

Bubble Sort

Kartik Gopalan

Sequential Bubble Sort

Sequential Bubble Sort

10	5	3	11	0	2	6	8
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Sequential Bubble Sort

Compare and
Swap

10	5	3	11	0	2	6	8
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Sequential Bubble Sort

5	10	3	11	0	2	6	8
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Sequential Bubble Sort

5	3	10	11	0	2	6	8
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Sequential Bubble Sort

5	3	10	11	0	2	6	8
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Sequential Bubble Sort

5	3	10	0	11	2	6	8
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Sequential Bubble Sort

5	3	10	0	2	11	6	8
---	---	----	---	---	----	---	---

Sequential Bubble Sort

5	3	10	0	2	6	11	8
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Sequential Bubble Sort

5	3	10	0	2	6	8	11
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Sequential Bubble Sort

3	5	10	0	2	6	8	11
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Sequential Bubble Sort

3	5	10	0	2	6	8	11
---	---	----	---	---	---	---	----

Sequential Bubble Sort

3	5	0	10	2	6	8	11
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Sequential Bubble Sort

3	5	0	2	10	6	8	11
---	---	---	---	----	---	---	----

Sequential Bubble Sort

3	5	0	2	6	10	8	11
---	---	---	---	---	----	---	----

Sequential Bubble Sort

3	5	0	2	6	8	10	11
---	---	---	---	---	---	----	----

Sequential Bubble Sort

3	5	0	2	6	8	10	11
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Sequential Bubble Sort

3	0	5	2	6	8	10	11
---	---	---	---	---	---	----	----

Sequential Bubble Sort

3	0	2	5	6	8	10	11
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Sequential Bubble Sort

3	0	2	5	6	8	10	11
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Sequential Bubble Sort

3	0	2	5	6	8	10	11
---	---	---	---	---	---	----	----

Sequential Bubble Sort

0	3	2	5	6	8	10	11
---	---	---	---	---	---	----	----

Sequential Bubble Sort

0	2	3	5	6	8	10	11
---	---	---	---	---	---	----	----

Sequential Bubble Sort

0	2	3	5	6	8	10	11
---	---	---	---	---	---	----	----

Sequential Bubble Sort

0	2	3	5	6	8	10	11
---	---	---	---	---	---	----	----

Sequential Bubble Sort

0	2	3	5	6	8	10	11
---	---	---	---	---	---	----	----

Sequential Bubble Sort

0	2	3	5	6	8	10	11
---	---	---	---	---	---	----	----

Sequential Bubble Sort

0	2	3	5	6	8	10	11
---	---	---	---	---	---	----	----

No swaps in the last round.

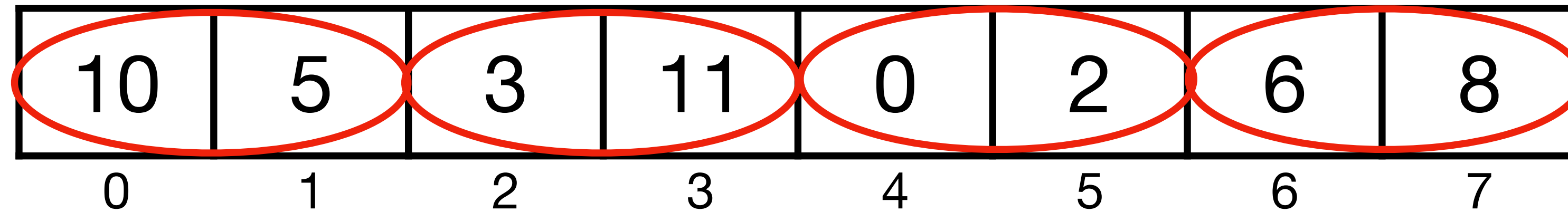
Sorted!

Stop.

