

## Week 6: Homework 2: Blinking LED Websocket server

[https://hc.labnet.sfbu.edu/~henry/npu/classes/embed/raspberry\\_pi/slide/exercise\\_raspberry\\_pi.html](https://hc.labnet.sfbu.edu/~henry/npu/classes/embed/raspberry_pi/slide/exercise_raspberry_pi.html)Links to an external site.

Q19 ==> Blinking LED Websocket server

1. Blinking LED Websocket server
  - Please implement a Blinking LED [websocket server](#) on Raspberry Pi.
  - Reference
    - [Quiz](#)
    - [Controlling LEDs by node.js](#)
    - [Implement WebSockets server using Node.js](#)

### Step 1: Install Package

Install websocket

\$ npm install websocket

```
pi@raspberrypi:~$ npm install websocket
[...]
```

\$ npm install onoff

```
pi@raspberrypi:~$ cd nodetest
pi@raspberrypi:~/nodetest$ npm install onoff
[...]
```

\$ pigpiod -v

\$ sudo apt-get update

\$ sudo apt-get update

\$ sudo apt-get install pigpio

\$ npm install pigpio

```
added 17 packages, and audited 45 packages in 41s

found 0 vulnerabilities
pi@raspberrypi:~ $ cd nodetest
pi@raspberrypi:~/nodetest $ npm install onoff

