What's in the Pipeline for Tekton

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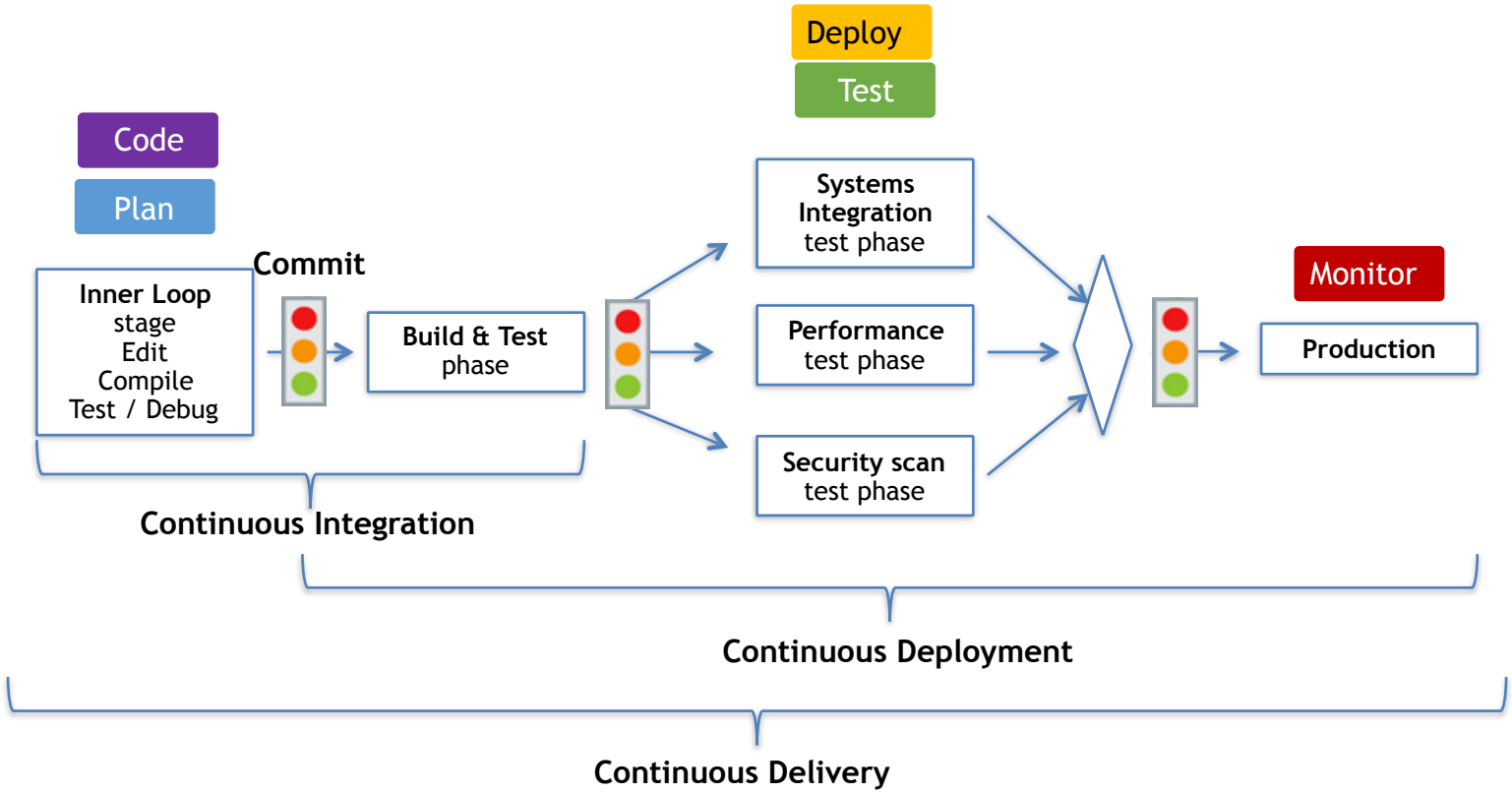
IBM Cloud DevOps

