API Testing and more.

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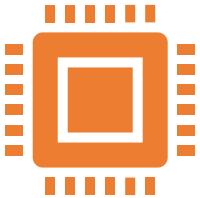
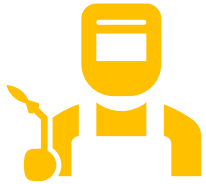
trivago N.V.
Dusseldorf - Jun 22, 2023

API Economy

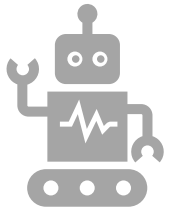


Enterprises need to ensure that end-to-end testing simulates end-user flows accurately.



Demand for Developers and Testers will outstrip supply.

~20k QA jobs available in the US as on date



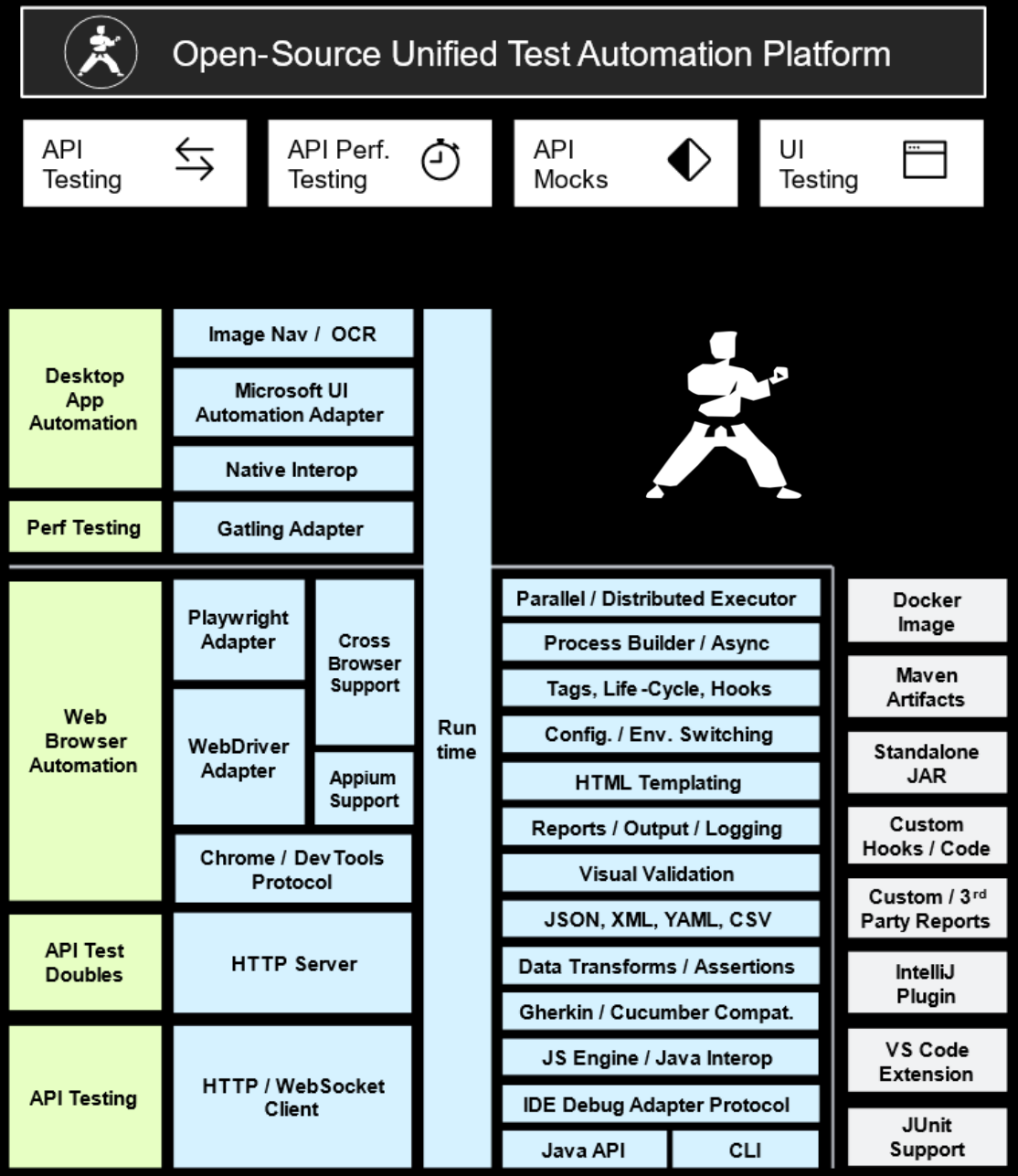
Automation of tests is critical to release customer-benefit faster and more often.

