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Evaluating IPv4 vs. IPv6-Based Home Automation Systems in Mitigating Reconnaissance Attacks

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Abstract

Helping the elderly and the disabled with their household needs is the primary goal of this project. Household appliances are controlled using either the control technique or the tone approach. Accessing and calculating strategies and appliances remotely is made possible by the primary organize system installation in wireless technology, which allows for distant contact through phone Internet Protocol connection. A dedicated server PC is not required for the intended system, which provides a novel communication protocol and the value of parallel systems, allowing for the observation and management of a home environment beyond the capabilities of a simple switch. Incorporating devices such as light switches, power outlets, and motion detectors into the proposed home control system allows for more secure management of the control with a low electrical energy activation mechanism, demonstrating the system's potential and efficiency. This control system has a matching hierarchy of switches, and all user interfaces show the current state in real time. With its low-cost design, user-friendly interface, easy installation, and high-security features, this system is intended to handle electrical-appliances and gadgets in the home.

1. Introduction

The "Analysis of Different Automation Systems A long time has passed since the concept of "Mitigating Reconnaissance with IPv4 and IPv6" was proposed. An example of the usage of the phrase "Comparison of ipv4 and ipv6" to describe robots is here."Use of organized systems and information technologies to decrease the need of human work with high security" is the definition for automation. To describe home automation, the American-Association of Home Builders coined the phrase in 1984. Although the concept of home automation isn't new, it has been more of a matter of technology catching up with the notion. Combining a number of sub-systems is necessary for your house to be considered an automatic home [1]. Lighting, security, media, etc., make up the bulk of a home automation system's general components. Right now, it feels like any other era. Because there are a plethora of modern conveniences at our fingertips, made possible by technological progress. Some homes have even been dubbed "Automatic" because of their apparent ability to think for themselves. Automated home is another name for this "thinking" ability. The use of networking equipment is paving the way for new areas of study in engineering and computer science. Controlling "lighting, appliances, locks of gates and doors and additional systems" via home automation presents a significant research opportunity for improved energy efficiency, security, and peace of mind. H.A.S. seems to be in vogue right now, therefore you should get on the bandwagon for this expanding industry. The ability to remotely or automatically manage all aspects of one's home is provided by home automation systems [2].

1.1 Purpose and Aims

The foundation that the Home Automation System (HAS) is laying may unleash the brilliance of future generations. Our age may enjoy a less hectic and more carefree way of life. Additionally, many upgrades are possible for Home Automation Systems (HAS) as time goes on, making them the next generation of technology after the elderly.

The primary goal of this study was to develop and implement a secure, low-cost wireless home system.

- A user-friendly interface that accepts commands from the user. - A communication-system that relays such commands to the terminals.- The ability to access the home appliances remotely from anywhere. This home appliance control feature enables the user to activate any appliance just by speaking into it.- An IP-Cam that enables users to monitor their home in real-time from any location. - An program that can be easily expanded to include more functionality as required. I used IPv6 with the latest SEUI approach, which is 64 bits. □ □

1.2 Key Elements of the Robotics System

Instead than relying on human ingenuity, operations may be "automated" via the use of control systems. Just so you know, automation is basically just having knowledge do things for you instead of you having to do them yourself. Just because I think our nation should be developing more and more is the sole reason we chose this initiative. The widespread adoption of "smart home" ideas in Europe has made life much easier for the average citizen [3]. These systems automate the operation of several electrical equipment, including lights, doors, and HVAC systems. You can easily check in on your home from anywhere with a customized home automation system that integrates your alarms, cameras, recorders, and even lighting and appliances. This will allow you to make the most of the management features. If you have an intuitive automation system, you can control its operations from anywhere, even your bed [4].

1.3 Application Design for Android

1.4 Stages of Implementation

"Goals, objectives, scope, risks, issues, budget, timescale and approach" must all be determined before this system can be started and used. Every stakeholder's opinion and consent must be sought by making this method accessible to them. Before work is created and implemented, any differing opinions must be clarified.

