Using JavaFX in the First OO Programming Course

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- Course 'Object-Oriented Programming'
- What is JavaFX?
- Java FX characteristics
- JavaFX vs. Swing
- Strategy for incorporation Java FX into OOP course
- Conclusion

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Object-Oriented Programming

- Mandatory course held at the Faculty of Mathematics during the second semester of the second year of undergraduate studies.
- Student should be capable for programming, testing and debugging in Java, from both command line and IDE. She/he should be capable to use objects, classes and inheritance in order to solve problems.
- Classes: 2+2
- ECTS: 5



- Visual applications, i.e. applications with GUI are good examples for explaining and exploring objectoriented approach, from both technological and methodical viewpoint:
 - Students are able to create 'fancy' applications and that make them more interested in further learining.
 - Because of OO approach, they are able to create GUI applications with not-so-much efforts.
 - Graphical controls are almost perfect example of adequate using of OO concepts and paradigms.

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Object-Oriented Programming (3)

- According to curricula, OOP course is performed on Java programming language.
- Traditionally, during Java programming within OOP course, students are encouraged to better acquainted Eclipse IDE.
- In that course, in most cases, GUI is build with RAD (visual) IDE tools – it is not focus on GUI programming, but on OO concepts.
- In previous years, Java GUI programs are written by using Swing classes and objects
 Celipse plugin for Swing visual editing is far form ideal



What is Java FX?

 JavaFX is a set of graphics and media packages that enables developers to design, create, test, debug, and deploy rich client applications that operate consistently across diverse platforms.





What is Java FX? (2)

- JavaFX 2.0 is the next step in the evolution of Java as a rich client platform.
- It is designed to provide a modern Java environment that shortens the development time and eases the deployment of data driven business and enterprise client applications.
- Starting with version 2.0, JavaFX applications are completely developed in Java, which has become ubiquitous with over 9 million developers worldwide.



What is Java FX? (3)

- The JavaFX platform enables application developers to easily create and deploy Rich Internet Applications (RIA) that behave consistently across multiple platforms.
- Built on Java technology, the JavaFX platform provides a rich set of graphics and media API with high performance hardware-accelerated graphics and media engines that simplify the development of data-driven enterprise client applications.
- In other words, JavaFX in Oracle's world is similar to Flash in Adobe's world and to Silverlight in Microsoft's world.



What is Java FX? (4)

 JavaFX roadmap is intended to outline general product direction. It is intended for information purposes only, and may not be incorporated into any contract.





What is Java FX? (5)

- JavaFX development have following goals:
 - Open Source the OpenJFX project was launched in December 2011, with the JavaFX UI Controls source code being contributed initially; the rest of JavaFX is planned to follow.
 - Tighter Integration with Java SE as of Java SE 7 update 6 and JavaFX 2.2, the JavaFX Runtime libraries have become part of Oracle's Java SE implementation.
 - Platform Support Oracle has made available an Early Access release of JDK 8 (with JavaFX) for Linux/ARM, which can be tested on the Raspberry Pi.
 - Advanced Tooling Oracle is continuously improving JavaFX support in NetBeans.



Java FX characteristics

Java APIs for JavaFX

- End-to-end Java development
- Java language features—generics, annotations, multithreading
- Reduced static footprint of runtime and applications
- Fluent API design for UI construction
- Development in alternative languages (e.g. JRuby, Groovy) with JavaFX
- Leverage sophisticated Java IDEs, debuggers and profilers
- Java APIs preserve convenient JavaFX Script features (e.g., bind)



Java FX characteristics (2)



- Scriptable, XML-based markup language for defining user interfaces
- Convenient alternative to developing UI programmatically in Java
- Easy to learn and intuitive for developers familiar with web technologies or other markup based UI technologies
- Powerful scripting feature allows embedding scripts within a FXML file. Any JVM scripting language can be used, including JavaScript, Groovy, and Clojure, among others





 Scene Builder is a Visual design tool for JavaFX, which supports FXML code generation and can be easily incorporated into Java IDE.