Test Automation - Challenges

- Flaky tests
- Keeping up with the pace of development “in-sprint”
- Maintainability
- Functional Regression Coverage
- Performance Testing

December 2016 - The Problem

- Architect in the Pro Connect Group (PCG) - team responsible for a set of 15 services that run PCG's business.
- Test would randomly fail, and this was blocking a production release - not clear if there was a problem with the test or if there was a genuine defect.
- Started troubleshooting the web-service automated tests.
  - The test was implemented in the Java programming language, and also depended on a framework created in-house, which had evolved over 3 to 4 years.
- Despite his many years of Java programming experience, it was very hard to understand what the test was doing.
  - The test depended on code contained in multiple files scattered across the workspace.
  - Many programmers had attempted to fix this test over the years, and Peter started to think hard about whether there was a better way to express web-service functional tests.
  - Peter was convinced that he was looking at a textbook case of **"impedance mismatch" between Java and Web-Services**.



INTEGRATIONS

HTTP APIs

Other Protocols

Core Adapters

Cloud Executors

Cloud Dev

Cloud Runtime

JetBrains IntelliJ

Visual Studio Code

IDE Plugins

Standards

Core Runtime

Java / Interop

Reports / Collab.

Other Adapters

Why API Testing is more relevant today?

UI vs API Testing - Comparison

	UI Testing	API Testing
Complexity	High	Low
Speed	Very Slow	High, can be run in parallel
Resource Requirements	Very High	Minimal
Stability	Flaky	Very Stable
Data Coverage	Hard to achieve	Easier to achieve, higher confidence
Mocking / Isolation	Hard or near impossible	Easy
Architecture Coverage	Only the UI layer	Can easily involve other layers
Simulating End-User Workflows	Hard	Easy
Variations	Many, and hard to cover	Simpler, focused on business-logic
Server Performance Testing	Not possible	Can be re-used effectively
Test Data Management	Hard	Easy
Dynamic / Data-Driven Testing	Hard	Easy
Programming Skill Required	High	Minimal, easy for non-programmers
Value as living documentation	Low	High

Misconceptions about API Testing

- Harder than UI Automation
- Requires more technical depth
- Does not achieve functional coverage

