



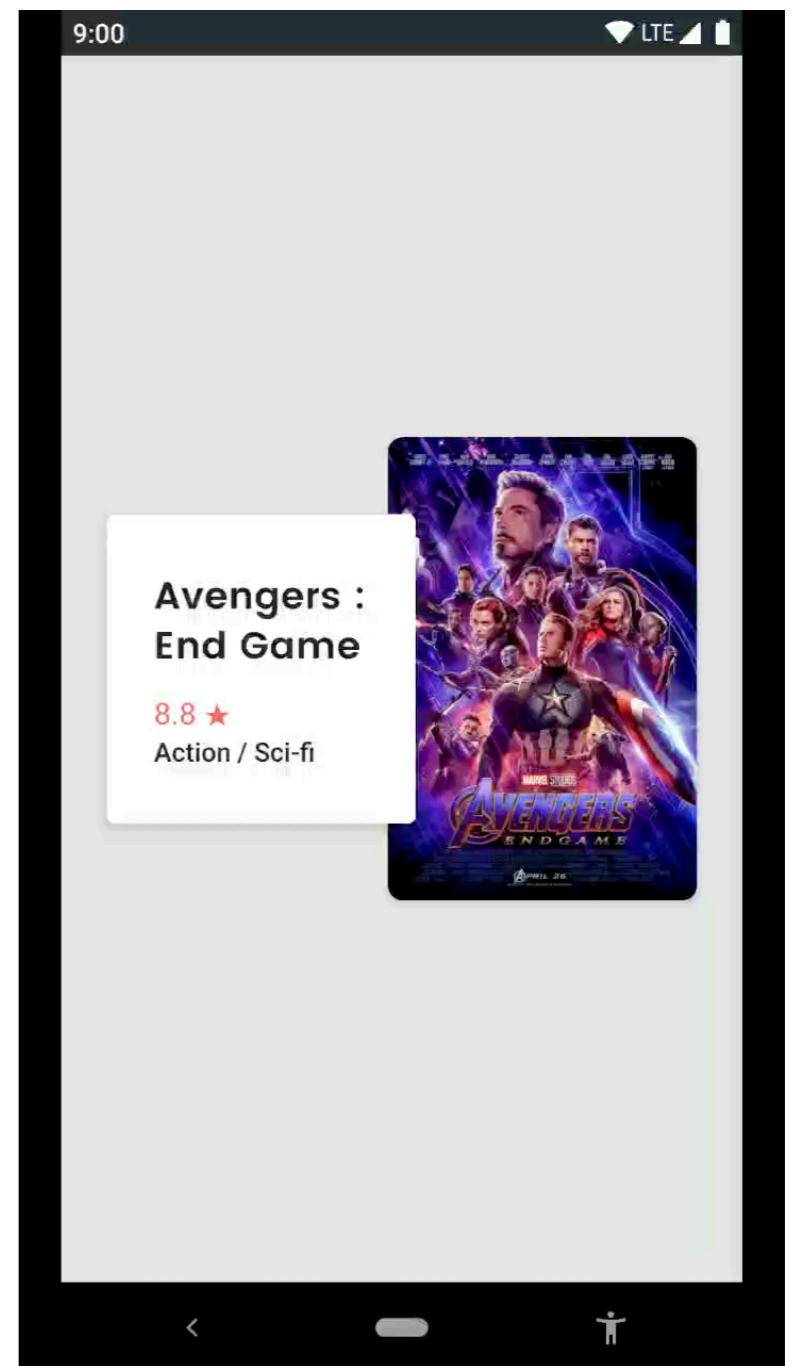
Motion Layout:

Make your apps move auto-magically

@Linminphyoel

About the talk

- A walkthrough to sample app
- Strategy for building an interactive animations easily
- Learning approaches to Motion Layout
- Tips and tricks



Who am I ?



Lin Min Phyo
Senior Android Developer

Product, UI/UX, Software Architectures



Motion Layout

Make your apps move auto-magically

Motion Layout

```
class MotionLayout extends ConstraintLayout
```



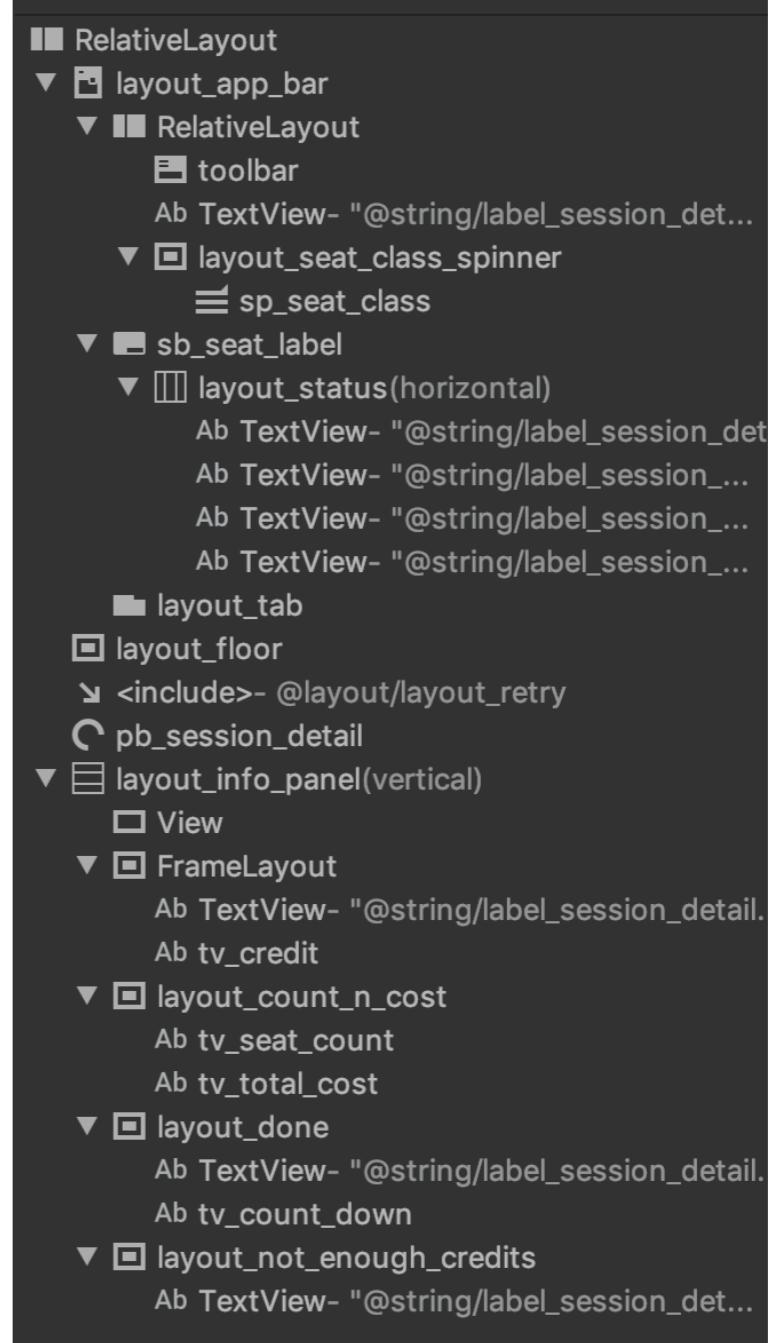
Back to the past

Before Constraint Layout

Building UI is hard

Before Constraint Layout

- Nested Hierarchy
- Non-functional Design View
- Not Flexible

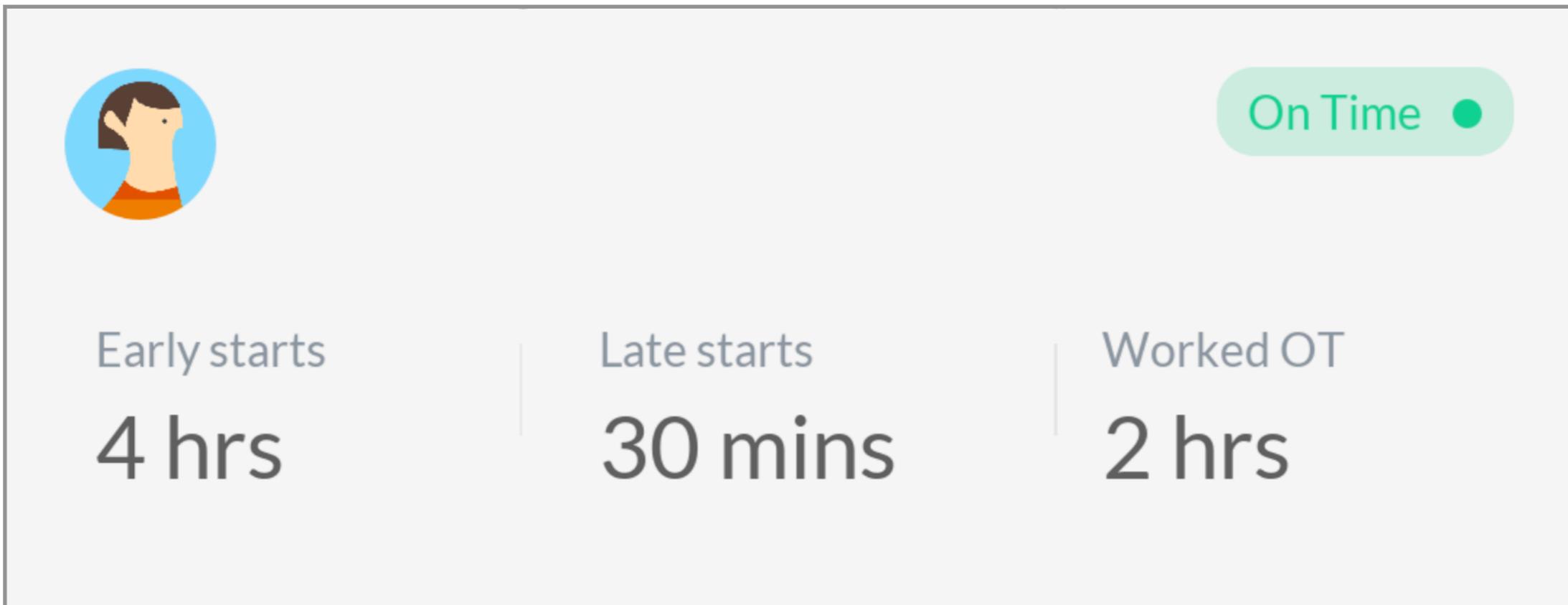


Constraint Layout 1.x

Which problems are solved?

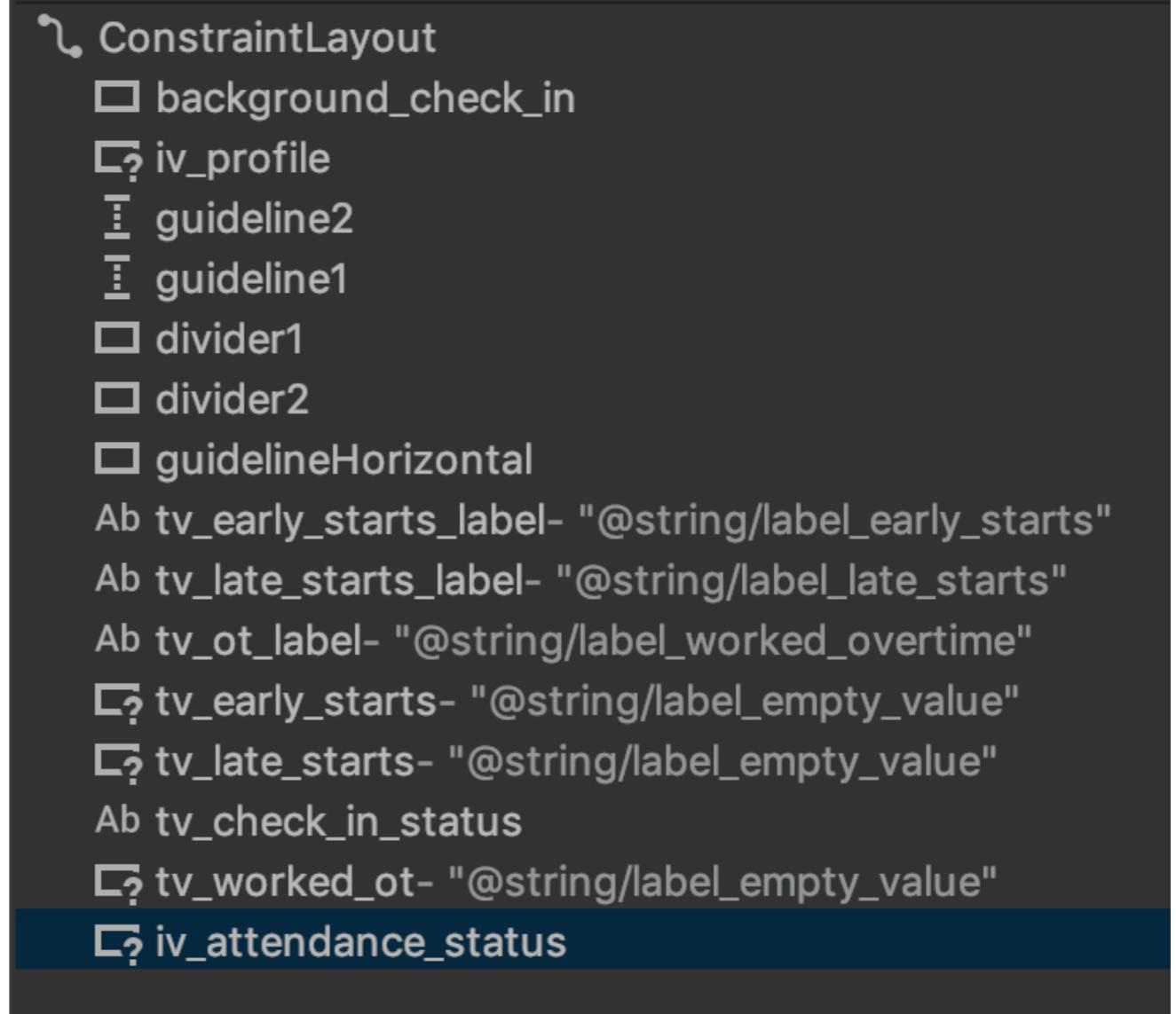
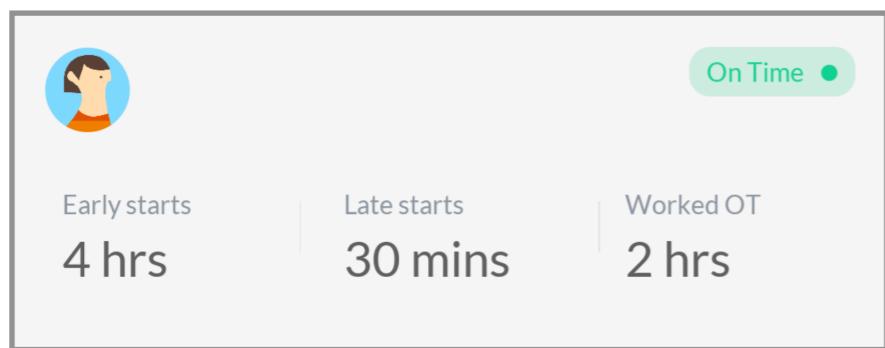
Constraint Layout 1.x

Flatter Hierarchy



Constraint Layout 1.x

Flatter Hierarchy



Constraint Layout 1.x

Features Highlights

- Easy positioning views
- Guidelines
- Chains
- Bias
- Many utilities and functionalities

<https://developer.android.com/reference/android/support/constraint/ConstraintLayout>

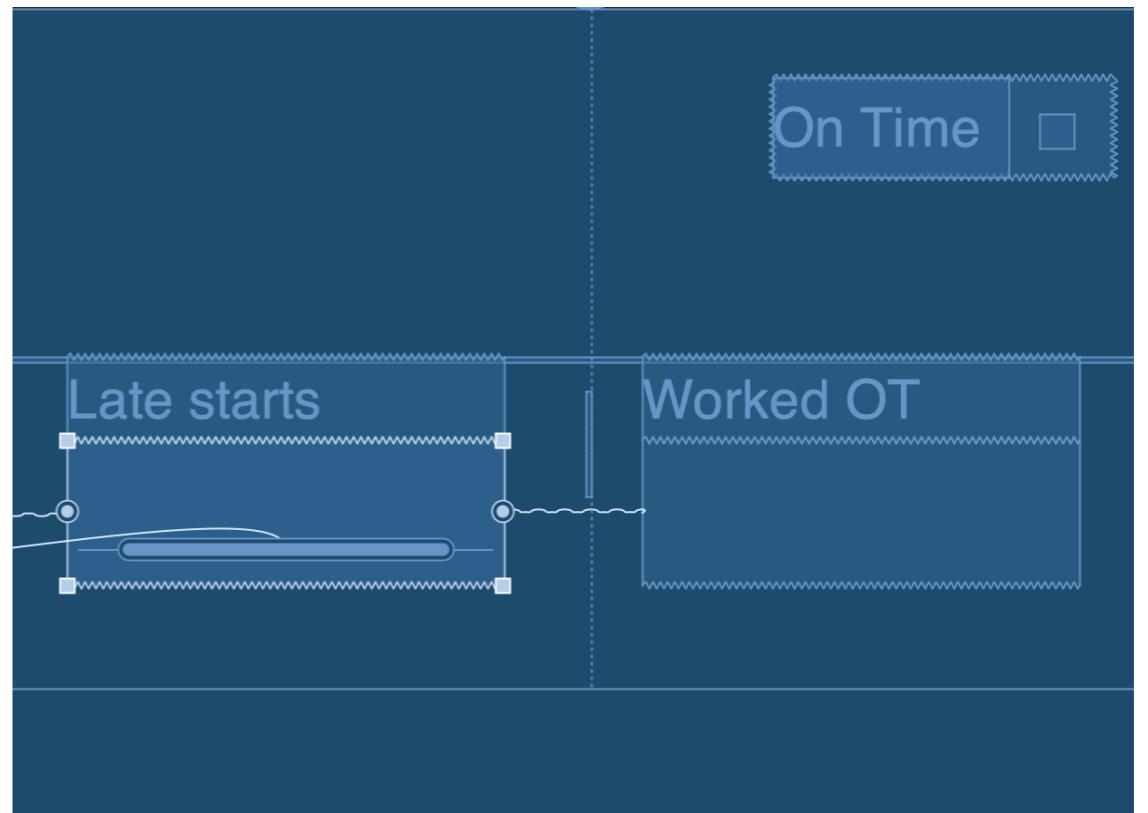
Constraint Layout 1.x

How?

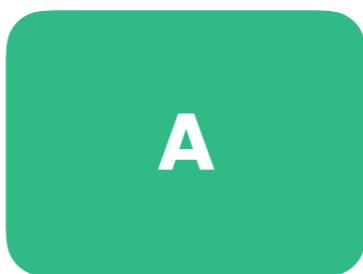
Constraint Layout 1.x

Constraints

- Connections between views
- Connections between view and parent view group
- Connections between view and helper views

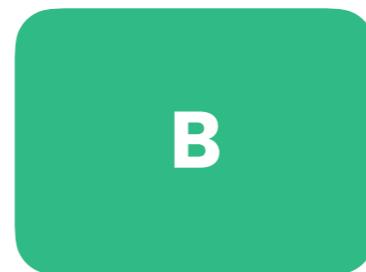
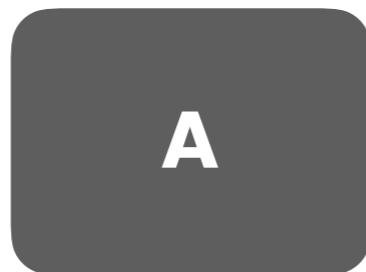


Constraints



```
<Button android:id="@+id/A" />
```

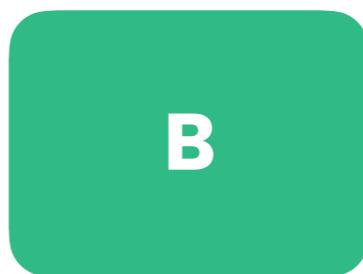
Constraints



```
<Button android:id="@+id/A" />
```

```
<Button android:id="@+id/B" />
```

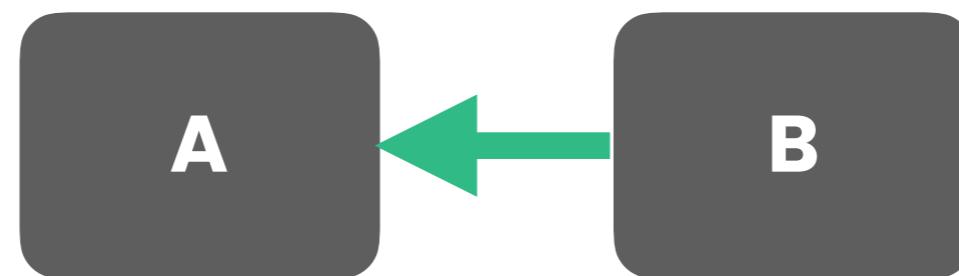
Constraints



```
<Button android:id="@+id/A" />
```

```
<Button android:id="@+id/B" />
```

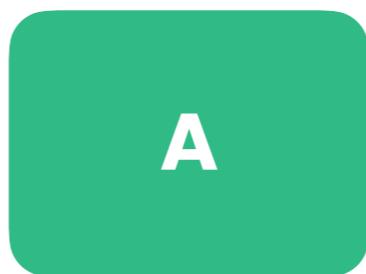
Constraints



```
<Button android:id="@+id/A" />
```

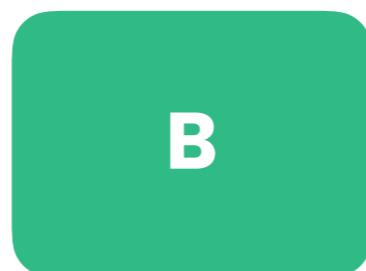
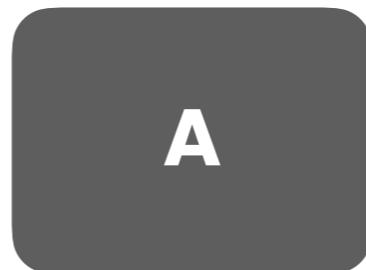
```
<Button android:id="@+id/B"  
    app:layout_constraintStart_toEndOf="@+id/A" />
```

Constraints



```
<Button android:id="@+id/A" />
```

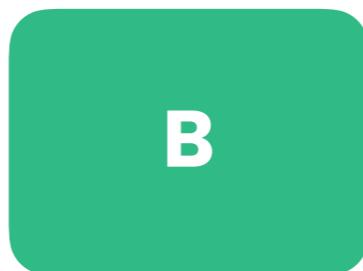
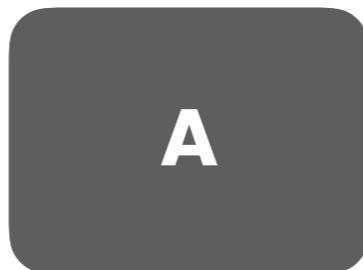
Constraints



```
<Button android:id="@+id/A" />
```

```
<Button android:id="@+id/B" />
```

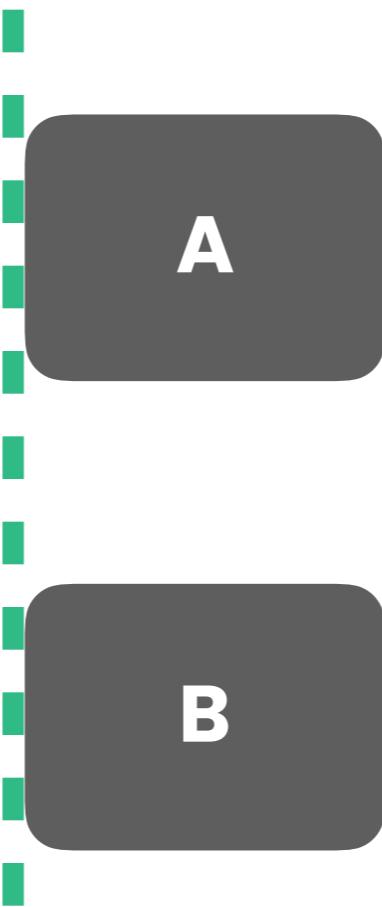
Constraints



```
<Button android:id="@+id/A" />
```

```
<Button android:id="@+id/B" />
```

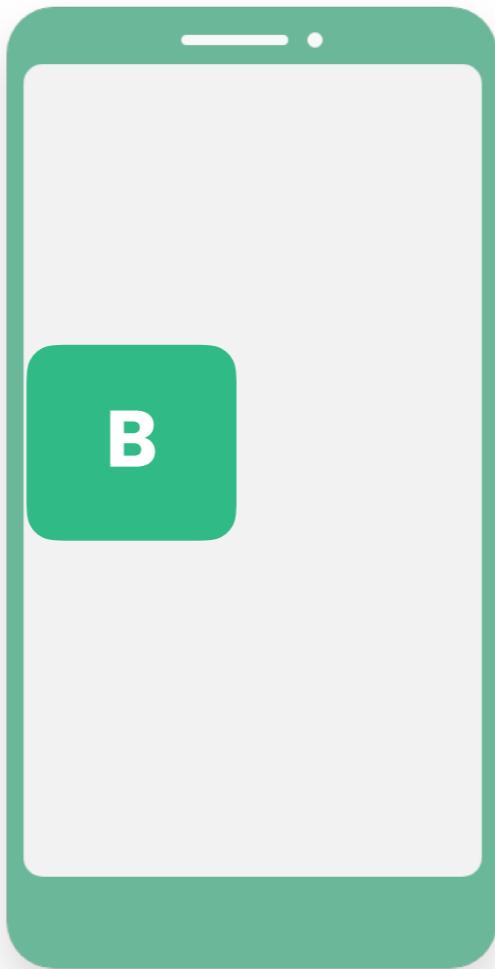
Constraints



```
<Button android:id="@+id/A" />
```

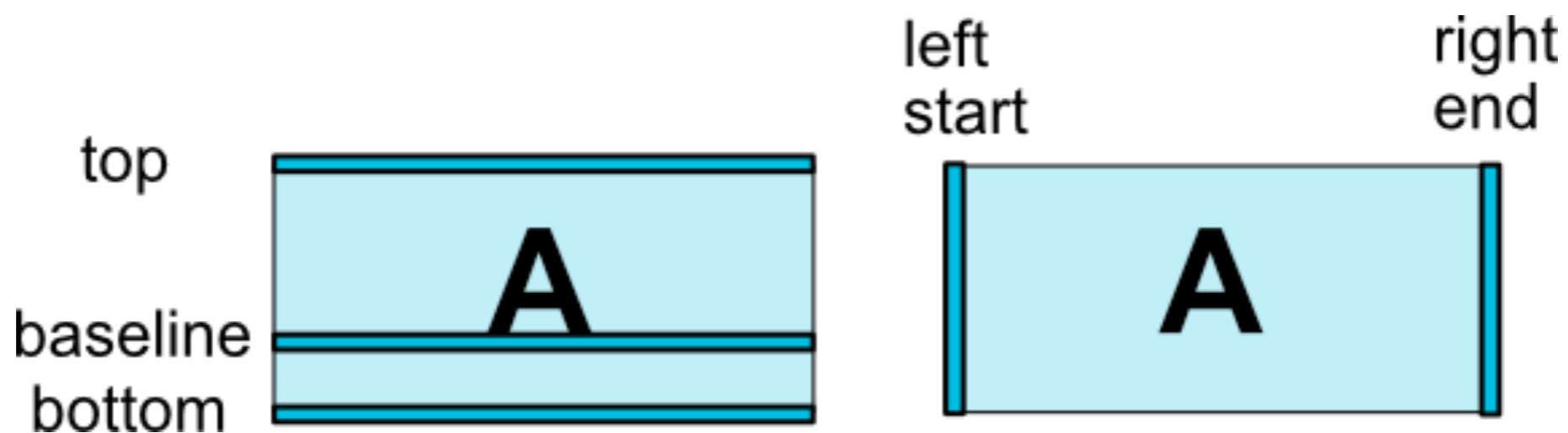
```
<Button android:id="@+id/B"  
    app:layout_constraintStart_toStartOf="@+id/A" />
```

Constraints

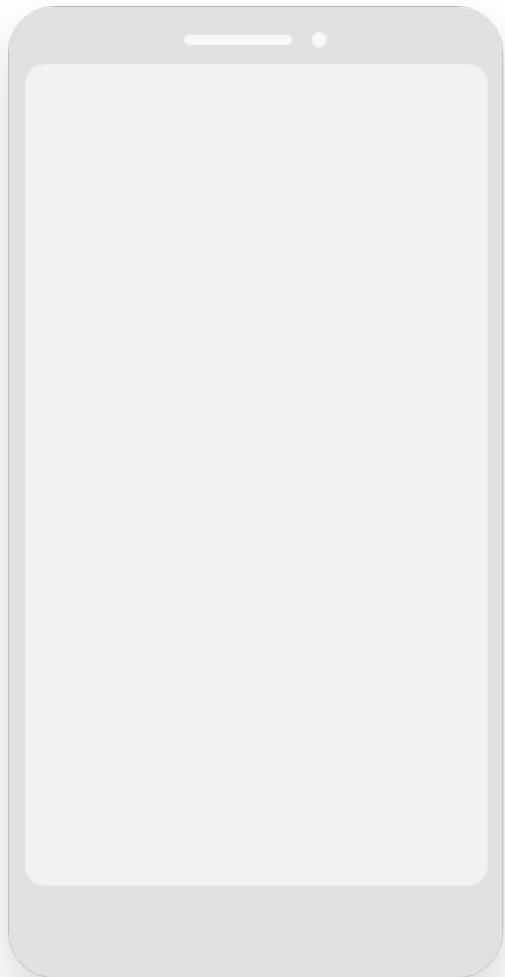


```
<Button android:id="@+id/B"  
    app:layout_constraintStart_toStartOf="parent" />
```

Constraints

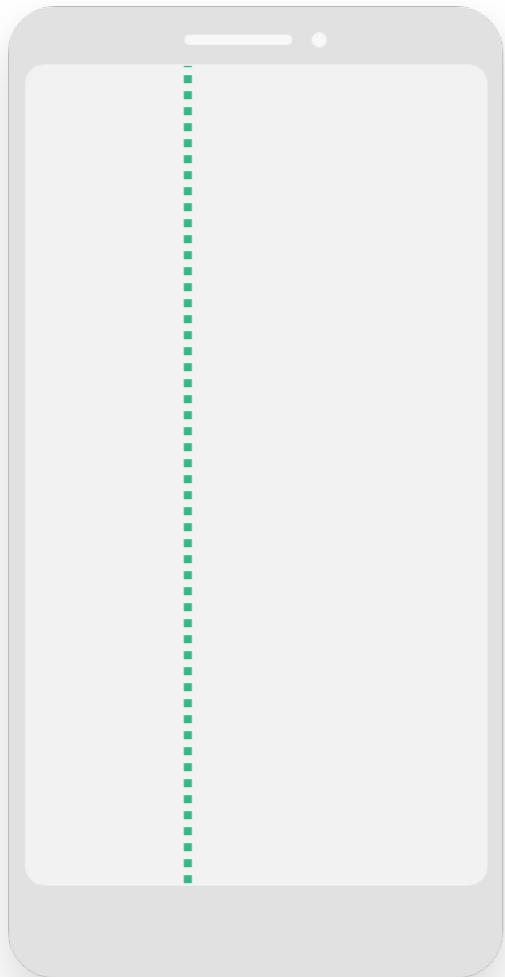


Guidelines



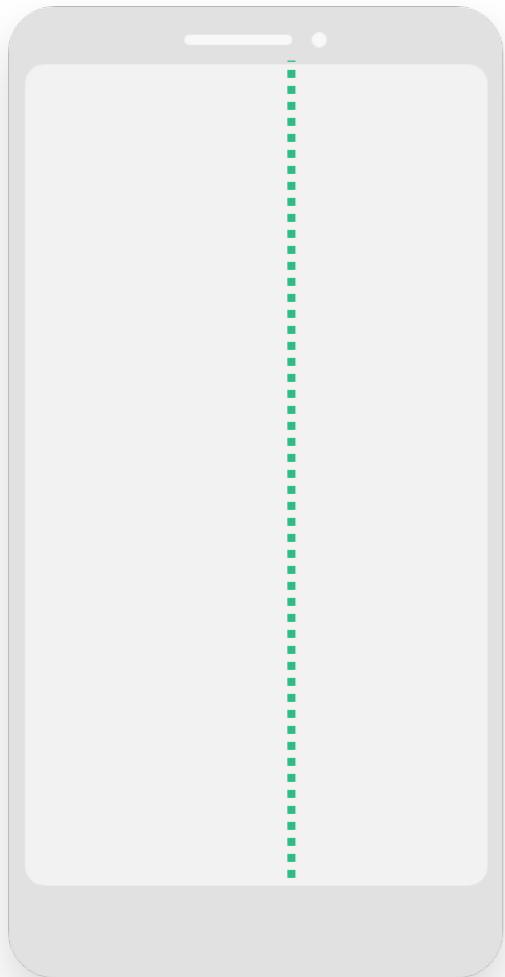
```
<androidx.constraintlayout.widget.Guideline  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
/>
```

Guidelines



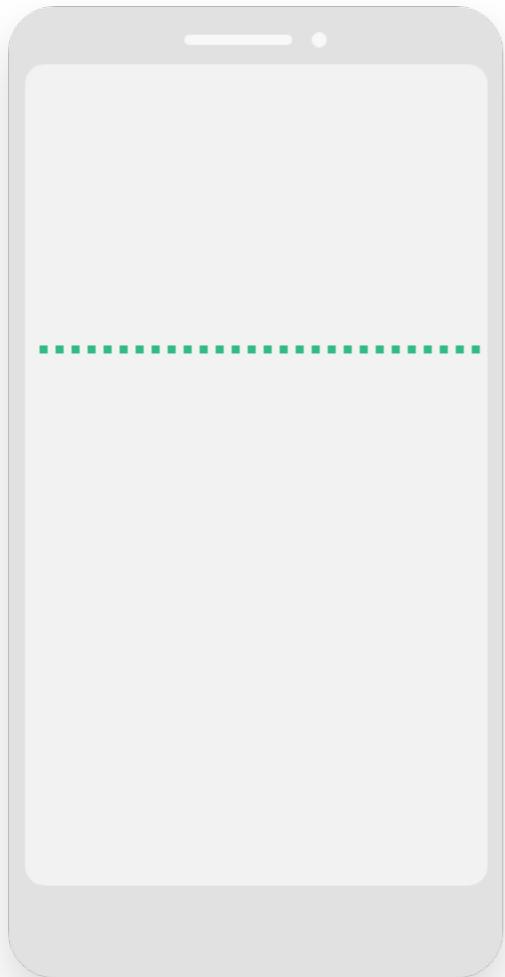
```
<androidx.constraintlayout.widget.Guideline  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:orientation="vertical"  
    app:layout_constraintGuide_percent=".30"  
/>
```

Guidelines



```
<androidx.constraintlayout.widget.Guideline  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:orientation="vertical"  
    app:layout_constraintGuide_percent=".60"  
/>
```

Guidelines

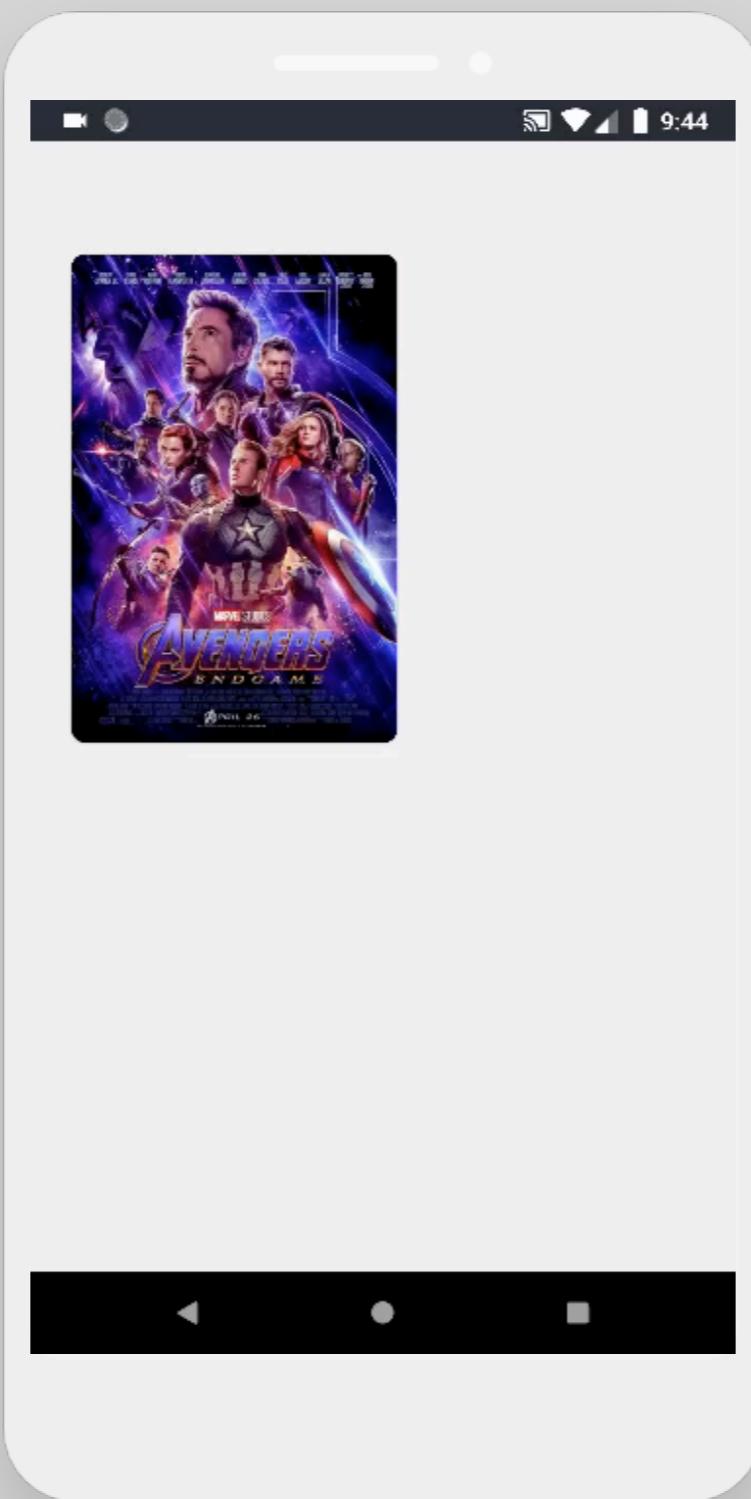


```
<androidx.constraintlayout.widget.Guideline  
    android:layout_width="wrap_content"  
    android:layout_height="wrap_content"  
    android:orientation="horizontal"  
    app:layout_constraintGuide_percent=".40"  
/>
```

