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Editorial

We would like to wholeheartedly thank our honorable Chairman, Secretary, Executive Director and Principal for their continuous encouragement and constant support for bringing out the magazine. We profoundly thank our Head of the Department for encouraging and motivating us to lead the magazine a successful one right from the beginning. Ishare serves as a platform for updating and enhancing upcoming technologies in Information and Communication. We are grateful to all the contributors to this magazine so far. The magazine has been sent to almost 60 Institutions in and around Tamilnadu. So far we have received feedbacks and appreciations from various Institutions.

We would be very pleased to receive your feedbacks. Please send your feedbacks to ishare@ksrcas.edu

By,

Editorial Board

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Introduction

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. It cuts across different application domain verticals ranging from civilian to defense sectors. These domains include agriculture, space, healthcare, manufacturing, construction, water, and mining, which are presently transitioning their legacy infrastructure to support IoT. Today it is possible to envision pervasive connectivity, storage, and computation, which, in turn, gives rise to building different IoT solutions. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

What is Internet Of Things?

The Internet of Things may be a hot topic in the industry but it's not a new concept. In the early 2000's,Kevin Ashton was laying the groundwork for what would become the Internet of Things (IoT) at MIT's AutoID lab. Ashton was one of the pioneers who conceived this notion as he searched for ways that

Proctor & Gamble could improve its business by linking RFID information to the Internet. The concept was simple but powerful. If all objects in daily life were equipped with identifiers and wireless connectivity, these objects could be communicate with each other and be managed by computers. In a 1999 articlefor the RFID Journal Ashton wrote:

"If we had computers that knew everything there was to know about things—using data they gatheredwithout any help from us -- we would be able to track and count everything, and greatly reduce waste,loss and cost. We would know when things needed replacing, repairing or recalling, and whether theywere fresh or

past their best. We need to empower computers with their own means of gatheringinformation, so they can see, hear and smell the world for themselves, in all its random glory. RFID andsensor technology enable computers to observe, identify and understand the world—without thelimitations of human-entered data."

At the time, this vision required major technology improvements. After all, how would we connecteverything on the planet? What type of wireless communications could be built into devices? Whatchanges would need to be made to the existing Internet infrastructure to support billions of new devices communicating? What would power these devices? What must be developed to make the solutions costeffective? There were more questions than answers to the IoT concepts in 1999.

Today, many of these obstacles have been solved. The size and cost of wireless radios has droppedtremendously. IPv6 allows us to assign a communications address to billions of devices. Electronicscompanies are building Wi-Fi and cellular wireless connectivity into a wide range of devices. ABIResearch estimates over five billion wireless chips will ship in 2020. Mobile data coverage has improvedsignificantly with many

networks offering broadband speeds. While not perfect, battery technology hasimproved and solar recharging has been built into numerous devices. There will be billions of objectsconnecting to the network with the next several years. For example,Cisco's Internet of Things Group(IOTG) predicts there will be over 50 billion connected devices by 2020IoT describes a system where items in the physical world, and sensors within or attached to these items,are connected to the Internet via wireless and wired Internet connections. These sensors can use varioustypes of local area connections such as RFID, NFC, Wi-Fi, Bluetooth, and Zigbee. Sensors can also havewide area connectivity such as GSM, GPRS, 3G, and LTE.

Advantages of IOT

The advantages of IoT span across every area of lifestyle and business. Here is a list of some of the advantages that IoT has to offer:

- **Improved Customer Engagement –** Current analytics suffer from blind-spots and significant flaws in

accuracy; and as noted, engagement remains passive. IoT completely transforms this to achieve richer and more effective engagement with audiences.

- **Technology Optimization –** The same technologies and data which improve thecustomer experience also improve device use, and aid in more potent improvements totechnology. IoT unlocks a world of critical functional and field data.

Though IoT delivers an impressive set of benefits, it also presents a significant set of challenges.Here is a list of some its major issues:

- **Security –** IoT creates an ecosystem of constantly connected devices communicating over networks. The system offers little control despite any security measures. This leavesusers exposed to various kinds of attackers.

