CSE423: Embedded System Summer-2020

Access data remotely

Today's Lecture

- *What is Ethernet Shield*
- *How Ethernet works?*
- *How to setup local server*
- *How to access data remotely via internet*

Working with Ethernet Shield

We will introduce and examine the use of Ethernet networking with Arduino over local networks and the greater Internet.

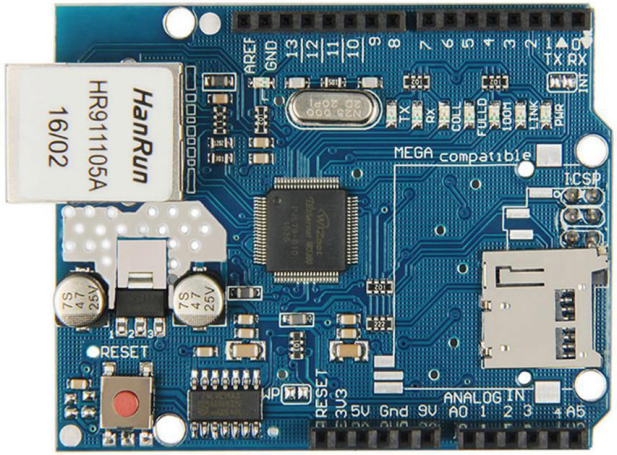
Pre-requisite:

- Basic understanding of computer networking
- Basic knowledge on IP and MAC address

Working with Ethernet Shield

Required hardware:

- Arduino UNO
- Ethernet Shield (W5100 Ethernet controller IC)
- External 9V 1.5A adapter
- Ethernet Cable with RJ45 connector



Working with Ethernet Shield

Steps to be followed:

- Open the Arduino IDE and **select** File > Examples > Ethernet > Webserver. This loads a simple sketch which will display data gathered from the analogue inputs on a web browser. However don't upload it yet, it needs a slight modification.
- You need to specify the IP address of the Ethernet shield – which is done inside the sketch. This is simple, go to the line:

```
IPAddress ip(192,168,1, 177);
```

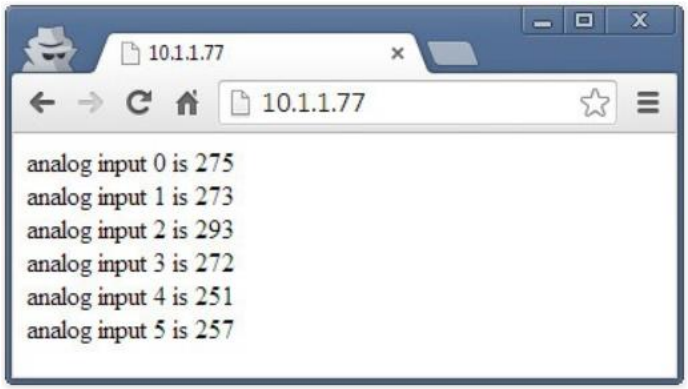
And alter it to match your own setup based on your router's IP assign range.

Working with Ethernet Shield

- If you are running more than one Ethernet shield on your network, ensure they have different MAC addresses by altering the hexadecimal values in the line:

```
byte mac[] = { 0xDE, 0xAD, 0xBE, 0xEF, 0xFE, 0xED };
```

- Once you have made your alterations, save and upload the sketch. Now open a web browser and navigate to the IP address you entered in the sketch, and you should be presented with something similar to the following:

