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REVIEW ON ADVENT OF INTERNET OF THINGS (IOT)

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Abstract: **Internet of things is a defined as the system of interrelated computing devices, mechanical and digital machines provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Traditional fields of embedded systems, wireless sensor networks, control systems, automation, and others all contribute to enabling the Internet of things. In the consumer market, IOT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smart phones and smart speakers. Important hardware development platforms are particle io, Espressif ESP8266 Boards, Intel IOT Development Boards, Adafruit Range of Development boards, Arduino IOT Product Line, The Raspberry Pi. Some application on Internet Of Things are connected cars, tracking and monitoring of properties, smart barcode recorders, connected health care systems, smart farming.**

Keywords—interrelated computing devices ,mechanical, Digital machines, unique identifiers ,human-to-computer interaction ,wireless sensors, control systems ,connected health care system, smart farming.

I. INTRODUCTION

Internet of Things (IOT) term represents a general concept for the ability of network devices to sense and collect data from around the world, and then share that data across the Internet where it can be processed and utilized for various interesting purposes such as data analytics, data analysis, and data mining. The IOT is comprised of smart machines interacting and communicating with other machines, objects, environments and infrastructures. . Devices and objects with built in sensors are connected to an Internet of Things platform , which integrates data from the different devices and applies analytics to share the most valuable information with applications built to address specific needs. IOT consists of connectivity, sensors, data processing , and user interface. Some of the user made applications of IOT is smart lamps which can be operated by phone IOT based attendance system which is used to take attendance using finger print ,IOT based gas detector, IOT based smart lock. IOT is a blend of artificial intelligence electronics and software, network connectivity and artificial intelligence. The air Conditioner can be switched from the car and lights could be controlled by using internet. This kind of an environment is especially more useful for persons with disability and moreover the ultimate arrangement of devices as a system instead of individual units. The theoretical basis of network of smart devices was first applied in 1982 to a coke vending machine at Carnegie Mellon University as the first digital appliance reporting its stock of bottles and the temperature condition of the drinks. After reading various sources ,it was found that the book “The Computer a of the 21st Century” written by Mark Weiser in 1991 as well as Academic quarters like Unicom and Percom designed a contemporary vision of IOT. Reza Raja, a researcher in 1994, described the concept of IEEE Spectrum as “moving small packets of data to a large set of nodes to integrate and automate everything from home appliances to entire factories.” From 1993 to 1997, several companies like Microsoft at Work (Maw) and Novell's proposed solutions based on a similar platform. Maw was a small project promoted by Microsoft to bring together common business machinery, like fax machines and photocopiers, using a common communications protocol permitting control and status information to be pooled with computers running Microsoft Windows. The idea gained popularity when Bill Joy envisaged D2D (Device to Device) communication at the World Economic Forum at Davis, Switzerland in 1999.Manpower requirements are urgent in every organization for the information desk to each and every department. To provide information, advertisements, messages and other notifications for the customers and the staff the information desk plays a crucial part. Due to IOT this function and manpower role has been cut down and replaced by smart devices. This has been a major achievement especially in cost cutting, updating of information for prompt services and better and efficient utilization of resources.

I. Working of IOT

IOT typically contains 4 fundamental components; they are sensors, connectivity, data processing, user interface.

1) Sensors

First, sensors or devices help in collecting very minute data from the surrounding environment. All of this collected data can have various degrees of complexities ranging from a simple temperature monitoring sensor or a complex full video feed.

A device can have multiple sensors that can bundle together to do more than just sense things. For example, our phone is a device that has multiple sensors such as GPS, accelerometer, camera but our phone does not simply sense things.

The most rudimentary step will always remain to pick and collect data from the surrounding environment be it a standalone sensor or multiple devices

2) Connectivity

The sensors can be connected to the cloud through various mediums of communication and transports such as cellular networks, satellite networks, Wi-Fi, Bluetooth, wide-area networks (WAN), low power wide area network and many more.

