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10
I/O

Casting a Wide Net: Targeting All Android Devices

Justin Mattson
Developer Advocate
19 May 2010

House keeping

Use Wave to see live notes and ask questions

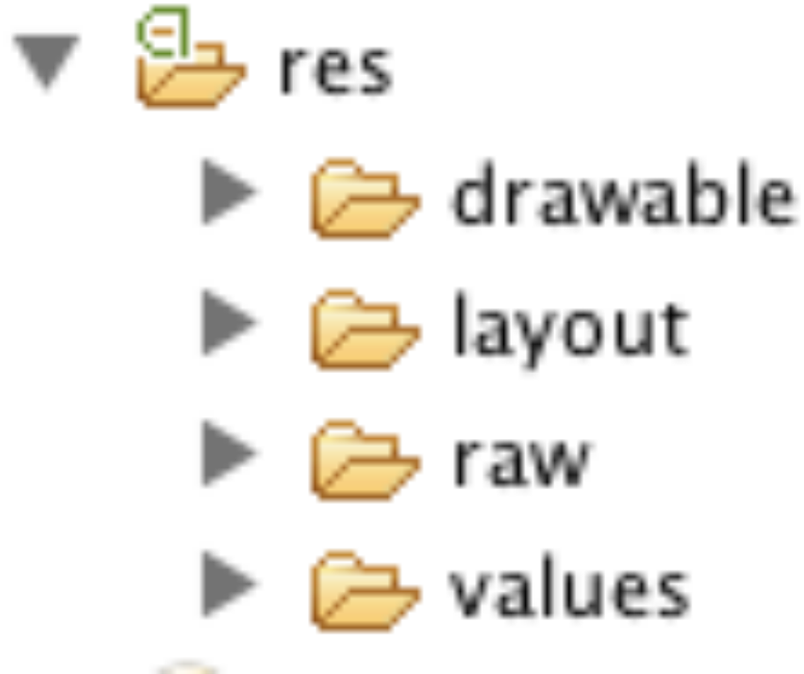
http://tinyurl.com/io10casting

Agenda

- Resource Loading
- Image & Drawable Considerations
- Adapting to API Availability
- Testing

Resource Loading

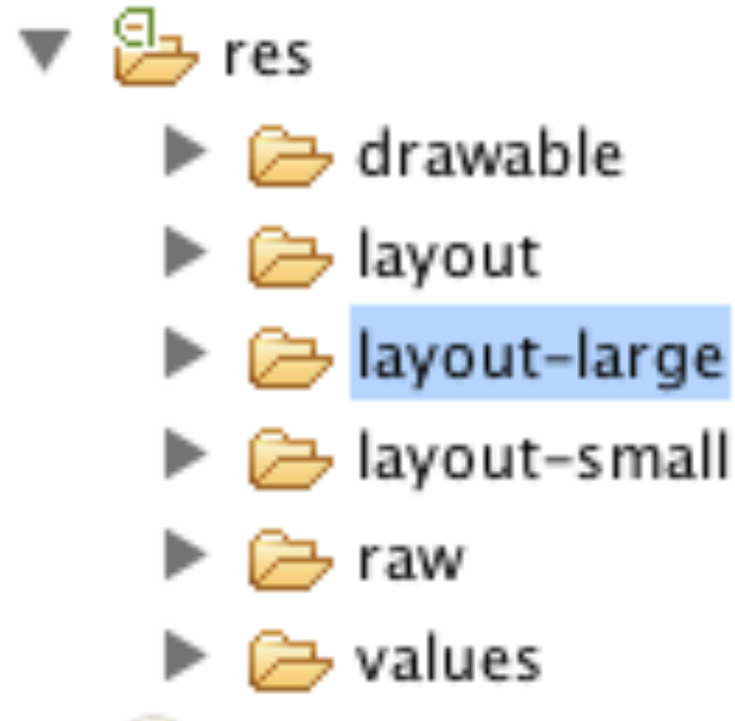
- Based on current system configuration
- If config changes, your app restarts (eg. orientation change)
- Hierarchy of qualifiers



Resource loading

Screen size

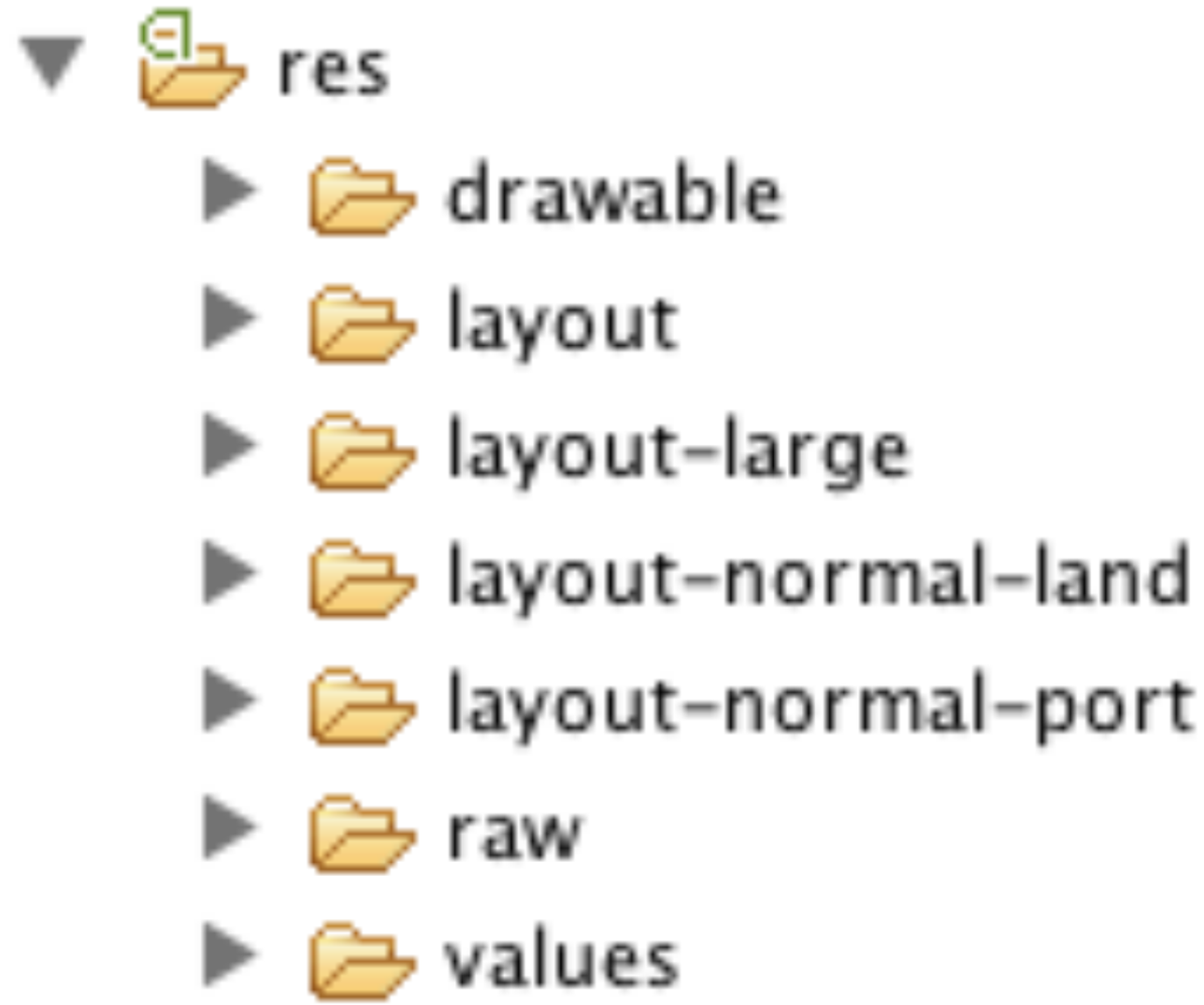
- Physical size of the screen
- Buckets
  - small: <~3.0”
  - normal: ~3.0” - ~4.0”
  - large: >~4.0”



Resource loading

Screen orientation

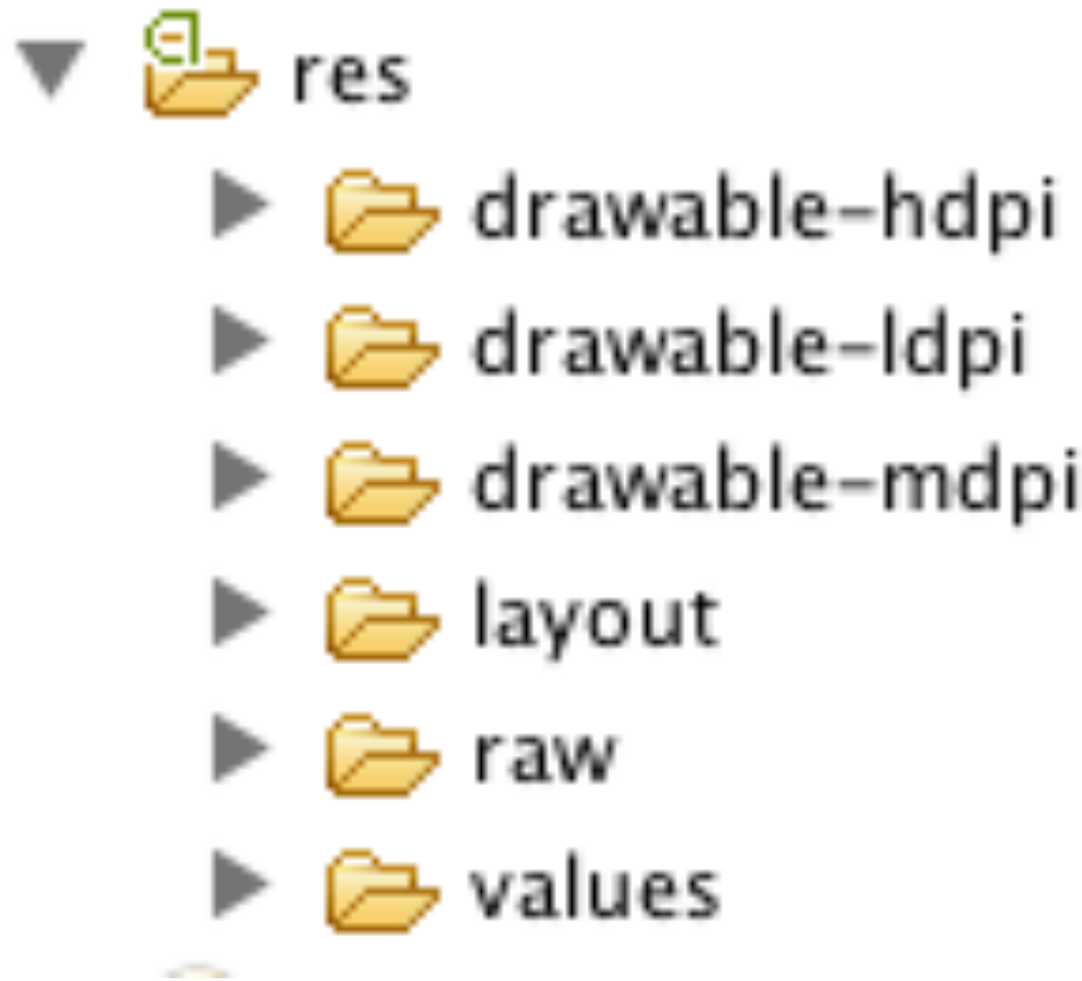
- landscape, portrait, or square
- Might be triggered by accelerometers or other events



Resource loading

Screen density

- Pixels per unit of measurement
- System looks for “best” fit*
- Buckets
  - ldpi: ~120dpi
  - mdpi: ~160dpi
  - hdpi: ~240dpi
- *Matching: everyone is a winner
  - first match on 1.5



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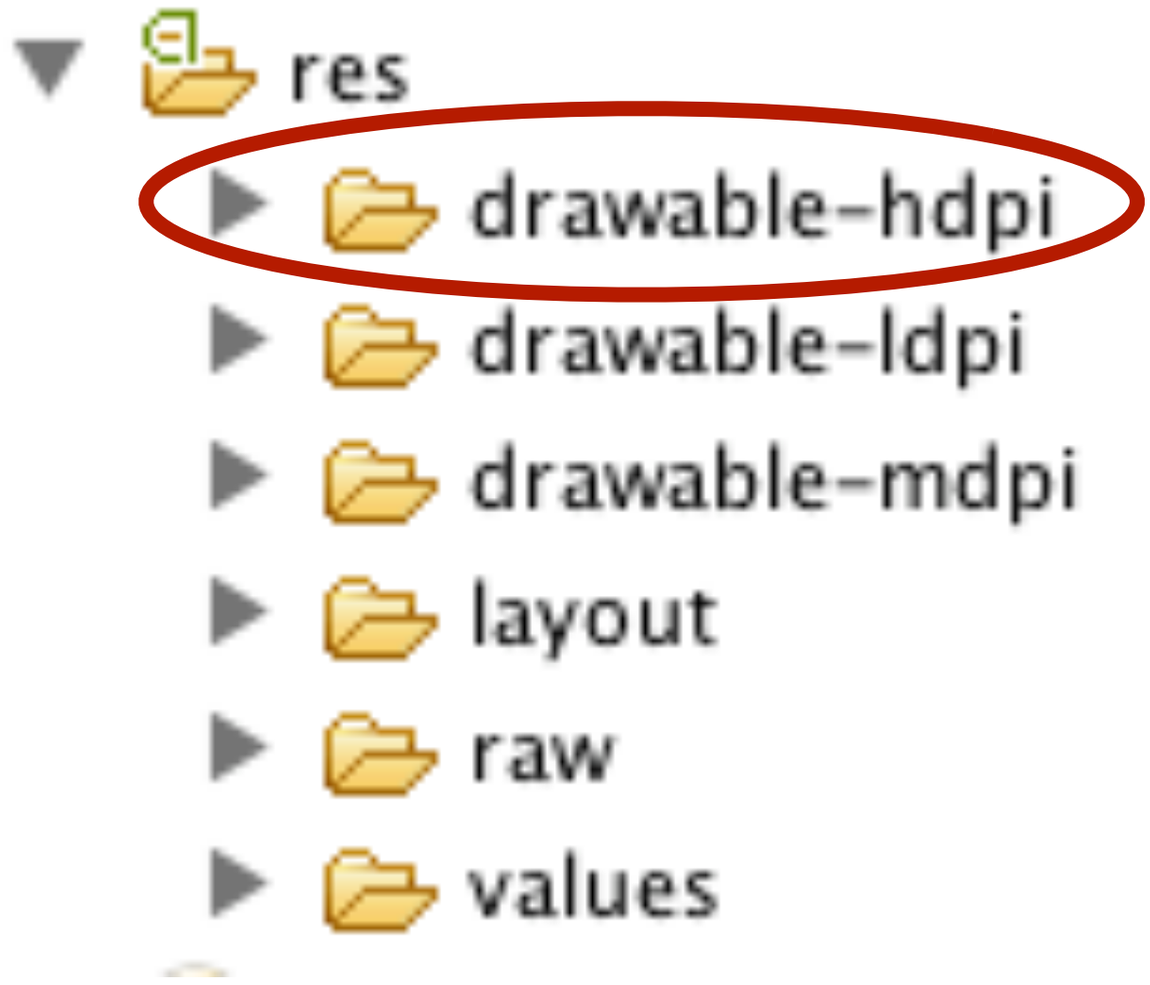
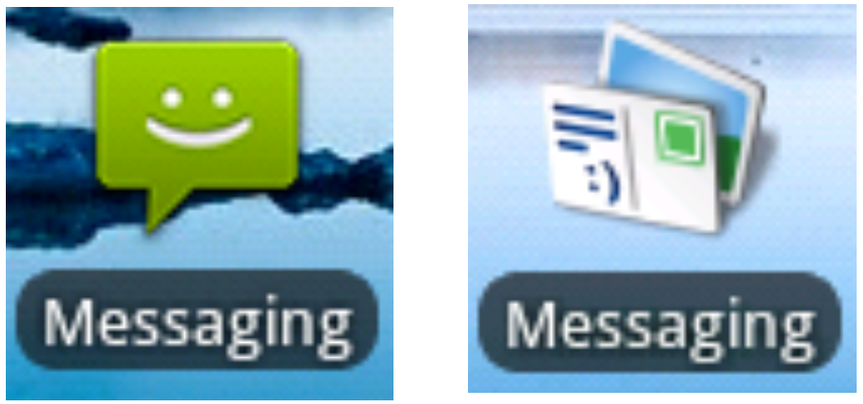


