

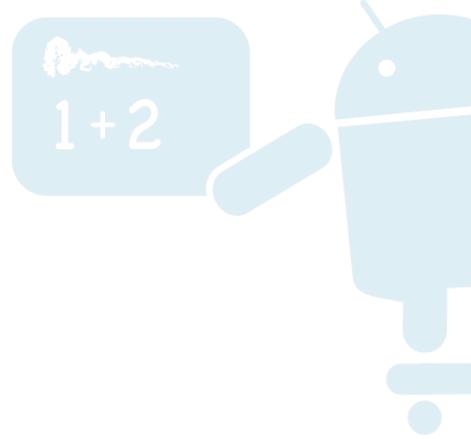


UI Design and Development

+Roman Nurik

+Nick Butcher

Agenda



1. Designing for Android
2. Layouts and resources
3. Tablet considerations
4. System UI integration
5. Wireframing



Designing for Android



d.android.com/design

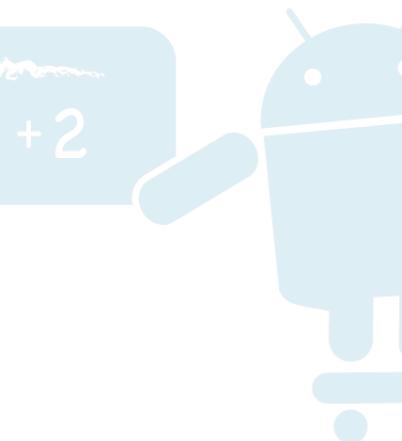
Design for...



- Touch
 - Interact primarily with your fingers
 - Expect direct manipulation
- Mobile
 - Often on the go
 - Often without network connectivity
- Heterogeneity
 - Different screen sizes and densities
 - Different hardware features
 - Different OS versions

Key principles

1 + 2



"Pictures are faster than words."

"Only show what I need when I need it."

"Make the important things fast."

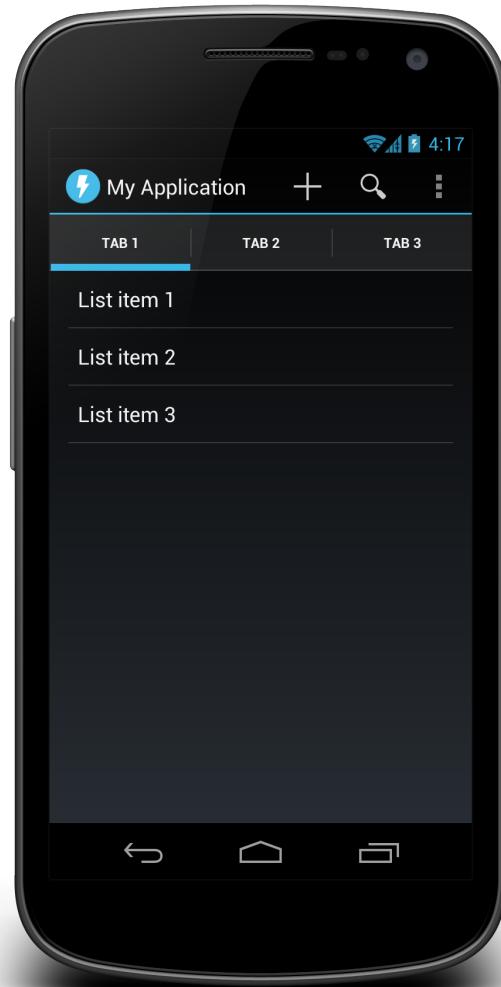
"Do the heavy lifting for me."



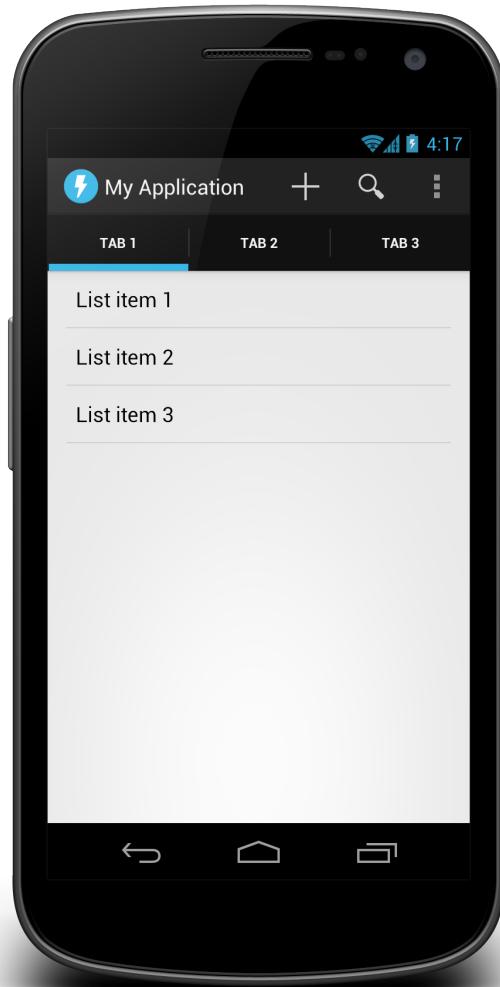
"Holo" visual language



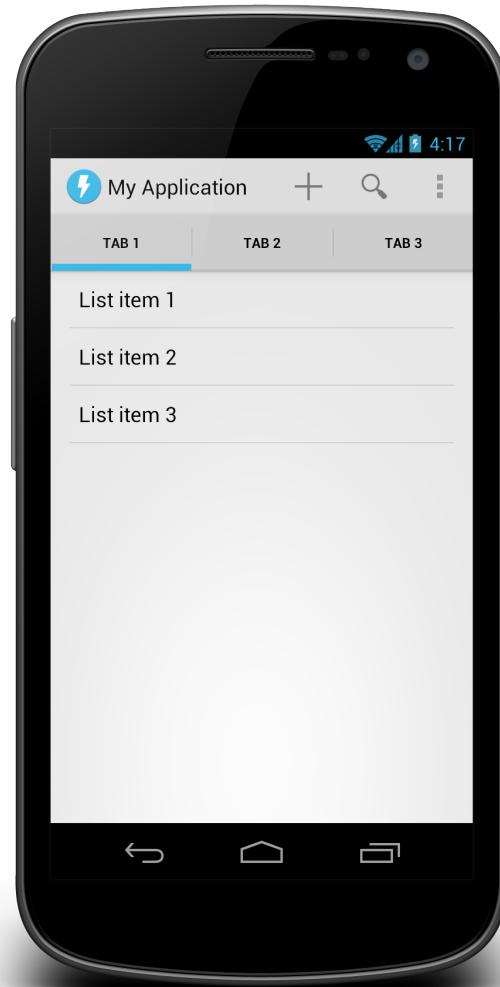
Holo variations



Dark



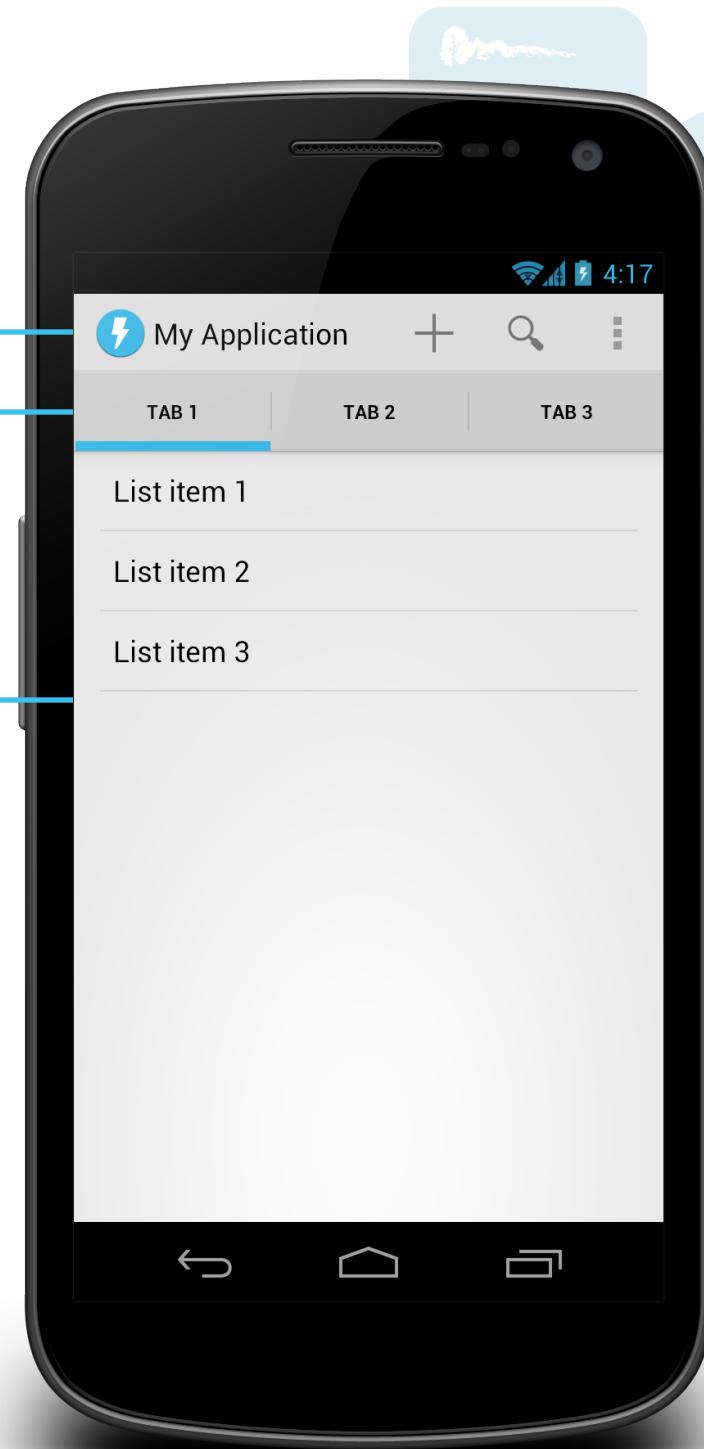
Dark Action Bar



Light

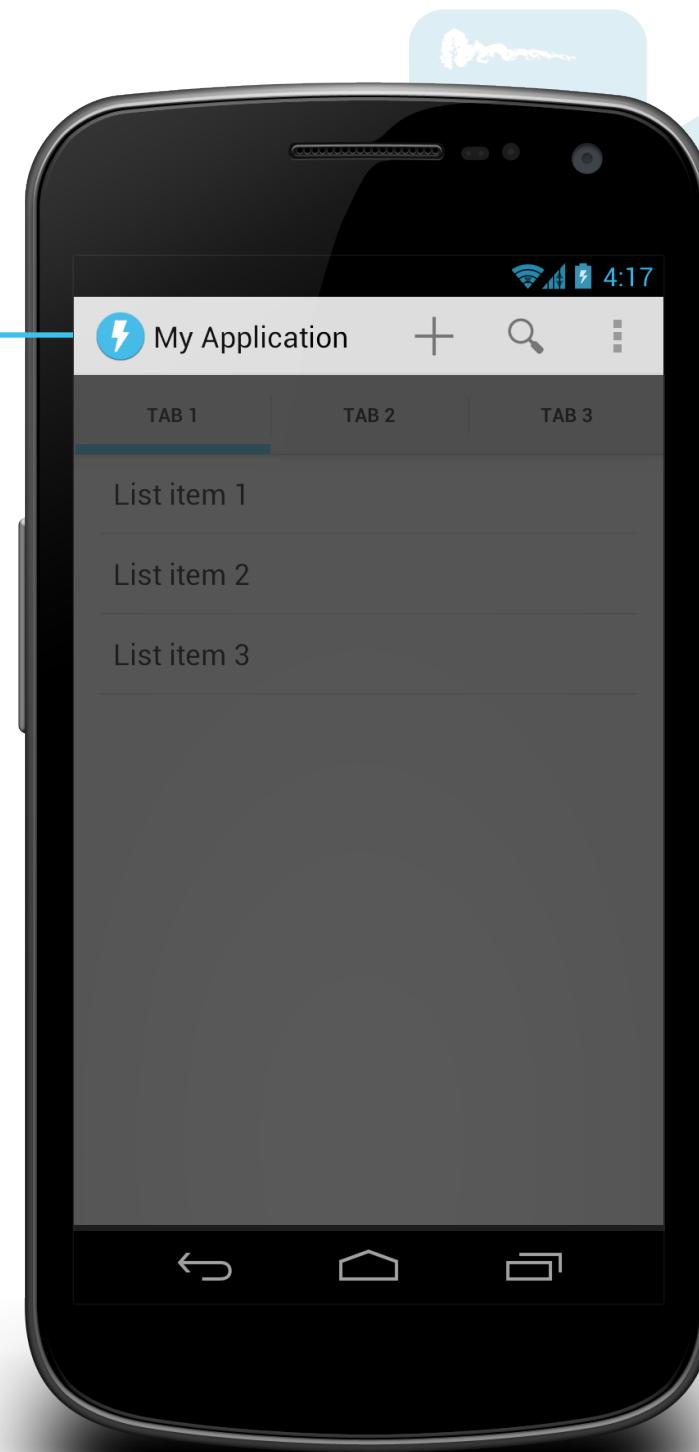
Activity UI structure

Action bar
Tabs
Content
(activity layout)