1.5 Getting Ready and Gathering Materials

Thorough study and careful preparation are the keys to an unbeatable strategy. Before taking charge of any system, the first thing you should do is make a strategy for it. It is common for system preparation to be invisible in order to proceed with the procedure. The value of a system plan in terms of time, money,

and avoiding other problems is, however, not fully appreciated by many.

1.6 Semantics of Assembly

Because it establishes the parameters under which the system will operate, this step is fundamental to all systems. The development is very likely to fail if it is not finished adequately. The likelihood of success may be increased by devoting time to planning, refining the system, and converting the predicted profit. While diving headfirst into an endeavor is appealing, rushing the creation of a system almost always results in problems and failure.

2. Literature Review

Work saving was the original goal of automation before time. The invention of the electric power source in the early 20th century paved the way for a plethora of household appliances that could run on electricity or gas, including washing machines (1904), water heaters (1889), refrigerators, sewing machines, dishwashers, and clothes dryers. According to ABI Research, 1.5 million automation systems were implemented in the United States through 2012. The IPv6 standard mandates the assignment of a unique routable number, 64, to every interface. Prefix and line ID are the two components that make up IPv6. The two pieces of the prefix that an ISP will provide you are the global prefix and the subnet ID. A prefix in the network may be easily obtained, making it a target for attackers. The next section details how to assign a locally created ID to an IPv6 network and how to identify an interface of a testing node that isn't accessible via the task method. There are a few unique methods that IPv6 addresses are assigned: static IPv6, tasteful and stateless DHCPv6, and (SLAAC).

3. Problem Statement:

IPV4 is a part of the current architecture that explains everything. When it comes to data transport, IPV4 has a few issues, such as a lack of security (since it doesn't employ IPsec by default) and a big routing table. The internet protocol version 6 (IPV6) was developed by the network operating group of the internet engineering task force (IETF) to mitigate some of the mentioned shortcomings. The 32-bit IP addresses specified by IPV4 were insufficient to accommodate the exponential growth of the internet for research purposes; thus, IPV6 included 128-bit IP address fields, allowing for massive addresses and improved security with IPsec.

4. Methodology

The system implementation relies on the Arduino IDE, a core development tool.

1) The Arduino IDE

The "Wiring and Processing" integrated development environment (IDE) is responsible for its creation. System programming is intended for performers and other novices unfamiliar with software development. Features such as "bracing, syntax, and indentation by automatic" and an easy-to-use, one-click approach to build and load programs to an Arduino board are included in the code editor. In the Arduino IDE, a "sketch" is defined as a set of program instructions.

Example Sketch for the Arduino IDE (Figure 1)
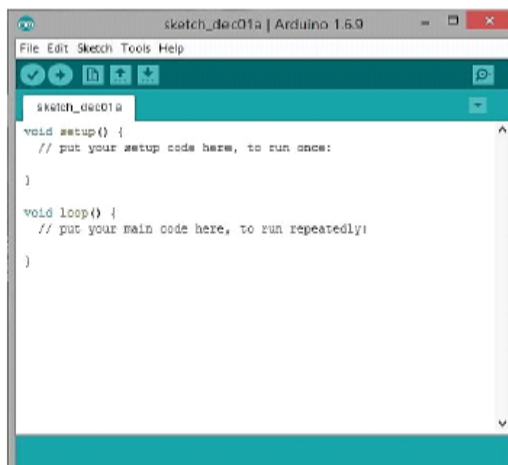
(ii) Parts and How Modules Are Put into Place

The following are some of the components that make up my first module:

➢ Arduino Microcontroller (UNO)
➢ Android Application
➢ Ultrasonic Sensors (HC-SR04)
➢ LEDs

ARDUINO MICROCONTROLLER

One board that contains microcontrollers is the (UNO). The Arduino development environment and user-friendly hardware form the basis of this platform. In response to instructions from an established software, it manages microcircuits. Users may connect a compatible software to their PC. You may use it to operate servo motors, PIR sensors, and more. On the UNO microcontroller circuit board, you'll find the Arduino software (IDE). In its initial edition, Arduino used the UNO board and Software (IDE) version 1.0. Launching a line of USB Arduino boards, the UNO serves as a stand-in for the Arduino electrical platform.