Even-Odd Pass Bubble Sort

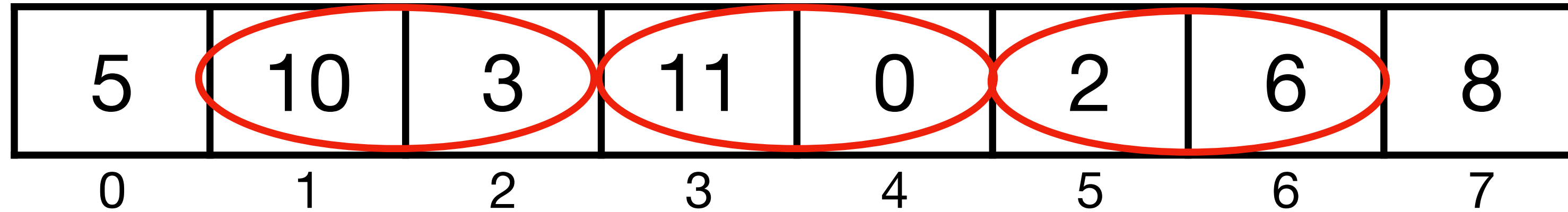
Even-Odd Pass Bubble Sort

Compare and swap even pairs (sequentially)



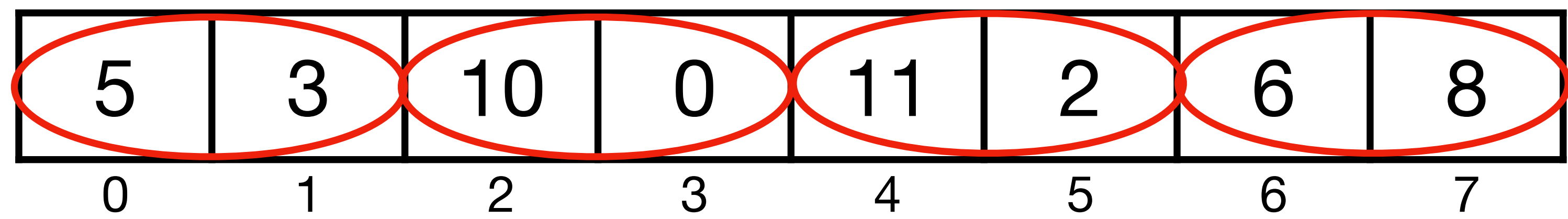
Even-Odd Pass Bubble Sort

Compare and swap odd pairs (sequentially)



