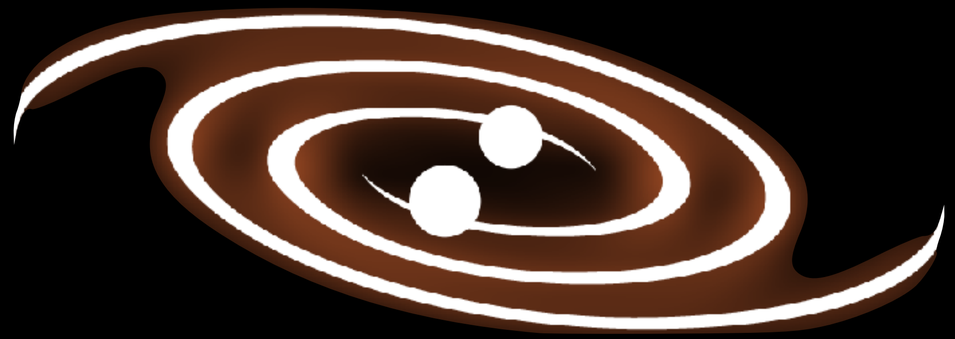
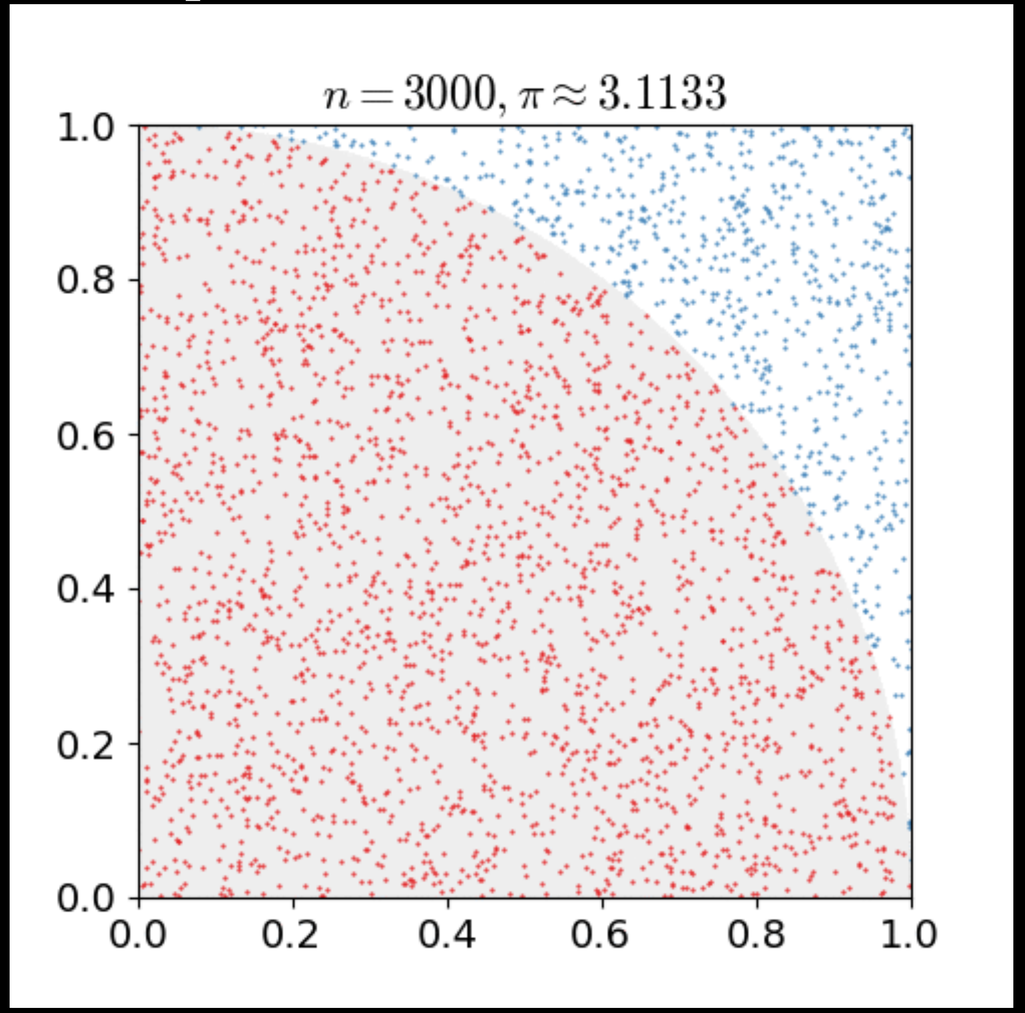
Tutorial goal

