearing, ZigBee has a distinct area upon which it is focussed. It is not intended to compete with standards such as Bluetooth and so on. It has been optimised to ensure that it meets its intended requirements fulfilling the needs for remote control and sensing applications. The cost of applying ZigBee PRO is relatively small. ZigBee IP enables low-power devices to connect with other Ethernet, Wi-Fi and home plug devices. To prevent unwanted users accessing a network, ZigBee authorization is used.

REFERENCES

[1] https://en.m.wikipedia.org/wiki/zigbee
[2] "Wireless sensor networks research group"
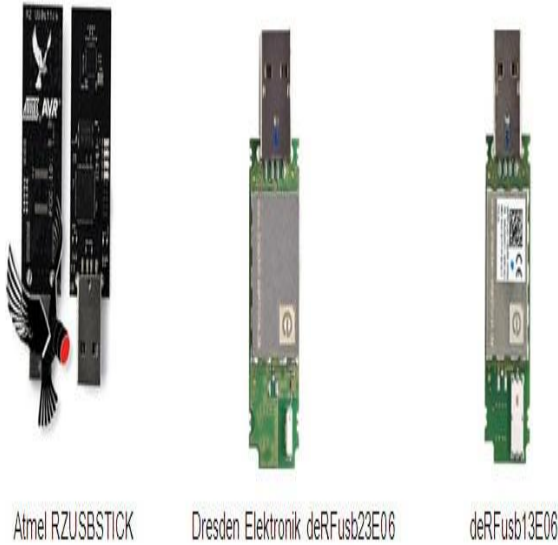[3] ZigBee PRO with Green Power
[4] Atmel AT02597

Fig 5:Supported Sniffer Hardware Platforms.