



Syllabus Version 2.5_R (04.04.2016)

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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 – Testing" Foundation (CMAP-Testing). It is established by the Special Interest Group SIG of the International Software Quality Institute (iSQI).

CMAP-Testing is an introduction to Mobile application testing. It provides an excellent introduction to mobile testing, the most relevant techniques and terminology.

The iSQI SIG CMAP-Testing 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-Testing certificate.

The SIG CMAP-Testing qualification is entry level certification aimed at anyone involved in mobile app testing: 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)

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 integrability to this scheme. Please refer to [CTFL2011] for more details.

0.3 The Examination

The CMAP-Testing Foundation Level 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 a 40 question multiple choice exam. Examinations may be taken as part of a training course or taken independently (e.g. at an examination center or in a public examination).

0.4 Business Outcomes

This section lists the Business Outcomes expected of a candidate who has achieved the CMAP-Testing Foundation Level certification.

A CMAP-Testing Foundation Level professional can

- BO1 Assist in adaptation of existing testing processes for testing of mobile applications
- BO2 Support the requirements team in review of mobile application related requirements using knowledge of mobile markets and contexts
- BO3 Adapt existing testing experience and knowledge and existing way of testing web and other applications to mobile testing
- BO4 Identify and apply appropriate methods for testing of characteristics unique to mobile technology
- BO5 Identify and use appropriate tools to assist in mobile application testing including emulators and simulators
- BO6 Assist the mobile application team in identifying potential test automation activities and corresponding tools
- BO7 Assist in identification of requirements of a test lab for carrying out mobile application testing

0.5 Specialization

CMAP – Testing Foundation Level certification is a first step in a series of certifications with more specialization.

- Certified Mobile Application Professional – Test Automation
- Certified Mobile Application Professional – Performance Testing
- Certified Mobile Application Professional – Security Testing
- Certified Mobile Application Professional – Test Advanced Level

1. Course Introduction - 30 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

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

The syllabus has following sections -

- Overview of Mobile World
- Mobile Application Test Types
- Mobile Application Testing Process & Techniques
- Tools and Automation

The exam structure and question distribution is explained as part of the course material. The course timing does not cover time taken to do the exercises. However, exam question distribution follows the timing described in the syllabus.

2. Overview of Mobile World - 135 minutes (K2)

2.1 Introducing The Mobile World – 15 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 the 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 Business Model in Mobile Space 15 minutes (K2)

L02.2-1 Compare various business models for mobile applications (K2)

There are various models for monetization of work done in creating mobile applications. Some of these include Free, Freemium, Advertisement based, Transaction based and Paid applications (including enterprise applications). There are certain advantages and disadvantages of each of these approaches and the application tester should keep the suitability of the business model in mind while testing the mobile application.

2.3 Overview of Mobile Devices 15 minutes (K1)

L02.3-1 Be able to recall different types of mobile devices (K1)

There are a variety of mobile devices available that support different types of applications. Smart phones, Tablets, Basic phones and feature phones are some of various types of devices. Each type of device is built for specific type of needs that are important to keep in mind while testing.

2.4 Different types of Mobile Applications 15 minutes (K2)

L02.4-1 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.

2.5 Mobile Application Architecture – 30 minutes (K2)

LO2.5-1 Be able to understand the general architecture of mobile applications (K2)

There are multiple solutions to architect a mobile application. Some of the considerations in choosing a particular architecture or design decision are

- Who is the target audience for the application?
- What kind of application we want to build – Native/Hybrid/Web application?
- Is the application meant to run across various mobile and non-mobile platforms?
- What are the connectivity needs for the application?
- What is the data storage need for the application?
- Etc.

2.5.1 Client-side architecture

Client side application can be Thin-client or Fat-client. Thin client applications do not have customized application code and these make minimal use of the features provided by the mobile operating system whereas Thick/Fat client applications may have multiple layers of application code and may make use of features provided by the mobile operating system. Communication and data storage needs between client and server also plays a role in choosing appropriate architecture.

2.5.2 Server-side architecture

Server side architecture can be a single-tier or multi-tier. In single-tier architecture all server side components like application server, database server etc. are clubbed into one unit, whereas in multi-tier architecture they are spread across various units.

2.5.3 Connection Types

There are various types of connections such as Wi-Fi, Cellular data networks, Bluetooth etc. and data synchronization method such as push and pull. The devices can operate in one of the three modes – always connected, never connected or partially connected, each mode being useful in certain situations.

