

# A Smart and Secured IOT Gateway Framework

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**Abstract:** Internet of Things (IoT) is an emerging technology where things of everyday objects can be connected to Internet. In IoT technology devices are supposed to be deployed 'everywhere' and to be accessed 'any time' from 'anywhere'. In this network gateways would have an important role for connecting heterogeneous networks to internet. The IoT Gateways must be smart enough to perform collected operations depending on the thing application. The significant actions of IoT Gateway are integration of wireless sensor network and mobile network, protocol mapping, managing the endpoint network, providing secure and safe communication between various end point networks. Here we are proposing a smart and secured framework of IoT Gateway using Raspberry Pi. This proposal makes the IoT Gateway as a smart thing just like other smart things in IoT technology. Apart from native Gateway functionalities this paper emphasize the security of IoT Gateway, since the present IoT Gateways are venerable to attacks. The Raspberry Pi board which is meant for IoT having some precautionary measures for security. In this paper we proposed those measures to provide security for IoT Gateways. Compared to the other smart Gateways the proposed Gateway is flexible, cost effective and provides security. And we implemented an architecture of smart irrigation system using our Gateway Pi.

**Index Terms**—IoT (Internet of Things, Gateway, Raspberry Pi, Security).

## I. INTRODUCTION

Internet of Thing is a new revolution of the Internet. In this technology, H2M (Human to Machine), M2M (Machine to Machine) and H2H (Human to Human) communication can occur. This technology is augmented with sensor networks, wireless networks, mobile networks, Internet, Big data analytic, Cloud Computing. Currently the IoT technology is being used in several applications like Home, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style. IoT allows things which are present in heterogeneous network can communicate and exchange data. These devices include hardware and software components, hubs or control centers. Statistics says that in coming few years the total number of things or devices connected to Internet will become 50 billion. These billions of devices or things are being connected to the Internet through the Gateways. The peer nodes for IoT are the machines or things with minimum in size, storing capacity, processing capacity, and peripherals with many constrains. So that the gateways will have to take care more about the processing and managing the things applications.

## II. INTRODUCING RASPBERRY PI

Raspberry Pi is a low-cost single board computer with the size of a credit card. It can perform almost all tasks that a normal computer can do. It has the capability to interact with outside world. The Raspberry Pi will support Linux operating system and also supports Python language. The functionalities of components makes Raspberry Pi as a normal PC. The important components are Processor & RAM, USB Ports, Ethernet Port, HDMI Output, Composite, Video Output, Audio Output, GPIO Pins, Display Serial Interface, Camera Serial Interface, SD Card Slot, Power Input. Raspberry Pi supports different flavor of Linux like Raspbian, Arch, Pidora, Rasp BMC, Open ELEC, RISC OS.

Implementing Smart Gateway

### Hardware Implementation

To meet the constraints of various IoT application our smart gateway adopts different interfaces for different types of networks. For the networks like WSN and PAN with constrained things RPG supports the interfaces like Bluetooth, Zigbee, 6LoWPAN. For the networks with high speed data like Ethernet and WAN the RPG is having RJ45 ports and WiFi connections. So that our gateway can also be operated remotely. In IoT most things transmit the analog data for this our smart gateway embedded with ADC and DAC converter.

### **Software Implementation**

Raspbian is a popular Operating System for Raspberry Pi since it is very easy to use and maintain. This OS is flexible for integrating different hardware. The important feature of this operating system is, which can be flexibly configured to adapt different applications.

We are proposing a mechanism to convert the protocols. A centralized proxy setup, accessed by all the devices in the network. The centralized proxy assumes each protocol as a module and this module has the capability to manipulate the protocols and transport them to target device.

### **Secure Module Implementation**

We are proposing two methods in Raspbian to make our Gateway as software firewall. The first is true iptables which is an administration tool for IPv4 packet filtering and NAT. With the best luminous efficiency, there is substantial motivation for using them in general lighting applications. Each table would be having several built in chains and user defined chains. A chain specifies the set of rules which can match to the set of packets. In iptables a firewall rule specifies criteria for the packets. In Raspbian the iptables-persistent package can be installed by following command.

```
#apt-get install iptables-persistent
```

Second method for implementing software firewall is "ufw" (Uncomplicated Firewall) service. The ufw are well suited for host-based firewalls. The following commands can be used to enable firewall, ssh access and to know about the status.

```
$ sudo ufw allow ssh/tcp  
$ sudo ufw logging on  
$ sudo ufw enable  
$ sudo ufw status
```

### **III. SMART IRRIGATION**

Irrigation is the significant application for Agriculture. Where water levels, temperature, humidity and soil signals are gathered from respective sensor devices. These data would be transmitted to the Cloud through the gateways to get the relevant real time data of agricultural production environment by means of WAP(wireless application protocols) and web. Here we are proposing an cost effective, simple IoT architecture for smart irrigation with our smart gateway. In our proposal our gateway can performs multiple functionalities similar to communication

terminal, Analog to Digital Converter for sensor data, agricultural production monitoring system, and output display device. Our smart irrigation consist of multiple nodes placed in different locations for monitoring soil moisture and soil properties in the field. The end nodes send and store the data in cloud. A cloud-based application used for visualizing the data. Based on the properties of the soil our gateway as a agricultural monitoring system, the following relevant information about which crop is suitable for the respective field, plant stress, water usage and irrigation recommendations would be sent to the user side mobiles and PCs from the cloud.

### **IV CONCLUSION AND FUTURE WORK**

In IoT technology, gateway plays an important role between various heterogeneous network nodes. In this paper we proposed a smart and secure gateway. Which works similar to normal PC. So that it can be flexible to adapt new things pertaining to user applications, and it has been automatically integrated with the new software versions. And we emphasized on the security which is not available in existing IoT gateways. A security module has been implemented using software firewalls which makes our Gateway Pi most reliable in IoT applications. The user cards available in Gateway Pi ensures the scalable interfaces. The operating system Raspbian supports more number of APIs that makes our Gateway Pi flexible and easy to use for any IoT application. Apart from all the important feature of our Gateway pi is cost effective. When compare with the price of existing IoT gateways 50% of amount can be saved.

In future works, we would like to add some more security modules to make Gateway Pi most secured one.