Security Concerns and Solutions for Zigbee (IEEE 802.15.4)

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Abstract— Zigbee is defined as a set of protocols and architecture of monitoring and control networks. Zigbee is a high level communication protocol that is used to create personal area networks with small low power digital radios such as for automation, low power bandwidth needs, design for small scale projects which needs wireless connections. Zigbee operates in low power mesh or star sensor networks, providing a maximum data rate of 250 kbps. Zigbee is simpler, less expensive than Wireless Personal Area Network (WPAN). The Main concern in Zigbee is of security, which means lack of privacy and stealing of information. This paper is focused on security issues and their respective solutions involved in Zigbee.

Key words: Zigbee, IEEE 802.15.4

I. INTRODUCTION

Zigbee is clarified as a set of properties and construction of observing with authority web works [1]. Zigbee has powerful quantity of transmission properties that utilize to generate personal area networks and small low power digital radios such as for automation, small of capability bandwidth needs, plan for small scale projects which needs wireless relationships [2]. Zigbee utilize in small ability mesh or star sensor web works, as long as biggest information charges of 250 kbps. Zigbee is uncomplicated, economical as compare to Wireless Personal Area Network (WPAN) [3]. Zigbee has long battery life with secure networking. Zigbee provides the efficiency as convey out protected communication, protected organization, and transport of cryptography keys. The basic security frame work defines in IEEE 802.15.4 [1]. Zigbee has low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. Zigbee is typically used in low data rate applications that require long battery life and secure networking [4].

A. Working

Zigbee is a set of normalized solutions for wireless telecommunications map out for sensors control and suitably used in grating and isolated conditions. Zigbee operates at one of three license-free bands, 2.4 GHz or 915 MHz in North America and 868 MHz in Europe. In Zigbee, Cost of terminal or last unit is low. Zigbee combines relatively low cost with a high level of integration, solving many issues, created historically by the lack of such a set of standards in the past [15]. The (Media Access Control) MAC layer with features are simplified as power management system. This system does not require multiple modes and allows for Reduced Functionality of a Device (RFDs) that does not require a great distribution of ROM or RAM. This comes in opposition to the Bluetooth system which has multiple modes of operation. Using Zigbee, data is moved in package over a distance of up to 230 feet or longer, if data is relayed across nodes in a network [18].

B. Zigbee Network Topologies

- Star Network.
- Tree Network.
- Mesh Network [7].

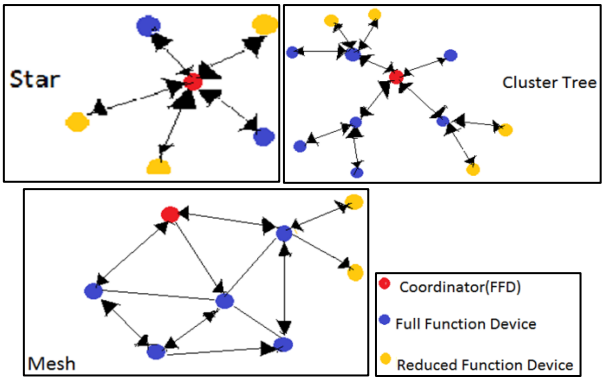

Fig. 1: Zigbee Network Topologies

C. Advantages

- Zigbee has whippy network construction.
- Zigbee has a very long battery life.
- Zigbee is low power utilization.
- Zigbee is easy to install.
- Zigbee can be easily implemented [9].
- Zigbee supports large number of nodes i.e. 6500 nodes approximately.
- Zigbee has a very low cost [10].
- Zigbee is more valid and self-healing.
- Setting up the network is very simple and easy.
- Secured details transplant.
- Zigbee has long range.
- Zigbee is easy to monitor and control gadgets from remote [8].

D. Disadvantages

- Zigbee is extremely dangerous to be used for official personal information.
- Zigbee has low transmission rate.
- Replacements with Zigbee compliant appliances are expensive.
- Zigbee does not have many end devices available yet.
- Zigbee cannot be used as outdoor wireless communication system because it has short coverage limit [8].
- Zigbee is not secure like Wi -Fi based system [9].

E. Applications

- Industrial Automation: In making and production of industries, a communication link continually monitors various parameters and critical equipments. Hence Zigbee considerably reduce this communication cost as well as optimizes the control process for large reliability [16].

- Home Automation: Zigbee is completely suited for managing home appliances remotely as a lighting system control, appliance control, heating and cooling system control, safety equipment operations and control, and so on [9].
- Smart Metering: Zigbee remote operations are smart metering involve energy consumption response, pricing support, security over power theft etc [6].
- Smart Grid Monitoring: Zigbee operations in this smart grid involve remote temperature monitoring, fault locating, reactive power management and so on [7] [10].
- Mobile Services: M-payment, M-monitoring and control, m-security and access control, m-healthcare and tele-assist.
- Commercial Building: Energy monitoring, HVAC, lighting, access control[15]

Fig. 2: Applications of ZIGBEE

F. Need of Zigbee

There are a multiple of requirements that labels mid to top information rates for channel, PC LANs, video, etc. Although, up until nowadays there hasn't been a wireless web work quality that gathers the special use of sensors with control gadgets. Sensors and controls doesn't use high bandwidth yet they used low latency and extremely small stamina utilization for extensive cell entities and for huge gadget [12].

There are a multiple exclusive wireless organizations manufacturing nowadays to explain a multiple of difficulties that also doesn't need unlimited data rates however lesser cost and extremely lesser current drain [19].

G. Next Generation Arrangements for Zigbee

- XCTU is free and compatible with Windows, Mac OS and Linux.
- Simple wireless network configuration and architecture.
- Simple development tool for quickly building Zigbee API frames.
- Survey and read firmware release notes.

H. Future Scope of Zigbee

- Profits: Zigbee profits would rise by amazing 3400% in next four existences.
- Agreements: Zigbee agreements would trace an amazing amount of 700m$ in 2008.
- Zigbee in Every Single Family: With in next two-three existences, a smallest amount of 100-150 Zigbee chips would be existing in every family.
- Charges: Zigbee would charge only $5 for a solo chip. However the lesser memory size of procedure stack will extra minor price of Zigbee around $2 per chip [13].

II. CONCLUSION

Zigbee technology is becoming more and more popular because of its low cost and ease-of-use. In many cases wireless has become cheaper than the wired alternatives. This technology allows us a faster and more convenient access to the world. Zigbee technology provides the world with a variety of wireless applications. The direct interfacing of analog sensors and digital input output makes Zigbee widely acceptable in variety of areas. From a simple domestic application of temperature control to the more complex mesh sensor networks that analyze volcano, Zigbee devices are gently becoming a manufacturing standard in wireless communication. This paper will help all the future researchers, as we have tried to conclude everything related to Zigbee in a single paper.

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