Sambamba:
A Runtime System for Online Adaptive Parallelization

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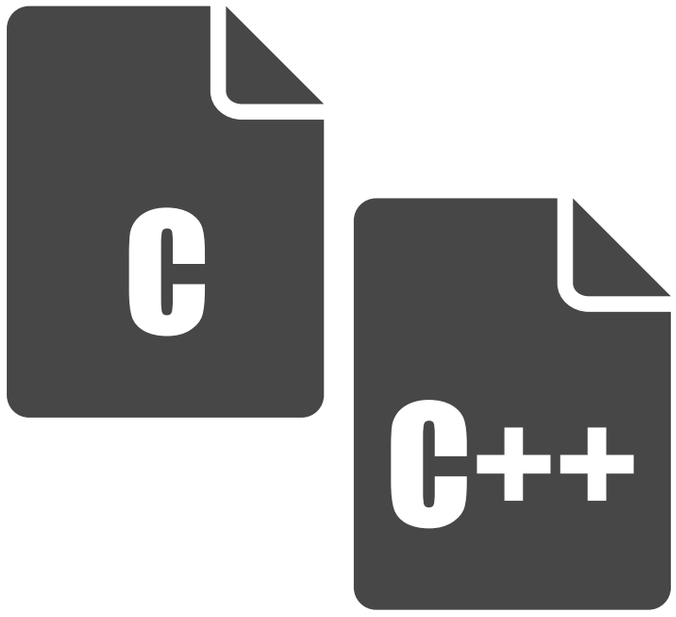
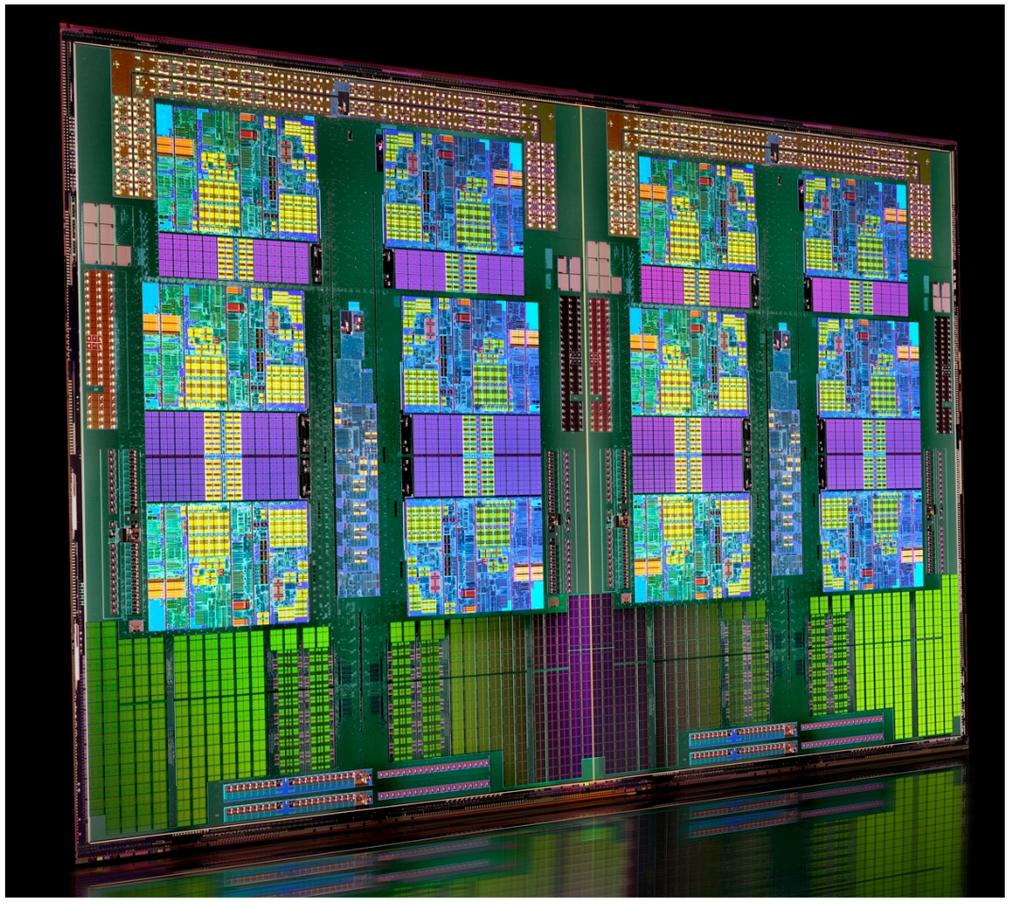
A well-known challenge

