Cheaper and Faster: Distributed Deep Reinforcement Learning with Serverless Computing

IntelliSys Lab

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Server-based vs. Serverless Distributed DRL

▶ Actor   ⚙ Learner   ▬ Running   ▨ Idle but incur costs

Synchronization

Round i

Trajectories

Update RL Model

Distribute model

Round i+1

Server-based

Idle

Serverless

Released

Actor Scaling Matters

- - - Fixed   ⋯ Decrease   — Increase

Same scaling budgets, different performance.
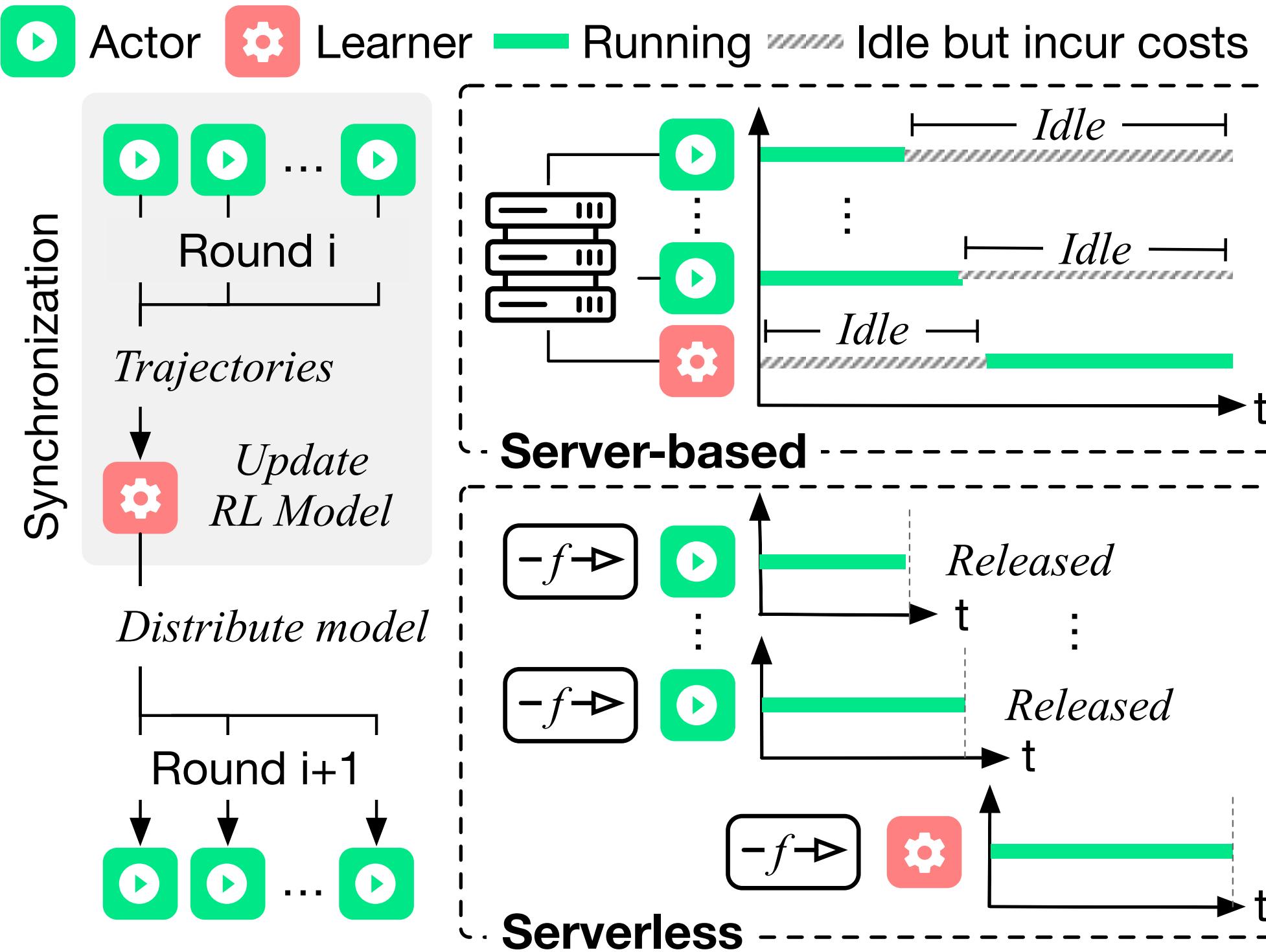
MinionsRL: Let DRL Guide DRL Training Itself!

