

A Review on IOT Based Home Automation Techniques

Deepak Mehar¹, Dr. Roopam Gupta², Dr. Anjana Pandey³

^{1,2,3}Department of Information Technology, Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal, INDIA

ABSTRACT

In this survey, paper discuss the techniques of communication in internet of things (IoT). Many times it is needed not only to send data to one IoT device to another IoT device in different network topologies like PAN, CAN etc. In this survey paper discuss the different IoT devices and its communication system. There are different type security challenges occurs in IoTs based network like Security, Privacy, Interoperability / Standards and Legal, Regulatory and Rights. Also discuss the different previous year works in IoT devices

and networks. Compare different previous work of IoT on the basics of devices used and devices applications in tabular form. This table helpful to understand the previous work and its advantages. In the IoT network there are different type of device are used like zig-bee, internet protocol (IP) camera, radio frequency and others.

Keywords-- PAN, Router, Wi-Fi module, Arduino board, PCB Micro controller.

I. INTRODUCTION

The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it" was Mark Weiser's central statement in his seminal paper in Scientific American in 1991. There is a sea change in human's daily life as well as in working conditions in organizations after the arrival of IT and ITeS technologies. This is becoming well-known concept across many horizontal and vertical markets including a common man's everyday life in the society, as it has several applications. The development of the Internet of Things [IoT] has been primarily driven by needs of large corporations that stand to benefit greatly from the foresight and predictability afforded by the ability to follow all objects through the commodity chains in which they are embedded [1]. The ability to code and track objects has allowed companies to become more efficient, speed up processes, reduce error, prevent theft, and incorporate complex and flexible organizational systems through IoT. The IoT is a technological revolution that represents the future of computing and communications, and its development depends on dynamic technical innovation in a number of important fields, from wireless sensors to nanotechnology. They are going tag the each object for identifying, automating, monitoring and controlling.

The Internet of things is a novel outlook change in it range. The expression "Internet of things" which is additionally quickly understood as IoT is authored from the two sayings i.e. the principal expression is "Internet" and the second one expression is "things". The Internet is an overall gadget of interconnected tablet arranges that utilization the standard Internet convention suite (TCP/IP) to serve billions of clients worldwide. it's miles a system of systems that incorporates a huge number of individual, open, instructional, undertaking, and specialists systems, of adjacent to overall extension, which are associated by utilizing a wide exhibit of electronic, remote and optical systems administration advancements [3]. These days more than a hundred countries are connected into trades of realities, data and assessments by means of Internet. With regards to Internet global measurements, as of December 31, 2011 there has been an expected 2, 267, 233, 742 net clients worldwide from the all inclusive guide range. This demonstrates 32.7% of the segment's all inclusive community is the use of net. Indeed, even net is going into range through cisco's net directing in territory (iris) application inside the coming fourth years. While going to the things that can be any question or person which can be discernible by methods for the genuine global. ordinary items incorporate never again best electronic devices we experience and utilize each day and mechanically unrivaled stock which incorporate gear and contraptions, however "matters"

II. INTERNET OF THINGS (IOT)

that we don't do commonly consider as advanced in any regard—comprehensive of suppers, apparel; and apparatuses; materials, parts and device, stock and concentrated articles; milestones, landmarks and works of fine art and all the randomness of business, way of life and class [4]. that implies ideal here things might be each abode things like individual, creatures cow, calf, canine, pigeons, rabbit et cetera., plants—mango tree, jasmine, banyan et cetera and nonliving things like seat, icebox, tube gentle, drape, plate and so forth any home machines or endeavor gear. So now, matters are genuine devices on this physical or fabric worldwide. The satisfactory definition for the Internet of things would be: "an open and complete system of brilliant things which have the capacity to vehicle-mastermind, rate information, information and sources, responding and acting in face of conditions and changes in the earth.

