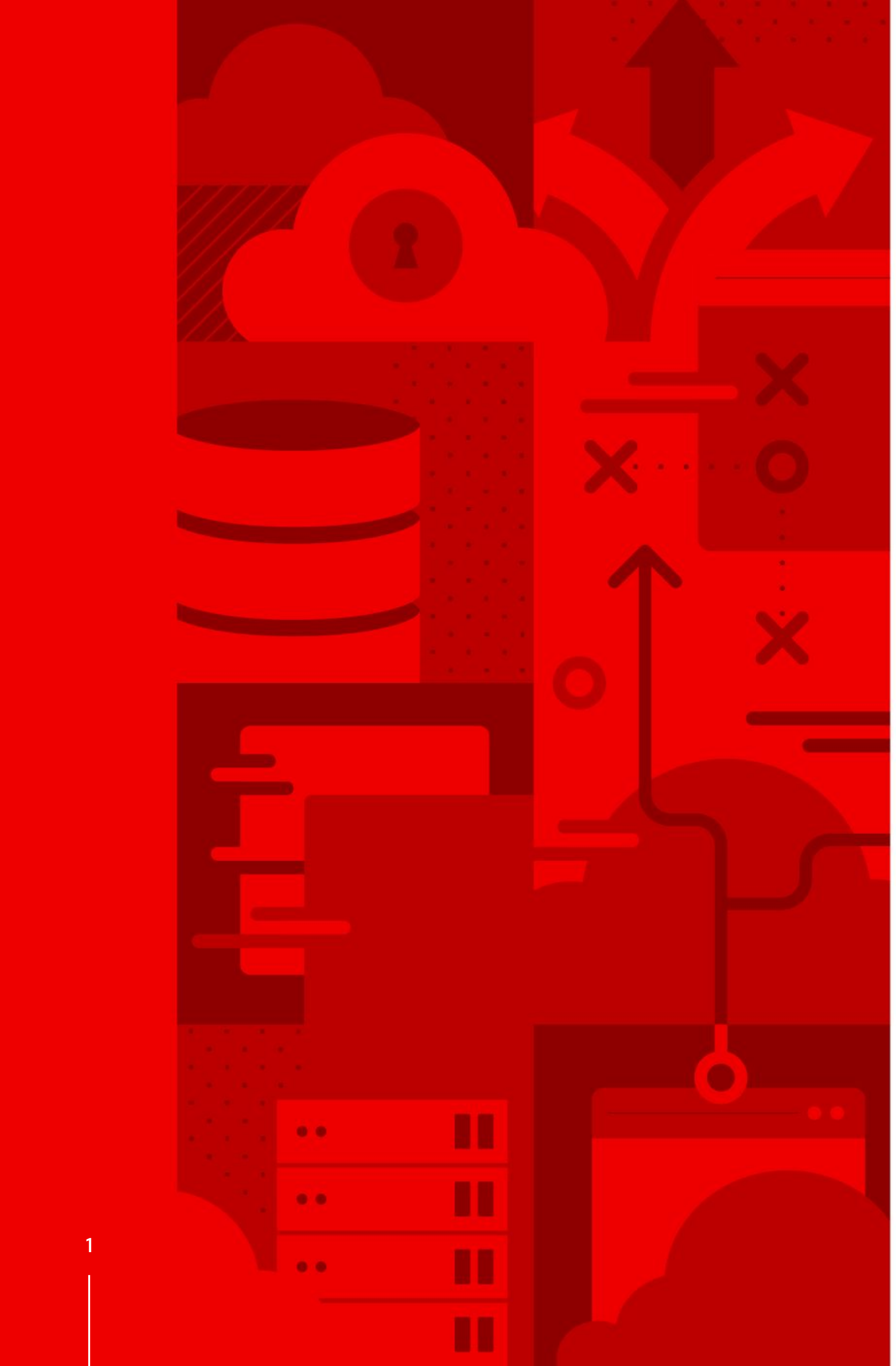


Cloud-agnostic Orchestration

For event-driven applications

Helber Belmiro
Open Source Software Engineer
Working on Kogito and CNCF Serverless Workflow

What we'll discuss today

- What is event-driven architecture
- Event-driven apps and workflows
- CNCF Serverless Workflow
- Kogito
- Demo

How does event-driven architecture work?

- Event producers and consumers
- Event producer detects an event and represents the event as a message
- Producers don’t know the consumer of the event, or the outcome of an event
- Event messages are transmitted from the producer to the consumers through event channels

Event-driven Architecture

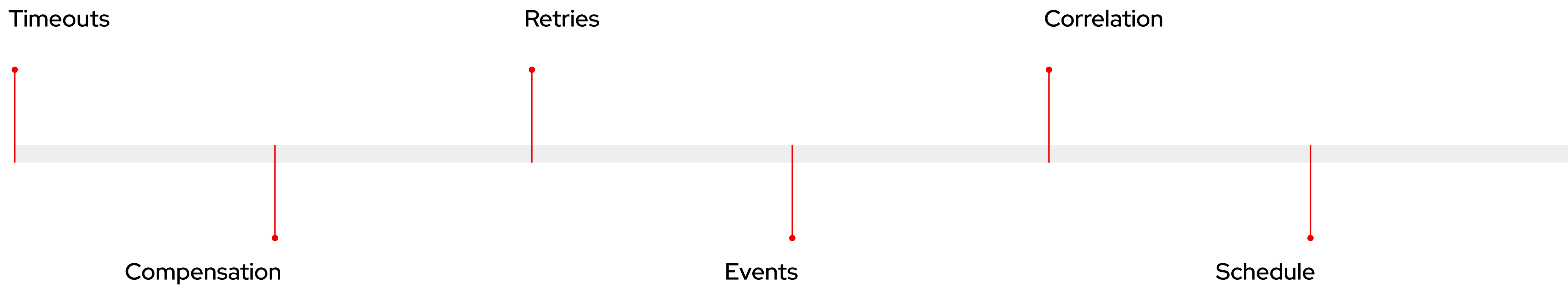
- The capture, communication, processing, and persistence of events are the core structure of the solution
- Used by modern applications that need to use data in real time
- Any programming language
- Enables minimal coupling
- Good for distributed and serverless architectures

What is an event?

- Any significant occurrence or change in state for system hardware or software
- Mouse click
- Keystroke
- Sensor output
- Loading a program

