ICT Improve
Part of ICT Group

Keynote

Gáspár Nagy

RAMP up your testing solution: test automation patterns

14.35 – 15.15 - auditorium

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Ramp Up Your Testing Solution: Test Automation Patterns

LDE25
10th April 2025

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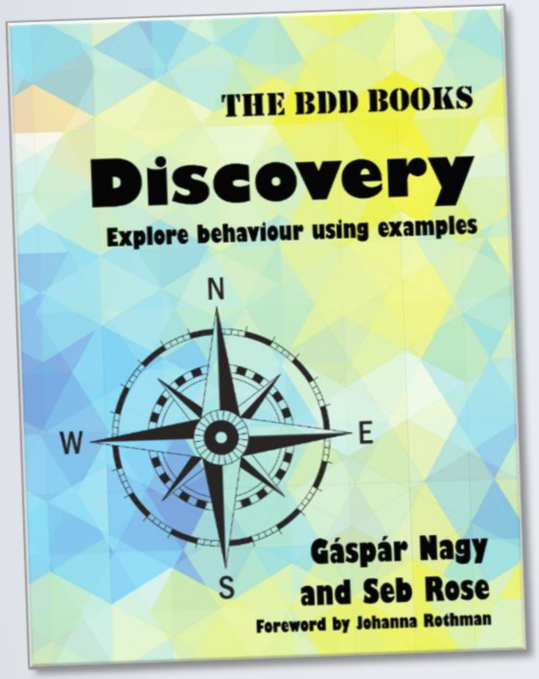

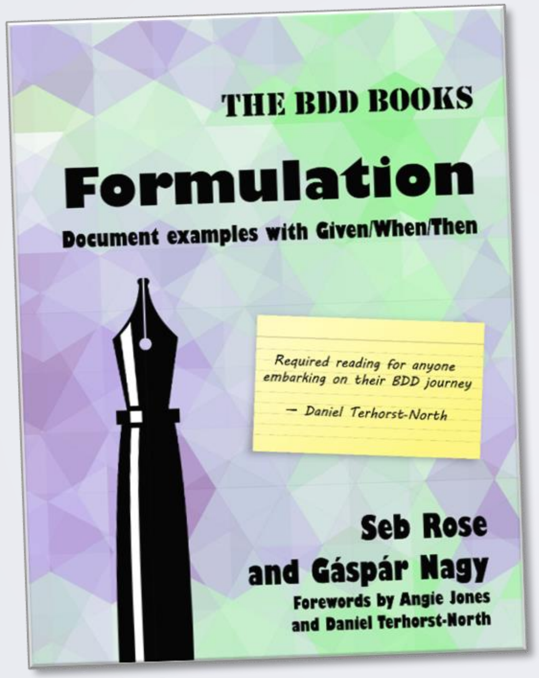
THE BDD BOOKS
Formulation
Document examples with Given/When/Then
Required reading for anyone embarking on their BDD journey
— Daniel Terhorst-North
Seb Rose
and Gáspár Nagy
Forewords by Angie Jones
and Daniel Terhorst-North

Find them on Amazon & Leanpub through https://bddbooks.com!

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Recognize this?

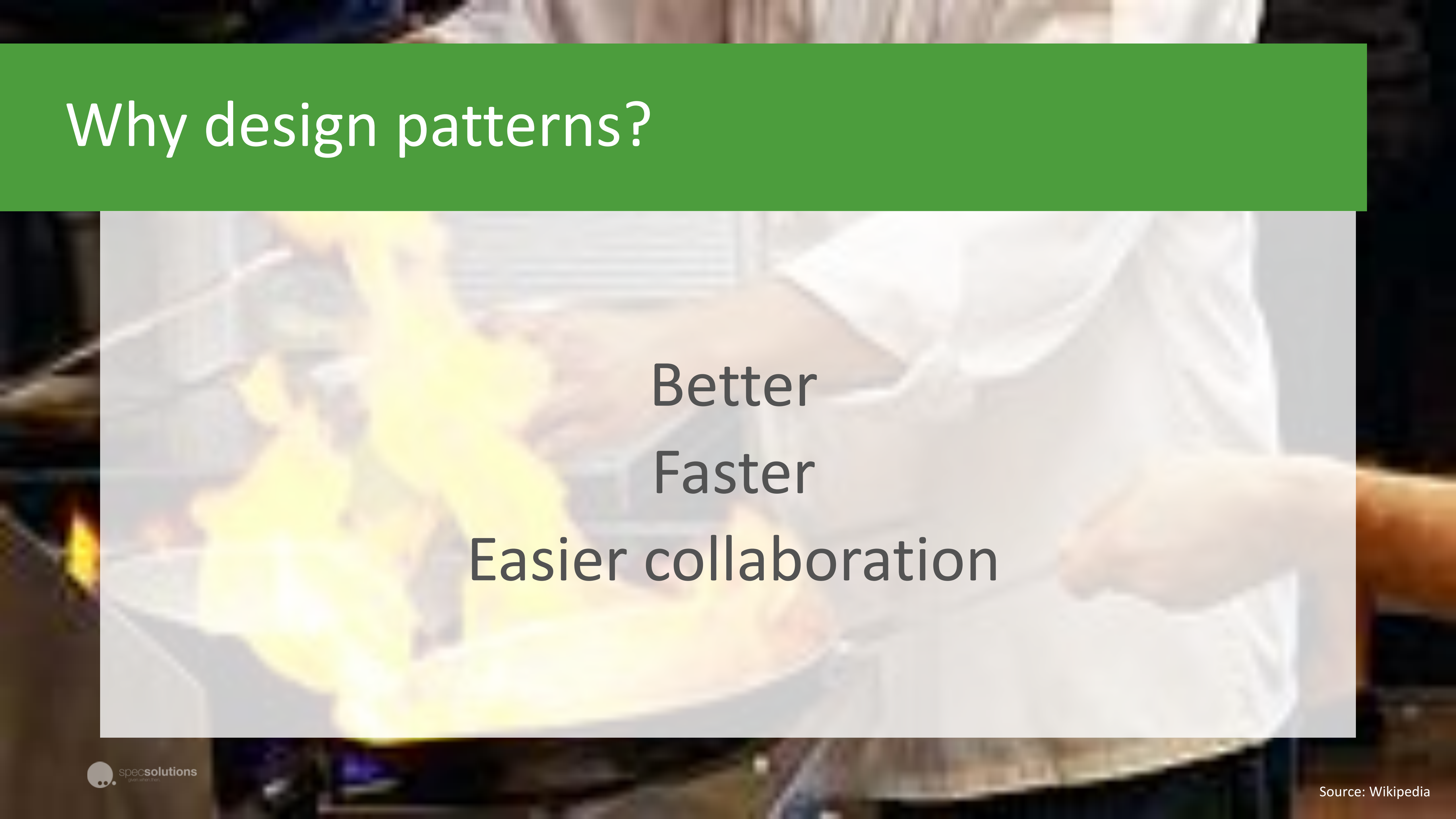
Today

- About design patterns
- Challenges of test automation today
- Benefits of using design patterns for test automation solutions
- Characteristics of test automation design patterns
- Documenting test automation design patterns

Design Patterns

recognized construct that works

Why design patterns?



