

Canonical Kubernetes Summit Workshop

Eric Chen , James Lin





2004

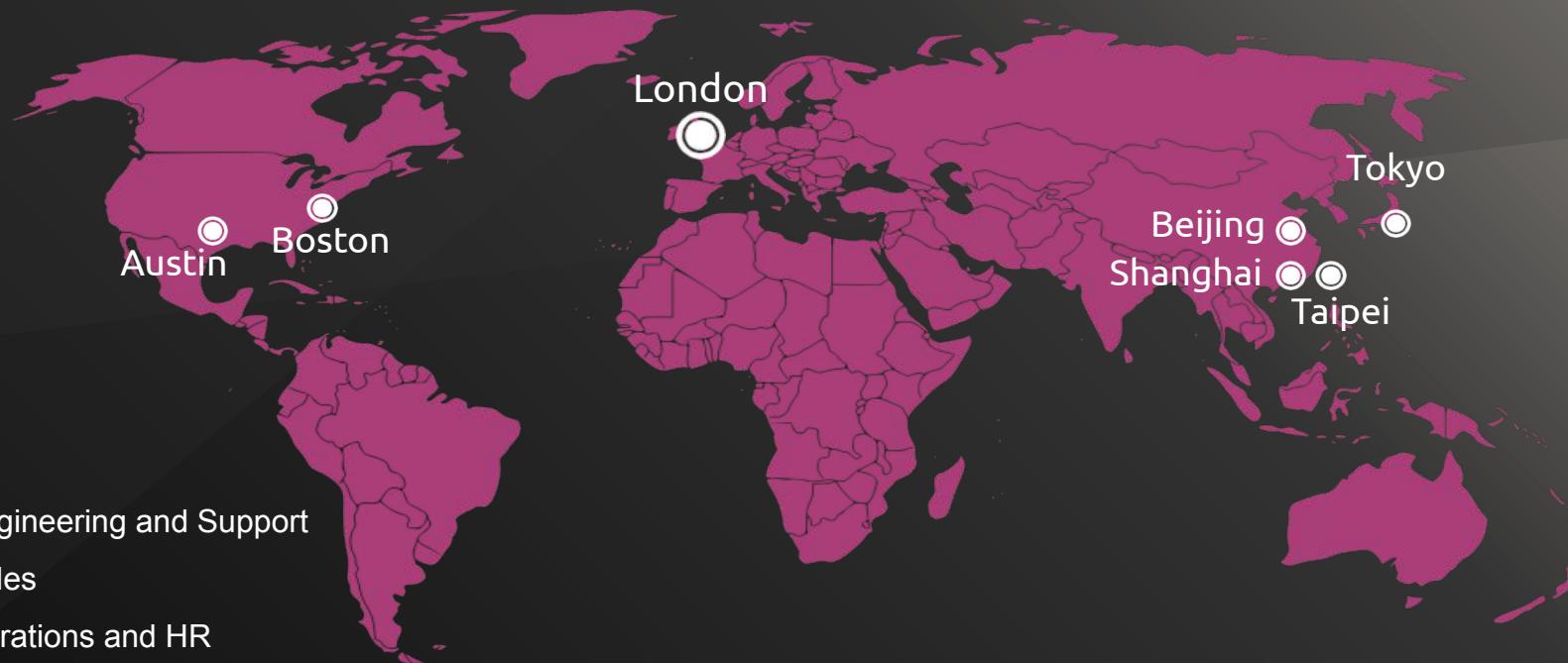
FOUNDED

900+

EMPLOYEES

50+

COUNTRIES



85% Engineering and Support

10% Sales

5% Operations and HR

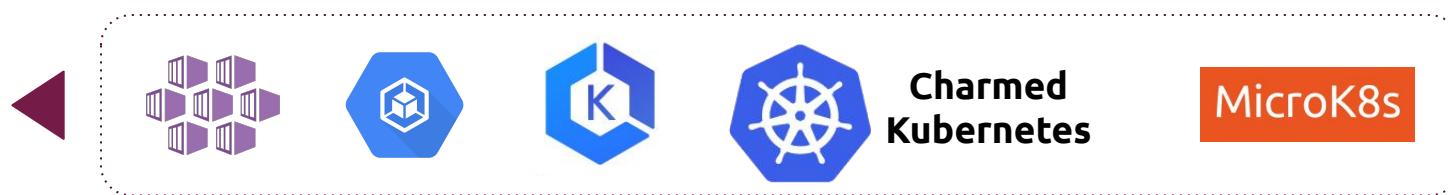
Canonical for multi-/hybrid-cloud



You business
applications



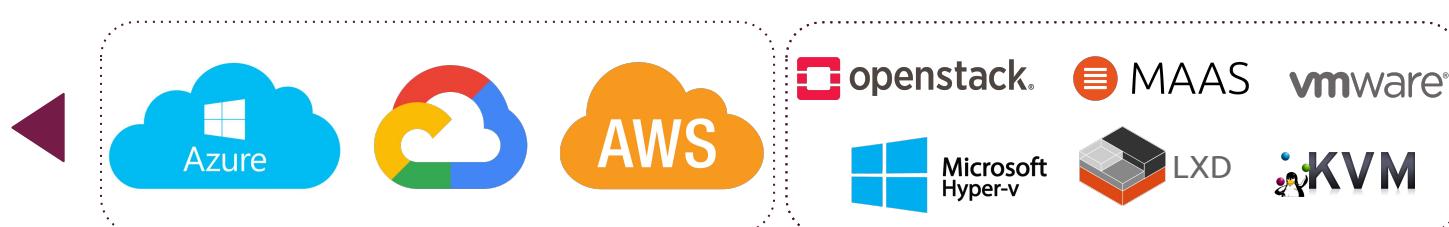
that run on any
Kubernetes



with Ubuntu OS

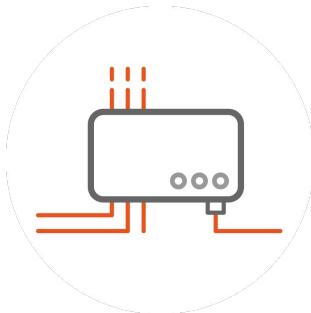
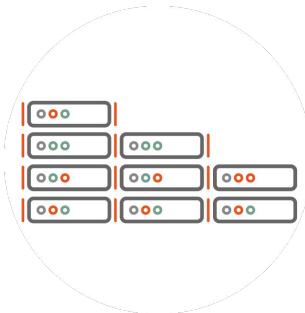
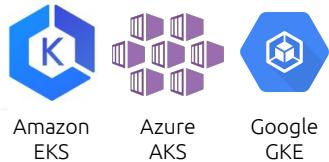


