**Genetic Algorithm for Heterogeneous Computing Scheduling Problem (HCSP)**

Let us take an example of five tasks to be scheduled on three machines, hence we have a ETC matrix as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Tasks/Machines | M0 | M1 | M2 | M3 | M4 |
| T0 | 314595.25 | 435684 | 494566.47 | 629749.56 | 724107.81 |
| T1 | 947062.56 | 1254837.5 | 1457126 | 1490963.25 | 1862252.12 |
| T2 | 1672892.88 | 1674524.5 | 1860717 | 1932243.62 | 1999172.75 |
| T3 | 1719276.62 | 2277404 | 2876880.5 | 2957155.5 | 2989716 |
| T4 | 693038.06 | 782094.75 | 837419.31 | 1026765.06 | 1175126.25 |

When Scheduled using **min-min algorithm**, the results are as follows:

T0→M0 Time: 314595.25

T4→M1 Time: 782094.75

T1→M0 Time: 947062.56

T2→M2 Time: 1860717.00

T3→M3 Time: 2957155.50

And the execution time for all the machines are as follows:

M1→1261657.81

M2→782094.7

M3→1860717

M4→2957155.5

M5→0.0

So, the total execution time of all the processes on all the machine is, 2957155.5 units of time. Now, when we schedule using **max-min algorithm**, the results are as follows:

T3→M0 Time: 1719276.62

T2→M1 Time: 1674524.50

T1→M2 Time: 1457126.00

T4→M3 Time: 1026765.06

T0→M4 Time: 724107.81

And the execution time for all the machines are as follows:

M1→1719276.62

M2→ 1674524.5

M3→ 1457126

M4→ 1026765.06

M5→724107.81

So, the total execution time of all the processes on all the machine is, 1719276.62 units of time.

Now, using the genetic algorithm with the Min-Min algorithm, with the following parameters,

pop\_size = 100

tasks = 5

machines = 5

survivalRate = 0.5

mutationRatio = 0.01

total\_generations = 500

we get the result as:

T3→M0 Time: 1719276.62

T2→M1 Time: 1674524.50

T1→M2 Time: 1457126.00

T4→M3 Time: 1026765.06

T0→M3 Time: 1656514.62

Hence, making the total execution time as 1719276.62 units time. It can be observed that, Min-Min algorithm which previously gave an execution time of 2957155.5 units time, when executed with the genetic algorithm, gives a reduced execution time of 1719276.62 units time. In this particular case, this ET, is same as that of Max-Min algorithm, suggesting that, the genetic algorithm combines the best features of both the Min-Max algorithm as well as Max-Min algorithm, and results in the most optimal schedule, hence reducing the overall execution time.