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Best Practices You Should

As from various projects complain about the stability of your framework, really so unstable and unreliable? Believe me, they are on a treacherous road that can be full of different holes. You need to transform your framework a high-speed track instead of an old and

How do you come up with the exact rules you need to follow to create a framework with very stable tests. This is because there is a fact that, there are principles that you should and

Here are the best practices for creating a solid and maintainable UI framework. I will give you some handy examples for each of these principles. In the end, you will have a framework that was created following these principles, which can be a good point for your framework as well.

The code snippets are based on the Java programming language and Selenium WebDriver as a base framework for my solution, but don't worry if Java language or Serenity are not your choice. All the principles are still the same and you can adapt them to your framework as you understand the main concept.

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AlphaSense, with more than 5 years of experience in Quality Assurance, DevOps and Development.



of the best practices that I am going to talk about, for

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omation framework:

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id principles
test requirements

network

sted checks on the same web page

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: first - do not rely on UI test automation alone. Ideally,
a UI automation suite from the test cycle, you will be
se. You always need to remember that high-level tests
ll the remaining issues that were not caught on the



Automated Integration Tests

Automated Component Tests

Automated Unit Tests

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lly designed by [Mike Cohn](#), one of the most successful
ommended proportion of tests to be implemented on
ation pipeline.

s way. First, low-level tests are much faster by nature.
much faster than UI tests. Why is this important?
Faster feedback from tests execution allows you to
its.

ne [QA automation pipeline](#). Usually, unit tests are run
r your project, then you can even say that you do not
get into the project repository. Of course, this also

level ones. When somebody asks me why I prefer more
e to show them this picture. It nicely represents the
white). That's why, in the automation process, I take

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-level tests (e.g. UI)

-level tests (e.g. API)

in the beginning of the paragraph was applied with world. That's why we have chose to include it at the

I always run all of these test types! But you always hat can be completely replaced by low-level, and

ology in which software is implemented in the way its je if you have never heard about this methodology. unit tests, component, integration as well as for many BDD can be applied with a great success. BDD is

nderstand each other, creating strong outside and DD you also create specifications that can help your This means that along with writing your tests, you are I don't waste other team members' time (who might :ause you don't need to explain and help with such

ject managers) understand these tests. This brings commendations based on business benefits.

ganization pattern, which helps avoid code ents called steps or actions that will be the building

o write a very small test that verifies a basic workflow : scenario and understand what it does:

```
    , "BlazeDemo" );
```

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```
getFlights();  
  
0);
```

the manager - how easy would it be for you to read such
error and you have to go over existing tests to understand
maybe you would be happier to see the same tests,

```
'BlazeDemo' title and 'Welcome to the Simple Travel  
> New York
```

style using **Gherkin line-oriented language** in one of

able text files, there are plenty of options for applying
naming language they are written in. For example, you
self:

Design principles

problem in software design. We can say that each
for a specific problem, regardless of the programming
languages, we have design principles. Design principles
allow for constructing well built and maintainable
design principles apply regardless of context.

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ough. You can think of design patterns and principles
ely in general (design principle), while another gives
ole if it got in your way (design pattern).

Page Objects pattern, which has become the most
nation engineers, and the **Screenplay** pattern, which

ed almost 10 years ago. Its purpose was to make UI
n, to improve readability and to organize code for web
ys need to interact with web pages and web elements
ments, images, etc.). The **Page Objects** pattern takes
mining principles on top of this, enforcing you to

It need to care about how to retrieve this button in the
should have the object of the page you are looking for
you are looking for inside it. All you need is to use a
ction on it. You can think about all pages and web

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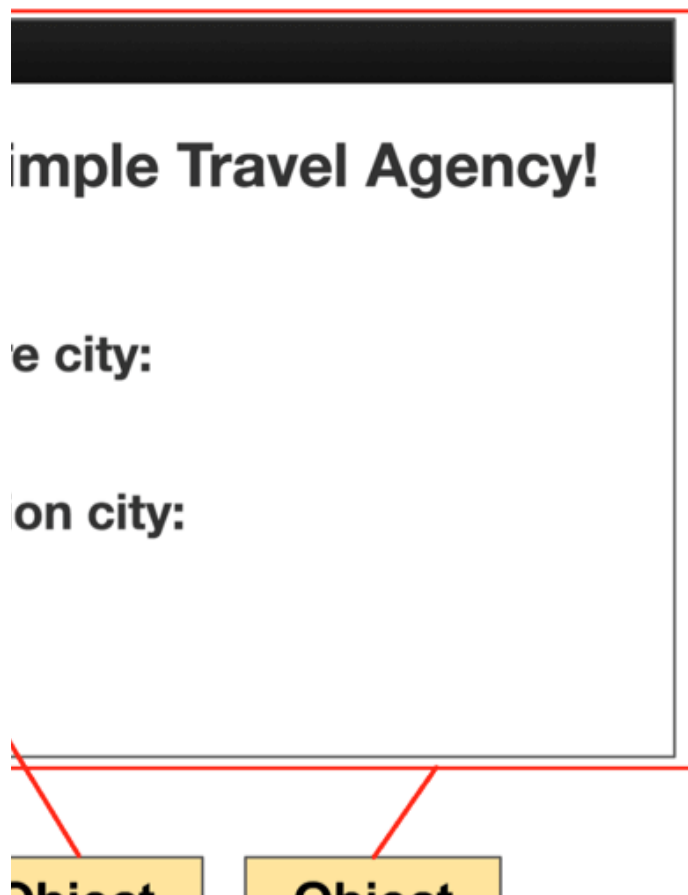
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you should create a separate object that will be a sample of the test written without the Page Objects

