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Parallel Computing

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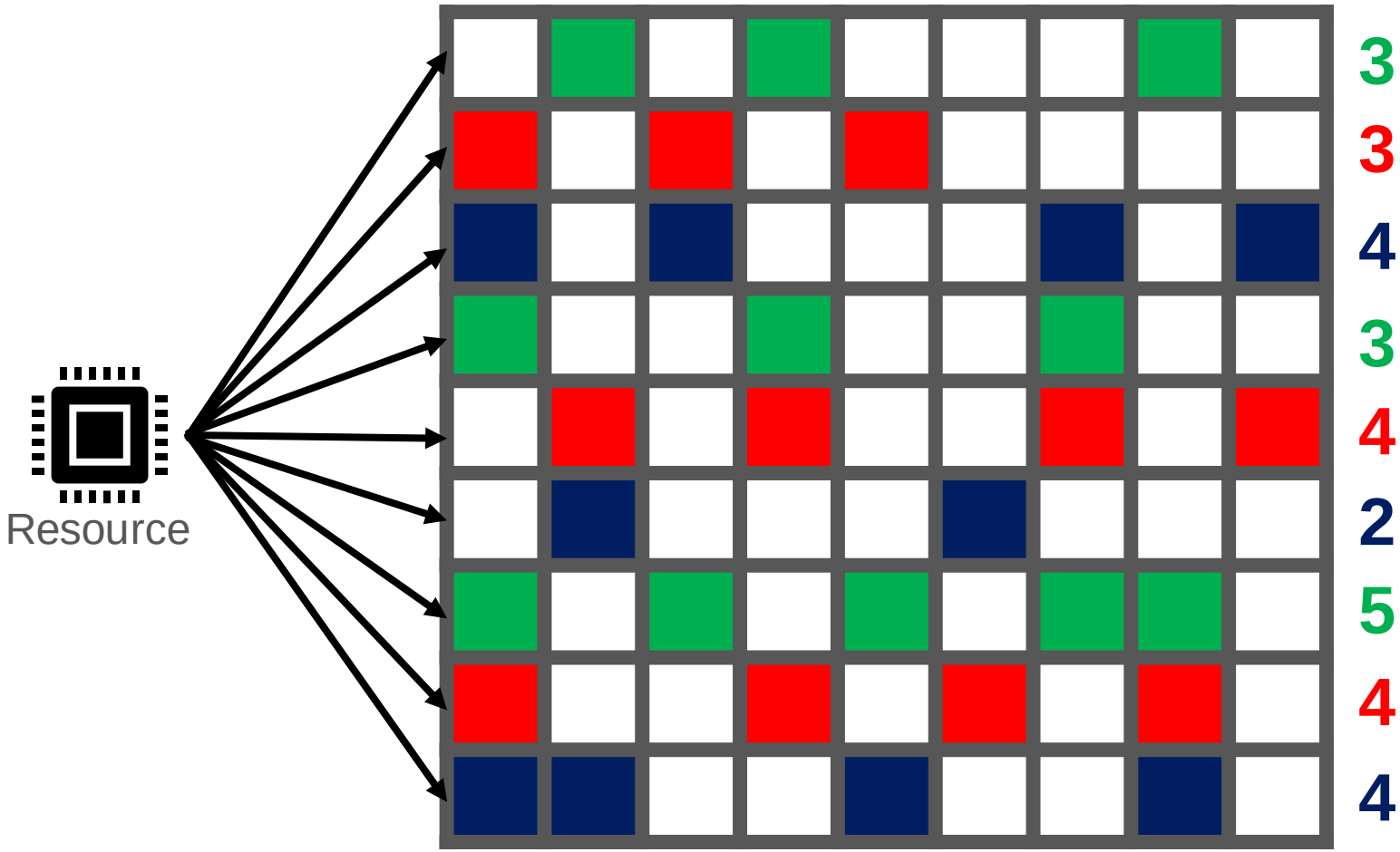
Roadmap

- Analogy to Sequential Computing
- Analogy to Parallel Computing
- Parallel Computing
- Types of Parallel Computing
- Summary
- Quiz

