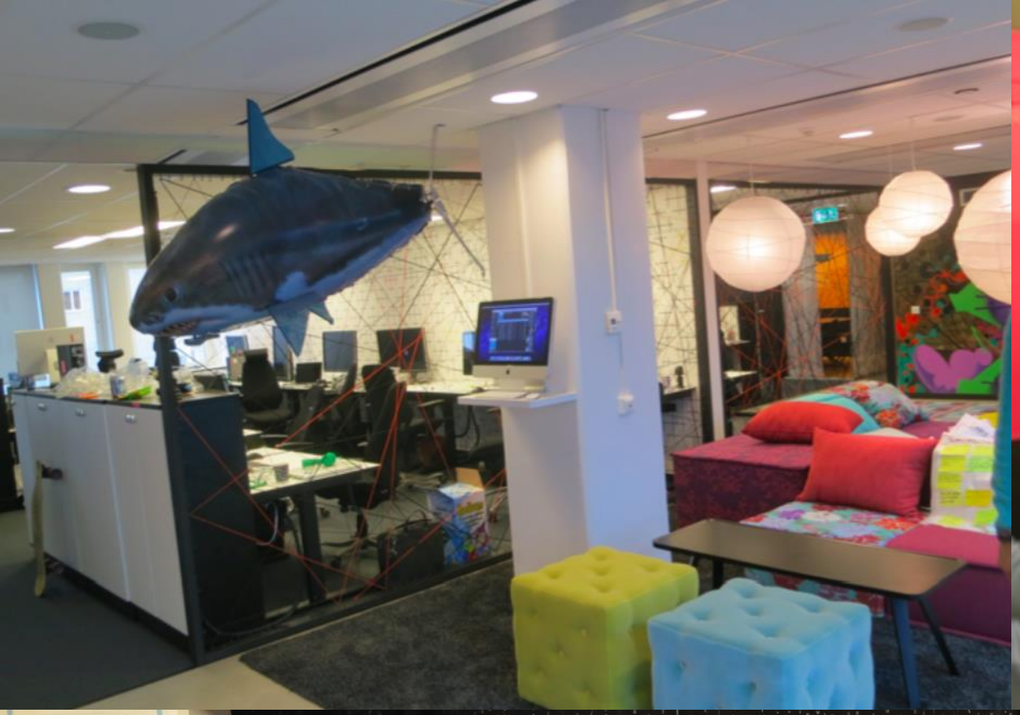
Test automation and Model-Based Testing in agile dev cycle @ Spotify

Kristian Karl and Peng Ge

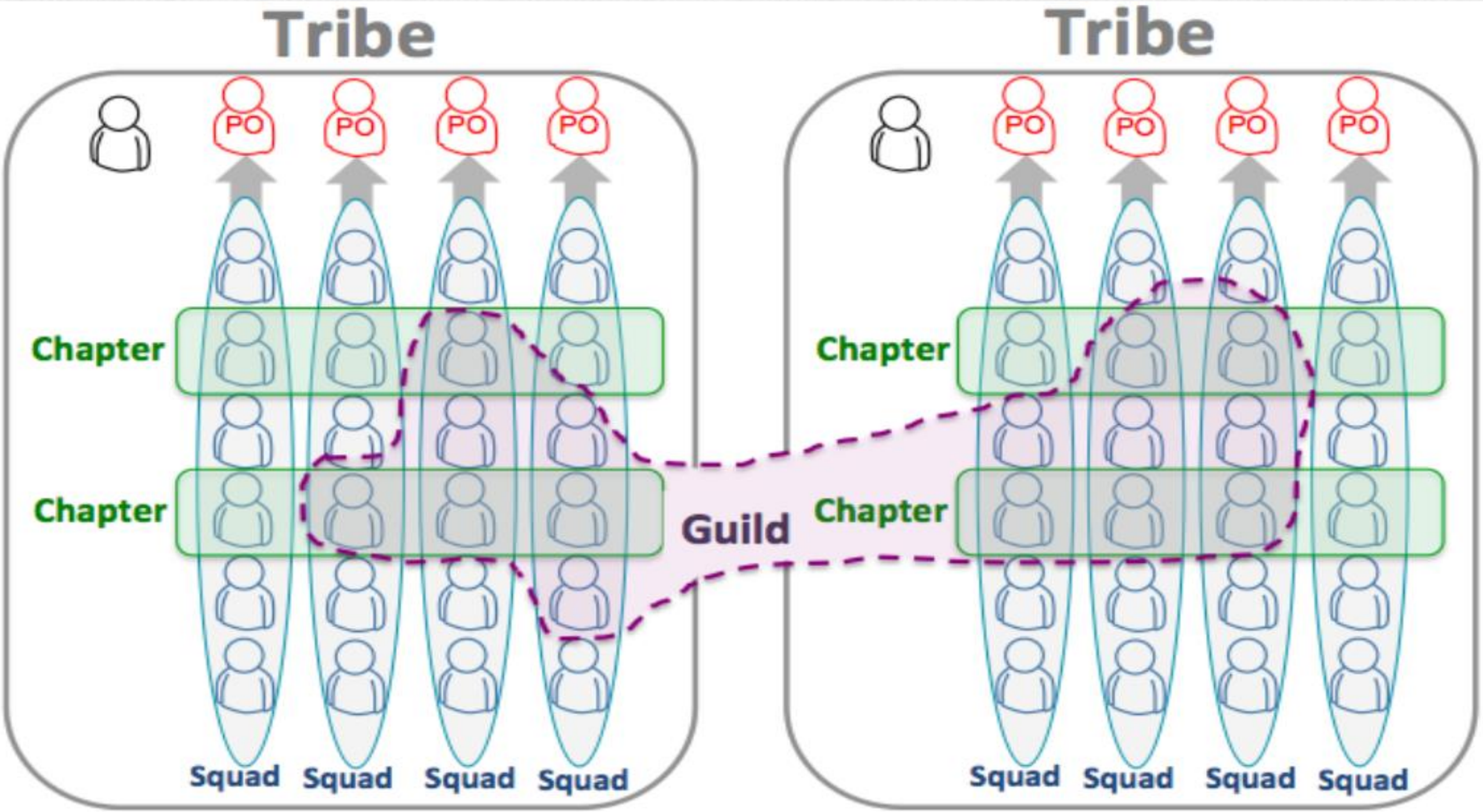
October 20, 2013

Spotify®




PHOENIX
RISING


OPS



Scaling Agile @ Spotify with Tribes, Squads, Chapters & Guilds, by Henrik Kniberg & Anders Ivarsson


