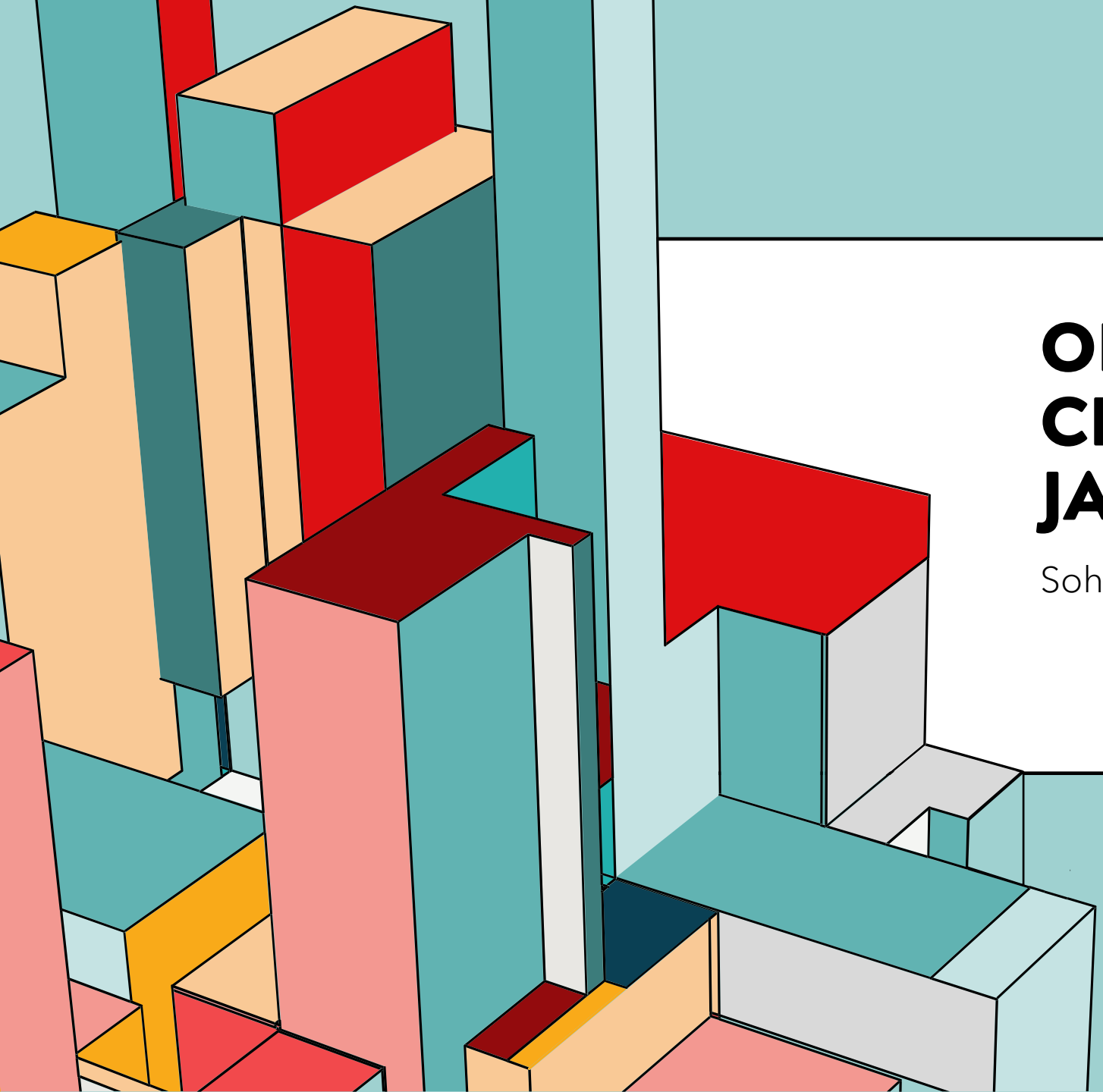


ORGANIZING CLOUD-NATIVE JAVA BACKEND

Soham Dasgupta

SPECIAL THANKS TO..

Tijn van den Bergh

Mad genius

Kevin Pors

Tech guru

ABOUT ME

Soham Dasgupta

Cloud Solution Architect @ Microsoft

Father and Football lover

Tech Enthusiast/Programmer

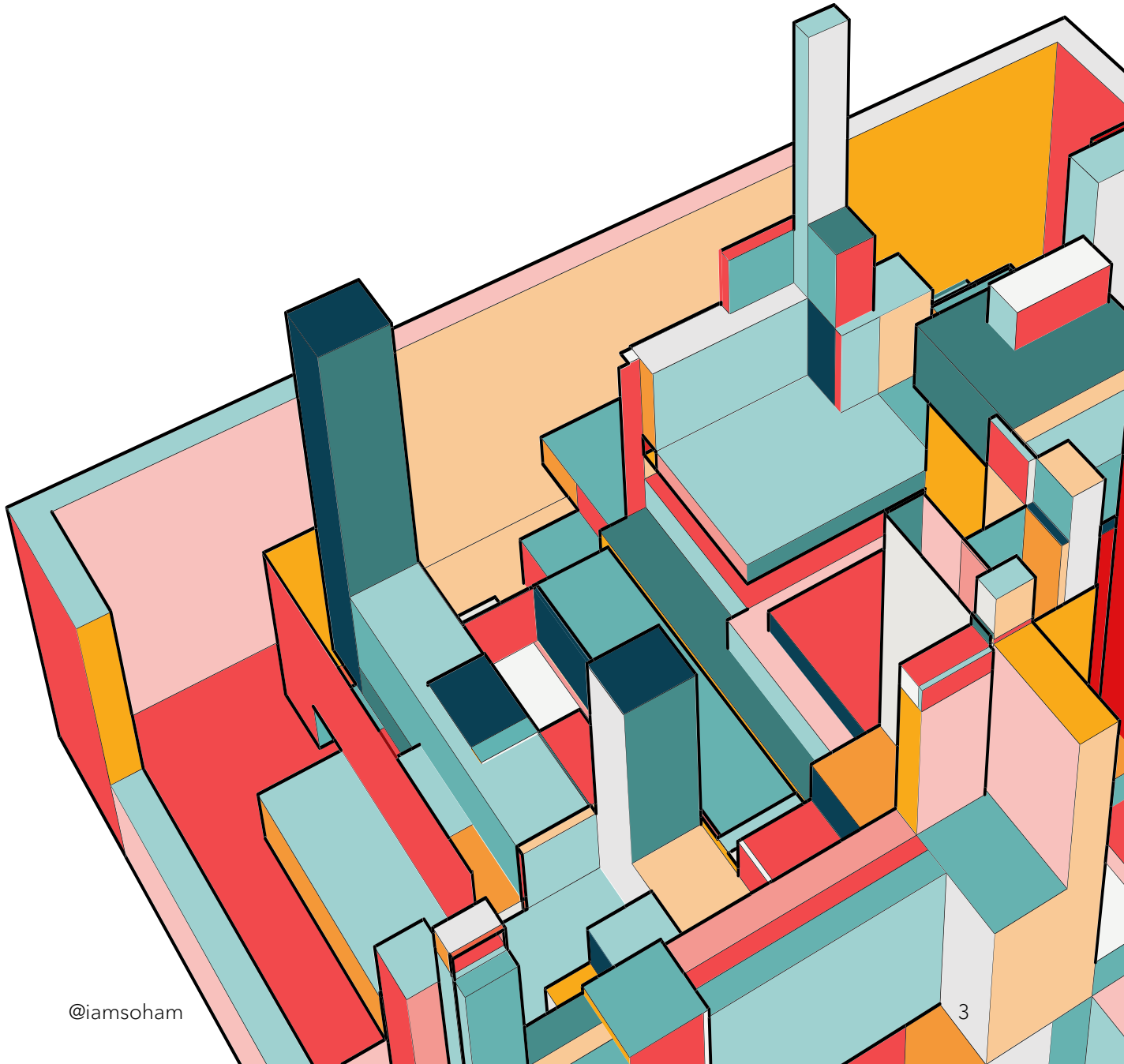
Speaker & Blogger

Twitter : @iamsoham

LinkedIn: dasguptasoham

Github: sohamda

Medium: @iam.soham



LANDSCAPE

Workflow/Pipeline

QA on PR/MR
OWASP exclusion list

Repo Management

Branching strategy
Versioning
Branch protection rule
Dir. vs Branches
App & config

