Introduction to Kubeflow Pipelines

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Kubecon Europe
Barcelona
May 21, 2019

Google Cloud

TAs

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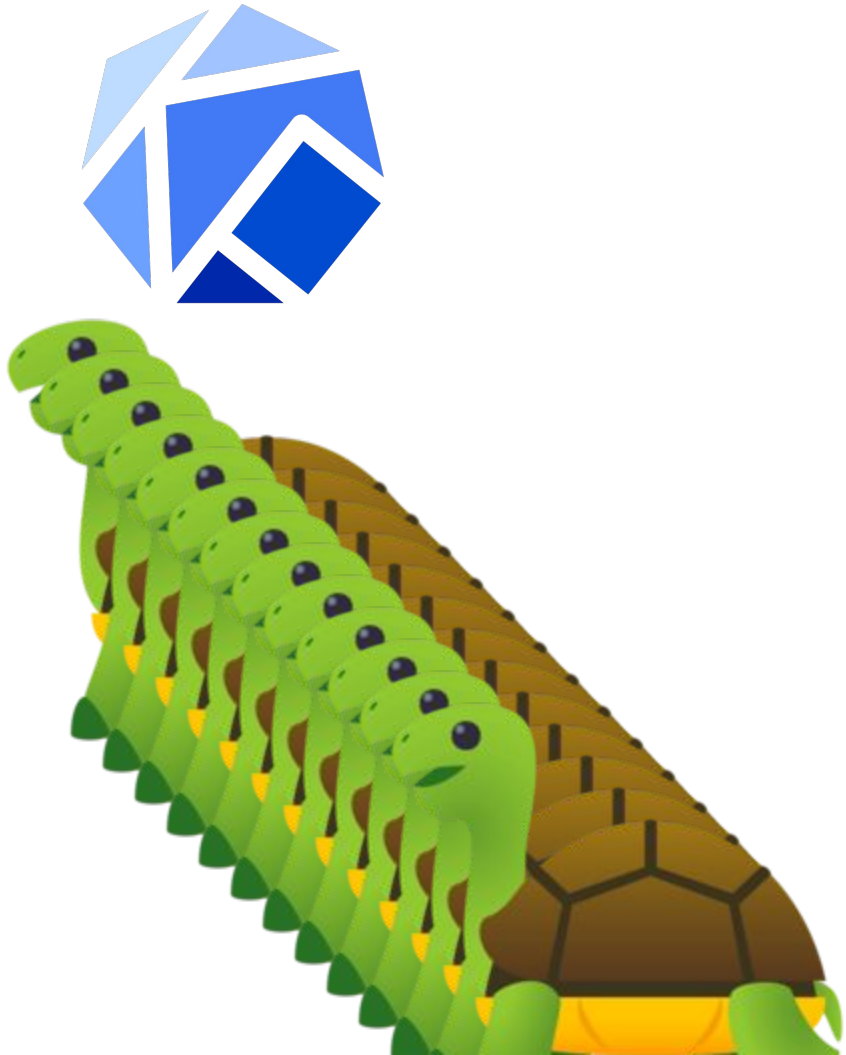

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Kubeflow is a curated set of compatible tools and artifacts that lays a foundation for running production ML apps

Enables consistency across deployments by providing Kubernetes object templates that bring together disparate components

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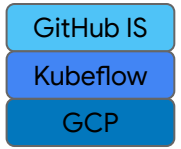