```

cssSelector(HEADING_ELEMENT)).getText();
Simple Travel Agency!");
"BlazeDemo");

(webDriver.findElement(By.cssSelector(FLIGHT_TO_SELECT))
(webDriver.findElement(By.id(FLIGHT_TO_SELECT))

"ston");
"ork");
FLIGHTS)).click();
lements(By.cssSelector(FLIGHTS_ROW_ELEMENTS)).s

```

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same test, we see an absolutely different picture:

```

BlazeDemo");
:(), "Welcome to the Simple Travel Agency!");

;
.size() > 0);

```

test project under the `ObjectExampleTest.java` location. Just go ahead and

```

;

```

the same page locator twice)

the UI automation pipeline faster => reduces costs

are maintainable, you can introduce one more level of
tests, you might see different names of these modules but
modules of actions that you can reuse in any test. Once
defined is to make a reference to the module in your test
use specific modules.

All functionalities related to flights search on our

```
red();  
verifyTextIsCorrect();  
  
"Boston", "New York");  
(0).size(), greaterThan(0));
```

you can find by
"WithStepsExampleTest.java" in the [test project](#).

might sooner or later run into a contradiction that will get
sorted out. Why? Because in addition to design patterns, you

design pattern becomes the reason of an anti-pattern called
large elements on some of the pages, so the number of
tests become really huge (this is called "**Large Class**")
violates design principles in object-oriented programming

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Responsibility Principle, which says that each class
should have one of the well-known software engineers and

S.

each principle in detail. You can go over many articles (wiki). But all you need to know for now is that in order to learn, we should always care how we separate actions and **code refactoring** once in a while to keep our

with the **SOLID** principles from scratch. Briefly, (including UI tests) that allows you to easily follow the **rule**, which will give you an outstanding explanation of unit testing. But even without going into details, you can see the usage of the **Screenplay** pattern, and feel the

```
page();

blazeDemo()),
("Welcome to the Simple Travel Agency!"))

location, "New York")

}
```

working example in our **test project**, which has been

ExampleTest.java.

test requirements

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ou the ability to **pause** your tests. When would you

actors like network speed, your machine capabilities or these factors, you cannot always predict how much it. That's why sometimes you might want to add a certain amount of time.

ay, you will never see stability in your UI automation.

home page and verify the heading of the main page. tions. One that opens the page and the second that is right value. But what if we knew that our application

y fast and honestly saying, even faster than you. It can ext of heading element while the application itself is code like this:

```
;(
```

lity. Why?

the application should be up and running in 7-8 nds of execution time.

s that have about 3000 UI tests. Each time you need ring. Maybe you even want to run it on 3 different s in average) = 22500 (seconds) = 375 (minutes) = **6.25** ours just because we do not want to create it

one day? Just because of some network slowness. We n the next day, it works perfectly fine. This is one more is way of waiting in your tests.

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is. If a certain element is not found in this time, report
specified time, move on and do not wait the full time.
at the element appeared after 2 seconds, then our
huge time saver for your UI automation tests.

using **Selenium**:

```
WebDriverWait(driver, 2, TimeUnit.SECONDS);
```

igned for needs when a certain web element or action
if your application works in a way that it takes a long
fast? There is no sense to specify the implicit wait as 10
lication loading. For this, you can use the explicit wait,
ount of time.

sing the idea of the explicit wait:

```
WebDriverWait(driver, 2, TimeUnit.SECONDS).until(  
    driver.findElement(By.id(MAIN_HEADING_LABEL)).isDisplayed());
```

ript execution will continue immediately after the

ne official Selenium website displays this very

*cause unpredictable wait times. For example setting an
seconds, could cause a timeout to occur after 20*

y it is better and enough to use ONLY explicit waits.

nst all target browsers is redundant and unnecessary.
achieve by running our tests across different browsers.

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Why not? Of course not. Browser-compatibility testing tests that interact with all web elements and perform all

you to get the main idea. Let's assume that we need to need to support (Firefox, IE, Chrome), as well as 100 terms).

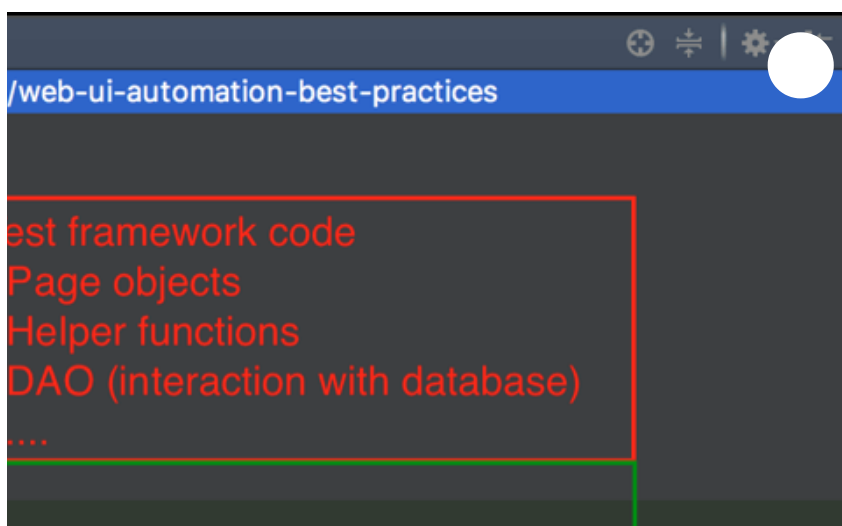
all 100 combinations for each browser? No, that's not compatibility. All we need is to ensure that the search input, fine for all 3 browsers. Should we run the search 100 times? It would be more than enough to verify the elements'

Why the relevancy of the search. They are not related to be done by using even one browser. 99 tests in 1 hour is **one hour of overall test suite execution**. Well done!

Framework

Let's talk about its structure. By structure, I mean the way you write the code - you should clearly separate your tests from your setup. In each class in the tests section should represent a single test.

Unit tests are supposed to test one web element. Here is a common approach:



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consists of several UI applications that are
ys better to create a separate module with your test
arate test modules (for each application accordingly).

a huge efforts to run them on another machine, unlike
s a very bad practice because it doesn't allow new
t struggling with setup troubles. And what if you need
icky task if your UI test automation framework is not
you avoid such issues.

nachine! If you have test automation files that are
to the framework. If they are relatively small, you can
amework itself. If they are big, then you can use
orage. Then, implement a mechanism that downloads
ecutions, if the files are not there yet.

reason, from project to project, I still see a lot of cases
to run tests. Moreover, sometimes you need a specific
at you can spend many hours trying to see the first

nger. It takes care of the whole driver download and
gure one more additional java dependency in your
d and configured automatically! It's a miracle that
d to run your tests on another machine that doesn't

ole and is covered in a few easy steps on [this page](#).
t for the first time for the Serenity framework.

tion. I couldn't find a proper solution across the web so
the Serenity framework. The main idea of the solution

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```
ments DriverSource {  
  
ation = new BaseConfiguration();  
  
ers.valueOf(baseConfiguration.getProperty("browser"  
  
:ance().setup();
```

serenity.conf file settings file:

```
downloadedWebDriver //reference to your created
```

out web drivers configuration anymore. Everything will
ne for the other engineers who work on the same

scriptive idea about which exact functionality is being
diately understand what each test verifies even a year
d always help your team members and make all your
ed during tests execution run, you should understand
look at the test name. You should not waste time on

