On-Premise FPGA Demo

https://fires.im

@firesimproject

HPCA Tutorial 2023

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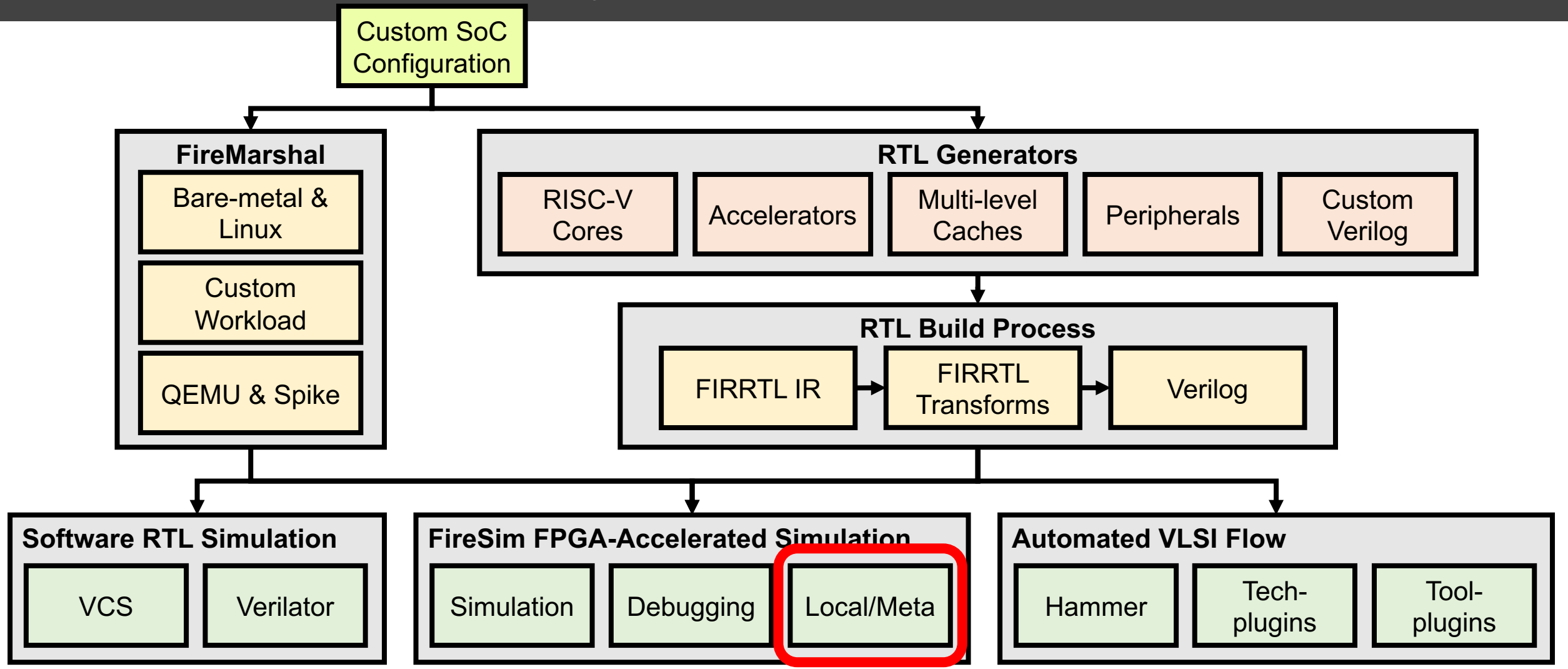
Berkeley Architecture Research

Tutorial Roadmap



Two new FireSim features!