Better

Faster

Easier collaboration

Source: Wikipedia

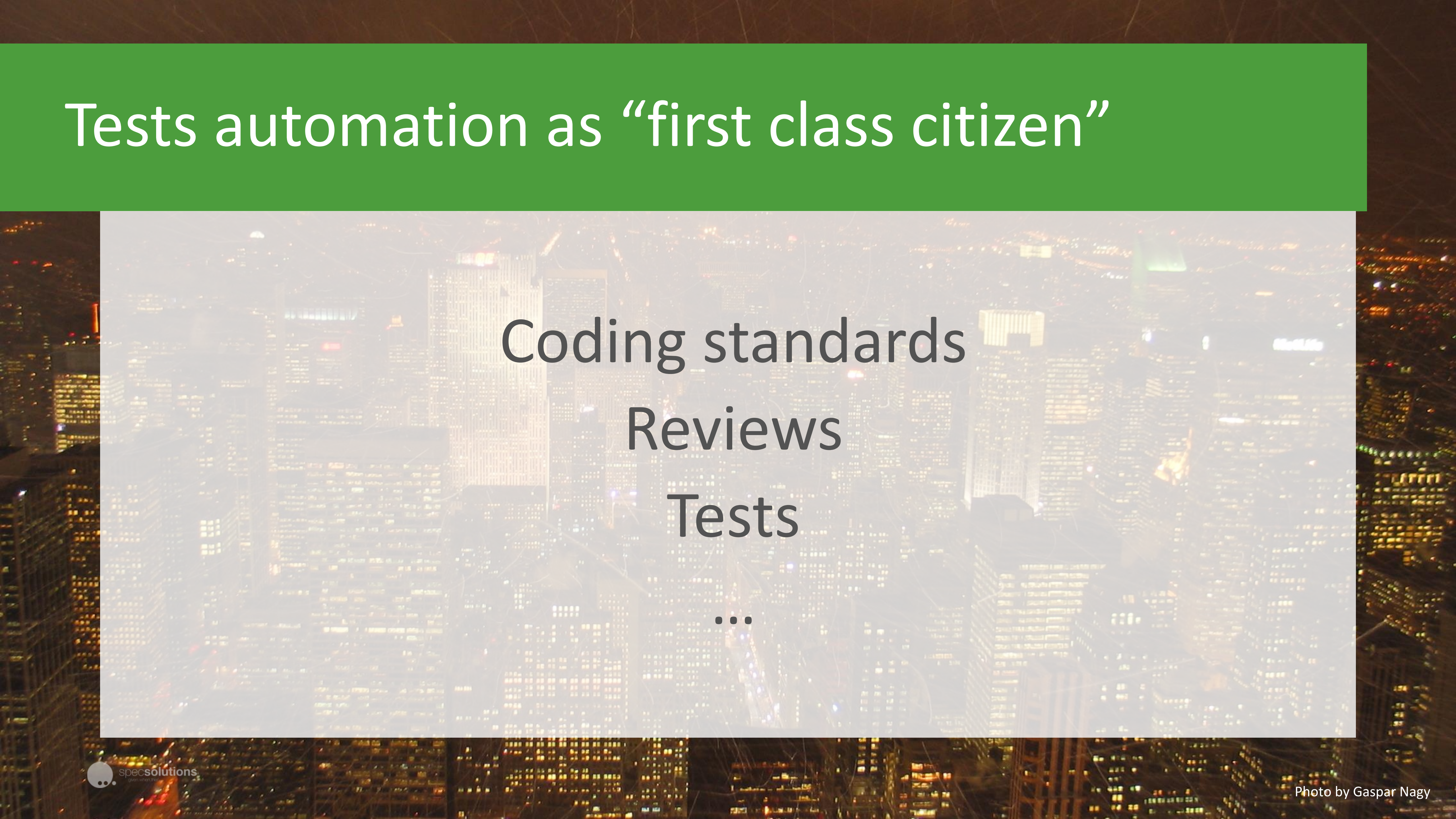
Challenges of Test Automation

Why to build a good quality test automation

$
$$
CHECK ENGINE
$$$
CHECK ENGINE

Photo by Denys Nevozhai on Unsplash

Tests automation as “first class citizen”



