Matter the New Way in IoT

P. S.Togrikar, Shashikant Patane, Pratik Phase, Harshaha Baravkar
SPVP's S. B. Patil College of Engineering, Indapur, Maharashtra, India

ABSTRACT

The Connected Home over IP project (Matter) is a unified standard for smart homes and will begin product certification in 2022. The standard will prioritize short-range wireless protocols over short-range connections, such as Wi-Fi, Wire, and Ethernet. In this paper, we rely on the Matter protocol to solve the long-standing problem of heterogeneity in smart buildings. It also introduced a network architecture for integrating smart home automation with cloud services. This design forms the basis for the investigation of security and privacy issues, analysis of archived data, and data in the data protocol established in the building intelligent ecosystem.

Keywords: Privacy, Smart Protocol, Security, Interoperability, End-To-End Encryption, Matter Protocol, Network Architecture

I. INTRODUCTION

The Matter protocol is a new protocol and also provides a detailed and comprehensive overview of the Matter protocol. Implementation of the Matter protocol enables collaboration, ensuring that different types of devices can work together seamlessly and be controlled by a single application. Additionally, Matter has high data security as it uses end-to-end encryption to protect communication between devices. [1] This article introduces the Material Process from a perspective that includes its statistics/architecture, use cases, challenges, and prospects. This article also provides a detailed and comprehensive overview of the resulting protocol components. [2] The Matter system provides an important support tool for the placement of all components of the building. Use ATmega168 and Bluegiga WT11 Bluetooth module. It supports wireless serial communication via Bluetooth and only a few devices can work simultaneously. [3] Zigbee is not as secure as WiFi-based security systems. The first of these are DSM (Digital Home Services Distribution and Management System) and OSG (Open Services Gateway Initiative). The first of these is DSM (Digital Home Services Distribution and Management System), which provides users with an interface for managing and monitoring electronic devices connected to the home, and the first is DSM (Digital Home Services Distribution and Management System), which provides users with an interface for managing and monitoring electronic devices connected to the home. Management system). Managing and monitoring the home network. The first automation product is DSM (Digital Home Services Distribution and Management System), which provides users with a connection to control and monitor home electronics. The design forms the basis for security and privacy issues, data analysis, interaction, edge, and information research in the process based on smart home devices.

II. LITERATURE SURVEY

A. Bluetooth-based home automation system using a mobile phone

In the Bluetooth-based home automation system, home devices are connected to the input and output ports of the Arduino BT board and use relays. The Arduino BT board is based on the microcontroller's level communication C language; The connection is made via Bluetooth. Provide password protection so that only authorized users can access the device. For wireless communication, a Bluetooth connection is established between the Arduino BT board and the mobile phone. Use ATmega168 and Bluegiga WT11 Bluetooth module. It supports wireless serial communication via Bluetooth and only a few devices can work simultaneously. Essentially, they connect multiple devices to a single application, with recommended frequencies ranging from 2.5GHz to 5GHz. [5]

B. Zigbee-based home automation system using a mobile phone

This system uses CC2530 ZigBee. The ZigBee wireless interface control module is the main function of communication between the computer and ZigBee wireless network, broadcasting person-machine commands. Zig bee. Design and use to monitor and control home appliances. The operation of the device is recorded and stored by the network administrator. It is a power, data rate wireless. It operates at three frequencies: 2.4 GHz, 868 MHz and 915 MHz. To do this, use a WiFi network using four routers of a standard wireless ADSL modern router. Network SSID and WiFi security are not preset. Essentially, they connect multiple devices to a single application, with recommended frequencies ranging from 2.5GHz to 5GHz. [6]

C. GSM-based home automation system using cell phones

GSM-based home automation is very interesting in terms of research due to mobile phones and GSM technology. SMS-based home automation and Dual Tone Multi-Frequency-based home automation are the primary GSM communication options we consider. Al Hraish's working diagram shows building sensors and devices connected to the home network and communicating via GSM and SIM (Subscriber Identity Module). The system uses sensors to convert machine operation into electrical signals that enter the microcontroller. Sensors convert physical energy such as sound, and humidity into other properties such as voltage. A wafer analysis. [7]

D. Wi-Fi-based home automation system using a mobile phone

Wi-Fi-based home automation systems generally have three modules: server, hardware interface module, and software package. This diagram shows the system model layout. The server and the hardware interface module communicate with each other via WiFi technology. Use the same technology to access web applications as a server. The server is connected to the Internet so remote users can access the server's Internet connection using a compatible web browser. The software of the home automation system is divided into server application software and microcontroller (Arduino) firmware. Almost all smart devices provide their functions via wireless communication (WiFi or Bluetooth). As with all digital communications, hackersintercept wireless communications and use them to gain access to your smart home devices. [8]

