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Advanced Wireless Transmission Using NGROK

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***Abstract:** This project explores the feasibility and practicality of accessing home appliances remotely from anywhere in the world using Ngrok, a secure tunneling service. Leveraging Ngrok's capabilities, users can control various home appliances via the internet, enhancing convenience and accessibility. The study investigates the efficiency and security aspects of such remote access, aiming to provide insights into the potential of Ngrok for widespread adoption in smart home systems. Additionally, considerations are made towards cost-effectiveness and scalability to ensure accessibility to a broad user base.*

I. INTRODUCTION

The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data. Thanks to the arrival of super-cheap computer chips and the ubiquity of wireless networks, it's possible to turn anything, from something as small as a pill to something as big as an aeroplane, into a part of the IoT. Connecting up all these different objects and adding sensors to them adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate real-time data without involving a human being. The Internet of Things is making the fabric of the world around us more smarter and more responsive, merging the digital and physical universes.

A lightbulb that can be switched on using a smartphone app is an IoT device, as is a motion sensor or a smart thermostat in your office or a connected streetlight. An IoT device could be as fluffy as a child's toy or as serious as a driverless truck. Some larger objects may themselves be filled with many smaller IoT components, such as a jet engine that's now filled with thousands of sensors collecting and transmitting data back to make sure it is operating efficiently. At an even bigger scale, smart cities projects are filling entire regions with sensors to help us understand and control the environment.

While industry-specific products will make the early running, by 2020 Gartner predicts that cross-industry devices will reach 4.4 billion units, while vertical-specific devices will amount to 3.2 billion units. Consumers purchase more devices, but businesses spend more: the analyst group said that while consumer spending on IoT devices was around $725bn last year, businesses spending on IoT hit $964bn. By 2020, business and consumer spending on IoT hardware will hit nearly $3tn.

II. LITERATURE REVIEW

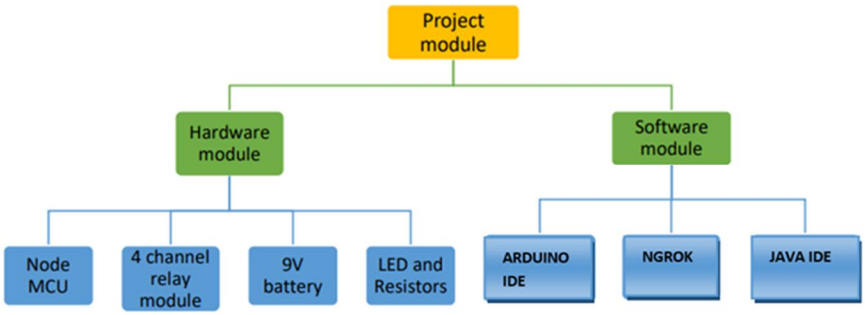
In the paper of A Literature Survey on Smart Home Automation Security done by Rohit Ragmahale Dr. D. Y. Patil College of Engineering, Ambi, Pune University, Maharashtra said that A central controller based home security system can be implemented by combining many homes into a security network with a control node dedicated to each locality depending on the number of users. There are few central or chief control nodes with high processing power which controls these nodes. Central Controller-based Home Automation System Challenges: There must be a considerable number of homes in the locality to implement this system. So that it will be cost effective and maintainable. A person having central control and its data will be able to know about a home's intimate and private information from the data at its disposal, like if a home's room AC is off or on, or if a person in a home is taking a shower. This may cause serious privacy concerns. A home automation Security System called SmartEye using GPRS also uses a central controller, to which many individual home controllers are connected .This system proposes a real-time monitoring system and home automation. The user can view the home using live camera feeds. The system notifies the homeowner by mobile phone using GPRS. SmartEye uses video cameras for security. This proposed system is also not suitable for securing single homes, but suits for a group of homes. This central controller-based security system is difficult to implement and can cause some very serious privacy concerns. In the paper of "Mobile Home Security with GPRS,"done by M. Danaher, D. Nguyen, in proceedings of the 8th International Symposium for Information Science, said that There are a lot of home security systems implemented using GPRS. Most systems use the word security in the traditional sense, and only address the threat put forth by old fashioned intruders in the home. Researchers M. Danaher and D. Nguyen propose a home security system using GPRS. The work uses a webcam to stream video and pictures of the home to its owner's mobile through GPRS. The webcam detects movement by comparing frames for differences, including light intensity.