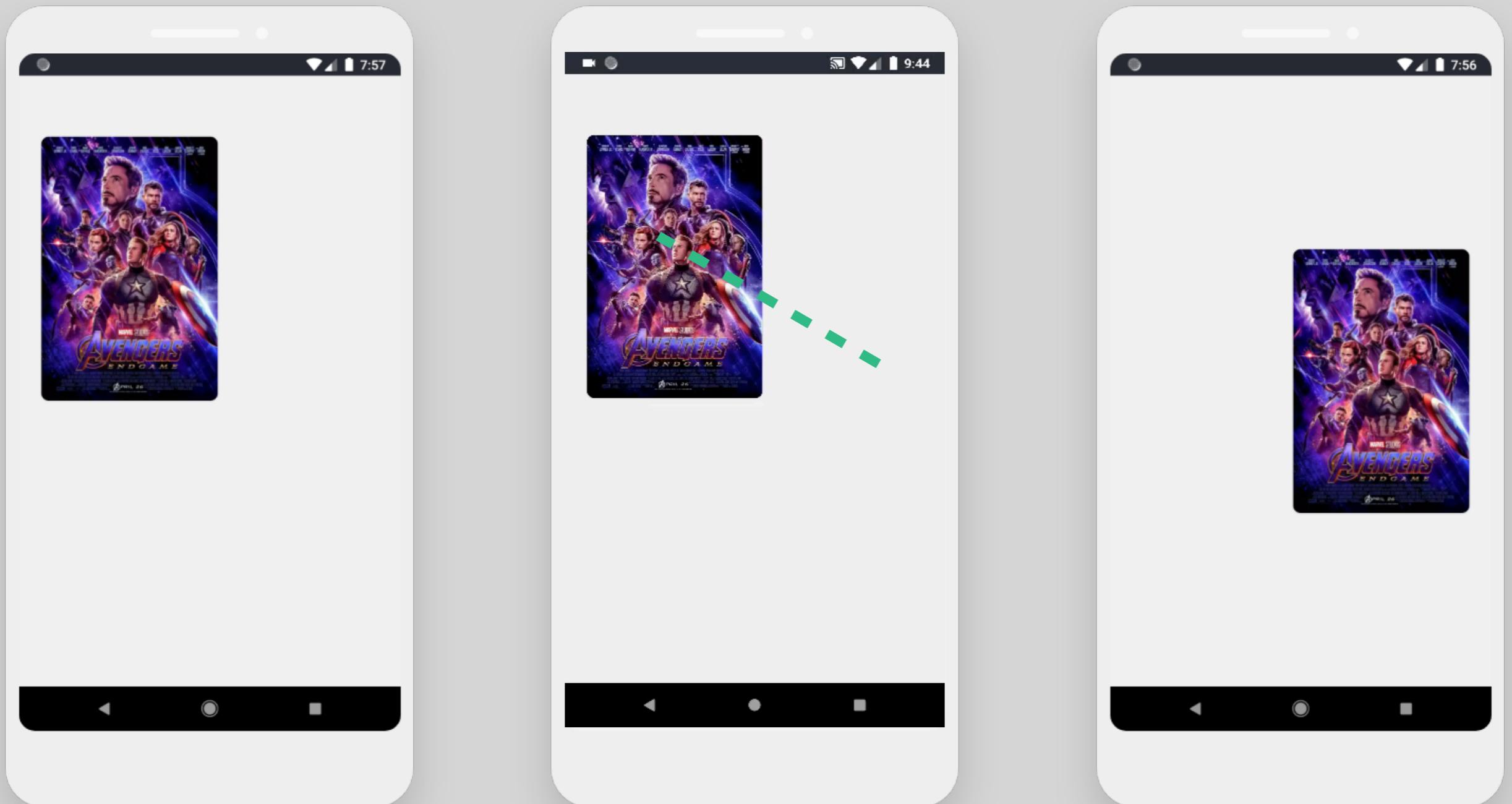
Transitions

How transitions work

How transitions work



How transitions work



Start State

Transition

End State

How transitions work

Start State

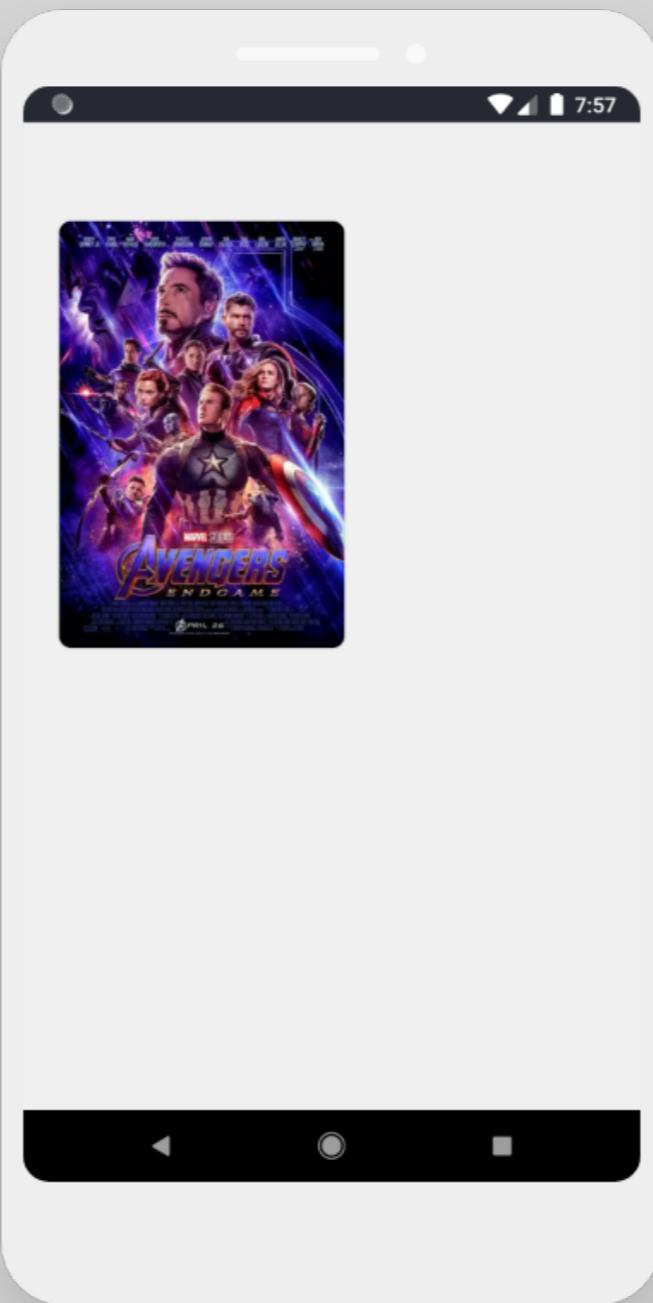
Transition

End State

Constraint Sets

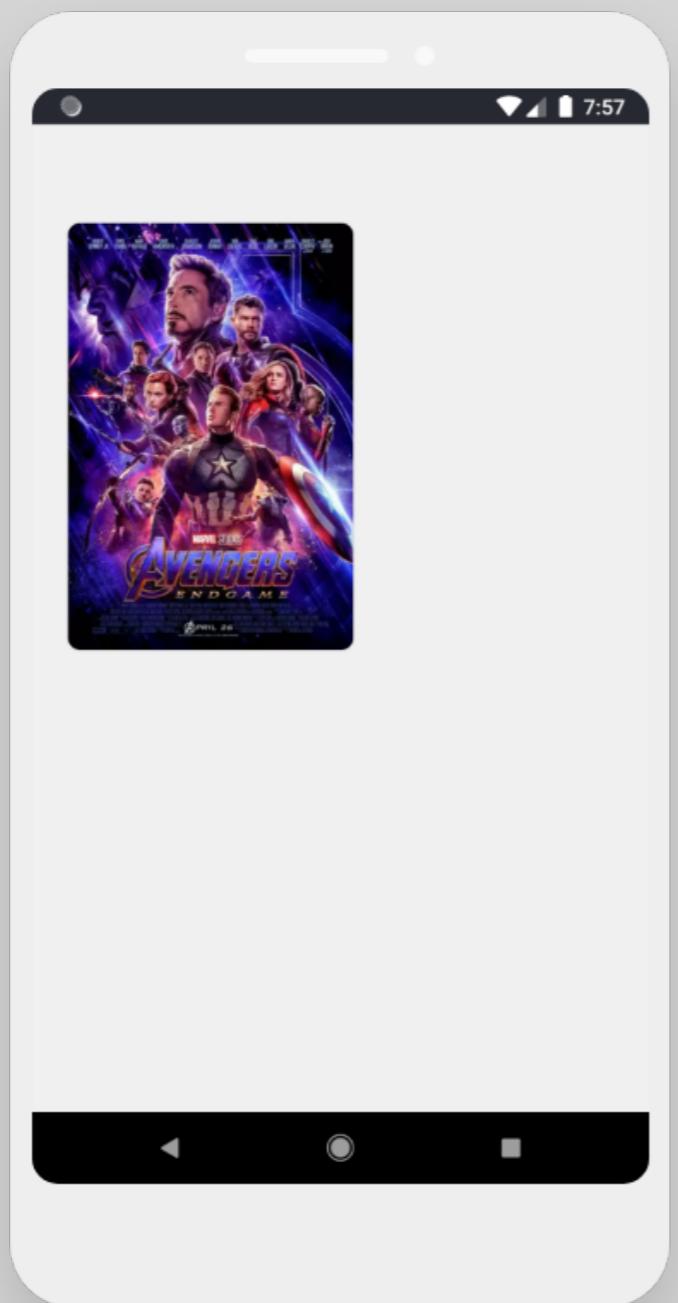
Made animation easy

Constraint Sets

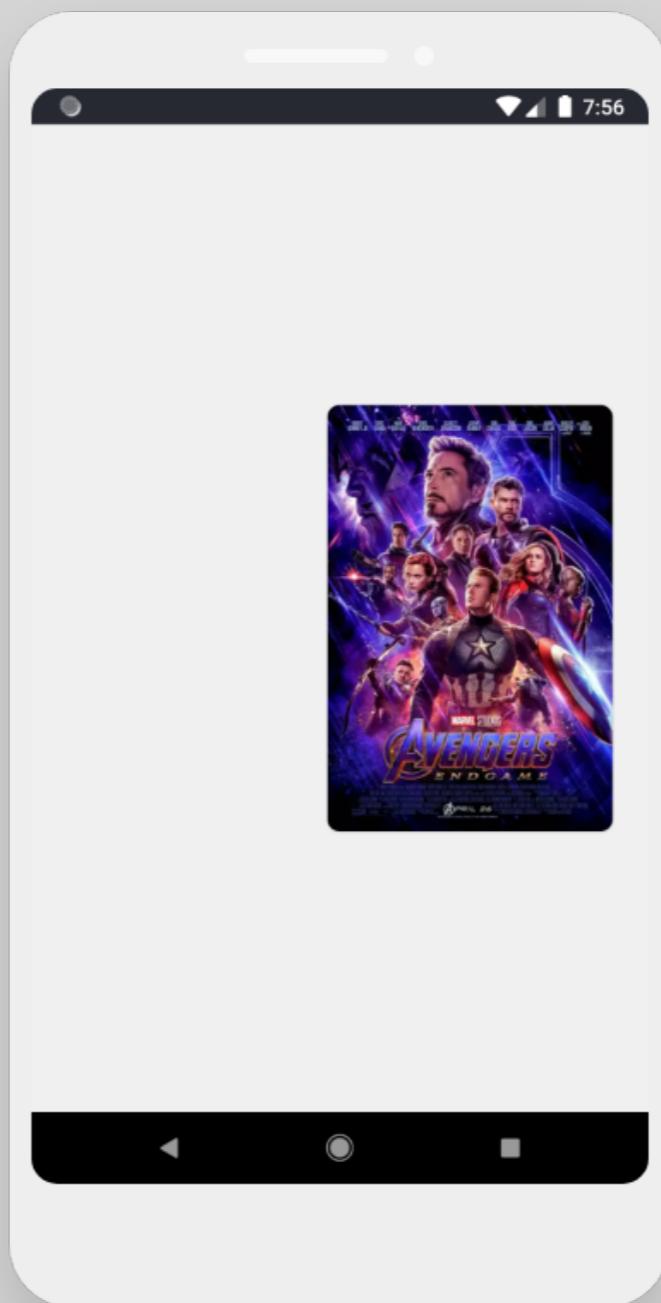


state_one.xml

Constraint Sets

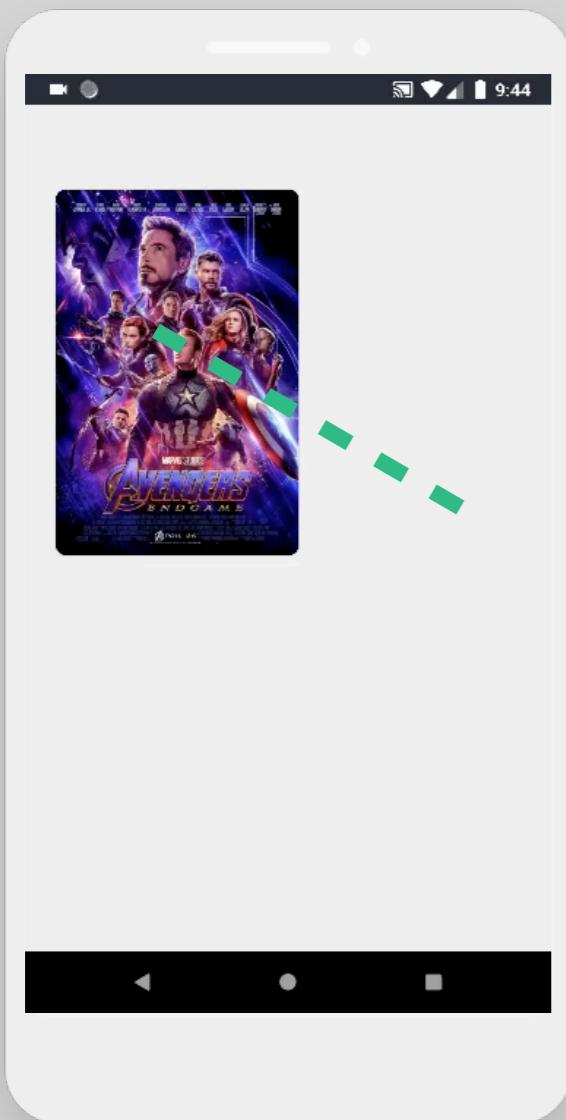


state_one.xml



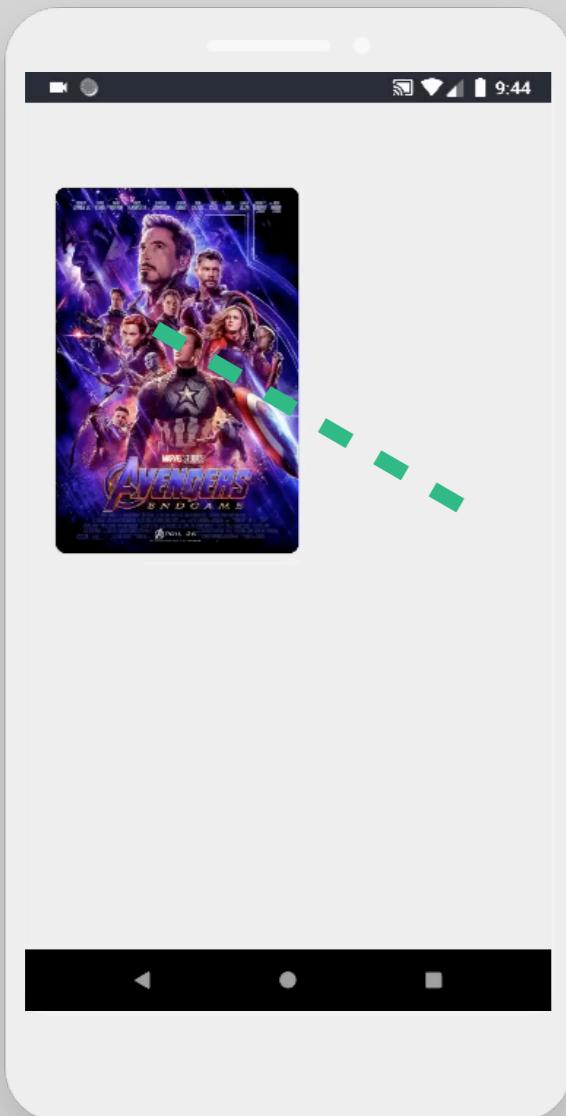
state_two.xml

Constraint Sets



Activity.kt

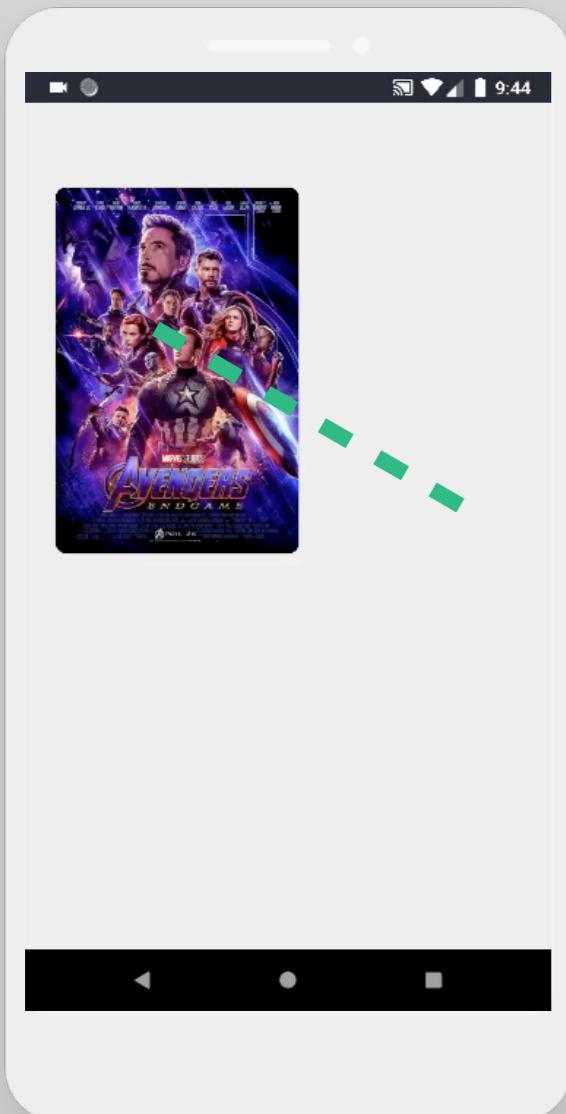
Constraint Sets



```
ConstraintSet constraintSet1 = new ConstraintSet();
ConstraintSet constraintSet2 = new ConstraintSet();
```

Activity.kt

Constraint Sets

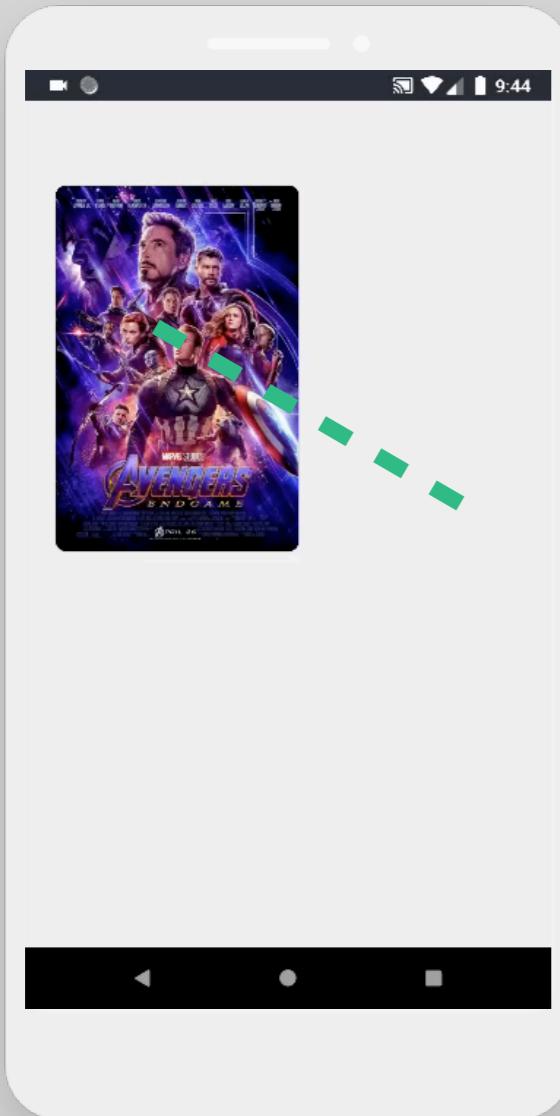


```
ConstraintSet constraintSet1 = new ConstraintSet();
ConstraintSet constraintSet2 = new ConstraintSet();

constraintSet1.clone(context, R.layout.state_one);
constraintSet2.clone(context, R.layout.state_two);
```

Activity.kt

Constraint Sets



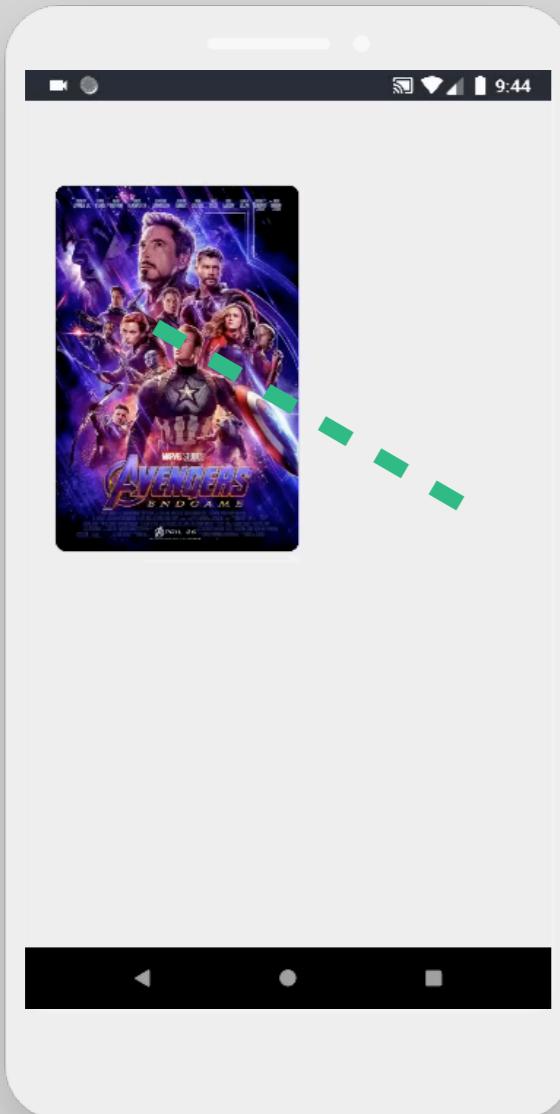
```
ConstraintSet constraintSet1 = new ConstraintSet();
ConstraintSet constraintSet2 = new ConstraintSet();

constraintSet1.clone(context, R.layout.state_one);
constraintSet2.clone(context, R.layout.state_two);

poster.setOnClickListener {
    if (nowAtStateTwo) {
        constraintSet1.applyTo(contentView);
    } else {
        constraintSet2.applyTo(contentView);
    }
}
```

Activity.kt

Constraint Sets



Activity.kt

```
ConstraintSet constraintSet1 = new ConstraintSet();
ConstraintSet constraintSet2 = new ConstraintSet();

constraintSet1.clone(context, R.layout.state_one);
constraintSet2.clone(context, R.layout.state_two);

TransitionManager.beginDelayedTransition(contentView);

poster.setOnClickListener {
    if (nowAtStateTwo) {
        constraintSet1.applyTo(contentView);
    } else {
        constraintSet2.applyTo(contentView);
    }
}
```

Constraint Layout 2.x

More goodness

Constraint Layout 2.x

- Linear helper
- Flow
- ImageFilterView
- Layer
- Mock View
- Decorators
- Motion Layout

Motion Layout

One layout to rule them all

Motion Layout

```
class MotionLayout extends ConstraintLayout
```

Constraint Sets

VS

Motion Layout

@layout/state_one.xml

@layout/state_two.xml

package/activity.kt

@layout/layout.xml

Constraint Sets

VS

Motion Layout

`@layout/state_one.xml`

`@layout/state_two.xml`

`package/activity.kt`

`@layout/layout.xml`

Views of the layout

Constraint Sets

VS

Motion Layout

`@layout/state_one.xml`

`@layout/state_two.xml`

`package/activity.kt`

`@layout/layout.xml`

`@xml/motion.xml`

View attributes and transitions

Constraint Sets

VS

Motion Layout

@layout/state_one.xml

@layout/state_two.xml

package/activity.kt

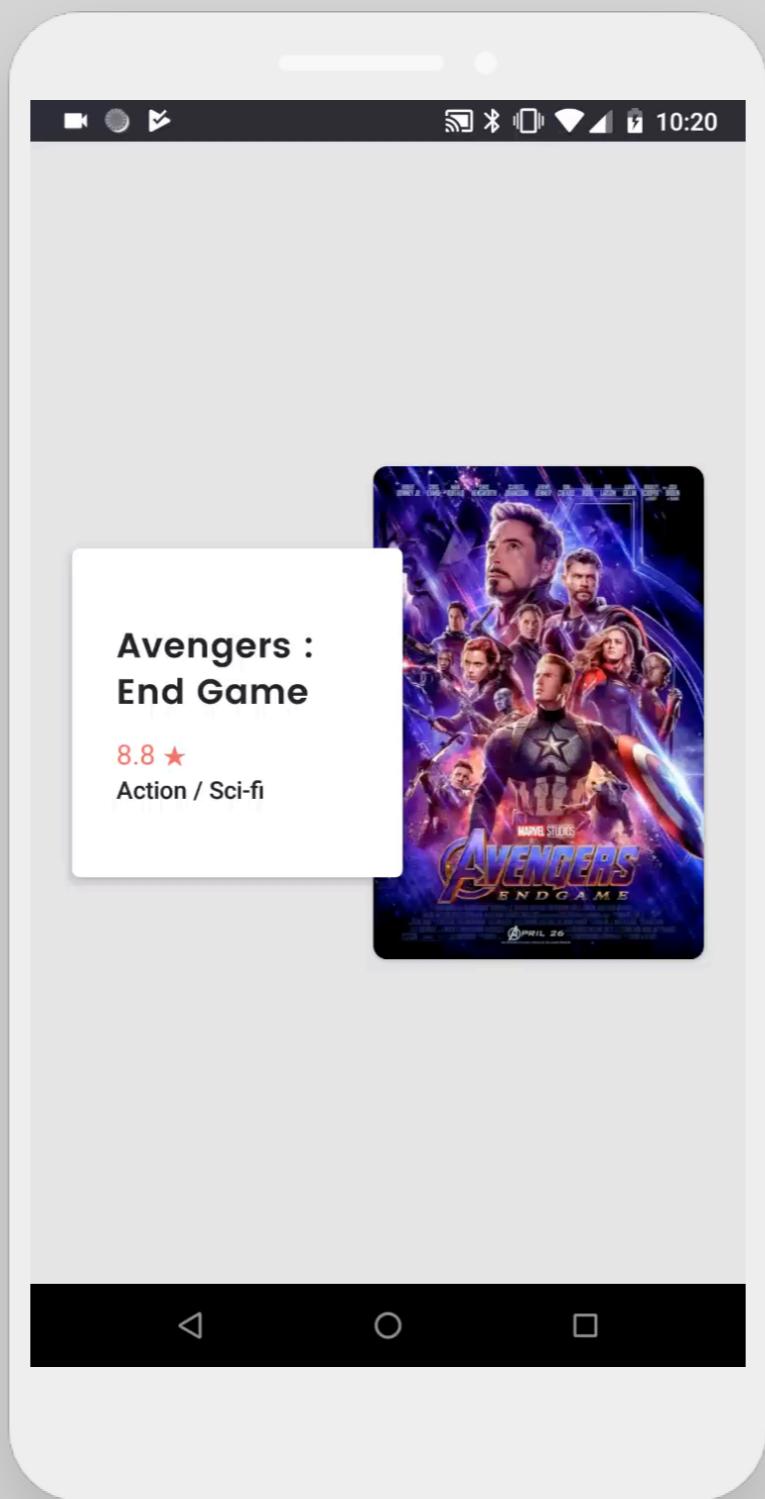
@layout/layout.xml

@layout/motion.xml

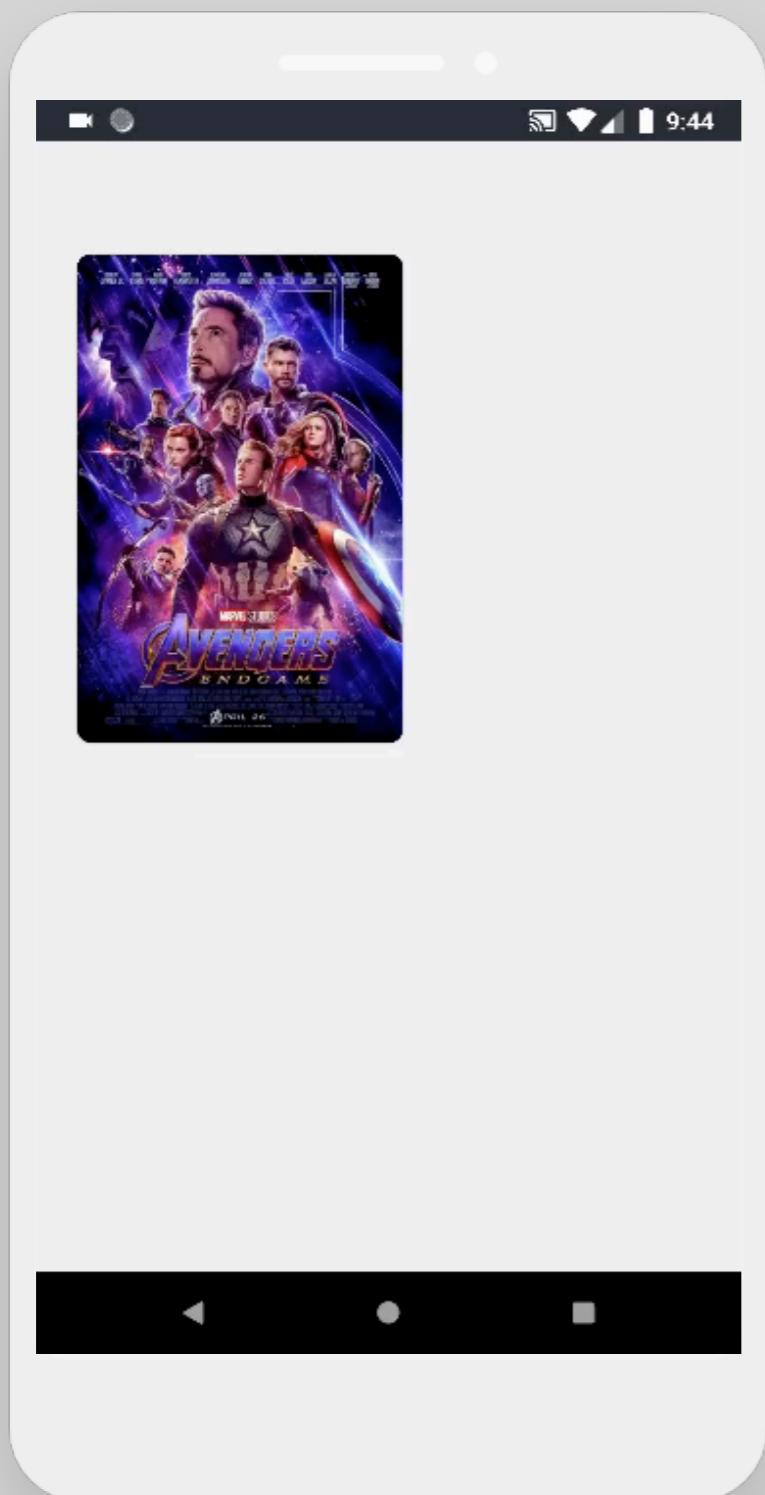
package/activity.kt

[Optional]

Sample App



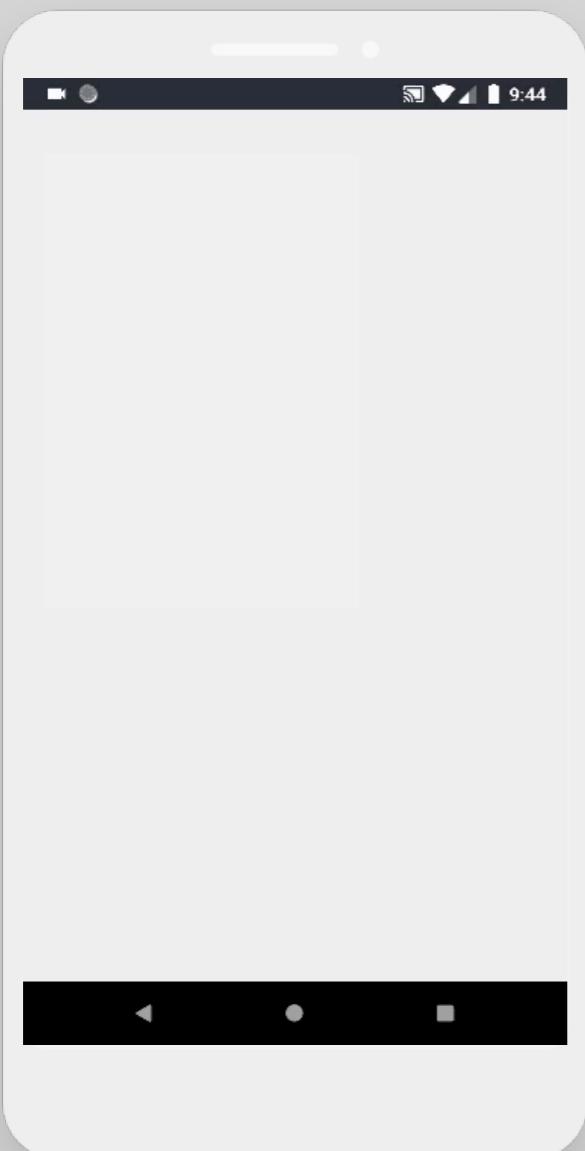
Movie Poster



@layout/layout_poster.xml

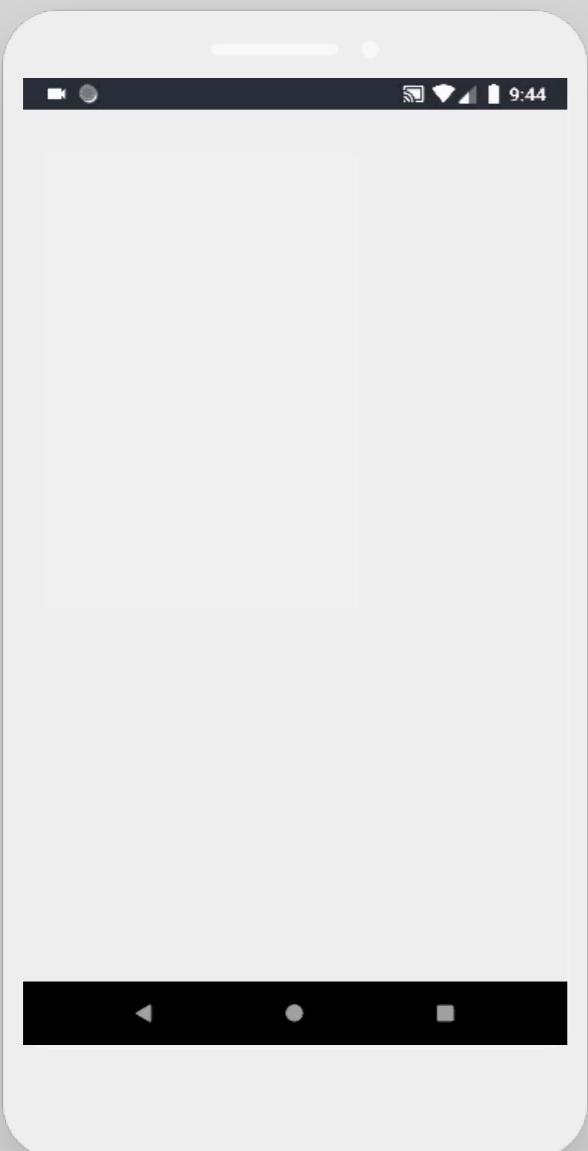
@xml/motion_poster.xml

@layout/layout_poster.xml



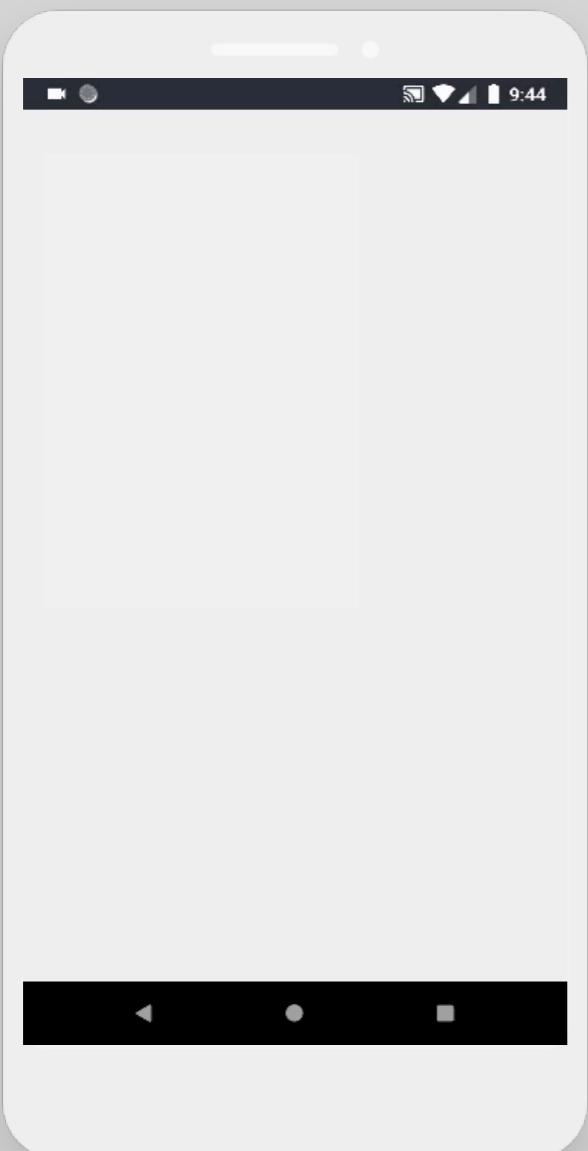
```
<androidx.constraintlayout.motion.widget.MotionLayout  
    android:layout_width="match_parent"  
    android:layout_height="match_parent"  
    app:layoutDescription="@xml/motion_poster">  
  
</androidx.constraintlayout.motion.widget.MotionLayout>
```

@layout/layout_poster.xml



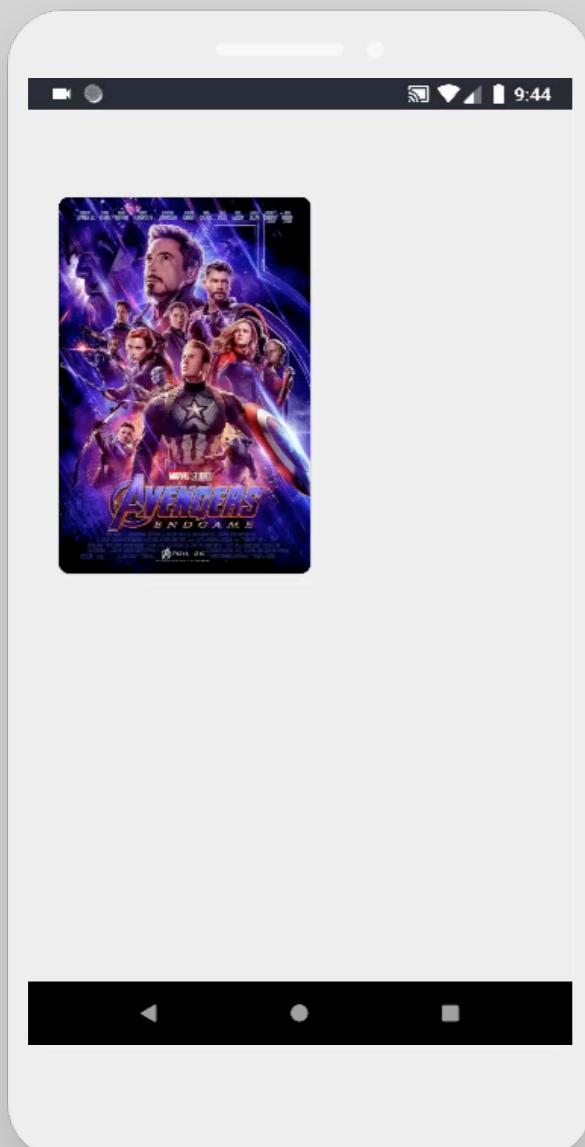
```
<androidx.constraintlayout.motion.widget.MotionLayout  
    android:layout_width="match_parent"  
    android:layout_height="match_parent"  
    app:layoutDescription="@xml/motion_poster">  
  
</androidx.constraintlayout.motion.widget.MotionLayout>
```

@layout/layout_poster.xml



```
<androidx.constraintlayout.motion.widget.MotionLayout  
    android:layout_width="match_parent"  
    android:layout_height="match_parent"  
    app:layoutDescription="@xml/motion_poster">  
  
</androidx.constraintlayout.motion.widget.MotionLayout>
```

@layout/layout_poster.xml

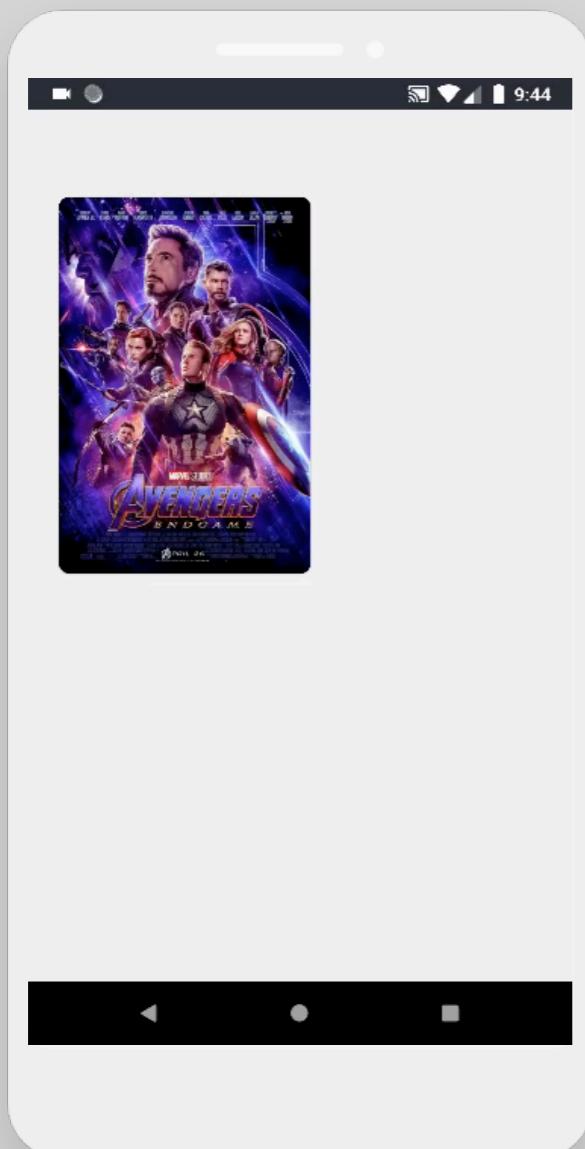


```
<androidx.constraintlayout.motion.widget.MotionLayout
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    app:layoutDescription="@xml/motion_poster">

    <com.google.android.material.card.MaterialCardView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:id="@+id/card_movie_poster"
        app:layout_constraintDimensionRatio="2:3"
        >
        <ImageView
            android:id="@+id/image_poster"
            android:layout_width="match_parent"
            android:layout_height="match_parent"
            android:scaleType="centerCrop"
            android:src="@drawable/poster_endgame"
            />
    </com.google.android.material.card.MaterialCardView>

</androidx.constraintlayout.motion.widget.MotionLayout>
```

@layout/layout_poster.xml

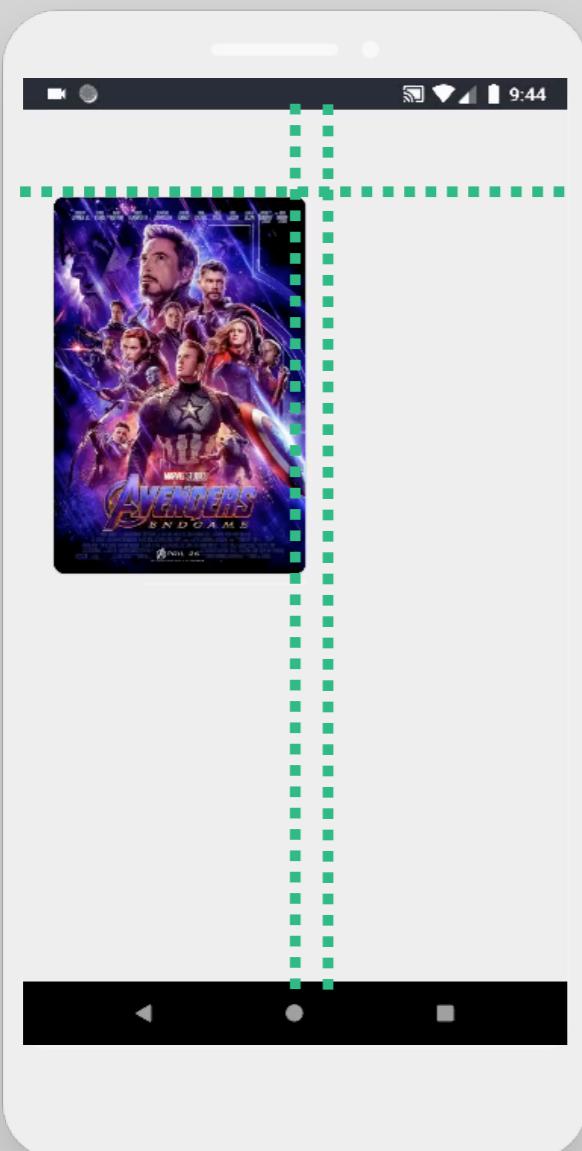


```
<androidx.constraintlayout.motion.widget.MotionLayout
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    app:layoutDescription="@xml/motion_poster">

    <com.google.android.material.card.MaterialCardView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:id="@+id/card_movie_poster"
        app:layout_constraintDimensionRatio="2:3"
        >
        <ImageView
            android:id="@+id/image_poster"
            android:layout_width="match_parent"
            android:layout_height="match_parent"
            android:scaleType="centerCrop"
            android:src="@drawable/poster_endgame"
            />
    </com.google.android.material.card.MaterialCardView>

</androidx.constraintlayout.motion.widget.MotionLayout>
```

@layout/layout_poster.xml



```
        android:layout_height="match_parent"
        android:scaleType="centerCrop"
        android:src="@drawable/poster_endgame"
    />
</androidx.constraintlayout.motion.widget.MotionLayout>
```

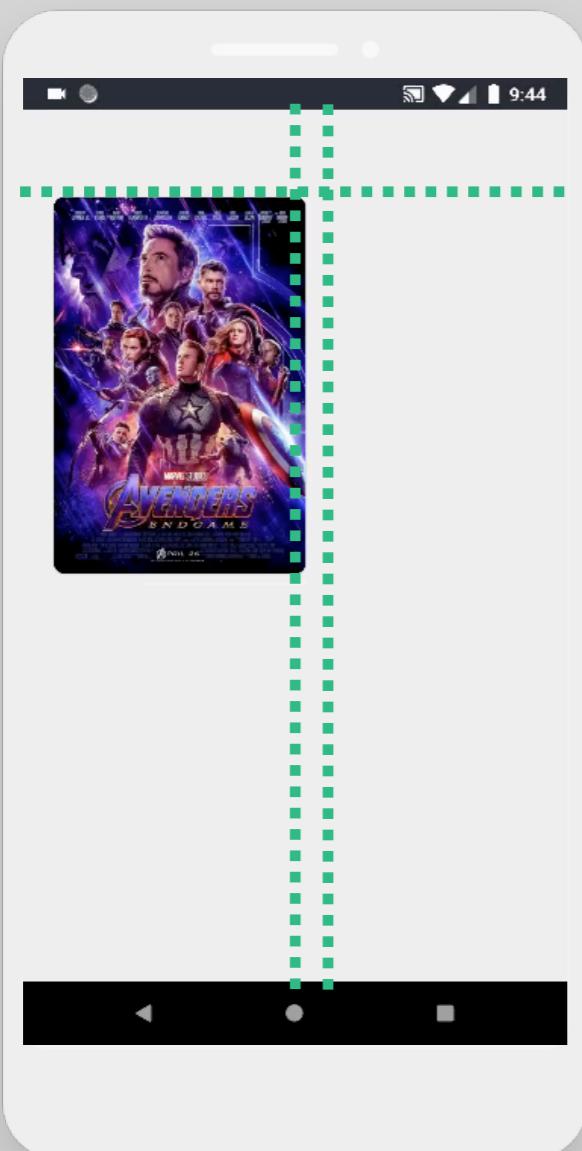
```
<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guideline_horizontal_10"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="horizontal"
    app:layout_constraintGuide_percent=".10" />
```

```
<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guideline_vertical_52"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="vertical"
    app:layout_constraintGuide_percent=".52" />
```

```
<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guideline_vertical_48"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="vertical"
    app:layout_constraintGuide_percent=".48" />
```

```
</androidx.constraintlayout.motion.widget.MotionLayout>
```

@layout/layout_poster.xml



```
        android:layout_height="match_parent"
        android:scaleType="centerCrop"
        android:src="@drawable/poster_endgame"
    />
</androidx.constraintlayout.motion.widget.MotionLayout>
```

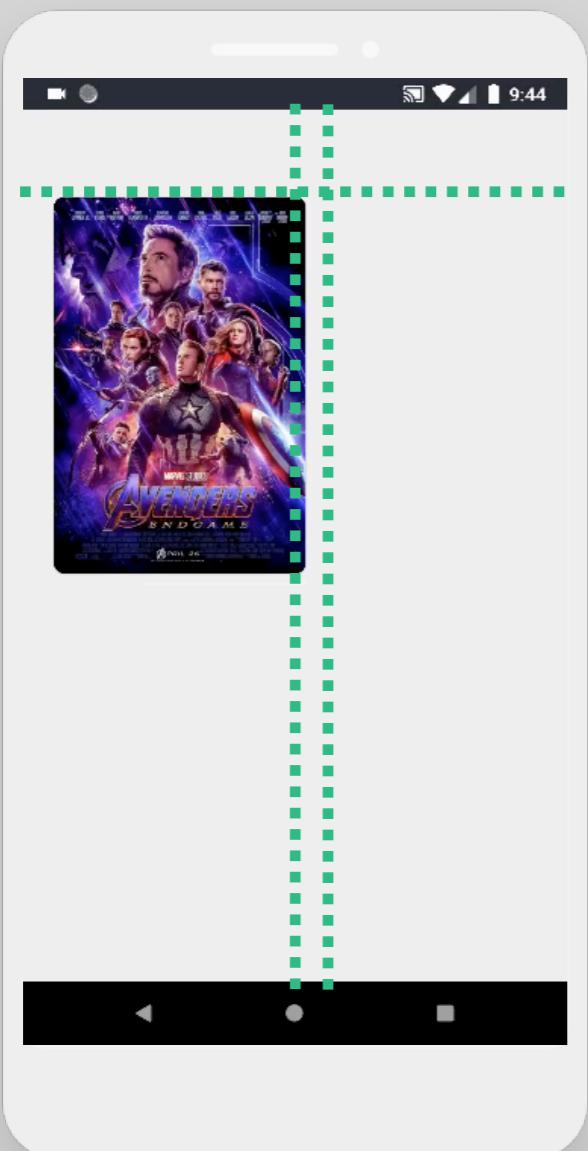
```
<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guideline_horizontal_10"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="horizontal"
    app:layout_constraintGuide_percent=".10" />
```

```
<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guideline_vertical_52"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="vertical"
    app:layout_constraintGuide_percent=".52" />
```

```
<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guideline_vertical_48"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="vertical"
    app:layout_constraintGuide_percent=".48" />
```

```
</androidx.constraintlayout.motion.widget.MotionLayout>
```

@layout/layout_poster.xml



```
        android:layout_height="match_parent"
        android:scaleType="centerCrop"
        android:src="@drawable/poster_endgame"
    />
</com.google.android.material.card.MaterialCardView>
```

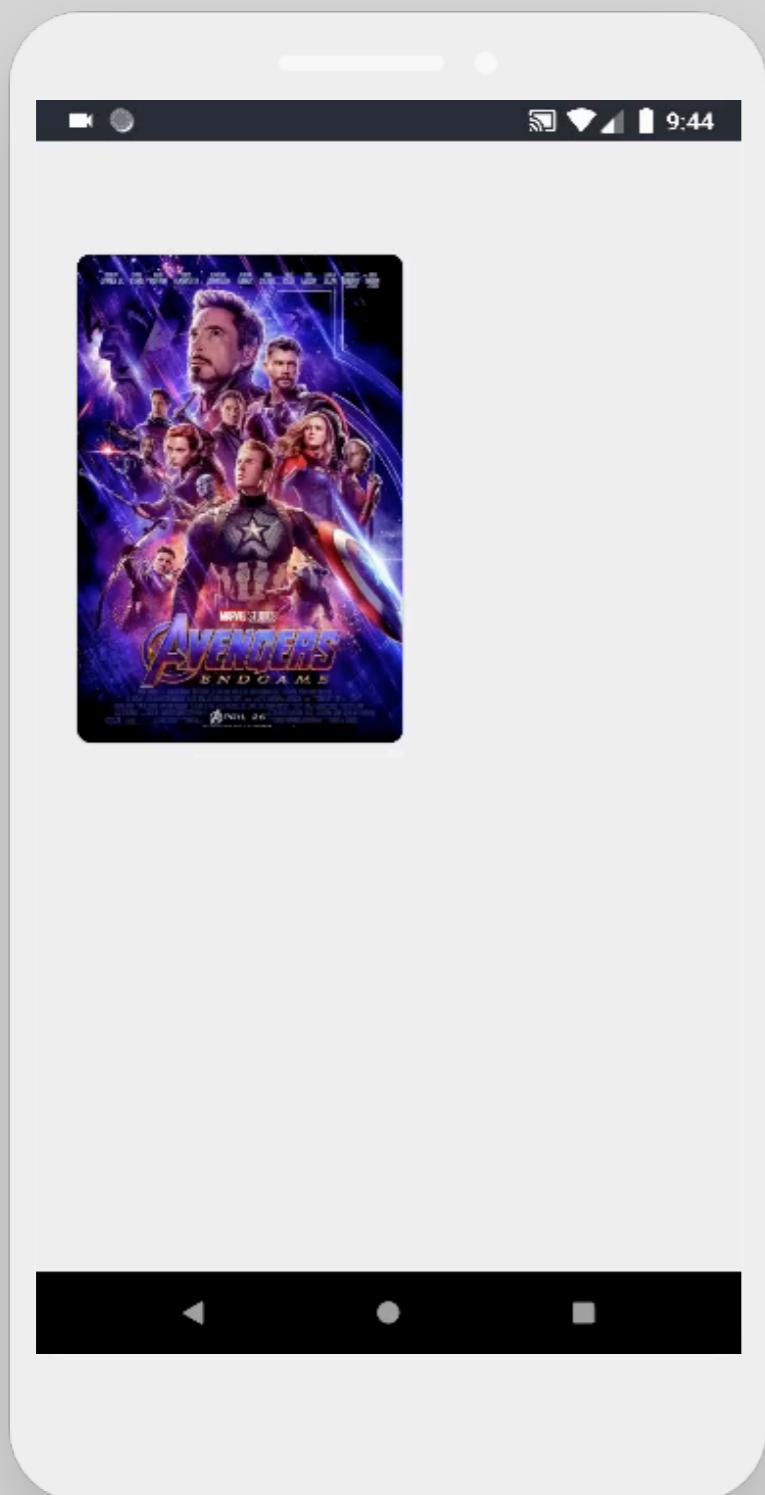
```
<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guideline_horizontal_10"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="horizontal"
    app:layout_constraintGuide_percent=".10" />
```

```
<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guideline_vertical_52"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="vertical"
    app:layout_constraintGuide_percent=".52" />
```

```
<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guideline_vertical_48"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="vertical"
    app:layout_constraintGuide_percent=".48" />
```

```
</androidx.constraintlayout.motion.widget.MotionLayout>
```