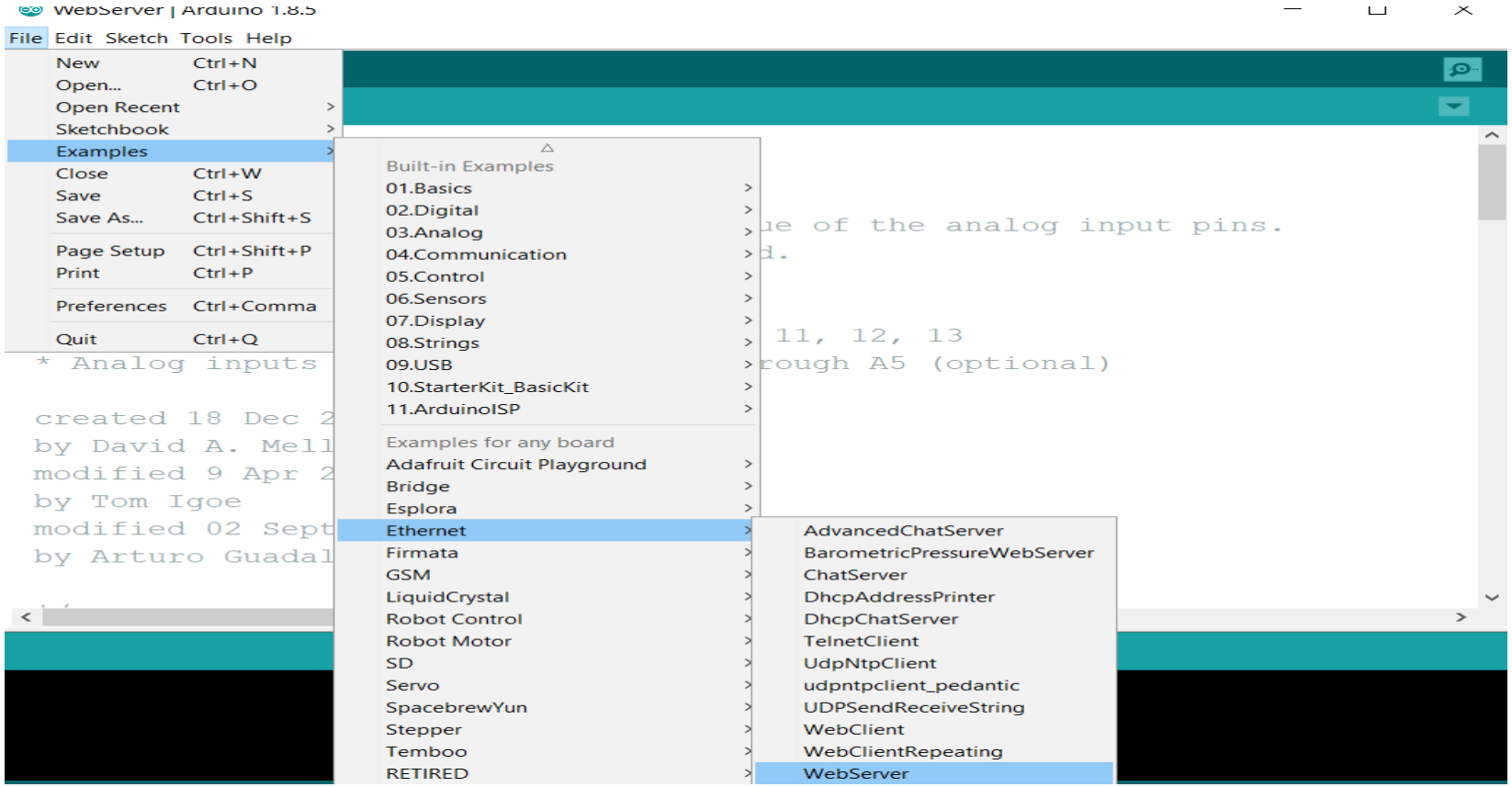


Working with Ethernet Shield

If some value appears in your web browser which means it is working!

Working with Ethernet Shield

Let's examine few things again:



Working with Ethernet Shield

If we scroll though the code we will be finding the following sections:

```
for (int analogChannel = 0; analogChannel < 6; analogChannel++)
{           int sensorReading = analogRead(analogChannel);
          client.print("analog input ");
          client.print(analogChannel);
          client.print(" is ");
          client.print(sensorReading);
          client.println("<br />");
        }
        client.println("</html>");
        break;
```

Working with Ethernet Shield

- *client.print ();*

Allows us to send text or data back to the web page. It works in the same way as serial.print(), so nothing new there.

- client.println("
");

