Volume 4, Issue 7, July 2014 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

# Bluetooth, Wi-Fi and Wi-Max A Review Study

**Anju Sangwan** [1]
Computer Science
Maharishi Dayanand University Rohtak,
India

**Harish Bedi**[2]
Computer Science
Maharishi Dayanand University,
India

***Abstract - To day there are several ways by which a Wireless Internet Service Provider can deliver service. It is known as Bluetooth, Wi-Fi & Wi-Max. Bluetooth is an open wireless protocol for exchanging data over short distances from fixed and mobile devices. It is used to creating personal area network (PANs). It is also knows as 802.15 standard of IEEE and wireless PAN. Wi-Max network can be built around an entire city, instead of providing limited coverage area while as Wi-Fi provides the services in broadband LAN. However it does not meet QoS requirements for real-time data traffic applications such as voice and video transmissions. Broadband Wireless technologies are increasingly gaining popularity by the successful global deployment of the Wireless Personal Area Networks. This is as an analytical review on various wireless technologies***

***Keywords- IEEE 802.15, Blutooth, IEEE 802.16, IEEE 802.11 , WEP.***

## I. INTRODUCTION

***Bluetooth*:-**The standards of IEEE 802.15 technology is better known as Bluetooth technology, is being deployed into Wireless Personal Area Network. Bluetooth network can be built around limited coverage area like as room, small building etc. The Bluetooth technology operates in the unlicensed industrial, scientific and medical (ISM) radio band at 2.4GHz that allows two Bluetooth enabled devices within 10-100 meter range to share data [3]. Although a piconet can have a maximum of seven secondary, an additional 255 secondary can be in the parked state. Piconets can be combined to form is called a scatternet. A secondary station in one piconet can be the primary in another piconet. This station can receive messages from the literature sometimes uses the terms *master* and *slave* instead of *primary* and *secondary*. from the primary in the first piconet (as a secondary) and, acting as a primary, deliver them to secondary in the second piconet. (11)

The major challenges facing Bluetooth technology are: (i) robust and efficient security solution; (ii) vendor independence and application interoperability; and (iii) quality of service. Although Bluetooth Special Interest Group (SIG) Specification defines security at the link level [4,5]; the security requirements for Bluetooth vary from application to application.

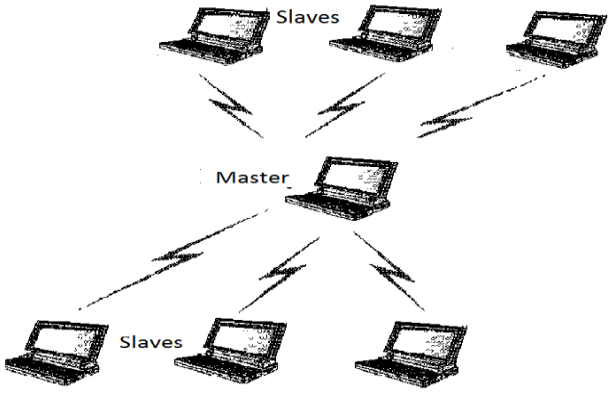


Figure 1

Bluetooth uses several layers that do not exactly match those of the Internet model we have defined in this.

<table>
<tr><td colspan="3">Application Layer</td></tr>
<tr><td rowspan="3">Audio Layer</td><td>Profiles</td><td rowspan="3">Control Layer</td></tr>
<tr><td>Data</td></tr>
<tr><td>Logical Link Control Adaptation Layer</td></tr>
<tr><td colspan="3">Baseband Layer</td></tr>
<tr><td colspan="3">Radio Layer</td></tr>
</table>

Figure 2

 

***Radio Layer***

The radio layer is roughly equivalent to the physical layer of the Internet model. Bluetooth devices are low-power and have a range of 10 m.

***Baseband Layer***

The baseband layer is roughly equivalent to the MAC sub layer in LANs. The access method is TDMA. The primary and secondary communicate with each other using time slots.