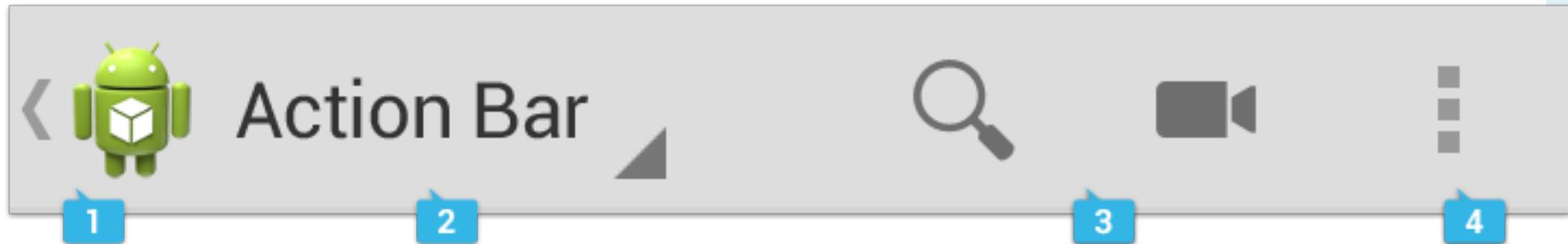


Activity UI structure

Action bar



Action bar



1. App icon and optional Up caret
2. View control (Title/tabs/dropdown)
3. Action buttons
4. Action overflow

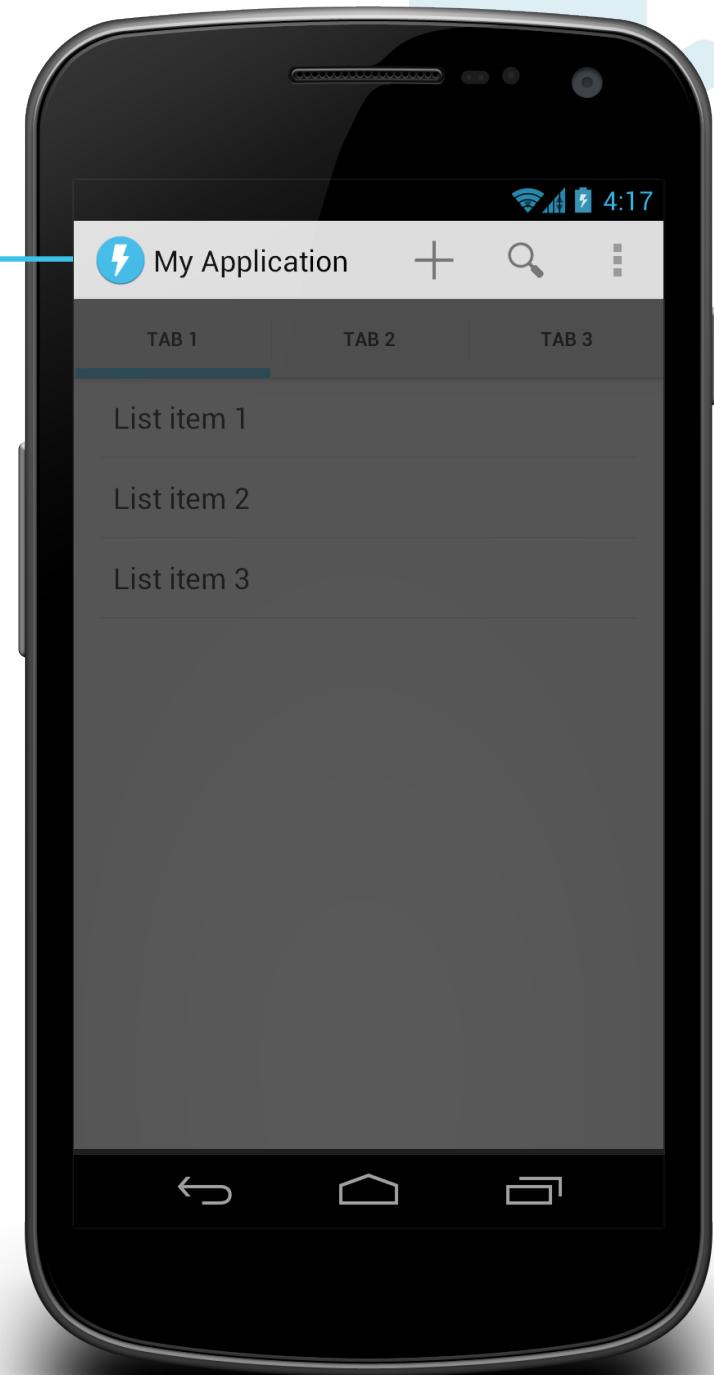
Action bar



- Automatically added to modern apps
- Customizable
 - `getActionBar().setDisplayOptions()`
 - `getActionBar().setNavigationMode()`
- Themeable

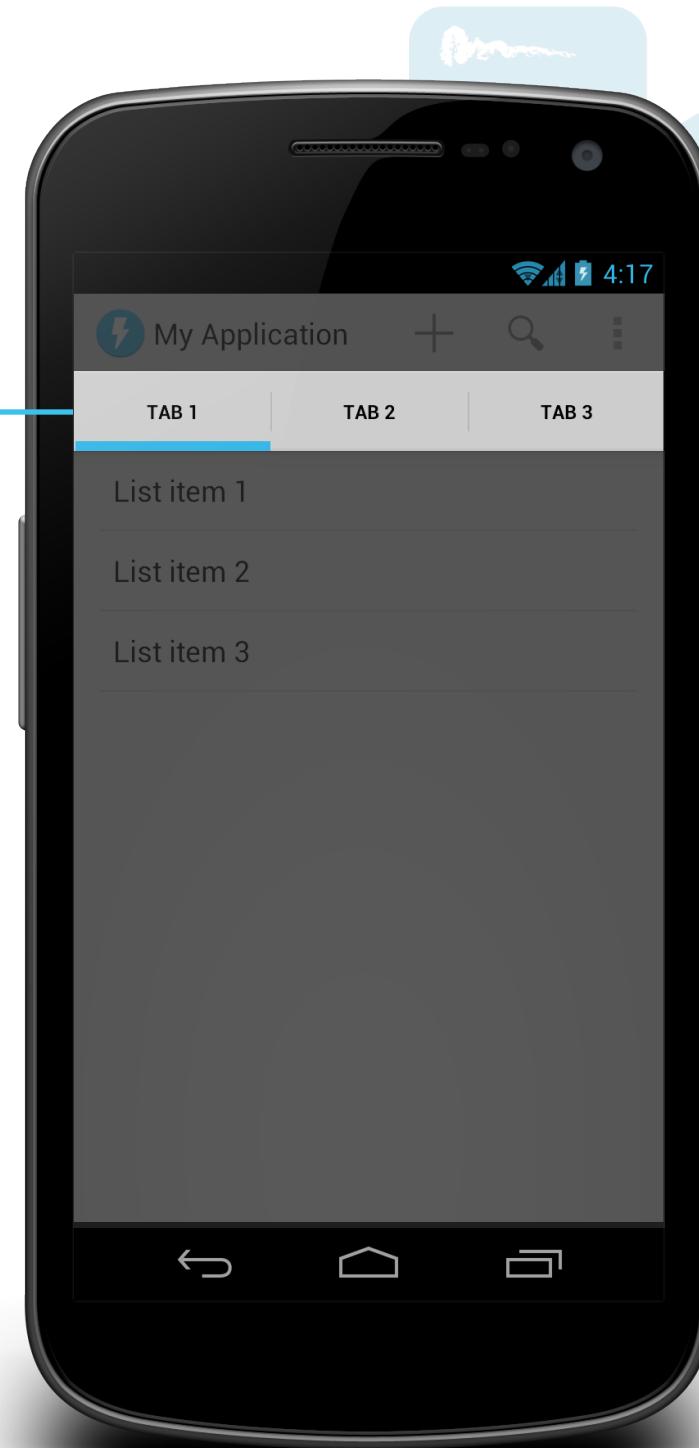
Activity UI structure

Action bar



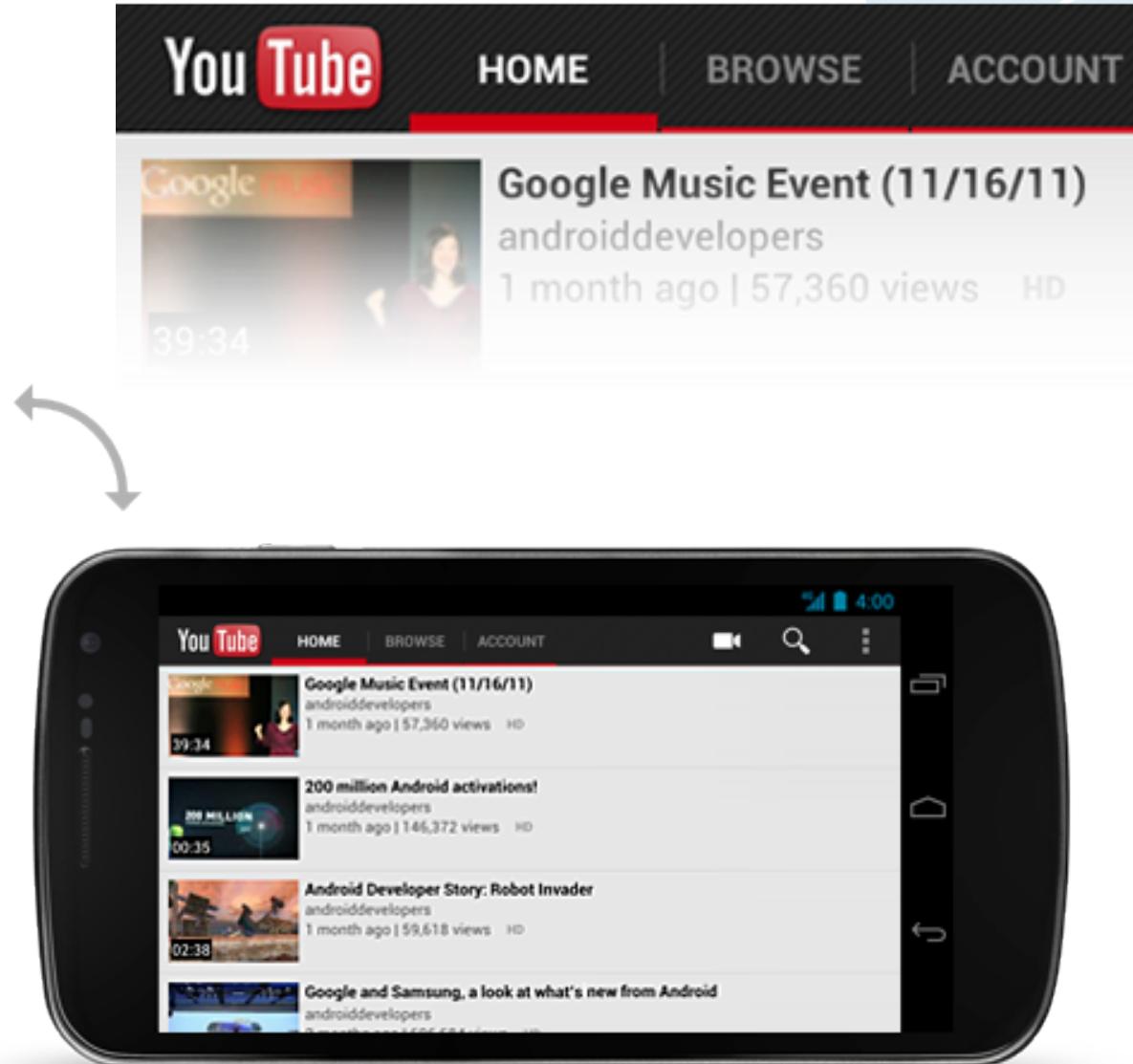
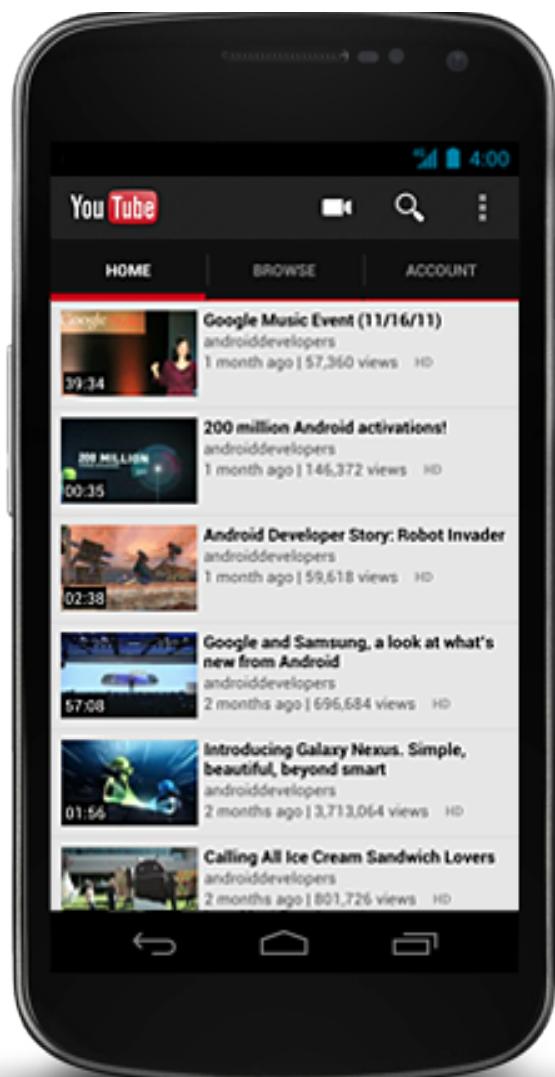
Activity UI structure

Tabs



Tabs

1 + 2



Tabs



- Part of the `ActionBar` APIs
- Usually gesture-enabled using `ViewPager`

```
getActionBar().setNavigationMode(NAVIGATION_MODE_TABS);  
  
ActionBar.Tab tab = actionBar.newTab();  
tab.setText("Tab 1");  
tab.setTabListener(this);  
getActionBar().addTab(tab);
```

