

Scaling Pipelines with Tekton

Andrea Frittoli

Developer Advocate

andrea.frittoli@uk.ibm.com

Scaling Continuous Delivery (Virtual)



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
➤ Chain
➤ Experiments

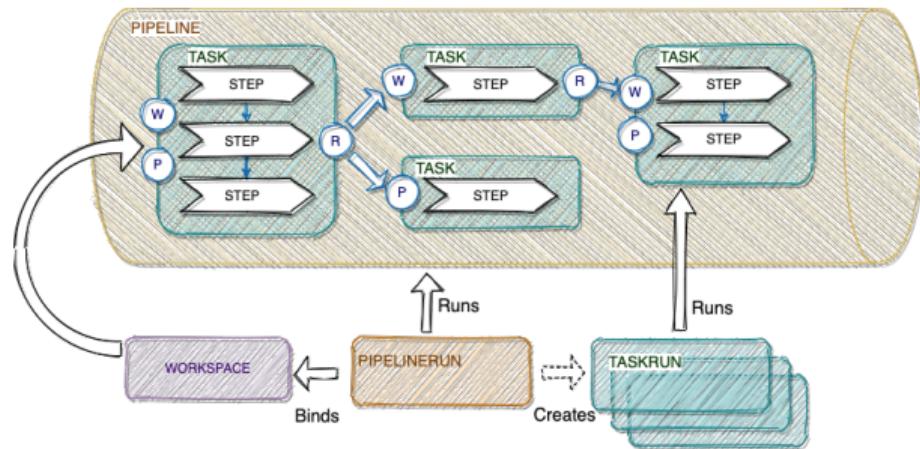


A bit of history

- › 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, Go, Image Build, Language, Messaging, Monitoring, Notification, Others, Security, Storage). A 'Sort By' dropdown is set to 'Rating'. The tasks listed are:

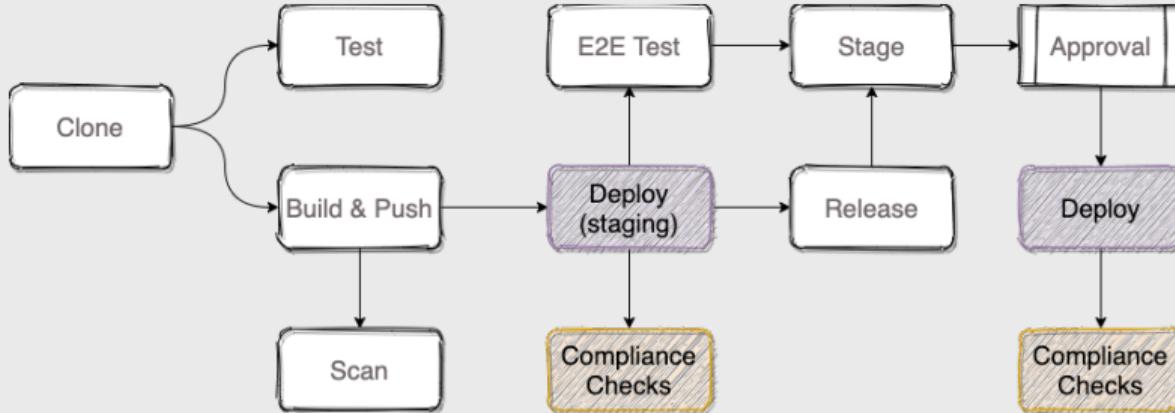
- buildid** v0.1 ★ 3: Given a base version, this task generates a unique build id by appending the base-version to the current timestamp. Updated 3 months ago. Tagged as 'Build-tools'.
- buildah** v0.2 ★ 4: Buildah task builds source into a container image and then pushes it to a container registry. Buildah 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.
- buildpacks-git-clt** v0.1 ★ 0: The Buildpacks Git Client task performs git operations. Updated 3 months ago.
- golang-build** v0.1 ★ 5: The Golang build task compiles Go code and performs git operations. Updated 3 months ago.