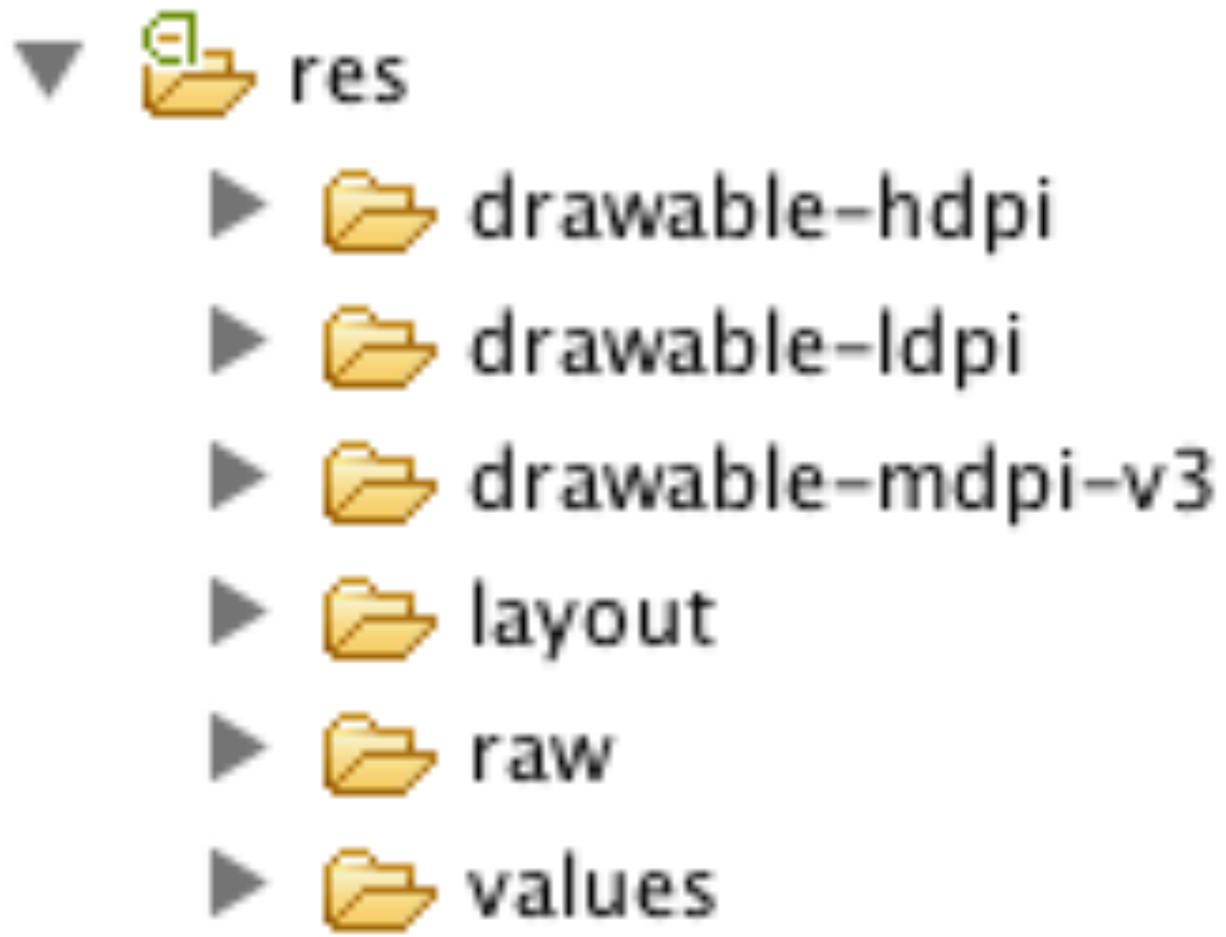
Resource loading

SDK Version

- Styles across versions



- Inexact matching, <= current version



- Work around 1.5 dpi bug
  - Exact matching on 1.5 - 2.0
  - v5 thinks its v6

Resource loading

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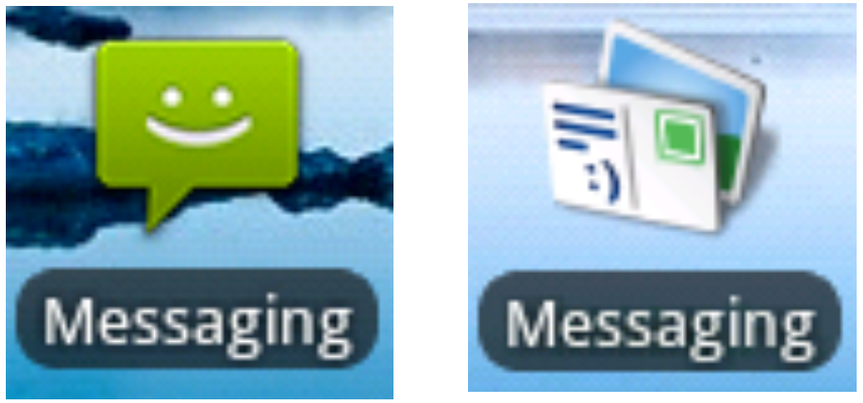

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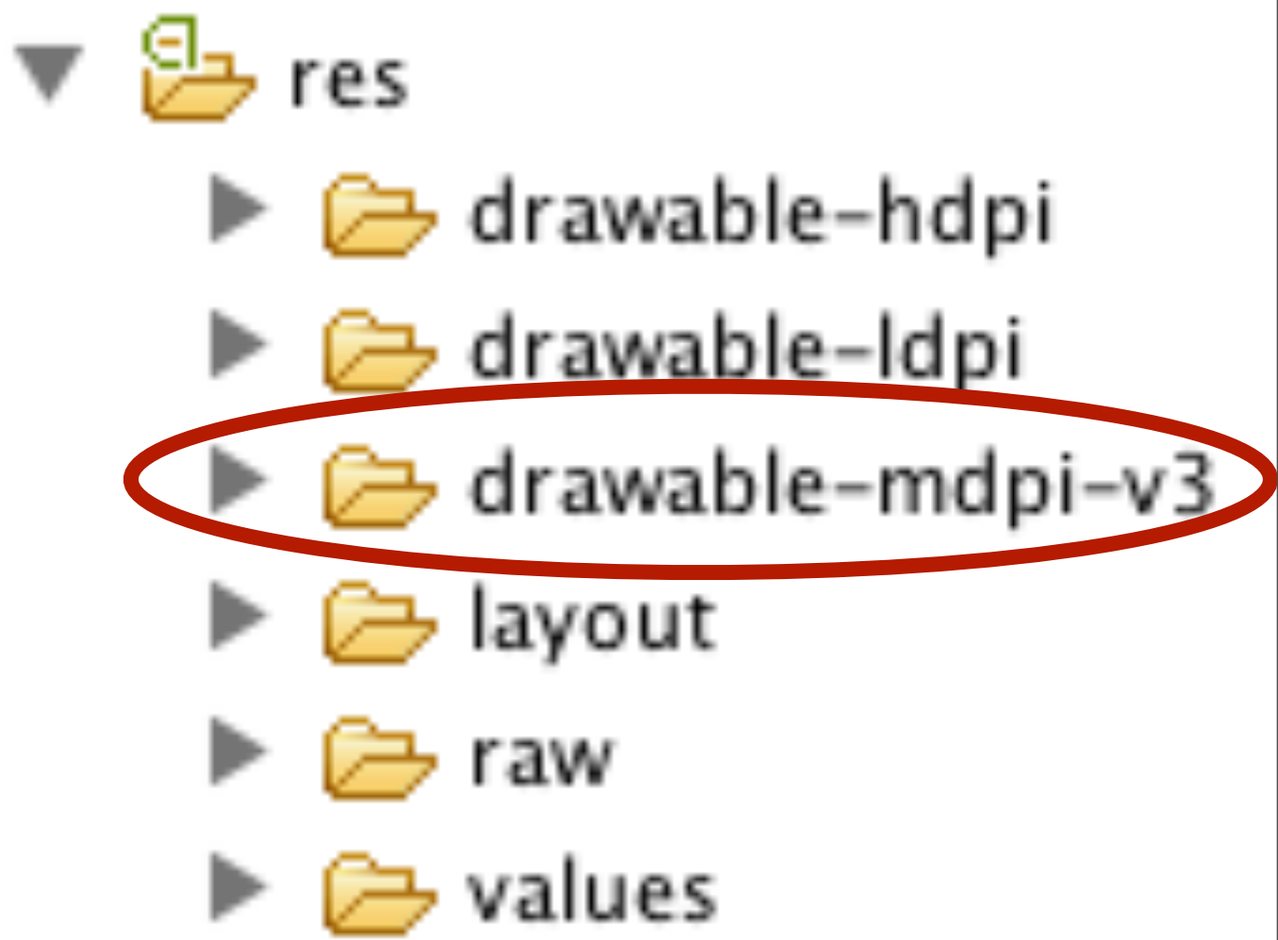

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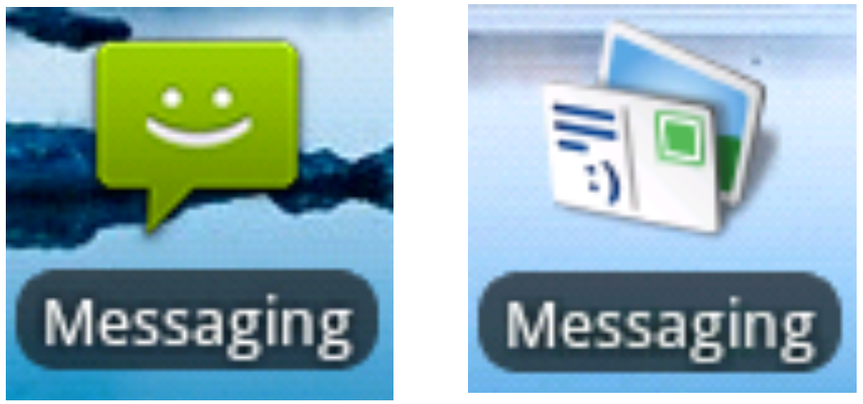

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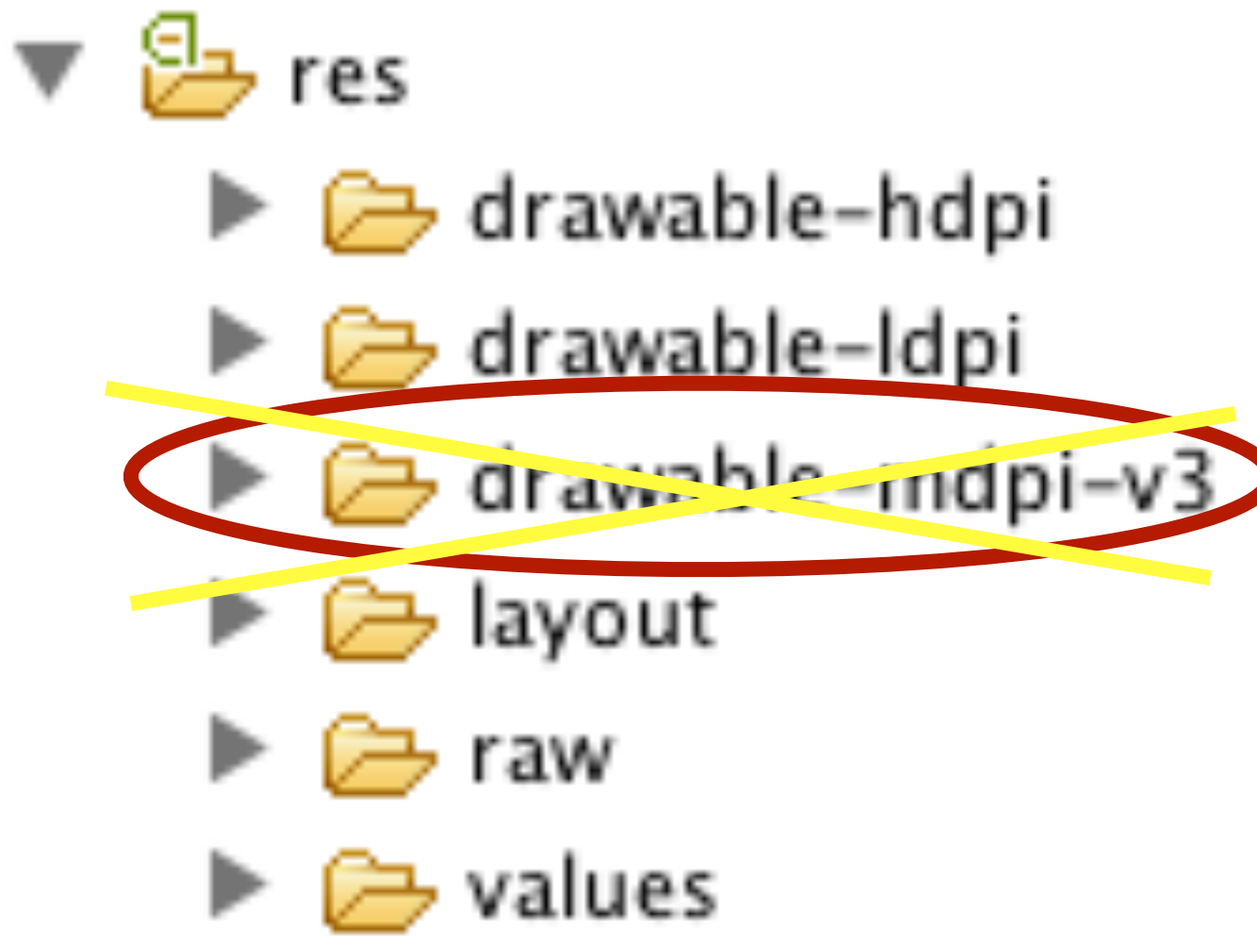