on top of any
infrastructure



MicroK8s

Multi-cloud Kubernetes



MicroK8s is lightweight Kubernetes done right

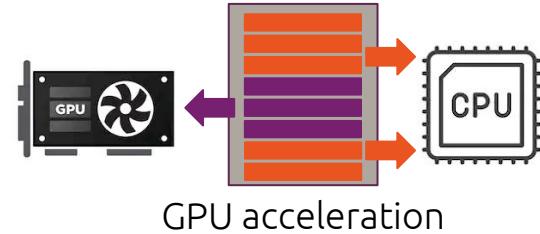


MicroK8s



- Pure upstream - NO vendor APIs
- Single package
- 60 second setup and cluster
- Standalone or clustered (HA)
- Opinionated, “sensible defaults”
- Zero-ops experience
- Edge, IoT and appliances
- Enterprise support

MicroK8s features



Kubeflow



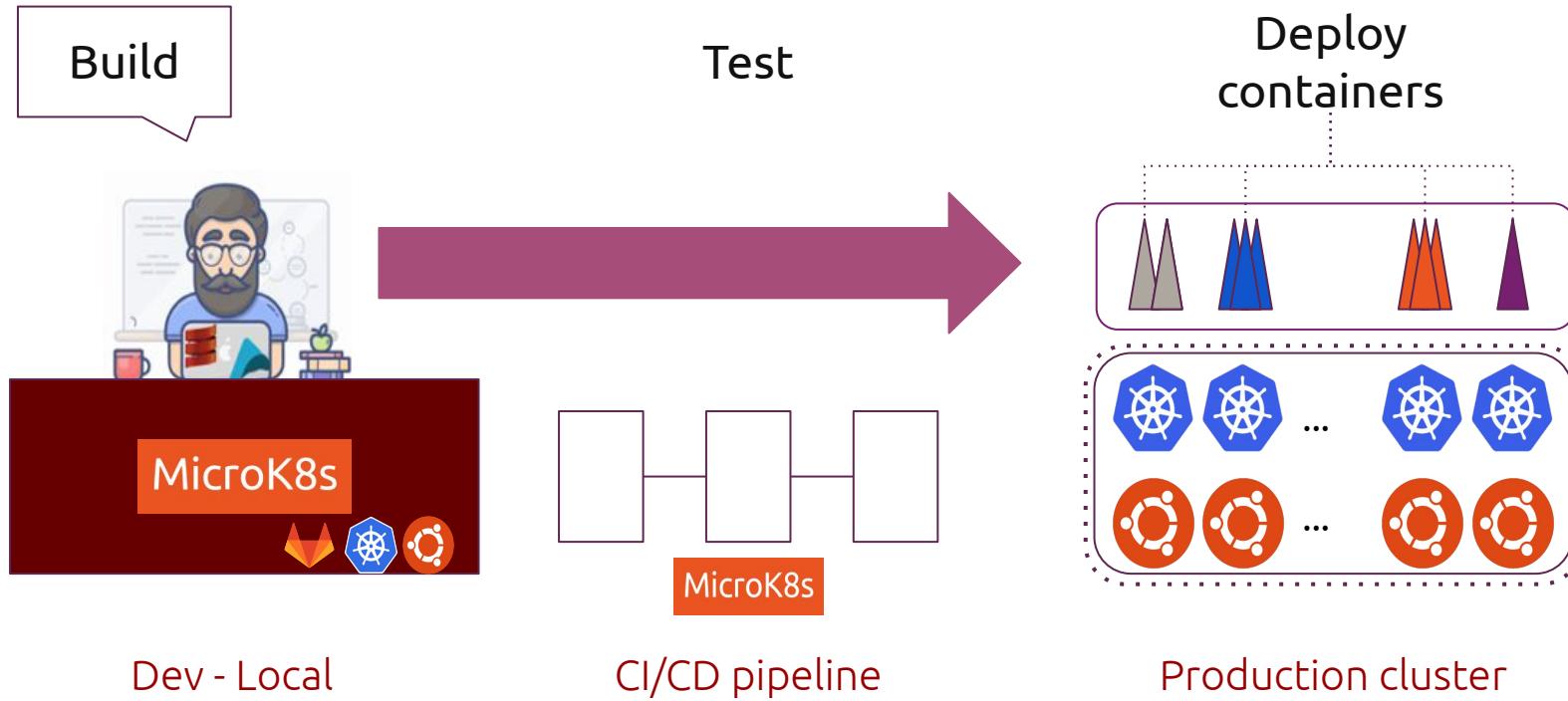
LINKERD



JAEGER



Use case#1: DevOps & CI/CD pipelines



Use case#2: AI/ML and GPU acceleration

Standardized
ML workflow

```
