OpenMP Loop Scheduling

Nandhana Sakthivel

Exercise 2

Objective

The objective of this exercise is to understand the loop scheduling in **OpenMP** via **static** and **dynamic** loop scheduling.

Result

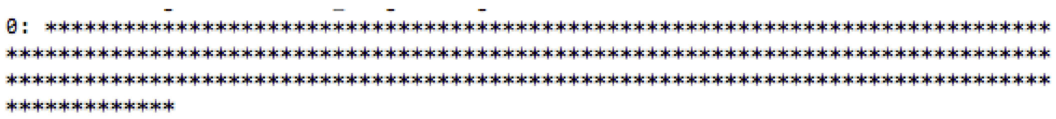
This implementation helps us to understand how the work is allocated to each thread in different kinds of scheduling.

Static:

Loop iterations are divided into pieces of size chunk and then statically assigned to threads. If chunk is not specified, the iterations are evenly (if possible) divided contiguously among the threads.

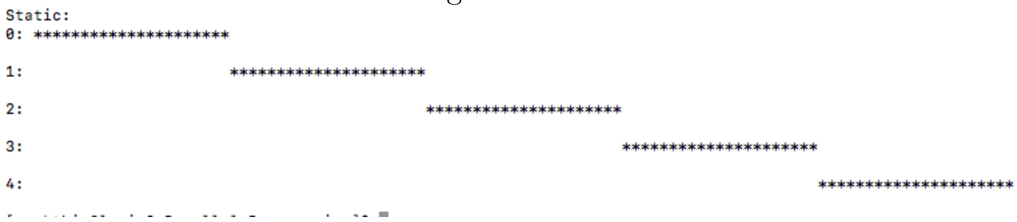
Dynamic:

Loop iterations are divided into pieces of size chunk, and dynamically scheduled among the threads; when a thread finishes one chunk, it is dynamically assigned another. The default chunk size is 1.



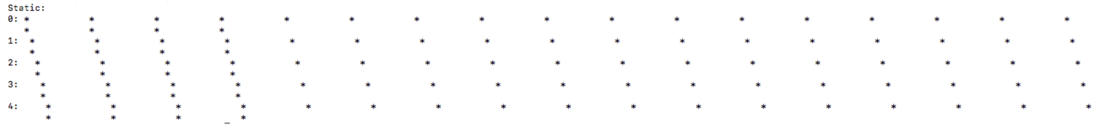
```
0: *****************************************************************************
********************************************************************************
********************************************************************************
*************
```

Figure 1: Serial



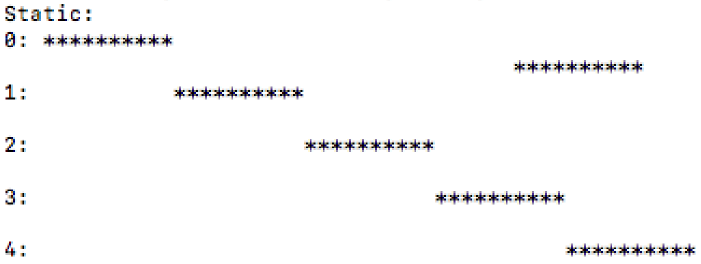
```
Static:
0: ********************

1:                     ********************

2:                                         ********************

3:                                                             ********************

4:                                                                                 ********************
```

Figure 2: Static



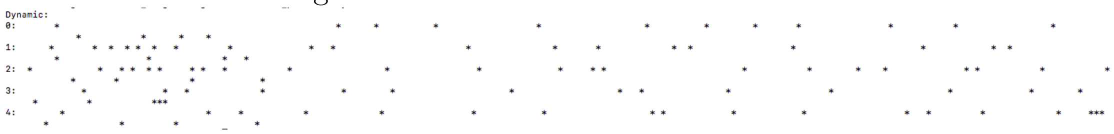
```
Static:
0: *           *           *           *           *           *           *           *           *           *           *           *           *           *           *           *           *
   *           *           *           *
1:  *           *           *           *           *           *           *           *           *           *           *           *           *           *           *           *           *
    *           *           *           *
2:   *           *           *           *           *           *           *           *           *           *           *           *           *           *           *           *           *
     *           *           *           *
3:    *           *           *           *           *           *           *           *           *           *           *           *           *           *           *           *           *
      *           *           *           *
4:     *           *           *           *           *           *           *           *           *           *           *           *           *           *           *           *           *
       *           *           *           *
```