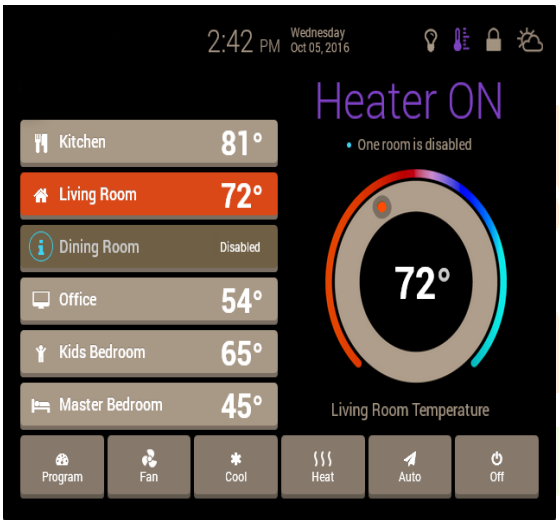
Every option we choose has some specifications and trade-offs between power consumption, range, and bandwidth. So, choosing the best connectivity option in the IOT system is important.

3) Data Processing

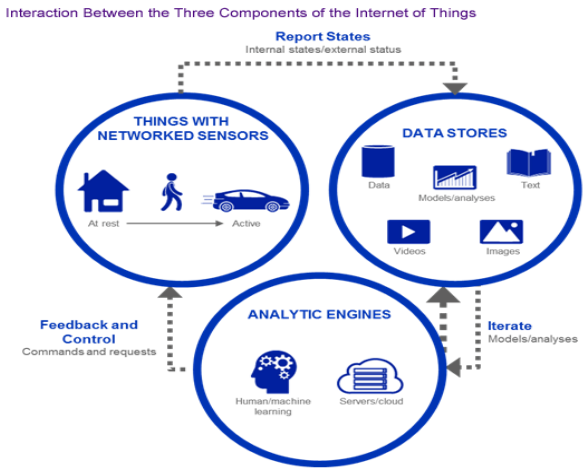
Once the data is collected and it gets to the cloud, the software performs processing on the acquired data.

4) User Interface

Next, the information made available to the end-user in some way. This can achieve by triggering alarms on their phones or notifying through texts or emails. (5)



User interface where information is obtained Through the smart phone



Interaction between the three components of Internet of things

II. Sensors used in IOT devices

1) Optical sensors

Electro-optical sensors are electronic detectors that convert light, or a change in light, into an electronic signal. These sensors are able to detect electromagnetic radiation from the infrared up to the ultraviolet wavelengths. They are used in many industrial and consumer applications, for example Lamps that turn on automatically in response to darkness .Position sensors that activate when an object interrupts a light beam Flash detection, to synchronize one photographic flash to another. Photoelectric sensors that detect the distance, absence, or presence of an object

i) **Optical sensors in automated vehicles**

The introduction of optical sensors is highly beneficial in the automotive industry. These devices are used for empowering smart parking applications, object recognition, and light detection tools in autonomous vehicles.

ii) Optical sensors in healthcare-Health tech companies adopt optical sensors for IOT when creating blood flow management tools, skin irritation testers, duodenum and stomach perfusion management equipment, and other health-assessment apps.

iii) **Optical sensors in smart cities**-Optical sensors empower urban security systems — they are the cornerstone of face recognition platforms, adaptive street lighting (a smart light bulb determines when there's a by passer in the vicinity and activates automatically). Other than that, IOT optical sensors are used to ensure the integrity of the urban infrastructure, detecting cracking or deformations of roads and bridges.