- **Privacy –** The sophistication of IoT provides substantial personal data in extreme detail without the user's active participation.
- **Complexity –** Some find IoT systems complicated in terms of design, deployment, and maintenance given their use of multiple technologies and a large set of new enabling technologies.
- **Flexibility –** Many are concerned about the flexibility of an IoT system to integrate easily with another. They worry about finding themselves with several conflicting or locked systems.
- **Compliance –** IoT, like any other technology in the realm of business, must comply with regulations. Its complexity makes the issue of compliance seem incredibly challenging when many consider standard software compliance a battle.The hardware utilized in IoT systems includes devices for a remote dashboard, devices for control, servers, a routing or bridge device, and sensors. These devices manage key tasks and functions such as system activation, action

specifications, security, communication, and detection to support-specific goals and actions.

The most important hardware in IoT might be its sensors. These devices consist of energy modules, power management modules, RF modules, and sensing modules. RF modules manage communications through their signal processing, WiFi, ZigBee, Bluetooth, radio transceiver, duplexer, and BAW.

The sensing module manages sensing through assorted active and passive measurement devices. Here is a list of some of the measurement devices used in IoT:

Devices

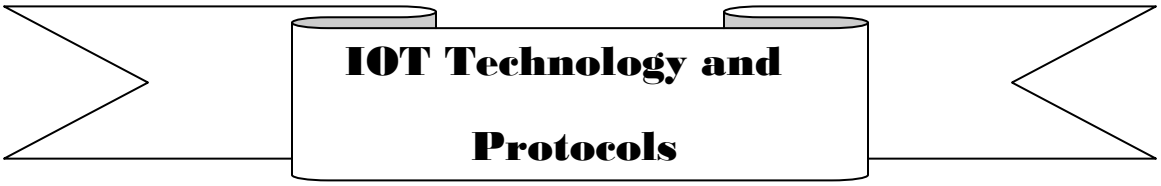
- ✓ accelerometers temperature sensors
- ✓ magnetometers proximity sensors
- ✓ gyroscopes image sensors
- ✓ acoustic sensors light sensors
- ✓ pressure sensors gas RFID sensors
- ✓ humidity sensors micro flow sensors

Beyond costs and the ubiquity of devices, other security issues plague IoT:

- **Unpredictable Behavior –** The sheer volume of deployed devices and their long list of enabling technologies means their behavior in the field can be unpredictable. A specific system may be well designed and within administration control, but there are no guarantees about how it will interact with others.
- **Device Similarity –** IoT devices are fairly uniform. They utilize the same connection technology and components. If one system or device suffers from a vulnerability, many more have the same issue.
- **Problematic Deployment –** One of the main goals of IoT remains to place advanced networks and analytics where they previously could not go. Unfortunately, this creates the problem of physically securing the devices in these strange or easily accessed places.

- **Long Device Life and Expired Support –** One of the benefits of IoT devices is longevity, however, that long life also means they may outlive their device support.Compare this to traditional systems which typically have support and upgrades long after many have stopped using them. Orphaned devices and abandon ware lack the same security hardening of other systems due to the evolution of technology over time.
- **No Upgrade Support –** Many IoT devices, like many mobile and small devices, are not designed to allow upgrades or any modifications. Others offer inconvenient upgrades,which many owners ignore, or fail to notice.
- **Poor or No Transparency –** Many IoT devices fail to provide transparency with regard to their functionality. Users cannot observe or access their processes, and are left to assume how devices behave. They have no control over unwanted functions or data collection; furthermore, when a manufacturer updates the device, it may bring more unwanted functions.

- **No Alerts –** Another goal of IoT remains to provide its incredible functionality without being obtrusive. This introduces the problem of user awareness. Users do not monitor the devices or know when something goes wrong. Security breaches can persist over long periods without detection.



IoT has applications across all industries and markets. It spans user groups from those who want to reduce energy use in their home to large organizations who want to streamline their operations. It proves not just useful, but nearly critical in many industries as technology advances and we move towards the advanced automation imagined in the distant future.