III. TECHNICAL CHALLENGES

Five key IoT issue regions are examined to discover a number of the most urgent challenges and questions associated with the era. Those include protection; privacy; interoperability and requirements; legal, regulatory, and rights; and rising economies and development. Those issues may be defined as follows:

1. Security
2. Privacy
3. Interoperability / Standards
4. Legal, Regulatory and Rights
5. Emerging Economy and Development Issues

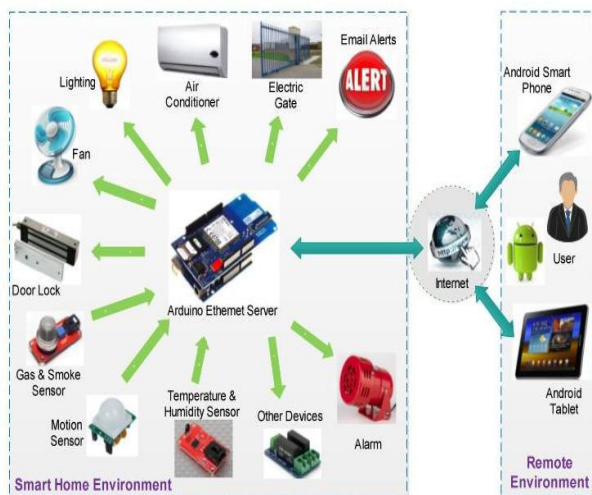


Fig. 1.1 Shows the IoT Device Connection

1. Security

While security contemplations aren't new inside the context of insights era, the characteristics of numerous IoT usage display new and exact assurance challenges. Tending to those difficulties and ensuring security in IoT

administrations and items must be a basic priority. Clients need to acknowledge as valid with that IoT contraptions and related insights administrations are comfortable from vulnerabilities, specifically as this era develop to be more inescapable and included into our day by day lives. Ineffectively secured IoT gadgets and administrations can fill in as capacity get to focuses for digital strike and uncover individual truths to burglary by leaving measurements streams insufficiently covered.

2. Privacy

The full limit of the Internet of things relies on upon methodologies that acknowledge individual protection determinations all through an immense range of anticipations. The measurements streams and purchaser specificity managed by methods for IoT devices can free super and one of a kind cost to IoT clients, however issues about security and potential damages may keep returned finish appropriation of the Internet of things. Due to this protection rights and respect for client security desires are quintessential to ensuring customer trust and certainty inside the net, connected gadgets, and related offerings.

3. Interoperability / requirements

A fragment situation of exclusive IoT specialized executions will repress an incentive for clients and undertaking. indeed, even as total interoperability all through administrations and items is not generally conceivable or essential, customers might be reluctant to purchase IoT administrations and items if there is coordination rigidity, high ownership many-sided quality, and circumstance over merchant secure.

4. legal, regulatory and rights

The utilization of IoT devices raises numerous new administrative and criminal inquiries notwithstanding enhance current jail inconveniences over the Internet. The inquiries are broad in scope, and the rapid rate of trade in IoT era consistently outpaces the capability of the related scope, lawful offense, and administrative frameworks to adjust.

5. Emerging economy and development troubles

The Internet of things holds mammoth guarantee for handing over social and budgetary advantages to developing and developing economies. This incorporates territories including maintainable horticulture, water fine and utilizes medicinal services, industrialization, and ecological control, among others. In that capacity, IoT holds guarantee as a device in achieving the unified countries economical advancement dreams.

IV. LITERATURE SURVEY

In 2013, Jayavardhana Gubbi, Rajkumar Buyya, Slaven Marusic, Marimuthu Palaniswami proposed in there paper "**Internet of Things (IoT): A vision, architectural elements, and future directions**". Consistent with their work ubiquitous sensing enabled via Wi-Fi sensor network (WSN)

