# 2D Graphics & Animation

# Drawing 2D Graphics

- Draw to a View
  - Simple graphics, little or no updating
- Draw to a Canvas
  - More complex graphics, with regular updates

# Drawable

Something that can be drawn, such as a bitmap, color, shape, etc.

Examples:

BitmapDrawable

ShapeDrawable

ColorDrawable

# Drawing to Views

Can set Drawable objects on Views

Can do this via XML or programmatically

# GraphicsBubble

Applications display a single ImageView

ImageView holds an image of a bubble


16:01
GraphicsBubbleXML

# GraphicsBubbleXML

```
<ImageView
    android:id="@+id/imageView1"
    android:layout_width="250dp"
    android:layout_height="250dp"
    android:layout_centerInParent="true"
    android:contentDescription="@string/bubble_desc"
    android:src="@drawable/b128" />
```

# GraphicsBubbleProgram

```
public class BubbleActivity extends Activity {
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        RelativeLayout relativeLayout = (RelativeLayout) findViewById(R.id.frame);

        ImageView bubbleView = new ImageView(getApplicationContext());
        bubbleView
                .setImageDrawable(getResources().getDrawable(R.drawable.b128));

        int width = (int) getResources().getDimension(R.dimen.image_width);
        int height = (int) getResources().getDimension(R.dimen.image_height);

        RelativeLayout.LayoutParams params = new RelativeLayout.LayoutParams(
                width, height);
        params.addRule(RelativeLayout.CENTER_IN_PARENT);

        bubbleView.setLayoutParams(params);

        relativeLayout.addView(bubbleView);
    }
}
```

# ShapeDrawable

Used for drawing primitive shapes

Shape represented by a Shape class

PathShape - lines

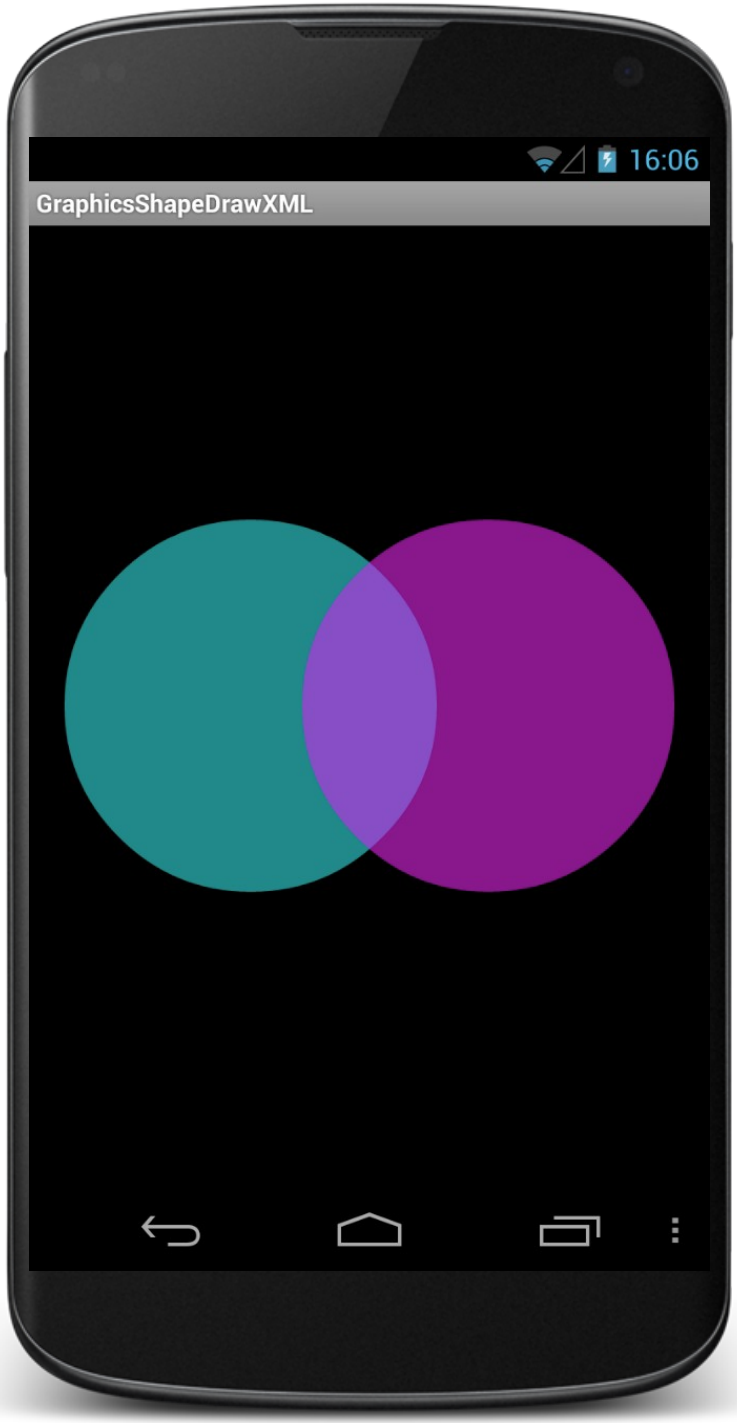
RectShape - rectangles

OvalShape - ovals & rings

# GraphicsShapeDraw

Applications display two Shapes within a RelativeLayout

The two shapes are partially overlapping and semi-transparent


16:06
GraphicsShapeDrawXML

# GraphicsShapeDraw

```
public class ShapeDrawActivity extends Activity {
    int alpha = 127;

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        int width = (int) getResources().getDimension(R.dimen.image_width);
        int height = (int) getResources().getDimension(R.dimen.image_height);
        int padding = (int) getResources().getDimension(R.dimen.padding);

        // Get container View
        RelativeLayout rl = (RelativeLayout) findViewById(R.id.main_window);
```