Analogy to Sequential Computing



3 + 3 + 5 = 11

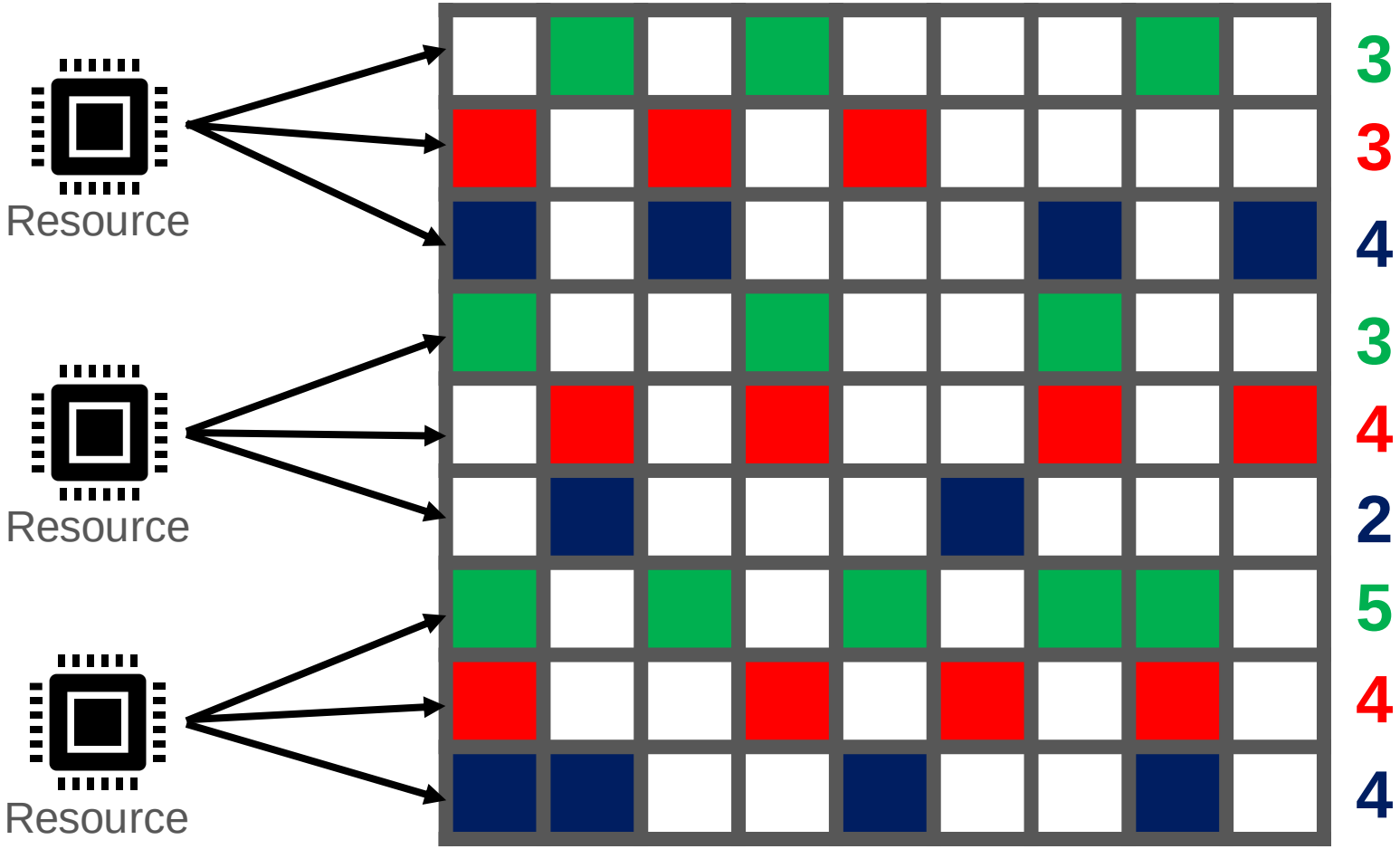
3 + 4 + 4 = 11

4 + 2 + 4 = 10

Tasks → How many green, red, and blue boxes are there?

How can we improve the timing?