technologies cuts across many areas of contemporary day living. This offers the capacity to measure, infer and apprehend environmental indicators, from sensitive ecologies and natural sources to urban environments. The proliferation of these devices in a communicating-actuating community creates the internet of factors (IoT), wherein sensors and actuators blend seamlessly with the surroundings round us, and the facts is shared throughout platforms which will expand a not unusual running photograph (cop). Fueled by way of the latest version of a variety of enabling wireless technology consisting of RFID tags and embedded sensor and actuator nodes, the IoT has stepped out of its infancy and is the following modern generation in remodeling the net into a totally included destiny net. As authors circulate from www (static pages internet) to web2 (social networking net) to web3 (ubiquitous computing net), the want for facts-on-demand using sophisticated intuitive queries increases drastically. This studies provides a cloud centric imaginative and prescient for worldwide implementation of net of things. The key allowing technology and alertness domains that are probably to force IoT research within the near destiny are mentioned. a cloud implementation the usage of areca, that's based totally on interplay of private and public clouds, is supplied. Authors finish our IoT imaginative and prescient through increasing at the want for convergence of WSN, the net and distributed computing directed at technological studies network. The proliferation of devices with speaking-actuating skills is bringing nearer the vision of an internet of factors, wherein the sensing and actuation capabilities seamlessly mixture into the heritage and new abilities are made viable thru get entry to of rich new facts resources. The evolution of the following generation cell device will rely on the creativity of the customers in designing new packages. IoT is an ideal rising technology to influence this area with the aid of providing new evolving facts and the desired computational sources for growing revolutionary apps. Offered here's a user-centric cloud based model for coming near this purpose via the interaction of personal and public clouds. On this way, the needs of the end-user are delivered to the fore. allowing for the important flexibility to fulfill the numerous and occasionally competing wishes of various sectors, authors advise a framework enabled with the aid of a scalable cloud to offer the capacity to utilize the IoT. The framework permits networking, computation, and storage and visualization subject matters separate thereby permitting impartial growth in each area however complementing every other in a shared environment. The standardization that's underway in every of these subject matters will now not be adversely affected with cloud at its middle. In offering the brand new framework related demanding situations were

highlighted starting from suitable interpretation and visualization of the significant quantities of facts, thru to the privations, safety and information control issues that have to underpin the sort of platform so as for it to be certainly feasible. The consolidation of worldwide initiatives is quite truly accelerating development toward an IoT, providing an overarching view for the mixing and functional elements that could supply an operational IoT.

In 2014, Chong Tang, Lixing Song, Jagadeesh Balasubramani, Shaoen Wu, Saâd Biaz, Qing Yang, and Honggang Wang presents there paper "**Comparative Investigation on CSMA/CA-Based Opportunistic Random Access for Internet of Things**". According to their work wireless communiqué is crucial to net of factors (IoT). service sensing a couple of get right of entry to collision avoidance is a properly-demonstrated Wi-Fi random get admission to protocol and lets in each node of identical chance in accessing Wi-Fi channel, which incurs identical throughput in long term regardless of the channel conditions. To exploit node diversity that refers to the difference of channel circumstance amongst nodes, this paper proposes opportunistic random get right of entry to mechanisms: overlapped competition and segmented competition, to favor the node of the great channel circumstance. Within the overlapped rivalry, the competition windows of all nodes percentage the identical ground of 0, however have distinctive top bounds upon channel condition. Inside the segmented rivalry, the competition window top bound of a better channel condition is smaller than the lower certain of a worse channel situation; particularly, their rivalry home windows are segmented with none overlapping. Those algorithms also are polished to offer temporal fairness and avoid ravenous the nodes of terrible channel situations. The proposed mechanisms are analyzed, implemented, and evaluated on a Linux-primarily based check bed and in the ns3 simulator. Massive comparative experiments show that each opportunistic answer can appreciably improve the network performance in throughput, postpone, and jitter over the current CSMA/CD protocol. Specifically, the overlapped rivalry scheme can offer seventy three. 3% and 37.5% throughput upgrades in the infrastructure-primarily based and advert hoc networks, respectively. IoT requires effective medium access protocols for wireless communiqué. This paintings proposes opportunistic random get admission to variants to take advantage of node diversity in wireless networks. These algorithms enable nodes to get admission to the shared wireless channel primarily based on their channel conditions in order that the node at the very best doable bit charge is preferred. To keep away from ravenous nodes with poor channel conditions, a slow filtering scheme are proposed to keep temporal equity among nodes. with

substantial experiments on a advanced Linux-based take a look at bed and the ns3 community simulator, the proposed opportunistic access schemes notably enhance the network overall performance in throughput, put off, and jitter, that can provide widespread blessings for helping future IoT programs.