- Local FPGA support!
  - Re-architecting of FireSim Manager, Drivers, and Shells to support adding new FPGA and host platforms
    - Now supports Xilinx Alveo XRT-enabled FPGAs (e.g. U250)
- Distributed Meta-simulations
  - Early-stage accelerator development requires running many parallel verilator/vcs sims, but these are traditionally accessed via Make-system in Chipyard/FireSim
  - FireSim manager now supports distributing metasims using the same machinery as distributing FPGA simulations, on both EC2 and local machines
    - Same user-interface for workload/job specification/mapping, constructing heterogeneous systems, running sims, and collecting outputs (now including waveforms)

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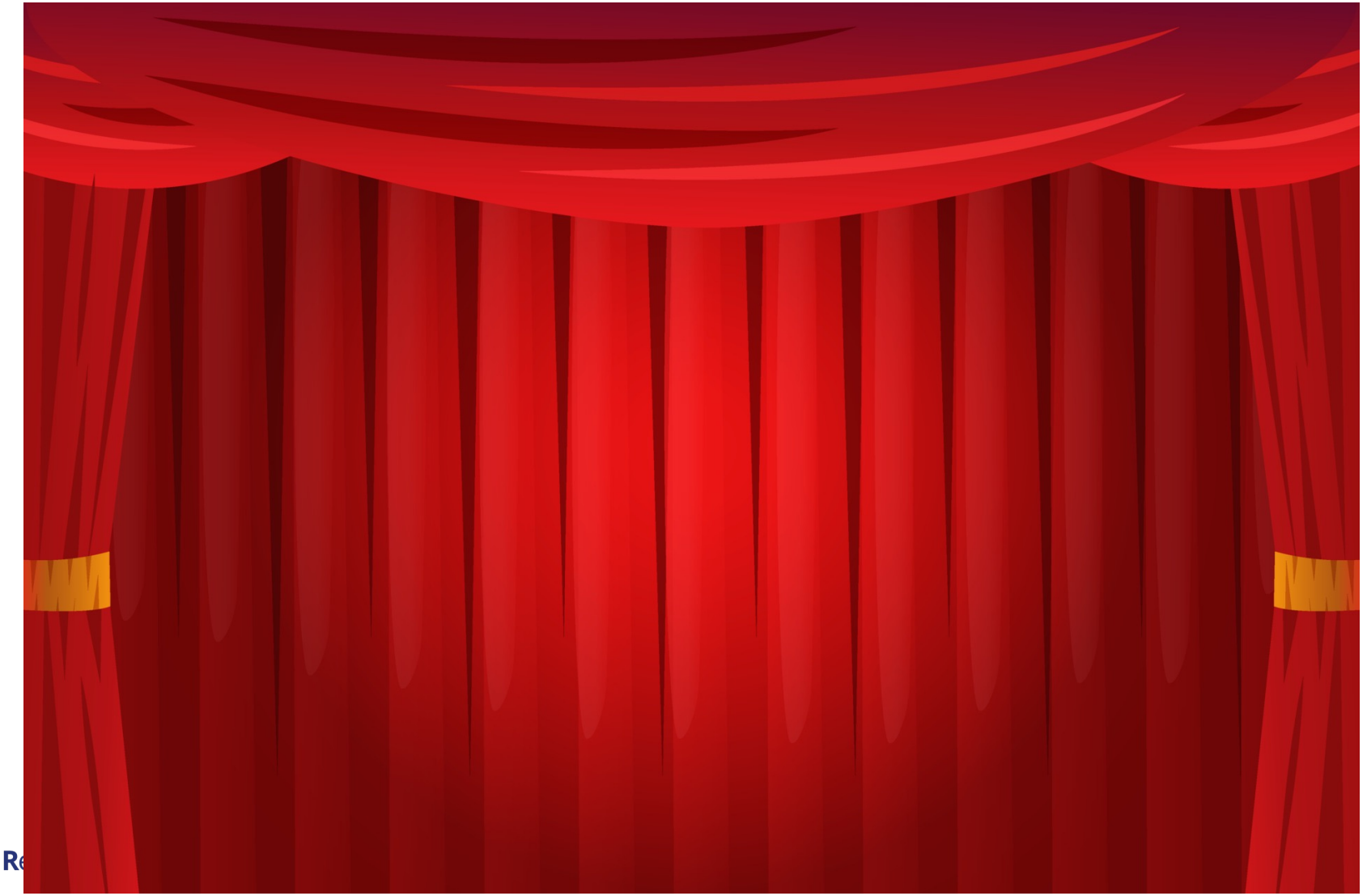
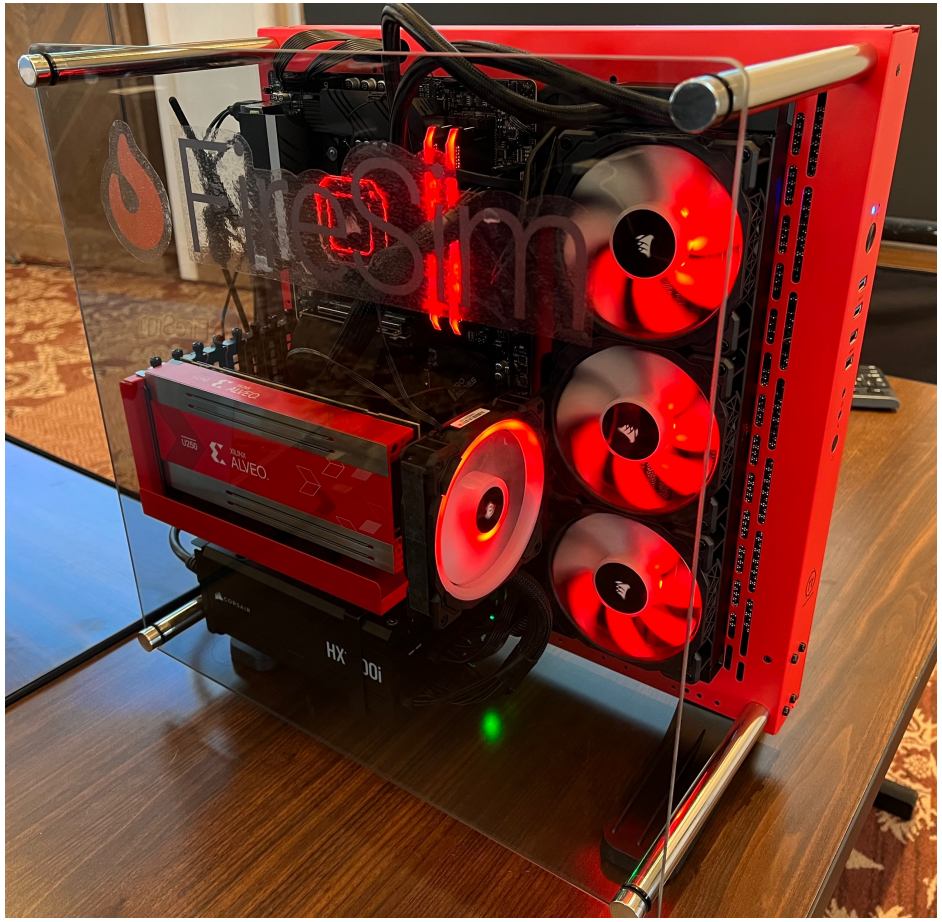
Drumroll…



