



# Scaling Pipelines with Tekton

---

Andrea Frittoli  
Developer Advocate  
[andrea.frittoli@uk.ibm.com](mailto:andrea.frittoli@uk.ibm.com)



# Scaling Tekton



Introduction  
Authoring  
Running  
Bottlenecks  
Q&A



# Introduction



Photo by Mike Benna, CC0



# Tekton is an open-source framework for creating CI/CD systems

Cloud Native  
Serverless,  
Scalable  
Pipelines



Standardization  
Built In Best  
Practices  
Maximum  
Flexibility

Core Projects  
➤ Pipeline  
➤ Triggers  
Tooling:  
➤ CLI *tkn*  
➤ Dashboard  
➤ Operator

Discovery:  
➤ Catalog  
➤ Hub  
Adds-on:  
➤ Results  
➤ Chains  
➤ Experiments

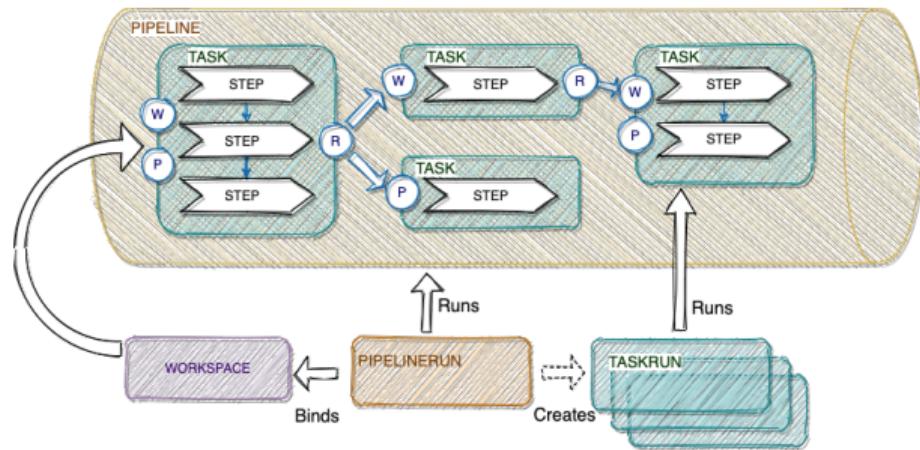


# A bit of history

- › From Knative Built, to Pipeline
- › Extend the k8s API with CRDs
- › Tekton and the CDF



- › Definitions: Step, Task, Pipeline
- › Bindings: Workspaces, Parameters, Results
- › Execution: TaskRun, PipelineRun



# Authoring



# Building Blocks



## Steps:

- Off the Shelves containers
- Small scripts

## Tasks:

- Solve one specific problem
- Owned by a team
- Distributed maintenance

## Reusability:

- Discovery
- Versioning
- Execution efficiency

# Catalog and Hub

## Discovery:

- › Kubernetes cluster
- › Tekton Catalog
- › Tekton Hub & API

## Versioning:

- › Tekton Bundles
- › Bundles CLI

## Execution efficiency:

- › Task Specialization
- › Multiple Tasks in a Pod/Node

The screenshot shows the Tekton Hub interface. At the top, there's a search bar with 'build' and a 'Login' button. Below it, a banner says 'Welcome to Tekton Hub' and 'Discover, search and share reusable Tasks and Pipelines'. The main area has a sidebar with filters for 'Kind' (Task), 'Catalog' (Tekton), and 'Category' (Automation, Build Tools, CLI, Cloud, Deploy, Editor, Git, Image Build, Language, Messaging, Monitoring, Notification, Others, Security, Storage). A 'Sort By' dropdown is set to 'Rating'. The tasks listed are:

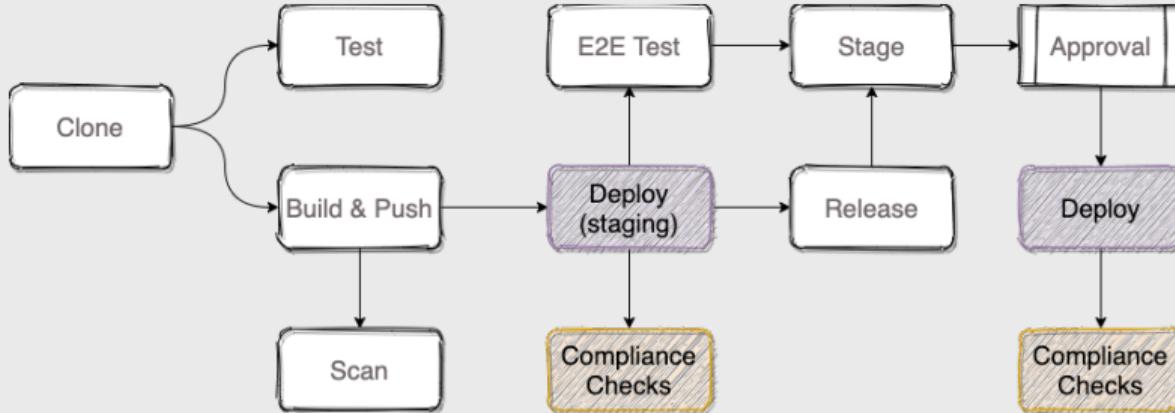
- buildid** v0.1 ★ 3: Given a base version, this task generates a unique build id by appending the base-version to the current timestamp. Updated 3 months ago. Tagged as 'Build-tools'.
- buildah** v0.2 ★ 4: Buldah task builds source into a container image and then pushes it to a container registry. Buldah Task builds source into a container image using Project Atomic's Buildah build tool. Updated 3 months ago.
- buildkit** v0.1 ★ 0: This Task builds source into a container image using Moby BuildKit. Updated 3 months ago.
- buildpacks** v0.2 ★ 5: The Buildpacks task builds source into a container image and pushes it to a container registry. Updated 3 months ago.
- golang-build** v0.1 ★ 5: The Golang-build task performs git operations. It can clone, pull, push, and commit code. Updated 3 months ago.

A detailed view of the 'buildpacks' task is shown at the bottom right, displaying its YAML configuration:

```
name: "git-clt"
catalog: {
  "id": 3,
  "name": "tekton",
  "type": "community"
}
kind: "Task"
LatestVersion: {
  "version": "v0.2"
}
tags: [
  {
    "id": 16,
    "name": "git"
  }
]
rating: 5
...
id: 41
name: "golang-build"
catalog: {
  "id": 1,
  "name": "tekton",
  "type": "community"
}
kind: "Task"
```



# Pipelines



Building block?

Supported by  
the catalog

Swap a block

Add a branch

Different:

- Team
- Access
- Namespace
- Cluster

One workflow.

How can we  
connect the  
parts?



# Running



Photo by Ray Bilcliff, CC0



# Triggers

Run Pipelines on Events:

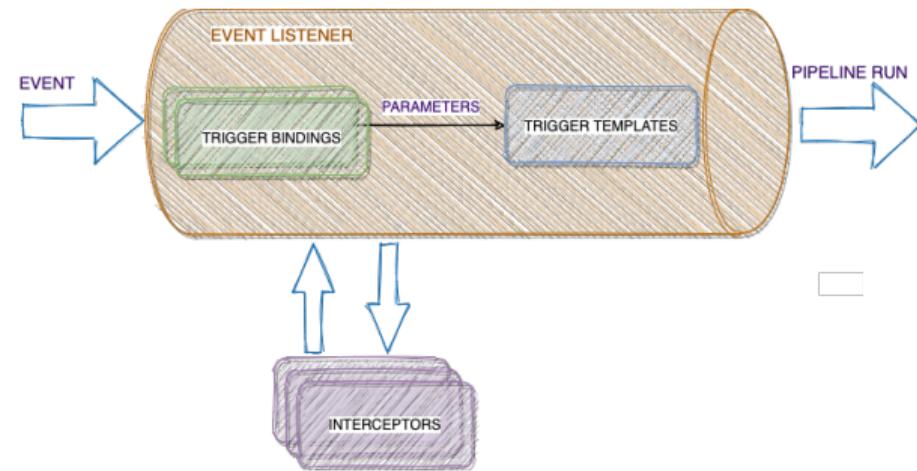
- › HTTP POST
- › Pull Request, Image Published

Components:

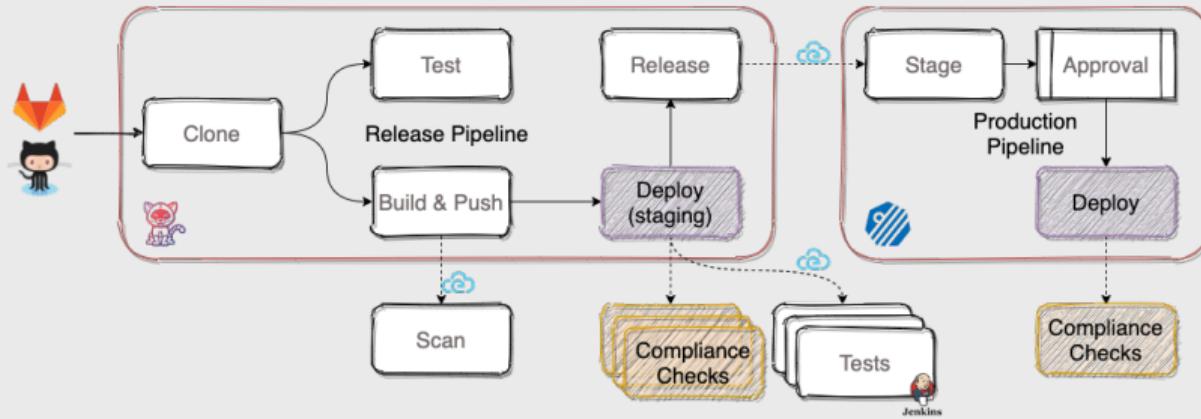
- › Receive: Event Listener
- › Filter: Interceptors
- › Run: Binding and Templates

Generate Events:

- › k8s and CloudEvents
- › Start, Run and Stop



# Events



Receiving and sending events

Composite Workflow

Separate Ownership

Dynamically add tasks

Reuse pipeline

Heterogeneous parts

*Issues:*  
Custom integrations  
Orchestration  
Visibility

Events in CI/CD  
Special Interest Group



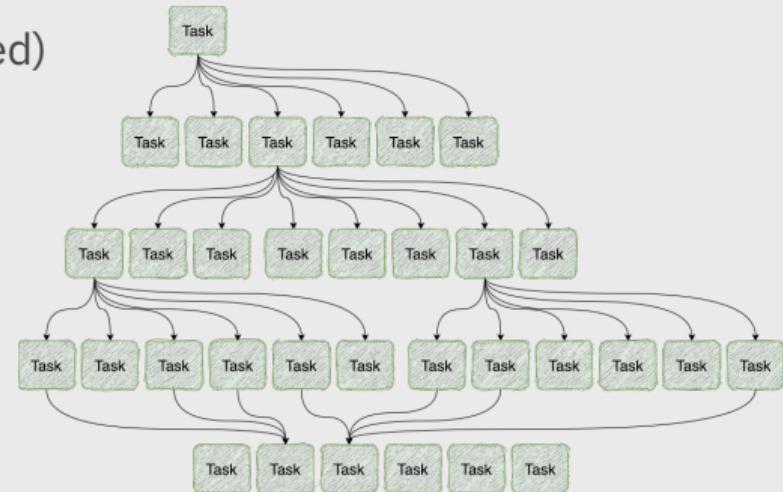


# Bottlenecks



# Growing pipelines

- › Directed Acyclic Graphs
- › Large Pipelines (100 nodes, densely connected)
- › Scale Issues?
- › DAG build on every reconcile
- › Suboptimal code in the DAG computation
- › Hundreds of nodes and connections



# Under Pressure

## Concurrent execution

- › Cluster Resources: K8s scheduler
- › K8s API: Informers
- › Tekton Controllers: LeaderElection

## In real life

- › Thousands Tasks/month upstream
- › Millions containers/month @IBM
- › Throttling (for security too)
- › Cluster pollution

## Potential enhancements:

- › Throttling pipeline execution
- › Tekton custom scheduler

## Upcoming features:

- › Tekton Results
- › Performance testing
- › Metric improvements



# Data and I/O

## *Reusability vs. Efficiency*

Common Tasks (→Pods):

- › Clone a git repository
- › Build a container image
- › Download content from storage
- › Run tests

## *Pods scheduled independently*

- › Shared storage required (PVC)
- › Extra I/O
- › Extra execution time

## *Data in Pipelines*

Meta: "Results", Large: "Workspaces"

Alternatives:

- › Multiple Tasks in a Pod
- › Re-usable Steps
- › Custom scheduler





# Thank You! Questions?

# References

- › Come and Join Us at Tekton!
- › Tekton community: [github.com/tektoncd/community](https://github.com/tektoncd/community)
- › Slides: [github.com/afrittoli/scaling\\_pipelines\\_with\\_tekton](https://github.com/afrittoli/scaling_pipelines_with_tekton)
- › Tekton: [tekton.dev](https://tekton.dev)
- › Tekton on GitHub: [github.com/tektoncd](https://github.com/tektoncd)
- › Tekton Results: [github.com/tektoncd/results](https://github.com/tektoncd/results)
- › Tekton Hub: [hub.tekton.dev](https://hub.tekton.dev)
- › Performance TEP: [TEP-0036](#)
- › Metrics TEP: [TEP-0006](#)