In 2014, John A. Stankovic presented his paper **“Research Directions for the Internet of Things”**. According to his work many technical communities are vigorously pursuing studies topics that make a contribution to the internet of factors (IoT). Nowadays, as sensing, actuation, conversation, and control turn out to be ever more sophisticated and ubiquitous, there may be sizeable overlap in these communities, on occasion from slightly exceptional perspectives. Greater cooperation among groups is advocated. To provide a foundation for discussing open studies issues in IoT, a vision for how IoT ought to exchange the arena in the remote future is first provided. Then, 8 key research topics are enumerated and studies troubles inside the ones subjects are discussed. IoT turns into a software with improved sophistication in sensing, actuation, communications, manage, and in growing information from substantial amounts of data. This will result in qualitatively distinctive life from these days. What the life would be is every body’s guess. It might be honest to mention that we can’t are expecting how lives will exchange. We did no longer expect the internet, the web, social networking, face book, twitter, hundreds of thousands of apps for clever telephones, and so forth, and those have all qualitatively changed societies’ way of life. New research troubles stand up due to the huge scale of gadgets, the relationship of the bodily and cyber worlds, the openness of the structures of structures, and persevering with troubles of privacy and protection. Its miles was hoping that there is greater cooperation between the research communities so one can remedy the myriad of problems sooner in addition to avoid re-inventing the wheel whilst a particular community solves a hassle.

In 2015, Hemant Ghayvat, Subhas Mukho padhyay, Xiang Gui and Nagender Surya devara proposed their paper **“WSN- and IOT-Based Smart Homes and Their Extension to Smart Buildings”**. Their studies approach is to design and expand reliable, efficient, flexible, low-cost, real-time and practical well being sensor networks for smart home systems. The heterogeneous sensor and actuator nodes based totally on Wi-Fi networking technologies are deployed into the house environment. These nodes generate actual-time information related to the item utilization and motion in the home, to forecast the wellness of an individual. Here, health stands for how successfully a person stays suit inside the home surroundings and plays his or her each day recurring with a purpose to live a long and healthy lifestyles. We provoke the studies with the

improvement of the clever home method and implement it in distinct home conditions (special houses) to display the interest of an inhabitant for health detection. additionally, our research extends the smart home gadget to smart homes and fashions the layout problems associated with the clever building surroundings; those layout issues are connected with device overall performance and reliability. This research paper additionally discusses and illustrates the possible mitigation to deal with the ism band interference and attenuation losses without compromising most useful gadget performance.

V. TECHNOLOGIES

The internet of things [15] turned into to start with inspired through individuals of the RFID community, who mentioned the possibility of coming across facts about a tagged item by means of browsing an internet deal with or database access that corresponds to a selected RFID or close to field communication [16] technologies. In the studies paper “studies and application at the clever domestic based totally on factor technologies and net of factors”, the blanketed key technologies of IoT are RFID, the sensor generation, nano generation and intelligence embedded technology. Among them, RFID is the muse and networking middle of the development of net of things [17]. The Internet of things (IoT) enabled customers to deliver bodily objects into the field of cyber global. this changed into made feasible by exceptional tagging technology like NFC, RFID and second barcode which allowed physical items to be recognized and referred over the net [18]. IoT, that’s integrated with sensor generation and radio frequency generation, is the ever-present network primarily based at the omnipresent hardware sources of internet, is the net contents items together. It is also a brand new wave of it enterprise because the software of computing fields, conversation network and global roaming technology have been carried out. it involves similarly to state-of-the-art technologies of laptop and communication community outdoor, still which includes many new supporting technology of Internet of things, which include amassing records technology, faraway communiq  generation, faraway records transmission technology, sea measures statistics intelligence analyzes and controlling generation etc. [19].