Coding standards

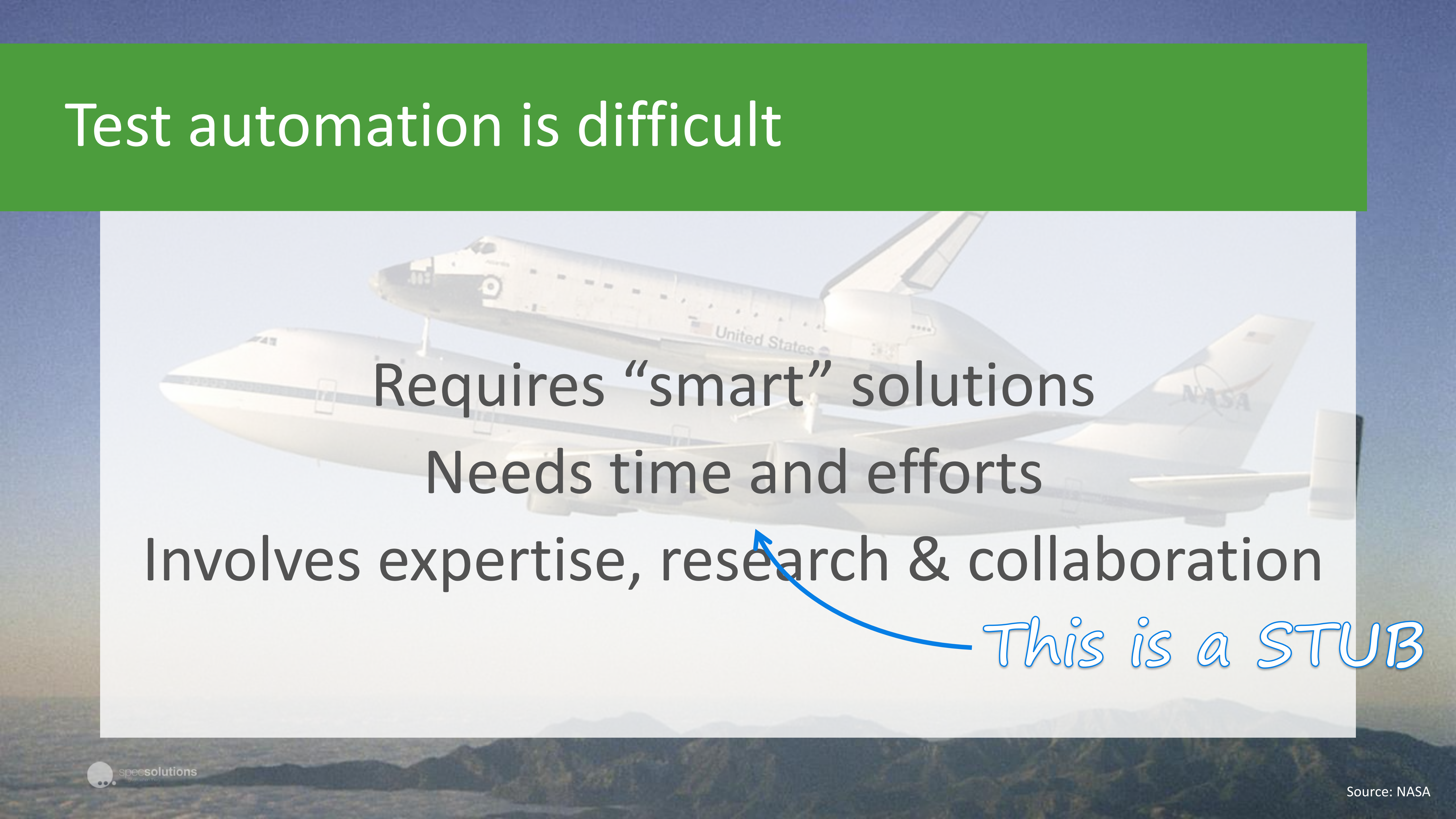
Reviews

Tests

…

Photo by Gaspar Nagy

Test automation is difficult



Requires "smart" solutions

Needs time and efforts

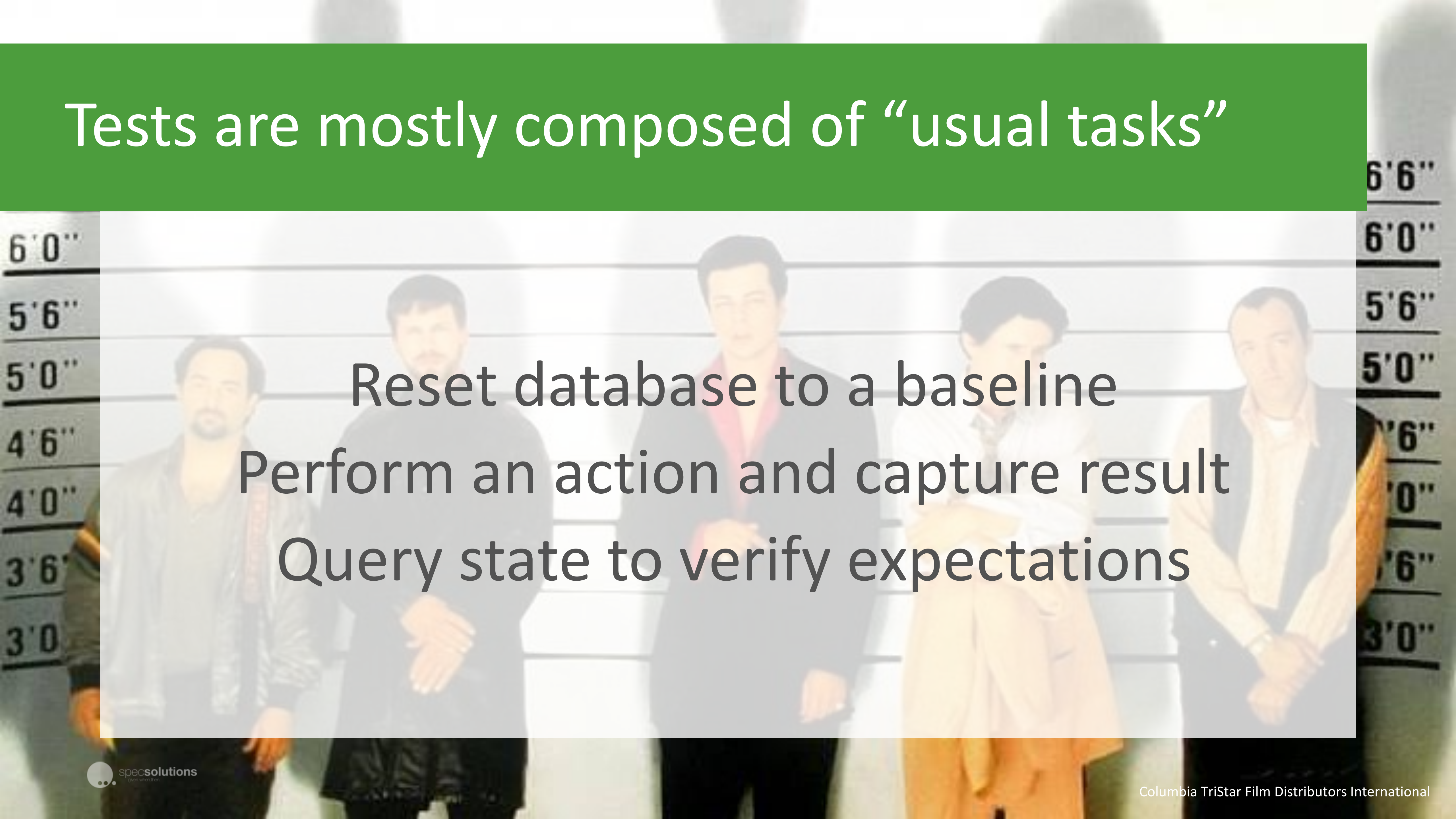
Involves expertise, research & collaboration

This is a STUB

Source: NASA

How could patterns help?

Tests are mostly composed of “usual tasks”