Video streaming of the proposed work is done using the home Internet connection, not the GSM modem. U. Ali proposes another home and office automation system using GPRS in mobile phones. The user interacts with the home via a client/server architecture implemented at home using a PC and a micro Java application. Home devices are controlled by a device controller, which is connected to the PC's parallel port. The proposed system allows users to remotely control and inquire the status of the devices that are connected to the device controller. The researchers J. Jin discuss a home automation system based on WSNs and GPRS. It allows it, users, to control equipment in their home, and collect data about a device's status and weather conditions at home through their mobile devices. The authors' custom-made the application for China, as users receive information about home intrusions and fire through the Chinese Instant Message Mobile Service. Unlike other GPRS-based home automation, the proposed system uses an embedded system-based central controller. Researchers S.R. Das developed an iOS-based home automation security system using GPRS. The proposed system uses t h e client/server model for communication. The authors develop an iOS application that runs on a user's mobile phone and acts as the client and the cloud to which the home devices are connected acts as the server. The authors use video cameras, microphones, and motion sensors for providing security at home. When a motion sensor is triggered, the video cameras in the vicinity start to record. A user can view these live feeds on a mobile device through GPRS. The proposed system can also be accessed using a web browser.

III. PROPOSED SYSTEM

1) Enabling access and control of Home Appliances from any location worldwide.
2) Converting LAN to WAN utilizing the ESP32 chip within the Node MCU module and Relay Module.
3) Facilitating Port Forwarding through the ESP32 to direct requests to specific IP addresses and implementing the Home Control Service.

Proposed System architecture:



IV. SYSTEM ARCHITECTURE

The Fig shows a high-level system architecture that consists of four modules:

1) Project module
2) Hardware module
3) Software module
4) Battery module

The project module likely represents the overall project and its goals. The other three modules represent the building blocks that will be used to achieve those goals.

Hardware module: This module includes a Node MCU, a 4 channel relay, a 9V battery, LEDs, and resistors. The Node MCU is a microcontroller board that can be programmed to interact with electronic devices. The 4 channel relay allows the system to control up to four devices with the Node MCU. The 9V battery provides power to the system, the LEDs provide visual cues, and the resistors limit the current flowing through the LEDs to prevent them from burning out.

Software module: This module includes Arduino IDE, NGROK, and a Java IDE. Arduino IDE is a software application that is used to program the Node MCU. NGROK is a tool that allows you to create a public URL for a device that is on a private network. A Java IDE is a software application that is used to develop Java applications.

It's not entirely clear from this diagram how the Java IDE fits into this system, but it's possible that it is used to develop a companion application for the system or to process data collected by the system.
Battery module: This module simply refers to the 9V battery that provides power to the system.
The lines connecting the modules likely indicate that they interact with each other. For example, the software module (which includes the Arduino IDE) is likely used to program the Node MCU (which is part of the hardware module). Inclusive, this diagram provides a basic overview of the system architecture, but it does not show the details of how the different modules interact with each other. More information would be needed to fully understand how the system works.

V. METHODOLOGY

1) Arduino based home automation using ESP826 project helps the user to control any electronic device using Device Control app on the Website
2) The website sends commands to the controller — Arduino, through wireless communication, namely, ESP826
3) The Arduino is connected to the main PCB which has five relays.
4) These relays can be connected to different electronic devices. Device 1— Buzzer, Device 2- Fan, Device 3 — Lights.
5) When the user presses on the 'On' button displayed on the app for the device 1, the Buzzer is switched on. This Buzzer can be switched off, by pressing the same button again.
6) Similarly, when the user presses on the 'On' button displayed on the Website for the device 2, the fan is switched on. The fan can be switched off, by pressing the same button again.
7) This project of home automation using Esp8266 and Arduino can be used for controlling any AC or DC devices.
8) In the demonstration, we have used DC Fan and DC Bulb. To drive this DC Fan and Light, a 9V battery is connected.
9) We can control it from any were from the world, for that am using the Esp826 WIFI-development board concept So that we can control the appliance from any were
10) It Has the access to the website so that the life data cand be feed to the website in a regular time of update and also we can see the live update of the home and the electrical both AC and DC appliances.