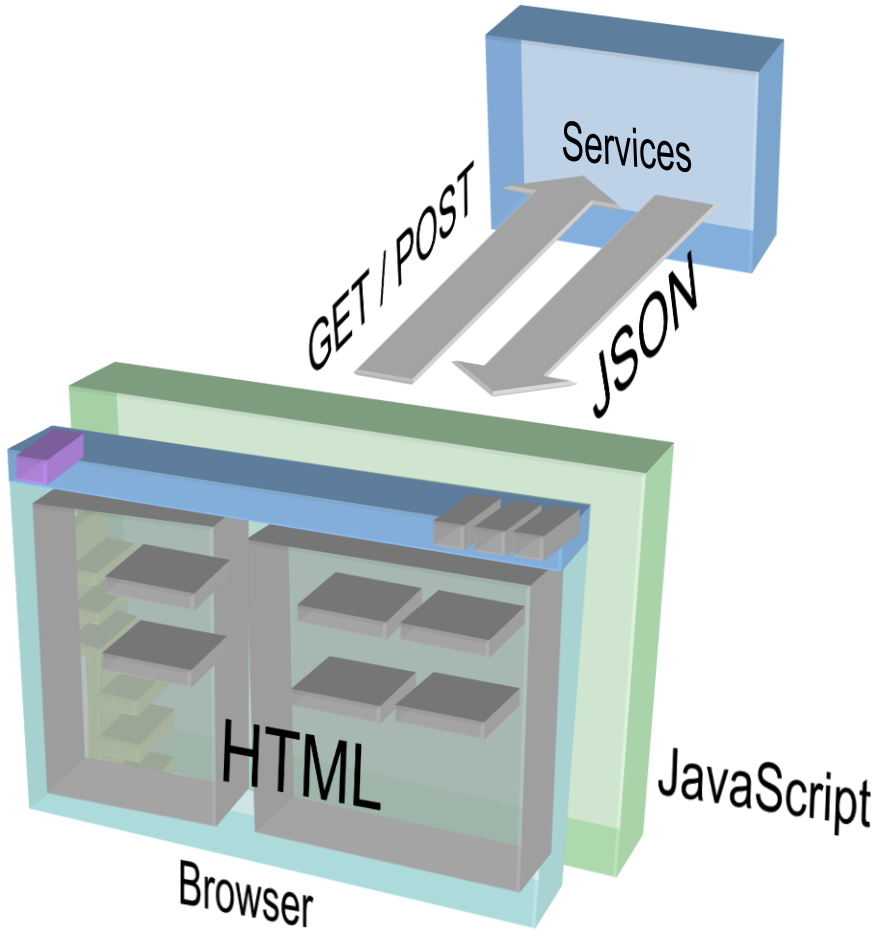
Why is API Testing not discussed more?

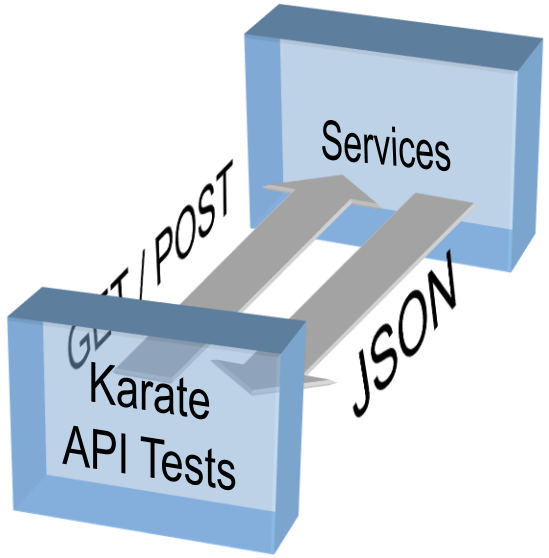
- Relatively New
- “Touch and Feel”
- Existing mindshare / community / tools

Why is API Testing more relevant today?

- APIs everywhere
- HTTP
  - Cross-platform
  - Language Neutral
  - Firewall-Friendly
  - Simple
- Most effective way to re-use core business-logic

API Testing in Context





Hello World

```
Scenario: create and retrieve a cat

Given url 'http://myhost.com/v1/cats'
And request { name: 'Billie' }
When method post
Then status 201
And match response == { id: '#notnull', name: 'Billie' }

Given path response.id
When method get
Then status 200
```

JSON is ‘native’ to the syntax

Intuitive DSL for HTTP

Payload assertion in one line

Second HTTP call using response data

API Testing

API Assertions	End-user workflows	Data Driven Testing	Parallel Execution	Java Interop	Re-use as Perf. Tests	Easy for non-programmers
Low-Code Schema Matching	Designed to chain API calls & user actions	Loop with ease and even use CSV files	~10 times faster than single-threaded	Test DB calls, async, gRPC, Kafka, and more	Save time instead of re-writing tests in a 2nd tool	Product Owners can contribute to tests