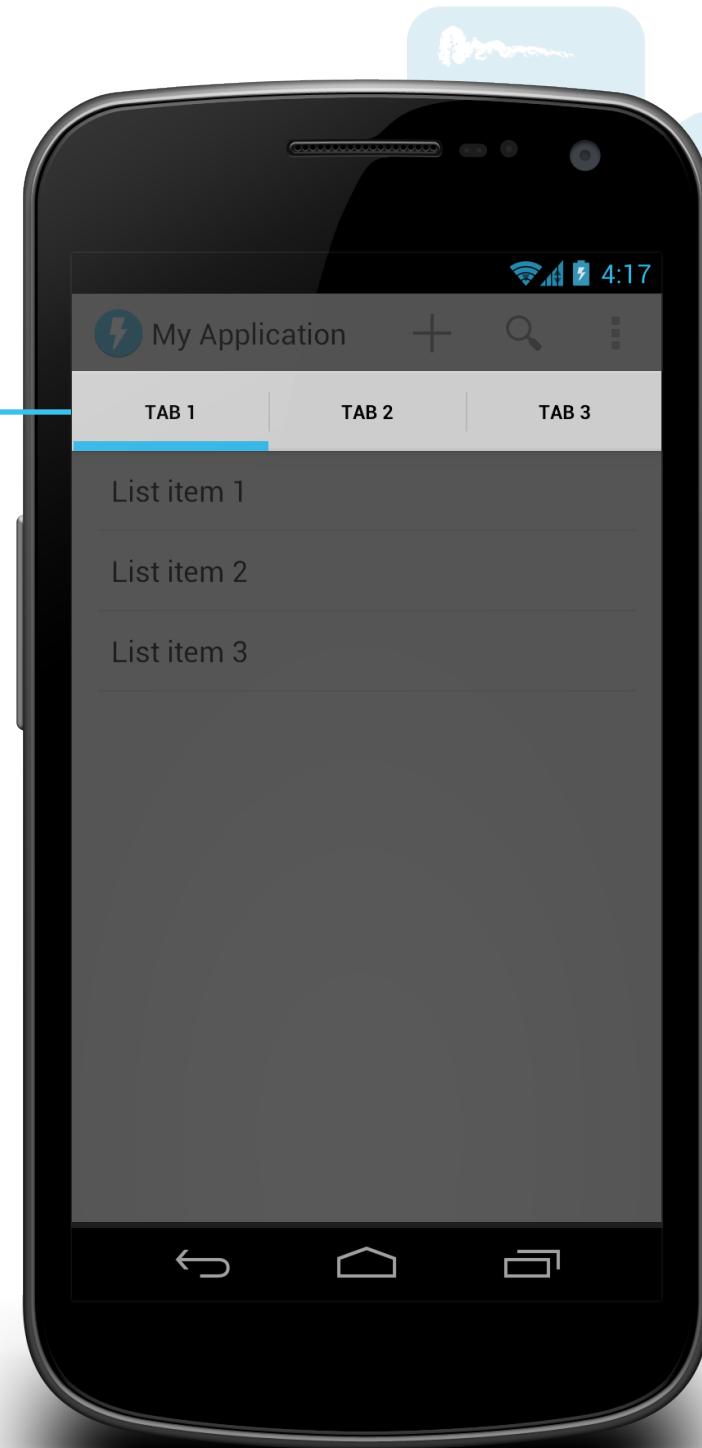


EXERCISE

Create an app with
an action bar + tabs

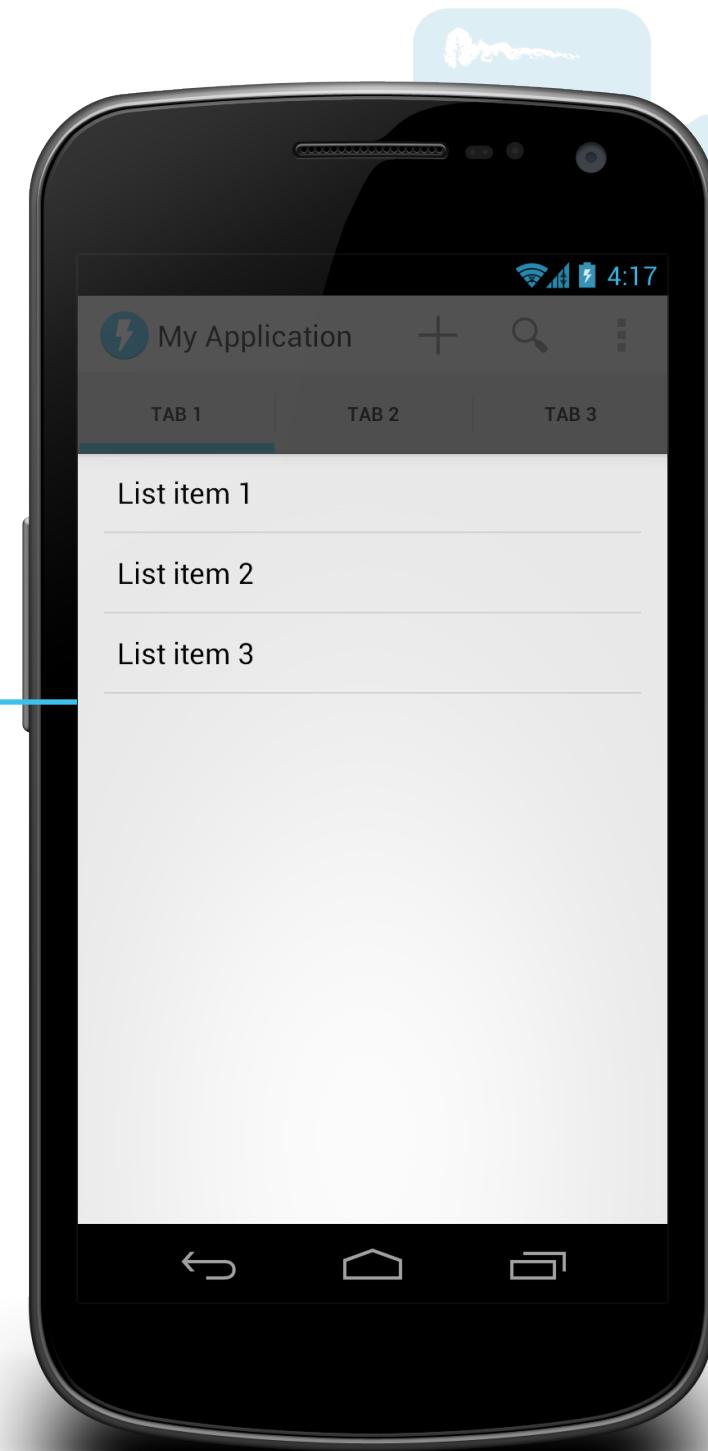
Activity UI structure

Tabs



Activity UI structure

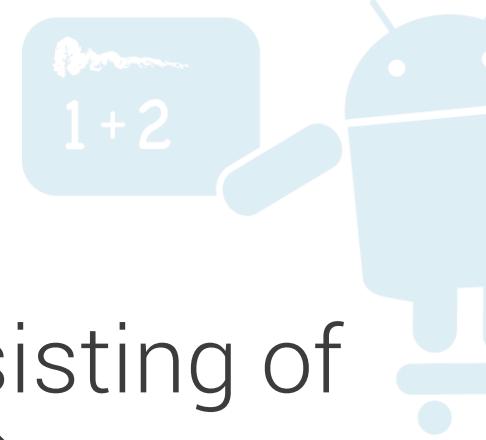
Content
(activity layout)





Layouts and resources

Layout system



- The UI for an activity is a tree consisting of view groups and views (leaf nodes), like HTML.

```
<view group>
    <view group>
        <view>
    <view group>
        <view>
        <view>
```

- Most commonly defined in XML under `res/layout/`.

Views and View Groups



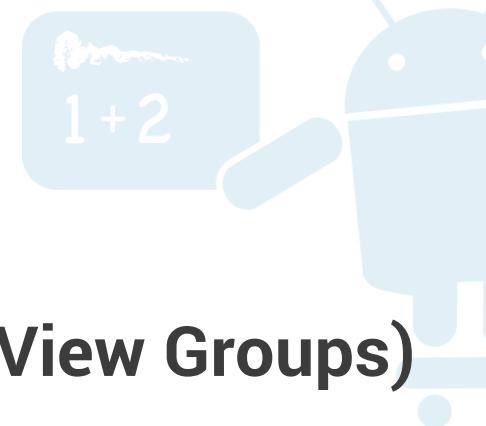
Views

- Reusable individual UI components
- Optionally interactive (clickable/focusable/etc.)
- Bare minimum functionality is to draw themselves

View Groups

- Ordered list of Views and View Groups
- In charge of positioning and sizing their child views and layouts
- Simple layouts and more complex groups (e.g. `ListView`)

Views and View Groups



Views

- TextView
- EditText
- Spinner
- Button
- ImageView
- ImageButton
- WebView
- SurfaceView
- Your own custom views

Layouts (simple View Groups)

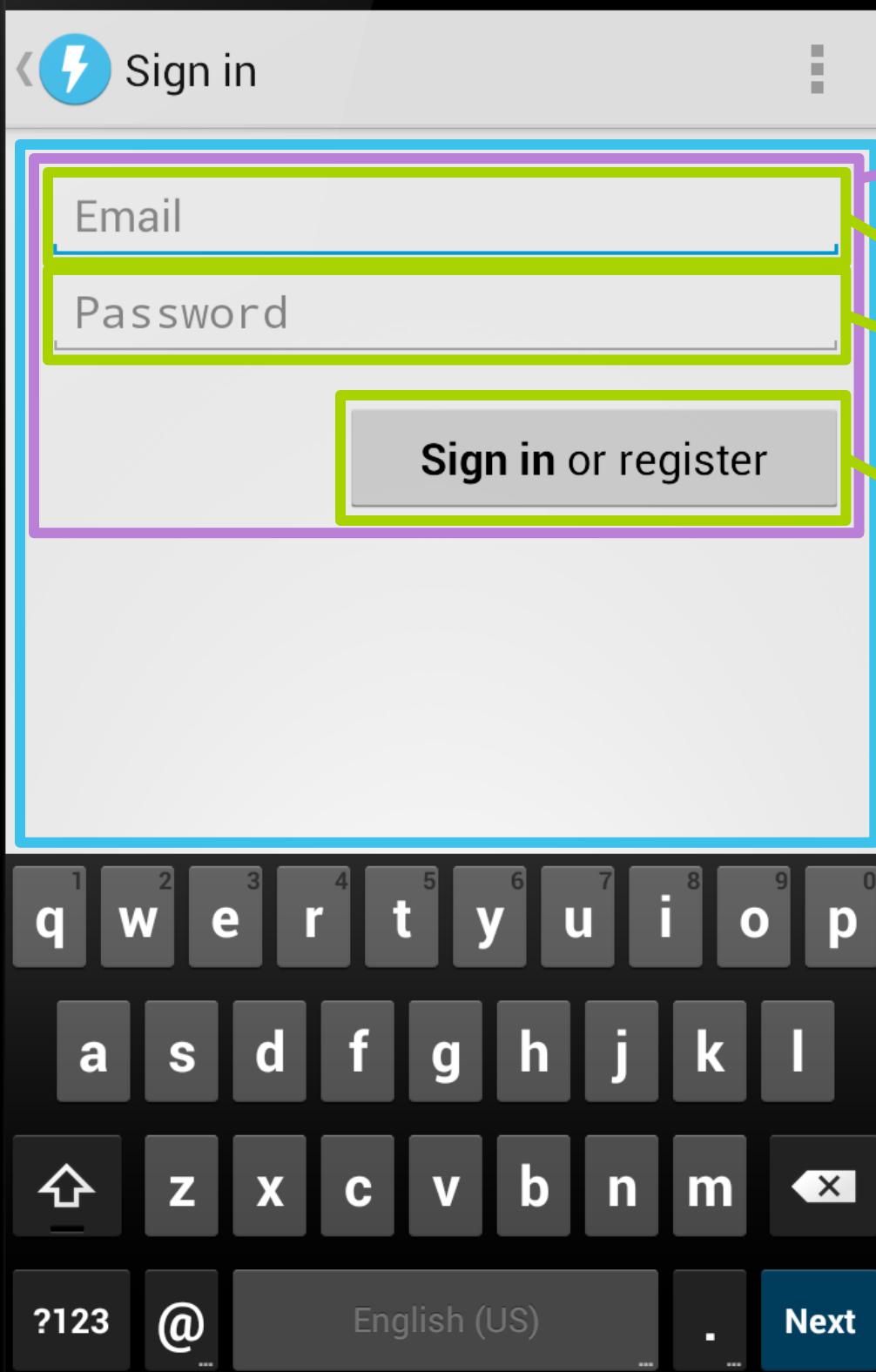
- FrameLayout
- LinearLayout
- RelativeLayout
- GridLayout
- Your own custom layouts