https://play.spotify.com/home
Spotify BETA
Search
What's New
Radio
Playlists
New recommended albums
Diamonds
Rihanna
CASSETTE
Run For Cover (Instrumental Mix)
CAZZETTE
Install Spotify on Windows
For the full Spotify experience
Install Spotify
Trending playlists near you
German Top 100 Single charts by Christian Rose
CRo - Playlist by Christian Stößel
CLUB SOUNDS Dancefloor Hits by Sony Playlists Germany
Top tracks near you
Diamonds
Lila Wolken
Gangnam Style (강남스타...
Sonnentanz - Original Ver...
One Day / Reckoning Son...
New releases
Call Me Maybe
Carly Rae Jepsen
Constance
Log out
Spotify Premium
Kristian Karl
File Edit View Playback Help
Search
Top Lists
Radio
Billboard Top Charts
Filtr
Fuse
The Guardian
Last.fm
Moodagent
Pitchfork
Rolling Stone Recommends
ShareMyPlaylists
Songkick Concerts
Soundrop
Top10
TuneWiki
Tunigo
We Are Hunted
COLLECTION
Library
Local Files
Downloads
Emerging Chart
Mainstream Chart
Genre Charts
Instant Playlist
Follow us
Add as Playlist
Viewing tracks from the most popular Emerging artists
03 Hold On ALABAMA SHAKES
04 Little Talks OF MONSTERS & MEN
05 Oblivion GRIMES
06 It's Time IMAGINE DRAGONS
07 Tongue Tied GROUPLOVE
08 The House That Heaven Built JAPANDROIDS
09 Disparate Youth SANTIGOLD
10 Too Close ALEX CLARE
WE ARE hunted
Discover New Music
wearehunted.com
Johanna Westerlund Karl
Enzo - Edit by Kraak, Smaak
Jesper Svensson
Stefan Rungardt
Fly By Night by Rush
Fredrik Gustafsson
listened to Our Own Way...
Fredrik Gustafsson
listened to All This Way b...
Fredrik Gustafsson
listened to Zaleilah (Radio...
Music is more fun when sharing, send some sweet tunes to Christina Widerstrand!
Send music
Nicholas Harteau
listened to Knock Knock by Mac Miller
Using Spotify radio
Nicholas Harteau
listened to Can't Get Enough featuring Trey Songz - Explicit Version b...
Using Spotify radio
Nicholas Harteau
listened to The Same Thin...
0:10
3:46
htc
Ed Harcourt
Albums
Until Tomorrow Ther
The Beautiful Lie
Elephant's Graveyar
Strangers
Strangers
From Every Sphere
Offline playlists
Playlists
high energy / soft
4 tracks
La Roux - La Roux
12 tracks
The Pogues - Dirty Old Town
17 tracks
Moby - 18
18 tracks
Robbie Williams - Escapology
14 tracks
Elegant Machinery - A Soft E
10 tracks
Search
Home
More
Party List
Grands Classiques...
pagne Evening

Why automate?

- We want to be faster
- Shorter release cycles
- Facilitate the testing in agile dev cycle

From: ”Intelligent Test Automation” by Harry Robinson

What to automate?

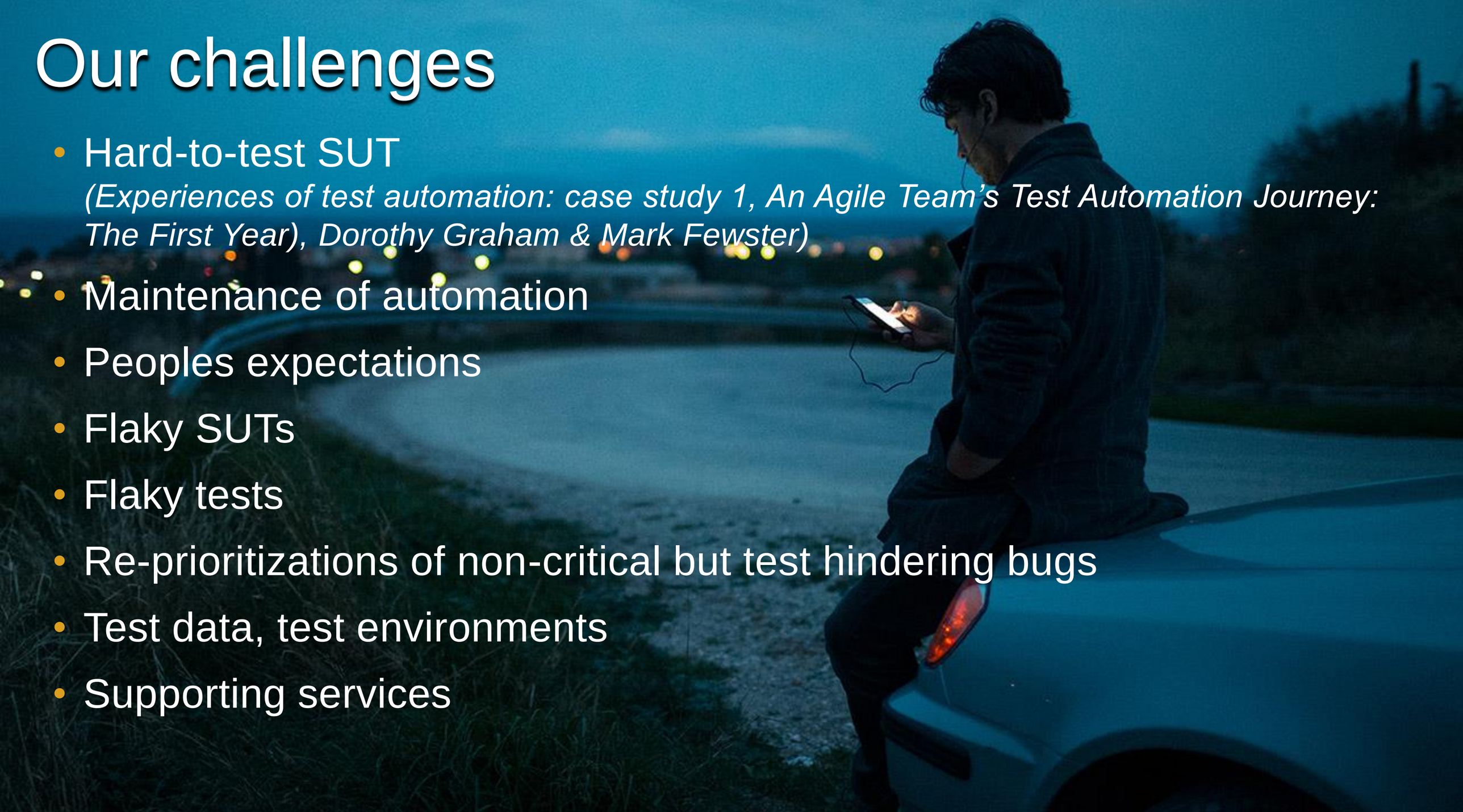
Graphical user interface testing
Usability testing
Software performance testing
System testing
Functional testing
Load testing
Volume testing
Stress testing
Security testing
Scalability testing
Sanity testing

