



# Software testing

Requirements, test scenarios, suites and cases

Pekka Ojala, Jouni Juntunen, 4.12.2025

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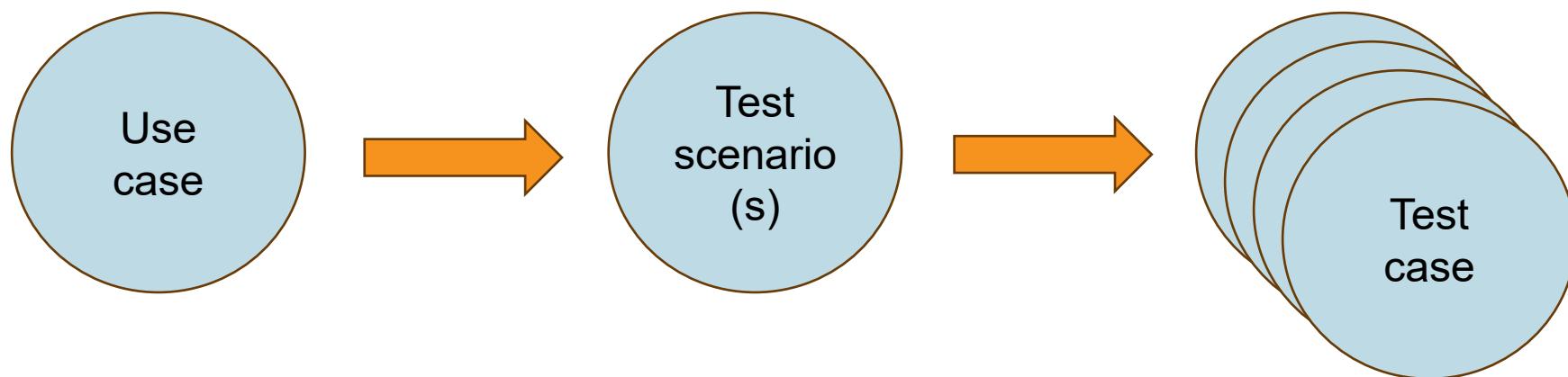
- Requirements
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# Requirements

- Developing software is based on requirements
- All testing is based on requirements
- Requirements are documented (backlog, requirement specification, ...)
- Requirements must be testable (e.g. acceptance criteria is defined)
- Also non-functional requirements must be documented and it will affect on testing
- If requirements change, testing must adapt
- Unclear and contradictory requirements will lead to higher costs and testing might become inefficient