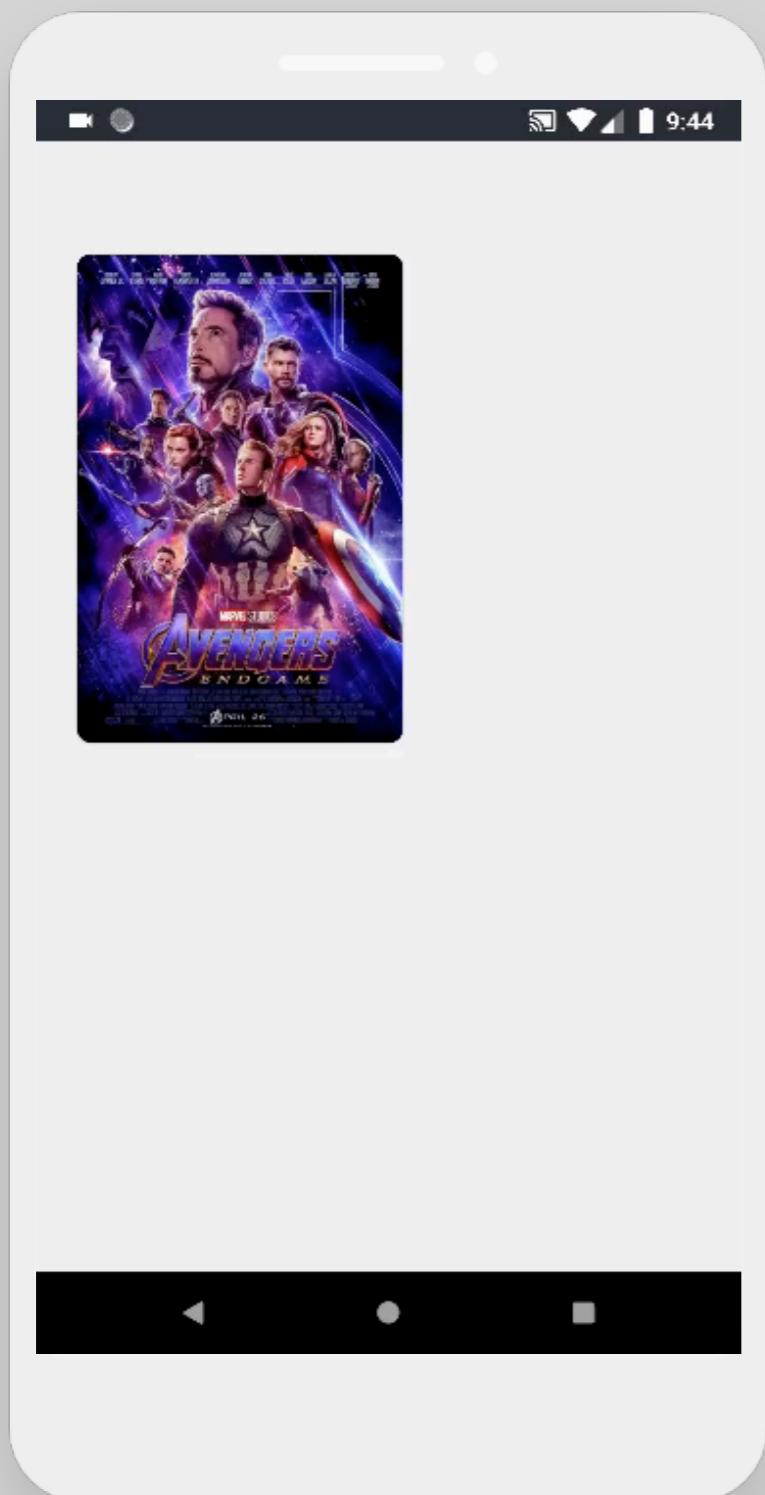
Movie Poster



@layout/layout_poster.xml

@xml/motion_poster.xml

Movie Poster

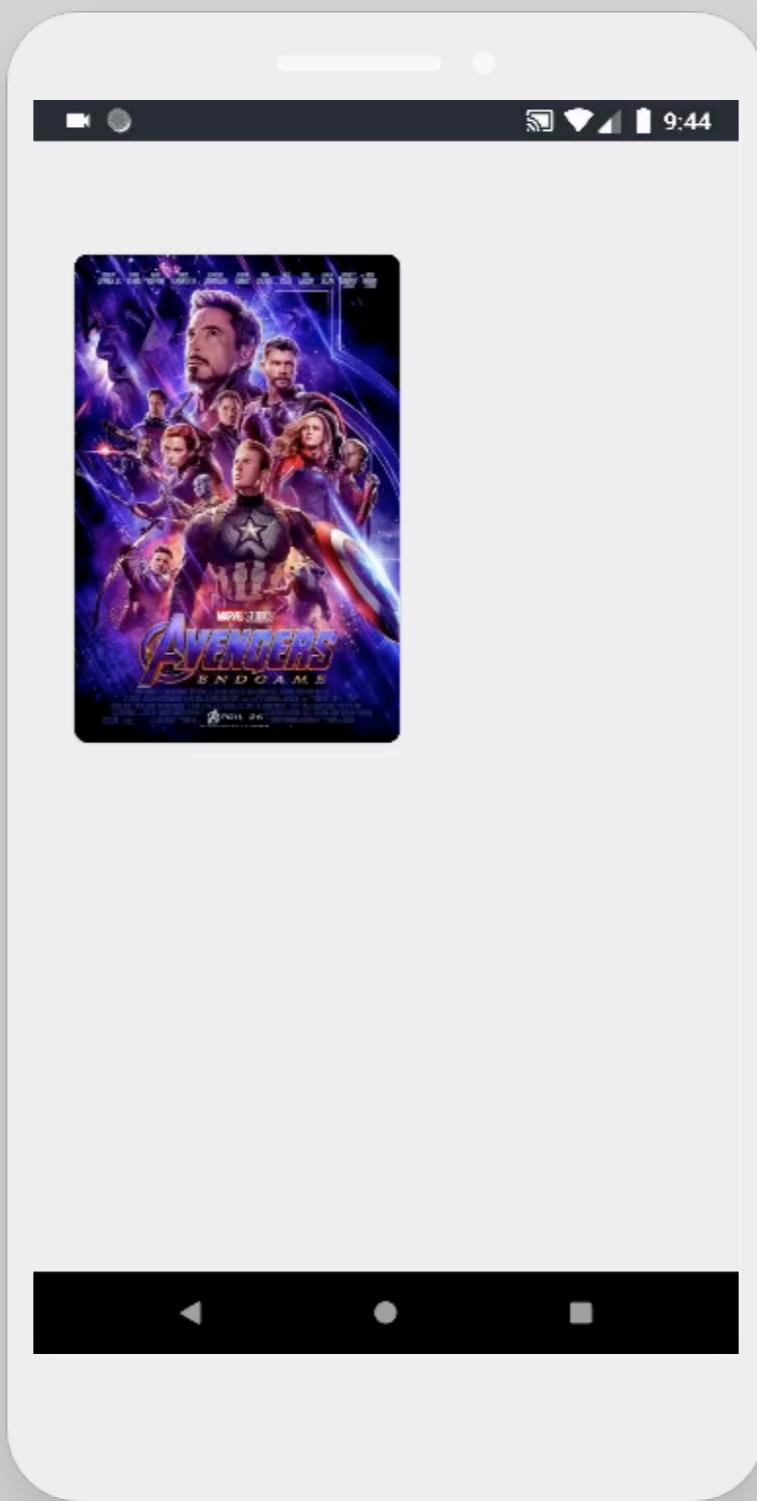


@layout/layout_poster.xml

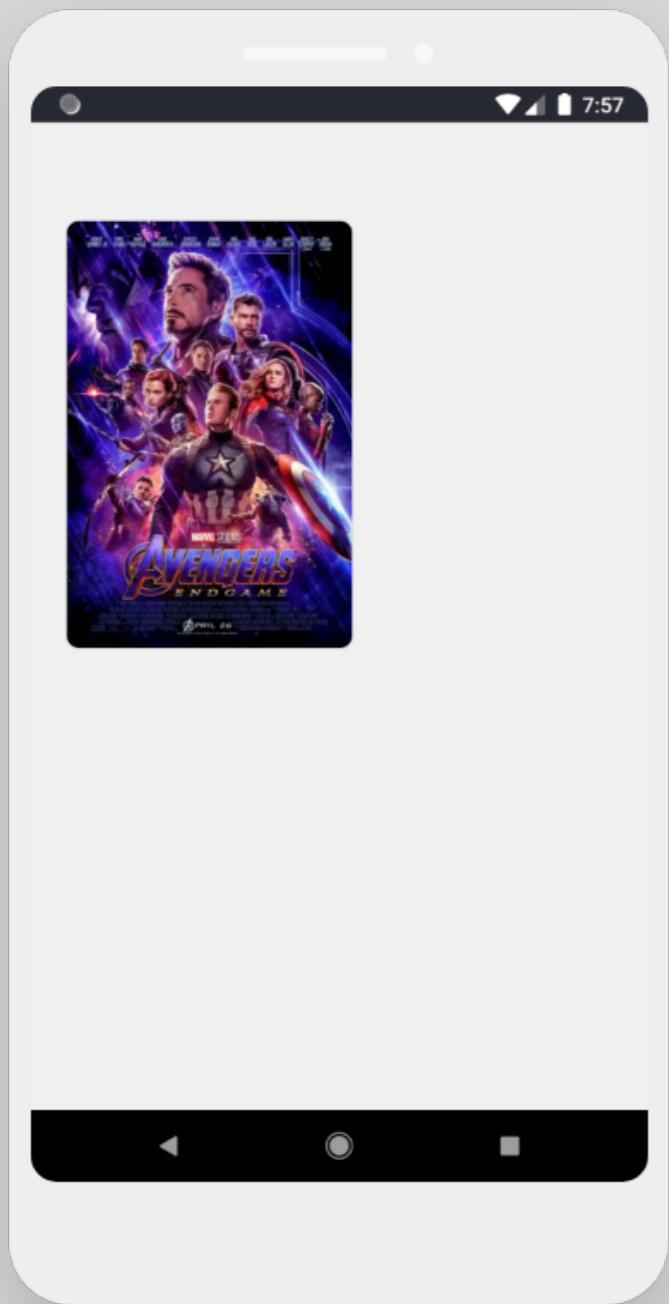


@xml/motion_poster.xml

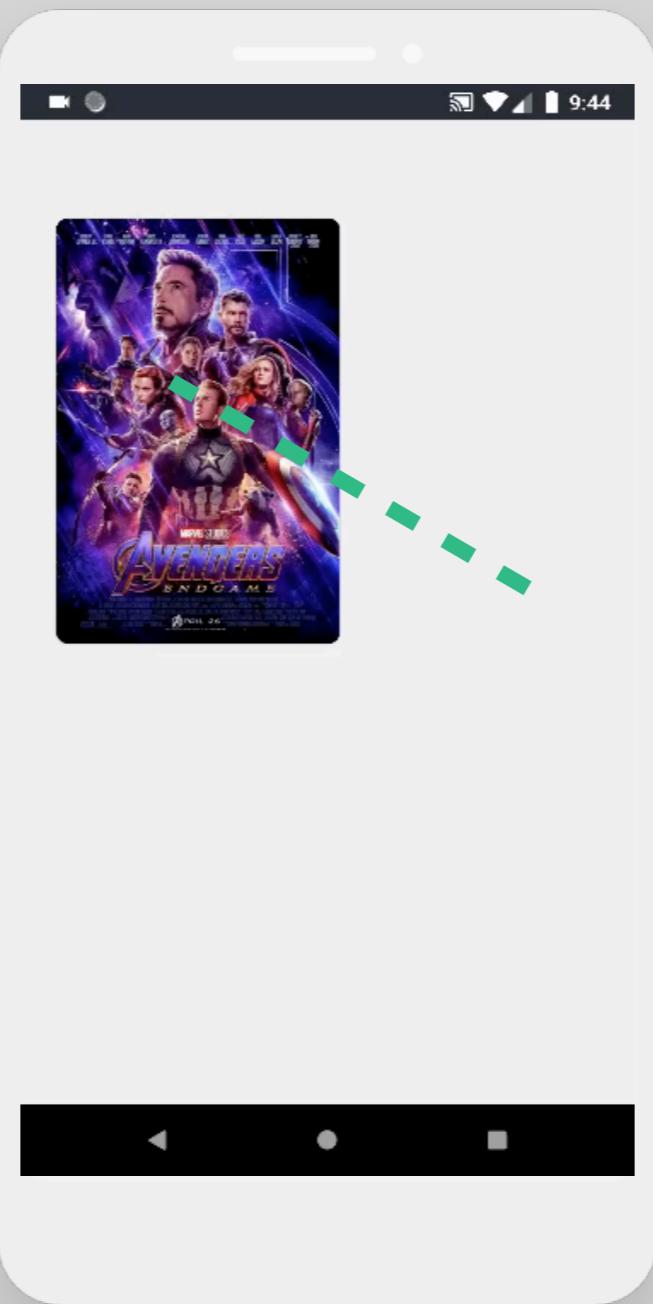
@xml/motion_poster.xml



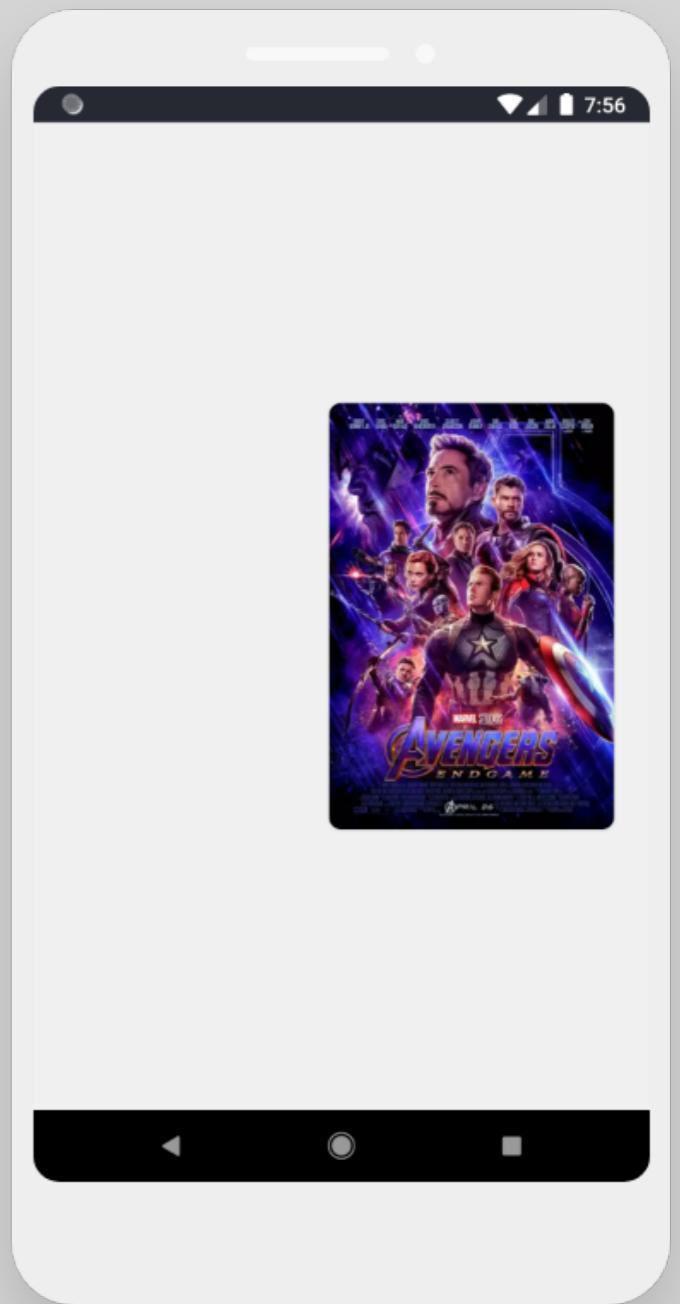
@xml/motion_poster.xml



Start State

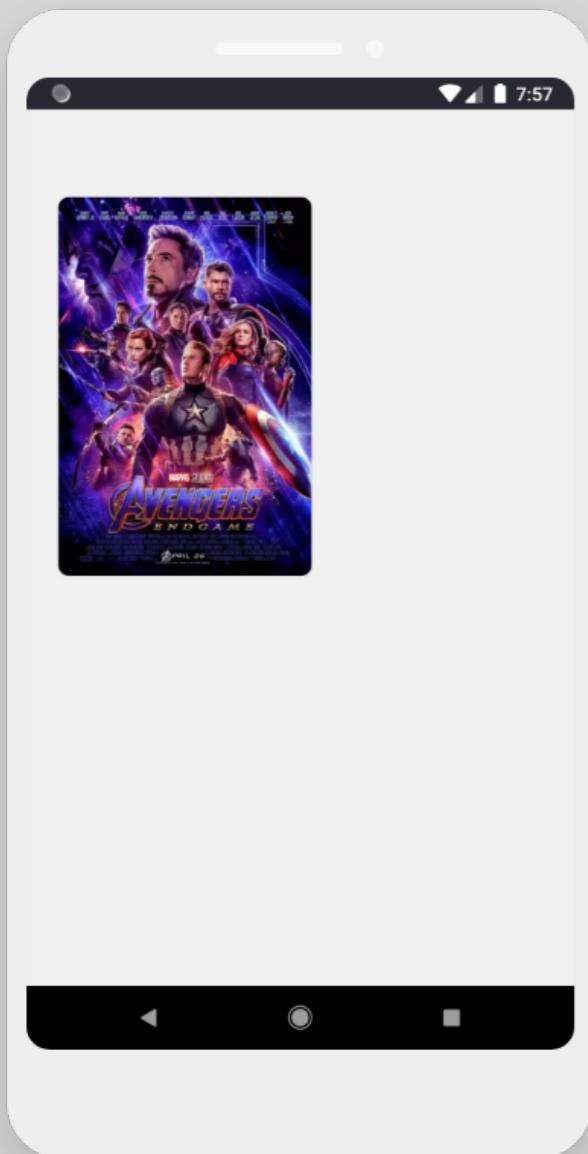


Transition



End State

@xml/motion_poster.xml



<MotionScene>

</MotionScene>

Start State

MotionScene

XML for holding **views' attributes** and **transitions**

MotionScene

<ConstraintSet>

<Transition>

<StateSet> (Optional)

MotionScene

<ConstraintSet>

Hold view attributes

<Transition>

<StateSet> (Optional)

MotionScene

<ConstraintSet>

<Transition>

Define start frame, end frame and transition information

<StateSet> (Optional)

MotionScene

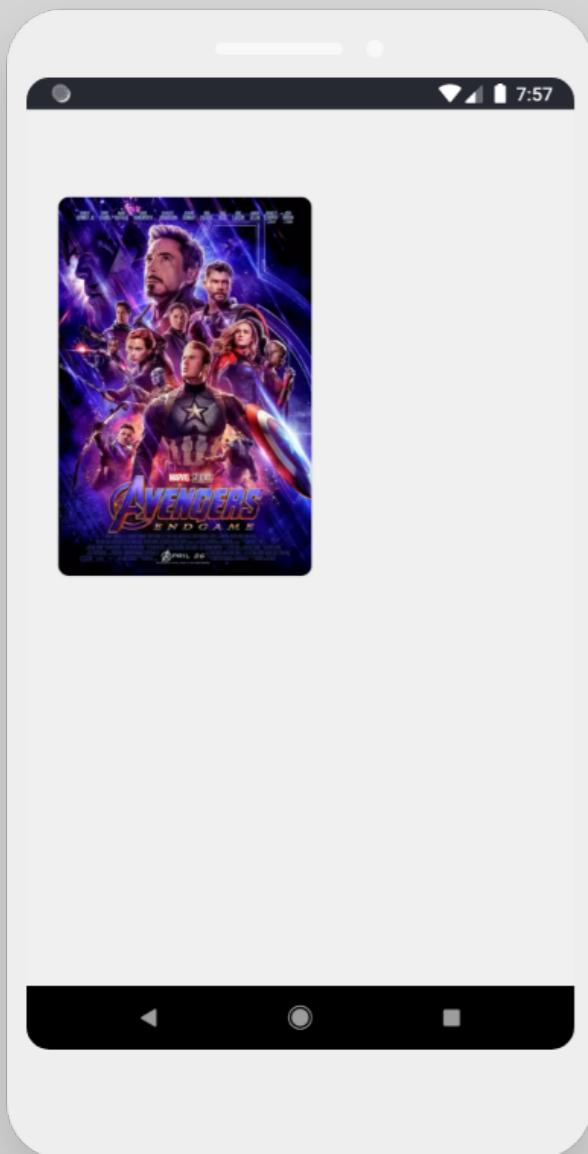
<ConstraintSet>

<Transition>

<StateSet> (Optional)

Group of states defined for different screens

@xml/motion_poster.xml

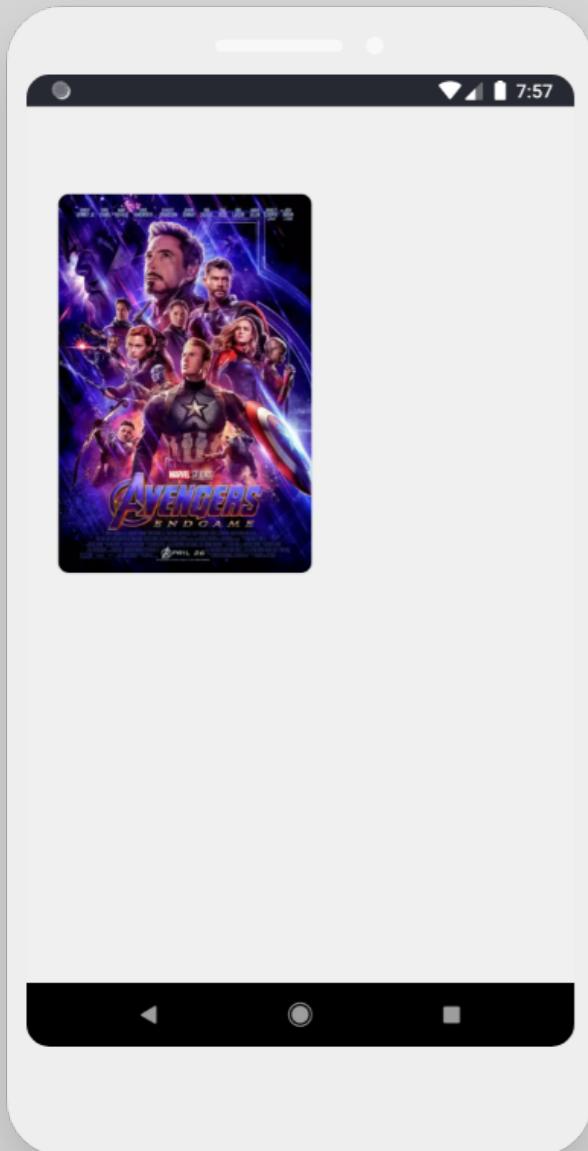


<MotionScene>

</MotionScene>

Start State

@xml/motion_poster.xml



```
<MotionScene>

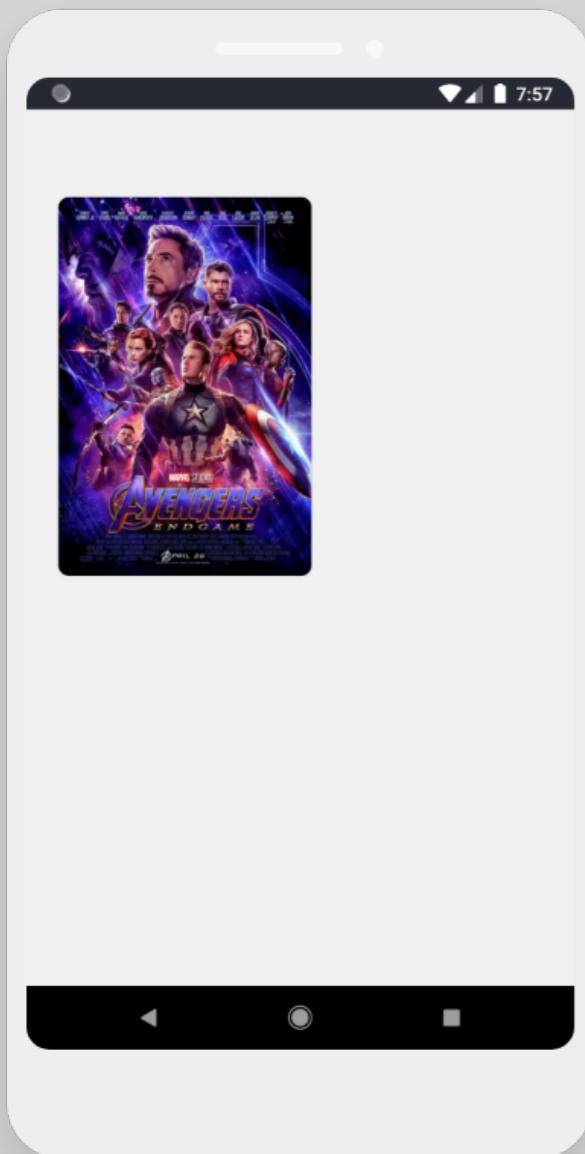
<ConstraintSet
    android:id="@+id/frame_poster_top">

</ConstraintSet>

</MotionScene>
```

Start State

@xml/motion_poster.xml



```
<MotionScene>

<ConstraintSet
    android:id="@+id/frame_poster_top">

    <Constraint android:id="@+id/card_movie_poster">

        </Constraint>

    </ConstraintSet>

</MotionScene>
```

Start State

Constraints

Attributes of a view

Constraint Attributes

Layout

Transform

Property

Motion

CustomAttribute

Constraint Attributes

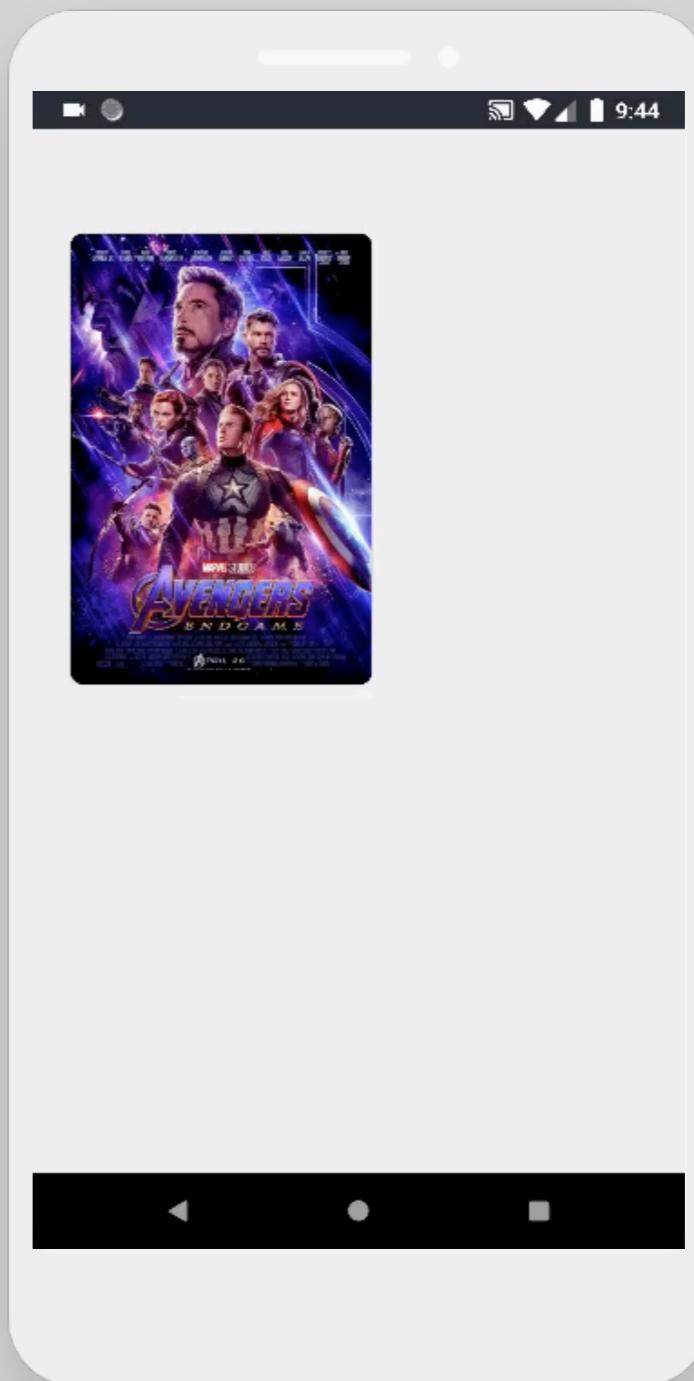
Layout
View Positioning Attributes

Transform

Property

Motion

CustomAttribute



Constraint Attributes

Layout

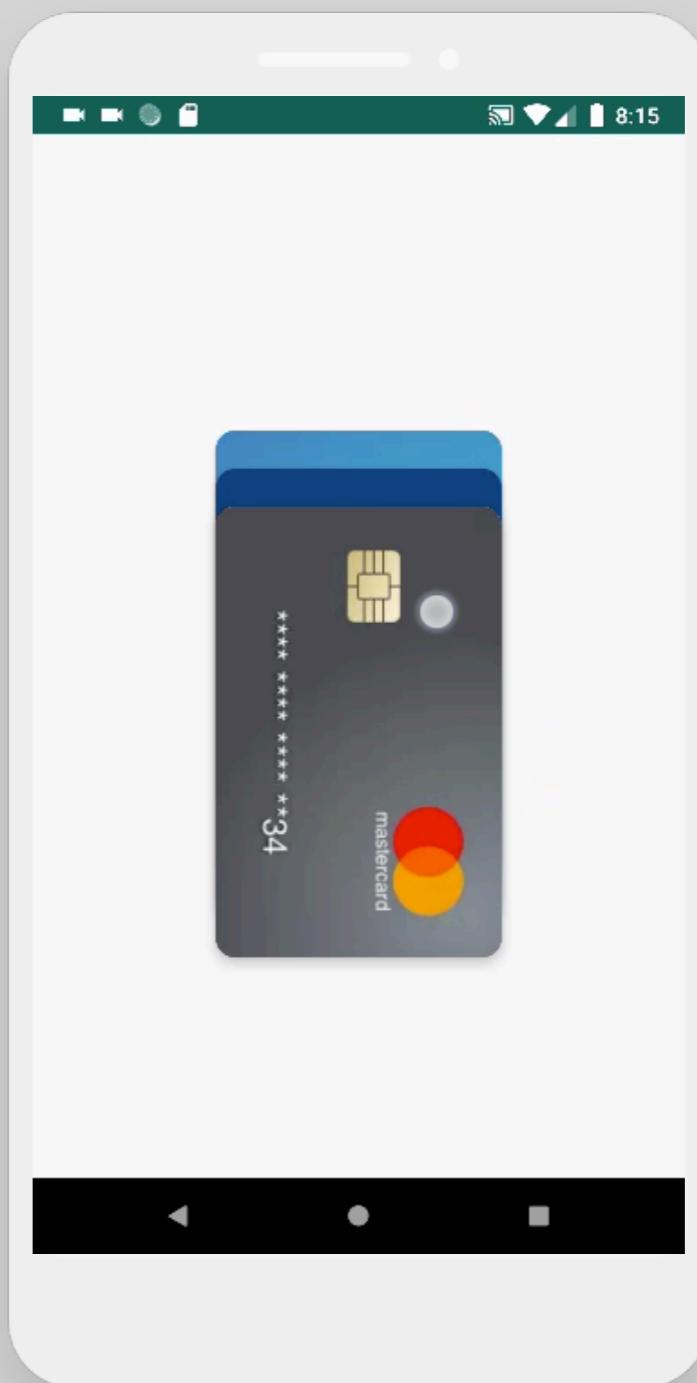
Transform

Rotations, re-sizings, translation

Property

Motion

CustomAttribute



Constraint Attributes

Layout

Transform

Property
Alpha, Visibility

Motion

CustomAttribute



Constraint Attributes

Layout

Transform

Property

Motion

Path Rotation, Easing

CustomAttribute



Constraint Attributes

Layout

Transform

Property

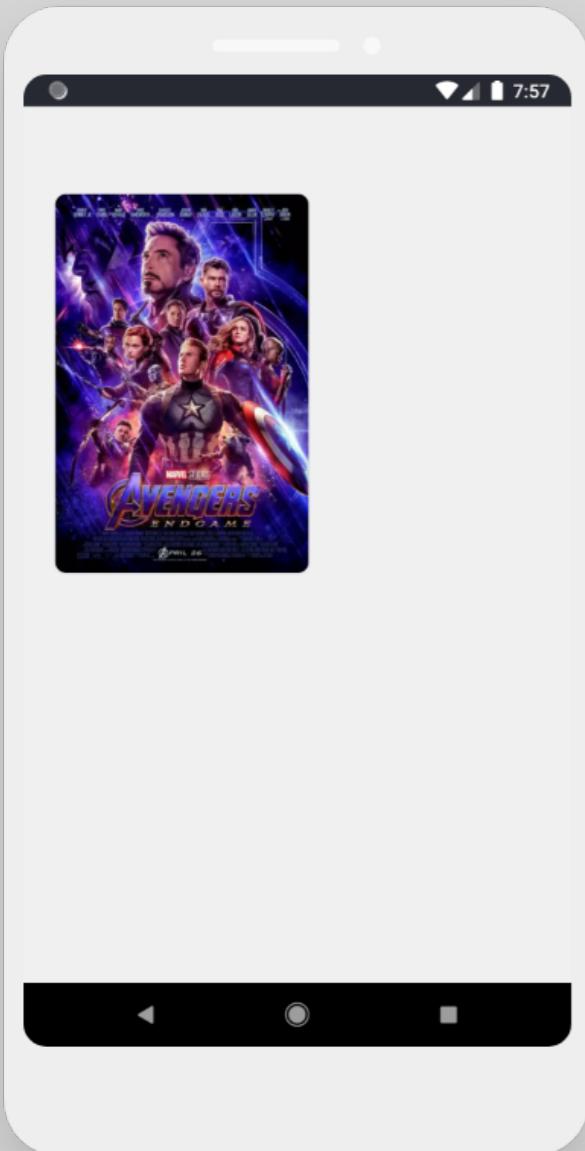
Motion

CustomAttribute

[View attributes with reflection](#)



@xml/motion_poster.xml

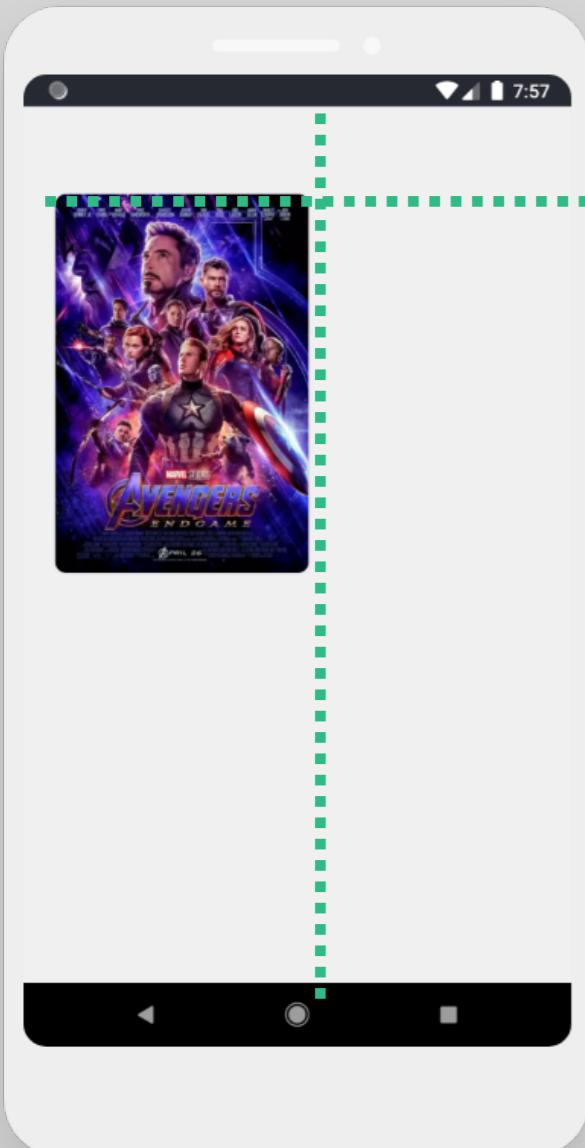


```
<MotionScene>  
  
<ConstraintSet  
    android:id="@+id/frame_poster_top">  
  
    <Constraint android:id="@+id/card_movie_poster">  
  
    </Constraint>  
  
</ConstraintSet>  
  
</MotionScene>
```

Start State

@xml/motion_poster.xml

<MotionScene>



<ConstraintSet

 android:id="@+id/frame_poster_top">

 <Constraint android:id="@+id/card_movie_poster">

 <Layout

 android:layout_width="0dp"

 android:layout_height="0dp"

 android:layout_marginStart="24dp"

 app:layout_constraintDimensionRatio="2:3"

 app:layout_constraintStart_toStartOf="parent"

 app:layout_constraintEnd_toStartOf="@+id/guide_y_52"

 app:layout_constraintTop_toTopOf="@+id/guide_x_10" />

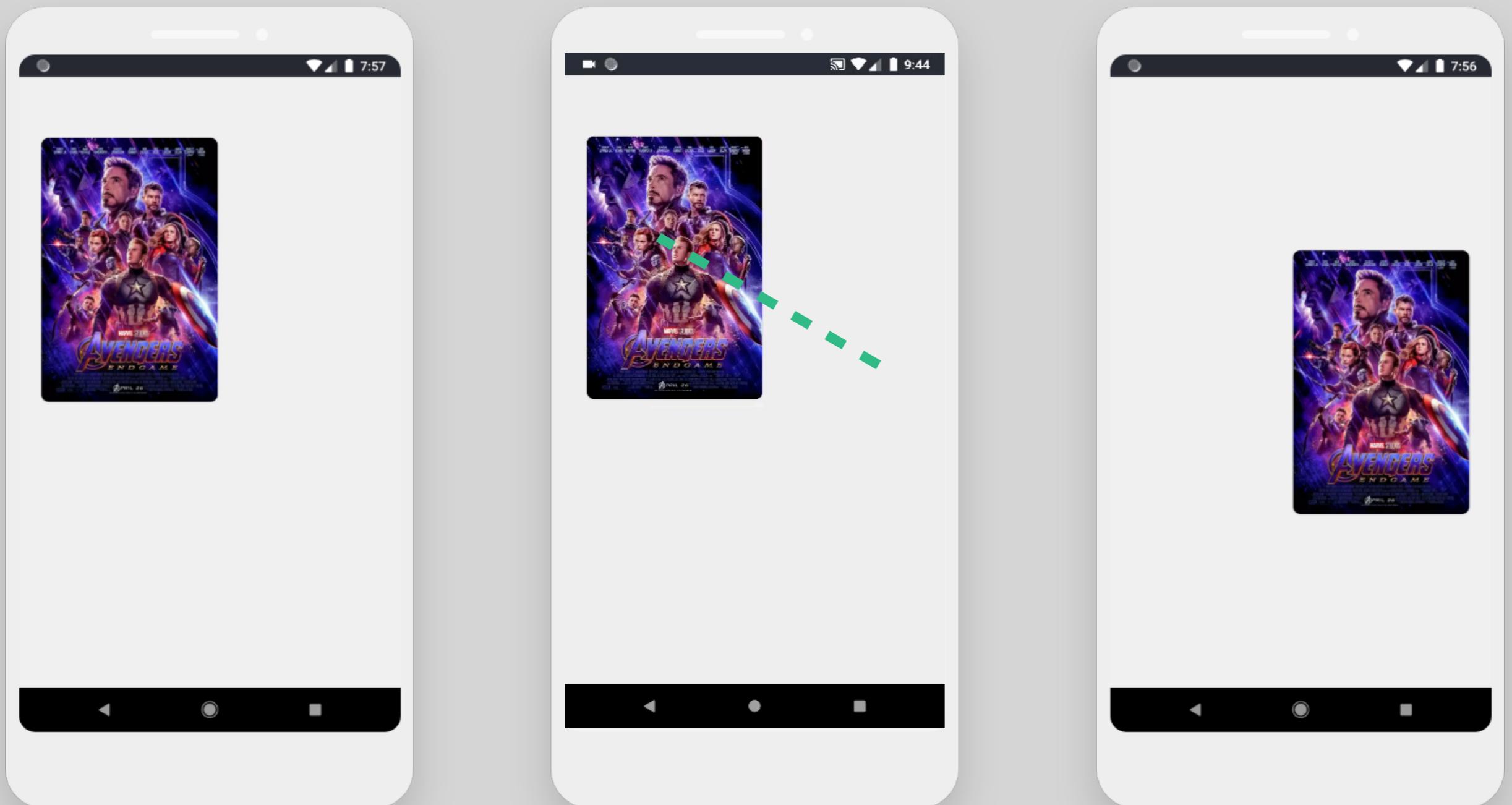
 </Constraint>

</ConstraintSet>

</MotionScene>

Start State

@xml/motion_poster.xml

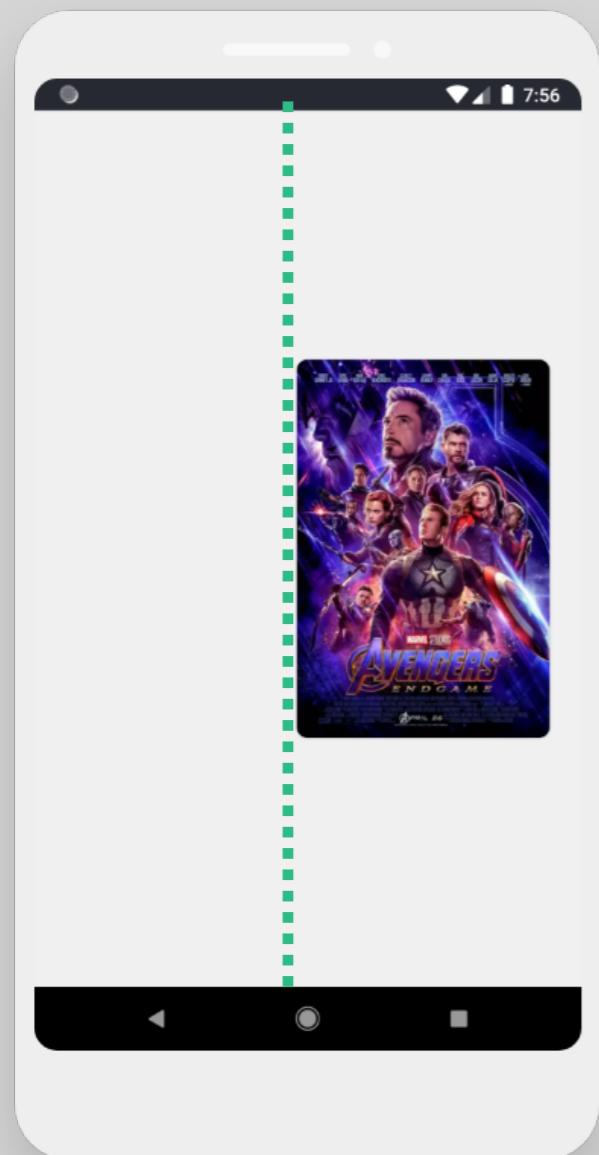


Start State

Transition

End State

@xml/motion_poster.xml



```
<MotionScene>
```

```
<ConstraintSet
```

```
    android:id="@+id/frame_poster_top">
```

```
    <Constraint android:id="@+id/card_movie_poster">
```

```
        <Layout
```

```
            android:layout_width="0dp"
```

```
            android:layout_height="0dp"
```

```
            android:layout_marginStart="24dp"
```

```
            app:layout_constraintDimensionRatio="2:3"
```

```
            app:layout_constraintStart_toStartOf="parent"
```

```
            app:layout_constraintEnd_toStartOf="@+id/guide_y_52"
```

```
            app:layout_constraintTop_toTopOf="@+id/guide_x_10" />
```

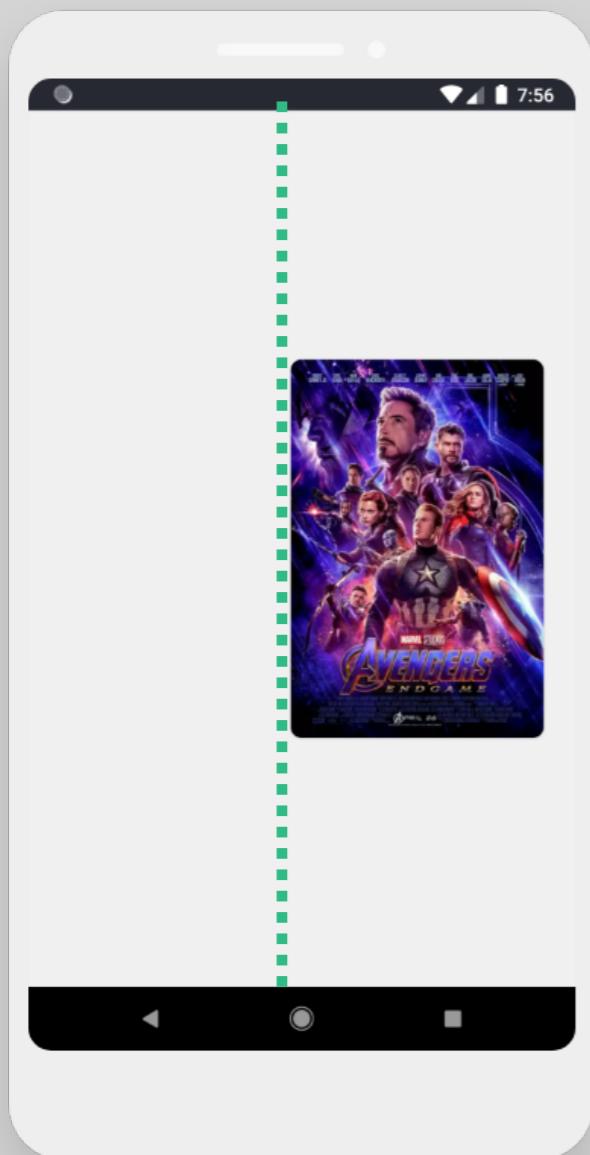
```
    </Constraint>
```

```
</ConstraintSet>
```

```
</MotionScene>
```

End State

@xml/motion_poster.xml



```
<Layout  
    android:layout_width="0dp"  
    android:layout_height="0dp"  
    android:layout_marginStart="24dp"  
    app:layout_constraintDimensionRatio="2:3"  
    app:layout_constraintStart_toStartOf="parent"  
    app:layout_constraintEnd_toStartOf="@+id/guide_y_52"  
    app:layout_constraintTop_toTopOf="@+id/guide_x_10"/>
```

```
</Constraint>
```

```
</ConstraintSet>
```

```
<ConstraintSet android:id="@+id/frame_poster_middle">
```

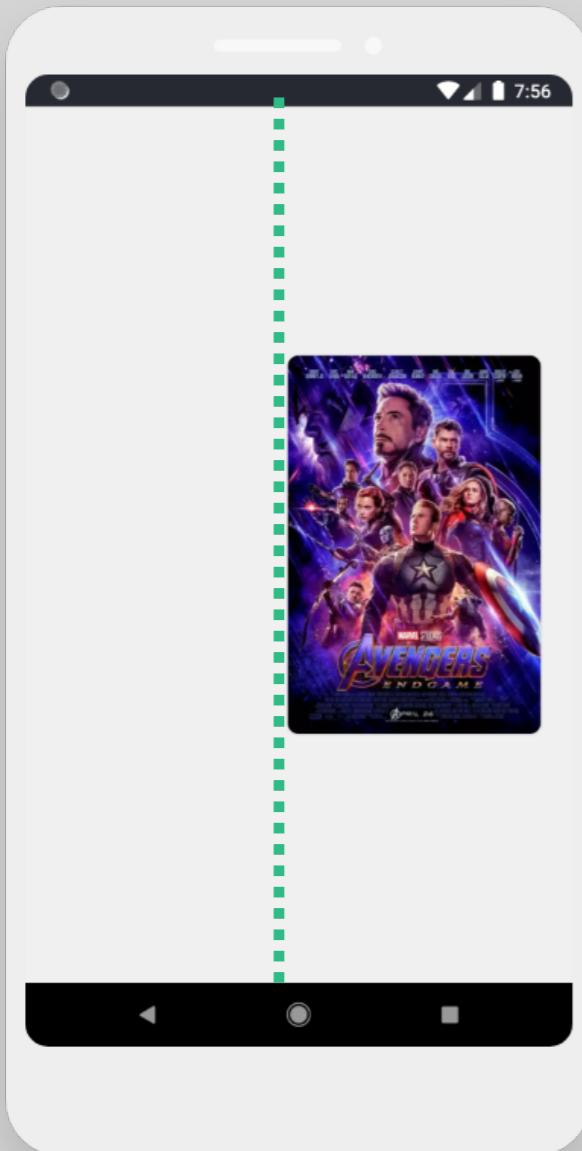
```
</ConstraintSet>
```

```
</MotionScene>
```

End State

@xml/motion_poster.xml

```
        android:layout_width="0dp"
        android:layout_height="0dp"
        android:layout_marginStart="24dp"
        app:layout_constraintDimensionRatio="2:3"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintEnd_toStartOf="@+id/guide_y_52"
        app:layout_constraintTop_toTopOf="@+id/guide_x_10" />
```



```
</Constraint>

</ConstraintSet>

<ConstraintSet android:id="@+id/frame_poster_middle">

    <Constraint android:id="@+id/card_movie_poster">

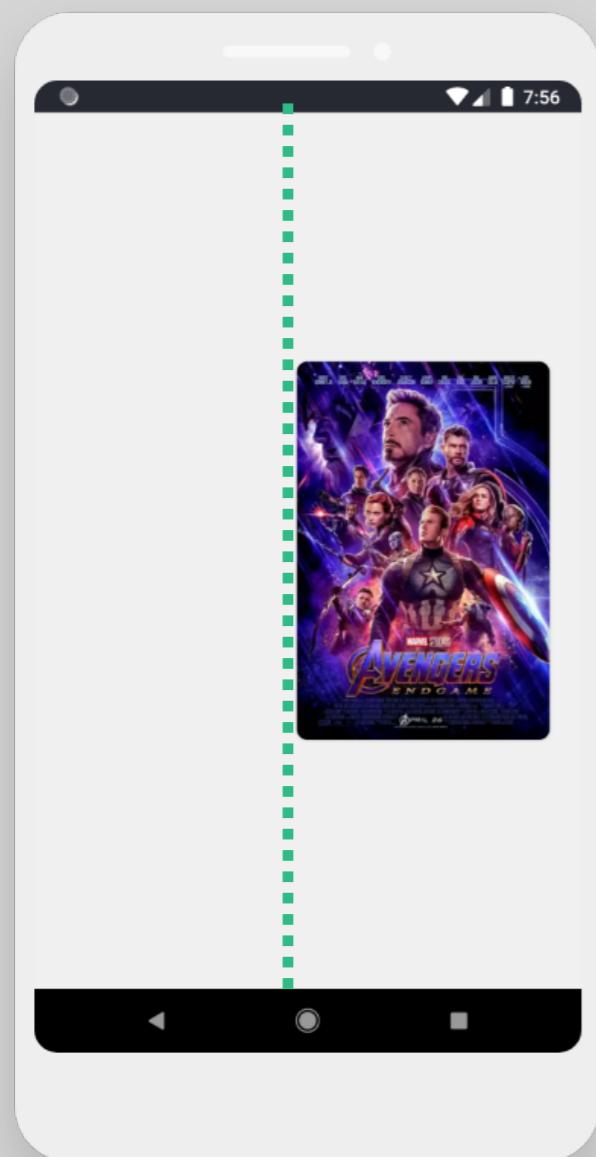
        </Constraint>

    </ConstraintSet>

</MotionScene>
```