Event-driven applications

Boilerplate



Event-driven Applications

Workflows

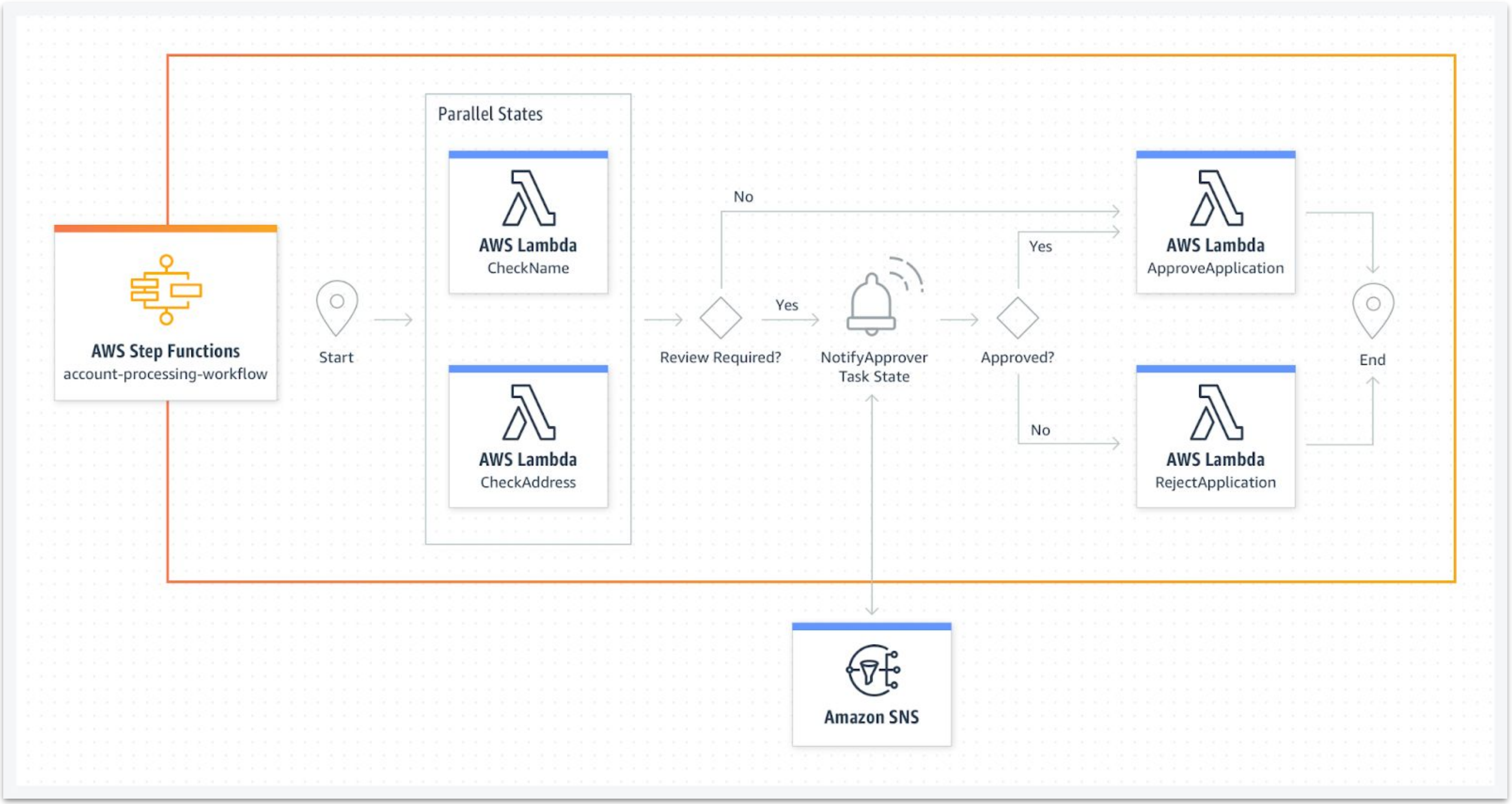
Provide out-of-the-box features to make your applications resilient, reliable, and simple.

Step Functions
Amazon Web Services

Workflows
Google Cloud Platform

Durable Functions
Microsoft Azure

Conductor
Netflix


AWS Step Functions
account-processing-workflow
Start
Parallel States
AWS Lambda
CheckName
AWS Lambda
CheckAddress
Review Required?
No
Yes
NotifyApprover
Task State
Approved?
Yes
No
AWS Lambda
ApproveApplication
AWS Lambda
RejectApplication
End
Amazon SNS

Proprietary solutions

- Low portability
- High coupling with other services of the same provider
- High learning curve (due to several vendors)
- Makes the hybrid cloud unfeasible

CNCF Serverless Workflow Specification

One standard rather than all custom solutions

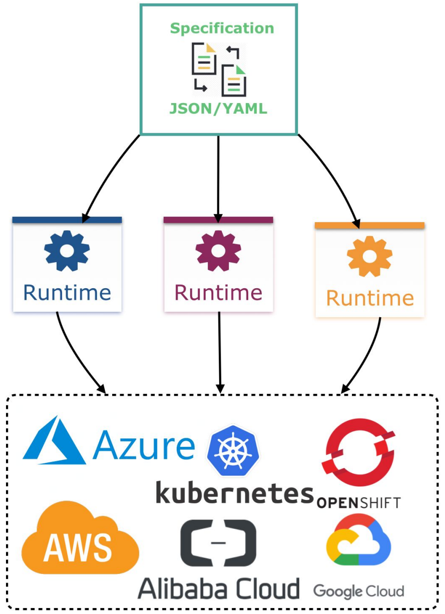
"A specification focused on defining a ***declarative workflow language*** *that targets the serverless computing technology domain."*

Red Hat · HUAWEI · Neuroglia · Temporal · EventMesh · tantl · OpenEnterprise · FaasNet

Serverless Workflow Specification is a CNCF Sandbox Project: https://www.cncf.io/sandbox-projects/

CNCF Serverless Workflow Specification

One standard rather than all custom solutions



- Vendor-neutral and platform-independent
- Being vendor-neutral, increases portability, productivity and learning curve
- Increases the potential for common libraries, tooling and infrastructure

Source: https://github.com/serverlessworkflow/specification/blob/main/specification.md#Overview

CNCF Serverless Workflow Specification

Takes advantage of well-established and known standards

cloudevents

OPENAPI INITIATIVE

AsyncAPI

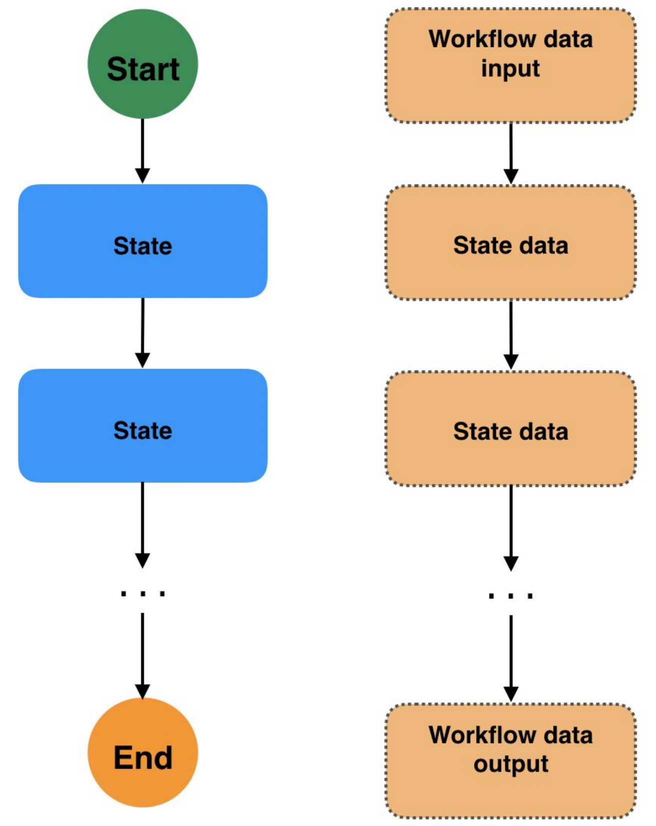
gRPC

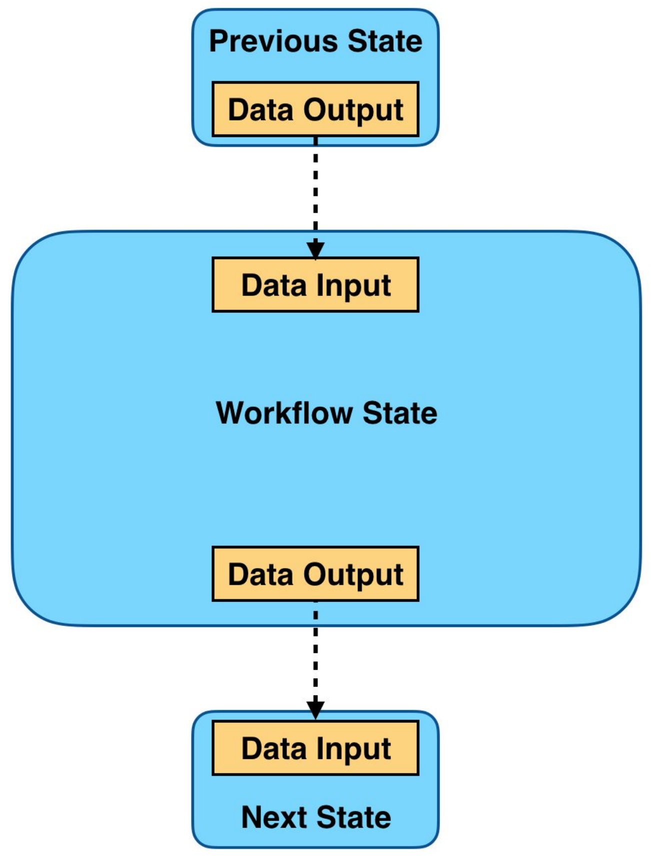
GraphQL

Source: https://github.com/serverlessworkflow/specification/blob/main/specification.md#focus-on-standards