Analogy to Parallel Computing



3 + 3 + 5 = 11

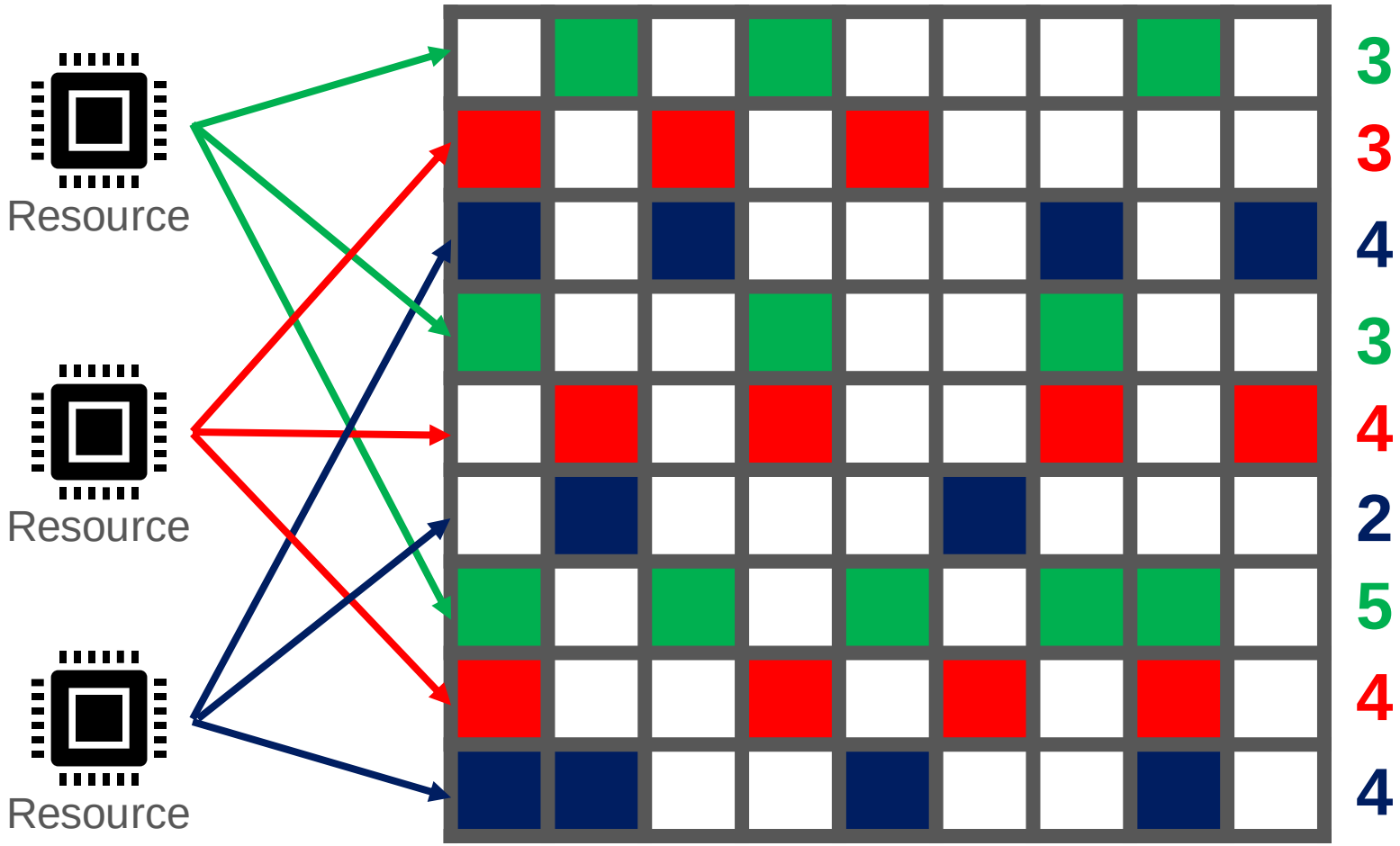
3 + 4 + 4 = 11

4 + 2 + 4 = 10

Divide the data among resources

Is there any other way to divide the resources?