End State

@xml/motion_poster.xml



```
</ConstraintSet>

<ConstraintSet android:id="@+id/frame_poster_middle">

    <Constraint android:id="@+id/card_movie_poster">

        <Layout
            android:layout_width="0dp"
            android:layout_height="0dp"
            android:layout_marginEnd="24dp"
            app:layout_constraintBottom_toBottomOf="parent"
            app:layout_constraintDimensionRatio="2:3"
            app:layout_constraintEnd_toEndOf="parent"
            app:layout_constraintStart_toStartOf="@+id/guide_y_48"
            app:layout_constraintTop_toTopOf="parent" />

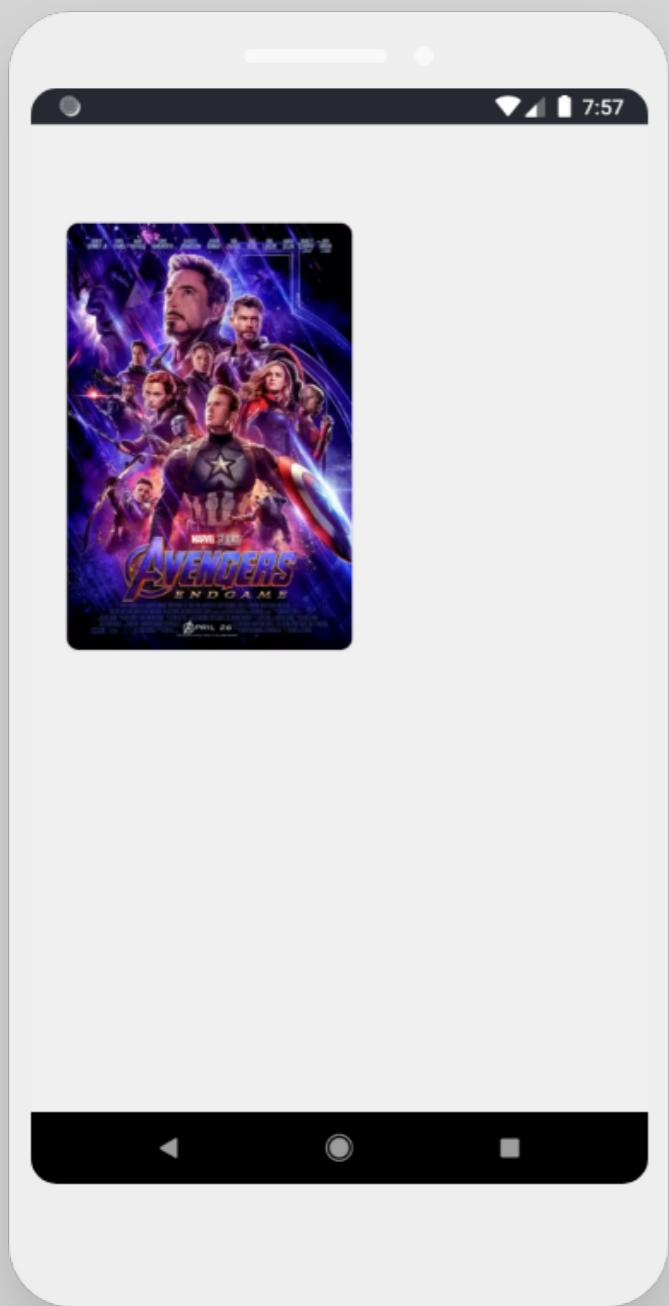
    </Constraint>

</ConstraintSet>

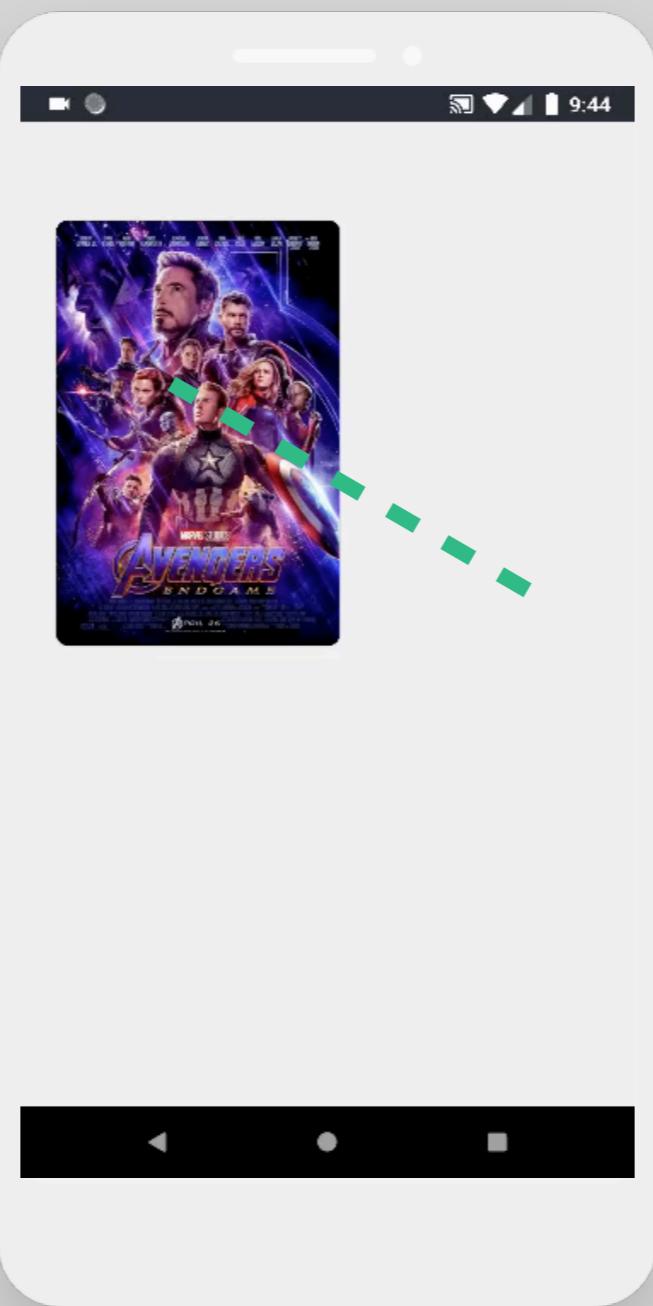
</MotionScene>
```

End State

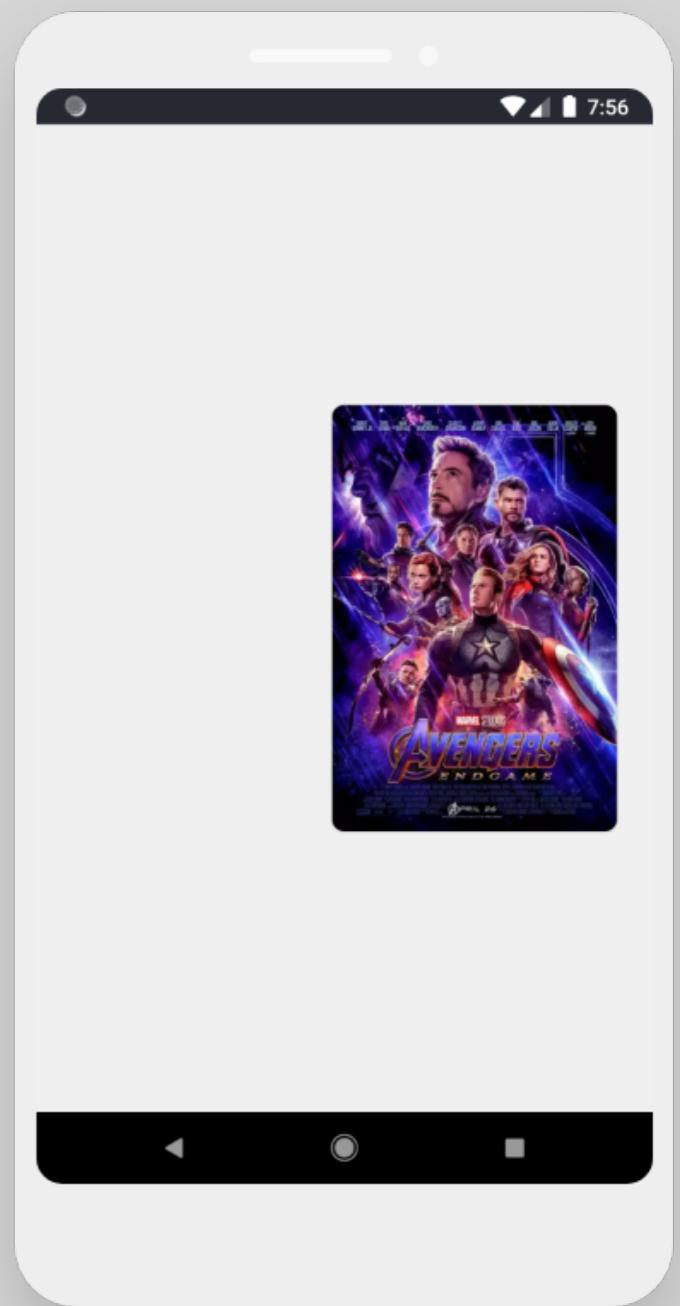
@xml/motion_poster.xml



Start State

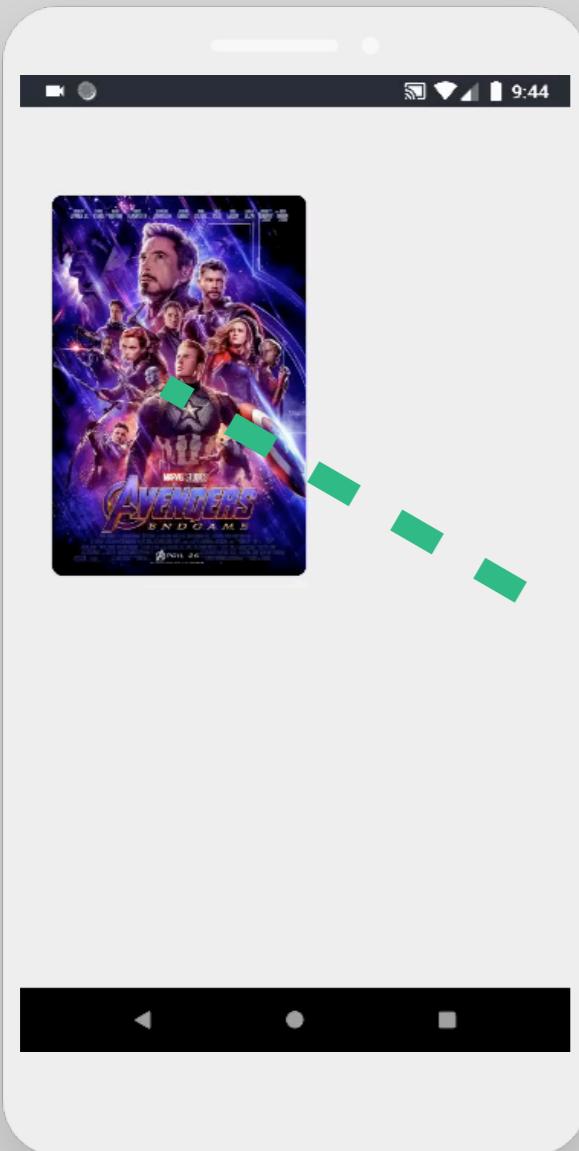


Transition



End State

@xml/motion_poster.xml



```
<MotionScene>

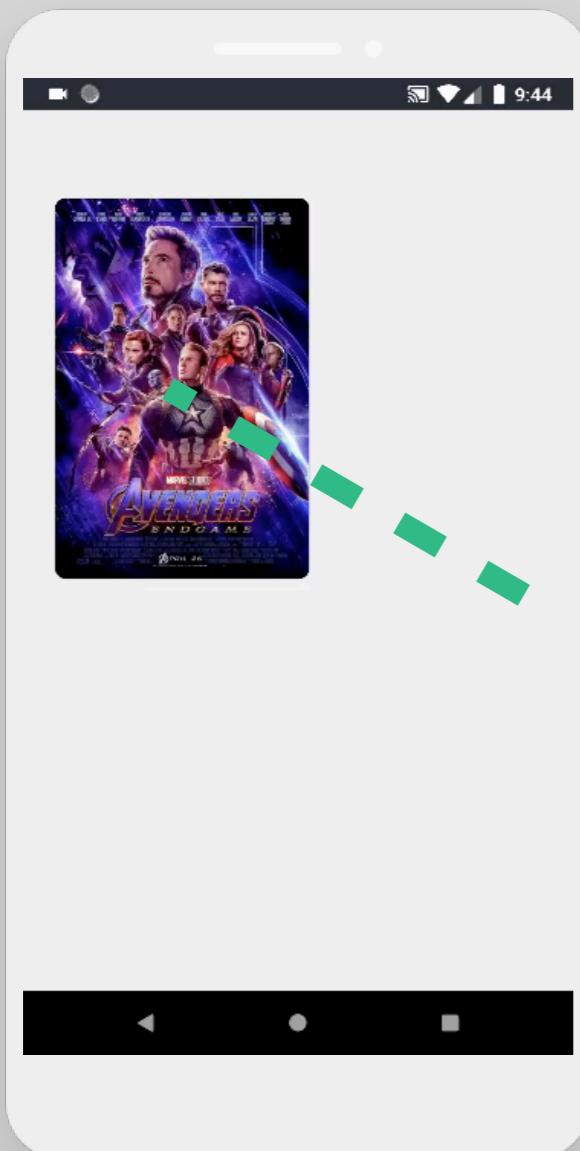
    <ConstraintSet android:id="@+id/frame_poster_top">
        ...
    </ConstraintSet>

    <ConstraintSet android:id="@+id/frame_poster_middle">
        ...
    </ConstraintSet>

</MotionScene>
```

Transition

@xml/motion_poster.xml



```
<MotionScene>

    <Transition
        android:id="@+id/transition_poster"
        app:constraintSetStart="@+id/frame_poster_top"
        app:constraintSetEnd="@+id/frame_poster_middle" >

        </Transition>

        <ConstraintSet android:id="@+id/frame_poster_top">
            ...
        </ConstraintSet>

        <ConstraintSet android:id="@+id/frame_poster_middle">
            ...
        </ConstraintSet>

    </MotionScene>
```

Transition

Transition

Describe **start** frame, **end** frame and **transition** informations

Transition

constraintSetStart

constraintSetEnd

motionInterpolator

duration

<OnSwipe>

<OnClick>

<KeyFrameSet>

Transition

constraintSetStart

constraintSetEnd

motionInterpolator

duration

<OnSwipe>

<OnClick>

<KeyFrameSet>

Transition

constraintSetStart

constraintSetEnd

motionInterpolator

duration

<OnSwipe>

<OnClick>

<KeyFrameSet>

Transition

constraintSetStart

constraintSetEnd

motionInterpolator
Transition easing

duration

<OnSwipe>

<OnClick>

<KeyFrameSet>

Transition

constraintSetStart

constraintSetEnd

motionInterpolator

duration

<OnSwipe>

<OnClick>

<KeyFrameSet>

Transition

constraintSetStart

constraintSetEnd

motionInterpolator

duration

<OnSwipe>

<OnClick>

<KeyFrameSet>

Transition

constraintSetStart

constraintSetEnd

motionInterpolator

duration

<OnSwipe>

<OnClick>

<KeyFrameSet>

Transition

constraintSetStart

constraintSetEnd

motionInterpolator

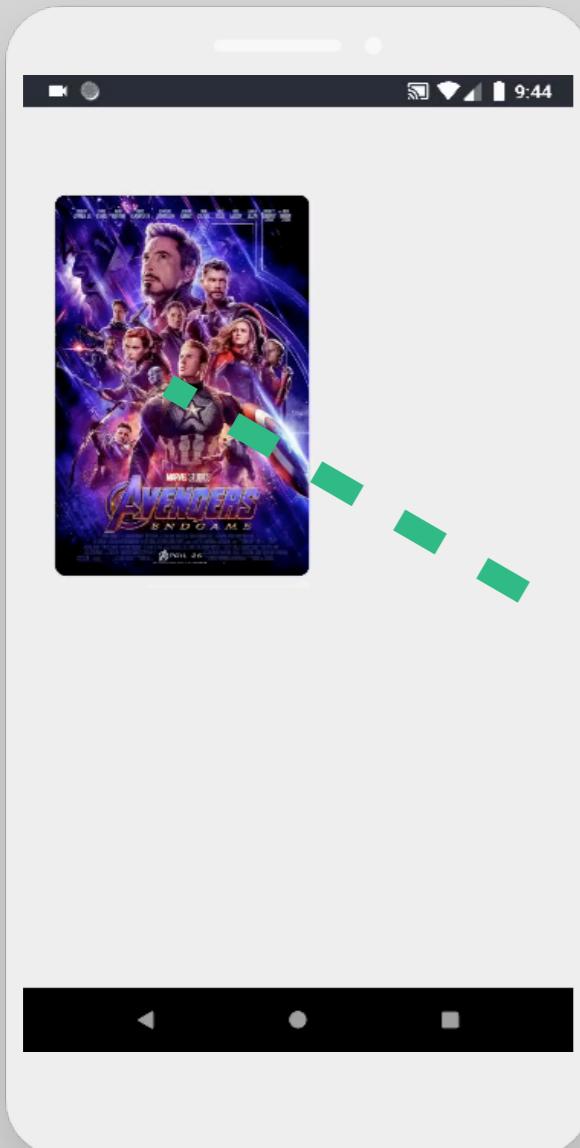
duration

<OnSwipe>

<OnClick>

<KeyFrameSet>

@xml/motion_poster.xml



```
<MotionScene>

    <Transition
        android:id="@+id/transition_poster"
        app:constraintSetStart="@+id/frame_poster_top"
        app:constraintSetEnd="@+id/frame_poster_middle" >

        </Transition>

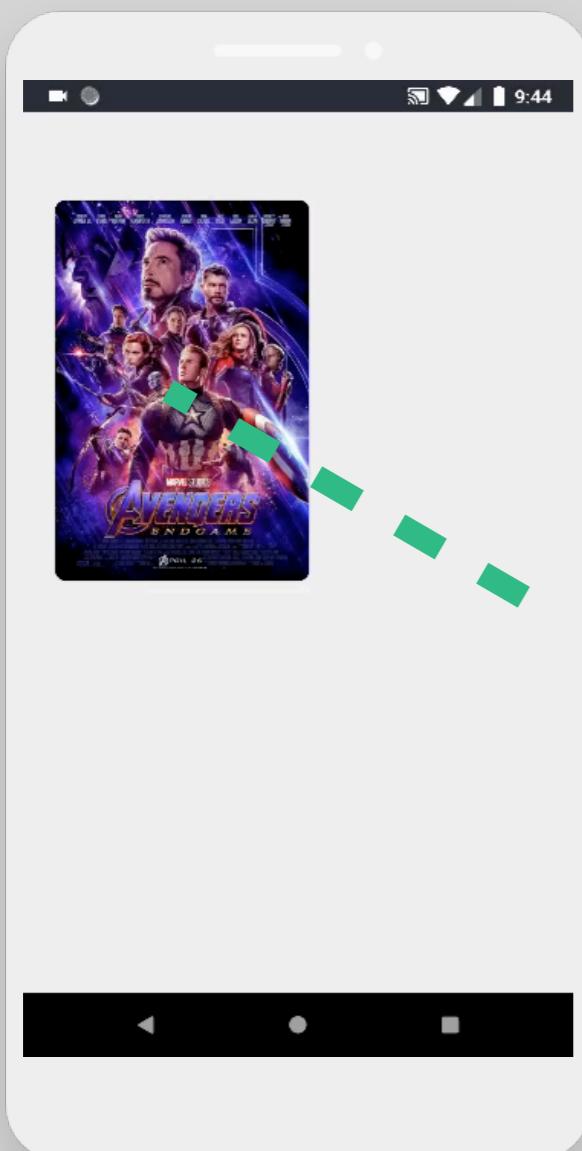
        <ConstraintSet android:id="@+id/frame_poster_top">
            ...
        </ConstraintSet>

        <ConstraintSet android:id="@+id/frame_poster_middle">
            ...
        </ConstraintSet>

    </MotionScene>
```

Transition

@xml/motion_poster.xml



Transition

```
<MotionScene>

    <Transition
        android:id="@+id/transition_poster"
        app:constraintSetStart="@+id/frame_poster_top"
        app:constraintSetEnd="@+id/frame_poster_middle" >

        <OnClick
            app:clickAction="toggle"
            app:targetId="@+id/card_movie_poster"/>

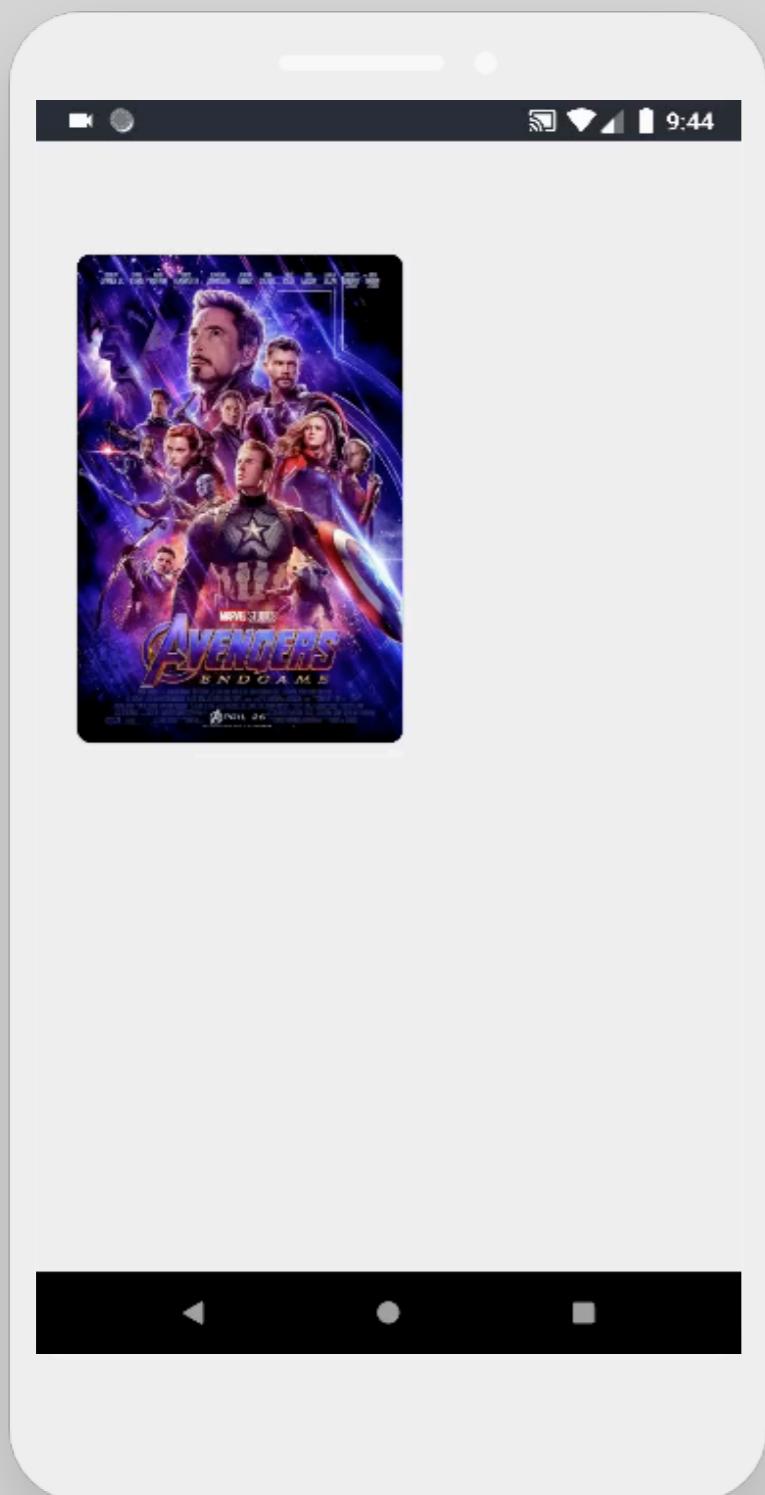
    </Transition>

    <ConstraintSet android:id="@+id/frame_poster_top">
        ...
    </ConstraintSet>

    <ConstraintSet android:id="@+id/frame_poster_middle">
        ...
    </ConstraintSet>

</MotionScene>
```

Movie Poster

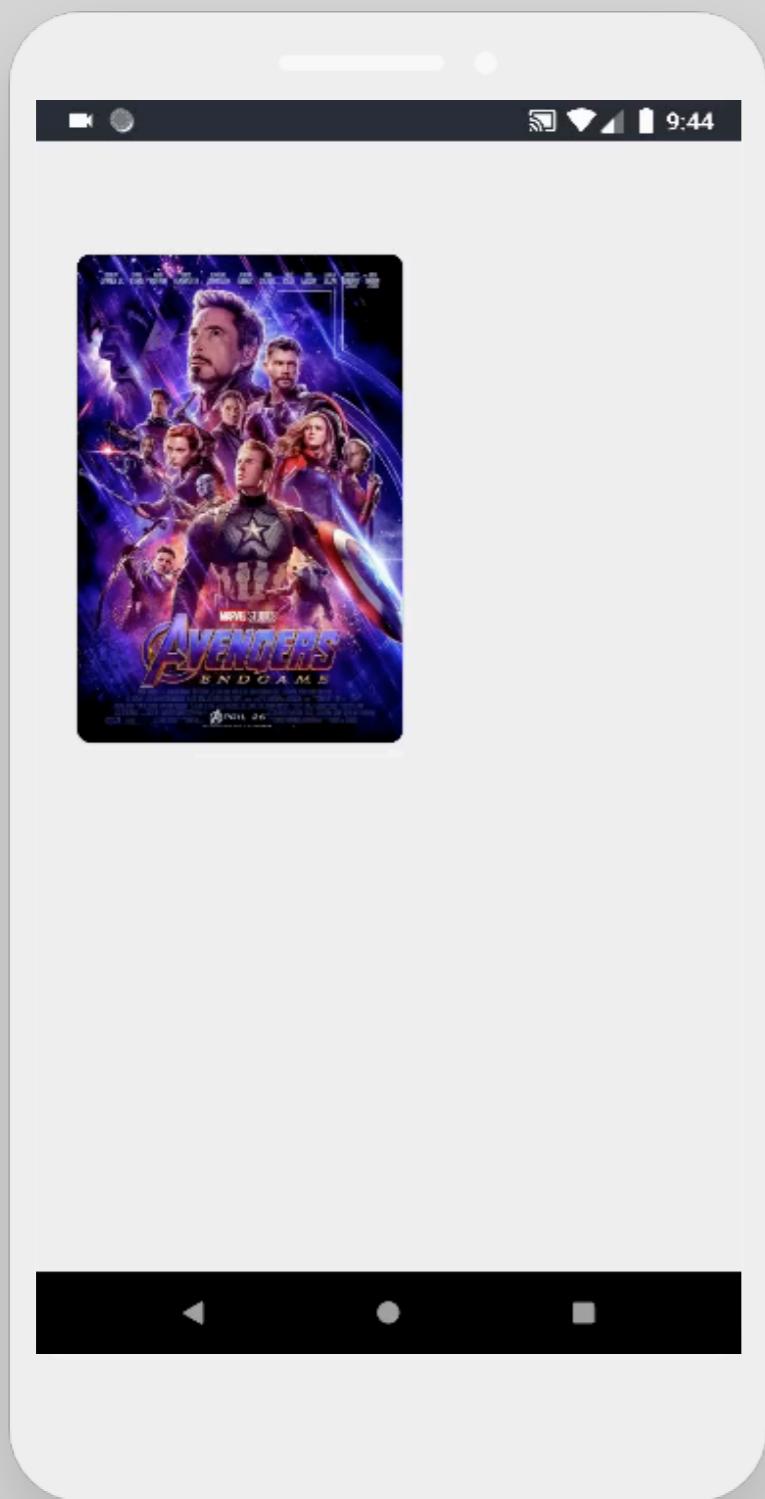


@layout/layout_poster.xml



@xml/motion_poster.xml

Movie Poster



@layout/layout_poster.xml



@xml/motion_poster.xml

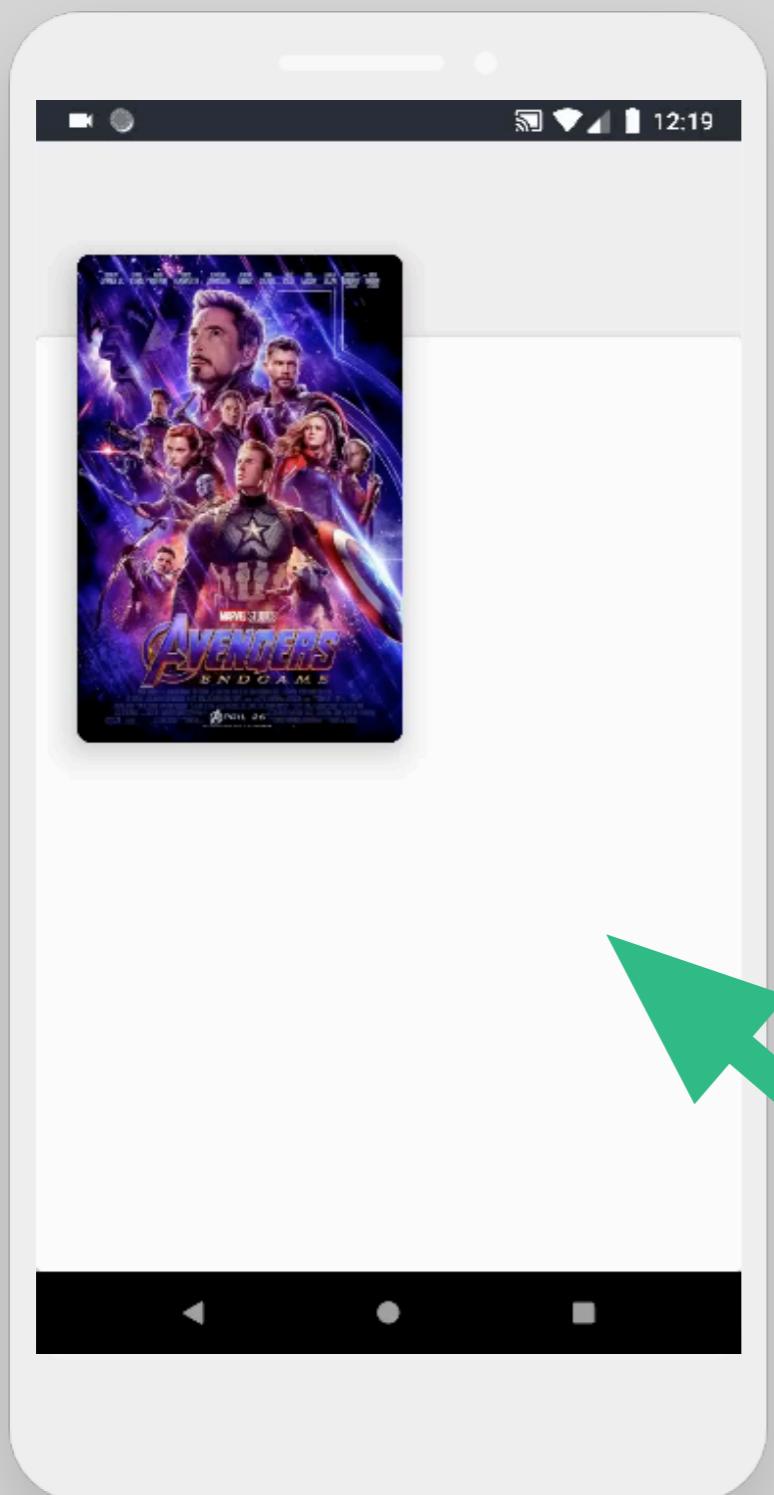




Yay !!!

First Version Done

Movie Poster + Movie Information Card



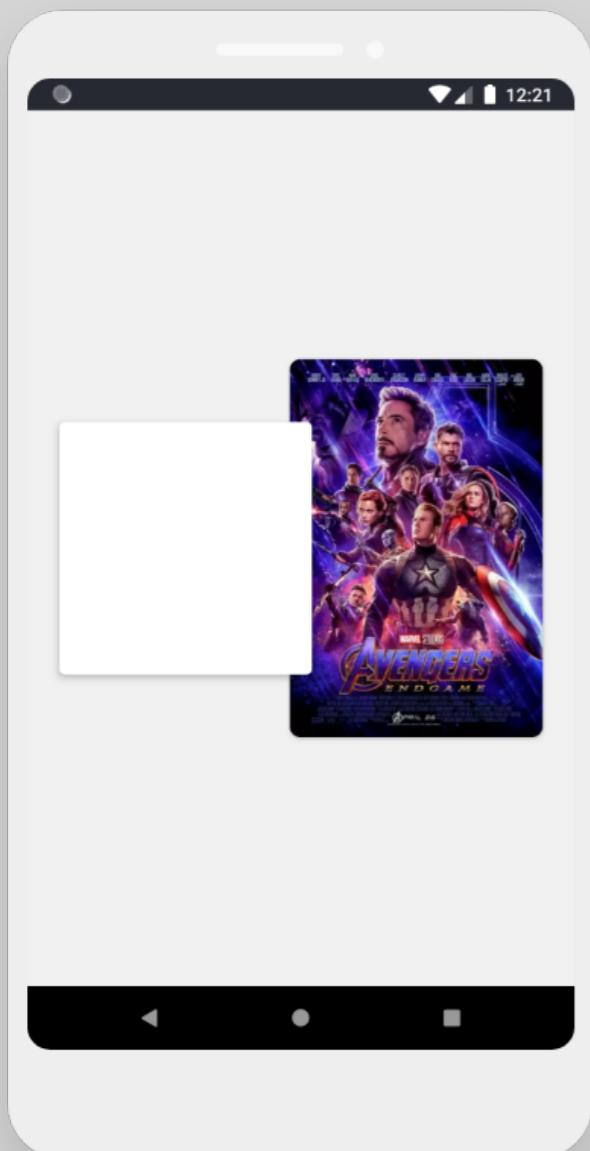
Add CardView to `layout_poster.xml`

Modify `motion_poster.xml`

! Poster's elevation changed

layout_poster.xml

@layout/layout_poster.xml



```
<androidx.constraintlayout.motion.widget.MotionLayout
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    app:layoutDescription="@xml/motion_poster">

    <com.google.android.material.card.MaterialCardView
        android:id="@+id/card_movie_poster">
        <ImageView android:id="@+id/image_poster" ... />
    </com.google.android.material.card.MaterialCardView>

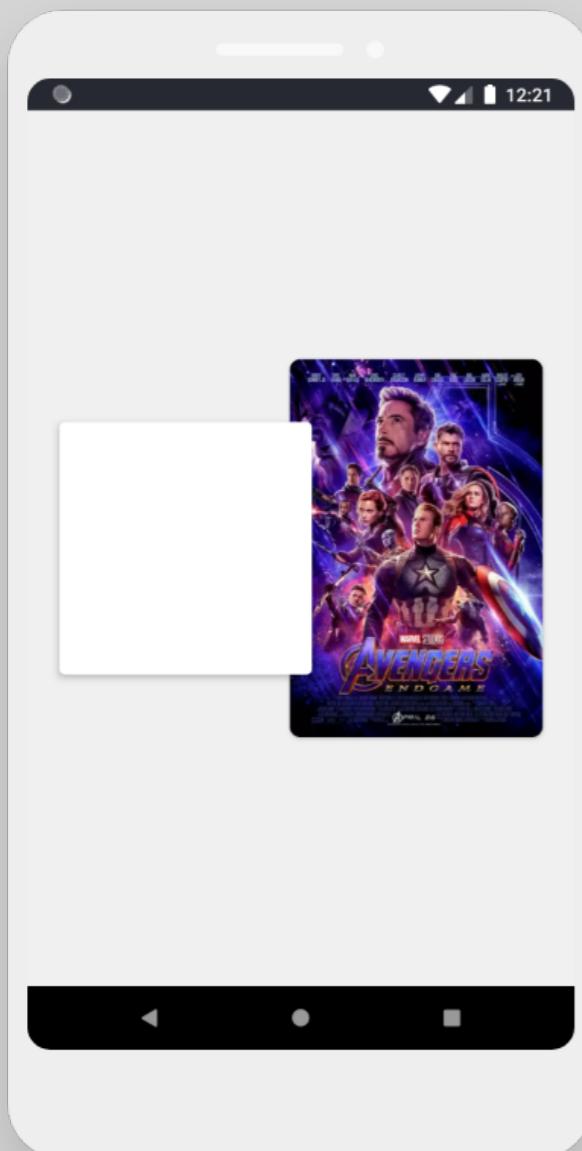
    <androidx.constraintlayout.widget.Guideline
        android:id="@+id/guide_x_10" ... />

    <androidx.constraintlayout.widget.Guideline
        android:id="@+id/guide_y_52" ... />

    <androidx.constraintlayout.widget.Guideline
        android:id="@+id/guide_y_48" ... />

</androidx.constraintlayout.motion.widget.MotionLayout>
```

@layout/layout_poster.xml



```
    android:id="@+id/card_movie_poster">
    <ImageView android:id="@+id/image_poster" ... />
</com.google.android.material.card.MaterialCardView>

<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guide_x_10" ... />

<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guide_y_52" ... />

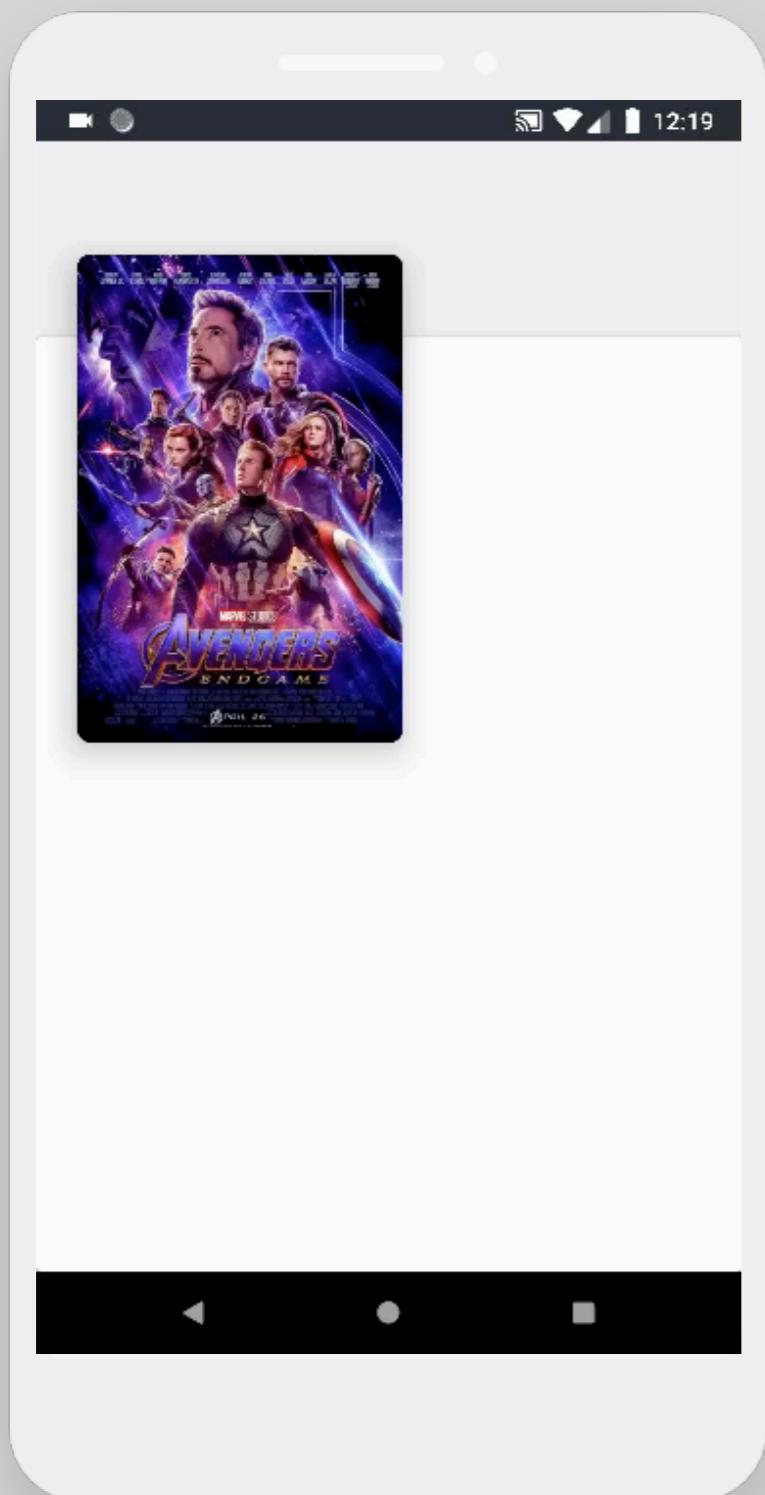
<androidx.constraintlayout.widget.Guideline
    android:id="@+id/guide_y_48" ... />

<com.google.android.material.card.MaterialCardView
    android:id="@+id/card_movie_info"
    android:layout_width="0dp"
    android:layout_height="0dp"
    app:cardElevation="4dp"
    app:layout_constraintDimensionRatio="1:1"
/>

</androidx.constraintlayout.motion.widget.MotionLayout>
```

layout_poster.xml

Movie Poster + Movie Information Card

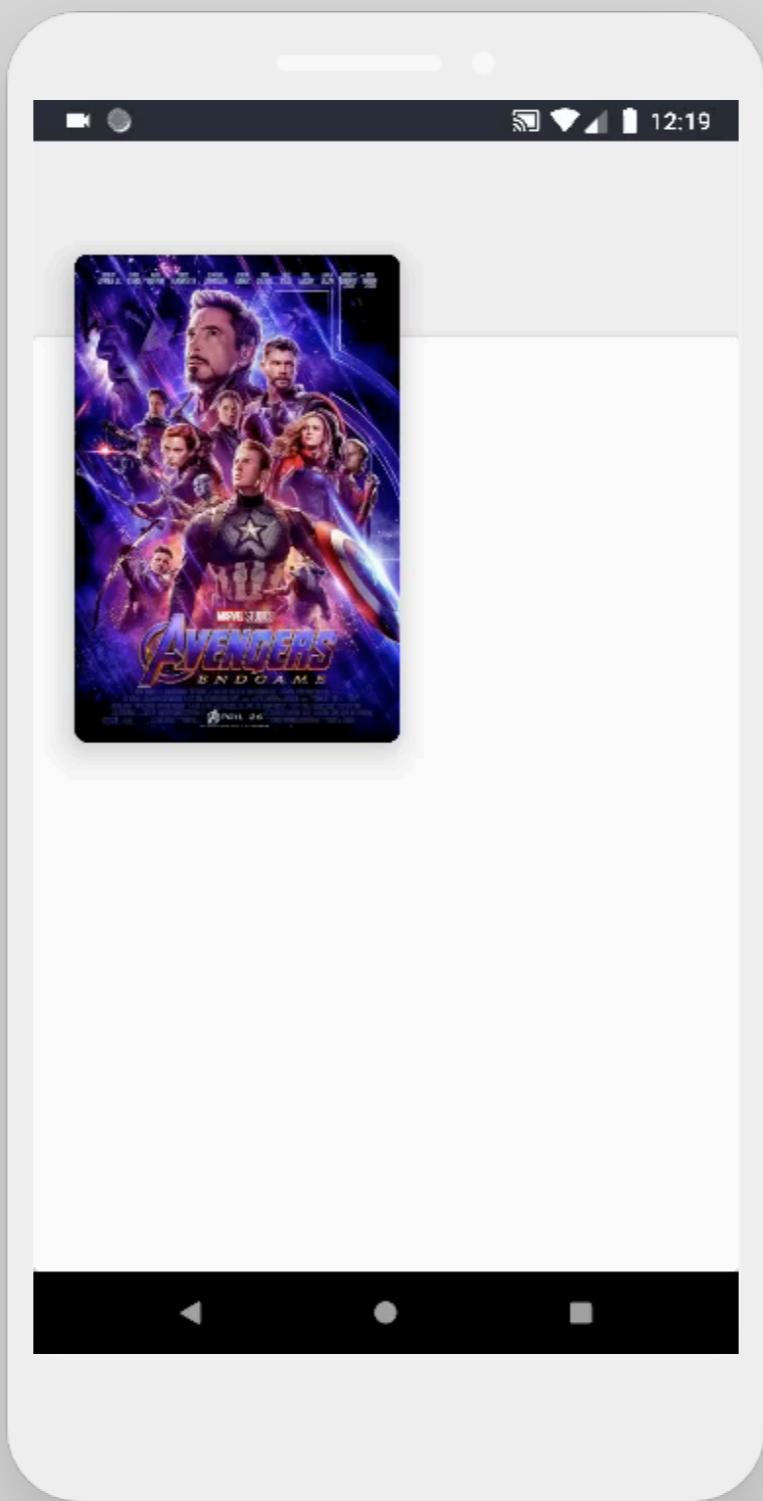


Add CardView to `layout_poster.xml`

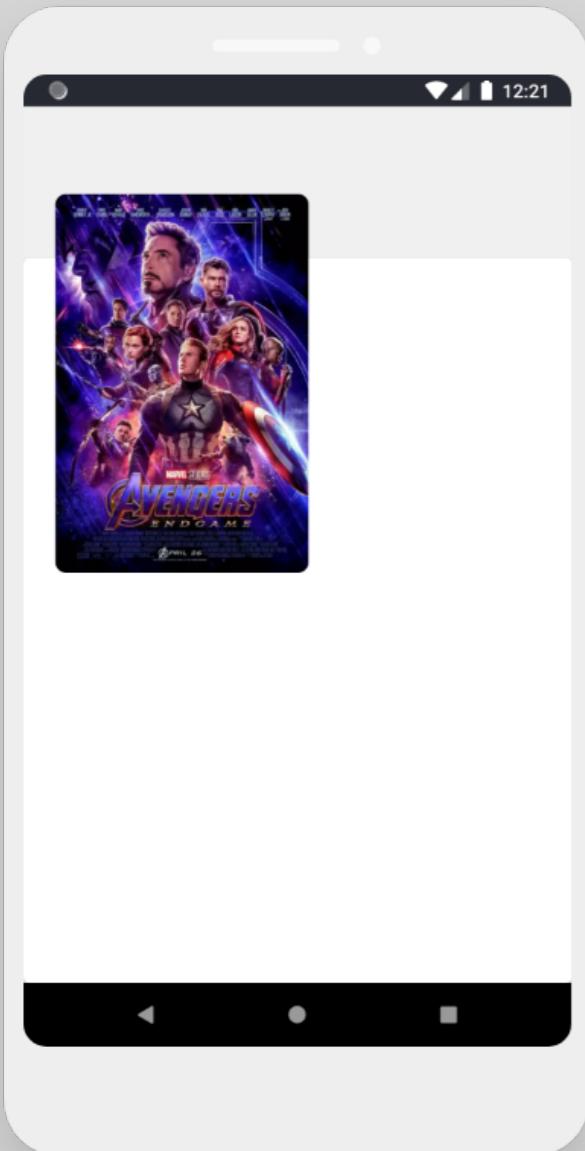


Modify `@xml/motion_poster.xml`

@xml/motion_poster.xml



@xml/motion_poster.xml



```
<MotionScene>
```

```
  <ConstraintSet android:id="@+id/frame_poster_top">
```

```
    <Constraint android:id="@+id/card_movie_poster">
```

```
      ...
```

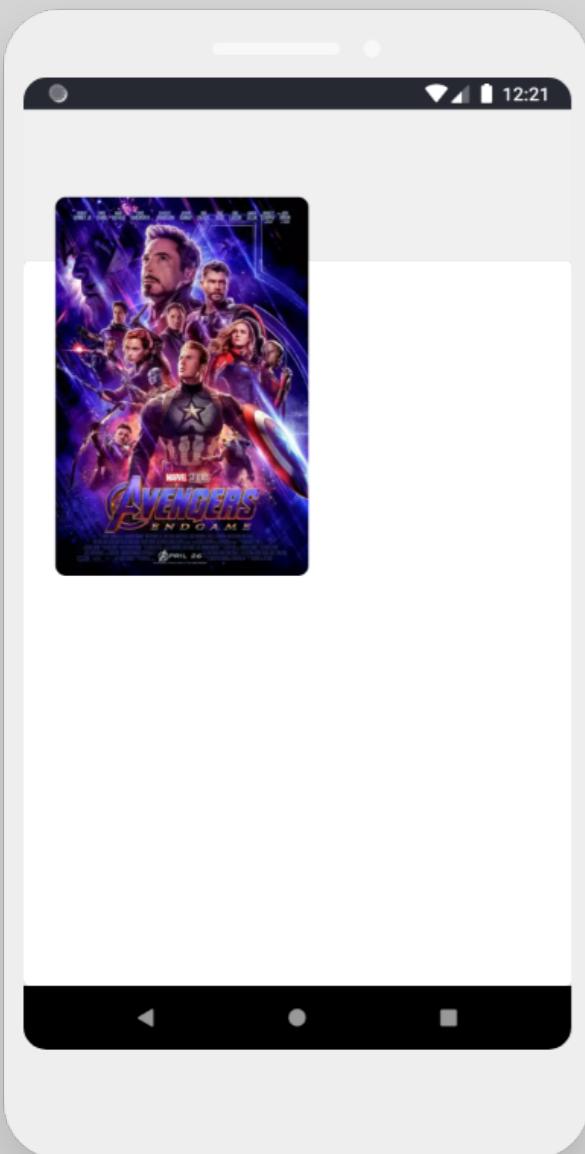
```
    </Constraint>
```

```
  </ConstraintSet>
```

```
</MotionScene>
```

