



Scaling Pipelines with Tekton

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Scaling Tekton



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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

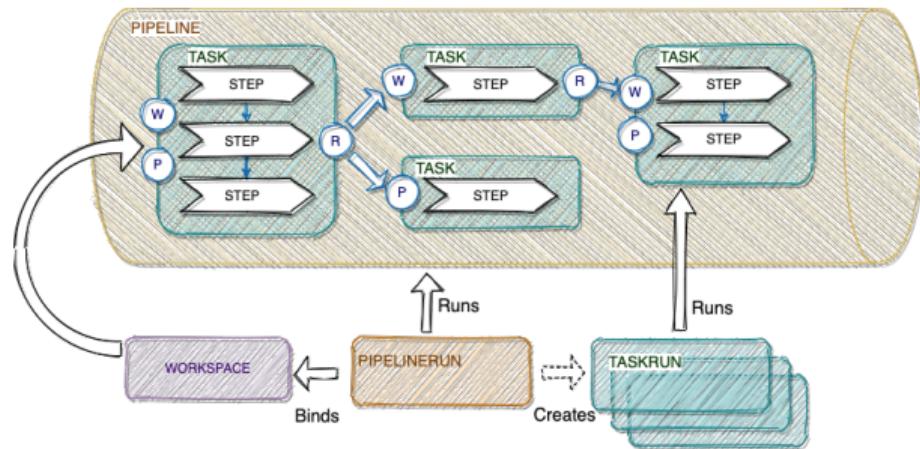


A bit of history

- › 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
- Best Practices



Catalog and Hub

Discovery:

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

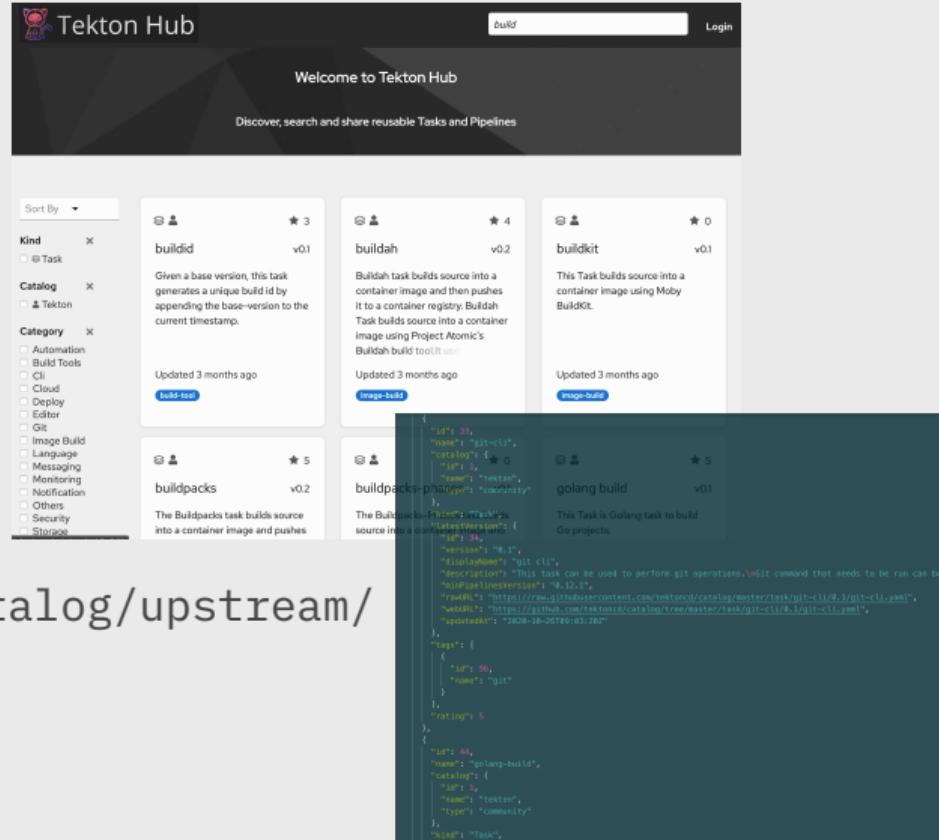
Versioning:

- › Tekton Bundles
 - › tkn bundle [push|list]
 - › gcr.io/tekton-releases/catalog/upstream/

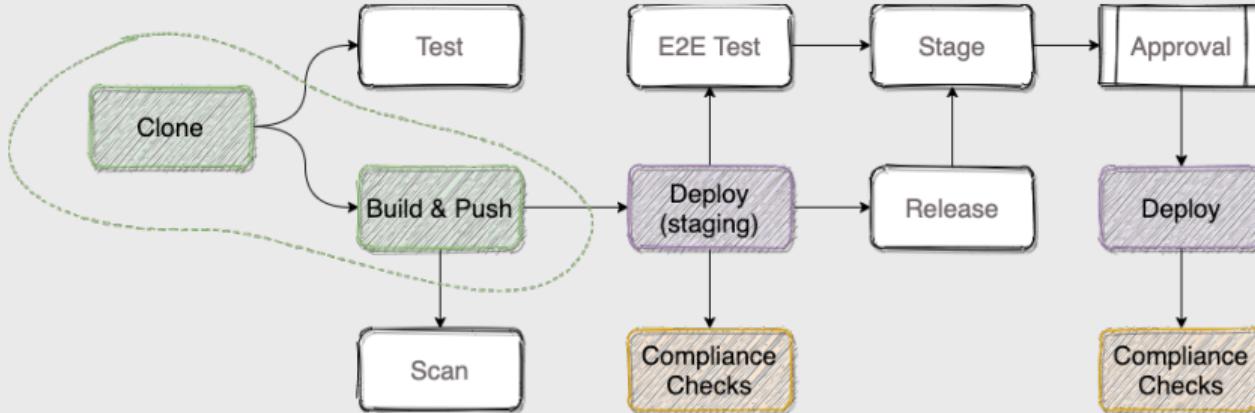
Language	buildpacks	★ 5
Messaging	v0.2	
Monitoring		
Notification		
Others		
Security		
Storage		

Best Practices:

- › Params, Results, Workspaces
 - › Portability



Pipelines



Short pipelines:

Building blocks

- Conditions
- Optional Inputs

Large Pipelines:
How to:

- Add a Branch
- Swap a Block
- Access Control
- Distribute

Distribute:

- Team
- Access
- Namespace
- Cluster
- Platform

One workflow:

- Pipeline in Pipeline (experimental)
- CloudEvents



Running



Photo by Ray Bilcliff, CC0



Triggers

Run Pipelines on Events:

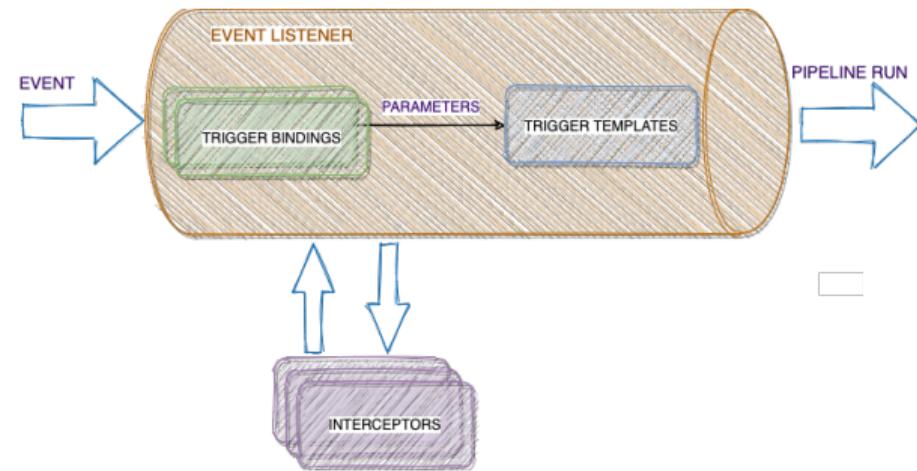
- › HTTP POST
- › Pull Request, Image Published

Components:

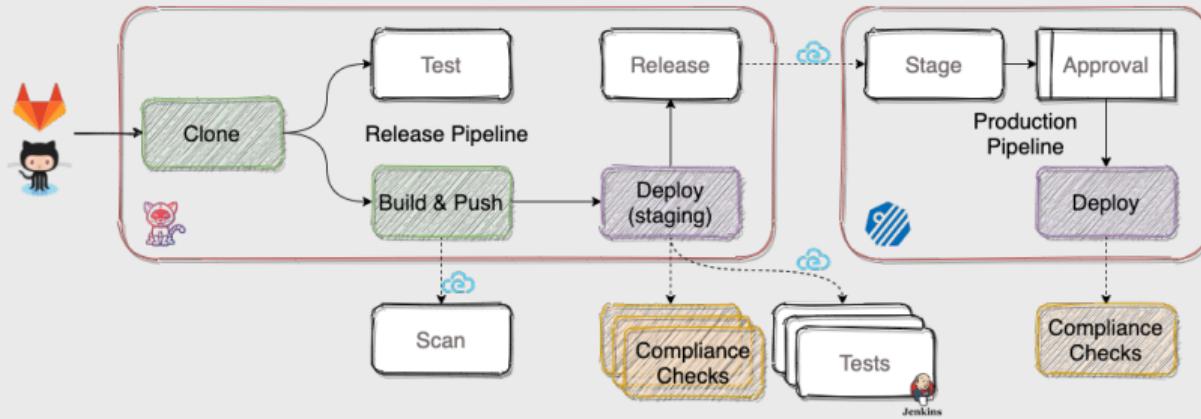
- › Receive: Event Listener
- › Filter: Interceptors
- › Run: Binding and Templates

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



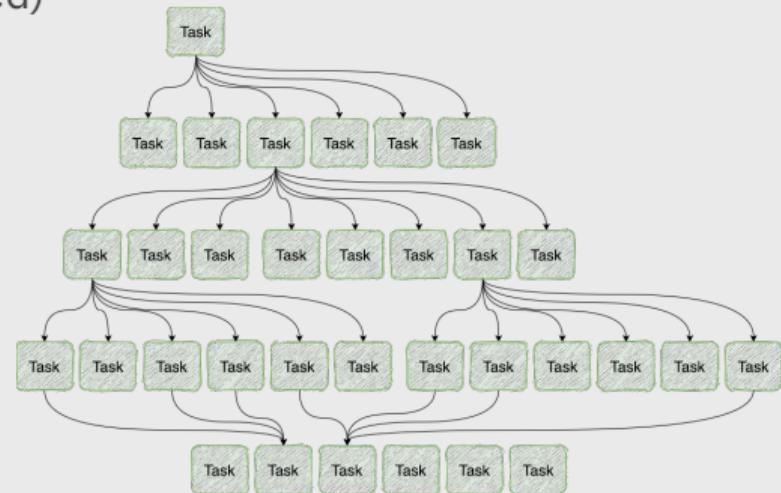


Bottlenecks



Very Large pipelines

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



Under Pressure - Running **many** Pipelines

Concurrent execution

- › Cached K8s API calls: Informers
- › Scale Up Controllers: LeaderElection
- › Cluster Resources: K8s scheduler

In real life

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

Potential enhancements:

- › Throttling pipeline execution
- › Optimize Execution Runtime
- › Tekton custom scheduler

Cluster pollution?

