Test Automation

M A P

Certified Mobile App Professional

Syllabus Version 2.5_R

0. Introduction to This Syllabus

0.1 Purpose of this document

This syllabus defines the content of the international qualification scheme for the "Certified Mobile App Professional – Test Automation" Foundation (CMAP-TA-FL). Special Interest Group (SIG) of the International Software Quality Institute (iSQI) has created this syllabus.

CMAP-TA-FL is an introduction to Mobile application test automation. It provides an excellent introduction to test automation in the mobile world for different kinds of apps, the most relevant techniques and terminology.

The iSQI SIG CMAP-TA-FL has created:

- The syllabus

- The Business Outcomes (BO)

- The course material and other artifacts

The course material can be licensed to training providers. In order to license the material the training provider must have at least two trainers that hold the CMAP-TA-FL certificate.

The SIG CMAP-TA-FL qualification is entry level certification aimed at anyone involved in mobile app test automation: project managers, quality managers, software development managers, business analysts, developers, testers, IT directors and management consultants.

It is assumed that the trainees have basic knowledge of software testing concepts. It is recommended that the candidate holds a foundation level certificate such as "ISTQB® Certified Tester – Foundation Level" (ISTQB - CTFL) and Certified Mobile App Professional – Testing" Foundation (CMAP-T-FL).

0.2 Cognitive Levels of Knowledge

Detailed Learning Objectives (LO) are indicated for each section in this syllabus. These objectives identify what the trainee will be able to do following the completion of each module. They are classified as follows:

Level 1: Remember (K1)

Level 2: Understand (K2)

Level 3: Apply (K3)

The top-level heading for each chapter shows the highest level of learning objectives that is covered within the chapter. The definition of these cognitive levels matches the definition given in the ISTQB Certified Tester scheme to guarantee compliance with and thus integrity to this scheme. Please refer to [CTFL2011] for more details.

0.3 The Examination

The CMAP-TA-FL certificate examination will be based on this syllabus. Answers to examination questions may require the use of material based on more than one section of this syllabus. All sections of the syllabus are examinable.

The exam is 45 minutes, 30 questions, multiple-choice exam. A practical assessment is a pre-requisite to taking the exam. Examinations have to be taken as part of a training course.

0.4 Business Outcome

This section lists the Business Outcomes expected of a candidate who has achieved the CMAP-TA-FL certification.

A CMAP-TA-FL professional can:

BO1   Assist in adaptation of current test automation processes for mobile app test automation

BO2   Adapt existing testing & test automation experience and knowledge to develop automated tests for mobile applications

BO3   Identify and Apply appropriate methods of test automation for mobile apps

BO4   Develop automated tests for various types of mobile applications including web, native and hybrid applications using open source tools

BO5   Evaluate and identify the right tools for a mobile app test automation context

BO6   Identify and use appropriate tools to assist in mobile application development including emulators and simulators

BO7   Assist in identification of requirements of a test lab for carrying out mobile application automation testing

0.5 Specialization

CMAP-Test Automation – Foundation Level is one of the family of CMAP certifications that target different proficiency levels as well as specializations. Other certifications from CMAP are listed below:

- • Certified Mobile Application Professional – Testing – Foundation Level
- • Certified Mobile Application Professional – Performance Testing
- • Certified Mobile Application Professional – Security Testing
- • Certified Mobile Application Professional – Testing - Advanced Level

1. Course Introduction - 20 minutes

Literature

[KOHL 2013]   Tap Into Mobile Application Testing – Jonathan Kohl

[HART 2010]   A Practical Guide to Testing Wireless Smartphone Applications –Julian Harty

[MILA 2011]   Android Application Testing Guide Diego Torres Milano

[CTFL2011]   ISTQB Foundation Level Syllabus

[CMAP-FLT2012]   Certified Mobile Application Professional – Testing (Foundation)

The Certified Mobile Application Professional – Test Automation – Foundation Level (CMAP-TA-FL) certification helps a tester get an overview of important tools and techniques used in mobile application test automation. The testers also get to understand the similarities and differences with respect to more conventional test automation.

The syllabus has following sections -
- Introduction
- Overview of Mobile World
- Mobile application testing challenges
- Mobile Test Automation
- Introduction to Selenium WebDriver
- Test Automation with Appium
- Choosing the Right Tool (Self-Study)

The exam structure and question distribution is explained as part of the course material. The course timing includes time taken to do the subject discussion as well as the exercises. However exam question distribution follows the timing described in the syllabus.

2. Overview of Mobile World - 40 minutes (K2)

2.1 Introducing The Mobile World – 20 minutes

2.1.1 Players in the Mobile Space

There are a large number of players in the Mobile Space such as Apple, Google, Microsoft, Blackberry and various others. Some of these players and their platforms are more popular than others with similarities and differences in features and capabilities.

2.1.2 Market size and figures

There is a need to understand mobile market and its growth as compared to personal computers. Mobile phones and other smart mobile devices continue to grow at exponential rate with corresponding changes in mobile internet usage as well. There is a change in the way information is created, transmitted, transformed, stored and consumed. This means a shift in the way applications are created and tested.

