IoT in Automotive Industries

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Abstract*— Home automation is a topic which gaining popularity day by day, because of large advantages. One can achieve home automation by simply connecting home appliance electrical devices to the internet or cloud storage. the reason for this surge demand of network enabled home automation is reaching the zenith in recent days for its simplicity and comparable affordability. Platforms based on cloud computing help to connect to the things surroundings everyone so that one can find it easy to access anything and everything at any time and place in a user friendly manner using custom defined portals. Hence, cloud act as a front end to access IOT. Here we are assuming a system which can control devices through wireless based network or cloud based approach. In project we use IOT based home automation system which goal is to develop a home automation system that gives the user complete control over all remotely controllable aspects of his or her home. The automation system will have ability to be controlled from a central host PC, the internet, and also remotely accessed via a packet PC with a windows mobile based application. The Internet of things describes devices with sensors, processing ability, software and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks. The Internet of things encompasses electronics, communication, and computer science engineering In this paper, we seek to highlight the concept of Internet of Things (IoT) in general, as well as reviewing the main challenges of the IoT environment by focusing on the recent research directions in this topic. Recently. IoT has emerged as a new technology that is used to express a modern wireless telecommunication network. and it can be defined as an intelligent and interoperability node interconnected in a dynamic global infrastructure network. also it seeks to implement the connectivity concept of anything from anywhere at any time, Indeed. the IoT environment possesses a large spectrum of challenges has a broad impact on their performance. which can be divided into two categories, namely. i) General challenges: such as communication. heterogeneity, virtualization and security: and ii) Unique challenges: such as wireless sensor network (WSN), Radio Frequency Identification (RFID), and finally Quality of service (QoS) that is considered as a common factor between both general and special challenges In addition, this paper highlights the main applications of the IoT

Index Terms*— IoT Heterogeneity, virtualization; WSN; RFID; QoS

I. INTRODUCTION

The Internet of Things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools. With more than 7 billion connected IoT devices today, experts are expecting this number to grow to 10 billion by 2020 and 22 billion by 2025. The Internet of things (IoT) describes devices with sensors, processing ability, software and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks. The Internet of things encompasses electronics, communication, and computer science engineering. "Internet of things" has been considered a misnomer because devices do not need to be connected to the public internet; they only need to be connected to a network and be individually addressable.

There are a number of concerns about the risks in the growth of IoT technologies and products, especially in the areas of privacy and security, and consequently there have been industry and government moves to address these concerns, including the development of international and local standards, guidelines, and regulatory frameworks. Because of their interconnected nature, IoT devices are vulnerable to security breaches and privacy concerns. At the same time, the way these devices communicate wirelessly creates regulatory ambiguities, complicating jurisdictional boundaries of the data transfer

II. DEFINATION AND HISTORY

Internet of Things (IoT), the vast array of physical objects equipped with sensors and software that enable

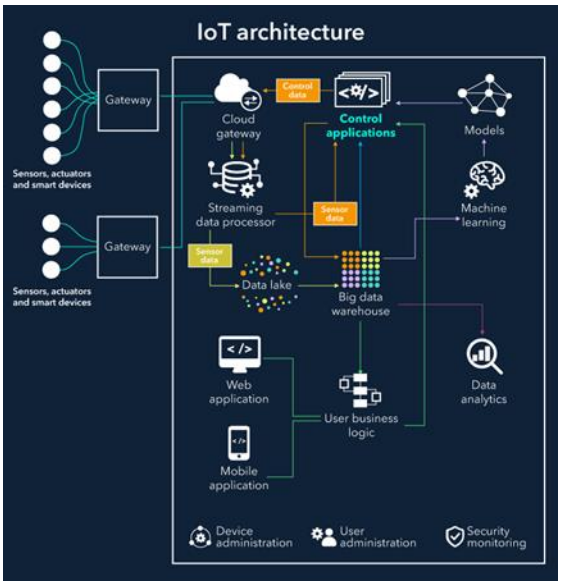
them to interact with little human intervention by collecting and exchanging data via a network.