# GraphicsShapeDraw

```
// Create Cyan Shape
ShapeDrawable cyanShape = new ShapeDrawable(new OvalShape());
cyanShape.getPaint().setColor(Color.CYAN);
cyanShape.setIntrinsicHeight(height);
cyanShape.setIntrinsicWidth(width);
cyanShape.setAlpha(alpha);

// Put Cyan Shape into an ImageView
ImageView cyanView = new ImageView(getApplicationContext());
cyanView.setImageDrawable(cyanShape);
cyanView.setPadding(padding, padding, padding, padding);

// Specify placement of ImageView within RelativeLayout
RelativeLayout.LayoutParams cyanViewLayoutParams = new RelativeLayout.LayoutParams(
        height, width);
cyanViewLayoutParams.addRule(RelativeLayout.CENTER_VERTICAL);
cyanViewLayoutParams.addRule(RelativeLayout.ALIGN_PARENT_LEFT);
cyanView.setLayoutParams(cyanViewLayoutParams);
rl.addView(cyanView);
```

# GraphicsShapeDraw

```
// Create Magenta Shape
ShapeDrawable magentaShape = new ShapeDrawable(new OvalShape());
magentaShape.getPaint().setColor(Color.MAGENTA);
magentaShape.setIntrinsicHeight(height);
magentaShape.setIntrinsicWidth(width);
magentaShape.setAlpha(alpha);

// Put Magenta Shape into an ImageView
ImageView magentaView = new ImageView(getApplicationContext());
magentaView.setImageDrawable(magentaShape);
magentaView.setPadding(padding, padding, padding, padding);

// Specify placement of ImageView within RelativeLayout
RelativeLayout.LayoutParams magentaViewLayoutParams = new RelativeLayout.LayoutParams(
        height, width);
magentaViewLayoutParams.addRule(RelativeLayout.CENTER_VERTICAL);
magentaViewLayoutParams.addRule(RelativeLayout.ALIGN_PARENT_RIGHT);

magentaView.setLayoutParams(magentaViewLayoutParams);

rl.addView(magentaView);
```

# Drawing with a Canvas

A Bitmap (a matrix of Pixels)

A Canvas for drawing to the underlying Bitmap

A Drawing Primitive (e.g. Rect, Path, Text, Bitmap)

A paint object (for setting drawing colors & styles)

# Drawing Primitives

Canvas supports multiple drawing methods

drawText()

drawPoints()

drawColor()

drawOval()

drawBitmap()

# Paint

Specifies style parameters for drawing, e.g.,

setStrokeWidth()

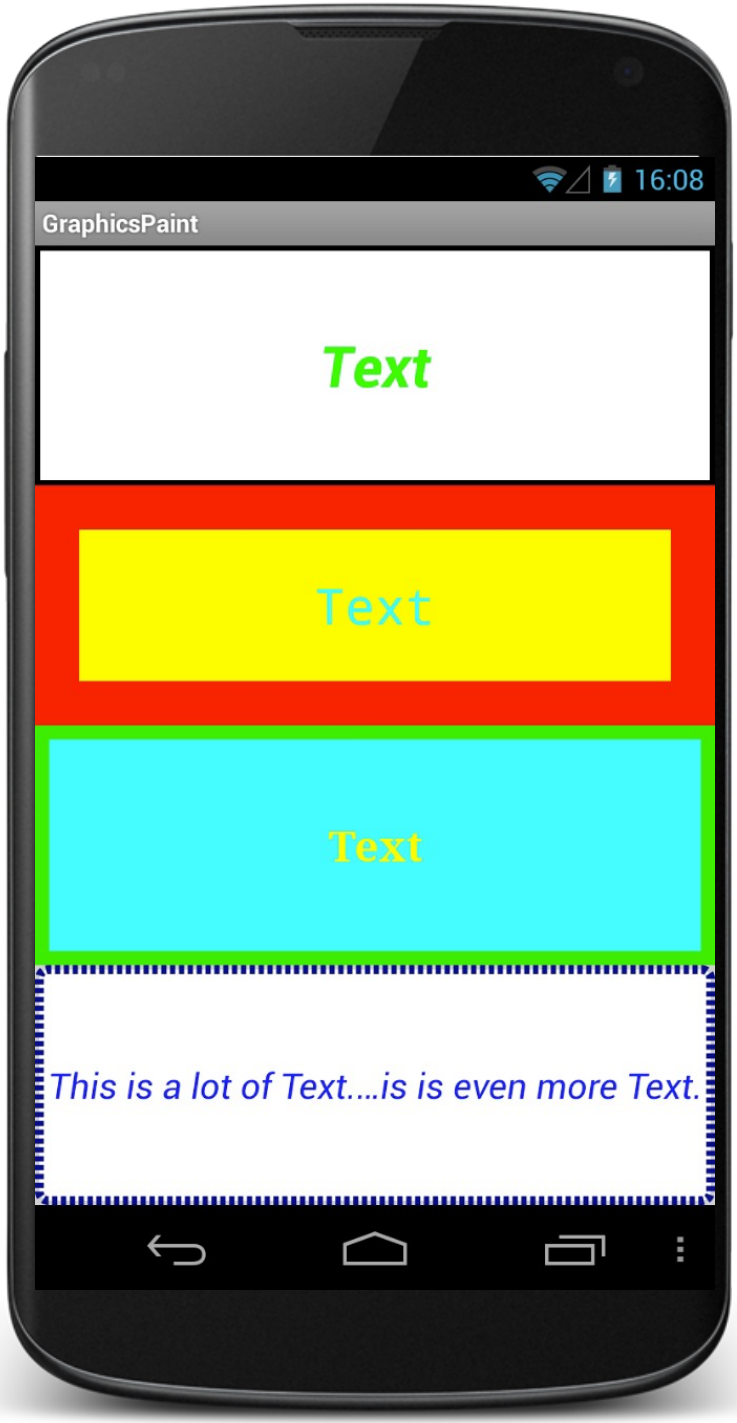
setTextSize()