A mobile application tester needs to be aware of the market distribution of various device types, including variations based on geography, in order to prioritize the tests for the representative device types. In addition, a mobile application tester needs to be aware of the business implications of the distribution of platforms; application downloads per platform and factors like revenue generation from advertisement or paid applications etc. per platform.

2.2 Different types of Mobile Applications 20 minutes (K2)

LO2.2-1 Compare different types of mobile applications (K2)

There are various types of mobile applications such as native, browser-based or hybrid mobile applications. Some of the applications come pre-installed on the mobile device and others can be downloaded from respective stores or marketplaces and installed

Each type of application has certain advantages and disadvantages requiring an engineering decision to be made before starting the application development. Testing of each of these application types may require a different approach.

3. Mobile Applications Testing Challenges 20 minutes (K2)

LO3.1-1 Comprehend the challenges in mobile application automation testing (K2)

Mobile application testing has a set of the challenges related to variety of devices, screen sizes and resolutions. Some of the challenges are:

- Hardware – challenges related to multiple manufacturers and compatibility of applications with all the devices, various CPUs and device specifications, various sensors, and different screen sizes and resolutions
- Software – challenges related to operating system and user interface compatibility as well as browser compatibility
- Network – challenges related to multiple network operators and network types such as Wi-Fi, GSM, 2G, 3G, 4G etc.

A tester has to test the application to ensure that application works on multiple devices with different specifications, backward compatibility to OS versions, taking into account the always/mostly on nature of devices and consequent data transfer and load on the serer and so on. Apart from this major application stores have their own compliance guidelines that need to be adhered to thus complicating the testing.

Need for quick releases and shorter development and test cycles compound the problems of providing applications of adequate quality.

4. Mobile Test Automation 75 minutes (K2)

Quick release cycles and large number of devices require ability to do certain amount of regression testing in an automated manner to reduce the testing effort, time to release and to increase coverage. Need for applications to be made available on multiple platforms may require tools that are cross-platform.

4.1 Automation Approaches 25 minutes (K2)

LO4.1-1 Compare various automation approaches & frameworks (K2)

Automating mobile application also depends on type of application i.e. if its mobile web application user can choose user agent-based approach, if its native & hybrid application user can choose remote/cloud based approach and lab based automation can be used for all types of applications.

All Automation frameworks used for conventional applications are applicable to Mobile applications as well i.e. Record/Playback, Data-Driven, and Keyword/Action Based automation.

4.2 Automation Solutions 20 minutes (K1)

LO4.2-1 Describe various automation solutions for mobile applications (K1)

To automate a mobile app, tester needs to understand the automation script recording or creation mechanism and also how to access application's objects such as buttons, list box, edit box, etc., There are varieties of access methods used for mobile automation such as Image recognition, OCR/Text recognition, Web-based recognition and native object recognition.

4.3 Automation Process 10 minutes (K1)

LO4.3-1 Describe various steps of automation process (K1)

Functional automation of mobile applications can benefit from a well-defined process for automation. Some steps of automation process include defining automation objectives and strategy, identifying test cases and test data, creating automation for a device and creating or using a framework around automation to replicate tests across multiple devices for execution and Identification of defects and follow-up for their resolution.

4.4 Test Environment and Test Lab 20 minutes (K2)

LO4.4-1 Compare various approaches of creating test labs (K2)

Mobile application testing adds a further challenge to the test lab infrastructure management because of mobile nature of the devices and the sheer variety of devices available. While building and maintaining a mobile application test lab, at least following factors need to be considered:

- Platforms the customer is using or is targeting in the near future
- Most popular devices in the market
- Cost of owning and maintaining a lab
- Requirement for access to various networks and service providers, locally or globally

The lab could be built by procuring physical device, by using emulators, by using a combination or using a Remote Device Access Service.

5. Introduction to Selenium WebDriver 270 Minutes (K3)

Selenium WebDriver, also known as Selenium 2.0, is an open source test automation framework that is the most widely used framework of its kind today. Given its popularity, flexibility and applicability for web automation as well as its adoption by mobile test automation tools like Appium as the underlying library, it has been chosen for inclusion in this certification.

5.1 About Selenium 20 minutes (K2)

Selenium WebDriver is used for automating web applications by automating the user actions in a browser. It supports all of the commonly used browsers today.

Apart from supporting multiple browsers, it also supports using multiple programming languages for writing automated tests and can be run on most of the operating systems.

It is also used as the basis of many other frameworks.

5.2 Components of Selenium 30 minutes (K2)

LO5.2-1 Comprehend various components of Selenium WebDriver (K2)

LO5.2-2 Develop automated tests using Selenium IDE (K2)

When using a test automation tool, it is important to understand the underlying architecture and the components involved.

Selenium WebDriver is no exception. Selenium WebDriver provides a Client API which has been implemented in a variety of programming languages. A tester uses the client API to write tests, which in turn utilizes the JSON Wire Protocol to talk to browser-specific Selenium listeners to interact with a browser.