Analogy to Parallel Computing



3 + 3 + 5 = 11

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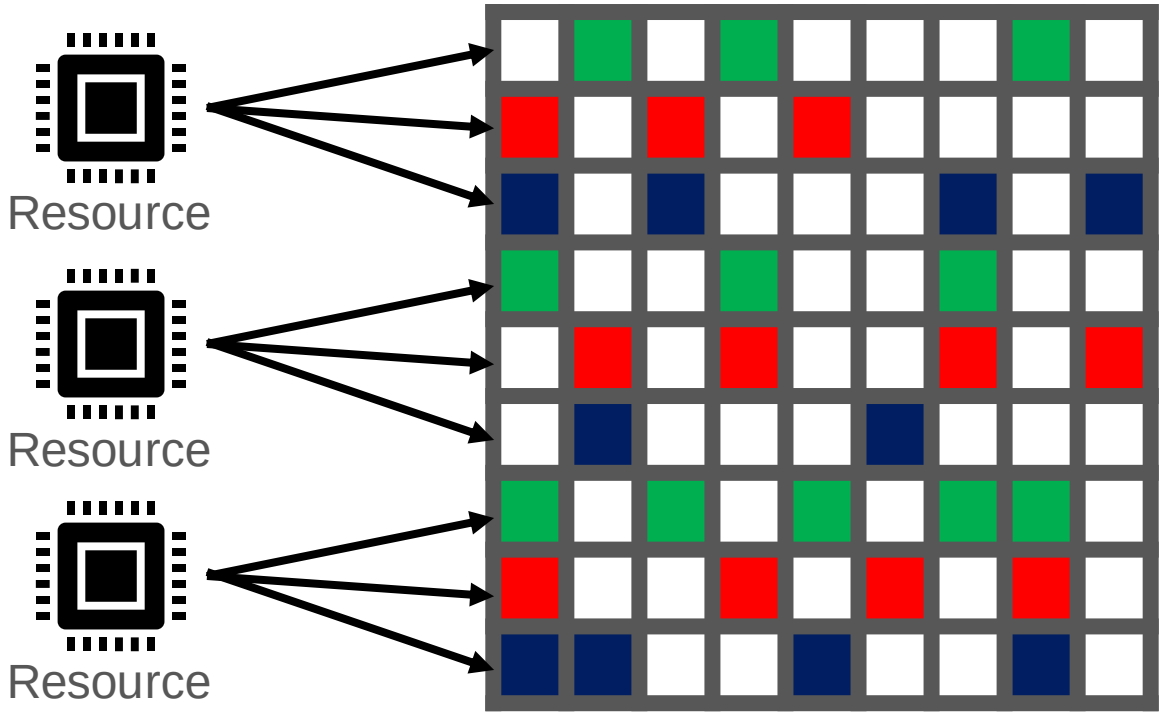
4 + 2 + 4 = 10

Divide the tasks among resources

Parallel Computing

- Divide larger problem into smaller and independent subproblems
- Resources solve the subproblems in parallel
- Synchronization is needed to get result



