

# Virtual Array Filling

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## Course Level:

CS0/CS1

## PDC Concepts Covered:

| PDC Concept                   | Bloom Level |
|-------------------------------|-------------|
| Serial vs Parallel (Speed UP) | K           |
| Partitioning                  | K           |
| Parallel Overhead             | K           |
| Sequential Dependency         | K           |
| Load Imbalance                | K           |

## Prerequisites:

None

## Tools Required:

Access to collaborative spreadsheet (Such as a shared google sheet)

Timer (Optional)

## Introduction:

The main goal of this module is to introduce the basic steps of parallelization namely partitioning, mapping, and synchronization.

Mapping is the task of assigning what data to which thread.

Synchronization is how the threads communicate to ensure the parts of the task are done in the right order.

## Activity Description:

1. Assign a student to fill up an array of cells with value = square of the cell above (eg. 1,4,9,etc.) Then add 2 to the resulting value
2. Time them
3. Assign another student, have them do the same thing, but start them about halfway down the array.
4. Time them. The timing of the second run should show some Speed up.
  - a. Repeat 3-4 with an increasing number of students

## Extensions:

Make a task list of starting and ending points on the array. Have two students grab a task from the queue and fill in the proper cells.

Using 2 students has one start at the beginning and one about a fourth of the way from the end. One student should finish well before the other. This symbolizes a load imbalance.

Have the first student do the first row, but have the instructions be harder

Have the second student add 2 to the resulting value, the second student cannot proceed until after the first student, showing a data dependency.