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Green IOT Schemes

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Abstract

Internet of things is the technology which enables to communicate with various objects present in the world without a human intervention. The Objects communicate directly between each other and can save the communication energy with a user in case of application of Green IOT. Green IOT is the term used for collective technologies of IOT where in components gets recycled and reused number of times. In this paper we are discussing some overview of the Green IOT Technology and its components.

Keywords: *GPS, Wi-Fi, GPS Repeaters, RFID etc*

INTRODUCTION

With the quick advancement of science and Innovation, the world is getting to be "astute". Living in such a brilliant world [1], individuals will be naturally and cooperatively served by the hi-fi gadgets (e.g., watches, cell phones, PCs), keen transportation (e.g., autos, transports, trains), savvy environments (e.g., homes, workplaces, manufacturing plants), and so forth [1].

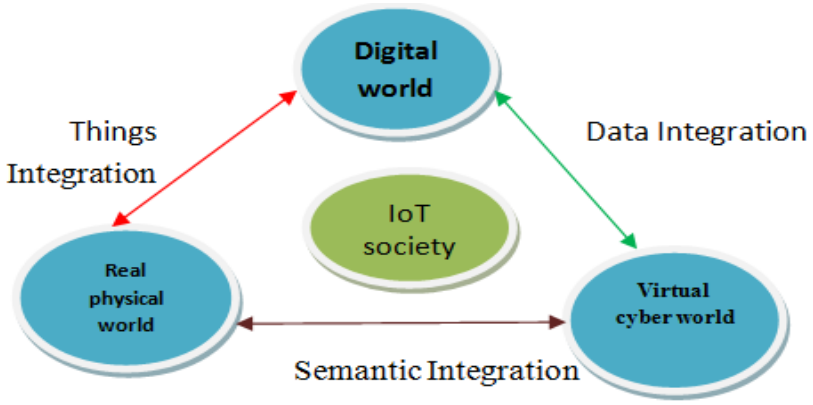

Fig.1*- Internet of things*

The power and excellence of Smart World comprise in its ability to union three unique universes as one incorporated entire: an Eco World, Digital World, and Social World. It in this manner brings together the natural standards of the eco world advancement, the innovative standards of the data world improvement, and the social standards of the human world development [2].

We have arranged this review paper into 7 sections as Introduction, Elements in IOT depicting its elementary classification, ICT Green IOT depicting technologies with classification, MAC protocols for energy saving in WSN describing various protocols, Applications of Green IOT and

Challenges in Wider Technologies for Green IOT.

ELEMENTS IN IOT

The Internet of Things (IoT) is a novel paradigm that is rapidly gaining ground in the scenario of modern wireless telecommunications. The basic idea of this concept is the pervasive presence around us of a variety of things or objects such as Radio-Frequency Identification (RFID) tags, sensors, actuators, mobile phones, etc. which, through unique addressing schemes, are able to interact with each other and cooperate with their neighbors to reach common goals [3]. Further green IoT targets at a sustainable smart world, by reducing the energy consumption of IoT.

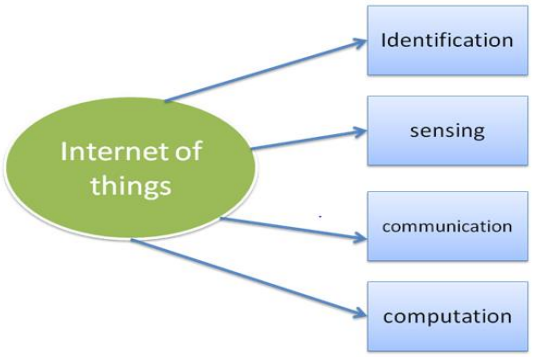

Fig.2*- Elements in IoT*

IDENTIFICATION

This is one of the important steps in this process which is used to identify the device and provide the required service to the IoT network. It is used to identify the objects in the network as electronic product codes (EPC) and ubiquitous codes (uCode).