E.   Home automation using RF modules

The main purpose of a home automation system is to create a home using remote-controlled   RF modules. RF control of automation systems. Technology is getting faster and therefore families are getting smarter. Today's buildings are eager to migrate from existing switches to centralized control systems that include radio frequency control switches. Nowadays, the walls are different in different parts of the building, making it difficult for end users to access the walls and manage and operate the business. Additionally, doing so will create more problems for the elderly or physically disabled people. [9]

F.   Home Automation using Android ADK

Home automation is integrated with ADK and creates a connection between Android and ADK. The devices in your home are connected to each other. Smart home devices have evolved over the years and have become common in many homes. From smart security cameras to smart locks, from smart speakers to smart homes. [10]

III.PROPOSED SYSTEM

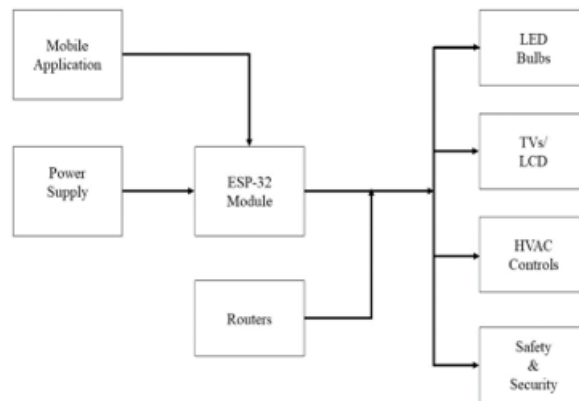
Figure 1:Block Diagram of Matter Protocol

Creating a system that incorporates the "new way" of IoT in terms of edge computing and other modern issues involves many important factors and considerations. The recommended system architecture is as follows:

A.   Edge Devices

Use of various IoT devices equipped for data collection. These tools should be able to complete simple data preprocessing and analysis. For example, sensors are usedenvironmental monitoring, industrial machinery, smart home devices, and wearable devices.

B.   Edge Gateways

Deploy edge gateway devices at the edge of the network to collect data from many edge devices. These gateways act as an intermediary between end devices and the cloud, performing additional processing, filtering, and encryption of data before transmission. Edge gateways can also host AI models for local insights, enabling rapid decision-making without relying on the cloud.

C.   Edge Computing Infrastructure

Create a distributed edge conversation sent to many locations close to the information source. Leverage containerization or virtualization technologies to better manage and optimize computing resources. Interview process

D.   Cloud Integration

Integration with cloud services to perform functions such as platforms such as AWS IoT, Azure IoT, or Google Cloud IoT for scalable data processing advanced analyticsand device management. Adopt an edge-to-cloud synchronization mechanism to ensure seamless integration between edge and cloud.

E.   User Interface
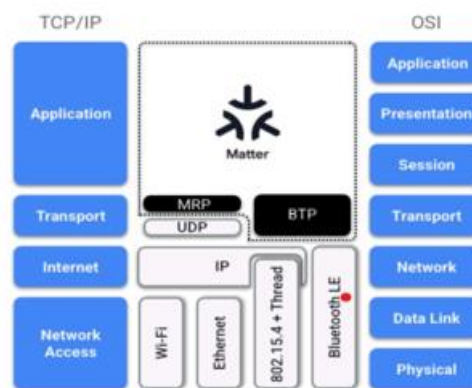
Figure 2:The Architecture of Matter Protocol

The main devices in the smart home ecosystem basically work on two technologies: Wi-Fi and Wire. Wi-Fi delivers more bandwidth by connecting Matter devices to the cloud and local networks.These devices include Google Home, Amazon Alexa, etc. There may be central devices such as On the other hand, Thread protocol is used to connect low bandwidth devices to the network. These devices include lighting, security cameras, smart locks and more. The device that connects the network of Thread devices to the main network is called Thread border router. In a Thread mesh network, any device can be a Thread border router because the device's data is bypassed through slave nodes and then sent to the central hub.

