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JavaFX on Smart Embedded Devices

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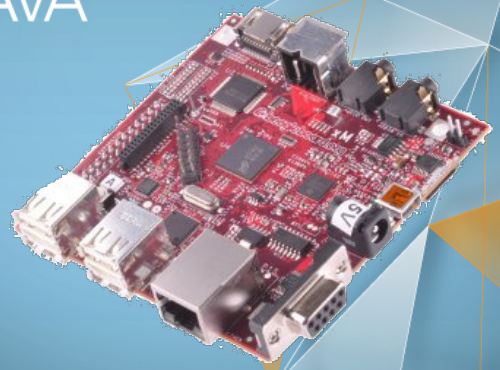
MAKE THE FUTURE JAVA



ORACLE

Program Agenda

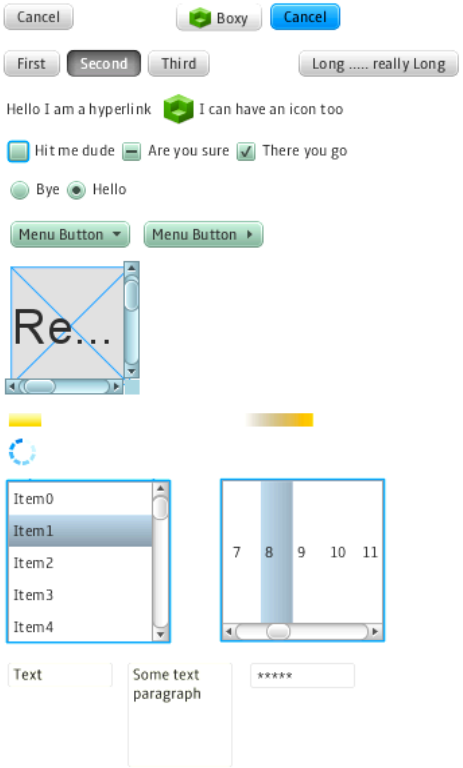
- JavaFX
- JavaFX Embedded
- Targeted Platforms
- Rendering Paths
- Design Considerations
- Demos

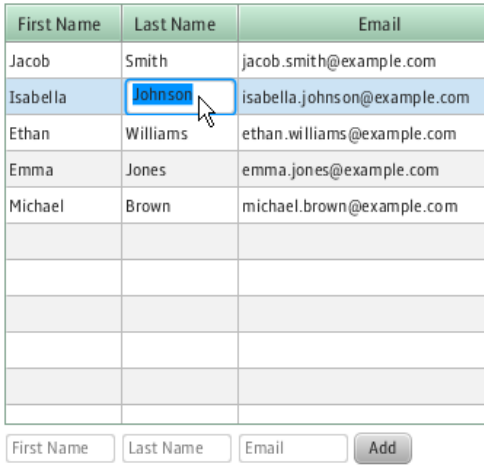
JavaFX

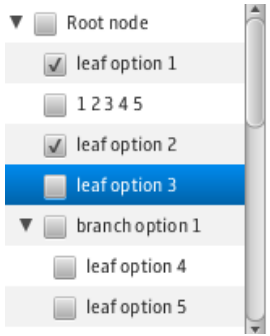
- A rich graphical application framework with built in support for animation, and effects using Java API
- Development tool support
- A graphics engine supporting GPUs
- Full integration with Java SE 7 for desktop