Maven

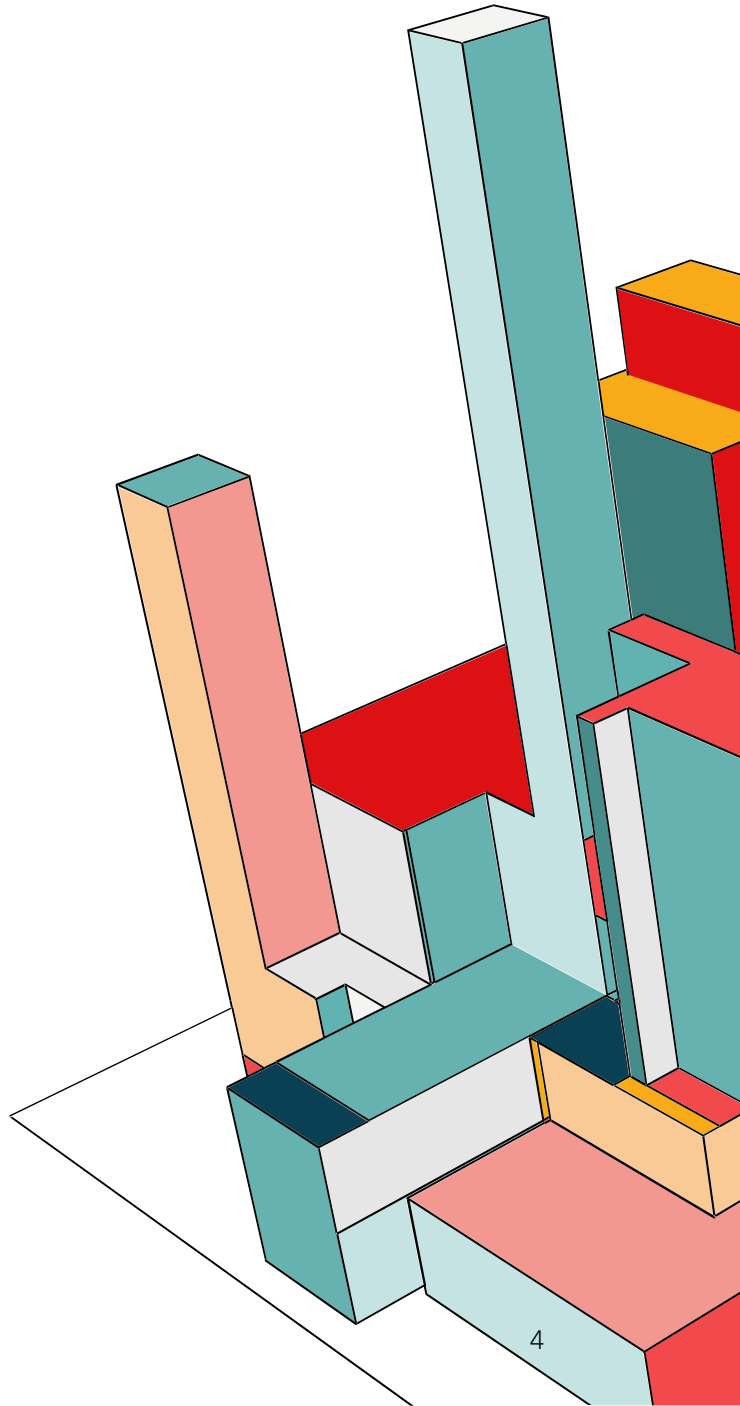
Structuring POMs
Enforcer

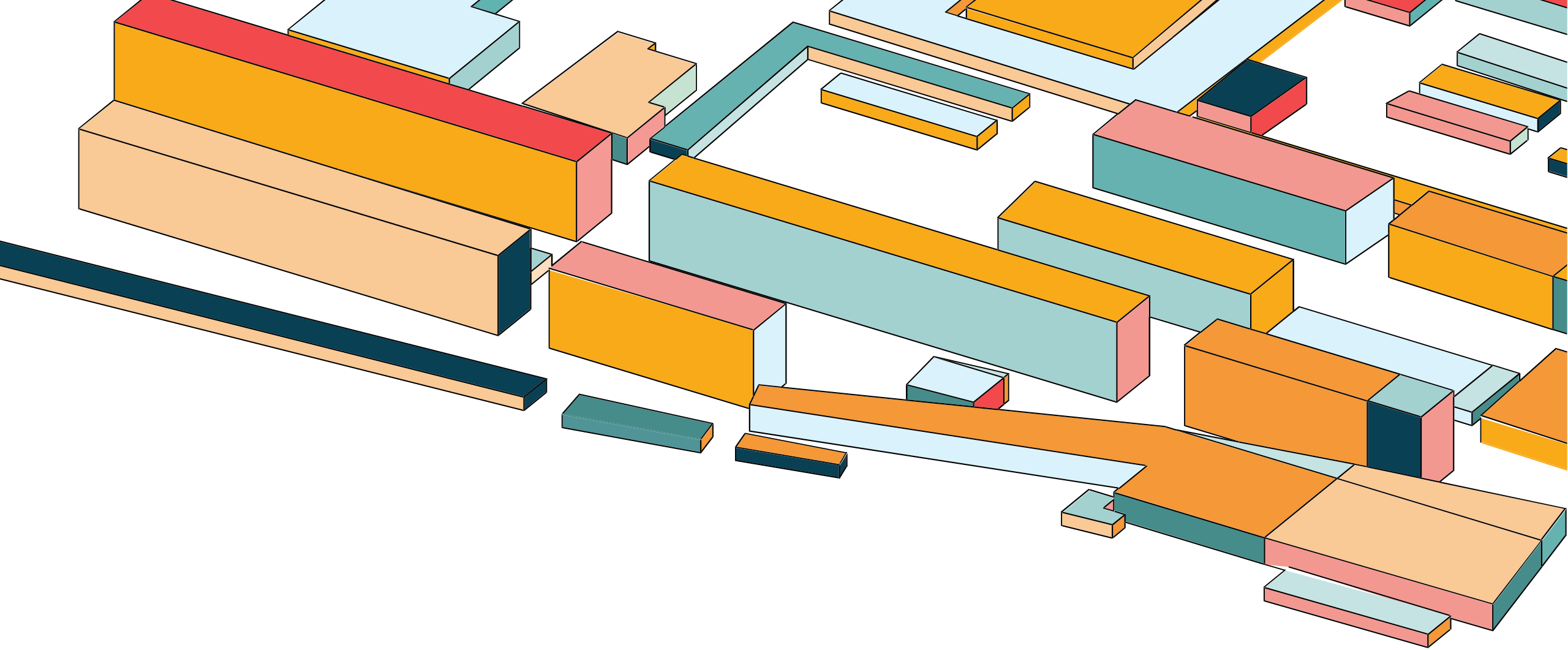
API servers & client

OpenAPI
Generation servers/clients
Sharing

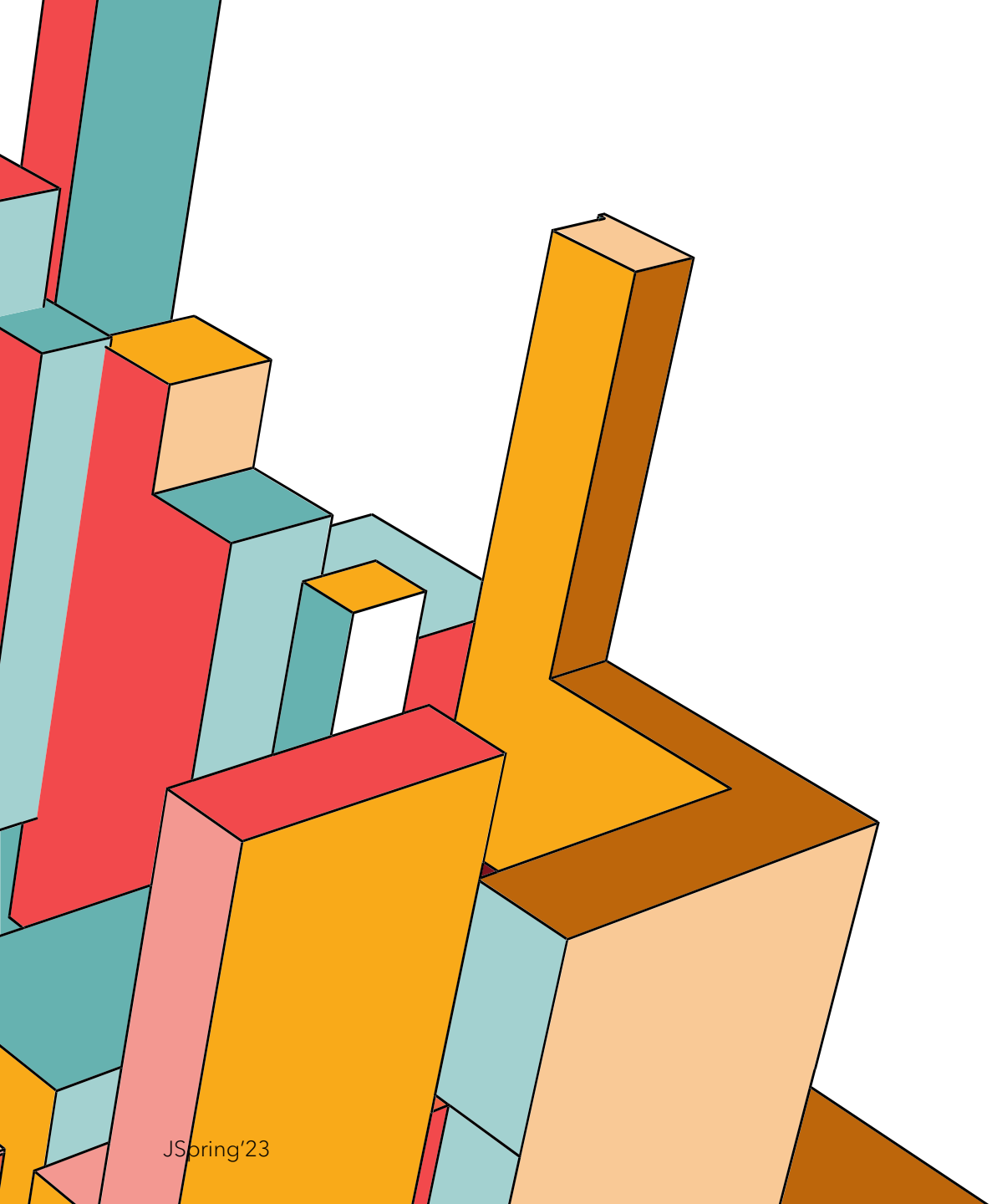
Handy Stuff

Kafka Schema Management
Unit tests as Natural Language
Awaitility
Pi-test





WORKFLOW/PIPELINES



WORKFLOW/PIPELINE

Repeatable steps

Repeatable steps were put on a centralized repo.
Separation of concerns

Same actions/steps for Deployable modules & Libraries

Identify and centralize actions/steps
Nurture the reusability from the beginning

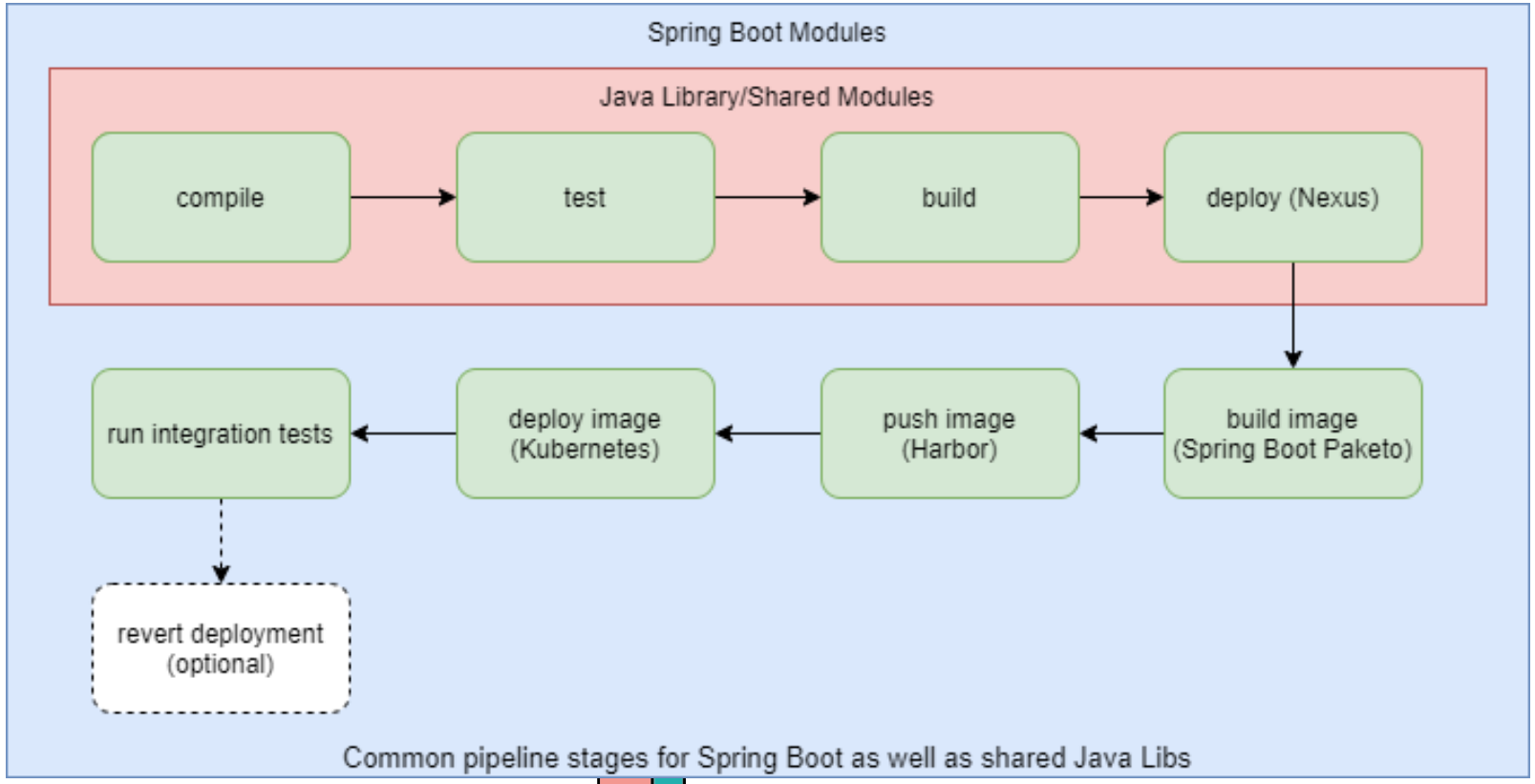
Streamline Branching & Release strategy

Centrally manage versioning, release and deploy

Easiness in Onboarding new repos

Simpler YAML files.
Not everyone has to be an expert on Github actions/Gitlab pipelines