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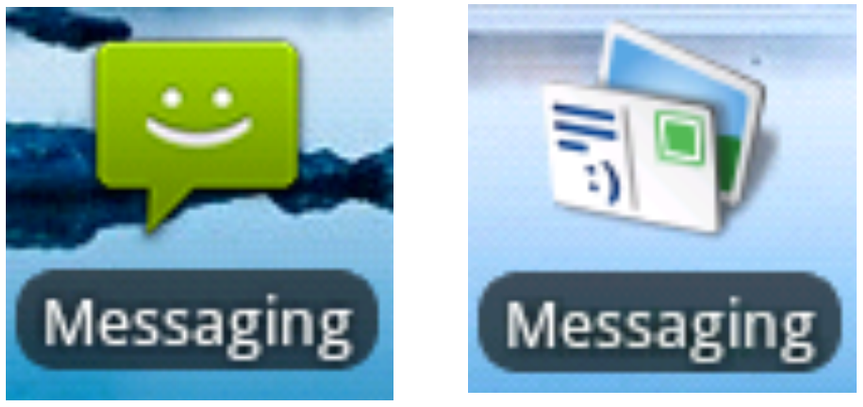

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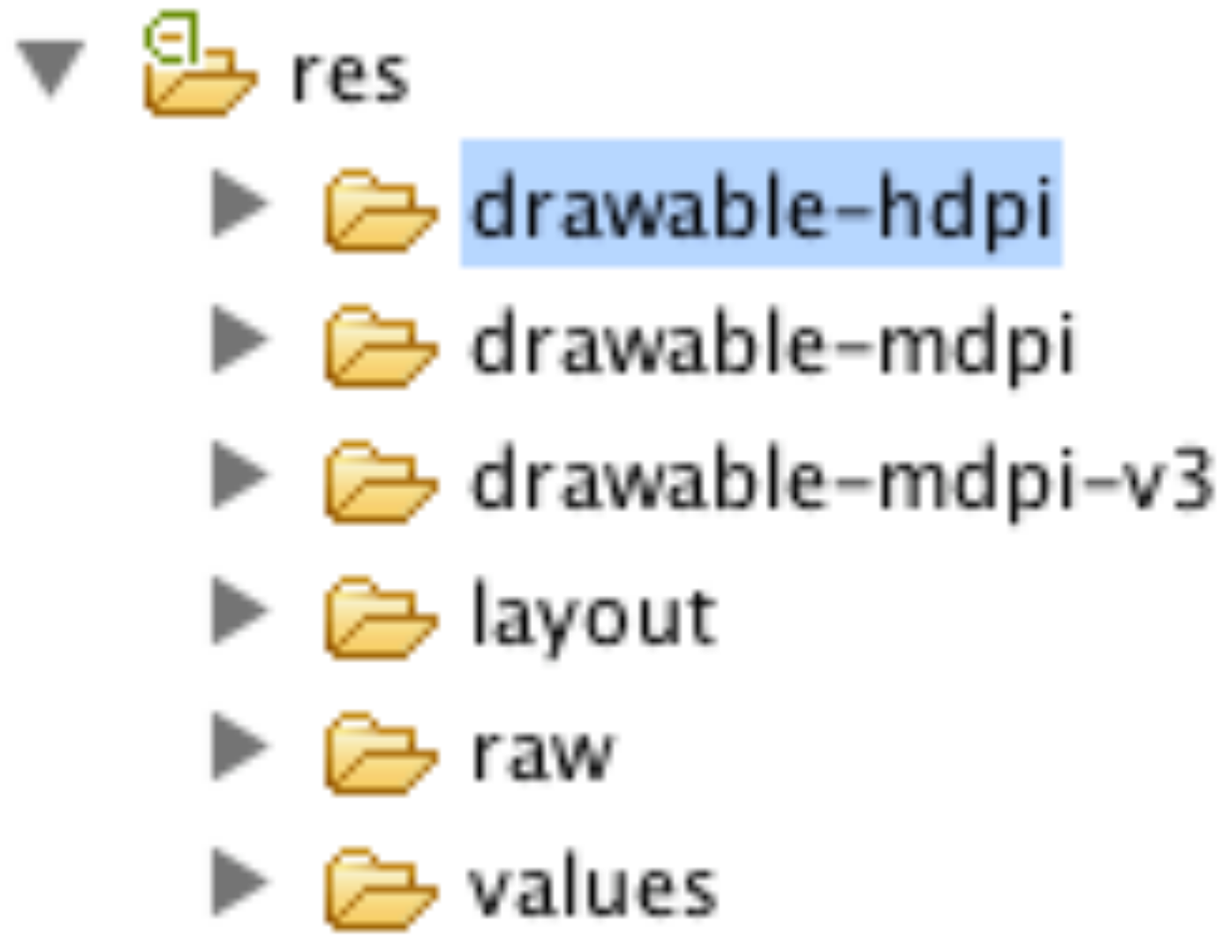

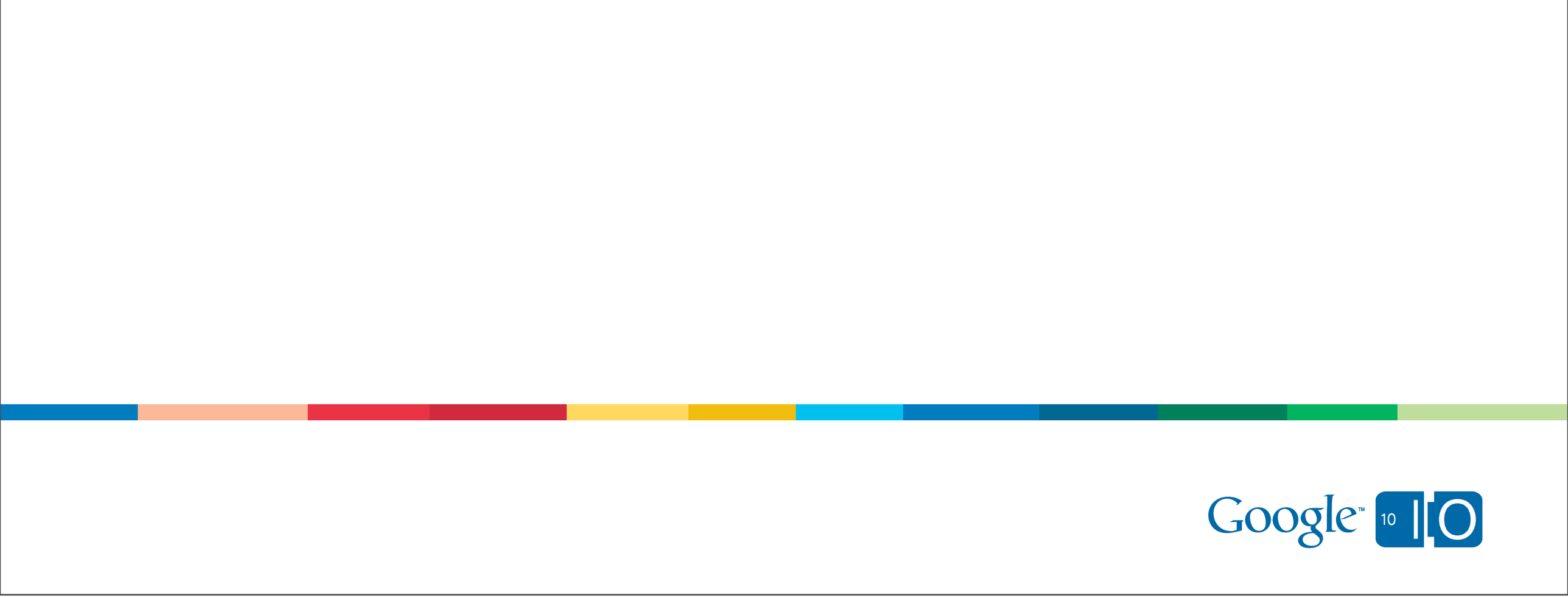
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Image resources

Image Resources

- Goal is uniform *physical* sizing across screens
- Best match allows for up or down sampling based on available resources
  - Single or few pixel features are most obviously impacted

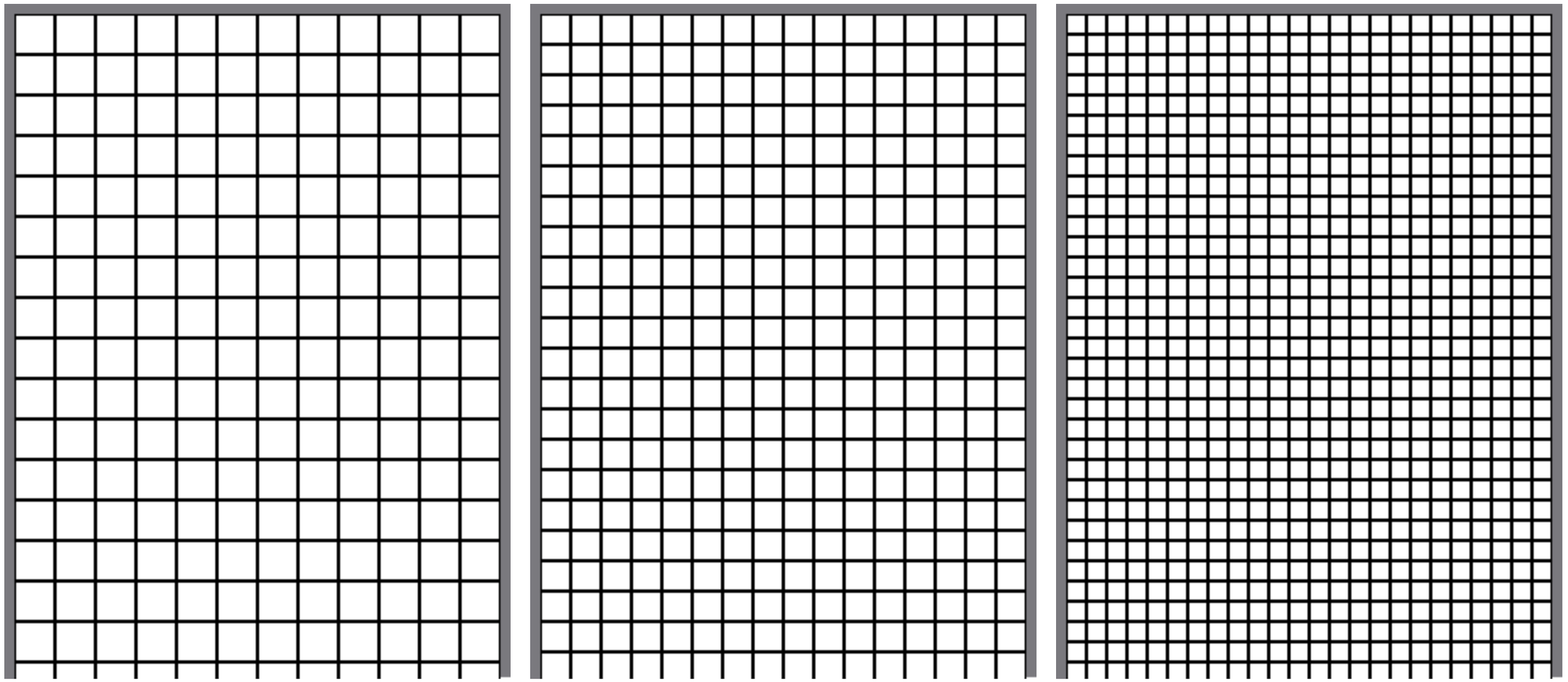
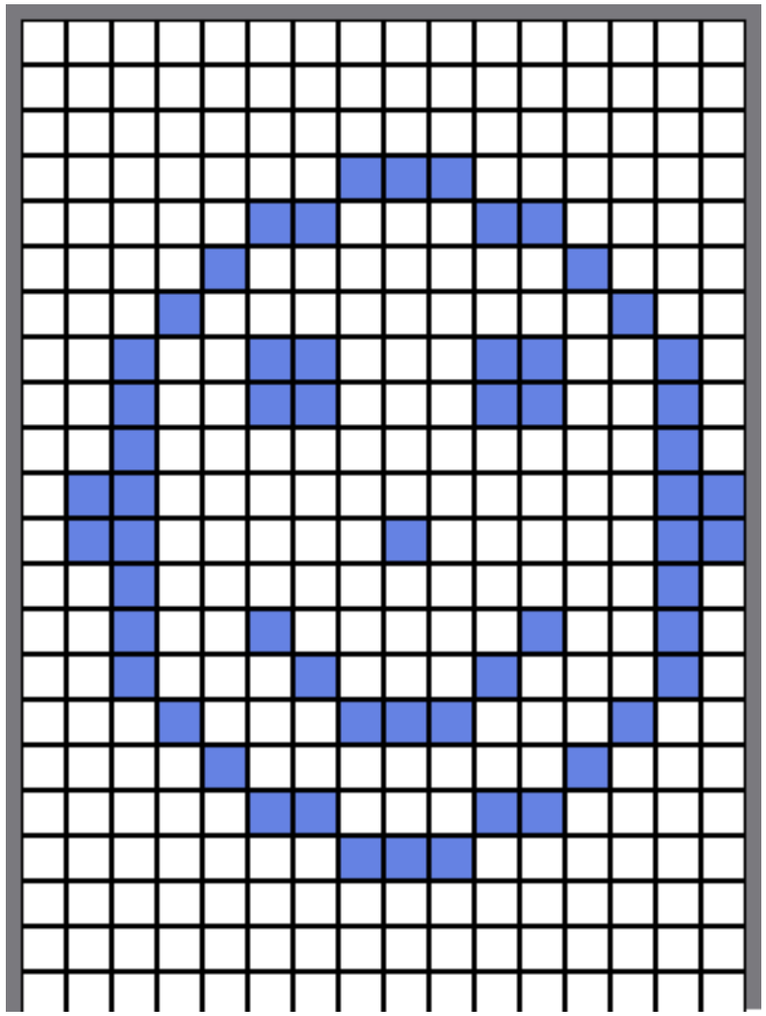


