Plastic Algorithmic Skeletons

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EPSRC **Centre for Doctoral Training in**
Pervasive Parallelism

Plasticity allows parallel applications to use new opportunities for improving performance and adapting to disruptions at runtime.
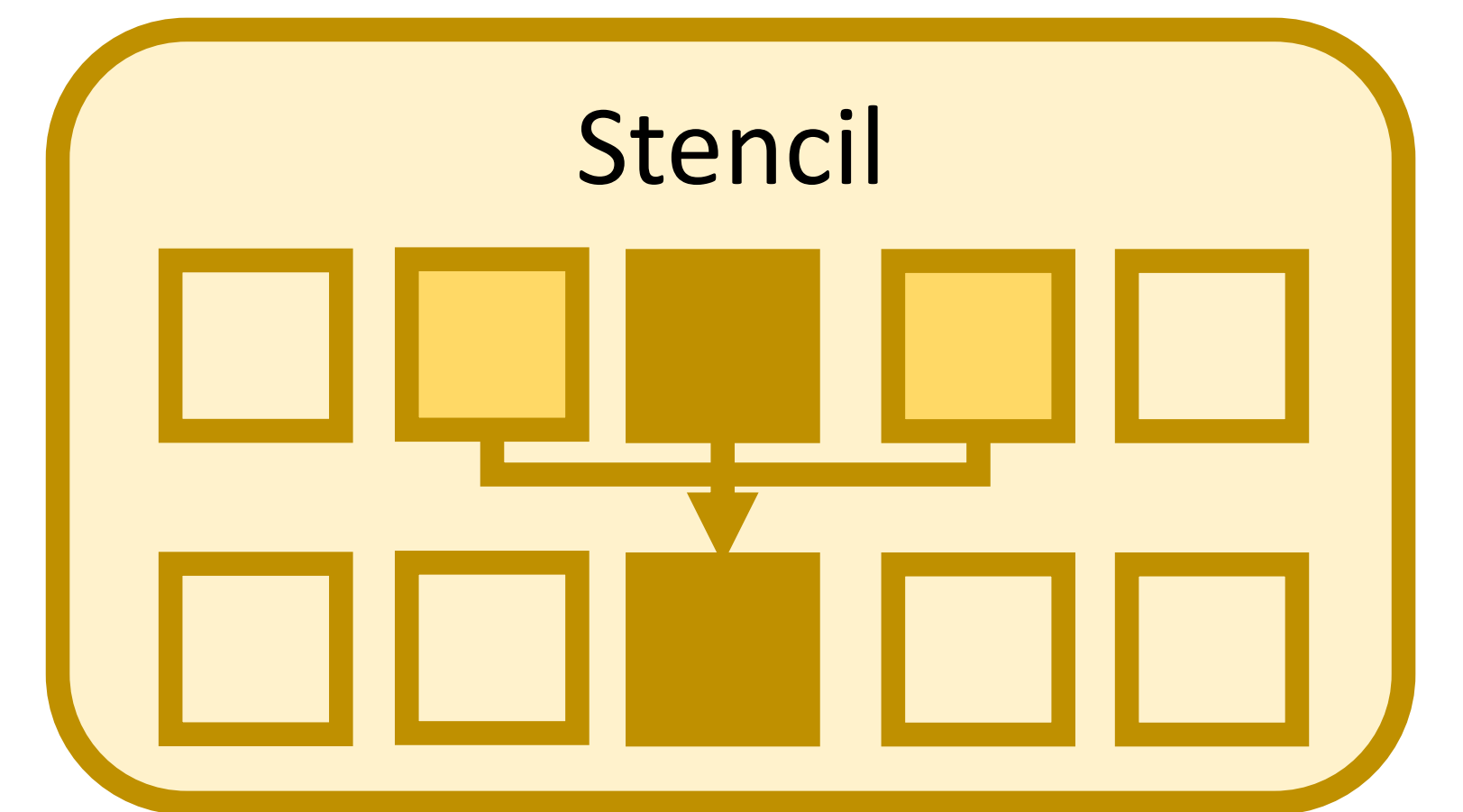
Disruptions at Runtime

