ZKG INTERNATIONAL

ISSN: 2366-1313

EFFICIENCY IN MOTION: SINGLE-GATEWAY MULTI-NODE MESH NETWORK FOR CONNECTED ELECTRIC VEHICLE ECOSYSTEMS

[#1] MUTTUNOORI NAVEEN, Assistant Professor
[#2] PASEPU SHRUTHI
[#3] MAHADEVOJU MANICHANDANA
Department of Electronics & Communication Engineering,
SREE CHAITANYA INSTITUTE OF TECHNOLOGICAL SCIENCES, KARIMNAGAR, TS.

ABSTRACT: An interconnected network of electric automobiles provides numerous benefits, including improved range predictions, remote software upgrades, collision detection, vehicle monitoring, and ensuring that traffic regulations are observed. Because each node requires its own internet link, connecting every car to the internet may be prohibitively expensive due to recurring fees that vary depending on the internet service provider used. When configuring a system with a single server and multiple nodes, using a mesh network may save money.

KEYWORDS: Collision detection, Vehicle tracking, Traffic law enforcement

1. INTRODUCTION

Every day, more electric vehicles are sold, and eventually, electric vehicles will replace all vehicles powered by internal combustion engines. Connecting an electric vehicle to the internet has numerous benefits. People who are concerned about range anxiety can feel better by employing data analytics and artificial intelligence to accurately predict how far an electric vehicle can travel. In light of this, it would be beneficial if all of these electric vehicles came equipped with a cheap internet connection. When there are a large number of sensor nodes dispersed around a specific area, such as an electric car fleet, each one must have its own internet connection. Additional equipment, such as a GSM module, can be installed to enable this. The best option would be to use a radio frequency mesh network to connect the remaining nodes to a single internet-connected gateway.

2. LITERATURE SURVEY

A group of scientists has developed an idea for an Internet of Things (IoT) system that uses an accelerometer and GPS to detect crashes and promptly call for assistance. The GPS coordinates and the severity of the accident are transmitted to the rescue services.

The authors devised a method that leverages Digimesh to create an internet of cars. Vehicles establish short contact links with other vehicles within a given range. They discuss their knowledge of reckless and risky driving. According to the authors' research, the Zigbee protocol outperforms the digimesh protocol in terms of RSSI performance, despite the fact that the digimesh protocol transmits more data.

According to studies, allowing cars to communicate with the internet and other vehicles might open up a plethora of new possibilities. And this is what prompted us to devise a solution that reduces operating costs while increasing chances of success.

3. SYSTEM ANALYSIS

EXISTING SYSTEM

The current architecture of wireless mesh networks is an excellent solution for covering large regions because it offers numerous benefits. Furthermore, using low-power, short-range RF units saves energy while eliminating the need for high-power, long-range antennas. This design

ISSN: 2366-1313

option is intended to have a lower environmental impact and use less energy. In the event of a node loss, the network can immediately identify alternative paths to maintain contact. This demonstrates how resilient the network is. Additionally, the network design is simplified because each server can act as a router, eliminating the need for additional routers. As previously stated, the wireless mesh network's capacity to self-organize is an important aspect of keeping the network simple. However, there are a few issues with the current situation. To address speed issues, optimization methods must be implemented at many stages. It also demonstrates how jitter can render nodes in a network that are constantly moving less effective. These issues highlight the necessity for continuous improvement and innovation in the design and use of wireless mesh networks.

DRAWBACKS

1. The fact that present wireless mesh network technology requires significant changes indicates that performance concerns may arise.
2. While nodes in a network are always moving around, jitter occurs, slowing everything down.
3. Despite its ability to recover fast, the system can grow complicated, indicating that it must be altered and enhanced on a regular basis.