2) **Motion detectors**

Motion detectors are a type of sensor designed to react to a shift in the placement of an object they are attached to — be it a human, an animal, or an object. These devices are primarily used in the security industry — business owners, governments, and homeowners use motion sensors to prevent privacy invasion. Combined with actuators, these devices help build systems that alert homeowners when someone's close to the property or ring the doorbell, and they are also often used to conserve energy

i) Motion sensors in wearable's

Wearable devices are one of the most used applications for motion sensors. Embedded in smart watches, these detectors track micro movements or location changes.

ii) Motion sensors in smart home

Motion detectors improve the quality of life at our homes by empowering dozens of connected applications. Hue Motion Sensor (an adaptive lighting system), Figaro, or Orvis Motion Sensor are some of the most popular motion detector tools homeowners use to have full control over their living space.

Motion sensors have a lot to do with ensuring at-home security — they are at the core of automated gate systems, camera triggers, and security alarms

iii) Motion sensors in smart cities

Motion sensors help create connected public transportation management systems (smart city residents get real-time updates on the location and availability of buses or taxis), plus traffic congestion management systems and smart road tools (devices that detect accidents in real-time and alert drivers). The motion sensors also integrate with smart lighting platforms and other connected solutions in the urban sector.

3) **Humidity sensors**

These devices capture the amount of water vapor and other gases in the air (referred to as 'relative humidity' or 'RH'). Humidity sensors are often used to ensure safety at industrial plants and other institutions with high-risk chemical hazards.

i) Humidity sensors in manufacturing

Industrial humidity sensors help manufacturers prevent condensation on factory floors. If a factory floor becomes too saturated with moisture, the production line could become crippled. By installing a humidity sensor on the floor, industrial company managers can monitor HVAC systems in real-time and build platforms that adjust in-air moisture

ii) Humidity sensors in smart home

To improve personal productivity and well-being, a lot of homeowners use humidifiers and HVAC systems. However, if mismanaged, these tools can do more harm than good — they can spread mold in the air or lead to furniture damage.

Thanks to humidity smart home sensors like iHome or Aqara, homeowners can keep track of how dry the air inside the house is. These devices collect real-time humidity data; transfer it to the network where it's transformed into actionable commands — adjusting the HVAC system, activating a humidifier, etc.

iii) Humidity sensors in manufacturing

Industrial humidity sensors help manufacturers prevent condensation on factory floors. If a factory floor becomes too saturated with moisture, the production line could become crippled. By installing a humidity sensor on the floor, industrial company managers can monitor HVAC systems in real-time and build platforms that adjust in-air moisture.

iv) Humidity sensors in agriculture

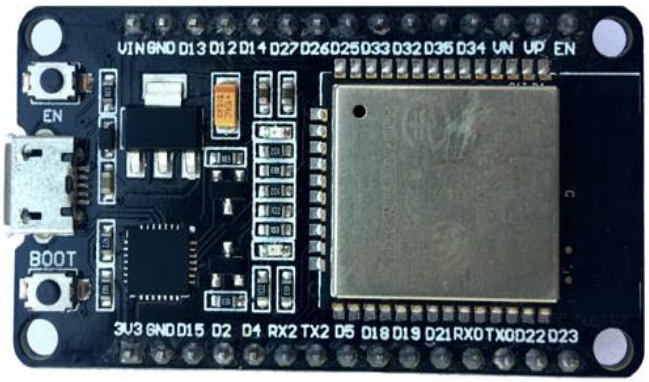
Humidity sensors are used to monitor and optimize the humidity inside of greenhouses. Additionally, these detectors help keep track of humidity levels in hay or straw, preventing the spread of fungi or micro bacteria that could damage crops and reduce the yield

IOT Hardware Development Platforms

i) Particle Io

Particle.io is one of the most comprehensive end to end IOT platforms. It is an all-in-one io platform that offers IOT hardware development platform, connectivity, device cloud and apps. Particle makes a long line of IOT hardware development products for both rapid prototypes and DFM level production. Building an IOT product starts with connecting the devices to the internet and all the Particle's microcontroller boards are enabled to communicate over either of Wi-Fi, cellular (2G/3G/LTE), **or mesh.** With some of their boards featuring multiple communication options onboard. Their microcontrollers are controlled by a special OS which enables developer to integrate the devices easily with particle's device cloud and apps. As a peck, their devices and communication modules come with CE and FCC certifications which reduce the cost of certificate, on when the product is ready to be scaled. Their boards are open source ensuring there is a lot of support for product development. Personally, one of the major reasons I like particle boards is the end to end nature of the services they provide. This ensures you to get support on every step of the way, without worrying about compatibility.

