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China 2018

Kubebench: Benchmarking ML Workloads on Kubernetes

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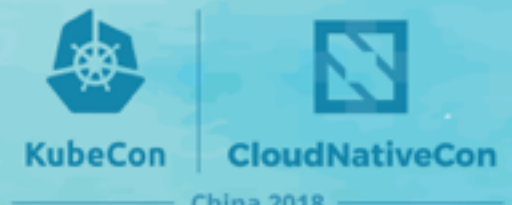
Why Kubebench?

- Understanding system performance is essential for moving ML from lab to production.
- Benchmarking and analyzing ML workloads on Kubernetes is not an easy job today.
- Many requirements for a good benchmark: compliance, consistency, reproducibility, …

What is Kubebench?



Kubebench is a harness for benchmarking and analyzing Machine Learning workloads on Kubernetes.

Goals of Kubebench

- Support benchmarking in various circumstances
  - Multi-cloud and various infrastructure
  - Different ML frameworks
  - Distributed workloads
  - …
- Make it easier to manage benchmarks
  - Consistent workloads
  - Reproducible results
  - Integrable with the rest of ML lifecycle
  - …

Tech Stack

Kubebench

Benchmark config/result management; Benchmark workflow deployment

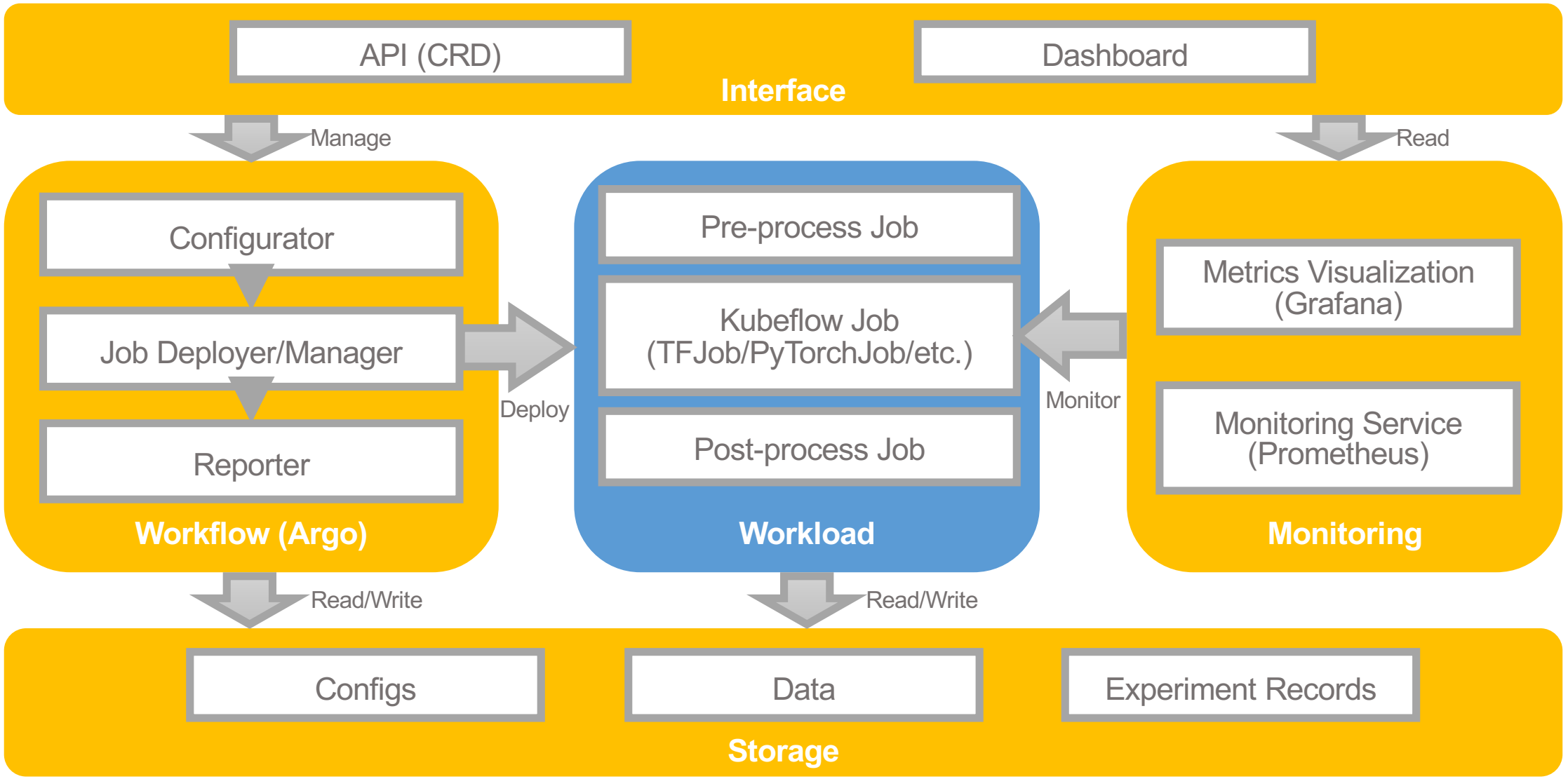
ML job deployment / lifecycle management