FireTower v1 Machine Specs

- Intel Core i7 13700K
  - Liquid cooler (w/RGB)
- 32 GB DDR4 (w/RGB)
- **Xilinx Alveo U250 (active)**
- Motherboard spec'd for:
  - 2 U250 + GPU
  - OR
  - 3 U250
- 1500W PSU to support multi-FPGA/GPU
- Thermaltake Core P3 Red Case
- Ubuntu 18.04

$1500 without FPGAs or GPUs



What are we running?

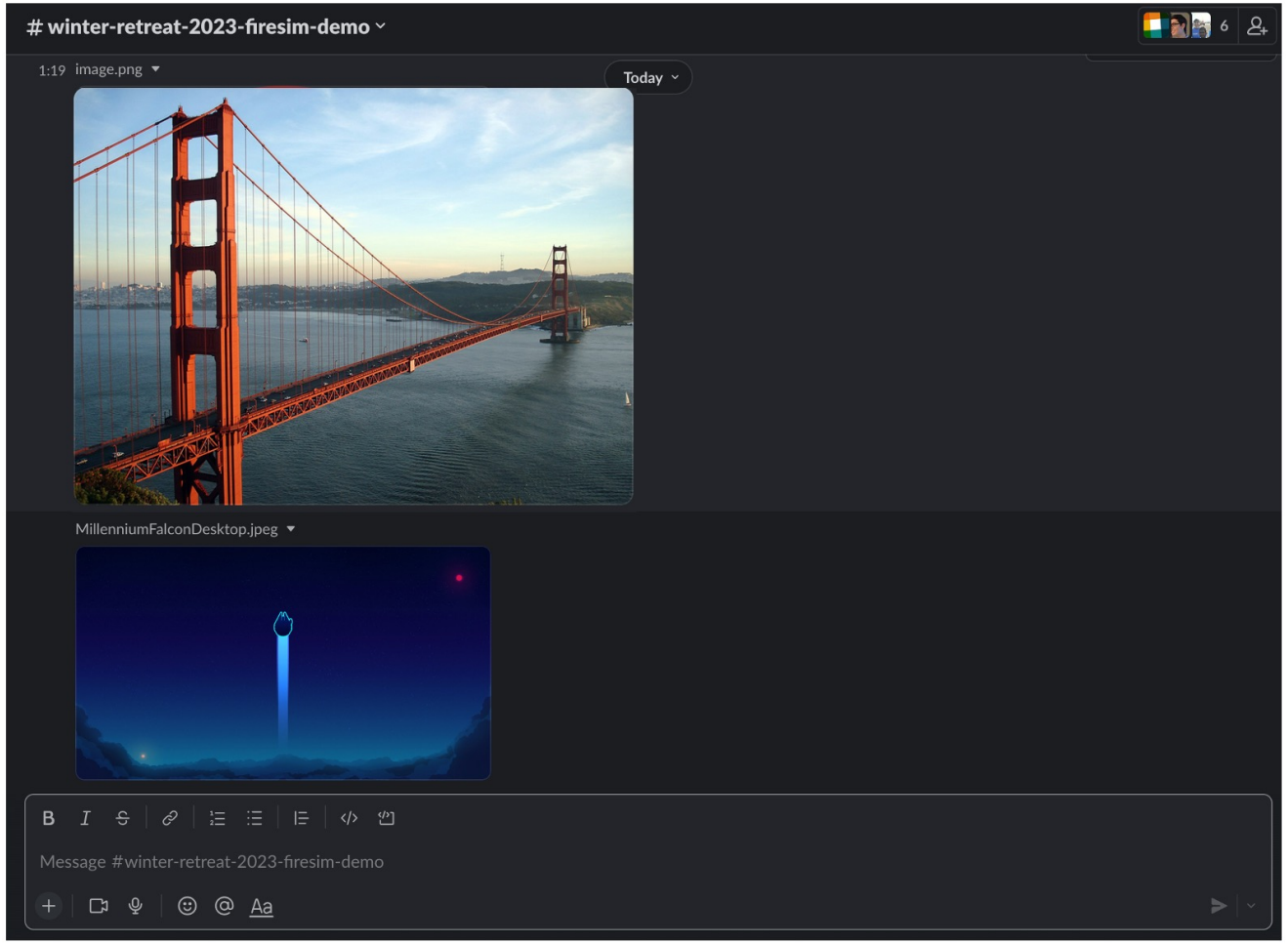
Running **MobileNet** image recognition

using the **Gemmini DNN accelerator**

on a **Chipyard Rocket-based SoC**

simulated with **a FireSim U250 FPGA-enabled desktop**

Demo Lifetime



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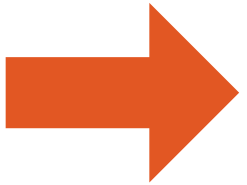

Convert to .png

Demo Lifetime

Convert to .png

PyTorch

Image Preprocessing

Demo Lifetime

Convert to .png

PyTorch

Image Preprocessing

Compile target Gemmini C binary with image

Demo Lifetime

FireSim

Run FireSim
Rocket + Gemmini
simulation

Compile target
Gemmini C binary
with image

Demo Lifetime

FireSim

Run FireSim Rocket + Gemmini simulation

Compile target Gemmini C binary with image

Reset + Flash FPGA

Copying collateral

Running simulation

Demo Lifetime

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Run FireSim
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"It's a **bridge**"