Particle io



ESPRESSIF ESP8266

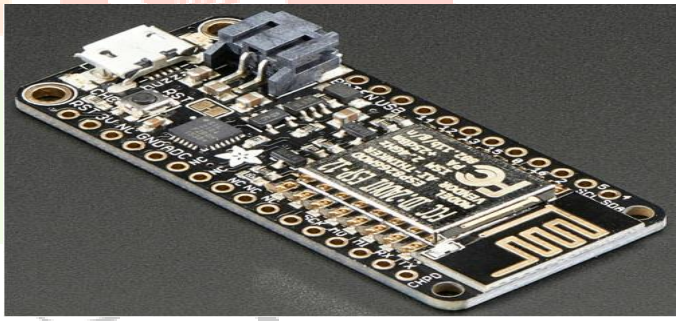
ii) **Espressif ESP8266 Boards**

When it comes to building IOT devices, the range of products from Espressif and AI thinker is the next best thing to particle. Since the release of the ESP8266-01 Wi-Fi chip some years back, ESP8266 based chips and boards have grown from being the darlings of makers and hobbyist to being one of the most preferred chipset for Wi-Fi based IOT devices. The Modules are usually low-cost, low-power, and easy to use. These among other factors, endear them to the heart of hardware designers. The ESP chips come with a lot of flexibility and can be used either as Wi-Fi modules, connected to other microcontrollers or used in standalone modes without additional microcontrollers .They Possess small form factors and make it easy to implement IOT enabling functions like OTA firmware updates. The availability of Development boards like Node MCU and several other ESP based third party boards enables developers to get a feel of the board before using them in Designs. Just like the particle boards, ESP8266 boards, come with FCC and CE certification to reduce the general cost of certifying the device after manufacturing. The ESP provides one of the most robust, dedicated Wi-Fi interface in the industry, featuring several protocols that support the IOT like the ESP Touch protocol that enables the device to safely and seamlessly access the internet via Wi-Fi networks.ESP8266 boards are easy to learn and can be used with any microcontrollers to buildESP8266 based IOT projects.

iii) Intel IOT Development Boards

Intel is by no doubt one of the major leaders of the semiconductor kingdom and it was no surprise when they released a couple of boards with IOT enabling features a while back. While they have discontinued support for some of the old boards, some of these boards are still being used for rapid prototyping by makers and product development by designers. One of the major features of the board unsurprisingly is the huge processing capabilities. One of the most popular of the Intel boards is the Intel Edison compute module

Intel IOT development boards



Adafruit range of development boards

iv) **Adafruit Range of Development boards**

Adafruit is one of the biggest online electronics component store. Adafruit joined the IOT race a while back with special line of product like the Adafruit feather boards that possessed unique features to enable the development of scalable IOT prototypes. Asides the development boards, just like particle, Adafruit provides cloud services for devices with simple client libraries for all major IOT hardware development platforms, Powerful API, beautiful Dashboards and an all-round secure IOT platform. It could be easily said that the major difference between Adafruit and Particle is the way their products are designed.Adafruit.io is designed with a unique focus on the maker community. It's a solution perfect for prototype development. Particle on the other hand, has a more commercial, product grade undertone

v) **Arduino IOT Product Line**

It's impossible for the Arduino to be an unfamiliar name to anyone within the IOT space. Long before the IOT became main stream, several of the Arduino boards were already being used to develop prototypes for connected devices. With the ease of programming and the plug and play nature of Arduino based system, it quickly became loved by many in the hardware space. The early Arduino boards were mostly general purpose microcontrollers which were connected to the internet using GSM and Wi-Fi modules, but as the IOT began to open up, boards with special features that support the IOT were developed. Boards like the Arduino 101(developed with Intel), the MKR1000, Arduino Wi-Fi Rev 2 and the MKR Vidor 4000 which is the first Arduino board based on an FPGA Chip.

