IoT Enabled Logistics Solution For Sustainable Development

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Abstract

With the dynamic increase in the number of internet-connected devices, a pervasive network has been formed that permits these devices to communicate and exchange data with one another. This network is called the Internet of Things. With more progression in the field of wireless sensor networks, now we observe traditional vehicles as smart vehicles, having the ability to interact with other connected vehicles as well as other connected objects within the network; and this is known as the Internet of Vehicles (IoV). Indian economic sector of small and medium scale industries relies very much upon on-road transportation. Also with the steady expansion of e-commerce and exponential growth of the logistics market, a well-managed logistics vehicle system can do wonders for such small-scale industries. In this paper, we present an Internet of Vehicles (IoV) enabled Smart Logistics Solution.

I. INTRODUCTION- EFFICIENT LOGISTICS MANAGEMENT

In order to make effective use of the existing infrastructure, major goods hubs must enhance their logistics processes from end to end – from unloading at the quayside to shipping goods to their destinations. It is a matter of making sure that the desired data is in the desired place at the desired time and of making traffic and infrastructure-relevant information available to everyone in real-time. With the assistance of a central, smart logistics platform, the person of authority has a constant overview and can control the increasing flows of products more efficiently, reduce truck downtimes and avoid traffic congestion considerably.

II. IoT IN LOGISTICS

A. Existing system and the proposed system

Today, logistics companies depend on advanced ICT solutions for information processing and sharing. Access to data and information about the demand for logistics services and supply opportunities is becoming a key competitive factor. Unfortunately, only the bigger companies can afford advanced systems. Small and mid-sized logistics companies have limited or poor IT-competence. A solution is therefore needed to facilitate cooperation between smaller logistics companies, which in turn, will bring down transaction costs. This paper proposes an idea of the SMART model, which is based on agent technology and cloud computing. It will enable ease in collection and flow of information and also, better and cheaper access to logistics management systems.

B. How does IoT aid in logistics?

IoT-based solutions can allow clients, logistics, and transportation companies to know where goods are located at all stages of the transportation process as well as to monitor transport conditions such as temperature, humidity, vibrations, etc. This information is critical in cases of sensitive goods transportation such as food, dangerous goods, pharmaceuticals, medical equipment, etc. Therefore, IoT can be used to control the transport conditions and make delivery more efficient. Logistic operators, transport companies, clients, and other stakeholders can achieve greater control over their freight by using these solutions. IoT may help in resolving some transport problems because it can offer integration into traditional supply chains to track, trace, and monitor the movement of vehicles

Use Case: Connecting sensors, equipment and control application over IoT Cloud
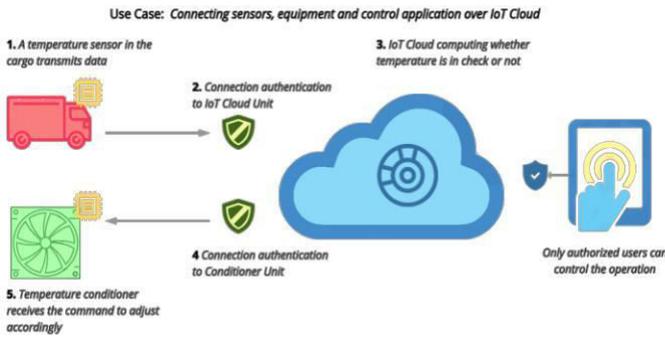
III. IMPLEMENTING IoT IN THE LOGISTIC CHAIN

The placement of small, affordable sensors will allow companies to effortlessly track inventory items, monitor their status, position and create a smart warehouse system. With the aid of IoT technology, employees will be able to successfully prevent any losses, ensure secure storage of products, as well as accurately locating an item needed. Nowadays, a majority of logistics companies have already opted to take up such IoT solutions.

IoT can help fabricate a smart location management system that will enable companies to easily track driver activities, vehicle location, and delivery status. Once the products are delivered to the desired location, a manager is notified by a push message.

A. Technical Aspects

By following this procedure, we can track the products and trigger alerts that can be sent to the receiver's mobile phone via cellular networks. Inexpensive tracking of goods can be accomplished, by using the various components listed below.

- Sensing data- Sensors- Sensing data from different kind of sensors (e.g. temperature, humidity, luminosity, CO, CO2, vibration, etc.)
- Real-time tracking- GPS and Maps -Tracking geo-location coordinates (longitude/latitude) and transmitting information to the corresponding infrastructure.
- Connectivity -Communication technologies- Sending data to storage and computing infrastructure such as Cloud computing or other devices (e.g. mobile phones).

- Computing- IoT devices, Cloud technologies Real-time monitoring, instantaneous control and optimization of transport processes.
- Visualization and control -Web and Mobile application- A web interface and mobile application that displays condition information and vehicle locations as well as alerts.