setColor()

setAntiAlias()

# GraphicsPaint

Application draws several boxes holding text, so using different  paint settings each time


16:08
GraphicsPaint
Text
Text
Text
This is a lot of Text....is is even more Text.

# GraphicsPaint

```
<TextView
    android:id="@+id/textView1"
    android:layout_width="match_parent"
    android:layout_height="0dp"
    android:layout_weight="1"
    android:background="@drawable/sq1"
    android:gravity="center"
    android:text="@string/text_literal"
    android:textColor="#ff00ff00"
    android:textSize="32sp"
    android:textStyle="bold|italic"
    android:typeface="normal" />
```

# GraphicsPaint

```
<TextView
    android:id="@+id/imageView2"
    android:layout_width="match_parent"
    android:layout_height="0dp"
    android:layout_weight="1"
    android:background="@drawable/sq2"
    android:gravity="center"
    android:text="@string/text_literal"
    android:textColor="#FF00FFFF"
    android:textSize="28sp"
    android:textStyle="normal"
    android:typeface="monospace" />
```

# GraphicsPaint

```
<TextView
    android:id="@+id/imageView3"
    android:layout_width="match_parent"
    android:layout_height="0dp"
    android:layout_weight="1"
    android:background="@drawable/sq3"
    android:gravity="center"
    android:text="@string/text_literal"
    android:textColor="#FFFFFF00"
    android:textSize="24sp"
    android:textStyle="bold"
    android:typeface="serif" />
```

# GraphicsPaint

```
<TextView
    android:id="@+id/imageView4"
    android:layout_width="match_parent"
    android:layout_height="0dp"
    android:layout_weight="1"
    android:background="@drawable/sq4"
    android:ellipsize="middle"
    android:gravity="center"
    android:singleLine="true"
    android:text="@string/long_text"
    android:textColor="#FF0000FF"
    android:textSize="20sp"
    android:textStyle="italic"
    android:typeface="sans" />
```

# Drawing with a Canvas

Can draw to generic Views, or to SurfaceViews

# Drawing to Views

Use when updates are infrequent

Create a custom View class

System provides the canvas to the View when it calls the View's onDraw() method

# Drawing to SurfaceViews

Create a Custom SurfaceView

Provide secondary thread for drawing

Application provides its own canvas and has greater control over drawing

# GraphicsBubble

This application draws to custom View

It has an Internal Thread that periodically wakes up and causes the View to move and to be redrawn


16:12
GraphicsCanvasBubble

# GraphicsCanvasBubble

```
public class BubbleActivity extends Activity {
    protected static final String TAG = "BubbleActivity";

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        final RelativeLayout frame = (RelativeLayout) findViewById(R.id.frame);
        final Bitmap bitmap = BitmapFactory.decodeResource(getResources(),
                R.drawable.b128);
        final BubbleView bubbleView = new BubbleView(getApplicationContext(),
                bitmap);

        frame.addView(bubbleView);

        new Thread(new Runnable() {
            @Override
            public void run() {
                while (bubbleView.move()) {
                    bubbleView.postInvalidate();
                    try {
                        Thread.sleep(1000);
                    } catch (InterruptedException e) {
                        Log.i(TAG, "InterruptedException");
                    }

                }
            }
        }).start();
    }
```

# GraphicsCanvasBubble

```
private class BubbleView extends View {

    private static final int STEP = 100;
    final private Bitmap mBitmap;

    private Coords mCurrent;
    final private Coords mDxDy;

    final private DisplayMetrics mDisplayMetrics;
    final private int mDisplayWidth;
    final private int mDisplayHeight;
    final private int mBitmapWidthAndHeight, mBitmapWidthAndHeightAdj;
    final private Paint mPainter = new Paint();

    public BubbleView(Context context, Bitmap bitmap) {
        super(context);

        mBitmapWidthAndHeight = (int) getResources().getDimension(
                R.dimen.image_height);
        this.mBitmap = Bitmap.createScaledBitmap(bitmap,
                mBitmapWidthAndHeight, mBitmapWidthAndHeight, false);

        mBitmapWidthAndHeightAdj = mBitmapWidthAndHeight + 20;

        mDisplayMetrics = new DisplayMetrics();
        BubbleActivity.this.getWindowManager().getDefaultDisplay()
```