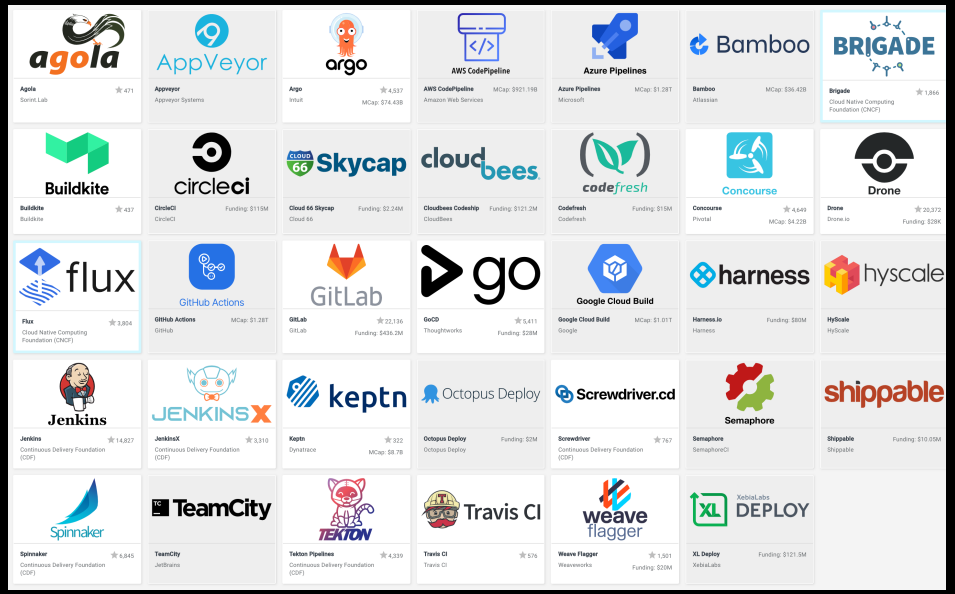
think
Digital
Event
Experience

IBM

CI/CD: Continuous Integration & Deployment



CI/CD tool considerations



Scope – CI vs. CD?

Who manages?

Where to run? Capacity?

How to organize artifacts?

Abstraction? Re-use?

Who gets to change process?

Key features?

Skills?

Continuous Delivery Foundation

https://cd.foundation/

CDF believes in the power of Continuous Delivery to **empower** developers and teams and to produce **high quality** software more **rapidly**

CDF believes in the **open-source** solutions collectively addressing the whole SDLC

CDF fosters and sustains the ecosystem of open-source, **vendor neutral** projects through **collaborations** and **interoperability**

CD.FOUNDATION

Jenkins

JenkinsX

Spinnaker

TEKTON

Tekton

Set of shared, open source components for building CI/CD systems

Builds on Kubernetes with CRDs for declaring CI/CD pipelines,
formerly known as “Knative Build” and “Knative build-pipelines”

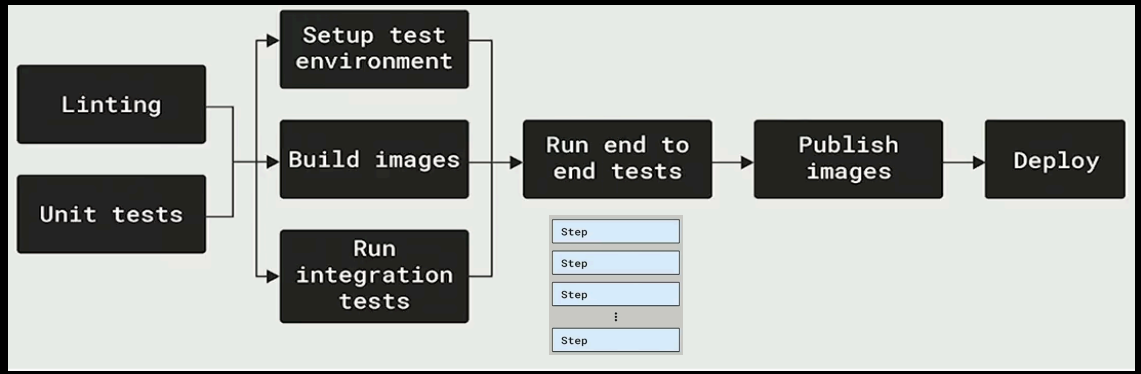
Contributors from IBM, Google, Red Hat, and more

Pipelines beta in April! (Other components, e.g. CLI and Dashboard, still alpha)

Already in use in commercial and open source projects, including:

- IBM Cloud Continuous Delivery
- RedHat Open Shift Pipelines
- Jenkins X
- Project Nebula (Puppet)
- Kabanero (IBM-led open source)
- Rio (Rancher-led open source)
- Kf (Google-led open source)

https://tekton.dev/



Why Tekton matters?