B. Device domains

- *Hardware platforms* - Arduino, Raspery Pi, Intel Galileo Gen, Intel Edison, Beaglebone Black, Broadcom, Netduino, Intel Edison, Flutter, Marvell, Tessel 2, Particle.io, Smart Things *Embedded objects* - Embedded sensors, Actuators, RFID/NFC tags, Identification (EPC, uCode, Q R...), touch screen displays, firmware, onboard software, etc.
- *Mechanical and Electrical parts* - Mechanical and electrical parts (e.g. batteries), Processing units (e.g. microcontrollers, microprocessors), Digital Signal Processors, Peripheral Controller Chips, etc

C. Model of the proposed logistics vehicles with wifi controlled robot
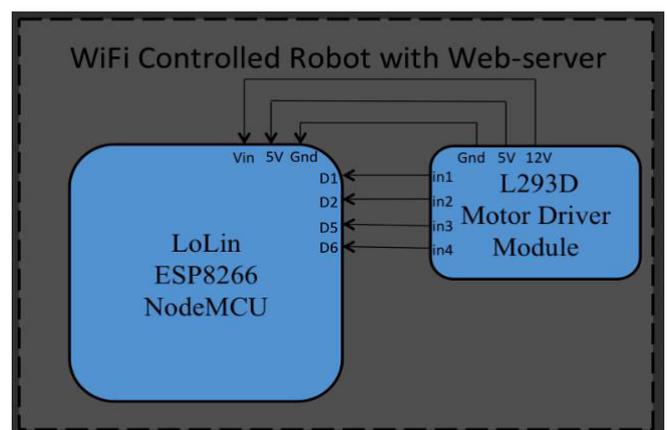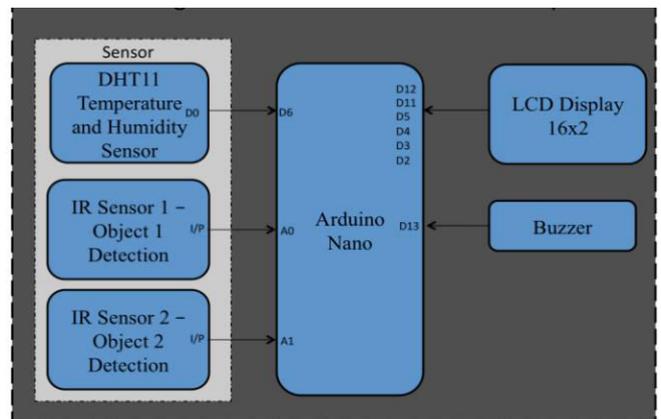
IV. SETUP OF IoT ENABLED LOGISTICS SYSYTEM

A. *Wi-Fi Controlled Robot with Web Server using NodeMCU ESP8266 module:*

In this setup, the ESP8266 Module is responsible for connecting to the Wi-Fi Network and also acting as a server. Coming to the client, a simple HTML page is created and the browser which opens this web page acts as a client.

Whenever you click on the web page, the corresponding information will be transmitted to the Server (ESP8266). This information is further received by the Micro-controller and it controls the motors of the robot.

B. *Logistics Management - Interfacing 2 IR sensors, DHT11 sensor & LCD display with Arduino Nano:*

In this setup, we will be having a controller and it will be interfaced with IR sensors for materials position detection, DHT11 sensor for temperature and humidity detection & LCD display to display the necessary details collected, so it will be easily visible to the others.

V. Use Cases

- IoT in warehousing – a quality increase of warehousing operations is achieved by different sensors tags, a connection between machines and vehicles to a central system, different devices for monitoring and use of intelligent LED lights. Some instances of IoT application in a warehouse are: smart inventory management, optimal asset utilization, connected workforce, smart energy management, etc.

- IoT in transportation – IoT in freight transportation allows tracking and monitoring a container in a freighter in the middle of ocean, as well as shipments in a cargo plane mid-flight. Telematics sensors and multi-sensor tags on items transmit data about location, condition, asset utilization, spare capacity, material degradation and damages. These features create a good foundation for end-to-end supply chain risk management

   IoT in last-mile delivery - Sensors in official and private post boxes can notify the customer about package delivery status, the exact time of delivery, detect when supplies are running low to make automatic replenishment. IoT in last-mile delivery enables the flexible delivery process.

VI. CONCLUSION

Reliable and swift transportation, as well as efficient logistics services, play a vital role in the activities of many companies. Logistics is not only a source of competitive advantage but can also determine whether the firm will exist in the market at all. Therefore, companies that are focused on their core business and don't have adequate resources and experience in the logistics field are beginning to use the services of external logistics agencies.

Logistics service providers are agencies or companies belonging to the transport, forwarding, and logistics industry. This sector caters to companies of various sizes, the multiplicity of services and the global range. It accommodates very large but also small firms, offering a range of services - from basic transport services, through service forwarding, warehousing, palletizing, packing, packaging, to full service of supply chains. Their range of activities might be widespread over a region (e.g. province), country, the continent or even the whole world.

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