ArgoCon

How to fine tune an LLM with Argo Workflows and Hera

Flaviu Vadan | J.P. Zivalich

ABOUT US

Flaviu Vadan

- Staff Engineer, Dyno Therapeutics
- Watertown, MA, USA

flaviuvadan

in flaviuvadan

J.P. Zivalich

- CTO & Founder, Pipekit
- Atlanta, GA, USA

JPZ13

in jpzivalich

OUTLINE

Motivation

Foundation models & fine tuning

Infrastructure

Walkthrough

MOTIVATION

Show how to do scalable distributed fine tuning for LLMs

Target Audience:

- Individuals, teams, and companies who want to use LLMs, but need additional customization
- Teams interested in distributed model training

FOUNDATION MODELS

- General, open-source models
- Very expensive to train
- Fine tune on your own data
- Good for …
  - Domain-specific training (medical, support, etc.)
  - Training on private/ proprietary data sets

FINE TUNING

- Transfer learning technique
- General guide:
  - Set up infrastructure
  - Take existing model
  - Feed it your own data

INFRASTRUCTURE

Kubernetes cluster with GPUs

Custom Storage Class

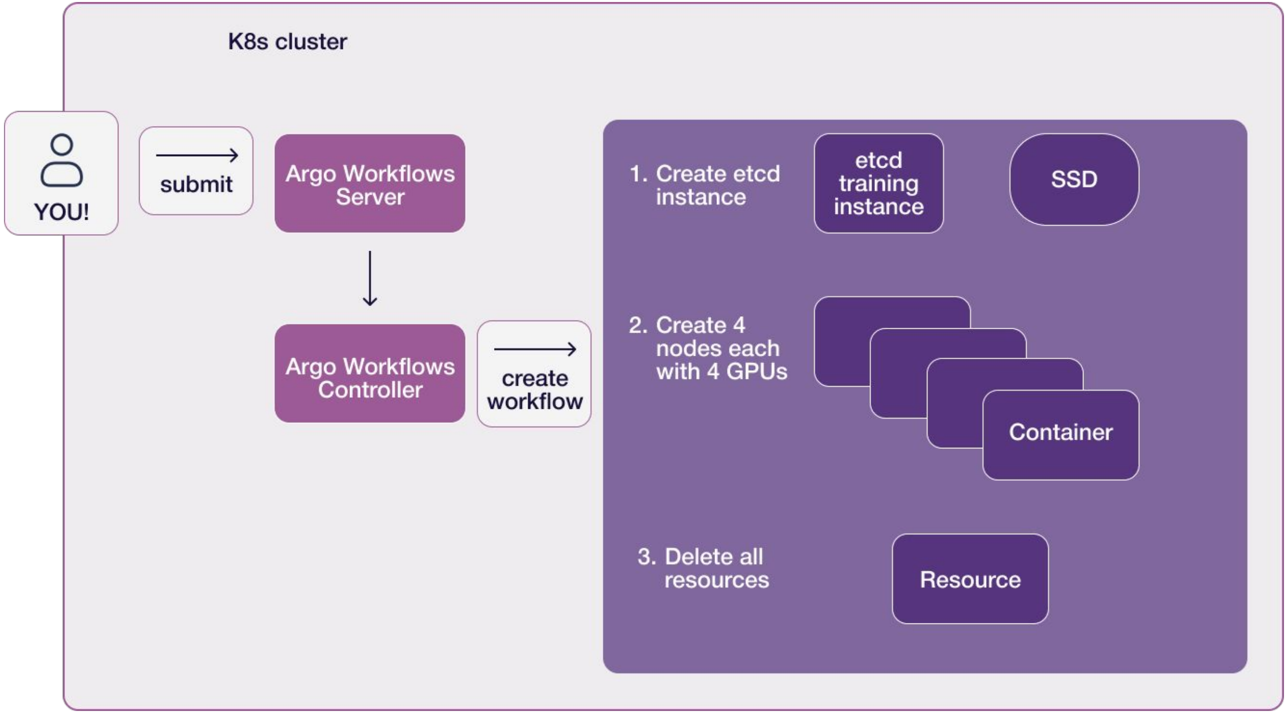
GPUs

Argo Workflows installed

HuggingFace account

Approval from Meta that you can use llama

ARCHITECTURE DIAGRAM



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DISTRIBUTED KEY-VALUE STORE

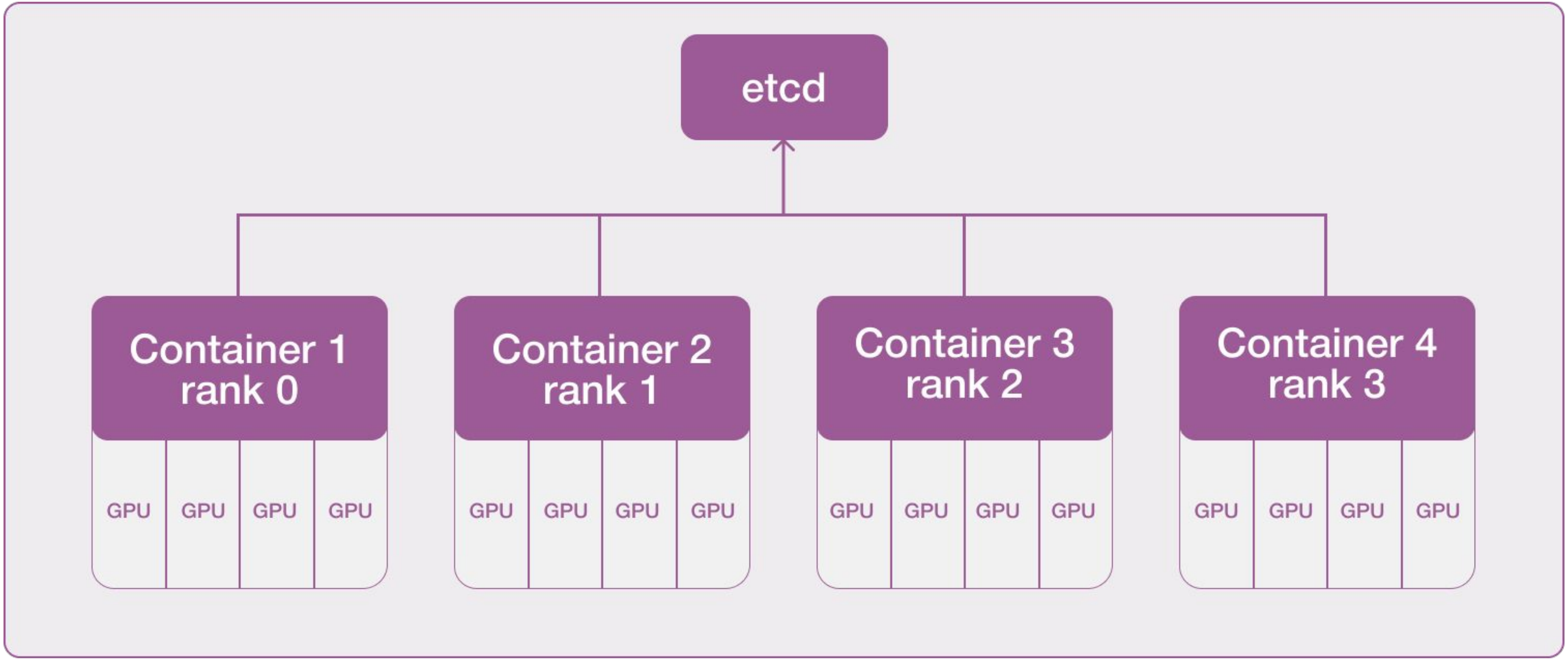
Problem: Track which shards of the model have been trained on which sections of the data set