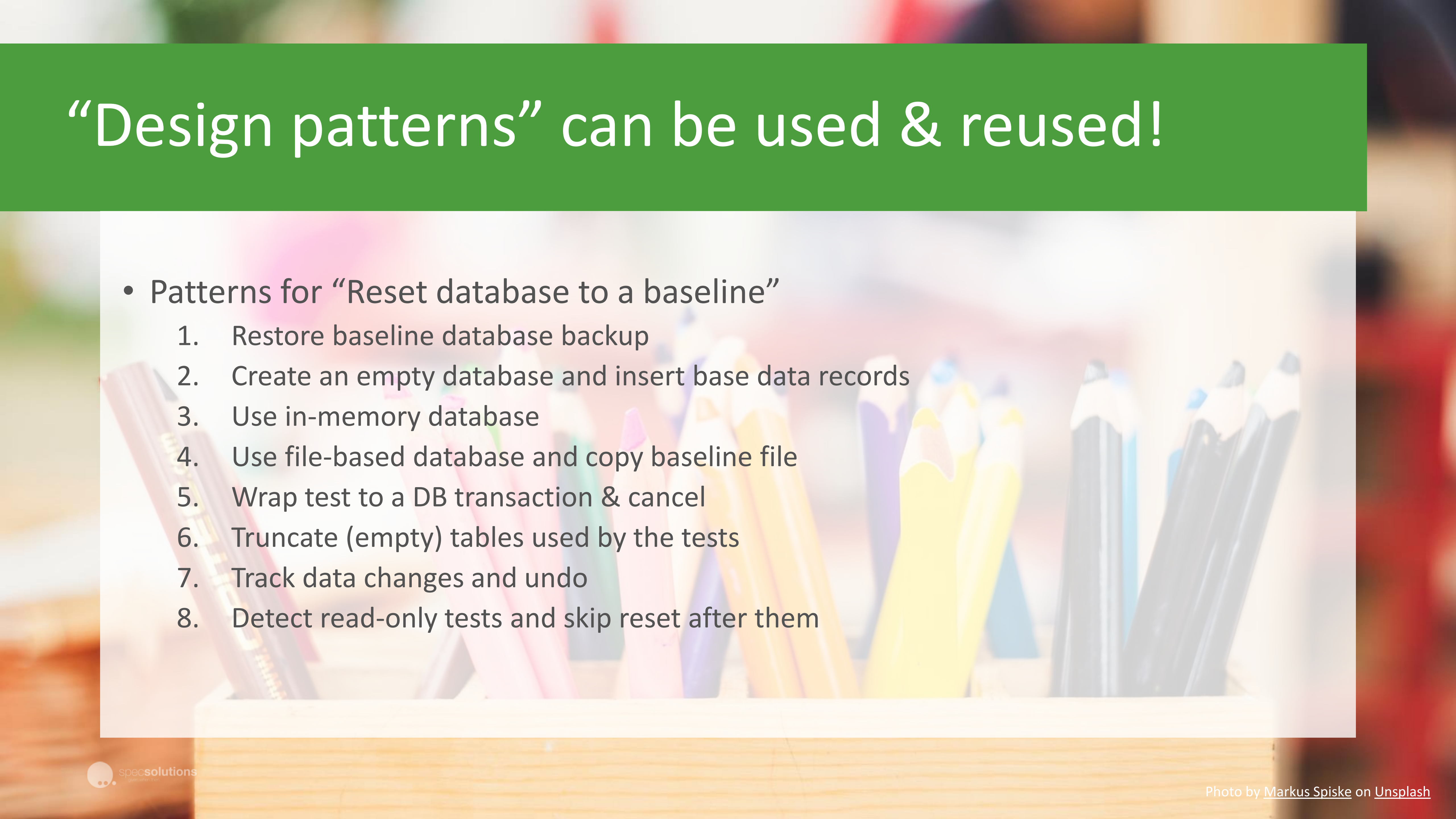


Reset database to a baseline

Perform an action and capture result

Query state to verify expectations

Columbia TriStar Film Distributors International

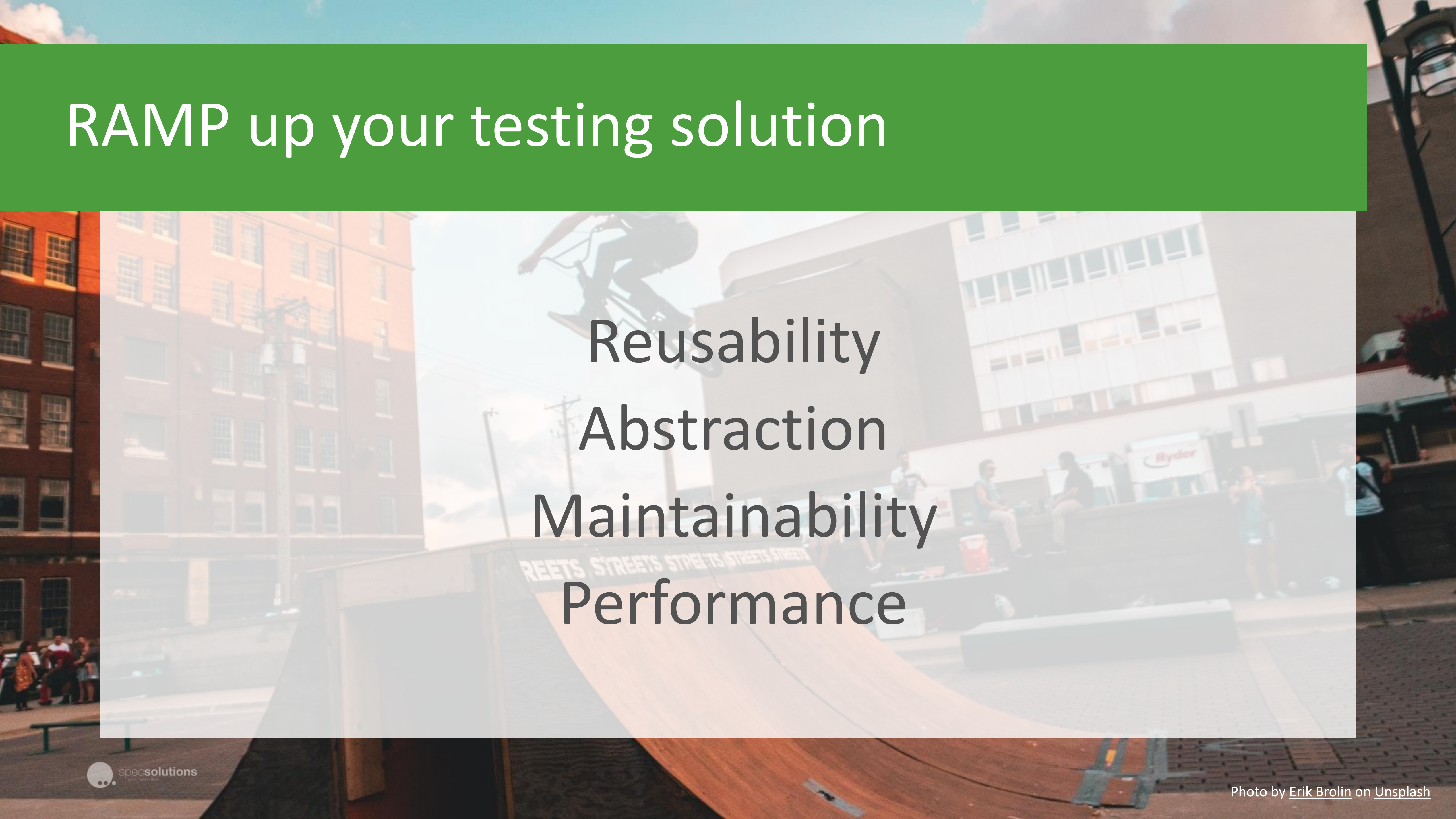


“Design patterns” can be used & reused!

- Patterns for “Reset database to a baseline”
  1. Restore baseline database backup
  2. Create an empty database and insert base data records
  3. Use in-memory database
  4. Use file-based database and copy baseline file
  5. Wrap test to a DB transaction & cancel
  6. Truncate (empty) tables used by the tests
  7. Track data changes and undo
  8. Detect read-only tests and skip reset after them

Photo by Markus Spiske on Unsplash

RAMP up your testing solution



Reusability

Abstraction

Maintainability

Performance

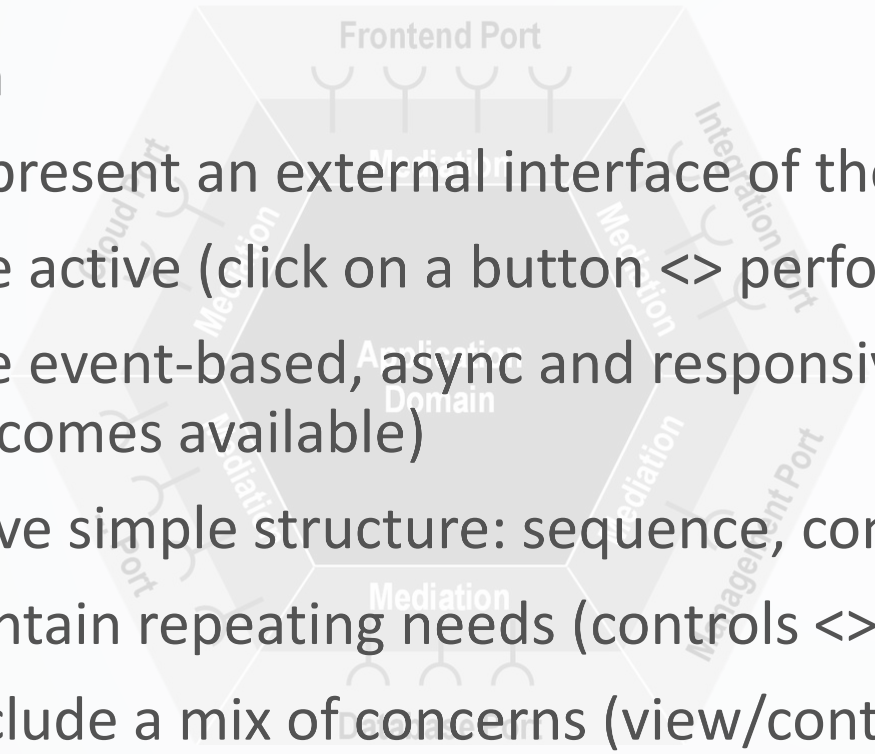
Photo by Erik Brolin on Unsplash

Test Automation Design Patterns

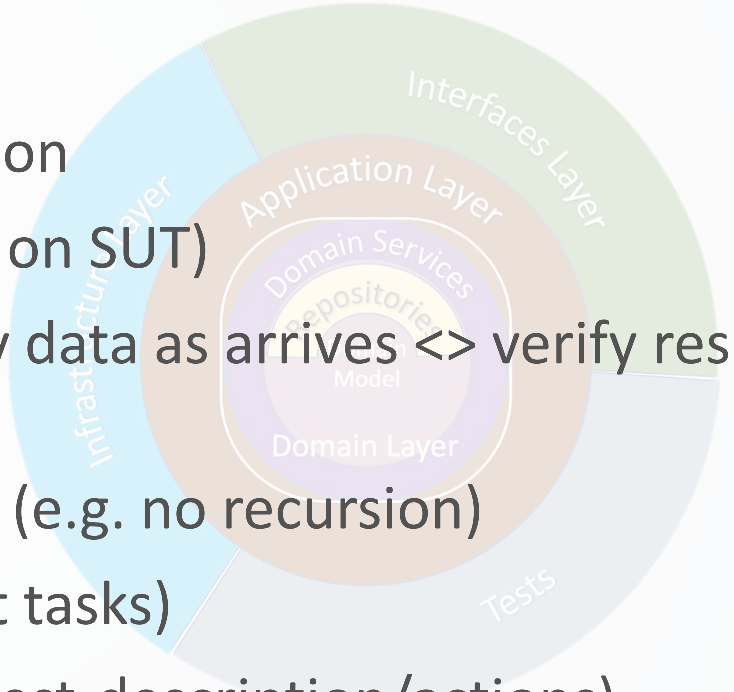
The UI analogy

Both

- represent an external interface of the application
- are active (click on a button <> perform action on SUT)
- are event-based, async and responsive (display data as arrives <> verify result as becomes available)
- have simple structure: sequence, containment (e.g. no recursion)
- contain repeating needs (controls <> usual test tasks)
- include a mix of concerns (view/controller <> test-description/actions)



Hexagonal Architecture



Onion Architecture

Hexagonal: Butzin, Bjorn & Golatowski, Frank & Timmermann, Dirk. (2016). Microservices approach for the internet of things. 1-6. 10.1109/ETFA.2016.7733707.