microk8s.enable kubeflow
```



Kubeflow bundle

Quick & versatile K8s



Multi-node cluster

Multi-environment
compute



Cloud VM



Use case#3: OT meets K8s



Industrial



Retail



Smart city



Healthcare



Automotive



Robotics

Security

OTA updates

Apps

Long term support



Core

Container orchestration

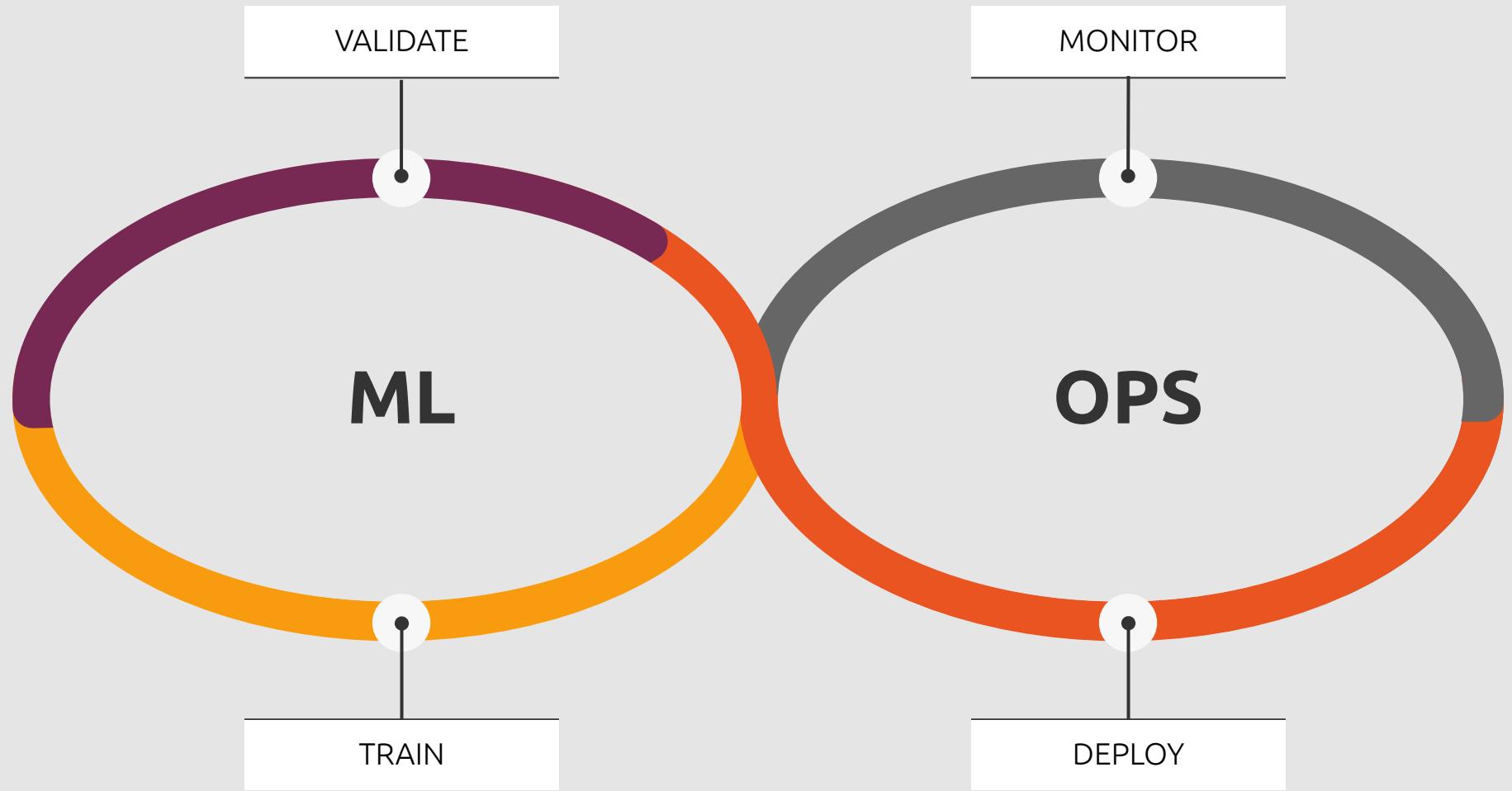
Workload consolidation

Resilience

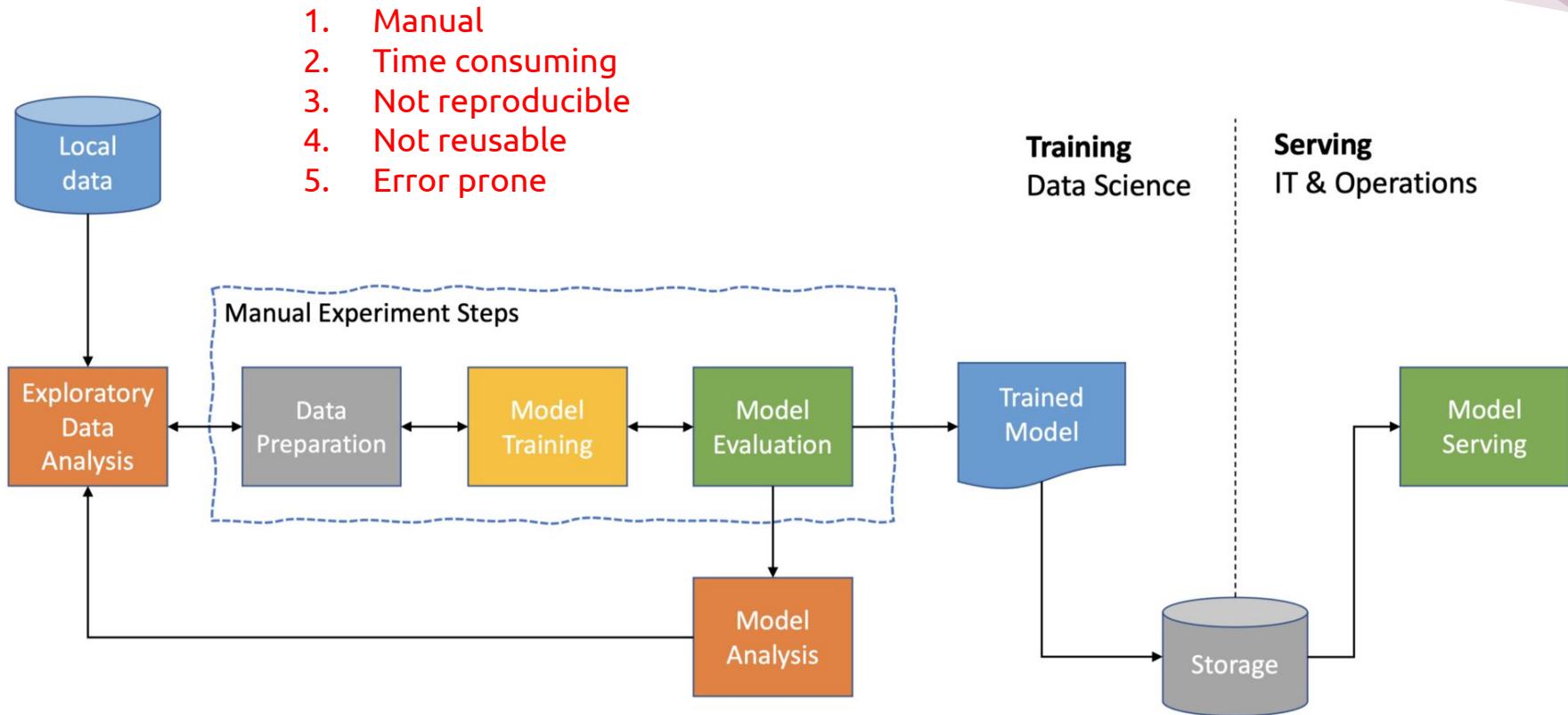
Low-touch

MicroK8s

Charmed Kubeflow



Most data scientists are doing this today



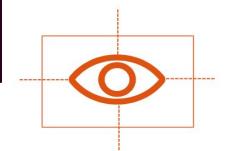
Problem - High technical debt!

