Unlocking the Power of Spec-Driven API Development

Meetup - Hasselt

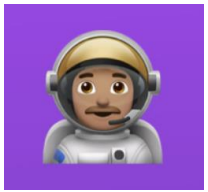
Jan 2024

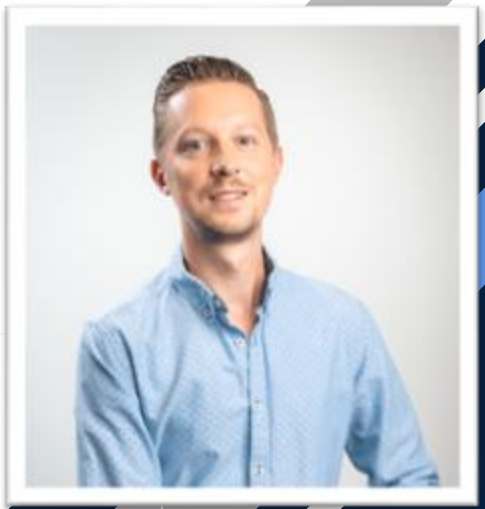
I'm **Tim Haselaars**

Product Manager at TrendMiner — A SOFTWARE AG COMPANY

API & Event enthusiast

Opensource contributor
on Portman, Postman-to-K6, OpenAPI-format, EventCatalog





OPENAPI-FORMAT

EventCatalog

Table of contents

REST API

Congrats!
You just launched your API 🚀

Where can I find the docs?

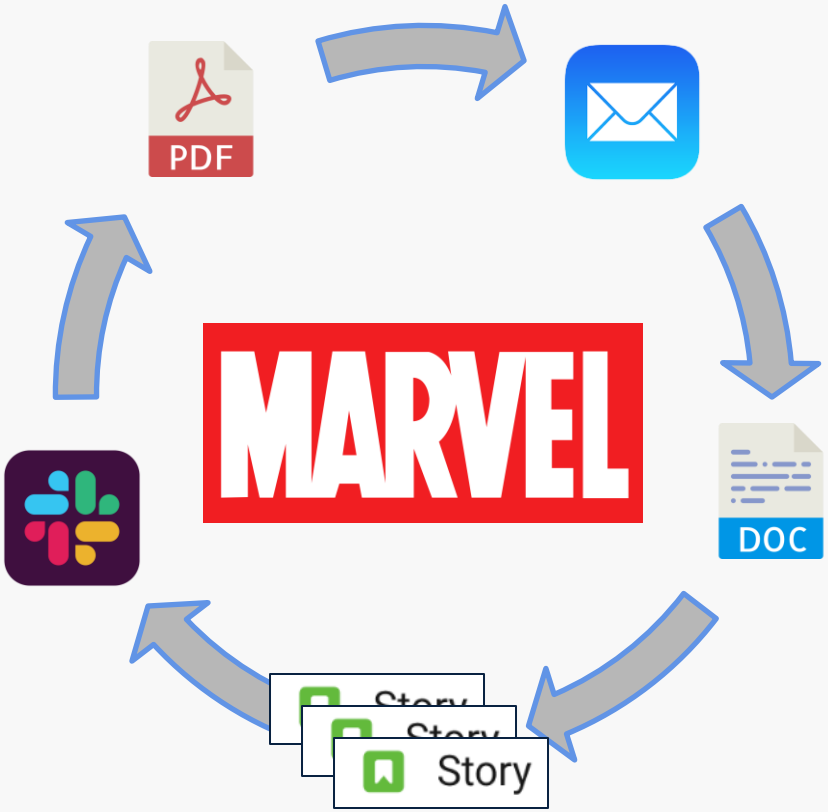
How fast can she go?

How can I play with it?

Which fields are required?

You got a feature request
Start all over again!

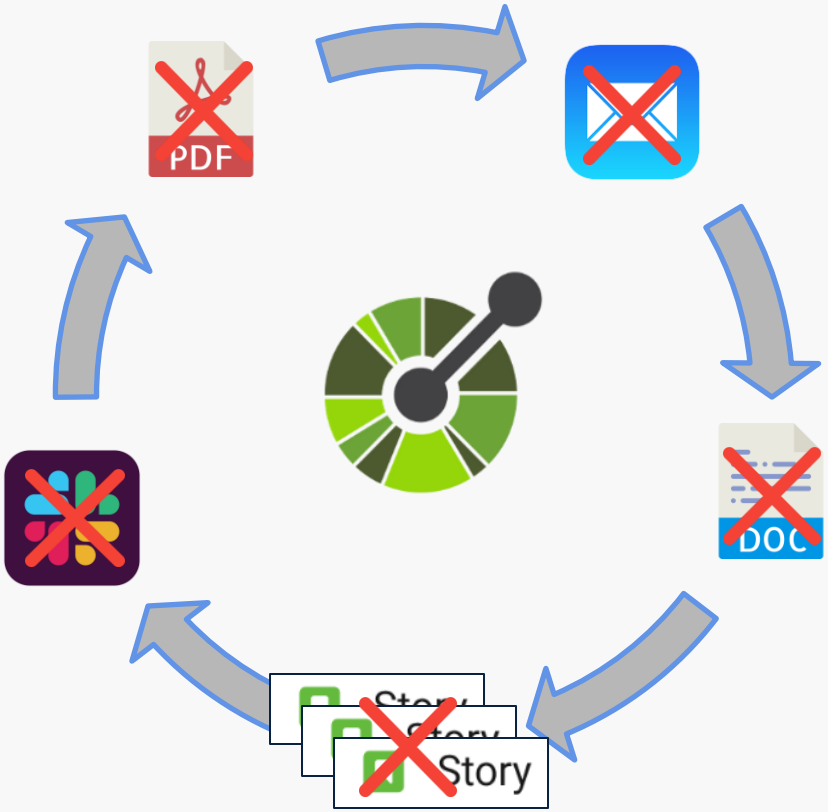
Let’s quickly create, some …

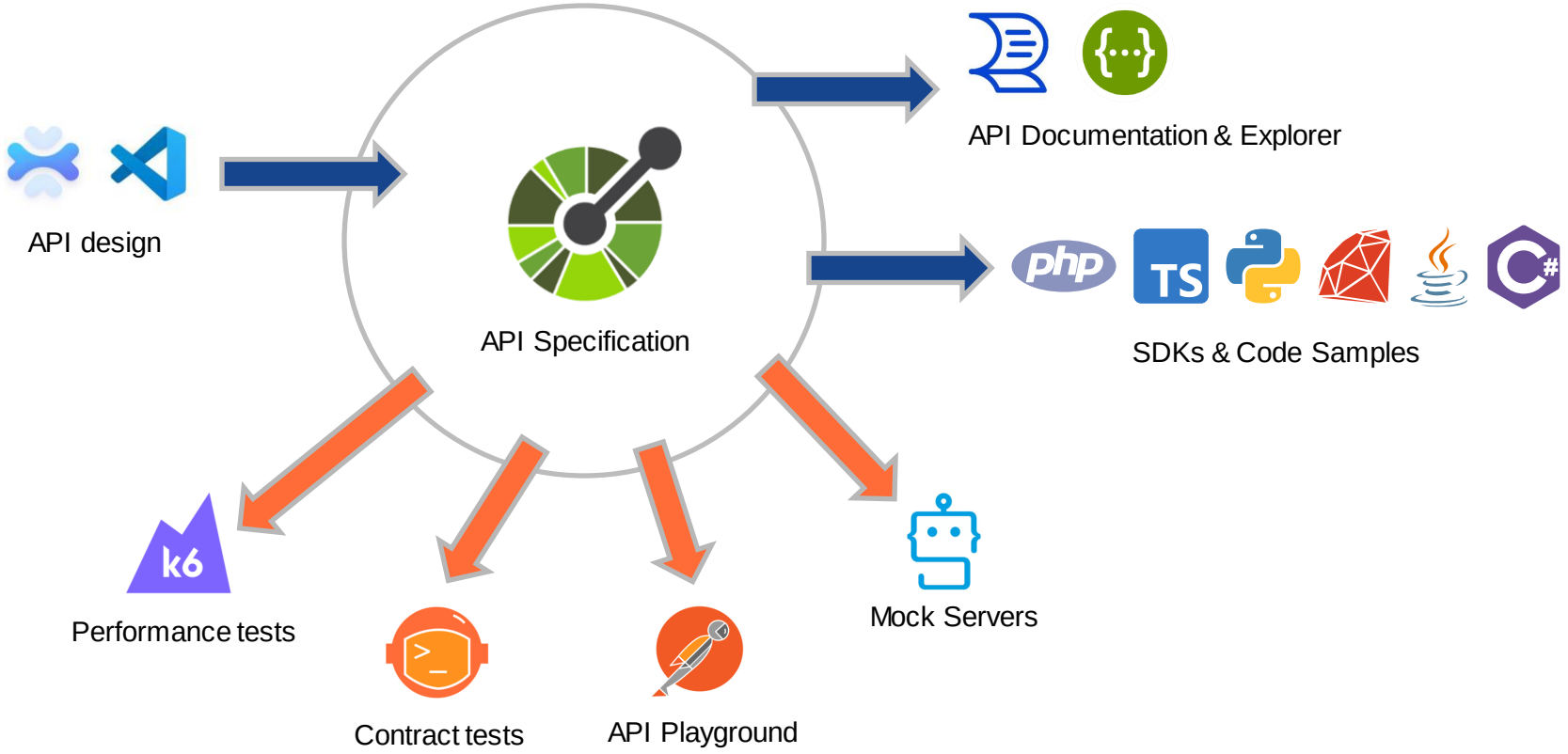


You are not alone
API docs are in poor condition

Let’s fix this

Let’s stop, doing one-off efforts




API design
API Specification
API Documentation & Explorer
SDKs & Code Samples
Performance tests
Contract tests
API Playground
Mock Servers

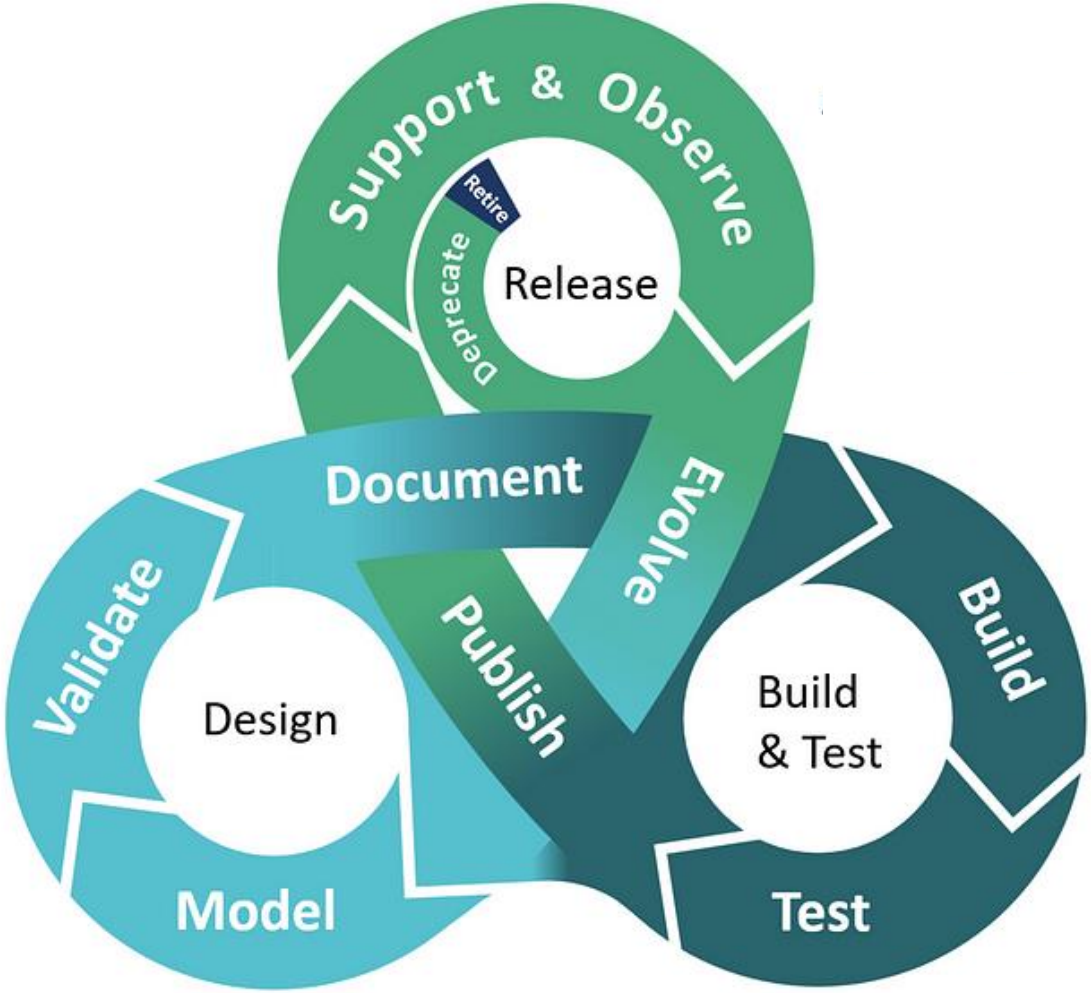


Diagram from TRGoodwill

Single source of truth

API specification

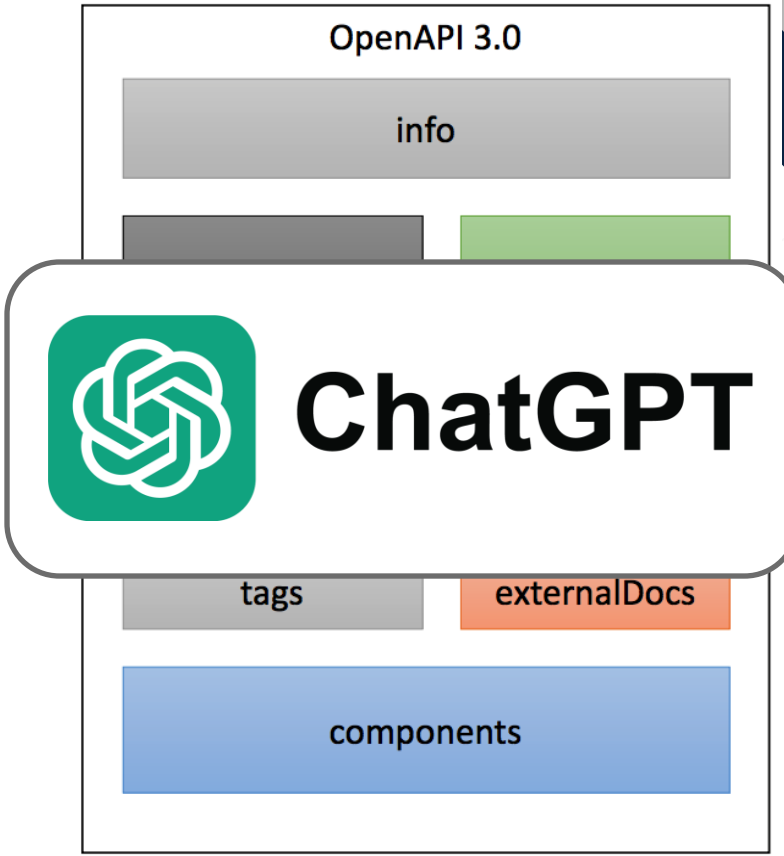
- **Describes** general information about the API
- Available **paths** e.g. /resources
- Available **operations** on each path e.g. GET /resources/fid}
- **input** & **output** for each operation
- Model **schemas**, describing the fields/properties
- **Security & Authentication**

api blueprint

WADL

OPENAPI

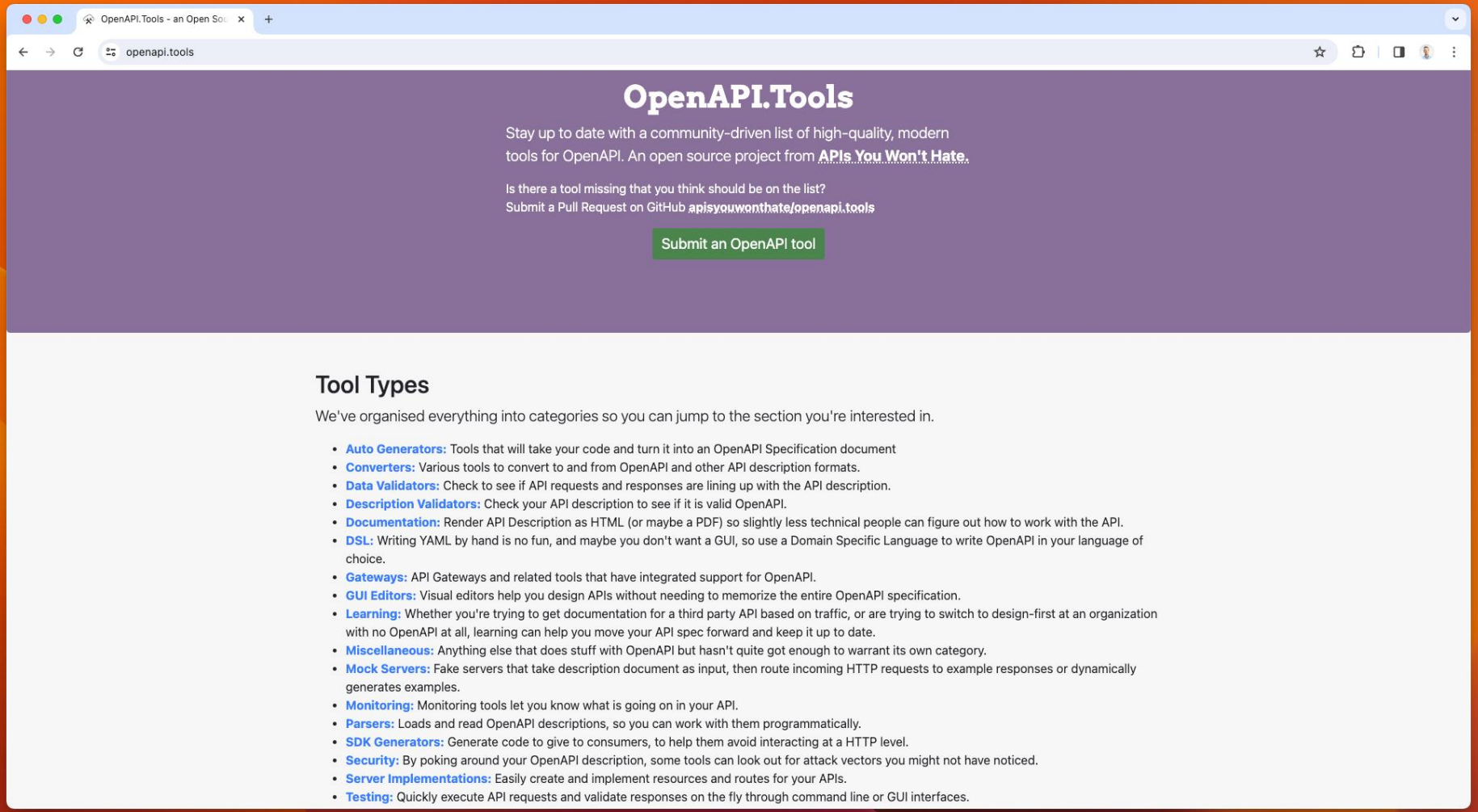
- Worldwide Standard
- Formerly named Swagger (2.0)- 2011
- Current version
  - 3.0 - 2017
  - 3.1 - 2021
- Format: JSON or YAML
- REST API
- JSON Schema
- Independent of language/framework