Workflow Data Handling

Data is represented in JSON format

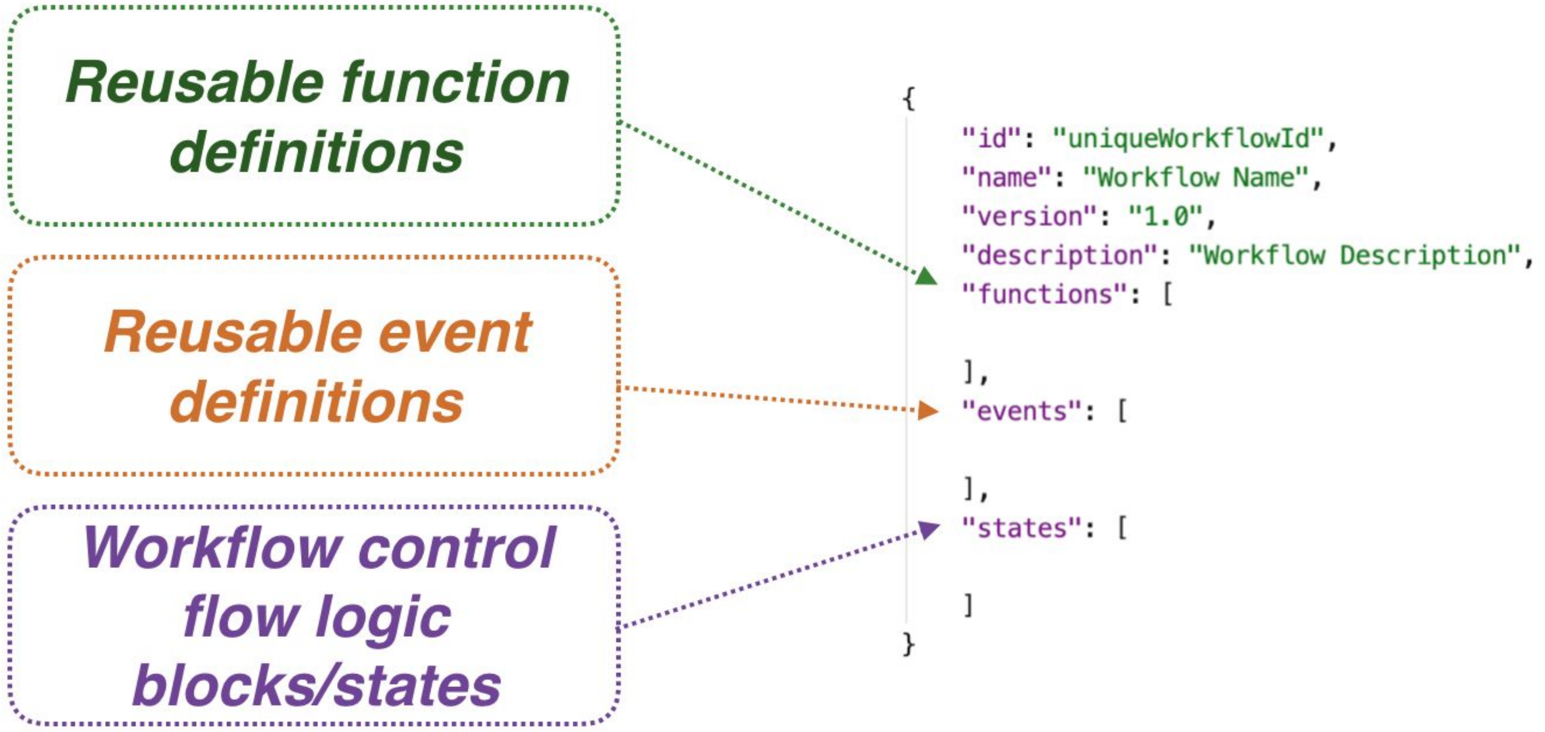




Source: https://github.com/serverlessworkflow/specification/blob/main/specification.md#workflow-data

Workflow Definition Structure

Main workflow definition blocks


Reusable function definitions
Reusable event definitions
Workflow control flow logic blocks/states

```
{
    "id": "uniqueWorkflowId",
    "name": "Workflow Name",
    "version": "1.0",
    "description": "Workflow Description",
    "functions": [

    ],
    "events": [

    ],
    "states": [

    ]
}
```

Source: https://github.com/serverlessworkflow/specification/blob/main/specification.md#workflow-definition-structure

Meet Kogito

Kogito is an open source implementation of the CNCF Serverless Workflow specification

Meet Kogito

The CNCF Serverless Workflow implementation used by Red Hat OpenShift Serverless Logic

Quarkus Support

A Kogito Serverless Workflow application is a Quarkus application

Red Hat

A Kogito Serverless Workflow application is a Quarkus application

- Open source with a vibrant community
- Container first and Kubernetes native
- Swagger UI
- Dev Services
- Live coding
- Continuous testing
- Supersonic: Superfast startup
- Subatomic: Low memory usage
- Can scale fast

How does Kogito work?

- Kogito Serverless Workflow runtime is a Quarkus extension
- Having the extension in your Quarkus application enables it to run workflows
- In build-time, Kogito parses the workflow files to Java classes
- In runtime, everything is ready - Fast startup and low memory footprint