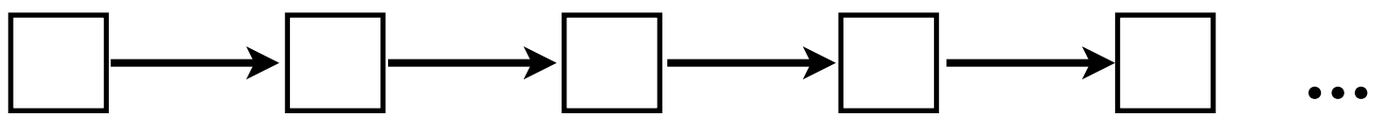
Legacy Code



Modern Hardware



The Problem



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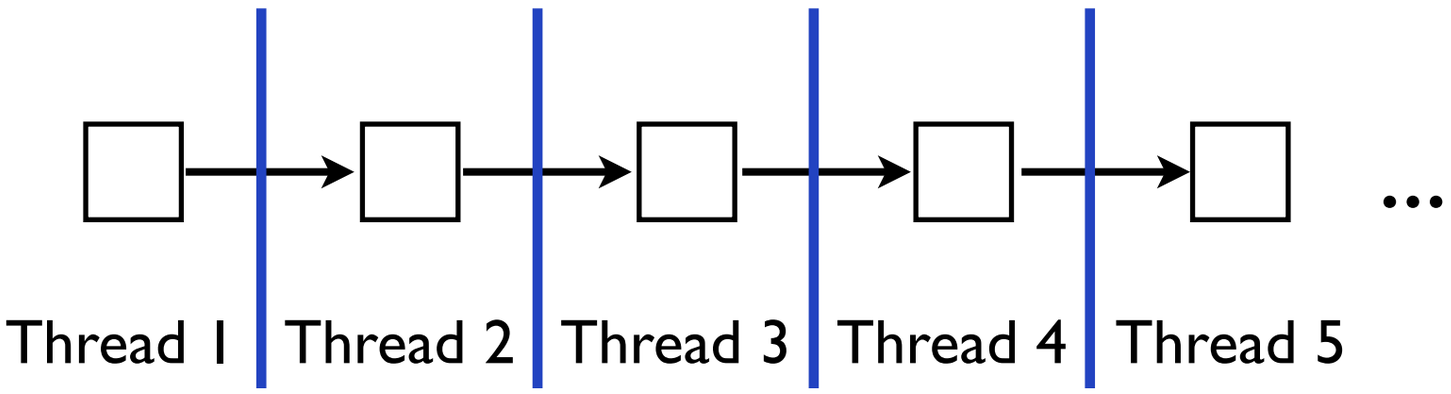
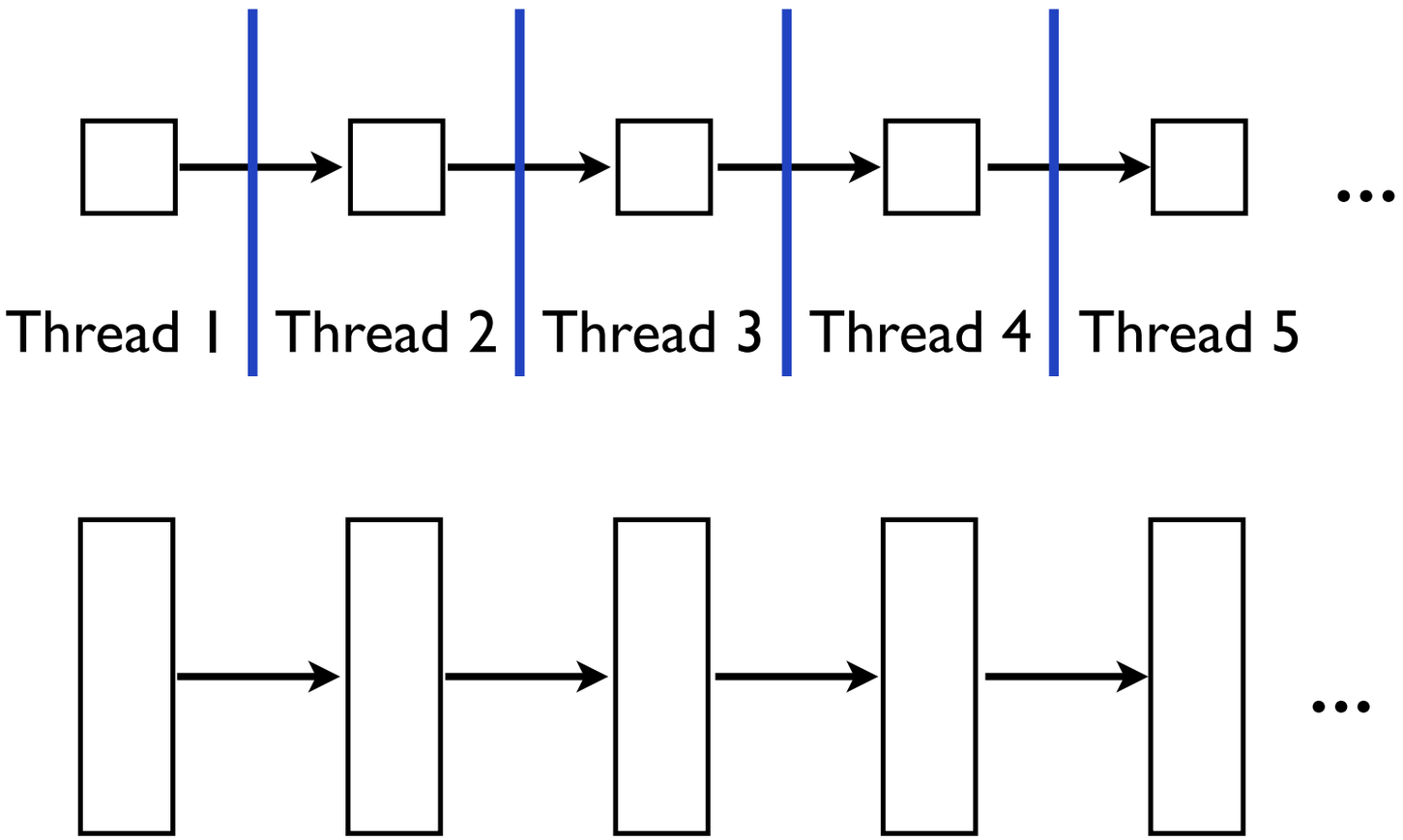
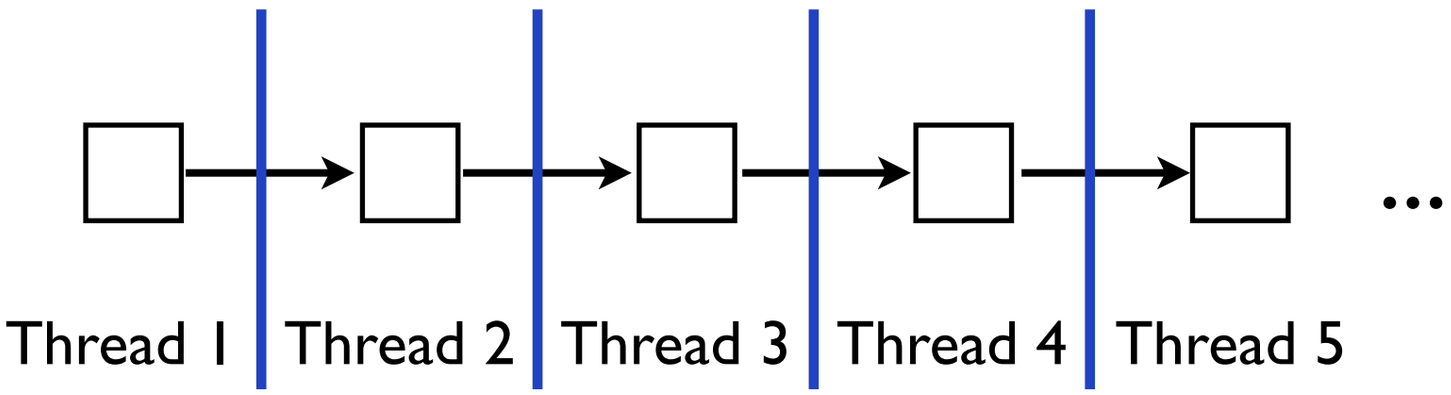
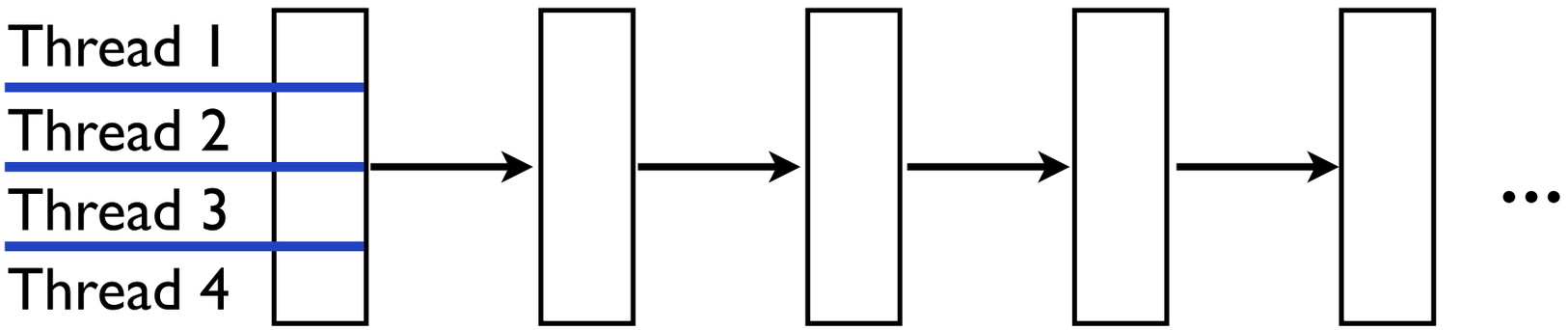