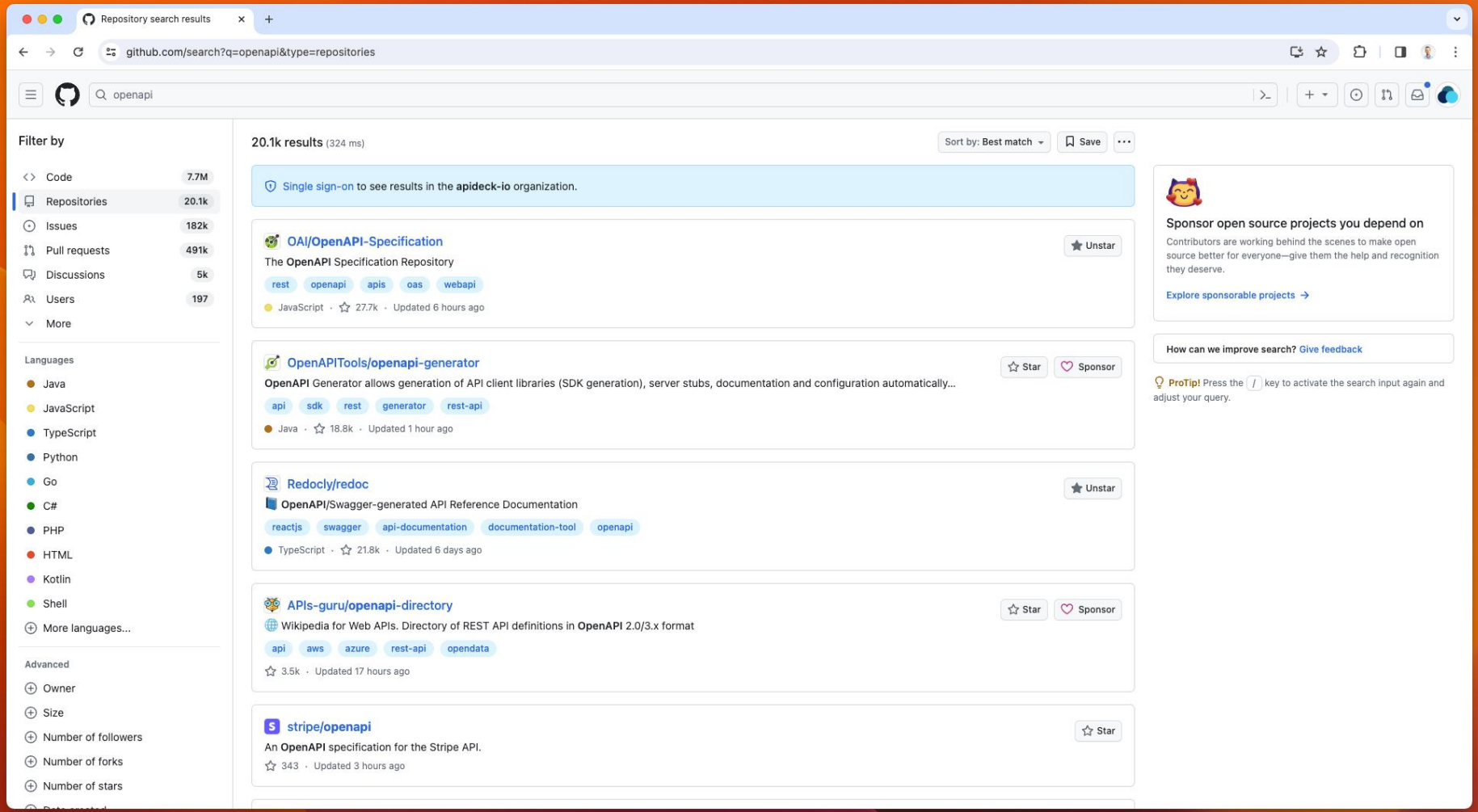


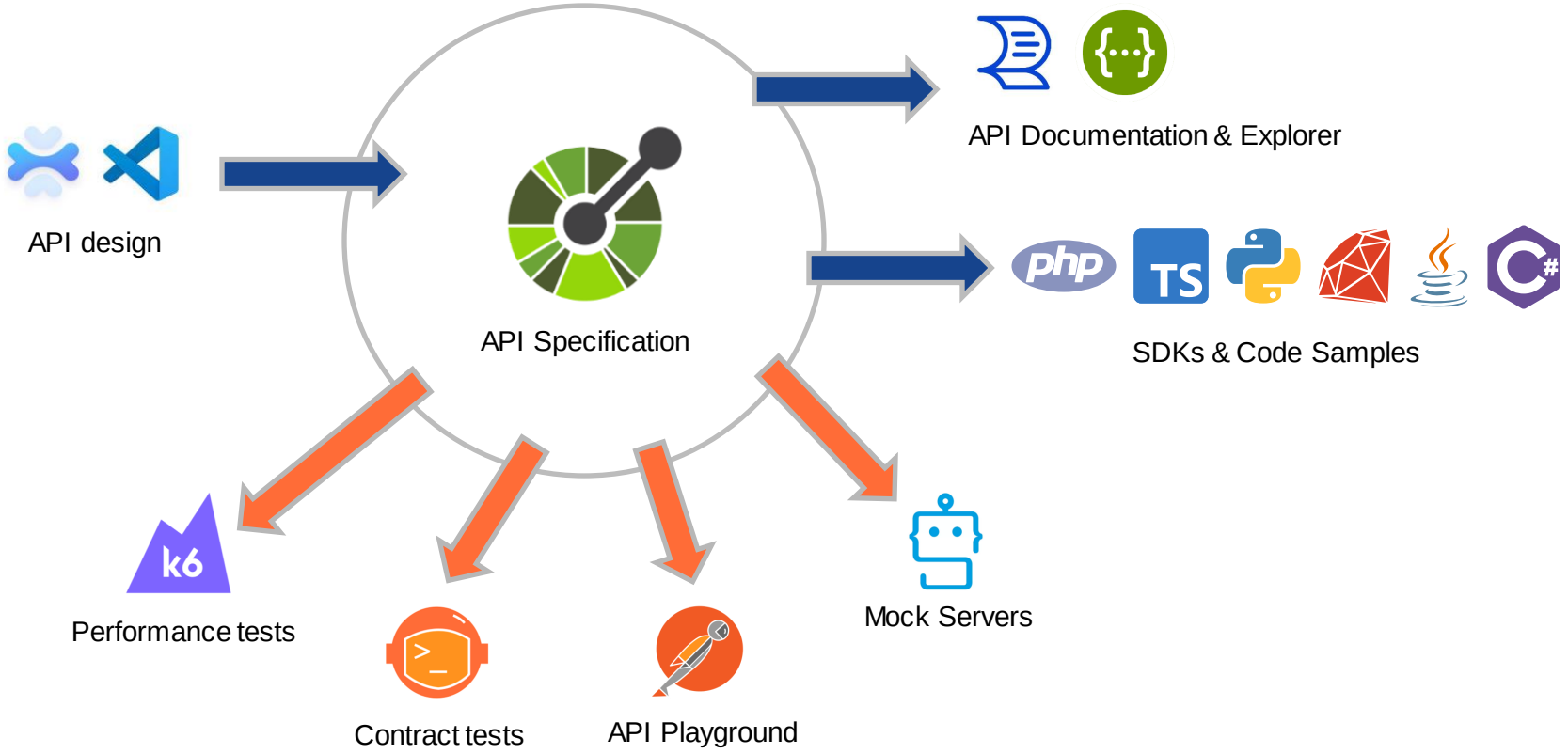
Ecosystem

- Open-source & Commercial tooling

- Supported by big brands


OpenAPI.Tools - an Open So
openapi.tools
OpenAPI.Tools
Stay up to date with a community-driven list of high-quality, modern tools for OpenAPI. An open source project from APIs You Won't Hate.
Is there a tool missing that you think should be on the list?
Submit a Pull Request on GitHub apisyouwonthate/openapi.tools
Submit an OpenAPI tool
Tool Types
We've organised everything into categories so you can jump to the section you're interested in.
Auto Generators: Tools that will take your code and turn it into an OpenAPI Specification document
Converters: Various tools to convert to and from OpenAPI and other API description formats.
Data Validators: Check to see if API requests and responses are lining up with the API description.
Description Validators: Check your API description to see if it is valid OpenAPI.
Documentation: Render API Description as HTML (or maybe a PDF) so slightly less technical people can figure out how to work with the API.
DSL: Writing YAML by hand is no fun, and maybe you don't want a GUI, so use a Domain Specific Language to write OpenAPI in your language of choice.
Gateways: API Gateways and related tools that have integrated support for OpenAPI.
GUI Editors: Visual editors help you design APIs without needing to memorize the entire OpenAPI specification.
Learning: Whether you're trying to get documentation for a third party API based on traffic, or are trying to switch to design-first at an organization with no OpenAPI at all, learning can help you move your API spec forward and keep it up to date.
Miscellaneous: Anything else that does stuff with OpenAPI but hasn't quite got enough to warrant its own category.
Mock Servers: Fake servers that take description document as input, then route incoming HTTP requests to example responses or dynamically generates examples.
Monitoring: Monitoring tools let you know what is going on in your API.
Parsers: Loads and read OpenAPI descriptions, so you can work with them programmatically.
SDK Generators: Generate code to give to consumers, to help them avoid interacting at a HTTP level.
Security: By poking around your OpenAPI description, some tools can look out for attack vectors you might not have noticed.
Server Implementations: Easily create and implement resources and routes for your APIs.
Testing: Quickly execute API requests and validate responses on the fly through command line or GUI interfaces.


Repository search results
github.com/search?q=openapi&type=repositories
openapi
Filter by
Code 7.7M
Repositories 20.1k
Issues 182k
Pull requests 491k
Discussions 5k
Users 197
More
Languages
Java
JavaScript
TypeScript
Python
Go
C#
PHP
HTML
Kotlin
Shell
More languages...
Advanced
Owner
Size
Number of followers
Number of forks
Number of stars
20.1k results (324 ms)
Sort by: Best match
Save
Single sign-on to see results in the apideck-io organization.
OAI/OpenAPI-Specification
The OpenAPI Specification Repository
rest openapi apis oas webapi
JavaScript · 27.7k · Updated 6 hours ago
Unstar
OpenAPITools/openapi-generator
OpenAPI Generator allows generation of API client libraries (SDK generation), server stubs, documentation and configuration automatically...
api sdk rest generator rest-api
Java · 18.8k · Updated 1 hour ago
Star
Sponsor
Redocly/redoc
OpenAPI/Swagger-generated API Reference Documentation
reactjs swagger api-documentation documentation-tool openapi
TypeScript · 21.8k · Updated 6 days ago
Unstar
APIs-guru/openapi-directory
Wikipedia for Web APIs. Directory of REST API definitions in OpenAPI 2.0/3.x format
api aws azure rest-api opendata
3.5k · Updated 17 hours ago
Star
Sponsor
stripe/openapi
An OpenAPI specification for the Stripe API.
343 · Updated 3 hours ago
Star
Sponsor open source projects you depend on
Contributors are working behind the scenes to make open source better for everyone—give them the help and recognition they deserve.
Explore sponsorable projects →
How can we improve search? Give feedback
ProTip! Press the / key to activate the search input again and adjust your query.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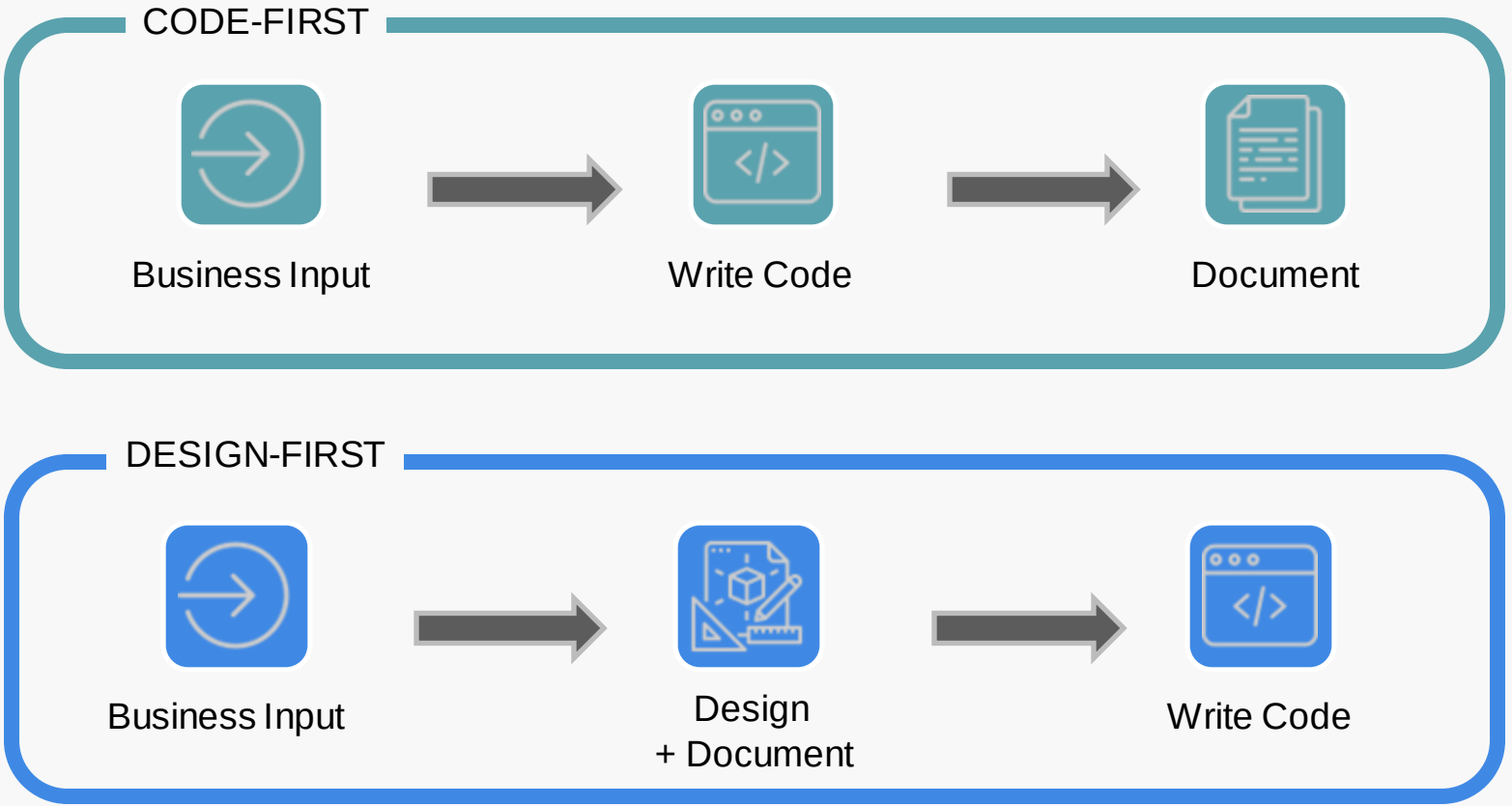
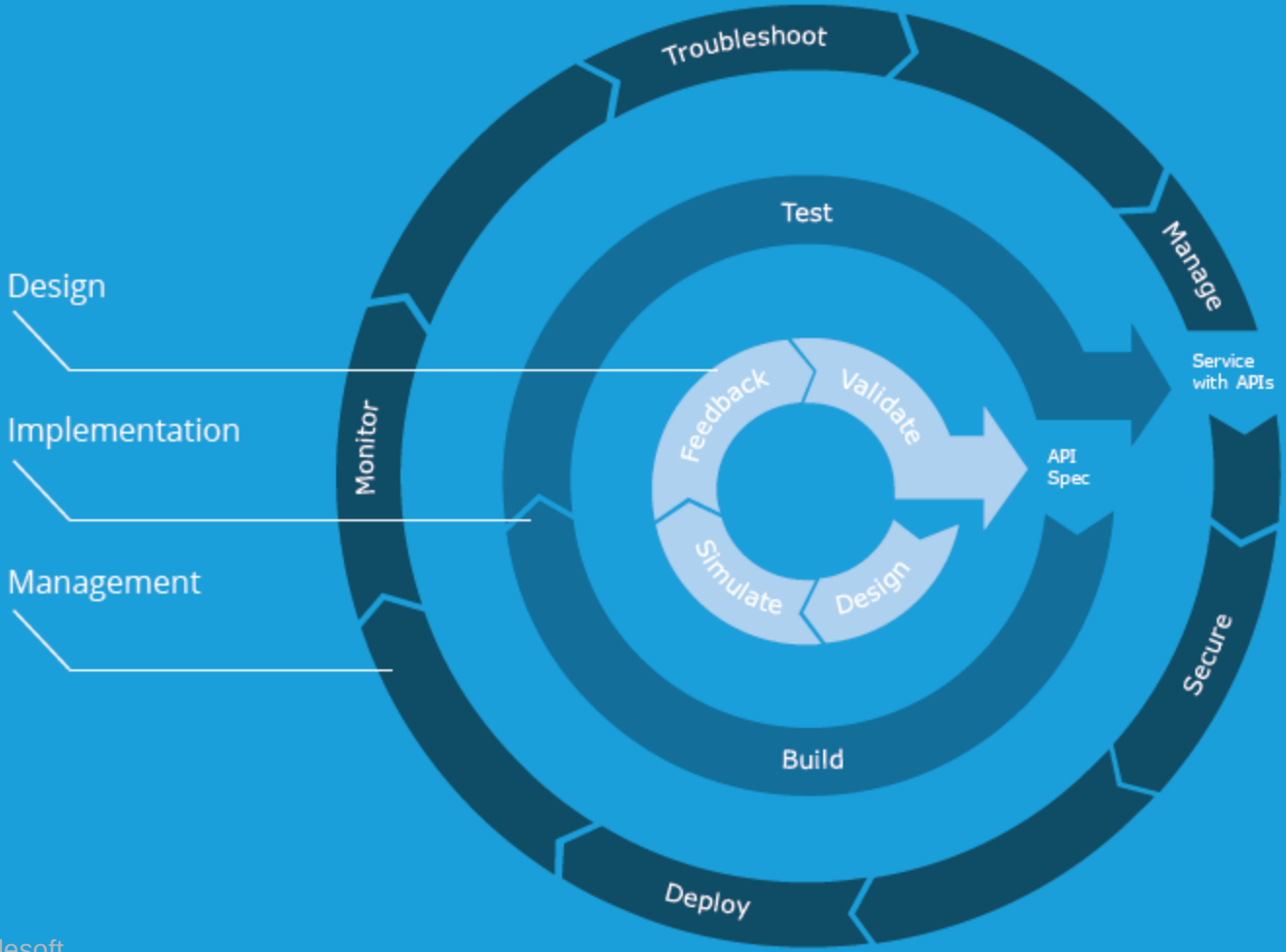
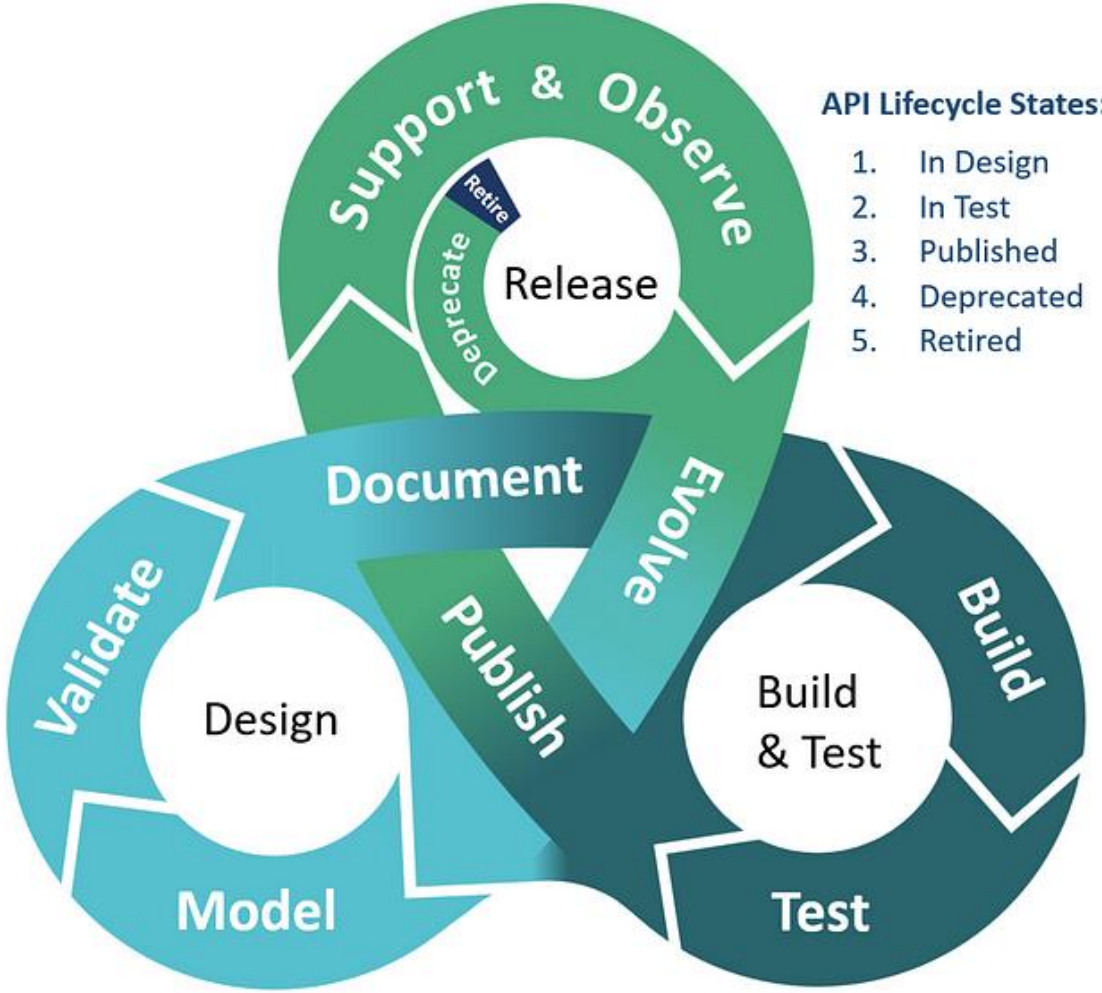

CODE-FIRST
Business Input
Write Code
Document
DESIGN-FIRST
Business Input
Design
+ Document
Write Code



Ideated by Mulesoft



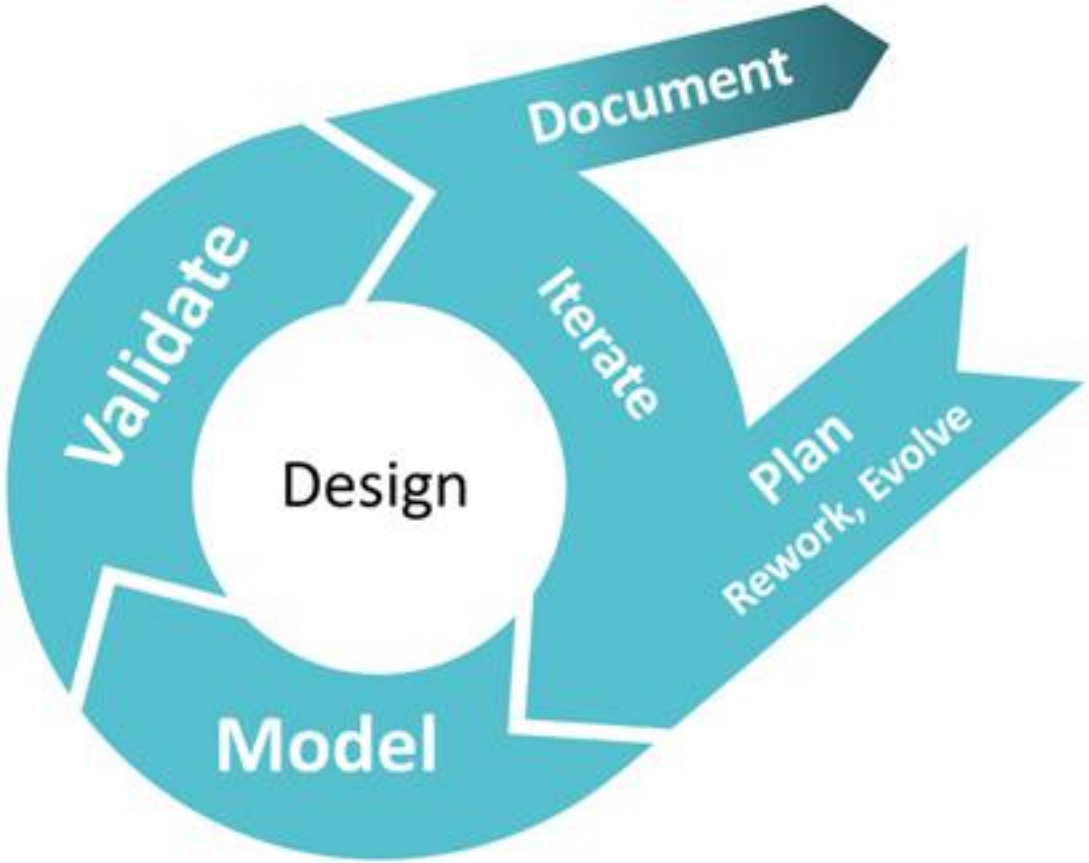
API Lifecycle States:

1. In Design
2. In Test
3. Published
4. Deprecated
5. Retired

Diagram from TRGoodwill

Spec-driven benefits

- Better **documentation**
- Clearer **requirements**
- Shorter **feedback** loops
- More **consistent** API design
- Easier Team **alignment**
- Docs that **match** the API (and vice versa)
- Much **lower** updating effort
- Automatable outputs like:
  - **Documentation**
  - **Tests**
  - **Playgrounds**
  - **SDKs**


Document
Validate
Iterate
Design
Plan
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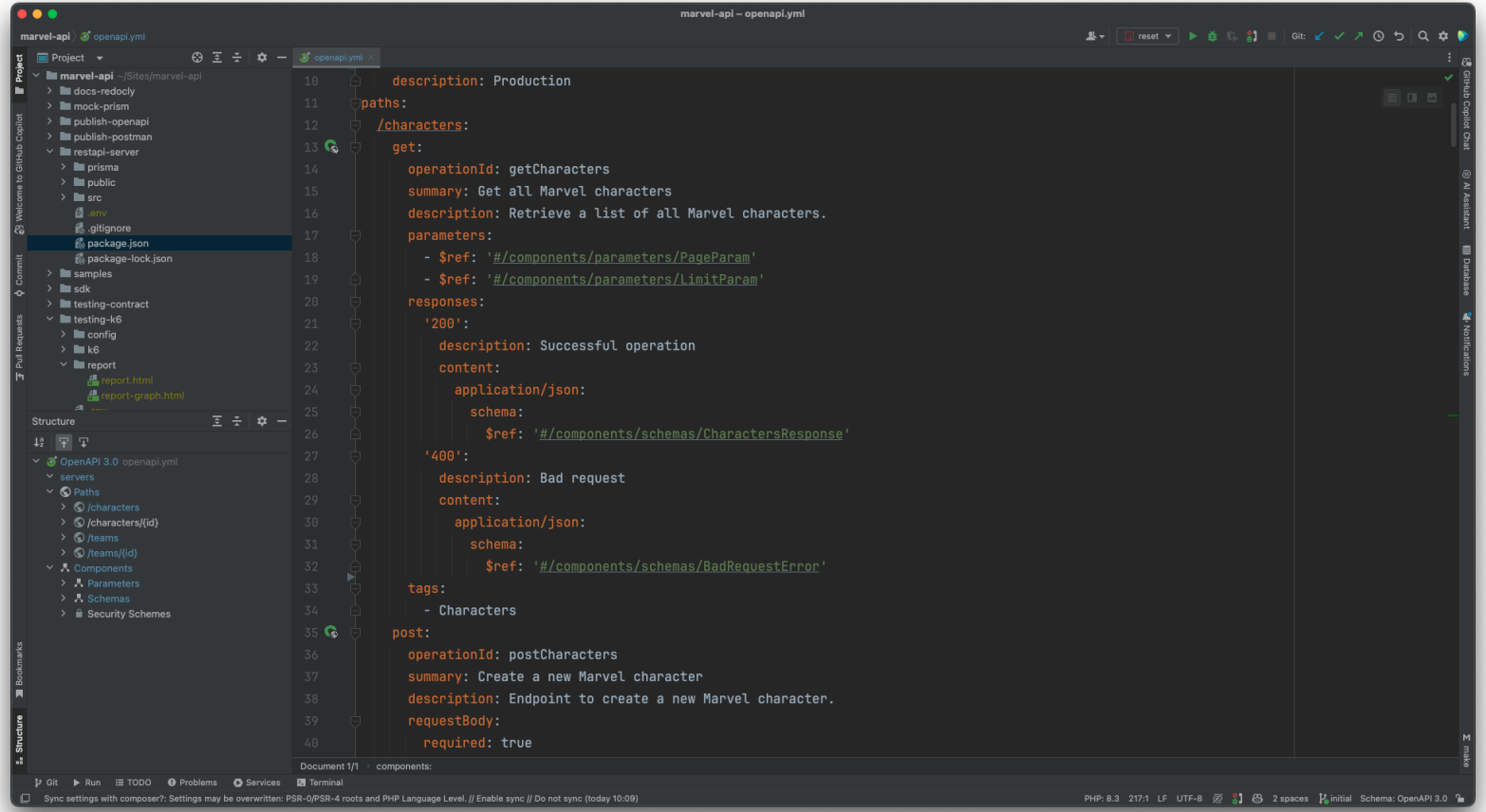
Model

