




# **XI. Mobile Application Development Methodology**


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# 1. Peculiarities of mobile application development


development differs significantly from desktop app development. The main reasons for this are the following:

- Currently used mobile communication technologies and mobile devices have a number of limitations, such as: the presence of time delays in wireless networks, more limited capabilities of the hardware and software of mobile devices, different possibilities for interactivity.




# 1. Peculiarities of mobile application development

- Mobile devices use a variety of operating systems (Android, Windows Phone, Apple iOS, etc.).
- Mobile devices work with different browsers , which support different languages for describing Internet pages - XHTML , HTML 4, HTML5 and client-side scripting languages.
- Availability of various development tools.
- Use of different architectures for the implementation of mobile applications - the so-called thin, fhick and smart clients.
- Mobile applications are created and tested on desktop computers, so it is necessary to use emulators to simulate their operation.




# 1. Peculiarities of mobile application development

- The process of developing an app designed for a mobile device is different from the process of developing software for desktop computers.
- The main difference is that in the first place the software under development is most often tested in the development environment (usually a PC) using an emulator. Only after the application has successfully worked is it uploaded to a corresponding mobile device for testing.
- The personal computer used for the development is very often referred to as the "source", and the final environment where the application will be executed - as the "target".



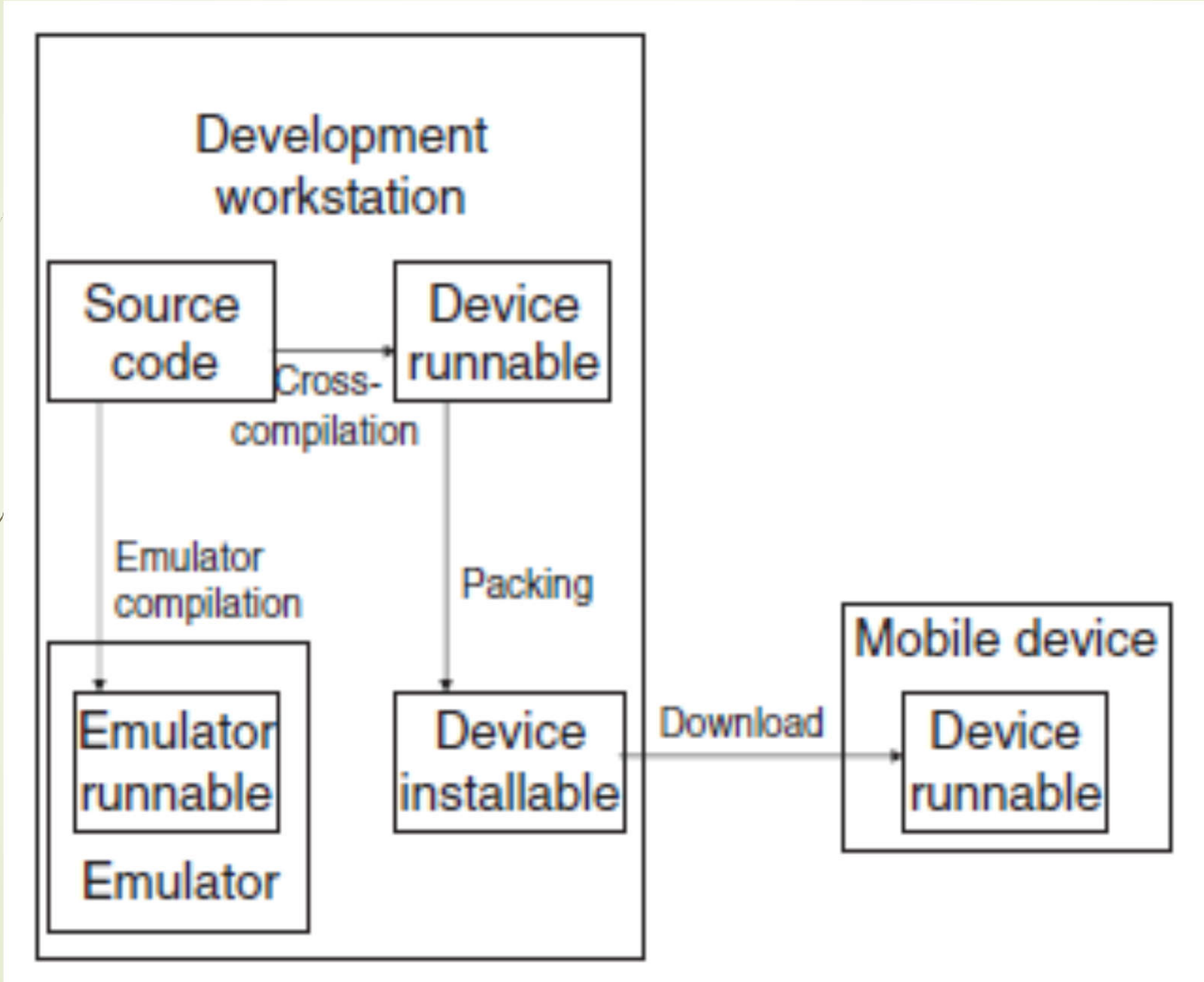
# 1. Peculiarities of mobile application development


