Enabling Computer Architecture Simulation as a Service

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Computer Architecture Simulation

Purpose
- Verify chip design ideas without costly manufacturing process

Simulators
- Recreate hardware's cycle-by-cycle behavior

Importance
- Enables new computer architecture research
- Provide sources for education materials
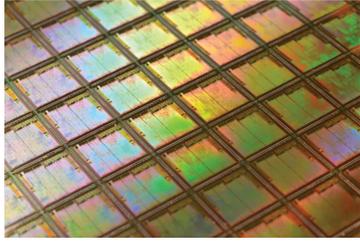
Problems with Existing Computer Arch. Simulators

Interoperability
- Model developed in one simulator cannot be used in another

Reproducibility
- Others' experiment configurations are diffult to obtain
- Results cannot be easily repeated in new environment

Accessibility
- Simulators require extensive environment configuration
- High compute requirements demand expensive devices

Result Interpretability
- Simulator results are challenging to be fully understood by human developers

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Our Solution: Providing a web-based environment for computer arch. simulation

Crowd-Sourced Modeling
GUI-Based Configuration
Cloud-Powered Simulation
Viz-Informed Analytics
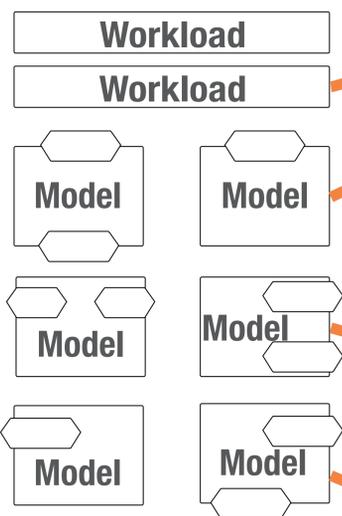
Model Zoo:
- Curate community contributed simulator models of hardware components
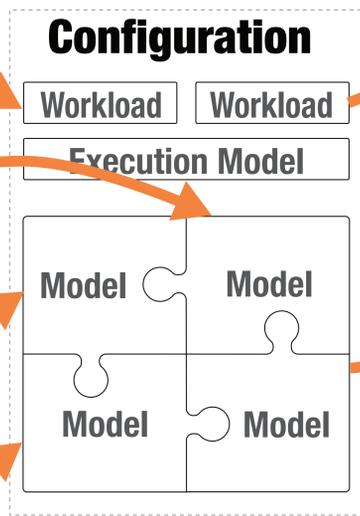
Config Tool:
- Build complex configs with drag-and-drop
- Fork existing experiments' configs
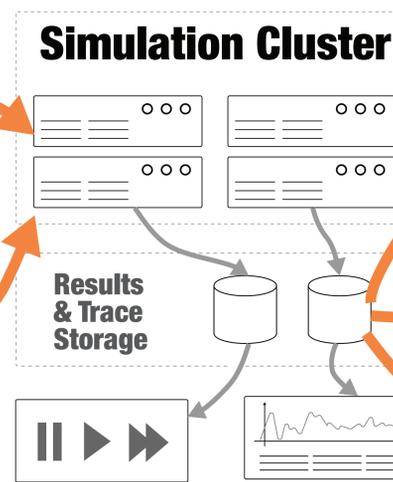
Simulation Platform:
- Run simulation with one click
- Monitor and control running simulations.
- Reproduce simulation results.
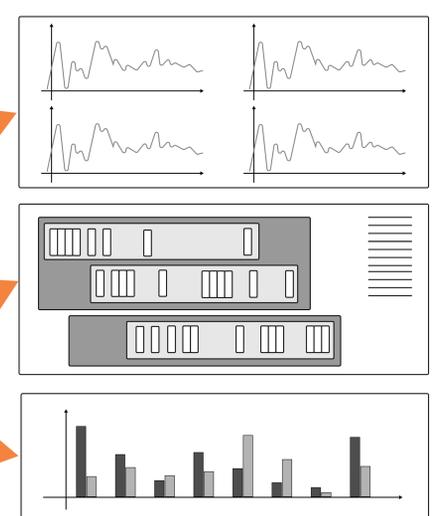
Analytics Platform:
- Visualize, examine, debug, and compare simulation results.

AkitaRTM

Real-time monitoring
- Check hardware status while simulation is running
- Control running simulator - Profile running simulator

Importance
- Identify problem early and reduce turn-around time
- Accelerate Innovation
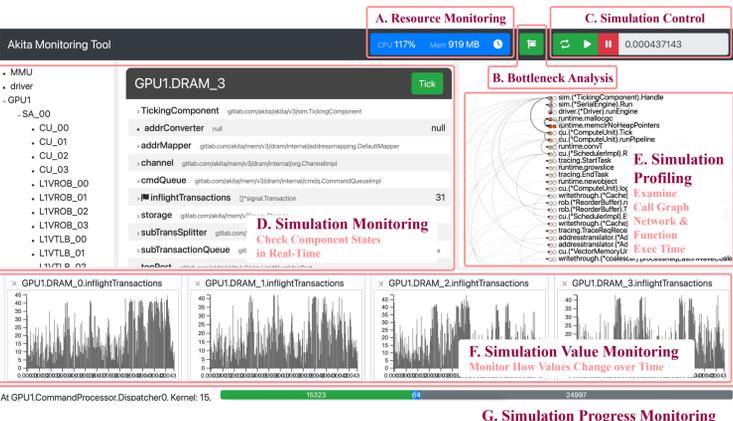
Daisen   Detailed hardware behavior visualization

- Uniform trace format - Universal visualization design - Reason about performance issues
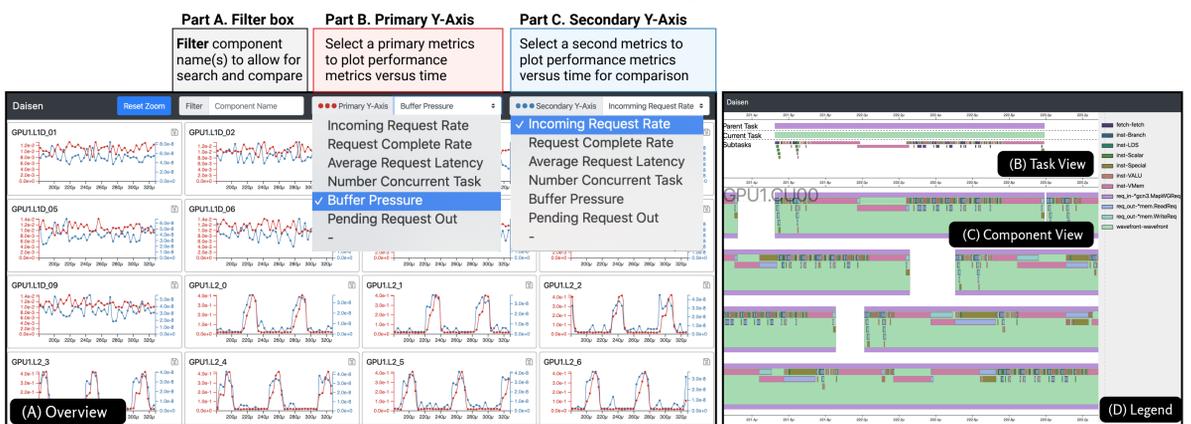
Future/On-Going Work   Towards building Explainable Computer Architecture

- Create website - Define how models can be imported - Build configuration tool
- Cloud-based simulation execution - Extra data for visualization - Edu. outreach

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