

Lesson 20 Controlling an LED through LAN

Overview

In this lesson, we will introduce TCP and socket, and then programming to control an LED through the local area network(LAN).

Requirement

- 1* Raspberry Pi
- 1* LED
- 1* 220 Ω Resistor
- 1* Breadboard
- Several Jumper wires

Principle

1. TCP

The Transmission Control Protocol (TCP) is a core protocol of the Internet Protocol Suite. It originated in the initial network implementation in which it complemented the Internet Protocol (IP). Therefore, the entire suite is commonly referred to as TCP/IP. TCP provides reliable, ordered, and error-checked delivery of a stream of octets between applications running on hosts communicating over an IP network. TCP is the protocol that major Internet applications such as the World Wide Web, email, remote administration and file transfer rely on. Applications that do not require reliable data stream service may use the User Datagram Protocol (UDP), which provides a connectionless datagram service that emphasizes reduced latency over reliability.

2. Socket

A network socket is an endpoint of an inter-process communication across a computer network. Today, most communication between computers is based on the Internet Protocol; therefore most network sockets are Internet sockets.

A socket API is an application programming interface (API), usually provided by the operating system, that allows application programs to control and use network sockets. Internet socket APIs are usually based on the Berkeley sockets standard.

A socket address is the combination of an IP address and a port number, much like one end of a telephone connection is the combination of a phone number and a particular extension. Based on this address, internet sockets deliver incoming data packets to the appropriate application process or thread.

Several Internet socket types are available:

1. Datagram sockets, also known as connectionless sockets, which use User Datagram Protocol (UDP).
2. Stream sockets, also known as connection-oriented sockets, which use Transmission

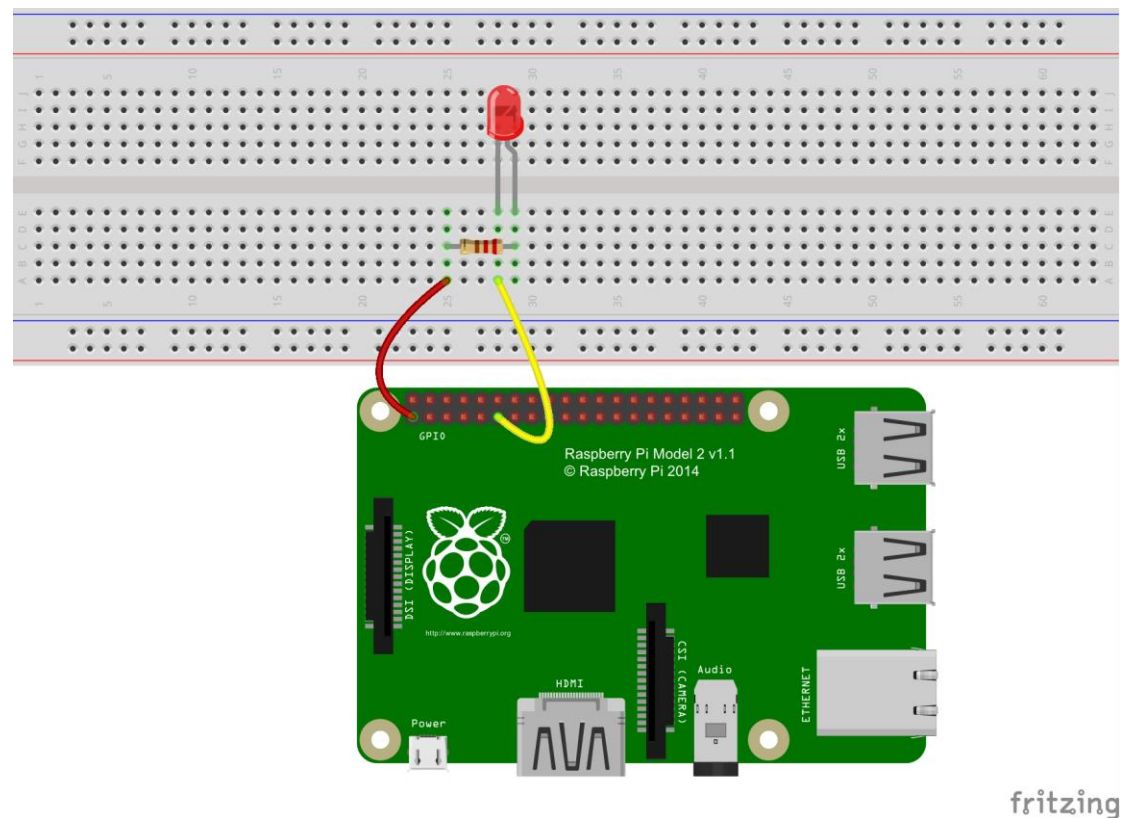
Control Protocol (TCP) or Stream Control Transmission Protocol (SCTP).

3. Raw sockets (or Raw IP sockets), typically available in routers and other network equipment. Here the transport layer is bypassed, and the packet headers are made accessible to the application.

