Joel Trainer
Assignment 3:

Network activity
Raspberry pi power when it was first turned on:
Initially started at 2W and slowly went up to 5W. It oscillated between 3.5-5W until it was ready to be logged into where it stayed at a steady 4.8W

When not being used steady state of 4.8W.

Using TCP on raspberry pi
From time 23:29:15 – 23:30:02, 362 packets captured in 47 seconds. This implies 7.7 events/s.

While using ping from raspberry pi to lab machine using flooding, the power rose to 5.5W and dropped back to 4.8W afterwards.

While using ping from lab machine to raspberry pi using flooding, the power rose to 5.1W with a little bit of fluctuation and then dropped back to 4.8W afterwards.

It is more expensive from an energy standpoint to send data from the raspberry pi than to receive. This could be because there is more processing to do to send out data than there is to receive it and processing uses power.

Iperf, raspberry pi as server, sending bandwidth 1Gbps UDP mode.
Power rose to around 5.8W and max 6W.
Iperf, raspberry pi as client, sending bandwidth 1Gbps UDP mode
Power rose to around 5.5W and max 5.7W.
So using raspberry pi as a server uses slightly more power.

For Rx-usecs = 57

Now for Rx-usecs = 0

Iperf, raspberry pi as server, sending bandwidth 1Gbps UDP mode.
Power rose to around 5.8W and max 6W.
Iperf, raspberry pi as client, sending bandwidth 1Gbps UDP mode
Power rose to around 5.7W and max 6W.

With this change in Rx-usecs it now used more power as the iperf client than earlier. This may be because it was able to send more data because of the reduced time. However the power as the iperf server did not change. I think this is because it was receiving from the lab machine which I did not change the settings of.

CPU activity

Stress test power went to 6.4W. This is higher than any previous values of power.

Theoretical Experiments

Theoretical carbon footprint of the raspberry pi
Country: Spain
CI = 112 g/kWh

raspberry pi running at full stress. 6.4W means 6.4Wh / hour
PCF = 0.0064 kWh /hour = 56.1 kWh/year

so CF = 6.28 kg CO2 /year

If 30B raspberry pis were connected to the internet
CF = 188B kg CO2 /year

The world total carbon emissions is 36.8 GT so this would imply the internet makes up 0.5% of emissions. In reality it is more like 3.7% of emissions.
The 188B kg CO2 /year is a significant number but in reality the number would be even larger. It is an unfair estimate of the Internet's carbon footprint.