Unit testing
Smoke testing
Component testing
API testing
Regression testing
Installation testing
Maintenance testing
Recovery and failover testing.
Accessibility testing
Monkey testing
Integration testing

Graphical user interface testing

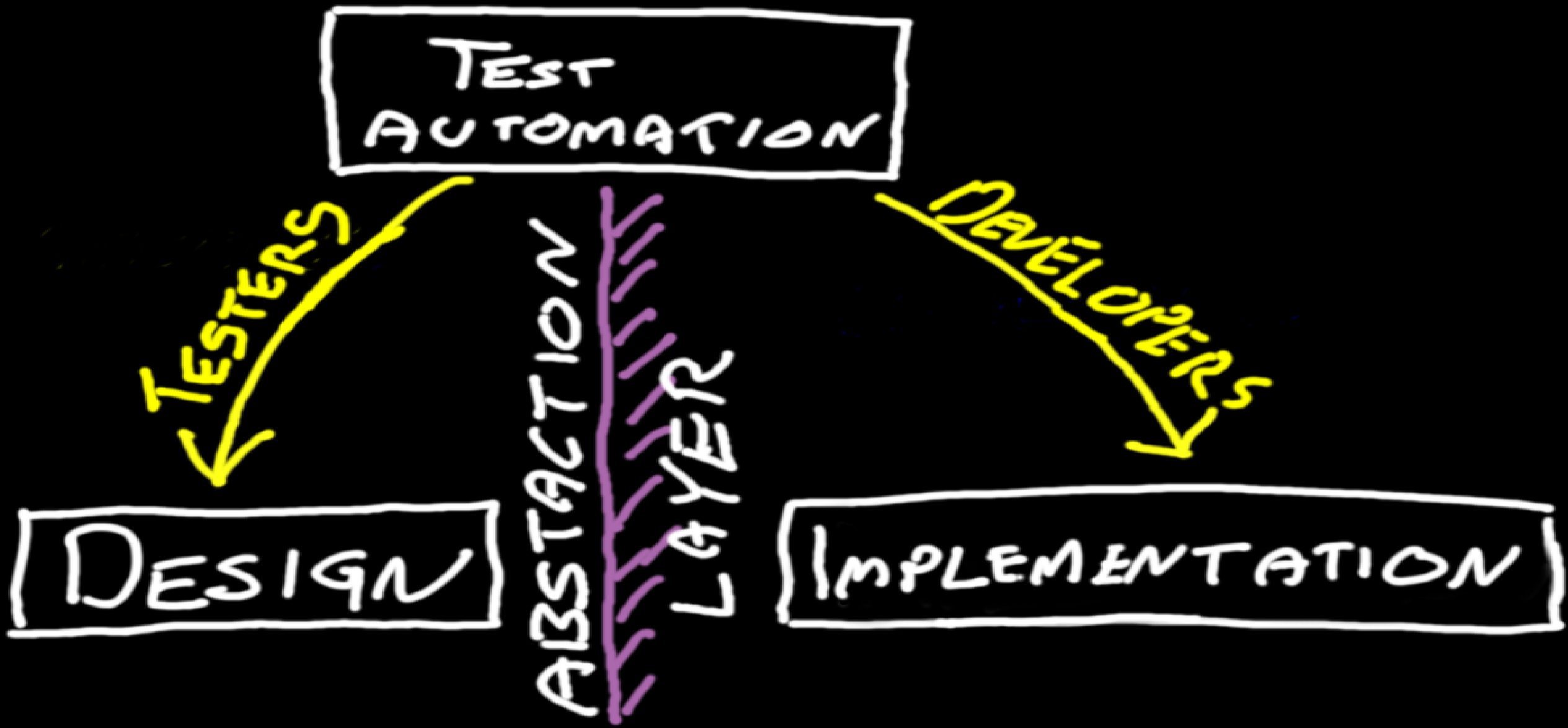
Our challenges

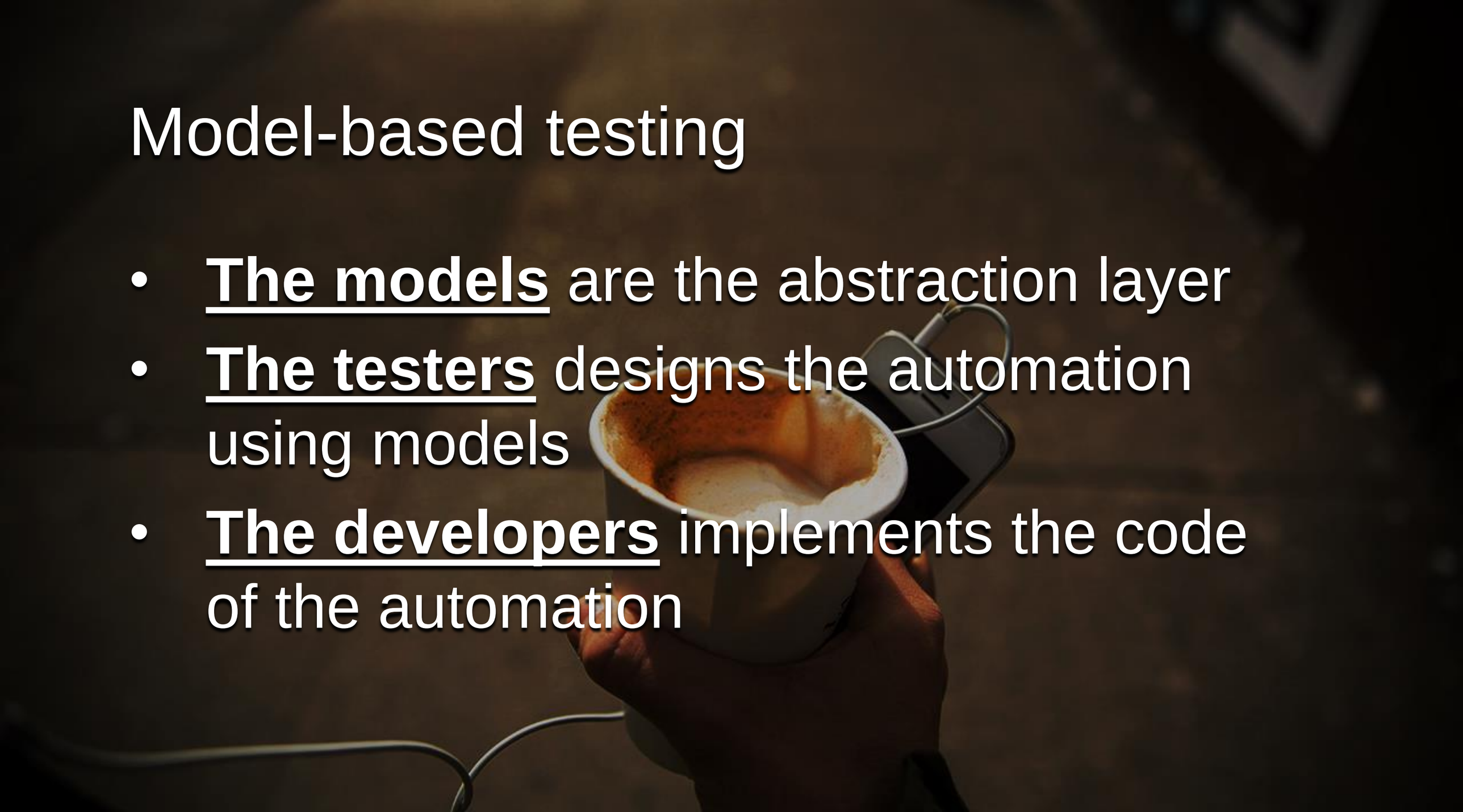
- Hard-to-test SUT
  (Experiences of test automation: case study 1, An Agile Team's Test Automation Journey: The First Year), Dorothy Graham & Mark Fewster)
- Maintenance of automation
- Peoples expectations
- Flaky SUTs
- Flaky tests
- Re-prioritizations of non-critical but test hindering bugs
- Test data, test environments
- Supporting services