Image Resources

The trouble with pixels



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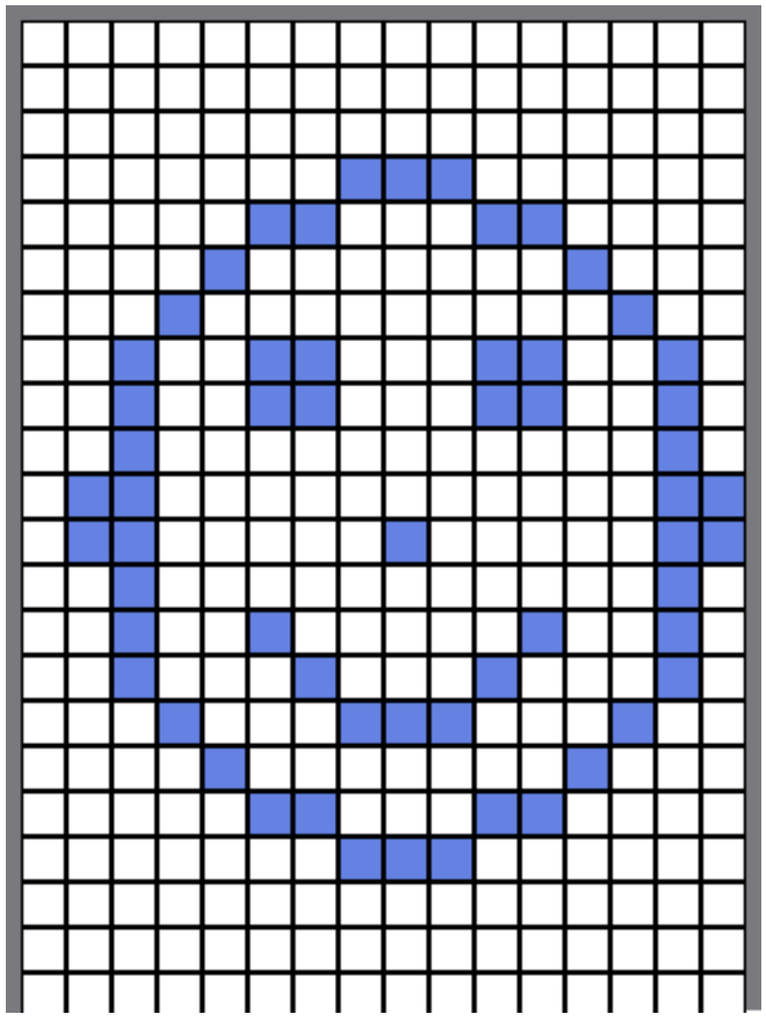

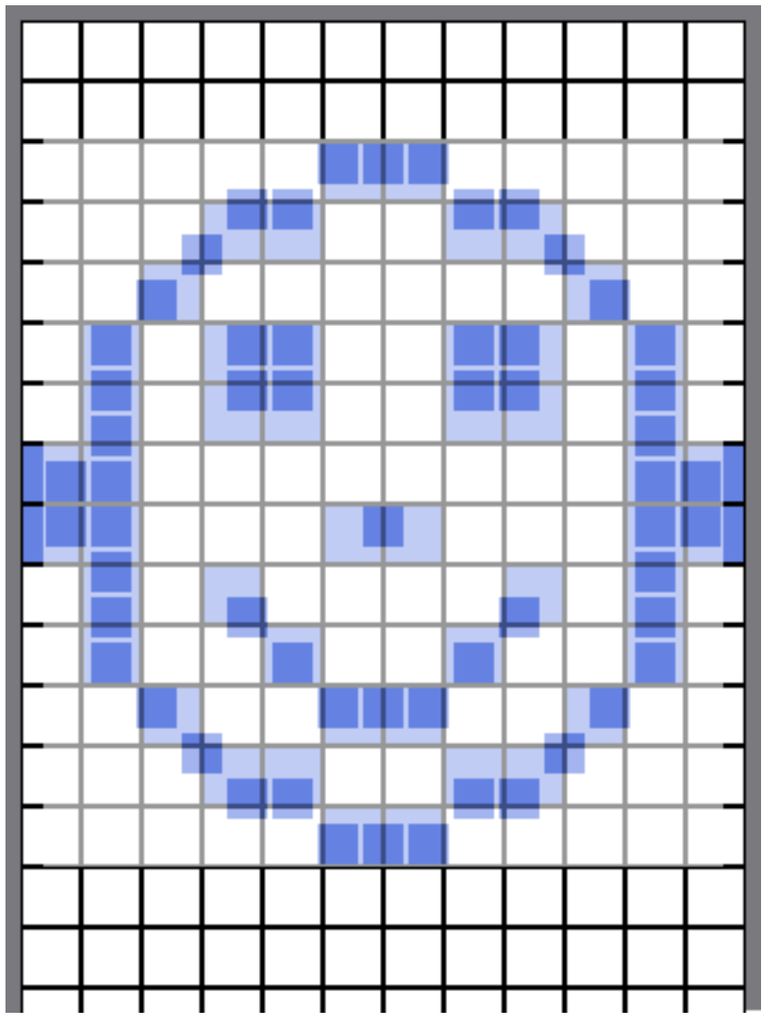

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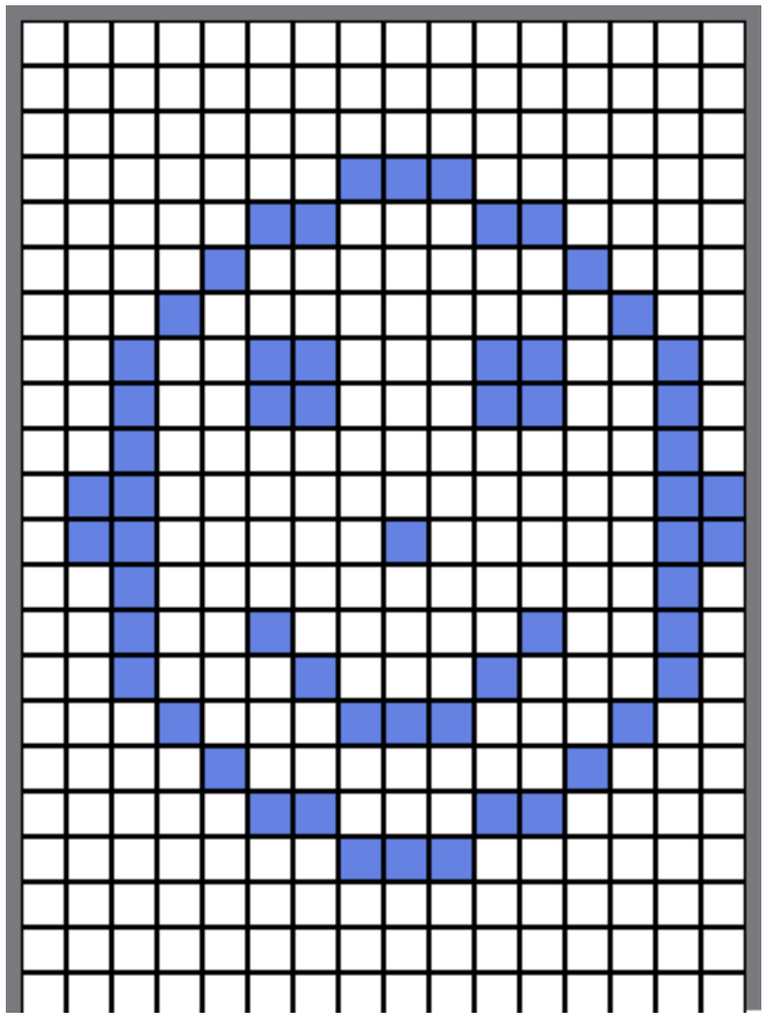

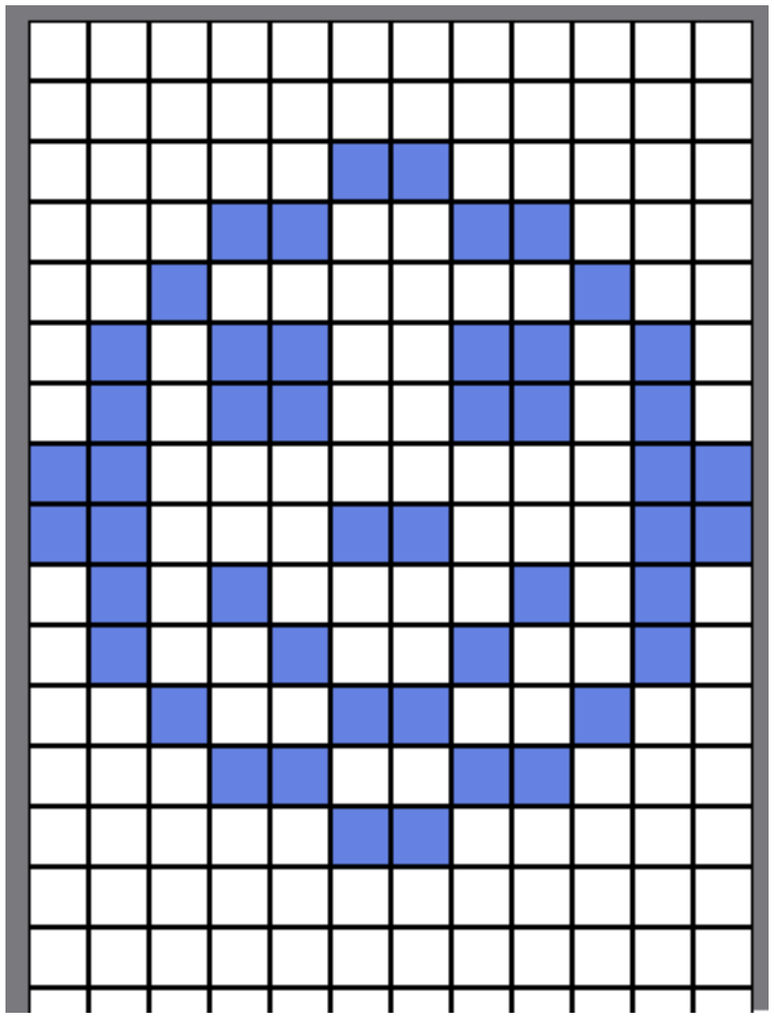

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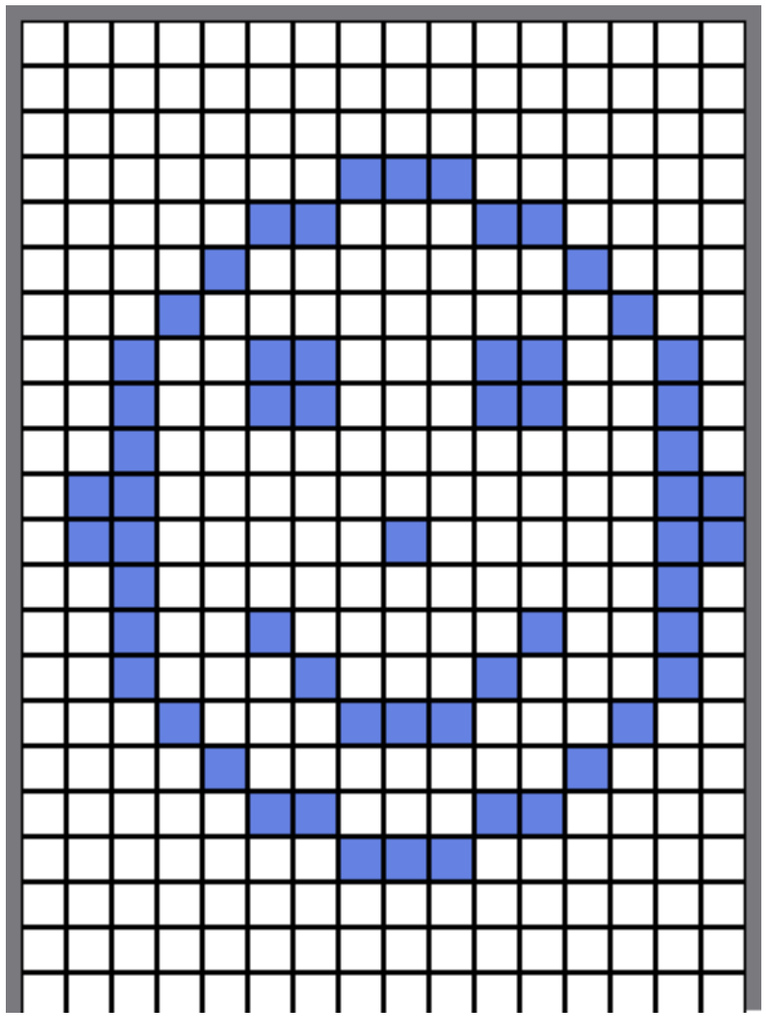