GR

```
private static final int STEP = 100;
final private Bitmap mBitmap;

private Coords mCurrent;
final private Coords mDxDy;

final private DisplayMetrics mDisplayMetrics;
final private int mDisplayWidth;
final private int mDisplayHeight;
final private int mBitmapWidthAndHeight, mBitmapWidthAndHeightAdj;
final private Paint mPainter = new Paint();

public BubbleView(Context context, Bitmap bitmap) {
    super(context);

    mBitmapWidthAndHeight = (int) getResources().getDimension(
            R.dimen.image_height);
    this.mBitmap = Bitmap.createScaledBitmap(bitmap,
            mBitmapWidthAndHeight, mBitmapWidthAndHeight, false);

    mBitmapWidthAndHeightAdj = mBitmapWidthAndHeight + 20;

    mDisplayMetrics = new DisplayMetrics();
    BubbleActivity.this.getWindowManager().getDefaultDisplay()
            .getMetrics(mDisplayMetrics);
    mDisplayWidth = mDisplayMetrics.widthPixels;
    mDisplayHeight = mDisplayMetrics.heightPixels;

    Random r = new Random();
    float x = (float) r.nextInt(mDisplayWidth);
    float y = (float) r.nextInt(mDisplayHeight);
    mCurrent = new Coords(x, y);

    float dy = (float) r.nextInt(mDisplayHeight) / mDisplayHeight;
    dy *= r.nextInt(2) == 1 ? STEP : -1 * STEP;
    float dx = (float) r.nextInt(mDisplayWidth) / mDisplayWidth;
    dx *= r.nextInt(2) == 1 ? STEP : -1 * STEP;
    mDxDy = new Coords(dx, dy);
```

GR

```
        mBitmapWidthAndHeight = (int) getResources().getDimension(
                R.dimen.image_height);
        this.mBitmap = Bitmap.createScaledBitmap(bitmap,
                mBitmapWidthAndHeight, mBitmapWidthAndHeight, false);

        mBitmapWidthAndHeightAdj = mBitmapWidthAndHeight + 20;

        mDisplayMetrics = new DisplayMetrics();
        BubbleActivity.this.getWindowManager().getDefaultDisplay()
                .getMetrics(mDisplayMetrics);
        mDisplayWidth = mDisplayMetrics.widthPixels;
        mDisplayHeight = mDisplayMetrics.heightPixels;

        Random r = new Random();
        float x = (float) r.nextInt(mDisplayWidth);
        float y = (float) r.nextInt(mDisplayHeight);
        mCurrent = new Coords(x, y);

        float dy = (float) r.nextInt(mDisplayHeight) / mDisplayHeight;
        dy *= r.nextInt(2) == 1 ? STEP : -1 * STEP;
        float dx = (float) r.nextInt(mDisplayWidth) / mDisplayWidth;
        dx *= r.nextInt(2) == 1 ? STEP : -1 * STEP;
        mDxDy = new Coords(dx, dy);

        mPainter.setAntiAlias(true);

    }
```

# GraphicsCanvasBubble

```
@Override
protected void onDraw(Canvas canvas) {
    Coords tmp = mCurrent.getCoords();
    canvas.drawBitmap(mBitmap, tmp.mX, tmp.mY, mPainter);
}

protected boolean move() {
    mCurrent = mCurrent.move(mDxDy);

    if (mCurrent.mY < 0 - mBitmapWidthAndHeightAdj
            || mCurrent.mY > mDisplayHeight + mBitmapWidthAndHeightAdj
            || mCurrent.mX < 0 - mBitmapWidthAndHeightAdj
            || mCurrent.mX > mDisplayWidth + mBitmapWidthAndHeightAdj) {
        return false;
    } else {
        return true;
    }
}
```

# Canvas with SurfaceView

Used for more high-performance drawing outside the UI thread

# SurfaceView

SurfaceView manages a low-level drawing area called a Surface

The Surface represent a drawing area within the View hierarchy

# Defining a Custom SurfaceView

Subclass SurfaceView & implement SurfaceHolder.Callback

SurfaceHolder.Callback declares lifecycle methods that are called when the Surface changes

# Using a SurfaceView

Set up SurfaceView

Draw to SurfaceView

# Setup

Use SurfaceView’s getHolder() to acquire Surface

# Setup

Register for callbacks with SurfaceHolder's addCallback()

surfaceCreate()

surfaceChanged()

surfaceDestroyed()

# Setup

Create the thread on which drawing operations will execute

# Drawing

Acquire lock on Canvas

SurfaceHolder.lockCanvas()

Draw

Canvas.drawBitmap()

Unlock Canvas

SurfaceHolder.unlockCanvasAndPost()


17:47
GraphicsCanvasBubbleSurfaceView

# GraphicsCanvasBubbleSurfaceView

```
public class BubbleActivity extends Activity {

    BubbleView mBubbleView;

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        RelativeLayout relativeLayout = (RelativeLayout) findViewById(R.id.frame);
        final BubbleView bubbleView = new BubbleView(getApplicationContext(),
                BitmapFactory.decodeResource(getResources(), R.drawable.b128));

        relativeLayout.addView(bubbleView);
    }
```

