Praktikum Entwicklung von Mediensystemen (Android)

Sommersemester 2014

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media
nformatics
m u n i c h

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

PEM (Android) - SS 2014

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

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)
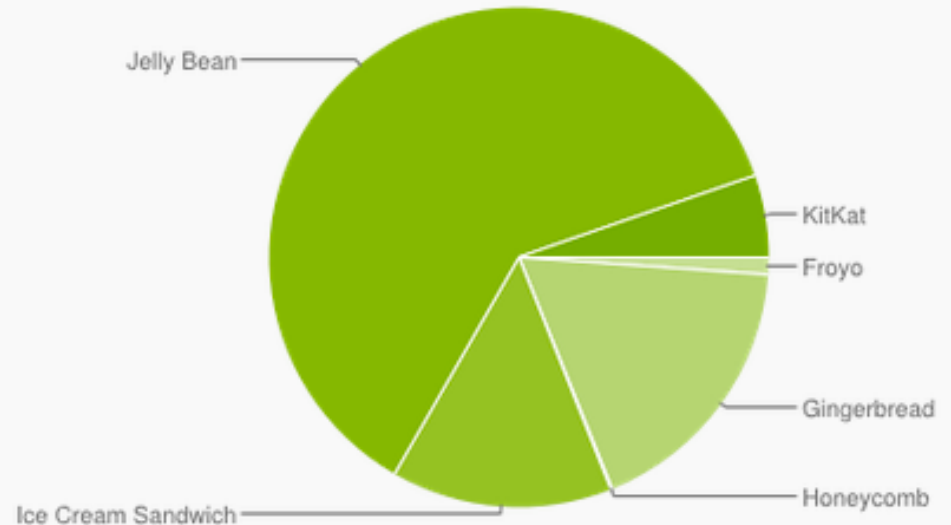
Device Fragmentation

- 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)
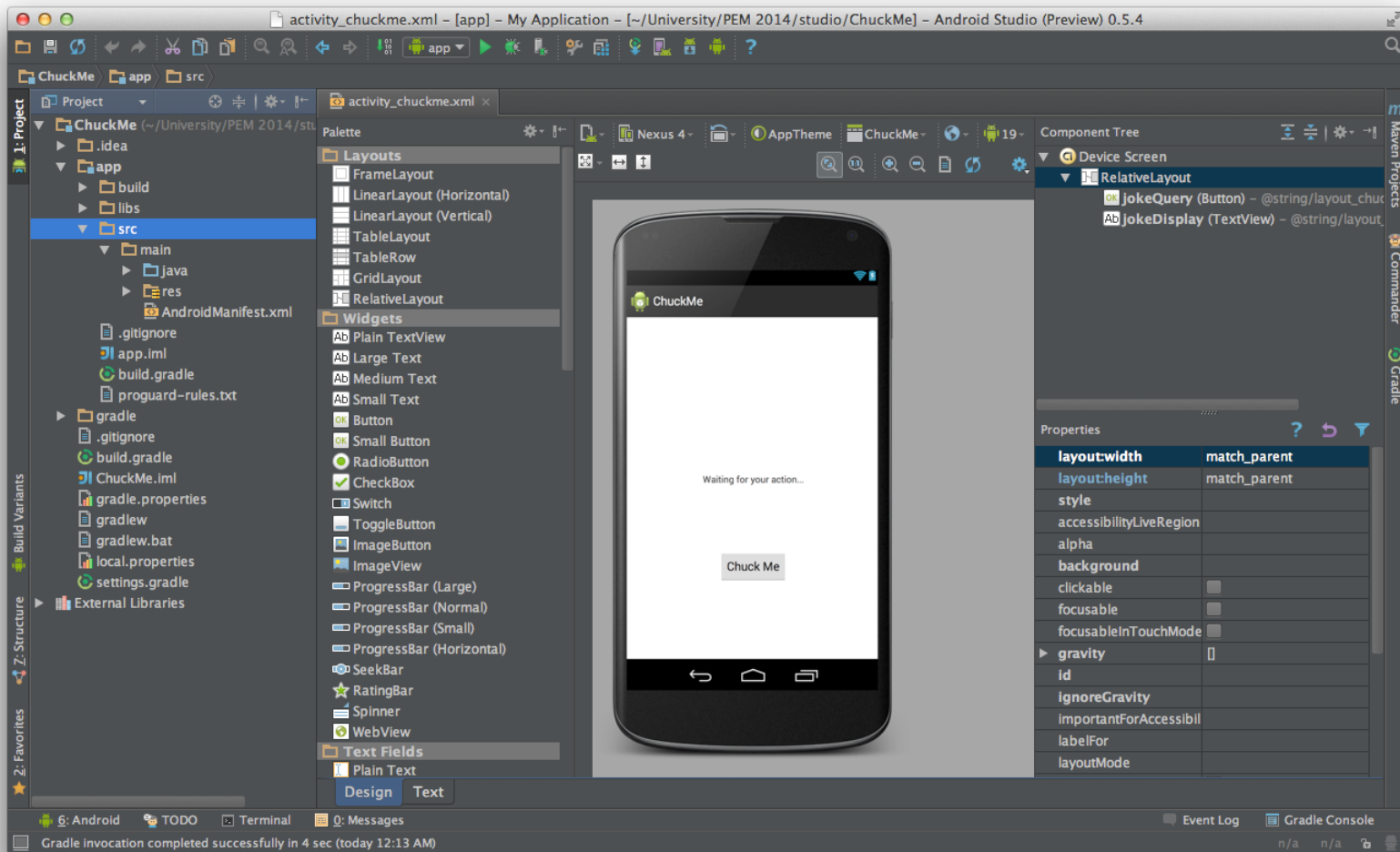
Version Distribution