The Problem



The Problem


Thread 1
Thread 2
Thread 3
Thread 4
Thread 5
...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Thread 2
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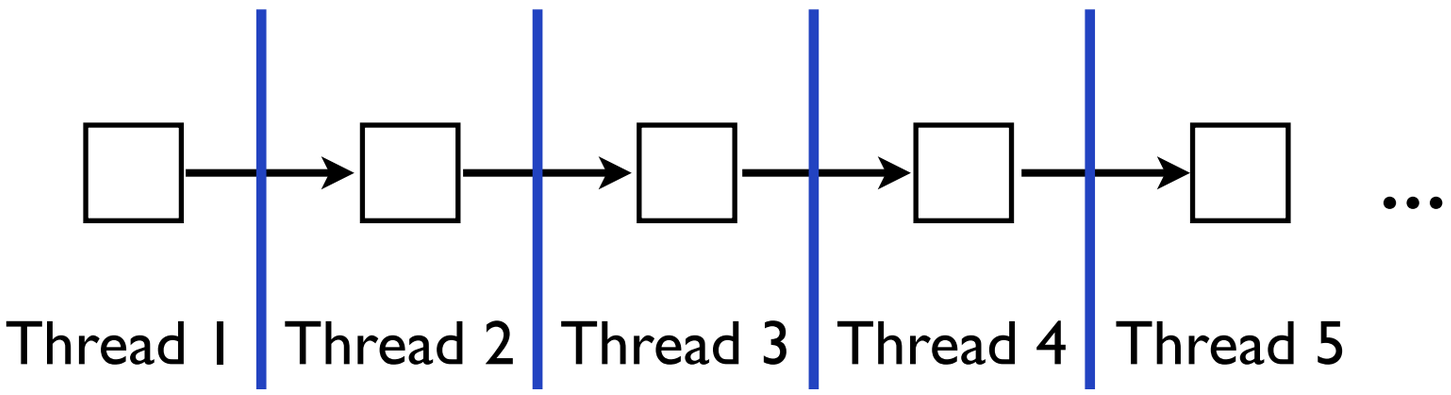
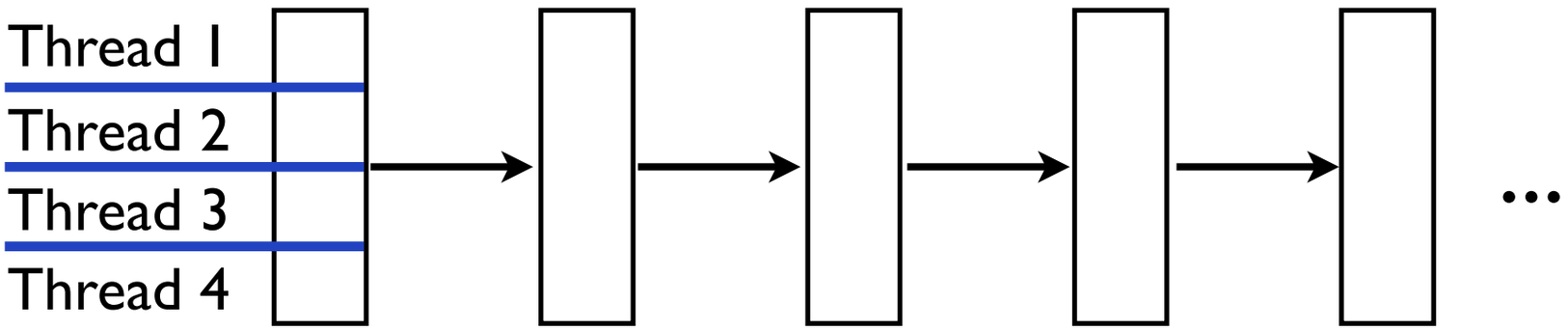
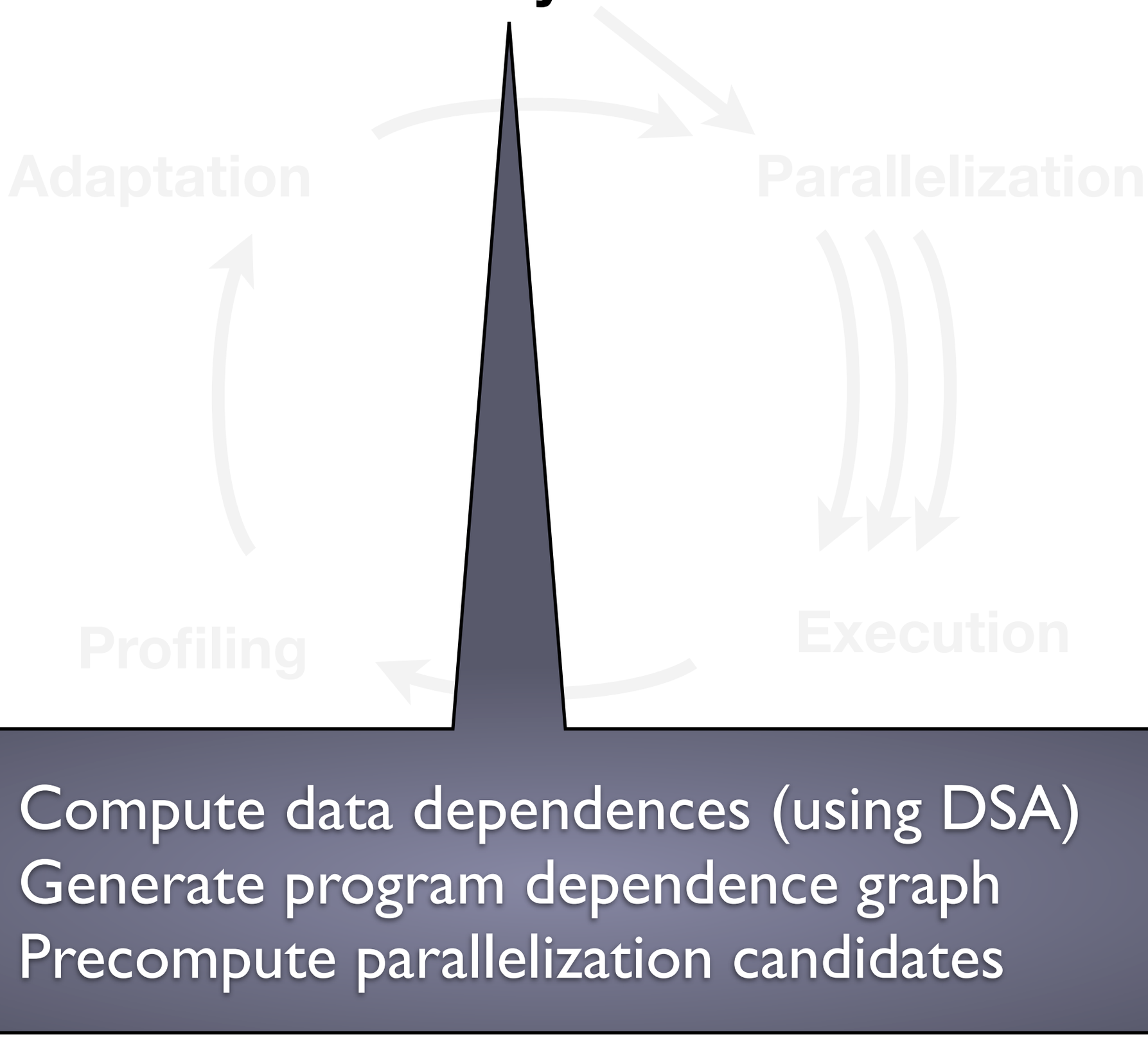
The Problem