- The software tested with the emulator and the software loaded on a mobile device can be the same, but it does not have to be.
- If the same software infrastructure is available for both environments (for example, the same virtual machine), then the software can be the same.
- However, if there is no infrastructure to allow the use of the same software, different builds are required.



# 1. Peculiarities of mobile application development

- The process when a personal computer is used to compile an executable application that is then loaded on a different system is called cross-compilation.
- Although it is possible to emulate low-level system behavior, it is sometimes necessary to use a real mobile device even during development.






# 1. Peculiarities of mobile application development


- The ability to run the same version in the development environment and to the final execution environment makes it easier to find bugs.
- At best, loading the final version into the mobile device is an easy task.
- If cross-compilation is required, the phase when the software is executed in the emulator may be only the beginning of the process of error detection and testing actions that are required when the program is compiled.
- For example, there may be additional build requirements if the mobile device does not support all emulator features.






# 1. Peculiarities of mobile application development

- Testing with an emulator has advantages and disadvantages.
- **Advantages:**
  - emulation of different operating systems;
  - availability of emulators for various mobile devices;
  - an opportunity for more cost-effective use in large projects with many developers working on them.
- **Disadvantages:**
  - the possibility that a mobile device may not support some functions supported by the emulator;
  - it is difficult to simulate real conditions and scenarios.




# 1. Peculiarities of mobile application development

- Testing with a real mobile device also has advantages and disadvantages.
- **Advantages:**
  - the program code is executed on a real mobile processor;
  - the tested application interacts with real buttons and/or a touch-sensitive screen;
  - testing can be done in real conditions (using sensors, GPS, outdoor environment).
- **Disadvantages:**
  - a mobile device must be available;
  - it takes time to load the application in the mobile device.



# 1. Peculiarities of mobile application development

- ▶ When developing mobile applications, their performance is of great importance, as they run on devices with different capabilities compared to PCs.
- ▶ Performance Testing Recommendations:
  - ▶ Common metrics should be used to measure application performance (how fast the application starts, how fast it closes, how fast it opens files, etc.). The sequences of events that occur when the user performs an action must be considered.



# 1. Peculiarities of mobile application development

- All assumptions should be tested on a mobile device and data from emulators should not be relied upon. One should start by testing the key capabilities and then look at those that are less critical.
- Older hardware platforms can be used for performance testing, as newer ones provide and will provide even greater performance in the future.
- The focus should be on the real bottlenecks as they determine the entire performance.



## 2. Mobile application

- When developing mobile applications, several basic steps must be followed in sequence.