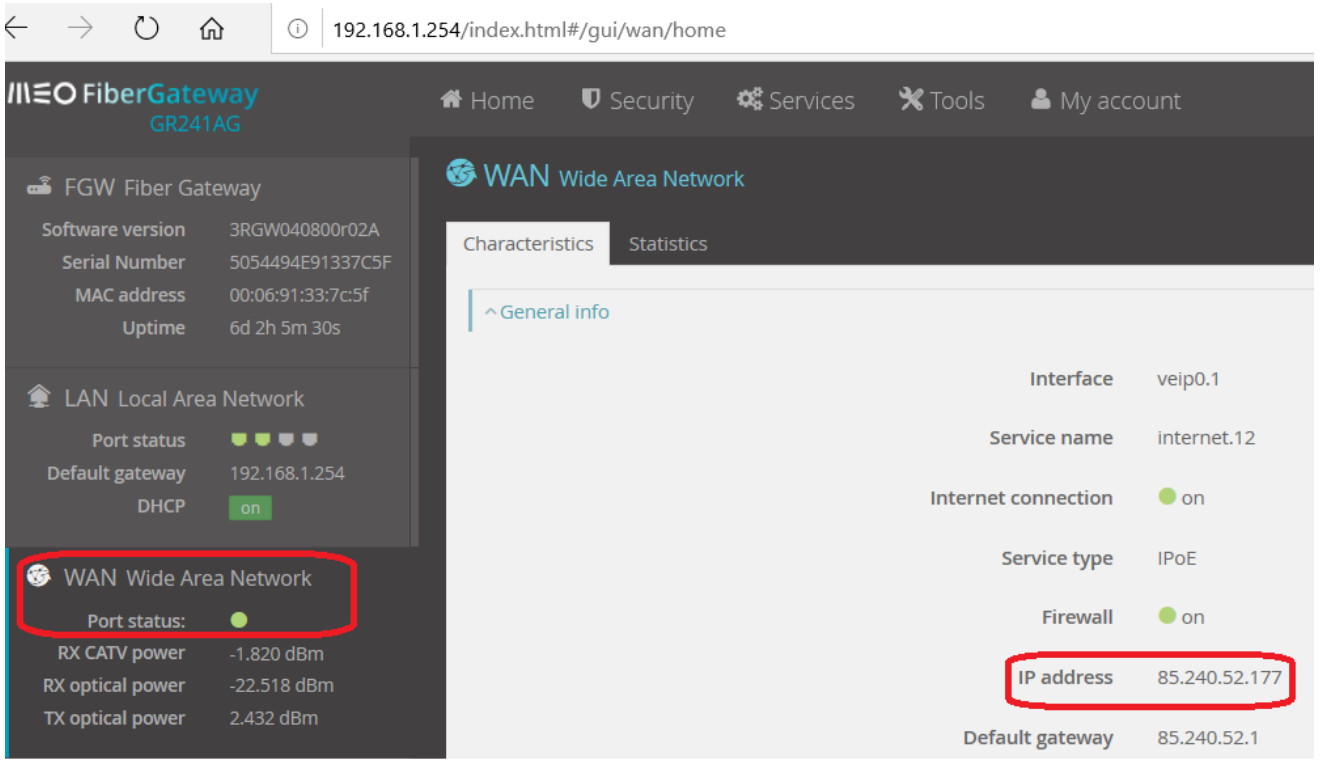
It sends the HTML code back to the web browser telling it to start a new line. The part that actually causes the carriage return/new line is the
 which is an HTML code (or “tag”) for a new line.

How to access data remotely ?

Accessing remotely via Ethernet Shield

Requirements:

- You will need a static IP address provided by your ISP.



Accessing remotely via Ethernet Shield

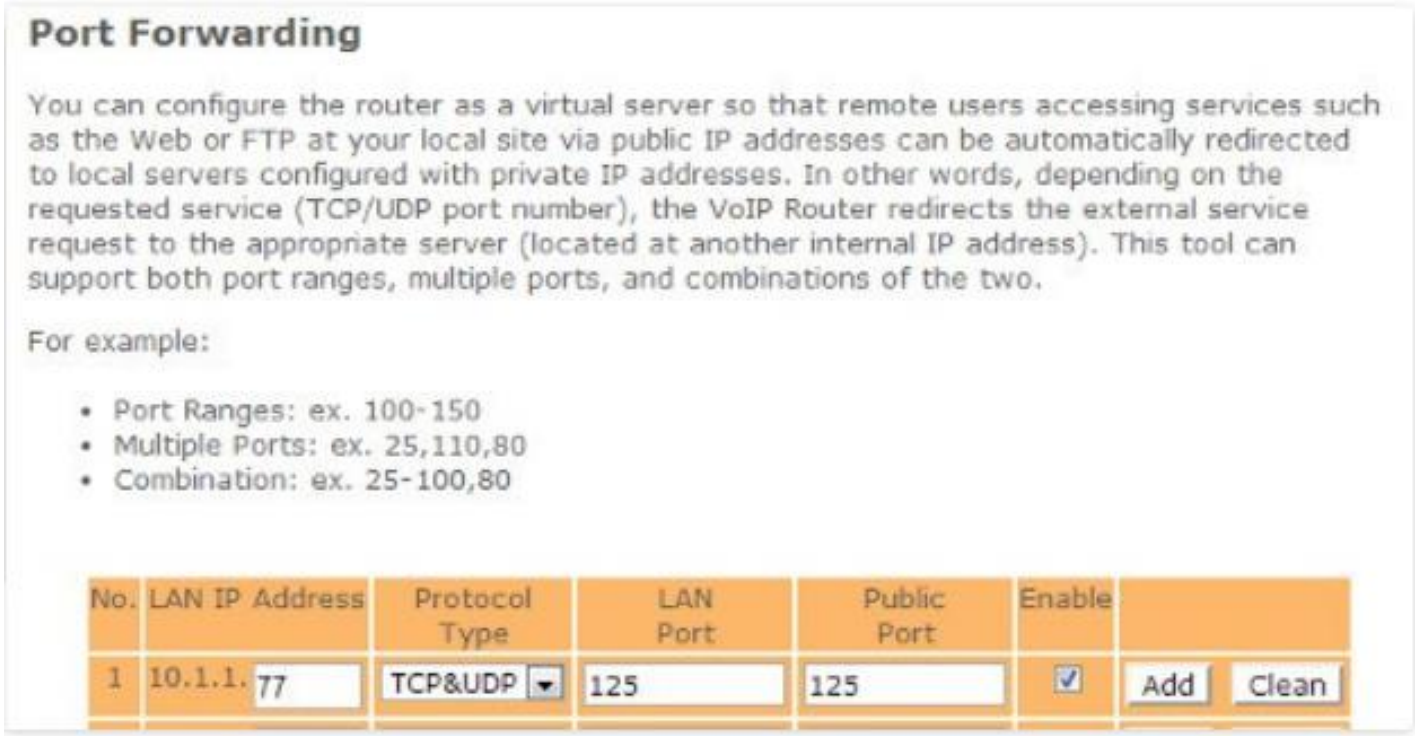
- The next thing to do is **turn on** port-forwarding. This tells the router where to redirect incoming requests from the outside world. When the modem receives such a request, we want to send that request to the port number of our Ethernet shield using the following command:

```
EthernetServer server(125);
```