Write OpenAPI

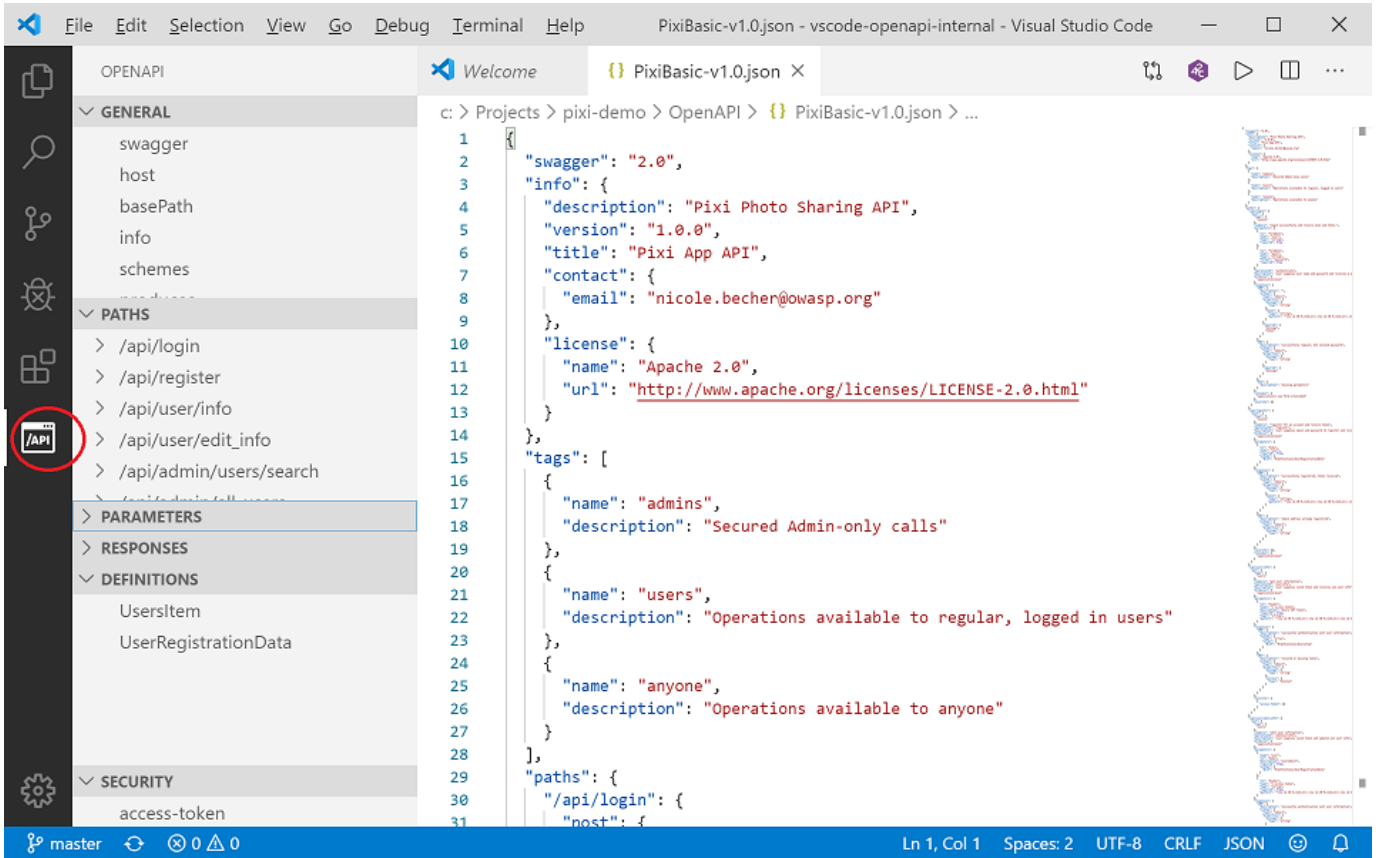
OpenAPI Spec

JetBrains


marvel-api – openapi.yml
marvel-api
openapi.yml
reset
Git:
Project
marvel-api ~/Sites/marvel-api
docs-redocly
mock-prism
publish-openapi
publish-postman
restapi-server
prisma
public
src
.env
.gitignore
package.json
package-lock.json
samples
sdk
testing-contract
testing-k6
config
k6
report
report.html
report-graph.html
Structure
OpenAPI 3.0 openapi.yml
servers
Paths
/characters
/characters/{id}
/teams
/teams/{id}
Components
Parameters
Schemas
Security Schemes
description: Production
paths:
/characters:
get:
operationId: getCharacters
summary: Get all Marvel characters
description: Retrieve a list of all Marvel characters.
parameters:
- $ref: '#/components/parameters/PageParam'
- $ref: '#/components/parameters/LimitParam'
responses:
'200':
description: Successful operation
content:
application/json:
schema:
$ref: '#/components/schemas/CharactersResponse'
'400':
description: Bad request
content:
application/json:
schema:
$ref: '#/components/schemas/BadRequestError'
tags:
- Characters
post:
operationId: postCharacters
summary: Create a new Marvel character
description: Endpoint to create a new Marvel character.
requestBody:
required: true
Document 1/1
components:
Git
Run
TODO
Problems
Services
Terminal
Sync settings with composer?: Settings may be overwritten: PSR-0/PSR-4 roots and PHP Language Level. // Enable sync // Do not sync (today 10:09)
PHP: 8.3
217:1
LF
UTF-8
2 spaces
Initial
Schema: OpenAPI 3.0

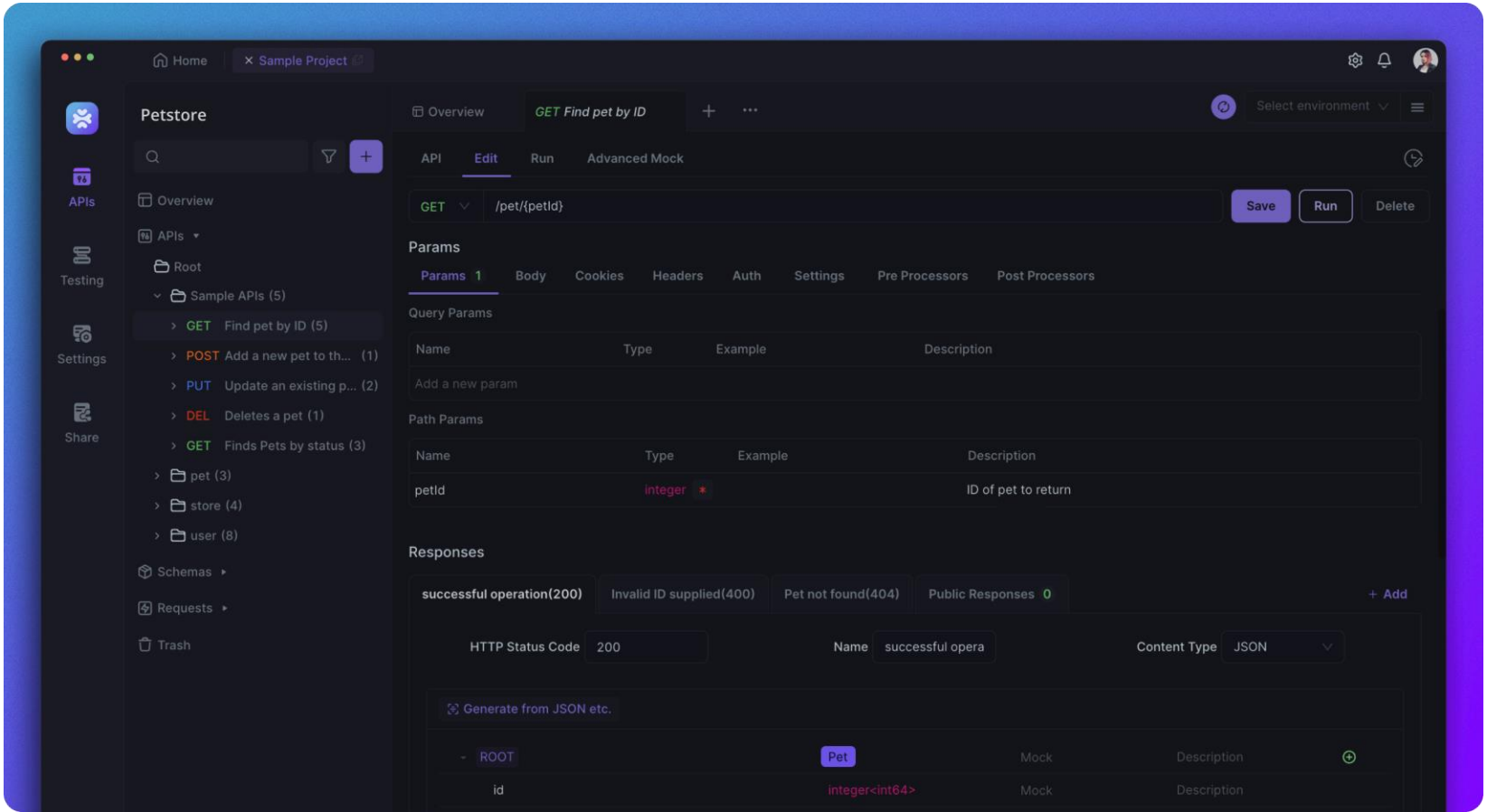
VS Code

https://marketplace.visualstudio.com/items?itemName=42Crunch.vscode-openapi



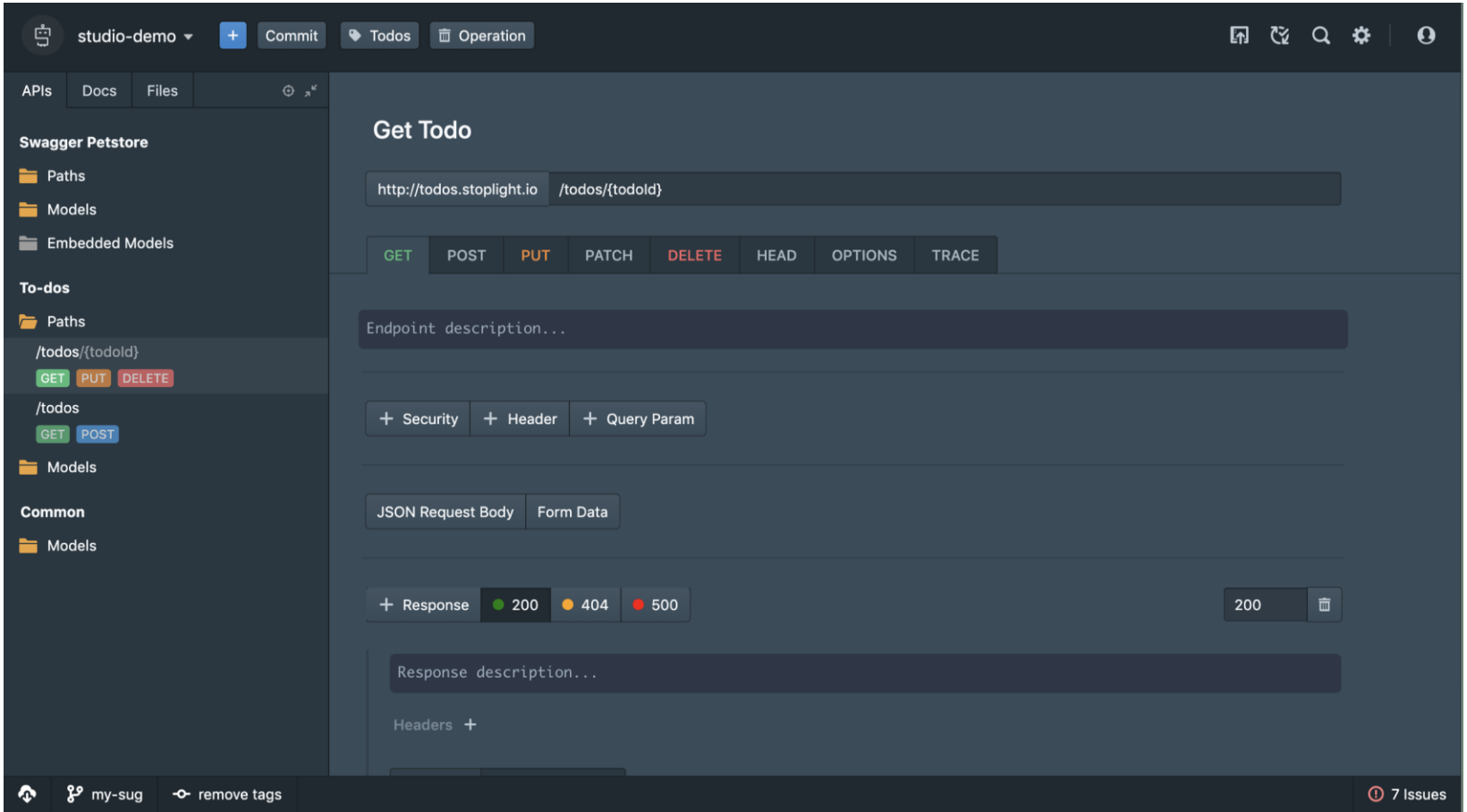
Apidog

https://apidog.com/

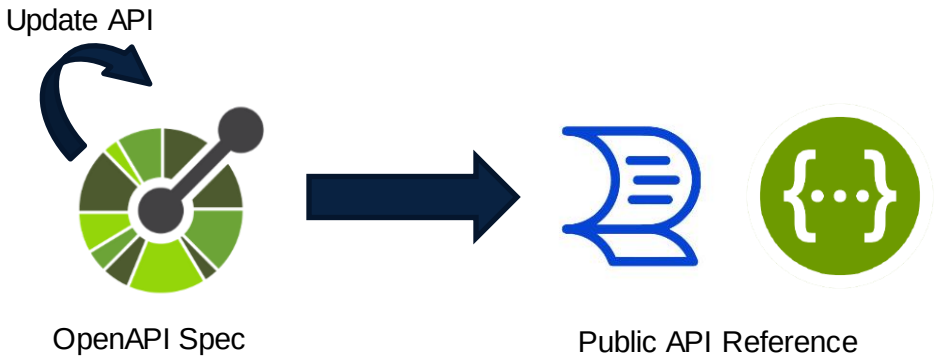


Stoplight Studio

https://stoplight.io/studio/

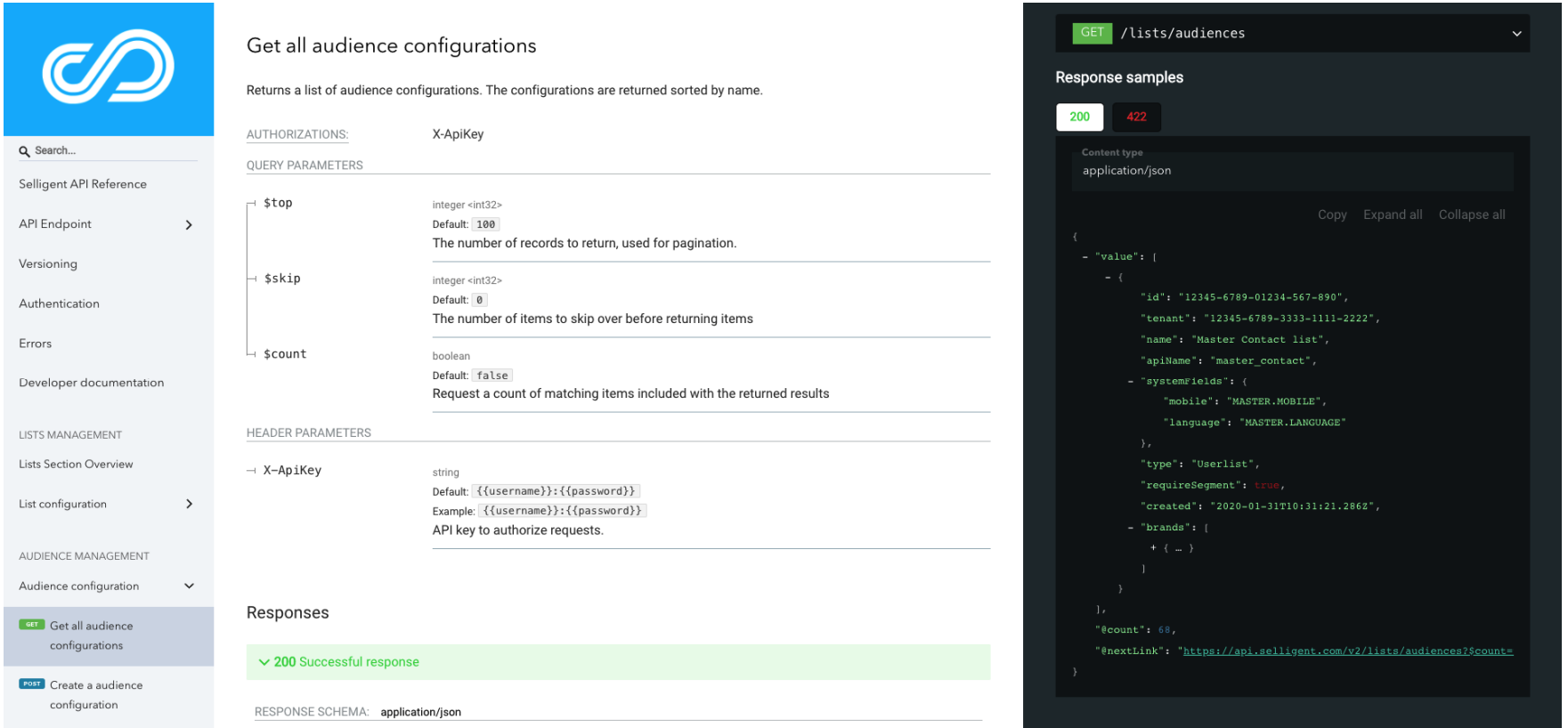


API Reference



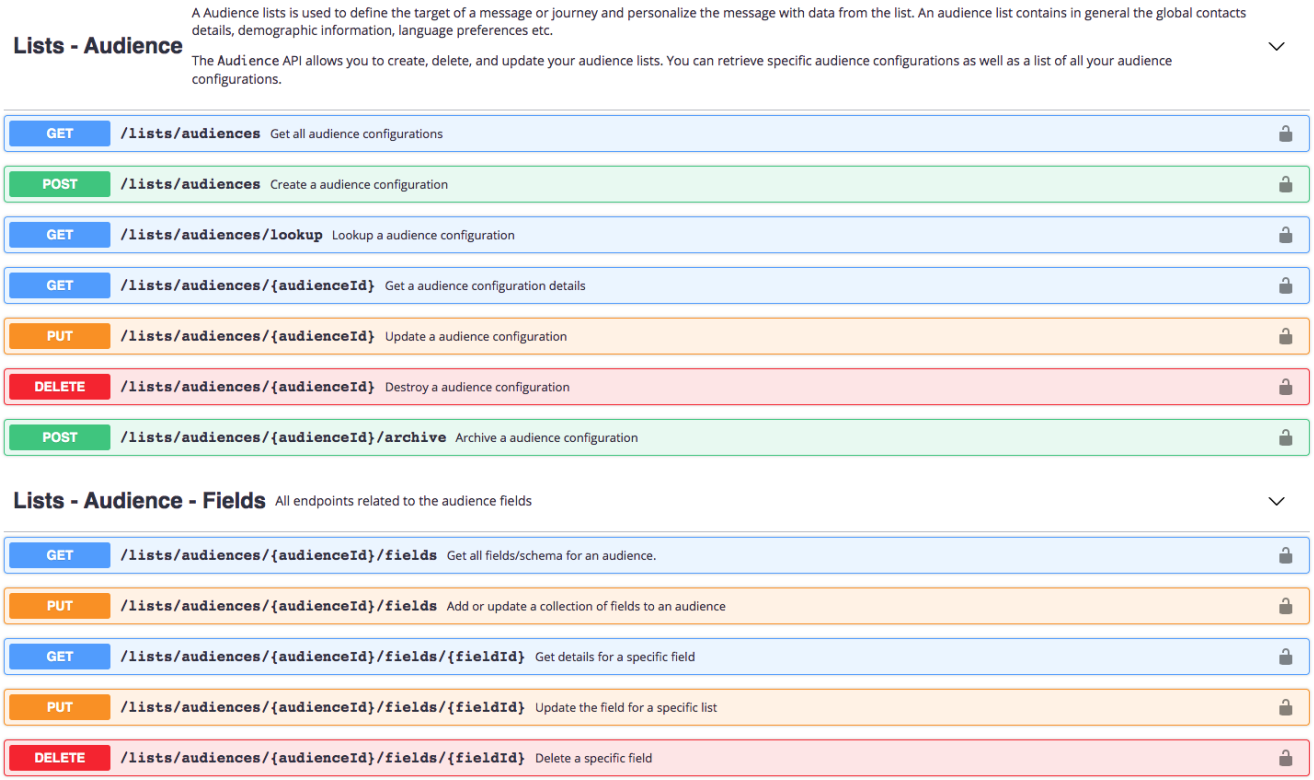
Redoc(ly)