API Mocks

Self Hosted	Dynamic Responses	Git Friendly	Parallel Requests	Life-cycle API	Easy Install	Simple Syntax
100% local, no data in the cloud	Handle state, simulate complex behavior	Share and collaborate using plain-text	Thread-safe, even support performance tests	Embed in unit-tests or command-line	Get started in minutes, minimal setup	No programming experience needed

API Performance Testing

Re-use API tests	Rich reports	CI / CD Friendly	Runtime Options	Java Interop	Payload Assertions	Simple Setup
Save time by re-using functional tests as-is	Detailed HTML powered by Gatling	Enable continuous performance testing	Support via Maven or Gradle	Any Java integration can be perf-tested	Confidence that server-responses are accurate	Easy to add to existing API testing project

Web Browser Automation

Standards Support	Cross Browser	Stable Tests	Parallel Execution	Visual Testing	Assertions and Reports	Hybrid Testing
W3C WebDriver, Chrome DevTools	Switch between browsers with just config	Wait for elements, powerful API	Use Docker or cloud-based grids	Self-hosted, local and low-latency	Built-in along with tags, config and env. switching	API and UI testing within same test

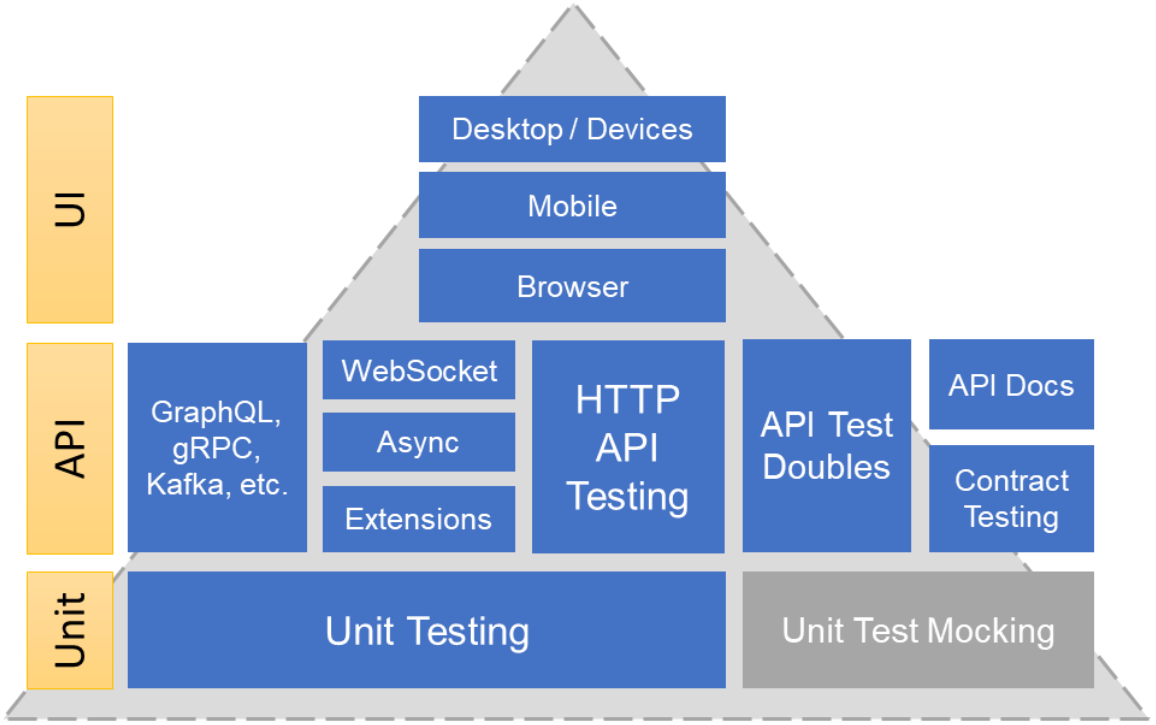
Demo: API Testing with Karate

415+ companies

including 42 of Fortune 500

use Karate

Test Automation Capability Map



Core Test Automation

- Assertions
- Env. / Config Switching
- Grouping / Tags
- Data Driven Testing
- Formats: JSON, XML, etc.
- Extensibility / Hooks
- Artifact & Code Re-use

Developer Experience

- IDE Support
- Live Debugging
- Low Code / Maintainability
- Parallel Execution
- Robustness / Predictability
- Docker / Cloud Readiness
- Self Hosted / Data On-Prem
- Git / Version Diffs
- Logging / Traceability
- Remote Dev Environments
- Test Runner SDK / CLI
- Low Code / No Code
- BDD / Natural Language

Reports & Integration

- Results Output / Export
- HTML Reports
- Run History & Insights
- Coverage Reports
- 3rd Party Tool Integrations

UI & UX

- Video Rec. / Screenshots
- Visual Validation
- Visual Navigation
- Accessibility
- Localization Testing
- Cross Browser / Device

Scale

- Distributed / Cloud Testing
- API Perf. / Load Testing
- UI / UX Performance
- Chaos Testing

Test Generation

- Artifact Import / Conversion
- Record & Replay