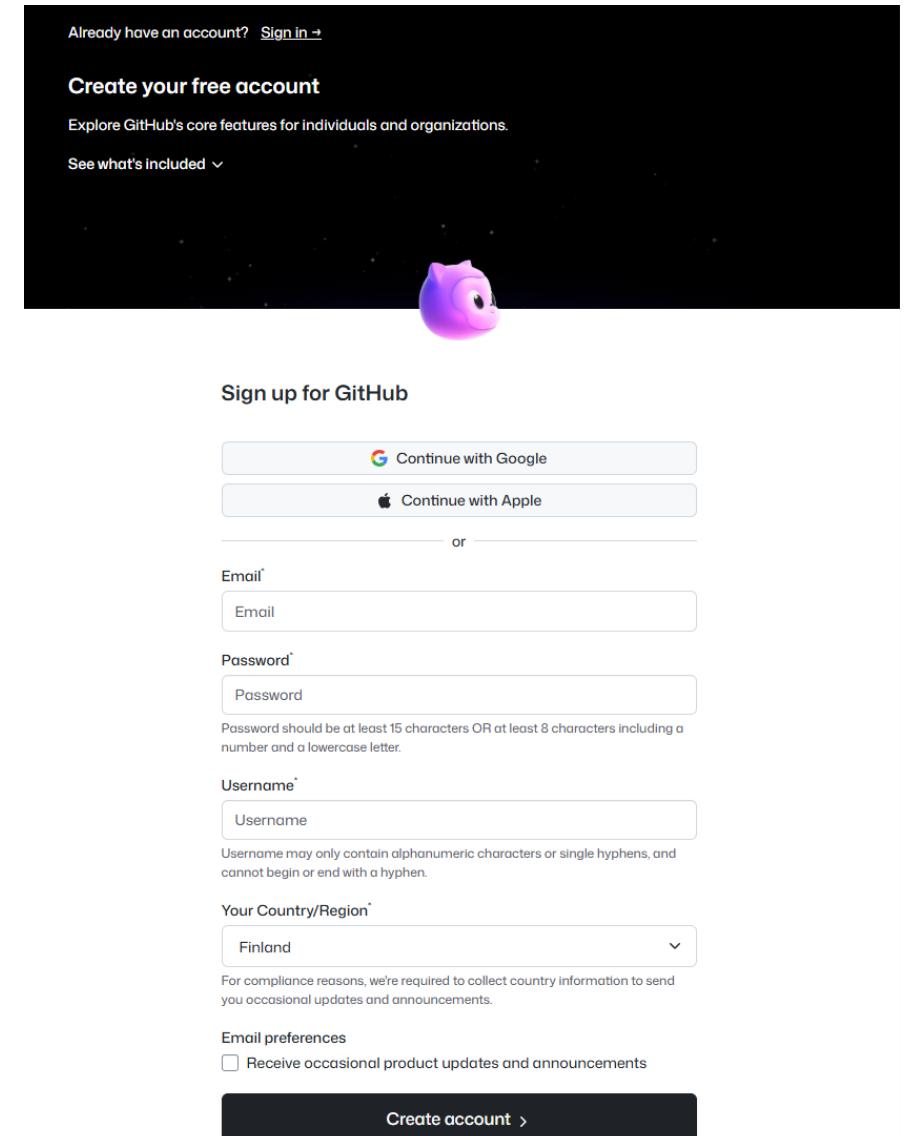
# Test scenarios

- A test scenario describes the functionality of a specific aspect to be tested in the software
- High-level description what to test, e.g., Successful account creation
- Behind a test scenario(s), there may be a use case, which describes the user's actions in interaction with the software
- From a use case, one or more test scenarios can be derived
- From a test scenario, one or more test cases can be derived



# Test scenarios

- Use case:  
*As a new GitHub user, I want to create an account so that I can access the platform and use its features.*
- Examples of test scenarios
  - Successful account creation
  - Invalid or missing input data
  - Email or username conflicts
  - Technical or system errors
  - Security requirements
  - ...



The screenshot shows the GitHub sign-up page. At the top right, there's a link to "Sign in →". Below it is a section titled "Create your free account" with the subtext "Explore GitHub's core features for individuals and organizations." and a "See what's included" link. A small purple octocat icon is visible. The main form area has a heading "Sign up for GitHub" and two social login buttons: "Continue with Google" and "Continue with Apple". Below these is a "or" link. The form fields include "Email\*" (with placeholder "Email"), "Password\*" (with placeholder "Password" and a note "Password should be at least 15 characters OR at least 8 characters including a number and a lowercase letter."), "Username\*" (with placeholder "Username" and a note "Username may only contain alphanumeric characters or single hyphens, and cannot begin or end with a hyphen."), "Your Country/Region\*" (set to "Finland" with a dropdown arrow), and an "Email preferences" checkbox labeled "Receive occasional product updates and announcements". A large "Create account >" button is at the bottom.