Monte Carlo Integration using task-based parallelism, SpECTRE



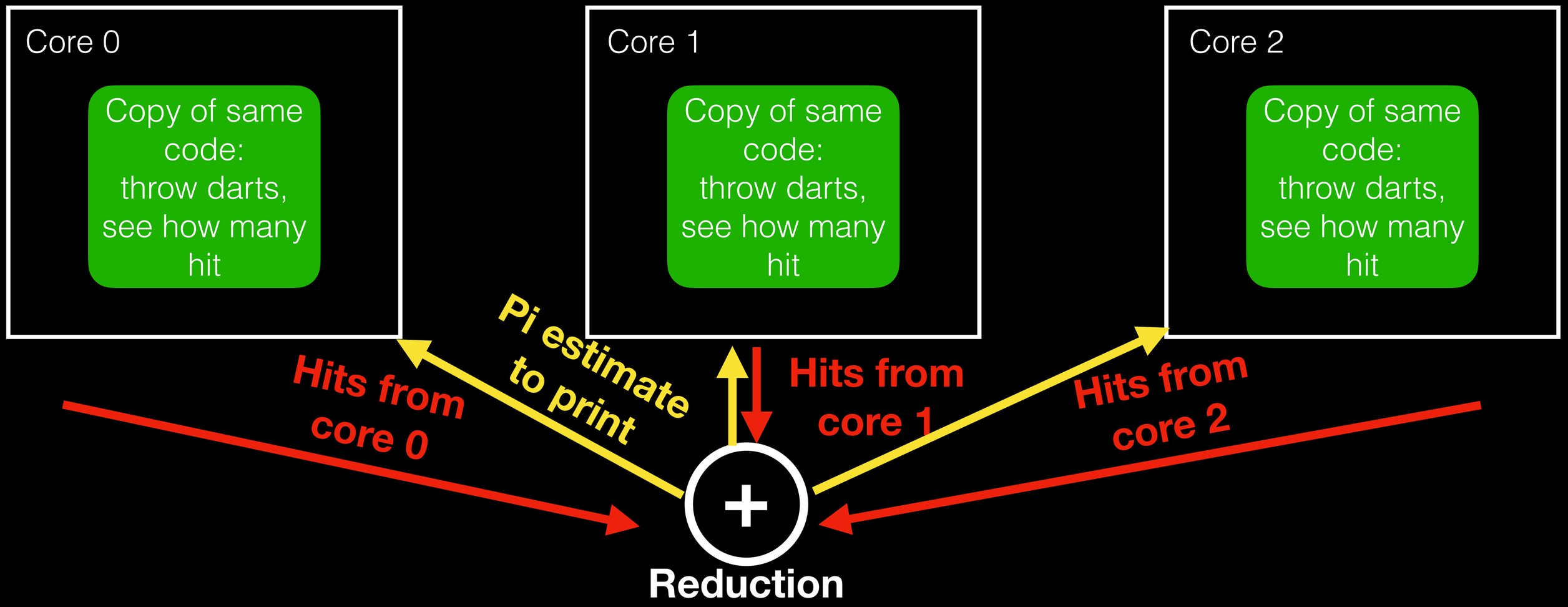
Example: Monte Carlo Integration to compute π

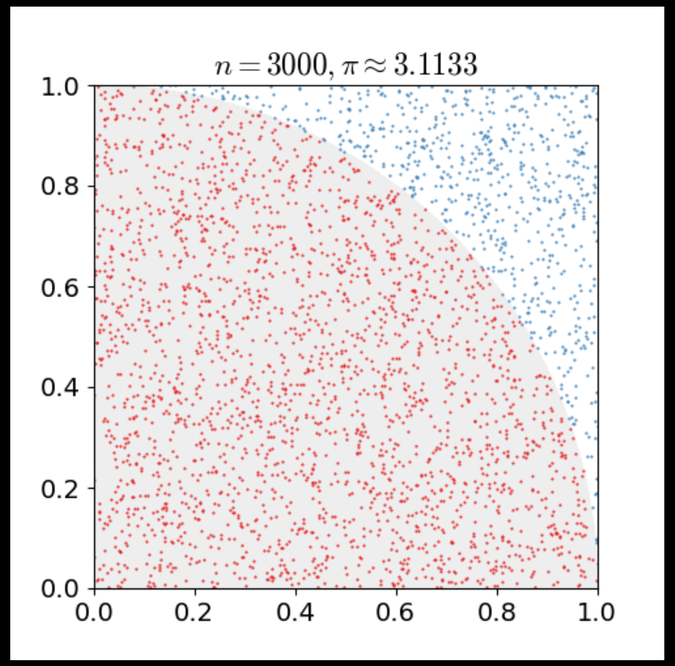
- Throw darts in square
  - (circle area) ÷ (square area) ≈ hits ÷ throws = π/4
  - So π ≈ 4 * (hits ÷ throws)



Courtesy wikipedia

Data parallelism





Task parallelism

Databox (this component)

DartsPerIteration

ThrowDarts action

DartThrower *k*

Databox (this component)

DartsPerIteration

AccuracyGoal

HitsAllProcs

ThrowsAllProcs

ProcessHitsAndThrows action

PiEstimator

GlobalCache (all components)