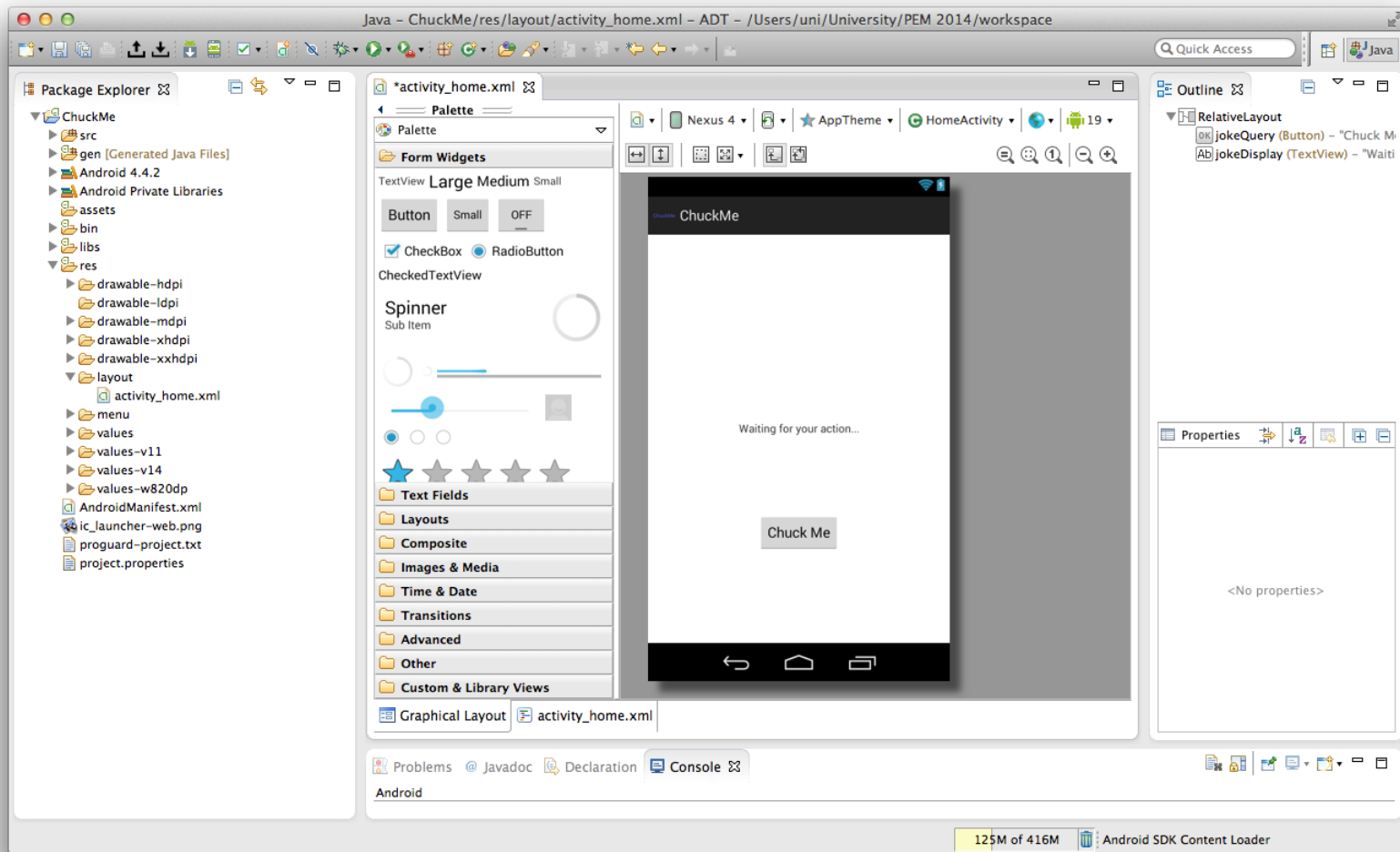| Version	Codename	API	Distribution
2.2	Froyo	8	1.1%
2.3.3 - 2.3.7	Gingerbread	10	17.8%
3.2	Honeycomb	13	0.1%
4.0.3 - 4.0.4	Ice Cream Sandwich	15	14.3%
4.1.x	Jelly Bean	16	34.4%
4.2.x		17	18.1%
4.3		18	8.9%
4.4	KitKat	19	5.3%