Our goals

- Create automated end-user regression tests on 4 major platforms
  1) Desktop – Windows and OSX
  2) iOS – iPhone and iPad
  3) Android
  4) Webplayer
  5) Some backend services
- To ease the workload for testers
- To deliver automated regression tests for a feature as a part of definition of done
- To deliver short feedback loops to teams using Dashboards


Test Automation
Testers
Developers
Abstraction Layer
Design
Implementation

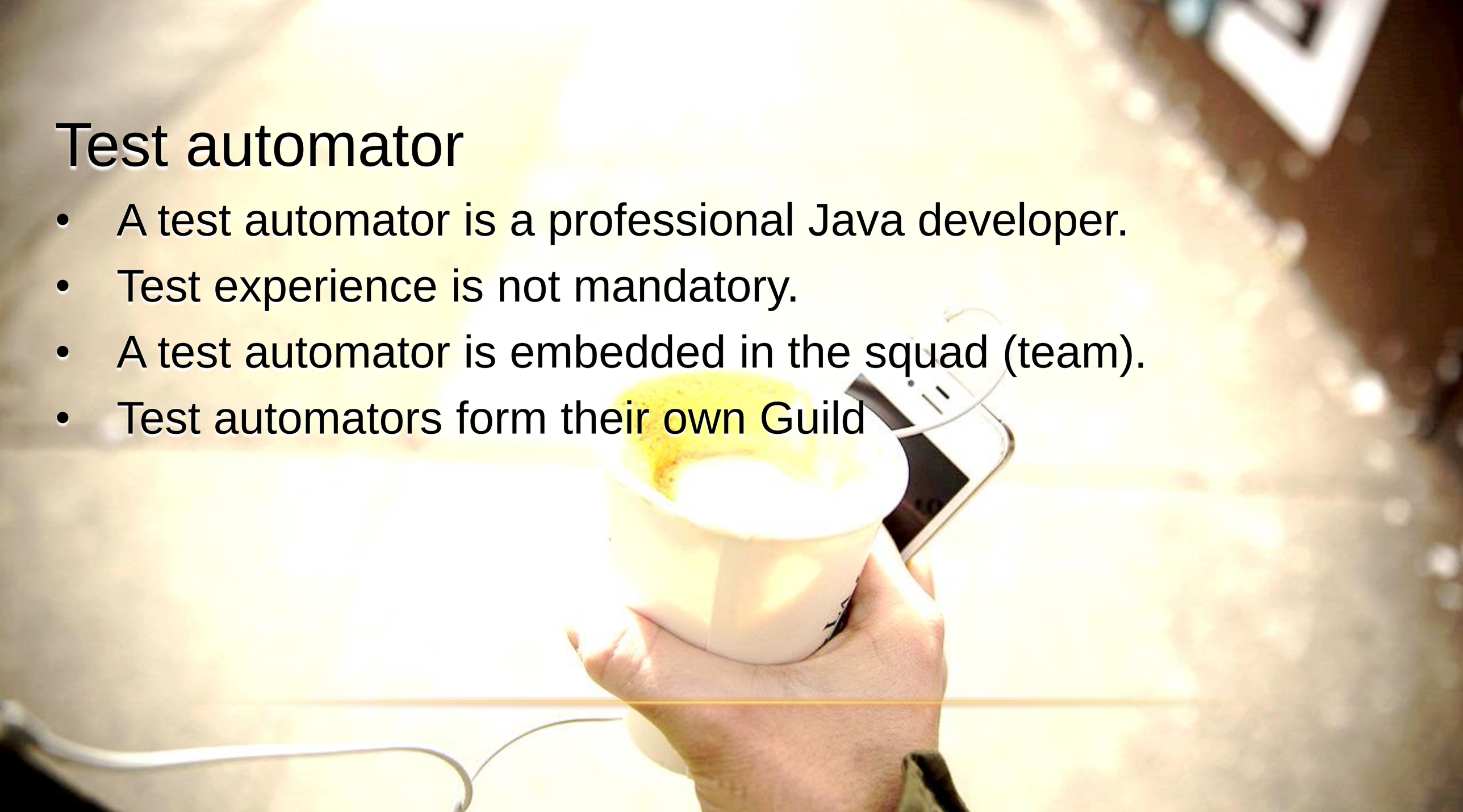


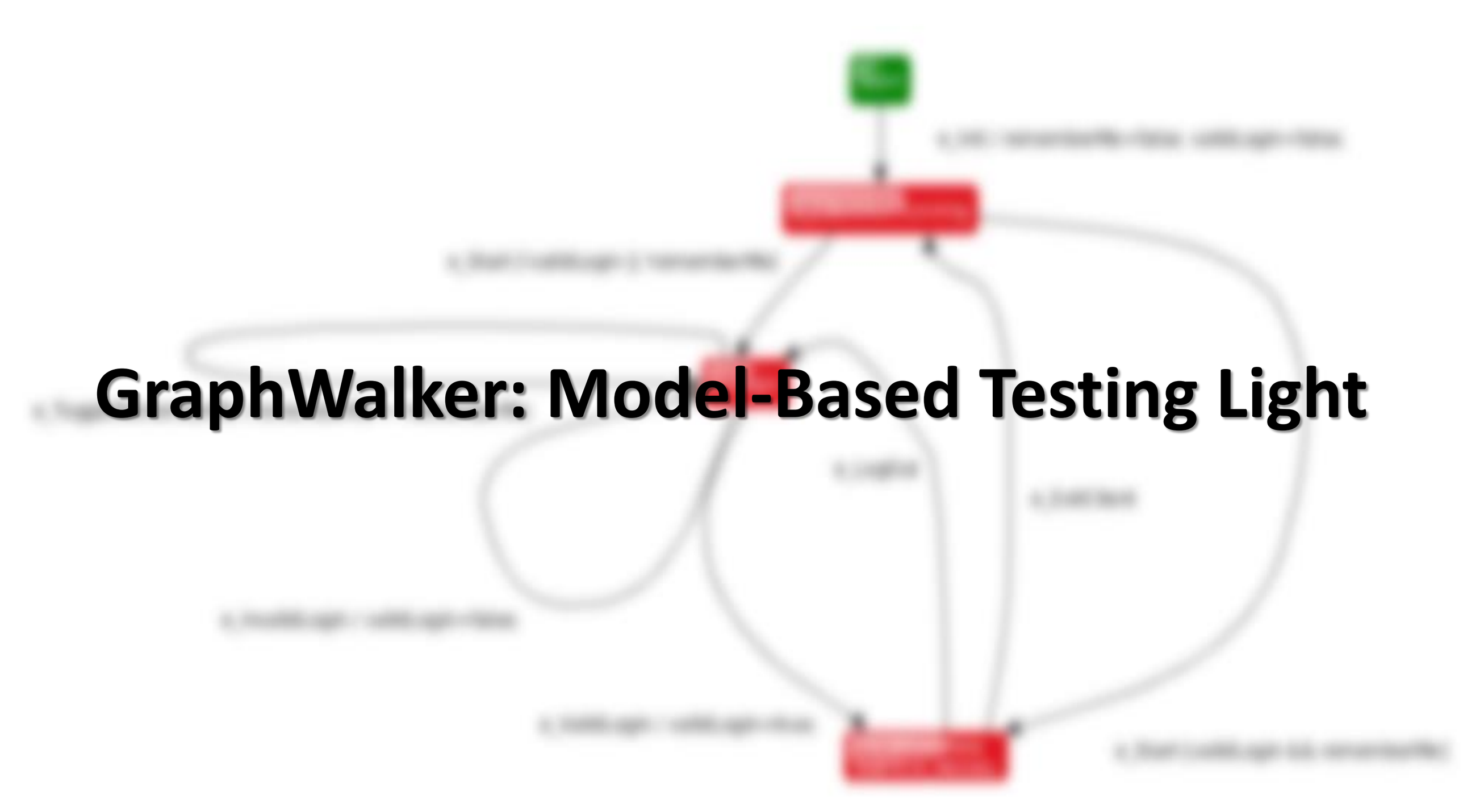
Model-based testing

- **The models** are the abstraction layer
- **The testers** designs the automation using models
- **The developers** implements the code of the automation

Test automator

- A test automator is a professional Java developer.
- Test experience is not mandatory.
- A test automator is embedded in the squad (team).