- True open source solution governed by Continuous Delivery Foundation under Linux Foundation
- Standardization of terminology, pipeline definition, common pipelines
- Pipeline portability across clouds and vendors
- Fosters ecosystem of common pipelines and tasks, e.g. tool integrations, compliance process
- Builds on Kubernetes concepts and ecosystem

- Modern features you'd expect
  - Pipeline-as-code
  - Parallel workflows
  - Container isolation
  - Leverages K8s

Tekton definitions: Steps, Tasks, Pipelines

Step

Basic building block

A step is a container spec

It is a container image with everything needed to run it

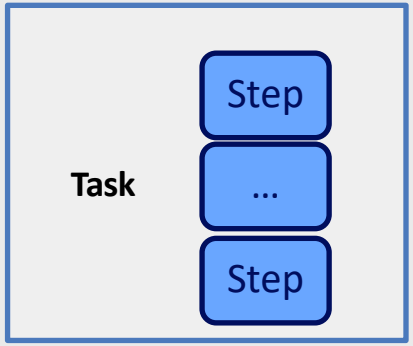
- Environment variables
- Arguments
- Volumes

…

Task CRD

Steps are put together to make up a Task

The steps are run in sequential order on the same Kubernetes node



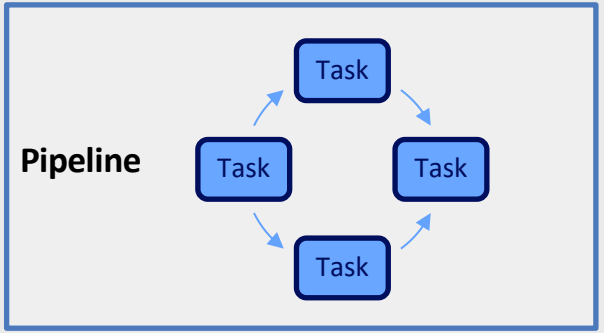
Pipeline CRD

Tasks are put together to make up a pipeline

Pipelines express the order of the Tasks

Tasks can be run sequentially, concurrently, on different nodes

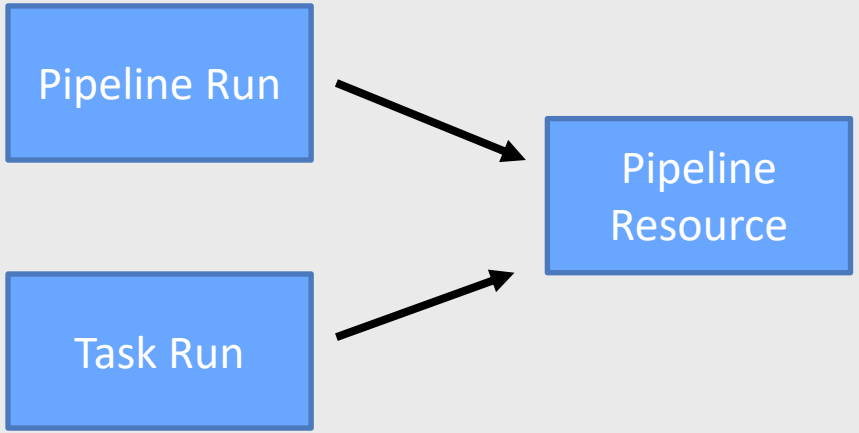
With pipelines you can connect the outputs of one task with the inputs of another



Tekton runtime resources

- **PipelineRuns** and **TaskRuns** are instances of Pipeline and Task executions
  - Provide context
  - Capture results

- **PipelineResource*** contains runtime information required to run the pipelines and tasks



Tekton example

Pipeline.yaml

```yaml
apiVersion: pipeline.knative.dev/v1alpha1
kind: Pipeline
metadata:
name: simple-pipeline
spec:
resources:
- name: source-repo
type: git
- name: image-name
type: image
tasks:
- name: build-simple
taskRef:
name: build-push
resources:
inputs:
- name: docker-source
resource: source-repo
outputs:
- name: builtImage
resource: image-name
- name: deploy-simple
taskRef:
name: deploy-simple-kubectl-task
resources:
inputs:
- name: git-source
resource: source-repo
- name: image-out
resource: image-name
- name: print-endpoint
taskRef:
name: print-endpoint-task
resources:
inputs:
- name: git-source
resource: source-repo
```

