Praktikum Entwicklung von Mediensystemen (Android)

Wintersemester 2014/15

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Today

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

- Android!
- 6 ECTS
- Bachelor: Vertiefendes Thema
- Master: Gruppenpraktikum
- Thursday, 16-18h, Amalienstr. 17, A107
- koestersr@cip.ifi.lmu.de
- http://www.medien.ifi.lmu.de/lehre/ws1415/pem/
- Hand in assignments via Uniworx
Roadmap

• October: Lectures
  – Individual assignments

• November, December, January: App development in teams
  – Groups of 4 (tbc)
  – 4 Milestone presentations (everyone is up once)

• January: Final presentation and showcase

• Next lectures: 16.10. and 30.10.2014
ANDROID 101
Android in a Nutshell

- AOSP (Android Open Source Project) 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>
<td>1.1%</td>
</tr>
<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>
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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>
<td>4.2.x</td>
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<td>17</td>
<td>18.1%</td>
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<td>4.4</td>
<td>KitKat</td>
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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.

Developer Tools

Android Developer Tools (Eclipse)
Developer Tools

Android Studio (IntelliJ)
HANDS-ON
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
ADDITIONAL INFORMATION
Assignment 01

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

• Due next week (16.10.)
• Submission via Uniworx
Next Lecture

• Next lecture next week 16.10.2014
Resources

- Android Developers
  - http://developer.android.com/design
  - http://developer.android.com/training

- Google IO Session Recordings
  - https://developers.google.com/events/io/2012
  - https://developers.google.com/events/io/2013

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