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

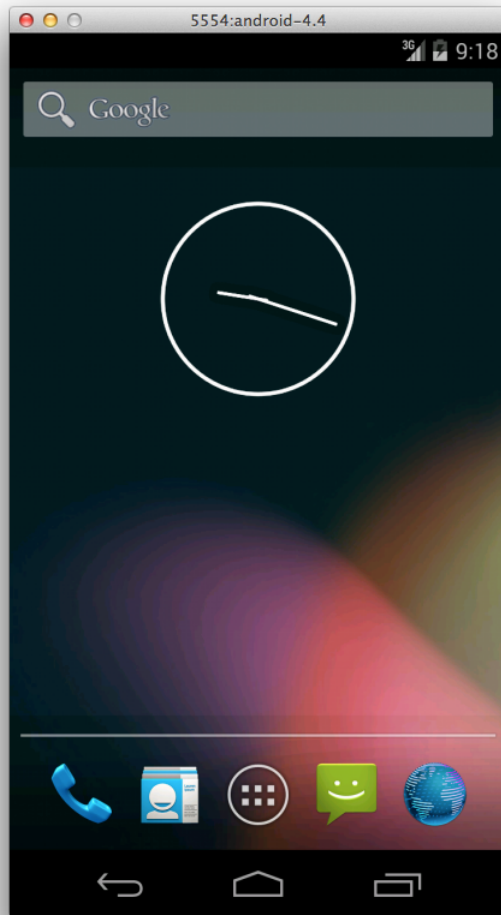*http://developer.android.com/about/dashboards/index.html*

Android Studio (IntelliJ)

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)

