

The wireless sensor network comprises 20 nodes **and** a base station. These nodes are arranged in a 4 x 5 (rectangular-shaped) grid.

Each node is an MPI Process, so now you have **total 21 MPI processes**.

Let's assume your map/grid looks like the following:

	A	B	C	D	E
1	A1	B1	C1	D1	E1
2	A2	B2	C2	D2	E2
3	A3	B3	C3	D3	E3
4	A4	B4	C4	D4	E4

### What is an “adjacent node”?

All the **immediate neighbours in top-bottom and left-right directions** are “adjacent nodes”.

- For node B2, adjacent nodes are: B1, A2, C2, B3.
- For node A2, adjacent nodes are: A1, B2, A3.
- For node A4, adjacent nodes are: A3, B4.

### Communication scheme:

Each node can only communicate with an adjacent node directly. Non-adjacent nodes (such as B3 and D3) can't communicate directly.

Communication between

- Adjacent Node  $\leftrightarrow$  Adjacent Node
- Node  $\leftrightarrow$  Base Station

may take place using any of the following methods:

- Blocking or non-blocking Send/Receive
- Broadcast
- Map/Reduce style functions
- Any other method that you think is appropriate.

The goal here should be, to pass **as fewer messages as possible**.

## What is an “Event”?

The program/simulation will run for x number of iterations (where x = you decide!) of y millisecond each (where y = you decide!). Every node in the grid will generate a random number within a range such that:

$$range\_lower\_bound \leq randomly\_generated\_number \leq range\_upper\_bound$$

where *range\_lower\_bound* = you decide!

and *range\_upper\_bound* = you decide!

You need to adjust the time interval, and range bounds such that there is a good chance that a few nodes throughout the grid, will end up generating the same random number.

An event occurs at a node *N* when **minimum three** of *N*'s adjacent nodes end up generating the same random number.

Let's assume nodes B1, C2 and B3 generated the same random number. That would count as an occurrence of the event at node B2.

Similarly, if nodes A1, B2 and A3 generated the same random number, that would count as an occurrence of the event at node A2.

Clearly, the event will never occur at the nodes located at four corners of the grid (such as node A4) since you require minimum three adjacent nodes to generate the same random number, and the nodes located at the corners have only two adjacent nodes.

## What to measure?

Below are the metrics you should keep track of, for every iteration:

- Number of messages passed throughout the network
- Number of events occurred throughout the network
- Details of nodes involved in each of the events (reference node and its adjacent nodes)

At the end of the program, writing these metrics to a log file would help us evaluate the efficiency and correctness of your program.