

Assignment 2

Odd – Even Sort using CUDA

In this assignment, you have to extend the Odd – Even sort of Assignment 1 by implementing it on CUDA. But first things first.

Task 1: Getting Ready

Visit the page <http://121.52.146.108> for a general overview of the LMAR HPC facility. Your user-accounts are already created on this machine. Please note the following credentials for login:

- Username: **pd-c-p101234** (substitute your roll number)
- Password: **p101324** (substitute your roll number)
- IP Address: **121.52.146.108**

You can log into **LMAR** as follows:

1. From Linux:

Just give the following command from any terminal.

```
ssh 121.52.146.108 -l pd-c-p101234 -XY
```

2. From Windows:

1. Download and run/install the Putty SSH client from:
<http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>
2. Specify the login credentials and connect.

Note: For first time login, you will be prompted to change the password (See below). Enter (1) your current password, followed by (2) your new password. You will not see any movement of cursor on screen when you do that.

```
You are required to change your password immediately (root enforced)
Changing password for pd-c-p101234.
(current) UNIX password:
New password:
Retype new password:
pd-c-p101234@lmar ~ $
```

Create a directory to contain your cuda code using the command:

```
pd-c-p101234@lmar ~ $ mkdir cuda
```

Check to see whether the folder is created by using any of the following:

```
pd-c-p101234@lmar ~ $ ls
cuda

pd-c-p101234@lmar ~ $ ls -lh
drwxr-xr-x 2 pd-c-p101234 pd-c-p101234 4.0K May  2 11:24 cuda
```

Task 2: Hello World

Create a code (hello.cu) with the following text on your local machine:

```
/* Name: hello.cu
 */

#include <stdio.h>

int main() {
    printf("hello world!\n");
    return 0;
}
```

You now need to transfer this code to the server.

1. From Linux:

Just give the following command from terminal of your **local** machine.

```
scp hello.cu pdc-p101234@121.52.146.108:/home/pdc-p191324/cuda
```

2. From Windows:

1. Download the Windows SCP client from: <http://winscp.net/eng/index.php>
2. Launch it and provide the login credentials.
3. Browse to the right location and simply drag and drop the files.

Once your files are copied, run the following commands on LMAR to ensure everything is okay:

```
pdc-p101234@lmar ~ $ cd cuda
pdc-p101234@lmar ~/cuda $ ls -lh
-rw-r--r-- 1 pdc-p101234 pdc-p101234 95 May  2 11:26 hello.cu
```

Compile the code as follows:

```
pdc-p101234@lmar ~/cuda $ nvcc hello.cu
```

Run the code as follows:

```
pdc-p101234@lmar ~/cuda $ ./a.out
hello world
```

Note: If you want the executable to be named something other than a.out, compile and run as follows

```
pdc-p101234@lmar ~/cuda $ nvcc hello.cu -o hello
pdc-p101234@lmar ~/cuda $ ./hello
hello world
```

From this point onward, make changes to the code on your local machine, then transfer it to LMAR, and then run it on remote machine **EVERYTIME**.