❖ **Engineering, Industry, and Infrastructure**

Applications of IoT in these areas include improving production, marketing, service delivery, and safety. IoT provides a strong means of monitoring various processes; and real transparency

creates greater visibility for improvement opportunities.The deep level of control afforded by IoT allows rapid and more action on those opportunities,which include events like obvious customer needs, nonconforming product, malfunctions in equipment, problems in the distribution network, and more.

Example

Joan runs a manufacturing facility that makes shields for manufacturing equipment. When regulations change for the composition and function of the shields, the new appropriate requirements are automatically programmed in production robotics, and engineers are alertedabout their approval of the changes.

- **Government and Safety**

IoT applied to government and safety allows improved law enforcement, defense, city planning,and economic management. The technology fills in the current gaps, corrects many current flaws, and expands the reach of these efforts. For example, IoT can help city planners have a clearer view of the impact of their design, and governments have a better idea of the local economy.

Example

Joan lives in a small city. She's heard about a recent spike in crime in her area, and worries about coming home late at night. Local law enforcement has been alerted about the new "hot" zone through system flags, and they've increases their presence. Area monitoring devices have detected suspicious behavior,and law enforcement has investigated these leads to prevent crimes.

❖ Home and Office

In our daily lives, IoT provides a personalized experience from the home to the office to the organizations we frequently do business with. This improves our overall satisfaction, enhances productivity, and improves our health and safety. For example, IoT can help us customize our office space to optimize our work.

➢ IoT − Manufacturing Applications

This XRS relay box connects all truck devices (e.g., diagnostics anddriver cell) to the XRS fleet management supporting software, which allows data collection.

❖ Improved Facility Safety

A typical facility suffers from a number of health and safety hazards due to risks posed by processes, equipment, and product handling. IoT aids in better control and visibility. Its monitoring extends throughout the network of devices for not only performance, but fordangerous malfunctions and usage. It aids (or performs) analysis and repair, or correction, of critical flaws.

❖ Product Safety

Even the most sophisticated system cannot avoid malfunctions, nonconforming product, and other hazards finding their way to market. Sometimes these incidents have nothing to do with the manufacturing process, and result from unknown conflicts. In manufacturing, IoT helps in avoiding recalls and controlling nonconforming or dangerous product distribution. Its high level

of visibility, control, and integration can better contain issues that appear.The optimization qualities of IoT in manufacturing also apply to energy consumption. IoT allows a wide variety of energy control and monitoring functions, with applications in devices, commercial and residential energy use, and the energy source. Optimization results from the detailed analysis previously unavailable to most organizations and individuals.

❖ Residential Energy

The rise of technology has driven energy costs up. Consumers search for ways to reduce orcontrol consumption. IoT offers a sophisticated way to analyze and optimize use not only atdevice level, but throughout the entire system of the home. This can mean simple switching offor dimming of lights, or changing device settings and modifying multiple home settings to optimize energy use. IoT can also discover problematic consumption from issues like older appliances, damaged appliances, or faulty system components. Traditionally, finding such problems required the useof often multiple professionals.

❖ Commercial Energy

Energy waste can easily and quietly impact business in a major way, given the tremendous energy needs of even small

organizations. Smaller organizations wrestle with balancing costs of business while delivering a product with typically smaller margins, and working with limited funding and technology. Larger organizations must monitor a massive, complex ecosystem of energy use that offers few simple, effective solutions for energy use management.A smart-meter still requires a reader to visitthe site. This automated meter reader makes visits unnecessary, and also allows energy companies to bill based on real-time data instead of estimates over time. IoT simplifies the process of energy monitoring and management while maintaining a low costand high level of precision. It addresses all points of an organization's consumption across devices. Its depth of analysis and control provides organizations with a strong means of managing their consumption for cost shaving and output optimization. IoT systems discover

- **IoT − Energy Applications**

Energy issues in the same way as functional issues in a complex business network, and provide solutions.

❖ Reliability

The analytics and action delivered by IoT also help to ensure system reliability. Beyond consumption, IoT prevents system overloads or throttling. It also detects threats to system performance and stability, which protects against losses such as downtime, damaged equipment, and injuries. IoT systems applied to healthcare enhance existing technology, and the general practice ofmedicine. They expand the reach of professionals within a facility and far beyond it. They increase both the accuracy and size of medical data through diverse data collection from large sets of real-world cases. They also improve the precision of medical care delivery through more sophisticated integration of the healthcare system.