- input dependent
- machine dependent

Compile-time Analyses



- Compute data dependences (using DSA)
- Generate program dependence graph
- Precompute parallelization candidates

Compile-time Analyses

Parallelization

Adaptation

Profiling

Execution

- Combine local parallel schedules

Compile-time Analyses

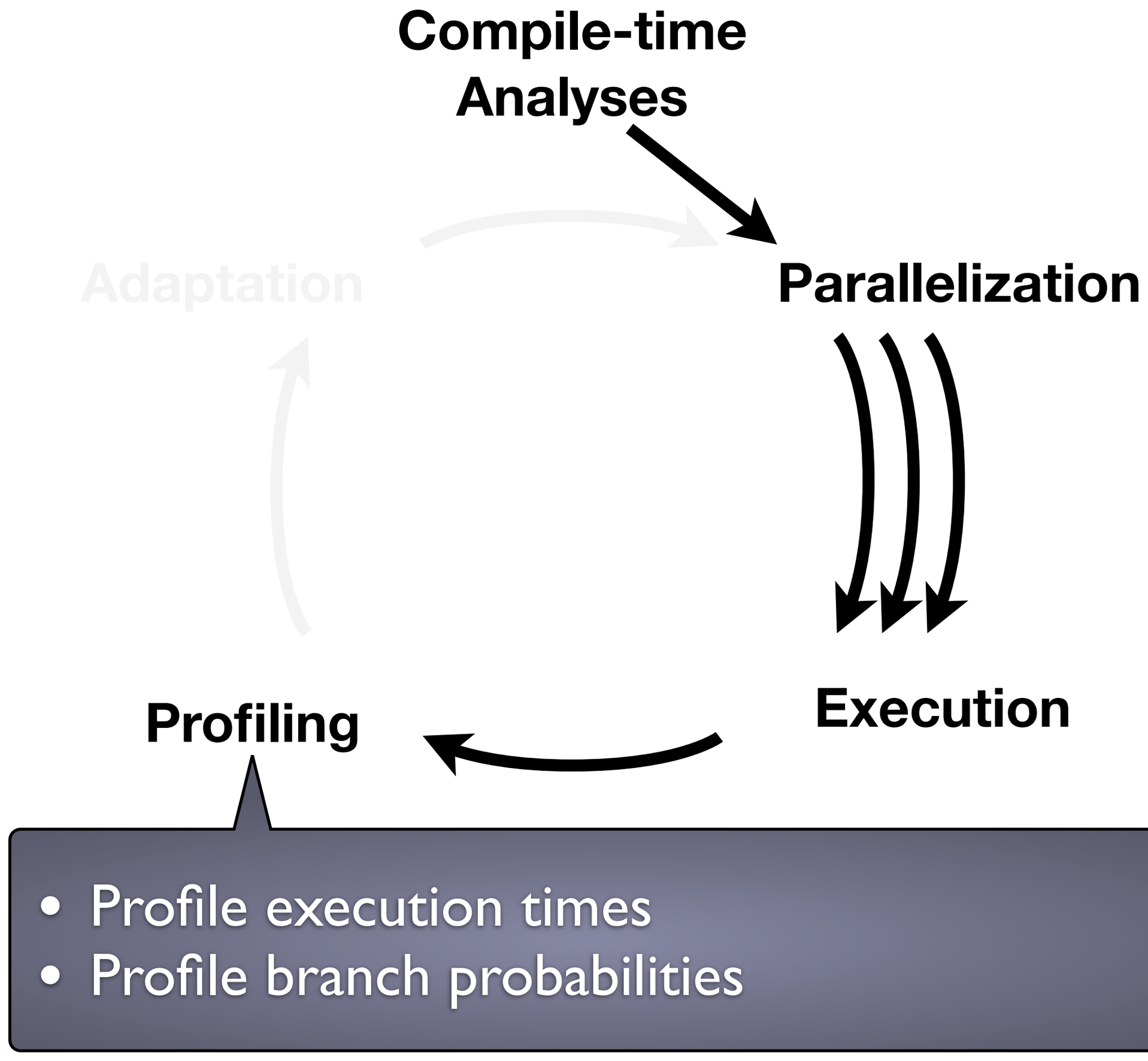
Parallelization

Execution

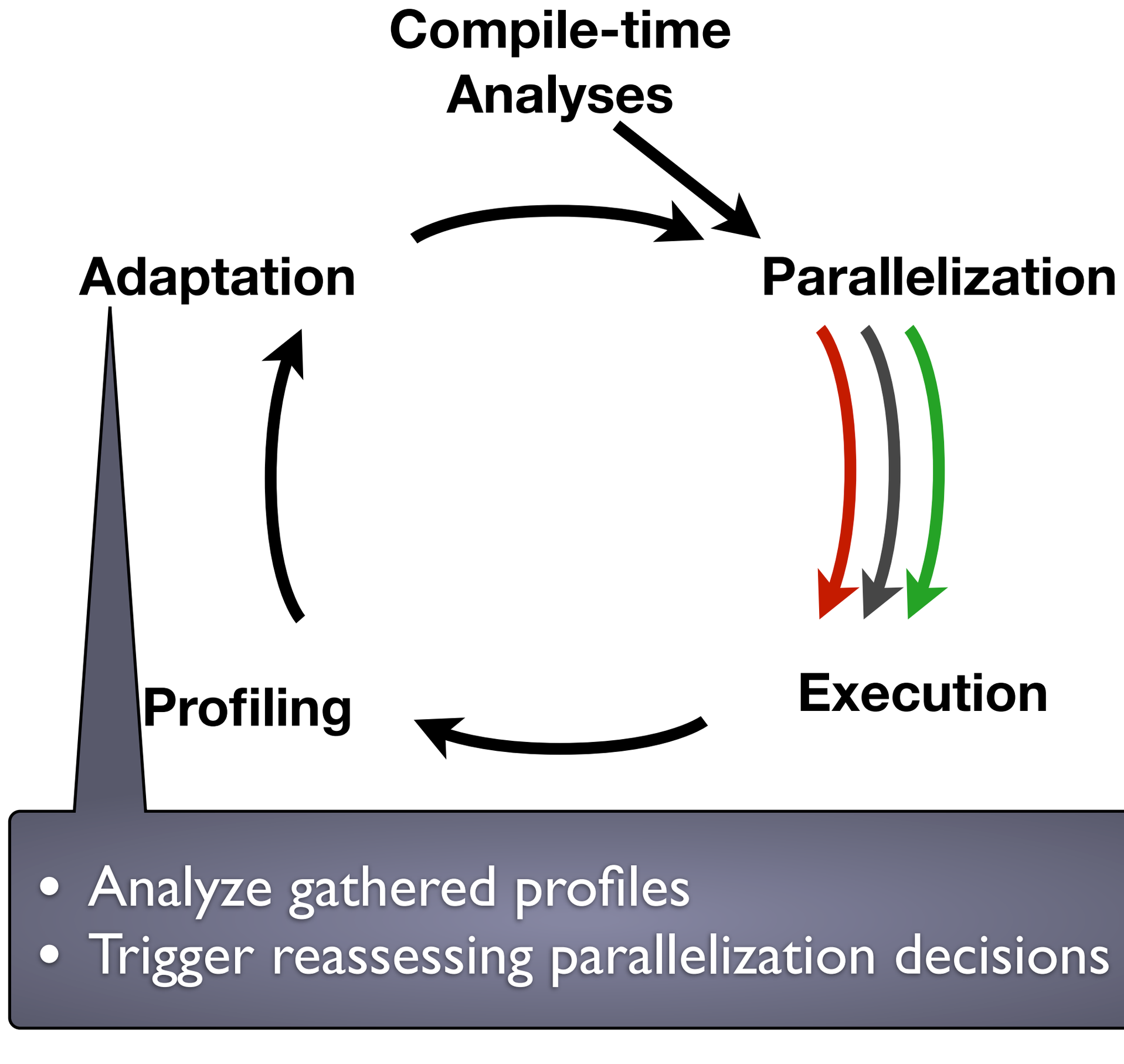
Profiling

Adaptation

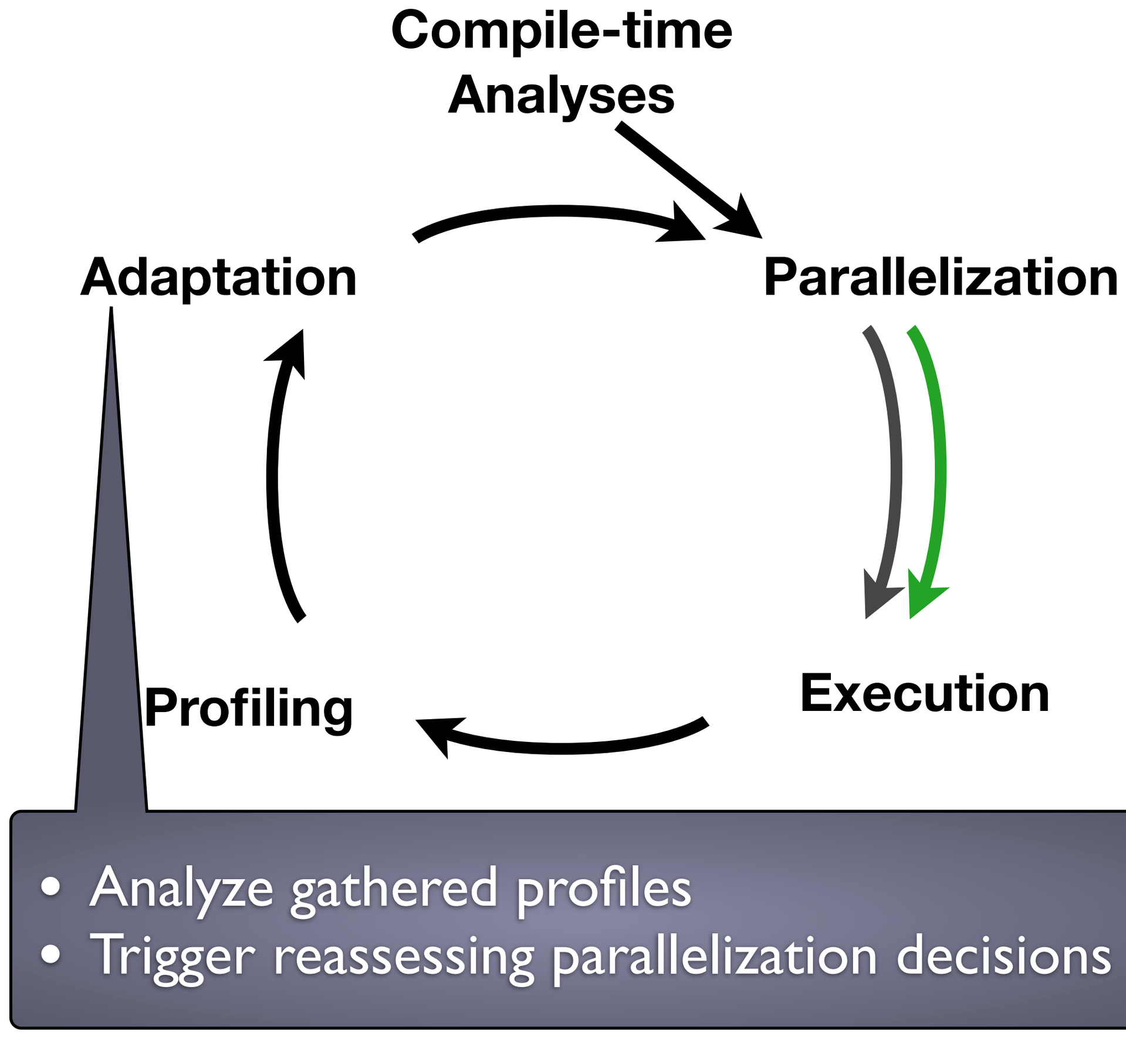
- JIT-compile code and inject into application
- Decide which *code variant* to execute