Start State

@xml/motion_poster.xml



```
<MotionScene>
```

```
  <ConstraintSet android:id="@+id/frame_poster_top">
```

```
    <Constraint android:id="@+id/card_movie_poster">
```

```
      ...
```

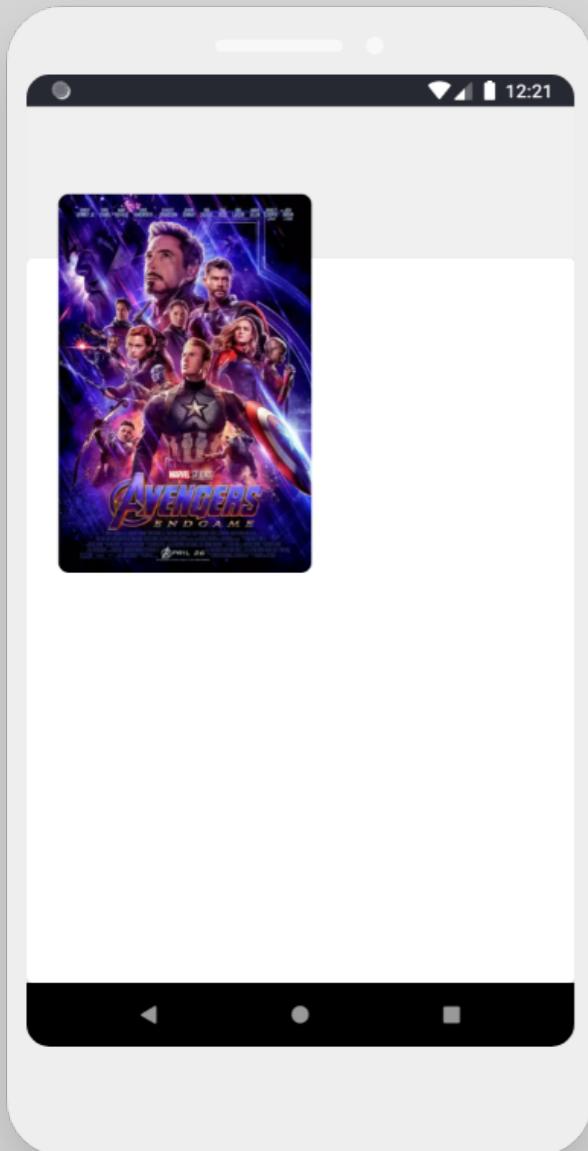
```
    </Constraint>
```

```
  </ConstraintSet>
```

```
</MotionScene>
```

Start State

@xml/motion_poster.xml



```
<MotionScene>

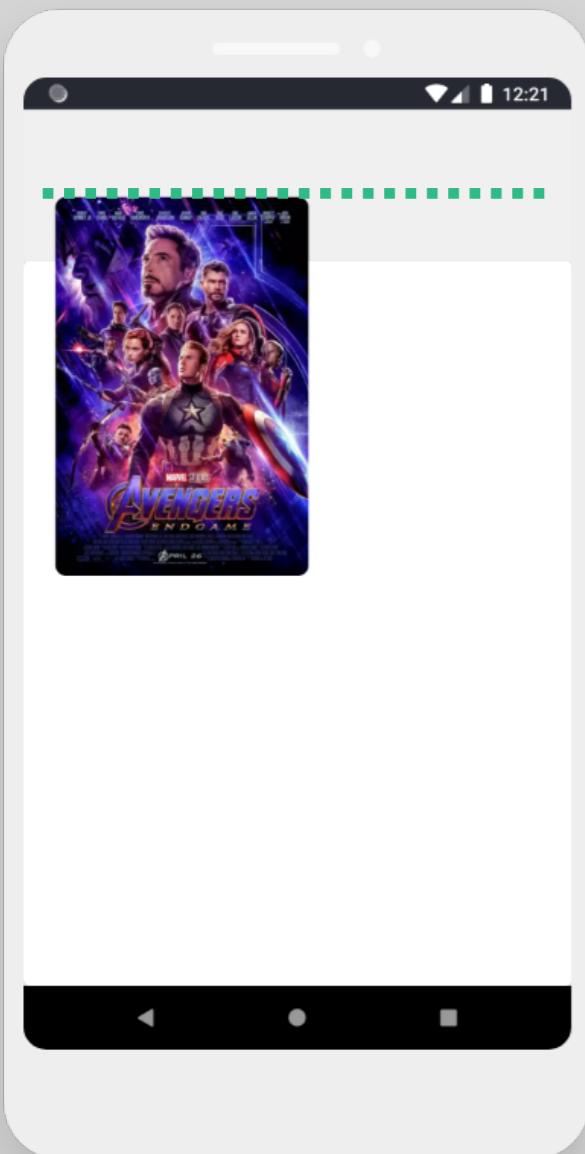
    <ConstraintSet android:id="@+id/frame_poster_top">

        <Constraint android:id="@+id/card_movie_poster">
            ...
            <CustomAttribute
                app:attributeName="cardElevation"
                app:customDimension="16dp" />
        </Constraint>
    </ConstraintSet>

</MotionScene>
```

Start State

@xml/motion_poster.xml



```
<MotionScene>

    <ConstraintSet android:id="@+id/frame_poster_top">
        <constraint android:id="@+id/card_movie_poster">
            ...
        </constraint>

        <CustomAttribute
            app:attributeName="cardElevation"
            app:customDimension="16dp" />

    </ConstraintSet>

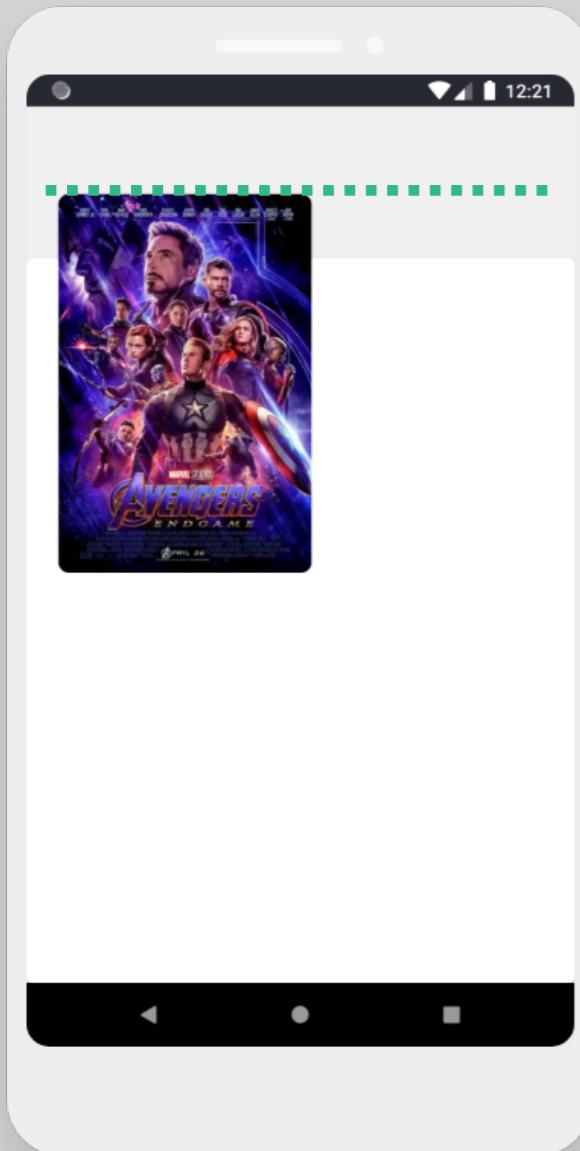
    <Constraint android:id="@+id/card_movie_info">
        </Constraint>

    </ConstraintSet>

</MotionScene>
```

Start State

@xml/motion_poster.xml



```
<ConstraintSet android:id="@+id/frame_poster_top">

    <Constraint android:id="@+id/card_movie_poster">
        <CustomAttribute
            app:attributeName="cardElevation"
            app:customDimension="16dp" />

    </Constraint>

    <Constraint android:id="@+id/card_movie_info">
        <Layout
            android:layout_width="match_parent"
            android:layout_height="0dp"
            android:layout_marginTop="48dp"
            app:layout_constraintTop_toBottomOf="@+id/guide_x_10"
            app:layout_constraintBottom_toBottomOf="parent" />

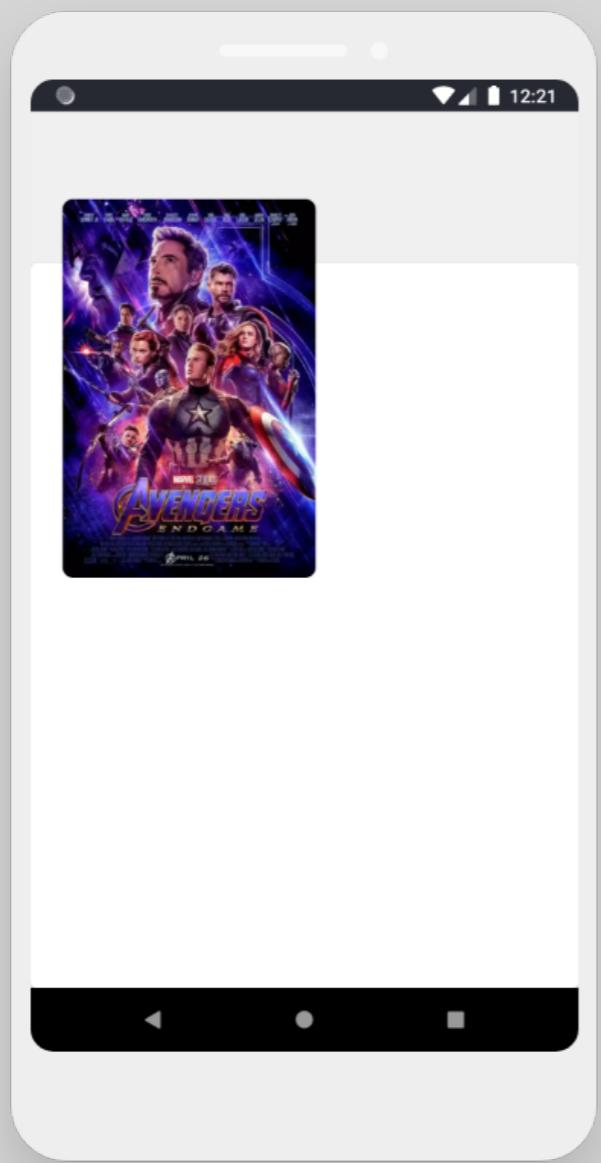
    </Constraint>

</ConstraintSet>

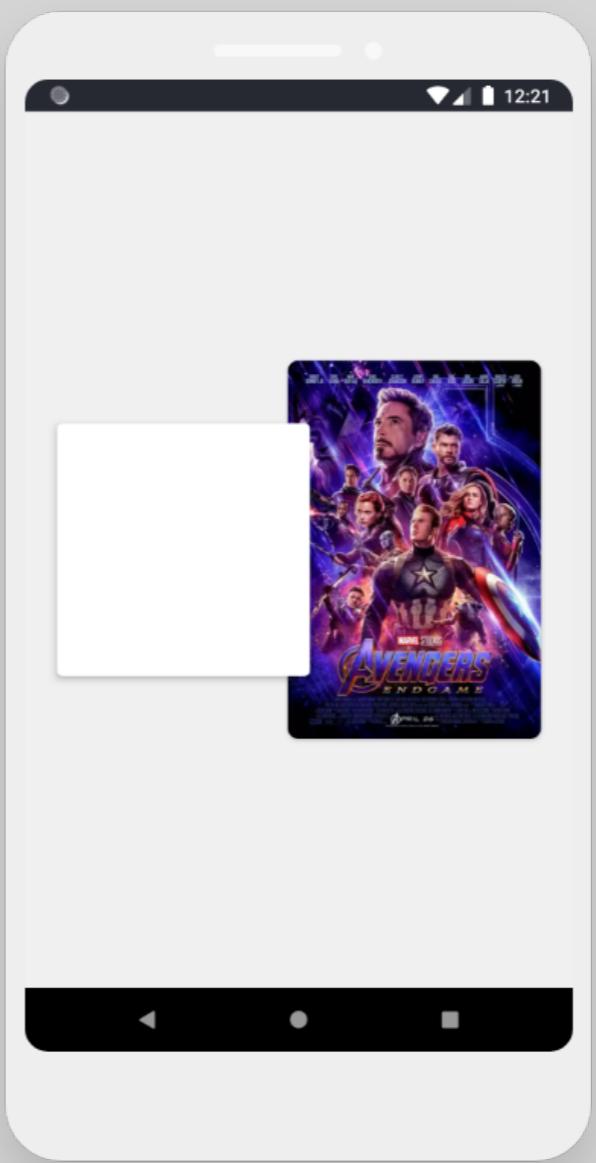
</MotionScene>
```

Start State

@xml/motion_poster.xml



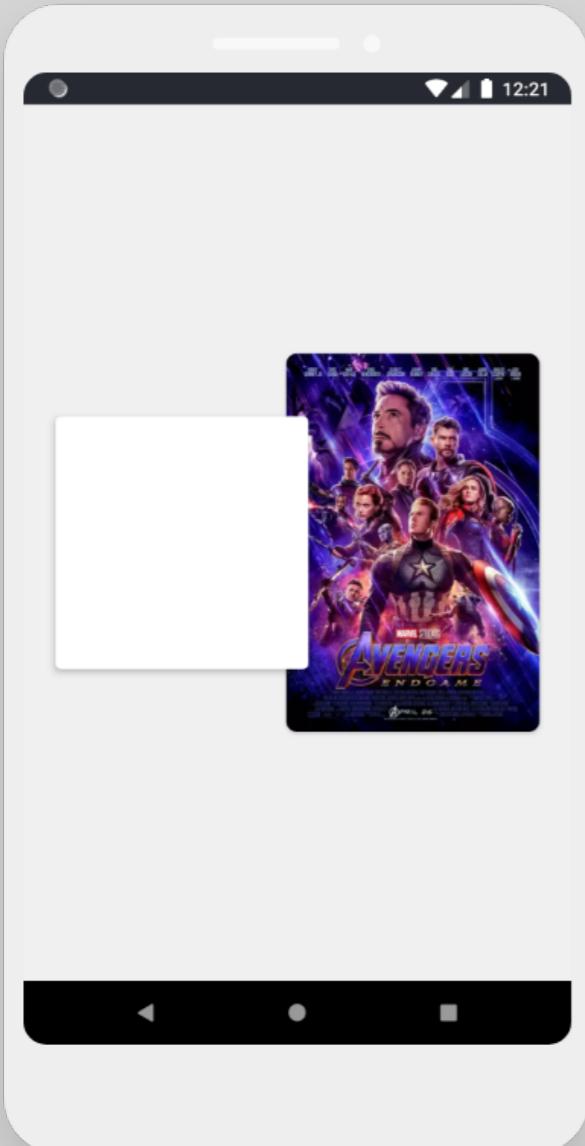
Start State



End State

@xml/motion_poster.xml

<MotionScene>



<ConstraintSet android:id="@+id/frame_poster_top">

...

</ConstraintSet>

<ConstraintSet android:id="@+id/frame_poster_middle">

<Constraint android:id="@+id/card_movie_poster">

...

</Constraint>

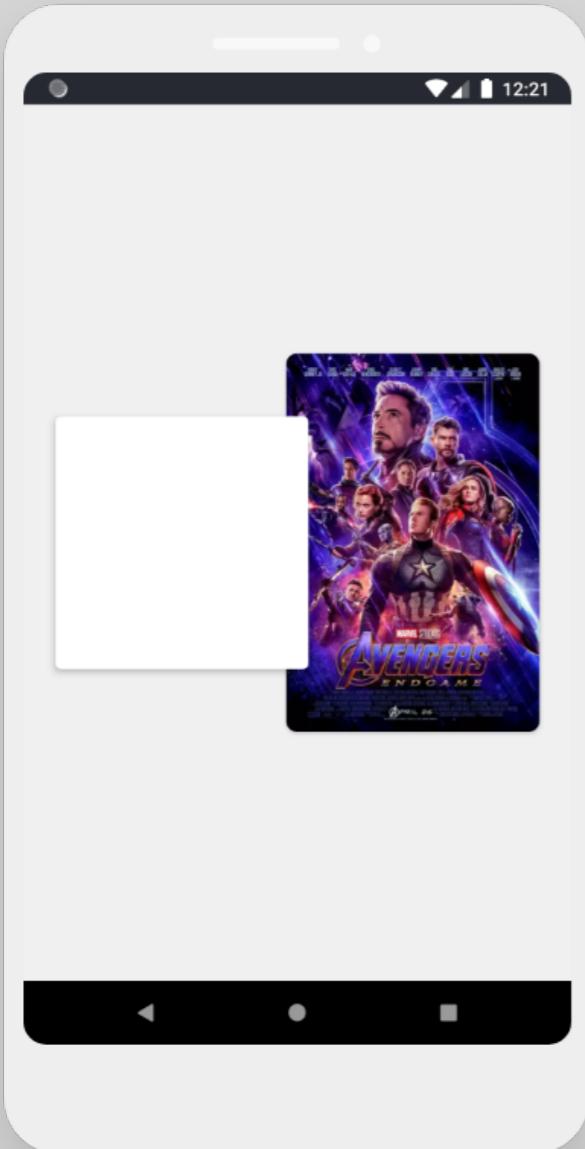
</ConstraintSet>

</MotionScene>

End State

@xml/motion_poster.xml

<MotionScene>



<ConstraintSet android:id="@+id/frame_poster_top">

...

</ConstraintSet>

<ConstraintSet android:id="@+id/frame_poster_middle">

<Constraint android:id="@+id/card_movie_poster">

...

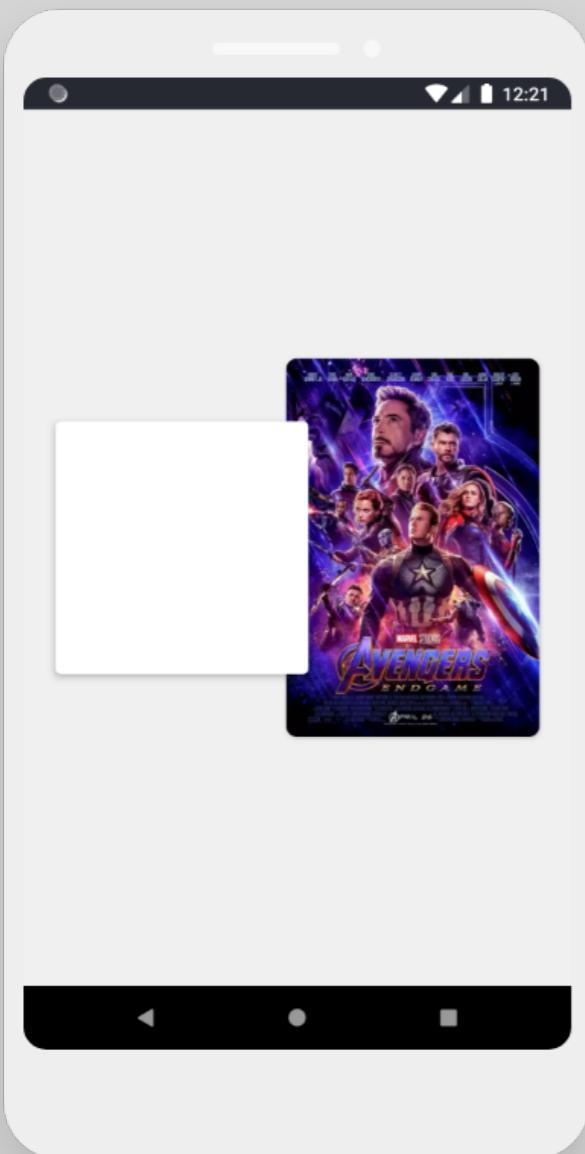
</Constraint>

</ConstraintSet>

</MotionScene>

End State

@xml/motion_poster.xml

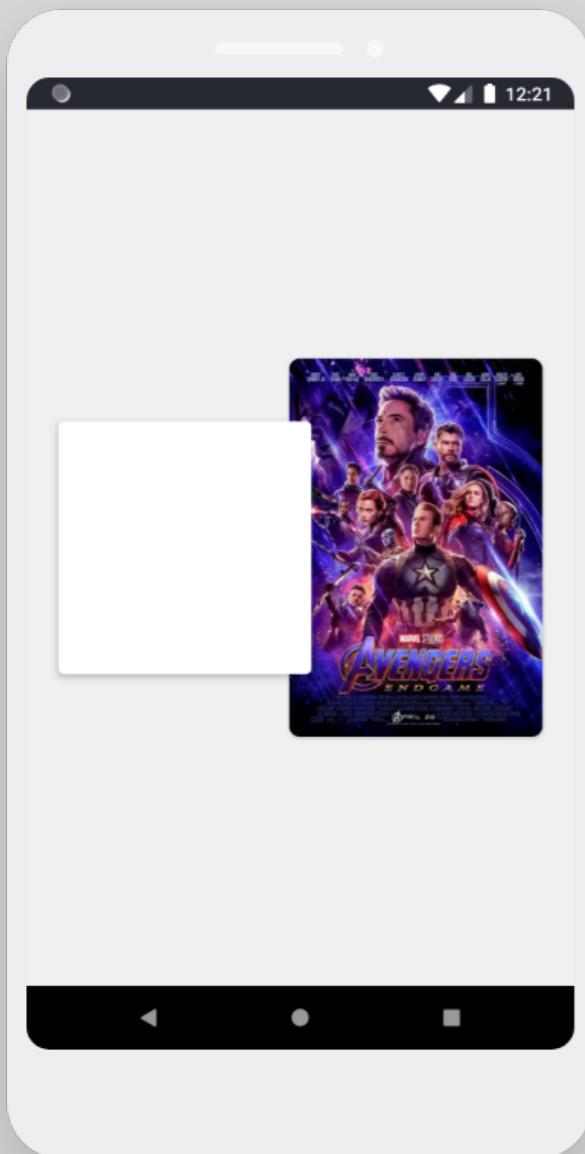


```
<MotionScene>
    <ConstraintSet android:id="@+id/frame_poster_top">
        ...
    </ConstraintSet>

    <ConstraintSet android:id="@+id/frame_poster_middle">
        <Constraint android:id="@+id/card_movie_poster">
            ...
            <CustomAttribute
                app:attributeName="cardElevation"
                app:customDimension="2dp" />
        </Constraint>
    </ConstraintSet>
</MotionScene>
```

End State

@xml/motion_poster.xml



```
<ConstraintSet android:id="@+id/frame_poster_middle">

    <Constraint android:id="@+id/card_movie_poster">
        <CustomAttribute
            app:attributeName="cardElevation"
            app:customDimension="2dp" />
    </Constraint>

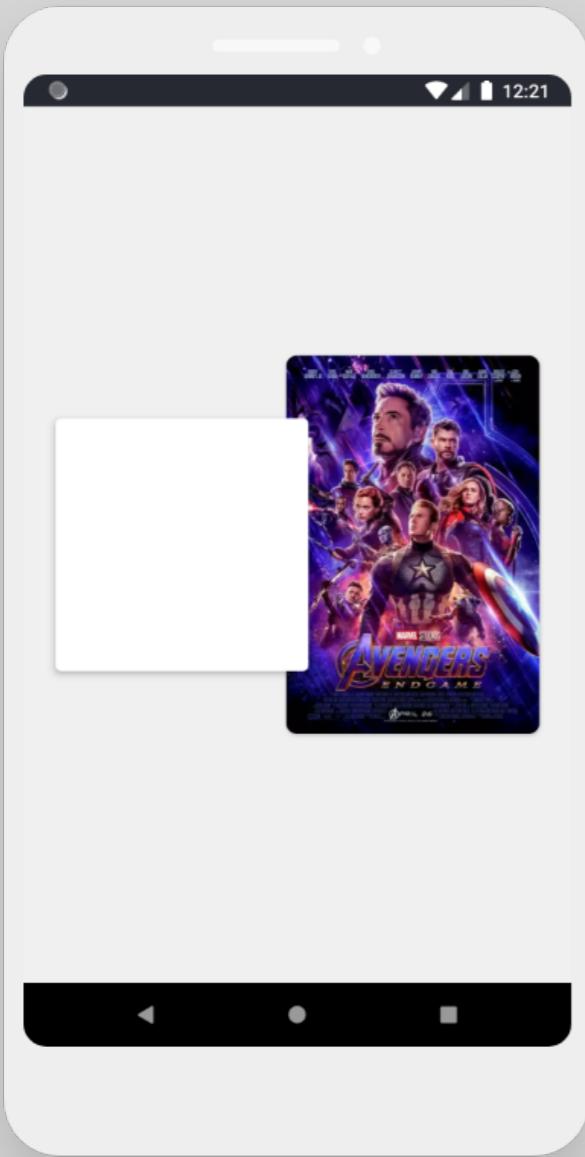
    <Constraint android:id="@+id/card_movie_info">
    </Constraint>

</ConstraintSet>

</MotionScene>
```

End State

@xml/motion_poster.xml



```
<CustomAttribute  
    app:attributeName="cardElevation"  
    android:dimension="2dp" />
```

```
</Constraint>
```

```
<Constraint android:id="@+id/card_movie_info">
```

```
<Layout
```

```
    android:layout_width="0dp"  
    android:layout_height="0dp"  
    android:layout_marginStart="24dp"  
    app:layout_constraintDimensionRatio="1:1"  
    app:layout_constraintEnd_toEndOf="@+id/guide_y_52"  
    app:layout_constraintStart_toStartOf="parent"  
    app:layout_constraintTop_toTopOf="parent"  
    app:layout_constraintBottom_toBottomOf="parent"  
/>
```

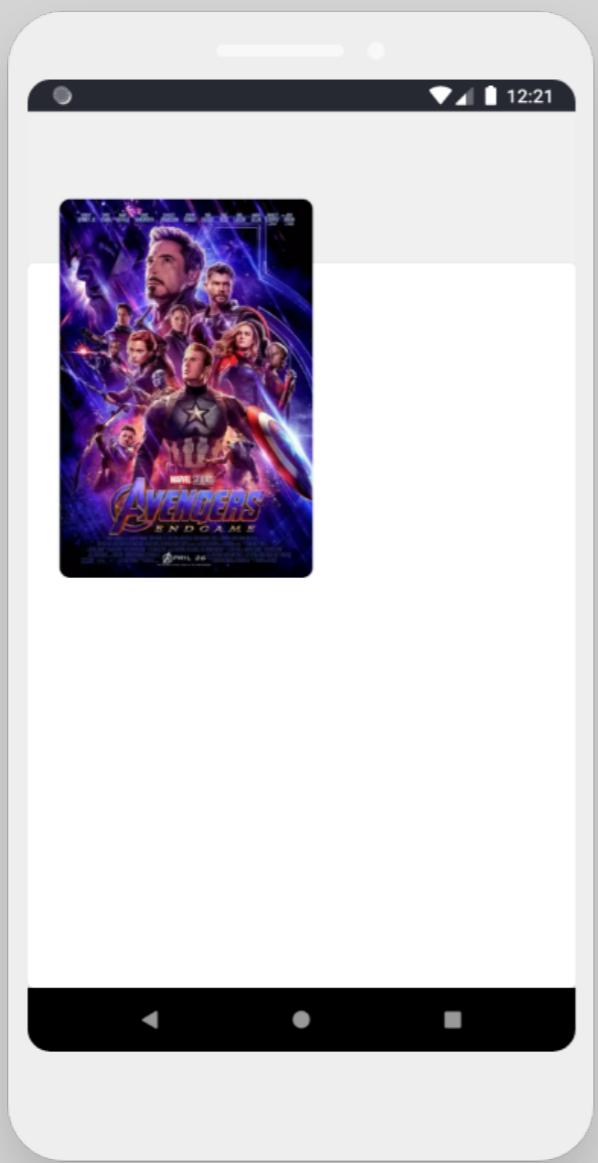
```
</Constraint>
```

```
</ConstraintSet>
```