Arduino IOT product line

Raspberry pi

VI) **The Raspberry Pi**

While the Raspberry Pi is naturally a general purpose device, it will be injustice to ignore the contribution of the raspberry to the development of some of IOT products and projects currently in vogue. They are generally too robust and sophisticated to be used in the development of simple connected sensors or actuators, but they find application serving as data aggregators, hubs and device gateways in IOT projects. The latest of the raspberry pi boards; the Raspberry pi 3 model B+ features a 1.4GHz Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC, 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE, and a Gigabit Ethernet port over USB 2.0 (maximum throughput 300 Mbps). Asides several other features including 4 USB ports, Audio output, to mention a few, the board comes with a 1GB LPDDR2 SDRAM which makes it quite fast for IOT based tasks. To appeal to the Industrial IOT crowd and generally people who would love to use the Raspberry pi in their products, the raspberry pi compute module was launched. The Raspberry pi compute module three (CM 3) is currently the latest and it contains the guts of a Raspberry Pi 3 (the BCM2837 processor and 1GB RAM) as well as a 4GB eMMC Flash device (which is the equivalent of the SD card in the Pi) running at a 1.2GHz processor speed all integrated on a small 67.6mm x 31mm board which fits into a standard DDR2 SODIMM connector (the same type of connector as used for laptop memory). (2) It has the vital role in construction of 3D printer.

Proposed work

The entire system is composed of two parts: Server and Client. When power supply is given, sensors starts sensing the corresponding parameters. The data collected by sensors is conditioned and amplified to interface it with Raspberry system. Simultaneously the sensed values uploaded onto webpage. The authorized person can access the data from any place at any time, monitor the parameters and control the load through IOT successfully. The authorized person can login by using username and password. If username and password is correct then and then only user can monitor and control the machine. Maintenance is one of the major issue in industry. The voltage and current of induction motor can be calculated by using voltage sensor and current sensor. By using this parameters power consumption can be calculated and according to that indication is given. Green signal for no maintenance, orange signal for maintenance is require within 10-15 days, red signal for maintenance require. When power exceeds particular level then the motor gets automatically turn off. Temperature sensor is used to monitor the temperature of solvent and control the heater in the machine. When temperature goes beyond particular temperature the heater gets automatically turn off. The Webpage is used to monitor and control of machine using the data collected by Raspberry Pi platform.

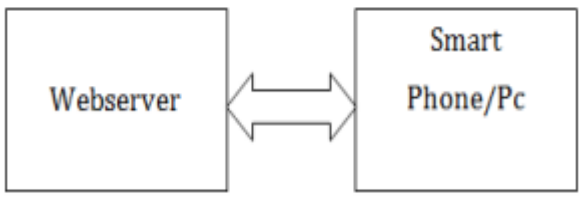


Fig 1: Server block diagram

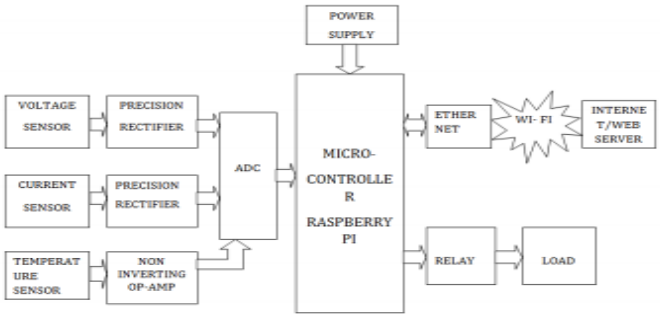


Fig2: Client block diagram

Temperature Sensor: Temperature sensor is used to monitor the temperature of chemical, which is used for etching purpose. When temperature exceeds particular temperature then the heater gets automatically off.