80% of Data Science efforts
is **NOT** Data Science



[1] [Hidden Technical Debt in Machine Learning Systems](#)

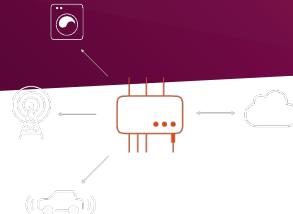
Project types



Computer vision



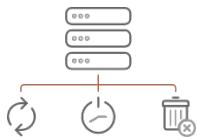
NLP



IoT analytics



Stream and batch processing



Recommender systems



Video analytics



Behavioral analysis



Bots and RPA



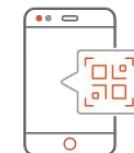
Self-driving cars



Industry 4.0



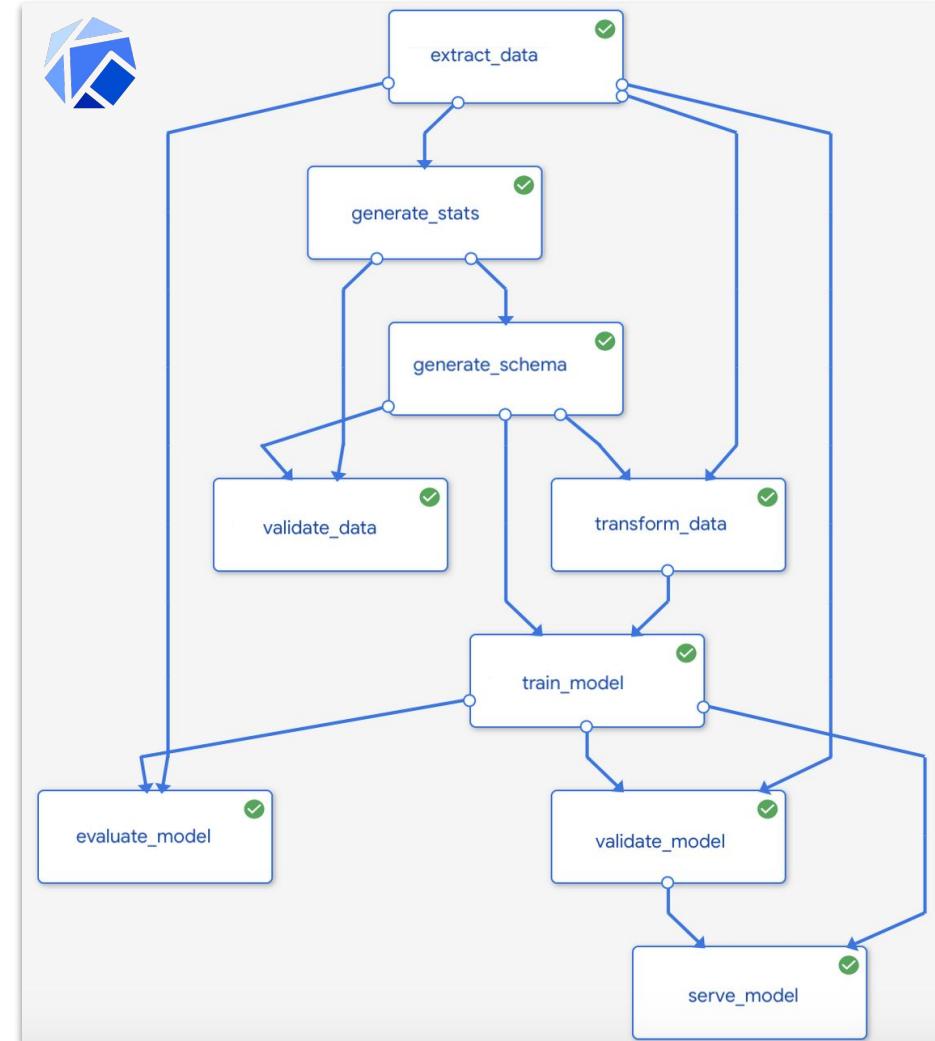
Smart cities



Augmented reality

Kubeflow Pipelines

1. Package each ML step into a container
2. Define inputs & outputs of each step
3. Choose global input parameters
4. Run pipeline
5. Hyperparameters tuning
6. Deploy model and serve service



