

Lecture 1. Introduction to Cross-Platform Development

Cross-Platform Application Development

September 22, 2017

Course Objectives and Prerequisites

Objective

To study programming technologies, libraries, and tools used in developing cross-platform software.

Prerequisites

- Discrete Mathematics
- Programming Fundamentals
- Programming Languages
- Operating Systems
- Database Technologies
- Computer Networks
- Web Technologies

ECTS credits	Lecture hrs	Lab hrs	Self-st. hrs	Total hrs
5	36	36	108	180

Table 1: course characteristics

Course Plan

- 1 Project Build Systems
 - Introduction to Cross-Platform Development
 - GNU make Project Build Tool
 - CMake Project Build System
- 2 Programming User Interface with Qt
 - Introduction to Qt Libraries
 - Event Processing in Qt
 - Implementing User Interface Elements in Qt
 - Model-View-Controller Idiom Support in Qt
- 3 Multithreading and Networking with Qt
 - Multithreading Support in Qt
 - Implementing Network Communication with Qt
- 4 Using Web Engines
 - Implementing User Interface with QML
 - Introduction to Electron Framework
 - Implementing Atom Packages

Academic Map for the Discipline

Laboratory Work	Points
Module 1. Project Build Systems	
Building an executable using a library	10
Module 2. Programming User Interface with Qt	
Implementing 2D graphics	10
Using Model-View-Controller idiom	15
Module 3. Multithreading and Networking with Qt	
Implementing background processing in GUI applications	10
Sharing computations with multiple threads	15
Using network communications	10
Module 4. Using Web Engines	
Using QML	10
Using Electron Framework	10
Developing an Atom Package	10
Total:	100

Table 2: control activities

Literature I

Build Tools



Martin K., Hoffman B. — Mastering CMake. — 6th ed. — Kitware, Inc., 09/2013. — 641 p. — ISBN 978-1-930934-26-9.



Дубров Д. В. — Система построения проектов CMake : учебник. — Ростов-на-Дону : Издательство Южного федерального университета, 2015. — 420 с. — ISBN 978-5-9275-1852-4.

Build Tools Online



CMake 3.6 Documentation. /. — Kitware, Inc. — URL: <https://cmake.org/cmake/help/v3.6/> (visited on 09/05/2016).



GNU Make Manual. /. — Free Software Foundation. — 05/22/2016. — URL: <http://www.gnu.org/software/make/manual/> (visited on 09/05/2016).

Literature II

Qt Basic






Blanchette J., Summerfield M. — C++ GUI programming with Qt 4. — Trans. from the English by. — 2nd ed. — Prentice Hall, 2008. — 752 p. — ISBN 978-0-13-235416-5.



Бланшет Ж., Саммерфилд М. — Qt 4. Программирование GUI на C++. — пер. с англ. — 2-е изд. — СПб. : КУДИЦ-Пресс, 2008. — 718 с. — ISBN 978-5-91136-059-7.



Literature III

Qt Advanced


-  *Summerfield M.* — Advanced Qt programming : creating great software with C++ and Qt 4. — Addison-Wesley, 2010. — xiii + 537. — ISBN 978-0-321-63590-7.
-  *Саммерфилд М.* — Qt. Профессиональное программирование : Разработка кроссплатформенных приложений на C++. — пер. с англ. — СПб. : Символ-плюс, 2011. — 560 с. — (High Tech). — ISBN 978-5-93286-207-0.
-  *Thelin J.* — Foundations of Qt Development. — Apress, 2007. — 528 p. — ISBN 978-1-59059-831-3. — DOI: 10.1007/978-1-4302-0251-6.

Literature IV

Qt Online

-  *Bocklage-Ryannel J., Thelin J.* — Qt5 Cadaques. — 03/21/2016. — URL: <http://qmlbook.github.io/> (visited on 09/05/2016).
-  Qt Documentation. — URL: <http://doc.qt.io/> (visited on 09/05/2016).

Additional Libraries Online

-  OpenCV Documentation. — URL: <http://docs.opencv.org/> (visited on 09/05/2016).

Literature V

Git



Chacon S., Straub B. — Pro Git. — 2nd ed. — Apress, 2014. — XXI + 456. — ISBN 978-1-4842-0077-3.



Чакон С., Штрауб Б. — Git для профессионального программиста : Подробное описание самой популярной системы контроля версий. — пер. с англ. — СПб. : Питер, 2016. — 496 с. — («Библиотека программиста»). — ISBN 978-5-496-01763-3.

Git Online



Chacon S., Straub B. — Pro Git. — 2016. — URL: <https://progit.org/> (visited on 09/05/2016).

Literature VI

CoffeeScript






Bates M. — Programming in CoffeeScript. — Addison-Wesley Professional, 2012. — 320 p. — (Developer's Library). — ISBN 978-0-32-182010-5.



Бейтс М. — CoffeeScript. Второе дыхание JavaScript. /. — пер. с англ. А. Киселёв. — М. : ДМК Пресс, 2012. — 312 с. — ISBN 978-5-94074-842-7.

Literature VII

CoffeeScript Online

-  CoffeeScript. — URL: <http://coffeescript.org/> (visited on 09/05/2016).
-  *Hoigaard E.* — Smooth CoffeeScript. — URL: <http://autotelicum.github.io/Smooth-CoffeeScript/> (visited on 09/05/2016).
-  *MacCaw A.* — The Little Book on CoffeeScript. — URL: <http://arcturo.github.io/library/coffeescript/> (visited on 09/05/2016).

Literature VIII

Electron Framework

-  Atom Documentation. — URL: <https://atom.io/docs> (visited on 09/05/2016).
-  Electron Documentation. — URL: <http://electron.atom.io/docs/> (visited on 09/05/2016).
-  Jasmine. — URL: <https://jasmine.github.io/1.3/introduction.html> (visited on 09/05/2016).
-  Less. — URL: <http://lesscss.org/> (visited on 09/05/2016).
-  HTML, CSS, and JavaScript Tutorials and Reference. — URL: <http://www.w3schools.com/> (visited on 09/05/2016).

Introduction

Definition (Wikipedia)

Cross-platform software: (*multi-platform, platform independent software*) — a computer software that is implemented on multiple computer platforms.

Platforms

- Hardware
- Software: operating system or executable environment
- Development tools: compilers

Examples of cross-platform software

Examples

- Operating systems
- Development tools
- Mobile applications
- Browsers
- Web applications
- Games

Main Approaches to Cross-Platform Development

Approaches

- Degradation of functionality
- Separate code bases
- Single code base: conditional compilation, separation of functionality (Web)
- Third-party libraries
- Interpreting

Development Tools

Compiled Languages

- C++
- Free Pascal
- Java
- C#

Scripting Languages

- JavaScript
- bash
- Ruby
- Python

Execution Environments

- JRE
- CLR/Mono

Libraries

- Qt
- wxWidgets
- GTK+
- FLTK
- OpenGL

IDEs

- Eclipse
- NetBeans
- Qt Creator
- Code::Blocks
- Lazarus IDE

Build Tools

- make
- CMake