- Test automators form their own Guild





GraphWalker: Model-Based Testing Light

What we needed:

- Easy to learn modelling syntax
- Open source, or freeware tools
- OS platform independency

Some words about GraphWalker

- GraphML [http://graphml.graphdrawing.org/]
- Simplistic syntax
- No exit or stop nodes
- Online generation
- Uses yEd as editor [http://www.yworks.com/en/products_yed_about.html]

GraphWalker – Commands

- ANALYZE
- GUI
- HELP
- LOG
- MANUAL
- MERGE
- METHODS
- OFFLINE
- ONLINE
- REQUIRMENTS
- SOAP
- SOURCE
- XML

GraphWalker – Generators

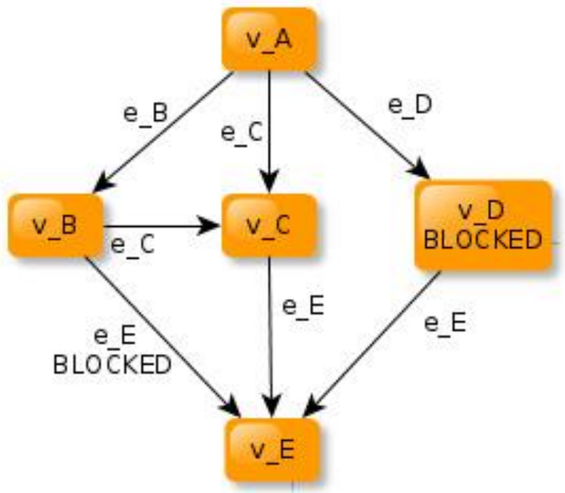
- RANDOM
- SHORTEST_NON_OPTIMIZED
- A_STAR
- ALL_PATH_PERMUTATION

GraphWalker – Stop conditions

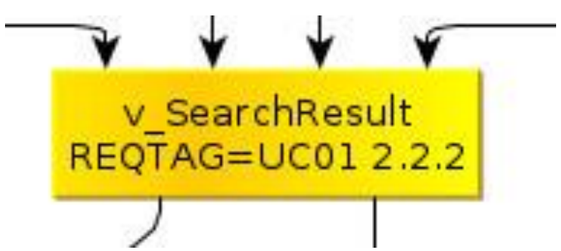
- REACHED_EDGE
- REACHED_VERTEX
- REACHED_REQUIREMENT
- EDGE_COVERAGE
- VERTEX_COVERAGE
- REQUIREMENT_COVERAGE
- TEST_LENGTH
- TEST_DURATION
- NEVER