Charmed Kubeflow



Kubernetes

Azure

AWS

GCP

Own Cloud

HPC / GPU



Demo Time

GitHub Link

<https://github.comcanonical/TWKubeSummit2022>

SSID: Canonical via KlickKlack

PW: K8s608Canonical

Workshop

01

MicroK8s Installation

- VM for Ubuntu
- Microk8s snap installation
- Juju bootstrap

02

Kubeflow Installation

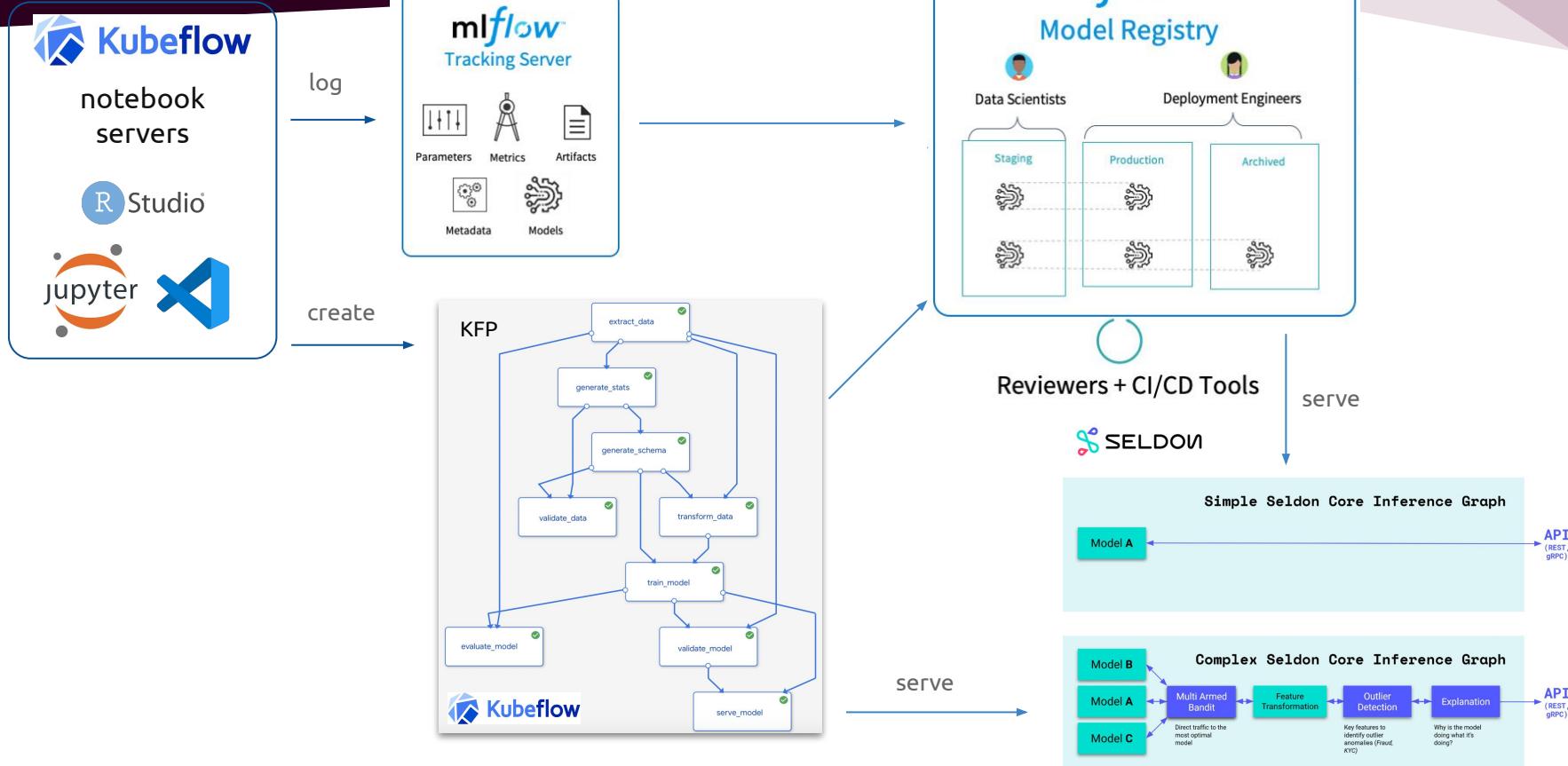
- Kubeflow installation
- MLflow installation

03

Application

- Red Wine
- [kaggle source](#)

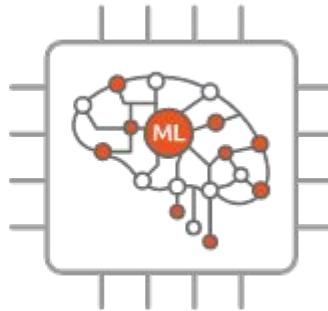
Kubeflow + MLFlow + Seldon



Key Takeaways



Kubeflow



Juju

Charmed-Kubeflow

- MLOps platform for any cloud

Juju

- Cloud Orchestration

MicroK8s

- Lightweight Kubernetes, zero-ops

MicroK8s



We are hiring



DevOps Engineer

HOME BASED - WORLDWIDE

This role is open to recent graduate software professionals as well as candidates with some professional product software engineering and site reliability experience who want to join a global community of like-minded engineers.

Help us shape the future of open source IT, devops, and IS, from bare metal to containers. Our goal is to revolutionise open source application and infrastructure operations.

<https://canonical.com/careers/3290946/devops-engineer-remote>

填寫問卷兌換獨家贈品



Questions?

Email

- eric.chen@canonical.com
- james.lin@canonical.com

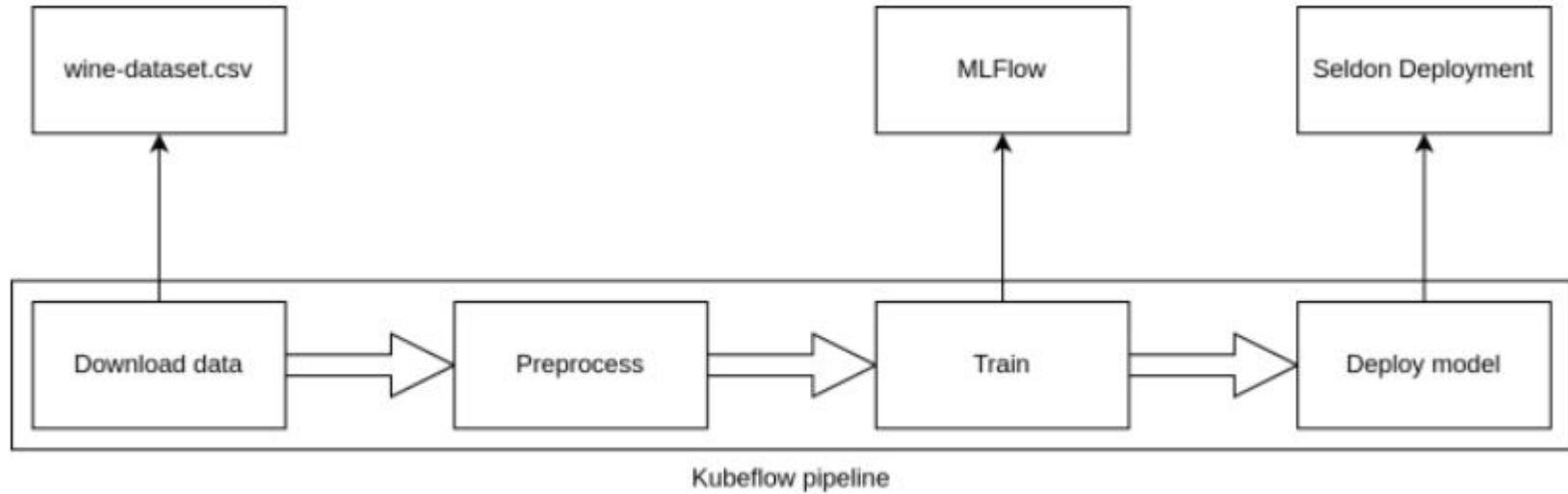


Thank you. Questions?