In this experiment, our program is based on stream socket, and the program is divided into two parts, the client and the server. The server routine is run on the Raspberry Pi, and the client routine is run on the PC. So you can send command to the server through the client, and then control the LED connected to the Raspberry Pi.

Procedures

1. Build the circuit



2. Program

C user:

2.1 Edit and save the server code with vim or nano on the Raspberry Pi.

(Code path: /home/Adept_Ultimate_Starter_Kit_C_Code_for_RPi/20_TCPCtrlLed/ledServer.c)

2.2 Compile the program(On Raspberry Pi)

```
$ gcc ledServer.c -o ledServer -lwiringPi
```

2.3 Edit and save the client code with vim or nano on the PC.

(Code path: /home/Adept_Ultimate_Starter_Kit_C_Code_for_RPi/20_TCPCtrlLed/ledClient.c)

2.4 Compile the program(On Linux PC)

```
$ gcc ledClient.c -o ledClient
```

2.5 Run the program

```
$ sudo ./ledServer (On Raspberry Pi)
```

```
$ ./ledClient 192.168.1.188 (On PC, Modify the IP Address to your Raspberry Pi's IP Address)
```

Now, input "ON" in the terminal and then press Enter, you will find the LED connected to the Raspberry Pi is on, input "OFF", the LED is off.

Python user:

2.1 Edit and save the server code with vim or nano on the Raspberry Pi.

(Code path: /home/Adept_Ultimate_Starter_Kit_Python_Code_for_RPi/20_TCPCtrlLed/ledServer.py)

2.2 Edit and save the client code with vim or nano on the PC.

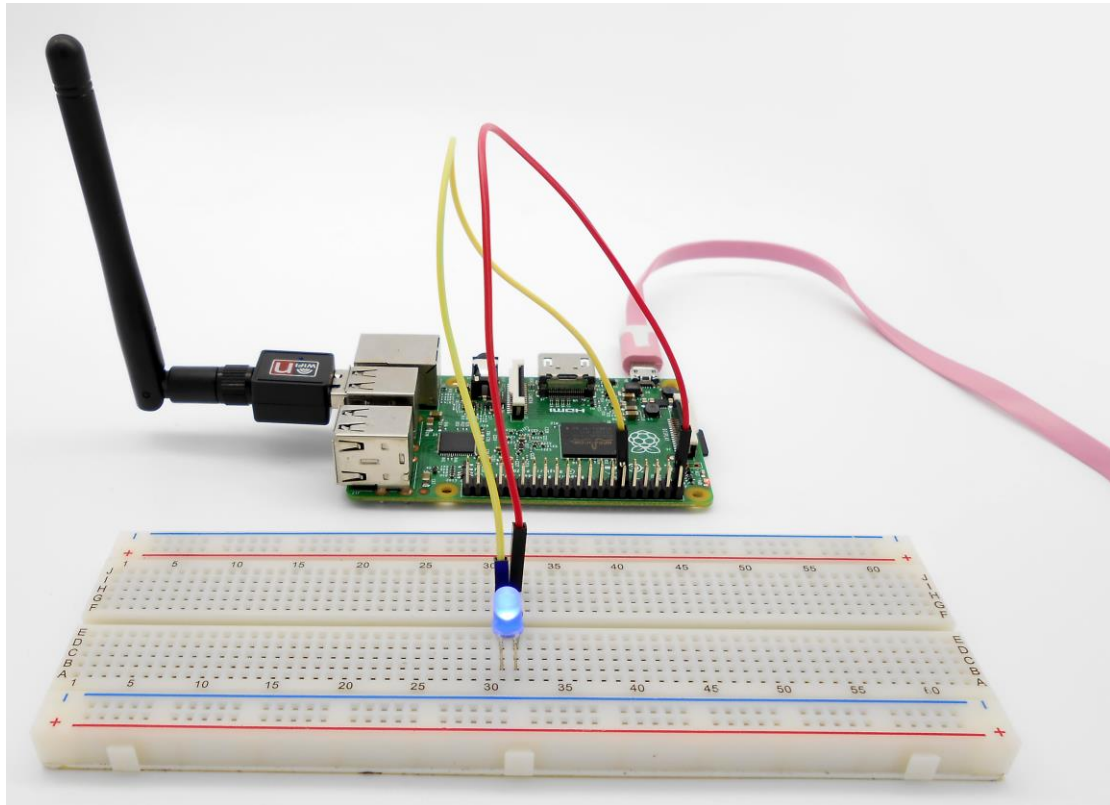
(Code path: /home/Adept_Ultimate_Starter_Kit_Python_Code_for_RPi/20_TCPCtrlLed/ledClient.py)

2.3 Run the program

```
$ sudo python ledServer.py (On Raspberry Pi)
```

```
$ python ledClient.py (On PC)
```

Now, input "ON" in the terminal and then press Enter, you will find the LED connected to the Raspberry Pi is on, input "OFF", the LED is off.



Summary

By learning this lesson, you should have understood the basic principles of inter-computer communication. I hope this lesson will help you open the door to learn IoT(Internet of Things).