Onion: Basic Rules for effective Onion Architecture by Bran Lim

Generic & project-specific patterns

The high level of reusability encourages teams to think about discovering project-specific patterns.

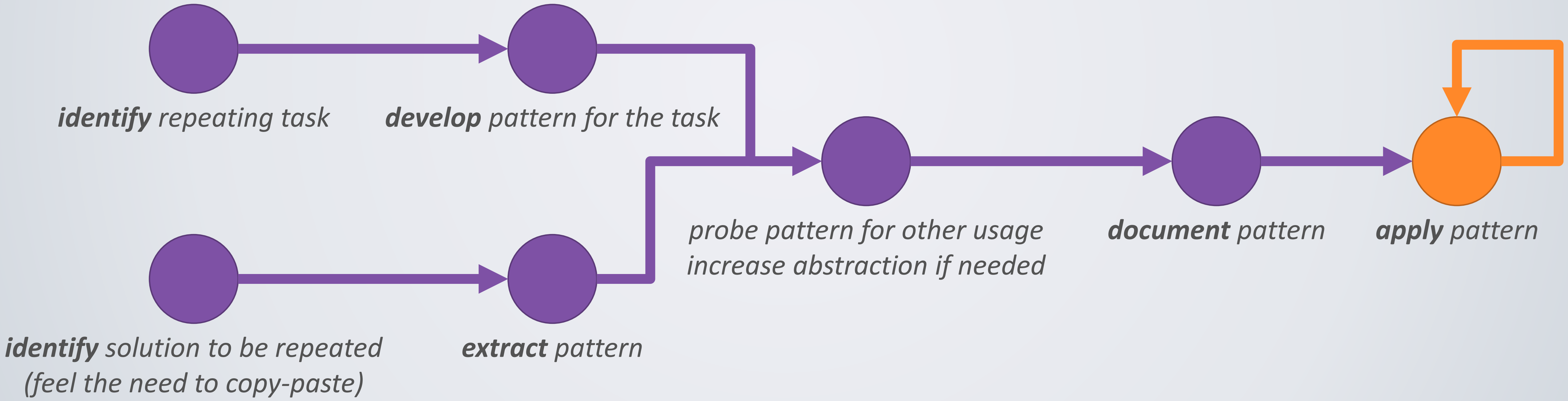
- Easier to develop (more specific context)
- Easier to document (sometimes the example in the code is enough)

Some test automation patterns are usable in broader context

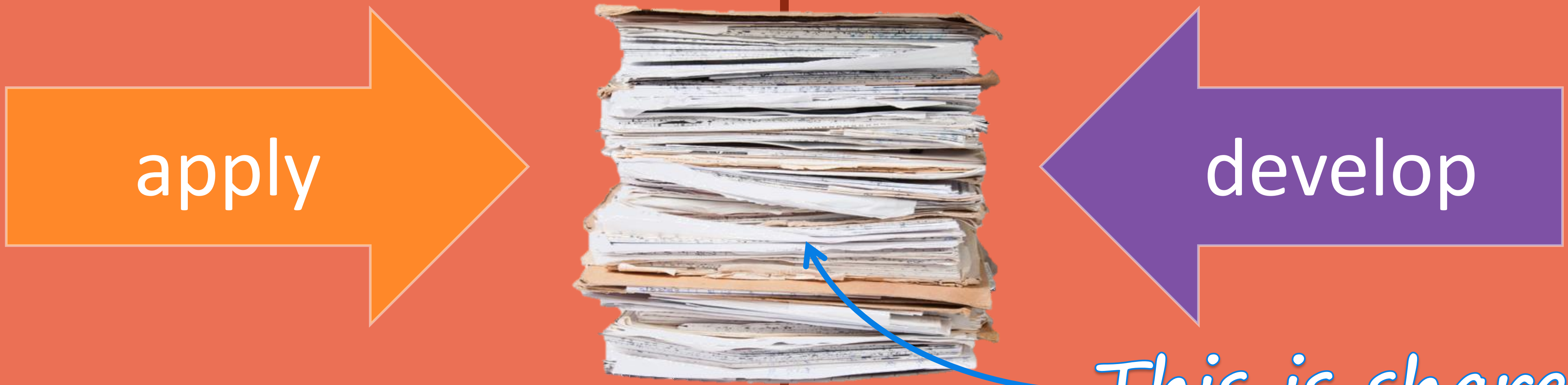
- They can become part of the tool-belt of the test automation experts

Photo by christian erra on Unsplash

Project-specific pattern discovery process


identify *repeating task*
develop *pattern for the task*
identify *solution to be repeated (feel the need to copy-paste)*
extract *pattern*
probe pattern for other usage increase abstraction if needed
document *pattern*
apply *pattern*

