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Computer Systems 414

Practical 1

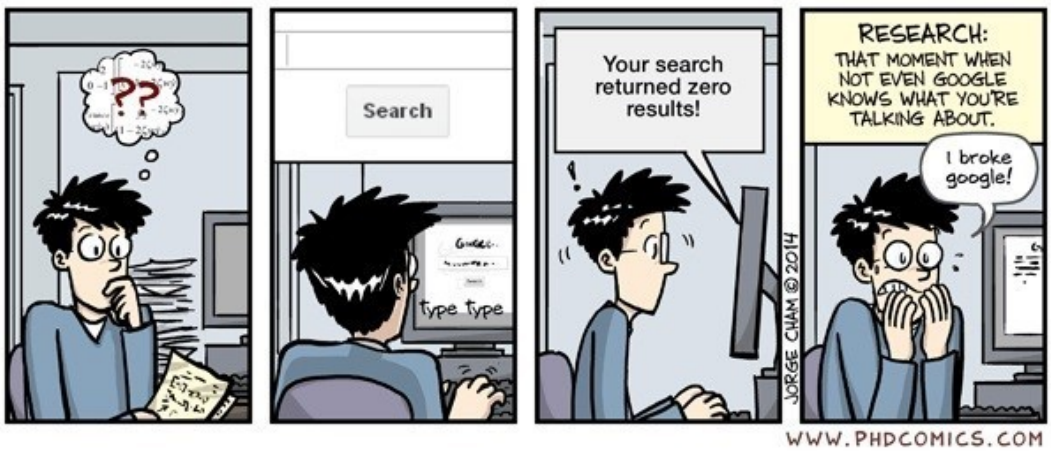
2021

Aim of Practical 1:

a) To introduce the lab setup for Beaglebone and Raspberry-Pi.

b) Writing, compiling and running programs from the command-line.

c) Searching content and methods on internet.



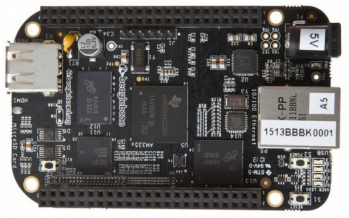
Rules of Engagement

1. Attendance is **compulsory** for all the practical sessions. See the study guide for more details.
2. All practicals containing hardware are conducted in **groups of two or three** (not more than).
3. Collect the required hardware (one set per group) from the store and **return it** at the end of the practical session in the **samestate** in which you got it.
4. All practicals **requires submissions** to learn.sun.ac.za. The deadline for the Assignment 1A is at the end of the practical (16:00) and for Assignment 1B 14:00 on Wednesday 31 March 2021.
5. Submit **one report per group member**. Ensure that each group member is clearly listed within the report.
6. Report all the relevant steps taken and results obtained in the format of screenshots ect. to indicate a correctly working system.
7. Google is your friend. Any information not given is left out on purpose. Search your solution and on the internet or relevant manuals and documentation.

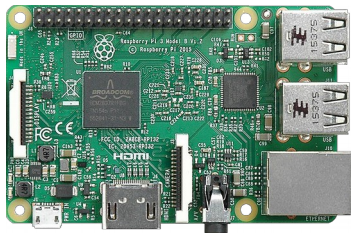
Assignment 1A

The BeagleBone Black and the Raspberry-Pi are both small compact computers flashed with an operating system. To simplify the working with the hardware a setup will be constructed where a standard PC, and both micro-computers can be used at the same time from the same screen and keyboard. This setup is constructed by creating a small network containing the PC, the BeagleBone and the Raspberry-Pi. The micro-computers are then accessed through SSH over the network.

1. Collect a BeagleBone Black (BBB), Raspberry-Pi (R-Pi), USB cable and Ethernet cable from component store.



Beagle Bone Black



Raspberry-Pi

2. ~~Install drivers for BBB - do not follow the Windows automatic driver installation route, it takes forever and does not always work.~~

3. Connect BBB cable - USB to PC.

4. Connect Ethernet between R-Pi and BBB.

5. Connect R-Pi cable - USB to PC

6. Confirm that the PC can communicate with the BBB by typing the following in the command-line

```
ping 192.168.7.2
```

This should indicate successful transfer of packets.

7. On the PC set Windows to communicate to the R-Pi through BBB

```
route ADD 192.168.123.1 MASK 255.255.255.255 192.168.7.2
```