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

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

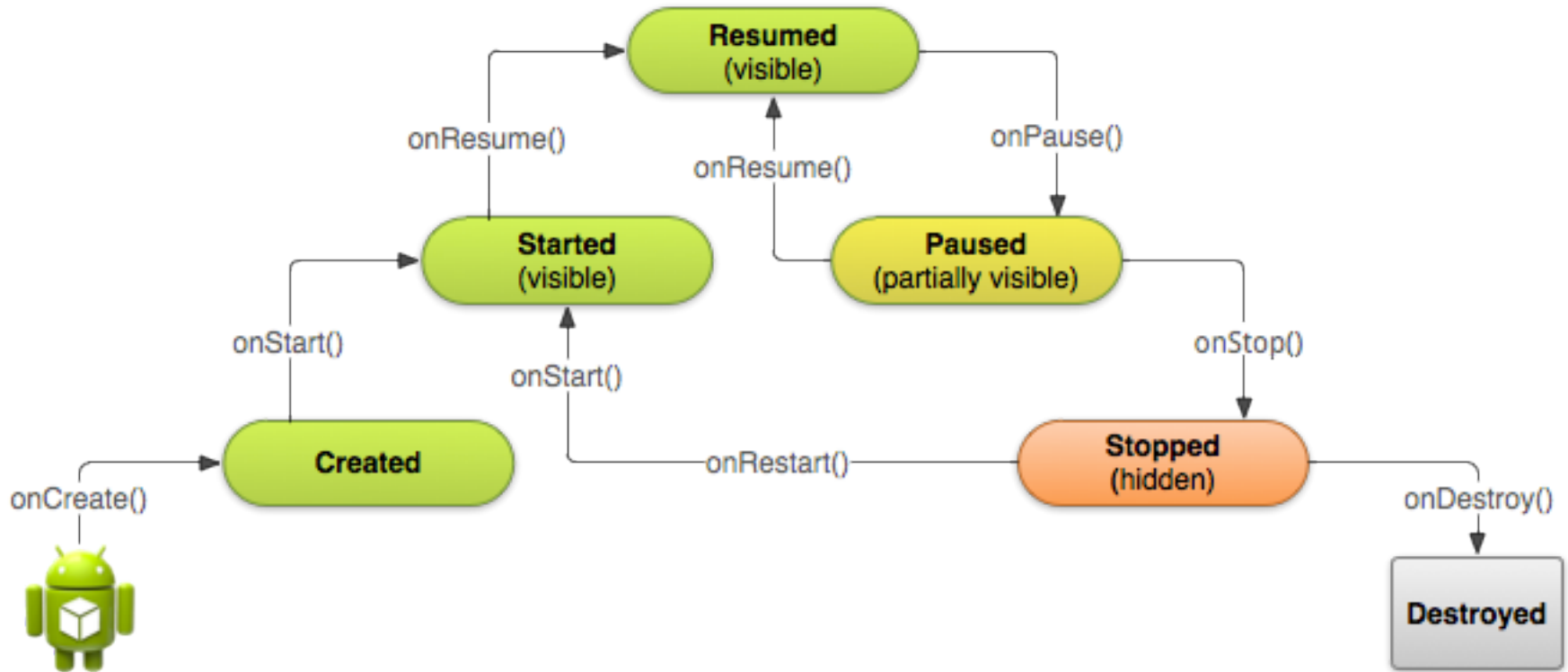- Automatic resource selection based on device capabilities