Complex View Groups

- ScrollView
- ListView

Anatomy of a simple layout





<LinearLayout
 orientation="vertical">

<EditText>

<Button>

<ScrollView>

```

<ScrollView
    android:layout_width="match_parent"
    android:layout_height="match_parent">

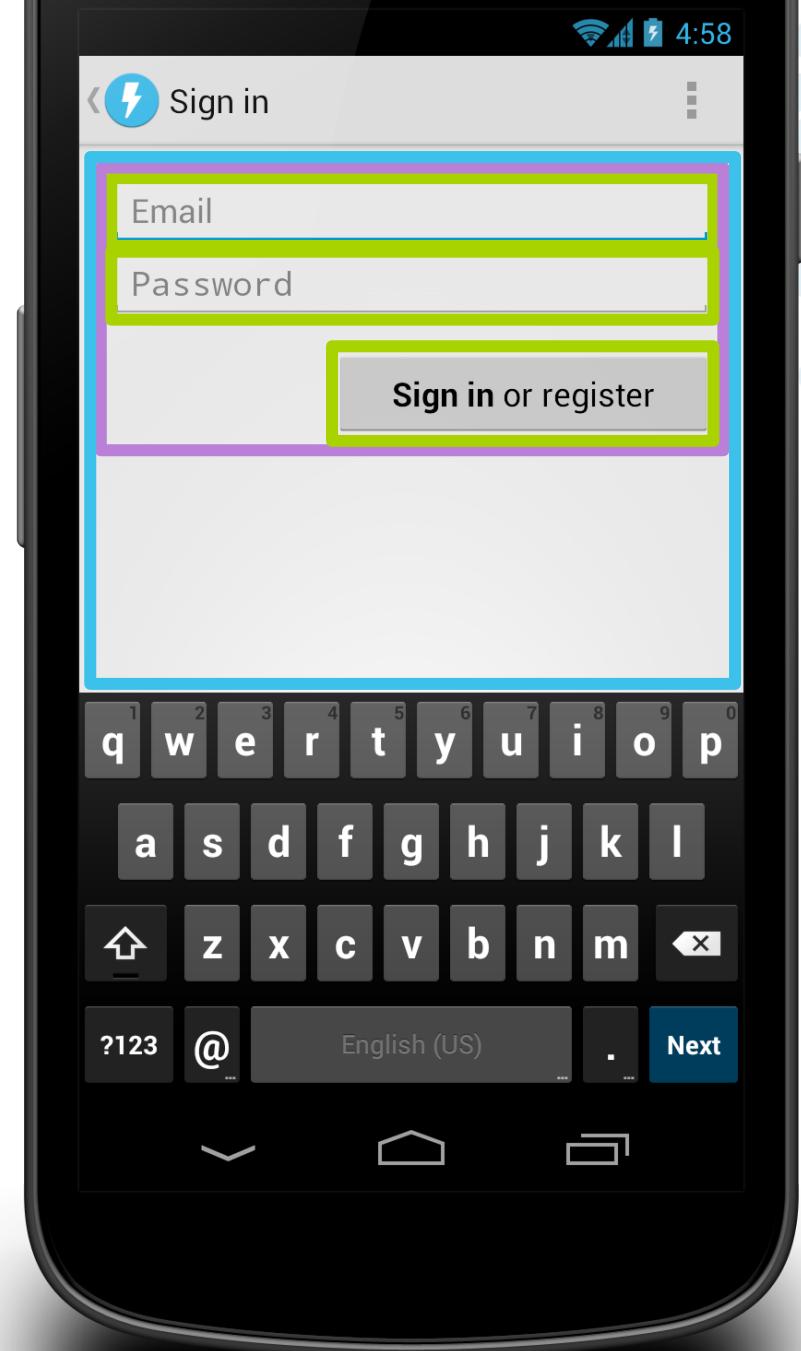
    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:orientation="vertical"
        android:padding="16dp">

        <EditText
            android:id="@+id/email"
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:hint="@string/prompt_email"
            android:inputType="textEmailAddress"
            android:singleLine="true" />

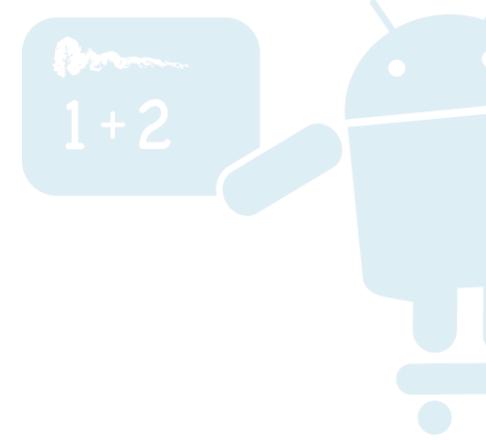
        <EditText
            android:id="@+id/password"
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:hint="@string/prompt_password"
            android:inputType="textPassword"
            android:singleLine="true" />

        <Button
            android:id="@+id/sign_in_button"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_gravity="right"
            android:layout_marginTop="16dp"
            android:paddingLeft="32dp"
            android:paddingRight="32dp"
            android:text="@string/action_sign_in_register" />
    </LinearLayout>
</ScrollView>

```



Important layout attributes



android:layout_weight

- Children of LinearLayout

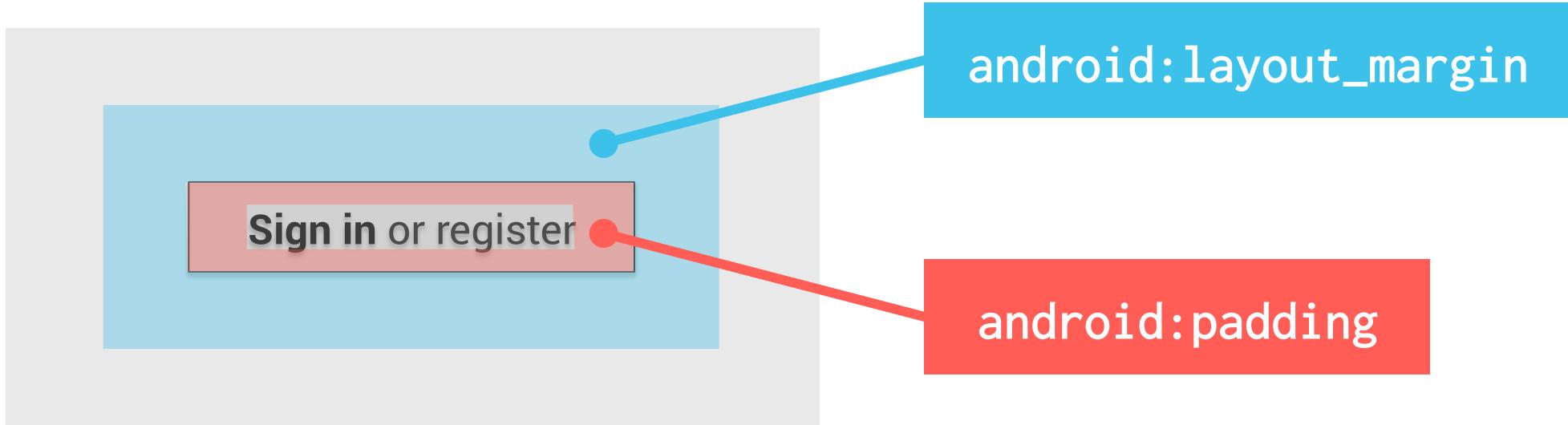
android:layout_gravity

- Children of FrameLayout, LinearLayout

android:gravity

- TextView, LinearLayout

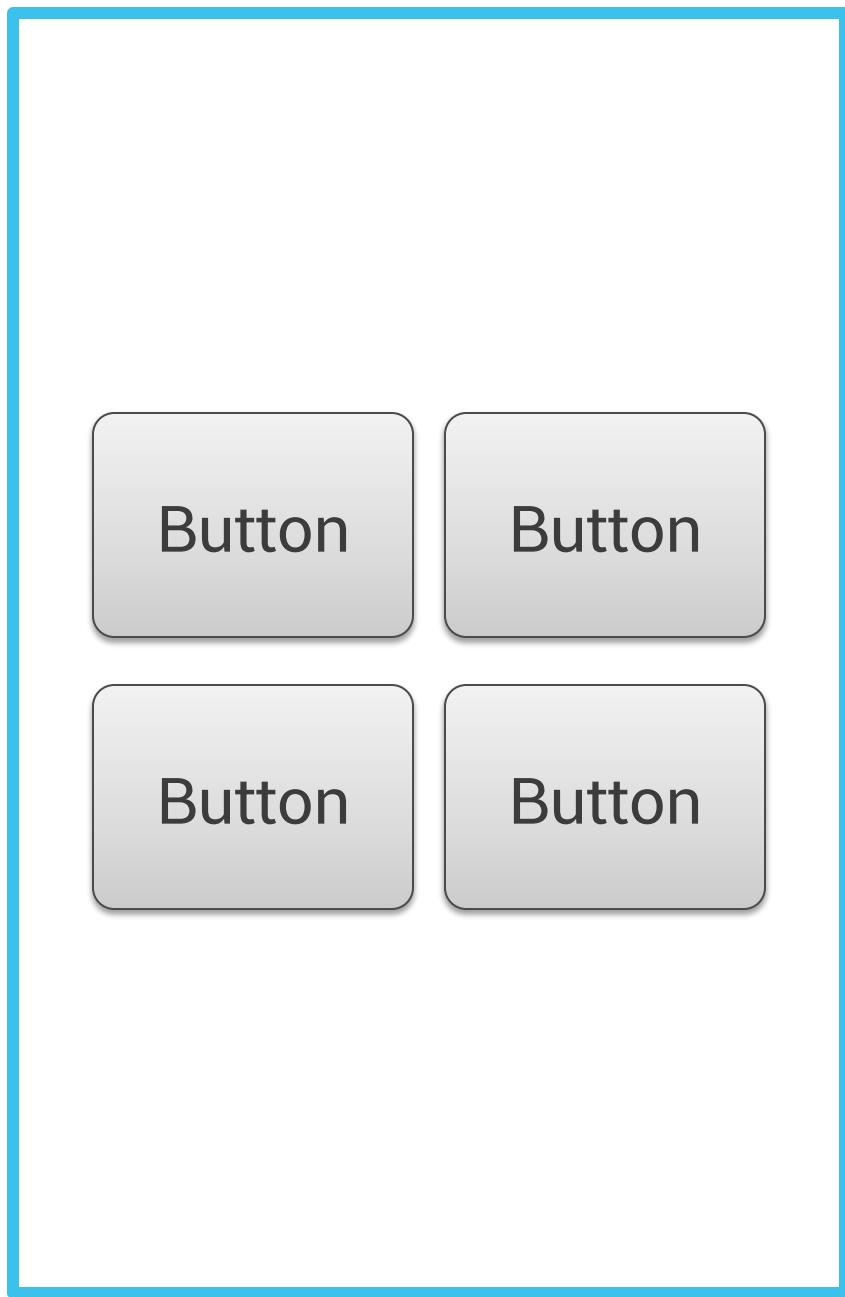
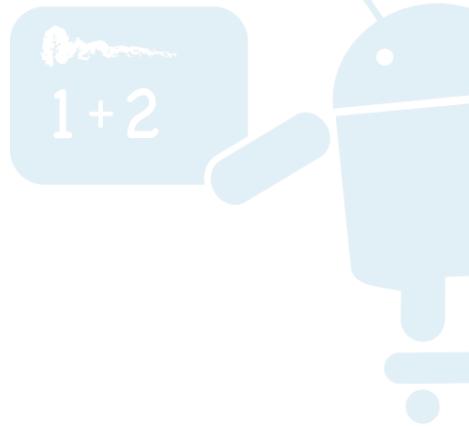
Margins and padding