GraphWalker – Vertex Keywords

- BLOCKED



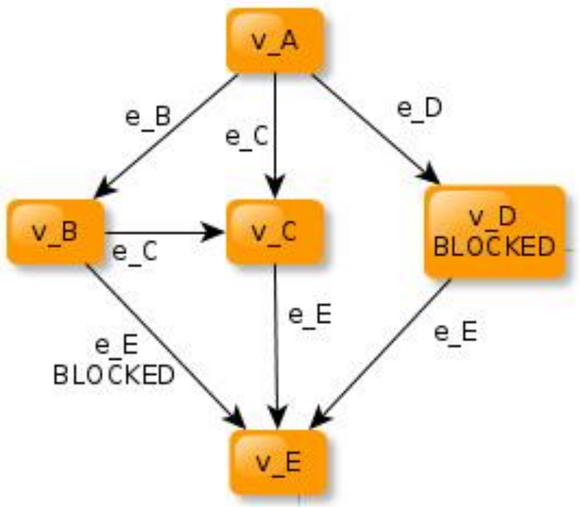
- REQTAG



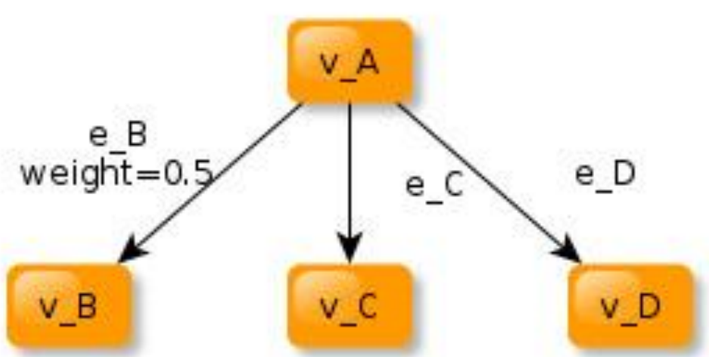
- SWITCH_MODEL

GraphWalker – Edge Keywords

- BLOCKED



- WEIGHT



GraphWalker – Java API

- Online generation
- Java Reflection
- Model <-> Java Class
- JavaDoc API

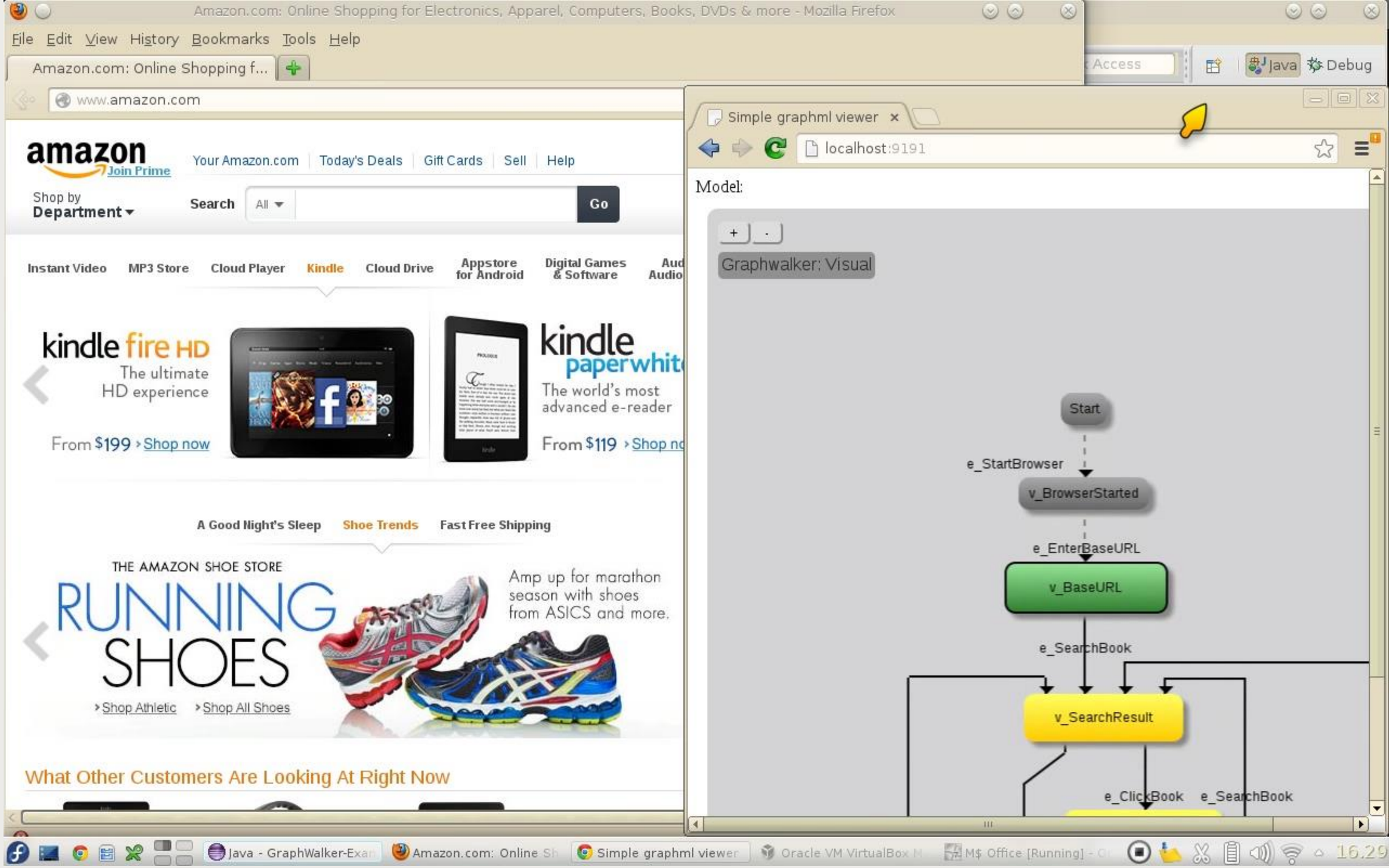
[http://graphwalker.org:8080/job/graphwalker/site/apidocs/index.html]

```java
@Test
public void a_star() throws InterruptedException, StopConditionException, URISyntaxException {
  ModelHandler modelhandler = new ModelHandler();

  // Get the model from resources
  URL url = MultiModelTest.class.getResource("/model/ShoppingCart.graphml");
  File file = new File(url.toURI());

  // Connect the model to a java class, and add it to graphwalker's modelhandler.
  // The model is to be executed using the following criteria:
  // EFSM: Extended finite state machine is set to true, which means we are using the data domain
  // in the model
  // Generator: a_star, we want to walk through the model using shortest possible path.
  // Stop condition: Edge coverage 100%, we want to walk every edge in the model.
  modelhandler.add("Amazon", new Amazon(file, true, new A_StarPathGenerator(new EdgeCoverage(1.0)), false));

  // Start executing the test
  modelhandler.execute("Amazon");

  // Verify that the execution is complete, fulfilling the criteria from above.
  Assert.assertTrue(modelhandler.isAllModelsDone(), "Not all models are done");

  // Print the statistics from graphwalker
  String actualResult = modelhandler.getStatistics();
  System.out.println(actualResult);
}
```

GraphWalker – Combined Stop conditions

```
@Test
public void addMultipleGenerators() throws StopConditionException {
  ModelAPI model = new ModelAPI("graphml/org.graphwalker.multipleModels/a.graphml");
  model.setWeighted(false);
  model.setExtended(true);

  CombinationalCondition combinationalCondition = new CombinationalCondition();
  combinationalCondition.add(new RequirementCoverage(1.0));
  combinationalCondition.add(new EdgeCoverage(1.0));

  AlternativeCondition alternativeCondition = new AlternativeCondition();
  alternativeCondition.add(combinationalCondition);
  alternativeCondition.add(new TimeDuration(900));

  CombinedPathGenerator generator = new CombinedPathGenerator();
  generator.addPathGenerator(new A_StarPathGenerator(new ReachedVertex("C")));
  generator.addPathGenerator(new RandomPathGenerator(alternativeCondition));

  model.setGenerator(generator);
  Assert.assertTrue("Failed setting up the model", model.getMbt().hasNextStep());
}
```