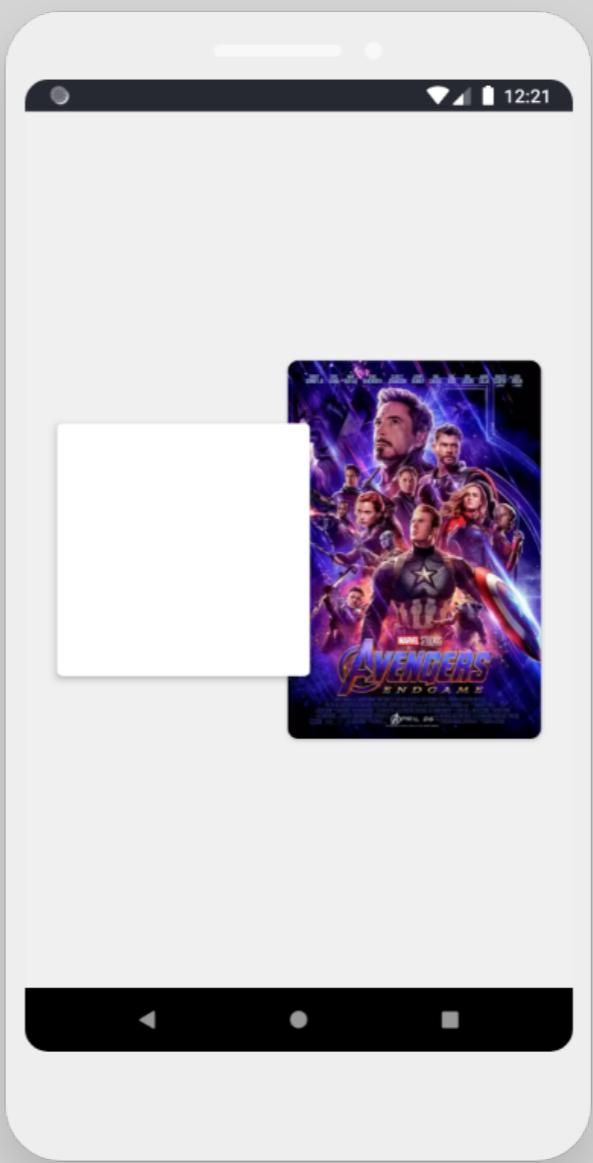
End State

```
</MotionScene>
```

@xml/motion_poster.xml

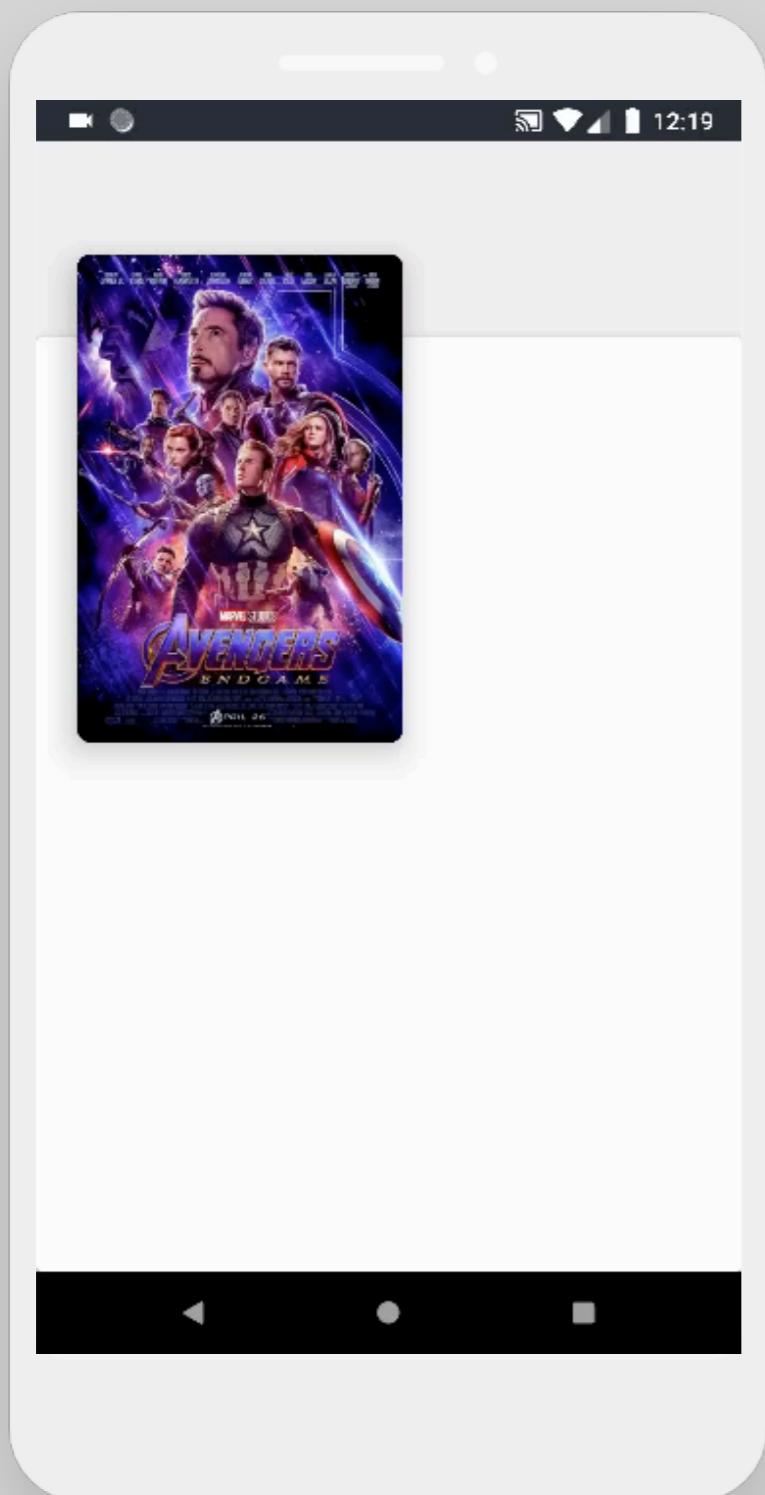


Start State



End State

Movie Poster + Movie Information Card



Add CardView to `layout_poster.xml`

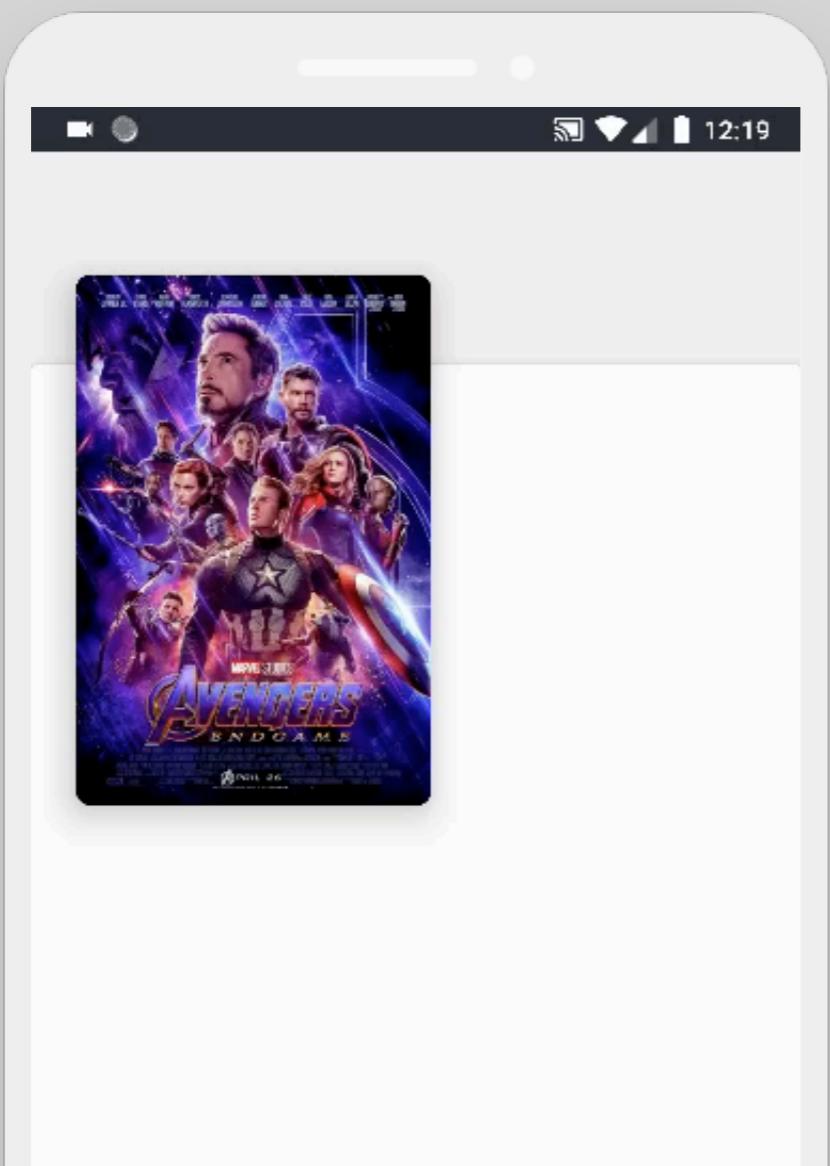


Modify `@xml/motion_poster.xml`

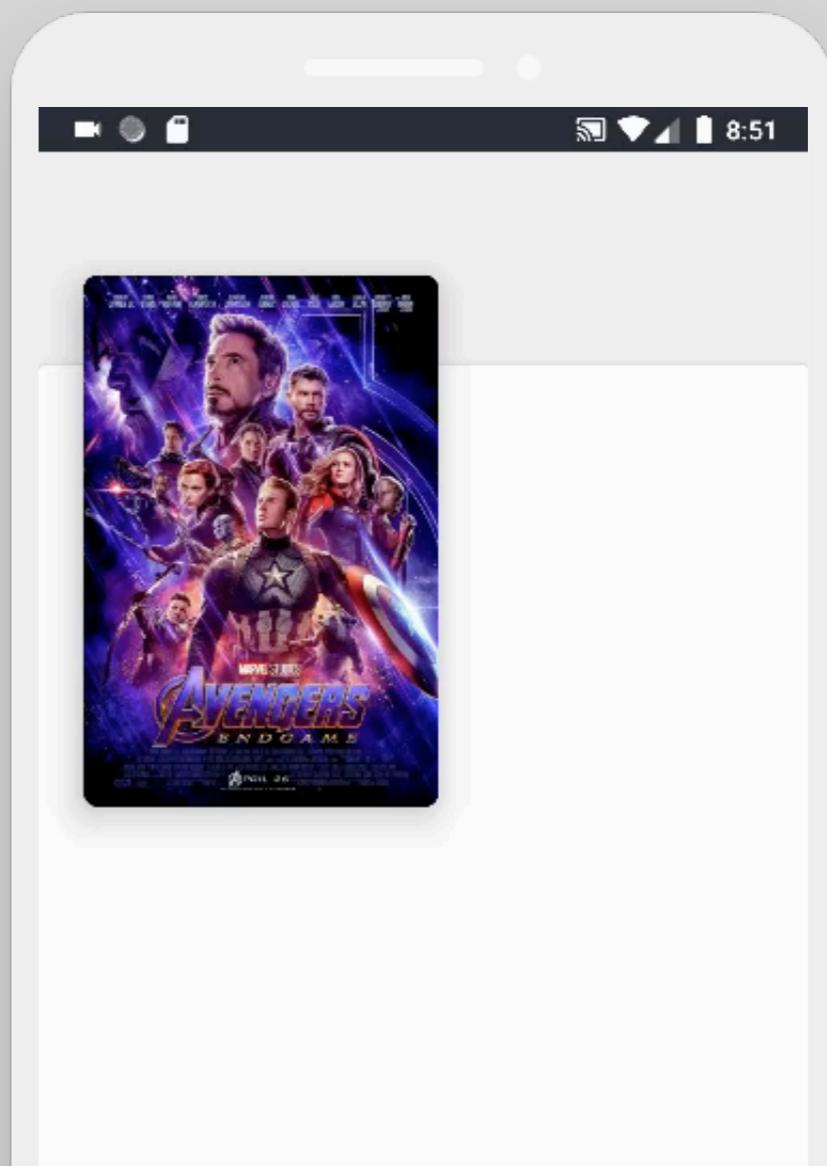


Movie Poster + Movie Information Card

Expected

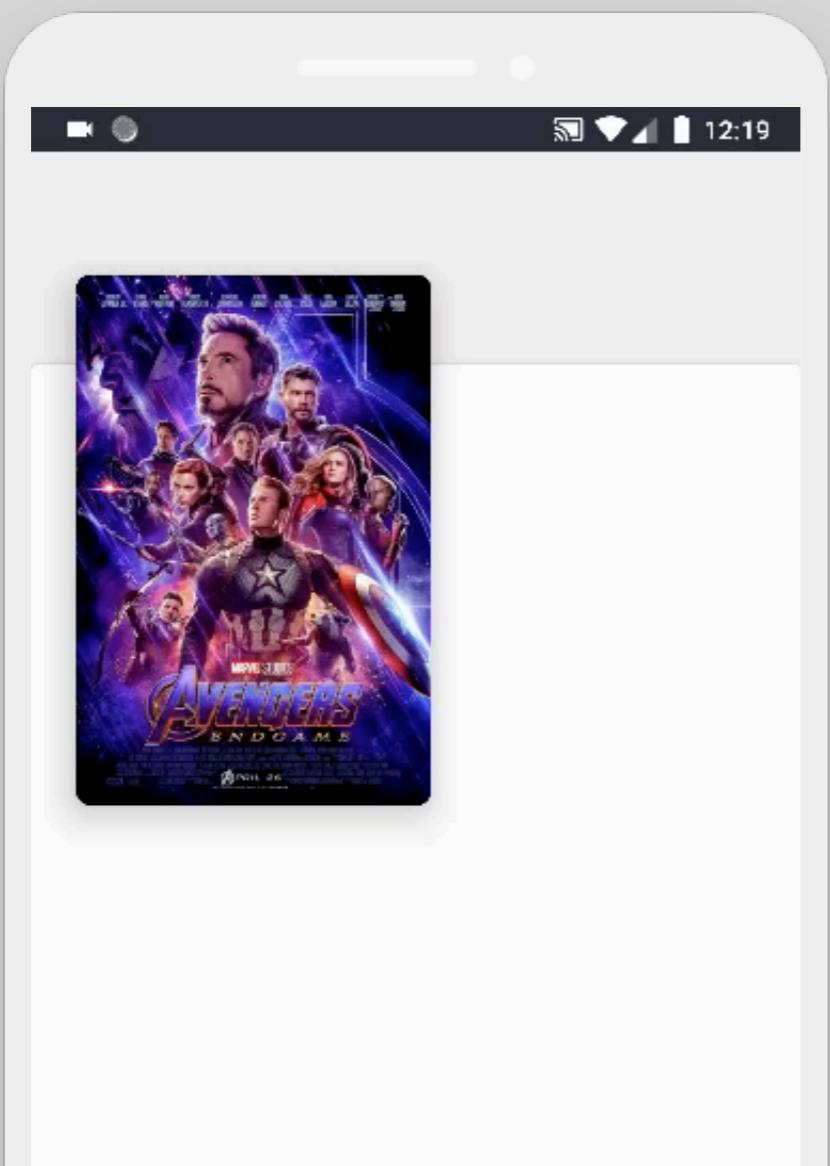


Result

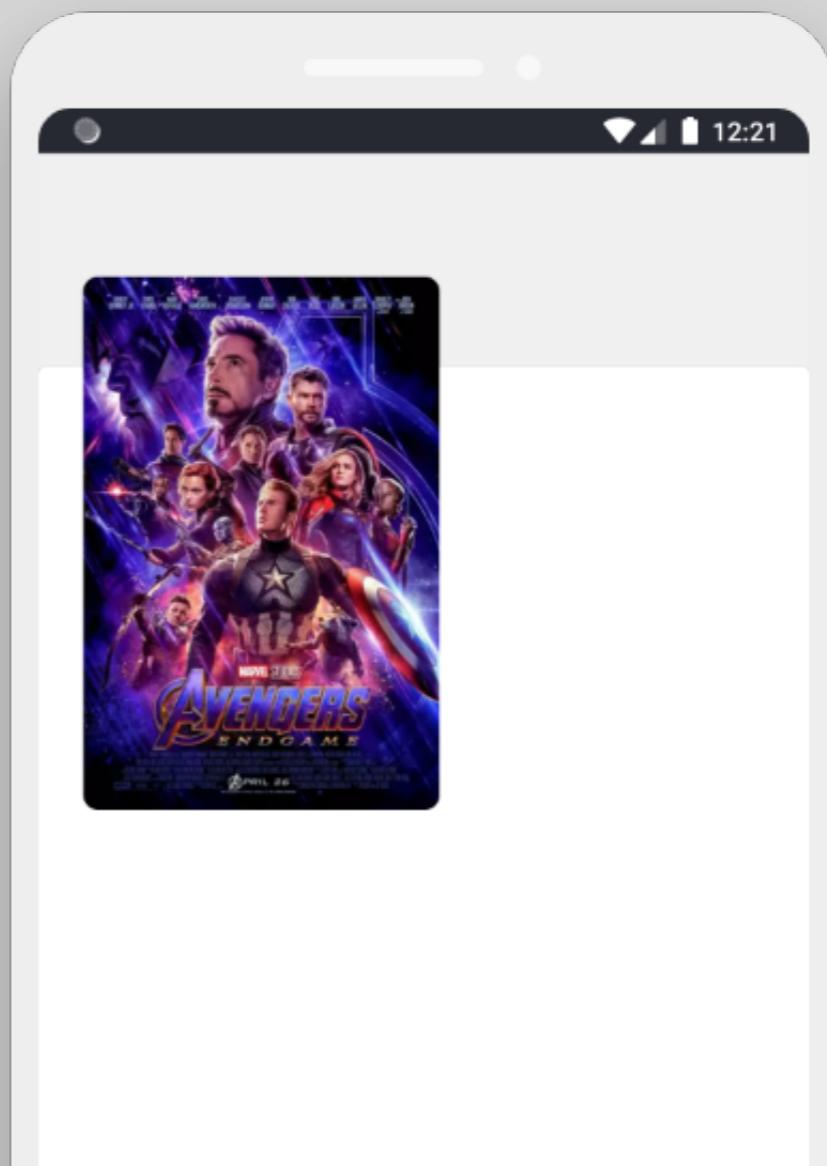


Movie Poster + Movie Information Card

Expected

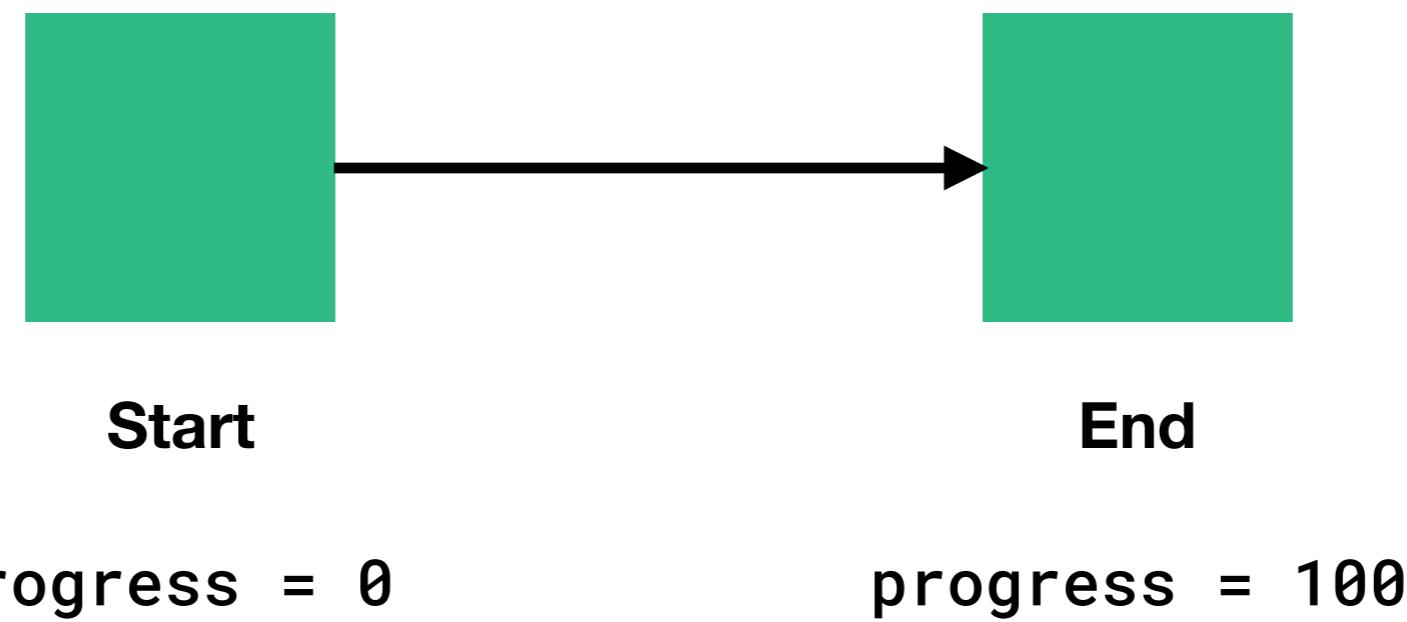


Result

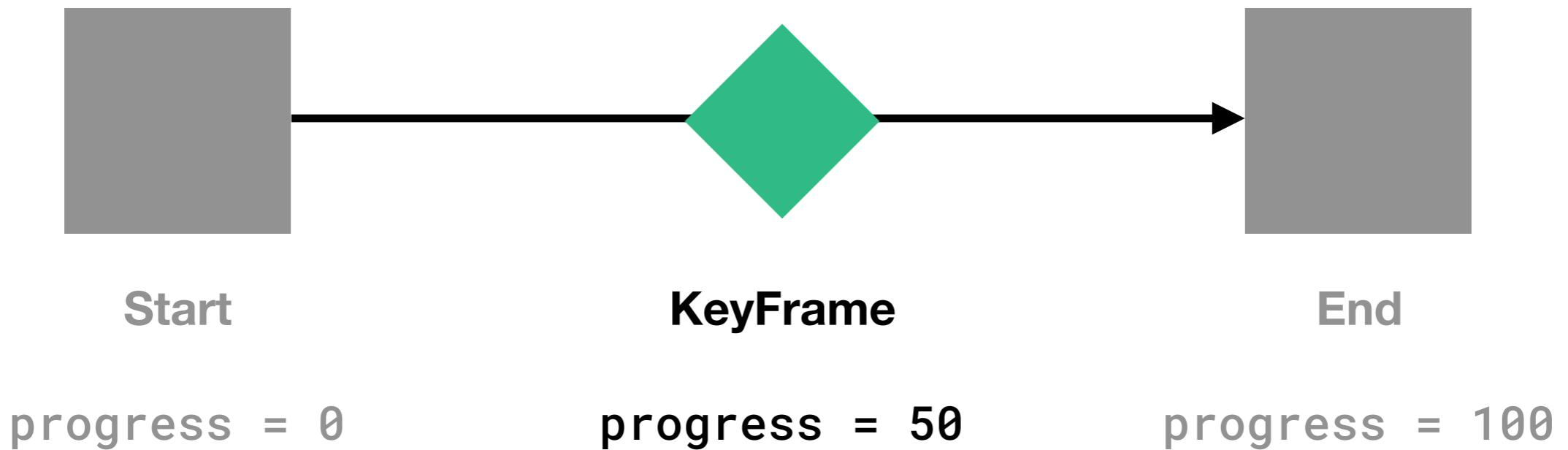


KeyFrames to the rescue

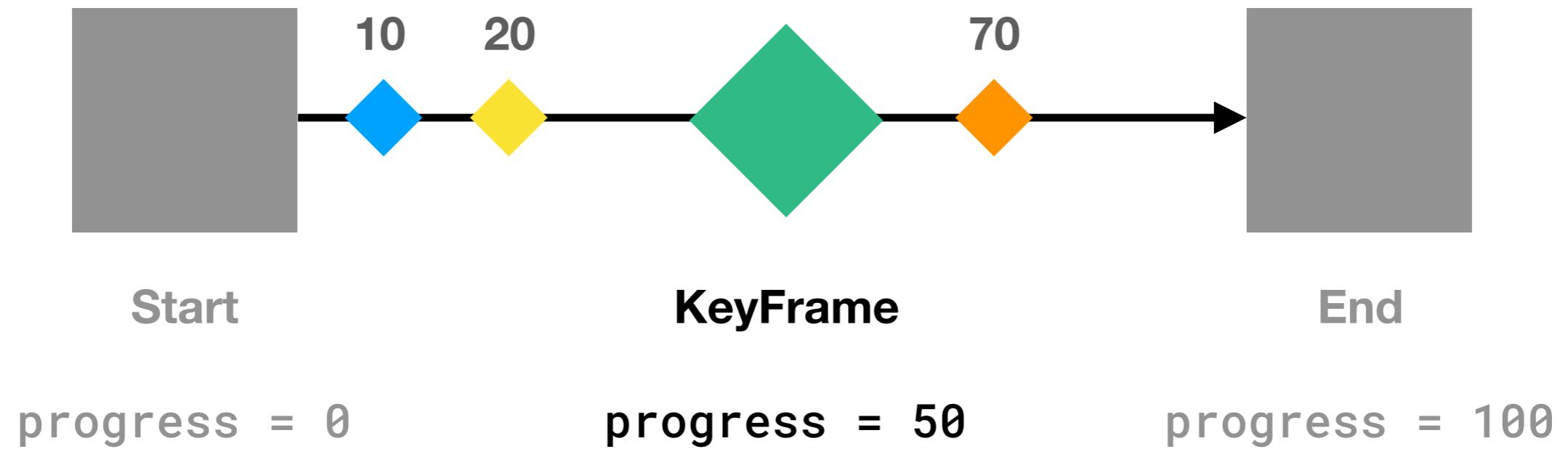
KeyFrames



KeyFrames



KeyFrames



KeyFrames

<KeyPosition>

<KeyAttribute>

<KeyCircle>

<KeyTimeCircle>

KeyFrames

<KeyPosition>

Controls layout position during animation

<KeyAttribute>

<KeyCircle>

<KeyTimeCircle>

KeyFrames

<KeyPosition>

Controls layout position during animation



<KeyAttribute>

<KeyCircle>

<KeyTimeCircle>



KeyFrames

<KeyPosition>

<KeyAttribute>

<KeyCircle>

<KeyTimeCircle>

KeyFrames

<KeyPosition>

<KeyAttribute>

Controls the post layout properties during animation

<KeyCircle>

<KeyTimeCircle>

KeyFrames

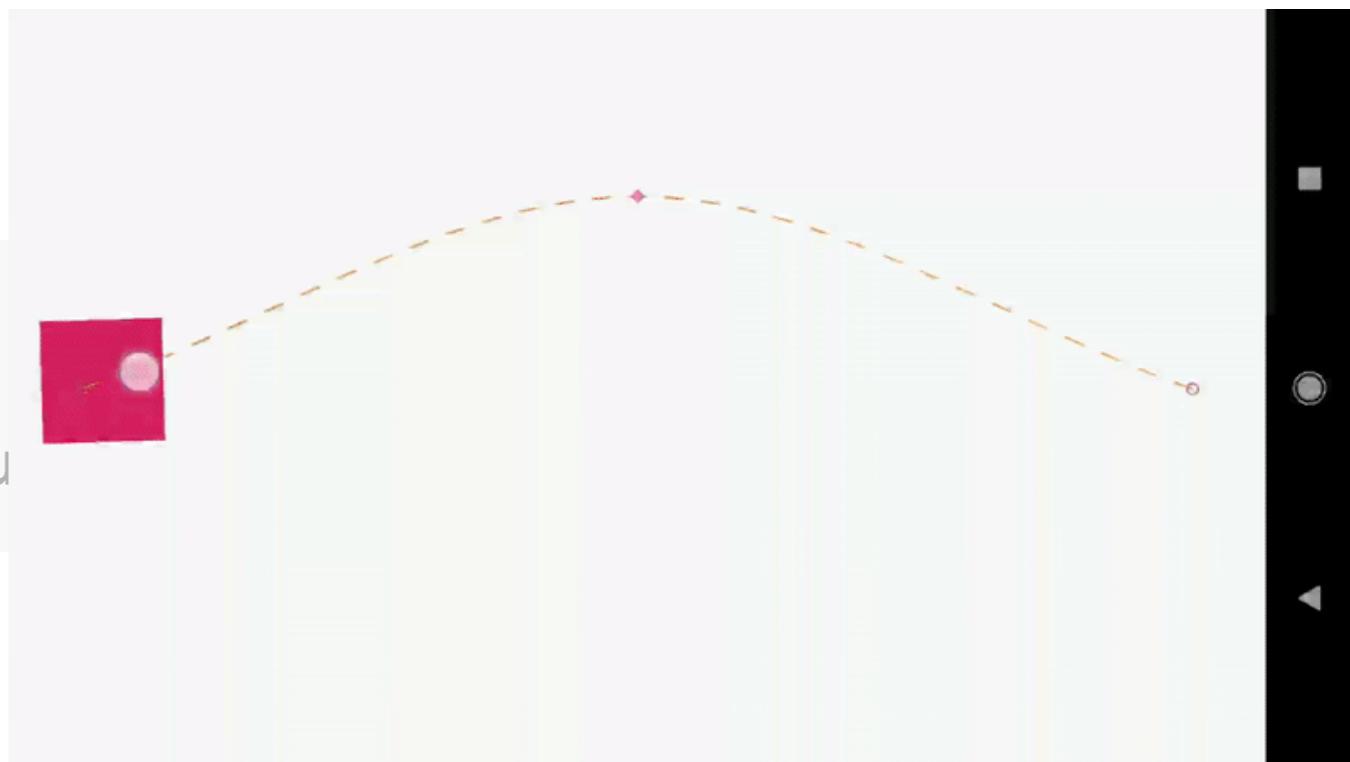
<KeyPosition>

<KeyAttribute>

Controls the post layout properties du

<KeyCircle>

<KeyTimeCircle>



KeyFrames

<KeyPosition>

<KeyAttribute>

<KeyCircle>

<KeyTimeCircle>

KeyFrames

<KeyPosition>

<KeyAttribute>

<KeyCircle>

Controls oscillations with respect to position of post layout properties during animation

<KeyTimeCircle>

KeyFrames

<KeyPosition

KeyCycles multiple waves

<KeyAttribute

<KeyCircle

Controls oscillation
layout properties

button

New recording

The image displays two line graphs side-by-side, both titled "translationX" and "translationY". The x-axis for both graphs ranges from -0.1 to 1.1, with major grid lines every 0.1 units. The y-axis for both graphs ranges from -100 to 100, with major grid lines every 100 units. Each graph shows a blue line representing a wave pattern. The top graph, labeled "translationX", has its y-axis scale from -100 to 100. The bottom graph, labeled "translationY", also has its y-axis scale from -100 to 100. Both graphs feature a light blue shaded area beneath the blue line, indicating the range of the oscillation. Red circular markers are placed at the start (x=0) and end (x=1) of each graph. A blue circular marker is positioned on the blue line at x=0.5. A yellow circular marker is located on the blue line at approximately x=0.83. A cursor arrow is visible at the bottom center of the interface.

KeyFrames

<KeyPosition>

<KeyAttribute>

<KeyCircle>

**Controls oscillations with respect to position of post
layout properties during animation**

<KeyTimeCircle>

KeyFrames

<KeyPosition>

<KeyAttribute>

<KeyCircle>

<KeyTimeCircle>

KeyFrames

<KeyPosition>

<KeyAttribute>

<KeyCircle>

<KeyTimeCircle>

Controls oscillations with respect to time of post layout properties during animation

KeyFrames

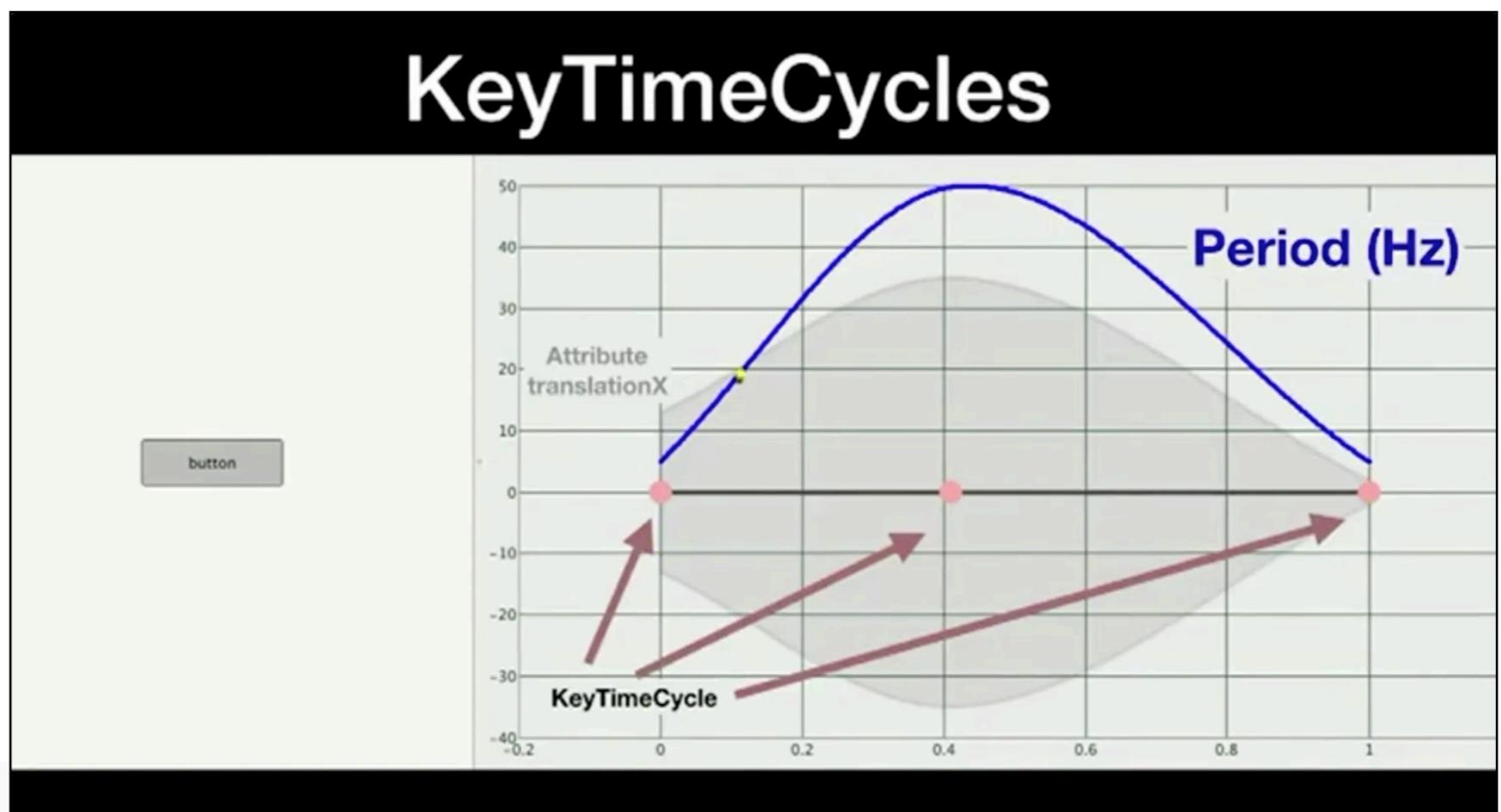
<KeyPosition>

<KeyAttribute>

<KeyCircle>

<KeyTimeCircle>

Controls oscillations with respect to time of post layout properties during animation



KeyFrames

<KeyPosition>

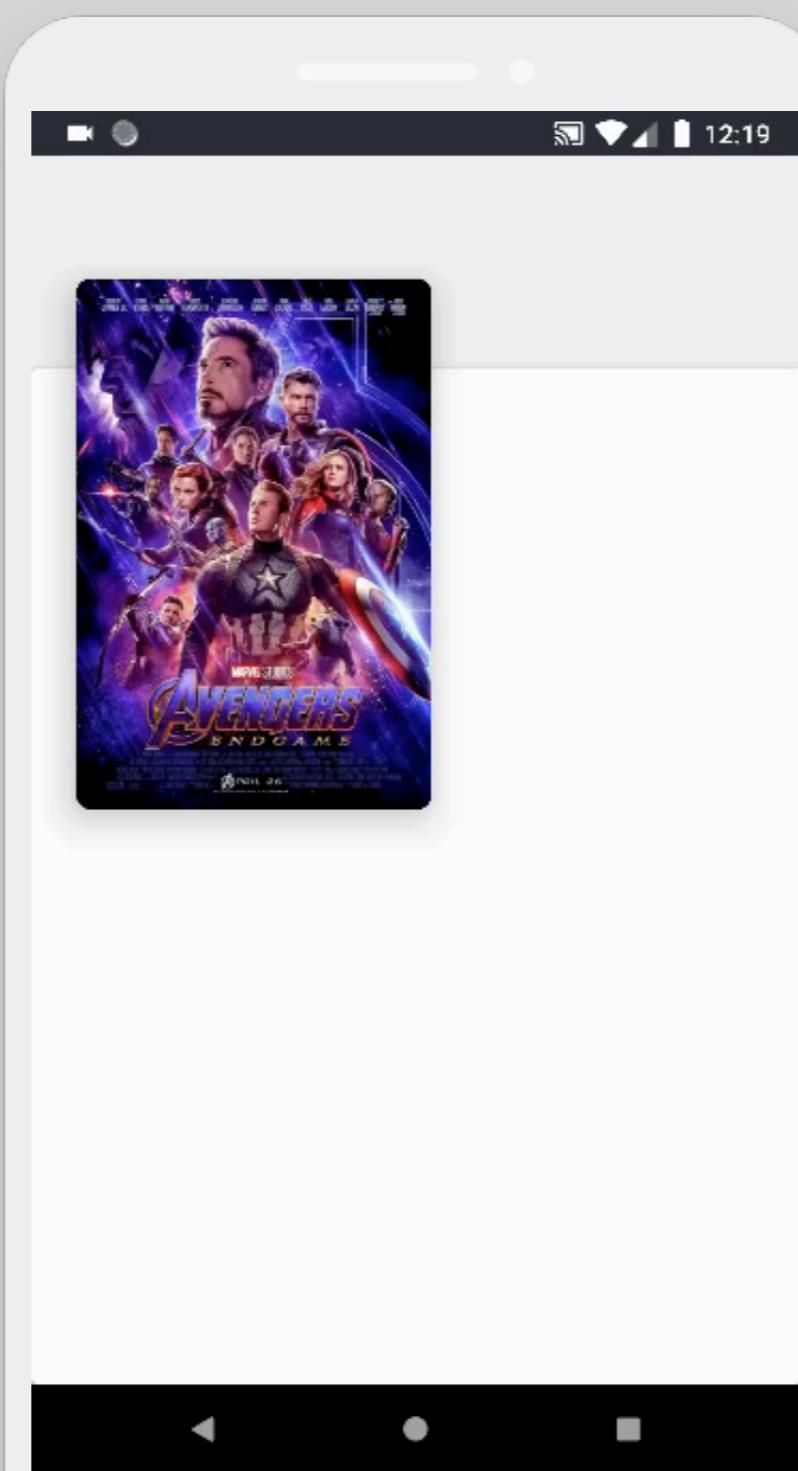
<KeyAttribute>

<KeyCircle>

<KeyTimeCircle>

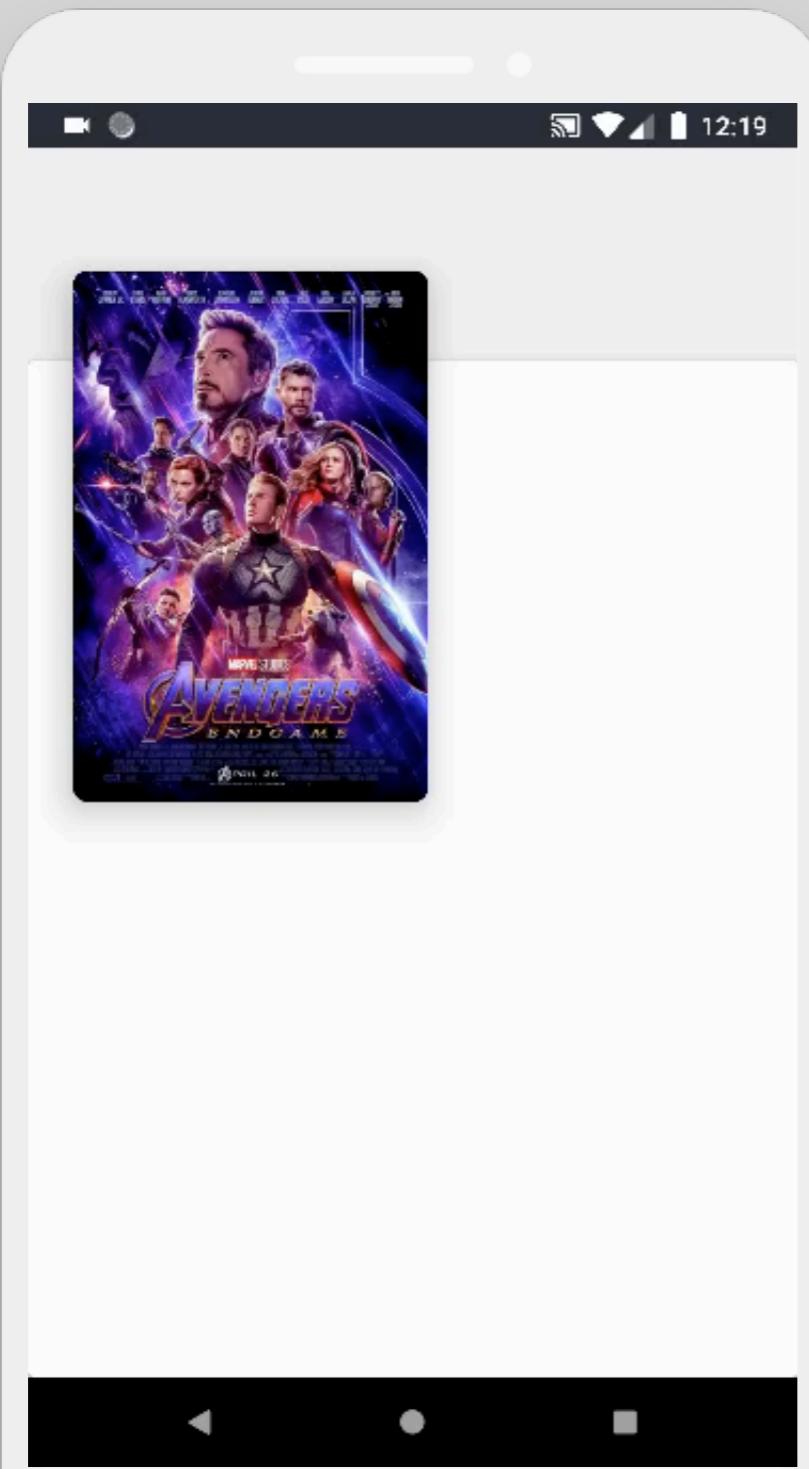
Controls oscillations with respect to time of post layout properties during animation

Add KeyFrames for Poster



Add KeyFrames for Poster

@xml/motion_poster.xml



<Transition

```
    android:id="@+id/transition_poster"
    app:constraintSetStart="@+id/frame_poster_top"
    app:constraintSetEnd="@+id/frame_poster_middle" >
```

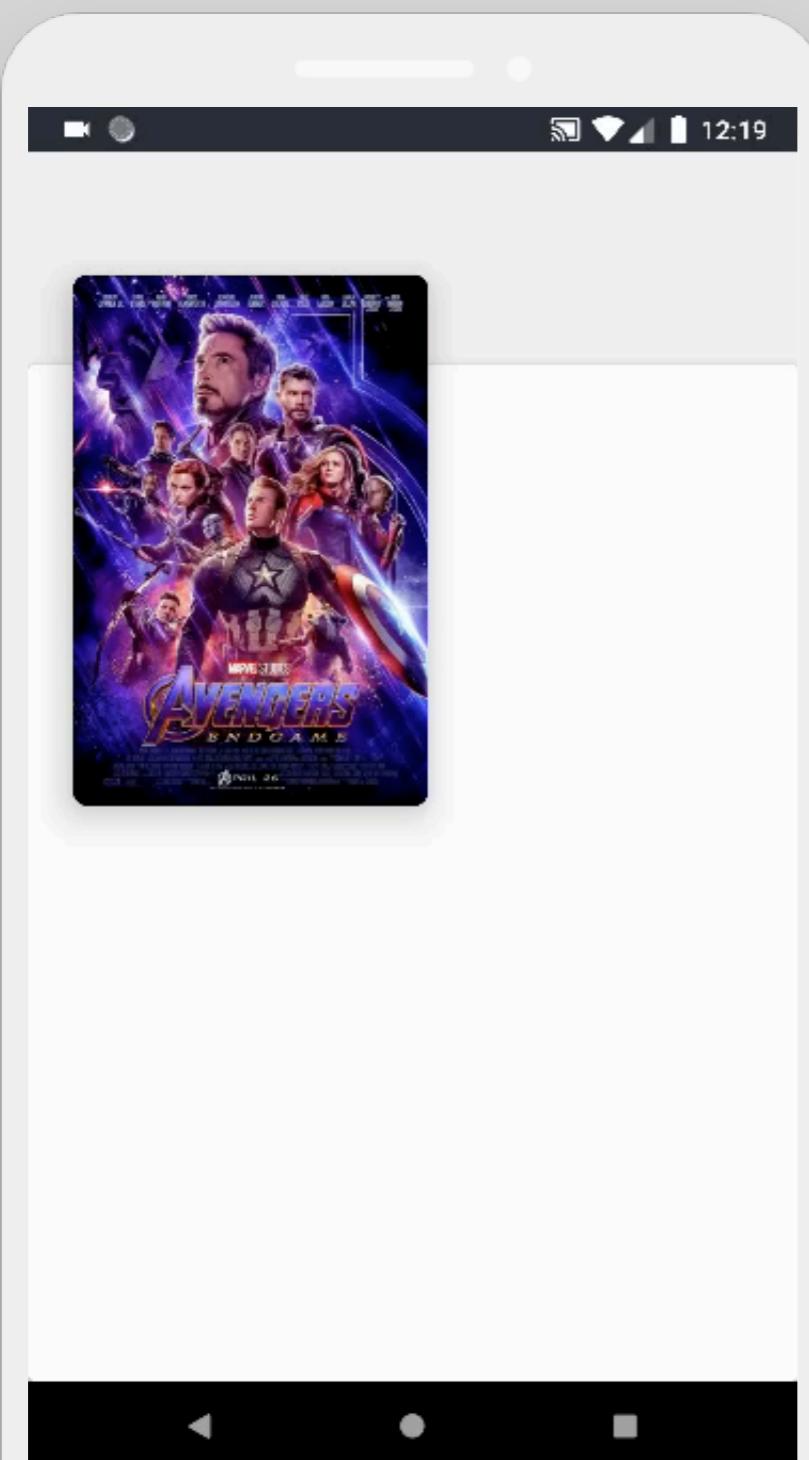
<OnClick

```
    app:clickAction="toggle"
    app:targetId="@+id/card_movie_poster"/>
```

</Transition>

Add KeyFrames for Poster

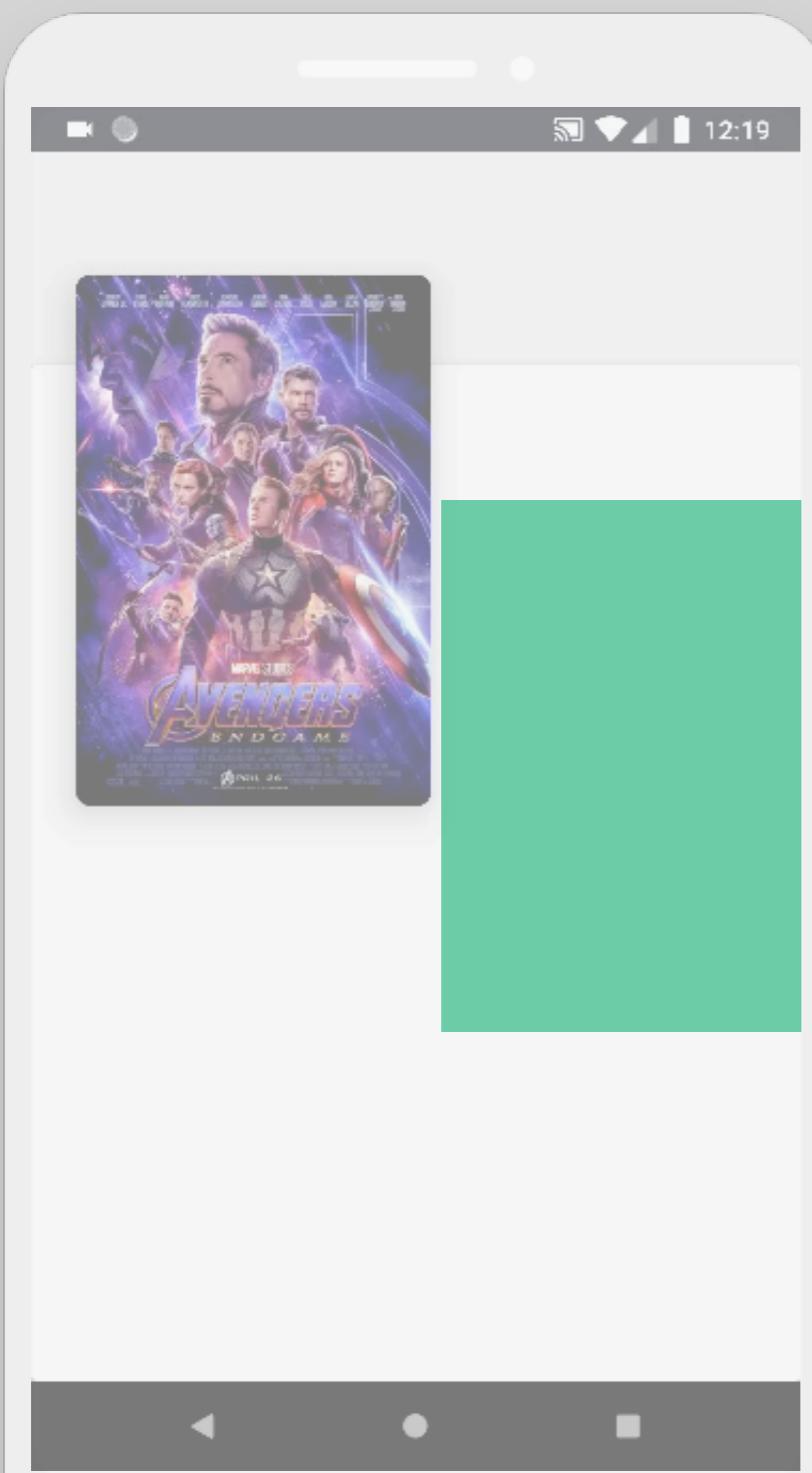
@xml/motion_poster.xml



```
<Transition  
    android:id="@+id/transition_poster"  
    app:constraintSetStart="@+id/frame_poster_top"  
    app:constraintSetEnd="@+id/frame_poster_middle" >  
  
    <KeyFrameSet>  
  
    </KeyFrameSet>  
  
    <OnClick  
        app:clickAction="toggle"  
        app:targetId="@+id/card_movie_poster"/>  
  
  </Transition>
```

Add KeyFrames for Poster

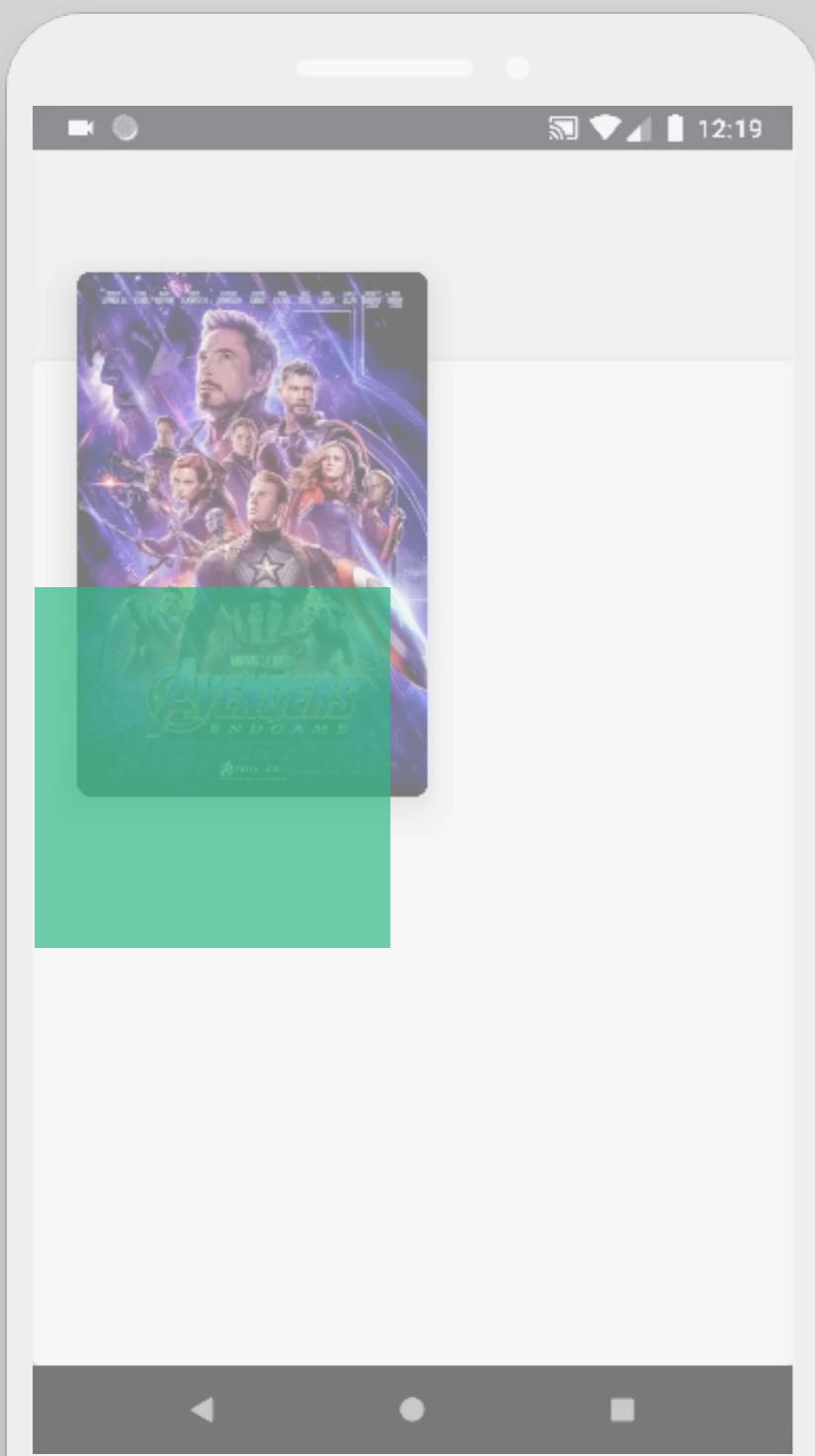
@xml/motion_poster.xml



```
<Transition  
    android:id="@+id/transition_poster"  
    app:constraintSetStart="@+id/frame_poster_top"  
    app:constraintSetEnd="@+id/frame_poster_middle" >  
  
<KeyFrameSet>  
  
    <KeyPosition  
        app:framePosition="90"  
        app:keyPositionType="parentRelative"  
        app:motionTarget="@+id/card_movie_poster"  
        app:percentX="1"  
        app:percentY=".5" />  
  
</KeyFrameSet>  
  
<OnClick  
    app:clickAction="toggle"  
    app:targetId="@+id/card_movie_poster"/>  
  
</Transition>
```

Add KeyFrames for Poster

@xml/motion_poster.xml



<Transition

```
    android:id="@+id/transition_poster"
    app:constraintSetStart="@+id/frame_poster_top"
    app:constraintSetEnd="@+id/frame_poster_middle" >
```

<KeyFrameSet>

<KeyPosition

```
    app:framePosition="90"
    app:keyPositionType="parentRelative"
    app:motionTarget="@+id/card_movie_poster"
    app:percentX="1"
    app:percentY=".5" />
```

<KeyPosition

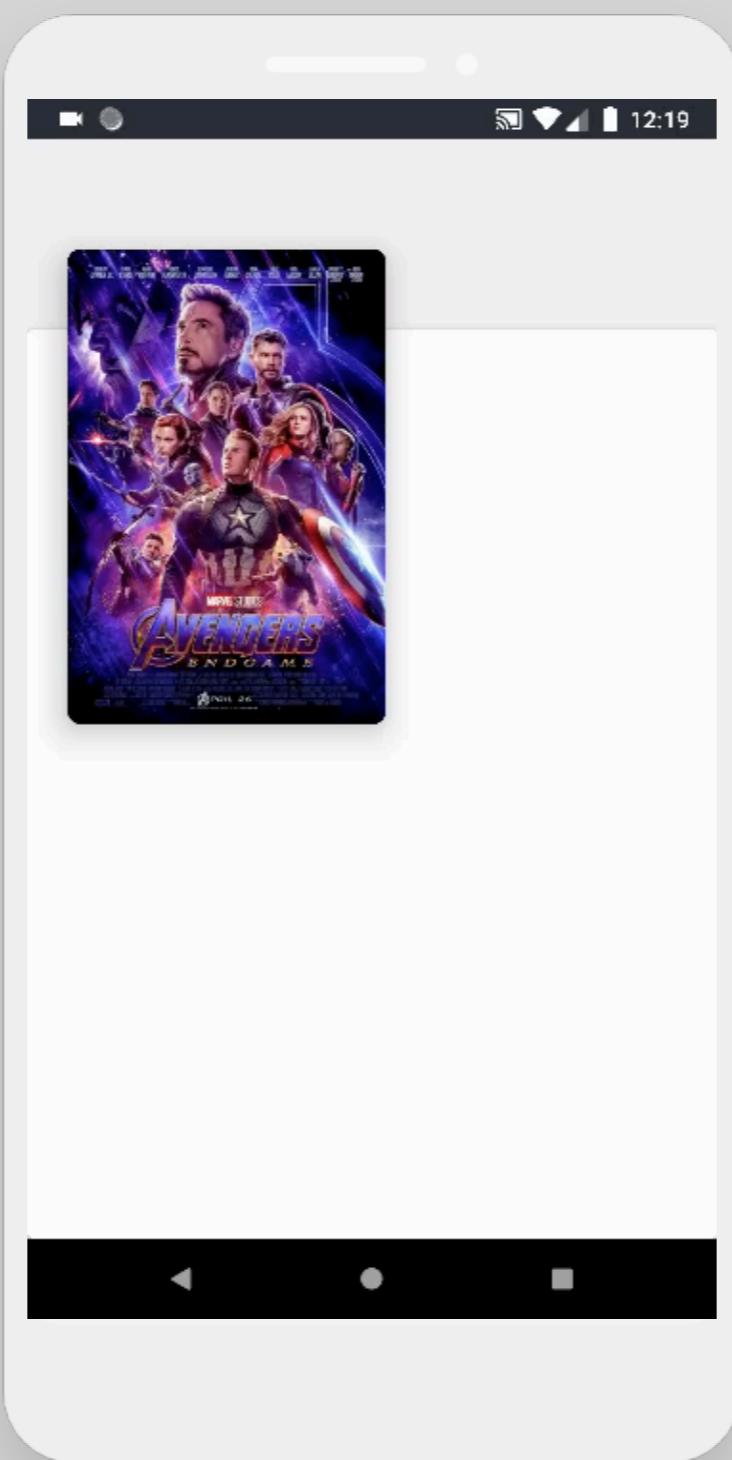
```
    app:framePosition="90"
    app:keyPositionType="parentRelative"
    app:motionTarget="@+id/card_movie_info"
    app:percentY=".5"
    app:percentX="0" />
```

</KeyFrameSet>

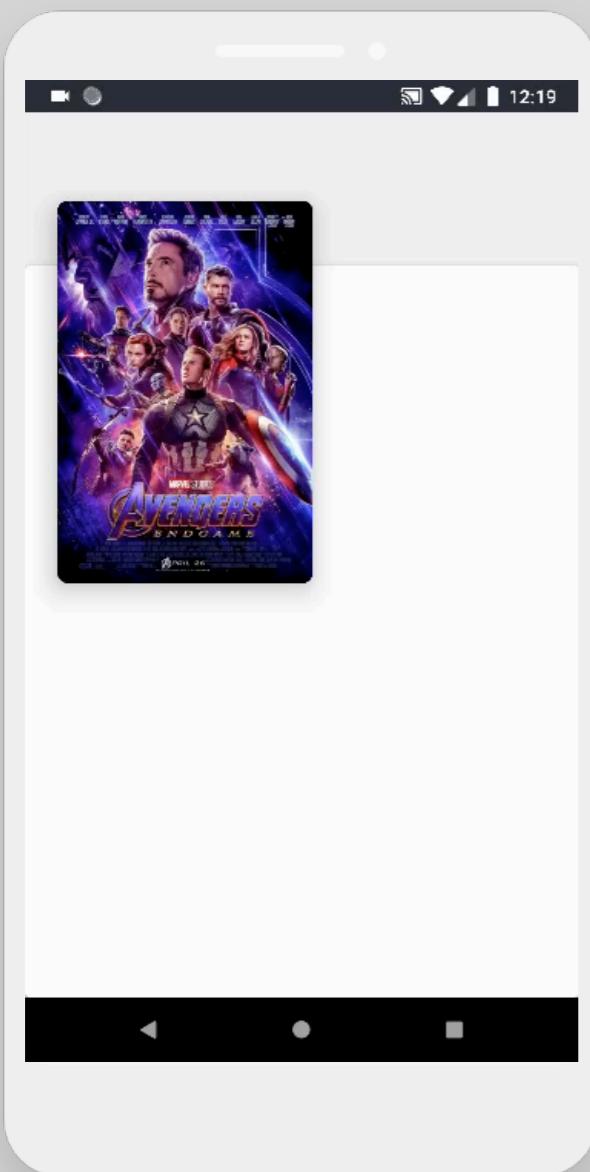
<OnClick

```
    app:clickAction="toggle"
    app:targetId="@+id/card_movie_poster"/>
```

Recap



Recap



<MotionScene>

```
<Transition  
    app:constraintSetEnd="@+id/frame_poster_middle"  
    app:constraintSetStart="@+id/frame_poster_top" >  
    ...  
</Transition>
```

```
<ConstraintSet android:id="@+id/frame_poster_middle">
```

...

```
</ConstraintSet>
```

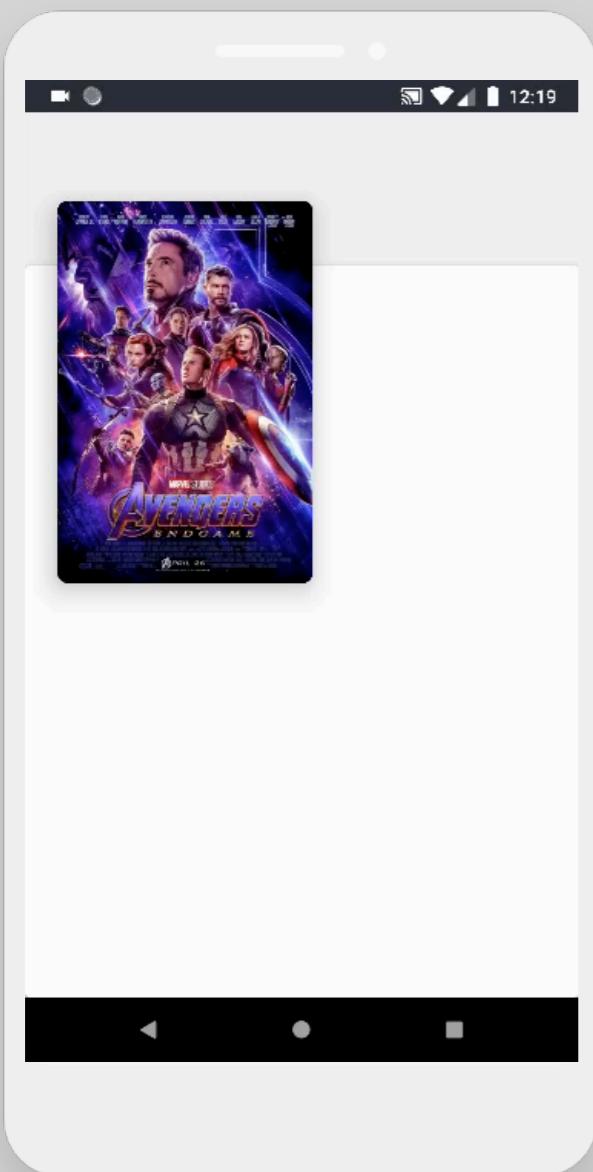
```
<ConstraintSet android:id="@+id/frame_poster_top">
```

...

```
</ConstraintSet>
```

</MotionScene>

Recap



```
<MotionScene>
```

```
<Transition
```

```
    app:constraintSetEnd="@+id/frame_poster_middle"
```

```
    app:constraintSetStart="@+id/frame_poster_top" >
```

```
...
```

```
</Transition>
```

```
<ConstraintSet android:id="@+id/frame_poster_middle">
```

```
...
```

```
</ConstraintSet>
```

```
<ConstraintSet android:id="@+id/frame_poster_top">
```

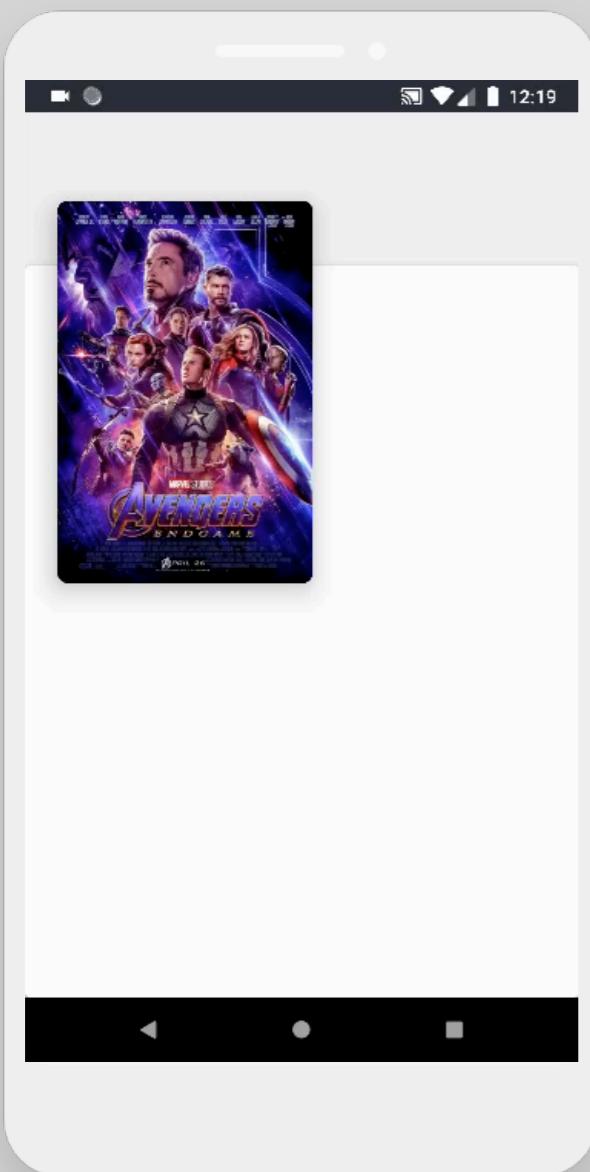
```
    <Constraint android:id="@+id/card_movie_poster">
```

```
    <Constraint android:id="@+id/card_movie_info">
```

```
</ConstraintSet>
```

```
</MotionScene>
```

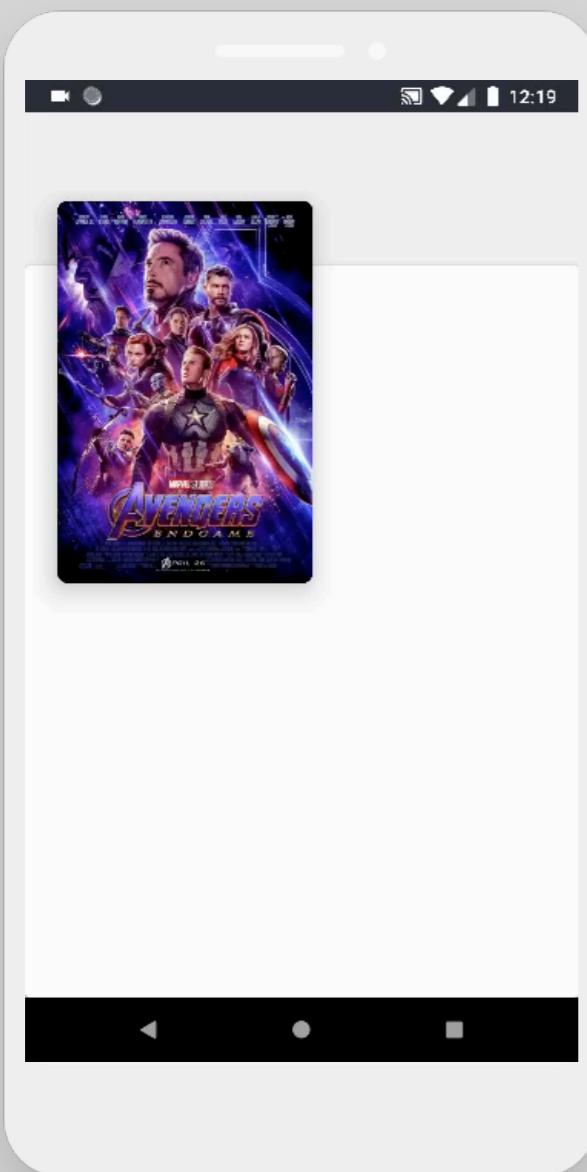
Recap



<MotionScene>

```
<Transition  
    app:constraintSetEnd="@+id/frame_poster_middle"  
    app:constraintSetStart="@+id/frame_poster_top" >  
    ...  
</Transition>  
  
<ConstraintSet android:id="@+id/frame_poster_middle">  
    ...  
</ConstraintSet>  
  
<ConstraintSet android:id="@+id/frame_poster_top">  
    ...  
</ConstraintSet>  
  
</MotionScene>
```

