DA274A: Internet of Things and People

Assignment 2

Smart Lighting

Controlling Philips Hue Lights by Arduino

Majid Ashouri

November 2018

Philips Hue Light

Philips Hue has a wide range of smart bulbs, lamps, luminaires and accessories. Philips Hue is a line of color changing LED lamps and white bulbs which can be controlled in different ways. It uses the ZigBee lighting protocol to communicate, and can be controlled via smartphone apps over cellular network, Ethernet or Wi-Fi via a ZigBee–Ethernet bridge wired to a router. In Figure 1 you can see a package of Hue lights containing lamps and the Gateway. In this assignment we want to work with these Lamps and Gateways, and to control and change the status of the lamps by Hue APIs.

Figure 1. Philips Hue Lighting Solution

Goals

- Learn how to control Philips Hue lights with JSON and REST interface
- Setup Arduino with Ethernet shield
- Control the lights based on the environment conditions through the Arduino board

Preparation

To avoid working on other team's lamps and gateways, each Lamp and gateway has been numbered beforehand. To reduce the complexity of the assignment, each Lamp can be controlled by a specific gateway and has been registered on that gateway before. Thus, there is no need to register them to the gateways.

Note: Please be careful about using the lamps and gateways, and don't disturb the other groups.

Finding the Gateways:

In order to start working with Hue gateway, firstly you should find your gateway IP address on the network. You can do this by using an IP scanner like Advanced IP Scanner.

This tool will help you find the hue light gateway IP address on the network. You can just simply download this software form https://www.advanced-ip-scanner.com/. You can install it or simply just run it (without installation) to find an appropriate Hue Gateway!

You should search for hue IP in the range of 192.168.20.0/255. By default Advanced IP Scanner should detect the IP range of the network.

Please note that there are at least three hue lights on the Lab, You should check the MAC address of your gateway (that is at the behind of the gateway) to find the IP address.

Assignments

Task 1: Controlling the Hue lights via Gateway webpage

In this section, you'll learn how to control the Hue lights via the debug page of Hue gateway. You can use following link to find how to start, and how to work with lights through the Clip API Debugger.

https://www.developers.meethue.com/documentation/getting-started

It is expected that you learn how to receive the lamps status, and how to control them like turning it on and off, changing the color, and brightness.

By doing this you will learn how to work with the Hue lights through JSON and REST interface.

Task 2: Setup a connection between Arduino and Hue gateway.

For this task you should setup a connection between the Arduino and Hue gateway. You should mount the Ethernet Shield on top of the Arduino Uno as shown in figure 2.

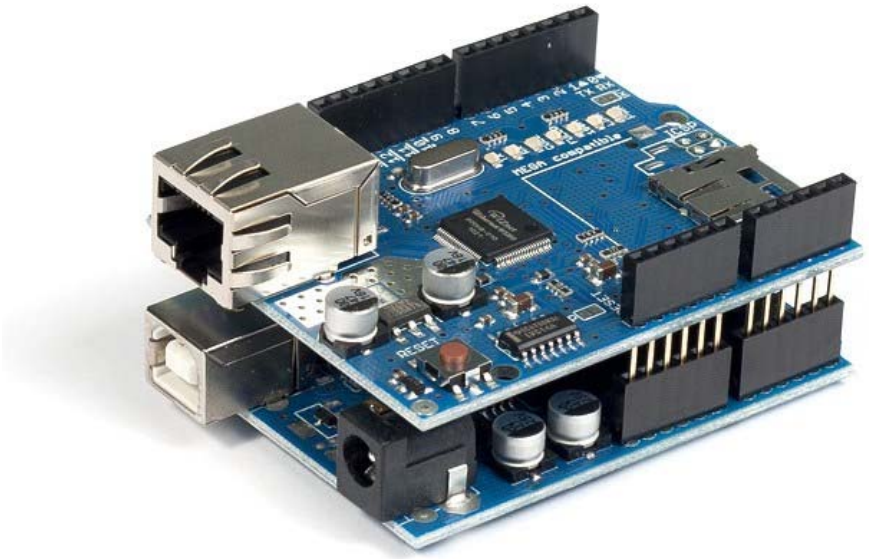

Figure 2: Arduino Uno with Ethernet Shield

Since we are using Ethernet shield you should work with Ethernet library to setup the Ethernet and connection with the gateway.

You can use Ethernet Library https://www.arduino.cc/en/Reference/Ethernet, and Examples in that page like WebClient to find how to setup this communication. You should successfully connect to the gateway IP address and port 80.

Note: please note that digital pins 4,10,11,12,13 are used for the SPI connection between Ethernet Shield and Arduino Uno as shown in figure 3, and you can not use them for other purposes like connecting LEDs or the Ultrasound sensor.

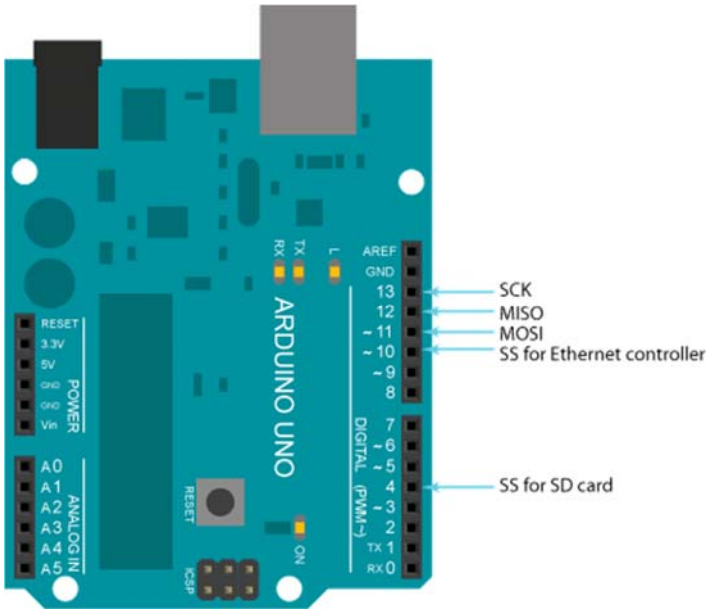

Figure 3: Pins used in Arduino Uno to communicate with Ethernet Shield

Task 3: Controlling the hue lamp via Arduino

After stablishing a connection, now in this task you should firstly receive the status of your lamp. You can do it by using GET command.

Then, you should also turn the lamp on and off by sending appropriate PUT command to the gateway.

You can use the EthernetClient object or HttpClient library to send the command to the gateway. There is also a link on the GitHub that you can follow to see how to send the commands to the gateway.

https://github.com/oguime/Hue_W5100_HT6P20B

In this link you can also find a short YouTube video that shows how they used the Arduino to control the lights.

Mandatory Final Demo

In order to pass the lab 2 you need to demo the result of the following task to the lab assistant:

- To receive (GET) and show the output of the lamp current status
- To change the Color or Brightness of the lamp based on the distance you detect by ultrasound sensor.