- New Graphics Pipeline for Modern GPUs
 - New hardware accelerated graphics pipeline (Prism)
 - New windowing toolkit (Glass) for Prism
 - Java2D software pipeline for unsupported graphics hardware
 - High-level support for making rich graphics simple: Shadows, Blurs, Reflections, Effects, 2D and 3D transforms
- Rich Set of UI Controls
 - Over 50 components for form-based UI
 - CSS3+ skinning and layout of UI controls
 - Advanced UI controls: table, tree view, rich text editor



Java FX characteristics (5)

• Web Component

- Embed Web content in JavaFX applications
- O HTML and JavaScript rendering based on Webkit
- DOM access and manipulation from Java
- Browser Plug-in Refreshed for JavaFX 2.0
 - Loading of JavaFX applets based on Prism
 - Preloader for JavaFX applets for improved user experience



Java FX characteristics (6)

Powerful Properties Model

- New collections ObservableList, Sequence and ObservableMap
- New design and implementation of bean properties
- Low level binding API for high performance, low footprint bindings
- High level binding API for simple usage
- Improved Animation Engine
 - Optimized implementation of transitions
 - Complete overhaul of API to simplify usage and in preparation of optimized and more stable implementation





- JavaFX development have following goals:
 - Improvements to UI Controls and Charts JavaFX 8 will introduce new UI controls, including TreeTableView and DatePicker.
 - Enhancements to WebView WebView will add support for additional HTML5 tags, such as WebSocket and Web Storage
 - Printing, Rich Text Support printing support, as well as Rich Text, are features that are expected to be supported in the next major release of JavaFX.
 - O 3D Graphics Support support for 3D graphics is a new feature planned for JavaFX 8, enabling modern forms of data visualization and advanced user experience.



Java FX vs. Swing

- According to Oracle, JavaFX will replace Swing as the new client UI library for Java SE. However, Swing will remain part of the Java SE specification for the foreseeable future, and therefore included in the JRE.
- Oracle recommend developers to leverage JavaFX APIs as much as possible when building new applications. At the same time, it is possible to extend a Swing application with JavaFX, allowing for a smoother transition.



Java FX vs. Swing (2)

- In this moment, JavaFX is modern and mature platform that is well supported by its vendor.
- JavaFX's event model is more clear than Swing's.
- JavaFX uses efficient language constructs (like generics and annotations).
- In JavaFX, GUI design can be clearly separated from underlying code.
- Creating JavaFX application isn't adventure anymore.
- In this moment, JavaFX is well suported (there are many books, tutorials and forums).



Java FX vs. Swing (3)

- SceneBuilder application allows programmer to create sophisticated GUI applications without any previous FXML and XML knowledge.
- JavaFX development is very active, with bugs being fixed quite fast and new features being added very regularly.
- Concerning Integration, JavaFX is now part of the Java SE, it is now available for Windows, OSX and Linux and it offers good integration with Java Webstart.



Incorporation Java FX into course

- Activity for incorporation should be well-planed, well-prepared and carefully carried out and tracked.
- Discussion with colleagues on that issue started one and a half year before change.
- Some parts of the course have to be restructured (e.g. generics and annotations should be described earlier).
- Joint work of teacher and teaching assistants started half year before incorporation.
- There is a lot of work that should be done by assistants and that work should be overseen.





Incorporation Java FX into course (2)

We try to keep 'all the good stuff'.

- During incorporation, special attention should be given to 'old' students, which learned Swing, not JavaFX.
- They should have available plenty of JavaFX assignments and programs they are familiar with, so they can learn by themselves and 'fill the gap'.
- It is not possible to immediately transfer to JavaFX all Swing-based solutions that are accumulated during years and used in teaching within first OOP course.

Bansko, Bulgaria, 2013

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Incorporation Java FX into course (3)

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Incorporation Java FX into course (4)

- Beside assignments and programs, teaching assistants created and maintained tutorials and FAQs for various installation and configuration tasks that requires successful JavaFX programs.
- Those instalation/configuration/programming tutorials are easy to understand and easy to follow.
- For somehow complicated tasks, like configuring interaction between SceneBuilder and Eclipse during JavaFX programming, we used multimedia technologies – we create films that explains how to accomplish such tasks.



Incorporation Java FX into course (5)





Incorporation Java FX into course (6)

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Conclusion

JavaFX is seen by Oracle as replacement for Swing.

- JavaFX is now mature product.
- It is reasonable to replace Swing with JavaFX in OOP course.
- During replacement, all the good stuff should be preserved.
- Replacing Swing with JavaFX in OOP course requires restructuring of whole course.
- Teacher and teaching assistant(s) should put much effort in order to minimize potential problems.





Contact and questions



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Questions?