REUSABLE ACTIONS/COMMON PIPELINE



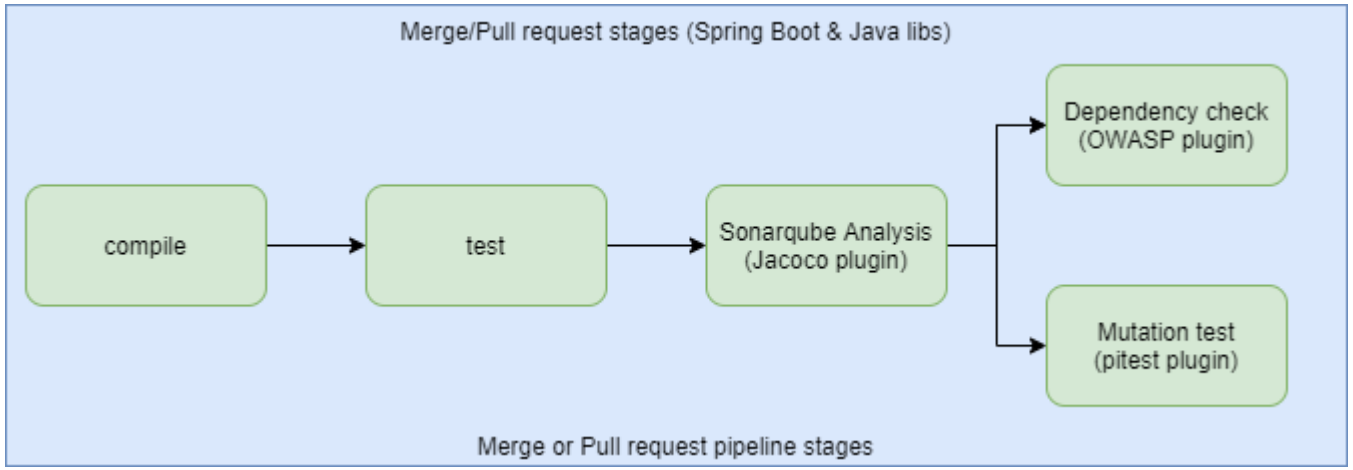
REDUCE WORKFLOW EXECUTION TIME

Separate by operation/actions/ types

Identify feature branches and env specific branches

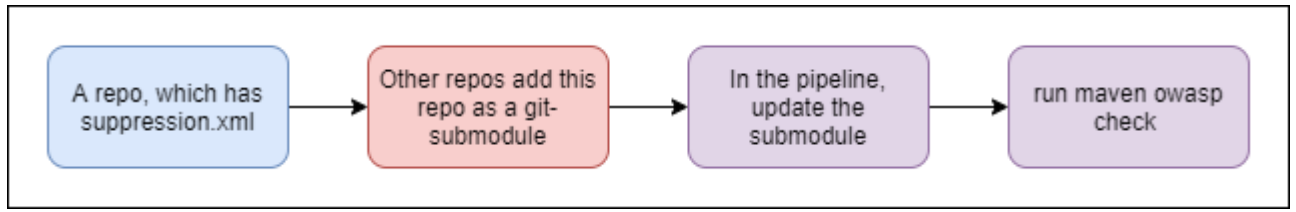
Developer productivity

QA ON MERGE/PULL REQUEST



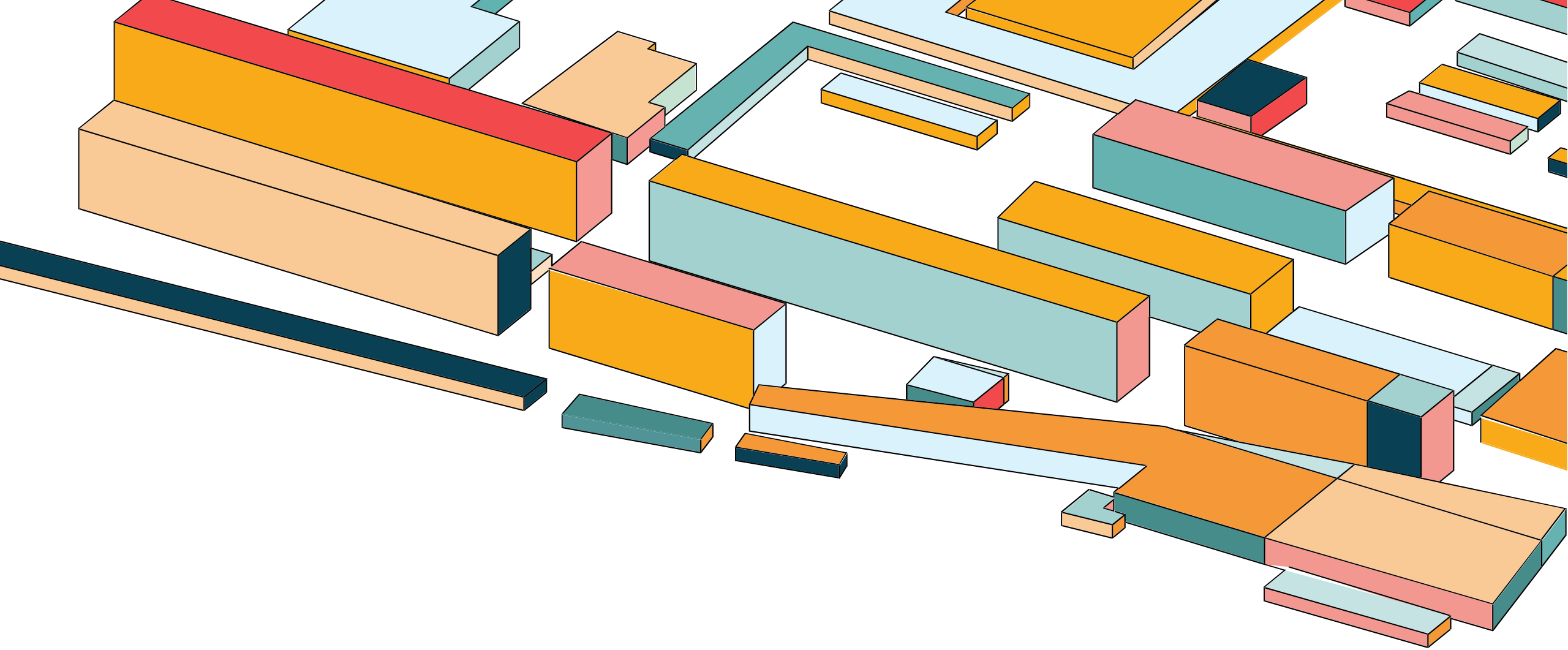
Static Code Analysis
OWASP dependency check
Mutation tests
Container scanning