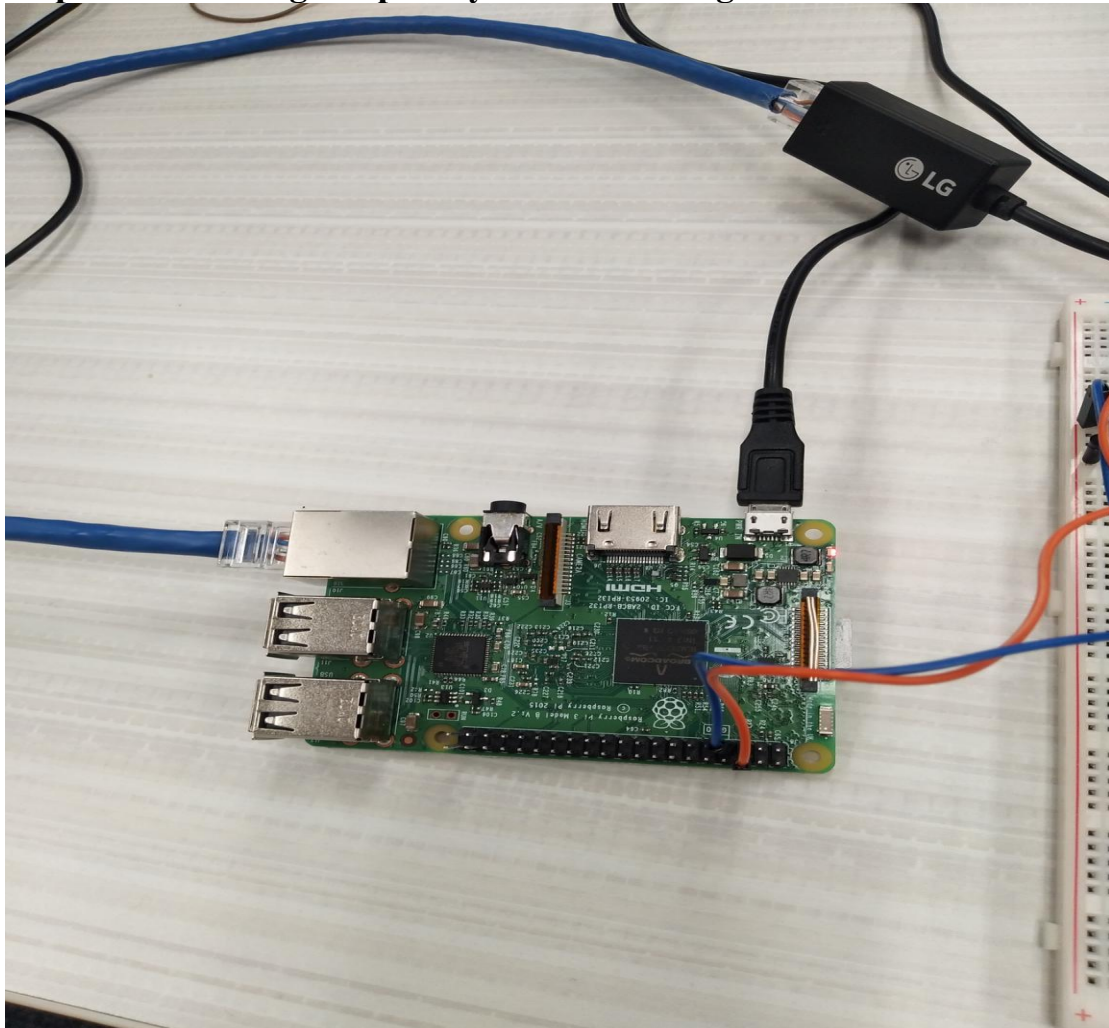
up to date, audited 45 packages in 1m

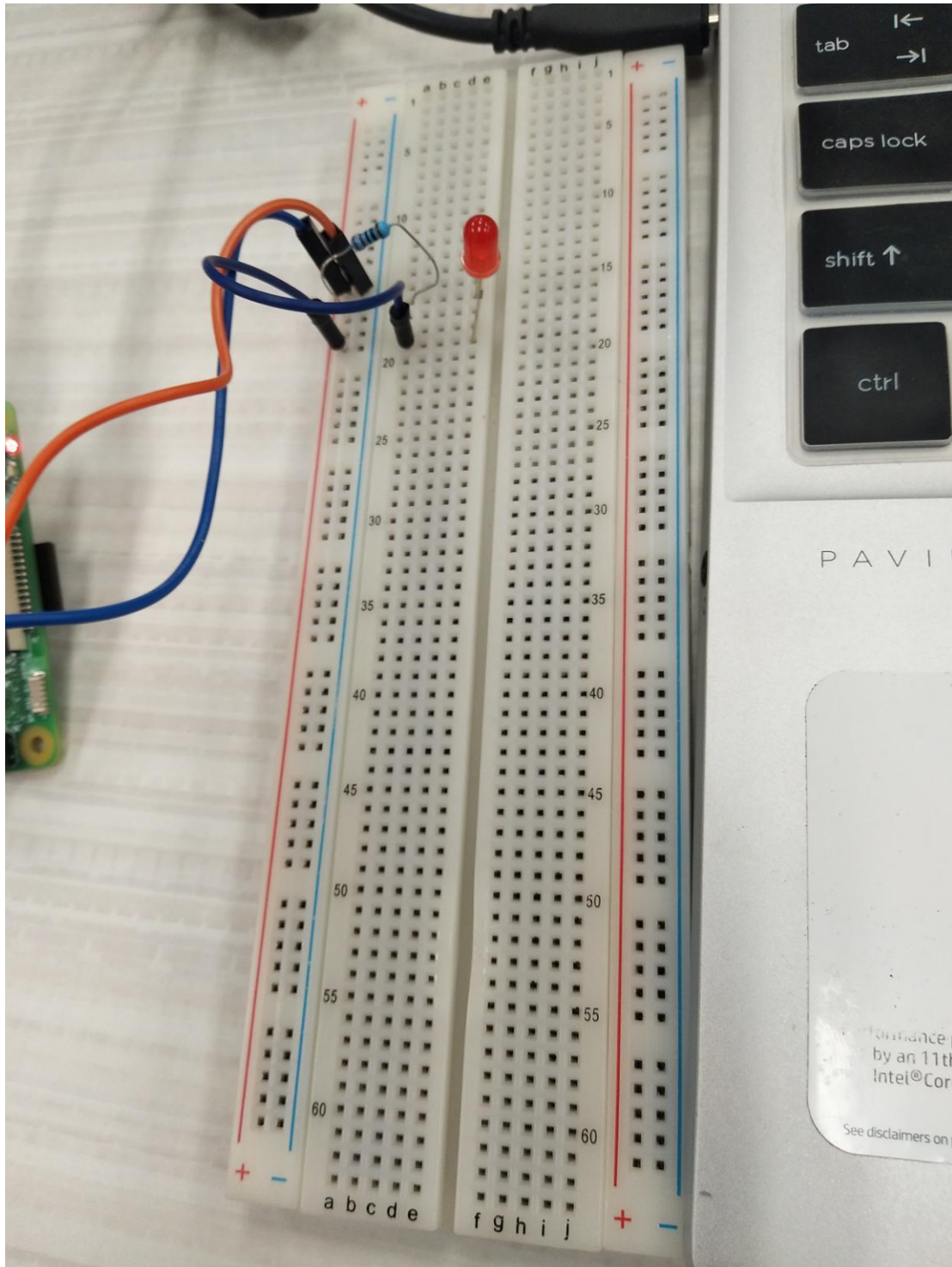
found 0 vulnerabilities
pi@raspberrypi:~/nodetest $ pigpiod -v
79
pi@raspberrypi:~/nodetest $ sudo apt-get update
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Get:2 http://archive.raspberrypi.org/debian bullseye InRelease [23.6 kB]
Hit:3 https://deb.nodesource.com/node_10.x bullseye InRelease
Get:4 http://archive.raspberrypi.org/debian bullseye/main armhf Packages [311 kB]
Fetched 349 kB in 4s (91.8 kB/s)
Reading package lists... Done
pi@raspberrypi:~/nodetest $ sudo apt-get install pigpio
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
pigpio is already the newest version (1.79-1+rpt1).
The following package was automatically installed and is no longer required:
  libfuse2
Use 'sudo apt autoremove' to remove it.
0 upgraded, 0 newly installed, 0 to remove and 1 not upgraded.
pi@raspberrypi:~/nodetest $ npm install pigpio

added 1 package, and audited 46 packages in 36s

found 0 vulnerabilities
pi@raspberrypi:~/nodetest $
```