VI. HARDWARE SPECIFICATION

A. *NODE MCU*

Node MCU (Node Microcontroller Unit) is a low-cost open source IOT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added

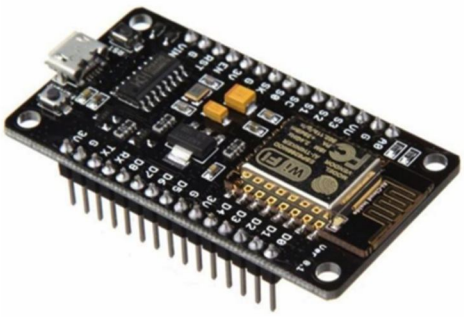


Fig No: 1 NODE MCU

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as luacjson and SPIFFS. Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially was based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IOT applications.

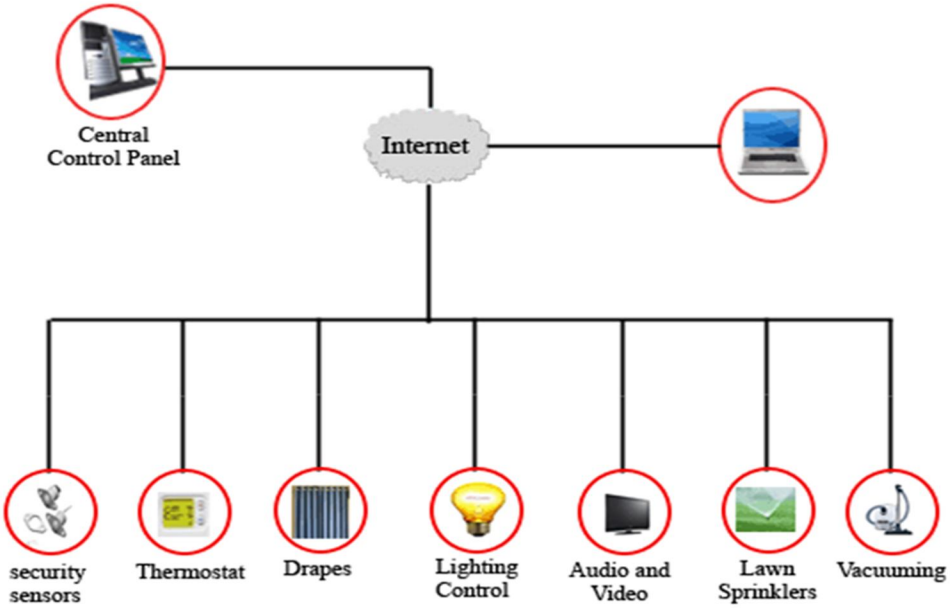
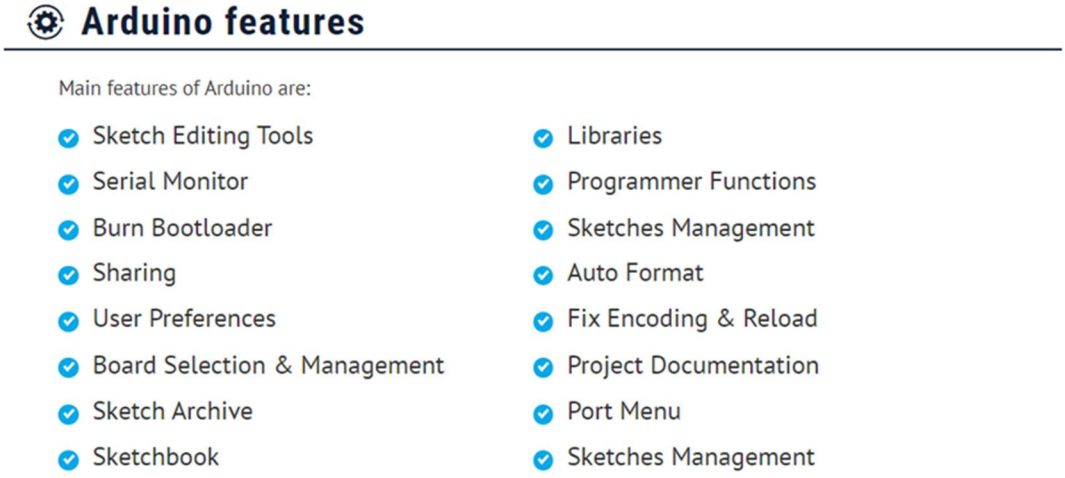
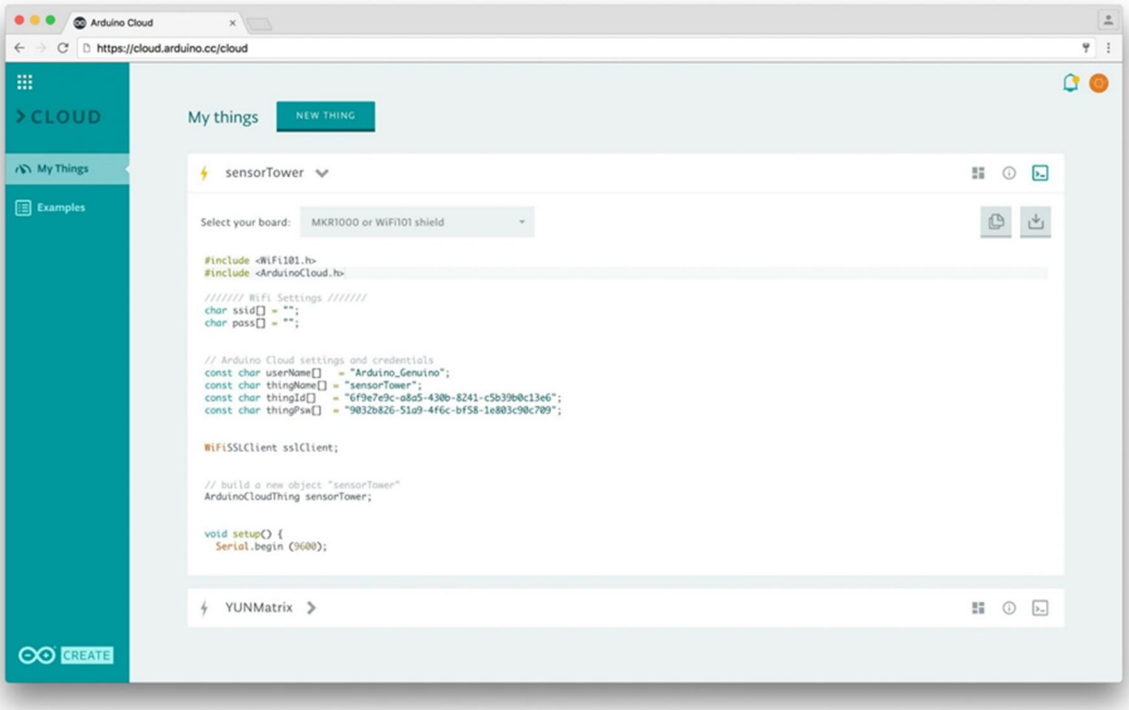