***Logical Link Control Adaptation Layer***

The Logical Link Control and Adaptation Protocol, or L2CAP is roughly equivalent to the LLC sub layer in LANs. It is used for data exchange on an ACL link.

***Wi-Fi:***-The standards of IEEE 802.11 technology is better known as Wi-Fi technology is being deployed into Broadband Wireless Access. The Local Area Network access points to quickly and efficiently connect computers to internet service providers and to LAN's respectively. Wi-Fi is more like a traditional Ethernet network and requires configuration to set up shared resources, transmit files and to set up audio links (for example, headsets and hands-free devices). It uses the same radio frequencies as Bluetooth but with higher power resulting in a stronger connection. IEEE 802.11 provides high bandwidth connectivity in a LAN environment that is suitable for most data applications. [15] Wi-Fi was originally designed for best-effort services. WLAN has different standards. The most common ones are IEEE802.11 and IEEE802.11g.[8] The Carrier Sense Multiple Access (CSMA) technique used in the Wi-Fi 802.11 standard provides fair and equal access to all devices. It is essentially a listen-before-talk mechanism. Data rate is depends on the range of coverage and utilization of wireless network resources. The newly standard can provide data rate up to 100Mbps in limited area. Wi-Fi is more cost-effective when compared with traditional wireless voice communications and Wi-MAX. The data is modulated by physical layer using DQPSK and DBPSK for the 2 Mbps and 1 Mbps data rates respectively. MAC provides logical connection among various subscribes stations and determine when a station is allowed to transmit and when it may be able to receive data packets over the shared wireless medium. Wi-Fi layered protocol Architecture (11)

<table>
<tr><td colspan="6">Uper Layer</td></tr>
<tr><td colspan="6">LLC</td></tr>
<tr><td colspan="6">MAC Sub Layer</td></tr>
<tr><td>Infrared</td><td>FHSS</td><td>DSSS</td><td>OFDM</td><td>HR-DSSS</td><td>OFDM</td></tr>
</table>

Figure 3 Layer Protocol Stack

**Wi-Fi frame format**

Frame Control

It is used to controlling the overall operation of the frame. It contains having the 11 subfield which is below briefly explain.

Version: This field used to define the versioning of the protocol like as a, b, g and n etc. It occupied two bits of the frame.

Type: Type field is used to control the data, type or management of the frame. It also occupied two bits of the frame.

Subtype: It is used to define the request to send (RTS) and clear to send (CTS). It also occupied four bits of the frame.

To Destination: It is used to indicate the frame is going to the destination. It has contained the one bit length of the frame.

From Destination: It is used to indicate the frame is coming from the destination. It has contained the one bit length of the frame.

More Fragmentation: It is used to indicate the frame has more fragments of the data. It has also contained the one bit length of the frame.

Retry: It is used to control the transmission of the frame which is may be transmitted or retransmitted. It also occupied four bits of the frame.

Power: It is used to control the power by the base system to the receiver station in sleep state or the active state.

More: It is used to indicate the more frame if which is remaining. It has also contained the one bit length of the frame.

WEP: It is control the wired encryption privacy algorithm. It also occupied four bits of the frame.

Order: It is used to control the order of the frames. It also occupied four bits of the frame.

Duration: This is used to define the length of the frame and occupied the channel. It contains two byte of the frame.

Address 1: It is used define the destination address of the station. It occupied six bytes of the frame.

Address 2: It also occupied six bytes of the frame. Address two is used define the source address of the station.

Address 3: Address three is used define the destination address of the base station. It also occupied six bytes of the frame.

Sequence: It occupied two bytes of the frame. It is responsible sequencing the frame. First 12 bits identify the frame and last 4 bit is defining fragments.

Address 4: It also occupied six bytes of the frame. Address three is used define the source address of the base station.

Data: It also occupied 2312 bytes of the frame. It contains the user information.