# GraphicsCanvasBubbleSurfaceView

```
private class BubbleView extends SurfaceView implements
        SurfaceHolder.Callback {

    private final Bitmap mBitmap;
    private final int mBitmapHeightAndWidth, mBitmapHeightAndWidthAdj;
    private final DisplayMetrics mDisplay;
    private final int mDisplayWidth, mDisplayHeight;
    private float mX, mY, mDx, mDy, mRotation;
    private final SurfaceHolder mSurfaceHolder;
    private final Paint mPainter = new Paint();
    private Thread mDrawingThread;

    private static final int MOVE_STEP = 1;
    private static final float ROT_STEP = 1.0f;
```

# GraphicsCanvasBubbleSurfaceView

```
public BubbleView(Context context, Bitmap bitmap) {
    super(context);

    mBitmapHeightAndWidth = (int) getResources().getDimension(
            R.dimen.image_height_width);
    this.mBitmap = Bitmap.createScaledBitmap(bitmap,
            mBitmapHeightAndWidth, mBitmapHeightAndWidth, false);

    mBitmapHeightAndWidthAdj = mBitmapHeightAndWidth / 2;

    mDisplay = new DisplayMetrics();
    BubbleActivity.this.getWindowManager().getDefaultDisplay()
            .getMetrics(mDisplay);
    mDisplayWidth = mDisplay.widthPixels;
    mDisplayHeight = mDisplay.heightPixels;

    Random r = new Random();
    mX = (float) r.nextInt(mDisplayHeight);
    mY = (float) r.nextInt(mDisplayWidth);
    mDx = (float) r.nextInt(mDisplayHeight) / mDisplayHeight;
    mDx *= r.nextInt(2) == 1 ? MOVE_STEP : -1 * MOVE_STEP;
    mDy = (float) r.nextInt(mDisplayWidth) / mDisplayWidth;
    mDy *= r.nextInt(2) == 1 ? MOVE_STEP : -1 * MOVE_STEP;
    mRotation = 1.0f;
```

# GraphicsCanvasBubbleSurfaceView

```
public BubbleView(Context context, Bitmap bitmap) {
    super(context);

    mBitmapHeightAndWidth = (int) getResources().getDimension(
            R.dimen.image_height_width);
    this.mBitmap = Bitmap.createScaledBitmap(bitmap,
            mBitmapHeightAndWidth, mBitmapHeightAndWidth, false);

    mBitmapHeightAndWidthAdj = mBitmapHeightAndWidth / 2;

    mDisplay = new DisplayMetrics();
    BubbleActivity.this.getWindowManager().getDefaultDisplay()
            .getMetrics(mDisplay);
    mDisplayWidth = mDisplay.widthPixels;
    mDisplayHeight = mDisplay.heightPixels;

    Random r = new Random();
    mX = (float) r.nextInt(mDisplayHeight);
    mY = (float) r.nextInt(mDisplayWidth);
    mDx = (float) r.nextInt(mDisplayHeight) / mDisplayHeight;
    mDx *= r.nextInt(2) == 1 ? MOVE_STEP : -1 * MOVE_STEP;
    mDy = (float) r.nextInt(mDisplayWidth) / mDisplayWidth;
    mDy *= r.nextInt(2) == 1 ? MOVE_STEP : -1 * MOVE_STEP;
    mRotation = 1.0f;

    mPainter.setAntiAlias(true);

    mSurfaceHolder = getHolder();
    mSurfaceHolder.addCallback(this);
}
```

# GraphicsCanvasBubbleSurfaceView

```
private void drawBubble(Canvas canvas) {
    canvas.drawColor(Color.DKGRAY);
    mRotation += ROT_STEP;
    canvas.rotate(mRotation, mY + mBitmapHeightAndWidthAdj, mX
            + mBitmapHeightAndWidthAdj);
    canvas.drawBitmap(mBitmap, mY, mX, mPainter);
}

private boolean move() {
    mX += mDx;
    mY += mDy;
    if (mX < 0 - mBitmapHeightAndWidth
            || mX > mDisplayHeight + mBitmapHeightAndWidth
            || mY < 0 - mBitmapHeightAndWidth
            || mY > mDisplayWidth + mBitmapHeightAndWidth) {
        return false;
    } else {
        return true;
    }
}

@Override
public void surfaceChanged(SurfaceHolder holder, int format, int width,
        int height) {
}
```

# GraphicsCanvasBubbleSurfaceView

```
@Override
public void surfaceCreated(SurfaceHolder holder) {
    mDrawingThread = new Thread(new Runnable() {
        public void run() {
            Canvas canvas = null;
            while (!Thread.currentThread().isInterrupted() && move()) {
                canvas = mSurfaceHolder.lockCanvas();
                if (null != canvas) {
                    drawBubble(canvas);
                    mSurfaceHolder.unlockCanvasAndPost(canvas);
                }
            }
        }
    });
    mDrawingThread.start();
}

@Override
public void surfaceDestroyed(SurfaceHolder holder) {
    if (null != mDrawingThread)
        mDrawingThread.interrupt();
}
```