- Changing resource properties
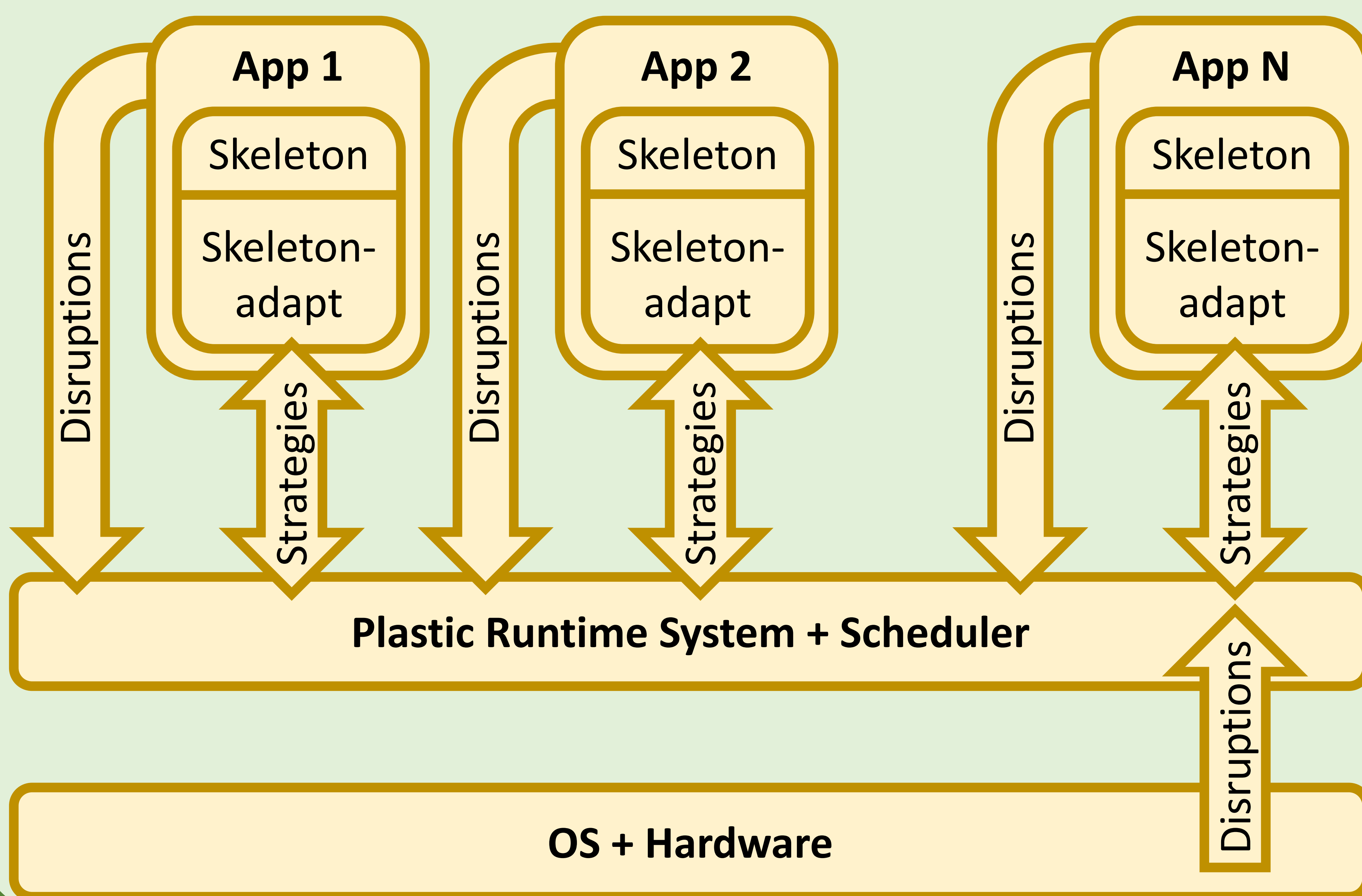- Changing program properties
- Changing data properties

Algorithmic Skeletons

Algorithmic skeletons implement common patterns in parallel programs.
Examples are:
- Map
- Reduce
- Stencil

Stencil

Plastic Skeleton Runtime System

Speed-ups

App 1
Skeleton
Skeleton-adapt

Disruptions
Strategies

App 2
Skeleton
Skeleton-adapt

Disruptions
Strategies

App N
Skeleton
Skeleton-adapt

Disruptions
Strategies

Disruptions

Plastic Runtime System + Scheduler

OS + Hardware

Preliminary Results

Avoiding oversubscription yields speedups for stencil computations.