MinionsRL Scheduler

State s_t

Action a_t

Scheduler Policy π^h

Reward r_t

s_{t+1} a_{t+1} r_{t+1}

π^w_{t-1} π^w_t π^w_t π^w_{t+1}

Sampled Data τ_t

Policy Weights θ_t

Sampled Data τ_{t+1}

Policy Weights θ_{t+1}

λ
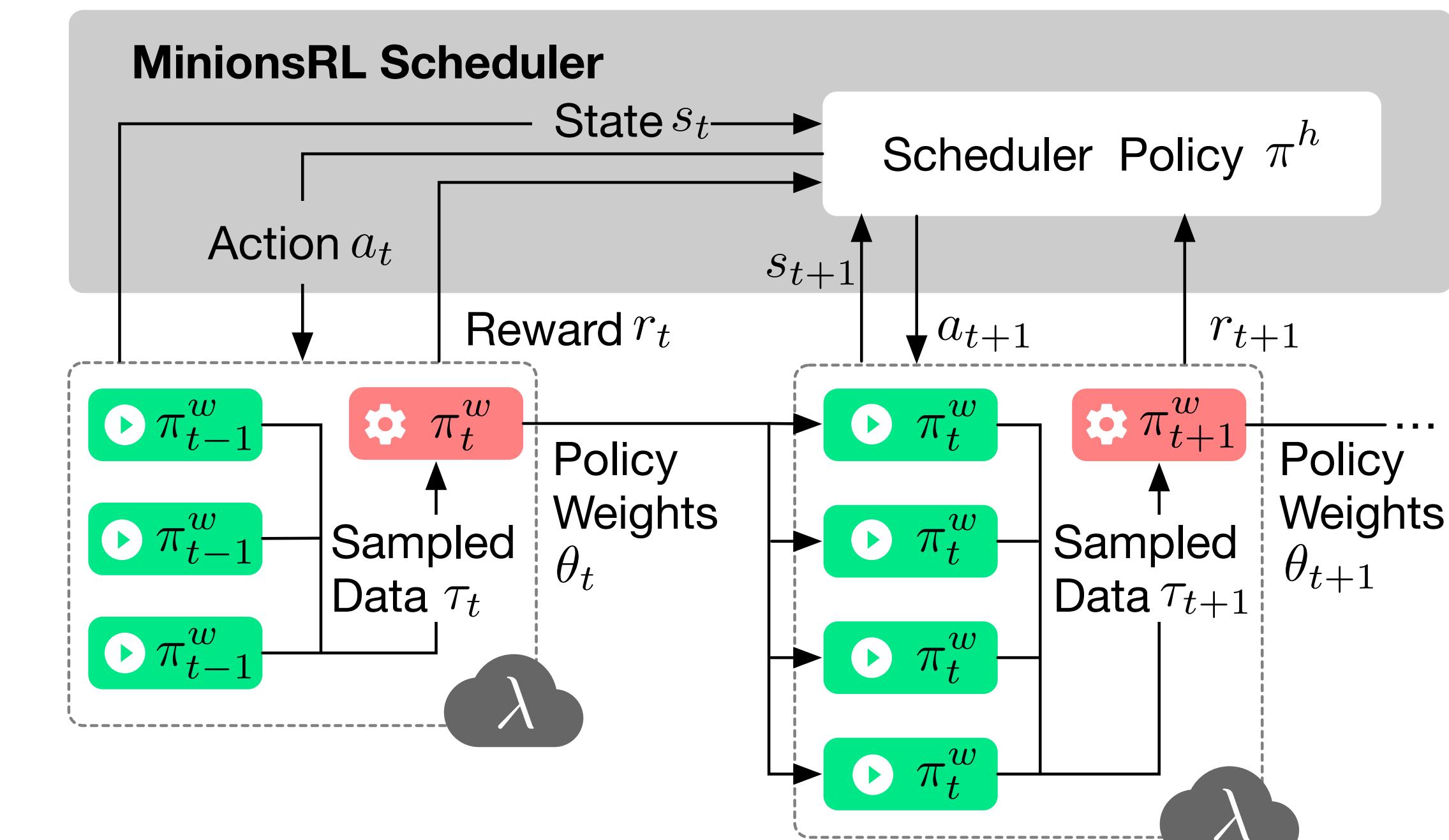
Benchmarks: MuJoCo and Atari Games

MuJoCo - Humanoid

Atari - SpaceInvaders

Final rewards

Wall clock time (s)