SENSING

This is used to collect data from different objects in the network and send it to the database. The collected data is used to take the required action. Various sensors are existing in the market such as smart sensors, etc.

COMMUNICATION

Communication is the manner in which we connect and communicate different elements in the IoT network. IoT devices have low power and noisy communication linkage. RFID is the first technology used for Machine to machine communication. Wi-Fi is a communication technology used to swap over data in 100 m range.

COMPUTATIONS

Hardware like microcontrollers, microprocessors, and software applications are used for the computations in the IoT network. Various Hardware and Software platforms have been developed for this purpose such as Arduino, Raspberry PI, etc. and Software platforms such as RTOS operating System. TinyOS, LiteOS, and RTOS are different lightweight OS that is designed for IoT environments.

ICT GREEN IOT

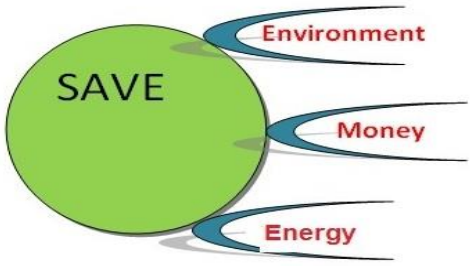

Fig.3*- ICT Green IoT*

GREEN RFID

RFID system is composed of one or more reader(s) and numerous RFID tags. Tags

are characterized by a definite address and are applied to objects. Tags use radio-frequency electromagnetic fields to transfer data attached to an object. The tags contain electronically stored information which can be read by the RFID reader when the object comes in the immediacy of the reader [4].

For green RFID 1) Reducing the sizes of RFID tags should be considered to decrease the amount of non-degradable material used in their manufacturing (e.g., biodegradable RFID tags, printable RFID tags, paper-based RFID tags), because the tags themselves are difficult to recycle generally 2) Energy efficient algorithms and protocols should be used to optimize tag estimation, adjust transmission power level dynamically, avoid tag collision, avoid overheating, etc.

GREEN WSN

A wireless sensor network (WSN) is a large network of sensor nodes which are deployed over an area to perform local computations based on information gathered from the surroundings. Each node in the network is equipped with a battery, but it is very difficult to change or recharge batteries. A commonly used commercial WSN solution is based on the IEEE 802.15.4 standard, which covers the physical and medium access control (MAC) layers for low-power and low-bit-rate communications.

The two main enabling techniques for energy consumption namely: duty cycling and data-driven approaches. Duty cycling is mainly focused on the networking subsystem. The most effective energy-conserving operation is putting the radio transceiver in the (low-power) sleep mode whenever communication is not required. Ideally, the radio should be switched off as soon as there is no more data to send/receive and should be resumed as soon as a new data packet becomes ready. In this way, nodes alternate between active and sleep periods depending on network activity. Duty cycle is defined as the fraction of time nodes which are active during their lifetime [5].

Regarding green WSN, the subsequent techniques ought to be adopted [6]. 1) create device nodes solely work once necessary, whereas disbursement the remainder of their lifespan during a sleep mode to save lots of energy consumption 2) Energy depletion (e.g., wireless charging, utilizing energy gather mechanisms that generate power from the surroundings (e.g., sun, K.E., vibration, temperature differentials, etc.) 3) Radio optimisation techniques (e.g., transmission power management, modulation optimisation, cooperative communication, directional antennas, energy-efficient psychological feature radio (CR) 4) knowledge reduction mechanisms (e.g., aggregation, adaptative sampling, compression, network coding) 5) Energy-efficient routing techniques (e.g., cluster architectures, energy as a routing metric, multipath routing, relay node placement, node mobility).