# View Animation

Changing the properties of a View over a period of time

Size

Position

Transparency

Orientation

# View Animation Classes

TransitionDrawable

AnimationDrawable

Animation

# TransitionDrawable

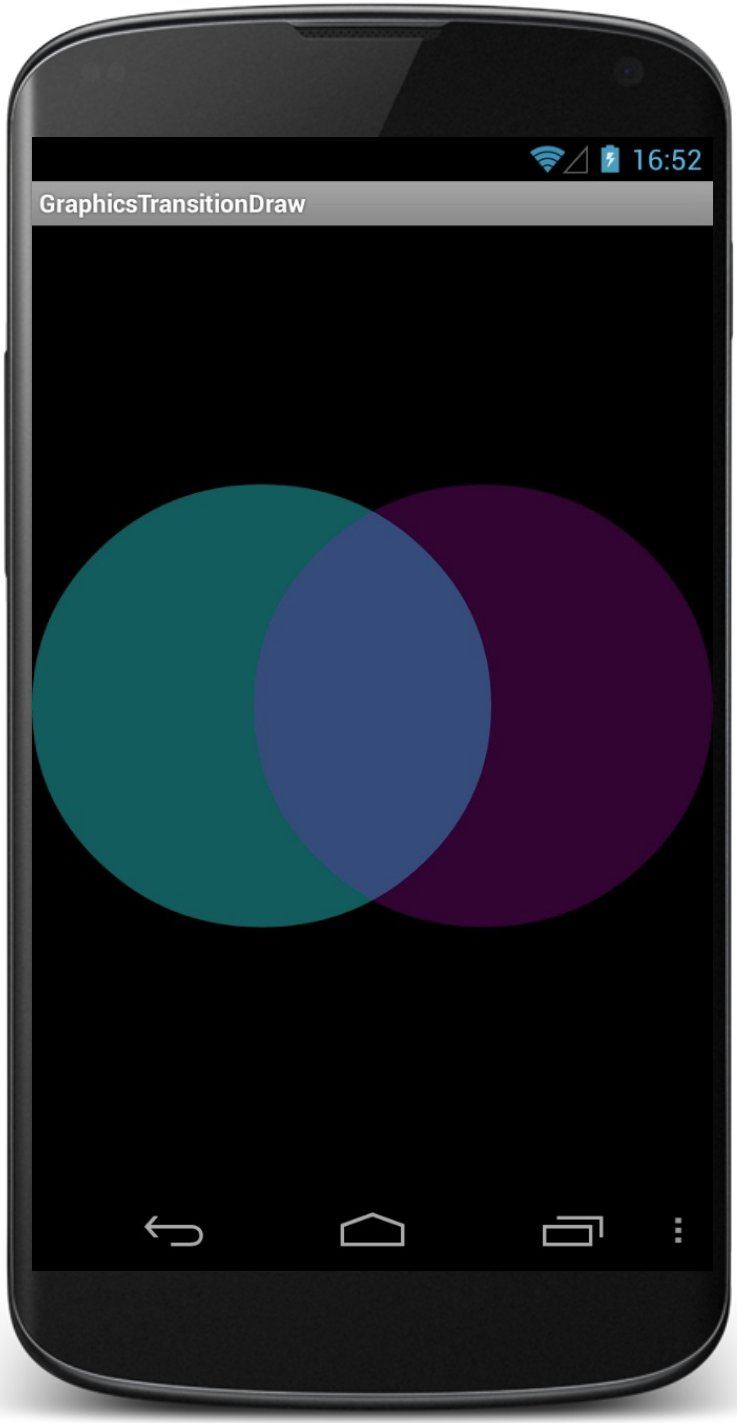
A 2-layer Drawable

Can fade between 1st & 2nd layers

# GraphicsTransitionDrawable

This application uses the same shapes as the GraphicsShapeDraw applications

Shows Cyan shape then fades to Magenta shape


16:52
GraphicsTransitionDraw

# GraphicsTransitionDrawable

```
<ImageView
    android:id="@+id/image_view"
    android:layout_width="match_parent"
    android:layout_height="250dp"
    android:contentDescription="@string/fading_image_desc"
    android:layout_centerVertical="true"
```

```
@Override
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);

    setContentView(R.layout.main);

    TransitionDrawable transition = (TransitionDrawable) getResources()
            .getDrawable(R.drawable.shape_transition);

    transition.setCrossFadeEnabled(true);

    ((ImageView) findViewById(R.id.image_view)).setImageDrawable(transition);

    transition.startTransition(5000);
}
```

# AnimationDrawable

Animates a series of Drawables

Each Drawable is shown for a specific amount of time

# GraphicsFrameAnimation

Uses an Animation Drawable to present a frame by frame animation


16:54
GraphicsFrameAnimation

# GraphicsFrameAnimation

```
<ImageView
    android:id="@+id/countdown_frame"
    android:layout_width="300dp"
    android:layout_height="250dip"
    android:layout_gravity="center"
    android:layout_marginBottom="20dp"
    android:layout_marginTop="20dp"
    android:contentDescription="@string/animation_desc"
    android:scaleType="centerCrop" />
```

# GraphicsFrameAnimation

```
private AnimationDrawable mAnim;
@Override
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.main);

    ImageView imageView = (ImageView) findViewById(R.id.countdown_frame);

    imageView.setBackgroundResource(R.drawable.view_animation);

    mAnim = (AnimationDrawable) imageView.getBackground();
}


@Override
protected void onPause() {
    super.onPause();
    if (mAnim.isRunning()) {
        mAnim.stop();
    }
}


@Override
public void onWindowFocusChanged(boolean hasFocus) {
    super.onWindowFocusChanged(hasFocus);
    if (hasFocus) {
        mAnim.start();
    }
}
```