Stipulation	
Input Voltage:	DC 3-5V

	3.3V (motion detected-output high)
Output signal:	
Detection Angle:	110 degree
Detection Angle:	max 7 m

Table 1: Arduino Microcontroller UNO Stipulation
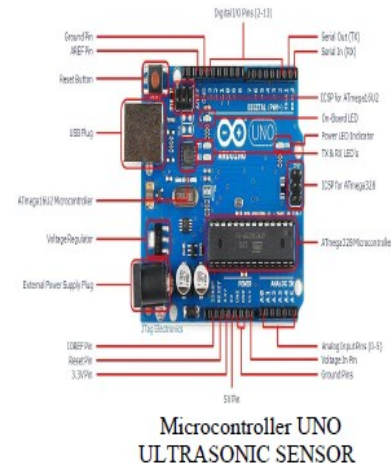

Figure 2: Arduino

Microcontroller UNO
ULTRASONIC SENSOR

The HC-SR04 transducers may switch from an ultrasonic effect to electrical indicators and back again. Ultrasound transceivers are devices that can send and receive ultrasound waves. Many health and medical sensors are transceivers because of their ability to transmit and receive intelligence.

LEDs

We can get by with any sort of lighting. Here we have another solution: the room lighting, which may be regulated or automated. We may proceed after we connect them with the relay. Nevertheless, we are using the following basic LEDs for the system example.

Use of Ultrasonic Transceivers with Arduino

What follows is a circuit schematic of the sensor and microcontroller, which will allow you to link the two. Four pins—VCC, Ground, Echo, and Trig—make up the Ultrasonic Module of the HC-SR04. It is

recommended to connect the section's Ground and VCC pins to the Arduino board's Ground and five volts pins in a certain sequence, and to each Digital Input or Output pin on the board using the trig and echo pins, respectively [5].
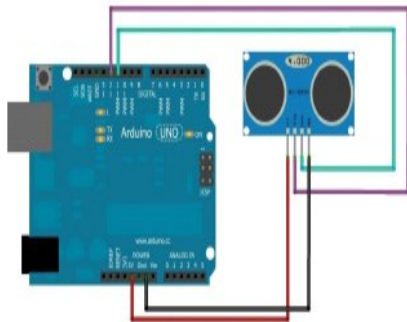
Figure

3: Ultrasonic Sensor

Arduino with Relay

The component is a 120-240V control that is coupled to an electromagnetic, and the acronyms NC, NO, and C stand for "normally closed," "normally open," and "common terminal," respectively. The electromagnet becomes electric and changes the contacts of the 120-240V control open or closed when the relay receives a HIGH signal on the signal pin [6].

Using Ultrasonic Transceivers with an Arduino (Figure 4)
Typically Open vs. Typically Closed
The system's real relay has two types of electrical connections: normally closed (NC) and usually open (NO). Which one you choose will be determined by your preference for using the 5V signal to either turn the button on or off. The common (C) mortal in both systems receives the 120-240V supply at the relay. Follow the NO mortal or terminal instructions to use the usually open connections. Regularly closed contacts are activated by activating the NC mortal or terminal.

5. Results and Discussion

1) Important Aspects
Developing and implementing a cost-effective smart automation system is the primary goal of this project. The development of this system will enable the planning of various tools and gadgets. The system's ability to use common household equipment and gadgets with little adjustment is one of its most notable features. In addition, a new technique called SEUI(64-bits) was established and IPv6 was used to create a safe and fast system. Why? Because IPv4 won't be sufficient for users in the future.

Crucial Elements Consist Of

The user-friendly system may easily gather their instructions. A system that transmits user instructions to the terminals using a wireless network. The process of receiving user instructions from the main controller via the terminal.