FIG NO. 2 : Central Control Panel Architecture

B. Arduino 1.8.9 Compiler

Arduino IDE is an open-source tool designed to enable users to write and upload code to a work environment in real-time. It facilitates cloud-based code deployment, providing an additional layer of redundancy for users. With full compatibility with any Arduino-based software board, it can be seamlessly deployed on Linux, Mac, or Windows operating systems. Written mostly in JavaScript, Arduino IDE offers smooth compilation and editing processes. While its primary function is code writing, it also offers various functionalities such as sharing project information with stakeholders and allowing internal layout and schematic modifications. Comprehensive installation guides and tutorials are available, catering to users of all levels of experience. Praised for its user-friendly interface, Arduino IDE can handle complex processes while conserving computer resources efficiently. Users can easily access libraries and receive updated support for the latest Arduino boards, enhancing their sketching experience with the latest IDE version.





VII. RESULT

The experimental model was made according to the circuit diagram and the results were as expected. The home appliances could be remotely switched over Wi-Fi network. Both the switch mode and the voice mode control methodologies were successfully achieved. The Blynk application was also successful in displaying the status of every application.

VIII. FUTURE ENHANCEMENT AND FUTURE SCOPE

The experimental model was made according to the circuit diagram and the results were as expected. The home appliances could be remotely switched over Wi-Fi network. Both the switch mode and the voice mode control methodologies were successfully achieved. The Blynk application was also successful in displaying the status of every application.