CENTRALIZED OWASP EXCLUSION LIST



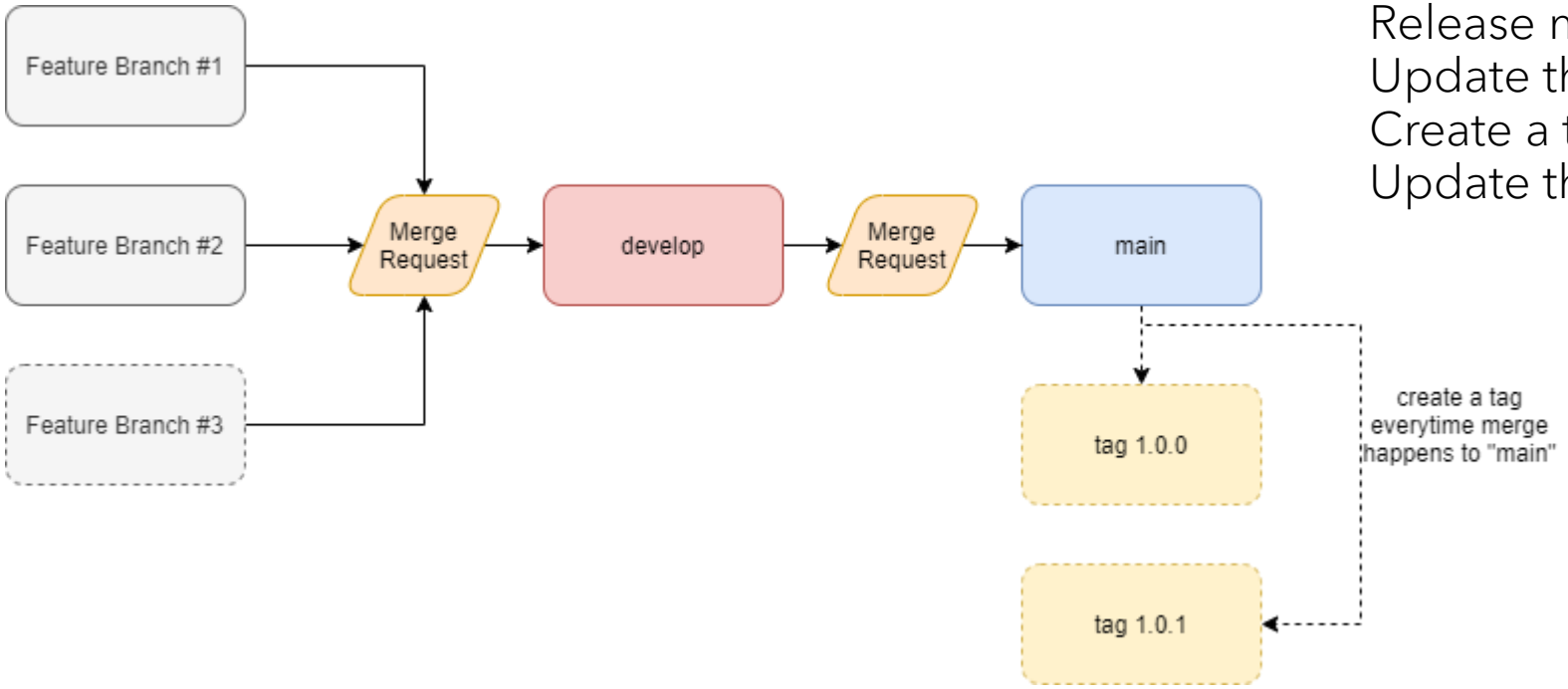
A central list for the all the repos.
Added as a git-submodule to every repo.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<suppressions xmlns="https://jeremylong.github.io/DependencyCheck/dependency-suppression.1.3.xsd">
    <suppress>
        <notes>Only applicable for spEL injection on @Query and @Aggregation</notes>
        <filePath regex="true">.*\bspring-boot-starter-data-mongodb-2.7.*.jar</filePath>
        <cve>CVE-2022-22980</cve>
    </suppress>
</suppressions>
```



REPO MANAGEMENT

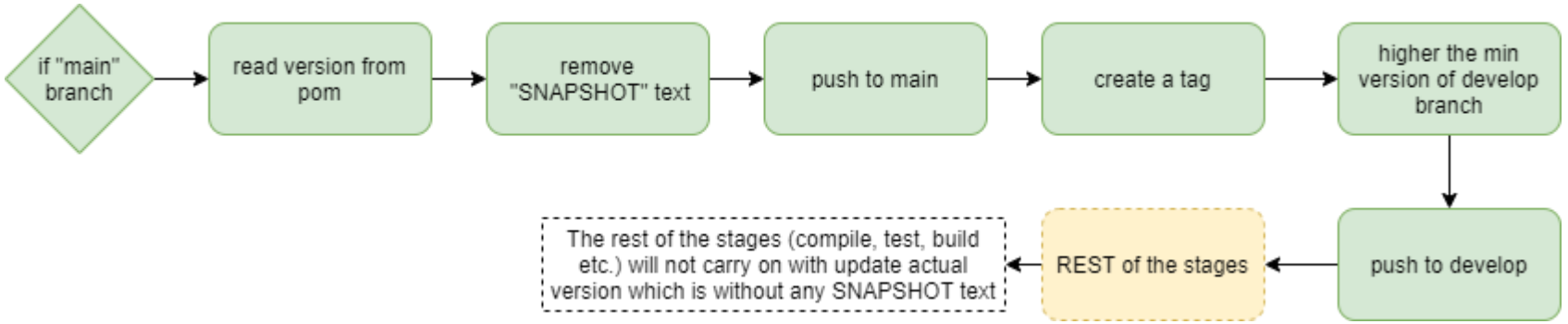
BRANCHING STRATEGY



Release meant merging to the main branch.
Update the version in the main pom.
Create a tag from the version.
Update the snapshot version of develop.

AUTOMATIC VERSIONING

Release meant merging to the main branch.
Update the version in the main pom.
Create a tag from the version.
Update the snapshot version of develop.



BRANCH PROTECTION RULE

- Non-deletable/Lock branch
- Review rule
- Review Merge rule
- Resolve Comments rule
- Restrict Push to branches

DIRECTORIES VS BRANCHES

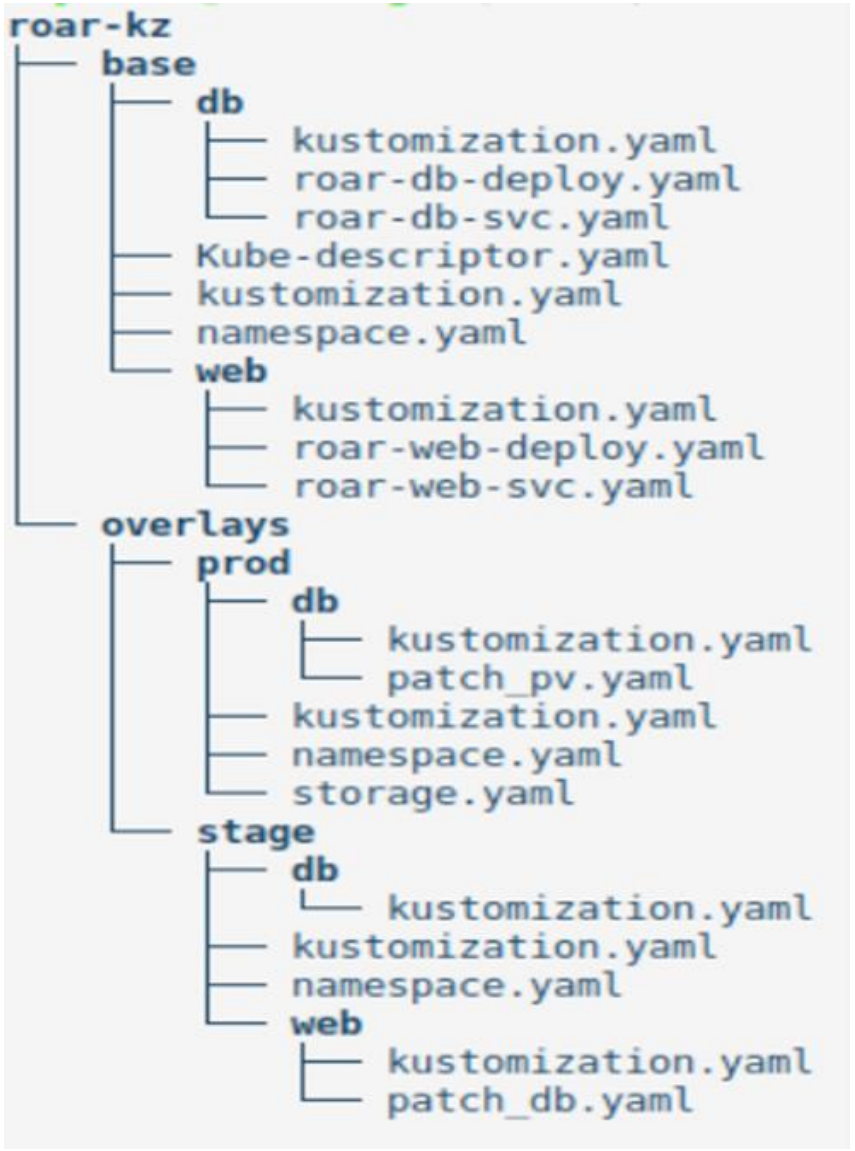


Image from : [Modify your Kubernetes manifests with Kustomize | Opensource.com]

APP & CONFIG SEPARATE

Application code and App Config separate
CI and CD separate
Desirably Async
App pipeline ends on container push
Config/deploy pipeline begins on new image

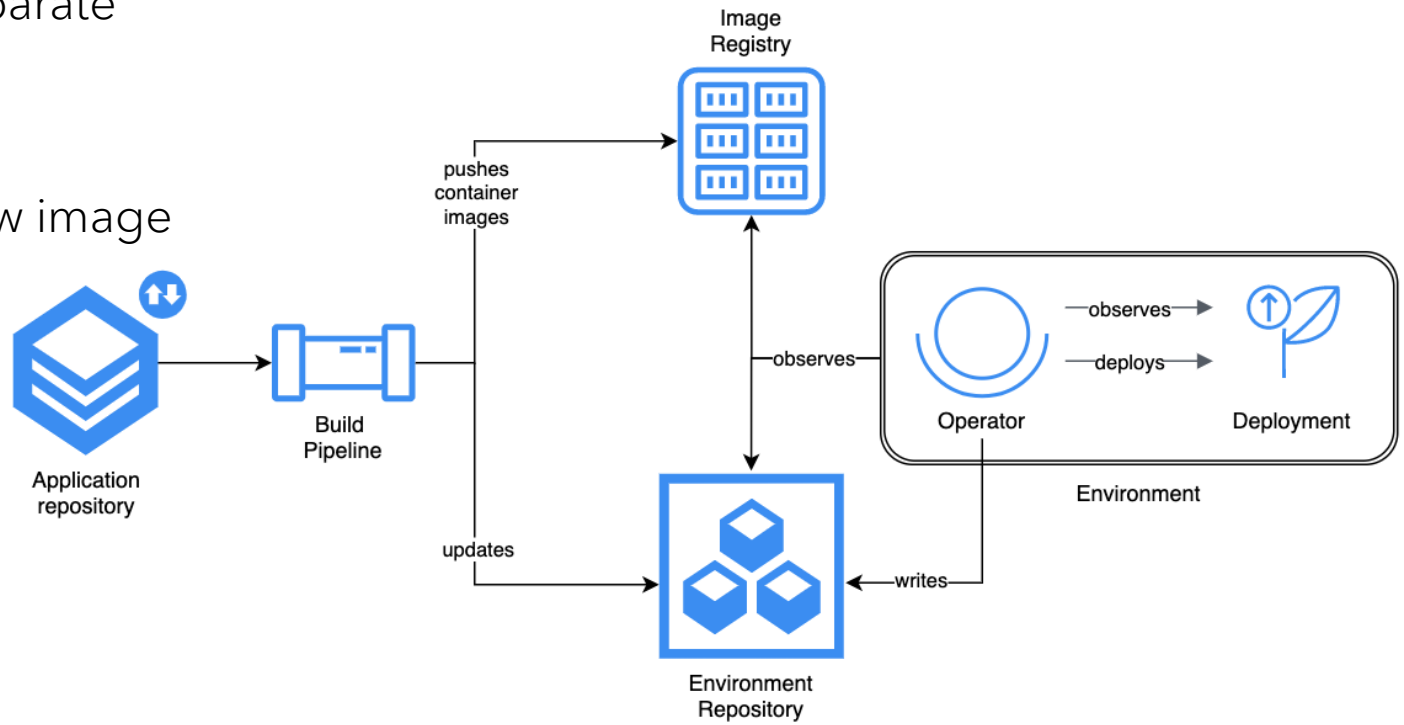
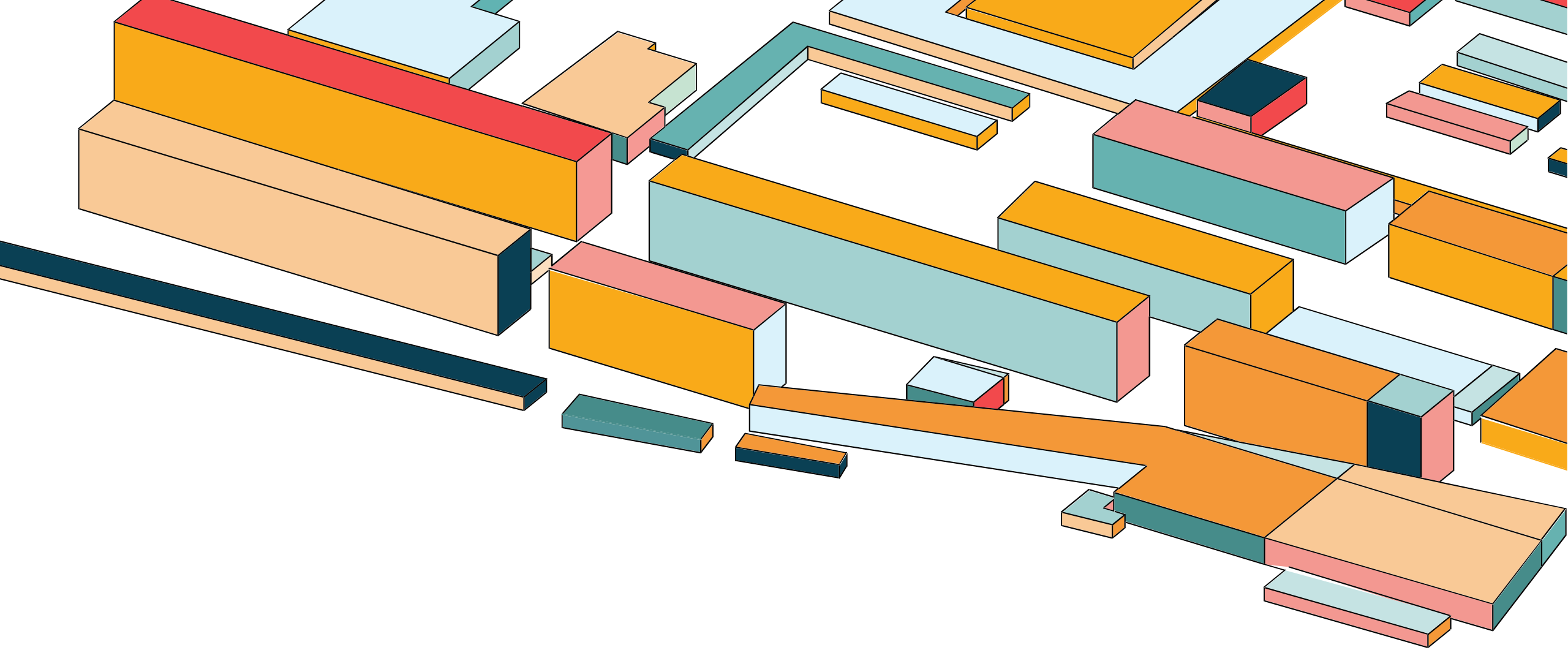
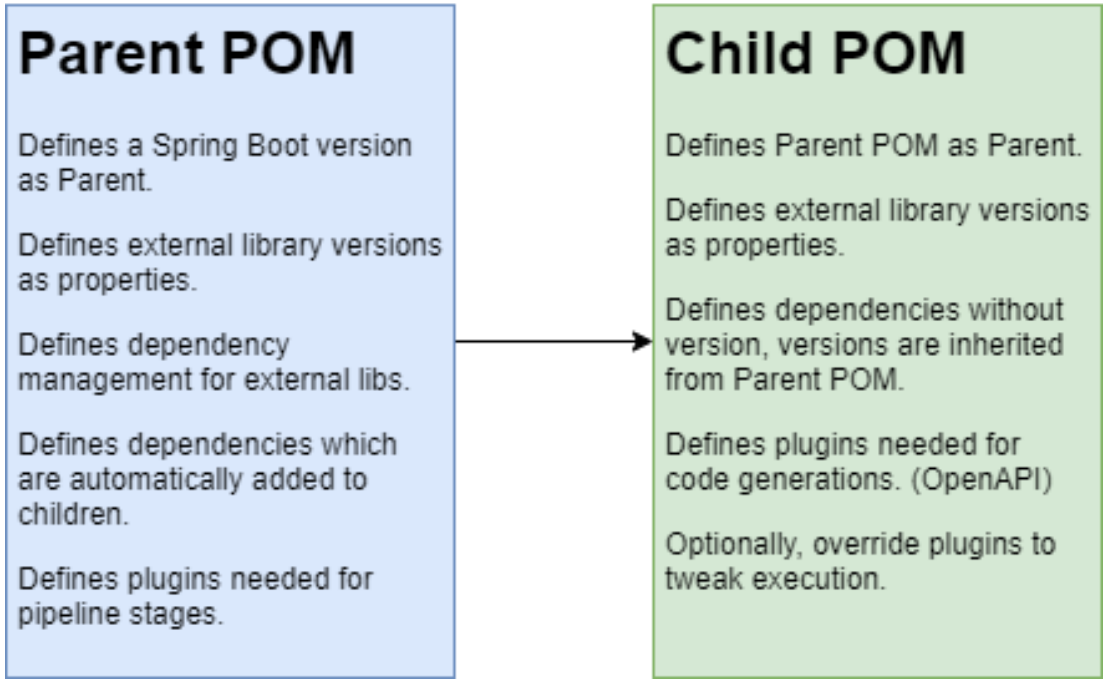


Image from: [GitOps – DevOps for Infrastructure Automation - DZone]



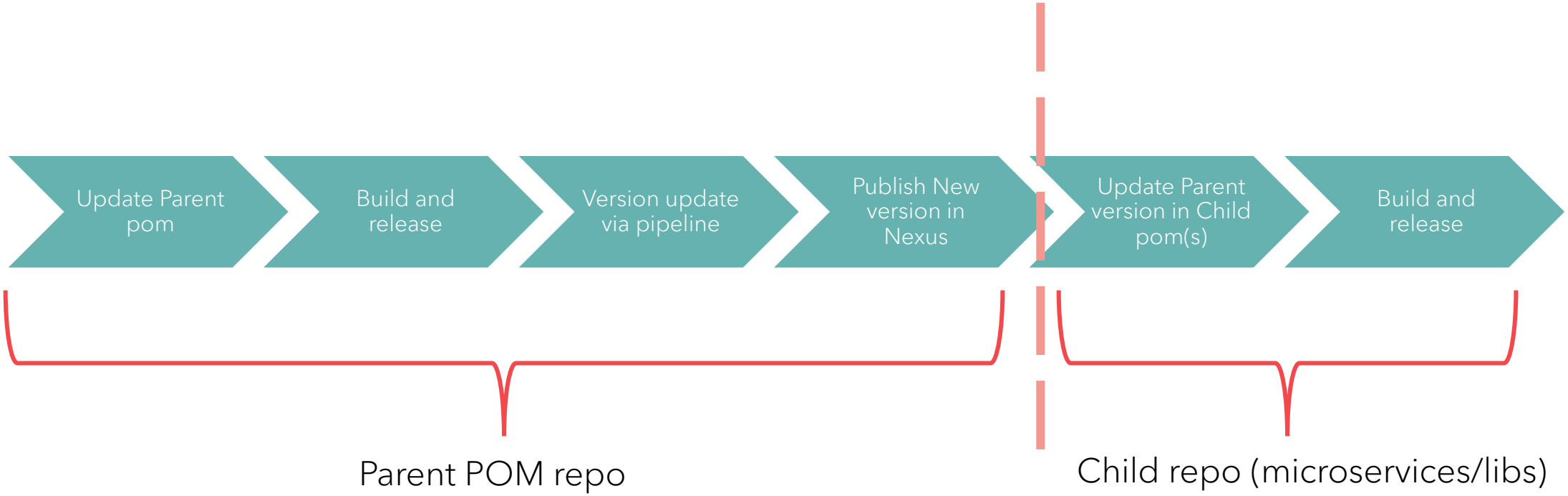
MAVEN TRICKS

PARENT POM



Dependency management, versions
Plugins
Profiles

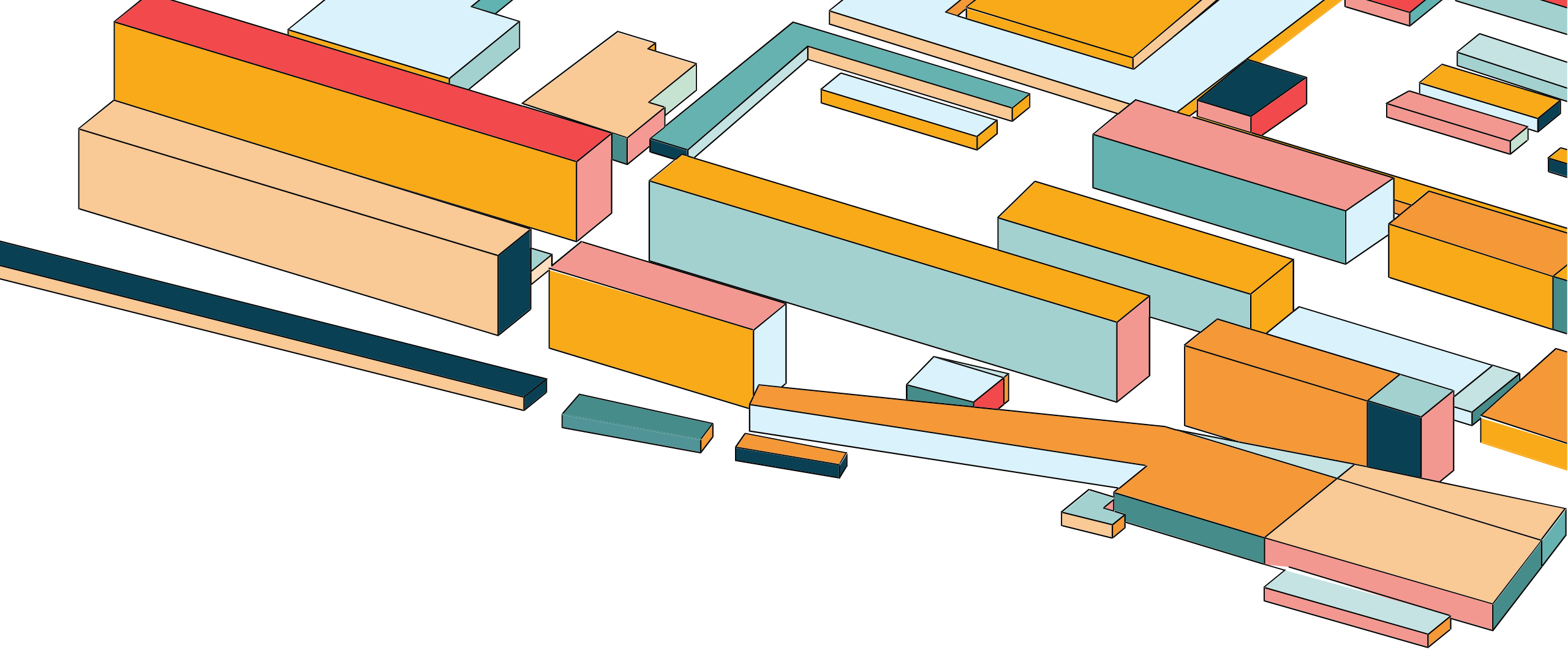
PARENT POM


Update Parent pom
Build and release
Version update via pipeline
Publish New version in Nexus
Update Parent version in Child pom(s)
Build and release
Parent POM repo
Child repo (microservices/libs)

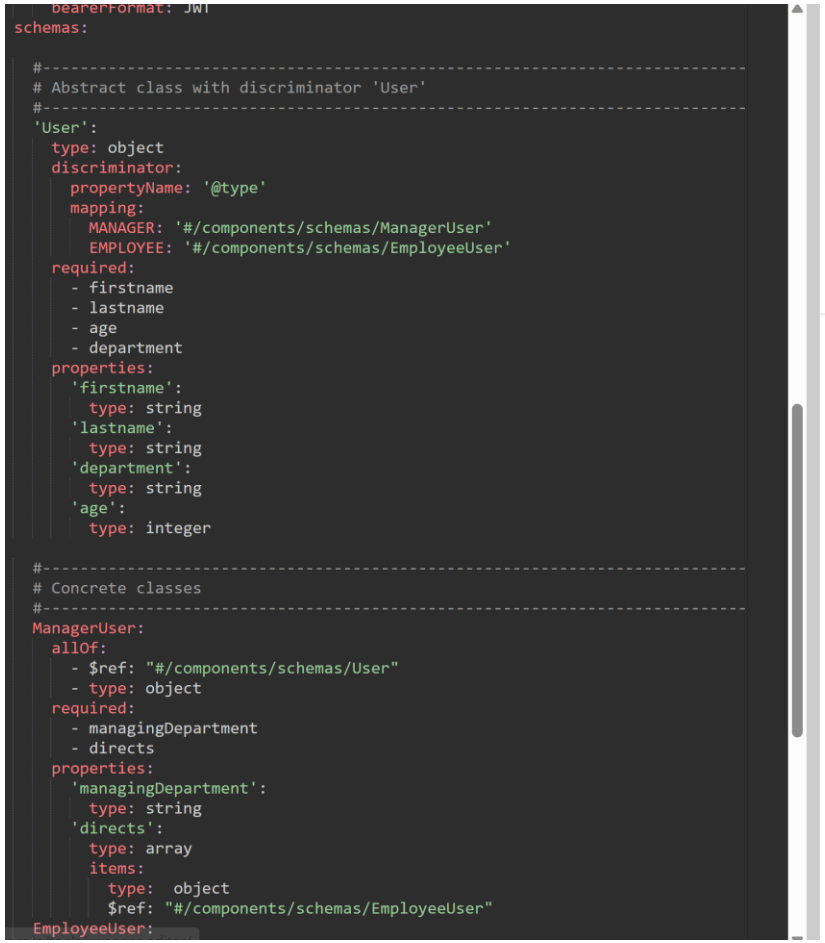
ENFORCER PLUGIN