Checksum: It is responsible for error, access and flow controlling of the frame. It occupied four bytes of the frame.[11]

 

*Wi-MAX:*-Wi-MAX is short name for Worldwide Interoperability of Microwave access. It is described in IEEE 802.16 Wireless Metropolitan Area Network standard. It is expected that Wi-Max compliant systems will provide fixed wireless alternative to conventional DSL and Cable Internet. As WiMAX networks are all-IP networks, voice services over WiMAX are implemented as Voice over IP (VoIP). The data rate generated by VoIP codecs differs from one codec to another, as there is a tradeoff between the voice quality, generated date rate and complexity of the codec. Since wireless resources are scarce, the need to deploy bandwidth efficient codecs with acceptable voice perception quality and moderate complexity is of great importance for WiMAX access networks. In addition, as digitized voice is packetized in small chunks the header overhead in VoIP is significant. In this paper, we examine the CS data rate required by a VoIP over Ethernet over WiMAX and IP over WiMAX flows. We compare the bandwidth requirements of all widely used codecs and analyze the performance of various rate reduction techniques (such as Voice Activity Detection and Header Suppression). As VoIP is expected to be a key application over WiMAX networks, this analysis is very important for network dimensioning and planning, call admission control and optimization of the application layer protocol implementation and parameterization. The transmissions are stronger and more stable because higher frequencies in the 10–66 GHz range can used, in which case, there is less interference and more bandwidth. On the other hand, NLOS service uses the 2–11 GHz range (similar to Wi-Fi) to transmit data because lower-wavelength transmissions are subject to fewer disruptions from physical obstructions. This is an improvement from earlier wireless technologies local multipoint distribution system and multichannel multipoint distribution system which were unable to provide NLOS service Wi-MAX layered protocol Architecture:- (11)

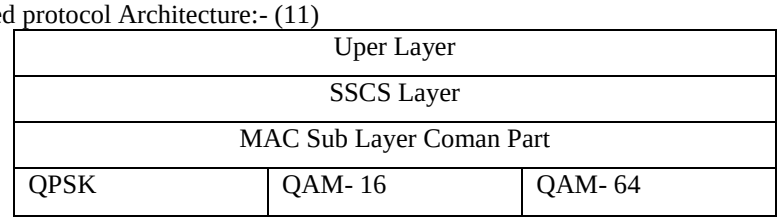


Figure 4 Layer Protocol Stack

**Wi-MAX** range depends upon connectivity if the connection is with Line of Sight. It can increase from up to 75 miles. Wi-MAX offers a solution called "Last mile" it can be used as alternative of cable and DSL internet access. Wi-MAX can provide data rate up to 70Mbps from larger distances which can be reached up 30 miles. Wi-MAX operates on two frequencies. IEEE 802 is very flexible standard and provides standard addresses frequencies ranges from 10 GHz to 66 GHz. IEEE 802.16 standard frequency stats that it will also support low latency applications like internet, video, voice all together. We will have idea until now that Wi-MAX is not yet as commercialized as Wi-Fi. (12) Wireless mesh networks comprise two types of nodes: mesh routers and mesh clients. In addition to providing the routing capability for gateway/bridge functions as in a conventional wireless router, mesh routers contain additional routing protocols to support multiple hops in a wireless mesh network.

Generic Frame

The first bit of each frame is indicating that the frame is Generic or Request Frame. If the first bit is 0 than the frame is Generic frame and if the bit is 1 than the frame is Request frame.

EC: It is used to define the payload is encrypted or not if bit is 1 than the payload is encrypted else not. It contains 1 bit length of the frame.

Type: This field is identified that the frame is packet or fragmented. It occupied the sit bits of the frame length.

Reserve: This 1 bit is reserved for future.

CI: It is used to indicator as the final checksum is present or absent if bit is 1 than the checksum is present else not. It also consumes 1 bit length of frame.

Reserve: This 1bit is also reserved for future use.

Length: It explains the complete length of the frame included header. It is occupied the 11 bit of frame.

Connection ID: It explains the type of connection which is belonging to the frame. It is occupied the 16 bit of frame.

Header CRC: It defines the only header CRC and reserve 8 bits length of frame.

Data: It is variable length of data or information.

CRC: It defines the CRC and occupied length is 4 bits.

