

Property Based API Testing

EDD Workshop Session

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Section 1

OpenAPI Basics

OpenApi: About

- API description language on top of JSON schema
- intended for REST and JSON RPC APIs with JSON or XML payloads
- language independent API specification written in JSON or YML
- plenty of generators and tools for individual language bindings
- client and server stubs generation for models and api

OpenApi: Building Blocks

- General info block (title, license, server, tags, ...)
- Operations (HTTP-verb + Path, request and responses, media-types)
- Schemata (named and anonymous models, parameters)
- Security (OAuth 2.0, HTTP BasicAuth, ...)

OpenApi: Swagger Editor

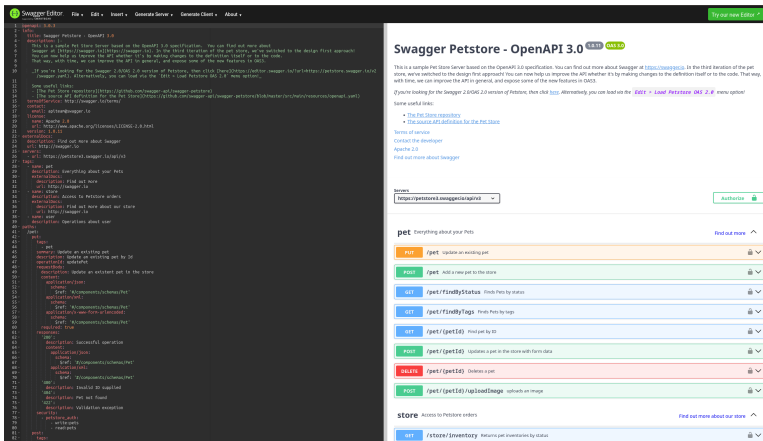


Figure 1: Editieren von OpenApi-Dateien in Swagger Editor.

A1: Modelliere in OpenAPI

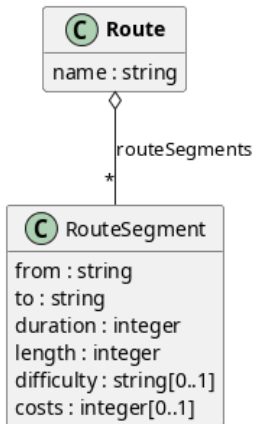


Figure 2: Klassendiagramm für das Modell "Route".

Section 2

Property-Based-Testing Basics

PBT: General



Figure 3: Testing Dilemma: “testing can only find bugs, not prove their absence” (E.W. Dijkstra in [1]).

PBT: Basics

$$\forall s \in S : P(s) = \top, \quad P : S \rightarrow \{\top, \perp\} \quad (1)$$

- S : state space of valid instances
- P : property to prove, candidates involve [2]:
 - invariants,
 - round-trips,
 - symmetry,
 - commutativity,
 - idem-potency, and
 - induction

A2: Implementiere PBT isValid()

- let jqwik generate arbitraries
- validate any arbitraries with openapi4j
- use model Route from previous exercise

Section 3

Applying PBT to OpenAPI /-Generator

A3: Modelliere in OpenApi und prüfe mit PBT

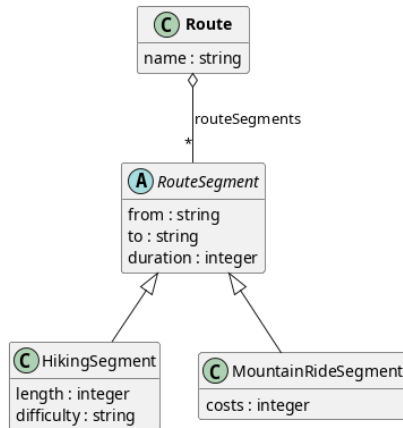


Figure 4: Klassendiagramm für das polymorphe Modell "RouteSegment".

Section 4

Questions?

References

- [1] P. Godefroid and K. Sen, “Combining model checking and testing,” *Handbook of Model Checking*, pp. 613–649, 2018, Available: https://patricegodefroid.github.io/public_psfiles/mchandbook2018.pdf
- [2] S. Sahayam, “Property-based testing patterns.” Jun. 2016. Available: <https://blog.ssanj.net/posts/2016-06-26-property-based-testing-patterns.html>