Production grade container orchestration

Infrastructure

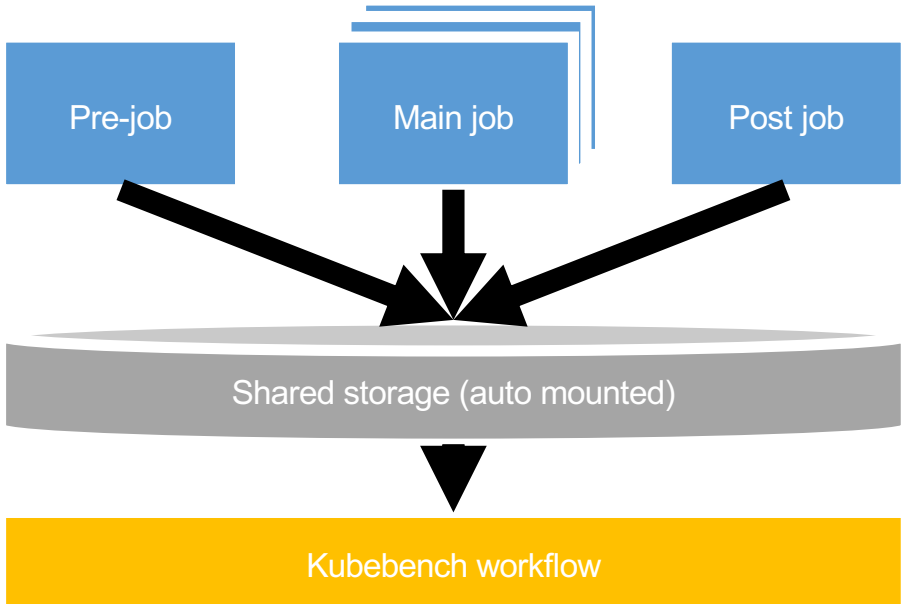
Cloud/On-premise infrastructure environment

Architecture

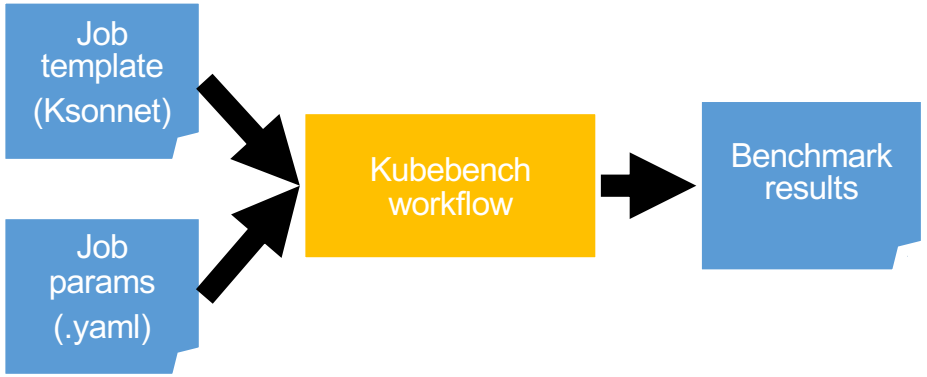


User's Perspective

Job Developer



Experiment Runner



Where we are

Current release (V0.3):

- Support local/distributed training workloads
- Support multiple frameworks
  - TFJob
  - PyTorchJob
  - (more planned)
- Support result aggregation for multi-experiments
  - Stored in filesystem
  - (Remote/Cloud DB planned)
- Quick starter package
  - Parameter-less e2e example for quick start
  - Example workloads (TF-CNN)

Upcoming and Future releases:

- UI/UX
  - Dashboard
  - Results/metrics visualizations
- API
  - Kubebench CRD
- More benchmarking scenarios
  - Serving/inference benchmarks
  - Mixed/scaled workloads
- …