```xml
<plugin>
    <groupId>org.apache.maven.plugins</groupId>
    <artifactId>maven-enforcer-plugin</artifactId>
    <version>3.3.0</version>
    <configuration>
        <rules>
            <dependencyConvergence/>
            <requireUpperBoundDeps/>
            <banTransitiveDependencies/>
            <banDuplicatePomDependencyVersions/>
            <bannedDependencies>
                <excludes>
                    <exclude>org.apache.commons:commons-lang3</exclude>
                </excludes>
            </bannedDependencies>
        </rules>
    </configuration>
</plugin>
```

Duplicate dependencies
Dependency Convergence
Ban Transitive Dependencies
Banned Dependencies
Require Upper Bounds
Dependencies



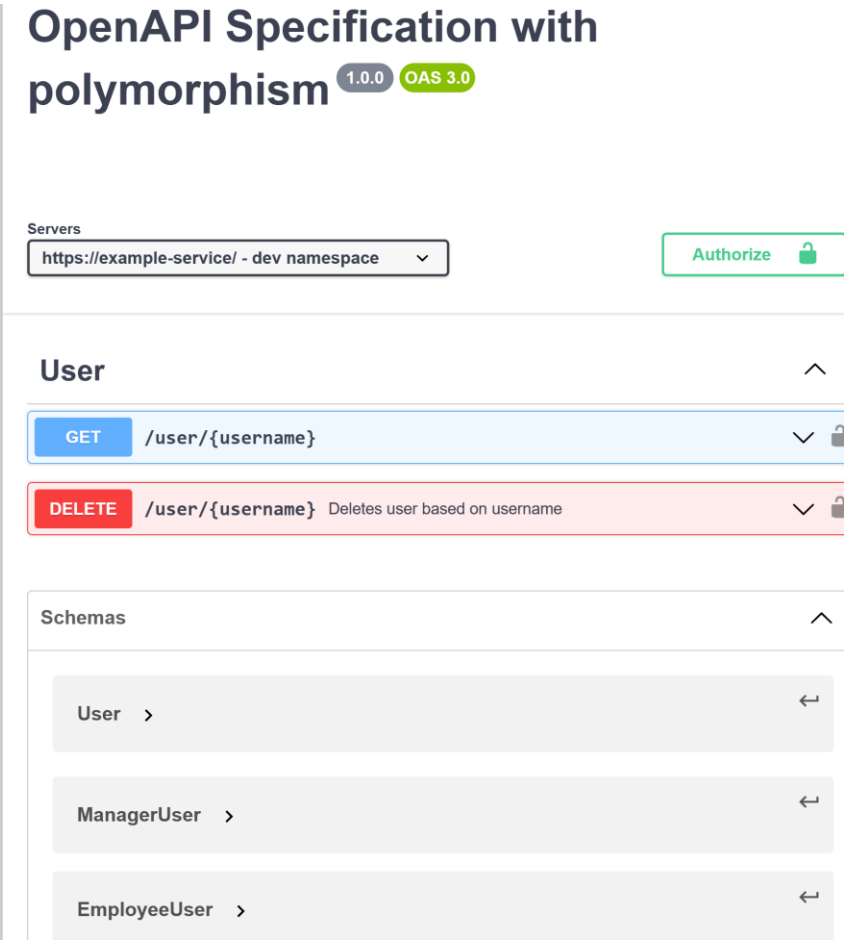
API DEFINITION MANAGEMENT