Although examples of interconnected electronic devices exist as far back as the early 19th century, with the invention of the telegraph and its ability to transmit information by coded signal over distance, the origins of the IoT date to the late 1960s. It was then that a group of prominent researchers began exploring ways to connect computers and systems. A prime example of this work was ARPANET, the network created by the Advanced Research Projects Agency (ARPA) of the U.S. Defense Department; this network was a forerunner of today's Internet. In the late 1970s businesses, governments, and consumers began exploring ways to connect personal computers (PCs) and other machines to one another. By the 1980s local area networks (LANs) provided an effective and widely used way to communicate and share documents, data, and other information across a group of PCs in real time. By the mid-1990s the Internet extended those capabilities globally, and researchers and technologists began exploring ways that humans and machines could better connect. In 1997 British technologist Kevin Ashton, cofounder of the Auto-ID Center at MIT, began exploring a technology framework, radio-frequency identification (RFID), that would allow physical devices to connect via microchips and wireless signals, and it was in a speech in 1999 that Ashton coined the phrase "the Internet of Things." Within a few years smartphones, cloud computing, advancements in processing power, and improved software algorithms had created a framework for collecting, storing, processing, and sharing data in a more robust way. At the same time, sophisticated sensors appeared that could measure motion, temperature, moisture levels, wind direction, sound, light, images, vibrations, and numerous other conditions—along with the ability to pinpoint a person or a device through geolocation. These developments made possible the ability to communicate with both digital devices and physical objects in real time. For example, by adding a tracking chip, such as an Apple AirTag to an object such as a wallet or suitcase, it is possible to view its location. The same chip built into a digital device can track its whereabouts if lost or stolen. Then, with the widespread adoption of mobile devices such as smartphones and tablets and the introduction of pervasive wireless connectivity, it was possible to connect people and things in a near ubiquitous way. As a result, smart traffic networks, connected storage tanks, and industrial robotics systems became the norm.

III. RELATED RESEARCH

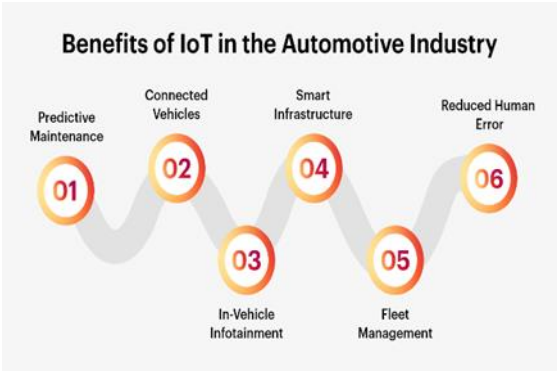
In this section, the paper seeks to offer a brief overview about IoT, its definition, its history and its architecture design of IoT;what is IOT ,benefits of IoT in automotive industris ;Application and the final part in this section discusses the similarities and differences between both IoT and traditional Internet. While the ability to connect physical objects and devices introduces increased efficiencies and, in some cases, cost savings, scaling up those connection points and networks creates greater possibilities, though not without some great risks and challenges. For example, a smart car that connects with a smartphone can already integrate mapping, entertainment, voice commands, and other functions that transform the vehicle into a computer on wheels, but a network of connected vehicles and infrastructure could potentially allow vehicles not only to avoid crashes while driving but also to "see" around corners and avoid collisions with a bicyclist or a pedestrian. In addition, sensors in bridges, tunnels, roads, and other infrastructure could indicate when repairs are necessary or when failure is imminent. Putting such innovations into practice, however, can be challenging. Current autonomous vehicles, for example, are already burdened with safety concerns and susceptibility to hackers.

IV. ARCHITECTURE AND DESIGN



- Benefits of IoT in automotive Industry:

Integrated the internet of vehicle has brought many benefits to car manufacturers and users alike. IoT technologies have enabled automakers to increase vehicle productivity, optimize maintenance processes, and improve safety features. Real-time data collection and analysis ensure predictive maintenance, reduction of downtime, and improvement of overall efficiency. Let's discuss all these in more detail and find out how your business can profit from them.



1. Vehicle Connectivity: When it comes to technical advancements, communication between vehicles is one of the most remarkable benefits of IoT in cars. Connecting smart cars and other transport systems with each other by integrating sensors, enables vehicle-to-vehicle interaction. This enables information sharing like live location, speed, route, etc. all in real-time via dedicated short-range communication. Also reduces the chances of accidents, manages the flow of traffic, and prevents possibilities of collision.

2. Increased Safety :IoT holds the power to change the way of driving for people. IoT-based sensors in IoT cars increase the safety of drivers. This sensor keeps track of the traffic patterns and weather conditions suitable for safe driving.To tackle accidents resulting from human errors IoT cars help in solving this issue. By analysing driver's behaviour, habits, and health status in real-time IoT can help to reduce the chances of casualty.