Using Selenium Grid, one can also do parallel testing on same or different machines.

For the purpose of the certification, Java is used the programming language, JUnit as the test engine and Eclipse as the IDE for development of automated tests.

5.3 Automation of Web based applications 220 minutes (K3)

LO5.3-1 Comprehend a Junit test case and its fixture methods (K3)

LO5.3-2 Develop automated tests using Junit as the test engine in Eclipse as the Integrated Development Environment (IDE) (K3)

LO5.3-3 Comprehend the various classes and methods available in Selenium WebDriver's API (K3)

LO5.3-4 Comprehend and Compare various ways of element identification (K3)

LO5.3-5 Develop automated web tests using Selenium WebDriver (K3)

Selenium IDE, an integrated test development with a test recoding option in Firefox, provides an easy way for getting started with Selenium. Although not used by seasoned professionals, it is a very good tool to know the basics of web test automation with Selenium. The option to export the recorded script in a variety of languages, offers the flexibility to include the tests in a more customized test automation framework that a tester wants to employ.

Selenium WebDriver provides a comprehensive client API for browser operations like launching a browser, mimicking browser navigation controls, controlling window size, switching between browser windows and so on. It also provides various API methods to identify and interact with various web controls like text boxes, links, dropdown lists and so on.

The key to effective Web application UI test automation is to be able to understand the various types of user actions in relation to various types of web controls. One should be able to choose the right identification methods for element based on its ID, name, text, XPath, CSS Selector etc.

Selenium WebDriver provides API to launch a browser of choice, configure the browser properties as a part of its configuration options.

Synchronization is also a key for effective test automation. It helps a tester to void the usage of brittle and hard-coded sleep times in script and helps in replacing such ineffective ways with polling mechanisms based on a variety of element states. Selenium's wait API comes very handy in building such a robust automated test.

6. Test Automation with Appium 475 minutes (K3)

Appium is one of the most widely used open-source and free test automation framework for mobile app test automation.

6.1   About Appium 15 minutes (K2)

Appium can be used to automate different types of applications on mobile devices, whether they are web applications or native applications or hybrid applications.

As it is built on the same fundamentals of JSON Wire Protocol as Selenium, it comes with same benefits of cross-platform, cross-language, cross-browser support. Added to that with its unique implementation of mobile test automation options utilizing native support provided by the OSes for UI automation, it supports automating tests across Android and iOS devices.

6.2   Components of Appium 15 minutes (K2)

LO6.2-1 Comprehend various components of Appium (K2)

When using a test automation tool, it is important to understand the underlying architecture and the components involved.

Although Appium uses the same underlying principles in its architecture, the specifics vary between Android and iOS implementations.

While automating tests using Appium, it is important to understand the role of the client API, the underlying WebDriver controller (which differs for Android and iOS) and the TCP Server. While the first two run on a PC or a Mac, the last one runs on a real mobile device or an emulator/simulator.

6.3   Automation of Web based applications 120 minutes (K3)

LO6.3-1 Comprehend the various classes and methods available in Appium's API (K3)

LO6.3-2 Develop automated mobile web application tests using Appium (K3)

Appium provides a UI to setup the device for testing. While you can use a Mac system to develop and run tests for Android as well iOS platforms, other operating systems can be used to run only Android tests. The Appium server must be running with desired settings in place for the tests to run successfully.

In Appium, you use the Desired Capabilities facility to specify the type of operating system and browser.

Appium does not fair well when it comes to element identification capabilities during the development of tests. A tester must be able to use the remote debugging capabilities provided by desktop browsers to explore the element identifiers and use the same in Appium tests.

6.4 Automation of Native and Hybrid Applications 250 minutes (K3)

LO6.4-1 Develop automated mobile native and hybrid application tests using Appium (K3)

When using Appium for automating native and hybrid applications, there are additional steps required in configuring the Appium server as well as the Desired Capabilities in the test code. These changes are needed to specify the application under test as Appium takes care of the installation of this app on the device or emulator before tests get conducted.

Unlike its limitations in case of Web applications, Appium provides a good enough UI inspector which can be used to explore the identification properties of UI elements to be used in test code.

6.5 Remote Device Access 75 minutes (K1)

LO6.5-1 Understand how a Remote Device Access Service work (K1)

Remote device access is very important in various situations such as requirement of accessing a particular device, a particular network from a service provider or situations where a local lab solution is not feasible. There are a number of service providers available who provide remote device access. One should know the situations where it makes sense to avail of these services esp. when a decision to create a local lab with required devices is to be taken.

7. Choosing the Right Tool (Self-Study)

One is faced with a lot of choices when it comes to mobile test automation tools. There is no absolute right or wrong answer when it comes to the choice of tool. The context has be evaluated in terms of project as well as technical variables involved.

Project variables involve but are not limited to time, budget, schedule, team's existing skills, existing tool licenses available and so on.

Technical variables include but are not limited to OS support, browser support, language support, CI support, record and playback options, complexity of the tool, special needs like signing/jail-breaking/rooting and so on.