5.1. Radio Frequency Identification (RFID)

Radio Frequency Identification (RFID) is a system that transmits the identity of an item or man or woman wirelessly the usage of radio waves within the form of a serial variety [20]. First use of RFID device turned into came about in 2nd world battle in Britain and its miles used for discovery of friend or foe in 1948. Later RFID generation is founded at auto-identity

middle in mit inside the year 1999. RFID technology performs a critical position in IoT for solving identification problems of objects round us in a fee effective way [5]. The era is assessed into 3 categories based totally on the technique of strength supply provision in tags: energetic RFID, passive RFID and semi passive RFID. The primary additives of RFID are tag, reader, and antenna, get entry to controller, software program and server. Its miles more reliable, efficient, secured, cheaper and accurate. RFID has an extensive range of wireless packages together with distribution, tracing, affected person monitoring, military apps and so forth [21].

5.2. Internet Protocol (IP)

Internet protocol (IP) is the primary community protocol used on the internet, developed in Nineteen Seventies. IP is the principal communications protocol inside the net protocol suite for relaying datagram's throughout network barriers. The two versions of net protocol (IP) are in use: IPv4 and IPv6. Each model defines an IP deal with in another way. Due to its occurrence, the conventional term IP deal with normally nonetheless refers back to the addresses described by using IPv4. There are five lessons of available IP tiers in IPv4: elegance a, magnificence b, class c, class d and sophistication e, whilst most effective a, b, and c are generally used. The actual protocol offers for four. Three billion IPv4 addresses even as the IPv6 will extensively increase the provision to 85,000 trillion addresses [22]. IPv6 is the 21st century net protocol. This supports round for 2128 addresses.

5.3. Electronic Product Code (EPC)

Electronic Product Code (EPC) is a 64 or 98 bit code electronically recorded on an RFID tag and meant to layout an improvement within the EPC barcode gadget. EPC code can store facts approximately the kind of EPC, unique serial quantity of product, its specs, producer facts etc. EPC became advanced via car-identity centre in met in 1999. EPCGLOBAL organization which is accountable for standardization of digital product code (EPC) technology, created EPCGLOBAL network, "EPC global Network", 2010] for sharing RFID statistics. It has 4 components namely object naming provider (ONS), EPC discovery provider (EPCDS), EPC records offerings (EPCIS) and EPC safety offerings (EPCSS).

5.4. Barcode

Barcode is only an extraordinary manner of encoding numbers and letters via the usage of aggregate of bars and areas of various width. Behind bars [23] serves its unique cause to be descriptive however isn't critical. Within the bar code e book, palmer (1995) recognizes that there are alternative techniques of data entry strategies. Quick response (QR) codes the trademark for a kind of matrix barcode first designed for the automobile industry in Japan. Barcodes are

optical device-readable labels attached to objects that report information related to the item. Recently, the qr code gadget has turn out to be popular outdoor the automobile enterprise due to its speedy clarity and greater garage potential compared to traditional. There are three forms of barcodes of alpha numeric, numeric and a couple of dimensional. Barcodes are designed to be device readable. Generally they are read by way of laser scanners, they also can be examining using a cameras.

5.5. Wireless Fidelity (Wi-Fi)

Wireless Fidelity (Wi-Fi) is a networking technology that allows computers and other devices to communicate over a wireless signal. Vic Hayes has been named as father of Wireless Fidelity. The precursor to Wi-Fi was invented in 1991 by NCR Corporation in Nieuwege in the Netherland. The first wireless products were brought on the market under the name Wave LAN with speeds of 1 Mbps to 2 Mbps. Today, there are nearly pervasive Wi-Fi that delivers the high speed Wireless Local Area Network (WLAN) connectivity to millions of offices, homes, and public locations such as hotels, cafes, and airports. The integration of Wi-Fi into notebooks, handhelds and Consumer Electronics (CE) devices has accelerated the adoption of Wi-Fi to the point where it is nearly a default in these devices [24]. Technology contains any type of WLAN product support any of the IEEE 802.11 together with dual-band, 802.11a, 802.11b, 802.11g and 802.11n. Nowadays entire cities are becoming Wi-Fi corridors through wireless APs.