HANDS-ON

ANDROID PARTS DAILIES

Activitiy

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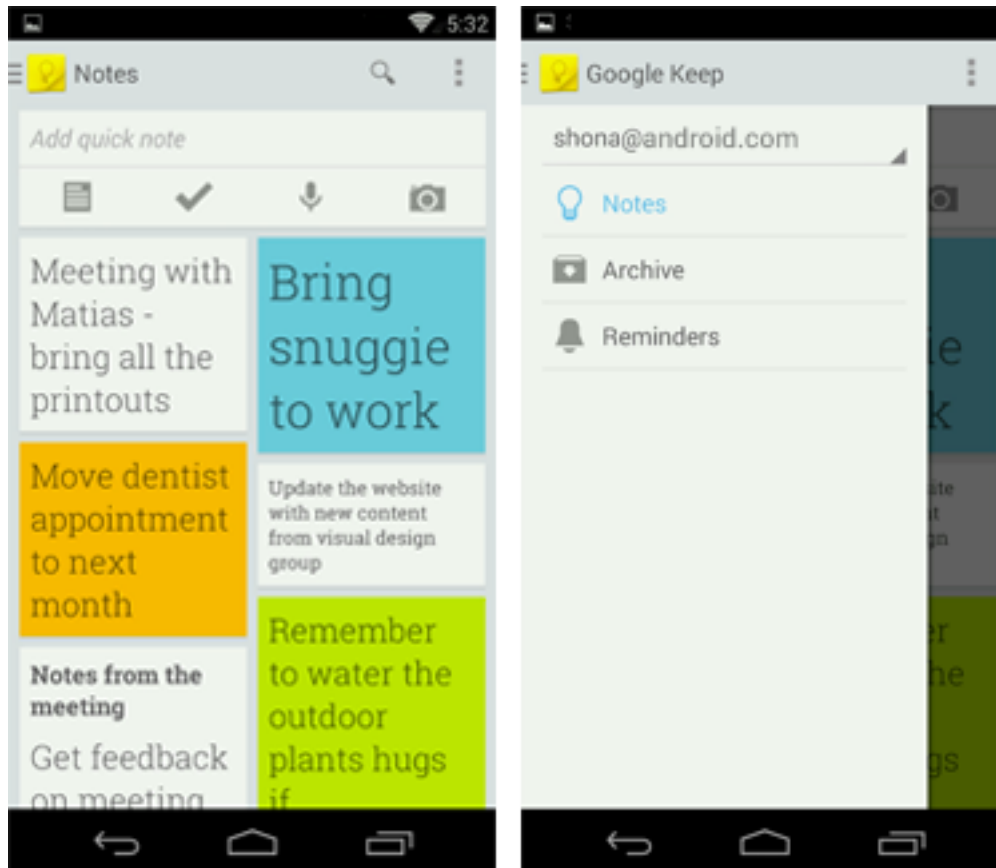
Intent & IntentFilter