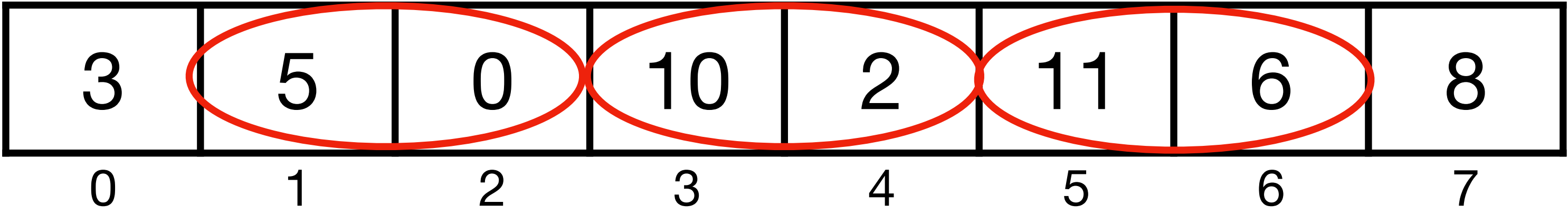
Even-Odd Pass Bubble Sort

Even pairs



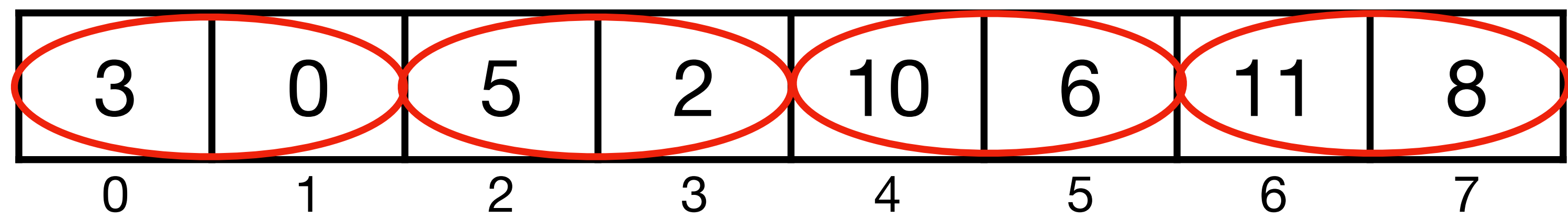
Even-Odd Pass Bubble Sort

Odd pairs



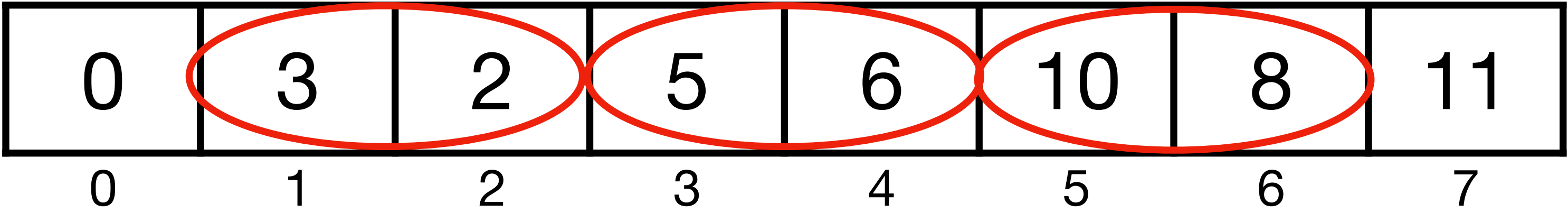
Even-Odd Pass Bubble Sort

Even pairs



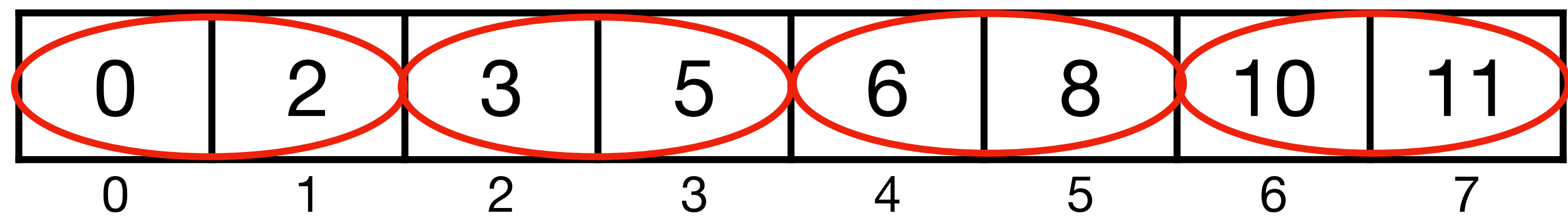
Even-Odd Pass Bubble Sort

Odd pairs



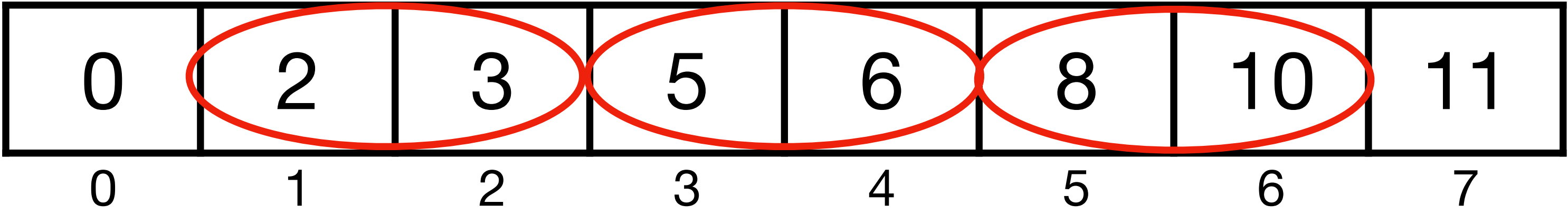
Even-Odd Pass Bubble Sort

Even pairs



Even-Odd Pass Bubble Sort

Odd pairs



Even-Odd Pass Bubble Sort

0	2	3	5	6	8	10	11
0	1	2	3	4	5	6	7

No swaps in the last two rounds.