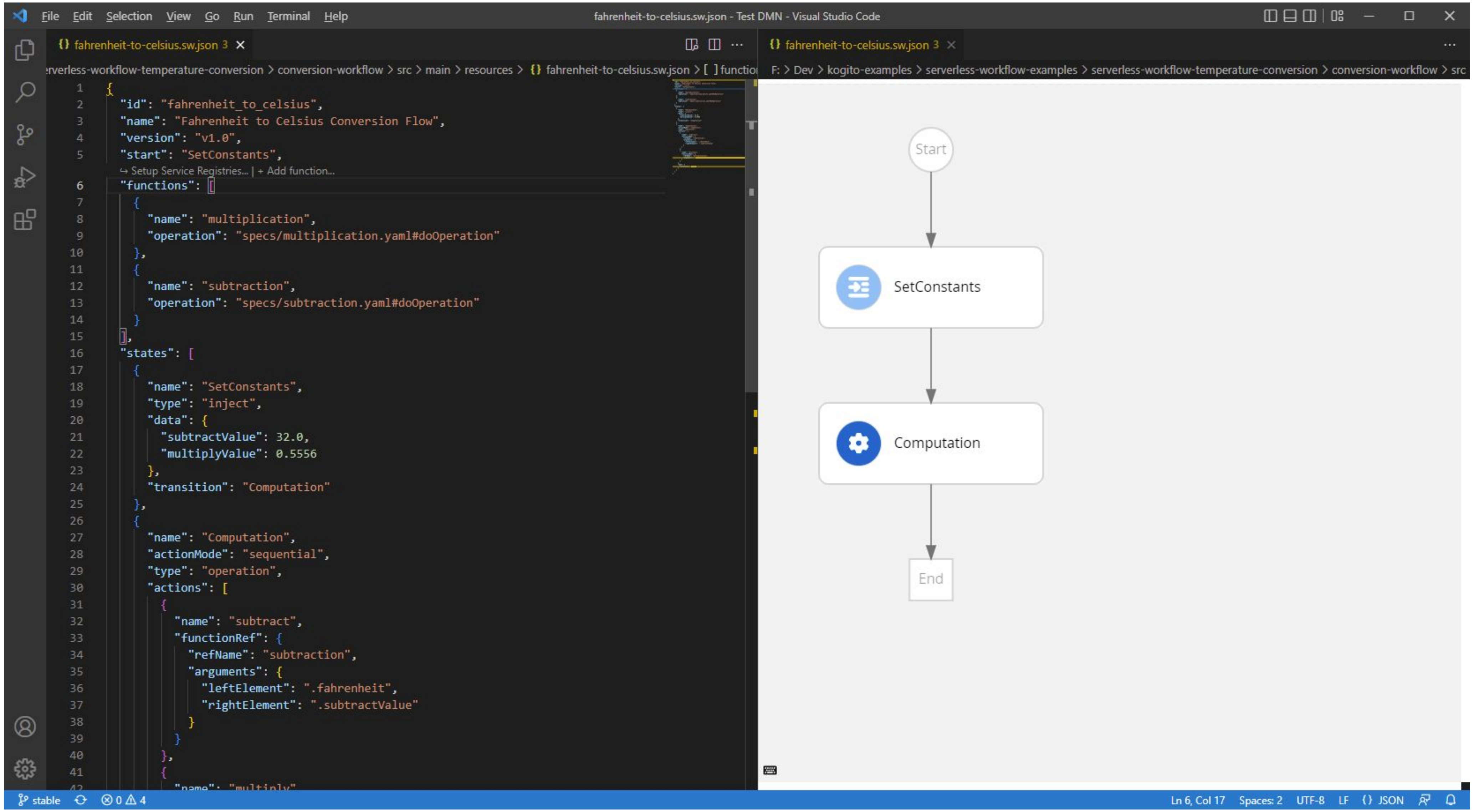
You don’t need to know Java

Kogito is written in Java, but you don’t need to know Java to use it

- Create, build, and deploy your project using Knative CLI

```
$ kn workflow create --name my-project
$ kn workflow build --image dev.local/my-project
$ kn workflow deploy
```

Editing your workflows - Visual Studio Code extension


File Edit Selection View Go Run Terminal Help
fahrenheit-to-celsius.sw.json - Test DMN - Visual Studio Code
fahrenheit-to-celsius.sw.json 3
erverless-workflow-temperature-conversion > conversion-workflow > src > main > resources > fahrenheit-to-celsius.sw.json > [ ] functio
F: > Dev > kogito-examples > serverless-workflow-examples > serverless-workflow-temperature-conversion > conversion-workflow > src
Start
SetConstants
Computation
End
stable
0 4
Ln 6, Col 17 Spaces: 2 UTF-8 LF JSON

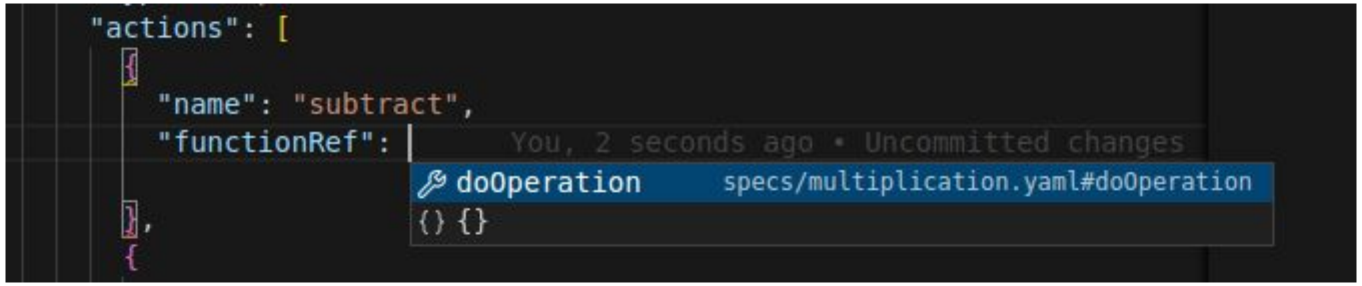
```
{
  "id": "fahrenheit_to_celsius",
  "name": "Fahrenheit to Celsius Conversion Flow",
  "version": "v1.0",
  "start": "SetConstants",
  ↪ Setup Service Registries... | + Add function...
  "functions": [
    {
      "name": "multiplication",
      "operation": "specs/multiplication.yaml#doOperation"
    },
    {
      "name": "subtraction",
      "operation": "specs/subtraction.yaml#doOperation"
    }
  ],
  "states": [
    {
      "name": "SetConstants",
      "type": "inject",
      "data": {
        "subtractValue": 32.0,
        "multiplyValue": 0.5556
      },
      "transition": "Computation"
    },
    {
      "name": "Computation",
      "actionMode": "sequential",
      "type": "operation",
      "actions": [
        {
          "name": "subtract",
          "functionRef": {
            "refName": "subtraction",
            "arguments": {
              "leftElement": ".fahrenheit",
              "rightElement": ".subtractValue"
            }
          }
        },
        {
          "name": "multiply"
```

Download: https://marketplace.visualstudio.com/items?itemName=redhat.vscode-extension-serverless-workflow-editor

