# Laboratory 5

Implement a sorting by selection (Selection Sort Algorithm) using MPI. In the first step processor number 0 generates "n" random values (float) and then distributes them equally to "p" available processors, each processor receive "n/p" values. Then each processor begin sorting by selecting a minimum value – local minimum. When all processors find the local minimum the global minimum is select. During selection a global minimum you need to use MPI_AllReduce operation with the parameter MIN_LOC. More details are presented below. When sorting is complete processor 0 collects partial results from all processors and checks whether they are sorted.

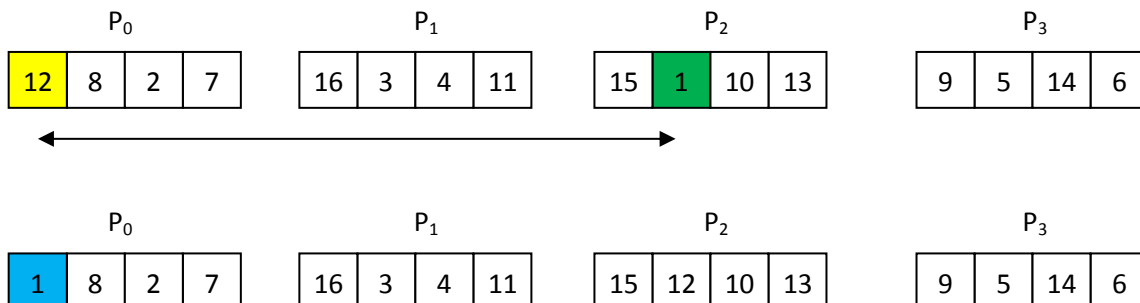## Distributed sorting algorithm by minimum selection

Initial phase: generating input values and its distribution among all available processor.
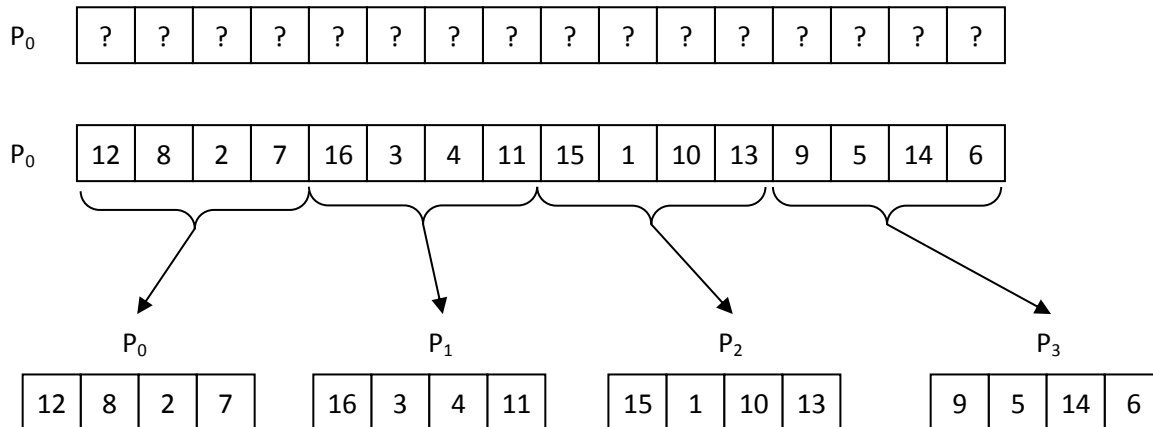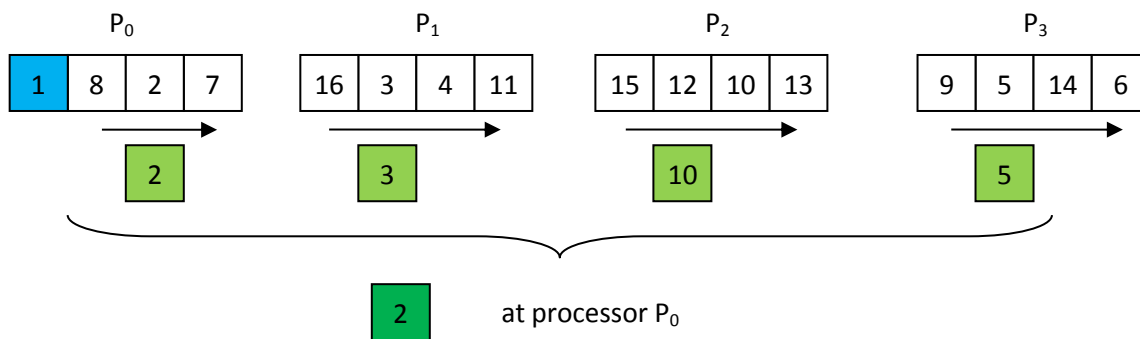