F.   Hardware Requirements

Hardware: ESP-32 DevkitWireless Connectivity-
Wi-Fi 802.11 b/g/n/e/i (2.4 GHz) Bluetooth v4.2 BR/EDR and BLE (Bluetooth Low Energy)Memory- 520 KB SRAM,448ROM, 4 MB Flash memoryGPIO Pins-34 GPIO pins, including analog input pinsSupport for SPI, I2C, UART, PWM,

IV.RESULT DISCUSSION

As mentioned above, Matter is a protocol that uses UDP and IPV6. The main devices in the smart home work on two technologies: Wi-Fi and Wire. Wi-Fi delivers more bandwidth by connecting Matter devices to the cloud and local networks. These devices include Google Home, Amazon Alexa, etc. There may be Central the other hand, Thread protocol is used to connect bandwidth devices to the network. These devices include

lighting, security cameras, smart locks. The device that connects the network of Thread devices to the main network is called Thread border router.

TABLE I COMPARISON BETWEEN MATTER, ZIG-BEE&BLUETOOTH

Parameters	Protocols		
	Matter	Zigbee	Bluetooth
Operating OSI layers	- Network layer (Layer-3/IPv6) -Transport layer (Layer-4/UDP) - Application layer (Layer-7)	- Physical layer (Layer-1) - Data link layer (Layer-2) - Network layer (Layer-3)	Data Link Layer (layer 2): Bluetooth utilizes two key protocols atthis layer: Logical Link Control and Adaptation Protocol (L2CAP)
Interoperability	Establishes interoperability among different devices and platforms	Only provides interoperability among Zigbee-compatible devices	The IrOBEX protocol is utilized by Bluetooth technology
Topology	Ethernet LAN, Wi-Fi LAN, Thread, and Bluetooth Low Energy	Mesh networking	Scatternet
Scalability	Designed to scale from small to large networks	Suitable for small to medium-sized networks	Scalable because of its optimized packet design and its use of the Bluetooth LE radio.
Authentication	Employs strong authentication mechanisms, such as public-key cryptography and certificates	Uses access control mechanisms, pre-shared keys, and device-specific keys for authentication	verify that the device requesting access knows the secret link key.
Licensing fee	Free	Free	Free
Membership	29 promoters and 281 participants	More than 300 members	the SIG is free andpublished.

Evaluation results of the Matter Protocol show that it is effective in identifying and classifying disruptive devices for companies. Develop IoT projects with all business objectives by conducting comprehensive testing on data privacy, intelligent processes, security, and interoperability. Identify how leveraging edge computing and AI can help increase efficiency, reduce costs, generate revenue, or create a competitive advantage. Evaluate the effectiveness of using edge computing and AI in existing IoT infrastructure. Consider factors such as device capacity, network connectivity, data volume, and computing requirements
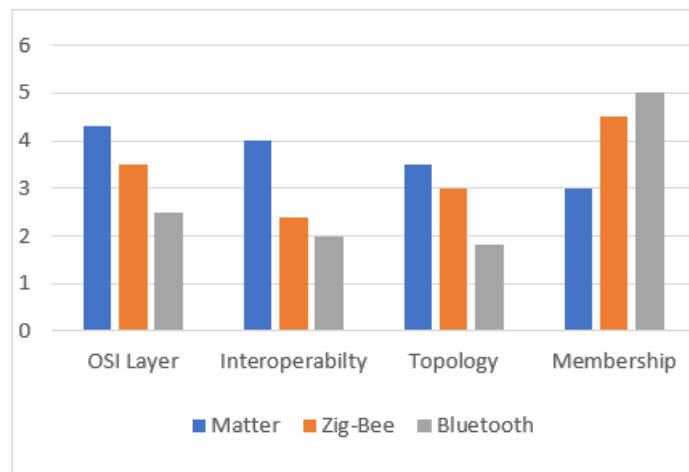
Figure 3:Matter, Zig-bee&Bluetooth
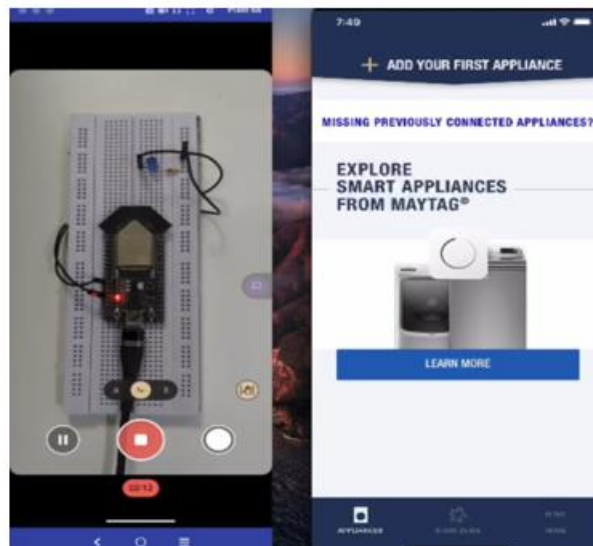
V. RESULT AND DESCRIPTION