Current sensor: Current transformer is sensor used to linearly step down the sensor to a lower level compatible with measurement instrumentation. The core of a current transformer is torpidly, or ringed, in shape with opening in the center. The number of wire winding around the core dictates the step down ratio, between the current in measured line, and the current output connected to the instrumentation.

Voltage sensor: Voltage transformer is sensor used to linearly step down the sensor to a lower level compatible with measurement instrumentation. The number of wire winding around the core dictates the step down ratio, between the voltage in measured line, and the voltage output connected to the instrumentation.

Webpage: HTML is a specific type of universal language used for decorating a web page.HTML stands for Hypertext Markup Language. Hypertext is the text that has been used up with extra specifications such as formatting, Image multimedia etc.

Relay: Relay is a device which allows low power circuit to switch a relatively high current/voltage and controlling the actions performed. Designing this on PCB we are connecting the appliances like bulb, DC motor etc.

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How IOT products are helping in covid 19 pandemic

The current cutting-edge IOT products have the potential to play a vital role in limiting the spread of the virus and assisting in the treatment of the infected individuals. Such products that enable touch-free attendance, sanitization conformity supervising of body temperature, all in one place in real-time, are also aiding in useful data collection while put into use in offices, warehouses, hospitals, etc.

I) Tracking the Corona virus Pandemic

According to a study by Massachusetts Institute of Technology (MIT), by superimposing geographic information systems (GIS) on IOT mobile data, it can assist epidemiologists in identifying people who have encountered the infected patients. The technology can also assist in monitoring patients who are at high-risk and can provide useful data to the healthcare workforce.

II) *Connected Thermometers*

At hospitals, connected thermometers are being used to monitor the body temperature and notify any differences at real-time. With the help of an IOT Access Controller, these devices receive and transmit real-time patient data from the sensors to a nurse's station for continuous monitoring .The gathered data from over one million connected thermometers has been used to generate daily maps indicating which US counties are seeing an increase in high fevers. In India, a team of product experts engineered a contactless fever detection system that uses AI based thermal imaging to remotely read skin temperature of any individual passing through the camera range.

III) IOT Buttons

Recently, the first Internet of Things buttons was designed which are being used by hospitals in Canada. It addresses the need for rapid deployment in a facility of any size and sends rapid alerts to management notifying of any cleaning or maintenance issues that may pose risks to public safety.

Future applications of IOT

1) THE IOT WILL BECOME PART OF MORE RETAIL STORES

The IOT powers numerous kinds of retail technology in ways you may not initially realize. For example, some retailers install sensors that help them learn which areas of a store are most popular at particular times of the day. The IOT is also a part of cashless retail stores or smart shelves that automatically update with the latest prices or instead show a product's ingredients

2) THERE WILL BE A BIGGER FOCUS ON IOT FOR ACCESSIBILITY

Many smart cities incorporate the IOT, leading some people to point out that the IOT could help make places more accessible to everyone. Various countries around the world are testing IOT solutions to improve accessibility.

For example, in the Netherlands, a city has technology that connects a sensor in a crosswalk's pavement to the traffic lights. The sensor can tell how fast a person moves and adjust the light timing accordingly. In another recent example, telecommunications brand .Vodafone connected with a charity that assists people with learning disabilities. Vodafone installed IOT technology in dozens of homes within a supported living community .The project, called Connected Living, aims to improve the quality of life for individuals with learning disabilities, as well as the people who support them. As more companies explore how the IOT could improve access, we'll likely see more examples in 2020, and during the foreseeable future. IOT is certainly convenient, but it could go further and provide opportunities that may otherwise be out of reach.