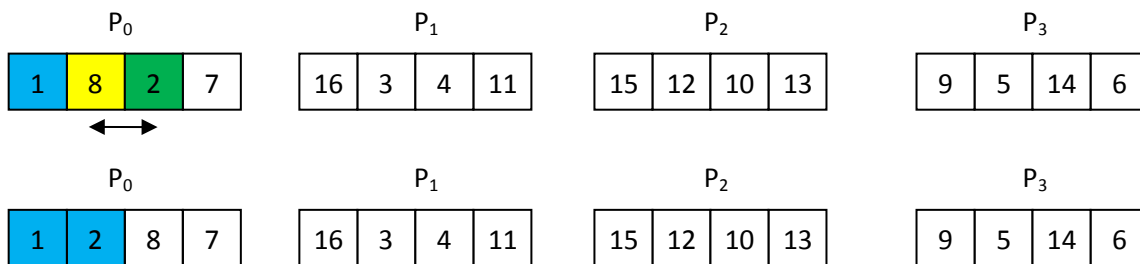Algorithm – first step - selection of the local, and then the global minimum
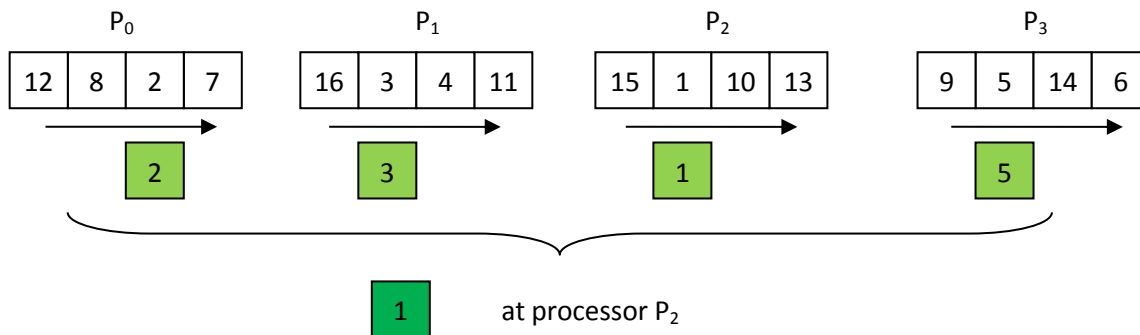
Algorithm – second step – exchange global minimum with the appropriate position

Algorithm – third step – selection of the local, and then the global minimum

P0					P1					P2					P3			
1	8	2	7		16	3	4	11		15	12	10	13		9	5	14	6

2   3   10   5

2   at processor P0

Algorithm – fourth step – exchange global minimum with the appropriate position

P0					P1					P2					P3			
1	8	2	7		16	3	4	11		15	12	10	13		9	5	14	6

P0					P1					P2					P3			
1	2	8	7		16	3	4	11		15	12	10	13		9	5	14	6

After inserting properly 4 elements, the processor 0 is no longer involved in the processing

P0					P1					P2					P3			
1	2	3	4		16	8	7	11		15	12	10	13		9	5	14	6

7   10   5

5   at processor P3
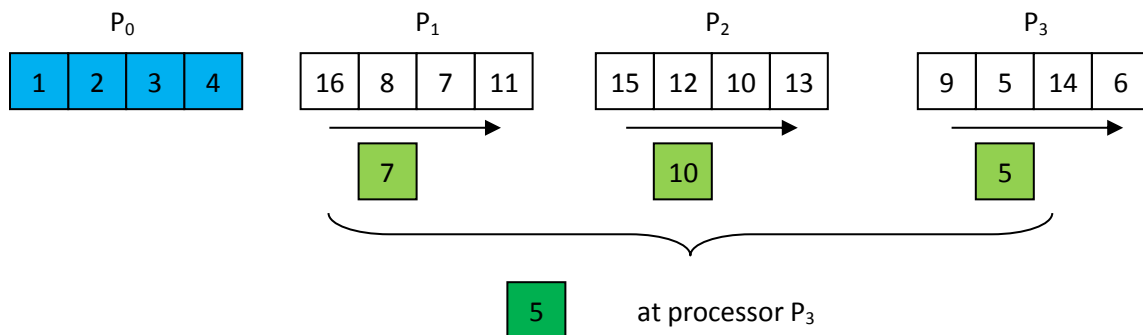
When the sorting process is finished processor 0 collects all partial results and checks if sorting is correct.

					P1					P2					P3			
1	2	3	4		5	6	7	8		9	10	11	12		13	14	15	16

P0

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