IX. CONCLUSION

It is evident from this project work that an individual control home automation system can be cheaply made from low-cost locally available components and can be used to control multifarious home appliances ranging from the security lamps, the television to the air conditioning system and even the entire house lighting system. And better still, the components required are so small and few that they can be packaged into a small inconspicuous container. The designed home automation system was tested a number of times and certified to cntrol different home appliances used in the lighting system, air conditioning system, home entertainment system and many more . Hence, this system is scalable and flexible.

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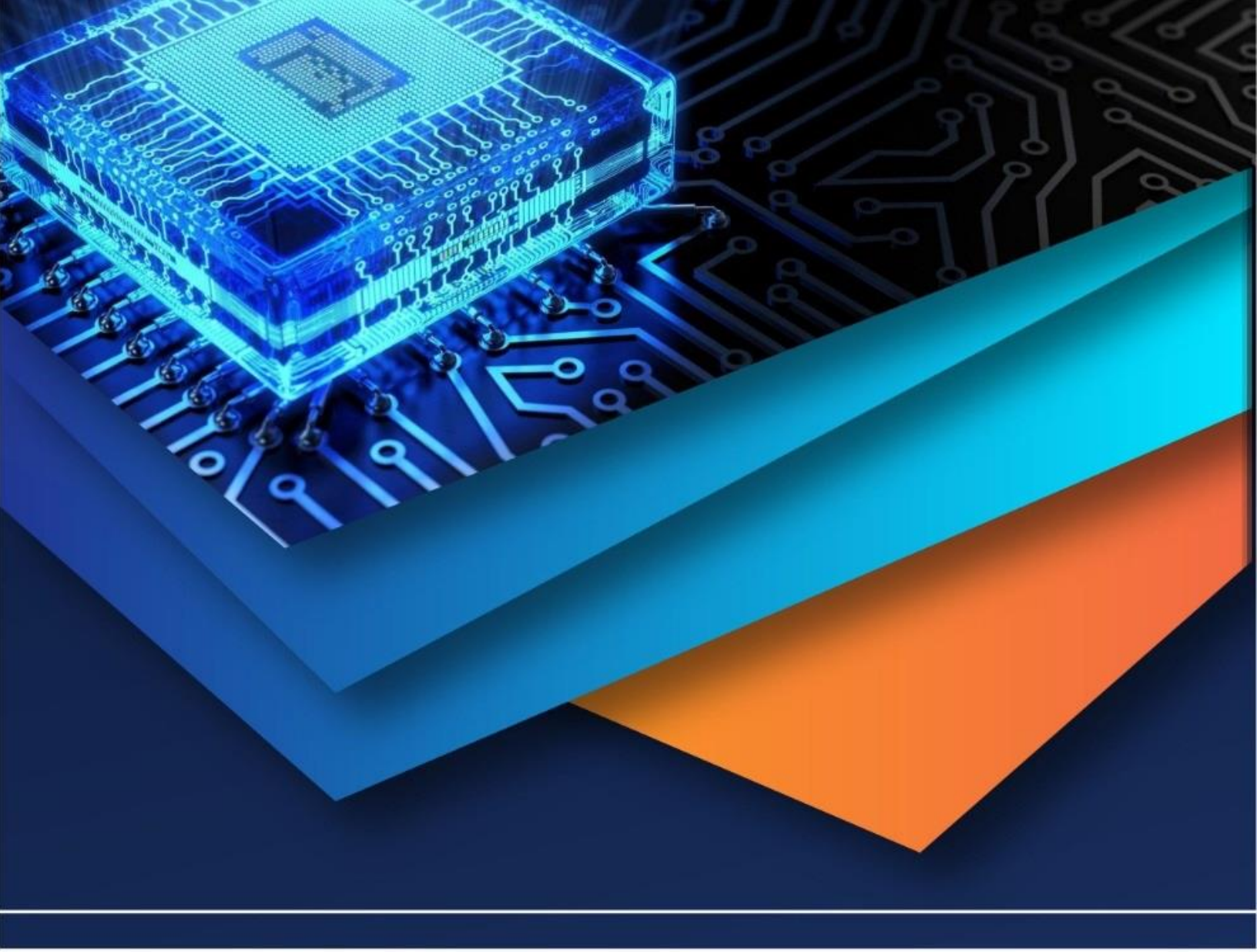

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