test & dev collaboration



Patterns

This is shared knowledge

Documenting Test Automation Design Patterns

The book project

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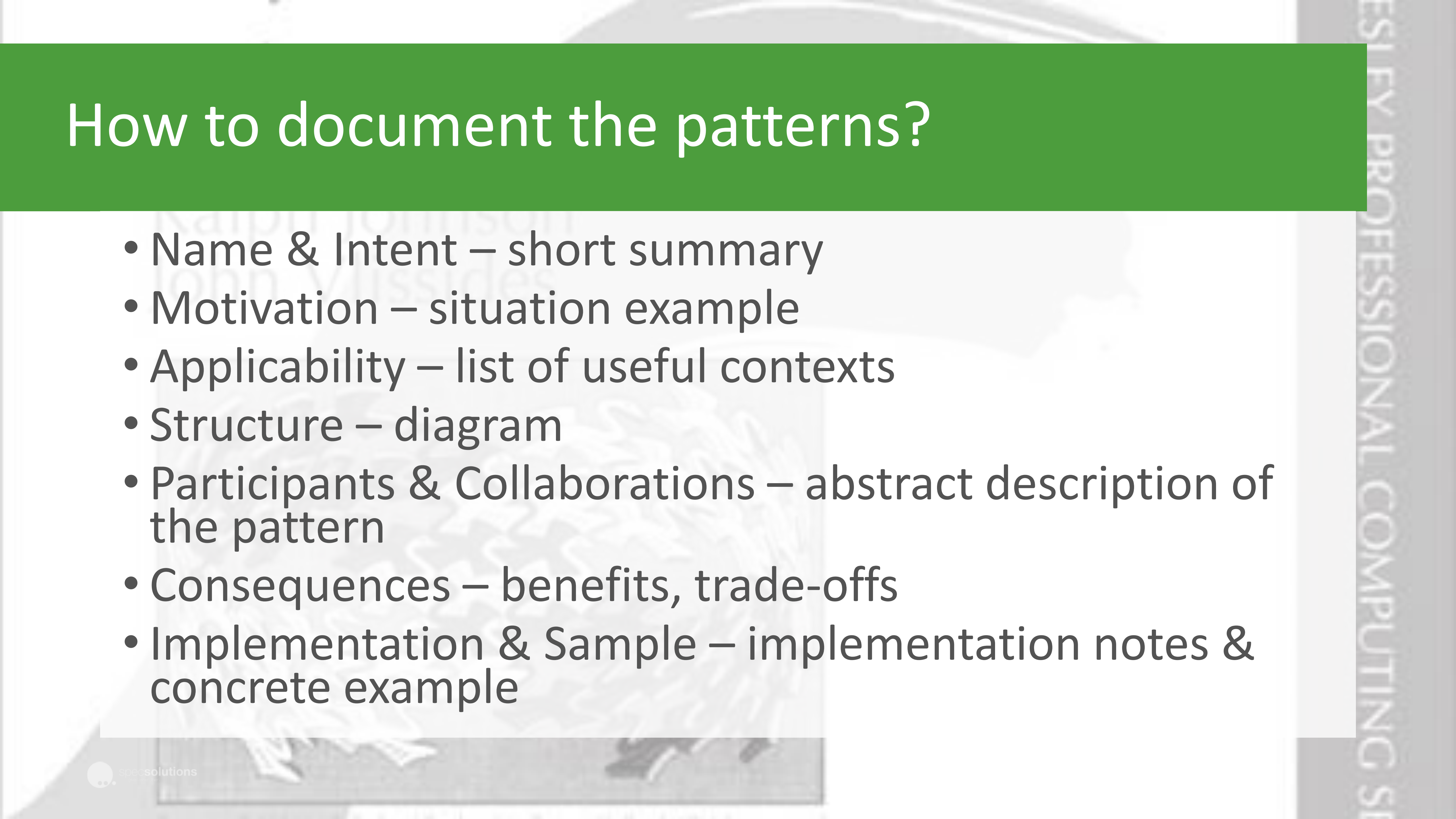
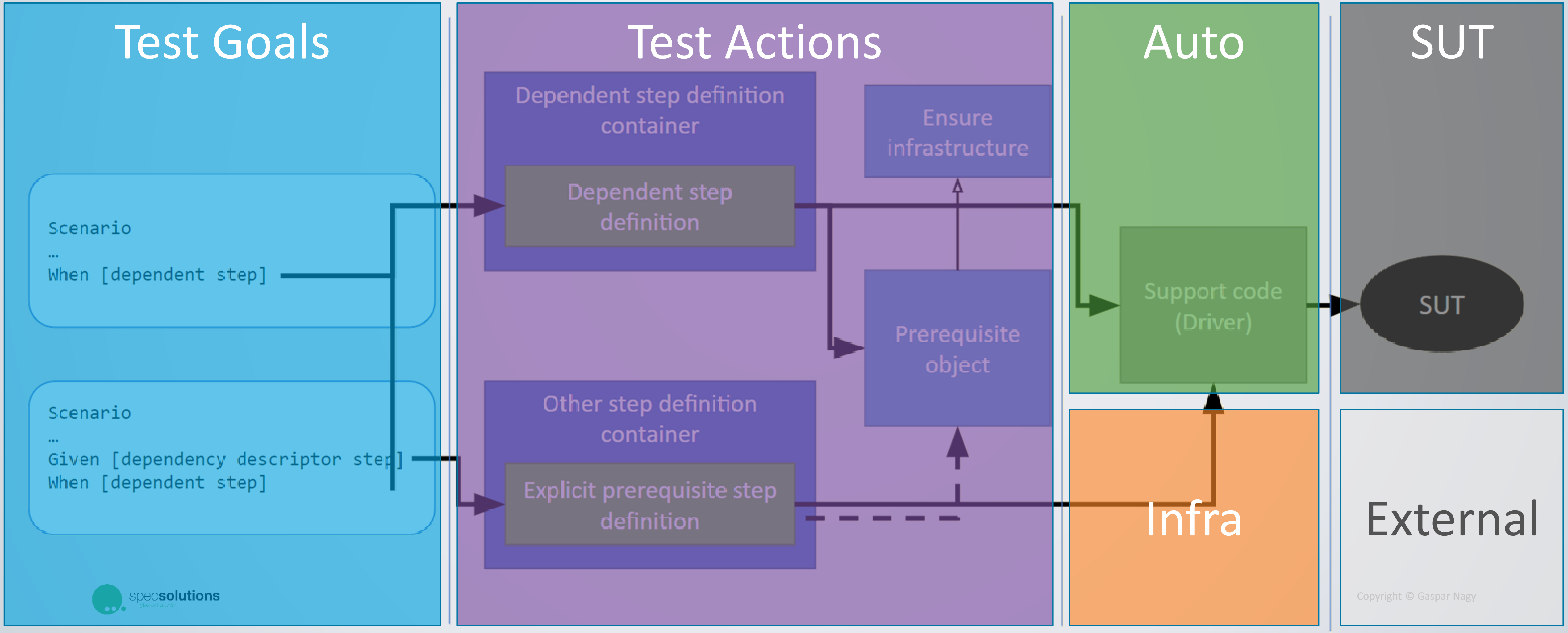


How to document the patterns?

- Name & Intent – short summary
- Motivation – situation example
- Applicability – list of useful contexts
- Structure – diagram
- Participants & Collaborations – abstract description of the pattern
- Consequences – benefits, trade-offs
- Implementation & Sample – implementation notes & concrete example

The Layering Problem


Test Goals
Test Actions
Auto
SUT
Dependent step definition container
Ensure infrastructure
Dependent step definition
Prerequisite object
Support code (Driver)
SUT
Other step definition container
Explicit prerequisite step definition
Infra
External

```
Scenario
…
When [dependent step]
```

```
Scenario
…
Given [dependency descriptor step]
When [dependent step]
```

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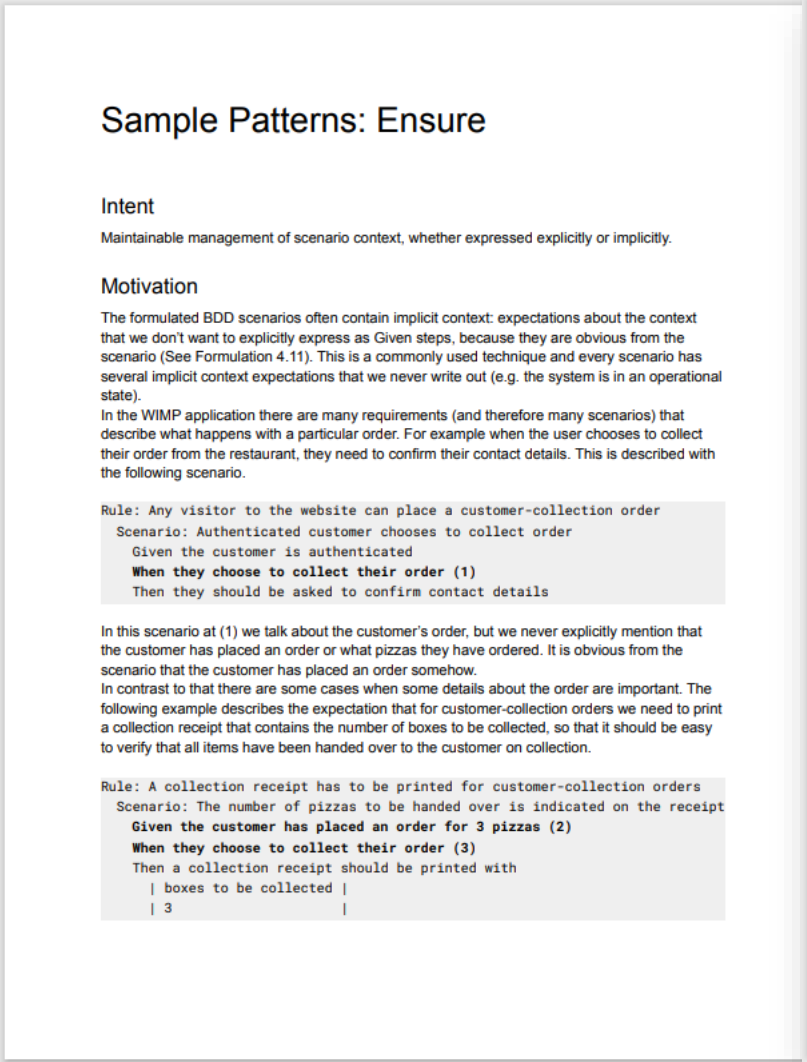
Samples



Sample Patterns: Ensure

Intent

Maintainable management of scenario context, whether expressed explicitly or implicitly.