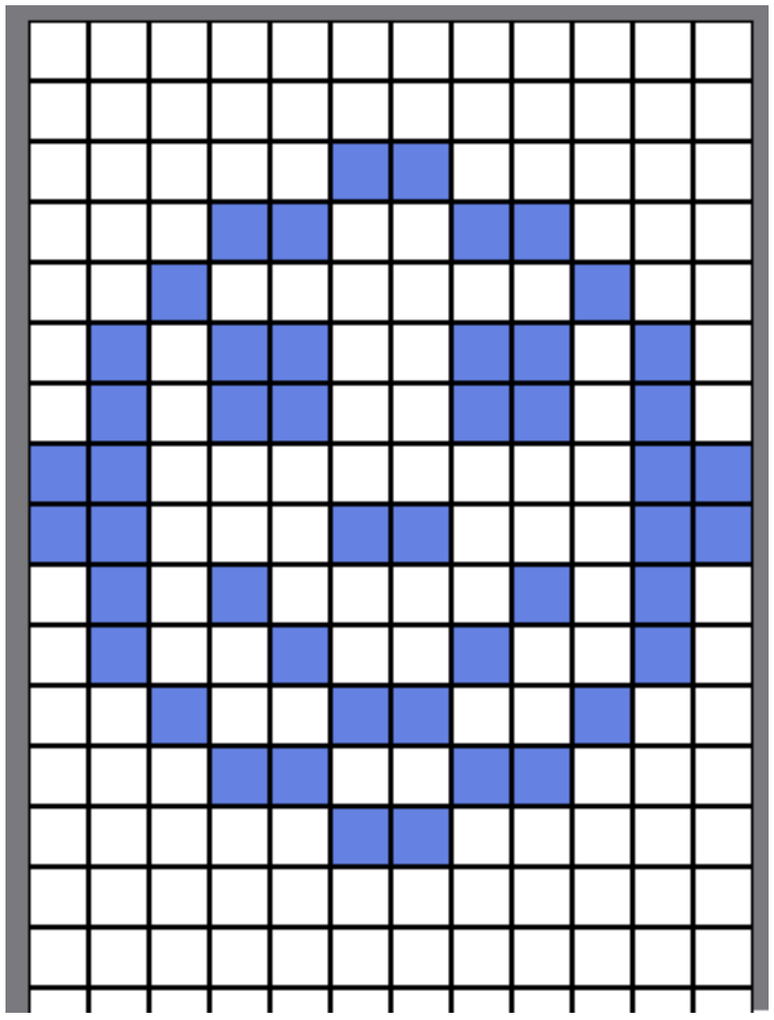

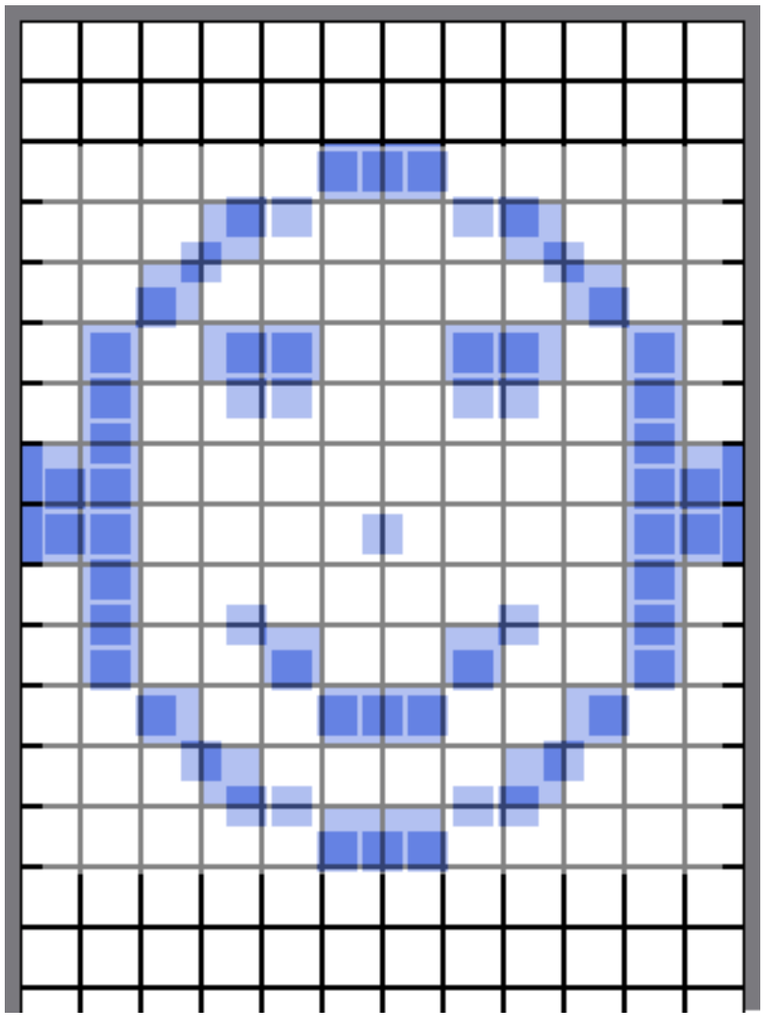

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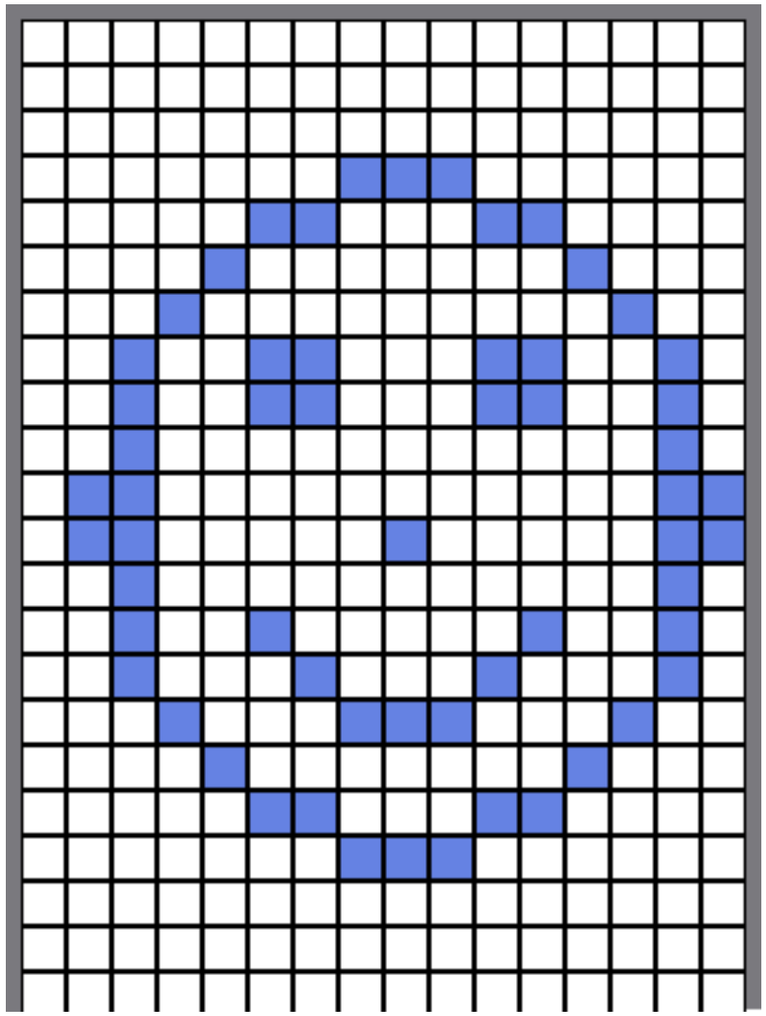
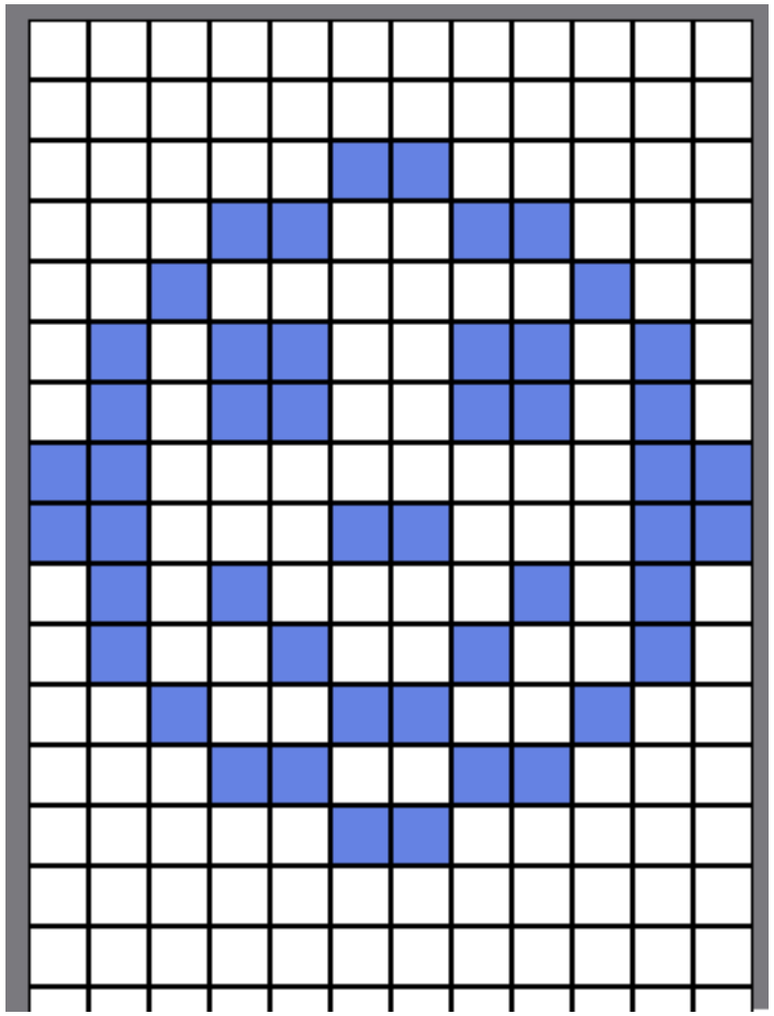
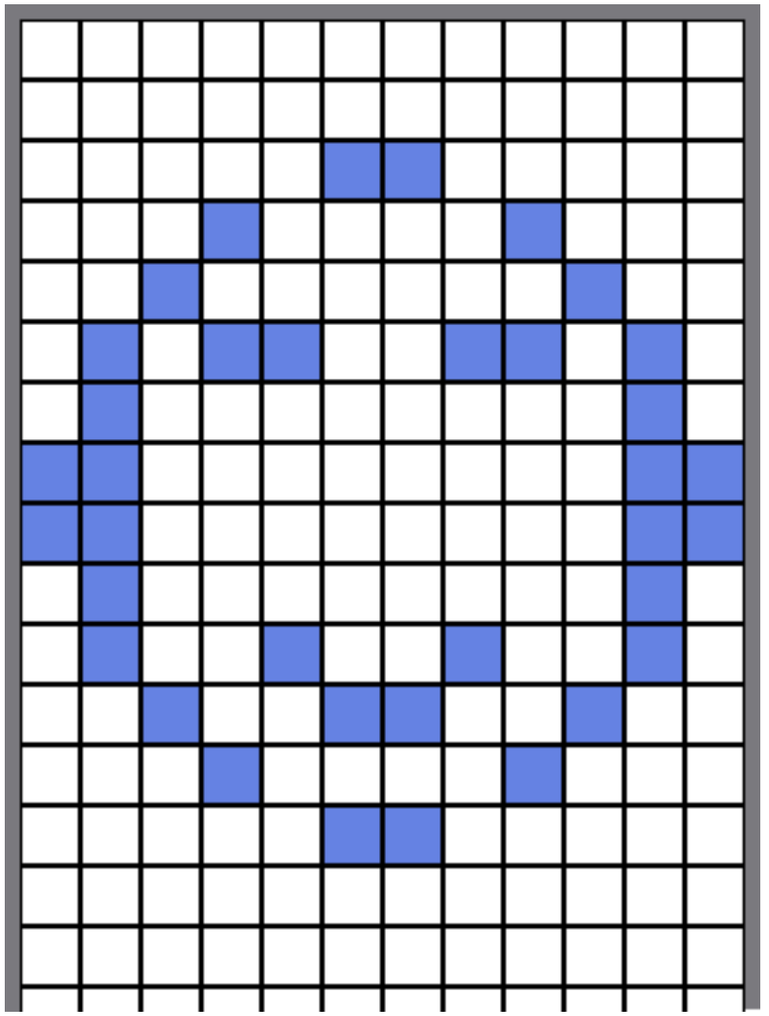






Manipulating Image Loading

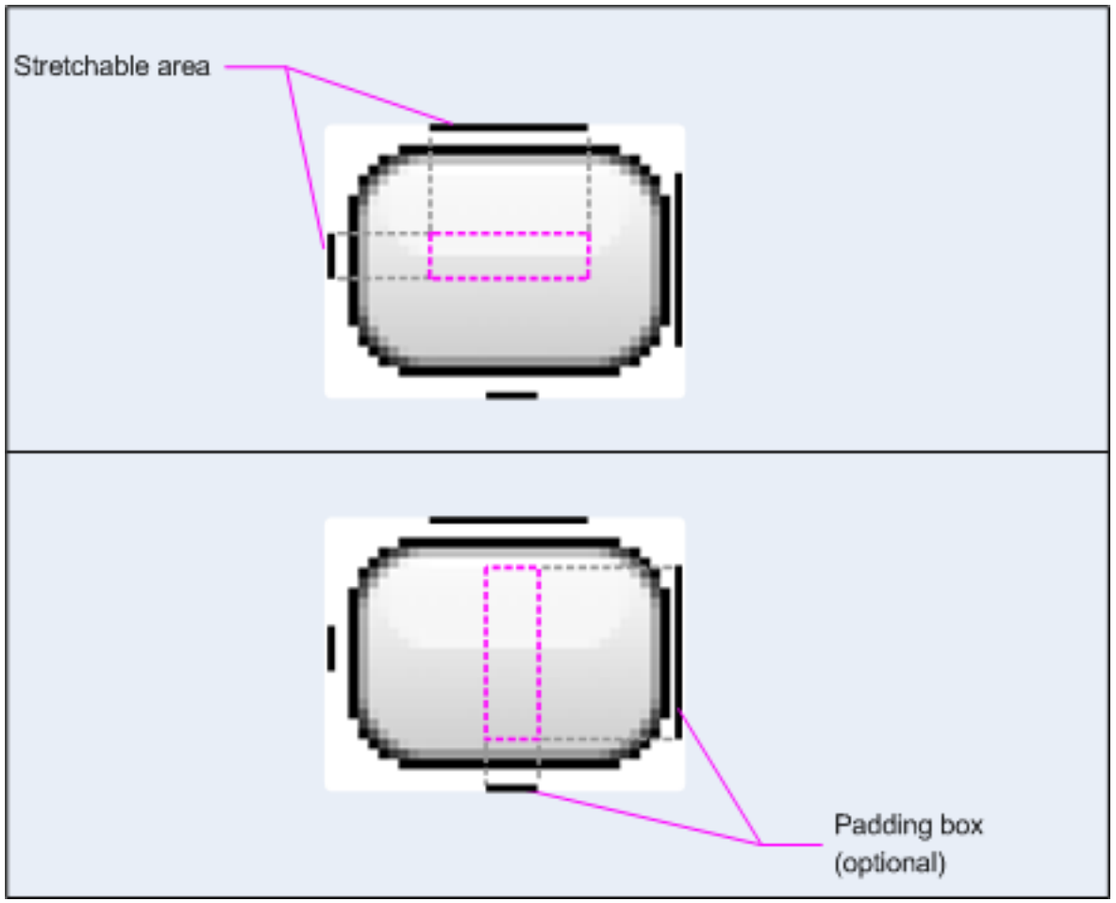
- DO NOT DO THIS
- OKAY, okay, if you must...
- Only possible (and sensical) on 1.6 and above
- Bitmap scaling controlled by density attributes of the object
- Normally...

```
BitmapFactory.Options default = new BitmapFactory.Options();
default.inDensity = <density of loaded resource>
default.inTargetDensity =
getResources().getDisplayMetrics().densityDpi;
```

- Pixels are scaled by inTargetDensity/inDensity
- Manually set inDensity = inTargetDensity = DisplayMetrics.densityDpi