Tasks called

print-endpoint-task.yaml (Task defined)

```yaml
apiVersion: pipeline.knative.dev/v1alpha1
kind: Task
metadata:
name: print-endpoint-task
spec:
inputs:
resources:
- name: git-source
type: git
steps:
- name: print-endpoint
image: ubuntu
command: [/bin/bash]
args: ['-c', 'if [ -f /workspace/git-source/echo.sh ]; then
/workspace/git-source/echo.sh; fi']
```

Steps are “just containers and parameters”

IBM Cloud: Delivery Pipeline

Cloud-native CI/CD built upon Tekton

- Tekton open source from Continuous Delivery Foundation with contributions from IBM, Google, Red Hat, et al
- Kube-native Pipelines, Tasks, Runs, etc

Pipeline-as-Code

- Defined in yaml like other K8s resources
- Participate in normal Git workflow – cloning, branching, pull (merge) requests, etc.
- Portable standard

Steps isolated in their own containers

- IBM provides curated image with common CLIs, SDKs, tools
- Bring your own image with your tools
- Parallel workflow, joins supported

Rich trigger support

- On git commits, pull requests, manually, specific times, generic webhooks, …

Managed Pipeline Workers

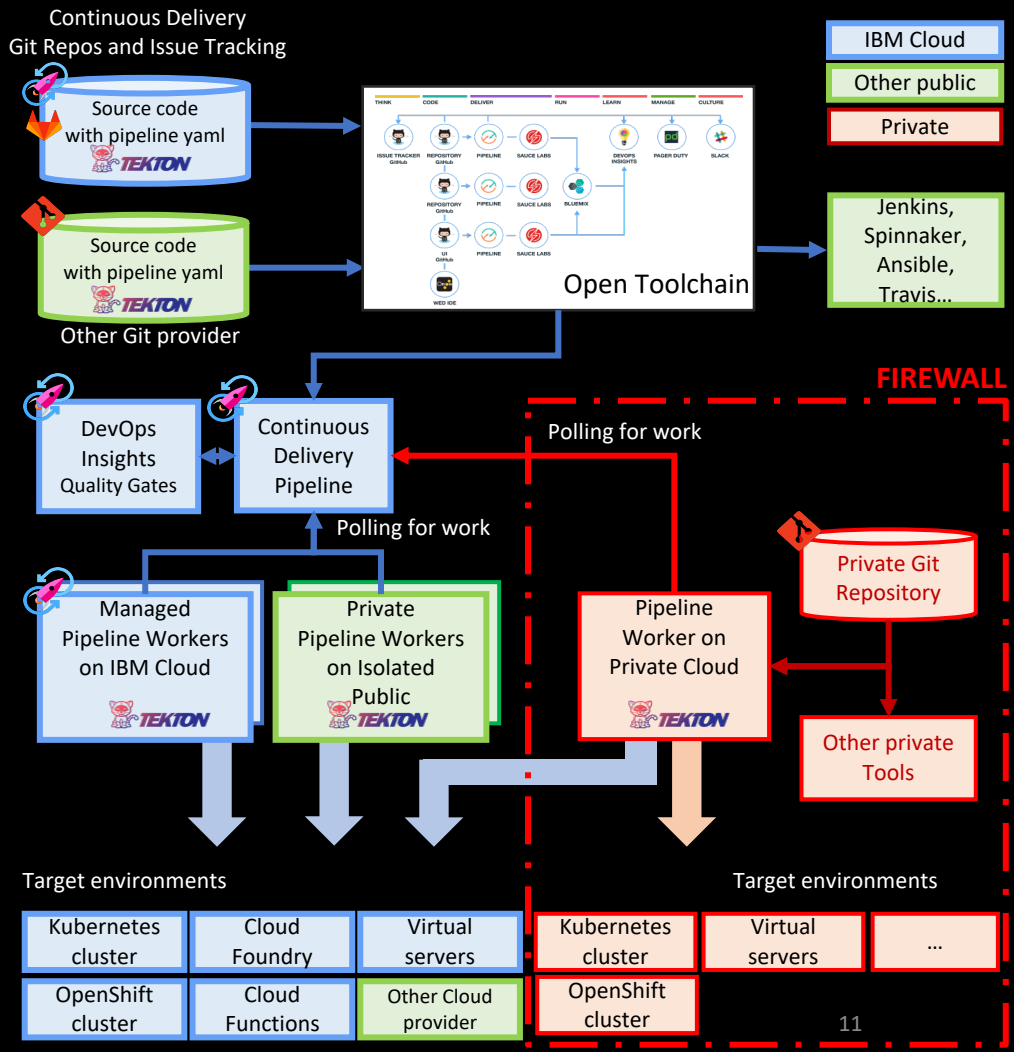
- Fully managed by IBM on IBM infrastructure
- Included with CD service with some limits (max 60 minutes per job, Lite plan limited to 500 jobs per month)