❖ Research

Much of current medical research relies on resources lacking critical real-world information. It uses controlled environments, volunteers, and essentially left overs for medical examination. IoT opens the door to a wealth of valuable information through real-time field data, analysis, and testing. IoT can deliver relevant data superior to standard analytics through integrated instruments capable of performing viable research. It also

integrates into actual practice to provide more key information. This aids in healthcare by providing more reliable and practical data, and better leads; which yields better solutions and discovery of previously unknown issues. It also allows researchers to avoid risks by gathering data without manufactured scenarios and human testing.

❖ **Devices**

Current devices are rapidly improving in precision, power, and availability; however, they still offer less of these qualities than an IoT system integrating the right system effectively. IoT unlocks the potential of existing technology, and leads us toward new and better medical device solutions. IoT closes gaps between equipment and the way we deliver healthcare by creating a logical system rather than a collection of tools. It then reveals patterns and missing elements in healthcare such as obvious necessary improvements or huge flaws. The ClearProbe portable connected ultrasound device can use any computer anywhere as a supporting machine. The device sends allimaging records to the master system.

➢ **IoT − Healthcare Applications**

❖ **Care**

Perhaps the greatest improvement IoT brings to healthcare is in the actual practice of medicine because it empowers healthcare professionals to better use their training and knowledge to solve problems. They utilize far better data and equipment, which gives them a window into blind spots and supports more swift, precise actions. Their decision-making is no longer limited by the disconnects of current systems, and bad data. IoT also improves their professional development because they actually exercise their talent rather than spending too much time on administrative or manual tasks. Their organizationaldecisions also improve because technology provides a better vantage point.

❖ Medical Information Distribution

One of the challenges of medical care is the distribution of accurate and current information to patients. Healthcare also struggles with guidance given the complexity of following guidance. IoT devices not only improve facilities and professional practice, but also health in the daily lives of individuals. IoT devices give direct, 24/7 access to the patient in a less intrusive way than other options.They take healthcare out of facilities and into the home, office, or social space. They

empower individuals in attending to their own health, and allow providers to deliver better and more granular care to patients. This results in fewer accidents from miscommunication, improved patient satisfaction, and better preventive care.

❖ Emergency Care

The advanced automation and analytics of IoT allows more powerful emergency support services, which typically suffer from their limited resources and disconnect with the base facility. It provides a way to analyze an emergency in a more complete way from miles away. It also gives more providers access to the patient prior to their arrival. IoT gives providers critical information for delivering essential care on arrival. It also raises the level of care available to apatient received by emergency professionals. This reduces the associated losses, and improves emergency healthcare. IoT applied to buildings and various structures allows us to automate routine residential and commercial tasks and needs in a way that dramatically improves living and working environments. This, as seen with manufacturing and energy applications, reduces costs,enhances safety, improves individual productivity, and enhances quality of life.

❖ Environment and Conditioning

One of the greatest challenges in the engineering of buildings remains management of environment and conditions due to many factors at work. These factors include building materials, climate, building use, and more. Managing energy costs receives the most attention,but conditioning also impacts the durability and state of the structure. IoT aids in improving structure design and managing existing structures through more accurate and complete data on buildings. It provides important engineering information such as how well a material performs as insulation in a particular design and environment.

❖ Health and Safety

Buildings, even when constructed with care, can suffer from certain health and safety issues.These issues include poor performing materials, flaws that leave the building vulnerable toextreme weather, poor foundations, and more.The Boss 220 smart plug allows the user to monitor, control, optimize, andautomate all plug-in devices. Users employ their mobile device or desktop toview performance information and control devices from anywhere.

➢ IoT − Building/Housing Applications

Current solutions lack the sophistication needed to detect minor issues before they becomemajor issues, or emergencies. IoT offers a more reliable and complete solution by observingissues in a fine-grained way to control dangers and aid in preventing them; for example, it can measure changes in a system's state impacting fire safety rather than simply detecting smoke.