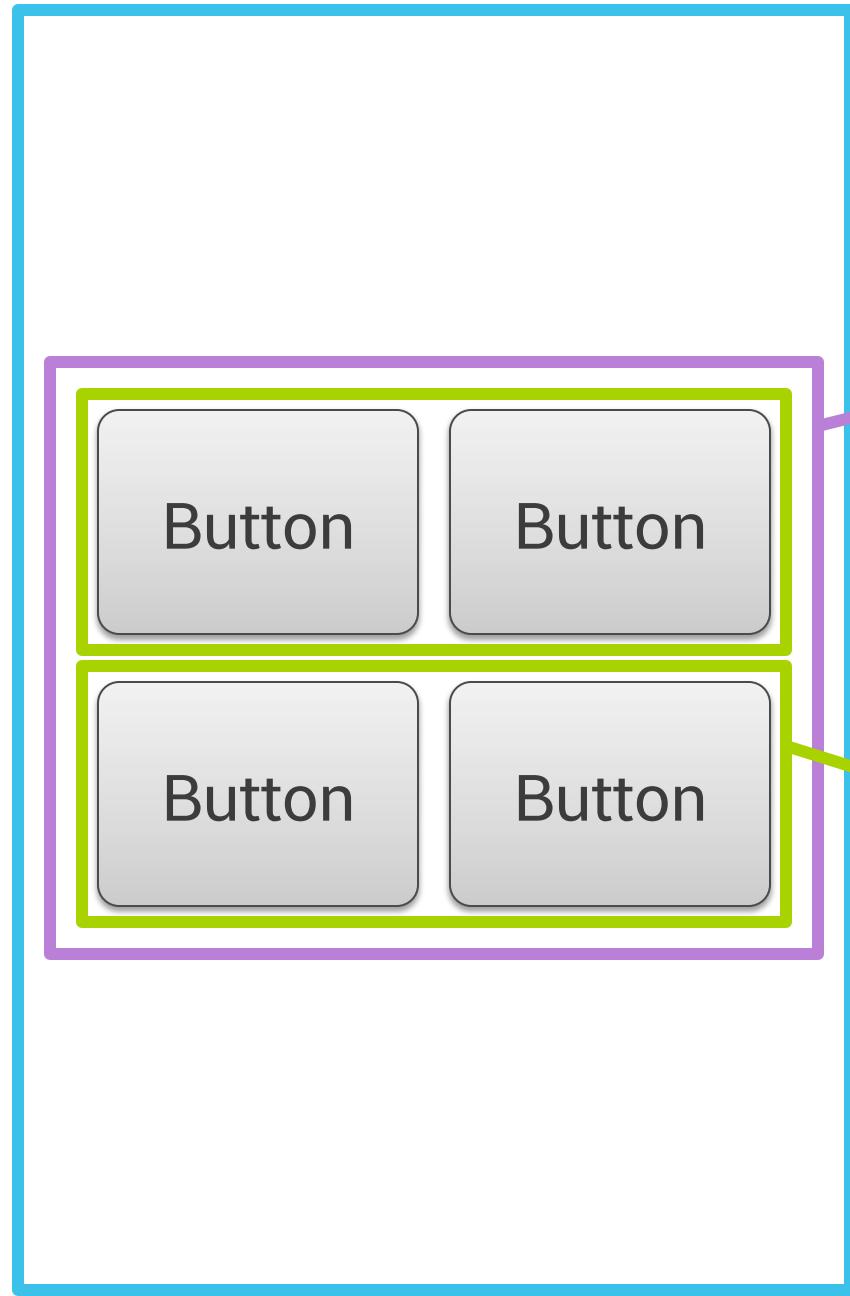




EXERCISE

Code this layout

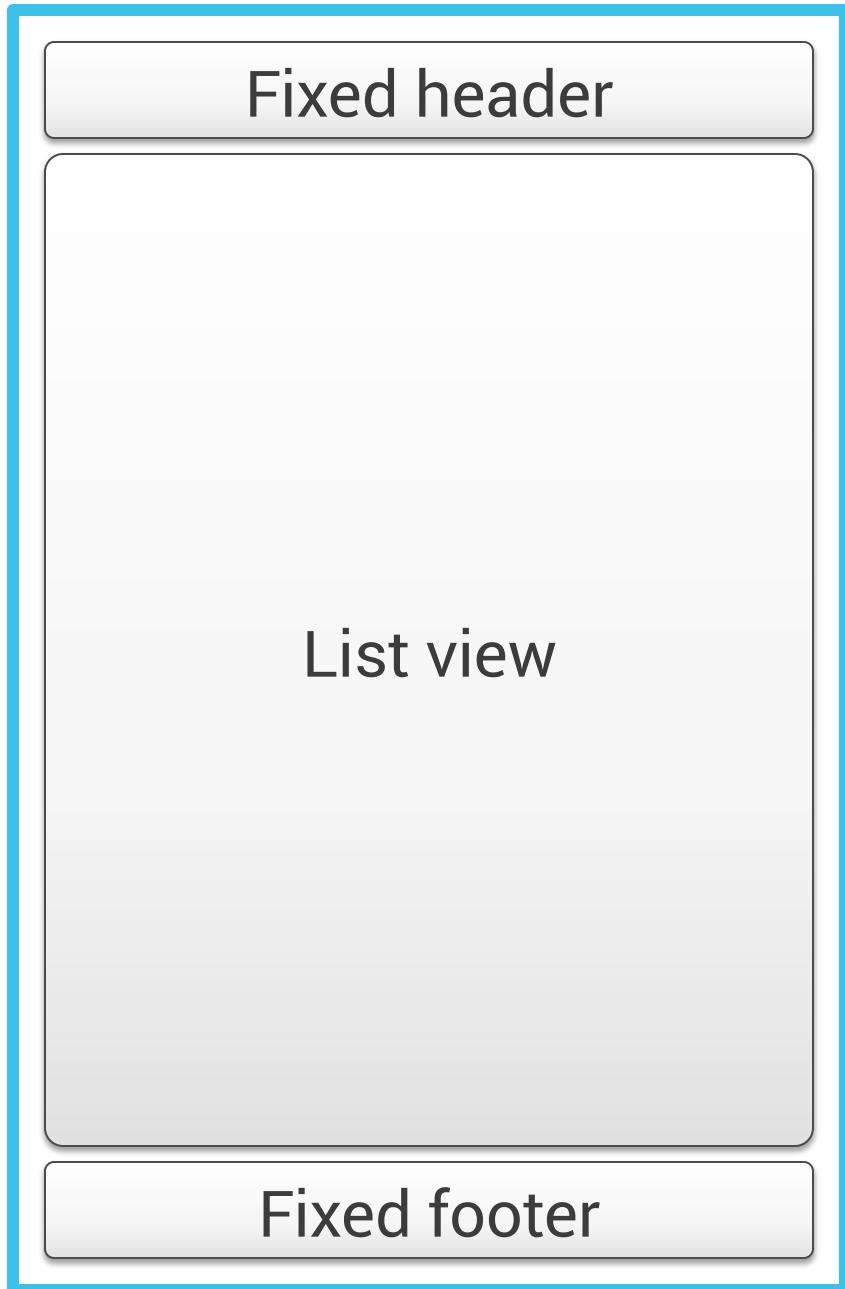


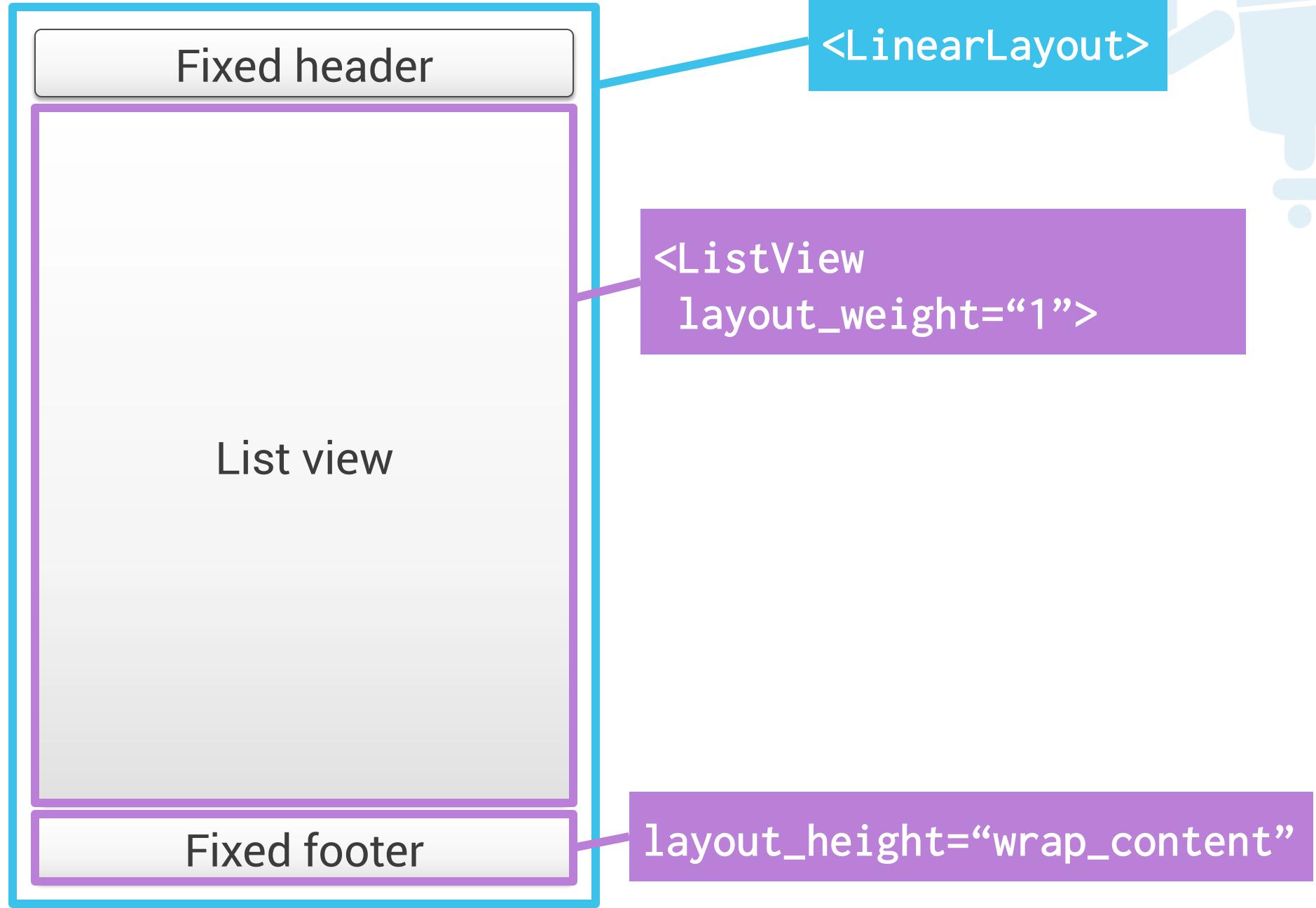


<FrameLayout>

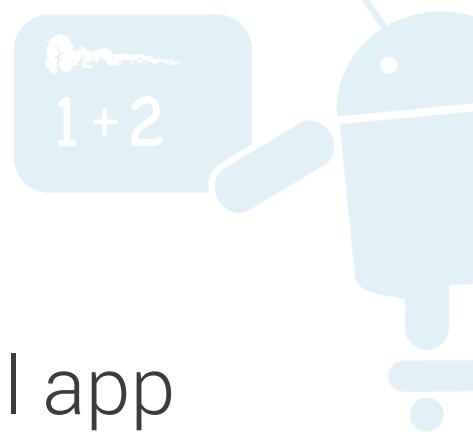
<LinearLayout
 orientation="vertical">

<LinearLayout
 orientation="horizontal"
 layout_weight="1">





App resources



```
res/  
  drawable  
  drawable-xhdpi  
  drawable-hdpi  
  drawable-mdpi  
  layout  
  layout-land  
  layout-large  
  layout-large-land
```

- One universal app binary contains all resources
- System chooses at runtime which resources to use

 res/

 drawable	Drawable XML
 drawable-xhdpi	PNGs, 9-patch PNGs, optimized for multiple densities
 drawable-hdpi	
 drawable-mdpi	
 layout	Layout XML optimized for physical screen size and orientation
 layout-land	
 layout-large	
 layout-large-land	
 values	Strings, styles, themes, etc.
 values-v11	Styles, themes varying by API level
 values-v14	
 values-en	
 values-fr	Strings XML localized for your target regions
 values-ja	

Referencing resources



- A string in `res/values/strings.xml`
 - In Java: `R.string.hello`
 - In XML: `@string/hello`
- The system “edit” icon:
 - In Java: `android.R.drawable.ic_menu_edit`
 - In XML: `@android:drawable/ic_menu_edit`

Referencing resources



`android.R.drawable.ic_menu_edit`

`@android:drawable/ic_menu_edit`

- Namespace (either android or blank)
- Resource type
- Resource name

Screen density and DIP units



DIP units keep things the
same physical size across any screen.

1 dip = 1 pixel @ MDPI (160 dpi)

1 dip = 2 pixels @ XHDPI (320 dpi)



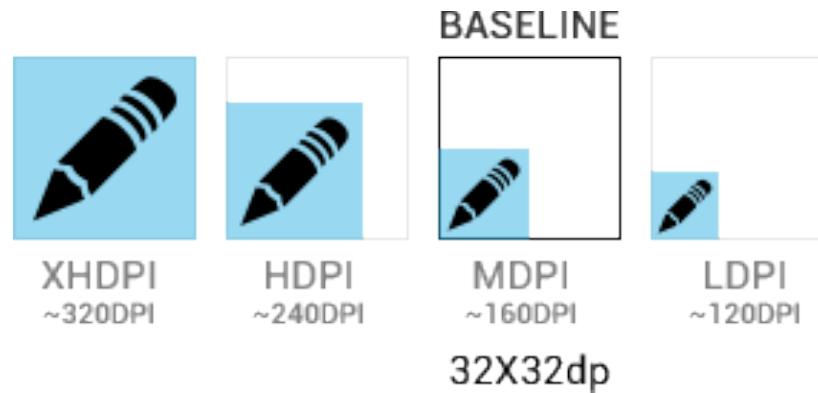
Q: What is the Nexus 7's screen resolution in DIPs if it's **1280x800 px** and **213dpi**?

A: **~960x600 dip**

Screen density and DIP units

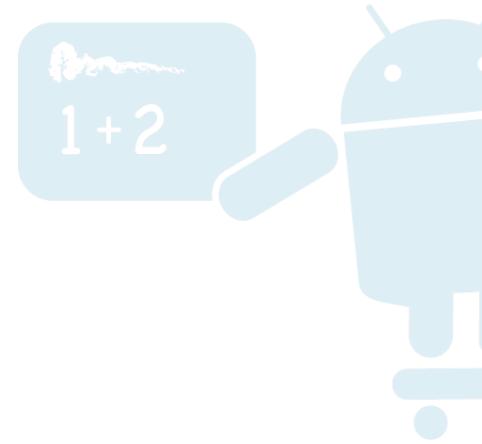


Icons and other PNG files should generally be provided for multiple densities

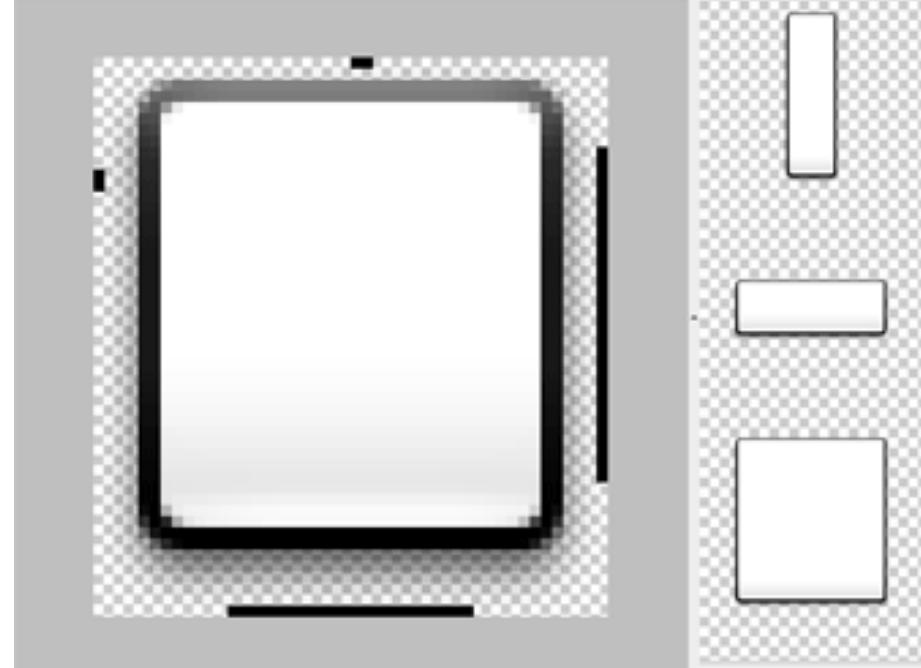


Key drawable types

- Bitmaps (.png)
- 9-patches (.9.png)
- State Lists (.xml)



9-patches – foo.9.png



- Border pixels indicate stretchable regions
- Make density-specific versions (**-xhdpi**)

State list drawables



drawable/

foo.xml

```
<selector>
    <item android:drawable="@drawable/foo_disabled"
          android:state_enabled="false" ... />
    <item android:drawable="@drawable/foo_pressed"
          android:state_pressed="true" ... />
    <item android:drawable="@drawable/foo_focused"
          android:state_focused="true" ... />
    <item android:drawable="@drawable/foo_default" />
</selector>
```

State list drawables



drawable-mdpi/



foo_default.png



foo_disabled.png



foo_focused.png



foo_pressed.png

drawable-hdpi/



foo_default.png



foo_disabled.png

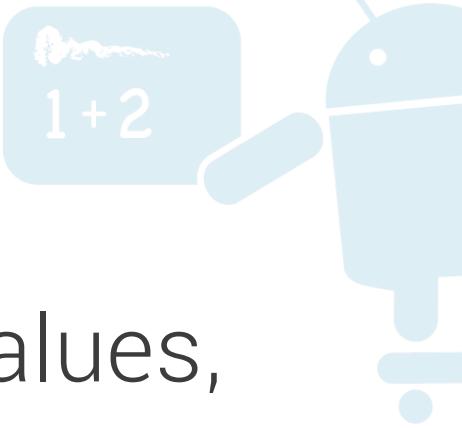


foo_focused.png



foo_pressed.png

Styles



Collections of layout XML attribute values,
kind of like CSS

Instead of
this...

```
<TextView  
    android:layout_width="match_parent"  
    android:layout_height="wrap_content"  
    android:padding="4dp"  
    android:text="1" />  
  
<TextView  
    android:layout_width="match_parent"  
    android:layout_height="wrap_content"  
    android:padding="4dp"  
    android:text="2" />
```

Styles

...use this!