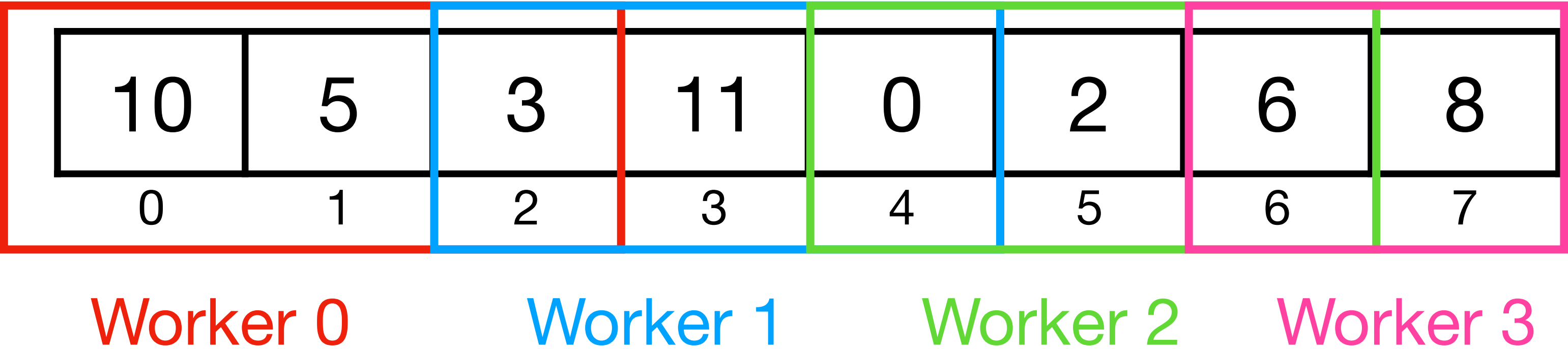
Sorted!

Stop.