- AI / ML
- Property Based Testing
- Fuzzing
- Fake Data Generation
- Security Testing

Getting to know Karate

- Reviews on Capterra and G2
- Getting started
- Kickstart videos
- Examples and demos of integrations
- Documentation
- Stack Overflow

Additional Resources

- The Test-Automation Capability Map
- Is test-automation a first-class citizen of your development pipeline?
- Is Behaviour Driven Development (BDD) right for API testing?
- API Contract Testing - Visual Guide
- The Karate Advantage: 5 Compelling Reasons to Switch from Selenium for Test Automation
- Guidewire Testing Framework
- Navigating The Brave New World of API Testing - **eBook by Peter Thomas**

Enterprise Users on Karate

- **Walmart** : **KAFKA Automation using KARATE**
- **Expedia** : **Karate: 5 reasons why you should try it**
- **Adobe** : **Karate, the black belt of HTTP API testing?**
- **Oktana** : **API Testing with Karate Framework**
- **Broadcom** : **Karate Plug-in**
- **Globant** : **Karate API Testing**
- **Enterprise users on Getting Started with Karate.**
- **Karate Customer Journey Webinars : SAP, FIS, Oracle, trivago, CRIO, Dell, Illumina (~1 hour each)**

IntelliJ Plugin

BASIC

- All open-source core features
- Core syntax support
- Embedded Language Support
- Code Formatting
- Run Tests / View Reports
- Remote environments - GitHub Codespaces, Gitpod

PRO

- All Basic features plus:
- Code Folding
- Autocomplete and Syntax Validation
- Debug & Step-Through
- Debug Java and Karate in same Session
- API Data Import (Postman, OpenAPI, Swagger, cURL, HAR)
- Advanced Reports - API / HTTP calls

Resources:
Get started with Karate using IntelliJ
Tutorials on Karate IntelliJ plugin
Pricing

Visual Studio Code Extension

BASIC

- **All open-source core features**
- **Core syntax support**
- **Embedded Language Support**
- **Code Formatting**
- **Run Tests / View Reports**
- **Remote environments - GitHub Codespaces, Gitpod**

PRO

- **All Basic features plus:**
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- **API Data Import (Postman, OpenAPI, Swagger, cURL, HAR)**
- **Advanced Reports - API / HTTP calls**

Resources:
Get started with Karate using VS Code
Tutorials on Karate VS Code Plugin
Pricing

THANK YOU!

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