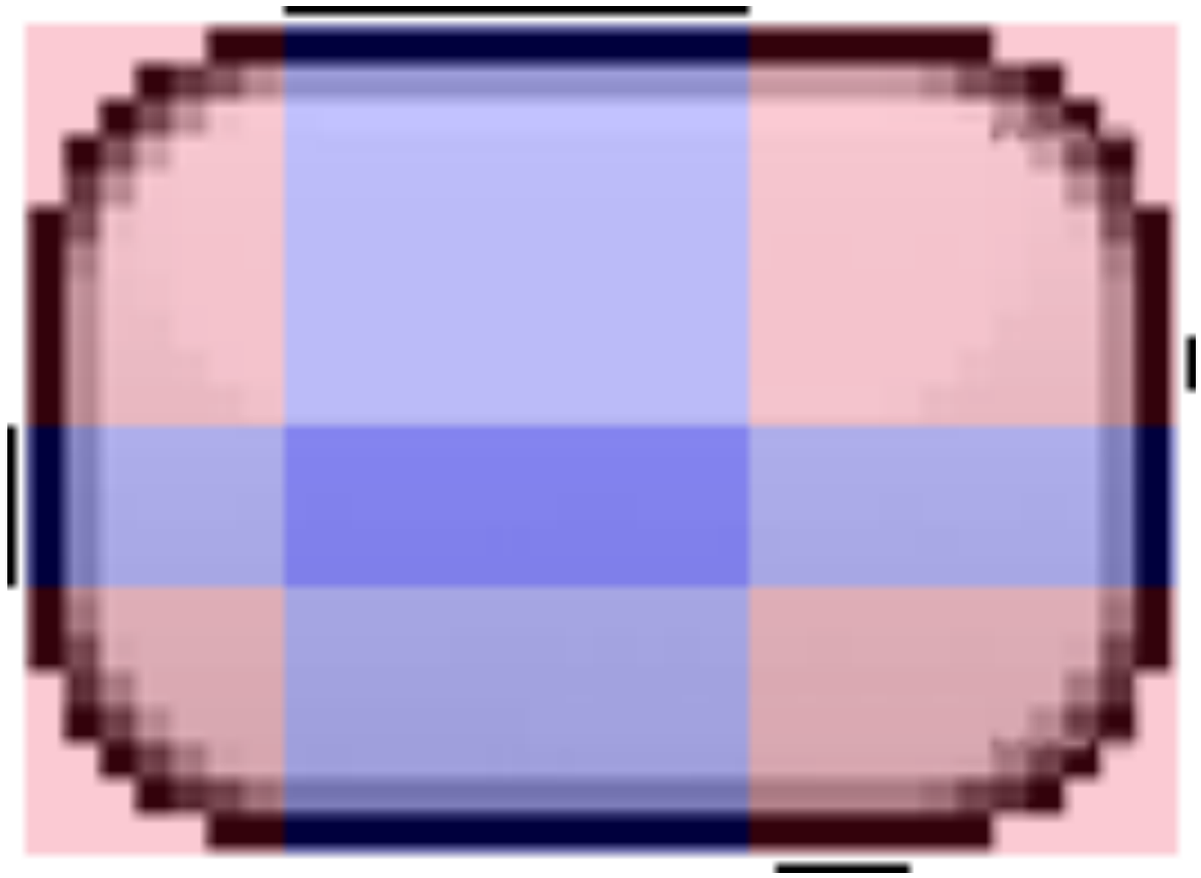
Nine-Patches

- Use to create image resources that can stretch controllably
- One set of controls for stretching, another for the content area



Nine-Patches

Stretching to fill the space

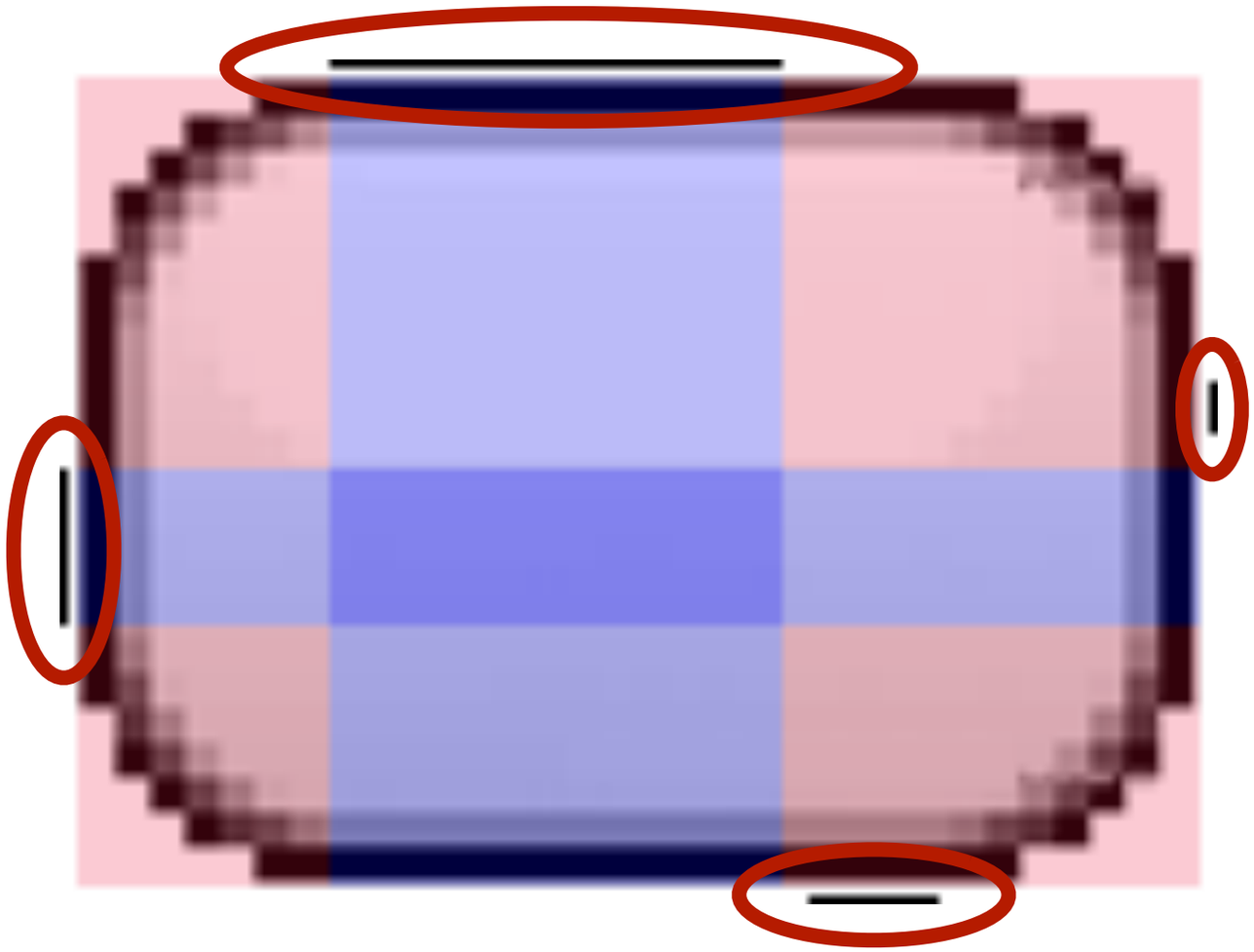


Nine-Patches

Stretching to fill the space

Nine-Patches

Stretching to fill the space



Nine-Patches

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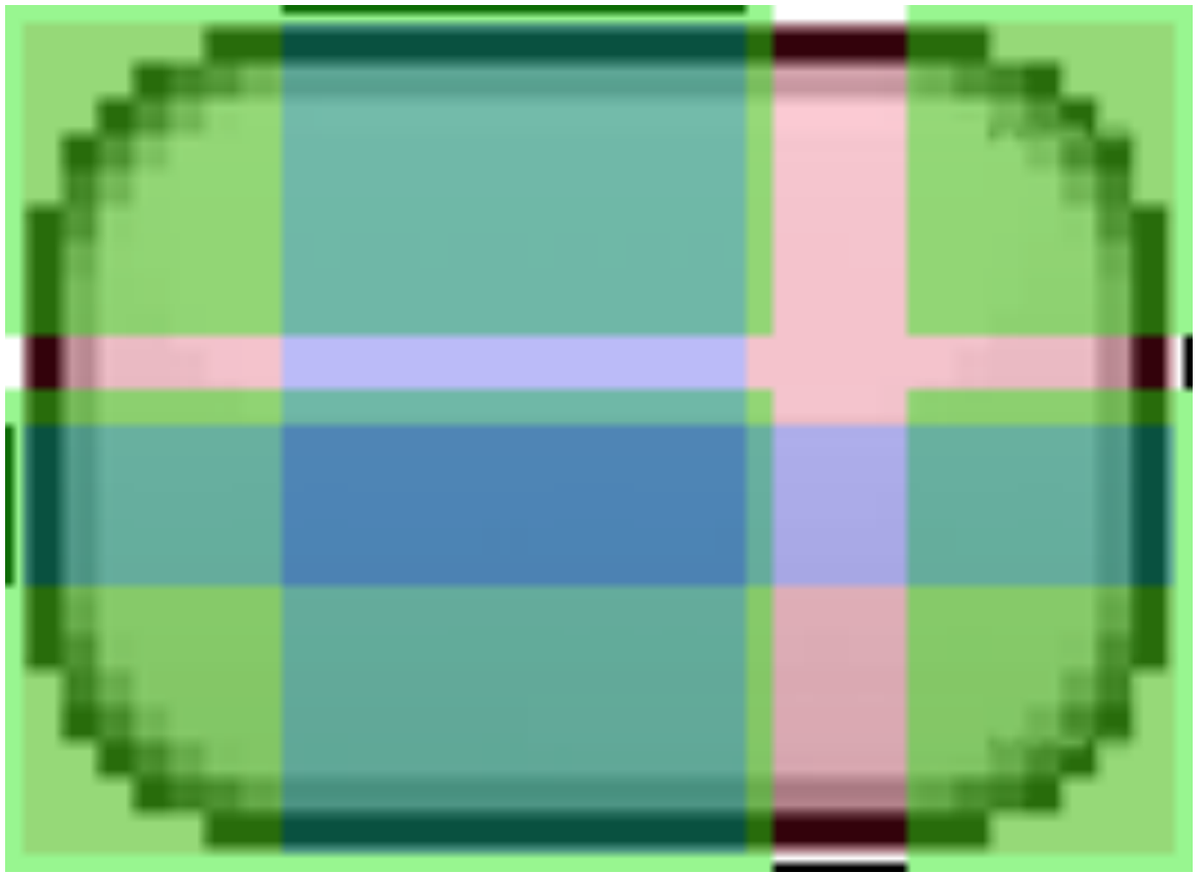


Nine-Patches

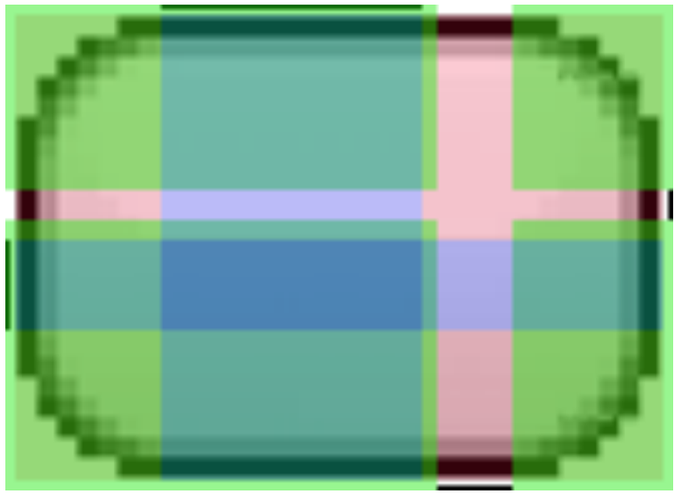
Stretching to fill the space

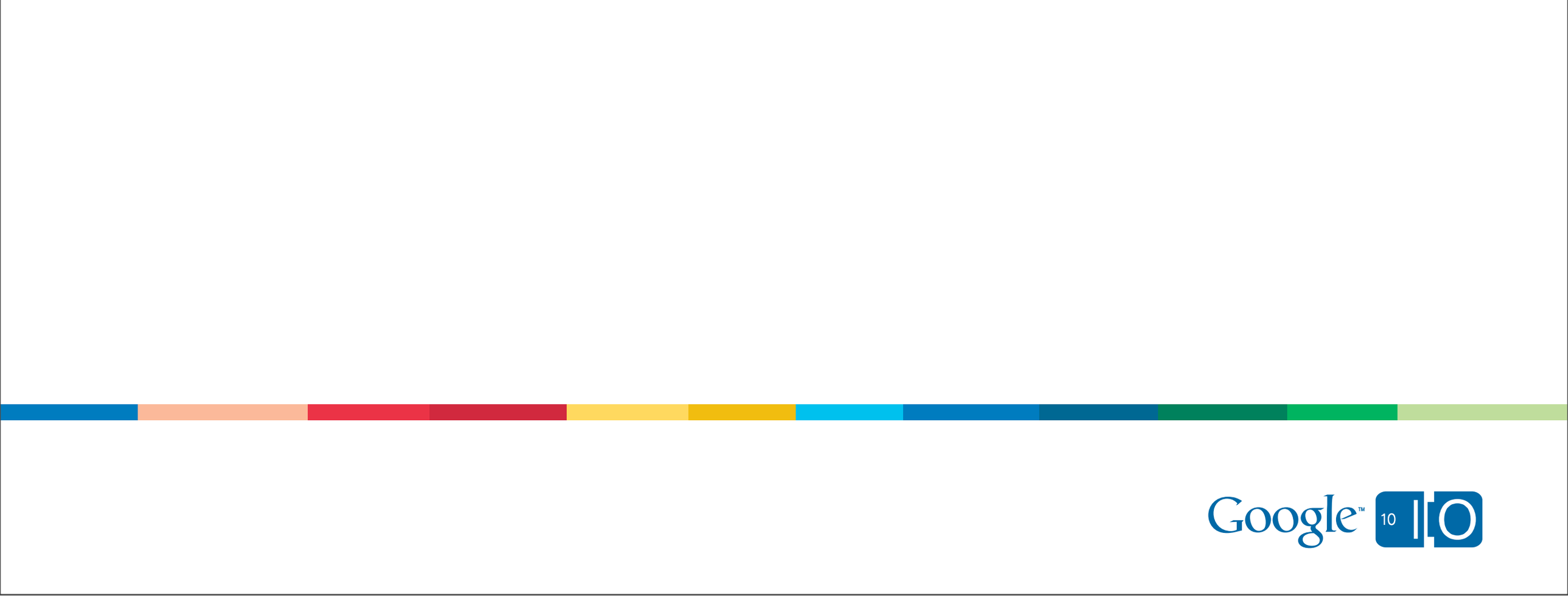
Nine-Patches

Stretching to fill the space

Nine-Patches

A little cushion

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Drawables

Shapes

- Draw optimized views, regardless of screen
- Primitives like square, oval, rectangle
- Use these as the basis for simple graphics instead of bitmaps
- Shape.draw() makes it easy to build a custom view

Shapes

```
public class LogoView extends View {
  private Shape mShape = new RectShape();
  private Drawable mLogo;
  public LogoView (Context context) {
    super(context);
    mLogo = getContext().getResources()
        .getDrawable(R.id.logo);
  }
  protected void onDraw(Canvas canvas) {
    mShape.resize(canvas.getWidth(), canvas.getHeight());
    mShape.draw(canvas, mLogoBackgroundPaint);
    mLogo.draw(canvas);
  }
}
```

