Praktikum Entwicklung von Mediensystemen (Android)

Sommersemester 2014

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Today

- Organization
- Android 101
- Hands-On
- Assignment 01
Organization

• Android!
• 6 ECTS
• Bachelor: Vertiefendes Thema
• Master: Gruppenpraktikum
• Thursday, 14-16h, Amalienstr. 73a, 106
• eumes@cip.ifi.lmu.de
• http://www.medien.ifi.lmu.de/lehre/ss14/pem/
• Hand in assignments via Uniworx
Roadmap

• April, May: Lectures
  – Individual assignments

• May, June, July: App development in teams
  – Groups of 4 (tbc)
  – 4 Milestone presentations (everyone is up once)

• July: Final presentation and showcase

• Next lectures: 24.04. and 08.05.
ANDROID 101
Android in a Nutshell

• AOSP maintaining code, open source
• Linux subsystem
• Specialized Java VM (Dalvik and ART)
• Currently version 4.4 (KitKat)

• Google adds additional services
  – Google Play Store
  – Google Apps (Mail, Chrome, Maps, …)
Lots of Cool Features

• Multiple sensors
  – Accelerometer, gyroscope, magnetometer,

• Communication interfaces
  – NFC, Bluetooth LE, Wifi, cellular

• GPS and cell location

• Cameras

• High definition displays

• Hardware keys and virtual controls
Programming Languages

• Mainly: Java (converted to Dalvik bytecode)
  – Baseline 1.6, some features of 1.7+
  – Limited namespace from classic JDK
  – Additional namespaces for new features

• Resources: XML
  – Layouts
  – Resource files (localizations, settings)

• NDK for native C/C++ programming
Limitations and Things to Consider

System Resources

• Apps compete for the “main” display
• Could be paused/terminated at all time
• Can be interrupted by various events
  – Phone call
  – App switch
  – …
• Limited number of resources available
Network Connectivity

- Changing network availability
- Flaky connectivity and unpredictable bandwidth

- Plan accordingly
  - Keep the in/out data small
  - Cache static data
- Network requests must be executed on separate threads (i.e. not on main thread)
Limitations and Things to Consider

Device Fragmentation

• Multitude of different device configurations out in the wild
  – Screen size and resolution
  – Features and sensors
  – ...
• No standard configuration that can be targeted
• Low adaptation rate of new Android versions (if available at all)
Version Distribution

<table>
<thead>
<tr>
<th>Version</th>
<th>Codename</th>
<th>API</th>
<th>Distribution</th>
</tr>
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<tbody>
<tr>
<td>2.2</td>
<td>Froyo</td>
<td>8</td>
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<tr>
<td>2.3.3 - 2.3.7</td>
<td>Gingerbread</td>
<td>10</td>
<td>17.8%</td>
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<tr>
<td>3.2</td>
<td>Honeycomb</td>
<td>13</td>
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<tr>
<td>4.0.3 - 4.0.4</td>
<td>Ice Cream Sandwich</td>
<td>15</td>
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<tr>
<td>4.1.x</td>
<td>Jelly Bean</td>
<td>16</td>
<td>34.4%</td>
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<tr>
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</table>

Data collected during a 7-day period ending on April 1, 2014. Any versions with less than 0.1% distribution are not shown.

http://developer.android.com/about/dashboards/index.html
Developer Tools

Android Studio (IntelliJ)
Developer Tools

Android Developer Tools (Eclipse)
SDK and Emulator

Emulator images for almost all Android versions

Intel provides x86 images that vastly increase performance (install via SDK Manager)
Project Structure

/src
Source files within respective packages
/res
Resources, including layouts, image assets and localizations
/libs
Precompiled libraries (jars) used for the project
/gen
Auto-generated files (changes will be overwritten)
Anatomy of an Android App

Manifest.xml

• General app settings
  – App unique identifier (package)
  – API version targets
• Contains available Activities and Services
• Lists required permissions
• Additional ways to define IntentFilter, BroadcastReceiver and Provider
• Can also be used specify hardware requirements
Anatomy of an Android App

Activities & Services

- Activity is main UI element that is being displayed
- Normally takes up the entire screen
- Specific lifecycle for various states
- New Activities will be stacked on top

- Long running operations should be handled in a Service
- Different runtime behavior, running in background
- Multiple Activities can bind to one service
Layouts & Resources

- UI layouts are defined in special XML files
- All resources automatically have a unique id assigned which are used as a reference throughout the app
- Easy to adapt localization functionality
- Automatic resource selection based on device capabilities
Android Parts

Activity

http://developer.android.com/training/basics/activity-lifecycle/starting.html
Intent & IntentFilter

- Intent is used to indicate desire to perform action
  - Make a call
  - Start an Activity

- IntentFilter automatically registers for Intents that can be handled
  - React to URLs
  - Default startup activity
Design Pattern

ActionBar
Command and control center

NavigationDrawer
Navigation options, overlaying the content area

Content Area
App content

http://developer.android.com/design/get-started/ui-overview.html#app
Design Pattern

ActionBar

App Icon
Customize to make it your own

Action Buttons
The most important actions at your fingertip

View Control
Toggle between different data views

Action Overflow
Infrequently used items are grouped and hidden

http://developer.android.com/design/patterns/actionbar.html
Design Pattern

NavigationView

http://developer.android.com/design/patterns/navigation-drawer.html
ADDITIONAL INFORMATION
Best Practices

• Make it snappy (asynchronous operations)
• Do not block the main thread
• Be aware of orientation changes and how to handle (or disable) them
• If you need a global app context, think about subclassing Application
• Make use of external libraries
  – Http/Rest, Testing, Injection, Eventbus
Assignment 01

- Individual assignment
- Set up development environment
- First steps with Android
- Layouts, Widgets, Interaction, http

- Due in 2 weeks (24.04.)
- Submission via Uniworx
Next Lecture

• Next lecture in 2 weeks (28.04.), 14.00h
• Specific topics you like to learn more about?
  – Sensors
  – Web
  – Maps
  – UI
  – Animations
  – …
Resources

• Android Developers
  – http://developer.android.com/design
  – http://developer.android.com/training

• Google IO Session Recordings
  – https://developers.google.com/events/io/2012

• Google IO Schedule App
  – https://code.google.com/p/iosched