```
    bearerFormat: JWT
schemas:

  #--------------------------------------------------------------------------
  # Abstract class with discriminator 'User'
  #--------------------------------------------------------------------------
  'User':
    type: object
    discriminator:
      propertyName: '@type'
      mapping:
        MANAGER: '#/components/schemas/ManagerUser'
        EMPLOYEE: '#/components/schemas/EmployeeUser'
    required:
      - firstname
      - lastname
      - age
      - department
    properties:
      'firstname':
        type: string
      'lastname':
        type: string
      'department':
        type: string
      'age':
        type: integer

  #--------------------------------------------------------------------------
  # Concrete classes
  #--------------------------------------------------------------------------
  ManagerUser:
    allOf:
      - $ref: "#/components/schemas/User"
      - type: object
    required:
      - managingDepartment
      - directs
    properties:
      'managingDepartment':
        type: string
      'directs':
        type: array
        items:
          type:  object
          $ref: "#/components/schemas/EmployeeUser"
  EmployeeUser:
```



OPENAPI

CODE GENERATION

OpenAPI generator - Server

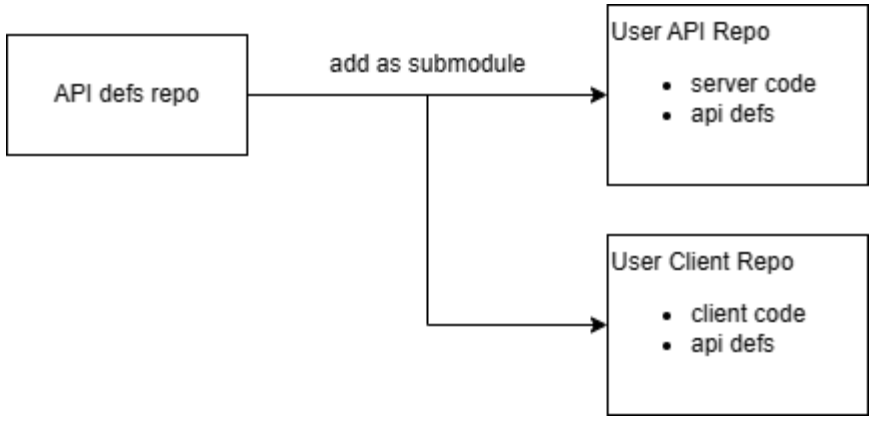
```xml
<plugin>
    <groupId>org.openapitools</groupId>
    <artifactId>openapi-generator-maven-plugin</artifactId>
    <version>${openapi-generator-maven-plugin.version}</version>
    <executions>
        <execution>
            <goals>
                <goal>generate</goal>
            </goals>
            <configuration>
                <inputSpec>
                    ${project.basedir}/src/main/resources/petstore_api.yml
                </inputSpec>
                <generatorName>spring</generatorName>
                <apiPackage>com.company.generated.pestore.controller</apiPackage>
                <modelPackage>com.company.generated.pestore.model</modelPackage>
                <configOptions>
                    <apiDocs>true</apiDocs>
                    <delegatePattern>true</delegatePattern>
                    <interfaceOnly>true</interfaceOnly>
                    <serializableModel>true</serializableModel>
                    <ensureUniqueParams>false</ensureUniqueParams>
                </configOptions>
            </configuration>
        </execution>
    </executions>
</plugin>
```

Kiota- Client

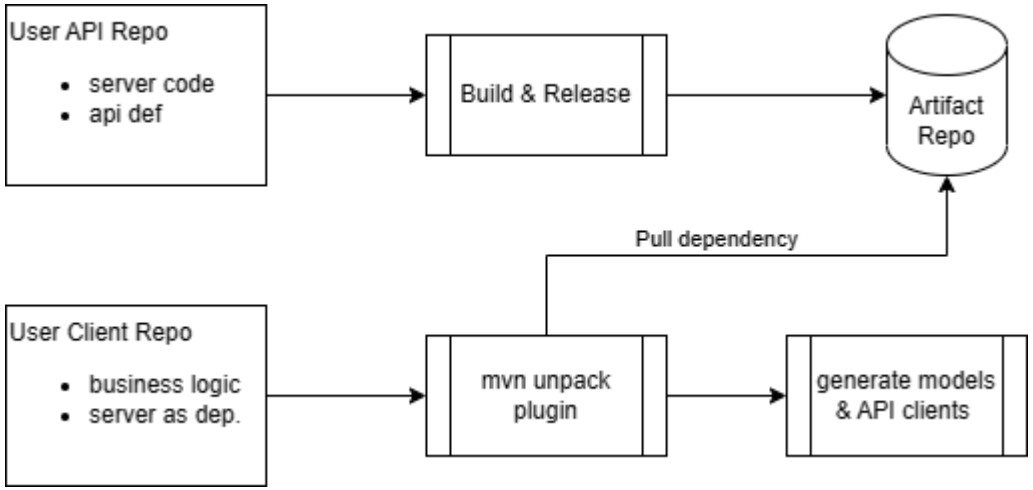
```xml
<plugin>
    <artifactId>kiota-maven-plugin</artifactId>
    <groupId>com.redhat.cloud</groupId>
    <version>0.0.4</version>
    <executions>
        <execution>
            <goals>
                <goal>generate</goal>
            </goals>
        </execution>
    </executions>
    <configuration>
        <file>${project.basedir}/src/main/resources/apiSpecs.yml</file>
    </configuration>
</plugin>
```

GIT SUBMODULE VS MAVEN UNPACK

Submodule



Unpack



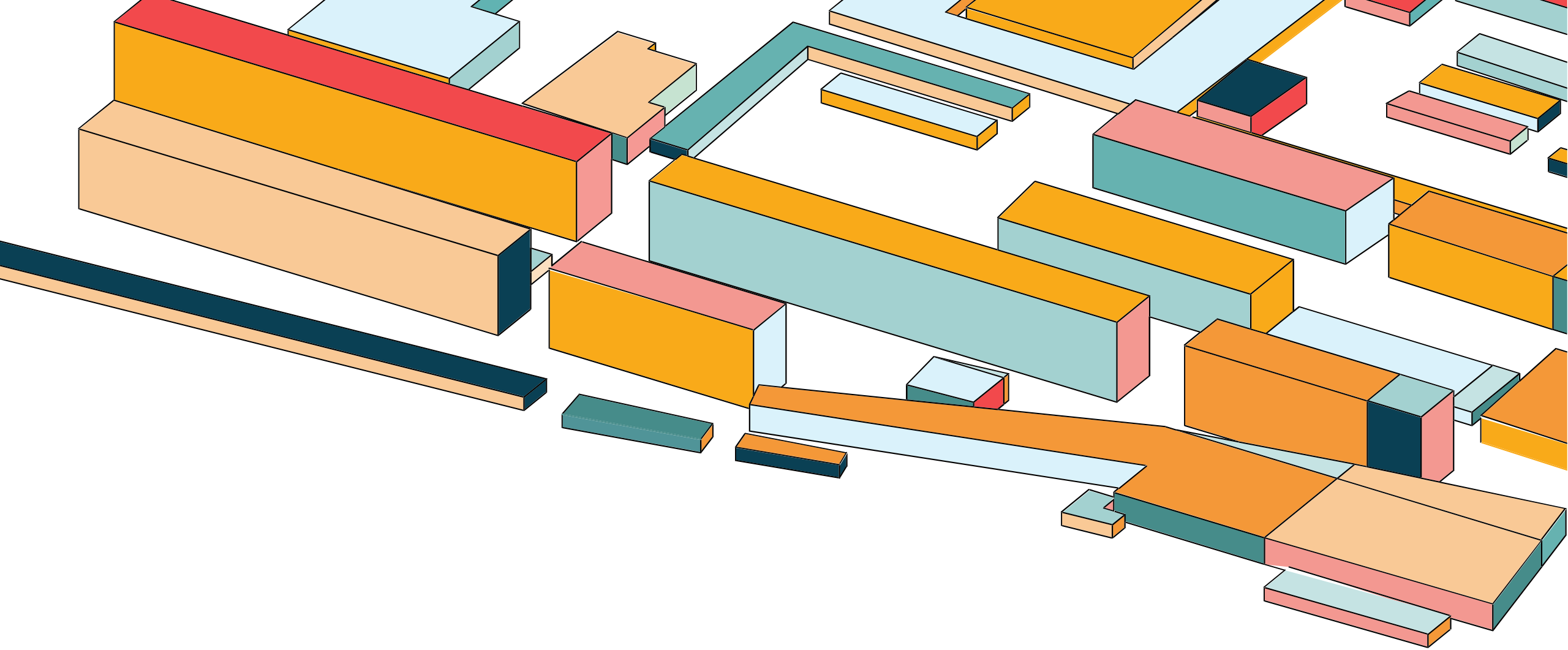
API DEF. CONSUMPTION

OpenAPI generator

```
<groupId>org.openapitools</groupId>
<artifactId>openapi-generator-maven-plugin</artifactId>
<version>${openapi-generator-maven-plugin.version}</version>
<executions>
    <execution>
        <id>pet-store-api</id>
        <goals>
            <goal>generate</goal>
        </goals>
        <configuration>
            <inputSpec>
                ${project.basedir}/petstore_api.yml
            </inputSpec>
            <generatorName>java</generatorName>
            <addCompileSourceRoot>true</addCompileSourceRoot>
            <apiPackage>com.company.generated.pestore.api</apiPackage>
            <modelPackage>com.company.generated.pestore.model.rest</modelPackage>
            <generateApis>true</generateApis>
            <generateModels>true</generateModels>
            <generateModelDocumentation>false</generateModelDocumentation>
            <generateModelTests>false</generateModelTests>
            <generateApiTests>false</generateApiTests>
            <library>feign</library>
            <configOptions>
                <dateLibrary>java8</dateLibrary>
                <sourceFolder>swagger</sourceFolder>
                <interfaceOnly>false</interfaceOnly>
                <java8>true</java8>
            </configOptions>
        </configuration>
    </execution>
</executions>
```

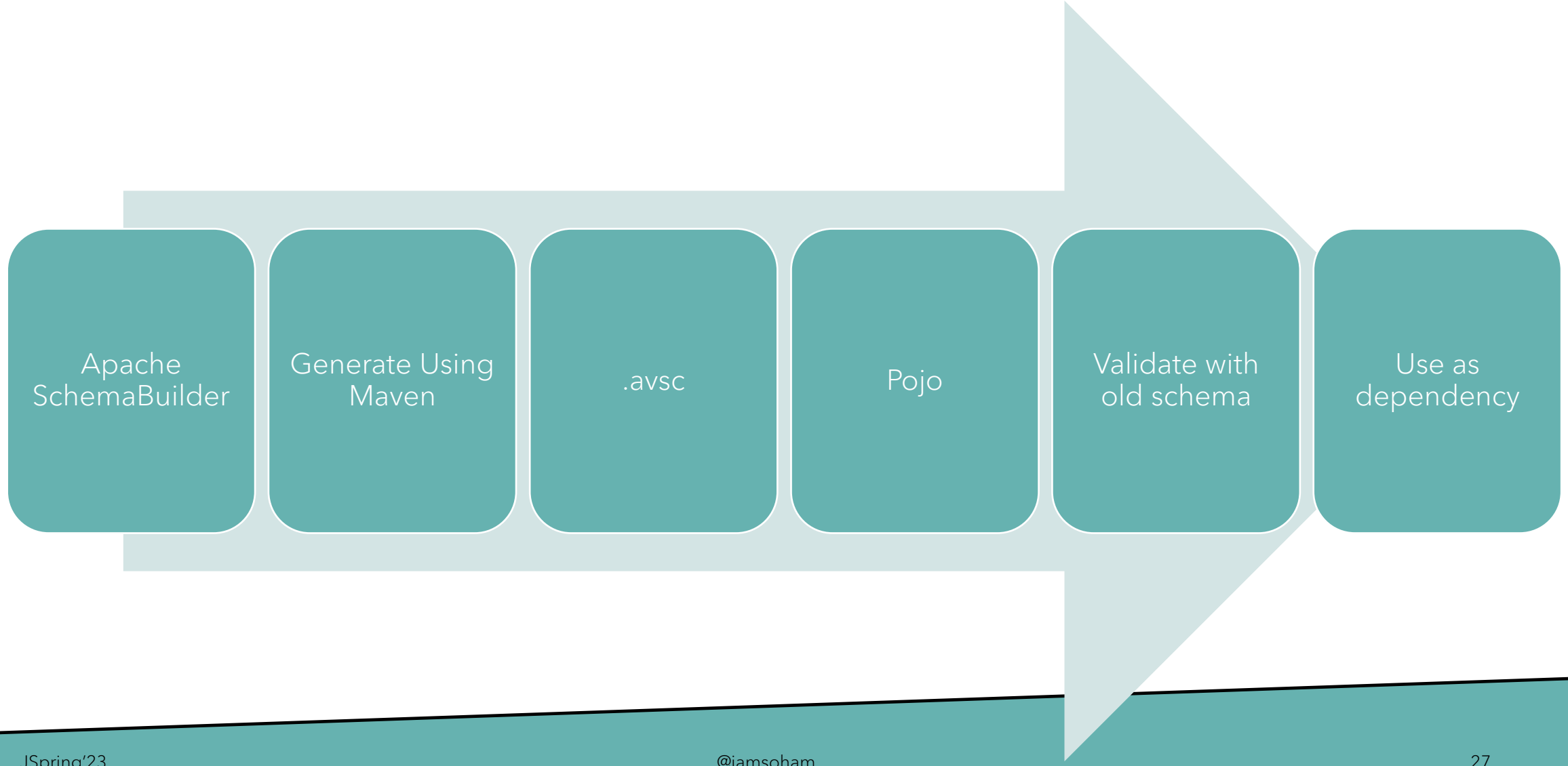
Kiota