Visual Studio Code extension

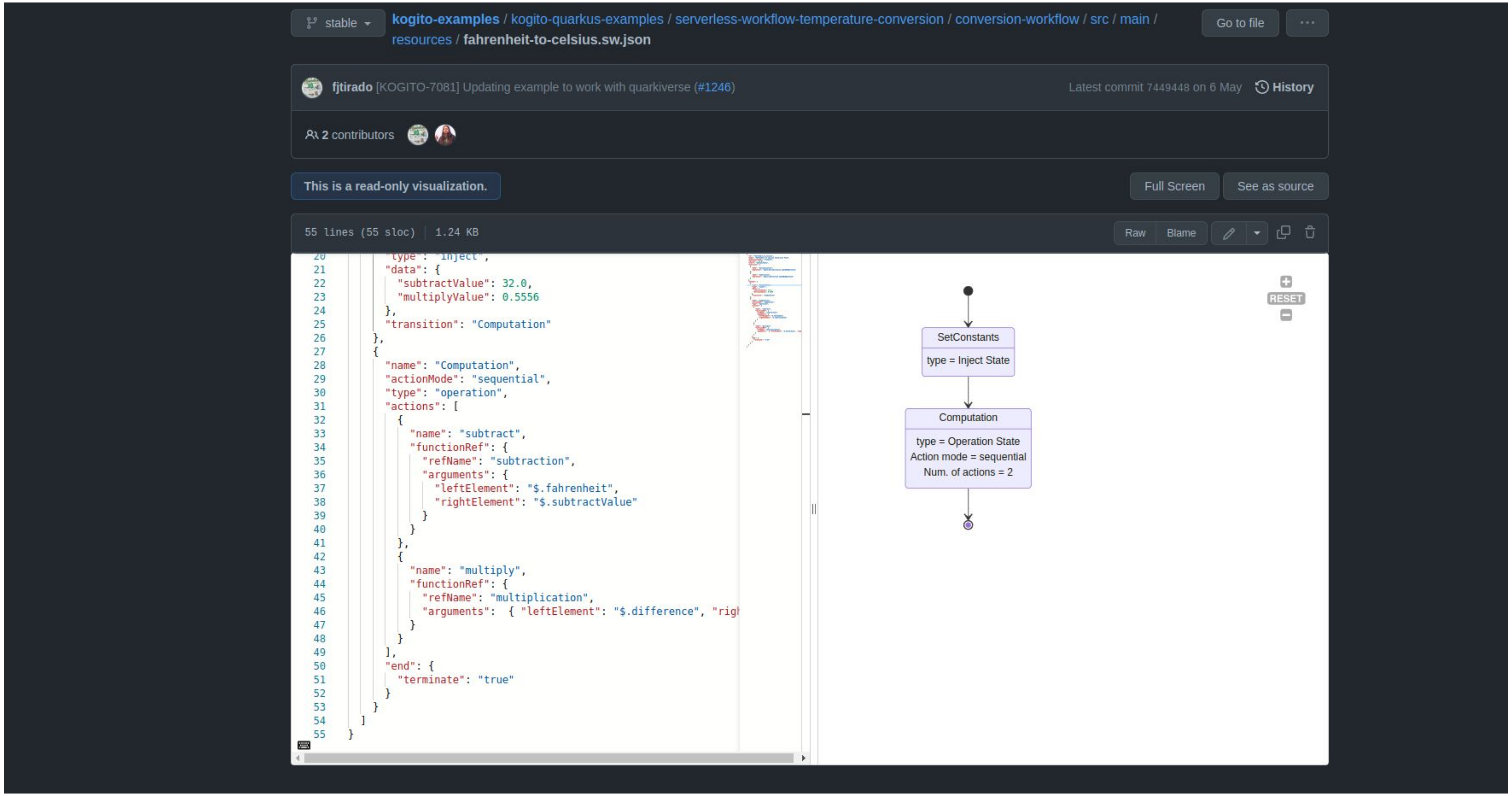
Features

- Dynamically reloads the diagram
- SVG generation
- Auto-complete
- Validation



```
"actions": [
  {
    "name": "subtract",
    "functionRef": |      You, 2 seconds ago • Uncommitted changes
                   doOperation      specs/multiplication.yaml#doOperation
                   {} {}
  },
  {
```

Editing your workflows – Chrome GitHub extension



stable ▾ kogito-examples / kogito-quarkus-examples / serverless-workflow-temperature-conversion / conversion-workflow / src / main / resources / fahrenheit-to-celsius.sw.json

Go to file ···

fjtirado [KOGITO-7081] Updating example to work with quarkiverse (#1246) Latest commit 7449448 on 6 May History

2 contributors

This is a read-only visualization.

Full Screen See as source

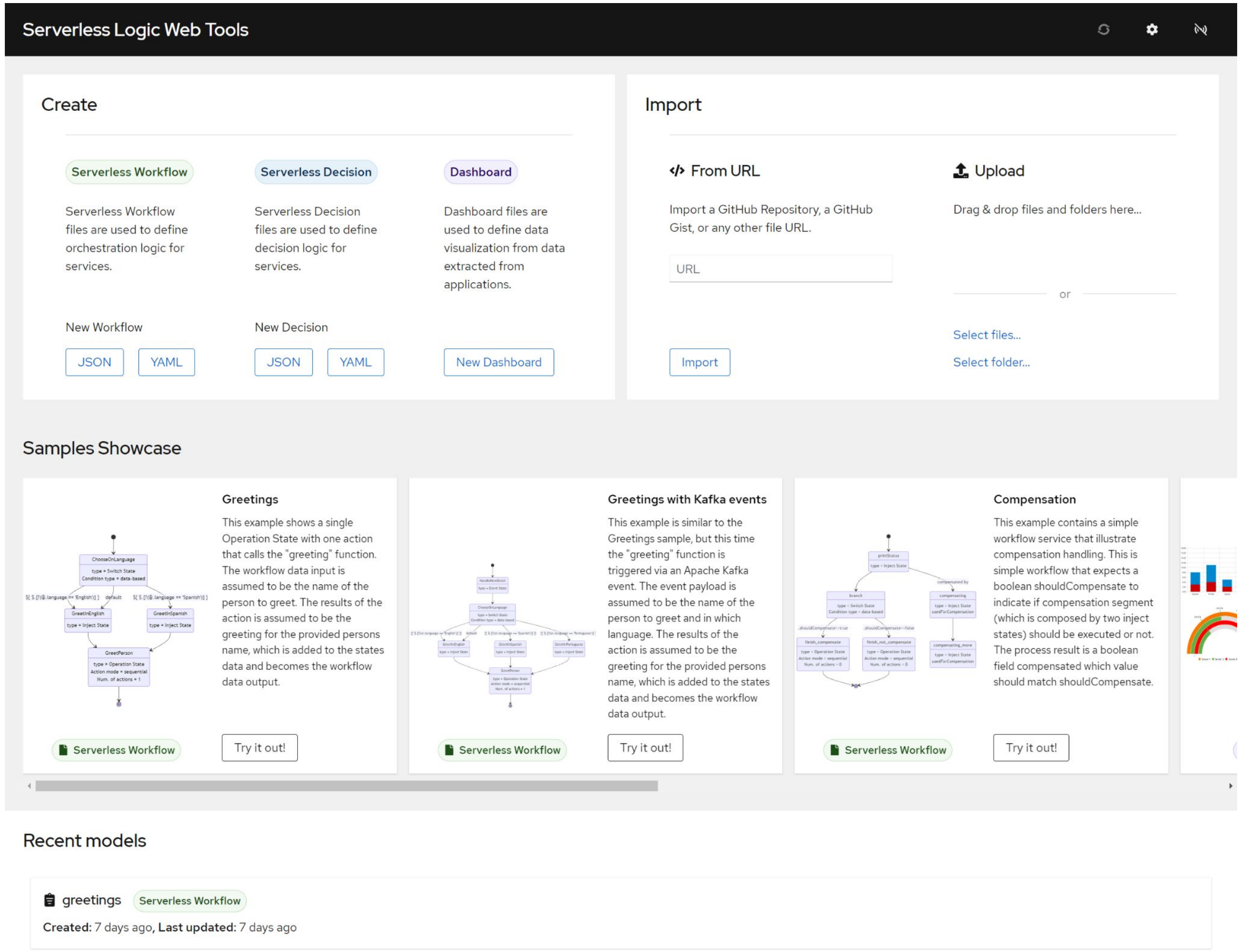
55 lines (55 sloc) | 1.24 KB

Raw Blame

```
        "type": "inject",
        "data": {
          "subtractValue": 32.0,
          "multiplyValue": 0.5556
        },
        "transition": "Computation"
      },
      {
        "name": "Computation",
        "actionMode": "sequential",
        "type": "operation",
        "actions": [
          {
            "name": "subtract",
            "functionRef": {
              "refName": "subtraction",
              "arguments": {
                "leftElement": "$.fahrenheit",
                "rightElement": "$.subtractValue"
              }
            }
          },
          {
            "name": "multiply",
            "functionRef": {
              "refName": "multiplication",
              "arguments":  { "leftElement": "$.difference", "rig
            }
          }
        ],
        "end": {
          "terminate": "true"
        }
      }
    ]
}
```

Download: https://marketplace.visualstudio.com/items?itemName=redhat.vscode-extension-serverless-workflow-editor

Editing your workflows - Serverless Logic Web Tools



Serverless Logic Web Tools

Create

Serverless Workflow

Serverless Workflow files are used to define orchestration logic for services.

New Workflow

JSON YAML

Serverless Decision

Serverless Decision files are used to define decision logic for services.

New Decision

JSON YAML

Dashboard

Dashboard files are used to define data visualization from data extracted from applications.

New Dashboard

Import

From URL

Import a GitHub Repository, a GitHub Gist, or any other file URL.

URL

Import

Upload

Drag & drop files and folders here...

or

Select files...

Select folder...

Samples Showcase

Greetings

This example shows a single Operation State with one action that calls the "greeting" function. The workflow data input is assumed to be the name of the person to greet. The results of the action is assumed to be the greeting for the provided persons name, which is added to the states data and becomes the workflow data output.

Serverless Workflow — Try it out!

Greetings with Kafka events

This example is similar to the Greetings sample, but this time the "greeting" function is triggered via an Apache Kafka event. The event payload is assumed to be the name of the person to greet and in which language. The results of the action is assumed to be the greeting for the provided persons name, which is added to the states data and becomes the workflow data output.