- App 1
- App 2
- App 3

CPU
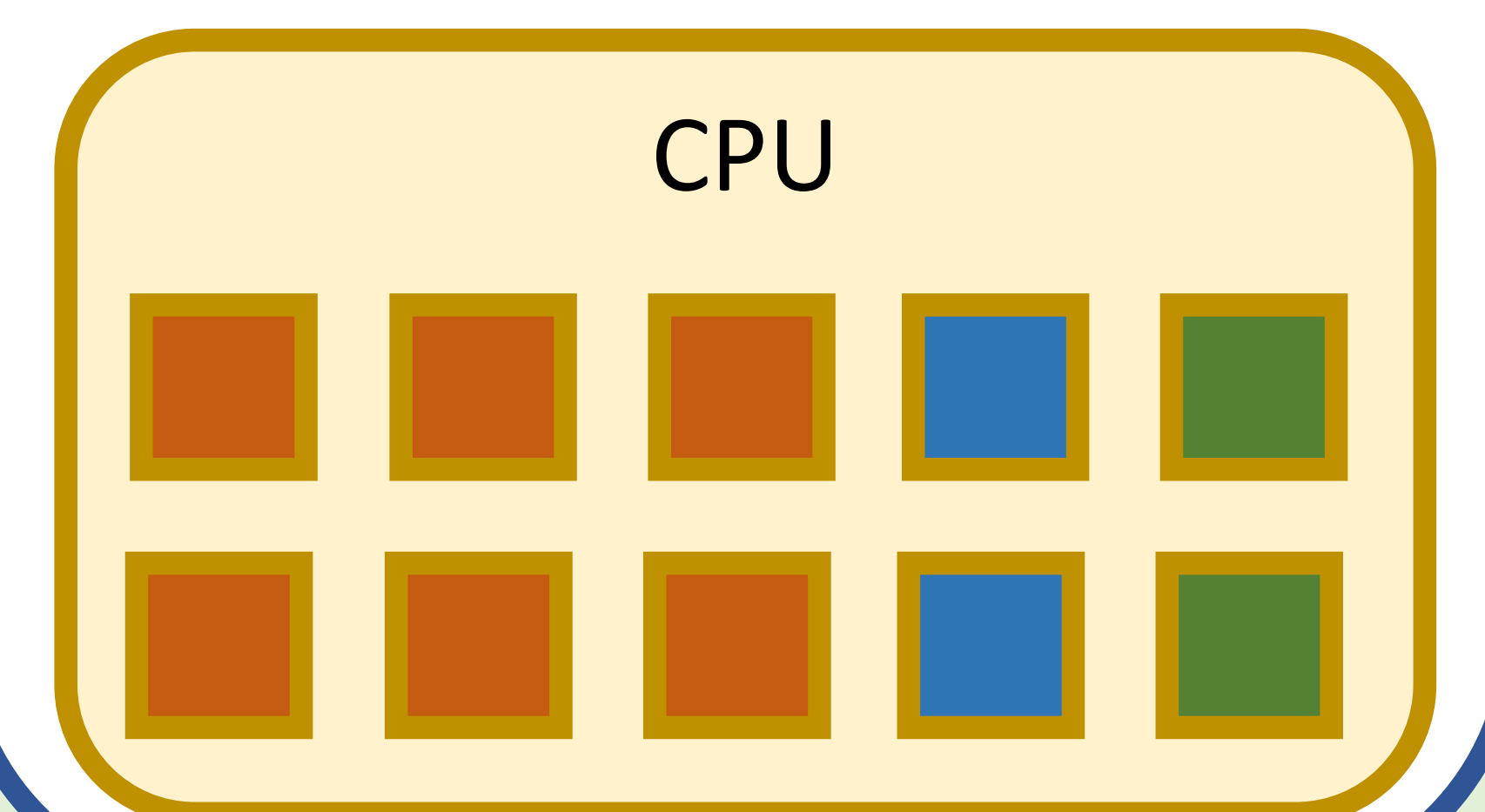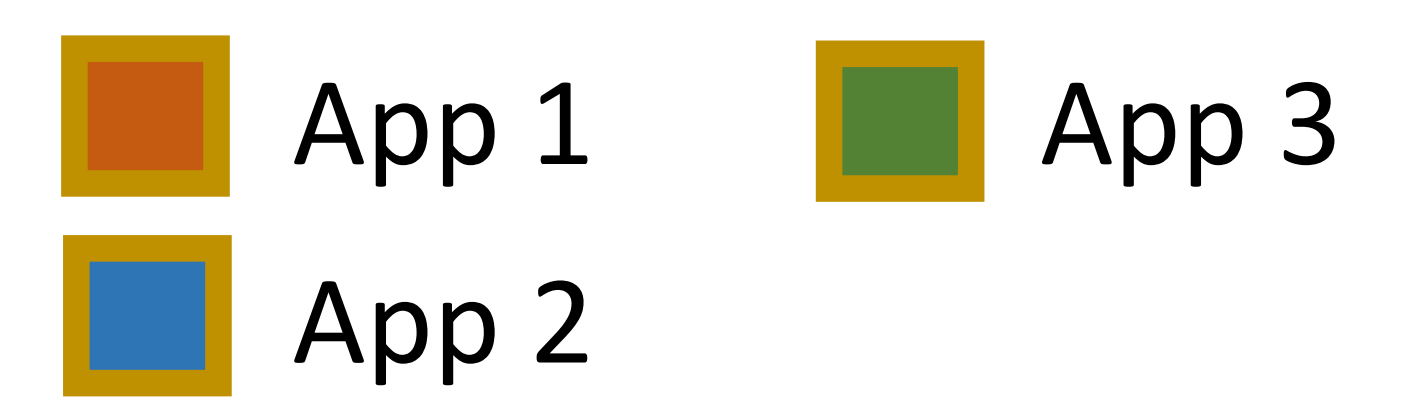
Execution Strategies