Recap



```
<MotionScene>
```

```
<Transition
```

```
    app:constraintSetEnd="@+id/frame_poster_middle"  
    app:constraintSetStart="@+id/frame_poster_top" >
```

```
...
```

```
</Transition>
```

```
<ConstraintSet android:id="@+id/frame_poster_middle">
```

```
    <Constraint android:id="@+id/card_movie_poster">  
    <Constraint android:id="@+id/card_movie_info">
```

```
</ConstraintSet>
```

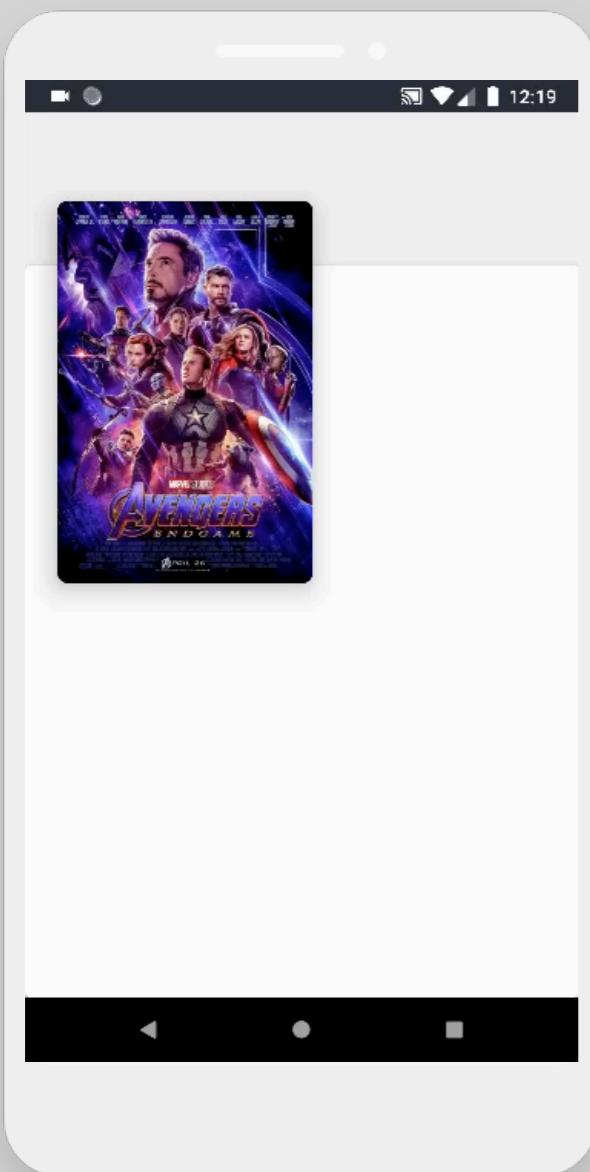
```
<ConstraintSet android:id="@+id/frame_poster_top">
```

```
...
```

```
</ConstraintSet>
```

```
</MotionScene>
```

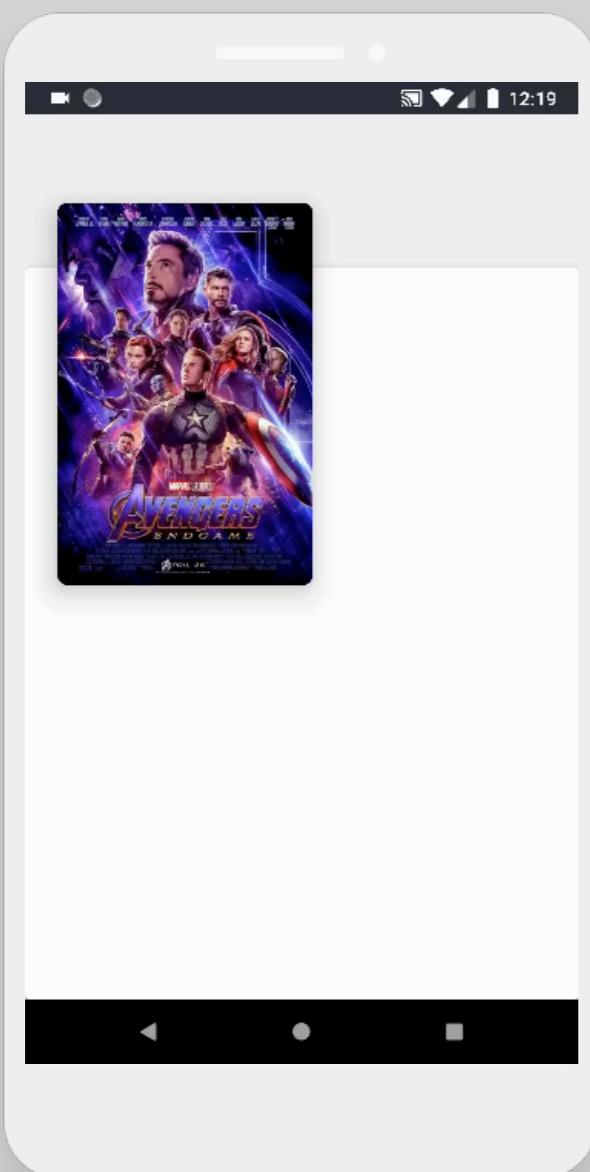
Recap



<MotionScene>

```
<Transition  
    app:constraintSetEnd="@+id/frame_poster_middle"  
    app:constraintSetStart="@+id/frame_poster_top" >  
    ...  
</Transition>  
  
<ConstraintSet android:id="@+id/frame_poster_middle">  
    ...  
</ConstraintSet>  
  
<ConstraintSet android:id="@+id/frame_poster_top">  
    ...  
</ConstraintSet>  
  
</MotionScene>
```

Recap



<MotionScene>

<Transition

```
    app:constraintSetEnd="@+id/frame_poster_middle"  
    app:constraintSetStart="@+id/frame_poster_top" >
```

<OnClick

```
    app:clickAction="toggle"  
    app:targetId="@+id/card_movie_poster"/>
```

• • •

</Transition>

<ConstraintSet android:id="@+id/frame_poster_middle">

• • •

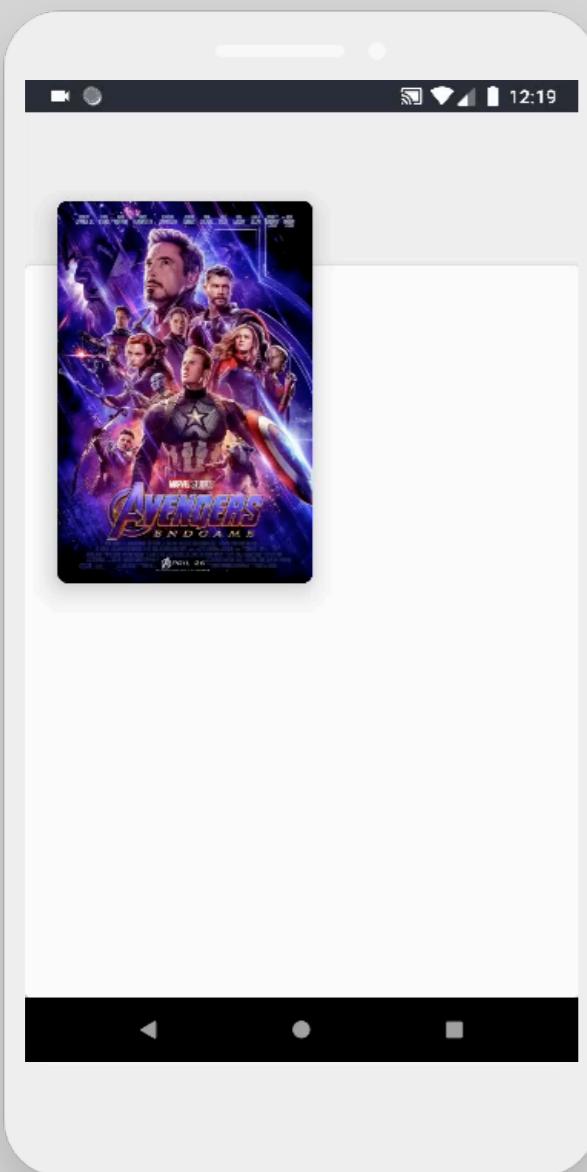
</ConstraintSet>

<ConstraintSet android:id="@+id/frame_poster_top">

• • •

</ConstraintSet>

Recap



```
<MotionScene>
```

```
<Transition
```

```
    app:constraintSetEnd="@+id/frame_poster_middle"  
    app:constraintSetStart="@+id/frame_poster_top" >
```

```
<OnClick
```

```
    app:clickAction="toggle"  
    app:targetId="@+id/card_movie_poster"/>
```

```
<KeyFrameSet>
```

```
<KeyPosition
```

```
    app:framePosition="90"  
    app:motionTarget="@+id/card_movie_poster" ... />
```

```
<KeyPosition
```

```
    app:framePosition="90"  
    app:motionTarget="@+id/card_movie_info" ... />
```

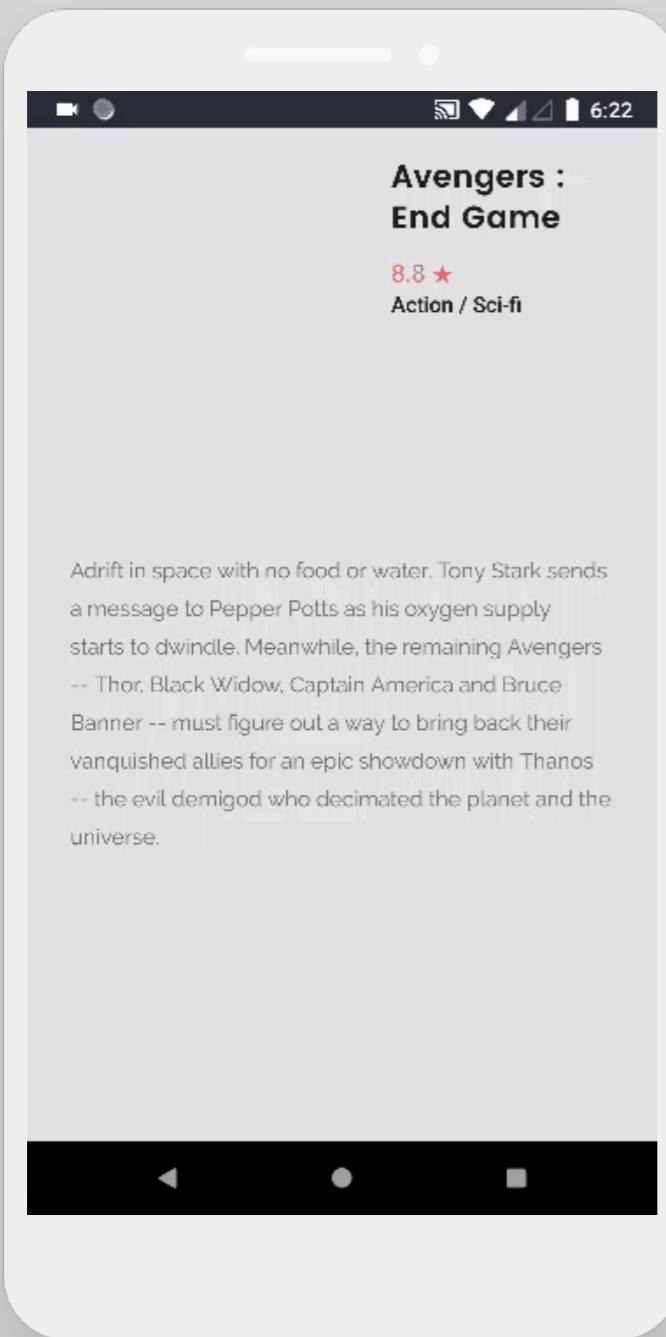
```
</KeyFrameSet>
```

```
</Transition>
```

```
<ConstraintSet android:id="@+id/frame_poster_middle">
```

```
...</ConstraintSet>
```

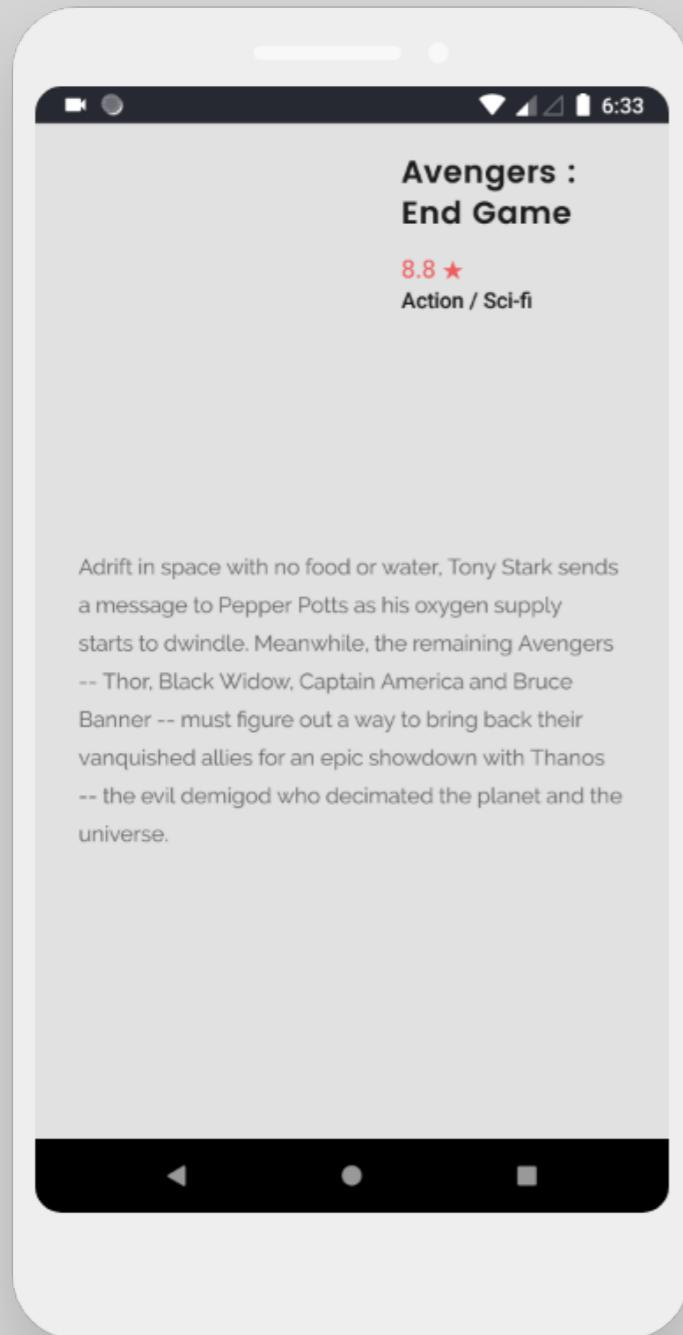
Movie Informations



`@layout/layout_movie_info.xml`

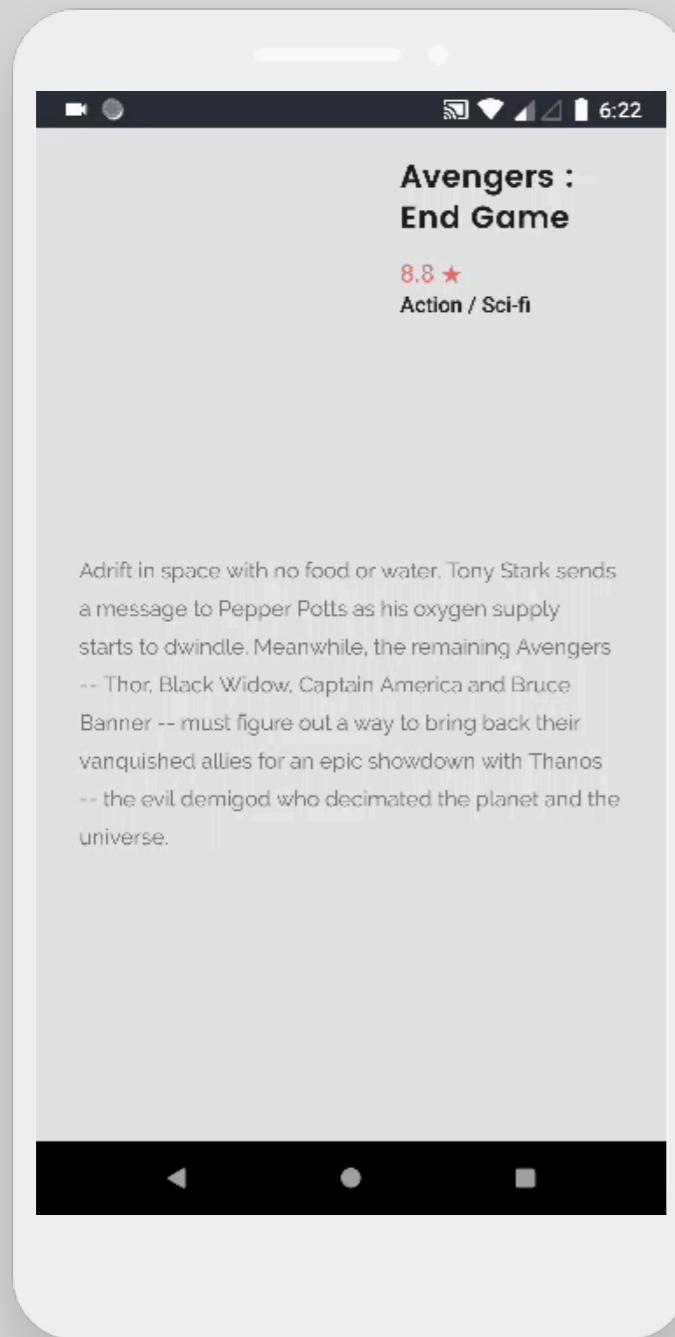
`@motion/motion_movie_info.xml`

@layout/layout_movie_info.xml



Holds 4 TextViews

Movie Informations

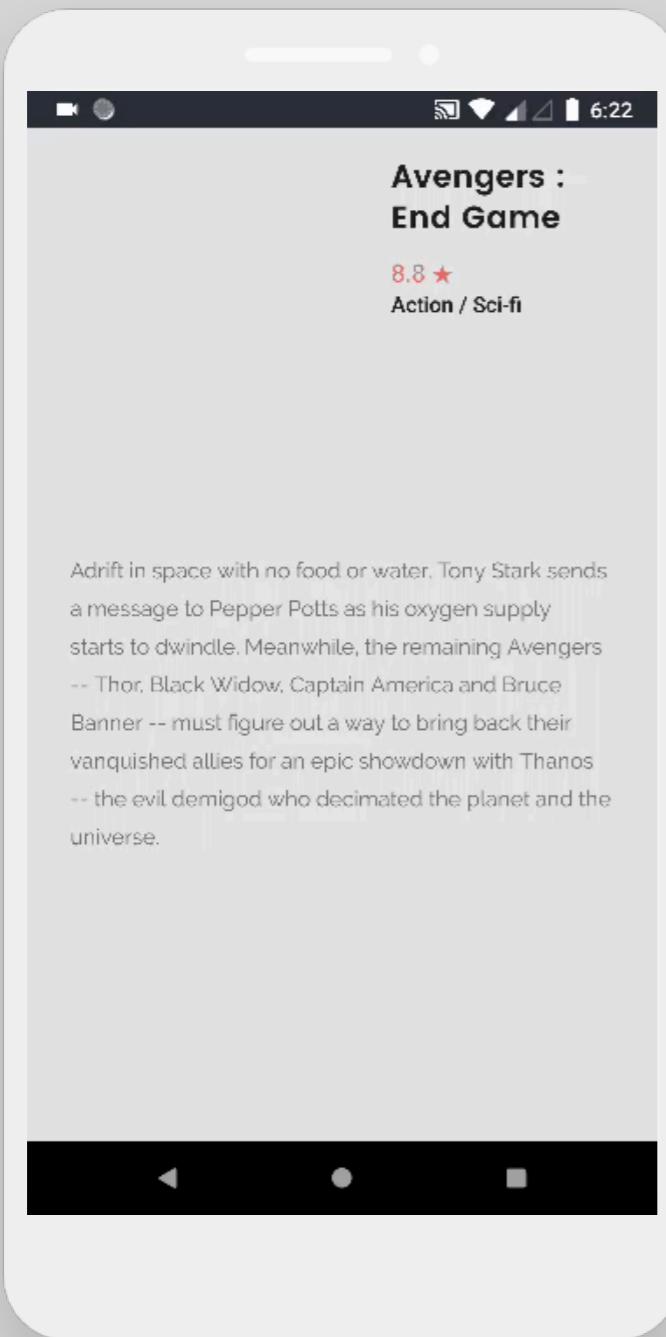


@layout/layout_movie_info.xml



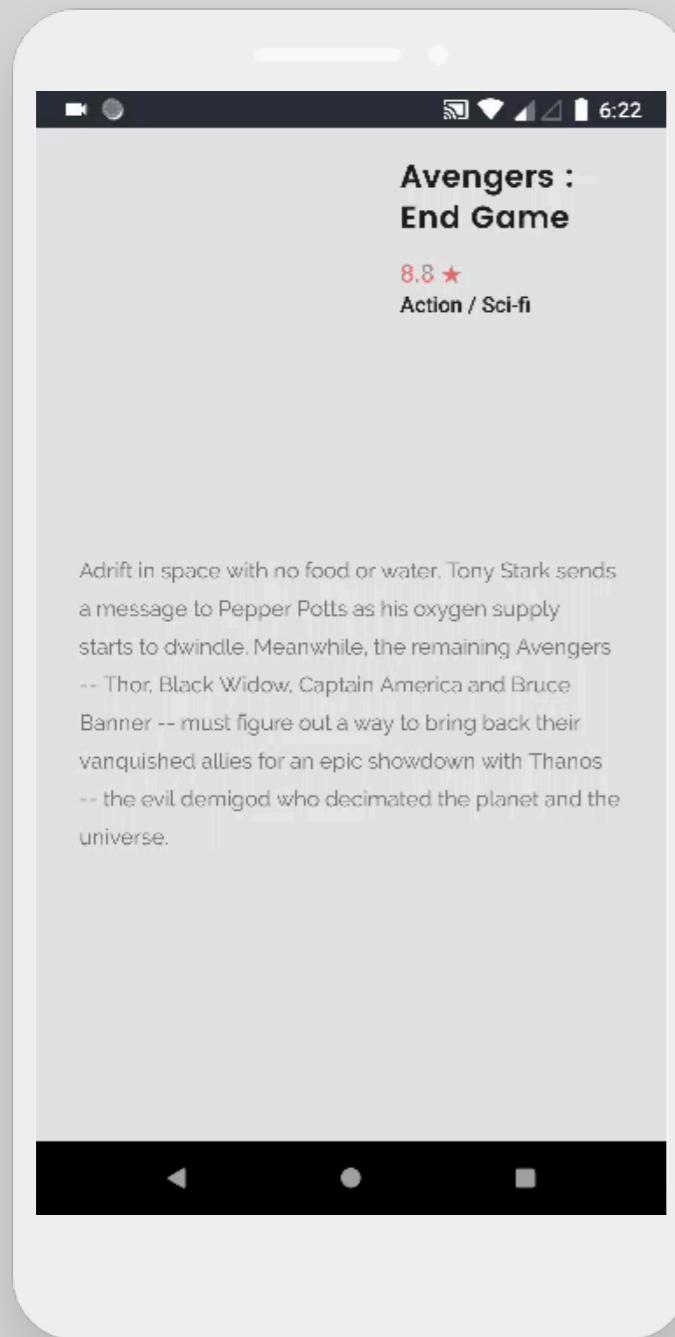
@motion/motion_movie_info.xml

@motion/motion_movie_info.xml



Holds 2 ConstraintSets and Transition

Movie Informations



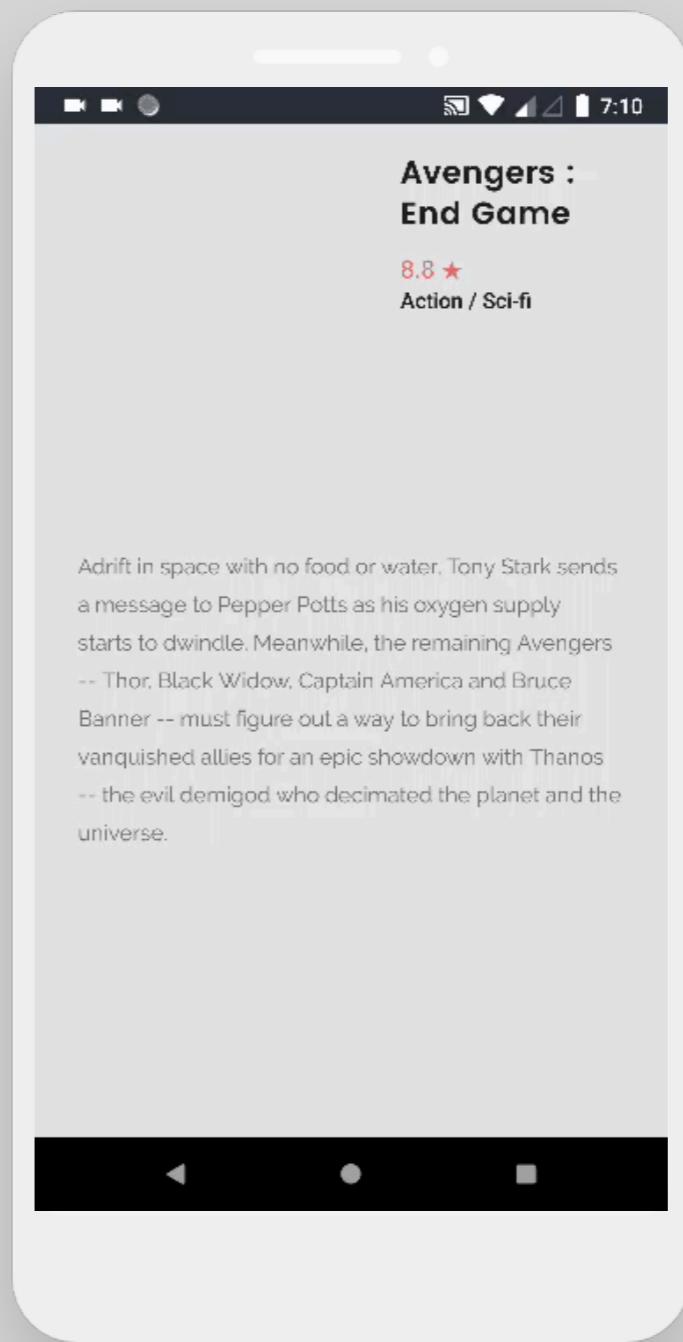
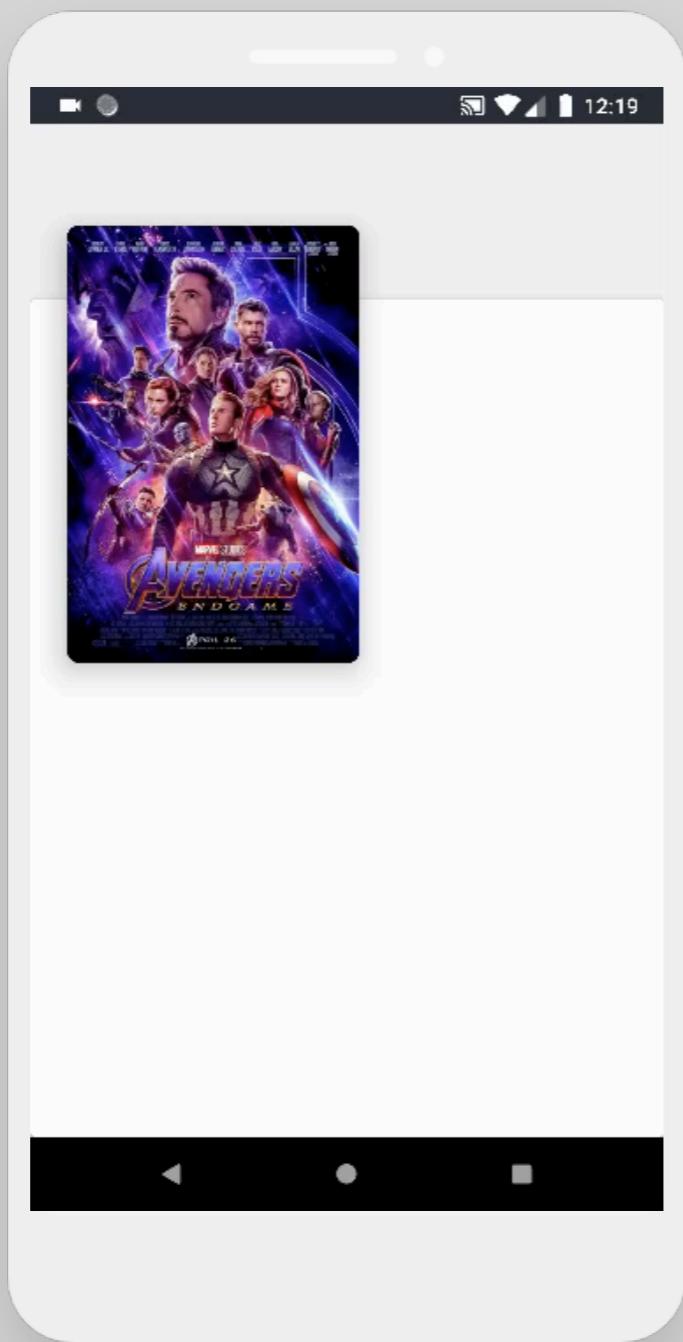
`@layout/layout_movie_info.xml` ✓

`@motion/motion_movie_info.xml` ✓



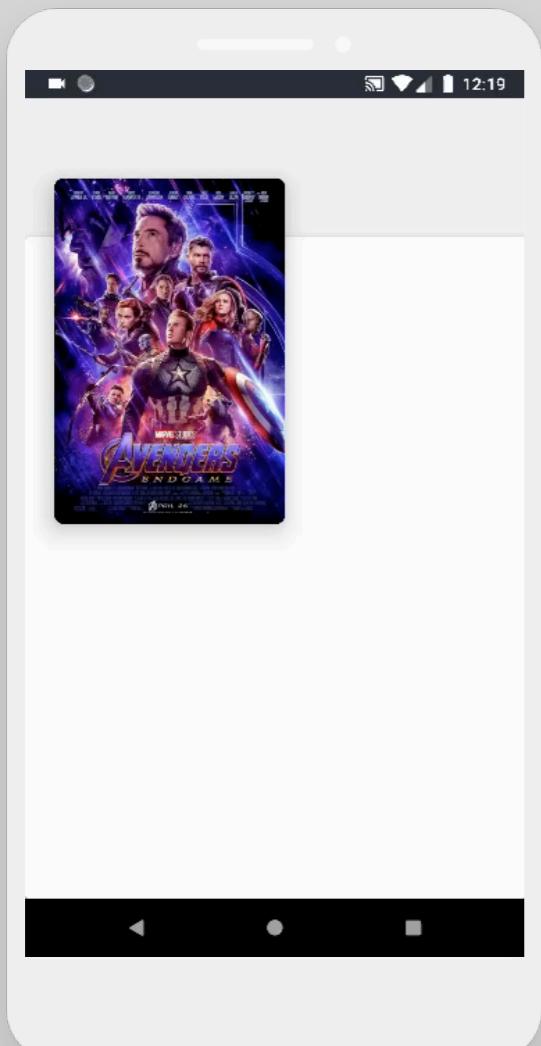
Use KeyFrames to show or hide movie summary at the middle

Two Screens

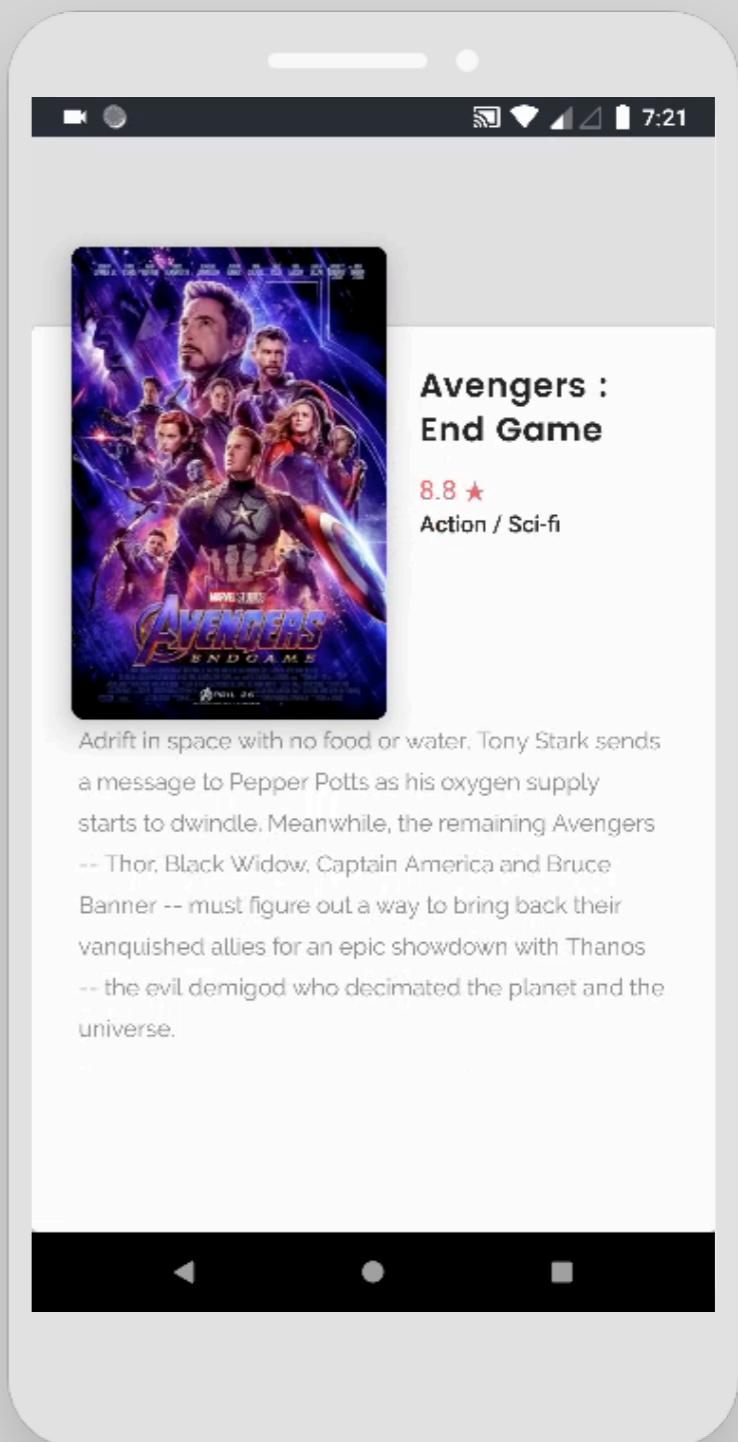
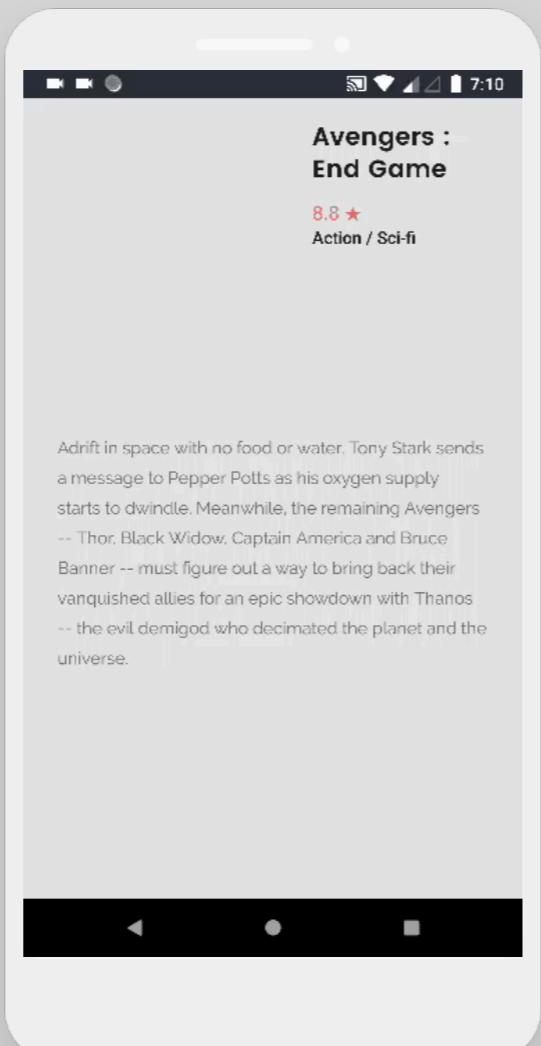


Combine Two Screens

@layout/movie_poster.xml

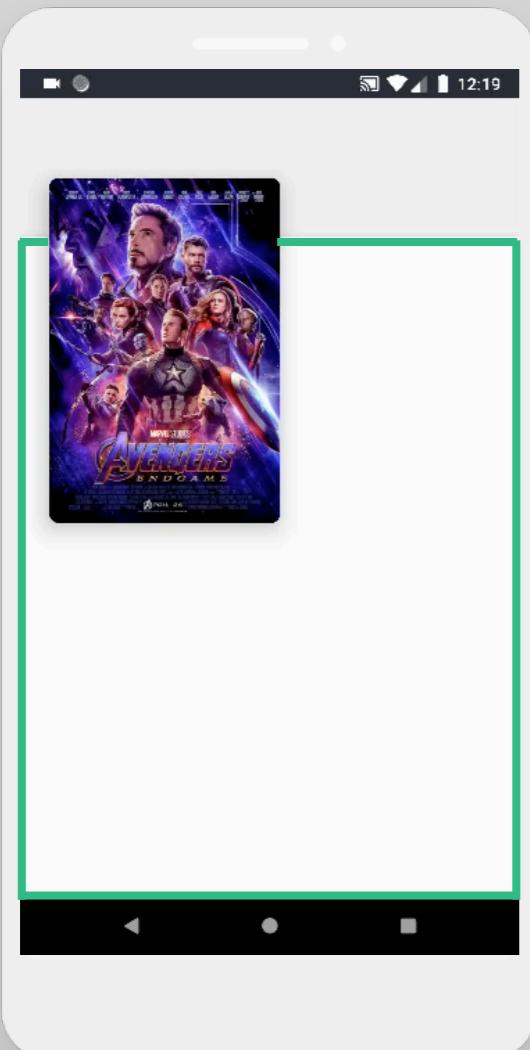


@layout/movie_info.xml

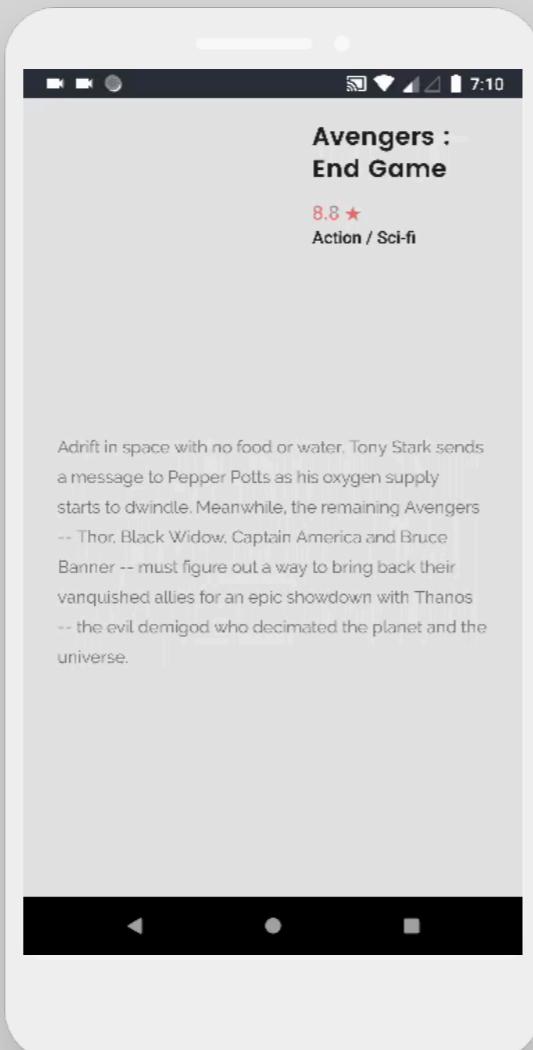


Combine Two Screens

@layout/movie_poster.xml

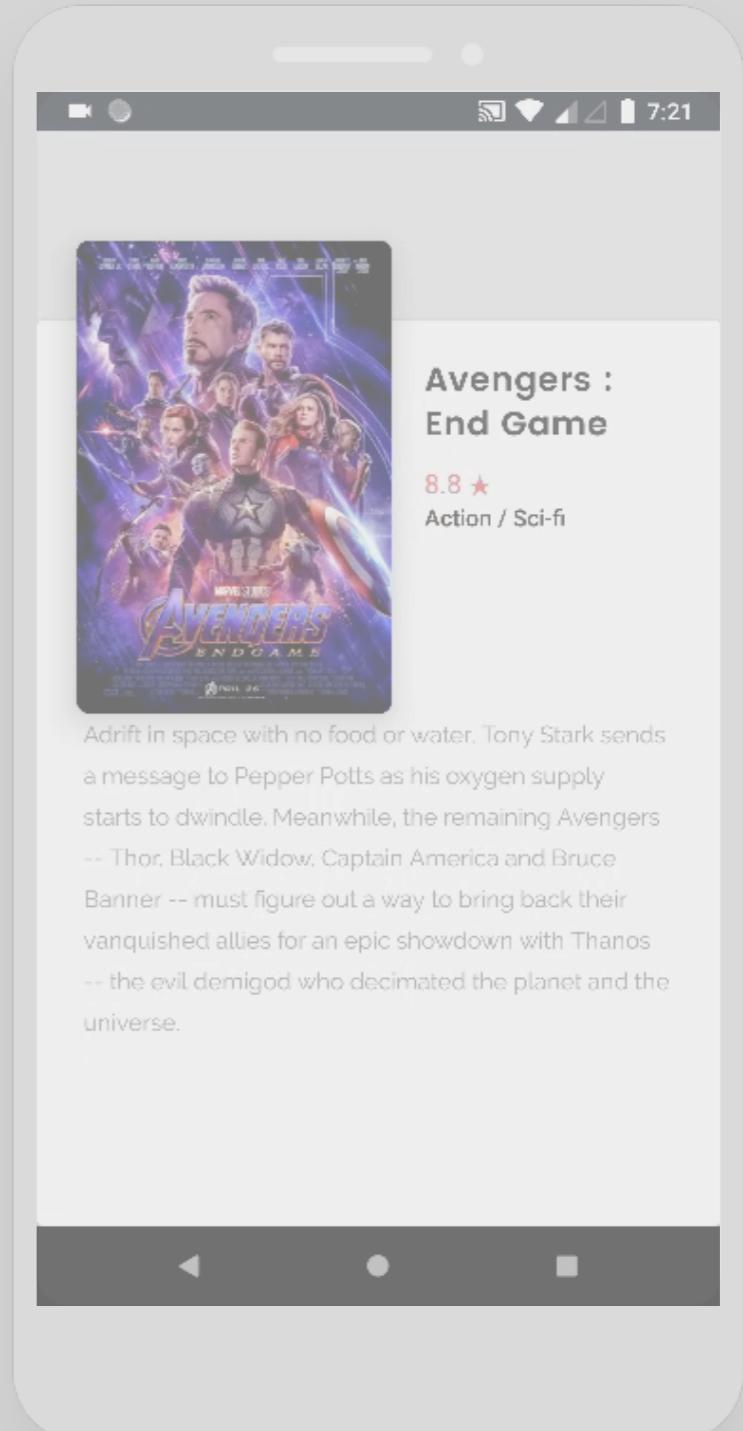


@layout/movie_info.xml



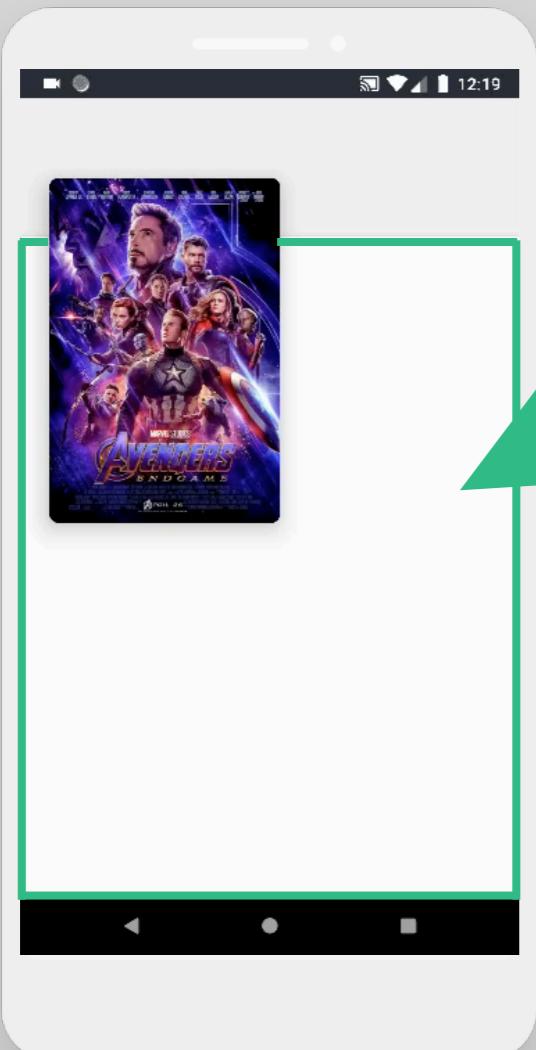
```
<com.google.android.material.card.MaterialCardView>
```

```
</com.google.android.material.card.MaterialCardView>
```