Figure 4:Graphical representation of Matter protocol, Zig-bee, & Bluetooth
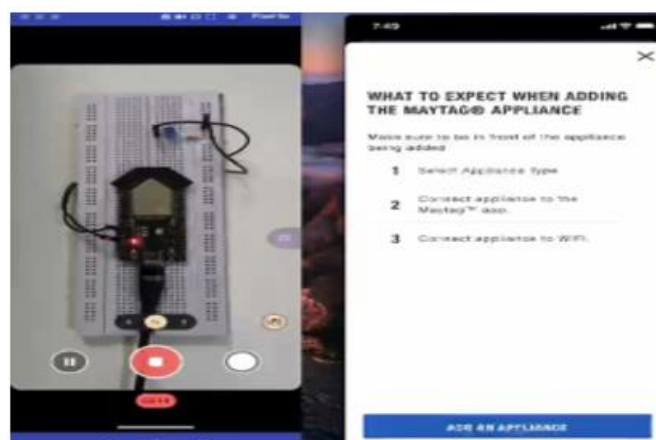

Figure 5:The above image describes the Home Page of the project which includes options for login or connecting smart devices.
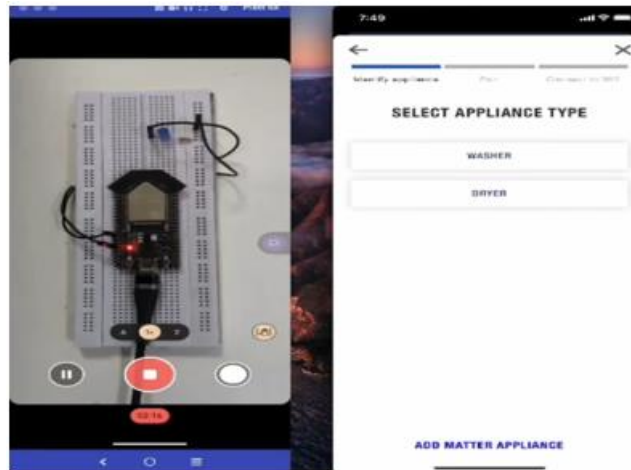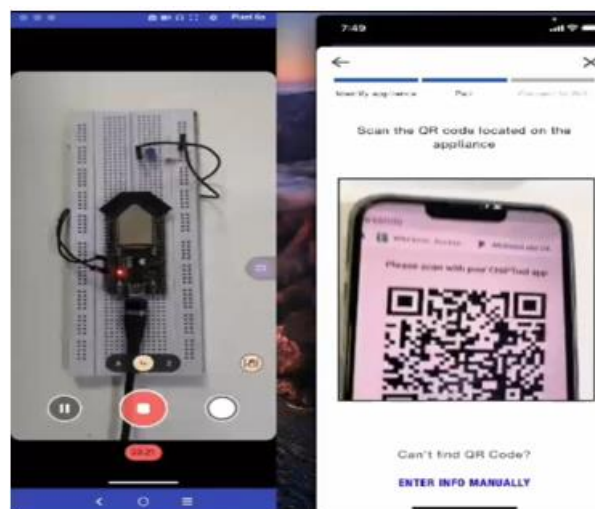
Figure 6:Add New Appliance

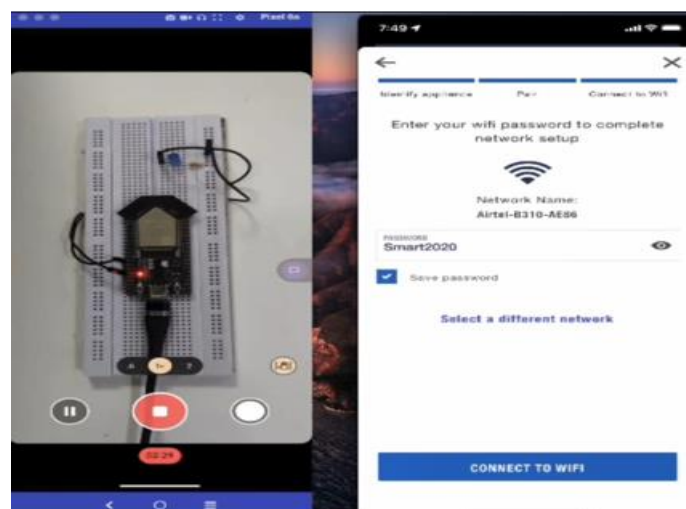Figure 7:Select appliance type e.g. Washer, Dryer

