Home Automation using Raspberry Pi 3
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Abstract: This paper provides an effective and flexible home control and monitoring system with the aid of an integrated micro-web server with IP connectivity for access to and control of equipment and devices remotely using. The proposed system does not require a dedicated server PC with respect to similar systems and offers a new communication protocol for monitoring and controlling the home environment with more than just switching functionality. Smart home interfaces and device definitions to ensure interoperability between Raspberry pi devices from various manufacturers of electrical equipment, meters and Smart Energy enables products to allow manufactured. We introduced the proposed home energy control systems design intelligent services for users.

Keywords: Raspberry pi, Smart Home, Home Automation.

I. Introduction
Intelligent management of the power system, facilitate the joint use the current and minimizes power loss during transmission and power consumption is highlighted by the global community, academic institutions, and State administration. To gain full utility and customer protection dimensions, the idea of a smart grid enabling technologies used in In recent years, attracting a great deal of attention in the energy industry and academia. Such studies. With continued growth in popularity and functionality of mobile devices, demand advanced mobile applications widespread human life continue to grow. The use of Web Services is an open and interoperable method for providing remote access service or applications can communicate with each other. An attractive market for home. Automation and network of busy families and individuals will be physical Limitations. electronics prototyping platform based on Flexible, easy-to-use hardware and software. The microcontroller Board of Based on the AT mega16. The Low-voltage switching relays were used to integrate Devices with Controller is to show switching functionality. The LM35 temperature Sensor is used to control a smart home environment. A supervisory control system Intranet, low cost and high performance can react The wifi technology. An end node, the node sends data to the coordinator, and the coordinator Hub sends the data back to the terminal end of the loop. Since all devices have their own IP Address based on IPv6, they can be directly connected to an external network. So, all smart devices it can not only through the handheld remote control device to the central and local home, but can also be controlled remote computer control through the introduction of home Internet Gateway machine.

II. Related Work
Smart Home is applied in order to provide comfort, energy efficiency and better security. Smart Home System is still rarely used in Indonesia because of the cost and the difficulty of getting the device. The objective of this paper is to offer a Small Smart Home System designed and created by utilizing WLAN network based on microcontroller. The system is able to monitor and control lights, room temperature, alarms and other household appliances. Results from testing the system show proper control and control monitoring functions can be performed from a device connected to a network that supports HTML5. [1]. Smart home network excite new possibilities. We proposed a new smart home energy management system based on wifi sensor networks to make home networks more intelligent and automatic. The role of the SHEMS for managing energy usage is a crucial factor in addressing the home’s growing energy concerns. The Smart Energy initiative serves these needs by providing an adoptable and sustainable experience by linking new and useful digital technologies to the needs of consumers. By empowering consumers with near real-time information of their energy usage through an array of products and services, the intent is to help consumers use energy more efficiently and also to minimize their personal impact on the environment.

We implement the proposed system and develop related hardware and software. We suggest new SHEMS based on the proposed system. We expect that our work contributes towards the development of ubiquitous home networks. As a part of future work, we will apply IEEE 802.15.4 standard technology in our home. [2]. Wireless sensor networks (WSNs) and power line communications (PLCs) are used in this work to implement a smart home control network. Internal Communication Every data transmit between

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Wifi networks can be communicated by each other, so people in any room can control the other room’s devices. The query flow-work of home appliance is shown as follows: Appliance receives information from home gateway by Wifi module and detects the household appliance’s status, and the corresponding status will be transmitted to the home gateway by Wifi module. If all appliances work properly, home gateway stores appliances’ status. If not, home gateway reports an error message to supplier.

**Hardware Implementation and Home Automation Devices**

The Atmeg 16 and Wifi were used to implement the micro server for the Home gateway in figure 4. Home gateway connects to the Internet a. The microcontroller that uses ATMEGA 16, an Atmel AVR processor which can be programmed by the computer in C language via USB port. LM35 temperature sensor was used for temperature monitoring while a non-invasive 30A current sensor was utilized for power monitoring. Used to successfully integrate the current sensor with the Atmegha 16. The hardware architecture presented is flexible and allows other home appliances and devices to be seamlessly integrated with minimal changes. [6]

**Energy Management**

Consumer-side energy management is a part of the smart grid program. The customer can control the power consumption according to the power line’s load. Smart-grid enabled smart homes with time-of-use metering and energy management devices and tools help consumers monitor, manage and control energy usage, while helping them optimize performance and reduce energy losses from major appliances, heating, cooling and lighting. With a smart home energy management system, consumers can manage energy usage and costs throughout the day, without compromising their lifestyles. The network architecture of SHEM system.