A modal window is open for the 'buildpacks' task, showing its detailed configuration and source code URL (<https://raw.githubusercontent.com/tektoncd/catalog/master/task/git-clt/v1/git-clt.yaml>). The modal also includes a snippet of the task's implementation:

```
  "spec": {
    "inputs": [
      {
        "name": "src",
        "type": "git"
      }
    ],
    "outputs": [
      {
        "name": "bin"
      }
    ]
  },
  "tags": [
    {
      "name": "v1"
    }
  ],
  "rating": 5,
  "id": 41,
  "name": "buildpacks-git-clt",
  "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:

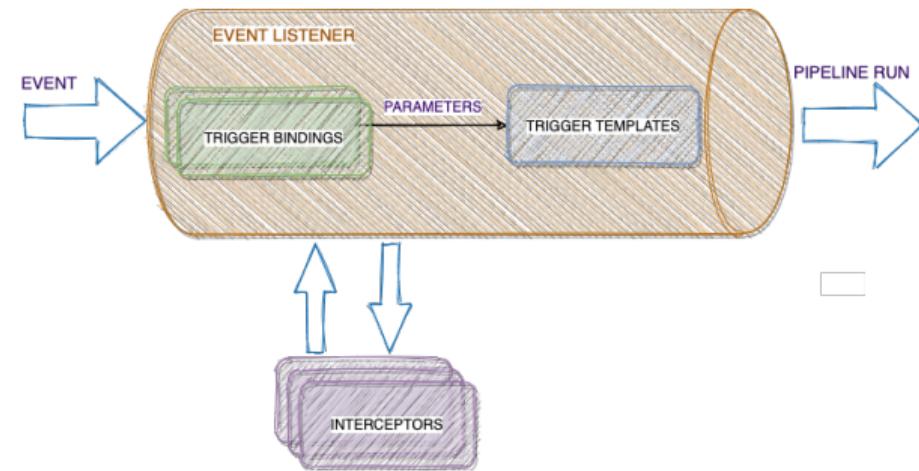
- › HTTP POST
- › Pull Request, Image Published

Components:

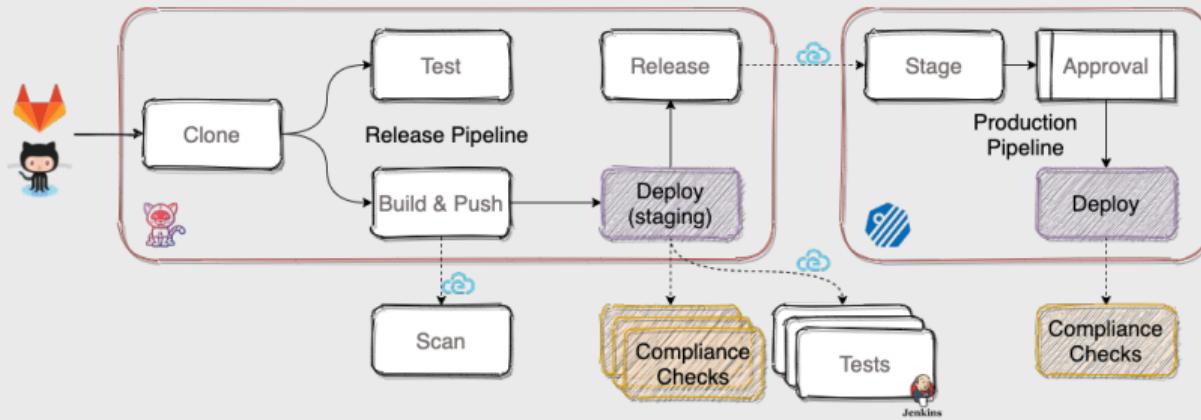
- › Receive: Event Listener
- › Filter: Interceptors
- › Run: Binding and Templates

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



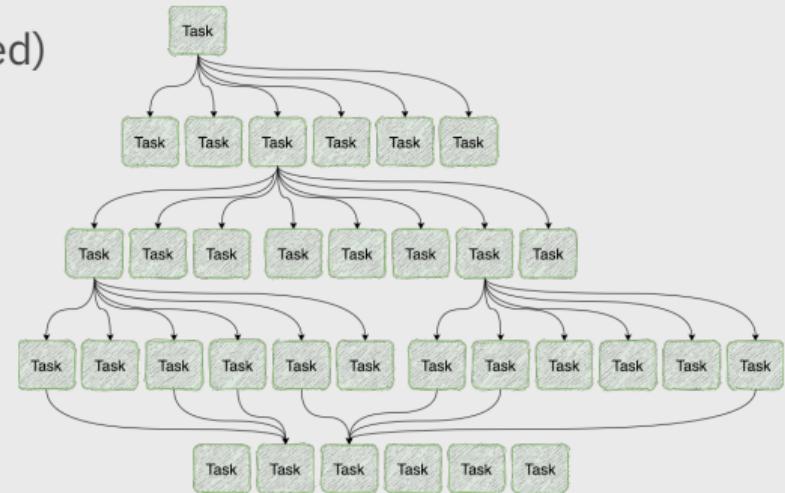


Bottlenecks



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
- › Slides: github.com/afrittoli/scaling_pipelines_with_tekton
- › Tekton: tekton.dev
- › Tekton on GitHub: github.com/tektoncd
- › Tekton Results: github.com/tektoncd/results
- › Tekton Hub: hub.tekton.dev
- › Performance TEP: [TEP-0036](#)
- › Metrics TEP: [TEP-0006](#)