Execution strategies determine:
- Hardware utilisation
- Algorithms
- Data structures

Not Executing   Executing

Applications

a4
a3
a2
a1

t1 t2   t3   t4   t5

Time
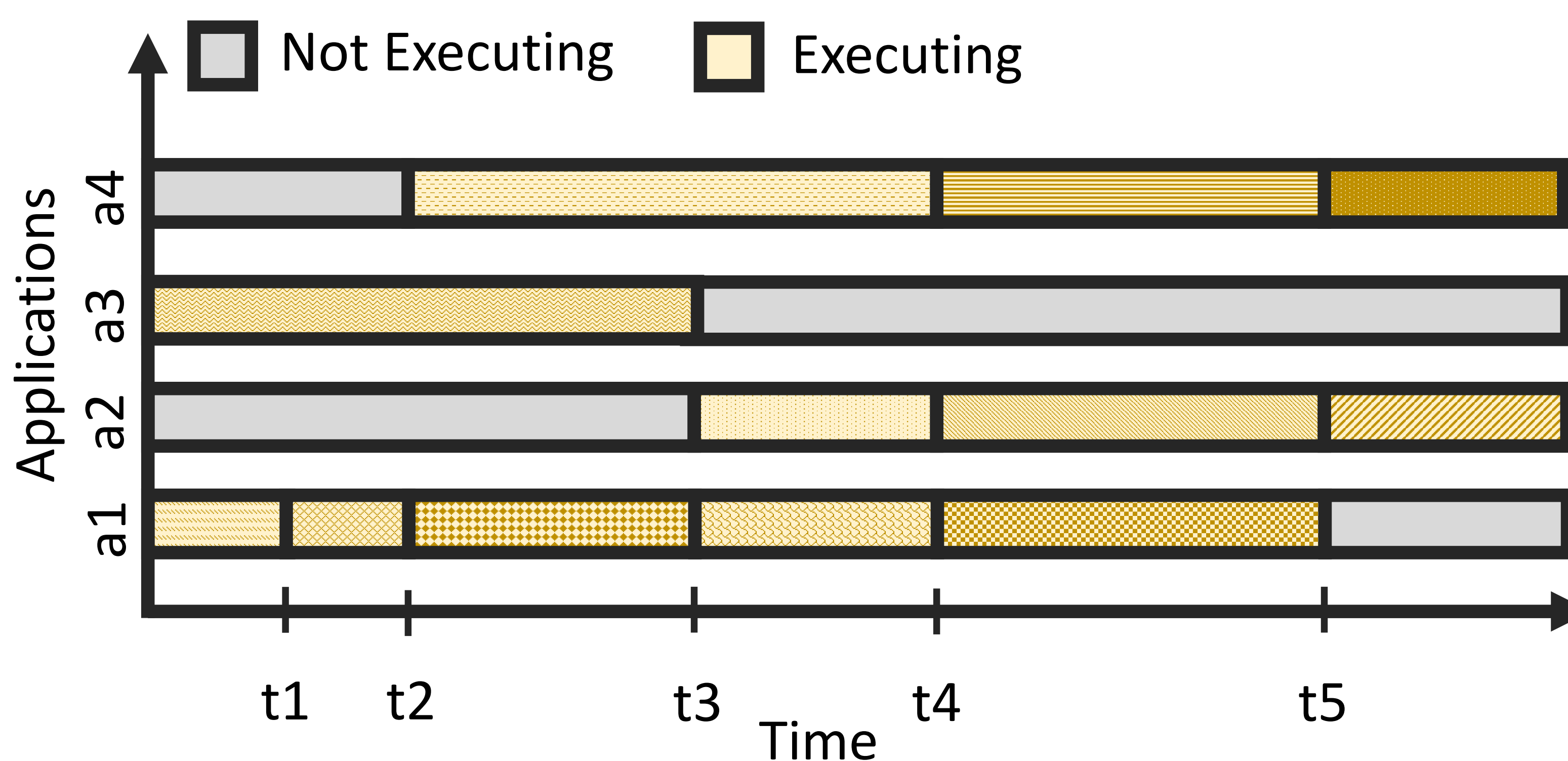
Applications a1 to a2 change their execution strategies in response to disruptions at t1 to t5.

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