## Step 2: Connecting Raspberry Pi and LED light





### Step 3: Code Source:

*websocket\_blink.js*

```
#!/usr/bin/env node
```

```
// - Node.js installation
```

```

// - The module websocekt is installed by this command

//   npm install -g websocket

// - If you want to use a formal protocol, you need to replace

//   var WebSocketServer = require(

//
'C:/Users/Henry/AppData/Roaming/npm/node_modules/websocket').serv
er;

//   with

//   var WebSocketServer = require("ws").Server

// - Please refer Zhomart Mukhamejanov's example if you want to deploy
server.js on Heroku

// - Please refer Vedit Mody's use of ws protocol

//var WebSocketServer =
require('C:/Users/Henry/AppData/Roaming/npm/node_modules/websock
et').server;

var WebSocketServer = require('websocket').server;

var http = require('http');

var server = http.createServer(function(request, response) {

    console.log((new Date()) + ' Received request for ' + request.url);

    response.writeHead(404);

    response.end();

});

server.listen(8080, function() {

```

```
    console.log((new Date()) + ' Server is listening on port 8080');
});

// Create Websocket Serve
wsServer = new WebSocketServer({
    httpServer: server,
    // You should not use autoAcceptConnections for production
    // applications, as it defeats all standard cross-origin protection
    // facilities built into the protocol and the browser. You should
    // *always* verify the connection's origin and decide whether or not
    // to accept it.
    autoAcceptConnections: false
});

function originIsAllowed(origin) {
    // Put logic here to detect whether the
    // specified origin (i.e., client) is allowed.
    return true;
}

wsServer.on('request', function(request) {
```

```

if (!originIsAllowed(request.origin)) {

    // Make sure we only accept requests from an allowed origin

    request.reject();

    console.log((new Date()) + ' Connection from origin '
                + request.origin + ' rejected. ');

    return;
}

var connection = request.accept('echo-protocol', request.origin);

console.log((new Date()) + ' Connection accepted. ');

////////////////////////////////////

// Case 1: receive message from the client

////////////////////////////////////

connection.on('message', function(message) {

    if (message.type === 'utf8') {

        console.log('Received Message: ' + message.utf8Data);

        connection.sendUTF(message.utf8Data);

    }

    else if (message.type === 'binary') {

        console.log('Received Binary Message of '

                    + message.binaryData.length + ' bytes');

```

```
connection.sendBytes(message.binaryData);
```

```
}
```

```
var Gpio = require('onoff').Gpio; //include onoff to interact with the  
GPIO
```

```
var LED = new Gpio(4, 'out'); //use GPIO pin 4, and specify that it is  
output
```

```
var blinkInterval = setInterval(blinkLED, 250); //run the blinkLED  
function every 250ms
```

```
function blinkLED() { //function to start blinking
```

```
  if (LED.readSync() === 0) { //check the pin state, if the state is 0  
(or off)
```

```
    LED.writeSync(1); //set pin state to 1 (turn LED on)
```

```
  } else {
```

```
    LED.writeSync(0); //set pin state to 0 (turn LED off)
```

```
  }
```

```
}
```

```
function endBlink() { //function to stop blinking
```

```
  clearInterval(blinkInterval); // Stop blink intervals
```

```
  LED.writeSync(0); // Turn LED off
```

```
  LED.unexport(); // Unexport GPIO to free resources
```

```
}
```

```
setTimeout(endBlink, 5000); //stop blinking after 5 seconds
```

```
});
```

```
////////////////////////////////////
```

```
// Case 2: close the connection
```

```
////////////////////////////////////
```

```
connection.on('close', function(reasonCode, description) {
```