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ScaleDrawable

- Adapt your drawables in a custom manner based on screen
- Wraps another drawable
- Allows for more exact control over scaling
- Ideal for situations where it doesn't make sense to preserve aspect ratio
  - Progress bars
  - Dividers
  - Any place where one dimension is more important than the other

LevelListDrawable

- Specified in XML
- Combines a group of resources into a drawable
- Use where the drawable is logically the same, but presentation varies based on state
  - status meters (eg. battery, signal)
  - weather condition
  - sports team
  - UI theme
- For cases without a natural “level”, define constants making code more readable
- Select the right resource for the right UI theme

LevelListDrawable

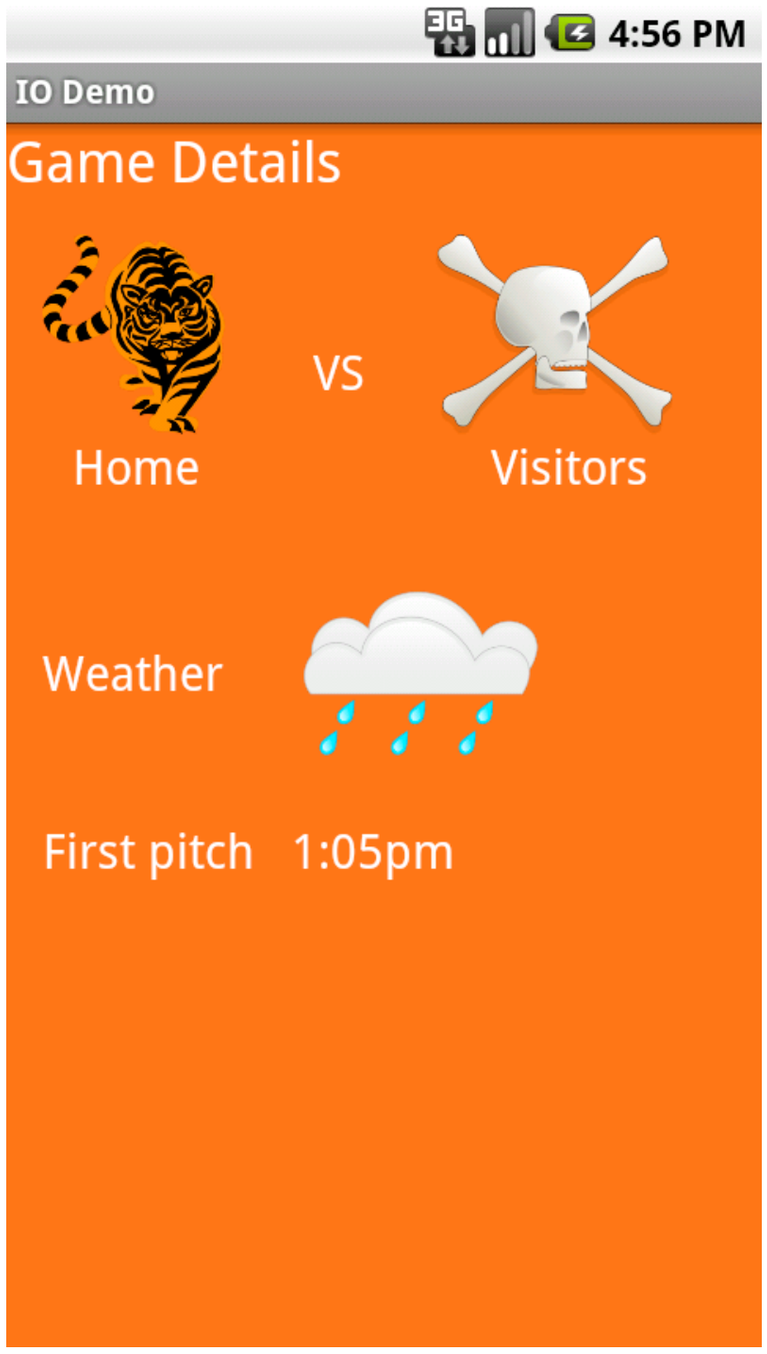
```
<?xml version="1.0" encoding="utf-8"?>
<level-list xmlns:android="http://schemas.android.com/apk/
res/android">
  <item android:maxLevel="0"
      android:drawable="@drawable/rain_chance_zero"/>
  <item android:maxLevel="10"
      android:drawable="@drawable/rain_chance_slight"/>
  <item android:maxLevel="40"
      android:drawable="@drawable/rain_chance_good"/>
  <item android:maxLevel="70"
      android:drawable="@drawable/rain_chance_high"/>
</level-list>
```

LevelListDrawable

```
public class IO_Demo extends Activity {
  public void onResume() {
    ((ImageView)findViewBy(R.id.weather))
        .setImageLevel(getRainChance());
  }

  private int getRainChance() {
    // call web service to get forecast
  }
}
```

LevelListDrawable



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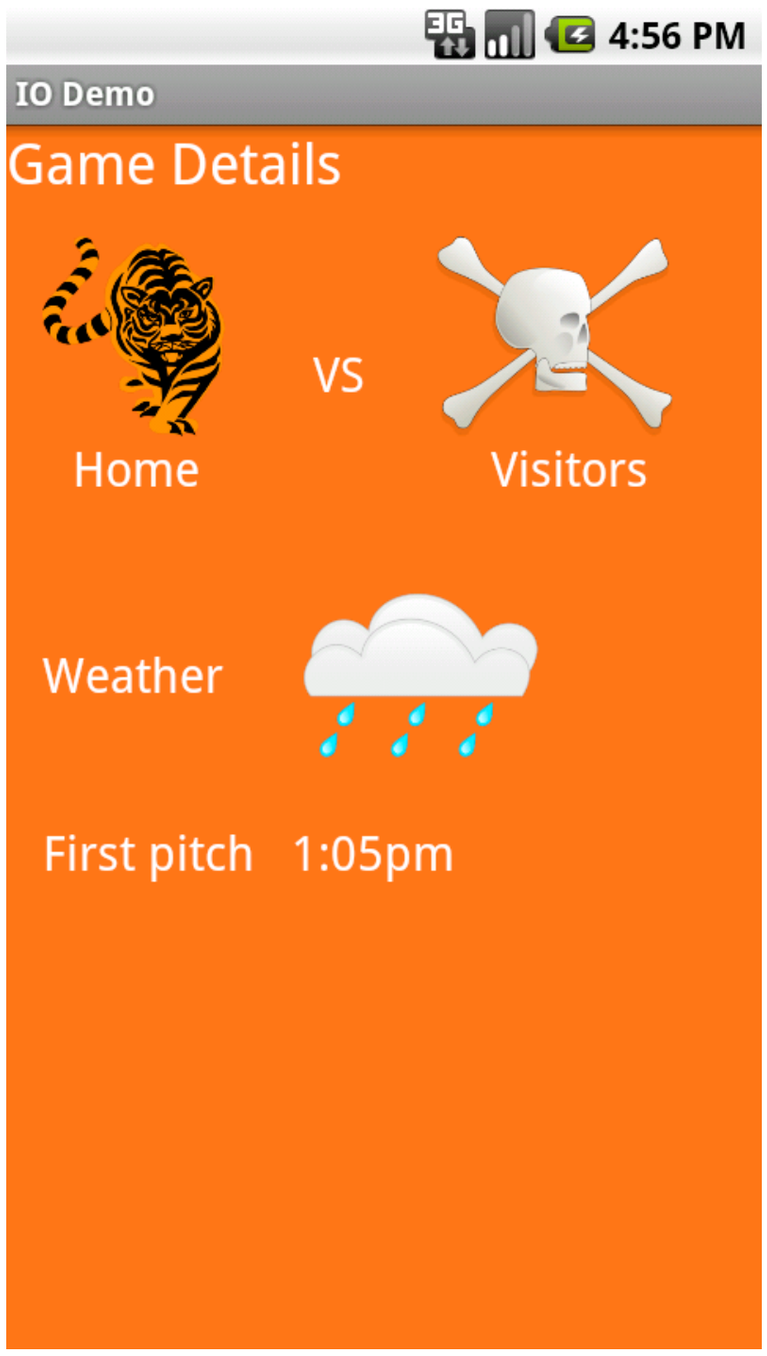
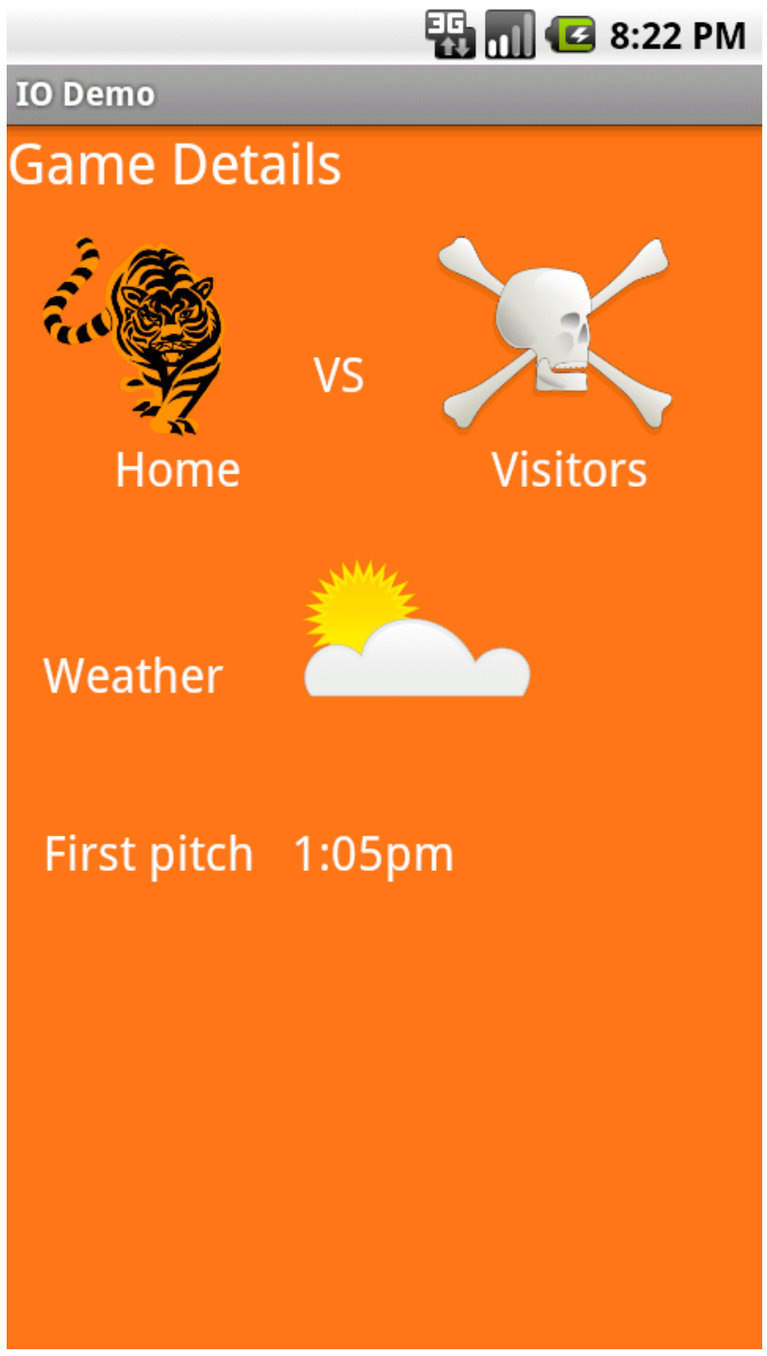
LevelListDrawable





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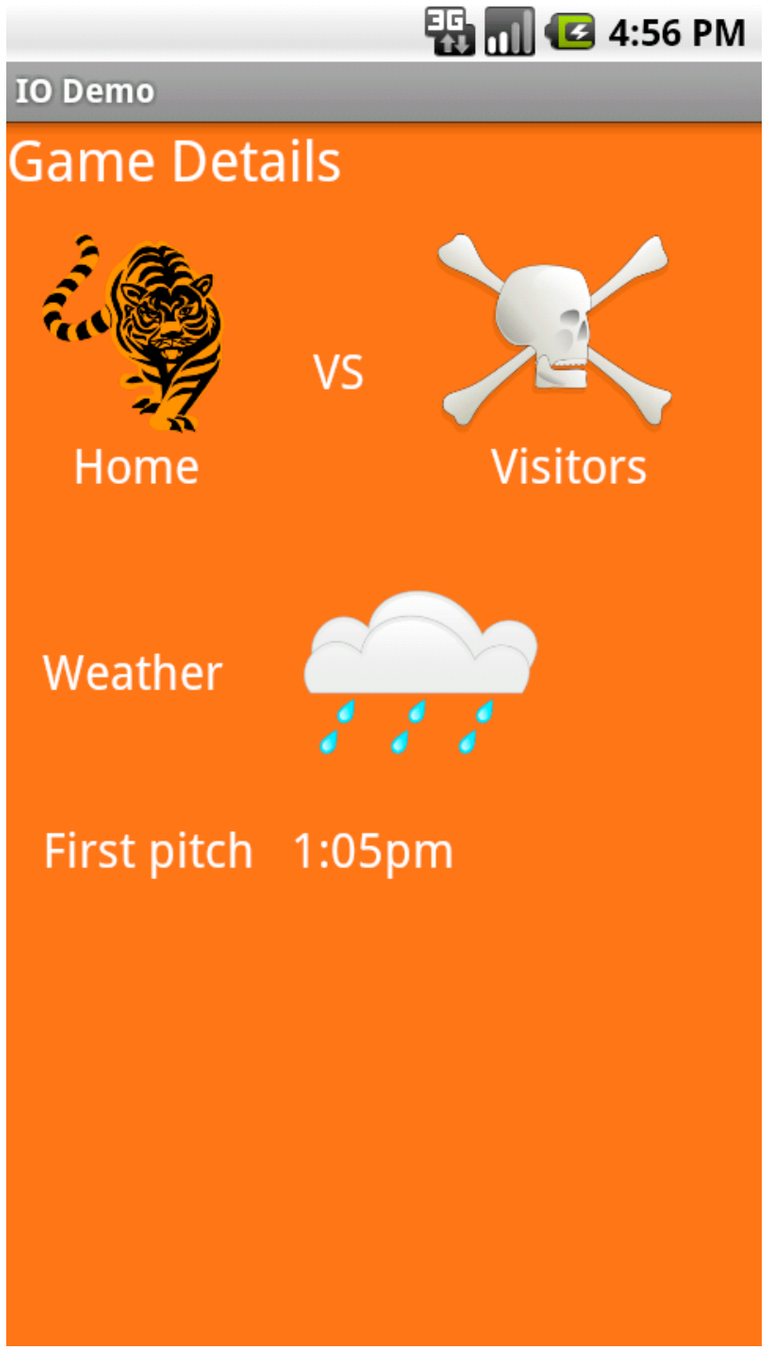