Figure 8:Scan the QR code located on the appliance.
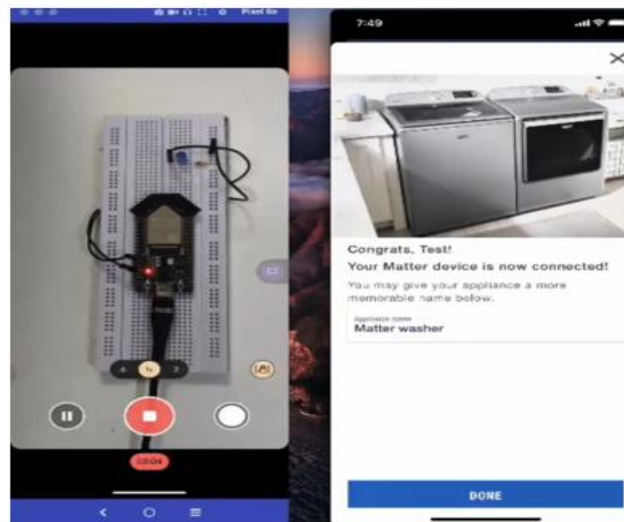
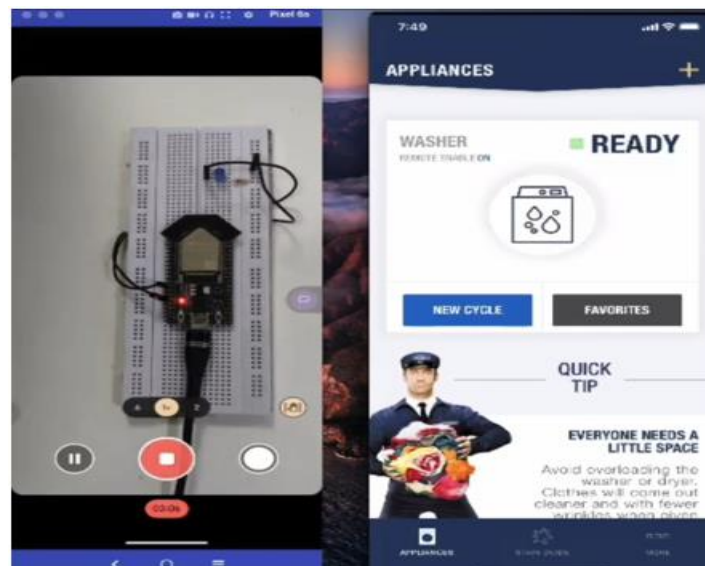Figure 9:Enter your wi-fi password to complete the network setup
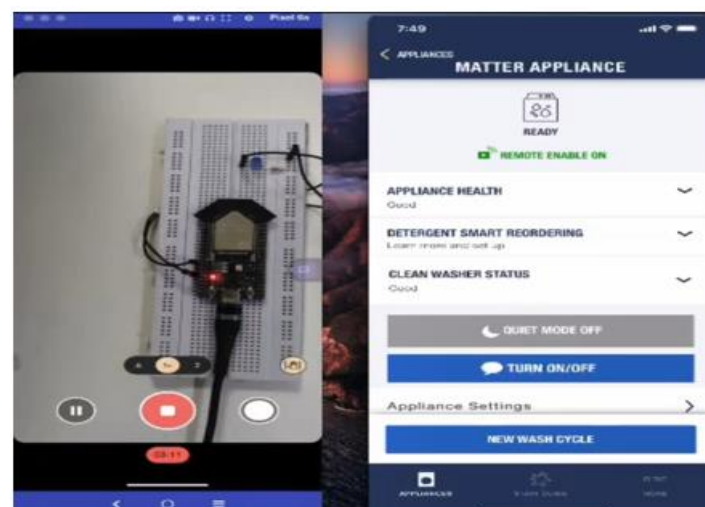

Figure 10:Your matter devices are now connected.

Figure 11:Your matter devices are ready to use.

VI. CONCLUSION

This article introduces a low-cost, secure, universal, and configurable remote control solution. This article discusses a new and successful goal, which is to connect home devices using WiFi technology to control home meet the needs of users. Enabled solutions are proven to offer remote control, provide home security, and be more efficient than ever. In this article, we can conclude that we rely on the Matter protocol to solve the standing problem of rotation in smart buildings. It also introduced a network architecture for integrating smart home automation with cloud services. This design forms the basis for the investigation of security and privacy issues, analysis of archived data, and data in the data protocol established in the building intelligent ecosystem.

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