Parallel Even-Odd Pass Bubble Sort

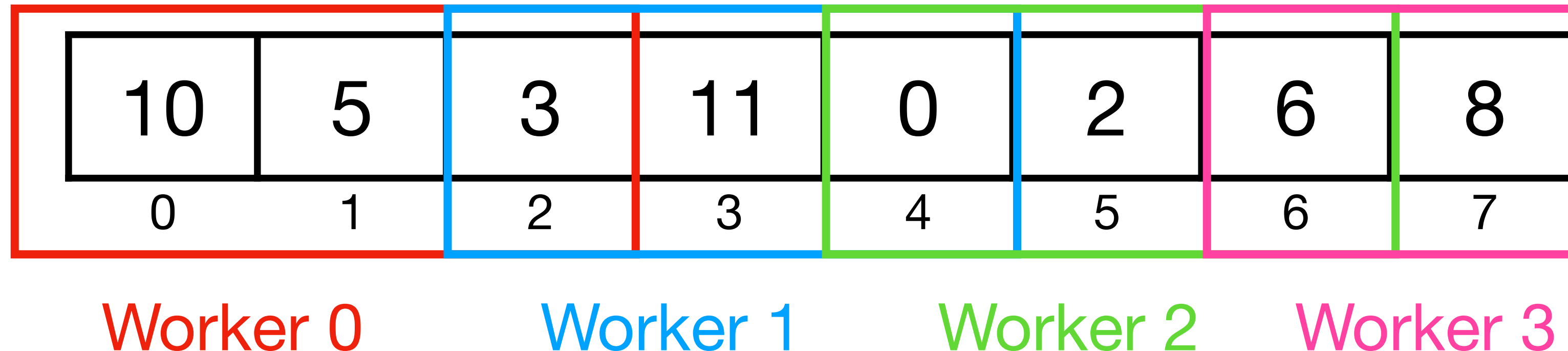
Parallel Even-Odd Pass Bubble Sort

Concurrent worker processes operate on overlapping segments of the array



Parallel Even-Odd Pass Bubble Sort

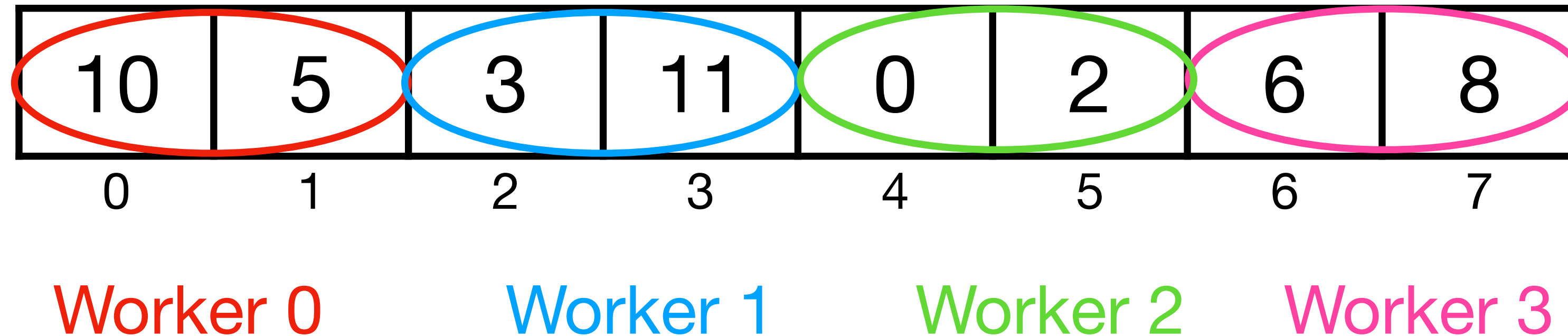
Concurrent worker processes operate on overlapping segments of the array



Each worker does the following on its range

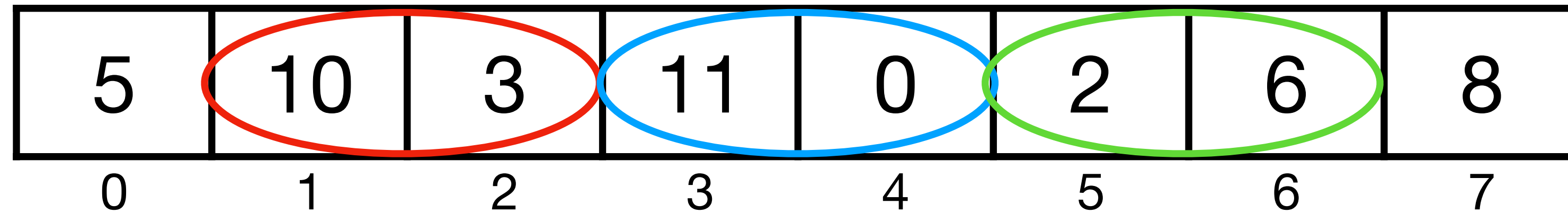
- Barrier (pass == even)
- Even pass bubbling
- Barrier (pass == odd)
- Odd pass bubbling

Parallel Even-Odd Pass Bubble Sort



- Barrier (pass == even)
- Even pass bubbling

Parallel Even-Odd Pass Bubble Sort



Worker 0

Worker 1

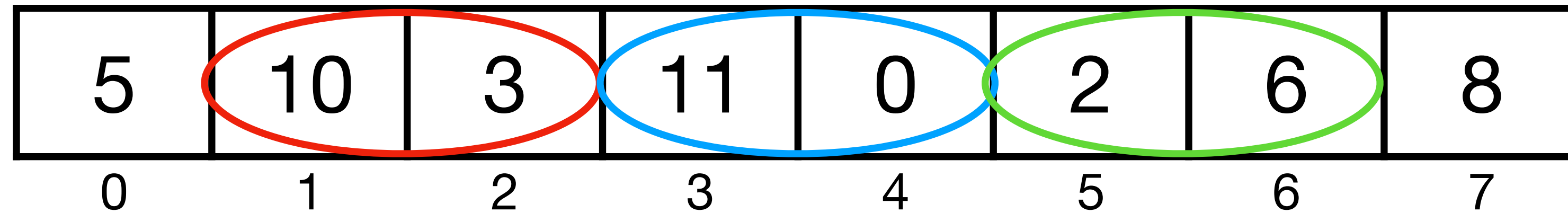
Worker 2

Worker 3 (does nothing)

- Barrier (pass == odd)
- Odd pass bubbling

And so forth as before...
....but in parallel

Parallel Even-Odd Pass Bubble Sort



Worker 0

Worker 1

Worker 2

Worker 3 (does nothing)

Barrier is simply a busy while loop checking for a condition

```
#define barrier(c) { while( !(c) ) continue; }
```