https://github.com/Redocly/redoc



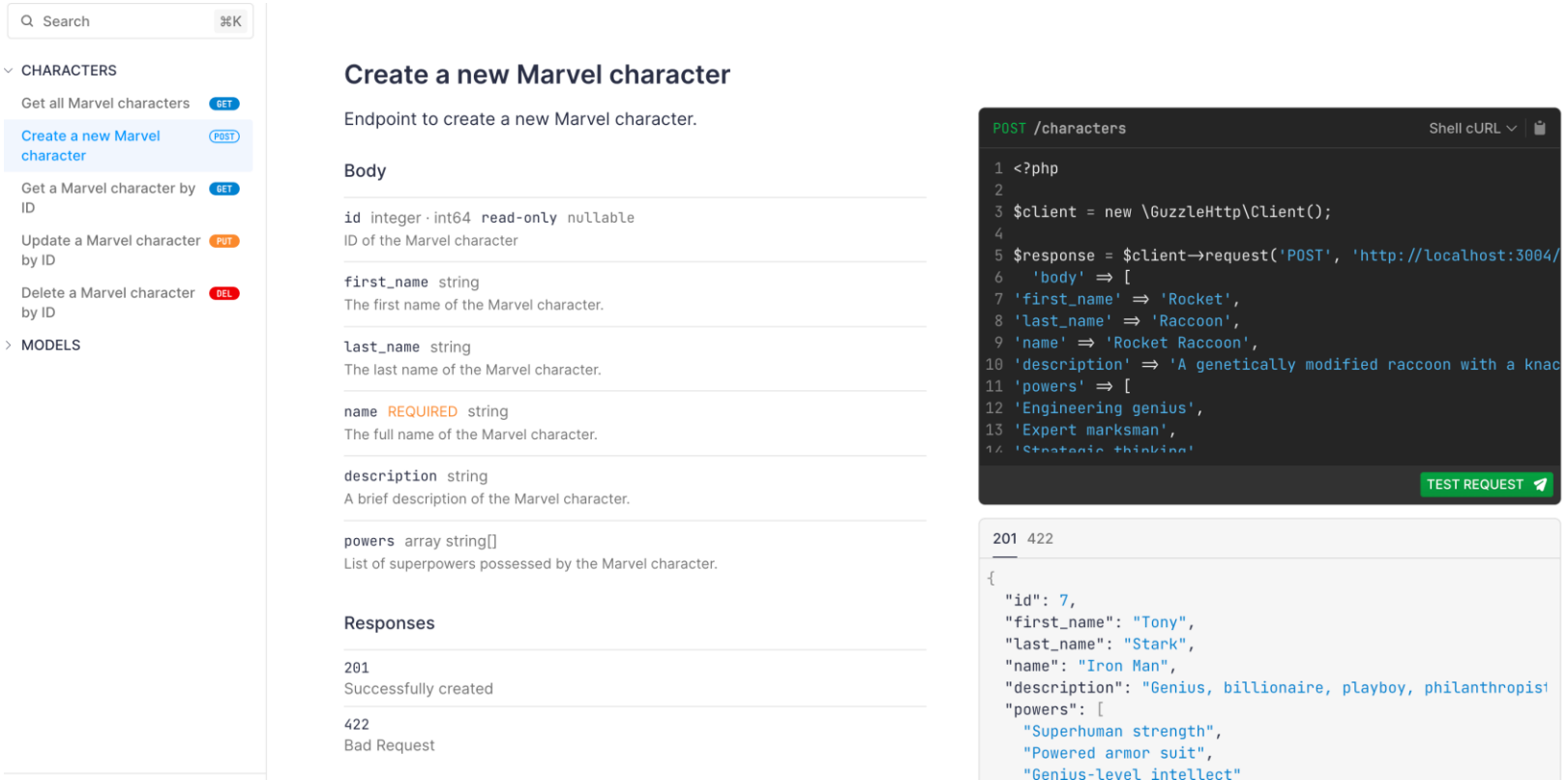
Swagger UI

https://swagger.io/tools/swagger-ui/

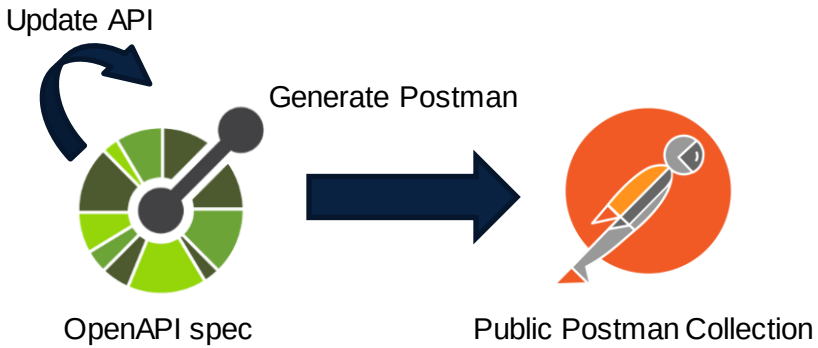


Scalar

https://github.com/scalar/scalar

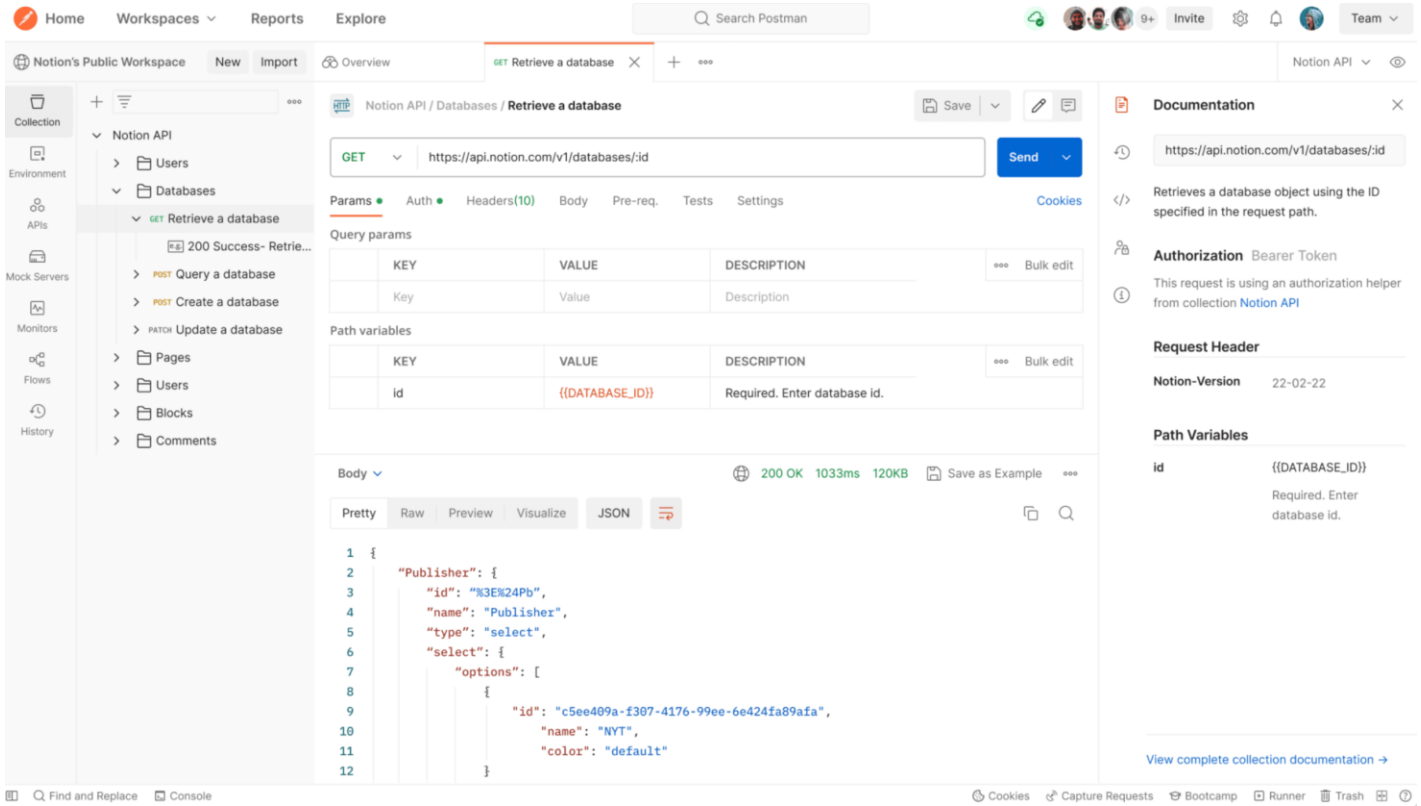


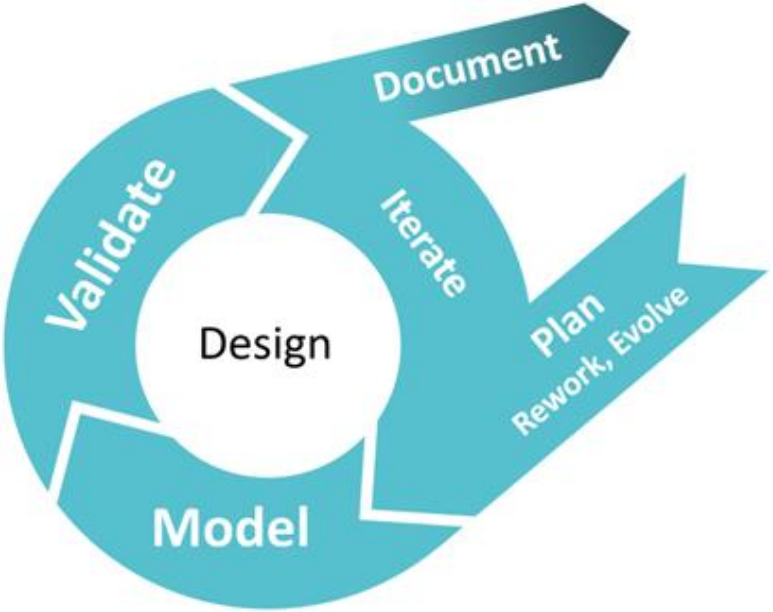
Generate Postman



Postman

https://www.postman.com/




Document
Validate
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Rework, Evolve
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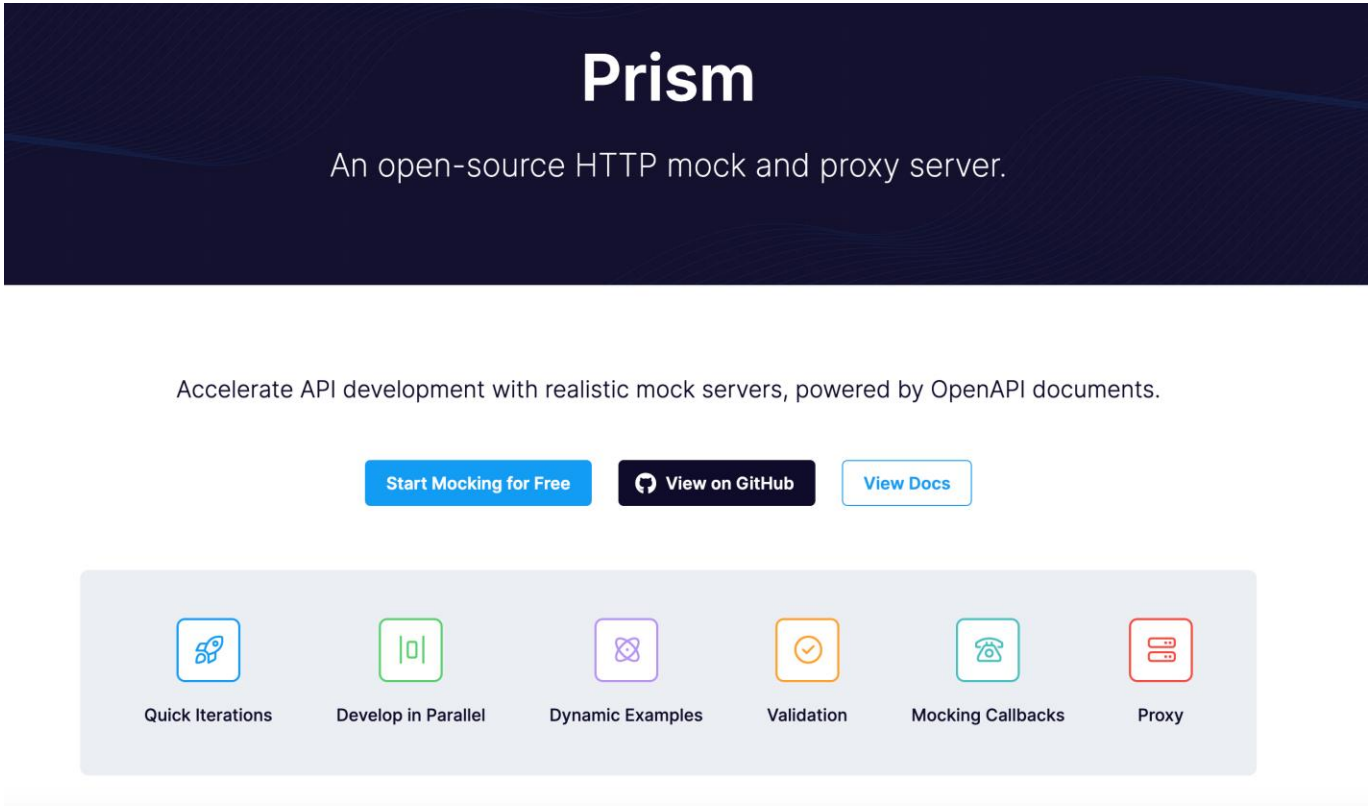
Mock API

Prism

https://github.com/stoplightio/prism



JSON-Server

https://github.com/typicode/json-server

typicode/**json-server**

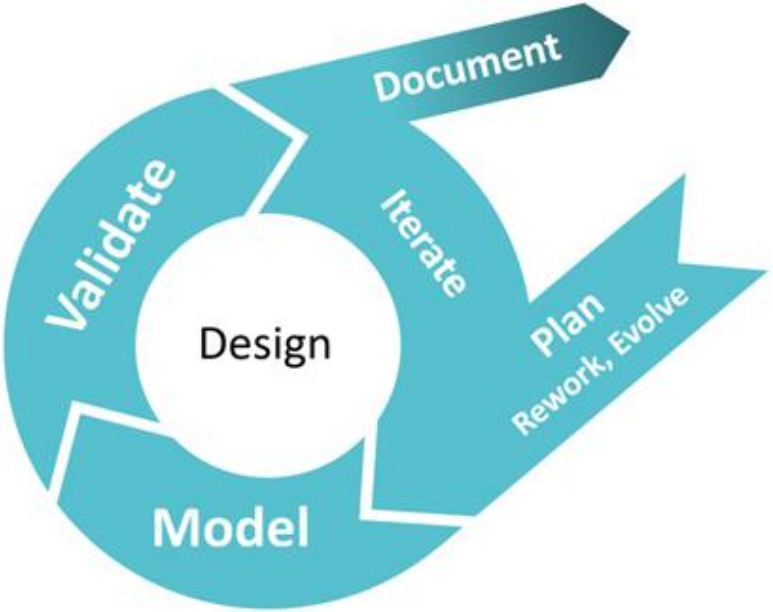
Get a full fake REST API with zero coding in less than 30 seconds (seriously)

72 Contributors

424k Used by

70k Stars

7k Forks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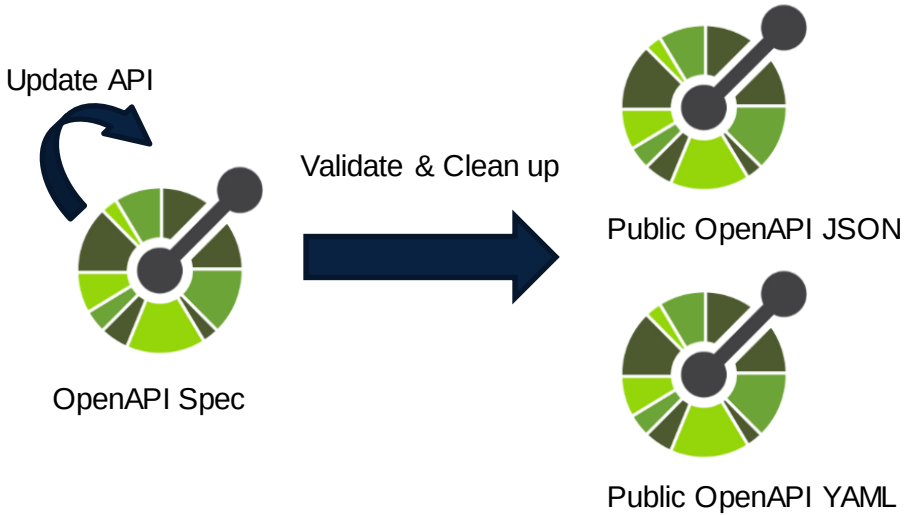
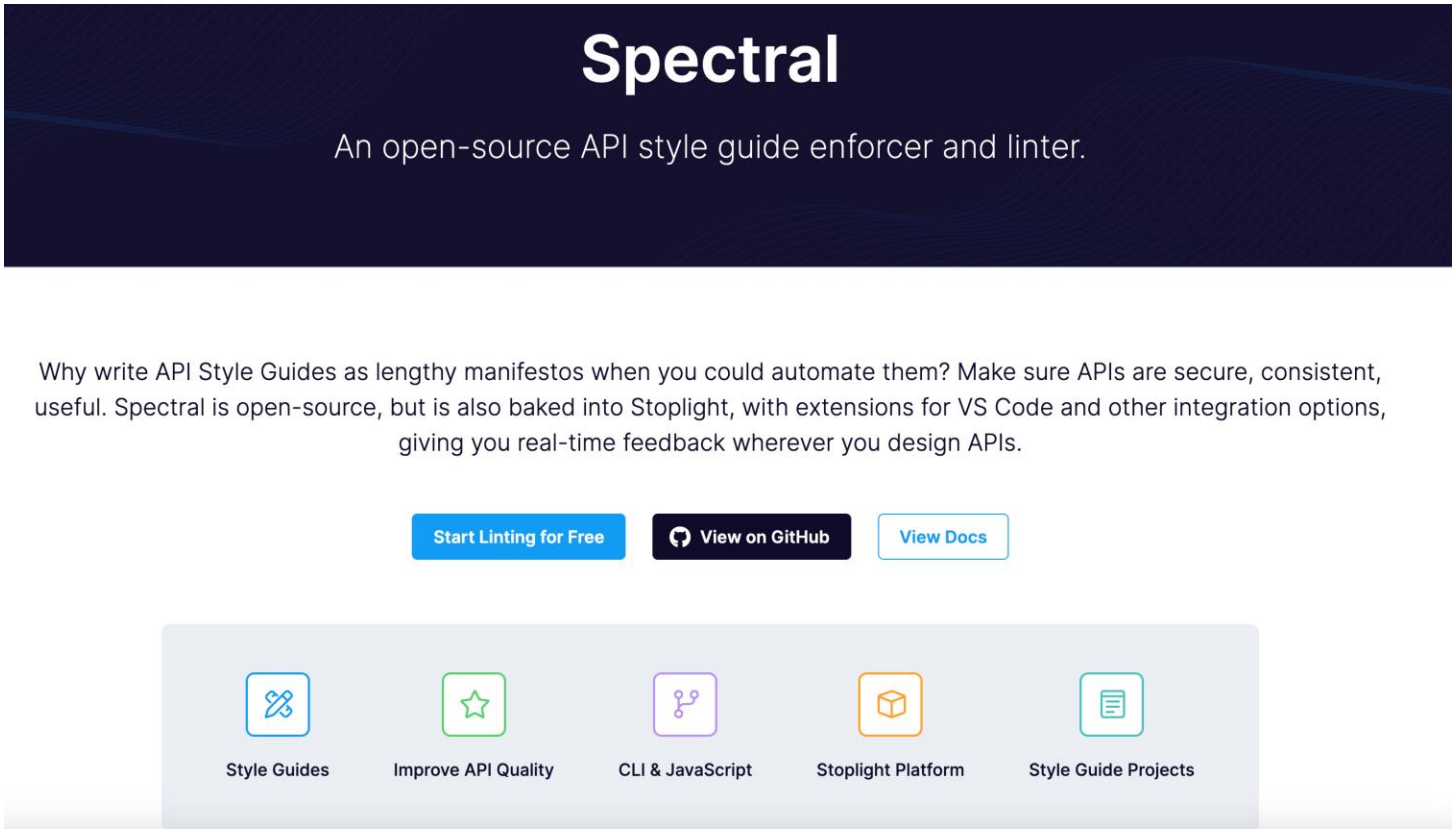
Validate & Publish OpenAPI



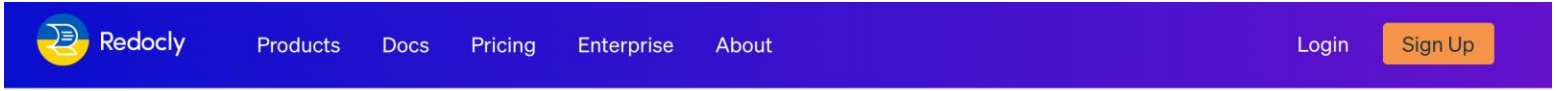
Spectral

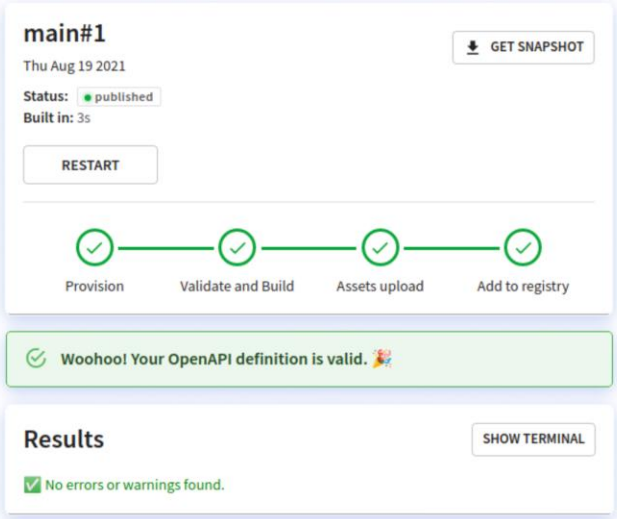
https://stoplight.io/open-source/spectral



Redocly CLI

https://redocly.com/redocly-cli/



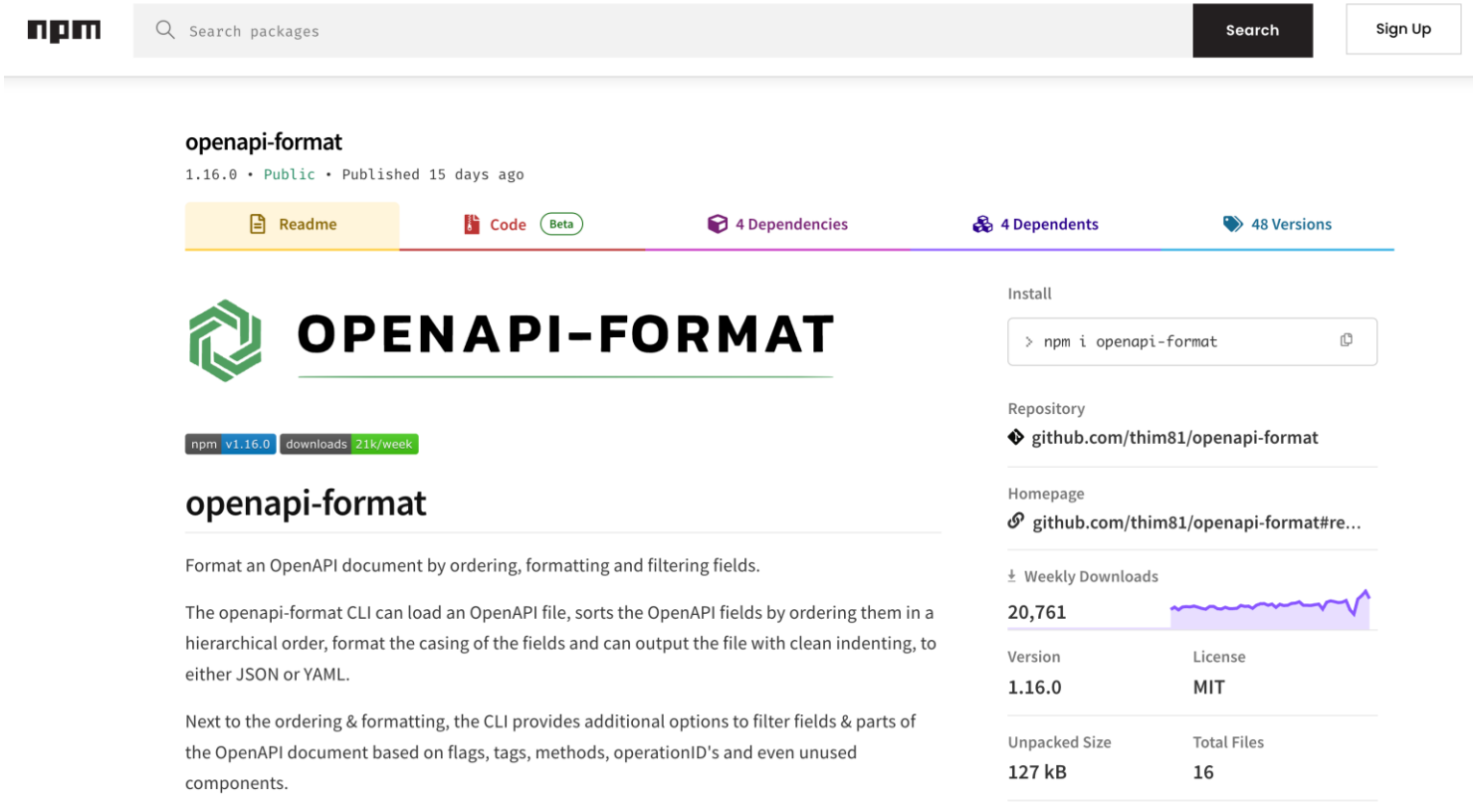


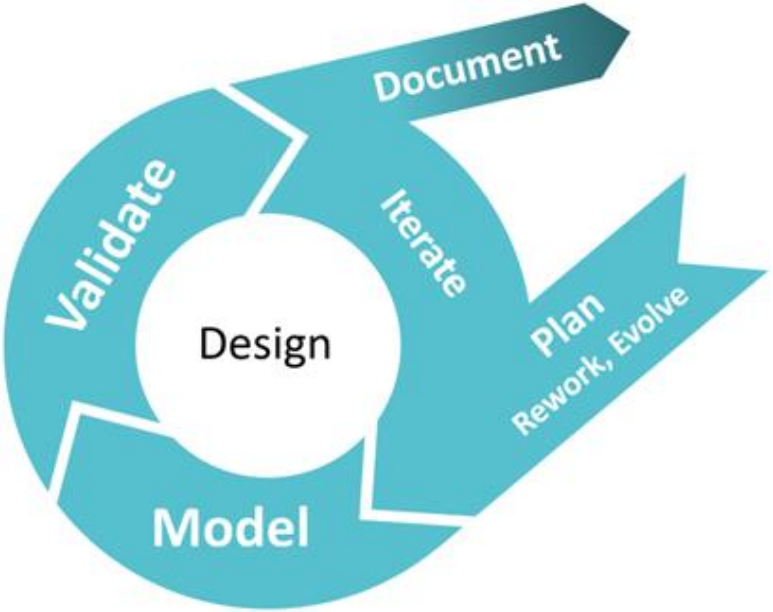
Validate a multi-file definition without having to bundle it

Behemoth YAML gets old pretty quick. An unbundled definition is far easier to edit and check for duplicates. Our Redocly CLI lets you quickly validate and lint a multi-file definition before bundling it into one file for distribution.