2.6 Development Platforms for Mobile Applications 45 minutes (K2)

LO2.6-1 Be able to identify and compare the development environment for mobile applications (K2)

LO 2.6-2 Be able to identify and recall the purpose of some of the common tools that are supplied as part of Android/iOS application development platforms (K1)

All the operating systems (OS) have different set of tools for developing mobile applications. It is useful to know which OS/platform uses which tools and also what host operating system can be used to install and use these tools.

Understanding the platform greatly helps testing of applications on that platform. It is important to get an overview of architecture, storage used, supported programming languages for application development, for major mobile operating systems namely, iOS, Android, Windows Mobile and Blackberry.

There are two major players in the smart phone market currently that provide mobile operating systems. Google, which has Android operating system, and Apple which has iOS. Architecture of each of these OSs is layered architecture. The OSes provide various services to application without allowing the applications accessing hardware directly or even through low-level libraries and routines. There are various tools provided with the development platforms to facilitate application development, testing and debugging.

Note - two other popular operating systems by Blackberry Limited (earlier Research in Motion or RIM) which has Blackberry operating system and Microsoft which has Windows Mobile operating system are not covered.

3. Mobile Applications Test Types 345 minutes (K3)

3.1 Challenges of mobile application testing 15 minutes (K2)

LO3.1-1 Comprehend the challenges in mobile application 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 server 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.

3.2 Emulators & Simulators 38 minutes (K2)

LO3.2-1 Understand differences between emulators and simulators (K2)

LO3.2-2 Understand the application of emulators/simulators for mobile application testing (K2)

Emulators are very useful in the early stage of development as these typically integrate with development environments and allow quick deployment and testing of applications. Emulators are also used to reduce the cost of test environments by replacing real devices with emulators. However an emulator cannot replace a device because the emulator may behave in a different manner than a mobile device. Emulators may not support all mobile device features. In addition, some hardware types may not be supported such as touch, accelerometer and others.

Simulators too are tools that mimic the device. However unlike emulators, which can consume device executable, simulators require applications to be compiled specifically for these.

3.3 Mobile Testing Types 292 minutes (K3)

LO3.3-1 Be able to understand and implement different test types related to the mobile devices (K3)

LO3.3-2 Demonstrate principles used for testing mobile applications on multiple device types (K3)

LO3.3-3 Understand the differences in testing for different connectivity modes of mobile device (K2)

LO3.3-4 Describe challenges involved in multi-platform application testing (K1)

L03.3-5 Demonstrate different types of testing specific to mobile applications (K3)

L03.3-6 Identify various types of common tests that can be applied to mobile testing as well (K1)

L03.3-7 Describe field testing and various factors to be taken into account for performing it (K1)

There are some types of testing which are specific to mobile devices because of the unique nature of mobile applications, devices and platforms.

3.3.1 Testing for the device features

Different types of devices and differences in capabilities of these devices mean that testing has to be conducted on a large number of devices. This means that for a given application the target devices must be prioritized and tested for.

3.3.2 Testing for the connectivity

Mobile devices typically operate in one of the three modes – always connected, never connected or intermittently connected. This has an impact on the way data is synchronized between Client and Server requiring local data storage and a Store and Forward approach when connectivity is not there.

3.3.3 Testing applications on different platforms

Each mobile operating system has its own limitations. Even testing a single application across multiple devices running on the same platform is a challenge because of shorter release cycles of platforms and issues of compatibility. Testing across every platform increases the challenge involved.

3.3.4 Mobile specific testing

There are various other types of tests specific to mobile applications. These are:

Functionality Testing – Functionality testing as usual but in mobile application context.

Input Methods Testing – Testing of data input using all supported input methods such as physical Keyboard, virtual keyboard, touch screen, motion sensors, voice, gestures, camera and sound inputs (if applicable), light sensors, acceleration, gravity, magnetic field, pressure, temperature sensors input and others.

Testing for UI & Guidelines: User Interface must be tested against guidelines as provided by each platform.

Orientation testing – Testing for the orientation to ensure that application UI is rendered correctly.

Testing for Interrupts – Testing various types of interrupts such as voice calls, SMS, charger, low memory Notification and others while application is running.

Testing for different Networks - Testing the application behavior with different connection types (Wi-Fi, GPRS or phone data connectivity etc.) under data transfer conditions.