### "Analysis"

- At this stage, the purpose for developing the application should be clearly defined.
- analysis stage covers:
  - **Research and analysis of the functional capabilities of existing applications** - offered services, supported devices and communication technologies, used development software, etc.



## 2. Mobile application

- ▶ **Research and analysis of the profile of potential users** and determination of target groups of users. The success of an application is very often determined by its adoption and use by users. That is why it is important to study the profile of the prospective users. Such a study can be carried out by the method of observation or with the help of a special survey. On the basis of the research and analysis of the profile of potential users, the target groups of users to which the application will be directed can be determined.



## 2. Mobile application

- ▶ **Formulation of the requirements for the developed application :**
  - ▶ defining the types of mobile devices that will be supported by the application.
  - ▶ determining whether the application will support asynchronous and/or synchronous communication.
- ▶ **Researching existing methodologies and models for mobile application development.** If such methodologies and models exist and meet the requirements of the developed application they can be used.



## 2. Mobile application

### "Design"

- After performing the analysis and formulating the requirements, the design stage follows. It includes several sub-steps:
  - **Defining the primary purpose** of the application by specifying what it can and cannot do. For a mobile version of a PC application, a subset of capabilities must be selected.
  - **Designing the application architecture.** A modular approach is most often used in this design . The basic modules, their purpose, interrelationship with other modules and users are defined .





## 2. Mobile application

### "Design" stage

- ▶ Architecture can be represented by the following models:
  - ▶ **Physical model.** The belonging of the individual modules to the physical devices is determined.
  - ▶ **Logic model.** It is built on the basis of a three-layer model: Data Layer, containing the database; Middle Layer containing the business logic; Presentation Layer containing the user interface. The logical model describes the interrelationship between individual modules and their belonging to one of the layers.



## 2. Mobile application

### "Design" stage

- ▶ **Development of a conceptual model.** Unified Modeling Language (UML) is most often used to develop a conceptual model. 3 types of charts are most often applied. Class Diagrams that describe the types of objects in the application and the types of interactions that exist between them. Use Case diagrams that describe the interactions between users and the application. Sequence diagrams to show the application usage scenarios.



## 2. Mobile application

### "Design" stage

- ▶ **Database design.** The logical structure of the database is defined - tables, fields, key fields and connections between the tables. The types of users of the application and their rights to access various data are defined.
- ▶ **User interface design.** This is one of the most important sub-steps in the design, as successful use depends on it. The basic principles of interface design must be respected - consistency of the symbols used, simplicity and intuitiveness. If the application will support several different types of devices, it is necessary to design a user interface for each device.



## 2. Mobile application

### "Development" stage

- The development stage builds on the previous two stages.
- It is a highly iterative process and involves developing, testing, fixing bugs found, and testing again.
- Testing can be divided into two types: testing in laboratory conditions using mobile device emulators and testing in real conditions using different mobile devices and different communication technologies.



## 2. Mobile application

- **The choice of development tools** depends on whether the application being developed will be of the "thick client", "smart client" or "thin client" type.
- **Prototype development** . This is an important stage of development, as two opportunities to evaluate the chosen development tools, the chosen way of presenting the information, the chosen emulators, and the usability of the user interface. With its help, the shortcomings of the future application can be tested and corrected before its full development begins.



## 2. Mobile application

- **Application development** . This sub-stage includes the development of the application itself - creating the database and developing the software.
- **Create documentation** . It includes writing documentation about the technical requirements and how to use the application.



## 2. Mobile application

### Stage "Implementation "

- The deployment stage represents the use of the application.
- The end result of the implementation should be its reliable and efficient operation.
- Application management can also be added to this stage.



## 2. Mobile application

### "Evaluation" stage

- Evaluation is an essential process in mobile application development.
- Unlike the other stages, evaluation actually takes place throughout the entire development process.
- It can be divided into two main types:
  - The first is formative assessment, which takes place during work on the other stages and between them.
  - The second type is the final evaluation, which takes place after the implementation of the application.