OpenAPI-Format

https://www.npmjs.com/package/openapi-format

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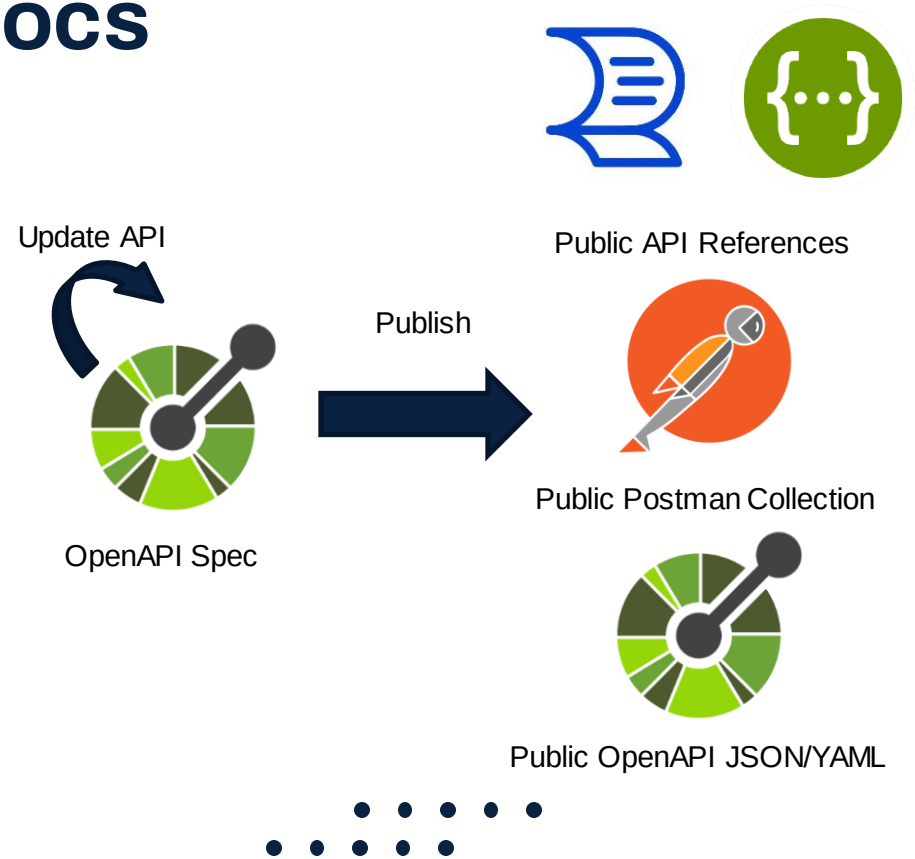
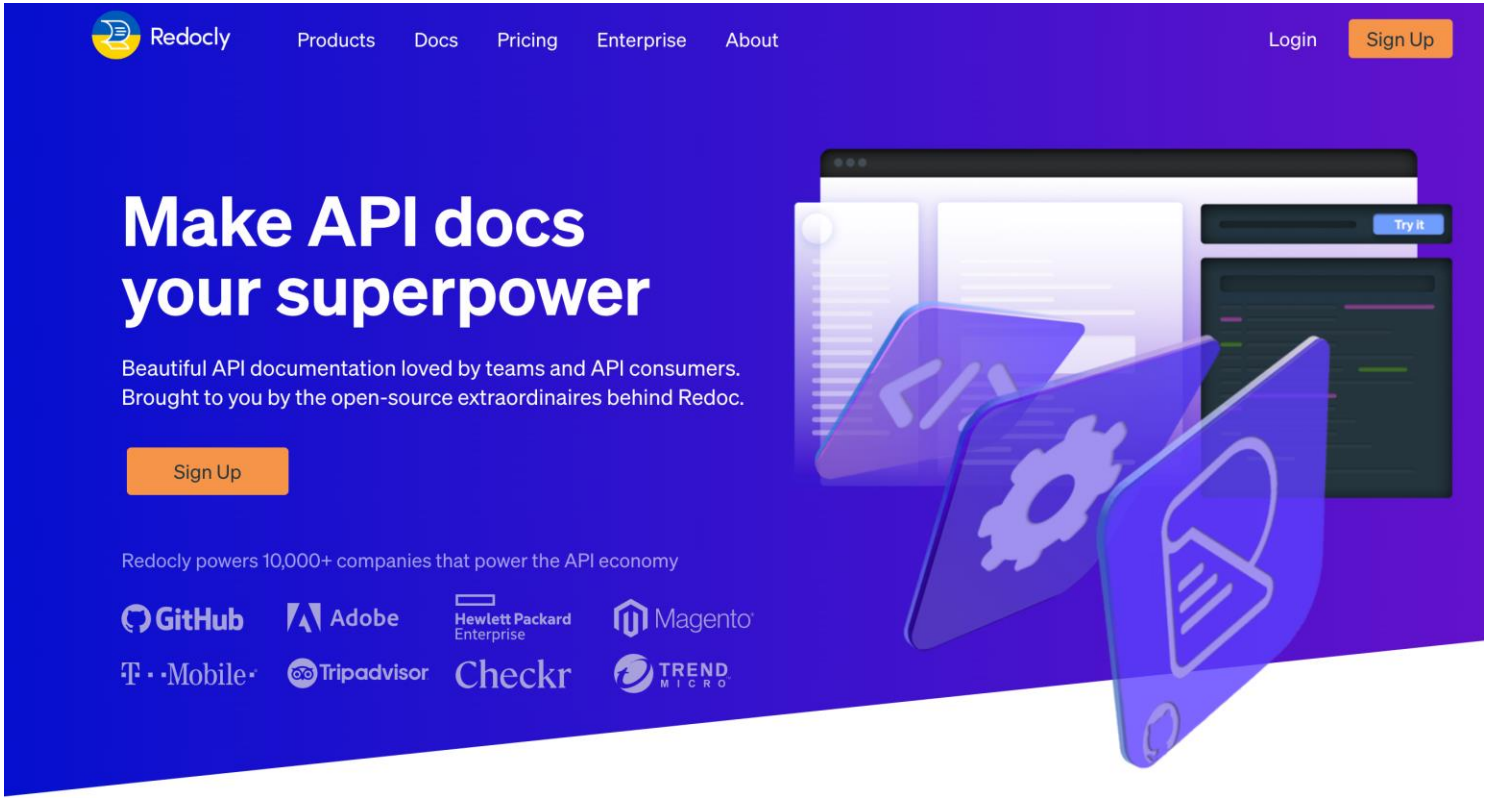
Publish Docs



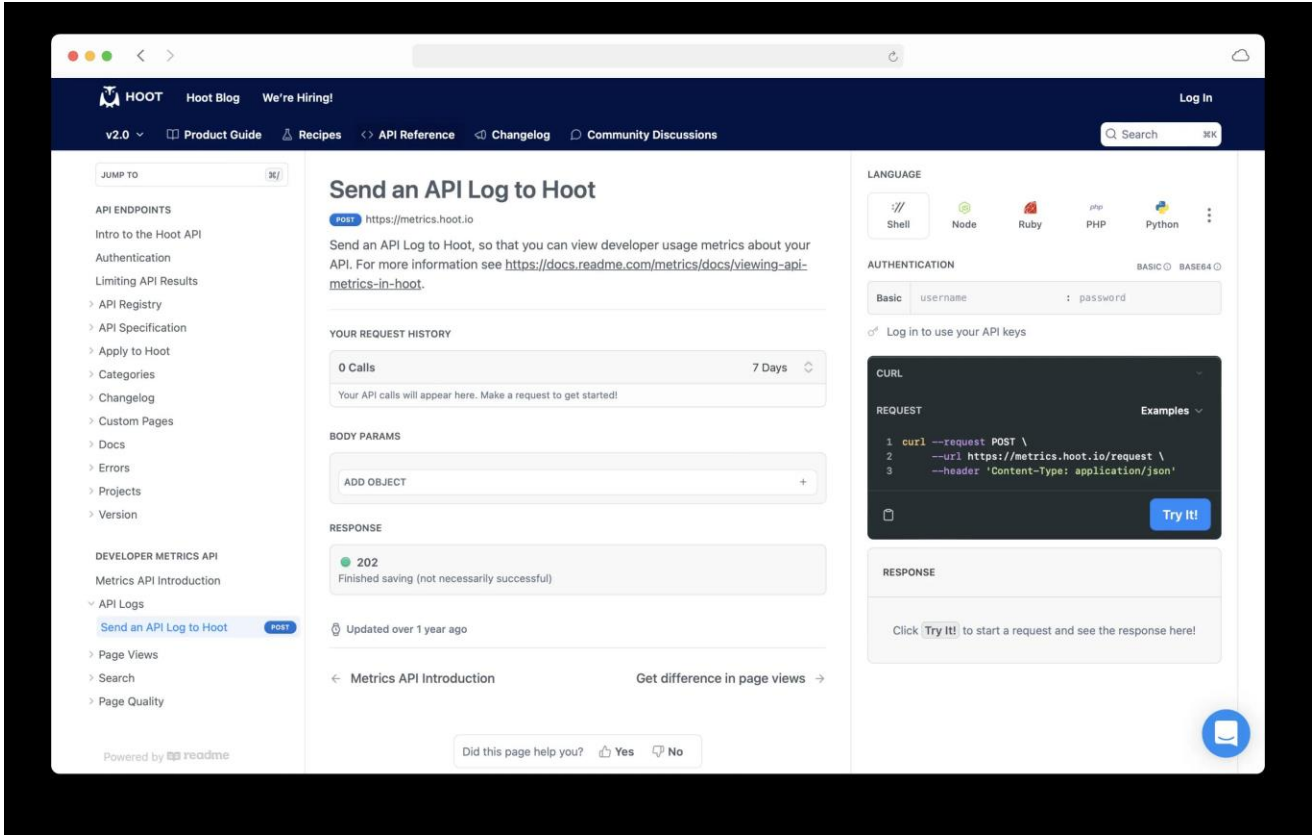
Redocly

https://redocly.com



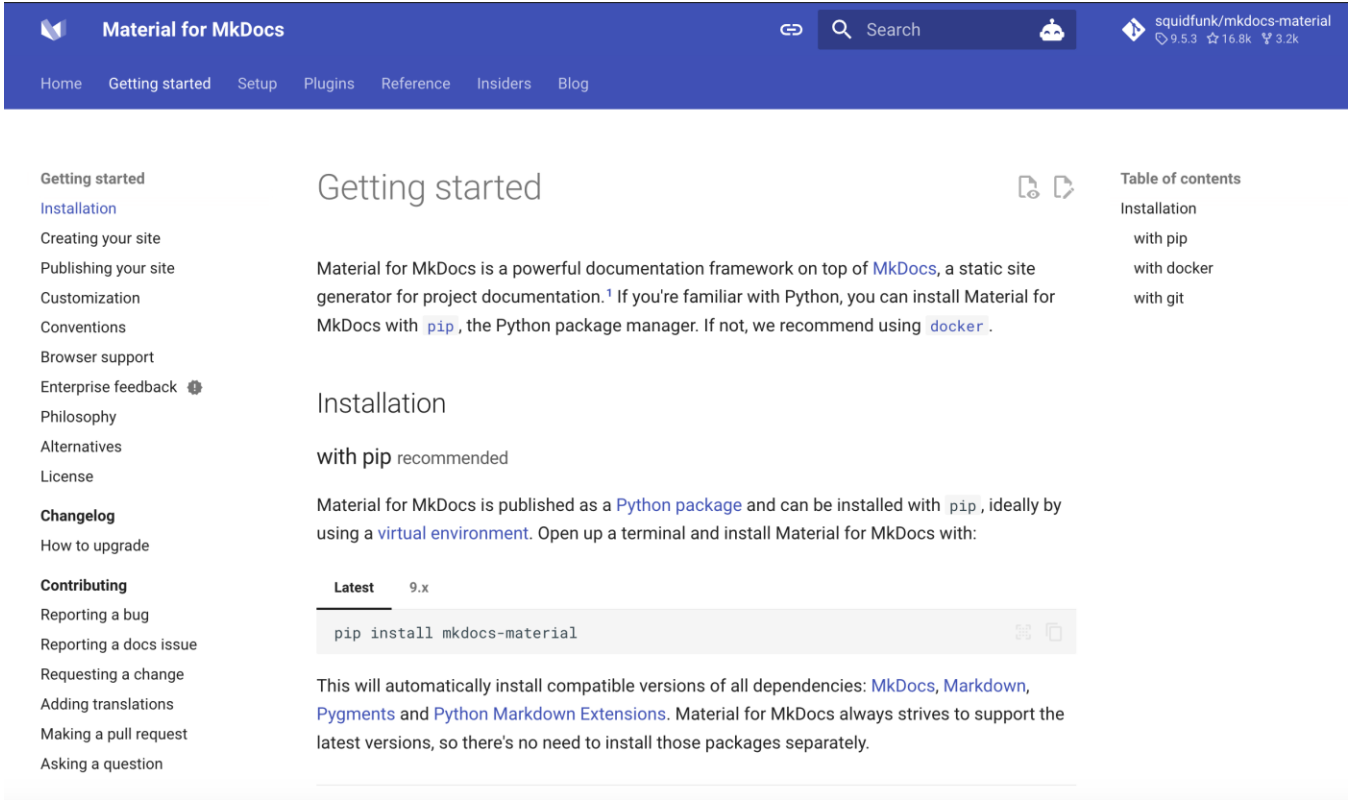
Readme.com

https://readme.com/



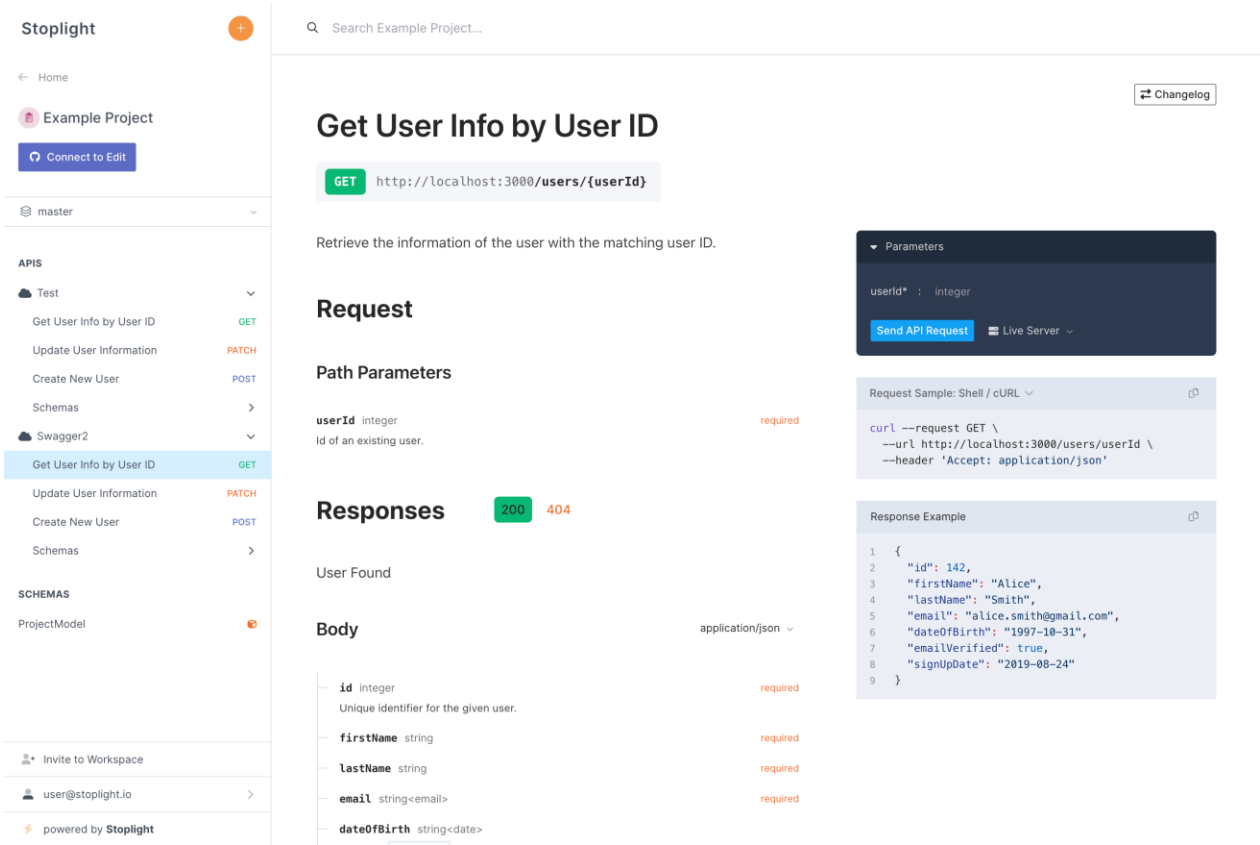
MkDocs

https://squidfunk.github.io/mkdocs-material



Stoplight

https://stoplight.io



Postman

Query Params

page	1
	The page number for pagination.
limit	10
	The number of items to return per page.

Example

Successful operation

Request

cURL

```
curl --location 'http://localhost:3004/characters?page=1&limit=10' \
--header 'Authorization: Bearer <token>' \
--header 'Accept: application/json'
```

Response

Body | Headers (1)

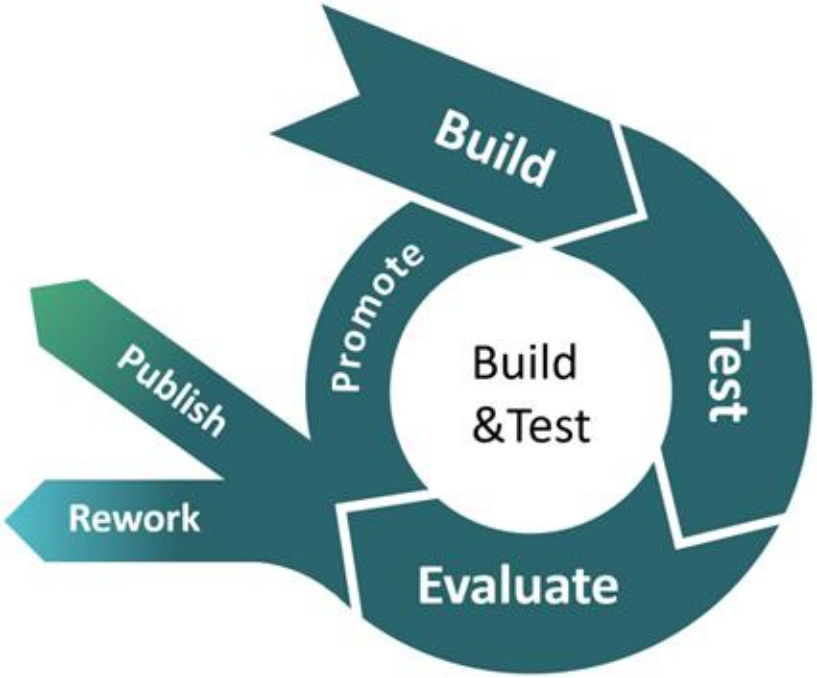
200 OK

json

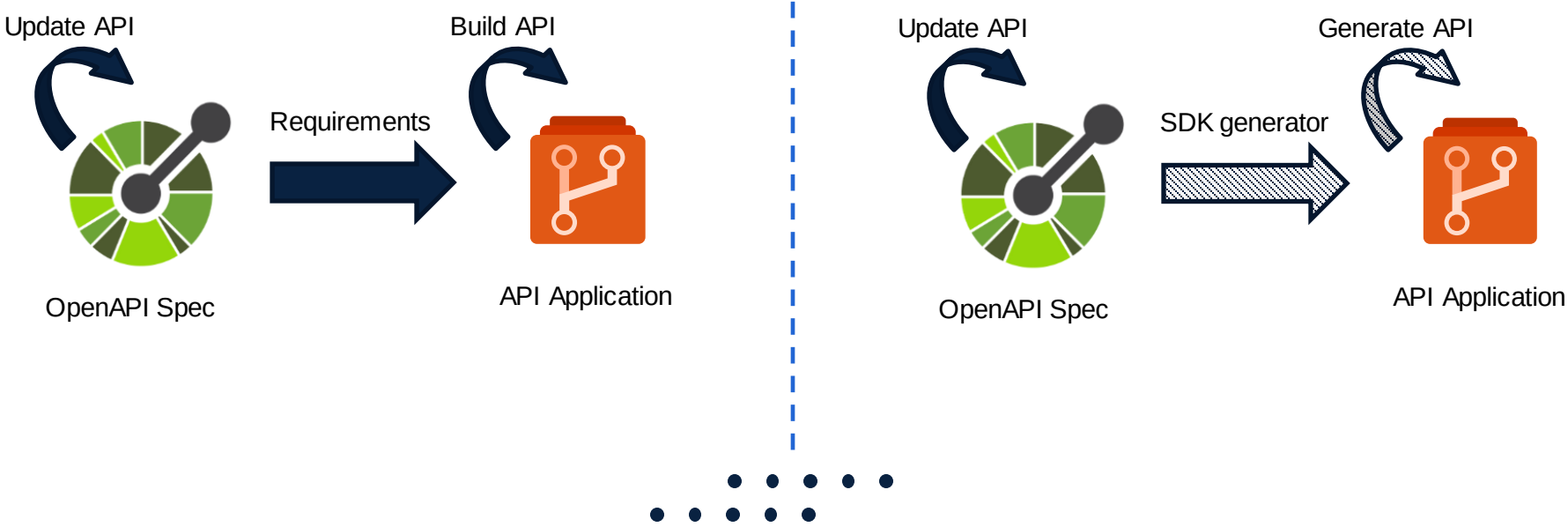

```
{
  "characters": [
    {
      "name": "Iron Man",
      "id": 7,
      "first_name": "Tony",
      "last_name": "Stark",
      "description": "Genius, billionaire, playboy, philanthropist.",
      "powers": [
        "Superhuman strength",
```


View More

JUMP TO

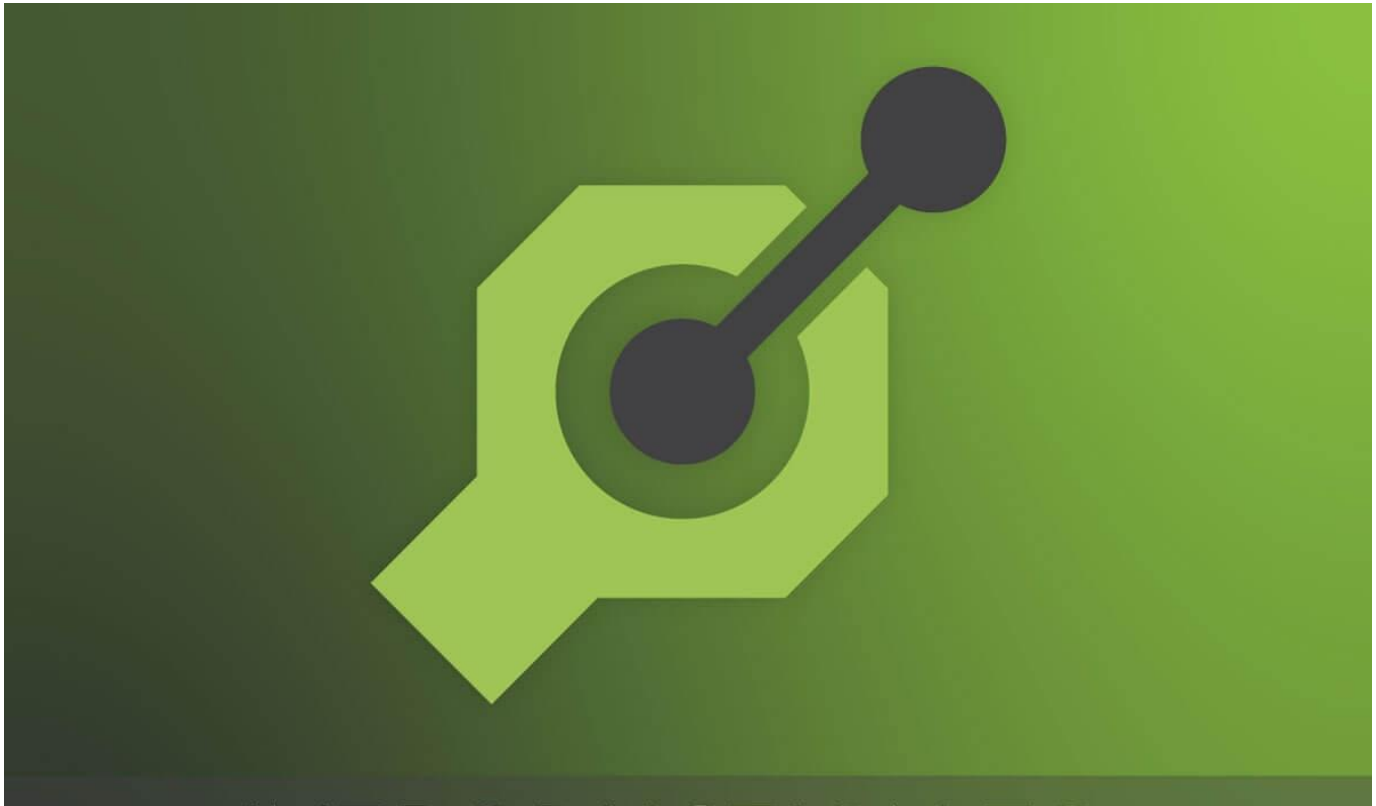

Build
Test
Evaluate
Rework
Publish
Promote
Build
&Test

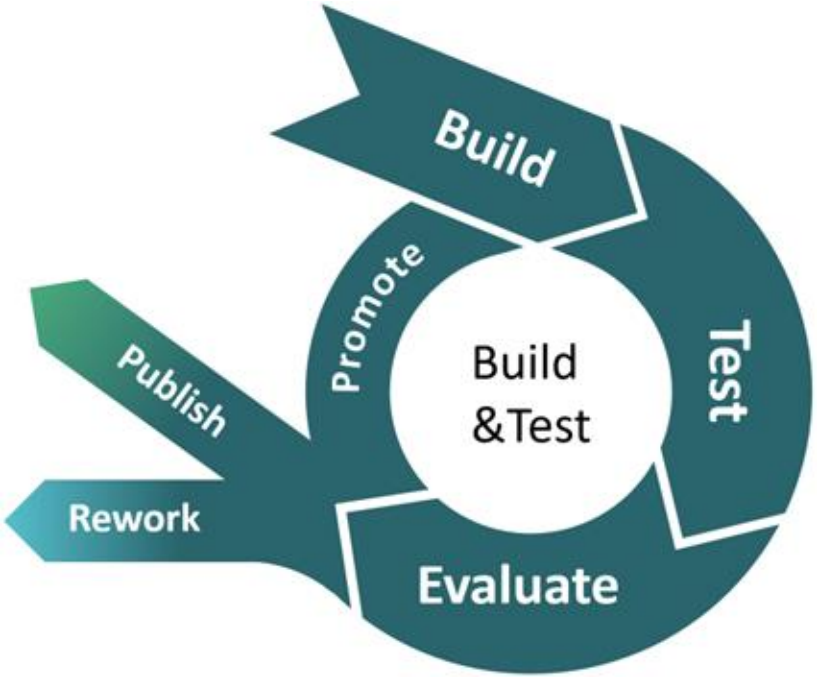
Build


Update API
Requirements
Build API
OpenAPI Spec
API Application
Update API
SDK generator
Generate API
OpenAPI Spec
API Application