Private Pipeline Workers

- Poll the CD service – no inbound traffic
- Easy to setup on customer K8s infrastructure
- Run on specific clusters (e.g. Open Shift) and networks (e.g. behind a firewall)
- Allocate bigger workers, for faster execution
- Allocate more workers, for reduced queuing
- No execution time limits

Develop on Cloud Public *Run anywhere*

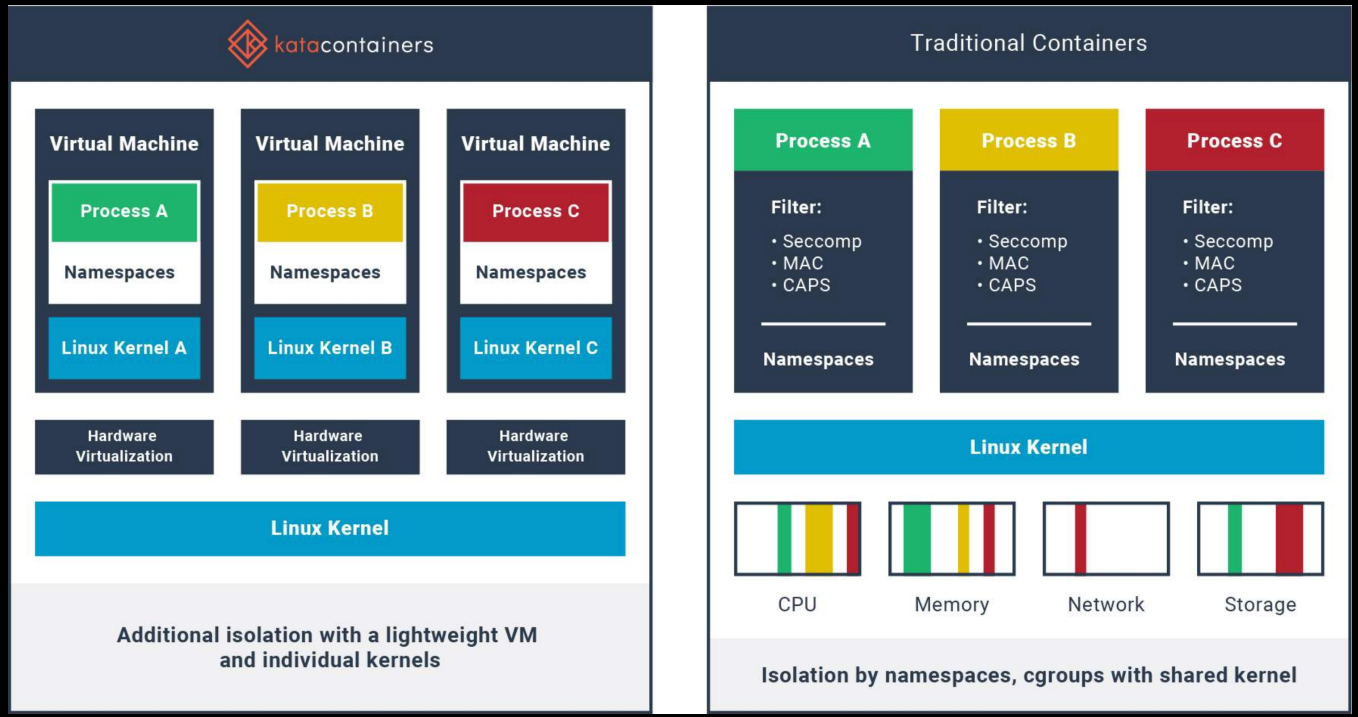
- Don’t assume development can’t use public cloud tools just because prod is on private
- Dev & test environments can benefit from public cloud regardless of where prod is deployed
- IBM Cloud Continuous Delivery toolchains can reach any compute targets in IBM Cloud (incl. across regions) or other cloud providers
- Reach private or local targets using private pipeline workers (either for build, test or deploy)
- Define pipeline as code using Tekton open standard. Tekton as a service with managed pipeline workers.
- Toolchains can be templated and integrate with existing DevOps tools deployed by customers
- Speed with control, using Insights quality gates and traceability across toolchains