where “125” is port number

Working with Ethernet Shield

- Port-forwarding:



Port Forwarding

You can configure the router as a virtual server so that remote users accessing services such as the Web or FTP at your local site via public IP addresses can be automatically redirected to local servers configured with private IP addresses. In other words, depending on the requested service (TCP/UDP port number), the VoIP Router redirects the external service request to the appropriate server (located at another internal IP address). This tool can support both port ranges, multiple ports, and combinations of the two.

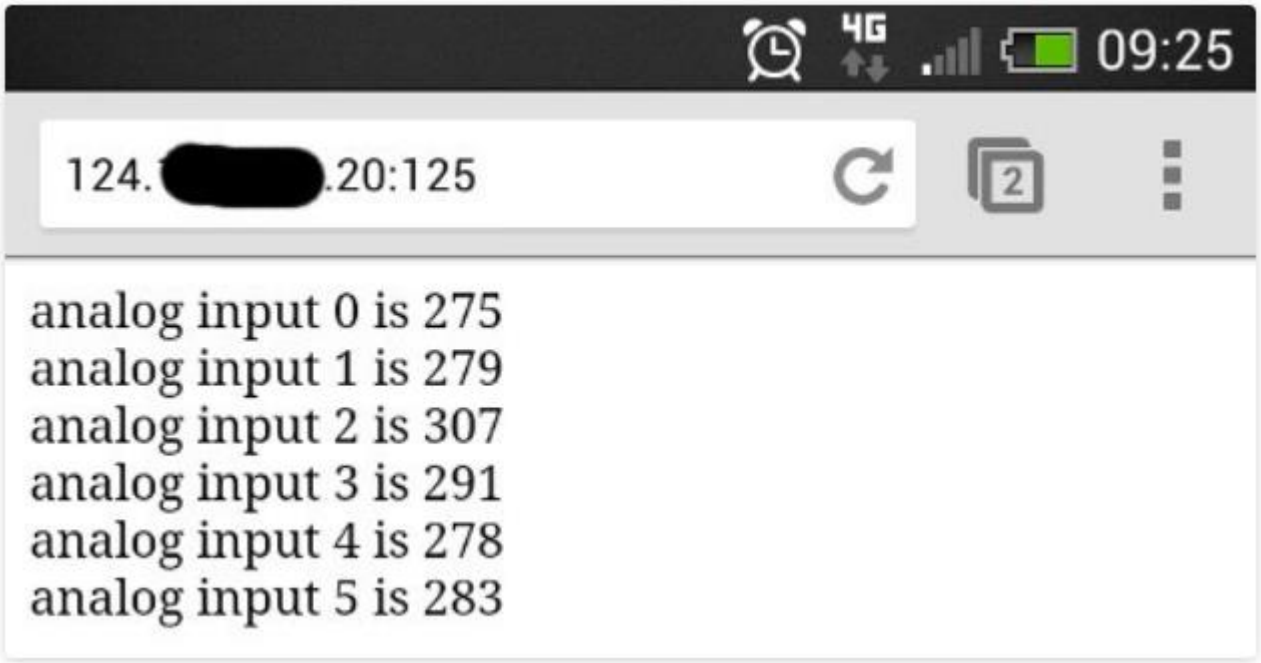
For example:

- Port Ranges: ex. 100-150
- Multiple Ports: ex. 25,110,80
- Combination: ex. 25-100,80

No.	LAN IP Address	Protocol Type	LAN Port	Public Port	Enable	
1	10.1.1. 77	TCP&UDP	125	125	☑	Add Clean

Working with Ethernet Shield

Once we are done port forwarding, we can access the remotely by adding the Port Number with the Static IP to access our data remotely.



What about sending a message to Twitter???