Server Generation

https://openapi-generator.tech

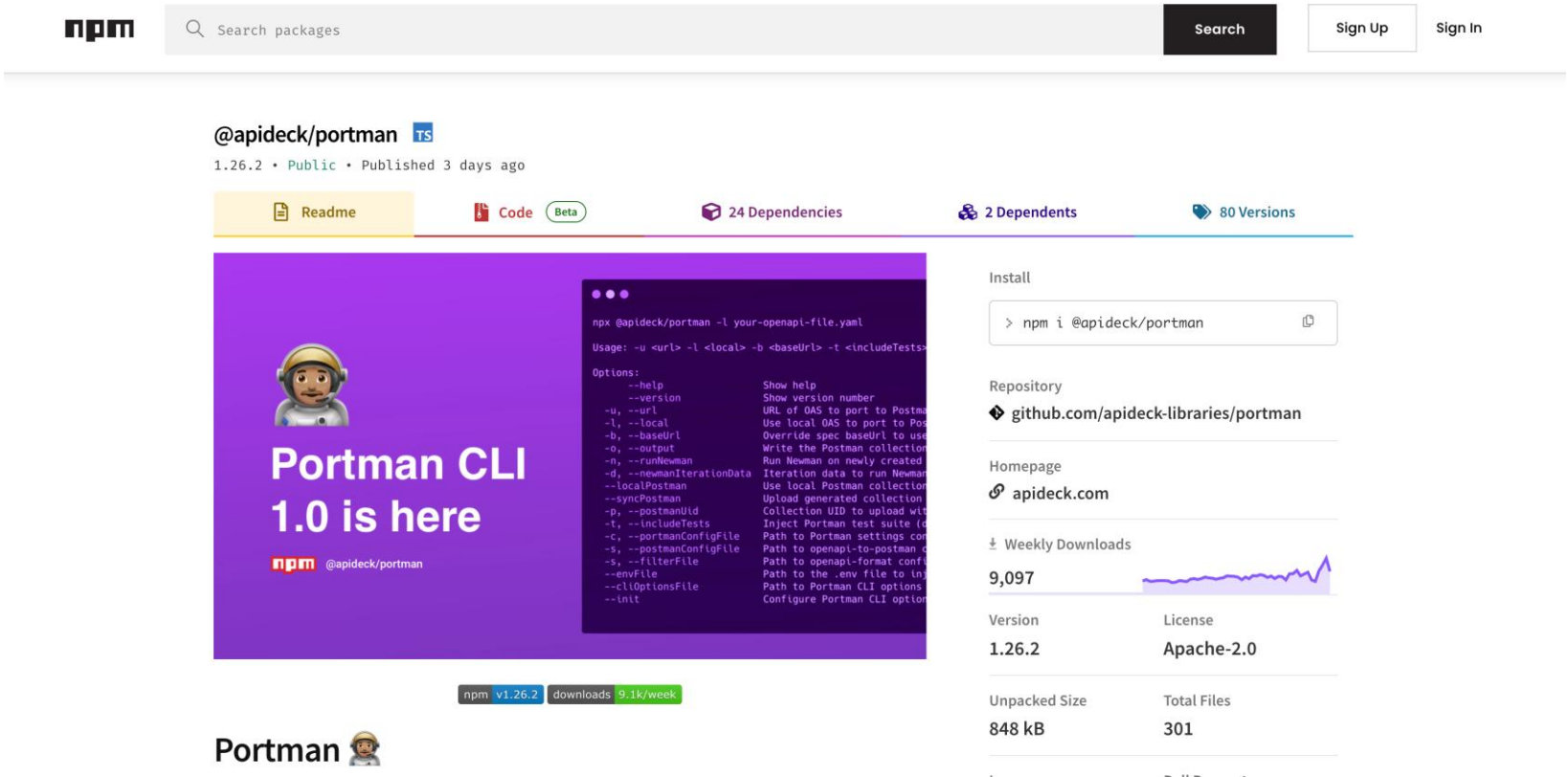



Build
Test
Evaluate
Rework
Publish
Promote
Build
&Test

Contract testing

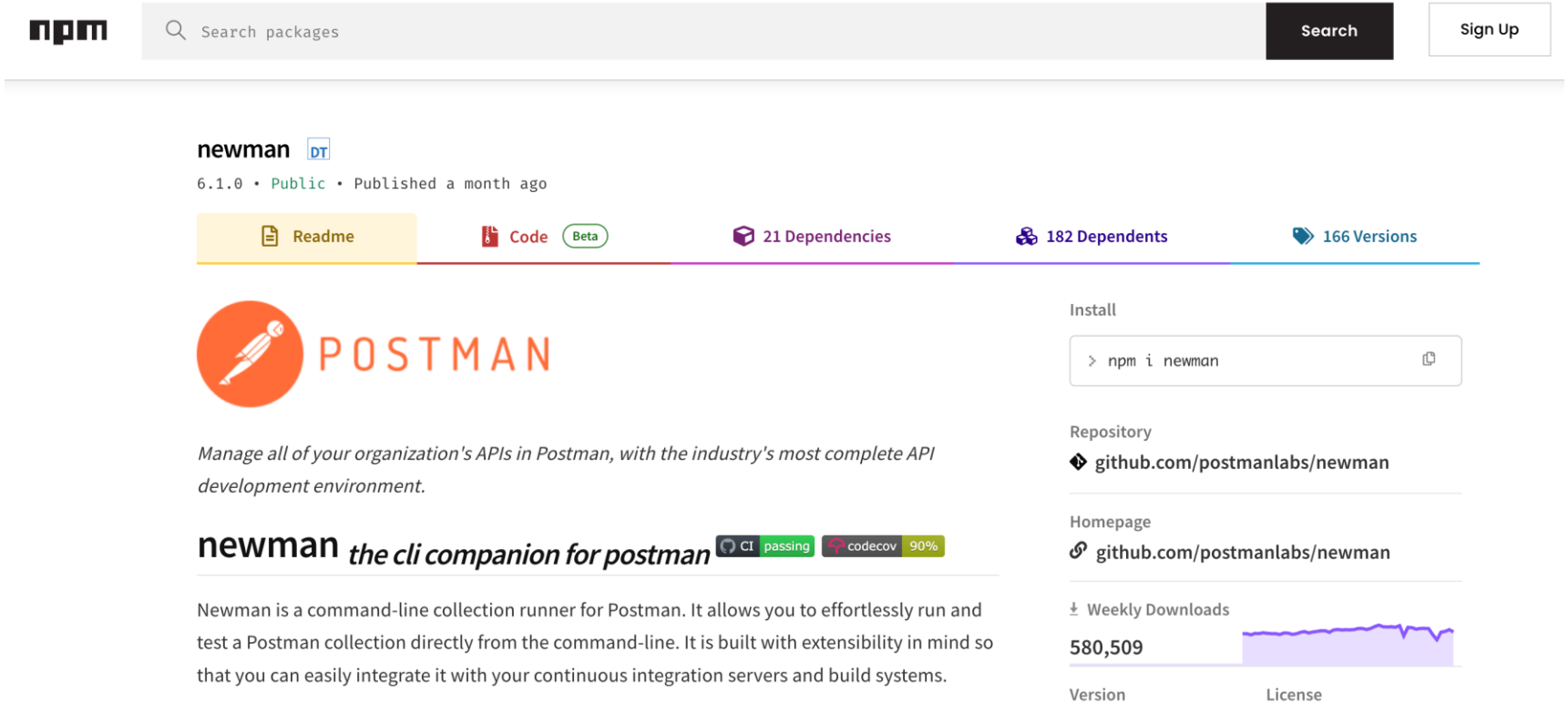
Portman

https://www.npmjs.com/package/@apideck/portman

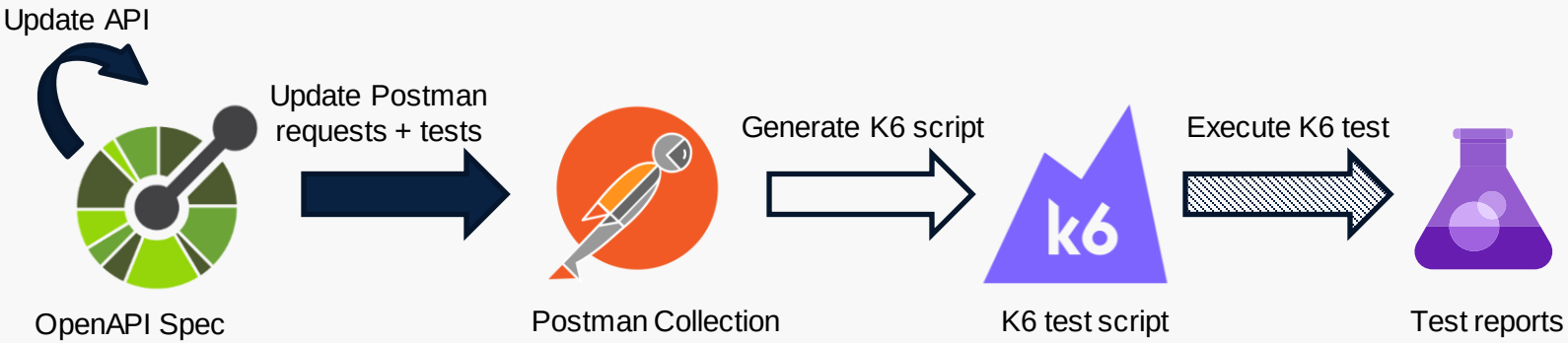


Newman

https://www.npmjs.com/package/newman

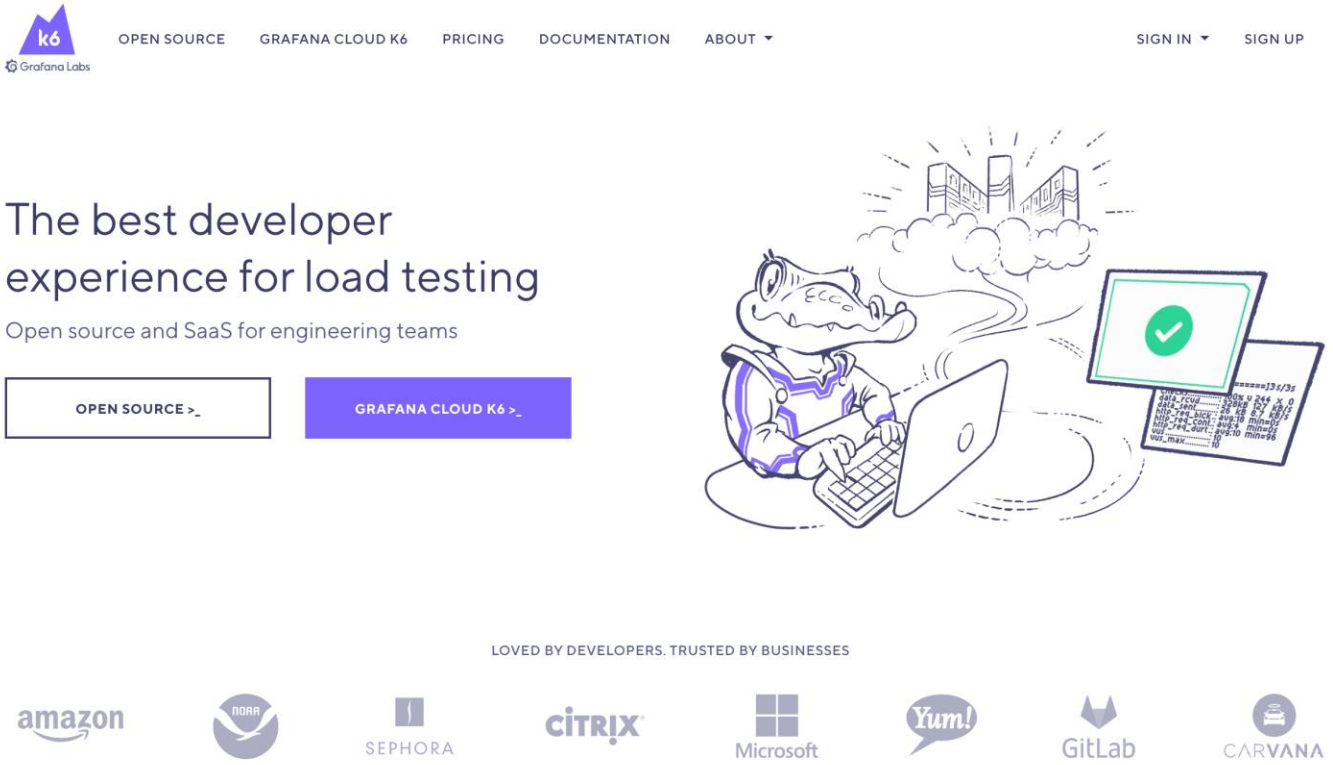


Performance testing



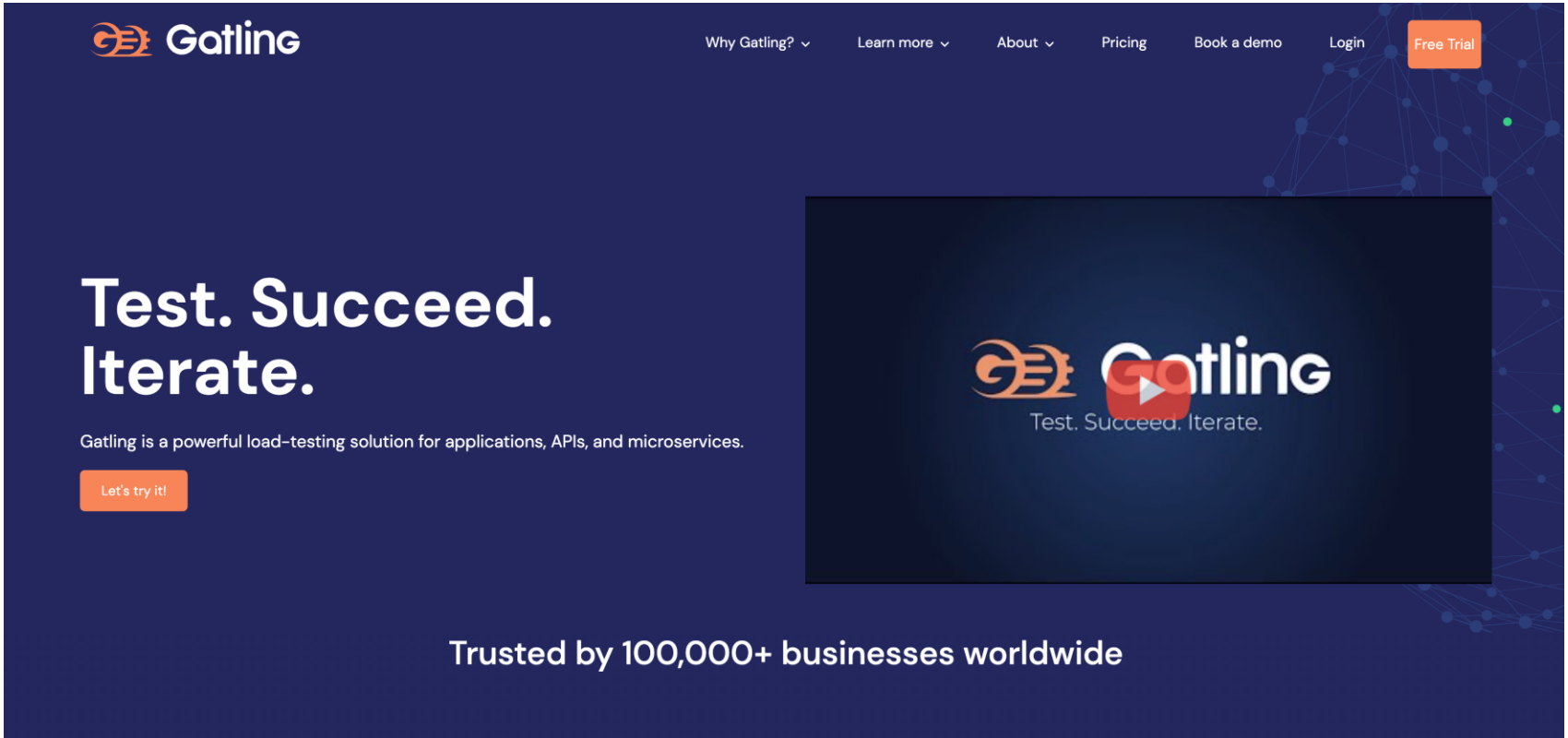
K6

https://k6.io/



Gatling

https://gatling.io/



Jmeter

https://jmeter.apache.org/

About
- Overview
- License

Download
- Download Releases
- Release Notes

Documentation
- Get Started
- User Manual
- Best Practices
- Component Reference
- Functions Reference
- Properties Reference
- Change History
- Javadocs
- JMeter Wiki
- FAQ (Wiki)

Tutorials
- Distributed Testing
- Recording Tests
- JUnit Sampler

Apache JMeter™

Twitter github

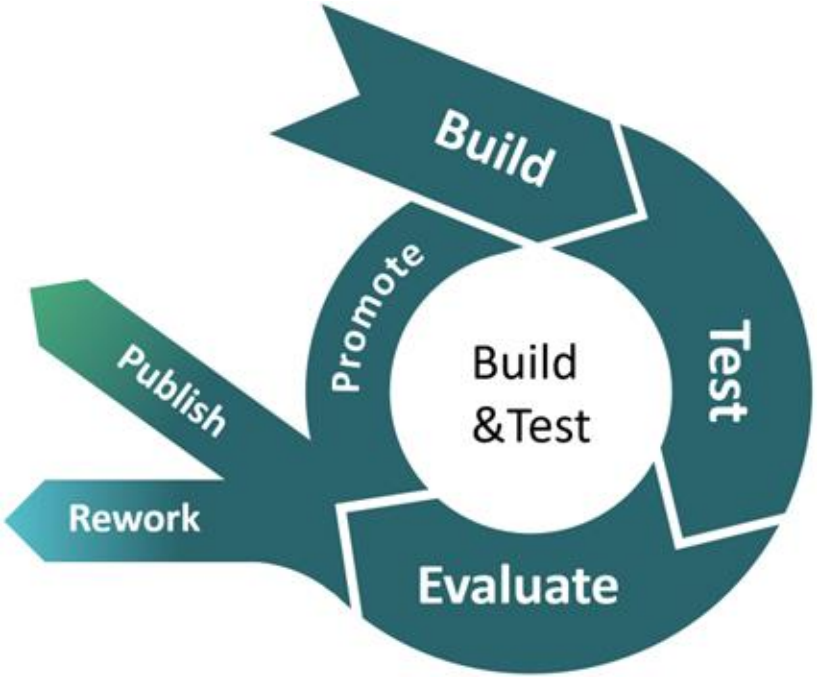
The **Apache JMeter™** application is open source software, a 100% pure Java application designed to load test functional behavior and measure performance. It was originally designed for testing Web Applications but has since expanded to other test functions.

What can I do with it?

Apache JMeter may be used to test performance both on static and dynamic resources, Web dynamic applications.
It can be used to simulate a heavy load on a server, group of servers, network or object to test its strength or to analyze overall performance under different load types.

Apache JMeter features include:

- Ability to load and performance test many different applications/server/protocol types:
  - Web - HTTP, HTTPS (Java, NodeJS, PHP, ASP.NET, …)
  - SOAP / REST Webservices
  - FTP
  - Database via JDBC
  - LDAP
  - Message-oriented middleware (MOM) via JMS
  - Mail - SMTP(S), POP3(S) and IMAP(S)
  - Native commands or shell scripts
  - TCP
  - Java Objects


Build
Test
Evaluate
Rework
Publish
Promote
Build
&Test

#smc-list-api.21067.02_merge Merge pull request 12945 from story/134362_links_to_records into main

on ES - smc.list.api - Deploy

Run new

Summary | Tests | Environments | Associated pipelines

Summary

2 Run(s) Completed (1 Passed, 1 Failed) 1 unique failing test in the last 14 days

16
Total tests
+16

15 Passed
1 Failed
0 Others

1 Failed tests (+1)
1 New
0 Existing

93.75%
Pass percentage
↑ 93.7%

1m
Run duration
↑ +1m

0
Tests not reported

Bug | Link | Flaky

Test run | Column Options

Filter by test or run name

Tags | SmcListsNewman | Owner | Passed

Test	Duration	Failing since	Failing build	Tags
Newman test suite "List" - buzz-main env (14/14)	0:00:03.194			
[POST] /lists/v2/audiences/{audienceId}/import - Response header Operation-Location is present	0:00:03.196			
[POST] /lists/v2/audiences/{audienceId}/import - Status code is 2xx	0:00:03.194			
[GET] /lists/v2/audiences/{audienceId} - Content-Type is application/json	0:00:01.460			
[GET] /lists/v2/audiences/{audienceId} - Schema is valid	0:00:01.460			
[GET] /lists/v2/audiences/{audienceId} - Status code is 2xx	0:00:01.460			
[GET] /lists/v2/audiences/{audienceId} - Response has JSON Body	0:00:01.457			
[GET] /lists/v2/audiences/{audienceId}/records/{recordId} - Schema is valid	0:00:00.564			
[GET] /lists/v2/audiences/{audienceId}/records/{recordId} - Status code is 2xx	0:00:00.564			

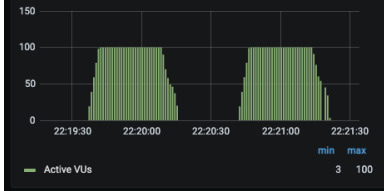
k6 Load Testing Results - Falcon

2021-03-08 22:19:15 to 2021-03-08 22:21:34

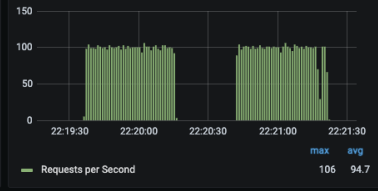
Measurement: http_req_duration + http_req_blocked

Dashboard Row

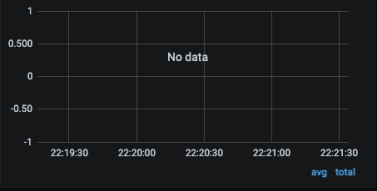
Virtual Users



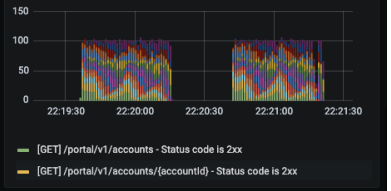
Requests per Second



Errors Per Second



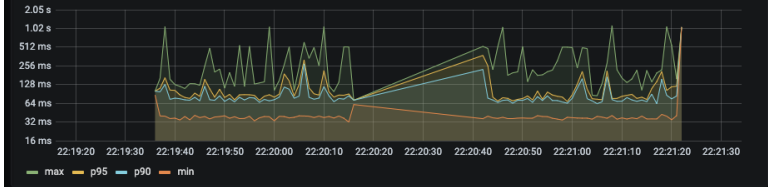
Checks Per Second



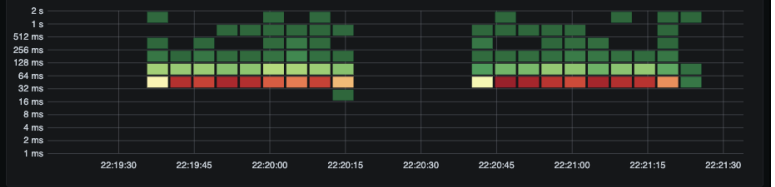
http_req_duration

http_req_duration (mean)	http_req_duration (max)	http_req_duration (med)	http_req_duration (min)	http_req_duration (p90)	http_req_duration (p95)
63.38 ms	1.14 s	54.16 ms	31.99 ms	79.70 ms	103.84 ms

http_req_duration (over time)