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Demo

Kirill Prosvirov, Andrey Velichkevich

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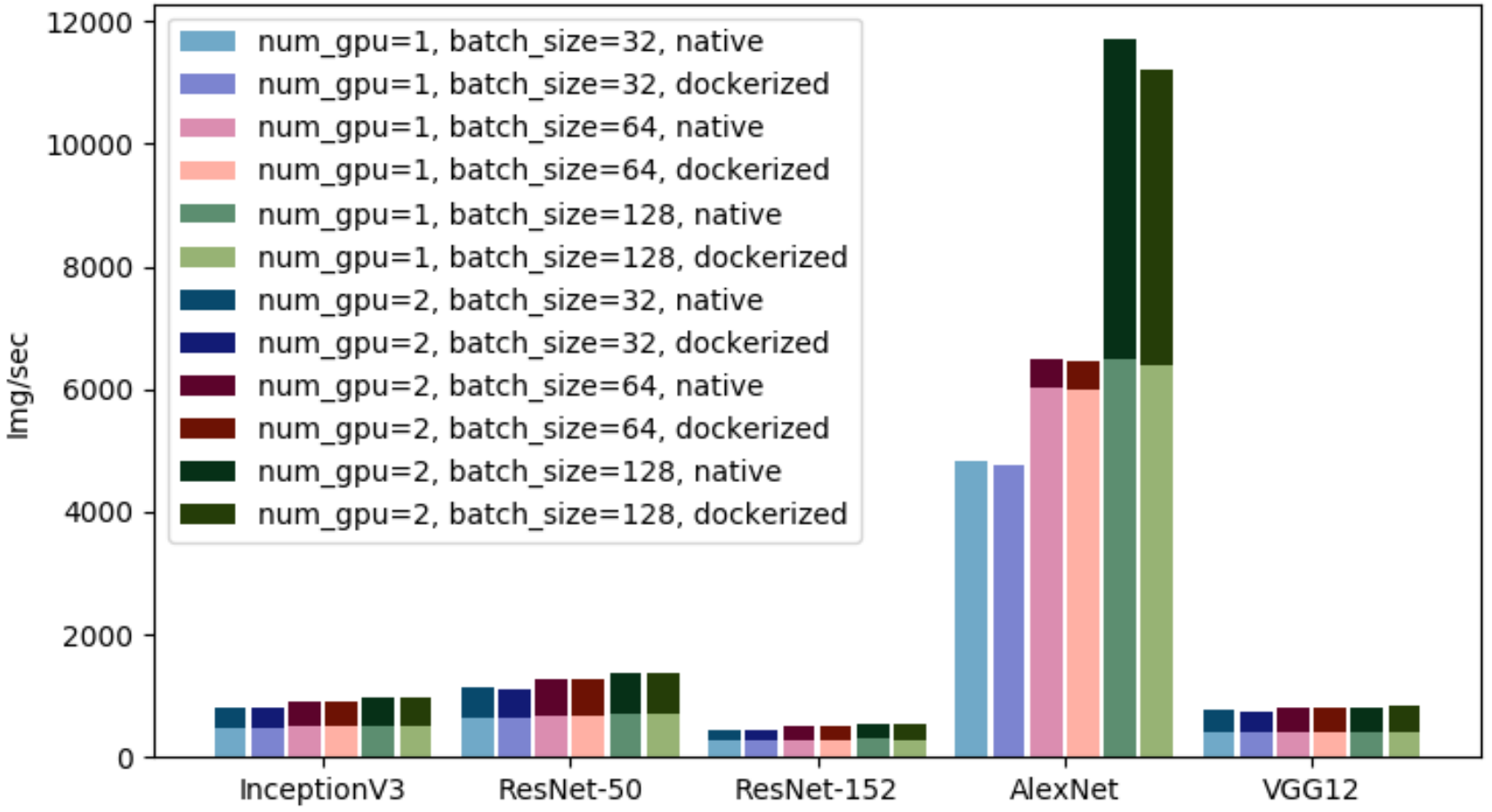
Case Study

