CONNECTIVITY

writing network aware programs

on your Raspberry Pi

using Python 3

BUZZWORDS 1

MESSAGE NETMASK

NETWORK INTERNET PORT

SERVER GATEWAY DYNAMIC

ADDRESS STATIC CLIENT

ETHERNET ROUTER

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STATIC IP SETUP 2

sudo nano /etc/network/interfaces

```
iface eth0 inet static
address 192.168.0.YourNumberHere
netmask 255.255.255.0
network 192.168.0.0
broadcast 192.168.0.255
gateway 192.168.0.1
```

press CTRL X
press Y
press ENTER
sudo reboot

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CONNECTING 2 RASPBERRY PI'S 3

Plug an ethernet cable in both Raspberry Pi's
Make sure the LEDs on both boards light up

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CHECK YOUR IP ADDRESS 4

Confirm your IP address configuration by typing

`ifconfig`

PING TO TEST THE NETWORK 5

PING means "packet internet groper"
It is a diagnostic tool

To "ping" another computer, use it's IP address like this:

`ping 192.168.0.2`

WRITE A SERVER 6

```
import network
import time

def heard(phrase):
  print(phrase)

network.wait(whenHearCall=heard)
print("connected")
while network.isConnected():
  print("waiting")
  time.sleep(4)
print("disconnected")
```

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INSTALL TELNET [OPTIONAL] 7

telnet means "make a telephone call over the network"
It should be pre-installed.

If it is not installed, connect to the internet and type:

`sudo apt-get install telnet`

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TEST YOUR SERVER WITH TELNET 8

Open lxterminal and type:
`python3 server.py`

Open another lxterminal and type:
`telnet localhost 8888`

Now type something in the second terminal and press ENTER

WRITE YOUR OWN CLIENT 9

```
import network
import time

network.call("localhost")

while network.isConnected():
  print("sending")
  network.say("hello")
  time.sleep(1)
```


TEST CLIENT/SERVER LOCAL 10

Open lxterminal and type:
`python3 server.py`

Open another lxterminal and type:
`python3 client.py`

Now type something in the second terminal and press ENTER

TEST CLIENT/SERVER BETWEEN PI'S 11

Open lxterminal on the first Pi and type:
`ifconfig`
Note down the IP address
Then type:
`python3 server.py`

On the second Pi, edit `client.py`
Change "`localhost`" to the IP address above
Then type:
`python3 client.py`

Now type something in the client lxterminal and press ENTER

INTERNET CHAT PROGRAM 12

```
import network
import sys

def heard(phrase):
  print("them:" + phrase)

if (len(sys.argv) >= 2):
  network.call(sys.argv[1], whenHearCall=heard)
else:
  network.wait(whenHearCall=heard)

while network.isConnected():
  #phrase = raw_input() #python2
  phrase = input() # python3
  print("me:" + phrase)
  network.say(phrase)
```


TESTING INTERNET CHAT 13

Open lxterminal on the first Pi and type:
`python3 chat.py`

Open lxterminal on the second Pi and type:
`python3 chat.py 192.168.0.2`

Make sure you replace the IP address with the address of the server Pi you want to contact

Now type messages on both Pi's and press ENTER

THE INTERNET OF THINGS 14

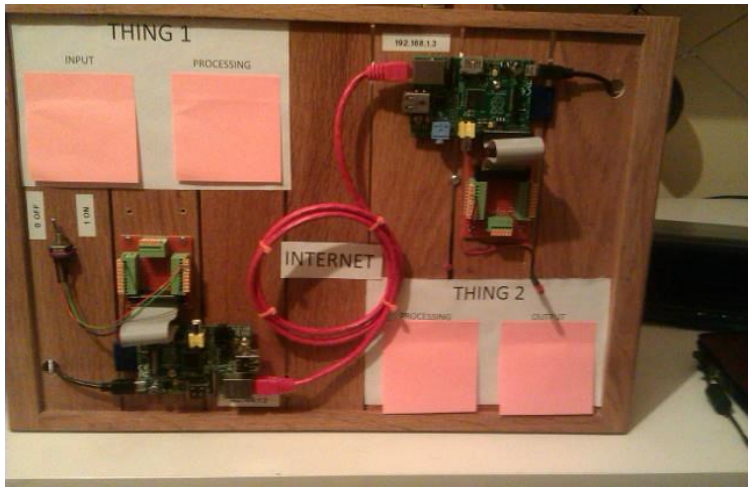
The next "wave" of innovation on the internet is being called "The Internet of Things".

Billions of small intelligent sensors and devices are being connected to the internet.

All you need to make an "Internet of Things" device is:

- a small computer
- a network connection
- a client program
- a server program
- some bits of hardware like sensors/lights

IOT DEMONSTRATOR 15



WHAT WOULD YOUR SWITCH BE? 16

Write down here what the switch in the IOT demonstrator could represent:

e.g. monitoring the heartbeat of a patient

WHAT PROCESSING ON CLIENT? 17

Write down here what the LED in the IOT demonstrator could represent:

e.g. checking heartbeat is normal (not too slow or too fast)

WHAT PROCESSING ON SERVER? 18

Write down here what processing would take place on your server computer:

e.g. look up patient records from hospital database

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WHAT WOULD YOUR LED BE?

Write down here what the LED in the IOT demostrator could represent:

e.g. a message popping up on a doctors mobile phone, showing the patient contact details and their health records

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WHAT HAVE YOU JUST INVENTED? 16

Write down here what you have just invented with your switch, your LED, your two computers and the internet:

e.g. a patient monitoring and alerting system.

NETWORK.PY REFERENCE 17

```
import network # use the network module

network.call() # client calls server

network.wait() # server waits for client

network.say() # sends message

network.isConnected() # still connected?

network.hangUp() # disconnect

network.whenHungUp() # do something on hangup
```


RESOURCES 18

Latest Raspberry Pi bake-off resources:
https://github.com/whaleygeek/pibakeoff

python:
http://python.org/download/

python documentation:
http://docs.python.org/3/

networking:
http://www.bbc.co.uk/schools/gcsebitesize/ict/datacomm/

MORE FLASHCARDS

http://blog.whaleygeek.co.uk

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