2) Data That Has Been Evaluated

Reason being that this system's components together constitute an intelligent being. Because we are living in the age of smart technologies, where technology is becoming more vital in our everyday lives, a stylish home is defined as a house that is entirely safe and innovative. In my system, I designed the following components specifically to transform your house into a "SMART HOME." Control over Ethernet, Smart Light, and High Security

3) Intelligent Beam

This unit exemplifies cutting-edge technology; as we've already established, it will allow you to control your home's lighting in a number of ways. For example, when a person enters a room, the lights will automatically turn on, and they will turn off again when they leave. Another way to control the lights is with voice recognition, so the lights will respond to your commands. Lastly, this module allows you to control the lights using predefined gestures, such as raising your hand to turn them on and lowering it to turn them off.

4). Intelligent Safety

Next up is the smart security module. I'm sure most of you are familiar with this part, and for good reason: it ensures that your home is safe from intruders. For example, if a stalker attempts to break in, the system will sound an alarm. So, what I've built or evaluated here is a system that, even when you're

not at home, no one can break in. If someone tries, a camera will capture the footage and the security alarm will go off.

In addition, I implemented a novel approach to network security called SEUI (64-bits).

The IPv4 and IPv6 comparison is shown in Table 2 [7].

Features	Ipv4	Ipv6
Addressing	32 IP addressing bits	128 IP addressing bits
IP-sec	Optional	IP-sec support is Required
Quality of service	Differentiated Service	Traffic classes and flow-labels use
Fragmentations	By routers and source-node	By the Source-node only
Unicast and multicast, broadcast	Use each and every one	Uni-cast ,Multicast Any-cast are used and cannot used broadcast
Configuration	Physically or DHCP	Auto-configuration or DHCP
Checksum system	Header include With Checksum system	Does not Include checksum system
Option-field in Header	Require	addition header
ARP(Address Resolution Protocol)	resolving an ipv4address	replace with ND(Neighbor Discovery)
Mobility	Uses mobile IPv4	IPV6 with faster Handover, routing and hierarchical Mobile
Internet Group Management Protocol(IGMP)	Use to manage Local-subnet Group	Replaced with Multicast
Size of packets	576 byte packet Size (possibly fragmented)	1280 byte packet Size (without fragmentation)

6. Conclusion

One may argue that "SYSTEM OF AUTOMATION WITH ARDUINO FOR HIGH SECURITY" was successful. An "Arduino-UNO board, power sockets, home appliances, PIR sensor, ultrasonic sensor, WI-FI module and camera, buzzer, servo motor and a mobile application to operate things" are all part of this infrastructure. Introducing the new IPv6 SEUI(64-bit) method is better, easier, and cheaper. The following goals of this system have been accomplished to a high degree of certainty:
- Construct a "wireless automation system" that is controlled by an android phone, with a focus on human actions and gestures. - Plan and implement an affordable, well-structured automation system that has been functioning well so far. - Think of it as a safe, user-friendly way to control household appliances, with a specific aim of helping the elderly and disabled.

An Android phone may now easily monitor and control the system's lighting. It is verified to be very structured and appropriate. Smart living will eventually become a reality so that customers may control their homes remotely and wirelessly. As an upgrade from IPV4, IPV6 is the most recent protocol version. While IPV6 is now maturing at the fastest rate possible online, IPV4 is still vulnerable to some types of known security threats. When compared to IPV4, the most recent definition of the internet protocol provides additional elements that improve the security of strategies connected to the net.

Some security concerns have persisted through all of these changes and need systematic attention at the current time. The IP Security Extensions for IPv6 (IPsec) are commands that improve IPV6 security, although they cannot resolve all IPV6 security issues. Despite IPV6's status as standard practice, it has the potential to become much more so on the internet if we allocate further time and energy to fixing the issues it now has.

7. Future Work

Some suggestions for what should be done in the future are as follows:

Instead of utilizing a breadboard for relays, it is better to use a relay module and connect it directly. Before using any parts, especially the relays, for defense, be sure to test them thoroughly. Set up automation on all of the household equipment. Improving home security by enhancing the security module. Additional work on SEUI (64-bits) is necessary to make the system more safe. Since IPv4 is insufficient for future usage, IPv6 was implemented so that more clients may access the system without any delays. We need to improve IPv6 such that it is both faster and more secure than IPv4.

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