❖ Productivity and Quality of Life

Beyond safety or energy concerns, most people desire certain comforts from housing orcommercial spaces like specific lighting and temperature. IoT enhances these comforts byallowing faster and easier customizing. Adjustments also apply to the area of productivity. They personalize spaces to create anoptimized environment such as a smart office or kitchen prepared for a specific individual. At every layer of transportation, IoT provides improved communication, control, and data distribution. These applications include personal vehicles, commercial vehicles, trains, UAVs, andother equipment. It extends throughout the entire system of all transportation elements such as traffic control, parking, fuel consumption, and more.

❖ Rails and Mass Transit

Current systems deliver sophisticated integration and performance, however, they employ older technology and approaches to MRT. The improvements brought by IoT deliver more complete control and monitoring. This results in better management of overall performance, maintenance issues, maintenance, and improvements. Mass transit options beyond standard MRT suffer from a lack of the integration necessary to transform them from an option to a dedicated service. IoT provides an inexpensive and advanced way to optimize performance and bring qualities of MRT to other transportation options like buses. This improves services and service delivery in the areas of scheduling, optimizing transport times, reliability, managing equipment issues, and responding to customer needs.

❖ Road

The primary concerns of traffic are managing congestion, reducing accidents, and parking. IoT allows us to better observe and analyze the flow of traffic through devices at all traffic observation points. It aids in parking by making storage flow transparent when current methods offer little if any data.

➢ IoT − Transportation Applications

This smart road sign receives data and modifications to better inform drivers andprevent congestion or accidents. Accidents typically result from a number of factors, however, traffic management impacts their frequency. Construction sites, poor rerouting, and a lack of information about traffic status are all issues that lead to incidents. IoT provides solutions in the form of better information sharing with the public, and between various parties directly affecting road traffic.

❖ Automobile

Many in the automotive industry envision a future for cars in which IoT technology makes cars "smart," attractive options equal to MRT. IoT offers few significant improvements to personal vehicles. Most benefits come from better control over related infrastructure and the inherent flaws in automobile transport; however, IoT does improve personal vehicles as personal spaces. IoT brings the same improvements and customization to a vehicle as those in the home.

❖ Commercial Transportation

Transportation benefits extend to business and manufacturing by optimizing the transport arm of organizations. It reduces and eliminates problems related to poor fleet management through

better analytics and control such as monitoring idling, fuel consumption, travel conditions, and travel time between points. This results in product transportation operating more like an aligned service and less like a collection of contracted services. IoT in the classroom combines the benefits of IoT in content delivery, business, and healthcare. It customizes and enhances education by allowing optimization of all content and forms of delivery. It enables educators to give focus to individuals and their method. It also reduces costs and labor of education through automation of common tasks outside of the actual education process.

❖ Education Organizations

Education organizations typically suffer from limited funding, labor issues, and poor attention to actual education. They, unlike other organizations, commonly lack or avoid analytics due to their funding issues and the belief that analytics do not apply to their industry. IoT not only provides valuable insight, but it also democratizes that information through low cost, low-power small devices, which still offer high performance. This technology aids in managing costs, improving the quality of

education, professional development, and facility management improvement through rich examinations of key areas:

- ✓ Student response, performance, and behavior
- ✓ Instructor response, performance, and behavior
- ✓ Facility monitoring and maintenance
- ✓ Data from other facilities
- ✓ Data informs them about ineffective strategies and actions, whether educational efforts or facilityqualities. Removing these roadblocks makes them more effective.

❖ **Educators**

Information provided by IoT empowers educators to deliver improved education. They have awindow into the success of their strategies, their students' perspective, and other aspects oftheir performance. IoT relieves them of administrative and management duties, so they canfocus on their mission. It automates manual and clerical labor, and facilitates supervising through features like system flags or controls to ensure students remain engaged.