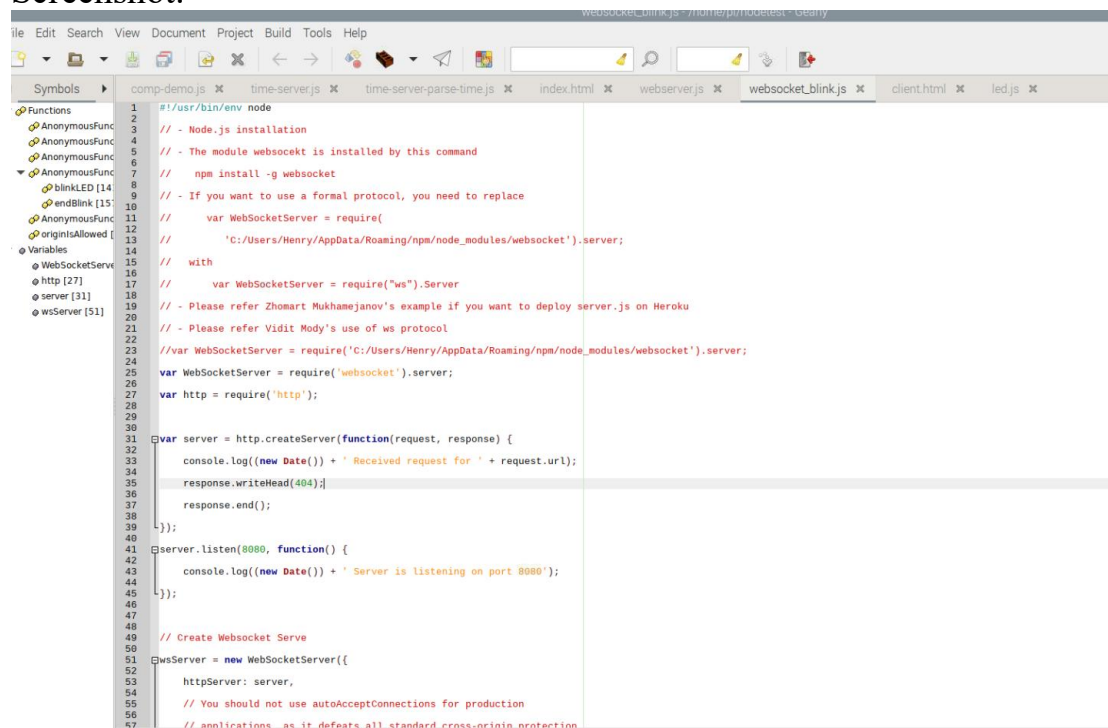
```
    console.log((new Date()) + ' Peer '
```

```
        + connection.remoteAddress + ' disconnected.');
```

```
});
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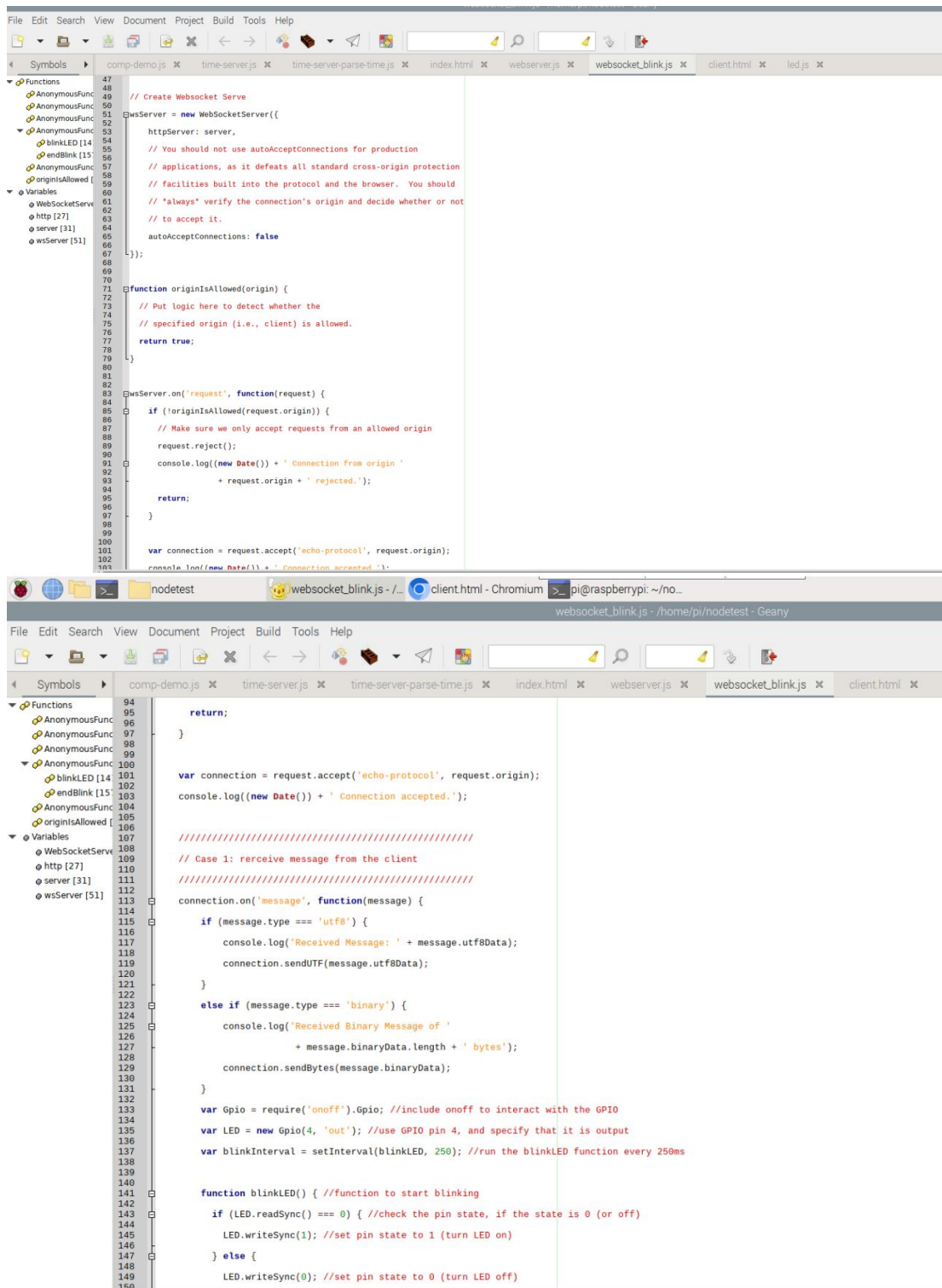
```
});
```

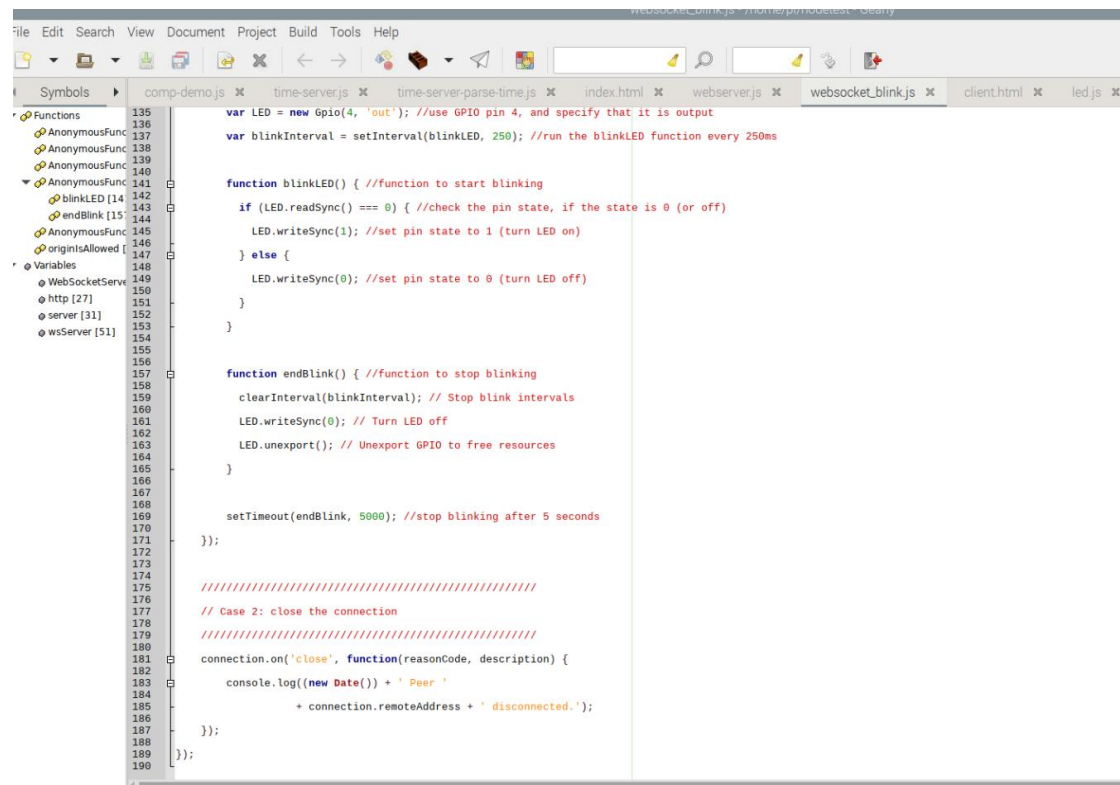
## Screenshot:



```
1  #!/usr/bin/env node
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3  // - Node.js installation
4
5  // - The module websocket is installed by this command
6
7  //   npm install -g websocket
8
9  // - If you want to use a formal protocol, you need to replace
10
11 //   var WebSocketServer = require(
12 //       'C:/Users/Henry/AppData/Roaming/npm/node_modules/websocket').server;
13
14 //   with
15
16 //   var WebSocketServer = require("ws").Server
17
18 // - Please refer Zhomart Mukhamejanov's example if you want to deploy server.js on Heroku
19
20 // - Please refer Vedit Mody's use of ws protocol
21
22 //var WebSocketServer = require('C:/Users/Henry/AppData/Roaming/npm/node_modules/websocket').server;
23
24 var WebSocketServer = require('websocket').server;
25
26 var http = require('http');
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30
31 var server = http.createServer(function(request, response) {
32     console.log((new Date()) + ' Received request for ' + request.url);
33     response.writeHead(404);
34     response.end();
35 });
36
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40
41 server.listen(8080, function() {
42     console.log((new Date()) + ' Server is listening on port 8080');
43 });
44
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46
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48
49 // Create WebSocket Serve
50
51 wsServer = new WebSocketServer({
52     httpServer: server,
53
54     // You should not use autoAcceptConnections for production
55     // applications, as it defeats all standard cross-origin protection
```







The screenshot shows an IDE with a file explorer on the left and a code editor on the right. The file explorer lists files like 'Functions', 'Variables', 'WebsocketServ', 'http [27]', 'server [31]', and 'wsServer [51]'. The code editor displays JavaScript code for a WebSocket connection and LED control. The code includes comments in red and uses the 'gpio' module for hardware control. The code is as follows:

```
135 var LED = new Gpio(4, 'out'); //use GPIO pin 4, and specify that it is output
136
137 var blinkInterval = setInterval(blinkLED, 250); //run the blinkLED function every 250ms
138
139
140
141 function blinkLED() { //function to start blinking
142     if (LED.readSync() === 0) { //check the pin state, if the state is 0 (or off)
143         LED.writeSync(1); //set pin state to 1 (turn LED on)
144     } else {
145         LED.writeSync(0); //set pin state to 0 (turn LED off)
146     }
147 }
148
149 function endBlink() { //function to stop blinking
150     clearInterval(blinkInterval); // Stop blink intervals
151     LED.writeSync(0); // Turn LED off
152     LED.unexport(); // Unexport GPIO to free resources
153 }
154
155 setTimeout(endBlink, 5000); //stop blinking after 5 seconds
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```

```
// - Error if use this line

//   var ws = new WebSocket("ws://localhost:8080");

// - Use this line if the browser would like to communicate with

//   the server where client.html is downloaded.

//   var ws = new WebSocket("ws://" + location.host, 'echo-protocol');

//   Refer Zhomart Mukhamejanov's example

// - Websocket allows connection from any source, but first

//   connection should be http request, they call it

//   "Websocket handshake". For example, you can access

//   http://npu-socket.herokuapp.com/

//   then it is possible to write like this

//   var ws = new WebSocket("wss://npu-socket.herokuapp.com",
'echo-protocol');

var ws = new WebSocket("ws://localhost:8080", 'echo-protocol');


// - The readonly attribute readyState represents the state

//   of the connection. It can have the following values:

//   + A value of 0 indicates that the connection has

//     not yet been established.

//   + A value of 1 indicates that the connection is

//     established and communication is possible.

//   + A value of 2 indicates that the connection is going
```

```
// through the closing handshake.

// + A value of 3 indicates that the connection has been

// closed or could not be opened.

// - The open event occurs when socket connection is established.

ws.onopen = function()

{

    // Web Socket is connected, send data using send()

    ws.send("Please blink LED...");

    alert("Message is sent...");

};

// The message event occurs when client receives data from server.

ws.onmessage = function (evt)

{

    var received_msg = evt.data;

    alert("Message is received...");

};

// The close event occurs when connection is closed.

ws.onclose = function()

{
```

```
// websocket is closed.

alert("Connection is closed...");

};


// The error event occurs when connection is closed.

ws.onerror = function()

{

    // There is erro

    alert("WebSocket error...");

};

}

else

{

    // The browser doesn't support WebSocket

    alert("WebSocket NOT supported by your Browser!");

}

}

</script>

</head>

<body>

<div id="sse">

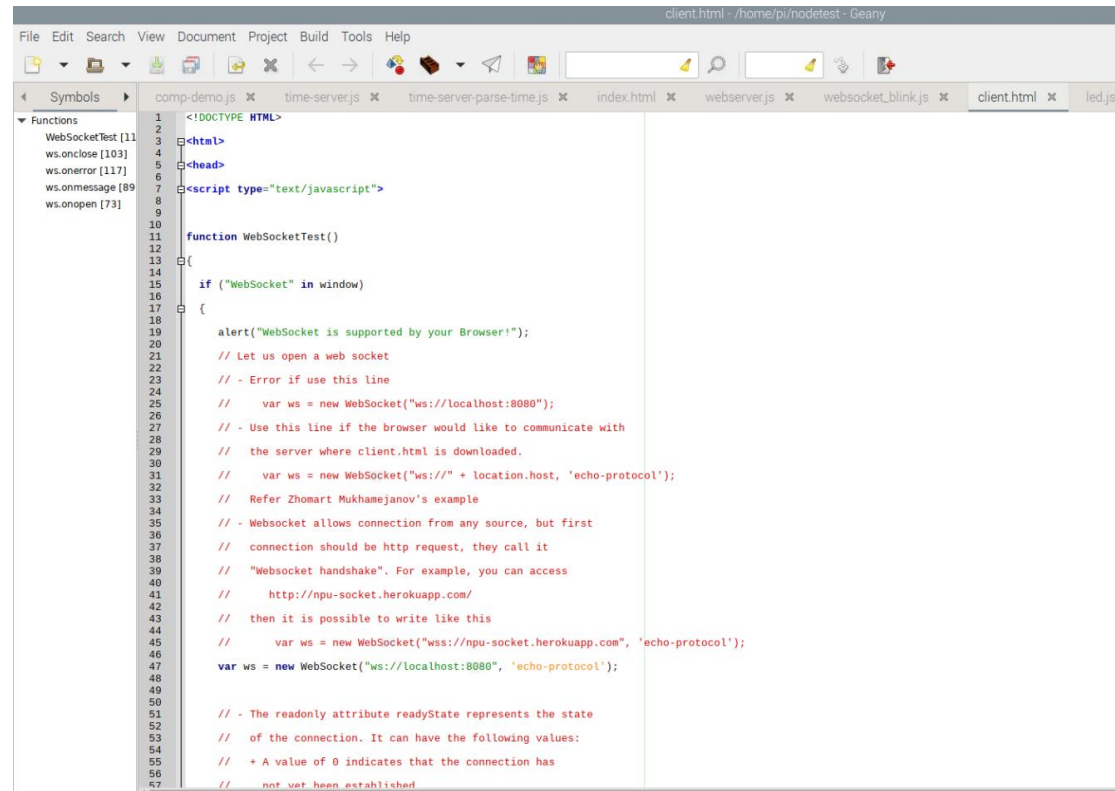
    <a href="javascript:WebSocketTest()">Run WebSocket</a>
```