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test scenario. This is an example of a well named test:

```
fromBostonToNewYork() {.....}
```

On a failed test, you immediately understand which assertion failed. It's just a "snake case" separation approach instead of the CamelCase:

```
lights_from_Boston_to_New_York() {.....}
```

multiple assertions on the same page

Fail if the assertion fails. Initially, assertions were hard. Each unit test should make only one specific assertion.

Things in a row. Let's assume that you have several UI elements and you have some unexpected values. With classic assertions, you get one error, after which the test would fail. This means that about the second issue? How will you be able to find it? It's not fixed. This might take days, sometimes weeks. That's why! Here you can reap huge benefits by using the

soft type of assertions is used when you need to assert a list of assertions, your test execution flow will continue even if one fails. You get the list of failed assertions and let you know of all the

How to refer to use soft assertions via a powerful assertions framework. If you do it, you should definitely go over my [other article](#) that covers different assertion frameworks.

That's

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ur **test project** at the
h.

n investigating the reasons for a test failure. You can
enshot in case a test failed. If you don't have this
f your UI test automation framework, please, keep in

plementation of screenshot creation for failed steps
enity framework which has an in-built mechanism for
he screenshots of all test steps for free because it is
l to care about it's implementation.

when you use this framework to handle your tests

	Screenshot	Outcome	Dur
		SUCCESS	9.57s
o'		SUCCESS	1.18s
me to the Simple Travel		SUCCESS	1.15s
		SUCCESS	6.33s
value greater than (0)		SUCCESS	1.35s
		SUCCESS	21.15s


eenshot, which shows the state of the web application

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take a step back and think again about what are you wait until the main page is fully loaded. We can do it

```
⋄(MAIN_HEADING_LABEL);// waiting for main page
```

t... so no! Please, never do this in your tests. Instead, I give this function a reasonable name. After that, in

your tests without any comments nearby.

. But on the other, most engineers ignore this rule. By red and are red, then 100% you have an issue in your

already has a list of bugs that are prioritized lower, foreseeable future. In this case, most of the test have them inside the run and finish up with many red. When execution is finished, they just go over the failed tests and find out to fail due to these existing bugs, or whether there

practices. First, each time when execution is finished, you don't know if it passed or not. If the result was red and it is still red, the next time you don't understand if you really had some unexpected errors or if it was just a flake some time. If it were only once that would be fine. But you probably do on daily basis. You are losing a huge amount of time on unnecessary checks again and again.

expected to fail, the best thing you can do is to separate the test from the first execution. This will save you a lot of time when you have unexpected failures from the build, you know that if test

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to test the same workflow by using different data.
between different cities. This is how tests would look like

```
idNewYork(){  
  
    k);  
lights().size() > 0);
```

```
idBerlin(){  
  
    );  
lights().size() > 0);
```

```
idAndRome(){  
  
    );  
lights().size() > 0);
```

Our test file will grow very fast and become unhandy to
o make a small change in the workflow itself, we need
e data-driven tests can give you a huge benefit. By
one array of data, which we are going to use in order

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```
from, City cityTo) {
```