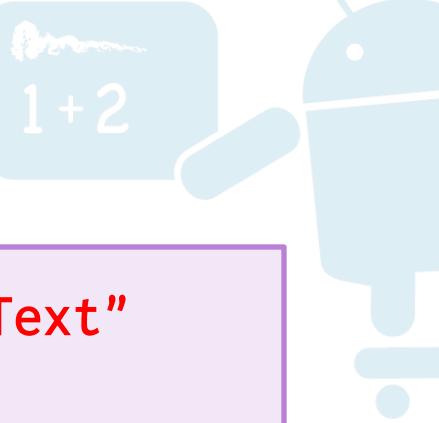
```
<TextView style="@style/MyText"  
        android:text="1" />
```

```
<TextView style="@style/MyText"  
        android:text="2" />
```

res/values/

styles.xml

```
<style name="MyText">  
    <item name="android:padding">4dp</item>  
    <item name="android:layout_width">match_parent</item>  
    <item name="android:layout_height">wrap_content</item>  
</style>
```



Themes

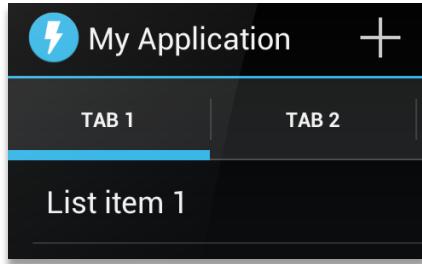


Are styles that apply to whole activities
(or the entire app)

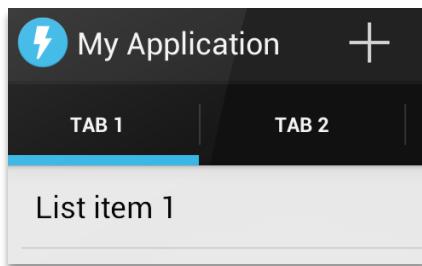
AndroidManifest.xml

```
<application android:theme="@android:style/Theme.Holo">  
    ...  
</application>
```

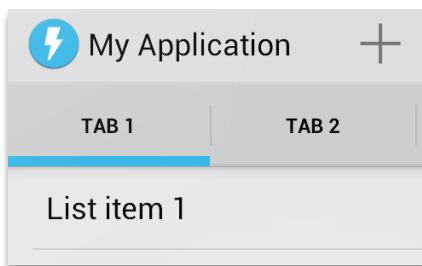
Themes



@android:style/Theme.Holo

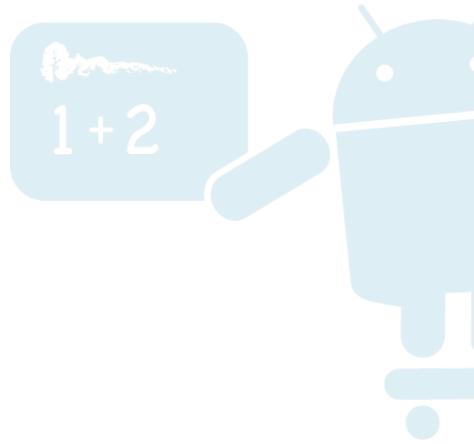


@android:style/Theme.Holo.Light.DarkActionBar



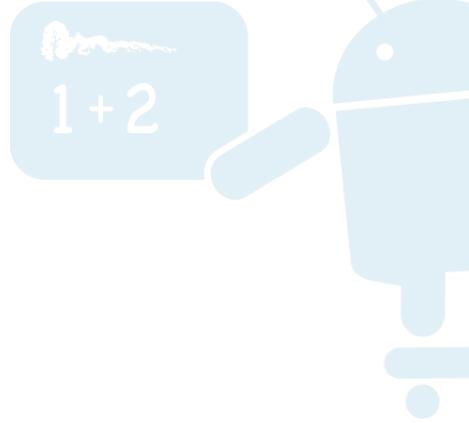
@android:style/Theme.Holo.Light

Themes



Like styles, themes are extensible

```
<style name="MyTheme" parent="@android:style/Theme.Holo">  
    ...  
</style>
```



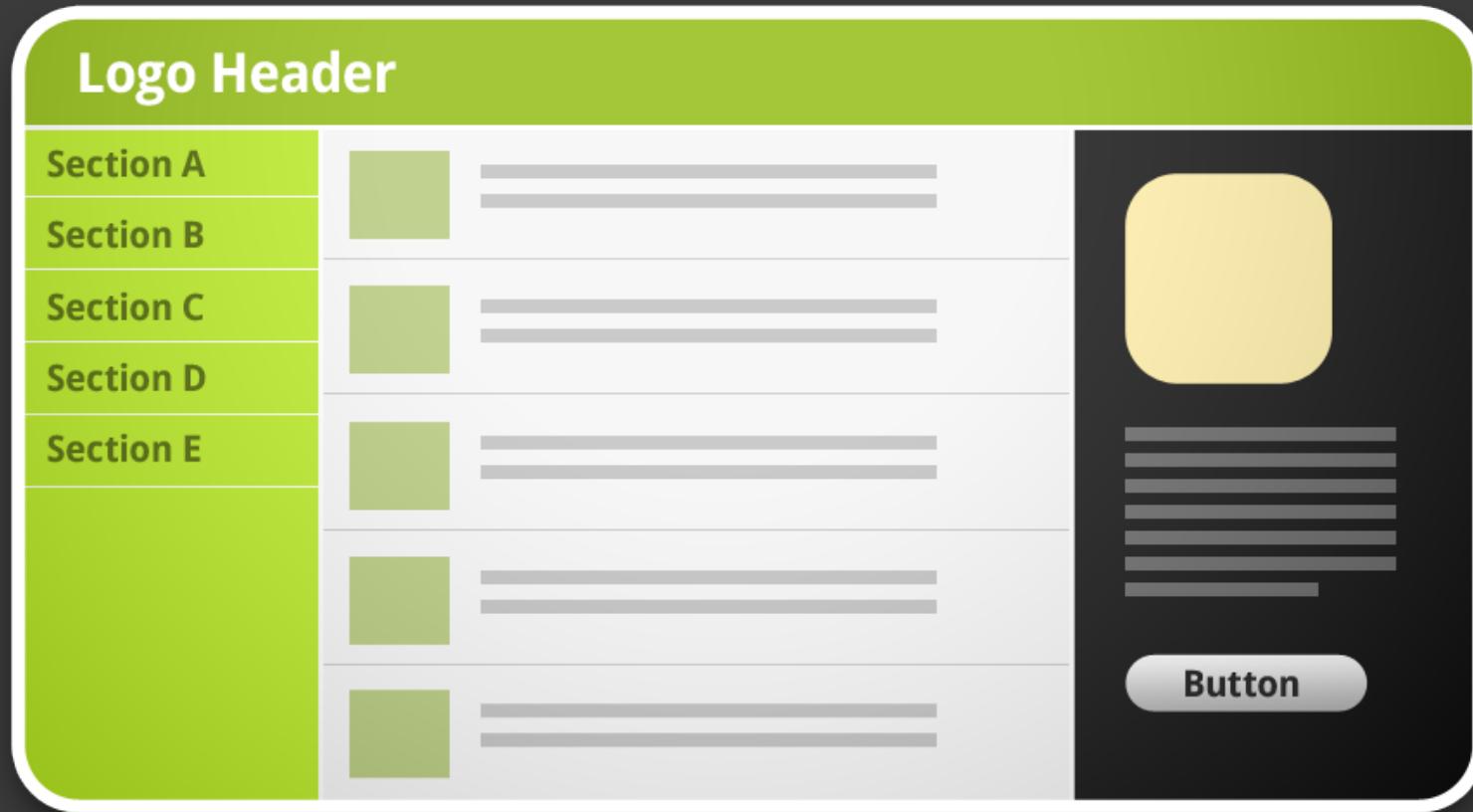
EXERCISE

**Change your app's
theme to Holo Light**



Tablet considerations

Information hierarchy and flow



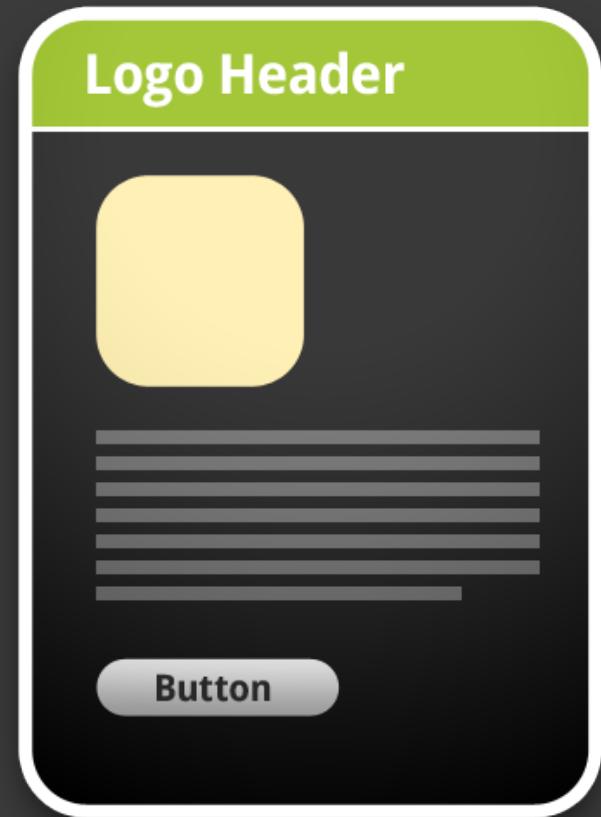
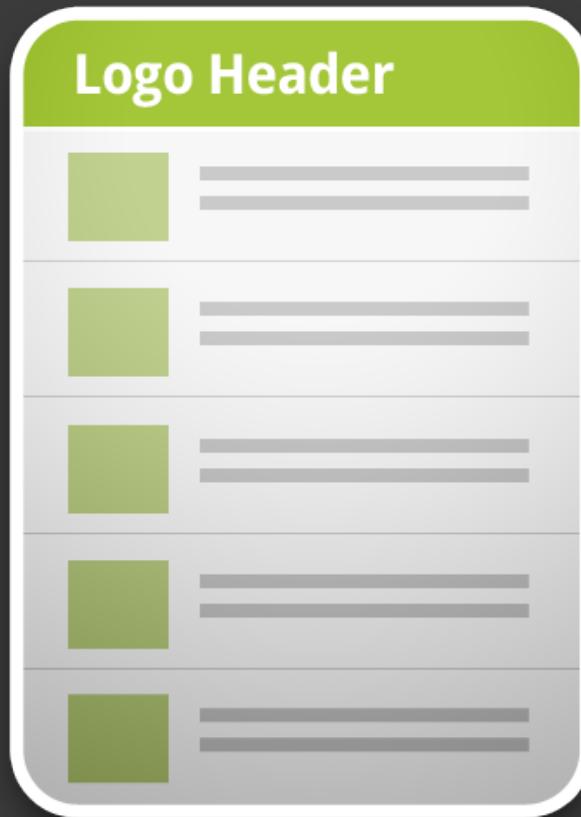
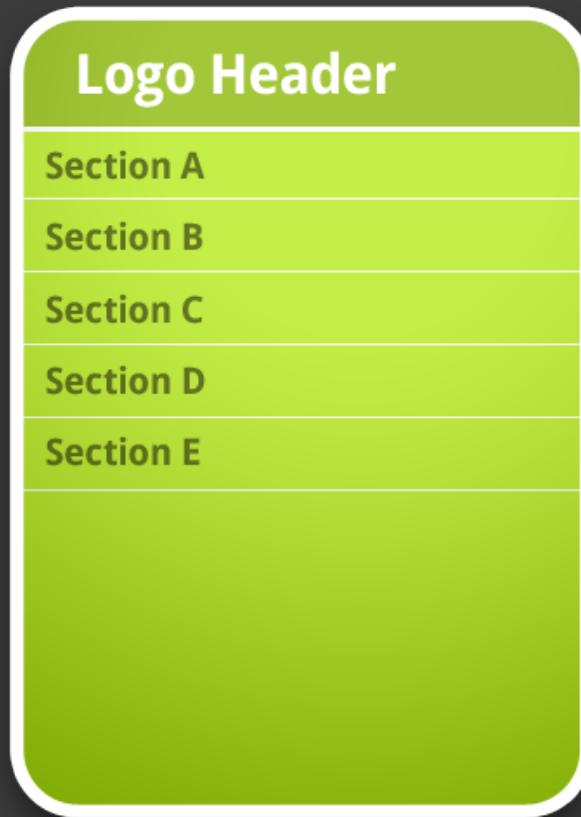
Traditional desktop app or website

Information hierarchy and flow



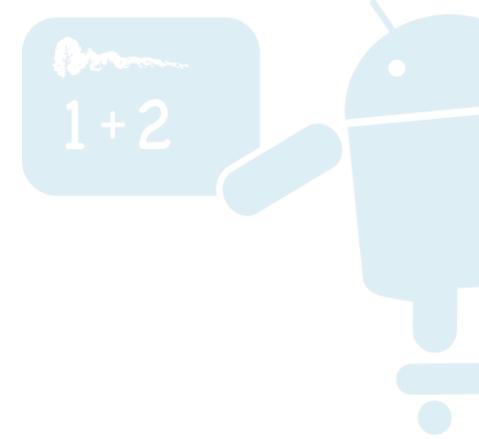
Tablet or mini desktop app

Information hierarchy and flow



Mobile phone app

Fragments



- Separate activities into UI or code **modules**, each have their own class
- Help with supporting phones + tablets
 - Each content pane is a fragment
 - Fragments split across activities
- **<fragment>** in layout XML
 - Automatically instantiates the given fragment
 - Acts as a placeholder for the fragment's view to be inserted in that part of the layout tree

Tablet resources

```
res/  
  layout-large/  
  values-large/  
    dimens.xml  
    styles.xml
```