PROPOSED SYSTEM

To address the issues with the present wireless mesh network, the Single-Gateway Multi-Node Mesh Network for a Connected Electric Vehicle Ecosystem is being proposed. The purpose of this system is to improve reliability and efficiency by addressing speed issues at various network layers using more advanced optimization techniques. One of the primary goals is to make it easier for electric cars to travel by eliminating the issues that nodes in continual mobility encounter in the network. The streamlined design, which uses a single gateway to connect numerous nodes, makes network management easier and more efficient. The proposed method intends to provide a flexible and trustworthy solution to an electric car network's changing needs by effectively controlling coverage and efficiency. In short, the proposed network aims to usher in a new era of long-lasting and useful wireless communication by capitalizing on the current system's strengths while addressing its shortcomings.

BENEFITS

1. The suggested Single-Gateway Multi-Node Mesh Network improves performance across several tiers by streamlining network activities.
2. It addresses issues that arise with constantly changing nodes, decreasing changes and ensuring that electric vehicles on the network have a smooth experience.
3. The design is efficient, with a central gateway coordinating multiple nodes, making network management easy. This makes it easy to employ resources in a dependable and efficient manner.

BLOCK DIAGRAM FOR GATEWAY

BLOCK DIAGRAM FOR NODE

ISSN: 2366-1313

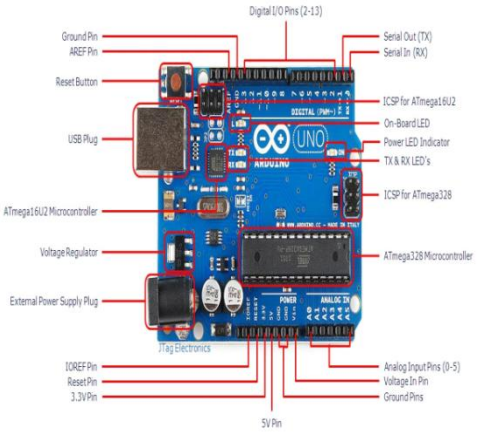
HARDWARE TOOLS

- ARDUINO UNO
- XBee
- IOT
- WIFI (ESP8266)
- RPS

ARDUINO UNO:

Most people utilize the Arduino Uno, the most recent iteration of the technology. When people say "Arduino," they usually mean this exact circuit board. The Uno, one of the most popular Arduino boards, is an excellent choice for beginners. The Arduino Uno has been updated multiple times. The most recent version, Rev3 or R3, is described in greater detail here.

This is a microprocessor board named Arduino Uno. It's based on the ATmega328. The device features a 16 MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins (6 of which can be used as PWM outputs), a reset button, an ICSP header, a USB connection, and a power jack. The processor contains all of the components required for proper operation. You can use it with a PC, a battery, or an AC-to-DC charger.



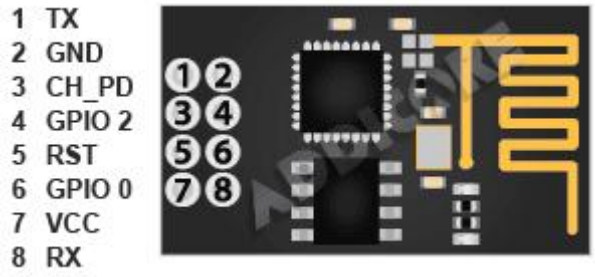
IOT:

The Internet of Things (IoT) is a network of computers, digital and mechanical equipment, items, animals, and people that can communicate via a network and be assigned unique IDs. They can accomplish this without having to communicate directly with humans or computers. The Internet of Things (IoT) was enabled by the convergence of micro-electromechanical systems (MEMS), wireless devices, microservices, and the Internet. Previously, operational technology (OT) and information technology (IT) were kept separate. However, now that these two domains have converged, we may examine unstructured data generated by robots in order to discover relevant insights that can lead to improvements.

WIFI (ESP8266):

This tutorial will demonstrate how to utilize an ESP-01 module to wirelessly control an LED. The ESP8266 is an inexpensive and practical means to communicate over the internet. It's exactly as simple to control using an Arduino. Once you've completed this ESP8266 class, you'll be able to use the internet to control any electrical equipment in the globe.