```
<plugin>
    <artifactId>kiota-maven-plugin</artifactId>
    <groupId>com.redhat.cloud</groupId>
    <version>0.0.4</version>
    <executions>
        <execution>
            <goals>
                <goal>generate</goal>
            </goals>
        </execution>
    </executions>
    <configuration>
        <file>${project.basedir}/src/main/resources/apiSpecs.yml</file>
    </configuration>
</plugin>
```

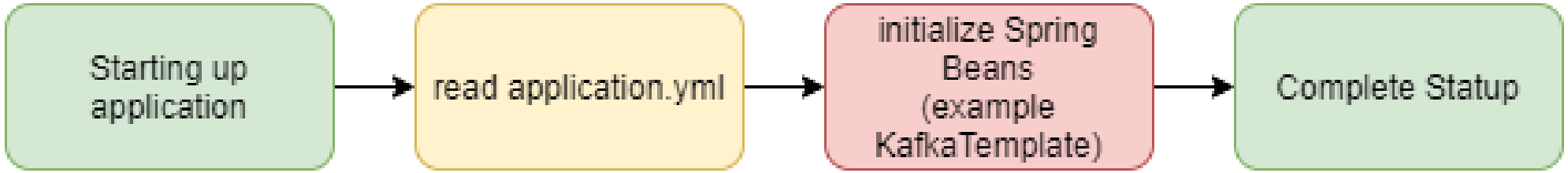


HANDY STUFFS

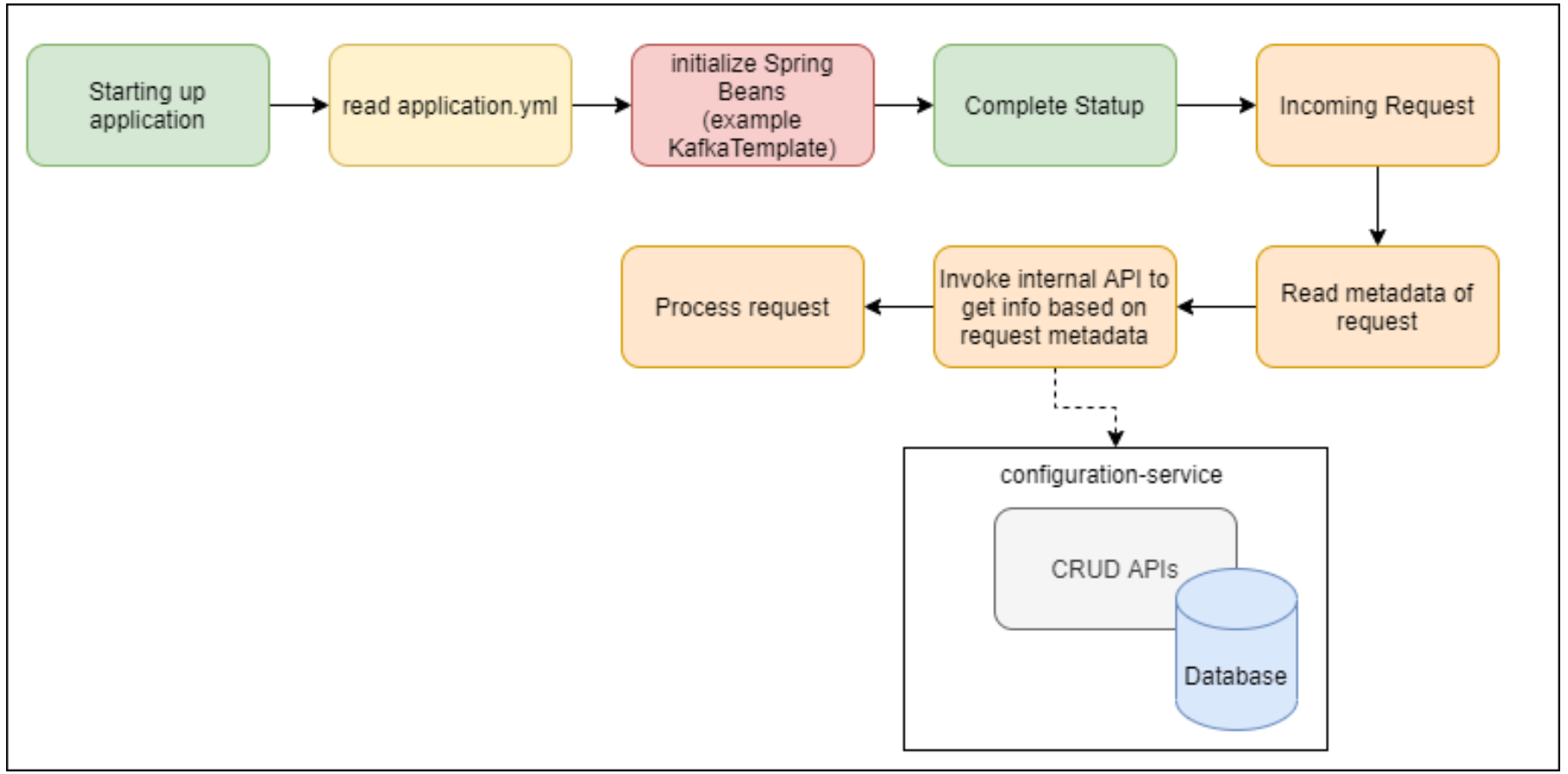
KAFKA SCHEMA MGMT.



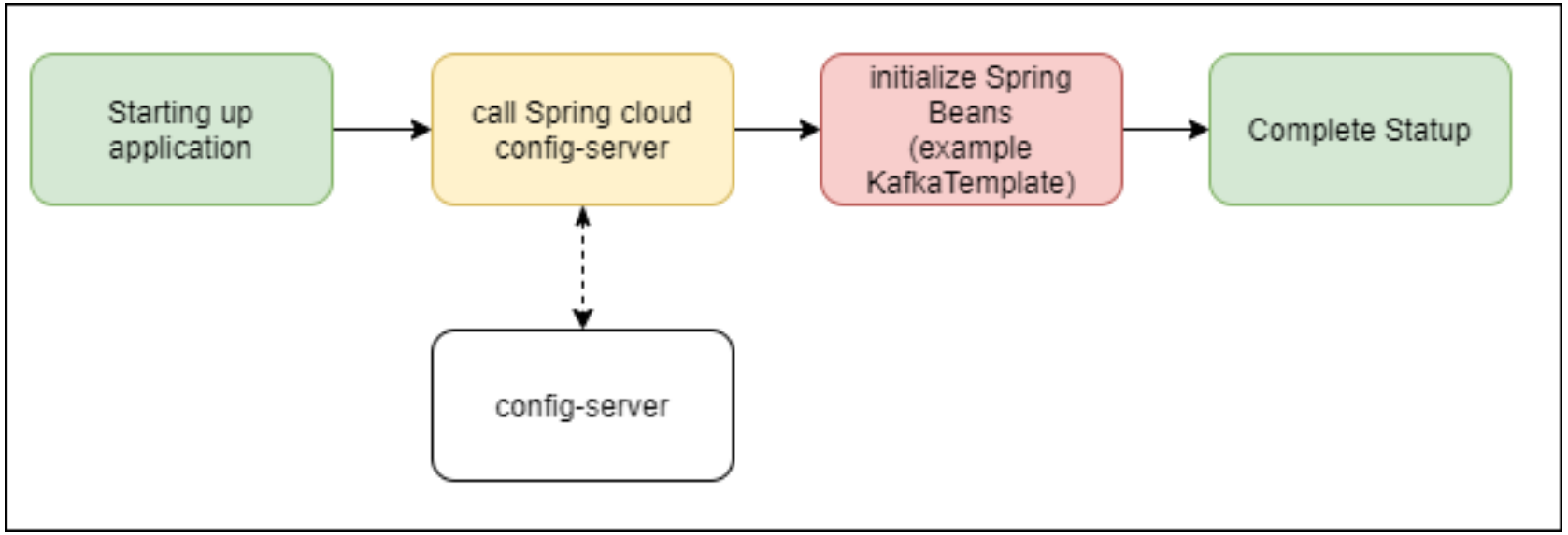
CONFIG MANAGEMENT



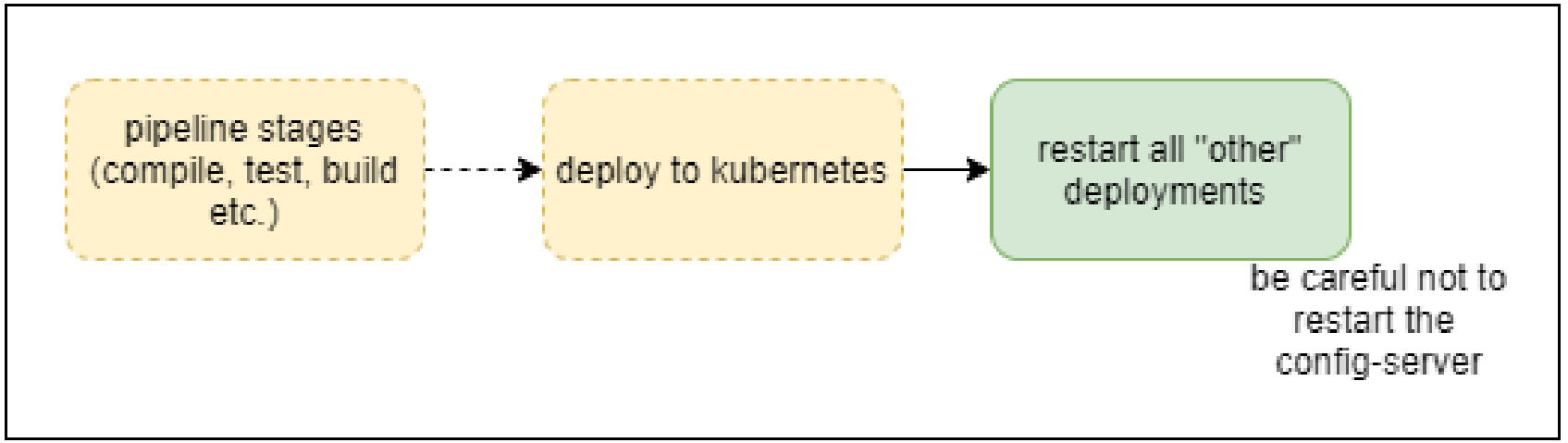
CONFIG MANAGEMENT



CONFIG MANAGEMENT

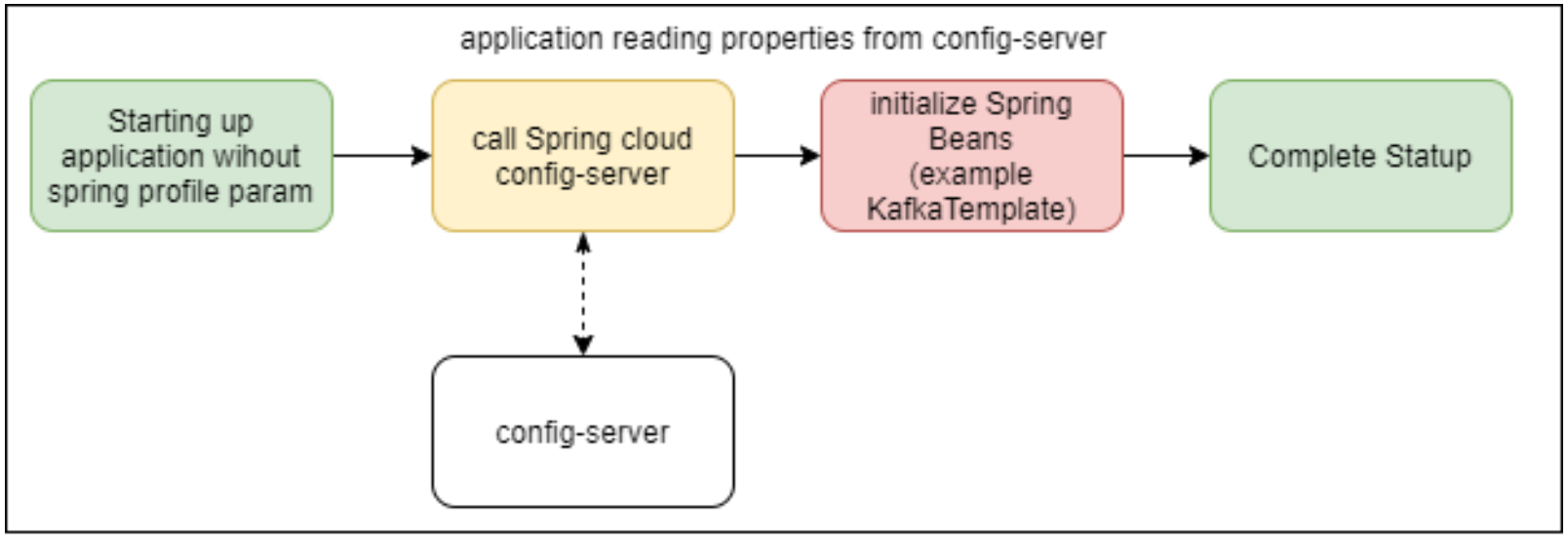


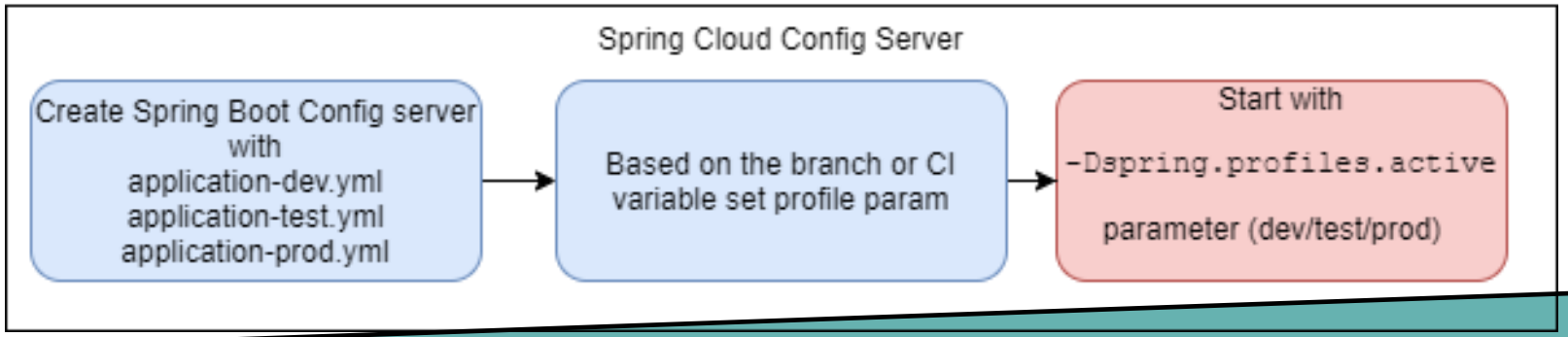
CONFIG MANAGEMENT



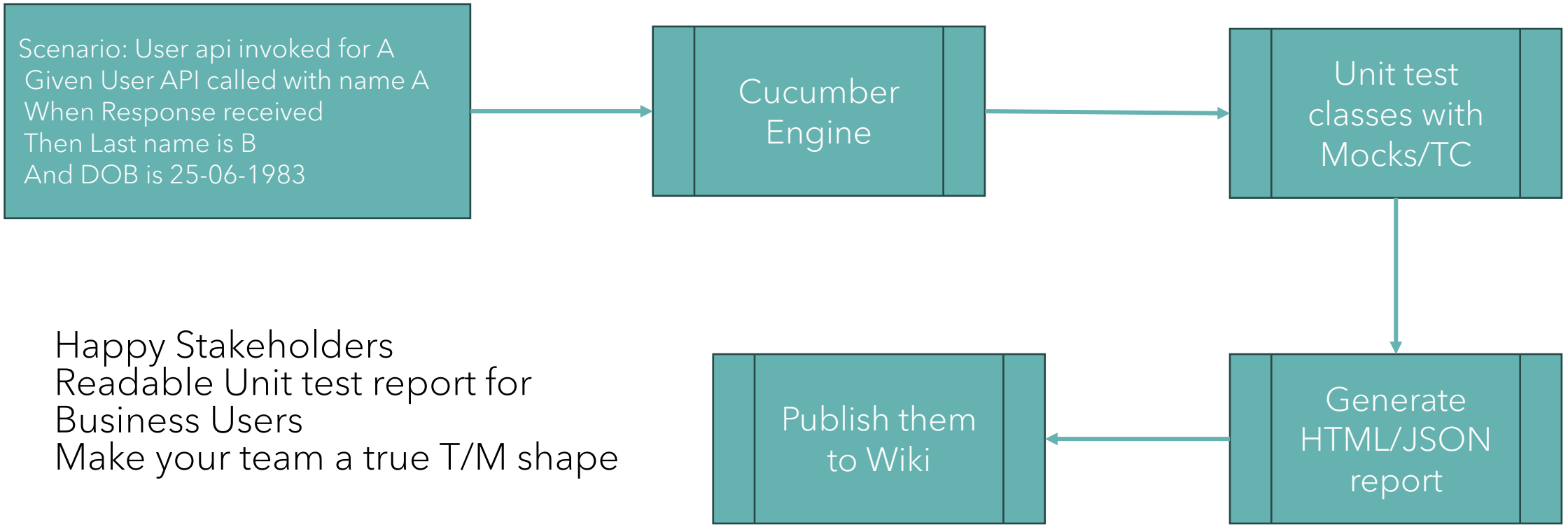
CONFIG MANAGEMENT

CONFIG MANAGEMENT





UNIT TESTS AS NATURAL LANGUAGE



Happy Stakeholders
Readable Unit test report for Business Users
Make your team a true T/M shape

PITEST