5.6. Bluetooth

Bluetooth Wi-Fi technology is an inexpensive, brief-variety radio generation that gets rid of the need for professionals. Praetor cabling among gadgets consisting of pocket book pcs, hand held pcs, cameras, and printers and effective variety of 10 - 100 meters. and generally speak at much less than 1 mbps and Bluetooth makes use of specification of IEEE 802.15.1 trendy. In the beginning in 1994 Ericson cellular communication organization commenced mission named "Bluetooth". It's miles used for introduction of personal region networks (pan). A hard and fast of Bluetooth gadgets sharing a commonplace channel for communication is called piconet. This picoted is capable of 2 - eight gadgets at a time for data sharing, and that records may be text, image, video and sound. The Bluetooth unique hobby group accommodates more than one thousand businesses with Intel, cisco, hp, aruba, Intel, Ericson, IBM, Motorola and Toshiba.

5.7. ZigBee

Zig bee is one of the protocols evolved for enhancing the capabilities of Wi-Fi sensor networks. Zig bee era is created with the aid of the Zig bee alliance that's based inside the yr 2001. traits of Zig bee are low price, low statistics price, exceedingly brief

transmission range, scalability, reliability, bendy protocol layout. It's miles a low strength wireless community protocol primarily based at the IEEE 802.15.4 widespread [25]. zigbee has range of around one hundred meters and a bandwidth of 250 kbps and the topologies that it works are celebrity, cluster tree and mesh. It's miles widely used in home automation, digital agriculture, industrial controls, scientific monitoring & energy structures.

5.8. Near Filed Communication (NFC)

Near Field Communication (NFC) is a hard and fast of quick-variety wireless generation at thirteen.56 MHz, usually requiring a distance of four cm. NFC generation makes life less difficult and more handy for consumers around the sector via making it simpler to make transactions, exchange digital content, and connect electronic devices with a touch. lets in intuitive initialization of wireless networks and NFC is complementary to Bluetooth and 802.eleven with their lengthy distance skills at a distance circa up to ten cm. it also works in grimy surroundings, does not require line of sight, smooth and easy connection approach. Its miles first developed by way of Philips and Sony businesses. Information trade rate now days approximately 424 kbps. Power intake all through information reading in NFC is underneath 15ma.

5.9. Actuators

An actuator is something that converts strength into movement; this means that actuators power motions into mechanical structures. It takes hydraulic fluid, electric powered modern-day or some different supply of electricity. Actuators can create a linear movement, rotary movement or oscillatory movement. Cover short distances, normally as much as 30 ft and commonly communicate at much less than 1 mbps. Actuators commonly are used in manufacturing or commercial applications. There are three types of actuators are (1) electric: ac and dc automobiles, stepper cars, solenoids (2) hydraulic: use hydraulic fluid to actuate motion (three) pneumatic: use compressed air to actuate motion. Most of these 3 sorts of actuators are very a lot in use nowadays. Amongst those, electric powered actuators are the maximum typically used kind. Hydraulic and pneumatic systems allow for extended pressure and torque from smaller motor.

5.10. Wireless Sensor Networks (WSN)

A WSN is a Wi-Fi community consisting of spatially disbursed self sustaining devices the use of sensors to cooperatively monitor bodily or environmental conditions, inclusive of temperature, sound, vibration, stress, motion or pollution, at exclusive locations Fashioned by hundreds or hundreds of motes that talk with every other and skip data along from one to any other. a wireless sensor network is an important detail in IoT paradigm. Sensor nodes might

not have international identification due to the big quantity of overhead and large wide variety of sensors. WSN primarily based on IoT has acquired first-rate interest in many regions, which includes navy, hometown protection, healthcare, precision agriculture monitoring, production, habitat monitoring, forest hearth and flood detection and so on [26]. Sensors mounted to a affected person's frame are tracking the responses to the medicine, in order that docs can degree the consequences of the drugs [27].