Bandwidth Request Frame

In case bandwidth request frame the first bit is 1. It is defines only extra one field that is byte needed. It defines the required data length.

Byte Needed: This field is defines the required length.[13]

## II. CONCLUSIONS

This is a review on Bluetooth, Wi-Fi and Wi-Max. In this paper we describe the brief introduction to the many challenges in the Bluetooth, Wi- Fi and Wi-Max technologies which is faces if it is to succeed as a technology for building PAN adhoc networks, LAN network and MAN network. We have described many of the issues that need to be tackled and that have been left unspecified by the current standards. We identified a number of objectives that any solution should aim at meeting and provided an initial investigation of some of these problems. This is obviously preliminary work and we are actively investigating many of the problems outlined in this paper. We hope that the paper will also entice others in exploring what we feel is a promising and rich research area.

 

**REFERENCES**

[1] Chou C. M., Li C. Y., Chien W. M. and Lan K. c. "A Feasibility Study on Vehicle-to-Infrastructure Communication WiFi vs. WiMAX". Proc. in IEEE DOI 10.1109/MDM.2009.127 0-7695-3650 pp. 397-978 (2009)

[2] Ghazisaidi N., Kassaei H. and Bohlooli M. S. "Integration of Wi-Fi and Wi-Max Mesh Networks". Proc. in IEEE, Vol.5: ISBN: 978-0-7695-3667 pp. 1-6 (2008).

[3] Henry P. S. and Luo H. "Wi-Fi what's Next?" Proc. in IEEE, Vol.40: ISSN: 0163-6804 pp. 66-72 (2002).

[4] Mahasukhon P., Hempe M., Ci S. and Sharif, "Comparison of Throughput Performance for the IEEE 802.11a and 802.11g Networks". Proc. in IEEE 0-7695-2846 pp. (2007)

[5] Ming C. C., Yuan L. C., Chien W., M. and chan K. "A Feasibility Study on Vehicle-to-

[6] Infrastructure Communication Wi-Fi vs. Wi-Max". Proc. in IEEE, Vol.1: ISBN: 978-0-7695-3650-7 pp. 397-398 (2009).

[7] Nasser A., Abdullah M., Moinudeen H. and Khateeb W. "Scalability and Performance Analysis of IEEE 802.11a". Proc. in IEEE 0-7803-8886 pp. (2005)

[8] Petajasoja S., Takanen A., Varpiola M. and Kortti H. "Case Studies from Fuzzing Bluetooth, Wi-Fi and Wi-Max". Proc. in Securing Electronic Business Processes Vieweg, Vol.2: ISBN: 978-3-8348-0346-7 pp.188-195 (2007).

[9] Rajasekhar S., Khalil I. and Tari Z. "A Scalable and Robust QoS Architecture for Wi-Fi P2P Networks" Proc. in Springer Verlag Berlin Heidelberg, Vol.3347: ISBN 978-3-540-24075-4 pp. 65–74 (2004).

[10] Shuaib K. A. "A Performance Evaluation Study of WiMAX Using Qualnet". Proc. in WCE Vol I ISBN: 978-988-17012 pp. 5-1 (2009)

[11] Shukla P. K, Silakari D. S, Bhadoria S. D. and Garg. "Multi-User FPGA An Efficient Way of Managing Expensive FPGA Resources Using TCP/IP, Wi-Max/ Wi-Fi in a Secure Network Environment". Proc. in IEEE, Vol.9: ISBN: 978-0-7695-3099-4 pp. 609-614 (2008).

[12] Tananbaum A.S. "Computer Networks". 4th ed. Pearson Education, Inc. Publishing as Prentice Hall PTR ISBN: 0-13-066102-3 (2007)

[13] Tang H., You Y., Rong C.W. and Shiang C. R. "An Integrated Wi-Max and Wi-Fi Architecture with QoS Consistency over Broadband Wireless Networks". Proc. in IEEE, Vol.18: ISBN: 978-1-4244-2308-8 pp. 1-7 (2009).

[14] W. Stallings, Wireless Communications and Network. Prentice Hall, (2002)

 