JavaFX

Standard UI Controls

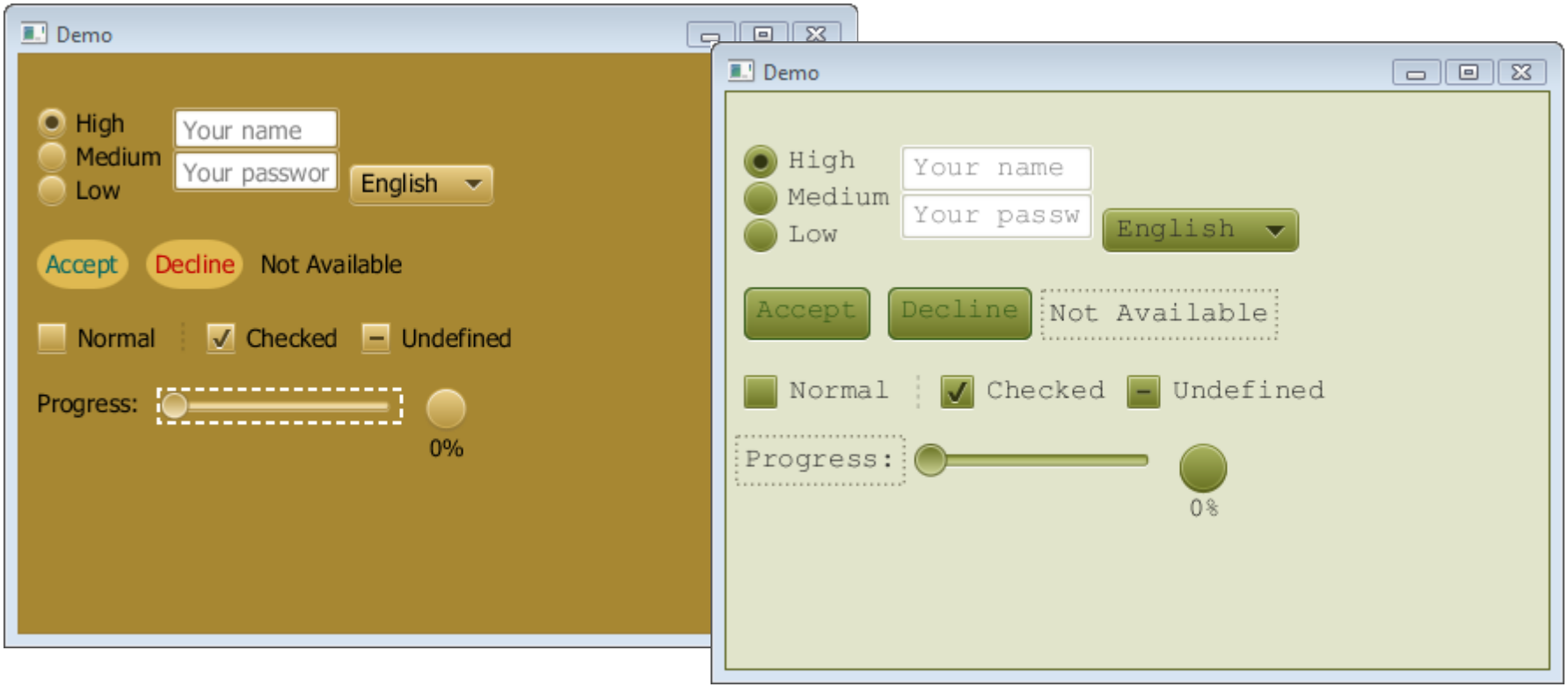






JavaFX

Visually Configurable – Using CSS



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JavaFX Embedded

Markets

- Industrial automation
- Home automation
- Home entertainment systems
- Medical devices
- Automotive
- Retail/Info Kiosks

JavaFX Embedded

What I am not talking about today

- For the purposes of this talk, I am not considering JavaFX Embedded for general purpose tablets or mobile phones

JavaFX Embedded

Features

- A proper subset of JavaFX
- No dependency on AWT/Swing
- Common Java and JavaFX development tools
  - Netbeans
  - Scene Builder
  - To name just a few …

JavaFX Embedded

Rendering

- Hardware accelerated and software only rendering
- Support for platform media decoders

JavaFX Embedded

Input

- Traditional mouse and keyboard
-

JavaFX Embedded

Targeted Footprint

-
  - Java Embedded SE (Compact 1 Profile) ~10MB *
    -

* For more details, check out CON4538: Java Embedded Goes Modular

JavaFX Embedded

Optional Footprint

- Additional footprint for optional features like

  Additional footprint for optional features like

  – Media

JavaFX Embedded

Porting Layer

- Only a small porting layer
  - Window Manager
  - Input (Key, Mouse, Touch)
  - Rendering (EGL/OpenGL ES)
- Most code is common with desktop

JavaFX Embedded

Features Not Planned for SE 8

- System Menu support
- Swing or SWT related nodes
- Drag and Drop support
- WebView (future release)

JavaFX Embedded

Availability

- JavaFX Embedded Developer Preview for ARM
  - http://jdk7.java.net/fxarmpreview/index.html
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- Integrated with Java SE Embedded 8 release

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Targeted Platform

Overview

- Linux 3.x
- ARM
- And depending on the application
  - Integrated EGL/ GLESv2 support
  - Integrated touch support
  - Integrated GStreamer with hardware decoding

Targeted Platform

So many platforms to choose from...