Serverless Workflow — Try it out!

Compensation

This example contains a simple workflow service that illustrate compensation handling. This is simple workflow that expects a boolean shouldCompensate to indicate if compensation segment (which is composed by two inject states) should be executed or not. The process result is a boolean field compensated which value should match shouldCompensate.

Serverless Workflow — Try it out!

Recent models

greetings Serverless Workflow

Created: 7 days ago, **Last updated:** 7 days ago

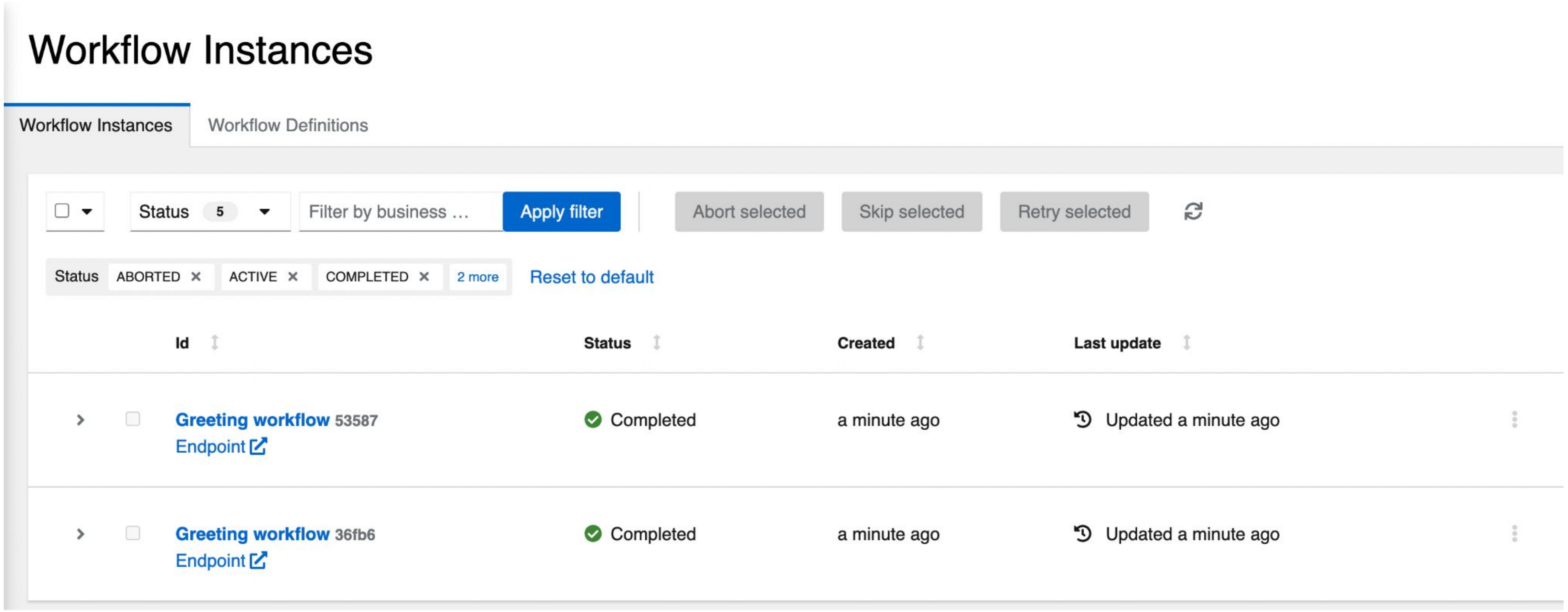
Download: https://marketplace.visualstudio.com/items?itemName=redhat.vscode-extension-serverless-workflow-editor

Serverless Logic Web Tools

Features

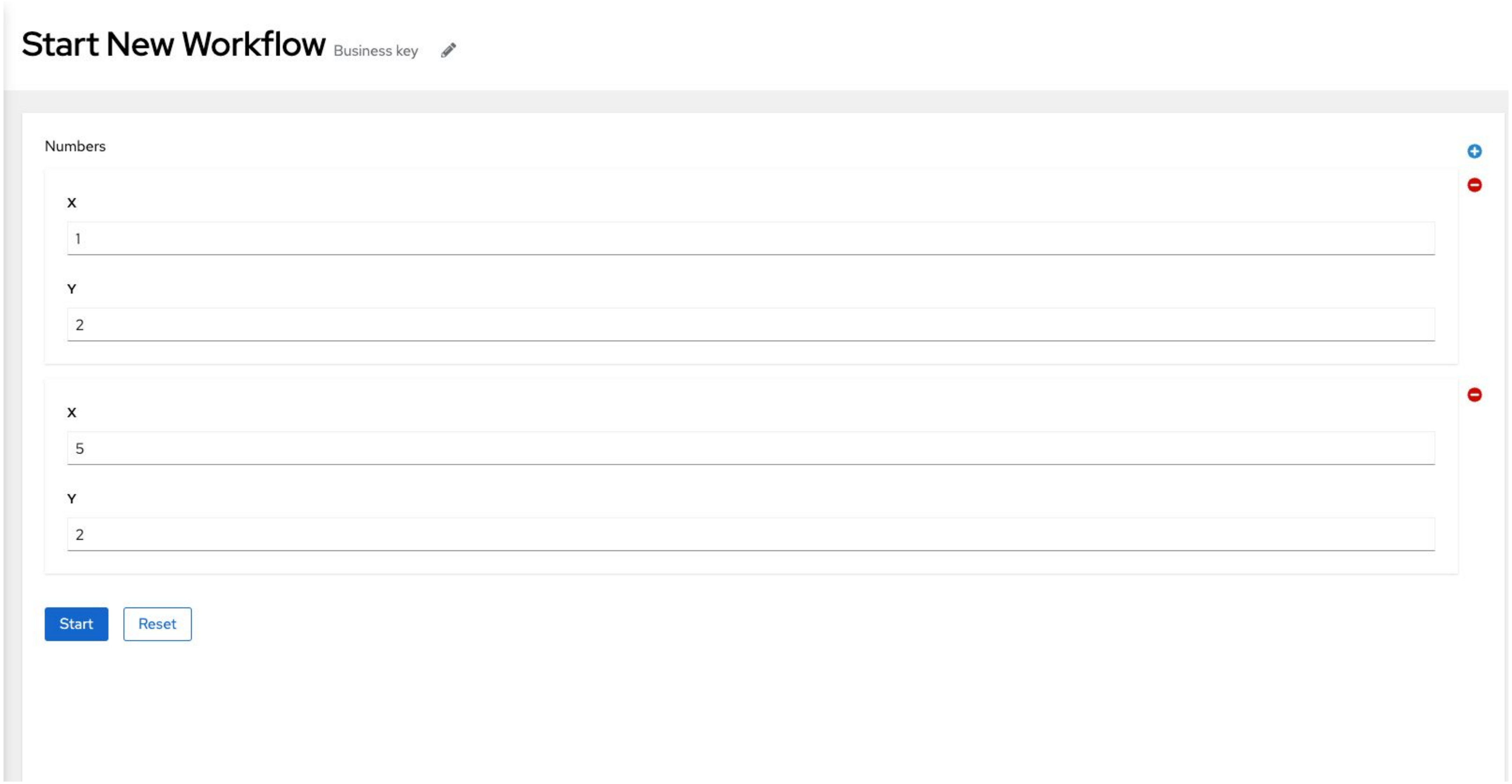
- Edit, deploy and test Serverless Workflow models in development mode
- Integration with Red Hat OpenShift and GitHub

Kogito Serverless Workflow Tools extension



Workflow Instances

Id	Status	Created	Last update
Greeting workflow 53587 Endpoint	Completed	a minute ago	Updated a minute ago
Greeting workflow 36fb6 Endpoint	Completed	a minute ago	Updated a minute ago