- Profile execution times
- Profile branch probabilities



- Analyze gathered profiles
- Trigger reassessing parallelization decisions


Compile-time
Analyses
Adaptation
Parallelization
Profiling
Execution
• Analyze gathered profiles
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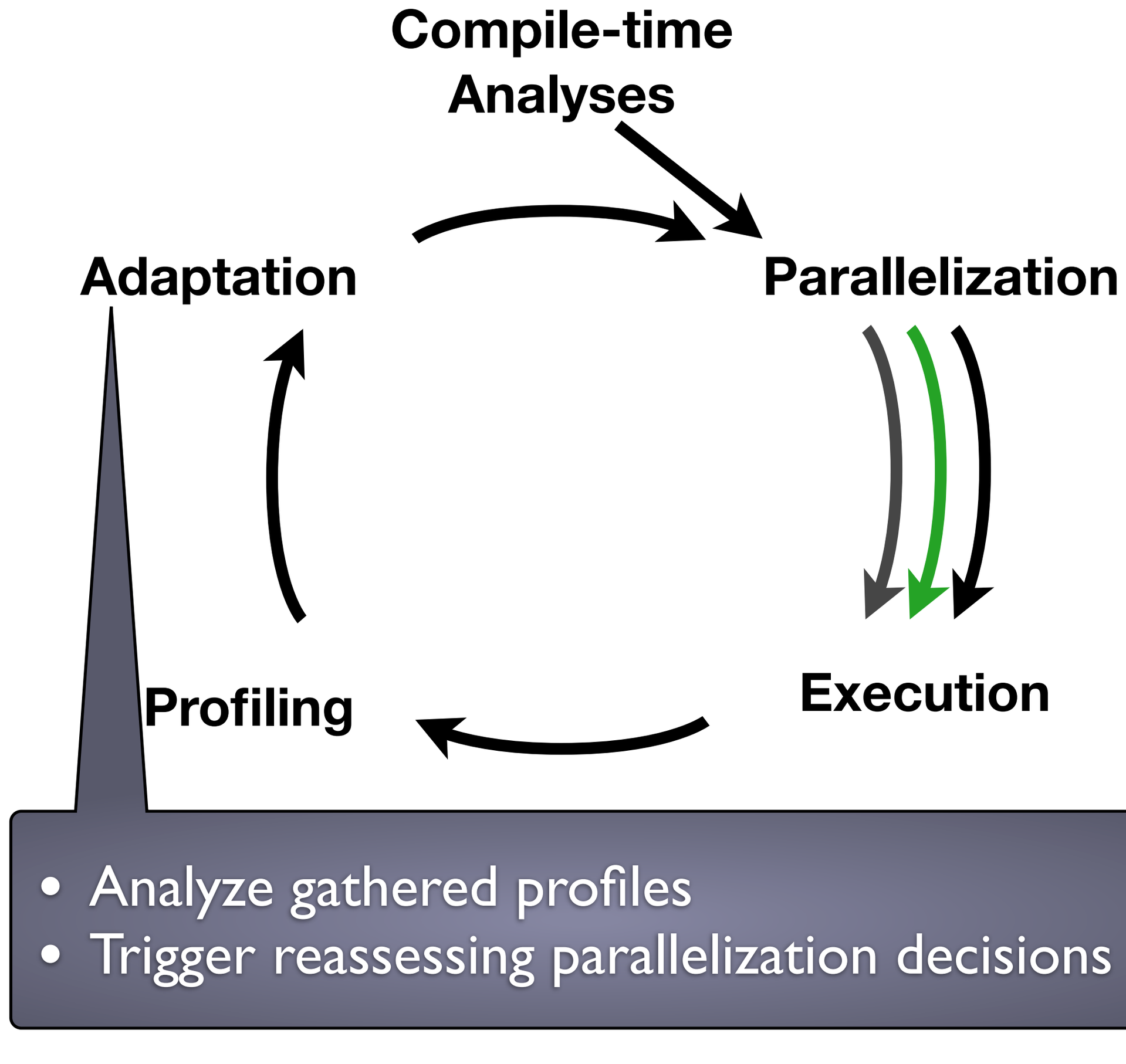

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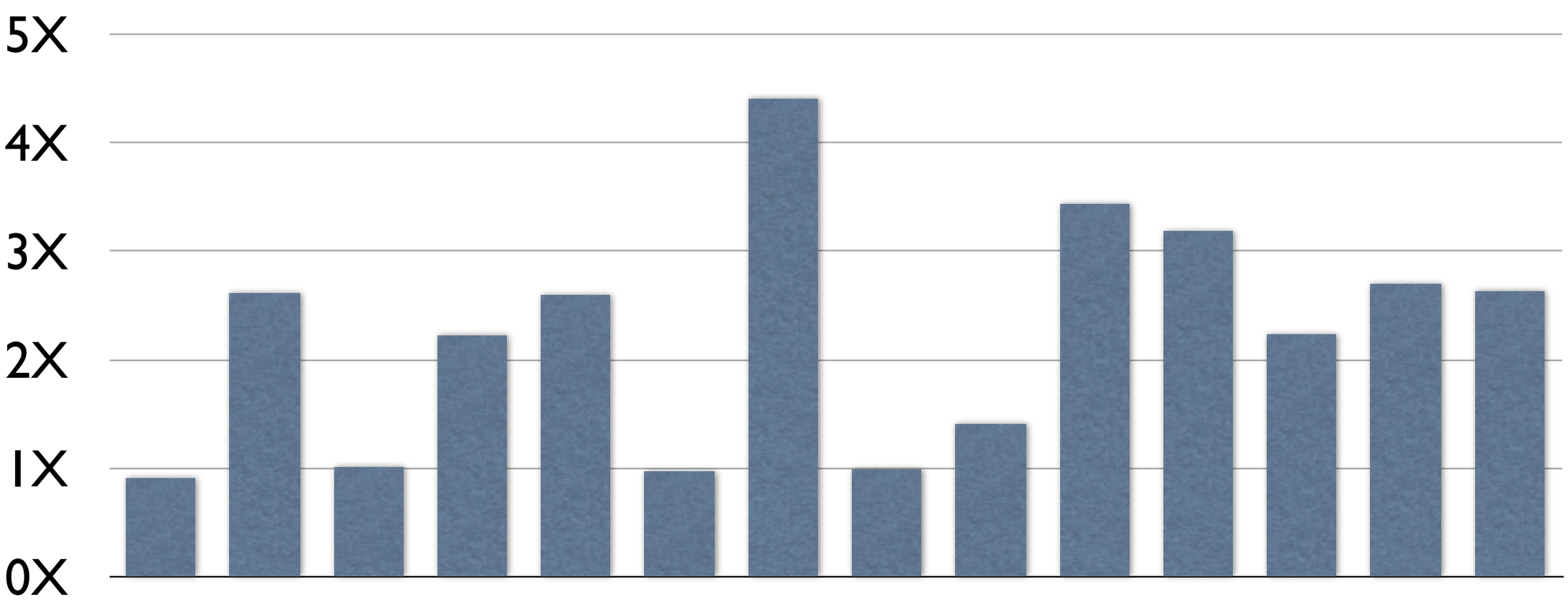
Speedup on CILK example programs



All experiments run on an i7 quad-core with HT.

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