**System Architecture**

In the proposed design, a low cost smart home system for remotely controlling and monitoring the smart home environment is presented. An overview of the proposed system architecture is shown. The sensors and actuators/relays are directly interfaced to the main controller.

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Building the Solution

In order for X10-managed lights and appliances to be remotely controlled, we are going to assemble a variety of separate technologies and use them in a unified way. We will do the following:

1. Test the X10 computer interface and modules with the application.
2. Create a server application that provides a C#-based front end.
3. Create an RDS application that will communicate with the Rails application, turning the light on and off via a native onscreen toggle switch control.

III. Implementation Of Smart Home Control Network

WiFi networking module circuit and sensors WiFi technology is a new type of wireless, short, low power network communication technology, which has so many technological advantages, such as low complexity, low Total wireless and Internet communication system architecture. Each Smart Switch devices had their own address. The address name is the number of smart switch device to follow as the address name of the smart switch unit 1 is smart switch node 1 and the address is the number of this unit to follow until the last units are in used a house. The access point has been installed on the first floor. The smart switch devices on the first floor can be communicated to the access point with single-hop radio frequency protocol (RF). The smart switch equipment to the second floor cannot communicate directly to the access point because the signal x bee is loss due to obstructions.

IV. Result And Specifications

A power management atmosphere is easy to control. Where it represents the active administration of energy management, flexible and scalable according to the needs and desire. Design and implementation of a smart home system The purpose of the system is to use the integrated installation WiFi mobile phone for automation without a lot of equipment and less expensive as well as what the high response system WiFi communication with wireless connection and less hostess between the transceiver and the server and WiFi Series 2 Hardware and software. Making better use of energy in the house by remote control by the technical system represented structuring sensor remote WiFi Smart house consists of a server with the wireless system where the of server logs.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sending modules</td>
<td>Thousands of sensors and actuators are needed for logoniscle network</td>
</tr>
<tr>
<td>Modem</td>
<td>Typical Sky, Zolertia Z1 mote or Muxa</td>
</tr>
<tr>
<td>Operating system</td>
<td>C# with OS</td>
</tr>
<tr>
<td>Network topology</td>
<td>Multi-hop mesh network</td>
</tr>
<tr>
<td>Modesty</td>
<td>All static</td>
</tr>
<tr>
<td>Transmission range</td>
<td>50 - 300m</td>
</tr>
<tr>
<td>Max. Bit Rate</td>
<td>250 kBit/s</td>
</tr>
<tr>
<td>Nodes Power source</td>
<td>Often from internal Batteries</td>
</tr>
<tr>
<td>Network lifetime</td>
<td>~ 3 years</td>
</tr>
<tr>
<td>Wireless channel</td>
<td>2.4 GHz, low-power radio based Zigbee 3.0 protocol</td>
</tr>
<tr>
<td>Identification</td>
<td>IPv6 addressing on each node</td>
</tr>
<tr>
<td>Gateways</td>
<td>Site node acting as border router</td>
</tr>
<tr>
<td>Routing</td>
<td>RPL - Evaluate with link throughput metric or change routing metric</td>
</tr>
<tr>
<td>Transport</td>
<td>UDP, 1st at transport</td>
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<tr>
<td>Application</td>
<td>Web-based application using CoAP protocol</td>
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<tr>
<td>Databases</td>
<td>NoSQL document database (Concurrent, Concurrent server)</td>
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<tr>
<td>Processing platform</td>
<td>Spark engine</td>
</tr>
<tr>
<td>Other considerations</td>
<td>Time synchronization, low throughput, low latency</td>
</tr>
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<td>Security</td>
<td>Security protocols based on cryptographic algorithms for data reception</td>
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</table>

Fig 3. New Architecture
In this paper we propose a new architecture for the monitoring and control system that uses a flexible home-based at a reasonable price and implemented by Wifi wireless transceiver The proposed architecture is used in a quiet based web services in an interoperable application layer for communication between the remote user and the home device. All, the Wi-Fi connection is the support built, the home access device to control.

The main characteristics of these solutions are as follows,
1) Most of the solutions use licensed or unlicensed spectrum bands (cellular or noncellular technologies).
2) Low-power consumption, which provides a long life of sensing devices battery and increase network lifetime from 5 to 10+ years.
3) The selection of reliability and safety sensors.
4) Data rate from 100 b/s to 250 kb/s.
5) Short or long geographical coverage (Wifi/IEEE 802.15.4 standards, low-power Wi-Fi, or LPWAN technologies).

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