ISSN: 2366-1313



In this example, a USB-to-TTL adapter will be utilized to configure the ESP8266 ESP-01 module.We will also utilize the Arduino IDE to create a web server that allows us to control an LED remotely. If you've just received your module, check read my previous ESP8266 guide to learn how to utilize the ESP-01 Wi-Fi module. It also demonstrates how to establish and validate a connection between the ESP8266 and another device, eliminating the need for a USB-to-TTL adaptor.

XBee:

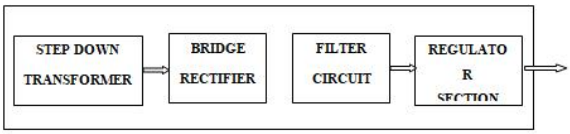
The XBee radio family consists of various XBee RF devices. Each has its own set of criteria. Most of the time, XBee devices operate at the unlicensed ISM 2.4 GHz frequency. The ZigBee protocol, which is based on IEEE 802.15.4, is compatible with XBee units.

XBee modules can communicate with broadcast and unicast groups, as well as individual sources and destinations. They enable peer-to-peer, point-to-multipoint, and other modes of communication. XBee units communicate using the Direct Sequence Spread Spectrum (DSSS) modulation mechanism. The XBee board includes digital I/O ports, analog ADC (10-bit) input pins, a PWM output, and various additional features. The device contains serial UART pins, which allow a microcontroller and a PC to communicate via a serial line. Some XBee devices, like as S2C, can also communicate with the SPI interface.

RPS:

POWER SUPPLY:

All digital circuits require a regulated power source. This effort will investigate how to obtain a stable and controlled power source from the main power supply.



4. CONCLUSION

This technique might make a networked electric automobile significantly cheaper, potentially saving 90% of the cost. The suggested solution uses a mesh network wireless radio frequency connection to connect several nodes, such as sensors, to the gateway. A high-speed wired broadband connection connects this network's lone internet access point. The cloud-based program organizes the data and provides simple explanations for it. To establish a wide area network, a multi-node single gateway device will use a mesh network comprised of low-range communication modules. This technology might be used to enforce traffic laws, provide remote car updates, identify collisions, monitor vehicles, and improve range prediction by analyzing collected

ISSN: 2366-1313

data. Using a variety of encryption methods can help make communication safer in the future.

REFERENCES

1. Shaik et al., ”Smart Car: An IoT Based Accident Detection Sys- tem,” 2018 IEEE Global Conference on Internet of Things (GCIoT), Alexandria, Egypt, 2018, pp. 1-5.
2. ZI. A. Zualkernan, F. Aloul, S. A. Qasimi, A. AlShamsi, M. A. Marashda and A. Ahli, ”DigiMesh-based Social Internet of Vehicles (SIoV) for Driver Safety,” 2018 International Symposium in Sensing and Instrumentation in IoT Era (ISSI), Shanghai, 2018, pp. 1-5.
3. A. Khalifeh, H. Salah, S. Alouneh, A. Al-Assaf and K. Darabkh, ”Performance Evaluation of DigiMesh and ZigBee Wireless Mesh Networks,” 2018 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), Chennai, 2018, pp. 1-6.
4. Saha, Sajeeb Acharjee, Uzzal Tahzib-Ul-Islam, Md. (2014). A Survey on Wireless Mesh Network and its Challenges at the Transport Layer. International Journal of Computer Engineering and Technology (IJCET). 169-177.
5. Manjunath P S and N. Reddy, ”Analysis of wireless mesh network performance under high speed mobility,” 2016 International Conference on Computation of Power, Energy Information and Commuincation (ICCPEIC), Chennai, 2016, pp. 118-122.
6. Akyildiz, Ian Wang, Xudong Wang, Weilin. (2005). Wireless Mesh Networks: a survey. Computer Networks. 47. 445-487. 10.1016/j.comnet.2004.12.001