3. Smart Infrastructure :Vehicle infrastructure plays a vital role in the automobile industry. Therefore, with IoT applications in the automotive industry, drivers can access a better, smarter, and tech-advanced infrastructure. Additionally, drivers get enhanced driving experience, improved road safety, easy parking management, and less chances of accidents.

4. Predictive Maintenance: Predictive maintenance in automotive IoT helps to monitor the status of cars and its connected devices. For instance, previously it was a hefty task for a customer to understand and take his vehicle for servicing and oil bearing. But with automotive IoT, customers can monitor the system status anytime, and accordingly determine when to take the vehicle for servicing. IoT cars, enable information collection of vehicles like performance and risk of malfunctioning, etc., and notify customers about maintenance.

5. Improved Engineering :IoT for automotive industry helps manufacturers in data collection based on the usage of vehicles. After understanding which functions and systems drivers use the most, manufacturers modify and update the design. Manufacturers might change the old or unwanted model with new and better functions. And help to offer more personalized services to drivers such as improved maintenance and technical support.

6. Integrating Smartphones in Cars :By bridging the gap between vehicles and smartphones, manufacturers are building advanced technology operating systems. Customers can connect their phones with IoT cars and enjoy data sharing, app downloading, data exchanging, Wi-fi connectivity and more.

- IoT Applications in the Automotive Industry:

IoT applications in the automotive industry have unveiled a number of opportunities and transformed the industry with improved quality at lesser cost. Here are some of the IoT applications in the automotive industry:

1. Fleet Management : Recently, automotive IoT in fleet management has brought a drastic change. Today vehicles are infused with weight or volume tracking, fuel & mileage performance, live location monitoring, and route, and traffic management. These fleet management systems in automotive IoT improve the vehicle's efficiency and reduce costs.

2. Autonomous Vehicles :What we imagined as a fully driverless vehicle is still a vision. However, semi-autonomous vehicles integrated with IoT and AI technology are coming into reality. These IoT cars are making decisions on the spot while controlling other vehicle operations partly.

3. Vehicle telematics :Vehicle telematics allows customers to monitor the movement, status, development, and location of a vehicle inside a fleet. Once IoT and telematics combine, vehicles can be advanced with availability and equipment permitting to communicate with other smart can even monitor their vehicles remotely.

4. Advanced Driver Assistance System (ADAS): ADAS is the active safety system integrated into IoT cars to enable drivers to take timely control of vehicles. This will help drivers to alert them reducing the chances of accidents on roads. ADAS system quickly scans the surroundings of vehicles, and provides drivers assistance for a safe and comfortable driving experience.

5. In-Vehicle Infotainment: In the era of smart and advanced cars who doesn't want entertainment? Operating systems offered in IoT-powered vehicles enable passengers to watch/stream movies, play games, and enjoy songs.The IoT-enabled in-vehicle infotainment system provides drivers a source of entertainment throughout their journey. It also allows drivers with services such as hands-free calling, voice assistance, and live navigation when connected to the internet.

- Future of IoT in the Automotive Industry in 2023 & Beyond:

IoT in the automotive industry is still a new concept and gaining momentum. There's no wonder that in forthcoming years automotive industry will evolve immensely with the integration of IoT technology into vehicles. There are various gigantic automobile companies who adopted IoT technologies in their vehicles to change the way of driving. Tesla, BMW, Ford, Audi, and Mercedes-Benz are a few sharks of the automobile market that launched fully autonomous vehicles. The sensors in IoT cars help to collect data based on the driver's likes, dislikes, seating positions, temperature settings, etc. This helps manufacturers to upgrade and provide drivers with a personalized, more comforting, and extensive driving experience. Undoubtedly, the automotive IoT manufacturing sector is shifting to advanced and modular systems. This paradigm shift will ensure improved efficiency, smoother travel, less environmental damage, empowering sustainability, and elevated driving experiences.

CONCLUSION AND RESEARCH DIRECTION

Along with an exponential growth in connected devices, each thing in IoT communicates packets of data that require reliable connectivity, storage, and security. With IoT, an organization is challenged with managing, monitoring, and securing immense volumes of data and connections from dispersed devices. Future scope of IoT in enhancing living environments. The integration of IoT technology in architecture and cities has the potential to transform the way we live and work, creating more sustainable, efficient, and livable environments.

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