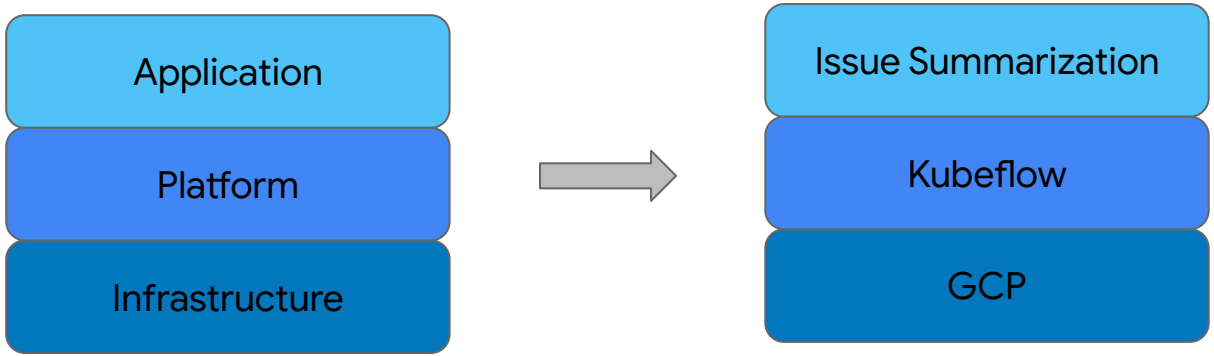

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GitHub IS
Kubeflow
GCP

Contributors

- Kubeflow is open
  - Open community
  - Open design
  - Open source
  - Open to ideas
- Get involved
  - github.com/kubeflow
  - kubeflow.slack.com
  - @kubeflow
  - kubeflow-discuss@googlegroups.com
  - Community call Tuesdays alternating 8:30am and 5:30pm Pacific
  - **Kubeflow Contributor Summit**
    - Q1 2019

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https://github.com/kubeflow/kubeflow

Agenda

g.co/codelabs/kubeconeu19

1. Set up the environment
2. Create a Kubeflow cluster
3. Run a pipeline from the Kubeflow Pipelines dashboard
4. Run a pipeline from a Jupyter notebook
5. Clean up

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Zones: us-west1-b, us-east1-c

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PROBLEM

Moving from local to production

SOLUTION

Portability

Package infrastructure components together

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Credit: Jörg Wagner and Stefan Prehn


chrome
backspace
enter
shift
ctrl
alt
tab

PROBLEM

Complexity

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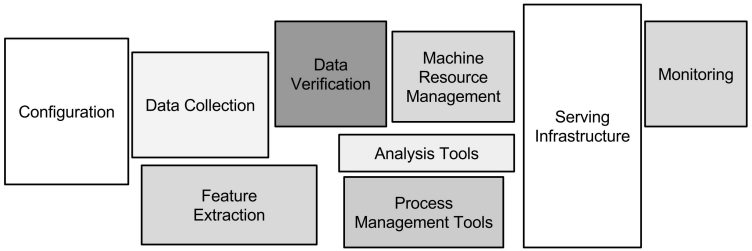
Perception

ML
Code



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Credit: Hidden Technical Debt of Machine Learning Systems, D. Sculley, et al.

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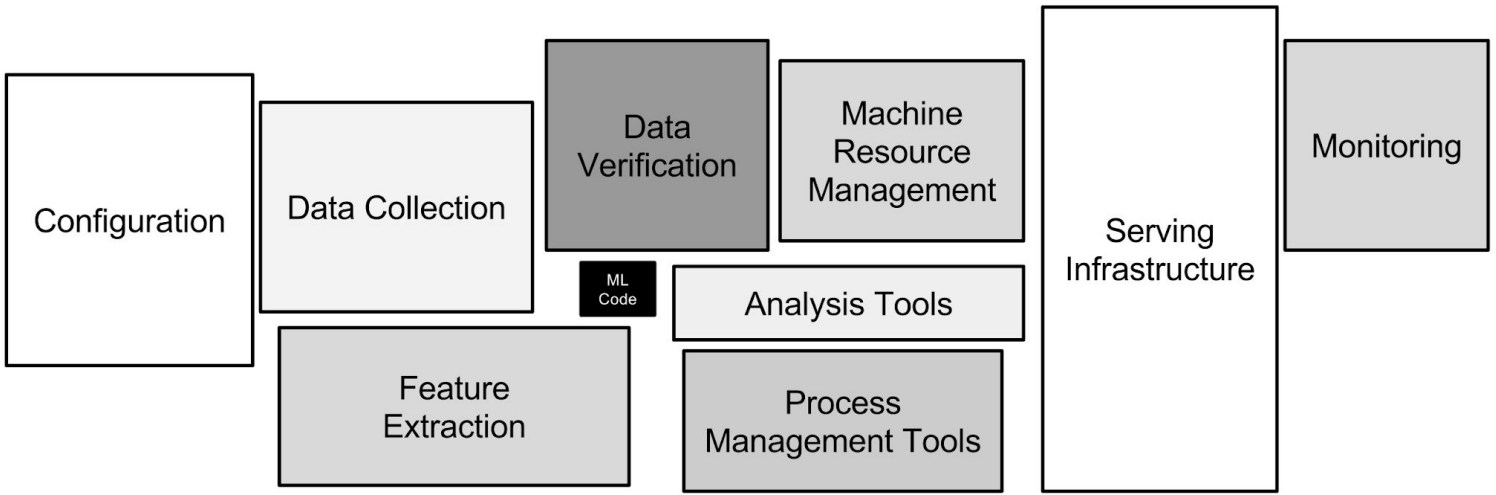
Reality