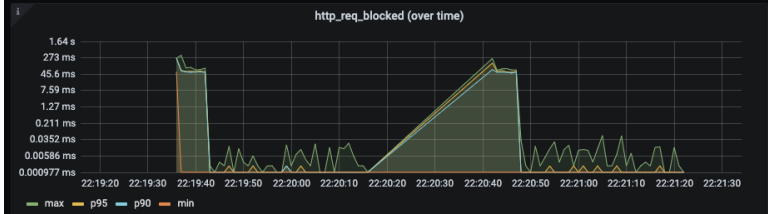
http_req_duration (over time)



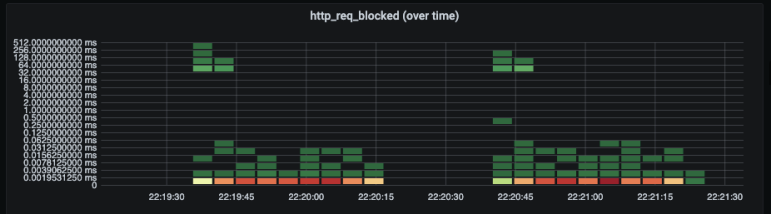
http_req_blocked

http_req_blocked (mean)	http_req_blocked (max)	http_req_blocked (med)	http_req_blocked (min)	http_req_blocked (p90)	http_req_blocked (p95)
1.68 ms	358.49 ms	0.00 ms	0.00 ms	0.00 ms	0.00 ms

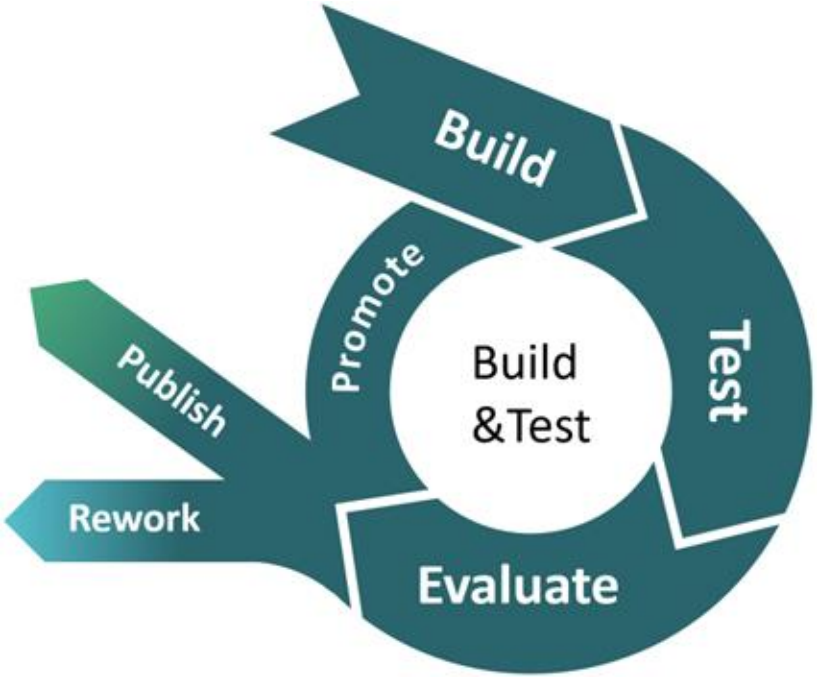
http_req_blocked (over time)



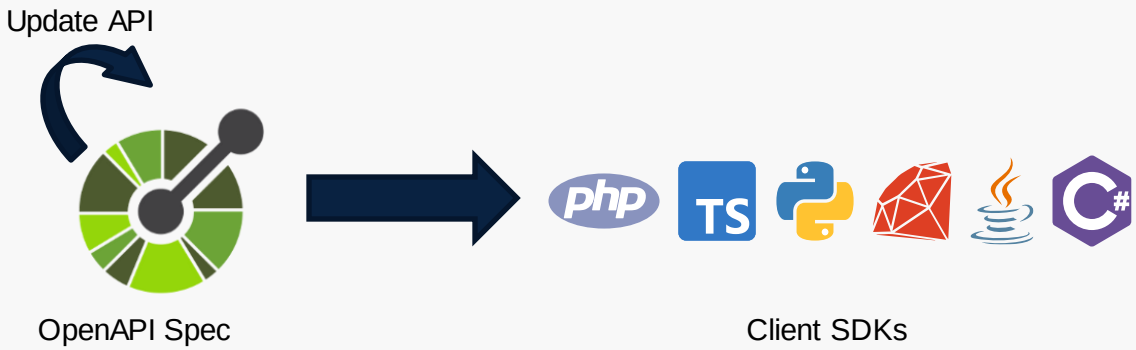
http_req_blocked (over time)