Figure 3: Static with chunk size 1



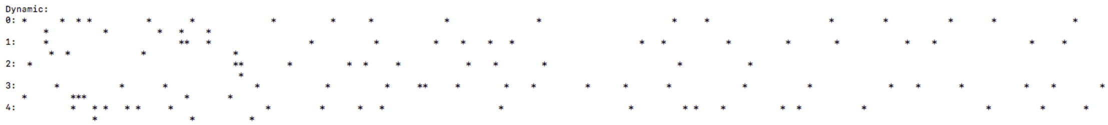
```
Static:
0: **********
                                       **********
1:           **********

2:                     **********

3:                               **********

4:                                         **********
```

Figure 4: Static with chunk size 10



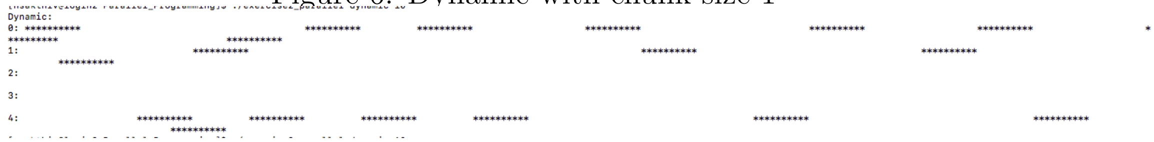
```
Dynamic:
0:       *                                                *      *         *                 *                  *         *        *       *               *          *                *
             *          *     *    *
1:      *      *  *  * *  *   *        *             *   *                       *              *       *            *  *                 *                     *            *  *
         *               *            *   *
2:  *           *   * *  * *    * *   *           *                *               *             *     * *                       *           *       *    *             * *          *           *
            *      *            *            *
3:            *             *   *            *             *        *                   *                  *   *              *                 *                    *             *        *
     *         *          ***
4:        *                        *     *          *             *               *           *                  * *           *            *                 *  *         *            *     ***
       *            *         *             *
```

Figure 5: Dynamic



```
Dynamic:
0: *      * * *         *      *             *         *      *           *               *                      *    *                    *         *          *      *             *
       *         *        *   *   *
1:     *                      **  *                 *          *         *   *    *  *                     *   *          *         *       *           *    *               *     *
        * *            *               *
2:  *                                 **       *         *  *    *           *    *       *                      *           *
                                        *
3:       *          *      *              *           *         *     **    *        *   *        *      *      *            *          *             *   *      *          *    *       *
   *        ***                ***      *
4:           *   * *  * *     *               *        *      *   *                   *                     *        * *   *         *  *          *                    *        *       *
               *               *          *
```

Figure 6: Dynamic with chunk size 1



```
[hsakthiv@login2 Parallel_Programming]$ ./exercise2_parallel dynamic 10
Dynamic:
0: **********                                        **********          **********                    **********                              **********                    **********                    *
*********                              **********
1:                               **********                                                                      **********                                        **********
         **********
2:

3:

4:                     **********          **********          **********          **********                                        **********                                        **********
                             **********
```

Figure 7: Dynamic with chunk size 10

Conclusion

We can conclude from the image that in **static scheduling** the work is assigned to the threads in an orderly fashion which is determined at the **compile time** where as in **dynamic scheduling** the work is assigned to the threads which is determined during the **run time**.