# GraphicsFrameAnimation

```
private AnimationDrawable mAnim;
@Override
public void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.main);

    ImageView imageView = (ImageView) findViewById(R.id.countdown_frame);

    imageView.setBackgroundResource(R.drawable.view_animation);

    mAnim = (AnimationDrawable) imageView.getBackground();
}


@Override
protected void onPause() {
    super.onPause();
    if (mAnim.isRunning()) {
        mAnim.stop();
    }
}


@Override
public void onWindowFocusChanged(boolean hasFocus) {
    super.onWindowFocusChanged(hasFocus);
    if (hasFocus) {
        mAnim.start();
    }
}
```

# Animation

A series of transformations applied to the content of a View

Can Manipulate animation timing to give effect of sequential or simultaneous changes

# GraphicsTweenAnimation

Application displays a single ImageView and animates several of its properties


13:26
GraphicsTweenAnimation

# GraphicsTweenAnimation

```
<ImageView
    android:id="@+id/icon"
    android:layout_width="200dp"
    android:layout_height="200dp"
    android:src="@drawable/b128"
    android:contentDescription="@string/bubble_desc"
    android:visibility="invisible"/>
```

# GraphicsTweenAnimation

```java
public class GraphicsTweenAnimationActivity extends Activity {

    private ImageView mImageView;
    private Animation mAnim;

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        mImageView = (ImageView) findViewById(R.id.icon);

        mAnim = AnimationUtils.loadAnimation(this, R.anim.view_animation);

    }

    @Override
    public void onWindowFocusChanged(boolean hasFocus) {
        super.onWindowFocusChanged(hasFocus);
        if (hasFocus) {
            mImageView.startAnimation(mAnim);
        }
    }
}
```

# GraphicsTweenAnimation

```java
public class GraphicsTweenAnimationActivity extends Activity {

    private ImageView mImageView;
    private Animation mAnim;

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        mImageView = (ImageView) findViewById(R.id.icon);

        mAnim = AnimationUtils.loadAnimation(this, R.anim.view_animation);

    }

    @Override
    public void onWindowFocusChanged(boolean hasFocus) {
        super.onWindowFocusChanged(hasFocus);
        if (hasFocus) {
            mImageView.startAnimation(mAnim);
        }
    }
}
```

# Property Animation

Animation - Changing properties of an Object over a period of time

# Property Animation Architecture

ValueAnimator – Timing engine

TimeInterpolator – defines how values change as a function of time

AnimatorUpdateListener – called back at every animation frame change

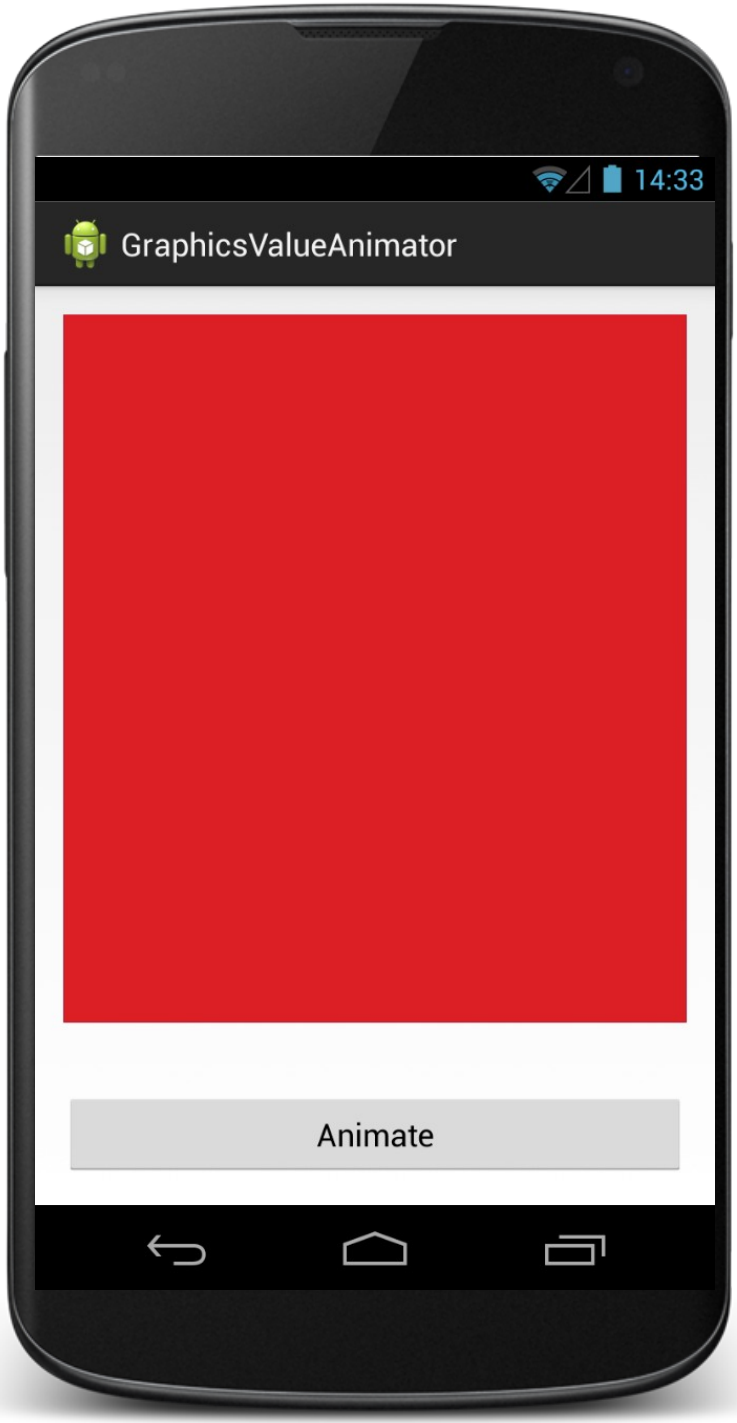
TypeEvaluator – Calculates a property’s value at a given point in time