Proxy to each || component

# of cores

= array parallel component

= singleton parallel component

= global cache

Parallel component

= "actor" that knows things, does things

Core 0

Cache

DartThrower 0

PiEstimator

Core 1

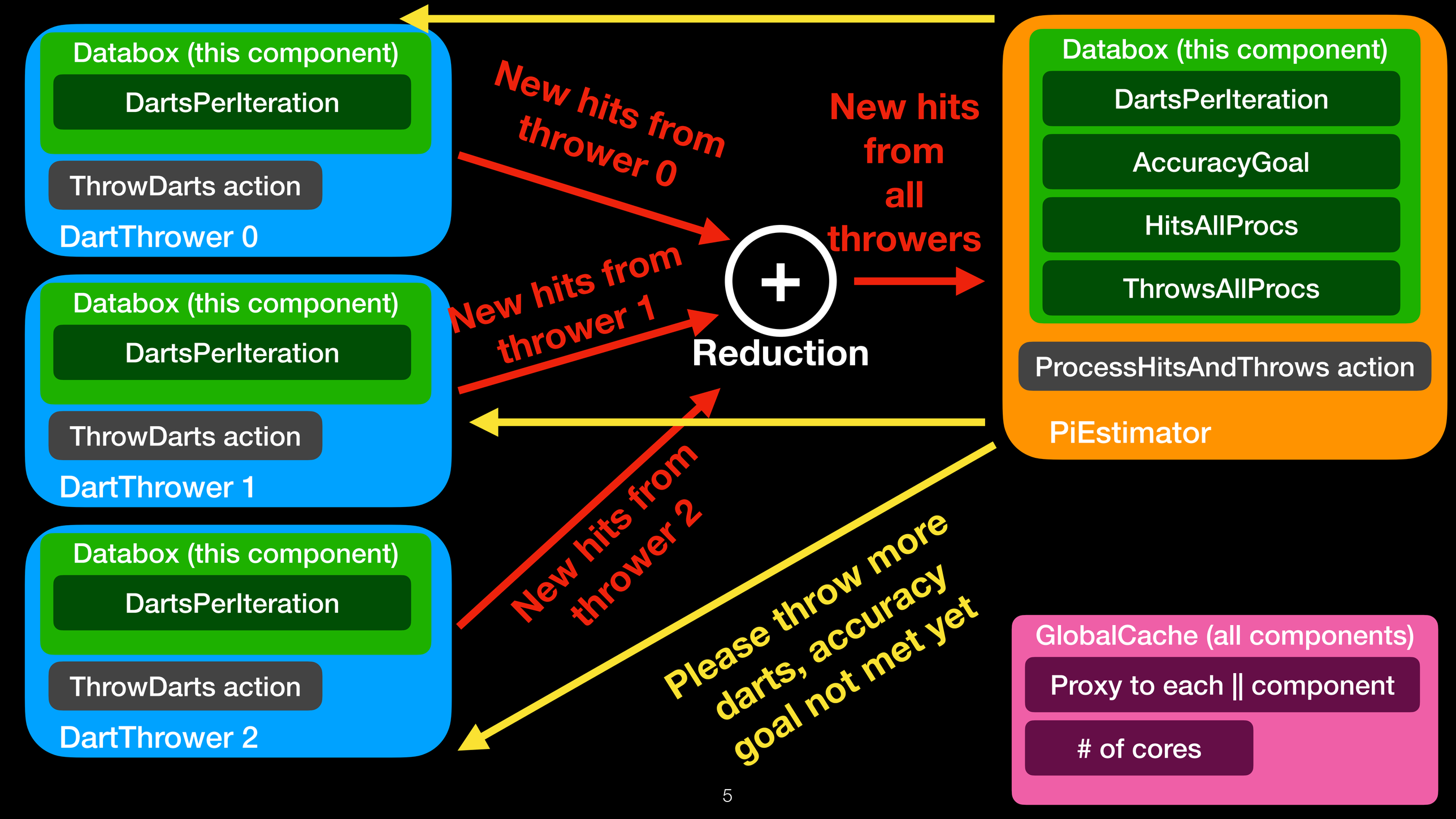
Cache

DartThrower 1

Core 2

Cache

DartThrower 2


Databox (this component)
DartsPerIteration
ThrowDarts action
DartThrower 0
Databox (this component)
DartsPerIteration
ThrowDarts action
DartThrower 1
Databox (this component)
DartsPerIteration
ThrowDarts action
DartThrower 2
New hits from thrower 0
New hits from thrower 1
New hits from thrower 2
+
Reduction
New hits from all throwers
Please throw more darts, accuracy goal not met yet
Databox (this component)
DartsPerIteration
AccuracyGoal
HitsAllProcs
ThrowsAllProcs
ProcessHitsAndThrows action
PiEstimator
GlobalCache (all components)
Proxy to each || component
# of cores

Checkup

A

1. I am trying to fix an error or bug

B

2. The code works; I am ready to keep going

C

3. I am still working on it

D

4. I am completely stuck or lost... help please!