# Test cases

- Test Case refers to the actions performed to verify a specific feature or functionality of the software
- A test case includes instructions for executing the test
  - Description
  - Steps
  - Preconditions (required to execute the test case)
  - Test data (e.g., inputs)
  - Expected result

# Test case, example 1/3

- Test scenario: Successful account creation
  - ID: 001
  - Sign up using valid email, username, password and country
  - Steps: 1) Go to Github's sign up page, 2) Enter valid email, 3) Enter valid password, 4) Enter valid username, 5) Select country/region, 6) Submit form, 7) Confirm email via verification link
  - Preconditions: The email address and username must be ones that have not been used for Github registration before.
  - Test data: Information used with sign up (valid email, password, username and country/region)
  - Expected result: Account is created successfully

## Test case, example 2/3

- Test scenario: Successful account creation
  - ID: 002
  - Sign up using valid Google/Gmail account
  - Steps: 1) Go to Github's sign up page, 2) Select Continue with Google, 3) Google OAuth page login window opens, 4) Enter Gmail address, 5) Enter password, 6) Approve Google authentication (if prompted), 7) Accept Github's terms and conditions (if asked), 8) Confirm creation of the Github account
  - Preconditions: Valid Google/Gmail account which is not currently used for Github account
  - Test data: Username/email and password for valid Google/Gmail Account
  - Expected result: Account is created successfully

# Test case, example 3/3

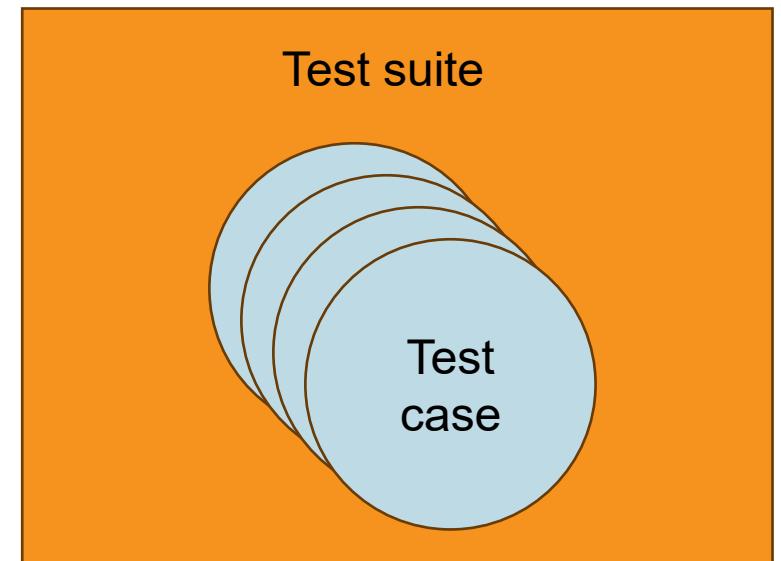
- Test scenario: Invalid or missing input data
  - ID: 001
  - Description: Attempt to sign up leaving email field empty
  - Steps: 1) Go to Github's sign up page, 2) Leave email field empty, 3) Enter valid username, 4) Enter valid password, 5) Select country/region, 6) Submit form
  - Preconditions: The username must be one that have not been used for Github registration before.
  - Test data: Information used with sign up (email left blank, password, username and country/region)
  - Expected result: Validation error "Email is required"