Backup Slide

Introduction to MLOps Pipelines



MLOps pipeline with external tool integration

MLOps pipeline



MLOps tools



Kubeflow

mlflow™



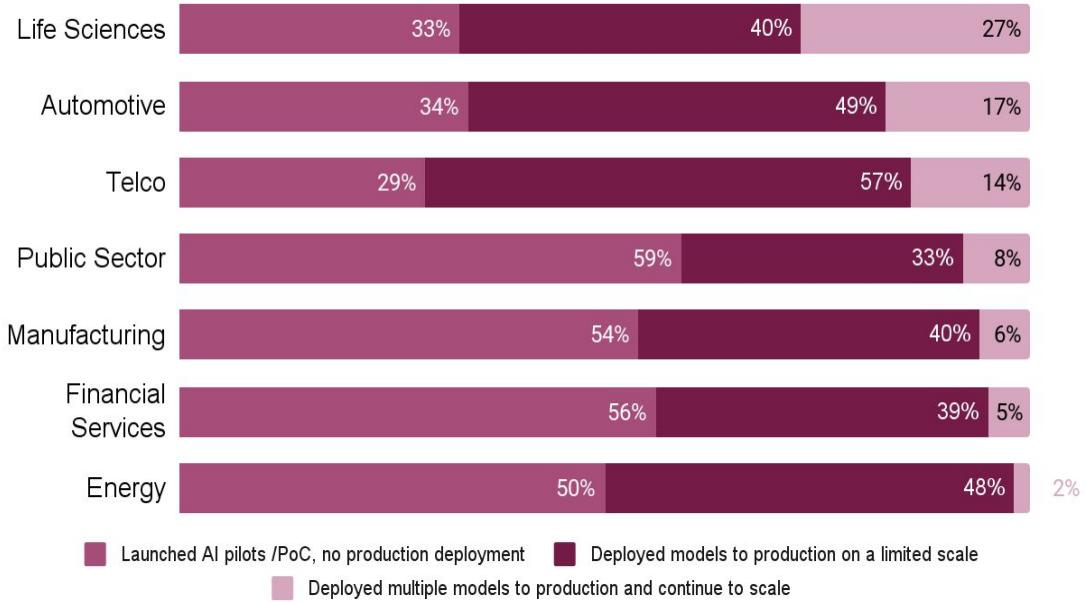
MINIO



SELDON

Market size and trends

AI implementation maturity by sector



1 in 4

companies are adopting AI because of labor or skills shortage.

1 in 5

companies are adopting AI because of environmental pressure



Charmed Kubeflow versioning

Charmed Kubeflow version	Release date	Kubernetes version
1.6	7 September 2022	1.22, 1.23, 1.24
1.4	30 June 2022	1.21

Why enterprises should choose Canonical?



Use existing hardware to its fullest extent

With latest kernel, drivers, scheduling mechanisms and optimized software



Reutilise the code to build best practices and architectures

Secure E2E tool chain



Build a data catalog at a company level

Discover data across multiple siloed departments to increase awareness and spark creativity



Optimise integrations on project

With many open source tools combined to add value to basic pipelines



Reduce operations

Juju allows to build secure, maintainable, automated infrastructure



Deliver projects faster

Get started on AI/ML quickly, having everything ready from lab to production



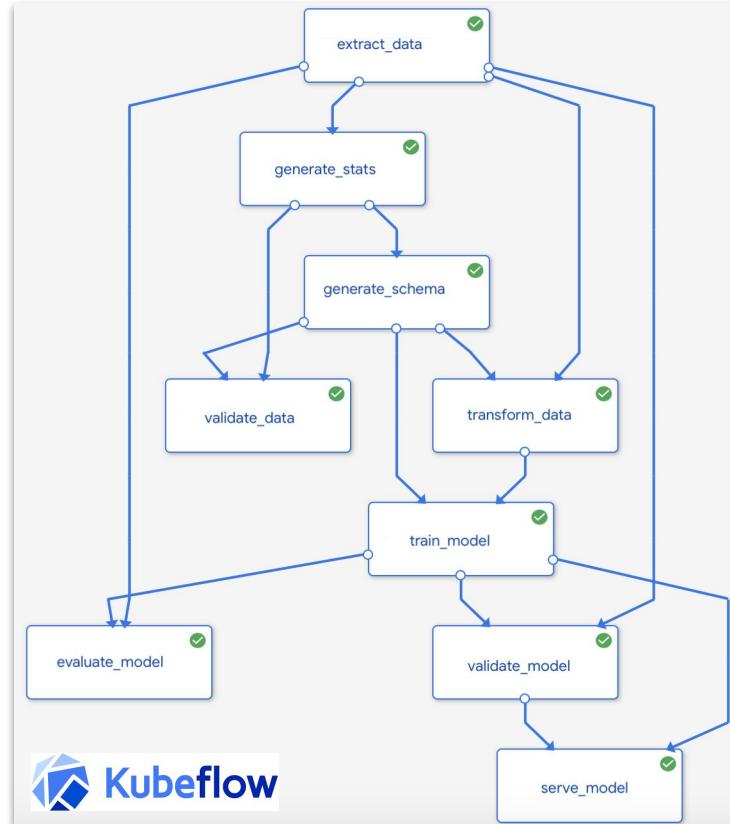
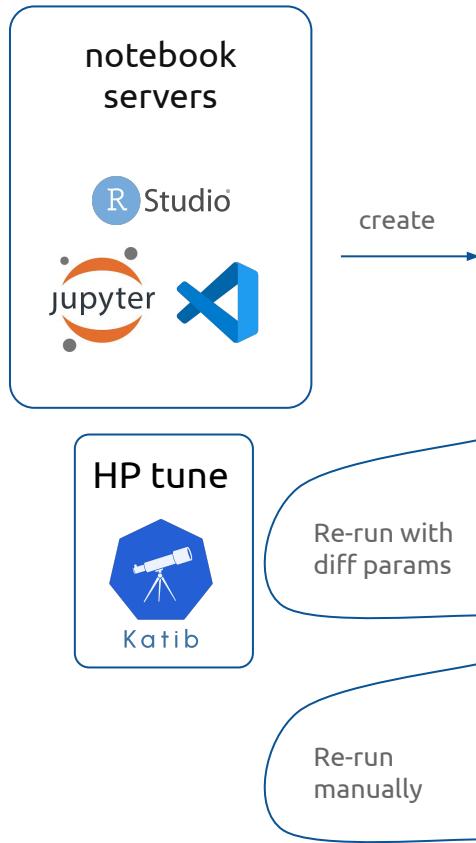
CHARMED KUBEFLOW