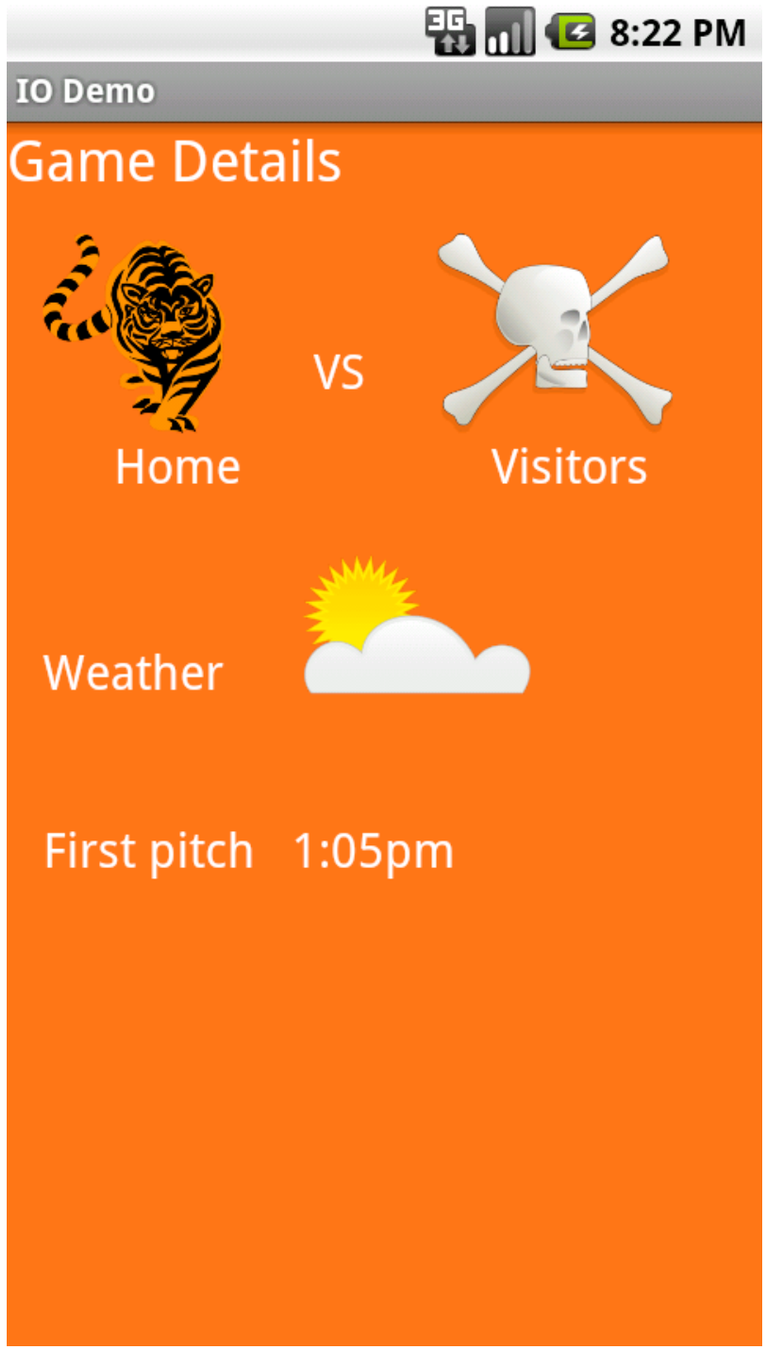

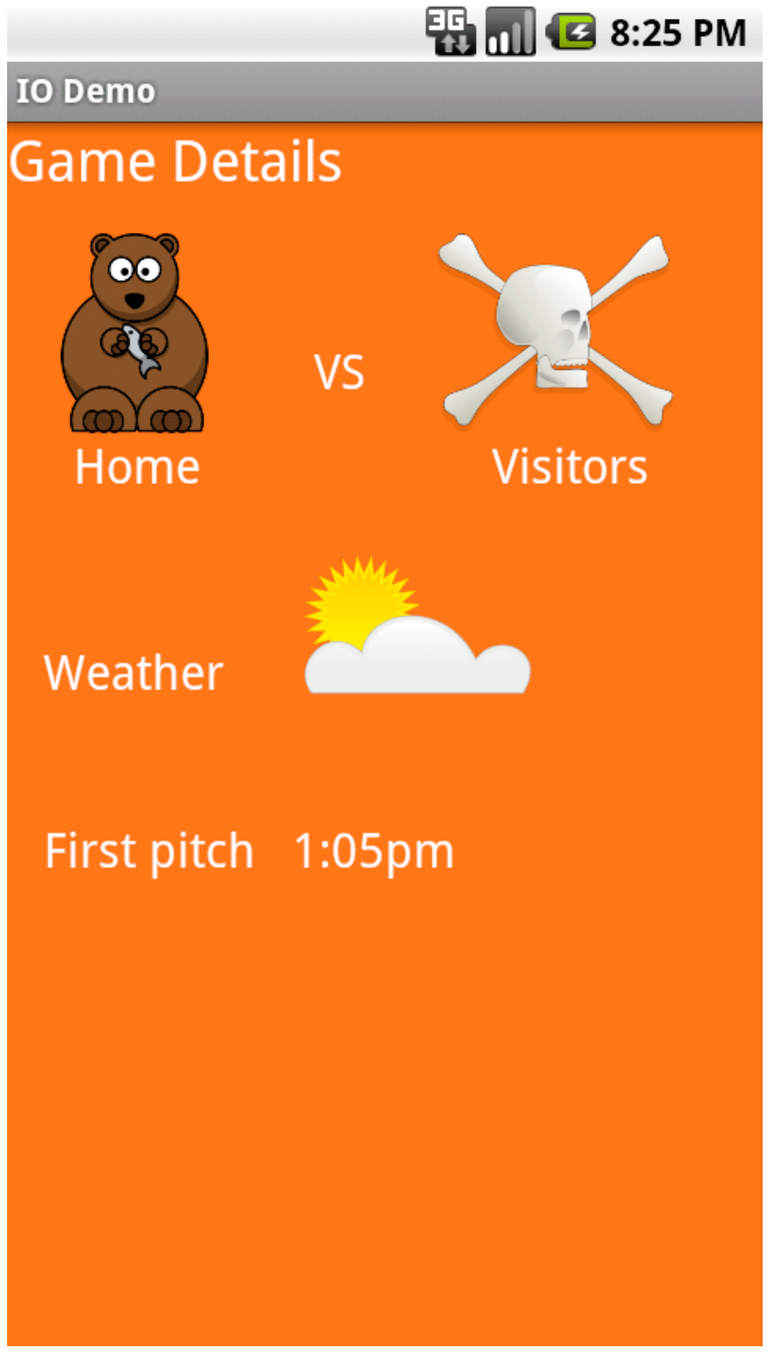

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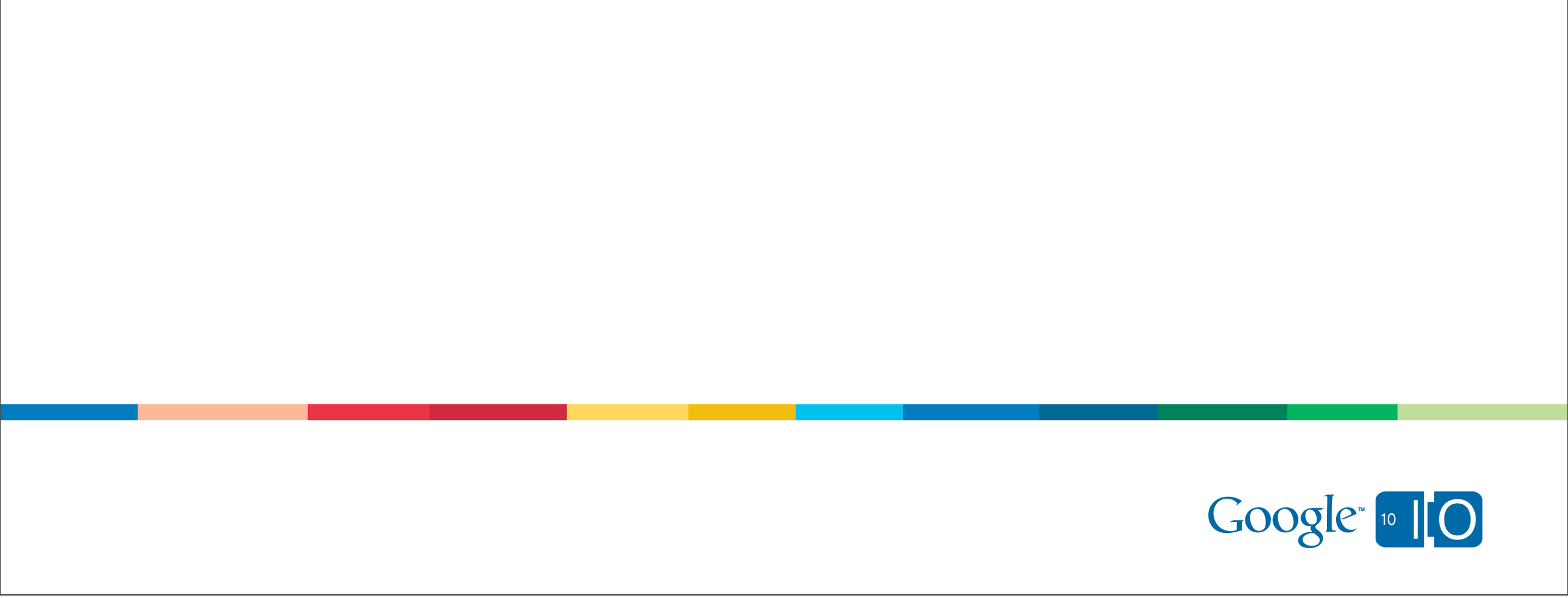
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Cross-Version Compatibility

API Changes: New Classes

- Runtime handling of class load failures
- Class dependencies resolved when class is first loaded
- Use a second class with a static method to provoke class verification
- Catch any verification error and adapt behavior
- Avoids messy Class.forName(“”) pattern, but grows number of classes needed
  - group in a single package or as inner classes

API Changes: New Classes

```
public class Canary {
  private static NEW_CLASS foo;

  public static void tryNewClass() {
    foo = new NEW_CLASS();
  }
}
```

API Changes: New Classes

```
public class MyActivity extends Activity {
  private boolean canaryAvailable;
  private void checkApis() {
    try {
      Canary.tryNewClass();
      canaryAvailable = true;
    } catch (VerifyError e) {
      canaryAvailable = false;
      Log.w(LOG_TAG, “Canary unavailable, falling back.”);
    }
  }
```

API Changes: New Methods

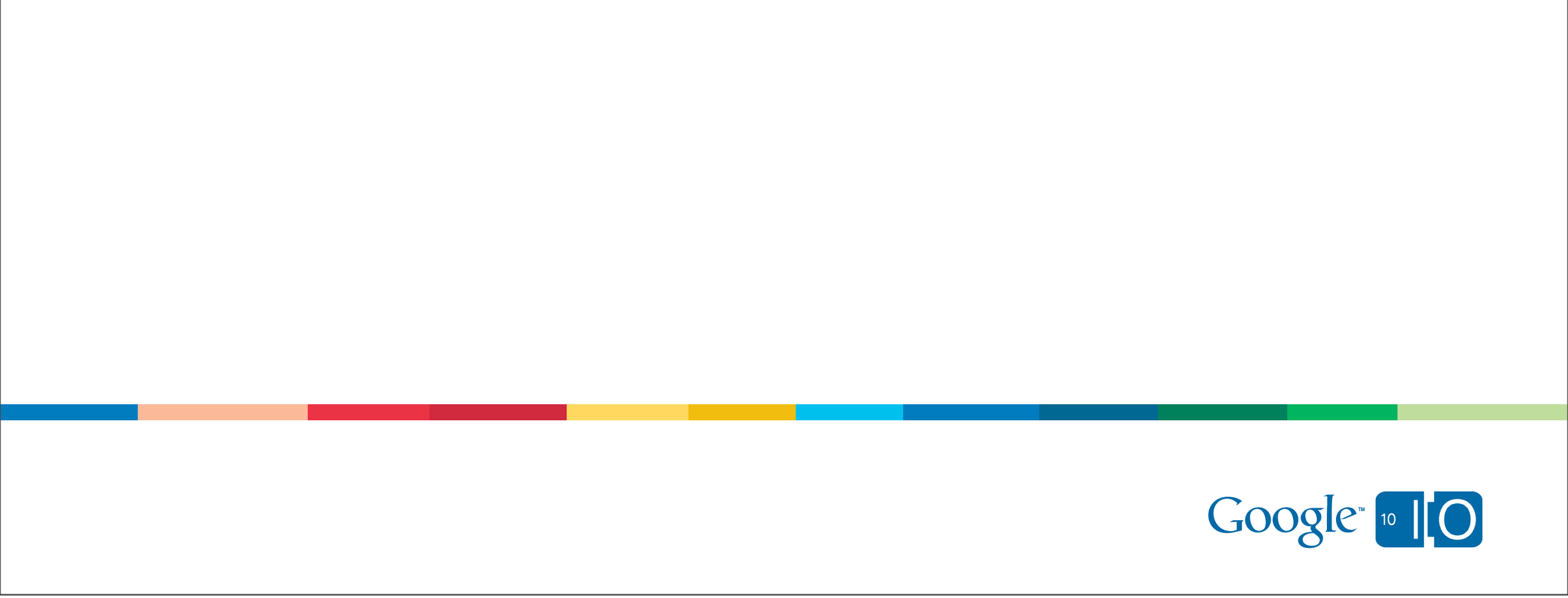
- A bit trickier than dealing with classes
- Determining which APIs are available
  - Use reflection to check availability
  - Make your code version aware
- Working with availability
  - Call through using reflection (fewer classes)
  - Write a factory to return the right class (cleaner)

API Changes: Mirror, mirror...

```
public class Canary {
  private static Method getDensity;
  static {
    getDensity = Canvas.class.getMethod(“getDensity”, null);
  } catch (NoSuchMethodException e) {
    Log.w(LOG_TAG, “getDensity method not available.”);
  }
}
```

API Changes: Mirror, mirror...

```
public class Canary {
  private static boolean hasDensity;
  private Canvas mDrawingSurface;
  public Integer getDensity() {
    if (getDensity != null) {
      return (Integer) getDensity.invoke(mDrawingSurface,
          null);
    } else {
      return DEFAULT;
    }
  }
```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Testing

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Testing, testing, testing

- Nothing beats it
- Verify the UI is behaving as expected
- Check that any API compatibility code functions properly
- Hardware testing is hopefully unnecessary, but...

Questions?

Use Wave to see live notes and ask questions

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