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Gemmini C binary
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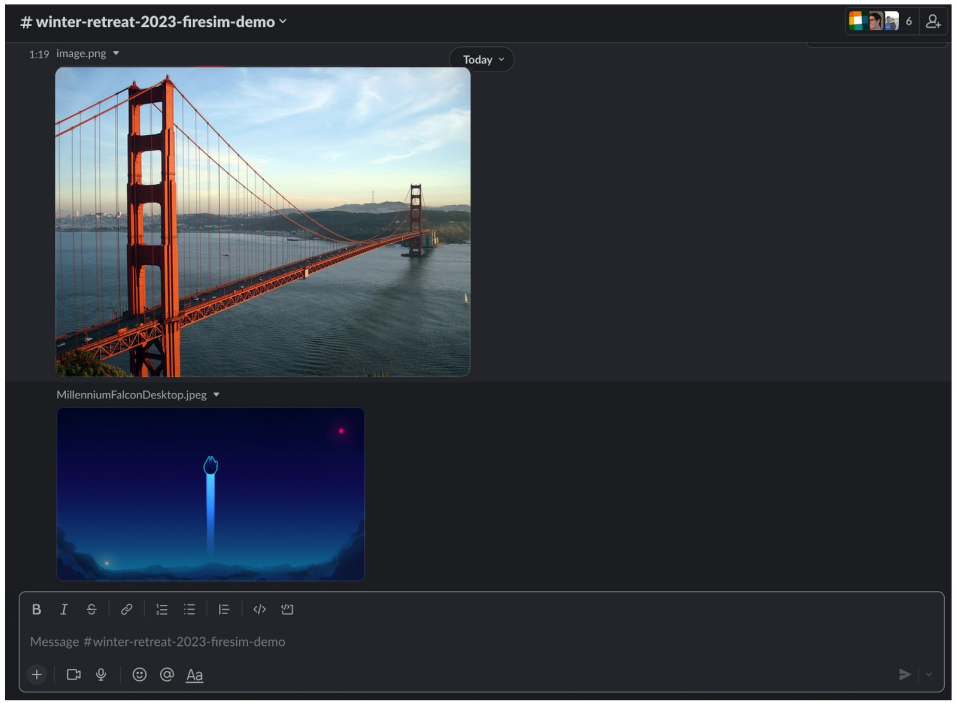

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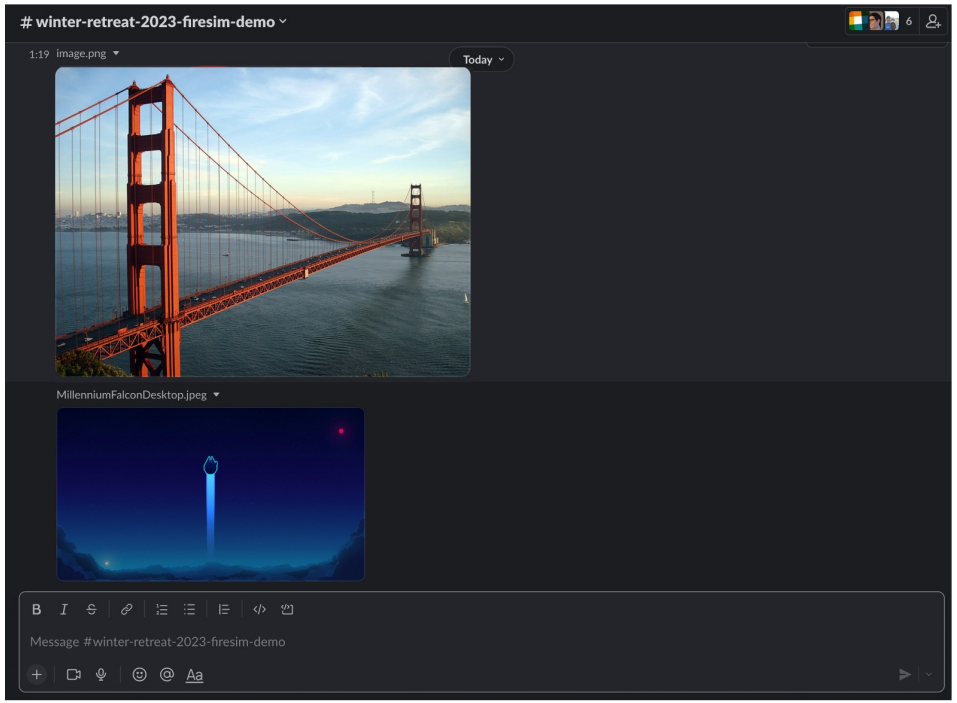