</div>

</body>

</html>

## Screenshot:



The screenshot shows a code editor window titled "client.html - /home/pu/nodetest - Geany". The editor displays the following HTML and JavaScript code:

```
1 <!DOCTYPE HTML>
2
3 <html>
4   <head>
5     <script type="text/javascript">
6
7       function WebSocketTest()
8       {
9
10        if ("WebSocket" in window)
11        {
12
13          alert("WebSocket is supported by your Browser!");
14
15          // Let us open a web socket
16          // - Error if use this line
17          //   var ws = new WebSocket("ws://localhost:8080");
18          // - Use this line if the browser would like to communicate with
19          //   the server where client.html is downloaded.
20          //   var ws = new WebSocket("ws://" + location.host, 'echo-protocol');
21          // Refer Zhomart Mukhamejanov's example
22          // - WebSocket allows connection from any source, but first
23          //   connection should be http request, they call it
24          //   "websocket handshake". For example, you can access
25          //   http://npv-socket.herokuapp.com/
26          //   then it is possible to write like this
27          //   var ws = new WebSocket("wss://npv-socket.herokuapp.com", 'echo-protocol');
28          var ws = new WebSocket("ws://localhost:8080", 'echo-protocol');
29
30          // - The readonly attribute readyState represents the state
31          //   of the connection. It can have the following values:
32          //   + A value of 0 indicates that the connection has
33          //   not yet been established
```

169.254.10.211 (raspberrypi) - VNC Viewer

nodetest client.html - /home/p... client.html - Chromium pi@raspberrypi: ~/no... client.html - /home/pi/nodetest - Geany

File Edit Search View Document Project Build Tools Help

comp-demo.js x time-server.js x time-server-parse-time.js x index.html x webserver.js x websocket\_blink.js x client.html x led.js x

Functions

- WebSocketTest [11]
- ws.onclose [103]
- ws.onerror [117]
- ws.onmessage [89]
- ws.onopen [73]

```
46 var ws = new WebSocket("ws://localhost:8080", "echo-protocol");
47
48
49 // - The readonly attribute readyState represents the state
50 // of the connection. It can have the following values:
51 // + A value of 0 indicates that the connection has
52 // not yet been established.
53 // + A value of 1 indicates that the connection is
54 // established and communication is possible.
55 // + A value of 2 indicates that the connection is going
56 // through the closing handshake.
57 // + A value of 3 indicates that the connection has been
58 // closed or could not be opened.
59
60 // - The open event occurs when socket connection is established.
61 ws.onopen = function()
62 {
63     // Web Socket is connected, send data using send()
64     ws.send("Please blink LED...");
65     alert("Message is sent...");
66 };
67
68 // The message event occurs when client receives data from server.
69 ws.onmessage = function (evt)
70 {
71     var received_msg = evt.data;
72     alert("Message is received...");
73 };
74
75 // The close event occurs when connection is closed.
```

169.254.10.211 (raspberrypi) - VNC Viewer

nodetest client.html - /home/p... client.html - Chromium pi@raspberrypi: ~/no... client.html - /home/pi/nodetest - Geany

File Edit Search View Document Project Build Tools Help

comp-demo.js x time-server.js x time-server-parse-time.js x index.html x webserver.js x websocket\_blink.js x client.html x