- AI/MLOps across **any cloud** and **on-premise**
- Learn once, work anywhere
- You keep your data
- 24/7 support available
- Free, open source software
- Built for Kubernetes
- Download for free

THE CHARMED KUBEFLOW ECOSYSTEM

- Integrated operational automation based on Canonical Juju
- Growing ecosystem of Canonical supported open source solutions
 - Seldon Core inference server
 - KNative serverless runtime
 - MLFlow model registry & metrics
 - Apache Spark big data processing
 - Apache Kafka streaming data hub
 - ...many more coming

Kubeflow lifecycle



compare

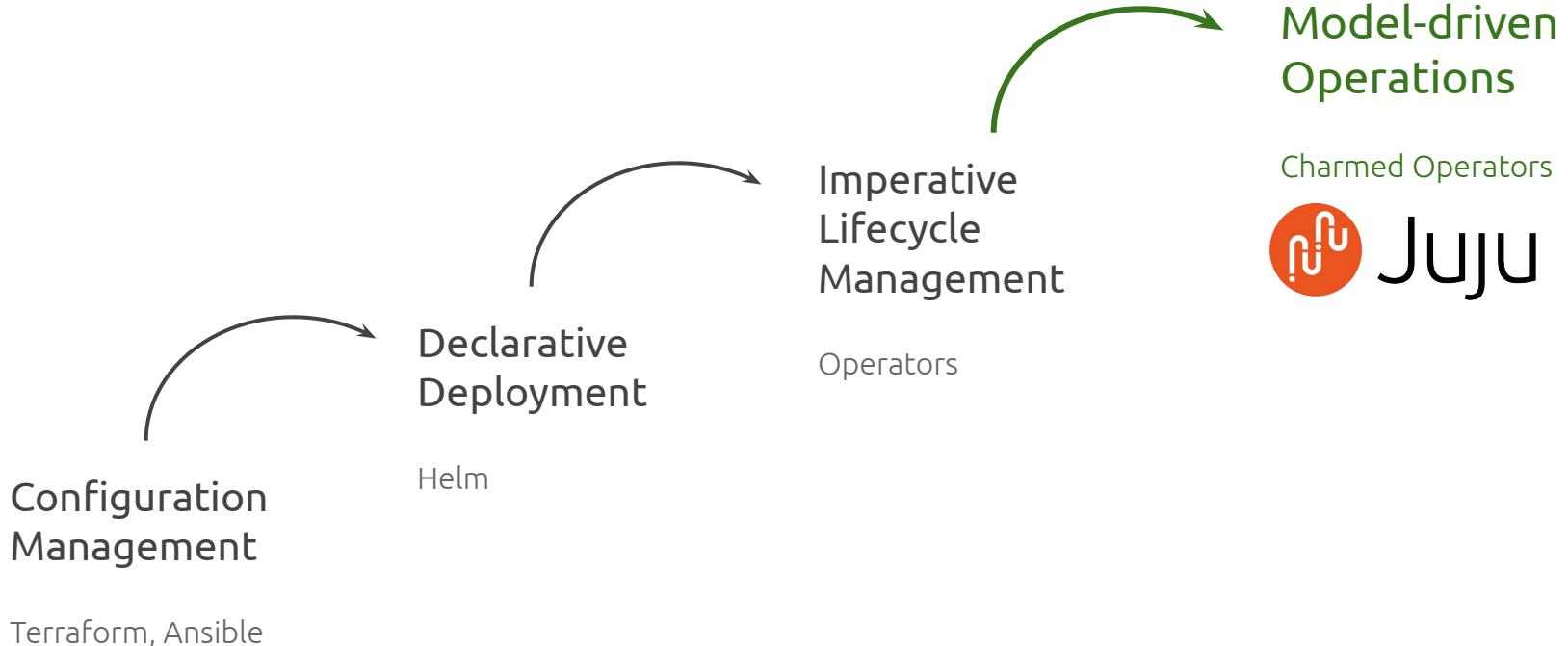
Runs list

Run name	Status	Duration	Pipeline Version	Recurring Run	Start time	Last accuracy
dog breed kubf-cf23af0db	green	0:08:07	dog-breed-g70h	-	06/05/2020, 18:08:26	98.23%
dog breed kubf-cf35d5b94	green	0:07:45	dog-breed-g70h	-	06/05/2020, 18:09:12	98.31%
dog breed kubf-cf35d513e	green	0:08:39	dog-breed-g70h	-	06/05/2020, 17:57:00	98.31%
dog breed kubf-cf39210f	green	0:08:24	dog-breed-g70h	-	06/05/2020, 17:41:48	98.23%
dog breed kubf-cf39210f	green	0:08:55	dog-breed-g70h	-	06/05/2020, 17:34:06	98.34%
dog breed kubf-cf430d5e	green	0:08:55	dog-breed-g70h	-	06/05/2020, 17:26:54	98.34%
dog breed kubf-cf4378502	green	0:08:50	dog-breed-g70h	-	06/05/2020, 17:20:54	98.34%
dog breed kubf-cf45020dc	green	0:07:44	dog-breed-g70h	-	06/05/2020, 17:16:41	98.4%
dog breed kubf-cf45020dc	green	0:07:37	dog-breed-g70h	-	06/05/2020, 17:10:29	98.3%
dog breed kubf-cf45450f1	green	0:08:19	dog-breed-g70h	-	06/05/2020, 17:03:47	98.2%
dog breed kubf-cf45710ee	green	0:08:18	dog-breed-g70h	-	06/05/2020, 16:57:05	98.3%
dog breed kubf-cf460f174f	green	0:07:05	dog-breed-g70h	-	06/05/2020, 16:49:23	98.4%
dog breed kubf-cf460f174f	green	0:07:37	dog-breed-g70h	-	06/05/2020, 16:42:11	98.4%
dog breed kubf-cf460f174f	green	0:08:11	dog-breed-g70h	-	06/05/2020, 16:36:30	98.4%
dog breed kubf-cf463f87e1	green	0:05:01	dog-breed-g70h	-	06/05/2020, 16:20:47	98.34%
dog breed kubf-cf4655023	green	0:05:40	dog-breed-g70h	-	06/05/2020, 16:24:35	98.2%
dog breed kubf-cf467fa202	green	0:05:18	dog-breed-g70h	-	06/05/2020, 16:18:53	98.2%

Runs per page: 20 < > < >

Why Juju?

“How can we improve operators?”



Object-oriented operations

Object-oriented programming

Classes

Objects

Variables

Methods

Object-oriented operations

Charms

Applications

Config options

Hooks and actions

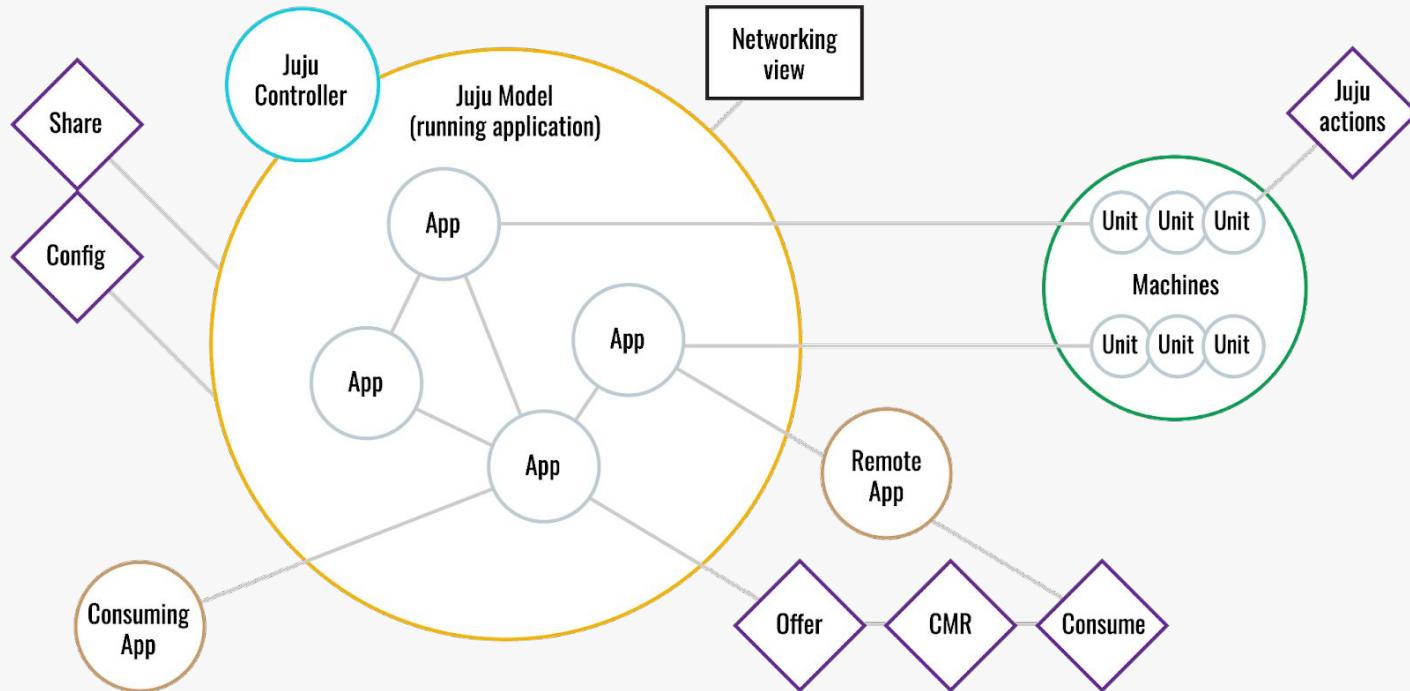
We already use packaged software
Why not to package operations software?

App domain knowledge, distilled into code

Application code is open source.

Why not share the operations code too?

Juju structure





Charmhub.io, the Juju store [link](#)

The screenshot shows the Charmhub homepage with a dark blue header. The header includes the Juju Charmhub logo, navigation links for About, Blog, Learn, Contribute, and a search bar. Below the header, a large banner reads "Take control of hybrid cloud" and "The Charmed Operator Collection". A sub-banner below it says "Take control of your applications and infrastructure across hybrid cloud, Kubernetes (K8s) and VM environments. Deploy, integrate and manage your way beyond configuration management to application management. Charmed Operators (Charms) use Juju, the Charmed Operator Framework. They're broad, they're powerful and they're Open Source (unless you choose otherwise)". On the left, there's a sidebar with a "FILTERS" section containing checkboxes for various categories like AI/ML, Big Data, Cloud, Containers, Databases, Logging and Tracing, Monitoring, Networking, Security, and Storage. The main content area displays a grid of 17 featured charms, each with a thumbnail, name, author, and a brief description. The charms shown are: Hello, Kubecon! (Jon Seager), Nginx Ingress Integrator (Tom Haddon), Mongdb K8s (Balbir Thomas), Elasticsearch K8s (Jeremy Lounder), Graylog K8s (Jeremy Lounder), Prometheus K8s (Balbir Thomas), Alertmanager K8s (Dylan Stephan-Shachter), and Grafana K8s (Jose).

The screenshot shows the detailed view of the Elasticsearch K8s charm. At the top, it has the Juju Charmhub header and a "stable 1" status with a deployment command: "juju deploy.elasticsearch-k8s 0". A warning message states: "⚠ You will need Juju 2.9 to be able to run this command. Learn how to upgrade to Juju 2.9." Below the header, there are tabs for Overview, Docs, Libraries, Configure, and Actions. The Overview tab is selected. It contains sections for "About" (describing it as a distributed search and analytics solution), "Description" (mentioning it uses Elasticsearch), "Discuss this charm" (a button to share thoughts), and "Setup" (instructions to increase virtual memory areas). Below these are command-line snippets: "sudo sysctl -w vm.max_map_count=262144" and "For a more permanent change edit /etc/sysctl.conf..". The "Install Dependencies and Build" section includes commands: "To build the charm, first install charmcraft, juju and microk8s" and "snap install charmcraft".

On the **Charmhub**, users can browse both **Charms** and **Bundles** with a UX similar to Snapcraft.io: changing tracks and channels in the channel map, getting detailed information and the command to deploy with Juju.

Juju lifecycle

State Diagram

- A-charms-life
 - Setup & teardown phases
- [juju/worker/uniter/charm/charm.go](#)