Ce Gao

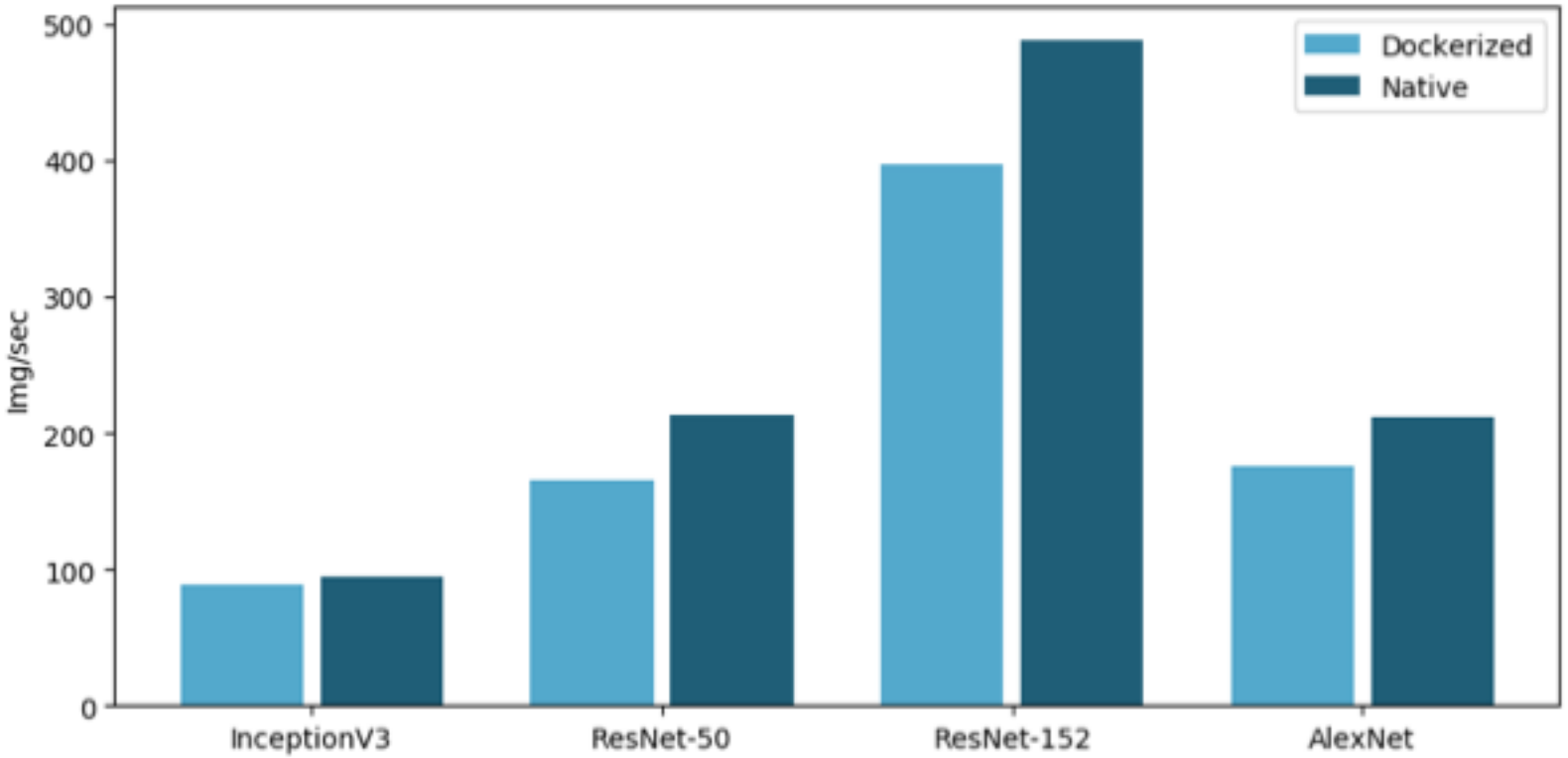
Local Training Benchmark



TensorFlow CNN Benchmark
Dataset: imagenet (synthetic)
Mode: forward-only
SingleSess: False
Num batches: 100
Num epochs: 0.00
Data format: NCHW
Optimizer: sgd
Variables: parameter_server

Training performance among different GPU numbers, batch sizes, and platforms

Distributed Training Benchmark



Training performance between different platforms

TensorFlow CNN Benchmark
Dataset: imagenet (synthetic)
Mode: forward-only
SingleSess: False

Num batches: 100
Num epochs: 0.00
Data format: NCHW
Optimizer: sgd
Variables: parameter_server

1 PS
2 workers (2 GPU per worker)

Testbed

Dependency	Version
Cuda	9.0
CuDNN	7.1
GPU	GTX 1080ti
TensorFlow	1.10
Kernel Version	3.10.0-862.11.6.el7.x86_64
OS Image	CentOS Linux 7 (Core)
Operating System	linux
Architecture	amd64
Container Runtime Version	Docker 18.03.0-ce
Kubernetes Version	v1.10.1

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Thanks!

Contributors & Advisors

(alphabetical order)

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