➢ **IoT − Education Applications**

A school in Richmond, California, embeds RFID chips in ID cards to track the presence of students. Even if students are not

present for check-in, the system will track and log their presence on campus. IoT provides instructors with easy access to powerful educational tools. Educators can use IoT to perform as a one-on-one instructor providing specific instructional designs for each pupil; for example, using data to determine the most effective supplements for each student, and auto generating content from lesson materials on-demand for any student.The application of technology improves the professional development of educators because they truly see what works, and learn to devise better strategies, rather than simply repeating old or ineffective methods. IoT also enhances the knowledge base used to devise education standards and practices.Education research suffers from accuracy issues and a general lack of data. IoT introduces large high quality, real-world datasets into the foundation of educational design. This comes from IoT's unique ability to collect enormous amounts of varied data anywhere.

- **Personalized Education**

IoT facilitates the customization of education to give every student access to what they need. Each student can control their experience and participate in instructional design, and much of this happens passively. The student simply utilizes the system,

and performance data primarily shapes their design. This combined with organizational and educator optimization delivers highly effective education while reducing costs.

IoT supports the development of smart nations and smart cities. This includes enhancement of infrastructure previously discussed (e.g., healthcare, energy, transportation, etc.), defense, andalso the engineering and maintenance of communities.

❖ City Planning and Management

Governing bodies and engineers can use IoT to analyze the often complex aspects of city planning and management. IoT simplifies examining various factors such as population growth, zoning, mapping, water supply, transportation patterns, food supply, social services, and landuse. It gathers detailed data in these areas and produces more valuable and accurate information than current analytics given its ability to actually "live" with people in a city. Smart trash cans in New York tell garbage collectors when they need to be emptied.They optimize trash service by ensuring drivers only make necessary stops, and drivers modify their route to reduce fuel consumption.

➢ IoT − Government Applications

In the area of management, IoT supports cities through its implementation in major services and infrastructure such as transportation and healthcare. It also aids in other key areas like water control, waste management, and emergency management. Its real-time and detailed information facilitate more prompt decisions in contrast to the traditional process plagued by information lag, which can be critical in emergency management. Standard state services are also improved by IoT, which can automate otherwise slow processes and trim unnecessary state expenses; for example, it can automate motor vehicle services for testing, permits, and licensing. IoT also aids in urban improvement by skipping tests or poor research, and providing functional data for how the city can be optimized. This leads to faster and more meaningful changes.

- **Creating Jobs**

IoT offers thorough economic analysis. It makes previous blind spots visible and supports better economic monitoring and modeling. It analyzes industry and the marketplace to spot opportunities for growth and barriers.

- **National Defense**

National threats prove diverse and complicated. IoT augments armed forces systems and services, and offers the sophistication necessary to manage the landscape of national defense.

It supports better protection of borders through inexpensive, high performance devices for rich control and observation.

IoT automates the protection tasks typically spread across several departments and countless individuals. It achieves this while improving accuracy and speed. IoT enhances law enforcement organizations and practice, and improves the justice system. The technology boosts transparency, distributes critical data, and removes human interventionwhere it proves unnecessary.

- **Policing**

Law enforcement can be challenging. IoT acts as an instrument of law enforcement which reduces manual labor and subjective decisions through better data, information sharing, and advanced automation. IoT systems save costs by reducing human labor in certain areas suchas certain traffic violations.

IoT aids in creating better solutions to problems by using technology in the place of force; for example, light in-person investigations of suspicious activities can be replaced with

remote observation, logged footage of violations, and electronic ticketing. It also reduces corruption by removing human control and opinion for some violations.This dart planted in a truck gate prevents dangerous car chases. A patrol car launches the tracking dart which pierces the vehicle. Then the main system receives all data needed to locate the vehicle.

❖ Court System

Current court systems utilize traditional technology and resources. They generally do not exploit modern analytics or automation outside of minor legal tasks. IoT brings superior analytics, better evidence, and optimized processes to court systems which accelerate processes, eliminate excessive procedures, manage corruption, reduce costs, and improve satisfaction.

➢ IoT − Law Enforcement Applications

In the criminal court system, this can result in a more effective and fair system. In routine court services, it introduces automation similar to that of common government office services; for example, IoT can automate forming an LLC. IoT combined with new regulations can remove lawyers from many common legal tasks or reduce the need for their involvement.