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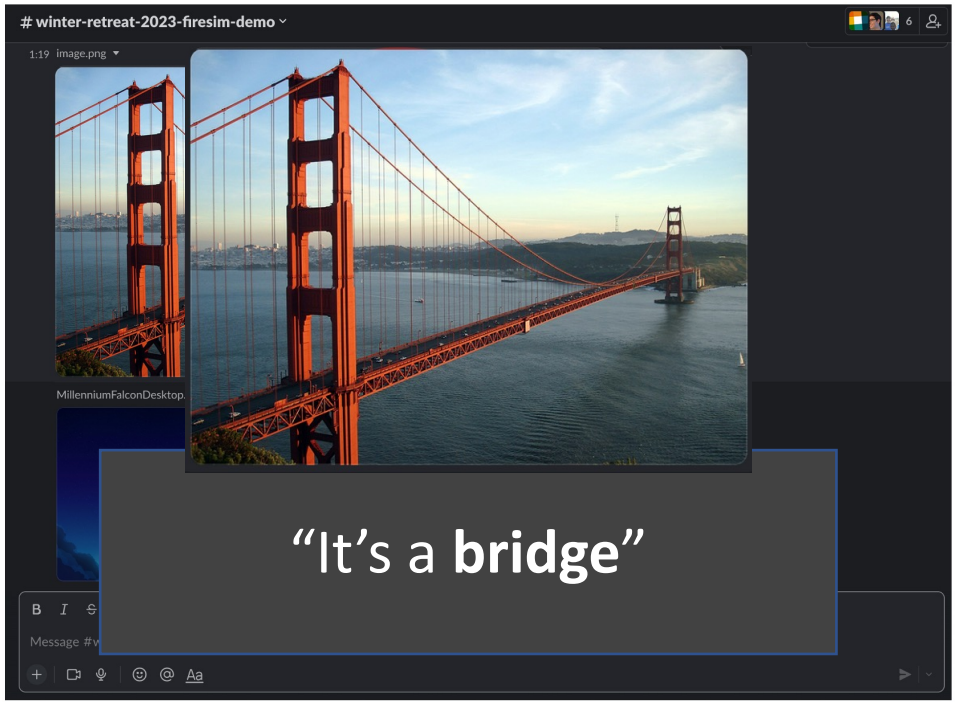
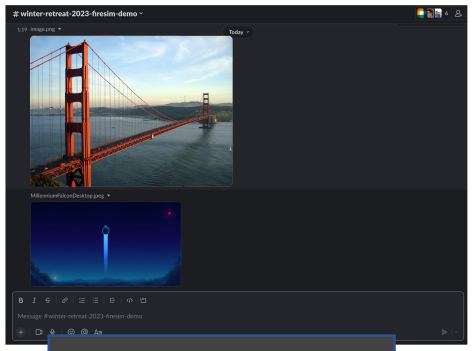


Let’s Run the Demo!



Slack UI

PyTorch

Image Preprocessing

Compile target Gemmini C binary with image

FireSim

Run FireSim Rocket + Gemmini simulation

“It’s a **bridge**”

Try it out yourself!

- You were added to a Slack called `firesim-chipyard-tutorial`
  - Done if you filled out the intro tutorial Google form
  - Link: fsim-cy-tutorial.slack.com
- Add your own photos in `demo-input` channel
- See the output in `demo-output` channel

!!! Reminder the photos uploaded are public !!!

On-premise FPGA support now available!

- High-level of automation/reproducibility enabled by FireSim on AWS F1 cloud now extended to local/on-prem FPGAs:
  - Went from new machine with no FPGA attached to working FPGA-accelerated simulation in 1 hour and 40 mins
- Use existing FireSim features at-scale and locally!
  - Cycle-accurate simulation
  - Debugging
    - Integrated logic analyzers, trace dumps, synth. assert/prints, co-simulation
  - Software support
    - FireMarshal workload management
  - … and more!