Dashboard Row

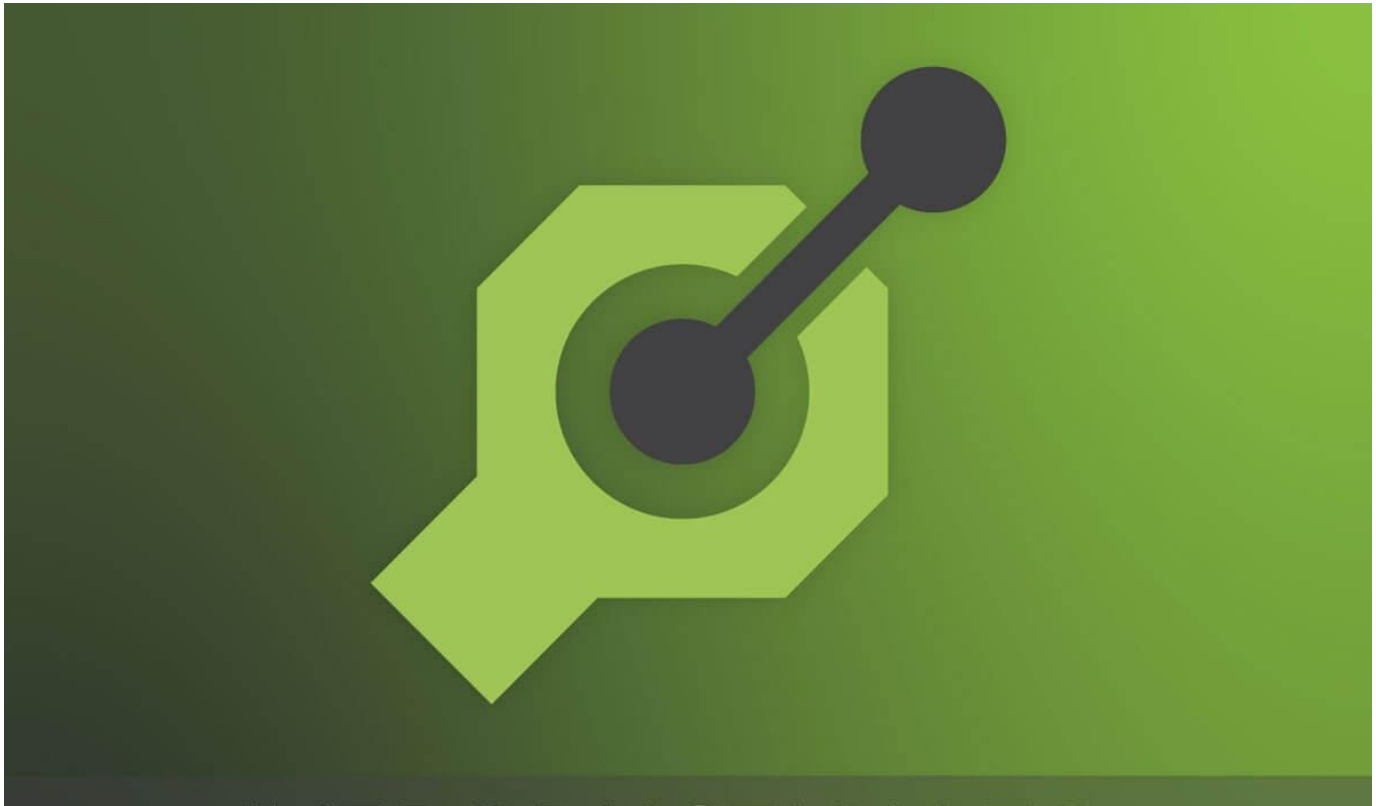

Build
Test
Evaluate
Rework
Publish
Promote
Build
&Test

Generate SDK



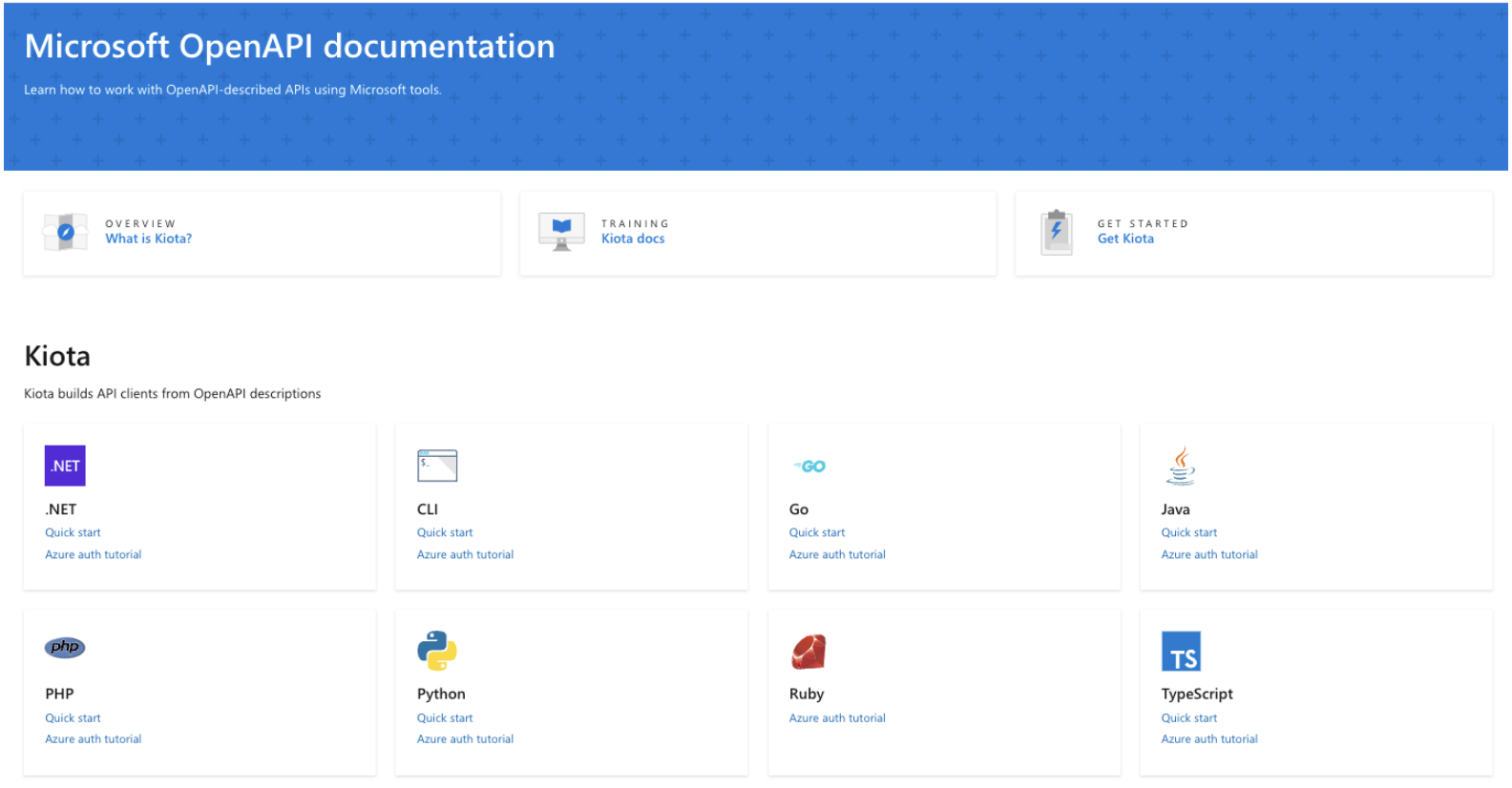
SDK Client Generation

https://openapi-generator.tech



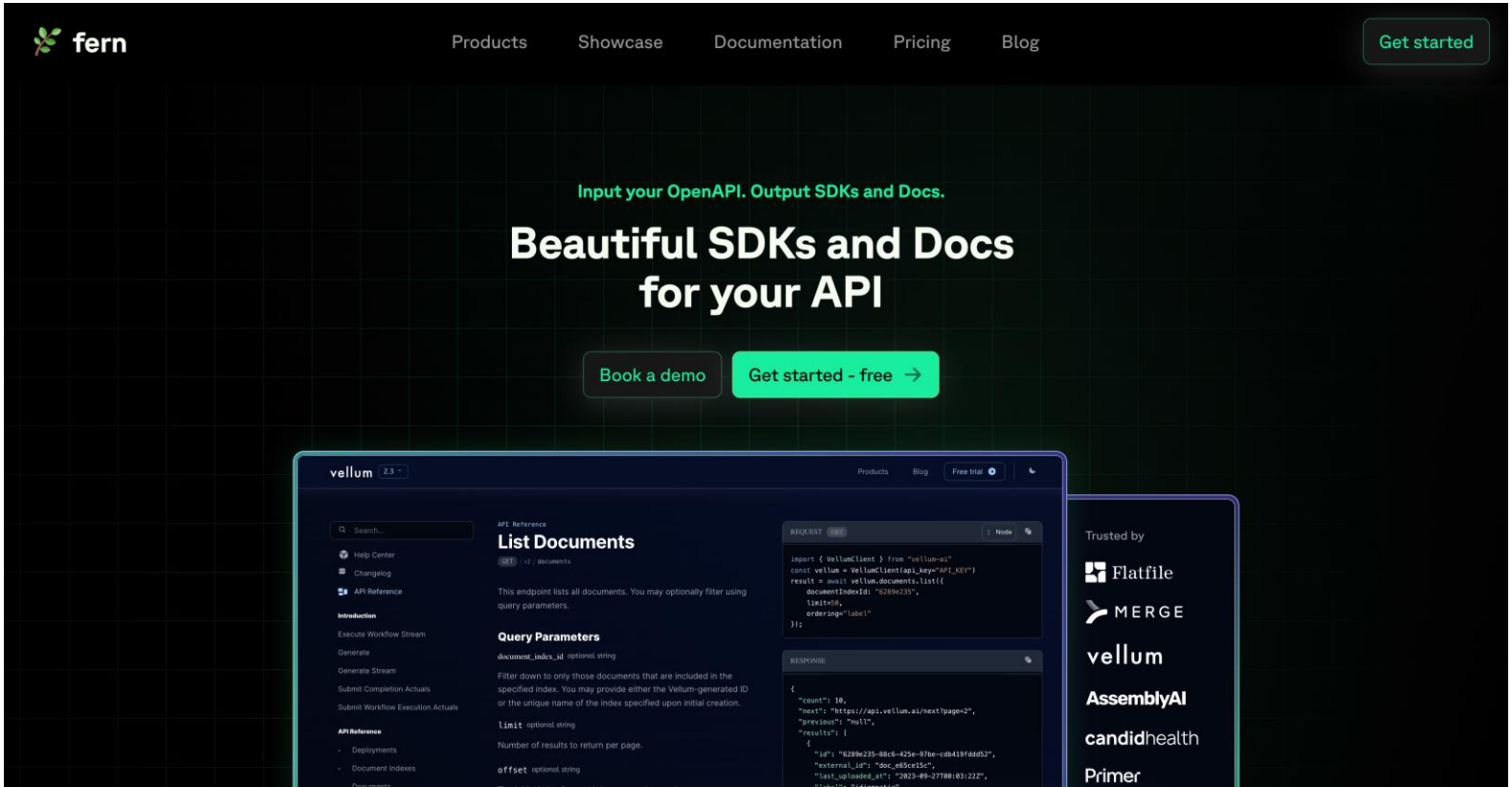
SDK Client Generation

https://learn.microsoft.com/en-us/openapi/



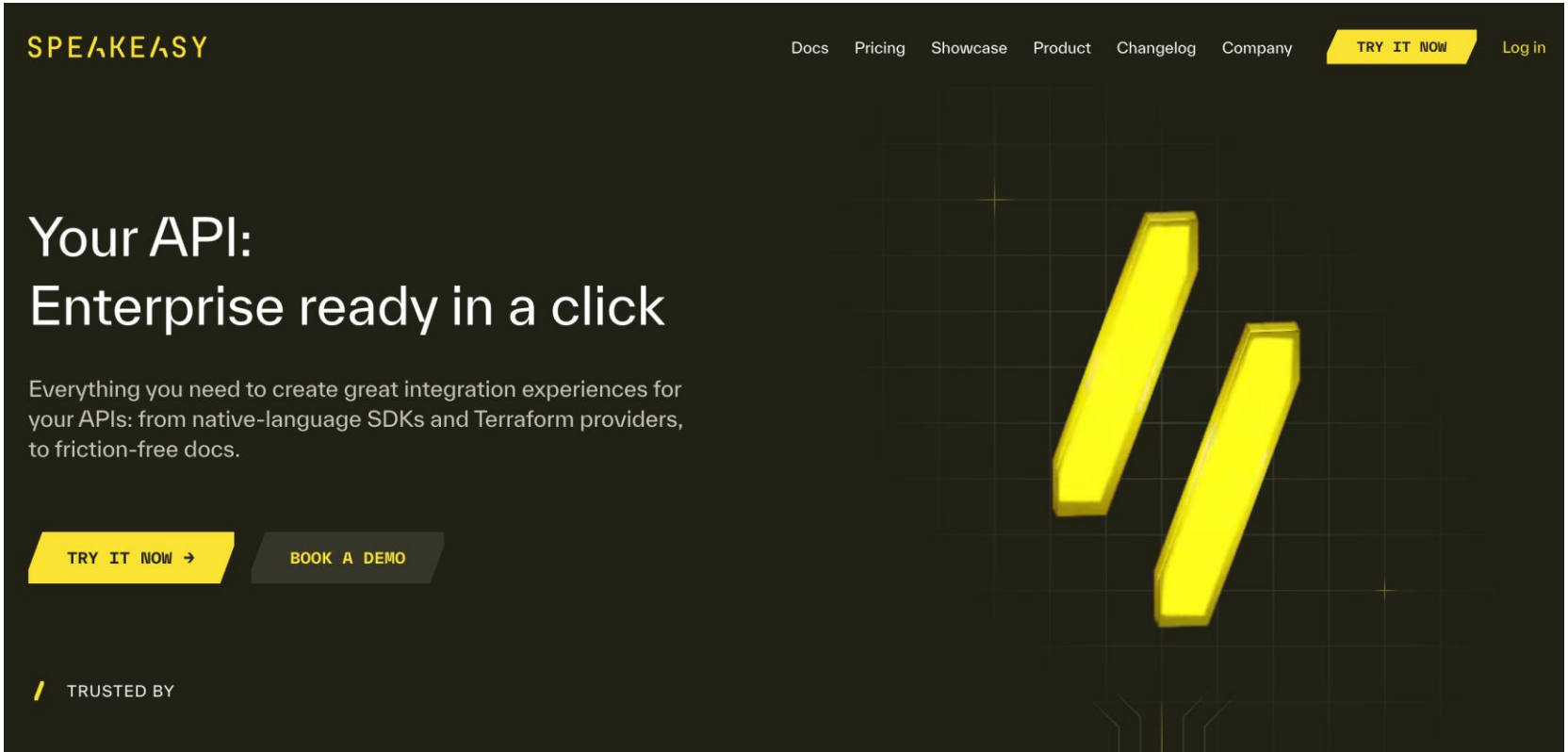
SDK Client Generation

https://buildwithfern.com/



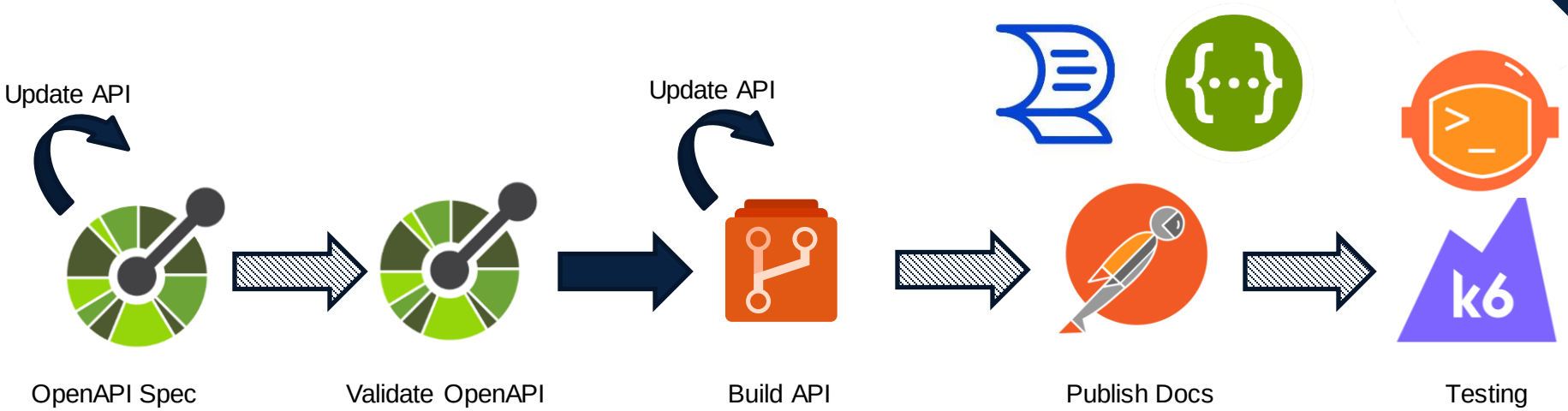
SDK Client Generation

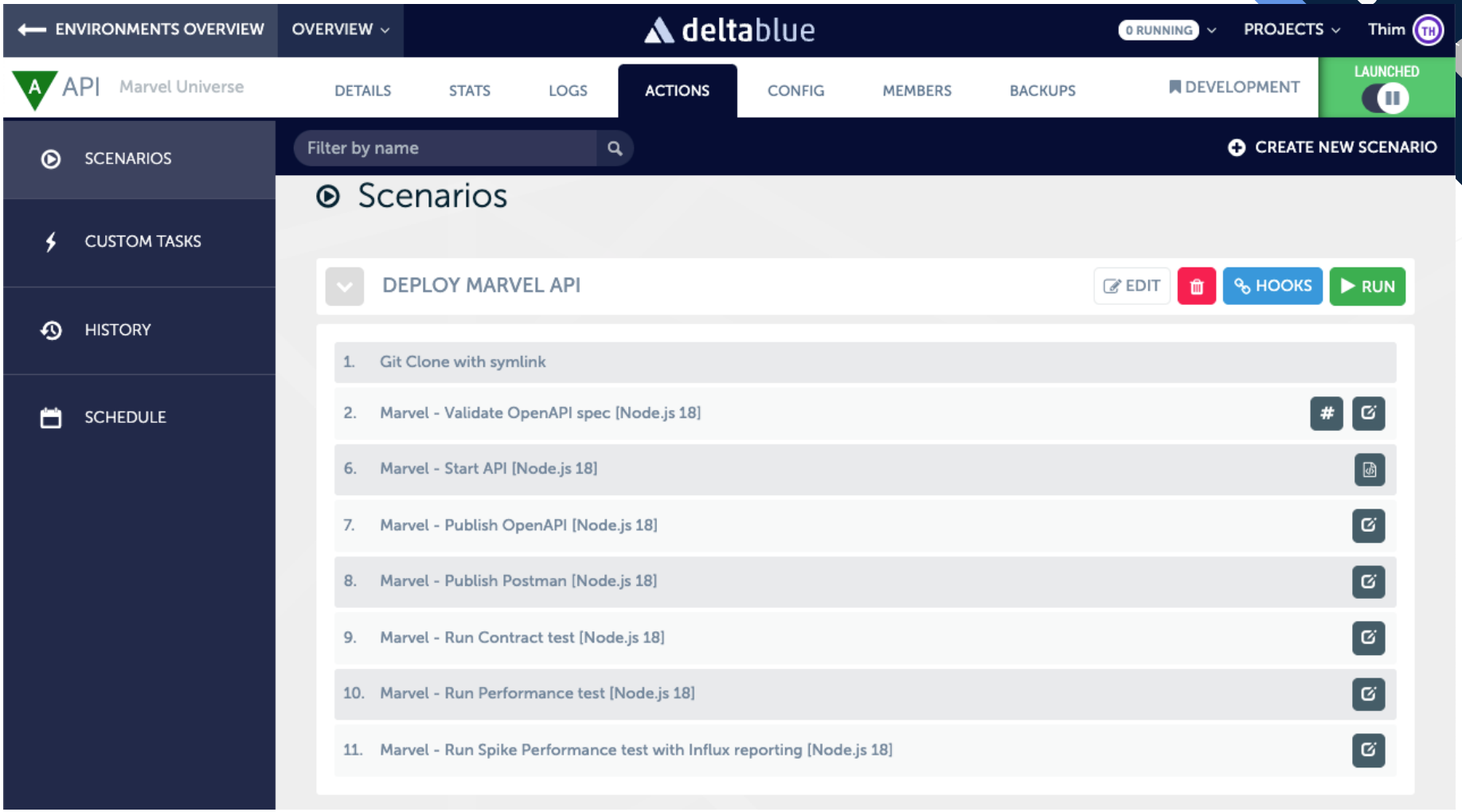
https://www.speakeasyapi.dev/

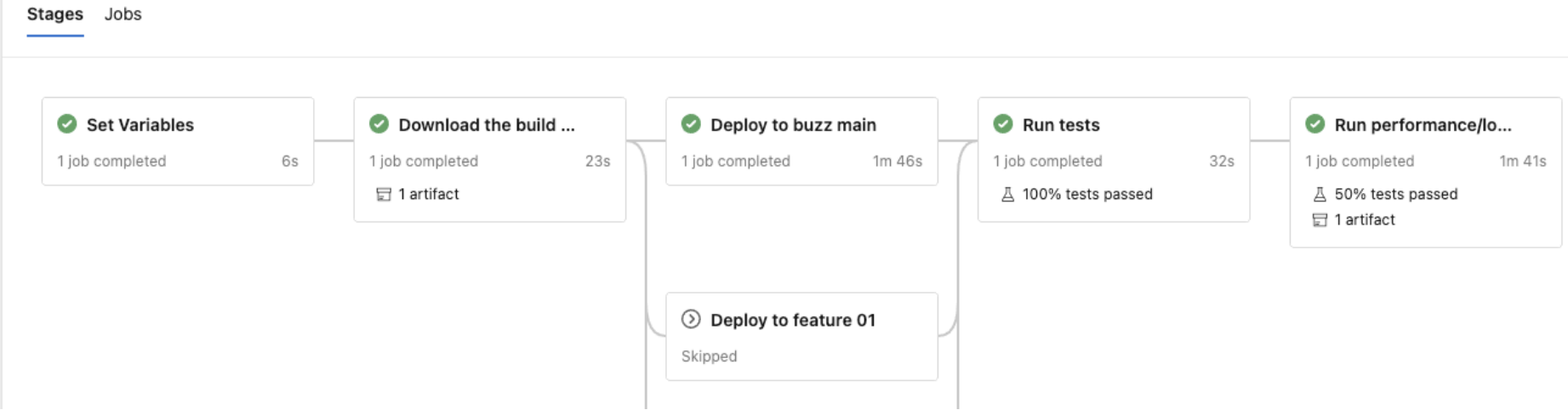


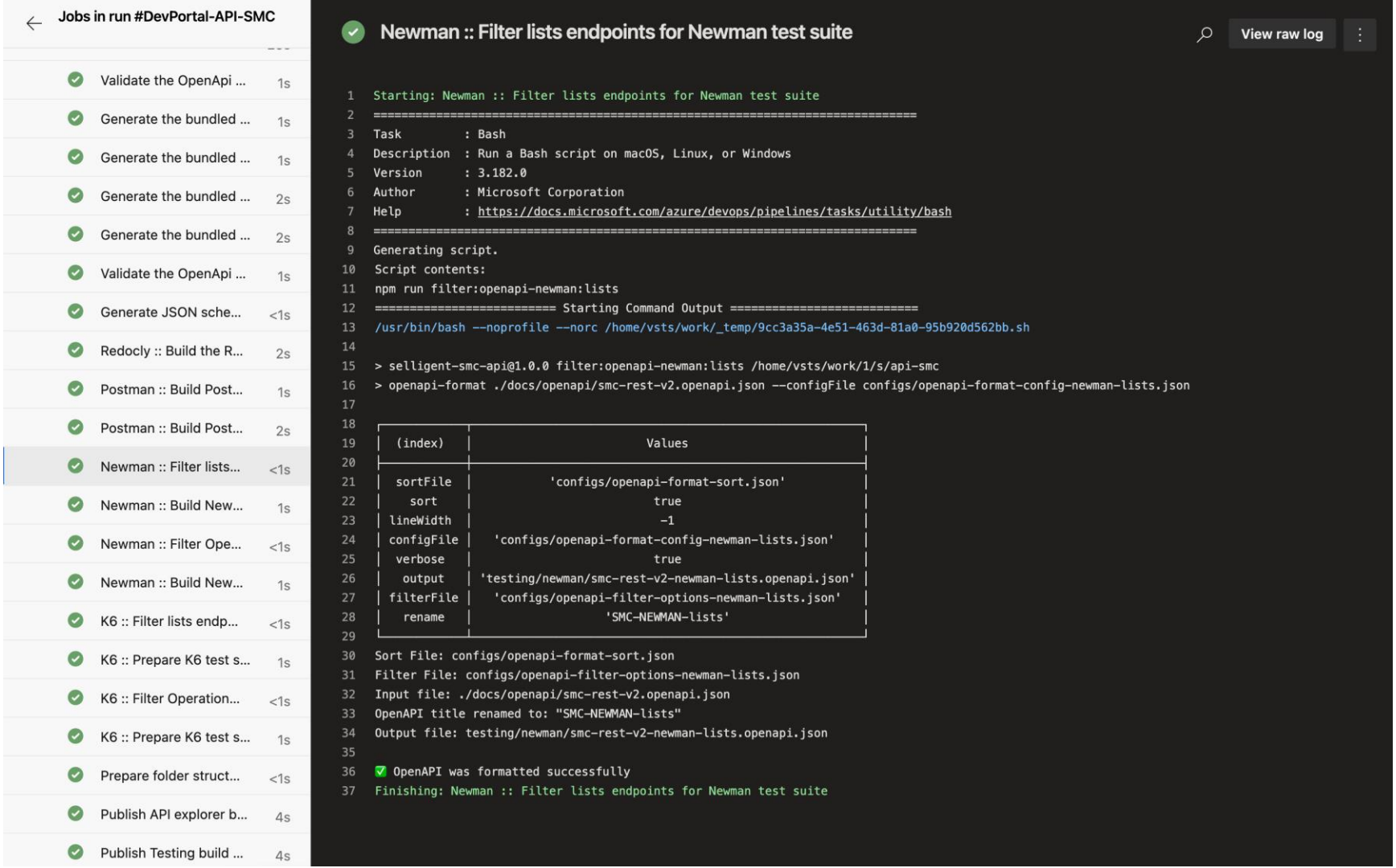

Support & Observe
Retire
Deprecate
Release
Publish
Evolve

Pipeline


Update API
Update API
k6
OpenAPI Spec
Validate OpenAPI
Build API
Publish Docs
Testing


ENVIRONMENTS OVERVIEW
OVERVIEW
deltablue
0 RUNNING
PROJECTS
Thim
API
Marvel Universe
DETAILS
STATS
LOGS
ACTIONS
CONFIG
MEMBERS
BACKUPS
DEVELOPMENT
LAUNCHED
SCENARIOS
CUSTOM TASKS
HISTORY
SCHEDULE
Filter by name
CREATE NEW SCENARIO
Scenarios
DEPLOY MARVEL API
EDIT
HOOKS
RUN
1. Git Clone with symlink
2. Marvel - Validate OpenAPI spec [Node.js 18]
6. Marvel - Start API [Node.js 18]
7. Marvel - Publish OpenAPI [Node.js 18]
8. Marvel - Publish Postman [Node.js 18]
9. Marvel - Run Contract test [Node.js 18]
10. Marvel - Run Performance test [Node.js 18]
11. Marvel - Run Spike Performance test with Influx reporting [Node.js 18]


Stages
Jobs
Set Variables
1 job completed
6s
Download the build ...
1 job completed
23s
1 artifact
Deploy to buzz main
1 job completed
1m 46s
Deploy to feature 01
Skipped
Run tests
1 job completed
32s
100% tests passed
Run performance/lo...
1 job completed
1m 41s
50% tests passed
1 artifact


Jobs in run #DevPortal-API-SMC
Validate the OpenApi ... 1s
Generate the bundled ... 1s
Generate the bundled ... 1s
Generate the bundled ... 2s
Generate the bundled ... 2s
Validate the OpenApi ... 1s
Generate JSON sche... <1s
Redocly :: Build the R... 2s
Postman :: Build Post... 1s
Postman :: Build Post... 2s
Newman :: Filter lists... <1s
Newman :: Build New... 1s
Newman :: Filter Ope... <1s
Newman :: Build New... 1s
K6 :: Filter lists endp... <1s
K6 :: Prepare K6 test s... 1s
K6 :: Filter Operation... <1s
K6 :: Prepare K6 test s... 1s
Prepare folder struct... <1s
Publish API explorer b... 4s
Publish Testing build ... 4s
Newman :: Filter lists endpoints for Newman test suite
View raw log
Starting: Newman :: Filter lists endpoints for Newman test suite
==
Task : Bash
Description : Run a Bash script on macOS, Linux, or Windows
Version : 3.182.0
Author : Microsoft Corporation
Help : https://docs.microsoft.com/azure/devops/pipelines/tasks/utility/bash
==
Generating script.
Script contents:
npm run filter:openapi-newman:lists
========== Starting Command Output ==========
/usr/bin/bash --noprofile --norc /home/vsts/work/_temp/9cc3a35a-4e51-463d-81a0-95b920d562bb.sh
> selligent-smc-api@1.0.0 filter:openapi-newman:lists /home/vsts/work/1/s/api-smc
> openapi-format ./docs/openapi/smc-rest-v2.openapi.json --configFile configs/openapi-format-config-newman-lists.json
(index) Values
sortFile 'configs/openapi-format-sort.json'
sort true
lineWidth -1
configFile 'configs/openapi-format-config-newman-lists.json'
verbose true
output 'testing/newman/smc-rest-v2-newman-lists.openapi.json'
filterFile 'configs/openapi-filter-options-newman-lists.json'
rename 'SMC-NEWMAN-lists'
Sort File: configs/openapi-format-sort.json
Filter File: configs/openapi-filter-options-newman-lists.json
Input file: ./docs/openapi/smc-rest-v2.openapi.json
OpenAPI title renamed to: "SMC-NEWMAN-lists"
Output file: testing/newman/smc-rest-v2-newman-lists.openapi.json
OpenAPI was formatted successfully
Finishing: Newman :: Filter lists endpoints for Newman test suite

API Gateway

APIs
Custom domain names
VPC links

API: unify-production-api
Resources
Stages
Authorizers
Gateway responses
Models
Resource policy
Documentation
Dashboard
API settings

Usage plans
API keys
Client certificates
Settings

API Gateway > APIs > unify-production-api (ncw0aa67i5) > Dashboards

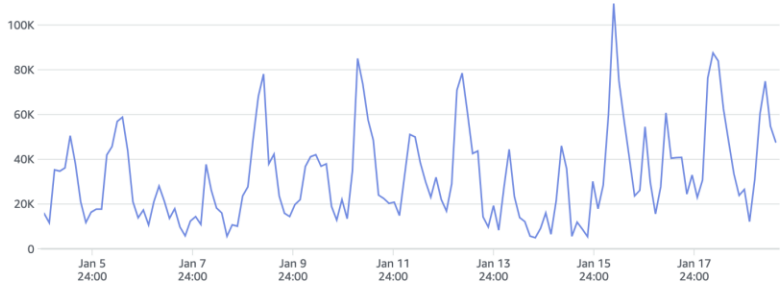
Dashboard

Stage: production

Date range: 2024-01-04 — 2024-01-18

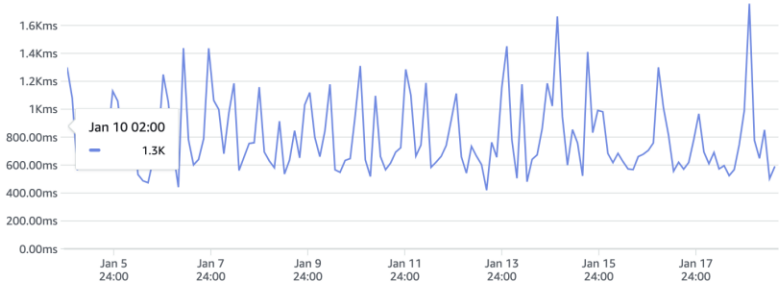
API calls

View in CloudWatch



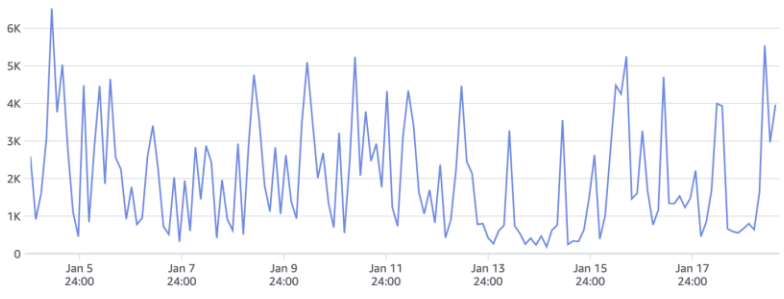
Latency

View in CloudWatch



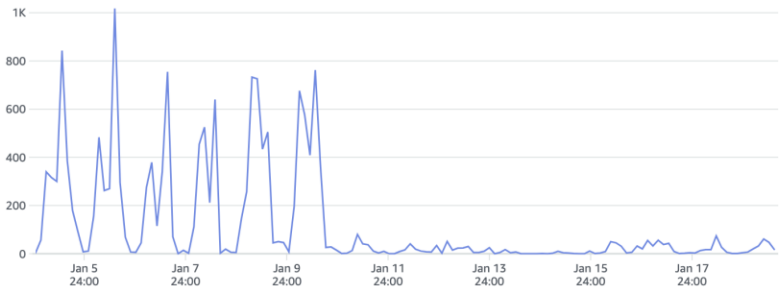
4xx error

View in CloudWatch



5xx error

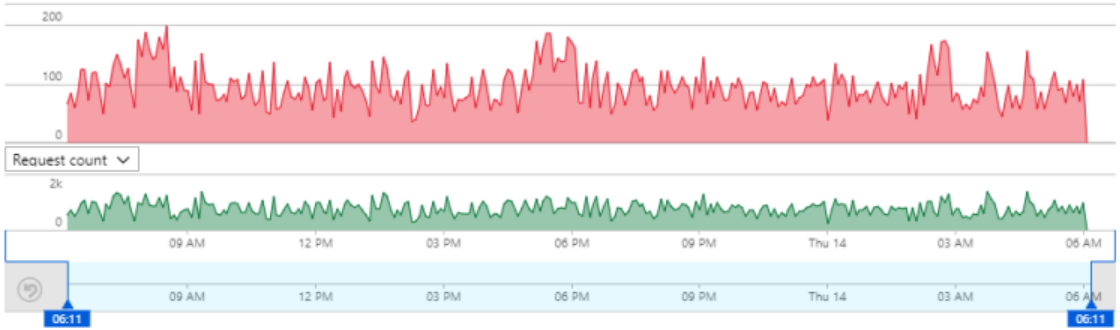
View in CloudWatch



Last 24 hours | Roles = **All** | Server | Browser

Operations | Dependencies | Exceptions | Roles | View in Analytics | Feedback | Refresh

Failed request count



Select operation

Search to filter items...

OPERATION NAME	USERS	COUNT (FAILED)	COUNT	PIN
Overall	**5.26k**	**27.53k**	**219.54k**	
GET ServiceTickets/Details	1.39k	13.86k	13.87k	
GET Employees/Details	1.38k	4.63k	9.24k	
POST ServiceTickets/Create	1.36k	4.41k	4.41k	
GET Employees/Create	874	2.90k	2.90k	
GET Home/Index	839	873	9.91k	
GET ServiceTickets/Index	404	404	14.26k	

Overall

Top 3 response codes

	COUNT	FILTERING
500	24.61k	
404	2.92k	

Top 3 exception types

	COUNT	FILTERING
NullReferenceExce...	18.49k	
SqlException	4.41k	
HttpException	2.92k	

Top 3 dependency failures

	COUNT	FILTERING
SQL	12.17k	
Azure blob	9.04k	

Drill into...

27.53k Operations

Unlocking the Power of Spec-Driven API Development

Recap

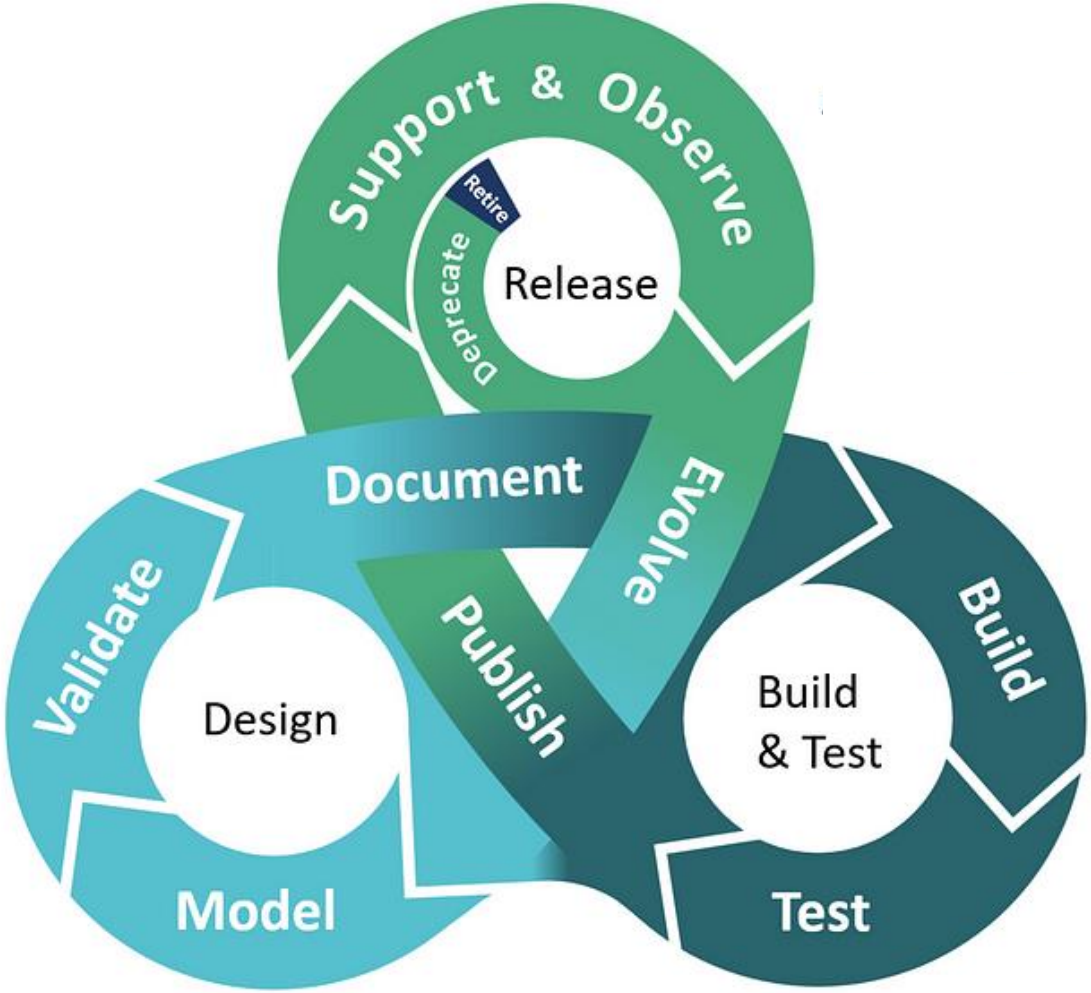
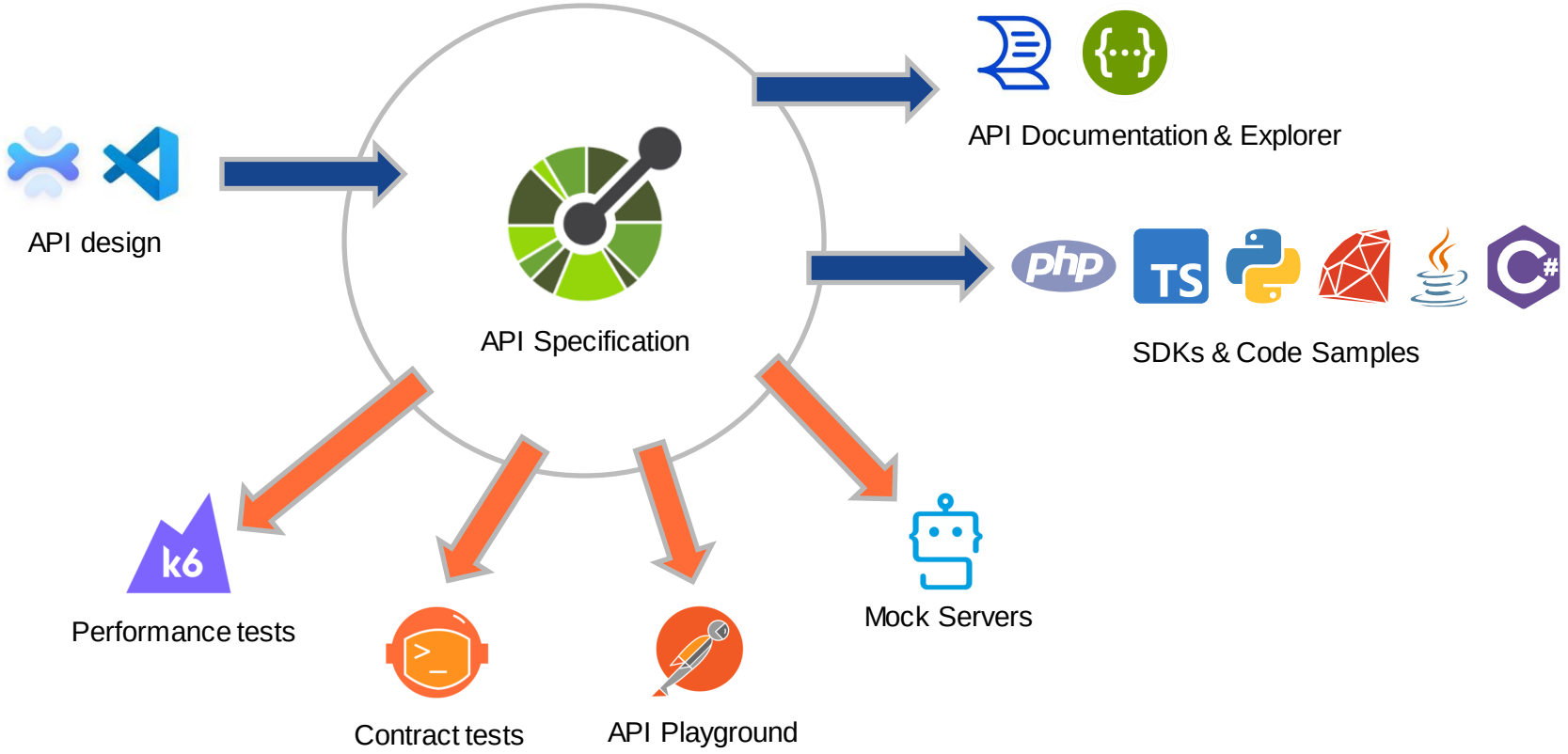


Diagram from TRGoodwill


API design
API Specification
API Documentation & Explorer
SDKs & Code Samples
Performance tests
Contract tests
API Playground
Mock Servers

Spec-driven benefits

- Better **documentation**
- Clearer **requirements**
- Shorter **feedback** loops
- More **consistent** API design
- Easier Team **alignment**
- Docs that **match** the API (and vice versa)
- Much **lower** updating effort
- Automatable outputs like:
  - **Documentation**
  - **Tests**
  - **Playgrounds**
  - **SDKs**

Thanks!

Do you have any questions?