ASSESSMENT COVER SHEET

Student ID number	25364170
Given Name	NABIL
Family name	AHMED

Unit Name and Code:	Parallel Computing FIT-3143
Campus:	Malaysia
Assignment Title:	Assignment -2
Name of Lecturer:	Dr. Vishnu Monn
Name of Tutor:	Dr. Rishwaraj gengarajoo
Tutorial Day and Time:	Thursday (1-3) PM
Phone Number:	+6011 61120390
Email Address:	nahm39@student.monash.edu

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Due Date:	8/10/18	Date Submitted:	9/10/18

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Part A

There are 20 nodes present in the WSN. The nodes can only communicate with the adjacent nodes. There is another additional node, the Base Station. The Base Station is in charge of receiving all the **events** that occur in the WSN and log them onto a file.

All the 20 nodes i.e. process is required to generate a random number given some fixed number of iterations for a given amount of time.

What is an event and how is it detected?

An event is triggered when there are at least three or more adjacent nodes to a node and all three of them generates the same random number. For example, let's say we focus on node 14. So, node (13, 9, 15, 19) if either any three of them generates the same random value it would triggered as an event and sent to the Base Station. However, node (1, 5, 16, 20) cannot trigger any events since they only have two nodes adjacent to them.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20

The Program Structure(***Algorithm***):

How to run the program:

>>mpicc -o <filename> filename.c

>>mpirun -np 21 filename

The number of nodes that are required must be 21 since the program does not handle other number as the processor node.

The program structure consists of 3 functions.

1. **Main**

2. randomNumber (for generating random numbers)

3. neighbourRanks (for finding out the adjacent nodes of a given node)

The **Main** program logic:

The MPI environment is initialized with 21 processing nodes. Simple arithmetic is used to distinguish the adjacent nodes. Based on the table above the arithmetic computations are performed.

As long as the rank is not zero:

The nodes will perform the following operations:

{

- Each Node will keep on generating a random number 1000 times.

- The adjacent nodes are found out by using a function and with simple arithmetic

-The random number generated by the adjacent nodes are put inside the buffer array

-The random number generated the given rank is also put into the buffer

}

Here, lies the most crucial part of the algorithm:

>> Non – blocking send and received are used.

Why?

Because blocking Send and Receive would result into a deadlock since two or more than two nodes in this case are trying to send or receive at the same time.

So, MPI_ISend(
sends random number : buffer,
to the neighbours : destination
using tag
)

MPI_IRecv(
receives random numbers from its neighbours : buffer
from its neighbours : source
using tag
)

Upon receiving the random numbers each node will compare at each iteration if there are more than three random numbers that are generated by its adjacent nodes. If this is true it will then send that information to the base station.

The base station will receive all the messages about the events. It will then record all these events and record them into the log file.

End of algorithm.

Part B

SIMD: Single instruction multiple data is recommended.

SIMD can look up from memory quickly. Every node has its own local memory to store their own bias entry (distributed memory). Each Graph Neuron compares the row sent by the Graph Neuron beneath it. The nodes communicate through the network. Each node concurrently sends the bias to the above column.