5.11. Artificial Intelligence (AI)

Artificial intelligence refers to digital environments which can be sensitive and conscious of the presence of human beings. In an ambient intelligence global, gadgets work in live performance to aid human beings in sporting out their normal existence sports in easy, herbal way using facts and intelligence this is hidden in the network related gadgets. it's miles characterized by way of the subsequent systems of characteristics (1) embedded: many networked devices are incorporated in to the surroundings (2) context aware: these gadgets can recognize you and your situational context (three) customized: they can be tailor-made on your desires (4) adaptive: they could trade in reaction to you (five) anticipatory: they are able to count on your desires without aware mediation.

VI. CONCLUSION AND FUTURE WORK

In this research provide the brief description of internet of things also discuss IoT modern era demanding situations and special IoT devices which in used at special places. IoT describes a world wherein just about anything can be connected and communicates in a smart fashion that ever before. Most of us consider "being linked" in phrases of electronic devices such as servers, computer systems, tablets, telephones and smart phones. in what's referred to as the net of factors, sensors and actuators embedded in bodily objects—from roadways to pacemakers—are related via wired and Wi-Fi networks, regularly the use of the same internet IP that connects the internet. Those networks churn out large volumes of statistics that waft to computer systems for evaluation. When gadgets can each sense the environment and communicate, they turn out to be tools for knowledge complexity and responding to it swiftly. What's innovative in all that is that these bodily statistics structures are now starting to be deployed, and some of them even work largely without human intervention. In destiny work the "Internet of things" refers back to the coding and networking of normal gadgets and matters to render them in my view system-readable and traceable on the internet [6]-[11]. Tons present content material in the net of things has been created via coded RFID tags and

IP addresses related into an EPC (electronic product code) Community [12]. Practice IoT based totally home security with the help of zig bee.

Year	Title	Platform	Advantages
2015	Internet of Things (IoT): A Literature Review.	RFID, IPv6, EPC, Barcode, Wi-Fi, Bluetooth, NFC, ZigBee, Sensors, Actuators	The main objective of this paper is to provide an overview of Internet of Things, architectures, and vital technologies and their usages in our daily life. However, this manuscript will give good comprehension for the new researchers,
2015	IoT-based Intelligent for Fire Emergency Response Systems	Detour Evacuation System, Wireless Sensor Network, Internet of Things, Fire Detection, Integrated Control System	This paper suggests an IoT-based intelligent fire emergency response system with decentralized control that can intelligently guide evacuees based on the location and time of a fire to minimize the loss of human life.
2014	Research Directions for the Internet of Things	Index Terms—Cyber Physical Systems, Internet of Things, Mobile Computing, Pervasive Computing, Wireless Sensor Networks	
2012	Design and Implementation of a WiFi Based Home Automation System	Home automation, Wireless LAN, WiFi, Micro Controllers	The proposed system is better from the scalability and flexibility point of view than the commercially available home automation system
2012	Design of Remote Intelligent Home System Based on ZigBee and GPRS technology	MC39i; CC2430; host control control; sub function module; Smart Home	
2009	Employed Hardware Computing for Localization Based on ZigBee via SOPC	localization, wireless sensors network, ZigBee, RSSI-based, SOPC ,	In final, we constructed the signals strength diagrams via system measurement equations and acquired states. By way of RSSI-based and location relation model, we adapted the system various variable and weight for computing more precise localization result.
2007	Wireless Access Monitoring and Control System based on Digital Door Lock	Index Terms — Digital Door Lock, ZigBee, Sensor Network, Access Monitoring, Home Networking.	Therefore, it can be a good practical product for the realization of an access monitoring and control system. It also can be applied to the real market for home networking system. Furthermore, the system can be extended to another service such as a connection between mobile phone and home networking system.1.