Functions

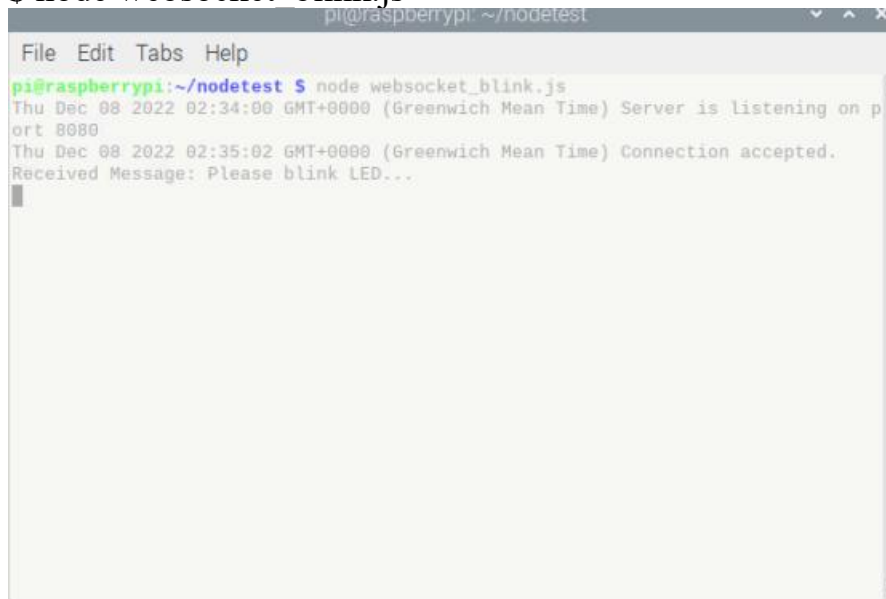
- WebSocketTest [11]
- ws.onclose [103]
- ws.onerror [117]
- ws.onmessage [89]
- ws.onopen [73]

```
100 // The close event occurs when connection is closed.
101 ws.onclose = function()
102 {
103     // websocket is closed.
104     alert("Connection is closed...");
105 };
106
107 // The error event occurs when connection is closed.
108 ws.onerror = function()
109 {
110     // There is error
111     alert("WebSocket error...");
112 };
113
114 else
115 {
116     // The browser doesn't support WebSocket
117     alert("WebSocket NOT supported by your Browser!");
118 }
119
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Step 3: Run codes