Managed worker isolation: Kata Containers

Kata Containers are as light and fast as containers and integrate with the container management layers — including Kubernetes — while also delivering the security advantages of VMs.

https://katacontainers.io/



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IBM Cloud Continuous Delivery

Git Repos and Issue Tracking

- Git repositories
- Modern Git workflow
- Merge requests
- Issue boards

Based on GitLab CE

Delivery Pipeline

- CI/CD
- Easy setup
- Deploy to any cloud
- Build pull requests
- Our container image or your own
- Private/Managed pipeline workers

New!: Tekton

Eclipse Orion WebIDE

- IDE in a browser
- Code completion
- Refactoring
- Git client

Based on Eclipse Orion

DevOps Insights

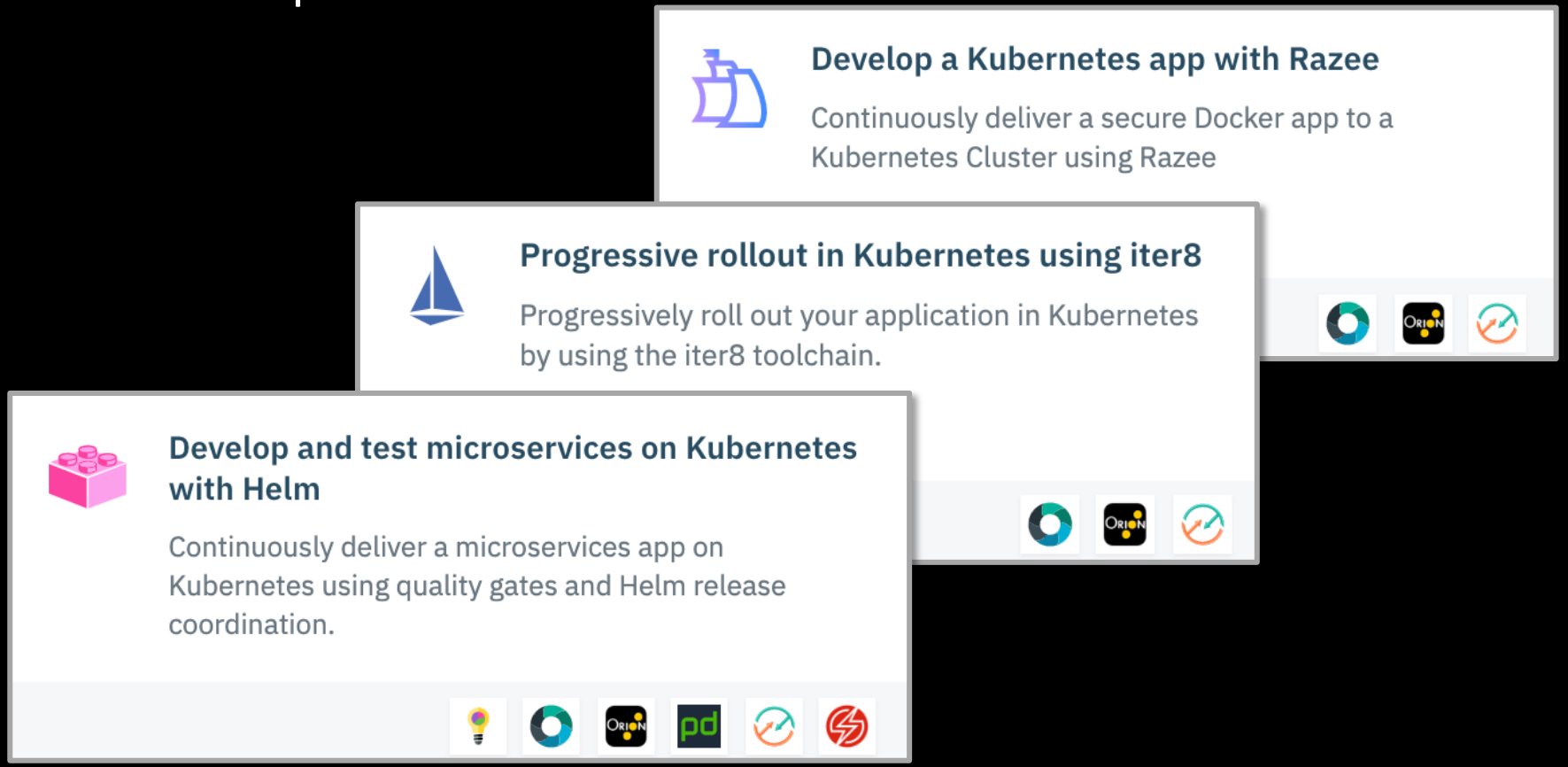
- Collect quality data
- Establish policies
- Implement gates
- Analyze trends