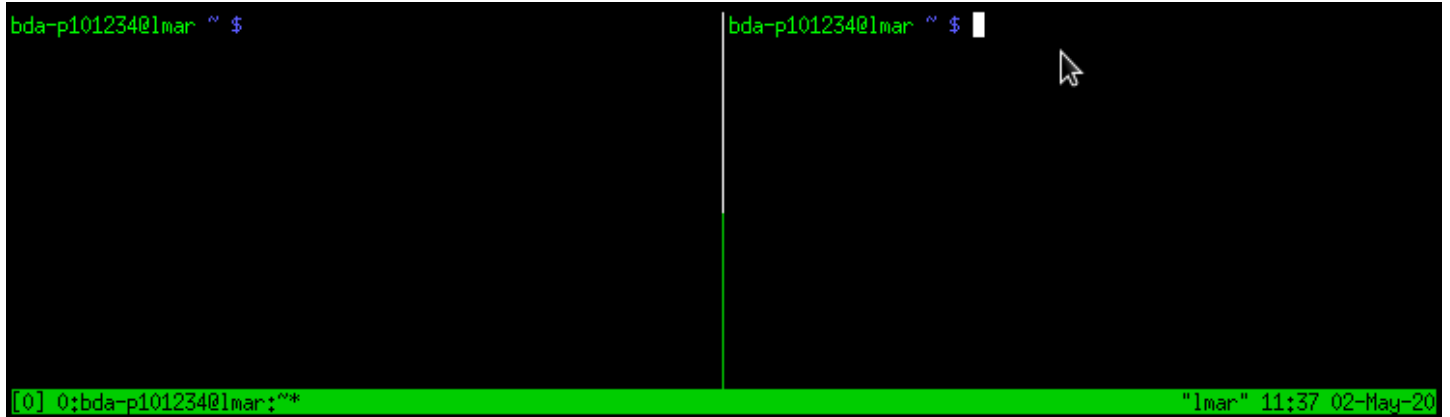
Task 3: Hello World in Another Way (Optional)

If you don't want to copy the code everytime you make some changes, follow through with the following instructions.

Start a terminal emulator environment called tmux as follows:

```
pdc-p101234@lmar ~ $ tmux
```

You will notice that a green line appears at the bottom and that's it. Once the green lined terminal window appears, type **CTRL + b** followed by **SHIFT + 5**. You should see the following window:



To move to the right shell, type **CTRL + b** followed by **right arrow** on numeric keypad.

To move to the left shell, type **CTRL + b** followed by **left arrow** on numeric keypad.

To change the size of a particular shell, type **CTRL + b + left** or **CTRL + b + right** repeatedly.

If you don't like the vertical arrangement, you can type **CTRL + b** followed by **SHIFT + "** for a horizontal arrangement.

Launch a text editor in any of the window you want as follows, and type in your code:

```
pdc-p101234@lmar ~/cuda $ vim hello.cu
```

This is the **vim** editor. Note the following shortcuts for editing the document:

- To enable editing the document, press **i** and then make changes.
- To disable editing the document, press **ESC**
- To save a document, type **:w**
- To exit the document, type **:q**
- To undo, type **u** in disable edit mode.
- To redo, type **CTRL+r** in disable edit mode.

For full list of these shortcuts, visit <https://www.fprintf.net/vimCheatSheet.html>

Task 4: Prevent Data Loss in accidental Disconnection (Optional)

Sometimes you just have to reboot your system, or there is a network outage which results in disconnection to LMAR and loss of whatever you were doing. To prevent this, do the following as soon as you login:

```
pdc-p101234@lmar ~ $ screen
```

You will be back at the same prompt you started with. Try to do some stuff like changing the hello.cu file

```
pdc-p101234@lmar ~/cuda $ vim hello.cu
```

While the file is open, just close the terminal abruptly, and log back in again. This time, resume the screen as follows:

```
pdc-p101234@lmar ~ $ screen -r
```

You will see that it is still at the session where your window was accidentally closed. If you have created multiple screens, you may see the following:

```
cdc-p101234@lmar ~ $ screen -r

There are several suitable screens on:
    23592.pts-4.lmar      (Detached)
    23597.pts-4.lmar      (Detached)

Type "screen [-d] -r [pid.]tty.host" to resume one of them.
```

Choose which one you want to launch and resume as follows:

```
cdc-p101234@lmar ~ $ screen -r 23597.pts-4.lmar
```

To minimize a screen, you can type **CTRL + a** followed by **d**. Note that launching programs within screen means that you can leave your programs running on LMAR while you safely switch off your laptops.

Task 5: Implementation of Odd – Even Sort

From this point onwards, you are all set to work on your assignment (Hopefully). Continue with the same steps of assignment 1, measure the speed of execution, and plot them along with previous results (of assignment1).

Deliverable

Your deliverable should contain the following:

1. Your Name (Roll Number)
2. Your Source Code; **TASK 5 Only** (with Comments)
3. The plot generated from your code (you can use excel), or a tool called gnuplot.