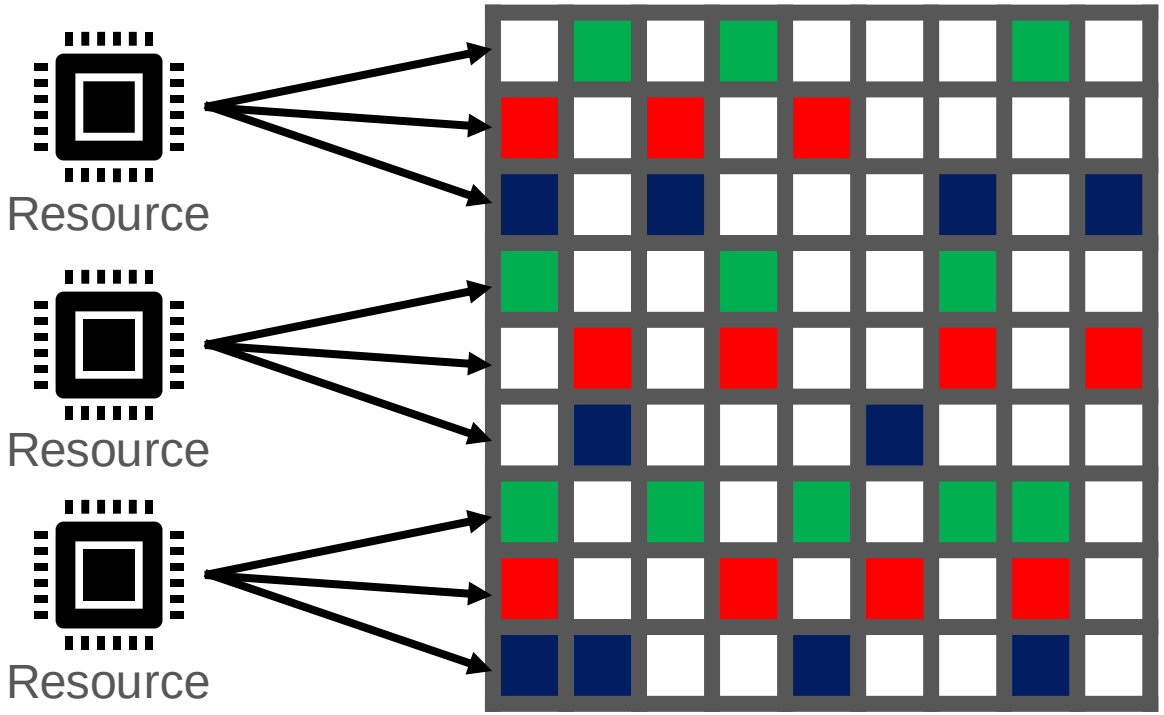
3 + 3 + 5 = 11

3 + 4 + 4 = 11

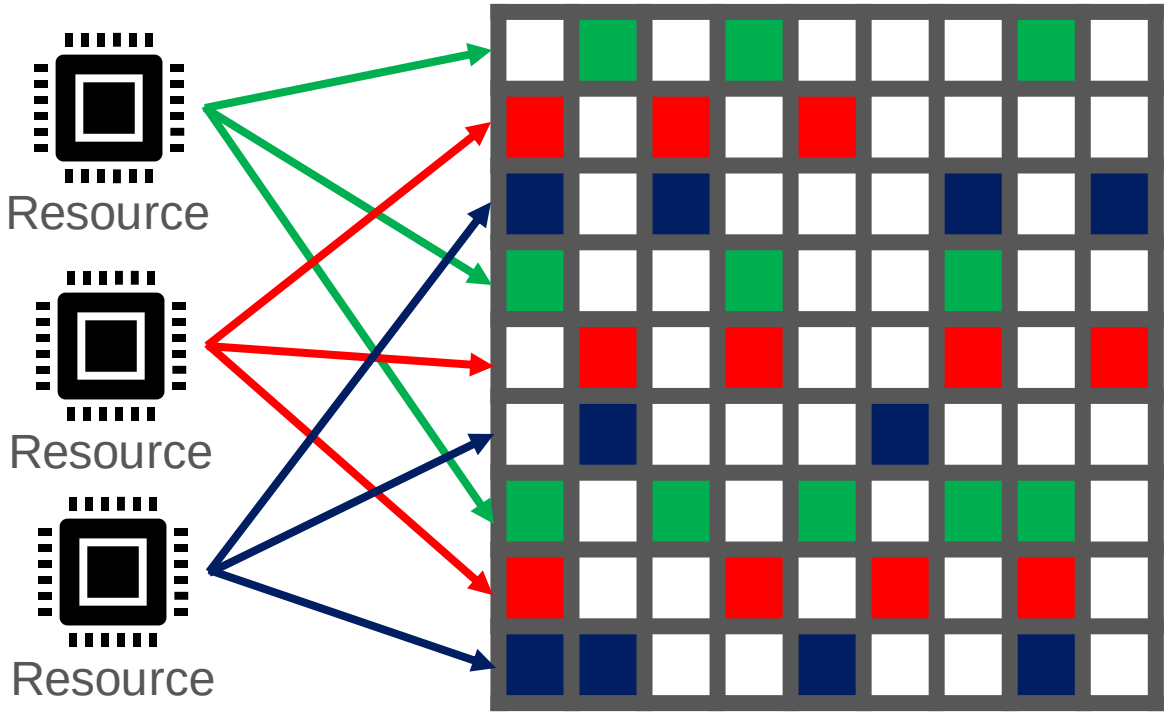
4 + 2 + 4 = 10

Types of Parallel Computing

- Data parallelism: divide data among resources
- Task parallelism: divide tasks among resources
- Can be combined together



Data parallelism



Task parallelism

Summary

01

Parallel computing solves large problem faster

02

Two types: data parallel, task parallel

03

Synchronization is needed to get result


Thank You
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Quiz 1:

Parallel computing can solve large problems faster than sequential computing because

- ❑ It divides a large problem into independent smaller subproblems
- ❑ Subproblems are solved simultaneously using multiple resources
- ❑ Resources can work on different subproblems concurrently
- ❑ All of the above

Quiz 1 (Solution):

Parallel computing can solve large problems faster than sequential computing because

- ❑ It divides a large problem into independent smaller subproblems
- ❑ Subproblems are solved simultaneously using multiple resources
- ❑ Resources can work on different subproblems concurrently
- ☑ All of the above

Quiz 2:

Synchronization between resources is required to combine the partial results into the final output.

- ❑ True
- ❑ False

Quiz 2 (Solution):

Synchronization between resources is required to combine the partial results into the final output.

- ☑ True
- ☐ False

Quiz 3:

Which approach involves splitting up data across multiple processors?

- ❑ Task parallelism
- ❑ Data parallelism
- ❑ Instruction parallelism
- ❑ Thread parallelism

Quiz 3 (Solution):

Which approach involves splitting up data across multiple processors?

- ❑ Task parallelism
- ☑ Data parallelism
- ❑ Instruction parallelism
- ❑ Thread parallelism