Start New Workflow Business key

Numbers

X

1

Y

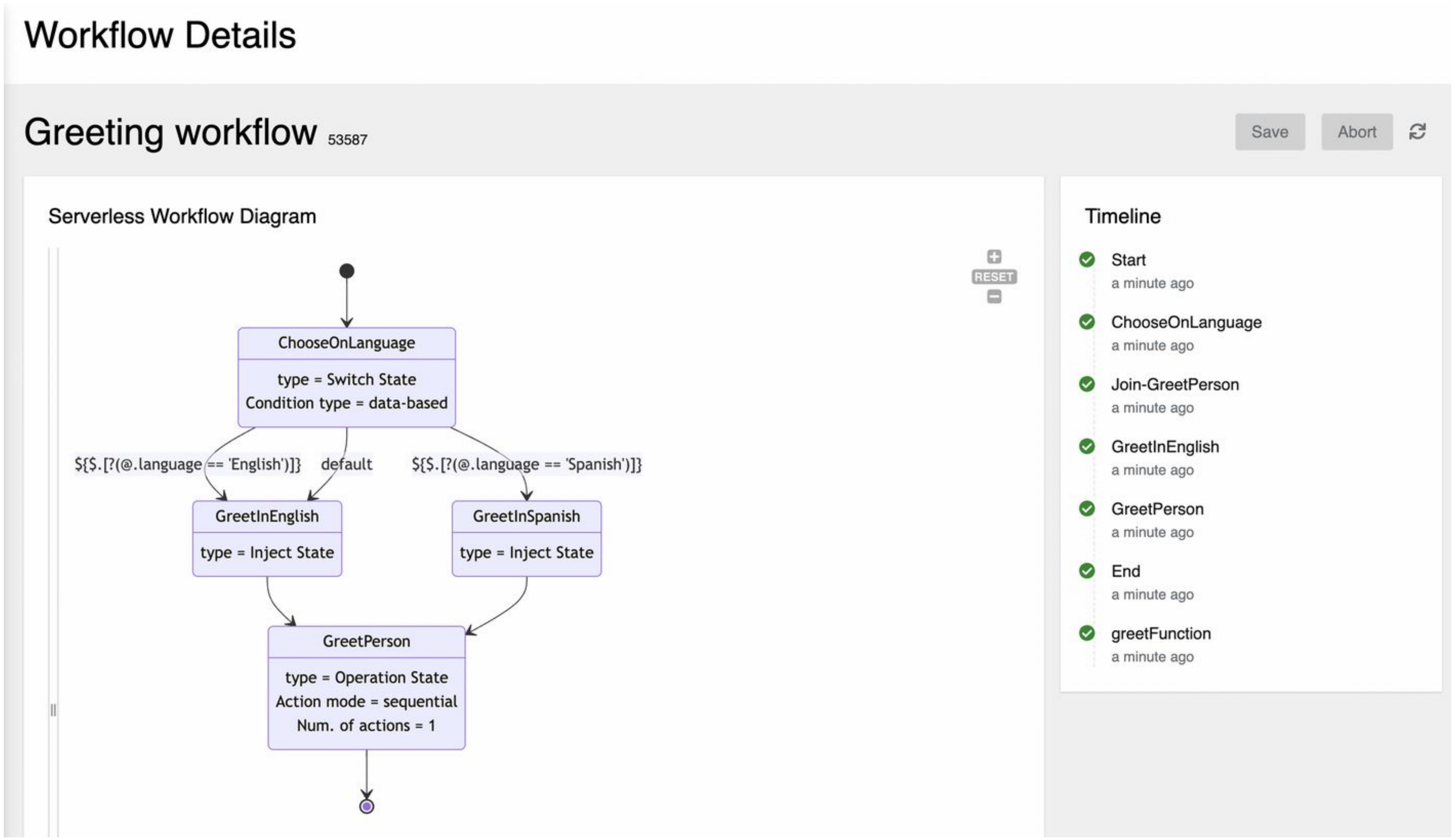
2

X

5

Y

2



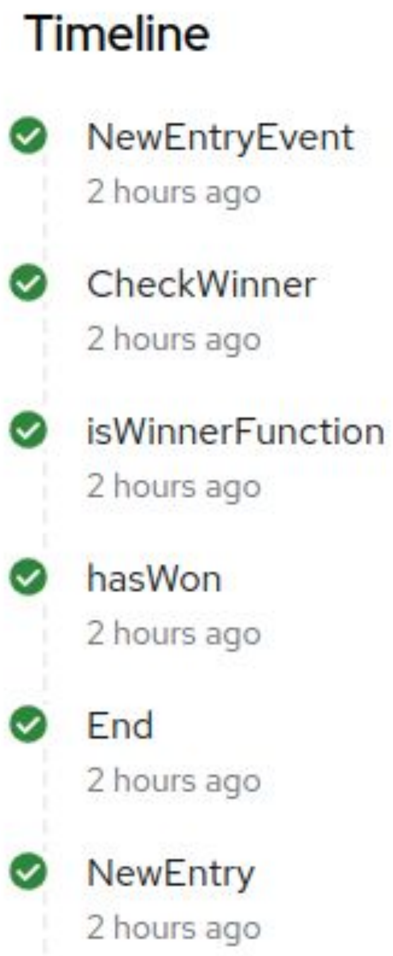
Workflow Details

Greeting workflow 53587

Serverless Workflow Diagram

Timeline

- ✓ Start — a minute ago
- ✓ ChooseOnLanguage — a minute ago
- ✓ Join-GreetPerson — a minute ago
- ✓ GreetInEnglish — a minute ago
- ✓ GreetPerson — a minute ago
- ✓ End — a minute ago
- ✓ greetFunction — a minute ago