# Property Animation Architecture

AnimatorSet – combines individual animations to create more complex animations

# GraphicsValueAnimator

Uses a ValueAnimator to animate changing an ImageView’s background color


14:33
GraphicsValueAnimator
Animate

# GraphicsValueAnimator

```
<ImageView
    android:id="@+id/image_view"
    android:layout_width="match_parent"
    android:layout_height="400dp"
    android:contentDescription="@string/app_name" />

<Button
    android:id="@+id/start_animation_button"
    android:layout_width="match_parent"
    android:layout_height="48dp"
    android:layout_alignParentBottom="true"
    android:text="@string/button_label"/>
```

# GraphicsValueAnimator

```
public class ValueAnimatorActivity extends Activity {
    protected static final String TAG = "ValueAnimatorActivity";
    final private static int RED = Color.RED;
    final private static int BLUE = Color.BLUE;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        Button startButton = (Button) findViewById(R.id.start_animation_button);
        startButton.setOnClickListener(new OnClickListener() {

            @Override
            public void onClick(View v) {
                startAnimation();
            }
        });

    }

    public void startAnimation() {

        final ImageView imageView = (ImageView) findViewById(R.id.image_view);

        ValueAnimator anim = ValueAnimator.ofObject(new ArgbEvaluator(), RED,
                BLUE);

        anim.addUpdateListener(new AnimatorUpdateListener() {

            @Override
            public void onAnimationUpdate(ValueAnimator animation) {
                imageView.setBackgroundColor((Integer) animation
                        .getAnimatedValue());
            }
        });

        anim.setDuration(10000);
        anim.start();
    }
```

# GraphicsValueAnimator

```
public class ValueAnimatorActivity extends Activity {
    protected static final String TAG = "ValueAnimatorActivity";
    final private static int RED = Color.RED;
    final private static int BLUE = Color.BLUE;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

        Button startButton = (Button) findViewById(R.id.start_animation_button);
        startButton.setOnClickListener(new OnClickListener() {

            @Override
            public void onClick(View v) {
                startAnimation();
            }
        });

    }

    public void startAnimation() {

        final ImageView imageView = (ImageView) findViewById(R.id.image_view);

        ValueAnimator anim = ValueAnimator.ofObject(new ArgbEvaluator(), RED,
                BLUE);

        anim.addUpdateListener(new AnimatorUpdateListener() {

            @Override
            public void onAnimationUpdate(ValueAnimator animation) {
                imageView.setBackgroundColor((Integer) animation
                        .getAnimatedValue());
            }
        });

        anim.setDuration(10000);
        anim.start();
    }
```

# GraphicsViewPropertyAnimator

Same as the GraphicsTweenAnimation,

Uses the ViewPropertyAnimator class, which is a simplified animator for Views


17:08
GraphicsViewPropertyAnimator

# GraphicsViewPropertyAnimator

```
<ImageView
    android:id="@+id/icon"
    android:layout_width="200dp"
    android:layout_height="200dp"
    android:src="@drawable/b128"
    android:alpha="0"
    android:contentDescription="@string/bubble_desc"/>
```

# GraphicsViewPropertyAnimator

```
public class GraphicsViewPropertyAnimatorActivity extends Activity {

    private ImageView mImageView;

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);

    }

    @Override
    public void onWindowFocusChanged(boolean hasFocus) {
        super.onWindowFocusChanged(hasFocus);

        mImageView = (ImageView) findViewById(R.id.icon);

        if (hasFocus) {
            fadeIn.run();
        }
    }
```

# GraphicsViewPropertyAnimator

```
Runnable fadeIn = new Runnable() {
    public void run() {
        mImageView.animate().setDuration(3000)
                .setInterpolator(new LinearInterpolator()).alpha(1.0f)
                .withEndAction(rotate);
    }
};

Runnable rotate = new Runnable() {
    public void run() {
        mImageView.animate().setDuration(4000)
                .setInterpolator(new AccelerateInterpolator())
                .rotationBy(720.0f).withEndAction(translate);
    }
};

Runnable translate = new Runnable() {
    public void run() {
        float translation = getResources()
                .getDimension(R.dimen.translation);
        mImageView.animate().setDuration(3000)
                .setInterpolator(new OvershootInterpolator())
                .translationXBy(translation).translationYBy(translation)
                .withEndAction(scale);
    }
};
```

# GraphicsViewPropertyAnimator

```
Runnable scale = new Runnable() {
    public void run() {
        mImageView.animate().setDuration(3000)
                .setInterpolator(new AnticipateInterpolator())
                .scaleXBy(1.0f).scaleYBy(1.0f).withEndAction(fadeOut);
    }
};

Runnable fadeOut = new Runnable() {
    public void run() {
        mImageView.animate().setDuration(2000)
                .setInterpolator(new DecelerateInterpolator()).alpha(0.0f);
    }
};
```