MAC PROTOCOLS FOR ENERGY SAVING IN WSN

The typical contention-based MAC protocols are S-MAC (Sensor-MAC), T-MAC (Timeout-MAC) [7], and U-MAC (Utilization-MAC). TDMA Based MAC Protocols In contrast to contention-based MAC protocols, the scheduling based TDMA technique offers an inherent collision-free scheme by assigning a unique time slot for every node to send or receive data. The first advantage of TDMA is that interference between diminished. Secondly, TDMA can solve the hidden terminal problem without extra message overhead because neighboring nodes transmit at different time slots. Main TDMA-based MAC protocols include μ-MAC (Energy-efficient MAC), SPARE

MAC (Slot Periodic Assignment for Reception MAC).

μ- MAC

The μ-MAC [8] is projected to get high sleep ratios whereas conserving the message latency and dependableness at a suitable level. The μ-MAC assumes one time slotted channel as shown in Figure. Protocol operation alternates between a competition and a contention-free amount. The competition amount is employed to make a constellation and to initialize transmission sub-channels. The μ-MAC differentiates between 2 categories of sub-channels: general traffic and sensing element reports. Within the μ-MAC protocol, the competition amount incurs giant overhead and must occur oft.

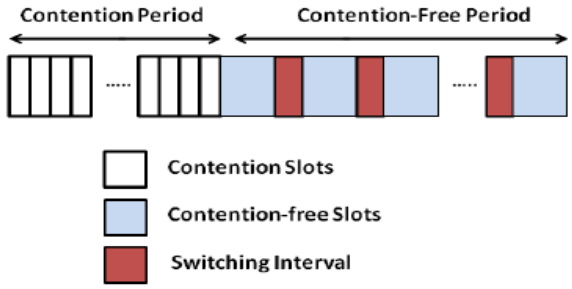

Fig.4*- Time Slot Organization*

SPARE-MAC

SPARE mac may be a TDMA based mostly raincoat protocol for knowledge diffusion in WSNs. The core plan of SPARE mac is to save lots of energy through limiting the impact of idle listening and traffic overhearing. To appreciate the goal, SPARE mac utilizes a distributed programing resolution, that assigns specific radio resources (i.e., time slots) to every sensing element node for the reception, termed as Reception Schedules (RS), and spreads the knowledge of the assigned RS to neighboring nodes. A sending node will consequently become active in correspondence with the RS of its receiver [8].

GREEN ICT IDEOLOGY

- T urn off facilities that are not needed.
- S end only data that are needed.
- M inimize the length of the wired data path.
- M inimize the length of the wireless data path.
- T he trade off processing for communications.
- A dvanced communication techniques.
- Renewable green power sources.

APPLICATION

- Smart Home: In the present instance, based on the weather forecast information, a smart home can automatically lower the blinds of windows or even set the room temperature accordingly.
- Industrial Automation: The need for automation in every industry is growing as technology is taking inroads, with a minimal human involvement, and super computers taking their tasks and achieving greater efficiency and functionalities
- Smart Healthcare: Performance of healthcare applications is improved, by embedding sensors and actuators in patients and their medicine for monitoring and tracking patients.
- Smart Grid: Control providers are helped to control and oversee assets with the goal that power can be offered relatively to the public development. Subsequently, the energy utilization of houses and structures could be improved.
- Smart City: Quality of life in the city is ameliorated, by making it more convenient and easier for the residents to obtain information of interest

CHALLENGES IN WIDER TECHNOLOGIES

Energy issues such as energy harvesting and low-power chipsets are central to the development of the IoT. There is a need to research and develop solutions in this area, having as objective a level of entropy as close as possible to zero. Current technology seems inadequate for the processing power and energy limitation of the forthcoming future.

The development of new and more efficient and compact energy storage like batteries, fuel cells, and printed/polymer batteries etc; as well as new energy generation devices coupling energy transmission methods or energy harvesting using energy conversion will be the key factors for implementing autonomous wireless smart systems.

CONCLUSION

We discussed overview of IoT and green IoT, various technologies which plays an important role in achieving a sustainable smart world. The technologies connected to green IoT (e.g., green RFID, green WSN) have been introduced and few energy saving WSN protocols have been discussed with green ICT ideology. The main challenge have come across by these technologies is security of the information and energy issues. Future research directions of green IoT have been presented.

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