- 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

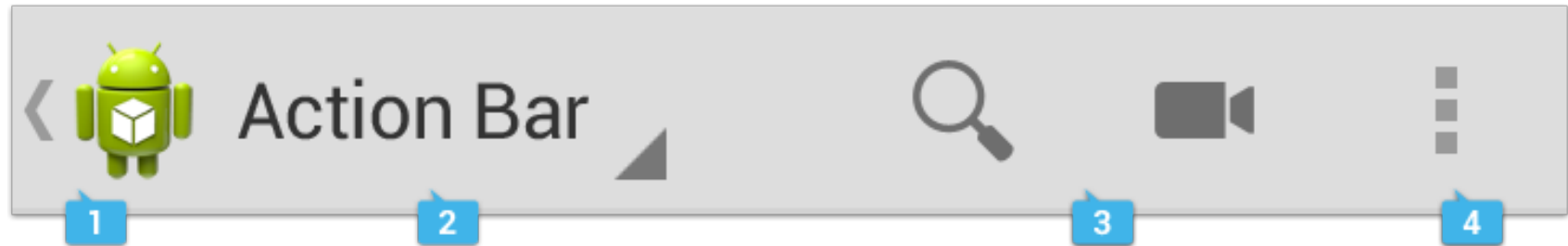ActionBar

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

ActionBar

App Icon

Customize to make it your own

Action Buttons

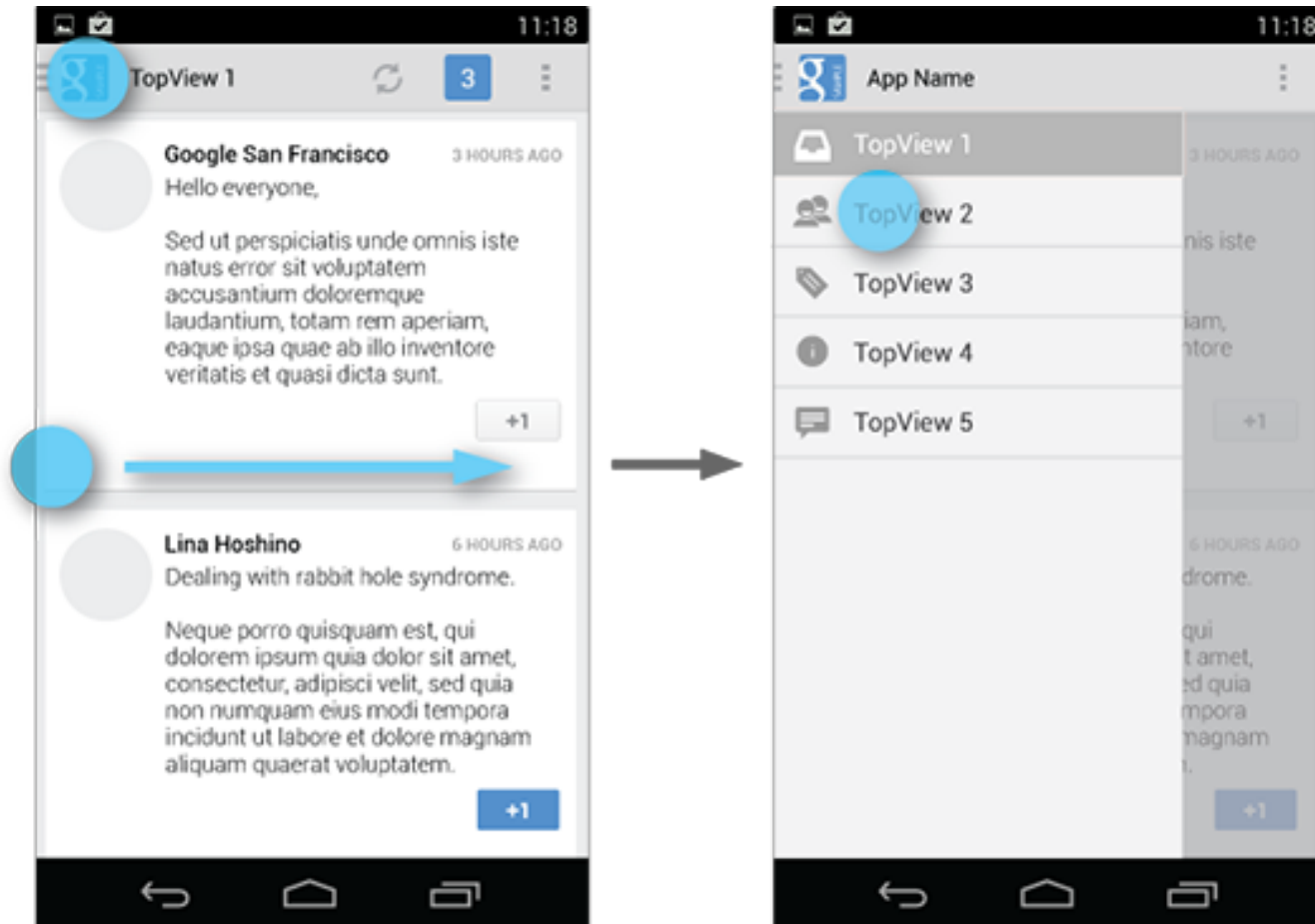The most important actions at your fingertip

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
NavigationDrawer

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
  - http://developer.android.com/guide
- 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