This reduces costs and accelerates many processes which often require months of traversing legal procedures and bureaucracy. Consumers benefit personally and professionally from the optimization and data analysis of IoT. IoT technology behaves like a team of personal assistants, advisors, and security. It enhancesthe way we live, work, and play.

❖ **Home**

IoT takes the place of a full staff:

- ✓ **Butler –** IoT waits for you to return home, and ensure your home remains fully prepared. It monitors your supplies, family, and the state of your home. It takes actions to resolve any issues that appear.
- ✓ **Chef –** An IoT kitchen prepares meals or simply aids you in preparing them.
- ✓ **Nanny –** IoT can somewhat act as a guardian by controlling access, providing supplies, and alerting the proper individuals in an emergency.
- ✓ **Gardner –** The same IoT systems of a farm easily work for home landscaping.
- ✓ **Repairman –** Smart systems perform key maintenance and repairs, and also request them.

- ✓ **Security Guard –** IoT watches over you 24/7. It can observe suspicious individuals miles away, and recognize the potential of minor equipment problems to become disasters well before they do. This smart, connected stove from Whirlpool allows two different heat settings on the samesurface, remote monitoring, and remote control.

➢ IoT − Consumer Applications

❖ Work

A smart office or other workspace combines customization of the work environment with smart tools. IoT learns about you, your job, and the way you work to deliver an optimized environment.This results in practical accommodations like adjusting the room temperature, but also moreadvanced benefits like modifying your schedule and the tools you use to increase your outputand reduce your work time. IoT acts as a manager and consultant capable of seeing what you cannot.

❖ Play

IoT learns as much about you personally as it does professionally. This enables the technology to support leisure:

- ✓ **Culture and Night Life –** IoT can analyze your real-world activities and response toguide you in finding more of the

things and places you enjoy such as recommending restaurants and events based on your preferences and experiences.

- ✓ **Vacations –** Planning and saving for vacations proves difficult for some, and many utilize agencies, which can be replaced by IoT.
- ✓ **Products and Services –** IoT offers better analysis of the products you like and need than current analytics based on its deeper access. It integrates with key information likeyour finances to recommend great solutions. Thingworx is a platform for the rapid development and deployment of smart, connected devices. Its set of integrated IoT development tools support connectivity, analysis, production, and other aspects of IoT development. It offers Vuforia for implementing augmented reality development, and Kepware for industrial connectivity. KEPServerEX provides a single point for data distribution, and facilitates interoperability when partnered with a ThingWorx agent.

➢ **Components**

Thingworx offers several key tools for building applications. These tools include the Composer,the Mashup Builder, storage,

a search engine, collaboration, and connectivity. The Composerprovides a modeling environment for design testing. The Mashup Builder delivers easy dashboard building through common components (or widgets); for example, buttons, lists, wikis, gauges,and etc.

Thingworx uses a search engine known as SQUEAL, meaning Search, Query, and Analysis. Usersemploy SQUEAL in analyzing and filtering data, and searching records.

- **Interface**

The ThingWorx platform uses certain terms you must familiarize yourself with. In the mainscreen's top menu, you search for **entities** or create them. “Entity” refers to something createdin ThingWorx. You can also import/export files and perform various operations on them.In the left menu, you find entity groups, which are used to produce models and visualize data;and manage storage, collaboration, security, and the system.

Conclusion

With the incessant burgeoning of the emerging IoT technologies, the concept of Internet of Things will soon be inexorably developing on a very large scale. This emerging paradigm of networking will influence every part of our lives ranging from the automated houses to smart health and environment monitoring by embedding intelligence into the objects around us. In this paper we discussed the vision of IoT and presented a well-defined architecture for its deployment. Then we highlighted various enabling technologies and few of the related security threats. And finally we discussed a number of applications resulting from the IoT that are expected to facilitate us in our daily lives. Researches are already being carriedout for its wide range adoption, however without addressingthe challenges in its development and providing confidentiality of the privacy and security to the user, it's highly unlikely for it to be an omni-present technology. The deployment of IoT requires strenuous efforts to tackle and present solutions for its security and privacy threats.

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