```java
public Long doSomeComplexMath(Long number1, Long number2, Long number3) {
    if(number3 == 0) {
        throw new RuntimeException("number3 cannot be zero");
    }
    Long firstDoSum = doSum(number1, number2);
    Long division = doDivision(firstDoSum, number3);
    return doSum(doMultiplication(number2, division), constantFactor);
}
```

```java
@Test
public void testNonZeroNumber3() {
    Throwable exception = assertThrows(RuntimeException.class, () -> {
        calculator.doSomeComplexMath(2l, 3l, 0l);
    });
    assertEquals("number3 cannot be zero", exception.getMessage());
}

@Test
public void checkCalculation() {
    Long result = calculator.doSomeComplexMath(3l, 4l, 7l);
    assertEquals(26l, result);
}
```

Calculator.java

```
1   package com.pitest.demo;
2
3   public class Calculator {
4
5       private final Long constantFactor = 22L;
6
7       public Long doSomeCor
8   1       if(number3 == 0)
9               throw new Ru
10          }
11          Long firstDoSum =
12          Long division = (
13  1       return doSum(doM
14      }
15
16      private Long doSum(L
17  2       return number1 +
18      }
19
20      private Long doDivis
21  2       if(number1 > numb
22  2           return number1 / number2;
23          } else {
24  2           return number2 / number1;
25          }
26      }
27
28      private Long doMultiplication(Long number1, Long number2) {
29  2       return number1 * number2;
30      }
31
```

Mutations

8	1. negated conditional → KILLED
13	1. replaced Long return value with 0L for com/pitest/demo/Calculator::doSomeComplexMath → KILLED
17	1. Replaced long addition with subtraction → KILLED 2. replaced Long return value with 0L for com/pitest/demo/Calculator::doSum → KILLED
21	1. changed conditional boundary → SURVIVED 2. negated conditional → SURVIVED
22	1. Replaced long division with multiplication → NO_COVERAGE 2. replaced Long return value with 0L for com/pitest/demo/Calculator::doDivision → NO_COVERAGE
24	1. Replaced long division with multiplication → KILLED 2. replaced Long return value with 0L for com/pitest/demo/Calculator::doDivision → KILLED
29	1. Replaced long multiplication with division → SURVIVED 2. replaced Long return value with 0L for com/pitest/demo/Calculator::doMultiplication → KILLED

PITEST

```xml
<plugin>
    <groupId>org.pitest</groupId>
    <artifactId>pitest-maven</artifactId>
    <version>${pitest-maven.version}</version>
    <configuration>
        <verbose>true</verbose>
        <maxDependencyDistance>1</maxDependencyDistance>
        <timeoutFactor>0.7</timeoutFactor>
        <threads>6</threads>
        <coverageThreshold>80</coverageThreshold>
        <mutationThreshold>80</mutationThreshold>
        <excludedClasses>
            <param>com.demo.generated.*</param>
            <param>org.springframework.jms.config.*</param>
            <param>org/slf4j/Logger.*</param>
            <param>com.demo.*.configuration.*</param>
        </excludedClasses>
        <avoidCallsTo>
            <avoidCallsTo>com.demo.generated</avoidCallsTo>
            <avoidCallsTo>org/springframework/jms/config</avoidCallsTo>
            <avoidCallsTo>org/slf4j/Logger</avoidCallsTo>
            <avoidCallsTo>com.demo.*.configuration</avoidCallsTo>
        </avoidCallsTo>
    </configuration>
    <dependencies>
        <dependency>
            <groupId>org.pitest</groupId>
            <artifactId>pitest-junit5-plugin</artifactId>
            <version>${pitest-junit5-plugin.version}</version>
        </dependency>
    </dependencies>
</plugin>
```

AWAITILITY

```java
@Test
public void updatesCustomerStatus() {
    // Publish an asynchronous message to a broker (e.g. RabbitMQ):
    messageBroker.publishMessage(updateCustomerStatusMessage);

    // Awaitility lets you wait until the asynchronous operation completes:
    await().atMost(5, SECONDS).until(customerStatusIsUpdated());
    ...
}
```

Awaitility

THANK YOU

Code and Presentation