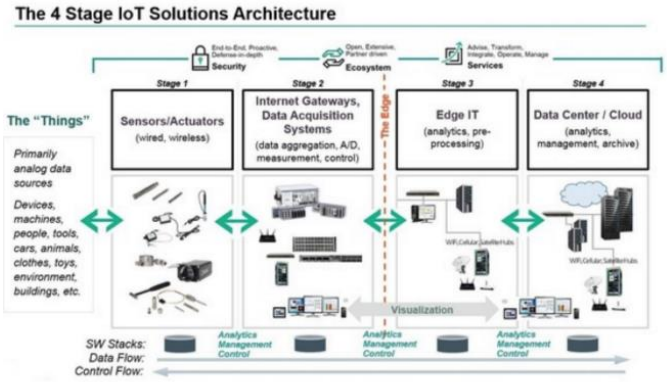
3) AI WILL MERGE WITH THE IOT MORE OFTEN

In the same way that people expect the IOT to enhance technologies like VR and AR, it'll likely have a positive impact on artificial intelligence (AI). A 2019 study from BDO investigated how businesses use emerging innovations connected with the IOT. The research found that 68% of companies already use AI to some extent to support their investments in Industry 4.0.Some analysts see the merging of IOT and AI happening on a widespread scale soon, perhaps by 2020. And, you may be able to identify instances where that's already happening. For example, Google has autonomous data center technology that collects information from sensors and uses AI to make decisions about how to maintain desirable conditions in the facility. That advancement alone helped reduce Google' spooling bill by 40%.BlackBerry is also investigating how to bring AI into its cyber security tools, including some that protect IOT gadgets. Not long ago, BlackBerry acquired an AI-based cyber security firm called Cylinder. It wants to fully integrate Clancy's technology into its core offering at some point in 2020.

This continual blending of the IOT and AI should open more possibilities to benefit from both technologies on both a personal and workplace level. Consider how many popular IOT products, like smart speakers, rely on AI to function. As more IOT gadgets bring AI into their programming, the devices will keep amazing people with what they can do.

IOT architecture

Stage 1. Networked things (wireless sensors and actuators)
The outstanding feature about sensors is their ability to convert the information obtained in the outer world into data for analysis. In other words, it's important to start with the inclusion of sensors in the 4 stages of an IOT architecture framework to get information in an appearance that can be actually processed. For actuators, the process goes even further — these devices are able to inter vane the physical reality. For example, they can switch off the light and adjust the temperature in a room. Because of this, sensing and actuating stage covers and adjusts everything needed in the physical world to gain the necessary insights for further analysis.
Stage 2. Sensor data aggregation systems and analog-to-digital data conversion
Even though this stage of IOT architecture still means working in a close proximity with sensors and actuators, Internet getaways and data acquisition systems (DAS) appear here too. Specifically, the later connect to the sensor network and aggregate output, while Internet getaways work through Wi-Fi, wired LANs and perform further processing .The vital importance of this stage is to process the enormous amount of information collected on the previous stage and squeeze it to the optimal size for further analysis. Besides, the necessary conversion in terms of timing and structure happens here. In short, Stage 2 makes data both digitalized and aggregated.
Stage3. The appearance of edge IT systems
During this moment among the stages of IOT architecture, the prepared data is transferred to the IT world. In particular, edge IT systems perform enhanced analytics and pre-processing here. For example, it refers to machine learning and visualization technologies. At the same time, some additional processing may happen here, prior to the stage of entering the data center. Likewise, Stage 3 is closely linked to the previous phases in the building of architecture of IOT. Because of this, the location of edge IT systems is close to the one where sensors and actuators are situated, creating a wiring closet. At the same time, the residing in remote offices is also possible.
Stage 4.Analysis, management, and storage of data
The main processes on the last stage of IOT architecture happen in data center or cloud. Precisely, it enables in-depth processing, along with a follow-up revision for feedback. Here, the skills of both IT and OT (operational technology) professionals are needed. In other words, the phase already includes the analytical skills of the highest rank, both in digital and human worlds. Therefore, the data from other sources may be included here to ensure an in-depth analysis .After meeting all the quality standards and requirements; the information is brought back to the physical world — but in a processed and precisely analyzed appearance already. This process starts over again and again.