Testing for Preferences – Testing impact of preferences on the application. Test whether application allows the preferences to be changed or not.

Power Consumption/Battery Life testing – Testing impact of application on battery life and impact of battery life and status on application

3.3.5 Common test types applied to mobile testing

There are many types of tests conducted for testing conventional applications and many of these are valid for mobile application testing as well. Some of these test types are - Installation, User Interface, Functional Testing, Security, Performance, Stress, Usability, Database, Compatibility, Low Resource Testing, Internationalization Testing, Memory Usage Testing, Certification Testing and others.

3.3.6 Field testing

Some of the mobile applications need field testing to ensure that applications are working as per the requirements on networks provided by different service providers and on different types of communication technologies. Field testing requires careful planning and identification of types of tests to be performed in the field. One of the challenges of field testing is availability of various types of connections and plans from the service providers especially when remote or off-shore application development and testing is carried out.

4. Mobile Application Testing Process & Techniques 105 minutes (K3)

4.1 Mobile test Process and Strategy 30 minutes (K3)

Mobile application testing requires a process to be established like any other software testing project. One of the key points to consider in this activity is the different levels at which the application would be tested and the focus for each level.

4.1.1 Test Process

LO4.1-1 Be able to understand the implementation of the required testing process in mobile application projects (K2)

The ISTQB defined testing process is applicable to mobile application testing as well. ISTQB defines the following steps in testing process -

- Planning and control
- Analysis and design
- Implementation and execution
- Evaluating exit criteria and reporting
- Closure

4.1.2 Test Levels

LO4.1-2 Identify various test levels for mobile application testing projects (K1)

Mobile application testing includes activities to be performed by developers and testers. Determining appropriate intensity of testing for these levels namely Unit, Integration, System, User Acceptance and Field testing is important for delivering good quality products.

4.2 Experience Based Testing Techniques 75 minutes (K3)

LO4.2-1 Apply experience based techniques to mobile application testing (K3)

Exploratory testing, error guessing, fault attacks etc. are some of the experience based techniques. These techniques complement other test design techniques. Key elements of exploratory testing are product exploration, test design and execution and learning from the execution. Exploratory testing can make good use of heuristics and tours.

Tours can be used to explore an application from a specific point of view and focus. Tour based testing in mobile applications can be performed to understand how an application works and also to create models on how an application works.

5. Tools and Automation 106 minutes (K2)

Quick release cycles and large numbers of devices require the 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.

5.1 Automation Approaches 15 minutes (K2)

L05.1-1 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.

5.2 Automation Solutions 23 minutes (K1)

L05.2-1 Describe various automation solutions for mobile applications (K1)

To automate a mobile application, the 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 the mobile automation such as Image recognition, OCR/Text recognition, Web-based recognition and native object recognition.

5.3 Automation Process 15 minutes (K1)

L05.3-1 Describe various steps of automation process (K1)

Functional automation of mobile applications can benefit from a well-defined process for automation. Some steps of the 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.

5.4 Exploring Mobile Automation tools 30 minutes (K1)

Mobile testing is a new field and many automation tools are available in the market and many tools are released every month. It is important to evaluate tools appropriately in order to choose and deploy one.

L05.4-1 Describe mobile test automation tool evaluation parameters (K1)

L05.4-2 Enumerate existing tools and salient features of the same (K1)

5.4.1 Tool Evaluation Process and Parameters

There are various parameters which need to be evaluated before selecting a tool for mobile test automation. Some parameters are more important than others and prioritization needs to be done before starting tool evaluation.

Introducing a new tool in an organization requires certain sequence of activities to be performed in an order, for example understanding requirements, performing market research, performing tool demonstration and feasibility tests, reviewing results and final selection, setting up a pilot project to introduce the tool, integrating it with test management tools(if required).

5.4.2 Existing Automation Tools

There are a number of tools available in the market and the list is ever-increasing. Some tools are platform specific whereas others are cross-platform. Some tools are open-source whereas others are commercial. Some work on devices and others on emulators. Some of the existing tools are SeeTest Automation (Experitest), Perfecto Mobile Android Testing Cloud, Monkey Tool, Robotium, T-Plan Robot, Eggplant, TestQuest, Test Droid, Meux-UFT, Sikuli and many others. There are many other tools also available in the market.

5.5 Test Environment and Test Lab 23 minutes (K2)

L05.5-1 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 devices, by using emulators, by using a combination or using a Remote Device Access Service.