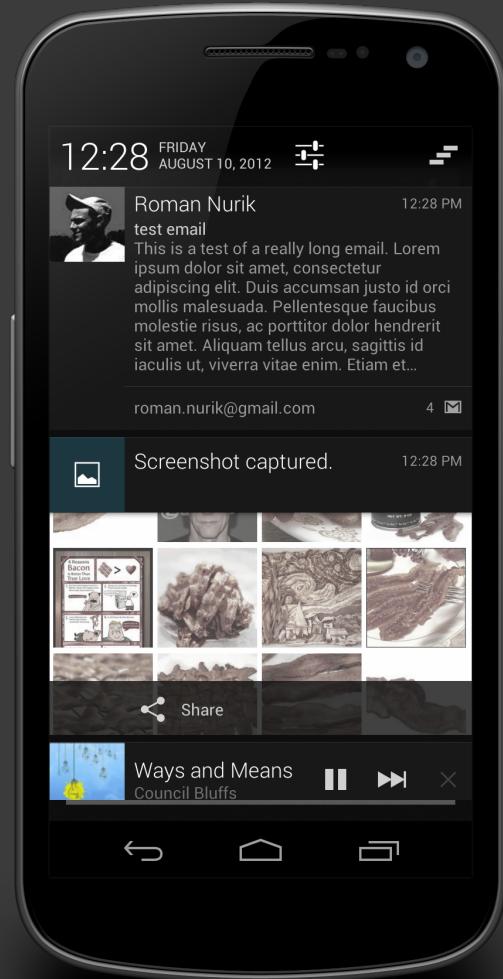
- Customize layouts for large screens
 - Includes <fragment> tags
- Incrementally increase font sizes, spacing, tweak styles



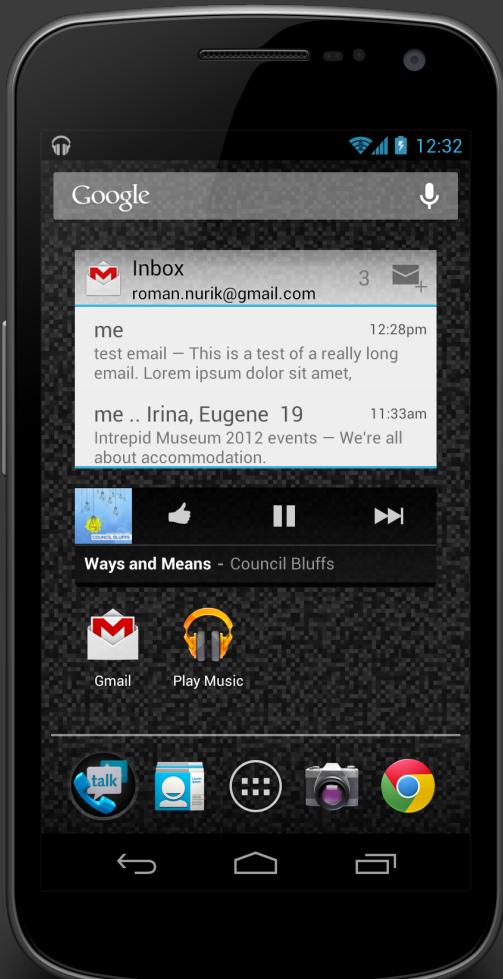


System UI integration

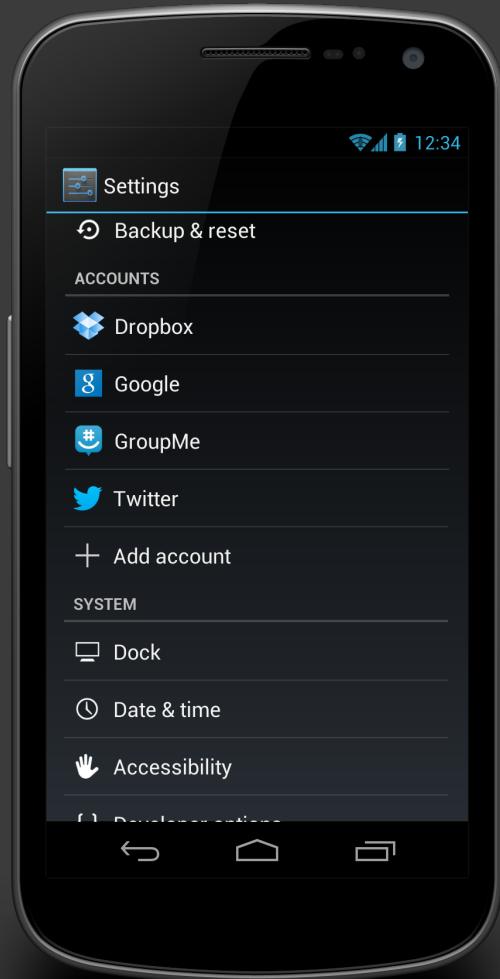
System UI integration



Notifications

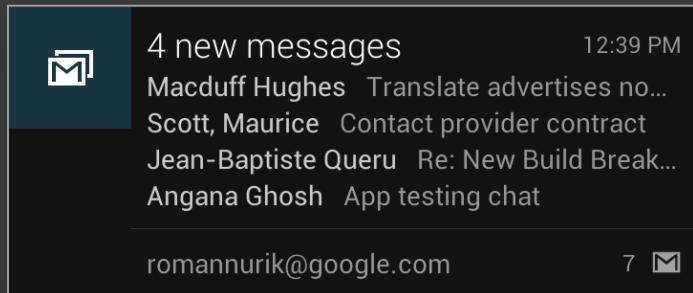
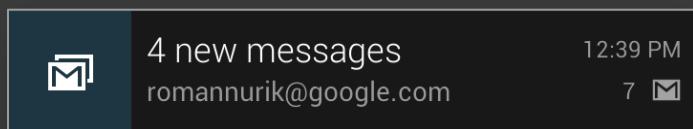
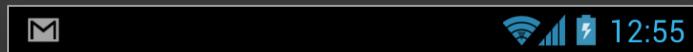
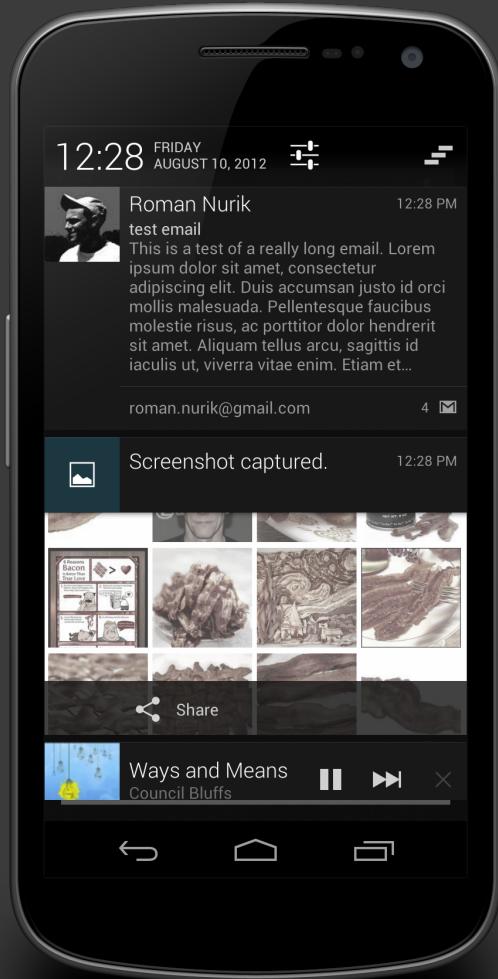


App Widgets



Accounts + Sync

Notifications

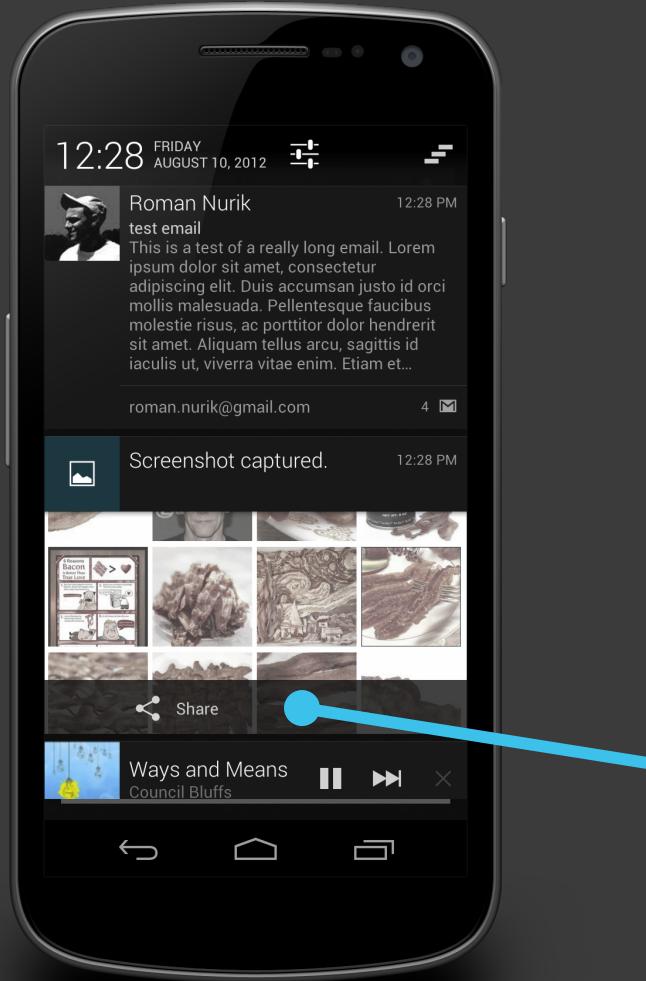


Iconified

Collapsed

Expanded
Android 4.1+

Notifications

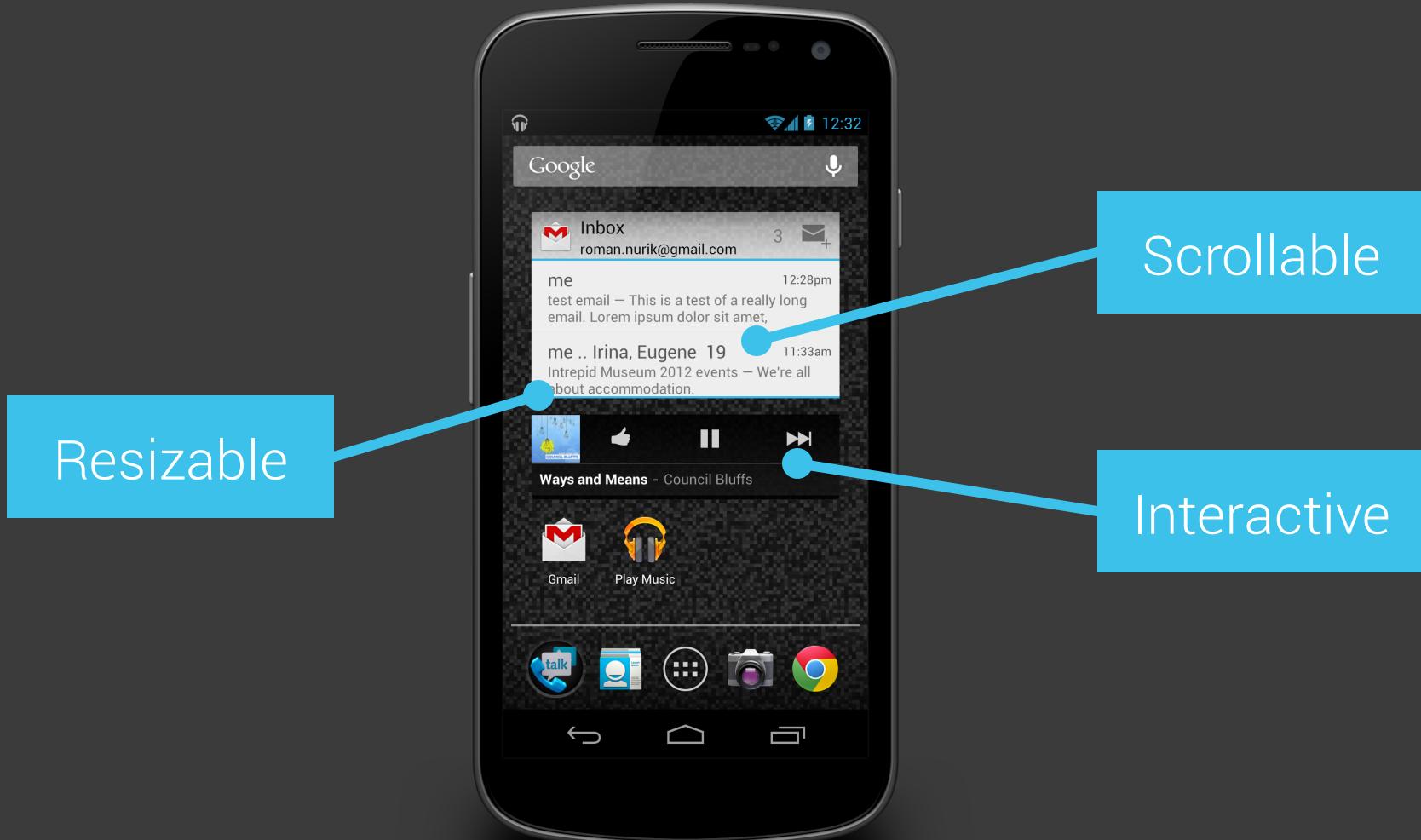


Interactive

Notifications

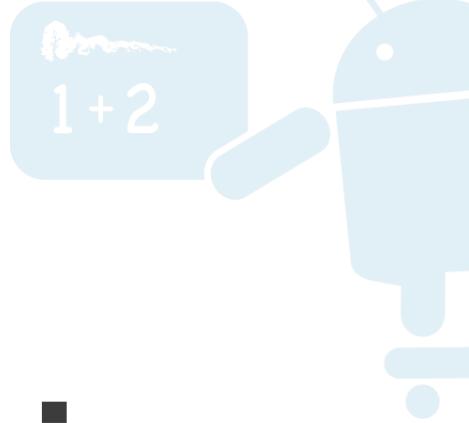
- Created with `NotificationManager` and `Notification.Builder()`
- Custom layouts with `RemoteViews`
 - Your layouts, used in a different process
- Interaction is handled entirely using intents

App widgets



App widgets

- Defined in your manifest as a receiver
 - Handles the APPWIDGET_UPDATE intent action
 - Metadata provided in `res/xml/widgetinfo.xml` and referenced in manifest
- Layout using `RemoteViews`
 - Your layouts, used in a different process
- Interaction is handled entirely using intents



EXERCISE

Show a notification in your project

Hint: use **NotificationManager**



Wireframing

Why create wireframes?