- › Tekton Results



Conclusions & Roadmap

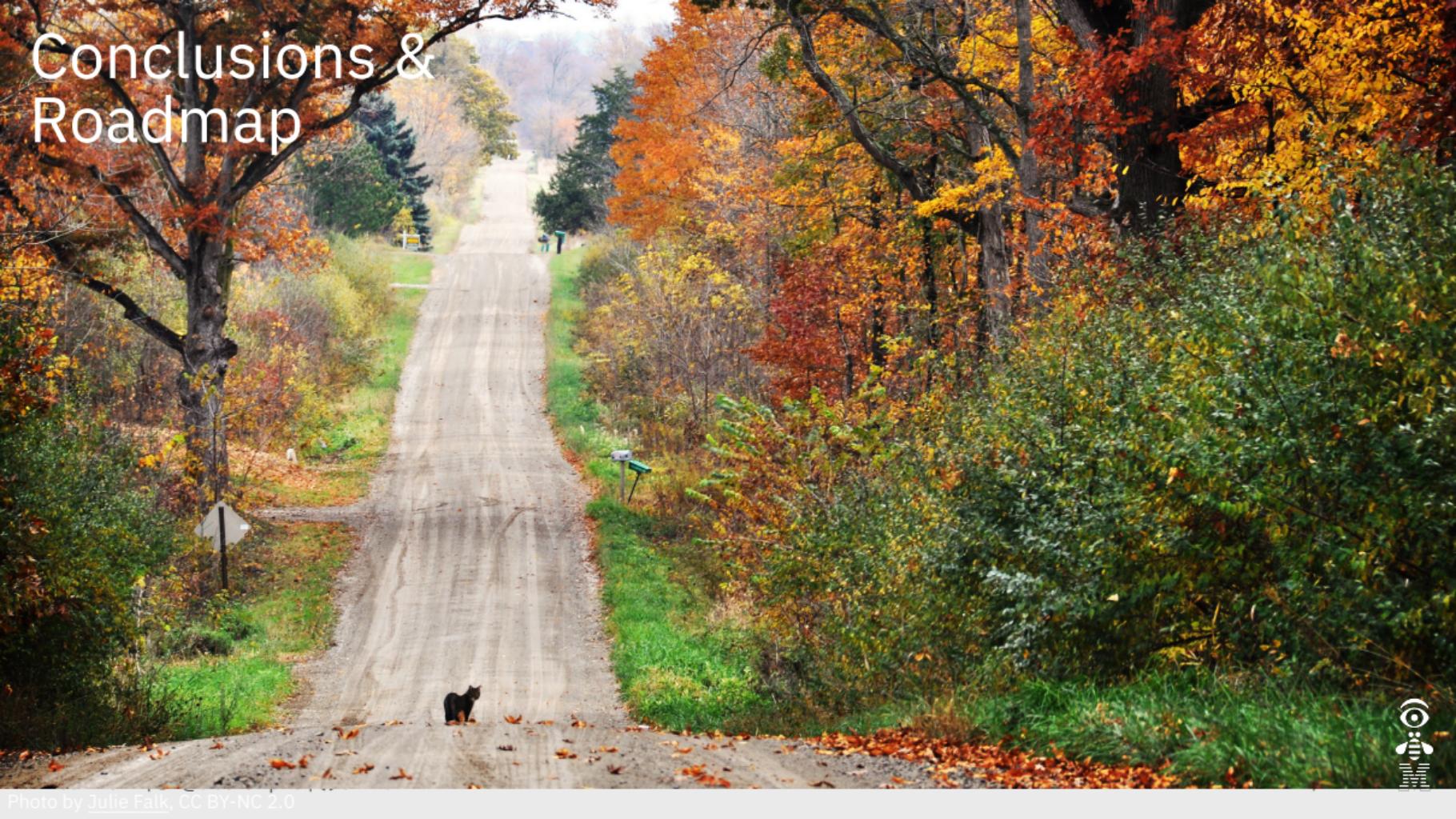


Photo by Julie Falk, CC BY-NC 2.0





Author Time Scalability:

- Best Practices
- Reusable Tasks and Pipelines
- Versioning & Sharing
- Break Down Large Pipelines

Run Time Scalability:

- Cloud Native & Scalable
- Execution Throttling
- Pod execution overhead



Roadmap

- › Continue Dogfooding Tekton at Scale!
- › Pipelines in Pipelines TEP-0056
- › Remote Resource Resolution TEP-0060
- › Decouple Task Composition from Scheduling TEP-0044
- › Runtime Task Bundle Definitions TEP-0068
- › Implement the SIG Events format of Cloud Events



A photograph of a fast-moving stream flowing through a dense forest. The water is blurred, indicating motion, and the surrounding trees are bare, suggesting a winter or early spring setting. Mossy rocks are visible in the water.

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
- › Tekton TEPs: github.com/tektoncd/community/tree/main/teps