Timeline

✓ NewEntryEvent
2 hours ago

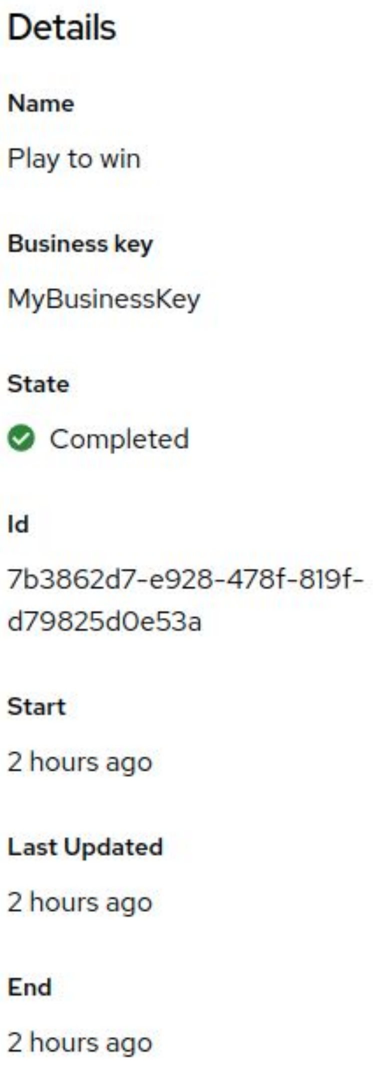
✓ CheckWinner
2 hours ago

✓ isWinnerFunction
2 hours ago

✓ hasWon
2 hours ago

✓ End
2 hours ago

✓ NewEntry
2 hours ago



Details

Name
Play to win

Business key
MyBusinessKey

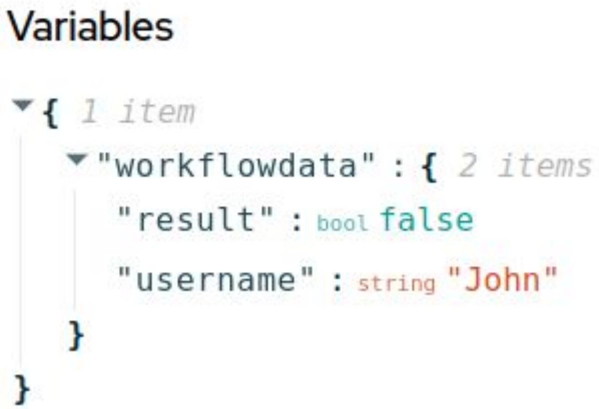
State
✓ Completed

Id
7b3862d7-e928-478f-819f-d79825d0e53a

Start
2 hours ago

Last Updated
2 hours ago

End
2 hours ago

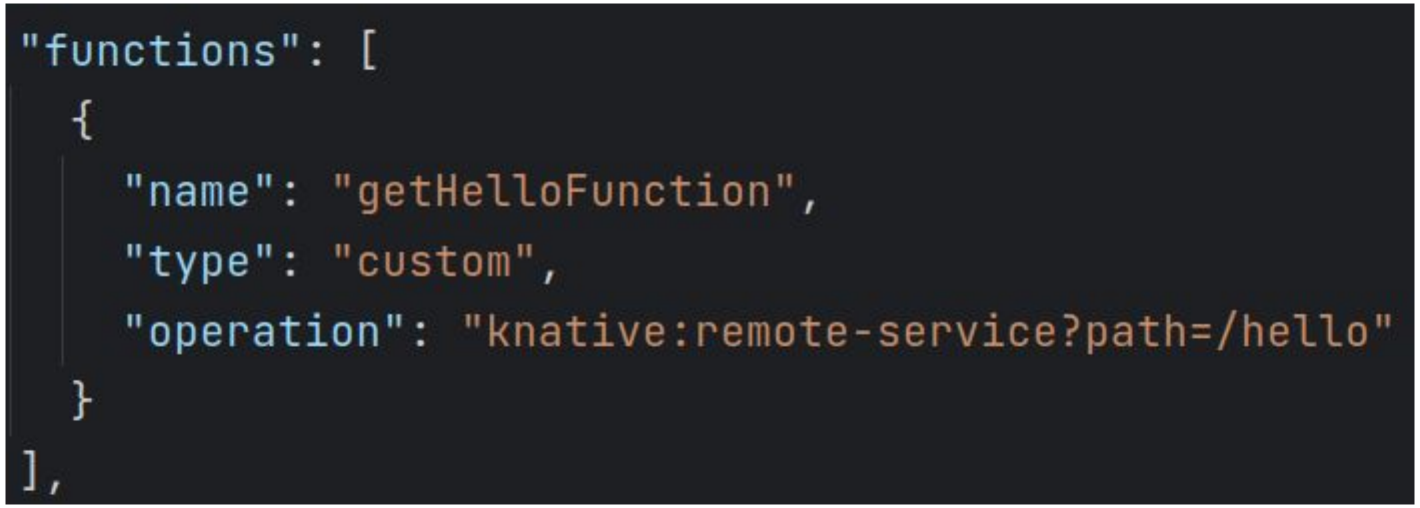


Variables

```
▼{ 1 item
  ▼"workflowdata" : { 2 items
     "result" : bool false
     "username" : string "John"
  }
}
```

Other relevant features

- Error handling
- Parallel execution
- Service discovery
- Custom functions
- Timeouts
- Callback
- Authentication (Basic HTTP, Bearer Token, API key, Oauth 2
- Persistence



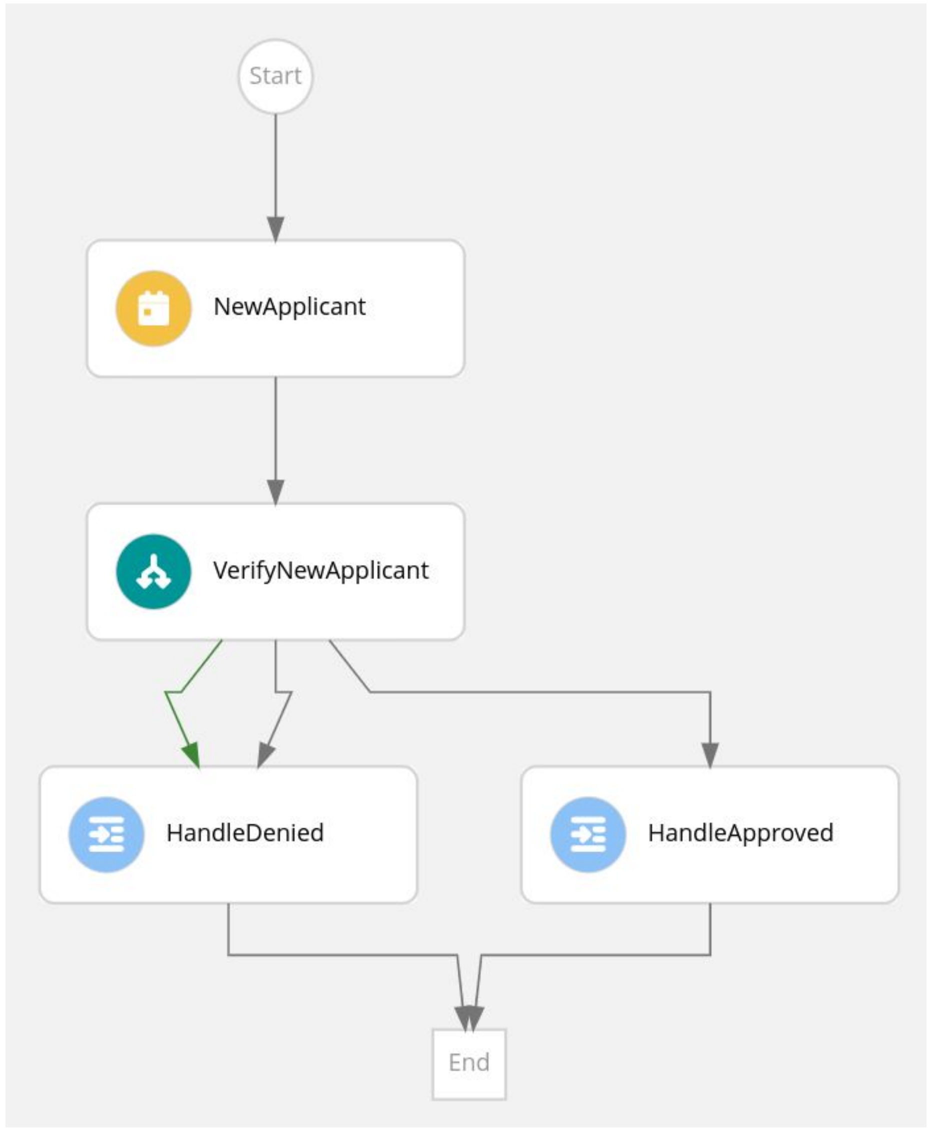
```
"functions": [
  {
    "name": "getHelloFunction",
    "type": "custom",
    "operation": "knative:remote-service?path=/hello"
  }
],
```

Kogito documentation

Kogito Examples

Red Hat

Demo


Start
NewApplicant
VerifyNewApplicant
HandleDenied
HandleApproved
End

What Now?

Use

- Serverless Workflow Specification

  https://serverlessworkflow.io/
- Kogito

  https://kogito.kie.org/
- Kogito Documentation

  https://kiegroup.github.io/kogito-docs/serverlessworkflow/latest/index.html
- Kogito Examples

  https://github.com/kiegroup/kogito-examples
- KIE Blog

  http://blog.kie.org/

Get Involved

- Serverless Workflow Repositories

  https://github.com/serverlessworkflow
- Kogito Repository

  https://github.com/kiegroup/kogito-runtimes
- Kogito Issue Tracker

  https://issues.redhat.com/projects/KOGITO

Questions?

Let's stay in touch:

thegreatapi.com

github.com/hbelmiro

linkedin.com/in/hbelmiro

twitter.com/helber_belmiro

Red Hat