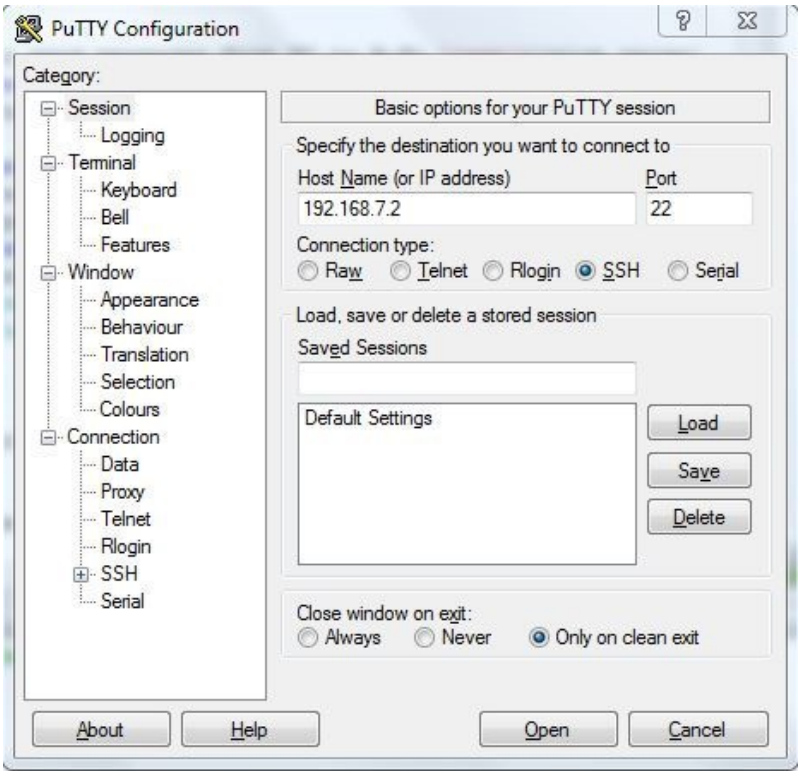
8. Set BBB to send messages from PC to R-Pi *vice versa*

(a) Use Putty en setup ssh connection to 192.168.7.2 with user:root

i. Save connection

ii. Open ssh connection to BBB, no password (b) At Linux prompt:

```
echo 1 > /proc/sys/net/ipv4/ip_forward
```



9. Connect to R-Pi with putty: 192.168.123.1, user: pi, pswd: raspberry

10. Create the helloworld.c file on the BBB and the R-Pi that writes

```
Hello World!
Group Member Name 1
Group Member Name 2
Group Member Name 3
```

To create and edit a file type in the following in the Linux screen

```
nano helloworld.c
```

and follow the rest of the prompts.

11. Use gcc from the command line to compile the code, format: gcc -o <appname> <c-source file>

12. Use the following in the command line to run the compiled application, format: <˙appname>

13. Congratulations you have just successfully created, compile and run a program from the command line

14. Submit your code as a text file to learn.sun.ac.za

Assignment 1B

The BeagleBone board is perfectly suited to applications with interfacing with a number of general purpose IO. Write an application on the Beagle Bone board that flashes an LED on the on-board ten times with a short delay before ending the program.

Submit a report in pdf format to learn.sun.ac.za describing what you have done and why as well as proof of your code running in the form of screen captures and/or photos (the format is up to you)

Information regarding the pin outs of the BeagleBone Black board and the library required to control these pins is a simple Google search away. Supply the source code, description of the program and sections from referred documentation in the supplied report.

Hint: Files can be created on the PC and then transferred to the BeagleBone or the RaspberryPi by using WinSCP.

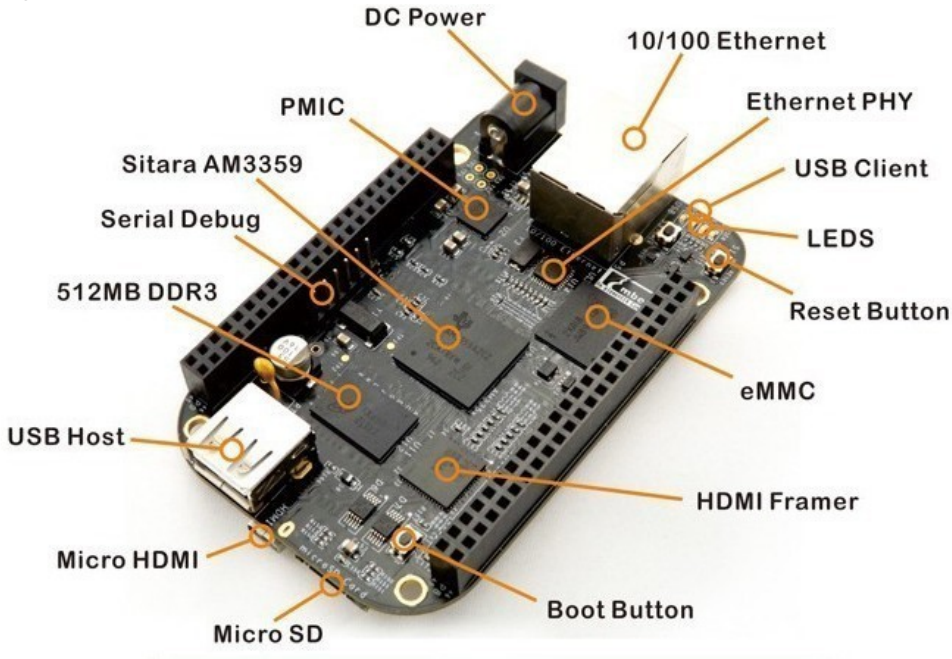


Figure 1: Description of BeagleBone Black board