Solution: Use a distributed key-value store

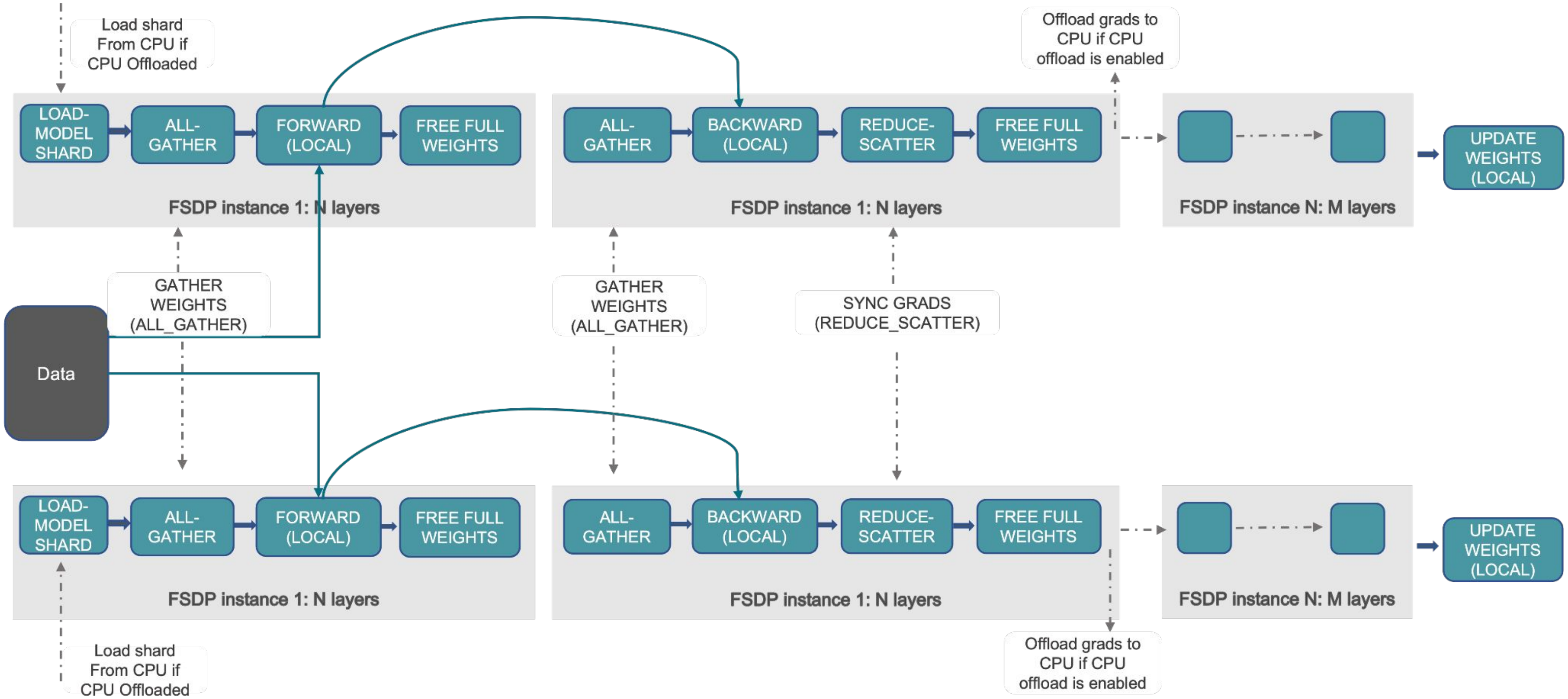
We chose to provision a replicated etcd instance

This is separate from the existing etcd instance that Kubernetes uses

Workflow steps for distributed training



PyTorch Fully Sharded Data Parallel (FSDP)



TEAR DOWN

A
The training etcd instance is torn down at the end of the workflow run using an Exit Handler in Hera/Argo Workflows

B
The cluster autoscaler tears down the GPUs, as they are no longer needed

C
This allows us to ensure tear down regardless of success or failure of the workflow run itself

D
As a general rule, workflow runs should be as ephemeral as possible

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Walkthrough of Hera code

https://github.com/flaviuvadan/kubecon_na_23_llama2_finetune

Acknowledgements / Resources

- https://hera.rtfd.io/
- https://argoproj.github.io/workflows/
- https://github.com/etcd-io/etcd
- https://pytorch.org/tutorials/intermediate/FSDP_tutorial.html
- https://github.com/facebookresearch/llama-recipes
- https://huggingface.co/meta-llama/Llama-2-7b-hf

Share your feedback and check out the code

https://s.pipekit.io/argo-llm

Chat more with us about Argo & LLMs

https://s.pipekit.io/chat-argo-llm