Demo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Gift Cards
Sell
Help
Shop by Department
Search
All
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Instant Video
MP3 Store
Cloud Player
Kindle
Cloud Drive
Appstore for Android
Digital Games & Software
kindle fire HD
The ultimate HD experience
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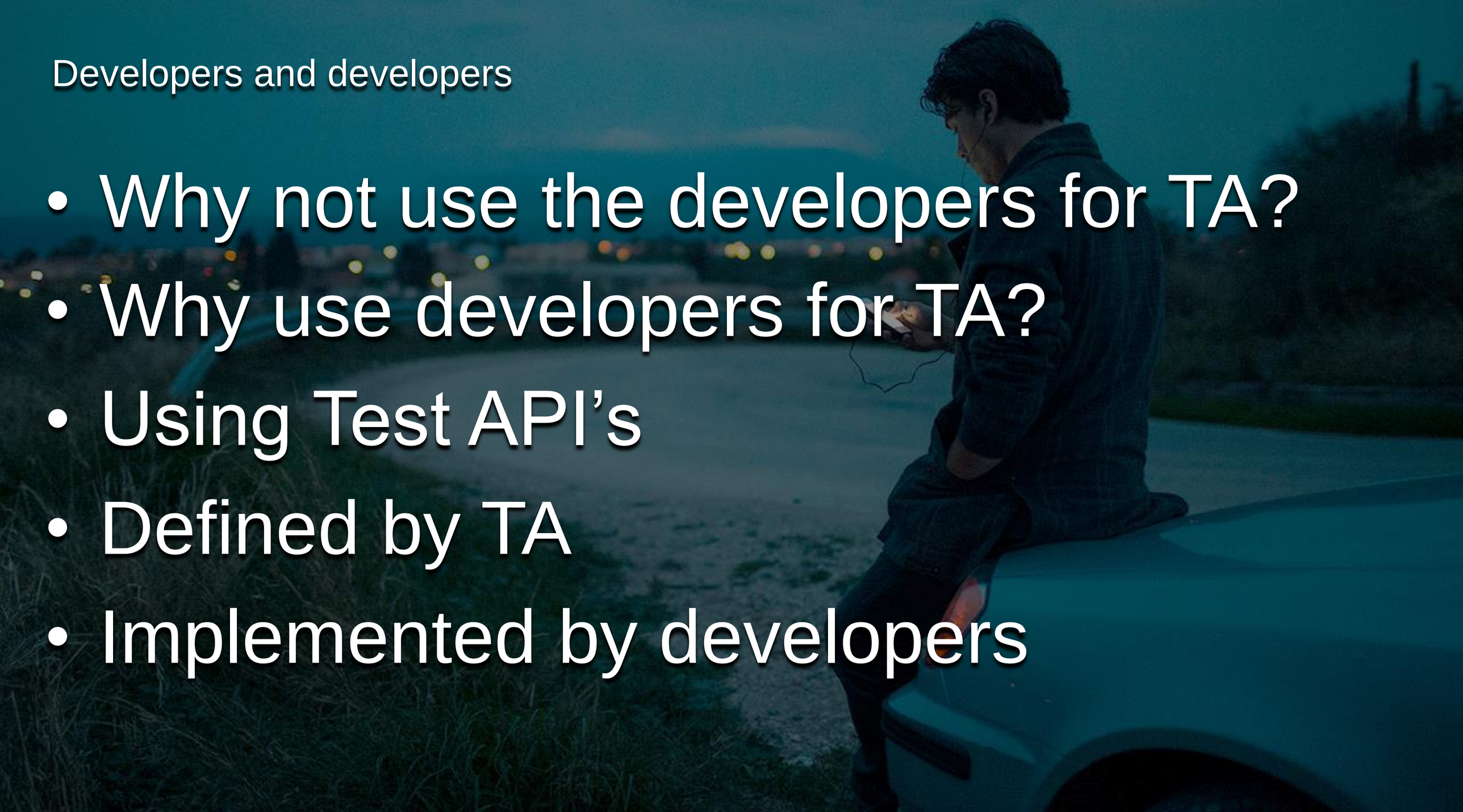
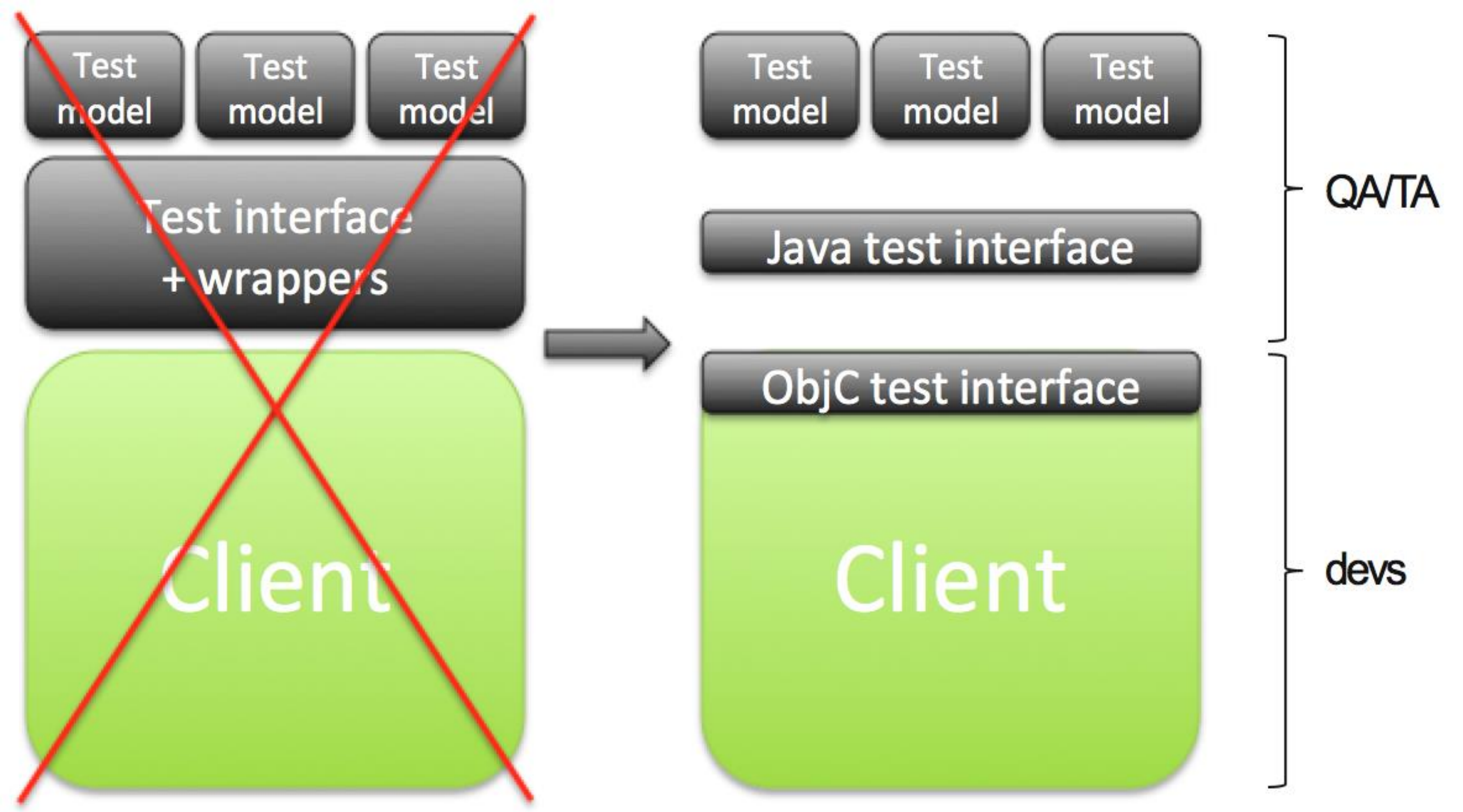
kindle paperwhite
The world's most advanced e-reader
From $119
A Good Night's Sleep
Shoe Trends
Fast Free Shipping
THE AMAZON SHOE STORE
RUNNING SHOES
Amp up for marathon season with shoes from ASICS and more.
› Shop Athletic
› Shop All Shoes
What Other Customers Are Looking At Right Now
Simple graphml viewer
localhost:9191
Model:
Graphwalker: Visual
Start
e_StartBrowser
v_BrowserStarted
e_EnterBaseURL
v_BaseURL
e_SearchBook
v_SearchResult
e_ClickBook
e_SearchBook
Java
Debug
Access
Java - GraphWalker-Exa
Amazon.com: Online Sh
Simple graphml viewer
Oracle VM VirtualBox M
M$ Office [Running] - O
16:29