REFERENCES

- [1] Lianos, M. and Douglas, M. (2000) Dangerization and the End of Deviance: The Institutional Environment. *British Journal of Criminology*, **40**, 261-278. Ferguson, T. (2002) Have Your Objects Call My Object. *Harvard Business Review*, June, 1-7.
- [2] Nunberg, G. (2012) The Advent of the Internet: 12th April, Courses.
- [3] Kosmatos, E.A., Tselikas, N.D. and Boucouvalas, A.C. (2011) Integrating RFIDs and Smart Objects into a Unified Internet of Things Architecture. *Advances in Internet of Things: Scientific Research*, 5-12.
- [4] Aggarwal, R. and Lal Das, M. (2012) RFID Security in the Context of "Internet of Things". *First International Conference on Security of Internet of Things*, Kerala, 17-19 August 2012, 51-56.
- [5] Biddlecombe, E. (2009) UN Predicts "Internet of Things". Retrieved July 6.
- [6] Butler, D. (2020) Computing: Everything, Everywhere. *Nature*, **440**, 402-405.
- [7] Dodson, S. (2008) The Net shapes up to Get Physical. *Guardian*.
- [8] Gershenfeld, N., Krikorian, R. and Cohen, D. (2004) the Internet of Things. *Scientific American*, **291**, 76-81.
- [9] Lombreglia, R. (2010) the Internet of Things, Boston Globe. Retrieved October.
- [10] Reinhardt, A. (2004) A Machine-to-Machine Internet of Things.
- [11] Graham, M. and Haarstad, H. (2011) Transparency and Development: Ethical Consumption through Web 2.0 and the Internet of Things. *Research Article*, **7**.
- [12] Jayavardhana, G., Rajkumar, B., Marusic, S. and Palaniswami, M. (2013) Internet of Things: A Vision, Architectural Elements, and Future Directions. *Future Generation*.
- [13] Gigli, M. and Koo, S. (2011) Internet of Things, Services and Applications Categorization. *Advances in Internet of Things*, 27-31.
- [14] (2005) ITU Internet Reports, International Telecommunication Union. The Internet of Things: 7th Edition.
- [15] Want, R. (2006) An Introduction to RFID Technology. *IEEE Pervasive Computing*, **5**, 25-33.
- [16] Li, B.A. and Yu, J.J. (2011) Research and Application on the Smart Home Based on Component Technologies and Internet of Things. *Procedia Engineering*, **15**, 2087-2092.
- [17] Razzak, F. (2012) Spamming the Internet of Things: A Possibility and its probable Solution. *Procedia Computer Science*, **10**, 658-665.
- [18] Shao, W. and Li, L. (2009) Analysis of the Development Route of IoT in China. *Perking: China Science and Technology Information*, **24**, 330-331.
- [19] Sun, C. (2012) Application of RFID Technology for Logistics on Internet of Things.
- [20] Moeinfar, D., Shamsi, H. and Nafar, F. (2012) Design and Implementation of a Low-Power Active RFID for Container Tracking @ 2.4 GHz Frequency: Scientific Research.
- [21] Bicknell, IPv6 Internet Broken, Verizon Route Prefix Length Policy, 2009.
- [22] Grieco A., Occhipinti, E. and Colombini, D. (1989) Work Postures and Musculo-Skeletal Disorder in VDT Operators. *Bollettino de Oculistica*, Suppl. 7, 99-111.
- [23] Pahlavan, K., Krishnamurthy, P., Hatami, A., Ylianttila, M., Makela, J.P., Pichna, R. and Vallstron, J. (2007) Handoff in Hybrid Mobile Data Networks. *Mobile and Wireless Communication Summit*, **7**, 43-47.
- [24] Chen, X.-Y. and Jin, Z.-G. (2012) Research on Key Technology and Applications for the Internet of Things. *Physics Procedia*, **33**, 561-566.
- [25] Arampatzis, T., et al. (2005) A Survey of Security Issues in Wireless Sensors Networks, in Intelligent Control. *Proceeding of the IEEE International Symposium on, Mediterrean Conference on Control and Automation*, 719-724.
- [26] Chorost, M. (2008) The Networked Pill, MIT Technology Review, March.