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Data

- Data Ingestion
- Data Exploration
- Data Transformation
- Data Validation
- Data Analysis
- Training Data Segmentation

Featurization

- Feature Extraction

Training

- Model Building
- Model Validation
- Model Versioning
- Model Auditing
- Distributed Training
- Continuous Training

Application

- Serving Infrastructure
- Business Logic
- UI
- Load Balancing

Platform

- Configuration
- Process Management
- Resource Management
- Monitoring
- Logging
- Continuous Delivery
- Authentication/ Authorization

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PROBLEM

Complexity

SOLUTION

Composability

Logical groupings

Reusable components

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PROBLEM

Maintainability

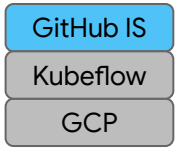
- Error resolution, recovery, & prevention
- Speed of iteration
- Versioning

SOLUTION

Composability

Shorten the development lifecycle

Automation



PROBLEM

Capacity Planning

- Usage patterns
- Demand spikes
- Efficient resource usage

SOLUTION

Scalability

Kubernetes

Autoprovisioning

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Make it easy for everyone to develop, deploy, and manage portable, scalable ML everywhere

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Portability

Entire stack

Scalability

Native to k8s

Reduce variability between services & environments

Composability

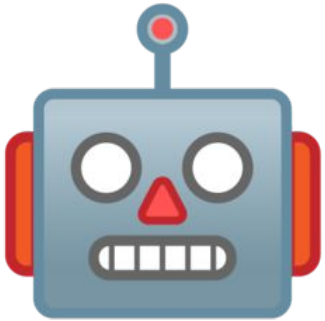
Single, unified tool for common processes

Full product lifecycle

Support specialized hardware, like GPUs & TPUs

Reduce costs

Improve model performance



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Who

Data scientists

ML researchers

Software engineers

Product managers

What

Portable ML products on k8s

v0.5.0 release

Why

Because building a platform is too big of a problem to tackle alone

`https://github.com/kubeflow/kubeflow`

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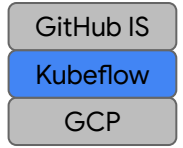

Kubeflow

Kubernetes-native platform for ML

Run wherever k8s runs

Use k8s to manage ML tasks

CRDs for distributed training

Adopt k8s patterns

Microservices

Manage infra declaratively

Package infrastructure components together

Kustomize & Ksonnet

Move between local -> dev -> test -> prod -> onprem

Support multiple ML frameworks

TensorFlow

Pytorch

Scikit

Xgboost

Et al.

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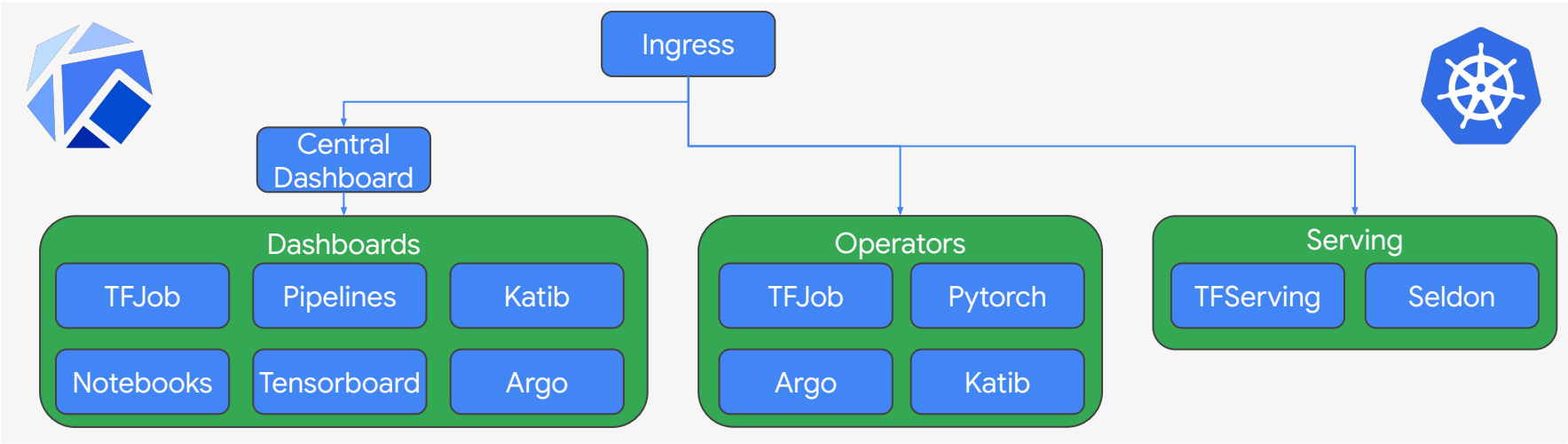
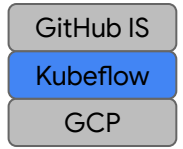
What's Inside v0.5?