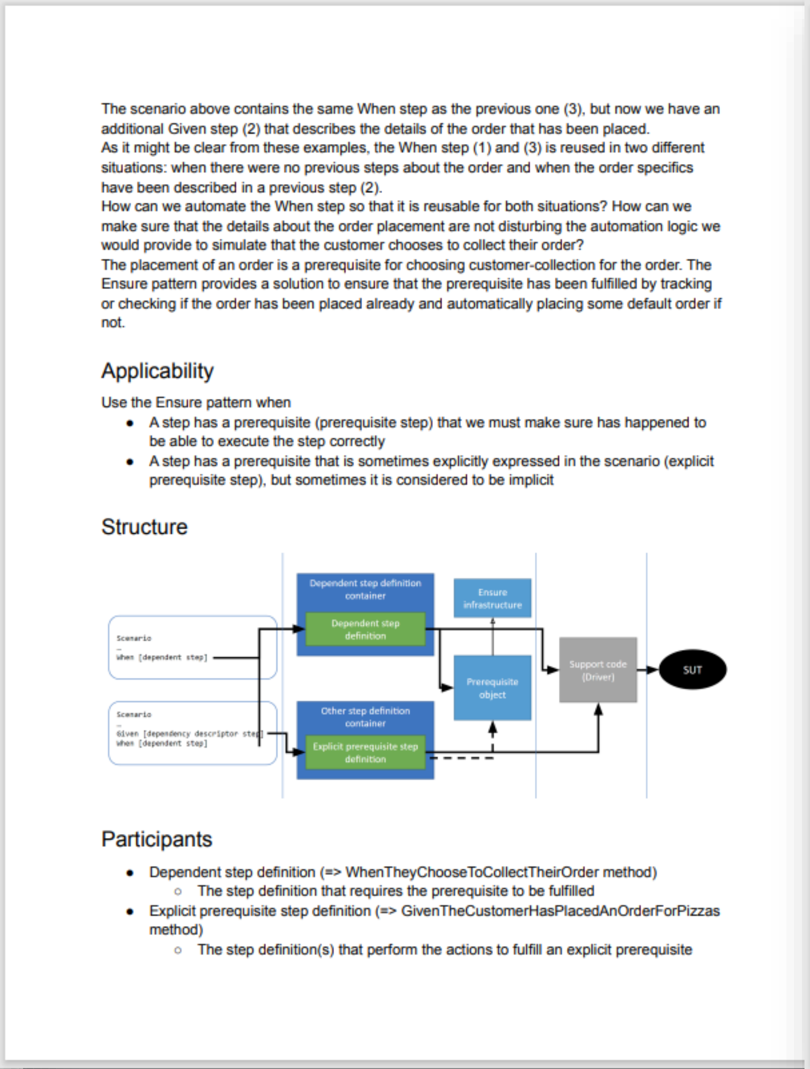
Motivation

The formulated BDD scenarios often contain implicit context: expectations about the context that we don't want to explicitly express as Given steps, because they are obvious from the scenario (See Formulation 4.11). This is a commonly used technique and every scenario has several implicit context expectations that we never write out (e.g. the system is in an operational state).
In the WIMP application there are many requirements (and therefore many scenarios) that describe what happens with a particular order. For example when the user chooses to collect their order from the restaurant, they need to confirm their contact details. This is described with the following scenario.

```
Rule: Any visitor to the website can place a customer-collection order
  Scenario: Authenticated customer chooses to collect order
    Given the customer is authenticated
    When they choose to collect their order (1)
    Then they should be asked to confirm contact details
```

In this scenario at (1) we talk about the customer's order, but we never explicitly mention that the customer has placed an order or what pizzas they have ordered. It is obvious from the scenario that the customer has placed an order somehow.
In contrast to that there are some cases when some details about the order are important. The following example describes the expectation that for customer-collection orders we need to print a collection receipt that contains the number of boxes to be collected, so that it should be easy to verify that all items have been handed over to the customer on collection.

```
Rule: A collection receipt has to be printed for customer-collection orders
  Scenario: The number of pizzas to be handed over is indicated on the receipt
    Given the customer has placed an order for 3 pizzas (2)
    When they choose to collect their order (3)
    Then a collection receipt should be printed with
      | boxes to be collected |
      | 3                     |
```



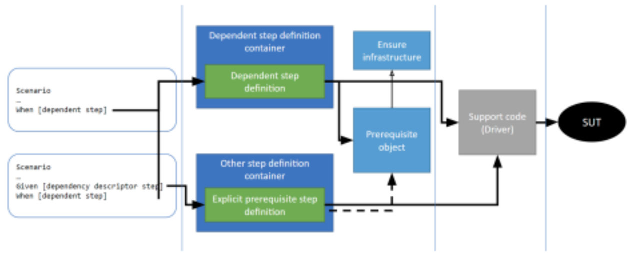
The scenario above contains the same When step as the previous one (3), but now we have an additional Given step (2) that describes the details of the order that has been placed.
As it might be clear from these examples, the When step (1) and (3) is reused in two different situations: when there were no previous steps about the order and when the order specifics have been described in a previous step (2).
How can we automate the When step so that it is reusable for both situations? How can we make sure that the details about the order placement are not disturbing the automation logic we would provide to simulate that the customer chooses to collect their order?
The placement of an order is a prerequisite for choosing customer-collection for the order. The Ensure pattern provides a solution to ensure that the prerequisite has been fulfilled by tracking or checking if the order has been placed already and automatically placing some default order if not.

Applicability

Use the Ensure pattern when

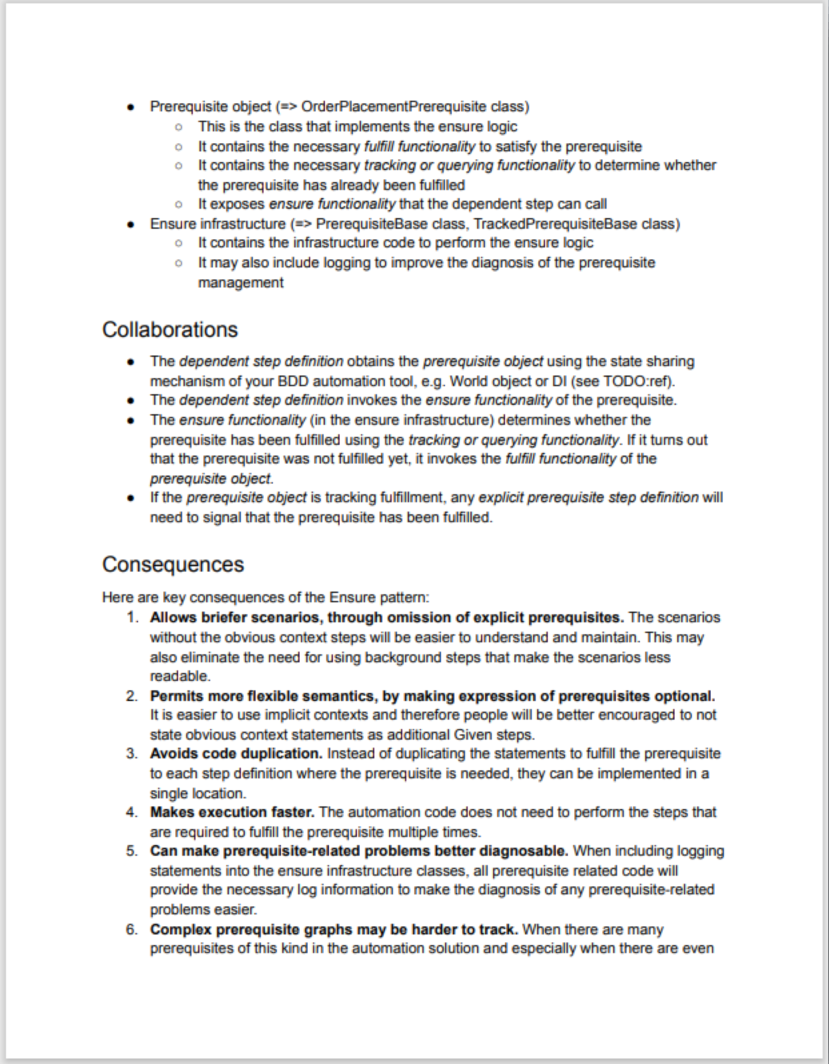
- A step has a prerequisite (prerequisite step) that we must make sure has happened to be able to execute the step correctly
- A step has a prerequisite that is sometimes explicitly expressed in the scenario (explicit prerequisite step), but sometimes it is considered to be implicit