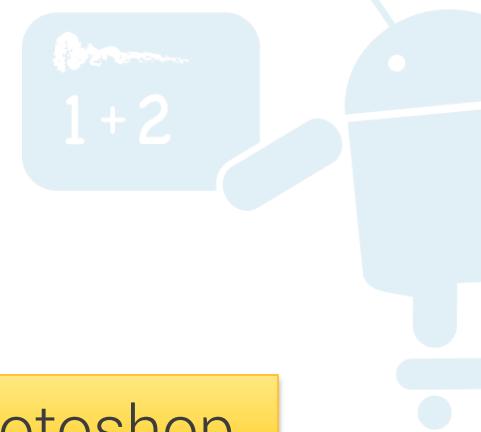


- Record your ideas and asses their real-world feasibility
- Test your ideas and **rapidly iterate**
 - See which work and which don't, evolve them
- Map out user flow and activity diagrams
 - Re-arrange/add/remove interactions quickly
 - Scope UI complexity
 - Plan out intra-app “Intent-based API”



Wireframing before
coding saves you time.

Wireframing tools



Time/Effort



Pen + Paper

OmniGraffle
(Mac)

Keynote/
Powerpoint

Balsamiq

Pencil
(Firefox addon)

Wireframe
Sketcher

Photoshop

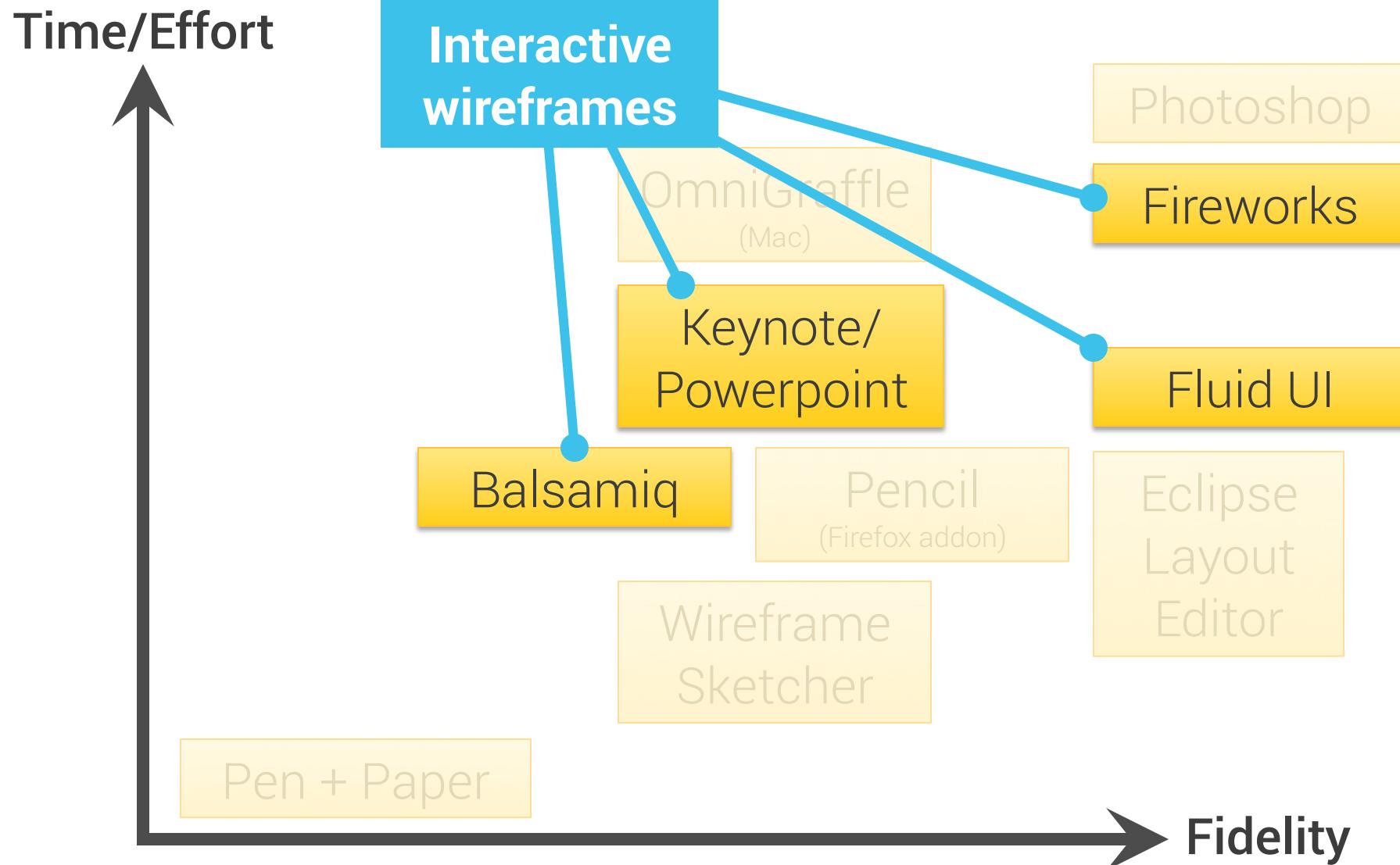
Fireworks

Fluid UI

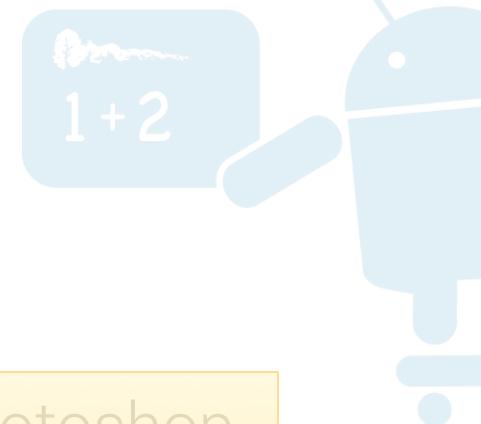
Eclipse
Layout
Editor

Fidelity

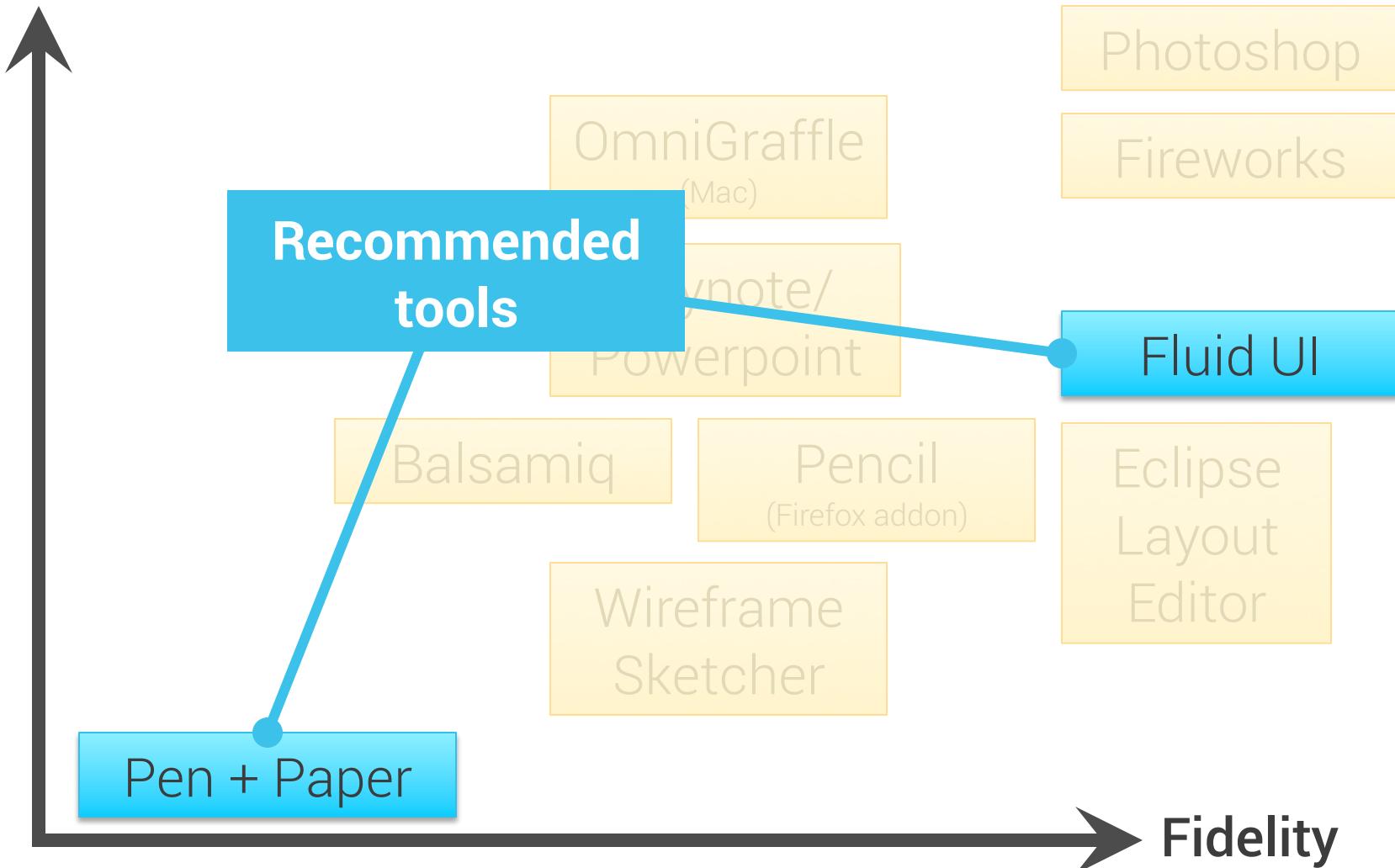
Wireframing tools



Wireframing tools



Time/Effort

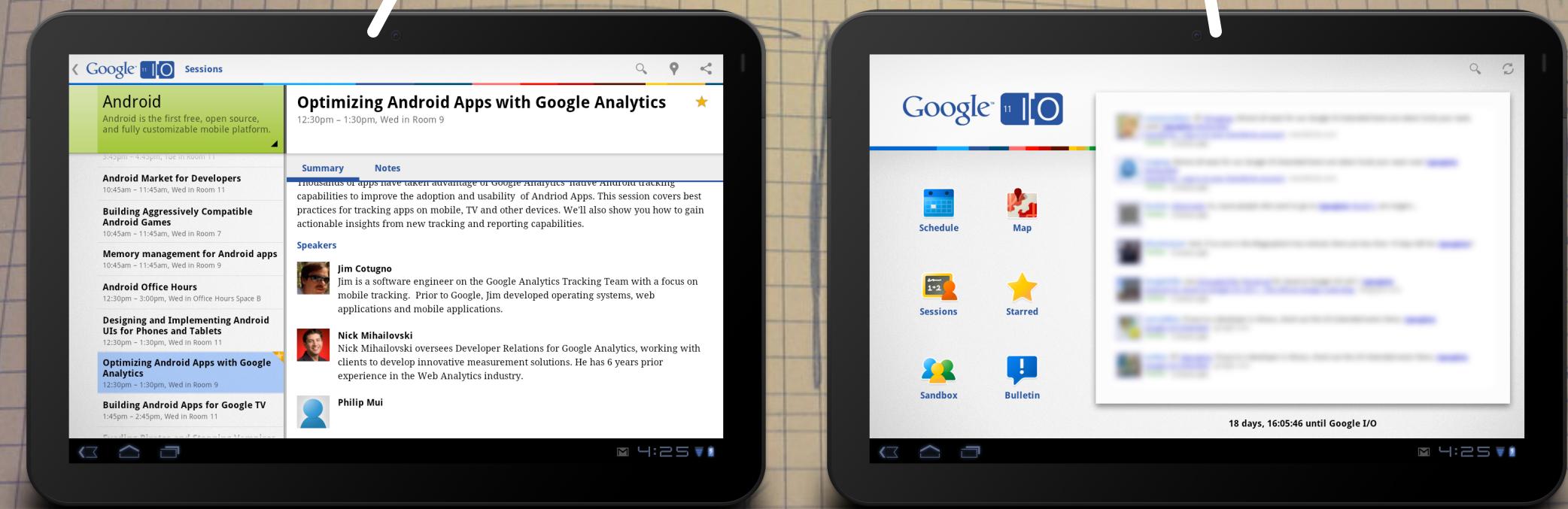


$1 + 2$



Always start with
pencil and paper.

(or a whiteboard)



< Google I/O Sessions

Android
Android is the first free, open source, and fully customizable mobile platform.

5:05pm - 6:45pm, Tue in Room 11

Android Market for Developers
10:45am - 11:45am, Wed in Room 11

Building Aggressively Compatible Android Games
10:45am - 11:45am, Wed in Room 7

Memory management for Android apps
10:45am - 11:45am, Wed in Room 9

Android Office Hours
12:30pm - 3:00pm, Wed in Office Hours Space B

Designing and Implementing Android UIs for Phones and Tablets
12:30pm - 1:30pm, Wed in Room 11

Optimizing Android Apps with Google Analytics ★
12:30pm - 1:30pm, Wed in Room 9

Building Android Apps for Google TV
1:45pm - 2:45pm, Wed in Room 11

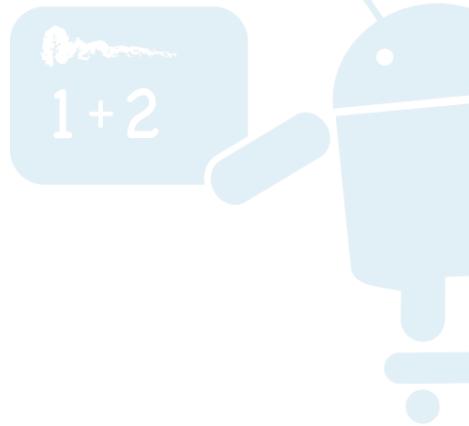
4:25

Google I/O

Schedule Map
Sessions Starred
Sandbox Bulletin

18 days, 16:05:46 until Google I/O

4:25



EXERCISE

**Sketch a
todo list app**