What's new in v0.5?

- Deploy
  - CLI: `kfctl` Go binary with bugfixes
  - Click-to-deploy: in-cluster auth
  - Istio support
- Develop
  - Central Dashboard overhaul
  - Notebooks UI
  - Fairing library
    - Build, train, & deploy directly from Python
  - Katib improvements

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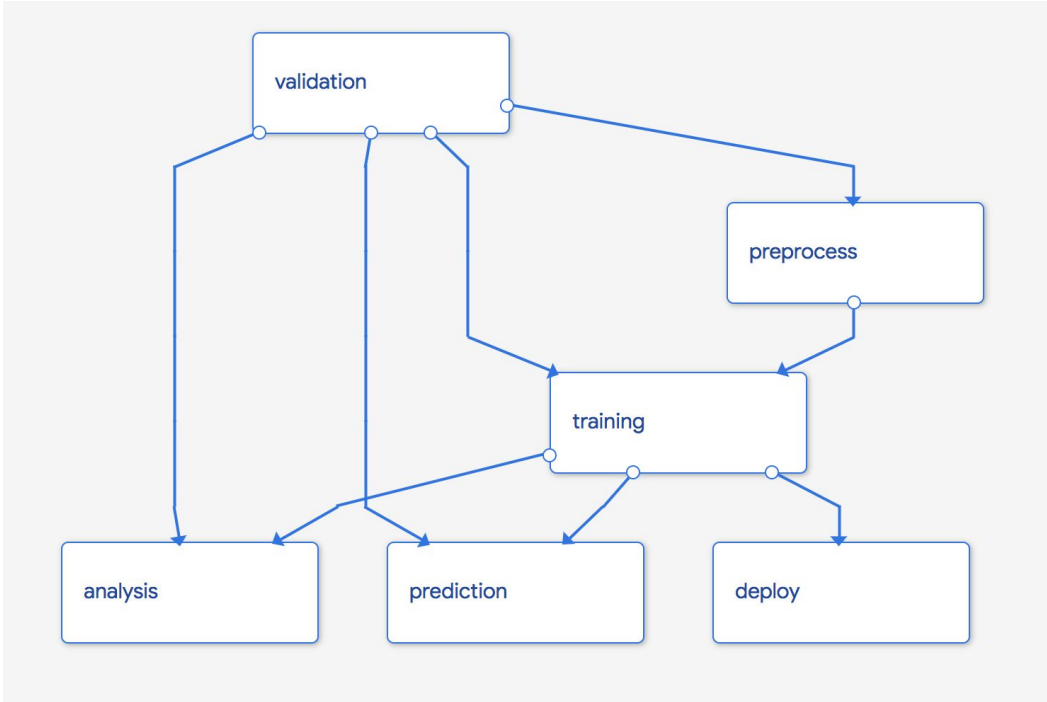
Pipelines

- End-to-end ML workflows
- Orchestration
- Service integration
- Components & sharing
- Job tracking, experimentation, monitoring
- Notebook integration



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Roadmap

- v0.6 out in early summer
- Multi-user isolation
- Ksonnet replacement
- v1.0 Enterprise readiness
  - Model management
  - Hardened APIs
  - Clean deployments, upgrades
- **You tell us!** (Or better yet, help!)

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Questions?

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