Developers and developers



- Why not use the developers for TA?
- Why use developers for TA?
- Using Test API’s
- Defined by TA
- Implemented by developers


Test model
Test model
Test model
Test interface + wrappers
Client
Test model
Test model
Test model
Java test interface
ObjC test interface
Client
QA/TA
devs

Before

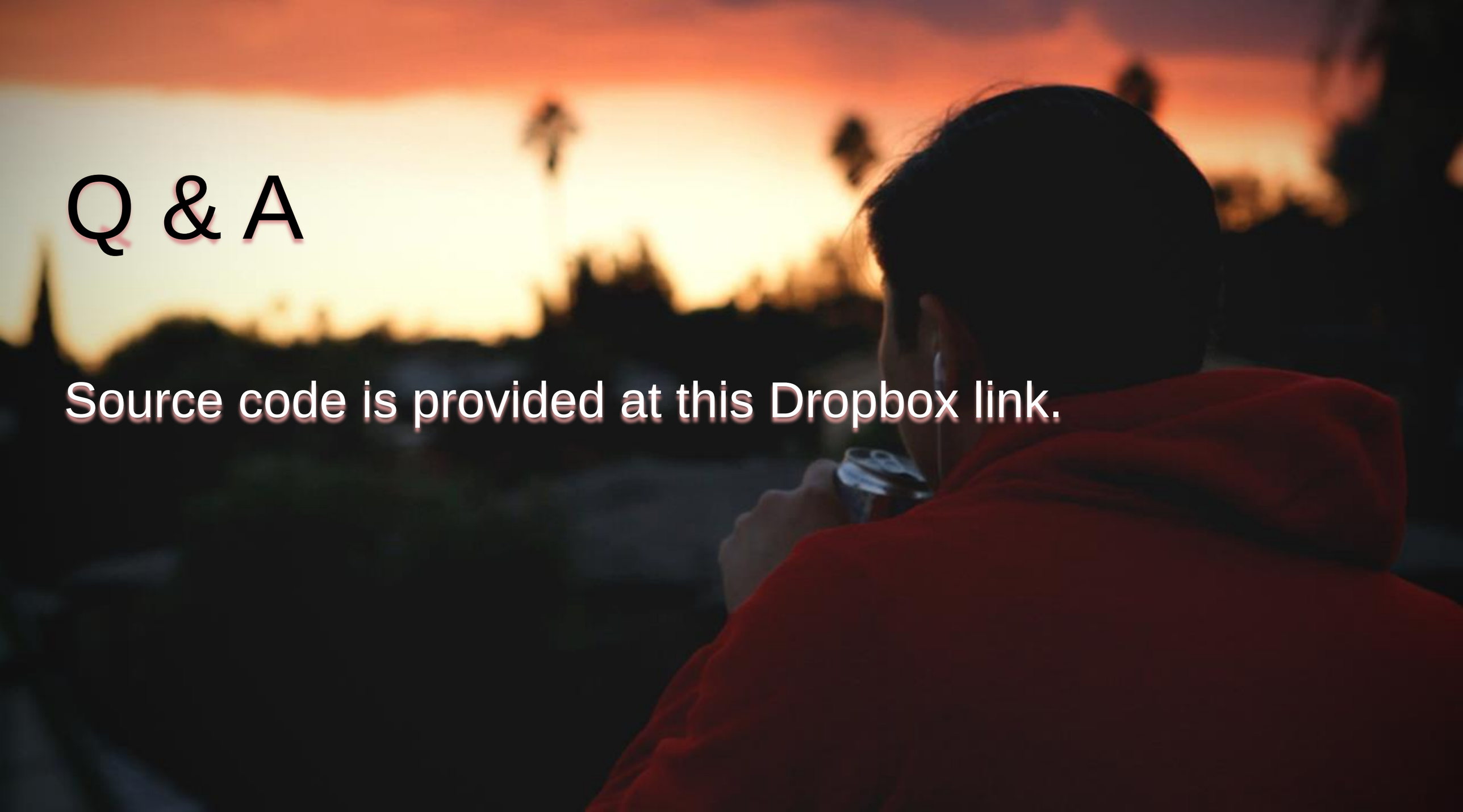
```
android.view.View seekBarView =
solo.getView(com.spotify.mobile.android.ui.view.CancellableSeekBar.class, 0);
int[] xy = new int[2];
seekBarView.getLocationOnScreen(xy);
solo.clickOnScreen(xy[0] + 9 + (seekBarView.getWidth() - 18) * position, xy[1] +
seekBarView.getHeight() / 2.0f);
```

After

```
page().seekTrack(position)
```

Live Tutorial

- **How to model a simple use case**
  Model an end user accpetance [regression] test of the Search functionality in the Spotify Webplayer. This is done by QA.
- **Refactor the model**
  Adapt the model so GraphWalker accept it's syntax. This is done by the test automator, and then reviewed by QA.
- **Develop the test auomation code**
  The test automator writes the code that impements model. GraphWalker is integrated into the code, and executes the test together with TestNG. This is don by the test automator.



Q & A

Source code is provided at this Dropbox link.