Structure


Scenario
…
When [dependent step]
Scenario
…
Given [dependency descriptor step]
When [dependent step]
Dependent step definition container
Dependent step definition
Other step definition container
Explicit prerequisite step definition
Ensure infrastructure
Prerequisite object
Support code (Driver)
SUT

Participants

- Dependent step definition (=> WhenTheyChooseToCollectTheirOrder method)
  - The step definition that requires the prerequisite to be fulfilled
- Explicit prerequisite step definition (=> GivenTheCustomerHasPlacedAnOrderForPizzas method)
  - The step definition(s) that perform the actions to fulfill an explicit prerequisite



- Prerequisite object (=> OrderPlacementPrerequisite class)
  - This is the class that implements the ensure logic
  - It contains the necessary *fulfill functionality* to satisfy the prerequisite
  - It contains the necessary *tracking or querying functionality* to determine whether the prerequisite has already been fulfilled
  - It exposes *ensure functionality* that the dependent step can call
- Ensure infrastructure (=> PrerequisiteBase class, TrackedPrerequisiteBase class)
  - It contains the infrastructure code to perform the ensure logic
  - It may also include logging to improve the diagnosis of the prerequisite management

Collaborations

- The *dependent step definition* obtains the *prerequisite object* using the state sharing mechanism of your BDD automation tool, e.g. World object or DI (see TODO:ref).
- The *dependent step definition* invokes the *ensure functionality* of the prerequisite.
- The *ensure functionality* (in the ensure infrastructure) determines whether the prerequisite has been fulfilled using the *tracking or querying functionality*. If it turns out that the prerequisite was not fulfilled yet, it invokes the *fulfill functionality* of the *prerequisite object*.
- If the *prerequisite object* is tracking fulfillment, any *explicit prerequisite step definition* will need to signal that the prerequisite has been fulfilled.

Consequences

Here are key consequences of the Ensure pattern:

1. **Allows briefer scenarios, through omission of explicit prerequisites.** The scenarios without the obvious context steps will be easier to understand and maintain. This may also eliminate the need for using background steps that make the scenarios less readable.
2. **Permits more flexible semantics, by making expression of prerequisites optional.** It is easier to use implicit contexts and therefore people will be better encouraged to not state obvious context statements as additional Given steps.
3. **Avoids code duplication.** Instead of duplicating the statements to fulfill the prerequisite to each step definition where the prerequisite is needed, they can be implemented in a single location.
4. **Makes execution faster.** The automation code does not need to perform the steps that are required to fulfill the prerequisite multiple times.
5. **Can make prerequisite-related problems better diagnosable.** When including logging statements into the ensure infrastructure classes, all prerequisite related code will provide the necessary log information to make the diagnosis of any prerequisite-related problems easier.
6. **Complex prerequisite graphs may be harder to track.** When there are many prerequisites of this kind in the automation solution and especially when there are even

Wrap-up

Wrap-up

- Design patterns are powerful tools
- Only good tests make sense
- Tests should really be first class citizens
- Tests composed of “usual tasks”, so design patterns are super-powerful
- You can discover project-specific patterns – this also helps dev-test collaboration
- But many patterns are even more broadly usable
- Think of “UI analogy” and test layers

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Watch for recurring problems.
Take the time to develop a pattern for them.
(let dev and test collaborate)
Apply pattern.
Repeat.

Thank you!

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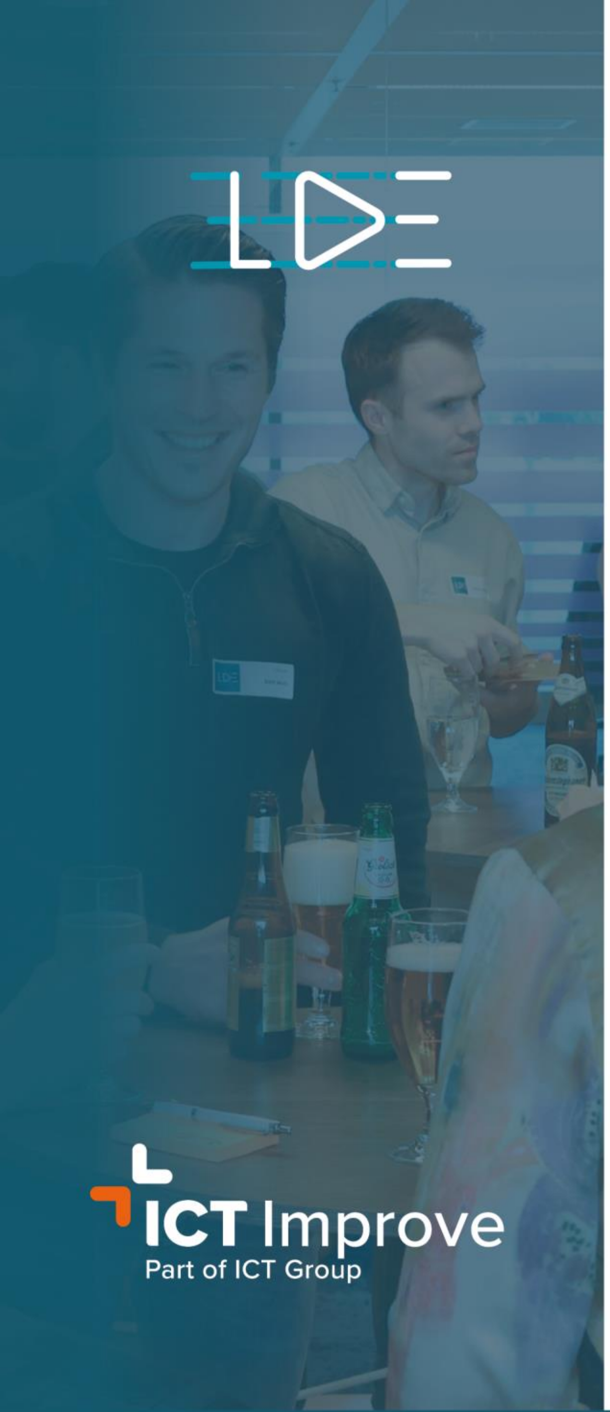
Thank you for your attention!

Share your insights using the hashtag **#LDE25** and tag **@ICT Improve**!



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PROGRAMME

Living Documentation Event
10 April 2025

14.00	**Walk in**	
14.30	**Opening**	*Auditorium*
14.35 - 15.15	**Keynote Gáspár Nagy** - RAMP up your testing solution: test automation patterns	*Auditorium*
15.25 - 16.10	**Choose between three tracks:**	
	Karl van Heijster Testing: A Philosophical Retrospective	*P083*
	Jennek Geels The journey is the reward	*Auditorium*
15.25 - 17.00	**Workshop Bas Dijkstra & Gáspár Nágy** I know it's only ReqnRoll (but I like it) - Making the most of the Automation phase in BDD (part 1)	*P030*
16.15 - 17.00	**Choose between two tracks:**	
	Rob Albers, Ronald Holthuizen & Martijn van Tienen - BDD, (A)TDD and DevOps practices as a recipe for continuous compliance	*P083*
	Rick Easton Tracy - Castles, not Silos	*Auditorium*
Continuation	**Workshop Bas Dijkstra & Gáspár Nágy** - I know it's only ReqnRoll (but I like it) - Making the most of the Automation phase in BDD (part 2)	*P030*
17.05 - 17.50	**Choose between three tracks:**	
	Jacob Duizer - From Team Topologies to Behavior-Driven Development: Building Teams That Deliver	*P083*
	Pieter Withaar - AI-First BDD, what if we redesign BDD to be AI-first?	*Auditorium*
	Machiel van der Bijl - Model Driven Design (MDD): A new approach to Living Documentation	*P030*
17.55 - 18.50	**Dinner: Beer and pizza's**	
18.55 -19.35	**Keynote: Angelo Hulshout** - GenAI and creativity - threat, or tool	*Auditorium*
19.35 -20.15	**LDE Community + Panel Discussion**	*Auditorium*
20.15 - 21.00	**Drinks**	