# A good test case

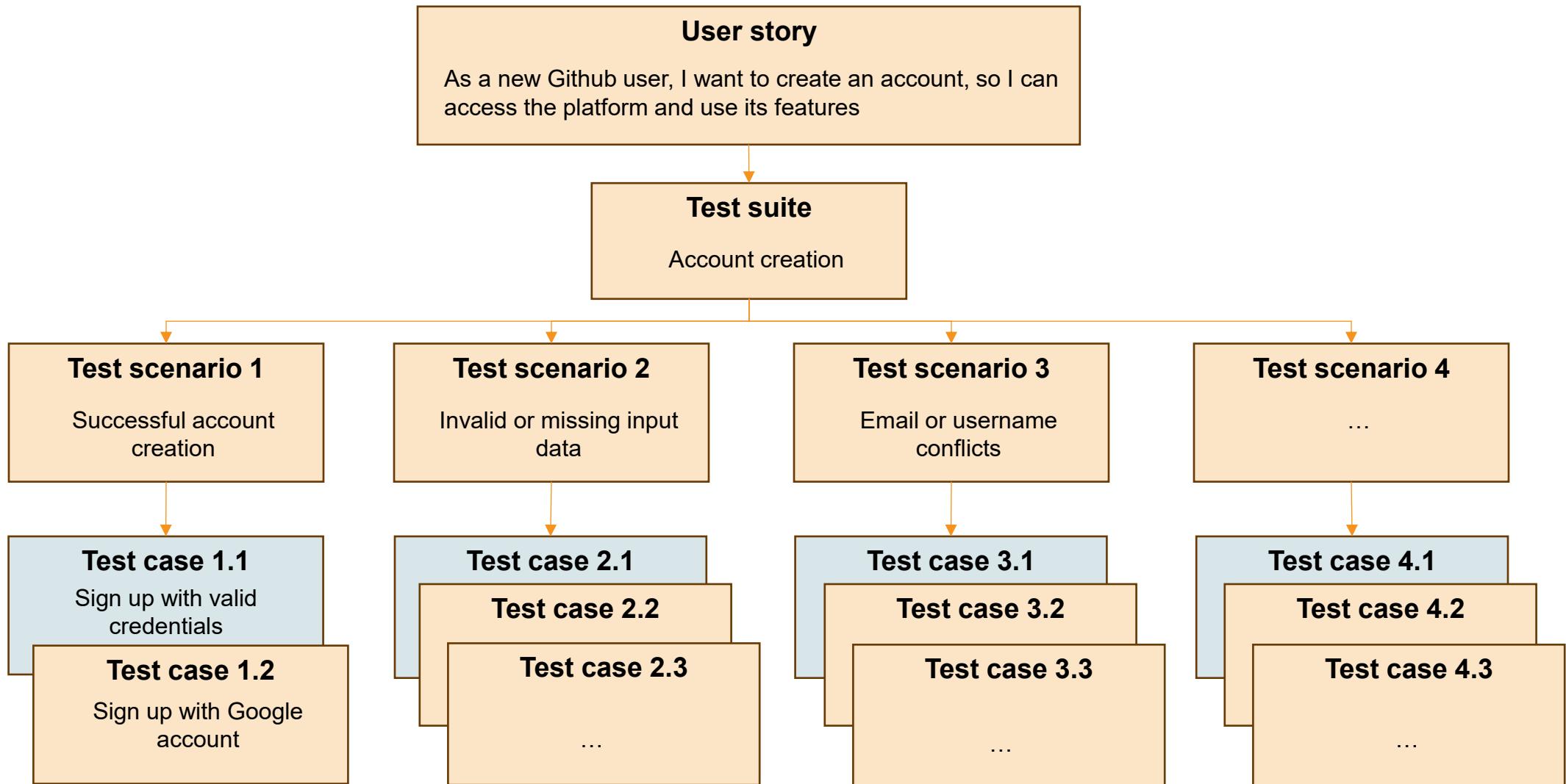
- Simple and easy to understand
- Designed from the perspective of the software user
- Does not include unnecessary steps or repetition
- Easy to identify from the requirements
- Easy to trace to the requirements
- Repeatable and reusable
- Contributes to building 100% test coverage

# Test suite

- A test suite is a collection or group of related test cases, which can be very numerous over the software's lifecycle
- Use to organize test cases, especially when doing automated testing
- Depending on the size of the software, there can be tens, hundreds, thousands, etc., of test cases
- AI enables an extremely large number of test suites and cases



# User story, test suite, scenario and cases



# Traceability

- Traceability refers to the ability to connect each requirement to the test cases
- Confirms, that all requirements are covered by tests (test coverage)
- Helps identify requirements that are not yet tested
- Makes easier to track changes in requirements and update related test cases
- Supports analyzing impact off requirement changes



OULUN AMMATTIKORKEAKOULU