IOT ARCHITECTURE
Application
Domestic & Home Automation- In home by using the IOT system remotely monitor and manage our home appliances and cut down on your monthly bills and resource usage. Energy and Water Use: Energy and water supply consumption monitoring to obtain advice on how to save cost and resources. Remote Control Appliances: Switching on and off remotely appliances to avoid accidents and save energy. Intrusion Detection Systems Detection of windows and doors openings and violations to prevent intruders. Art and Goods Preservation: Monitoring of conditions inside museums and art warehouses.

Medical field- All Detection: Assistance for elderly or disabled people living independent. Medical Fridges: Monitoring and Control of conditions inside freezers storing medicines vaccines, and organic elements. Sportsmen Care: Vital signs monitoring in high performance centers and fields. Patients Surveillance: Monitoring of conditions of patients inside hospitals and in old people's home. Ultraviolet Radiation: Measurement of UV sun rays to warn people not to be exposed in certain hours.

Industrial Control- Machine to Machine Applications: Machine auto-diagnosis the problem and control. Indoor Air Quality: Monitoring of oxygen levels and toxic gas inside chemical plants to ensure workers and goods safety. Temperature Monitoring: Monitor the temperature inside the industry. Ozone Presence: In food factories monitoring of ozone levels during the drying meat process. Vehicle Auto-diagnosis: Information collection from Can Bus to send real time alarms to emergencies or provide advice to drivers.

Advantages

i) Access to High-Quality Data

As the increase of usage of IOT products companies can easily access the high quality data which help them in understanding and monitoring customer behavior, deliver better customer experiences and take smarter business decisions.

ii) Better tracking and Management

Best Health Care and Management: The patient monitoring is possible on a real time basis without doctor's visit and also enables them to make decisions as well as offer treatment when emergency is there

iii) Cost- Effective Business Operations:

A large number of business operations like shipping and location, security, asset tracking and inventory control, individual order tracking, customer management, personalized marketing & sales operations etc. can be done efficiently with a proper tracking System using IOT .It helps the manufacturing company to track goods in a better manner to the customers

iv) Comfort and convenience

It helps us to control many devices through a single smart phone and it can be used to switch on and off whenever required irrespective of the place we live in.

v) Efficiency and Productivity

Using big data analytics through IOT can provide an overview of employee productivity and help determine what tasks are improving the function of your business—and which are impairing it.

Disadvantages

1) Privacy issues: Hackers can break into the system and possibility of stealing the data.

2) Becoming Indolent: People are more habituated to have a click based work making them lazy to any sort of physical activity, applied science in their daily routine

3) Unemployment: Lower level people like unskilled labor may have high risks of losing their jobs.

Conclusion

This paper aims to provides the reader a basic overview about Internet of Things, the major security and privacy challenges because of its exponential growth and what kind of security primitives and solution approaches are being taken to make communication secure and to protect the user's data. Conventional security primitives cannot be applied due to the heterogeneous nature of sensors, low resources and the system architecture in IOT applications. To prevent unauthorized use of user's data, protect their privacy and to mitigate security and privacy threats, strong network security infrastructures are required. Peer authentication and End-to-End data protection are crucial requirements to prevent eavesdropping on sensitive data or malicious triggering of harmful actuating tasks. Any unauthorized use of data may restrict users to utilize IOT based applications. This review paper provides the security solution approaches been proposed recently identifying both the challenges related to security and privacy and the attack techniques used to compromise/fail the sensor nodes in Internet of Things as well. Current approaches are focused on redeployed, pre-shared keys on both ends whereas certificate-based authentication is generally considered infeasible for constrained resource sensors. New security paradigm is needed for End-to-End secure key establishment protocols that are lightweight for resource-constrained sensors and secure through strong encryption and authentication.

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