```
    itLocations() {
```

```
        /To);  
        lights().size() > 0);
```

you need to maintain. If you want to write one more test
with the additional combination to the test data array.

your project by the
"java" path.

tests should **ALWAYS** be independent. Dependencies will
definitely get into trouble during parallel automation
regardless of the order of your tests in the run. If you need to
just use the **"Before"** method and configure it in the

optimize your work as a QA automation engineer.
Most of your time on the verification of test results from

started with this step. You can set up reporting by using
([see article](#)). You can make an integration with tests

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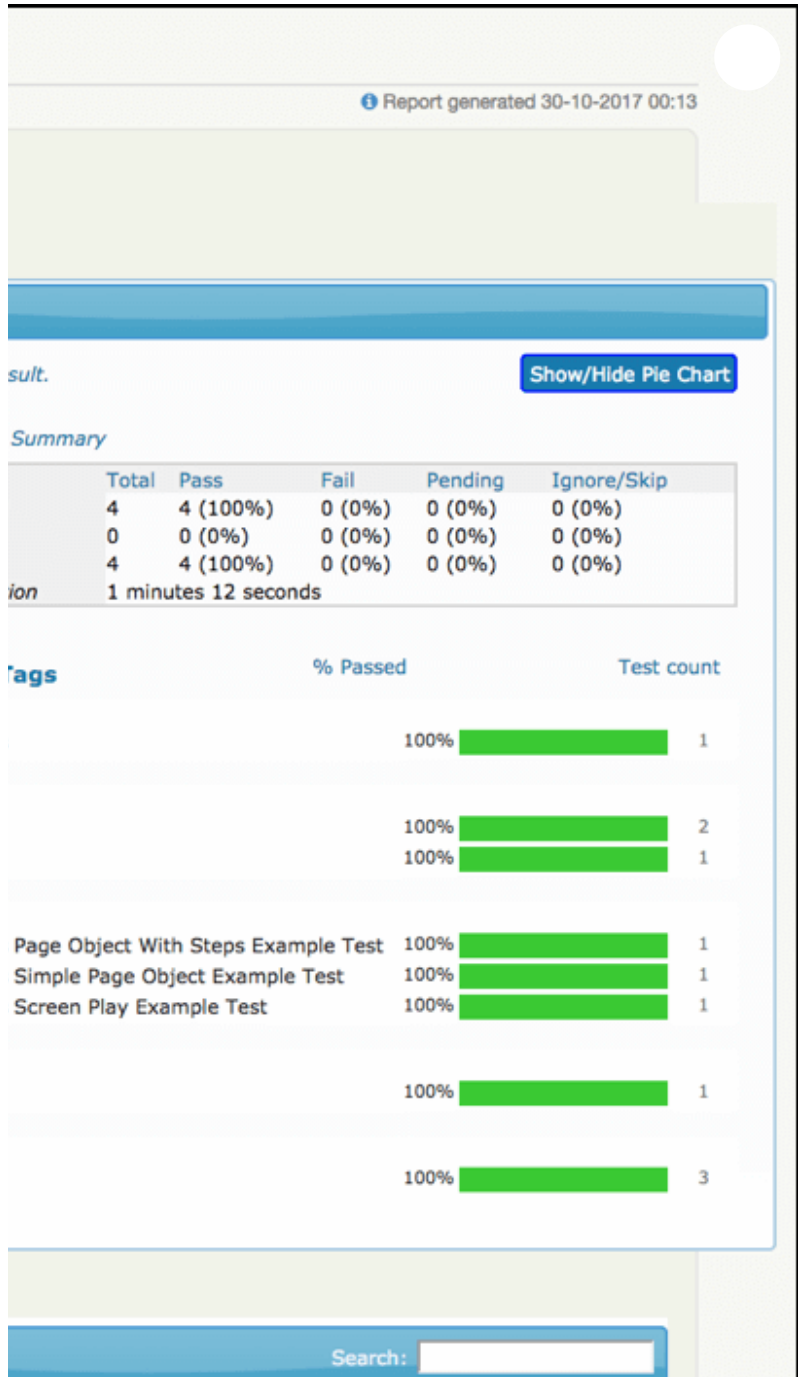
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frameworks, which give you outstanding live test results from test execution results, types, tags, functionality and so on. For each test, which are extremely useful during results analysis. **BlazeMeter** is a test automation framework, which was developed by using Selenium WebDriver. All you need to do is to execute all tests by running them from the project root:

```
mvn test -Dtest=TestName
```

in this path: `"/target/site/serenity/index.html"`.




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5	00:12:26	15.48
9	00:12:54	21.15
8	00:13:18	18.53

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your UI test automation framework is only up to you. True, it is also fun. You have a choice at the beginning of your journey. It will help you reach your goal and solve your issues, or it will lead you over on daily basis? To me, the answer is clear.

Execute your tests, achieve scalability and get advanced

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