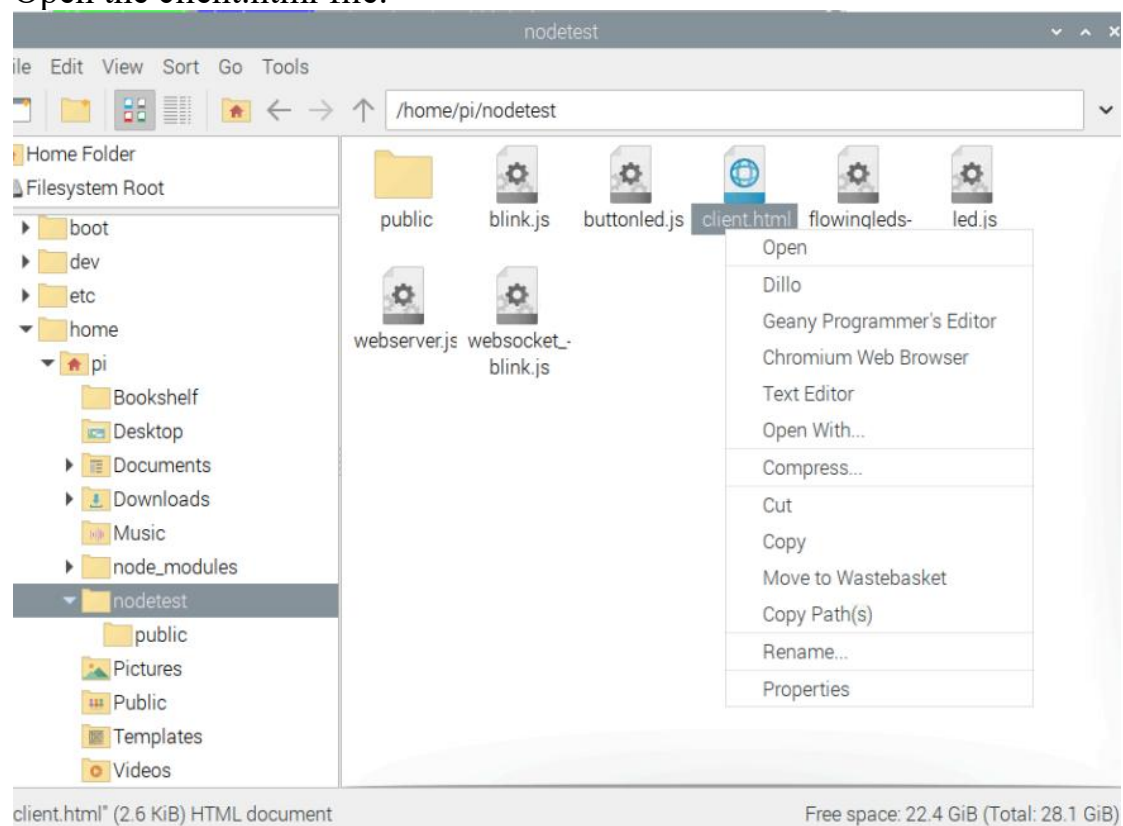
\$ cd nodetest

\$ node websocket blink.js

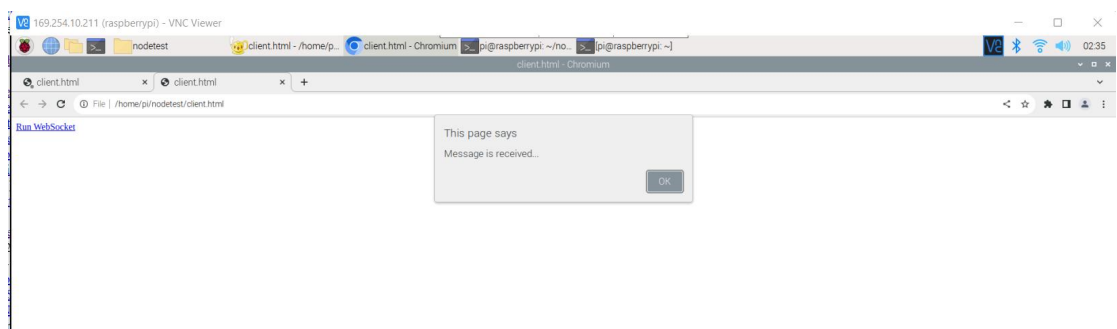
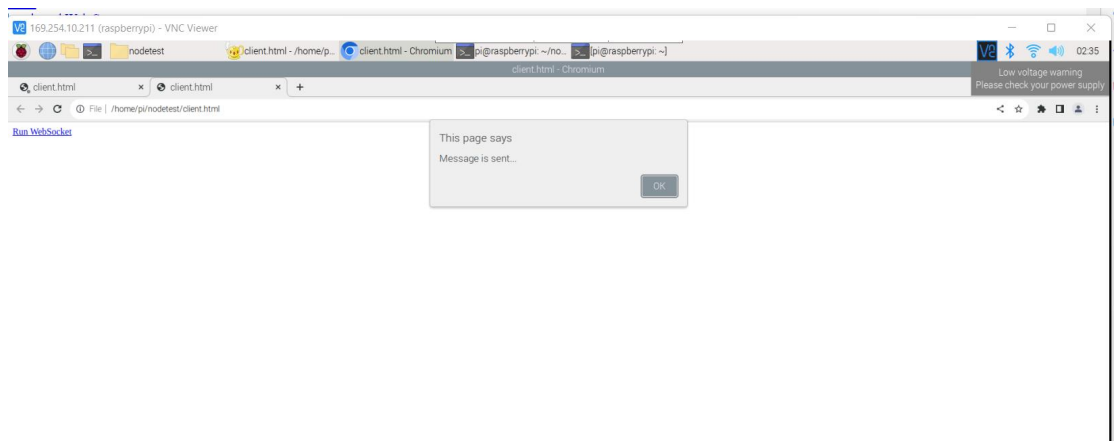
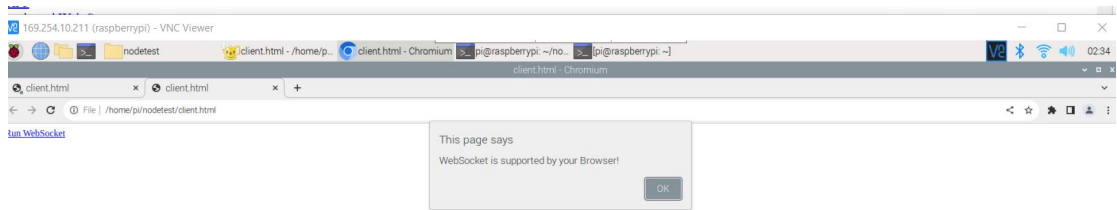
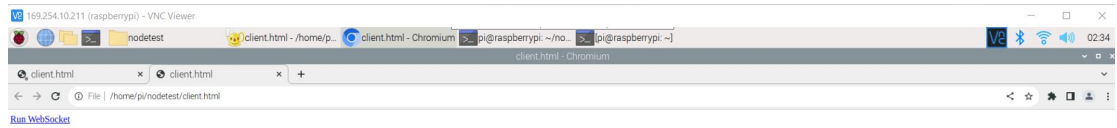


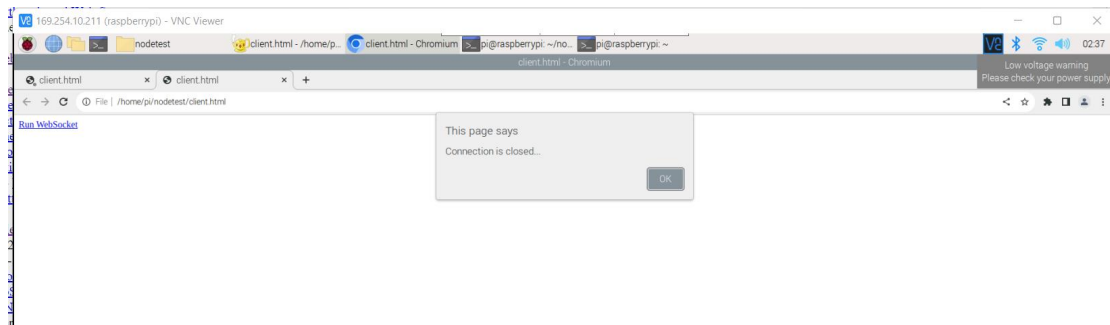
```
pi@raspberrypi: ~/nodetest
File Edit Tabs Help
pi@raspberrypi:~/nodetest $ node websocket_blink.js
Thu Dec 08 2022 02:34:00 GMT+0000 (Greenwich Mean Time) Server is listening on port 8080
Thu Dec 08 2022 02:35:02 GMT+0000 (Greenwich Mean Time) Connection accepted.
Received Message: Please blink LED...
```

Open the [client.html](#) file:









LED blinking:

