

Smart Cities: The Support for Internet of Things (IoT)

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Abstract— With the envision of the honorable prime minister to develop the smart cities in every state of India, the internet of things will finding its ground in support of the cause. It involves the everyday life get equipped with various heterogeneous gadgets like microcontrollers, trans-receivers for various digital communication and suitable network protocols for communication. This paradigm finds discipline in the field of medical aids, mobile health care, electricity grid system to surveillance cameras, home appliances etc. the paper discuss and suggest the various challenges, technologies and protocols used by IoT in building the smart cities. The papers aims at discussing the challenges and the possible outcomes for the IoT replacing the existing technologies for the Smart cities networks.

Keywords— Smart Cities, IoT, network architecture, sensor networks, WBAN.

I. INTRODUCTION

Business Process Management is rapidly changing by the spectacular growth of event data. Without using the recent drive for interaction among the various heterogeneous devices with single protocol stack is something requires a concept like Internet of Things (IoT). The Internet of things is an environment in which any object like animals, human being, gadgets provided with unique identifiers can communicated among themselves. The communication can refer to as human to machine interface or machine to machine (M2M). The interface is a converging technology involving Micro-electrochemical system (MEMS) and the internet for communication either can be wired or wireless. The objects have some micro devices installed with unique IP addresses to communicate information across the Internet. This knowledge sharing make them fall under the concept of Smart Systems. The Smart Systems either can be smart grid, smart label or a smart meter, but with the heterogeneous field of application make the identification of the solution for all the problems is a challenge. This will lead to various projects being floated to government agencies like Department of Science & Technology (DST), Department of Electronics & Information Technology (DeitY) to adopt

the ICT solution for the various public affairs management coined as concept known as “Smart City”. With no Formal definition proposed for the Smart Cities, the concept aims at enhancing the quality, performance and interactivity of the urban services with reduction in costs and the resource requirement. The technology has found its ground in various sectors like health care, irrigation, harvesting and waste management. The technologies & application refers to promote the IoT concept must involve the local and regional administrations so that the idea is easily adopted [7]. However, the framework in supporting the technology on various heterogeneous platform need to work and a generalized reference framework must be suggested in supporting the various service sector. The major sector like health care where the patient information requires large amount of data for specific time frame improves the quality output. Also the use of the sensor actuators like diabetes dozers and the heart pacemaker can accustom themselves as per the body parameters.

The paper objective lies in discussing the framework & the related for design the urban IoT support in health care network. The major networks types mostly involve with the health care is IEEE 802.15.4 aiming at Wi-Fi & Ethernet Technology. The paper also review the web based approach for the design of IoT services for the health care and further improvisation done to the approach selected.

II. SMART CITY: URBAN HEALTH CARE

The heath care with various wearable computing device is gaining the momentum in the last few years. With almost 13.45 million of the world population health is monitored though these devices in 2013, the business is expected to reach 51.23 million users in the year 2016[3]. The projections also emphasized on the frequently detected health care problems like diabetes, blood pressure, heart rate, respiration, blood pressure, oxygen, movement, and temperature can be monitored through either cloud services or through actuators

devices. The second category is requires the devices to be smart enough to generate the real time signals or response for the health abnormalities founded. However with extensive use of such devices the underlying technology remains untouched. The Technology make use of IEEE 802.15.4 or IEEE 802.15.6. The framework includes the urban IoT network developed over the link layer technologies with support to various heterogeneous set of devices. The standards are the approach for designed by IETF forum for IoT with promising literature review of the same. The further section discussed the same and their usage in health care industry.

III. IOT ARCHITECTURE FOR HEALTH CARE

A. WBAN Technology

The IOT architecture make use of IEEE 802.15.6 standards commonly known as Wireless Body Area Network (WBAN). The aim of the IEEE 802.15.6 network was to develop low power devices that are deployed or implanted into the human body to serve a variety of medical cases. The IEEE 802.15.6 standards defines a medium access control (MAC) layer that supports several physical (PHY) layers including narrow band(NB), ultra-wideband (UWB) and human body communications (HBC) Layer. The band is further subdivided into various types as shown in table [1]:

TABLE 1: IEEE 802.15.6 FREQUENCY BANDS[7]

S.no.	Band Type	Range(in MHz)
1.	Medical Implant Communication Services(MICS)	402-405
2.	Wireless Telemetry Service (WMTS)	420-450
3.	Industrial Scientific Medical(ISM)	902-928

With the short range for MICS and WMTS, high interference for ISM working as IEEE 802.11 and IEEE 802.13.4 standards operate in the same frequency range. The MAC layer Frame Format consisting of a 56-bit header, a frame body of variable length generally 255 octets and an 18-bit Frame checker sequence. The MAC header is further divided into the following sub-components figure [1]

1. Frame Control – 32 bit
2. Recipient ID – 8 bit
3. Sender ID – 8 bit
4. WBAN Id – 8 bit.

The MAC format can be further studied for the communication frames and the superframe boundaries.

MAC Header	MAC FRAME	Frame Check
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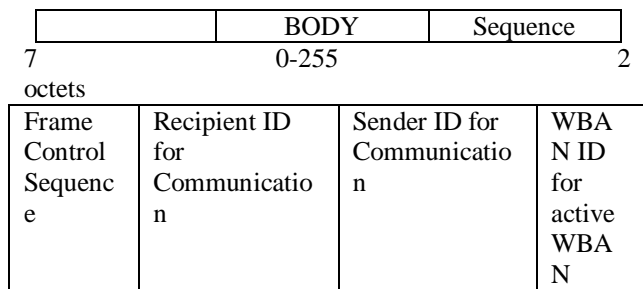


Figure 1. IEEE 802.15.6 MAC format [1]

IV. FUTURE TREND OF IEEE 802.15.6 (WBAN)

With the framework discussed in the previous section, the new research opportunities will be created which requires the effective technologies belonging to communication & computing comes together. The technologies can either be deployed through web based protocols or through the distributed network, but the implantable devices can be experimented with the web based protocols efficiently. Beside medical, the same technology can be extended to motion gaming, creating virtual reality manpower for the medical ailments. The real advantage for WBAN can be seen in diagnosing the Brain diseases which currently is an unexplored area for computing agencies.

V. CONCLUSION

In the age of interoperable devices and the wearable computing gaining the market, the technologies pertaining to low level energy consumption is required. The WBAN technology refers to such technology with gadgets being implanted in living bodies for communication. The paper discussed the MAC layer format for the IEEE 802.15.6 or WBAN technology and its possible usage in smart technology networks.

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