- Many chip vendors, with different GPUs and different features (hard float, etc.)
- Many OS versions and distros
- Many “favorite” development boards

Targeted Platform

And so many EGL drivers

- Issues obtaining good hardware drivers
  - OpenGL ES2 Drivers vary in availability
  - Support for Media drivers
  - Support for Hardware Cursors
- Differing levels of community support

Targeted Platform

And we picked...

- BeagleBoard xM Rev. C1
  - TI DM3730
  - Imagination Technologies PowerVR SGX530
- OpenEmbedded Linux
- Available drivers for OpenGL ES2, Media

Targeted Platform

some of the list we are “monitoring”

- Raspberry Pi
  - Broadcom BCM2835 with VideoCore IV GPU
- Freescale I.MX53
  - Freescale ARM Cortex™-A8 with AMD Z430 GPU
- PandaBoard
  - Dual-core ARM® Cortex™-A9 with SGX540 GPU
- Kontron M2m
  - Intel Atom with GMA 500

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Three rendering paths for Embedded JavaFX

- OpenGL ES2, EGL and Frame buffer
- Software Rendering with DirectFB
- OpenGL ES2, EGL and X11 (future)

Rendering Paths

OpenGL ES2, EGL and Frame buffer

- Direct Frame buffer access
- No X11 or Window Manager overhead
- Preferred by most embedded customers
- Requires native driver support
- Fastest, lowest overhead for accelerated rendering

Rendering Paths

OpenGL ES2, EGL and Frame buffer (continued)

- We provide “window management”
- Single JavaFX Application supported with
  - Multiple Stages/Windows
  - Partial or full screen
  - Programmatic reordering, resizing of windows
- Input direct from /dev/input
  - Mouse, Keyboard, Touch

Rendering Paths

Software Rendering with DirectFB

- DirectFB to access the Frame buffer
  - Provides window management
  - Mouse/Keyboard support
- JavaFX software rendering
  - Not based on AWT
- Slower rendering compared to EGL
  - Better suited for simpler control devices

Rendering Paths

OpenGLES2, EGL and X11

- Requires X11 Server and Window manager
  - Input provided by X11 Server
  - Limitations with X11 add to overhead
    - Shaped rendering for rounded windows
- OpenGL ES2 using EGL
- Not planned for the Java SE Embedded 8 release.

Rendering Paths

Media support

- Media uses GStreamer
  - Allows using vender supplied hardware assisted codex

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Design Considerations

My desktop App should just run, right ???

- Yes, it probably will, but will it be usable ?
- Embedded platforms have
  - Slower CPU/GPU
  - Less Memory
  - Likely smaller display
  - Possible Touch screen

Design Considerations

Keep it simple if you can

- Complex Scene graphs will slow rendering
  - Enabling caching can help, but will also take extra memory
- Free up unused resources
  - Time versus memory trade off

Design Considerations

Effects

- JavaFX has a rich set of visual effects
- Effects have different performance costs, mostly depending on platform GPU

Design Considerations

Think Big

- Large images use up precious memory
  - Think about your 12 Megapixel camera !
  - Use JavaFX features to load pre-scaled images

Design Considerations

Think Small

- Smaller screens often need
  - Larger text
  - Bigger overall controls

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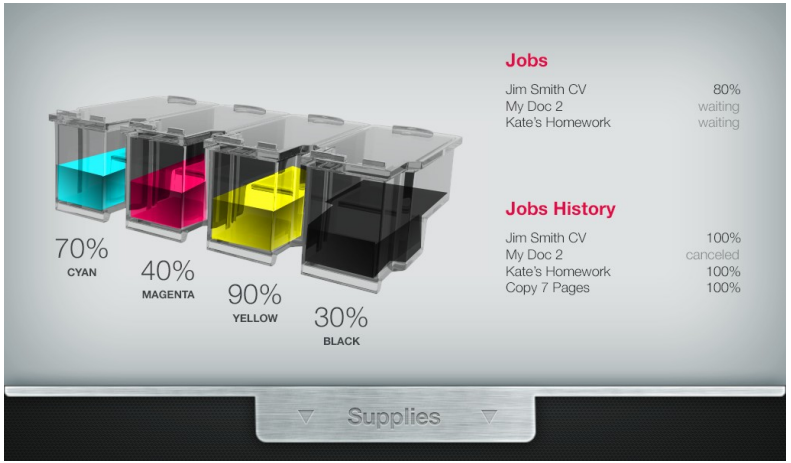
Demo

JavaOne Scheduler

Demo

Printer Interface



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