— MinionsRL   - - - Azure ML   — IMPACT
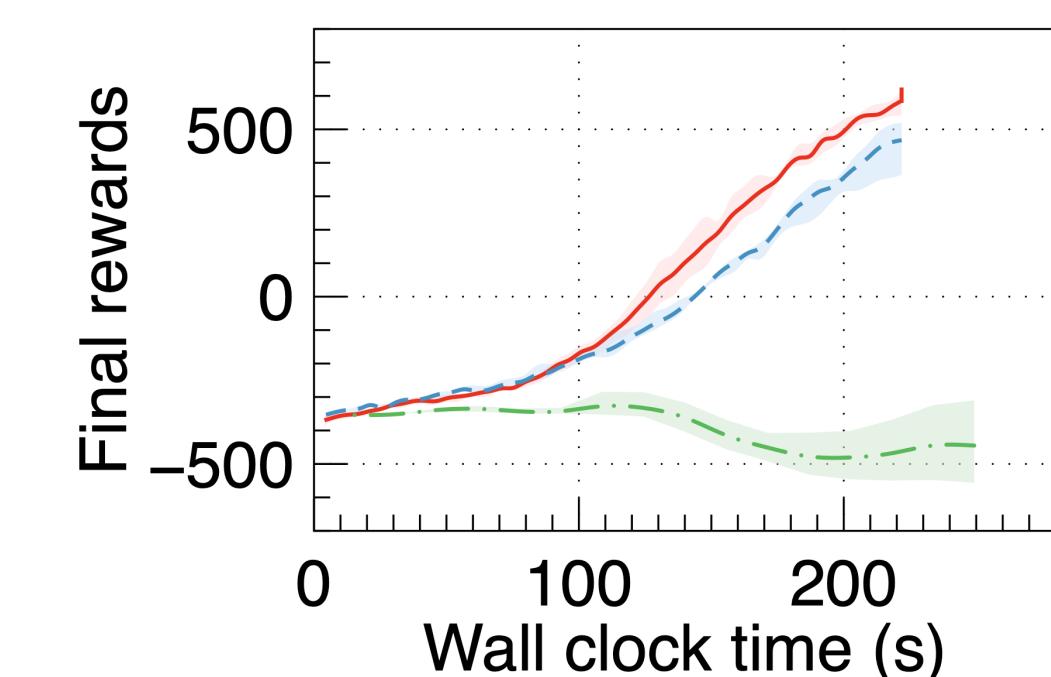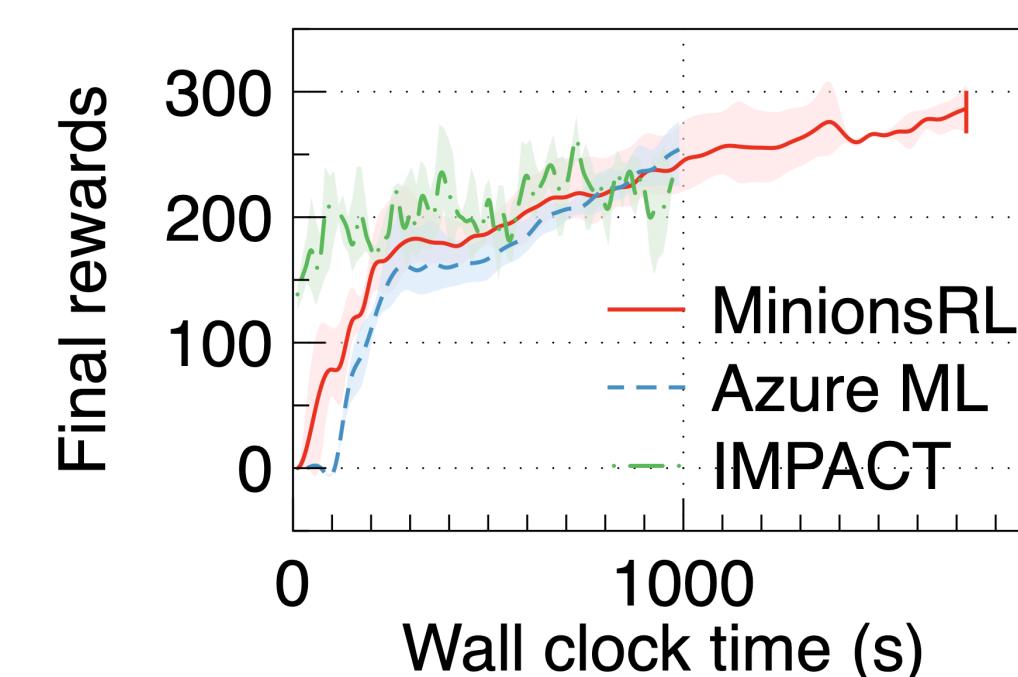
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