Open Toolchain

- Setup new projects quickly
- Integrate IBM and third-party tools
- Reproduce best practices with templates
- Access tools in one place

https://www.ibm.com/cloud/continuous-delivery

Toolchain templates



IBM Cloud DevOps

Integrated Cloud Experience

Available Worldwide

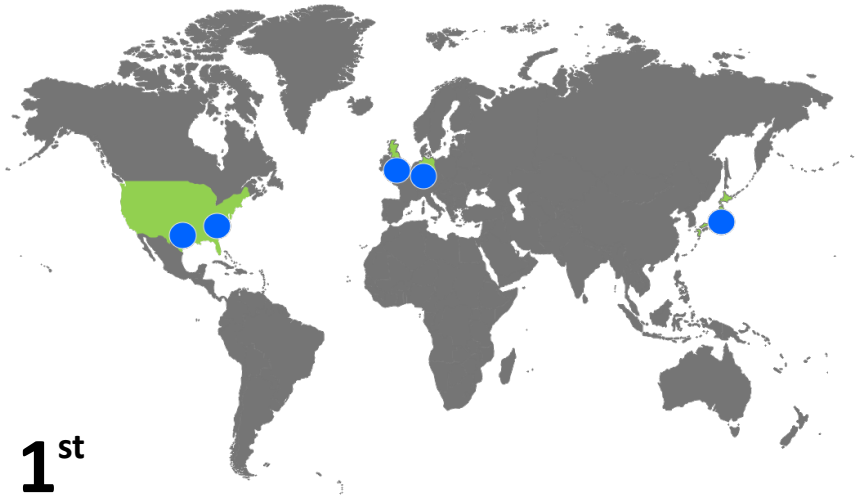
- US South (Dallas), US East (Washington, DC), Frankfurt (EU-managed), London, Tokyo
- Integrated with Identity Access Management

Security

- Regional data isolation
- Security - auditing, data encryption in motion and at rest, continuous vulnerability scanning including QRadar for application logs
- Compliance: ISO27K, GDPR, EU-managed, SOC2
- Backup in geo - encrypted and GDPR compliant

Reliability

- Rearchitected on Kubernetes in 2018 for Increased Reliability - exploits 3 availability zones per region for HA (MZR)



1st

cloud provider to deliver hyper-data protection & commit to GDPR compliance

170+

services with public, private & local models

60+

IBM Cloud data centers across 18 countries & 5 continents

ONE

Cloud Architecture

running Watson, Data, IBM Z, Blockchain

1,900

Cloud –technology patents granted in 2017 to IBM

IBM Cloud: The most open and secure public cloud for business

Open innovation

- API services that are cloud delivered applications
- Kubernetes on IBM Cloud™: 1,000-plus clients, 19,000-plus clusters in production
- Major contributor to cloud-native open source work: Istio, Knative, Razee and more

Security leadership

- Highest compliance for data encryption
- Configurable so that even IBM cannot see your data
- Edge-to-cloud threat management with security integration from IBM

Enterprise grade

- #1 VMware public cloud with 2,000 clients
- Cloud migration for IBM Power® AIX®, IBM i, IBM Z®, SAP and mission-critical applications
- Broadest portfolio of compute instances, including Power and x86

World's first financial services-ready public cloud with Bank of America

Good Design Award for VPC

Good Design Award for IBM API Connect®

Customer Choice Award for Cloud IaaS

Stratus Award for User Experience

Highest level of encryption
FIPS 140-2 Level 4

Isolation for cloud native
ROKS and containers on bare metal

Enhanced availability SLAs
HA: 99.99%, Non-HA: 99.9%

Higher SLA payouts versus market
25% of monthly at 60 minutes

No-cost bandwidth between regions
Significantly lower TCO

Audit transparency to bare metal
Traceable serial number compliance

Full control to bare-metal level
Full admin control of compute

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Thank you

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