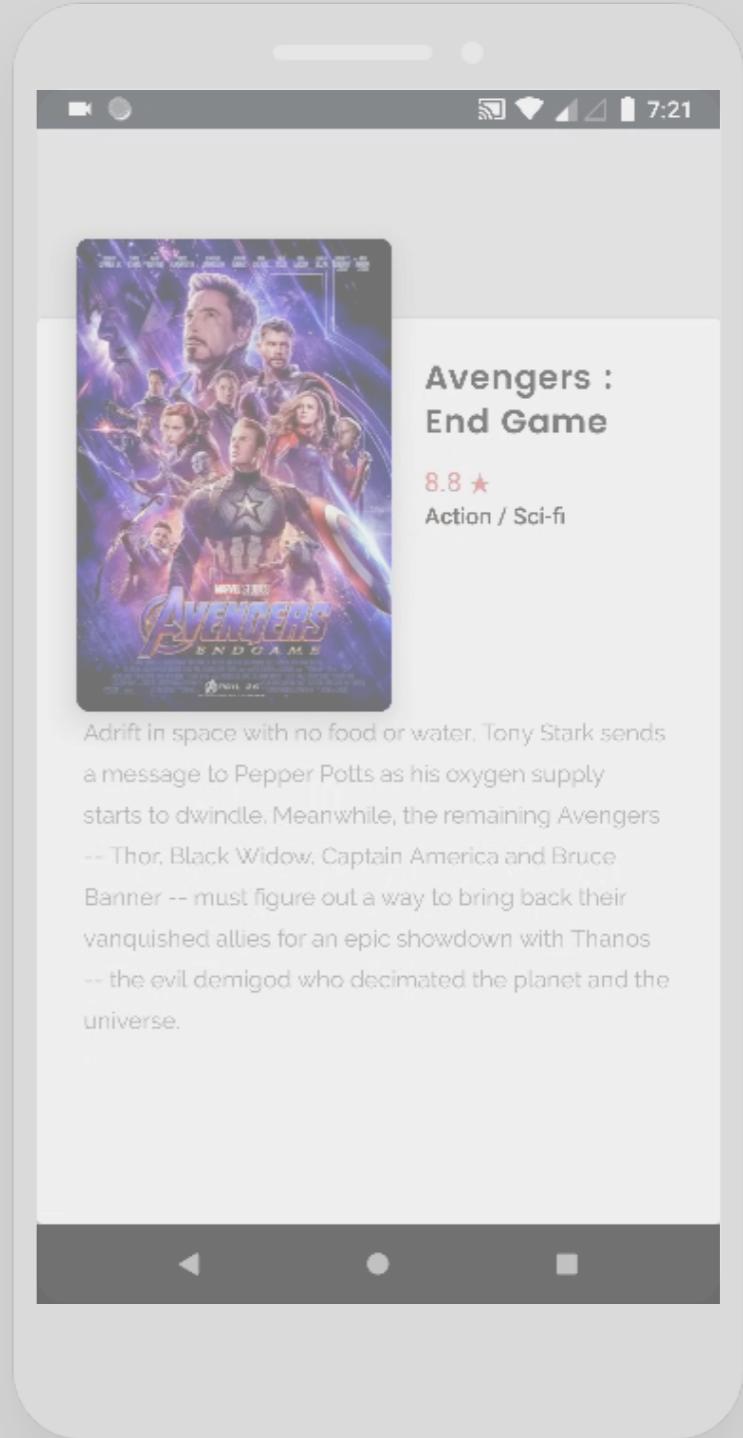
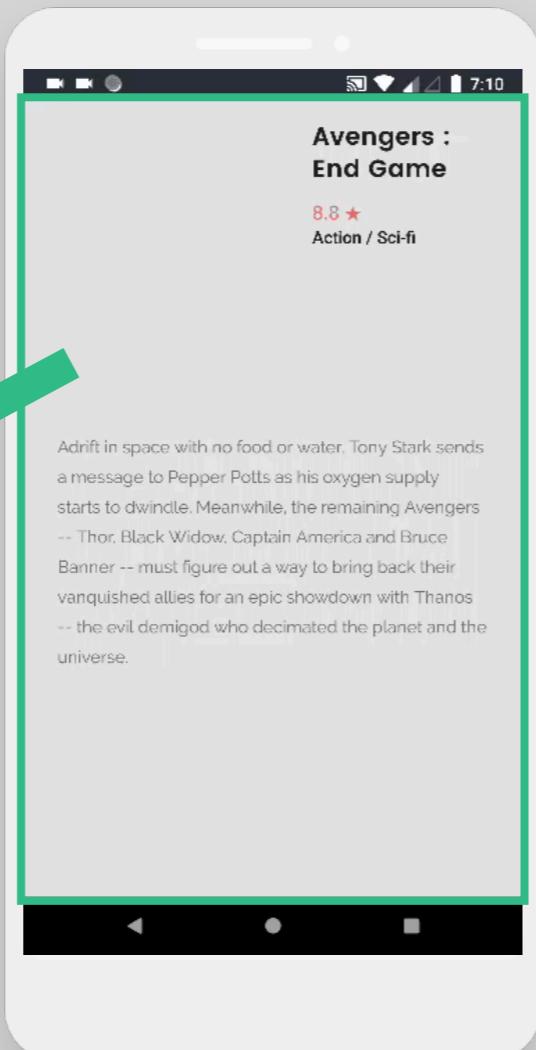


Combine Two Screens

@layout/movie_poster.xml



@layout/movie_info.xml



```
<com.google.android.material.card.MaterialCardView>
    <include layout="@layout/layout_movie_info"/>
</com.google.android.material.card.MaterialCardView>
```

Combine Two Screens

Passing progress to child layout

PosterActivity.kt

```
motionLayoutPoster.setTransitionListener( )
```

Combine Two Screens

Passing progress to child layout

PosterActivity.kt

```
motionLayoutPoster.setTransitionListener(object : TransitionListener {  
  
    override fun onTransitionChange(  
        motionLayout: MotionLayout?,  
        startState: Int,  
        endState: Int,  
        progress: Float  
    ) {  
    }  
  
    . . .  
})
```

Combine Two Screens

Passing progress to child layout

PosterActivity.kt

```
motionLayoutPoster.setTransitionListener(object : TransitionListener {  
    override fun onTransitionChange(  
        motionLayout: MotionLayout?,  
        startState: Int,  
        endState: Int,  
        progress: Float  
    ) {  
    }  
  
    ...  
})
```

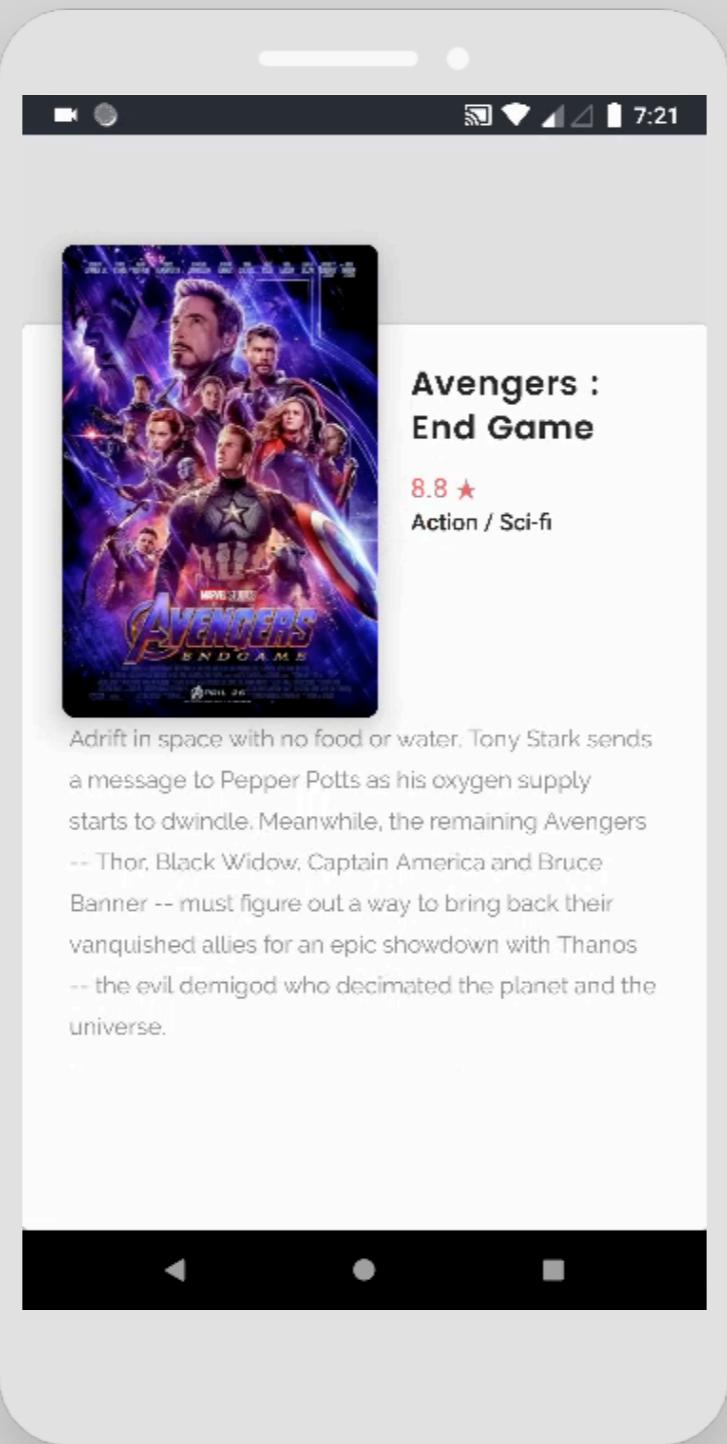
Combine Two Screens

Passing progress to child layout

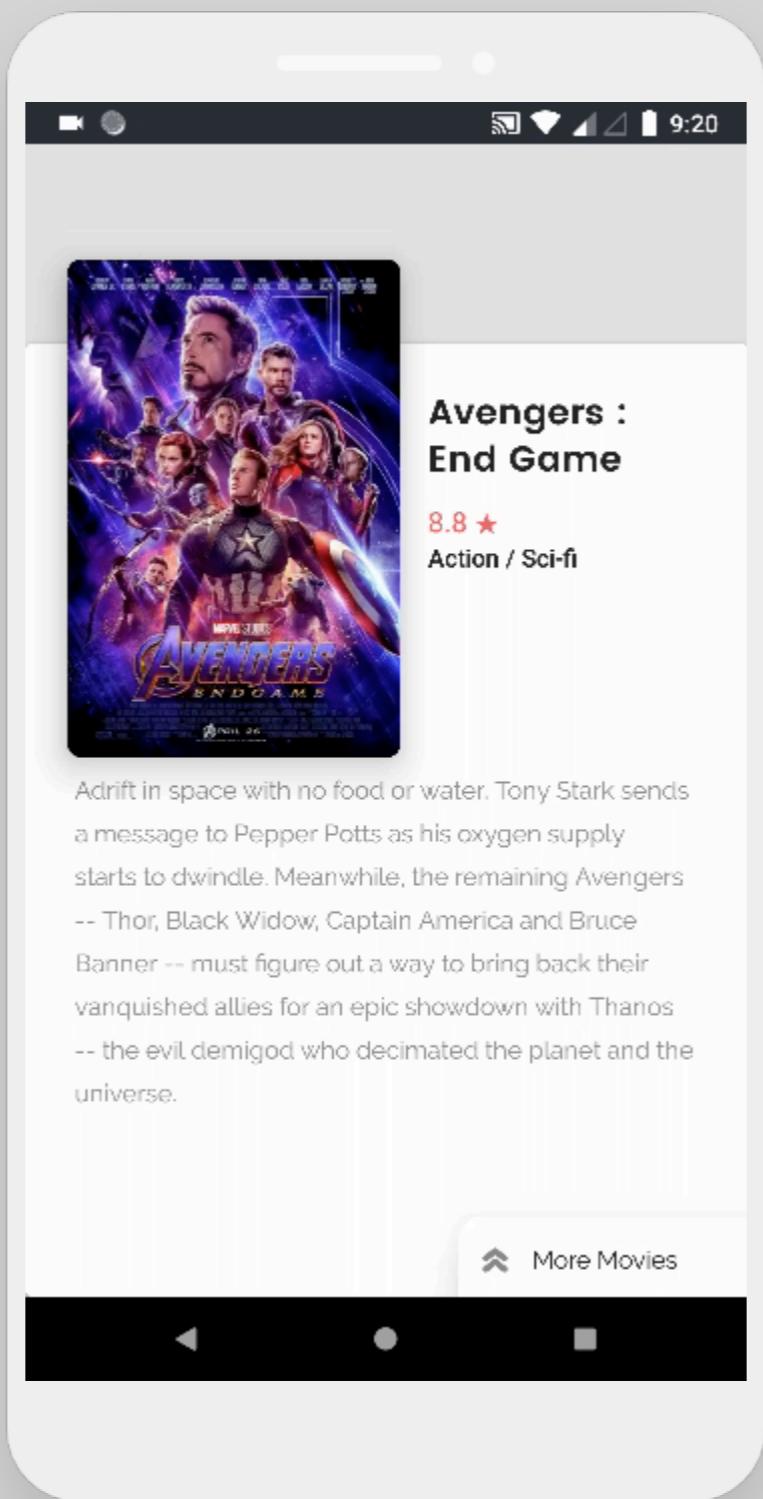
PosterActivity.kt

```
motionLayoutPoster.setTransitionListener(object : TransitionListener {  
  
    override fun onTransitionChange(  
        motionLayout: MotionLayout?,  
        startState: Int,  
        endState: Int,  
        progress: Float  
    ) {  
        motionLayoutMovieInfo.progress = progress  
    }  
  
    . . .  
})
```

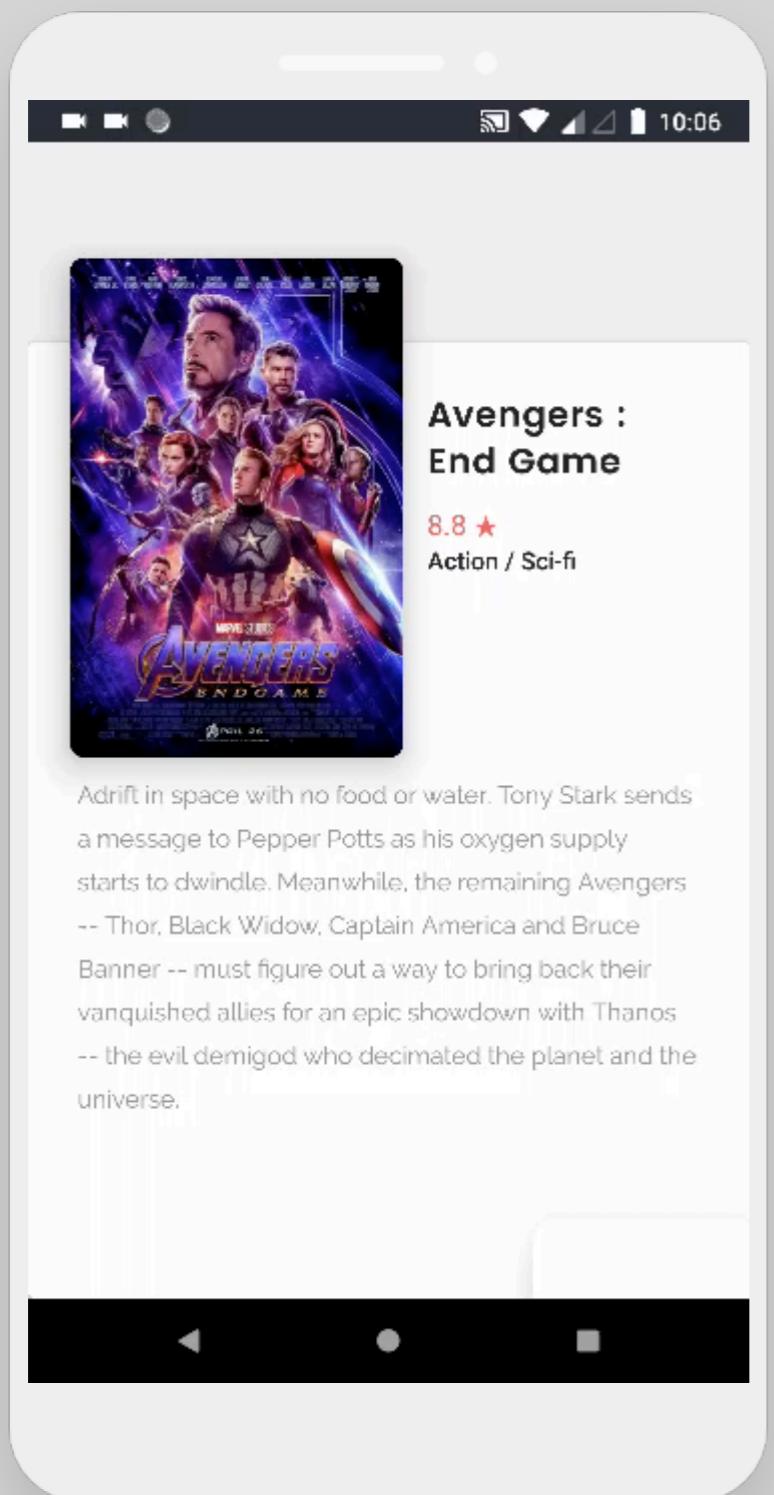
After Combining Two Screens



More Movies

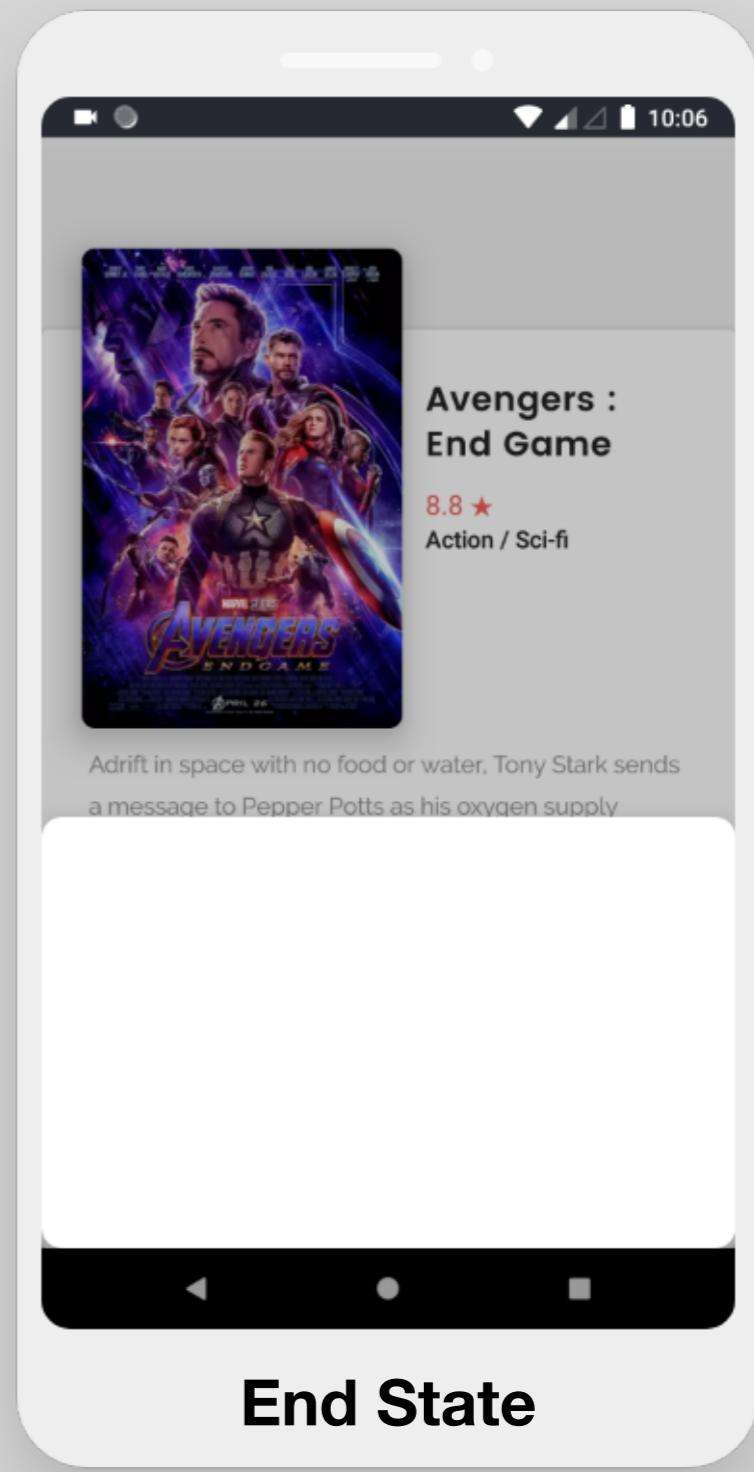
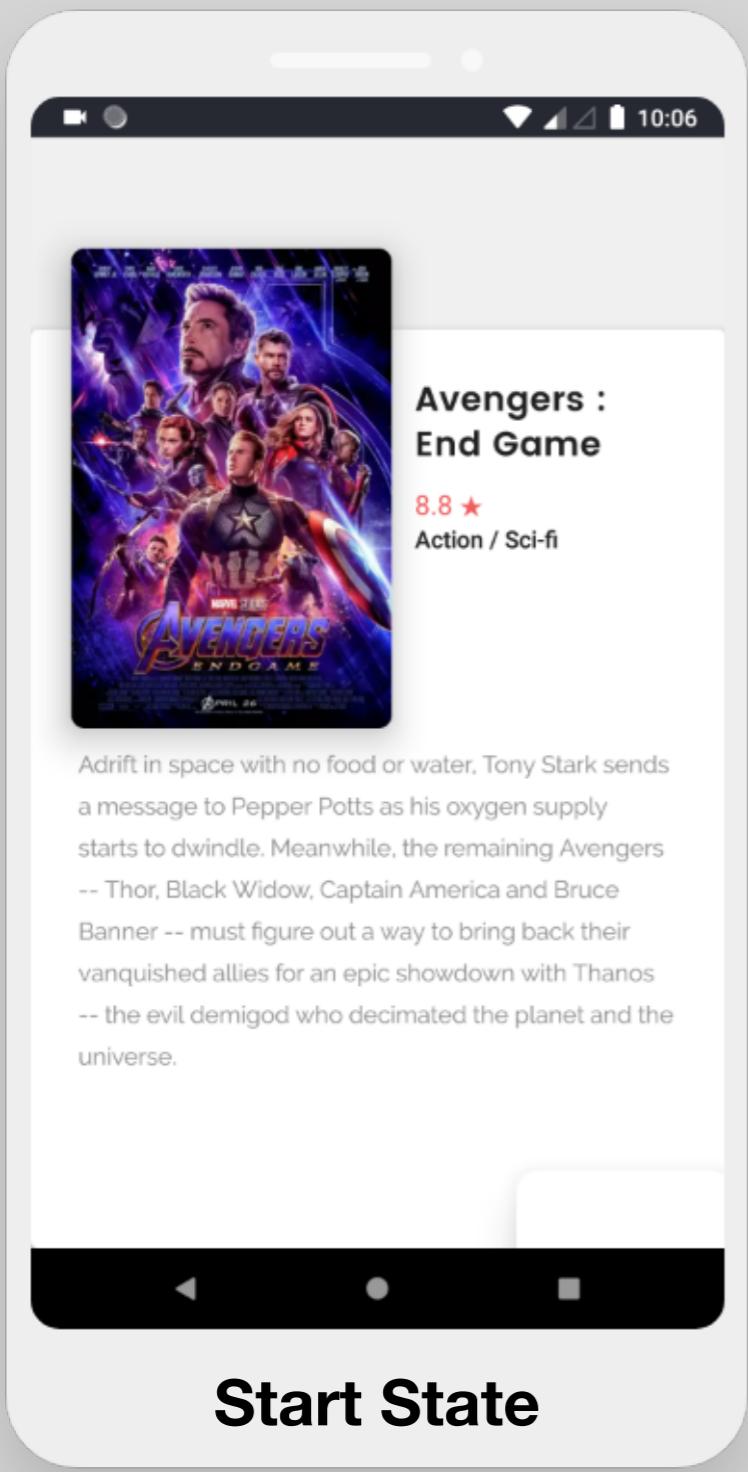


Card for More Movies

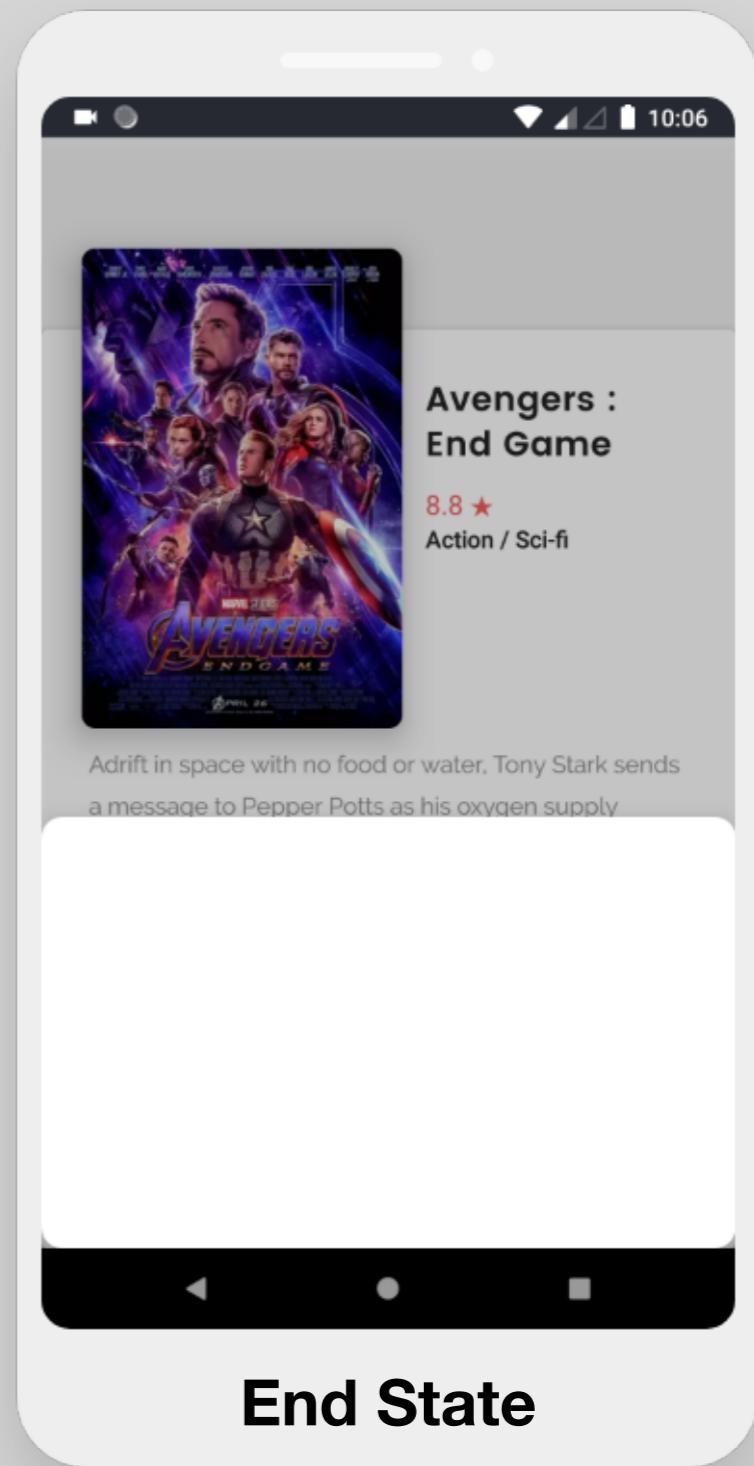
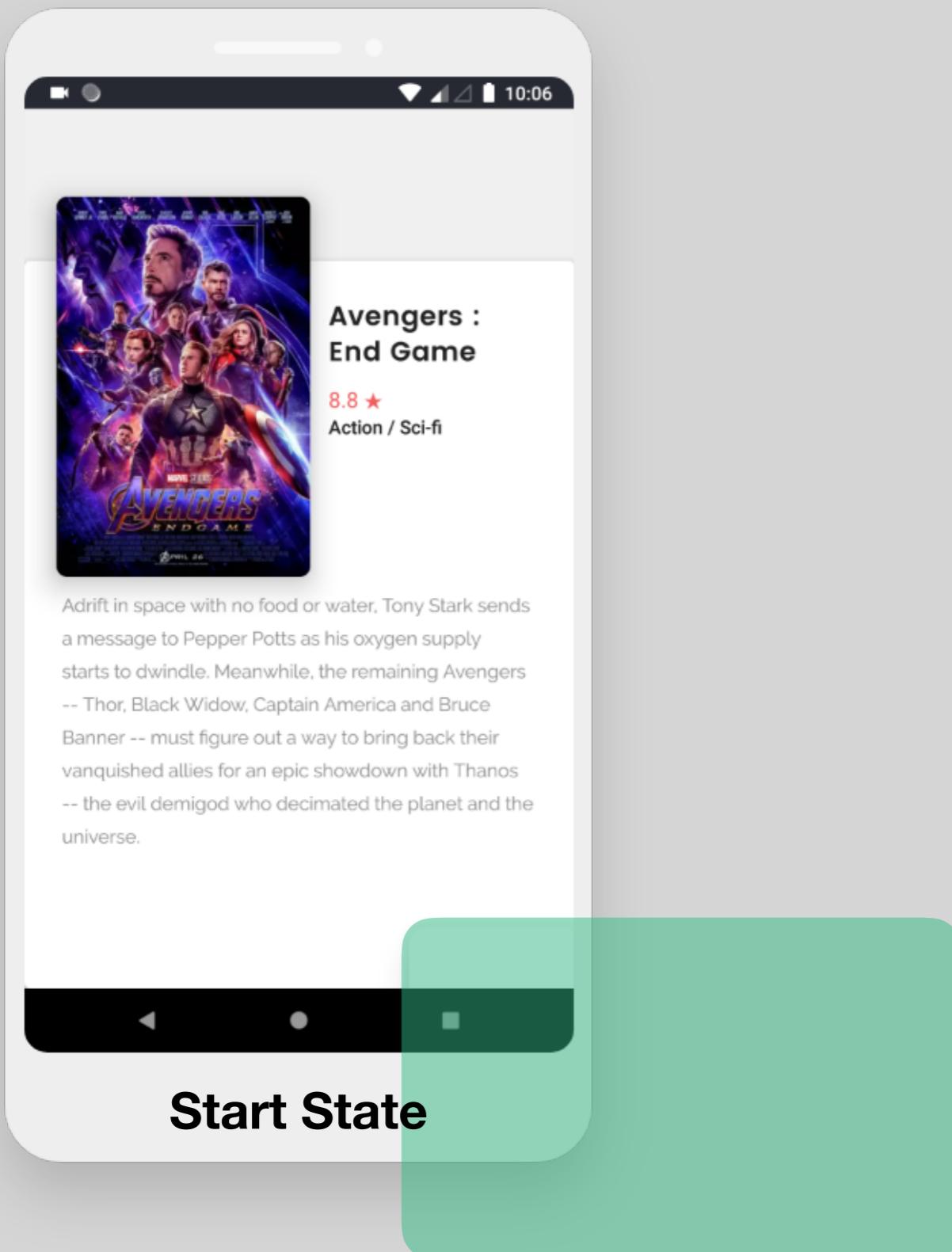


Add CardView to `layout_poster.xml`
+ Modify `motion_poster.xml`

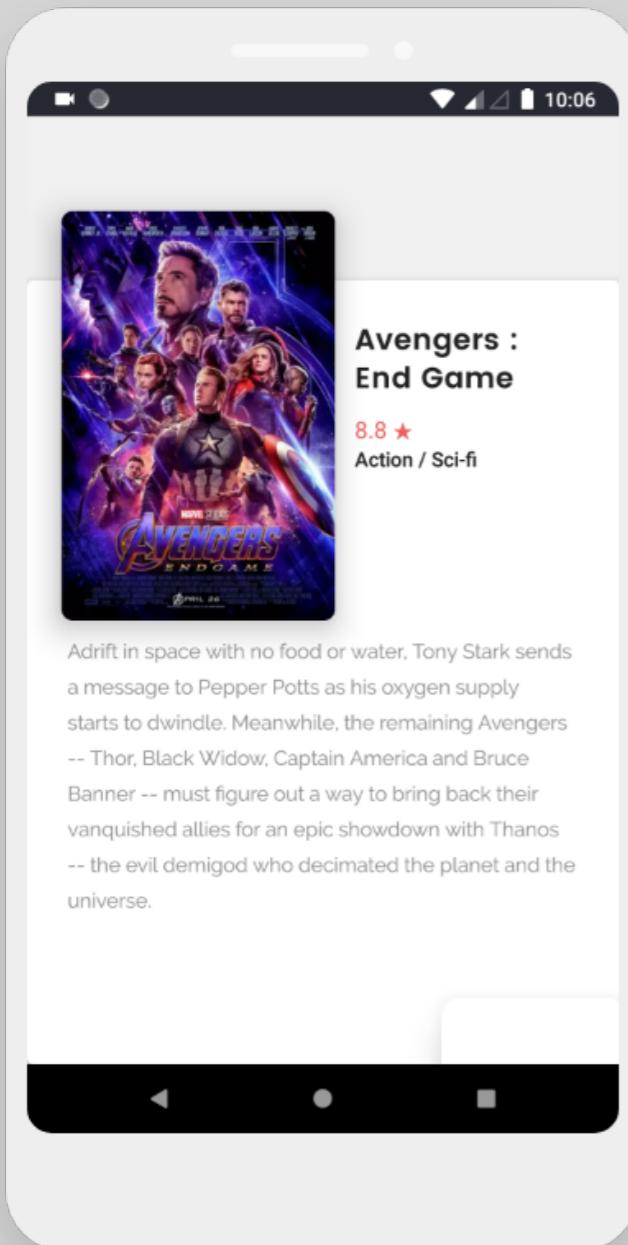
Card for More Movies



Card for More Movies



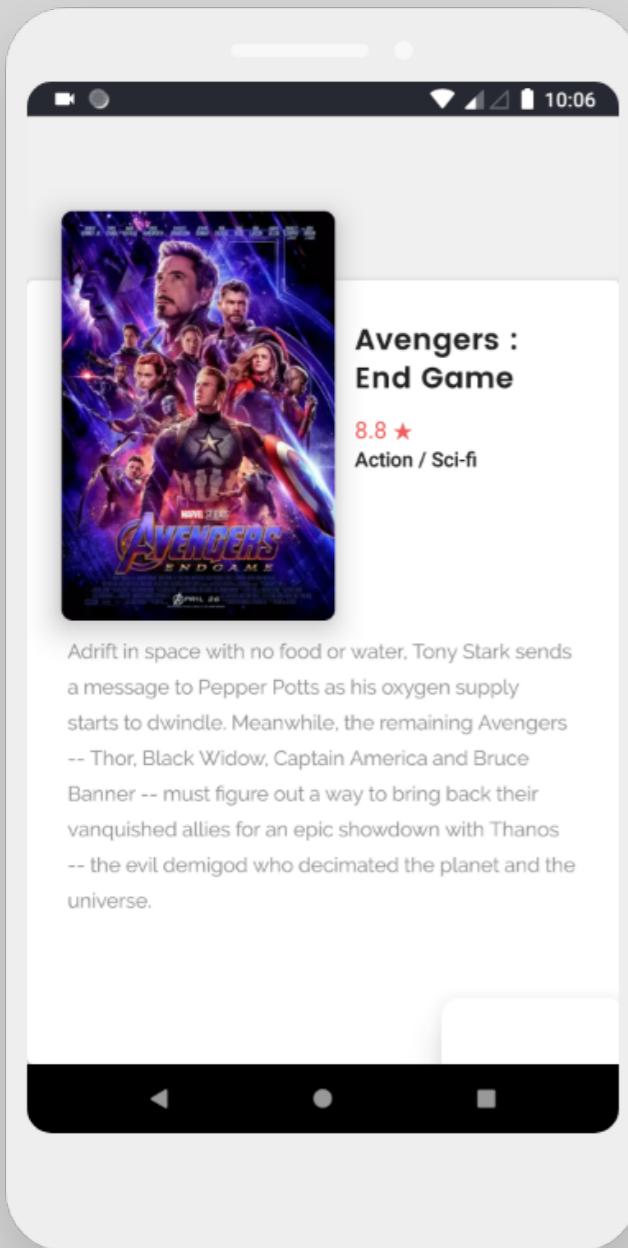
@xml/motion_poster.xml



```
<ConstraintSet  
    android:id="@+id/frame_poster_top">  
  
<Constraint android:id="@+id/card_movie_poster">  
    ...  
</Constraint>  
  
<Constraint android:id="@+id/card_movie_info">  
    ...  
</Constraint>  
  
</ConstraintSet>
```

Start State

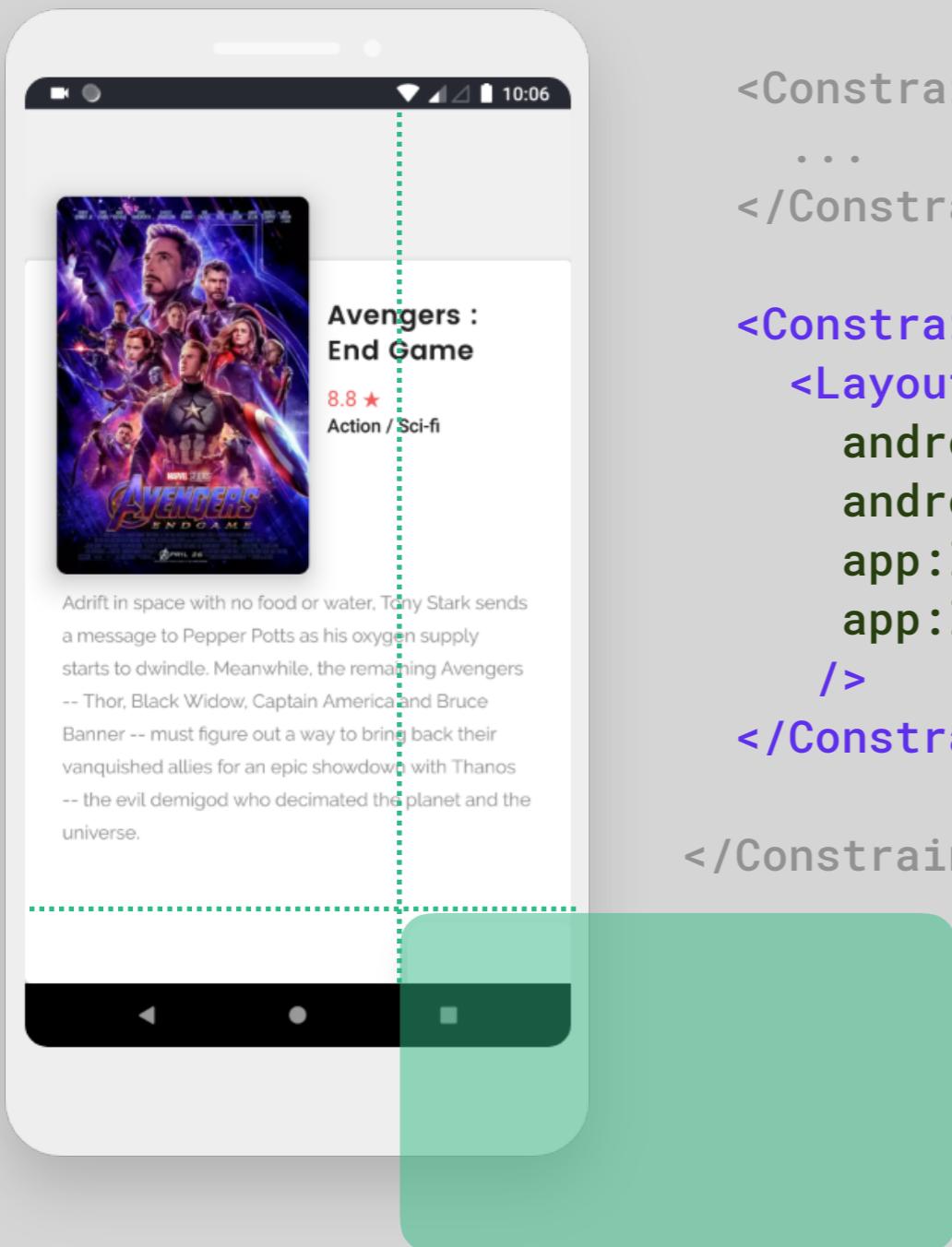
@xml/motion_poster.xml



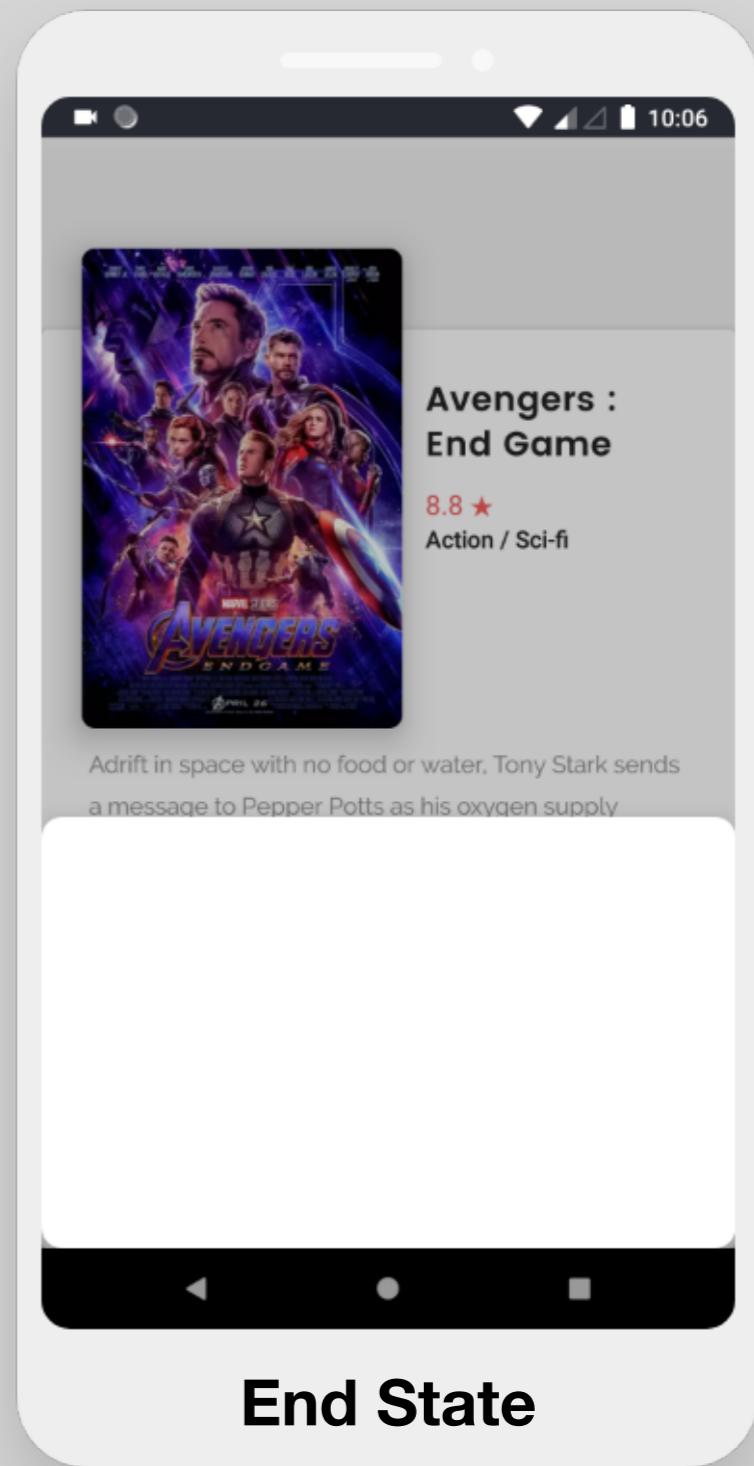
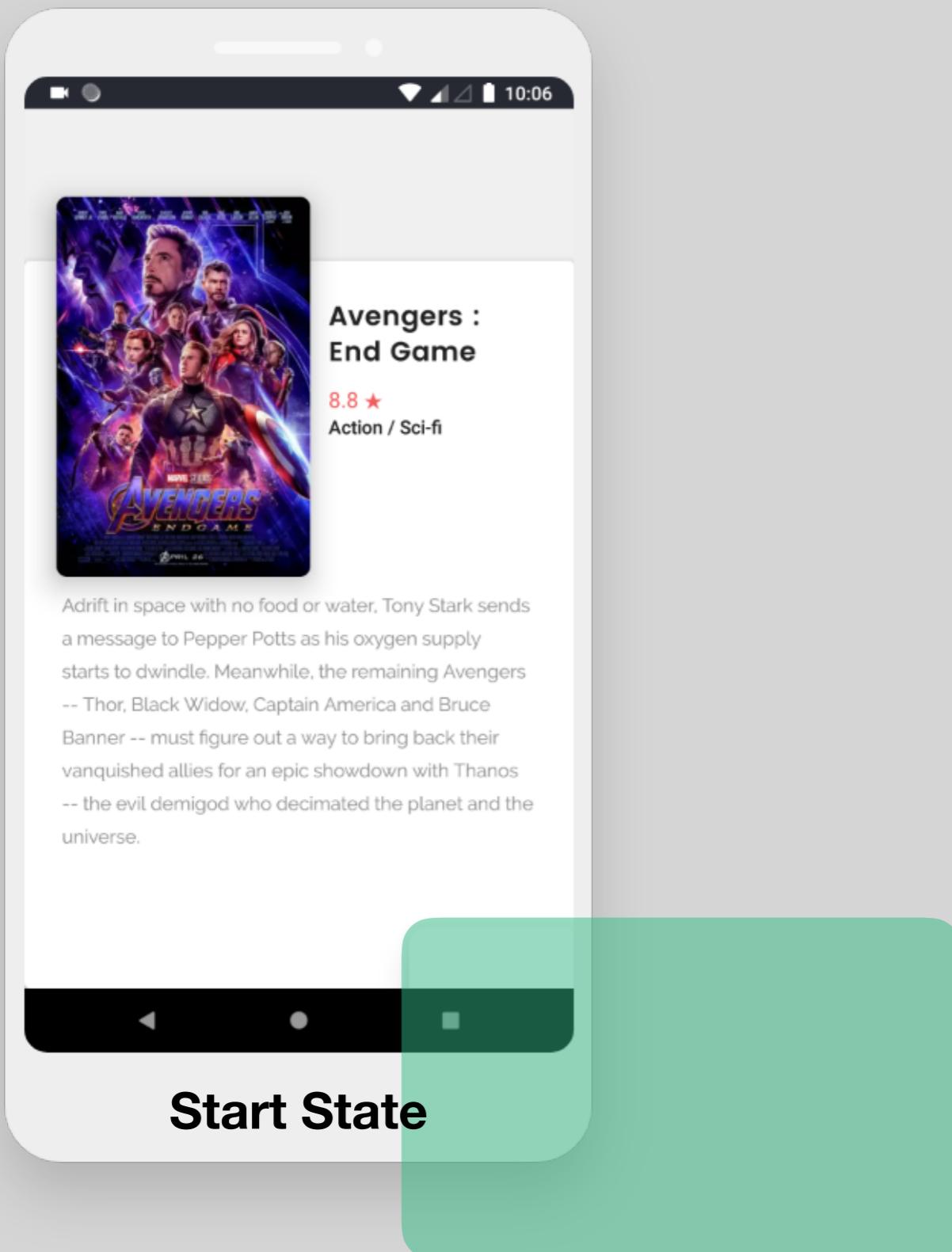
```
<ConstraintSet  
    android:id="@+id/frame_poster_top">  
  
<Constraint android:id="@+id/card_movie_poster">  
    ...  
</Constraint>  
  
<Constraint android:id="@+id/card_movie_info">  
    ...  
</Constraint>  
  
</ConstraintSet>
```

@xml/motion_poster.xml

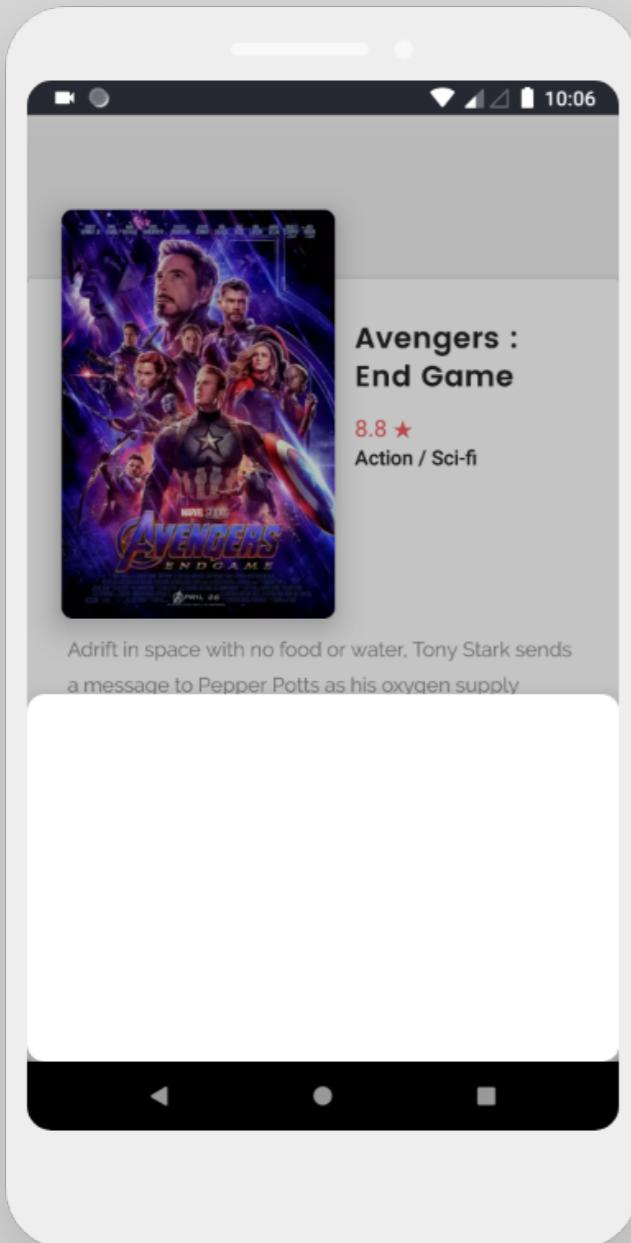
```
<ConstraintSet  
    android:id="@+id/frame_poster_top">  
    <Constraint android:id="@+id/card_movie_poster">  
        ...  
    </Constraint>  
  
    <Constraint android:id="@+id/card_movie_info">  
        ...  
    </Constraint>  
  
<Constraint android:id="@+id/card_more_movies">  
    <Layout  
        android:layout_width="400dp"  
        android:layout_height="128dp"  
        app:layout_constraintTop_toTopOf="@+id/guide_x_93"  
        app:layout_constraintStart_toStartOf="@+id/guide_y_60"  
    />  
    </Constraint>  
  
</ConstraintSet>
```



Card for More Movies



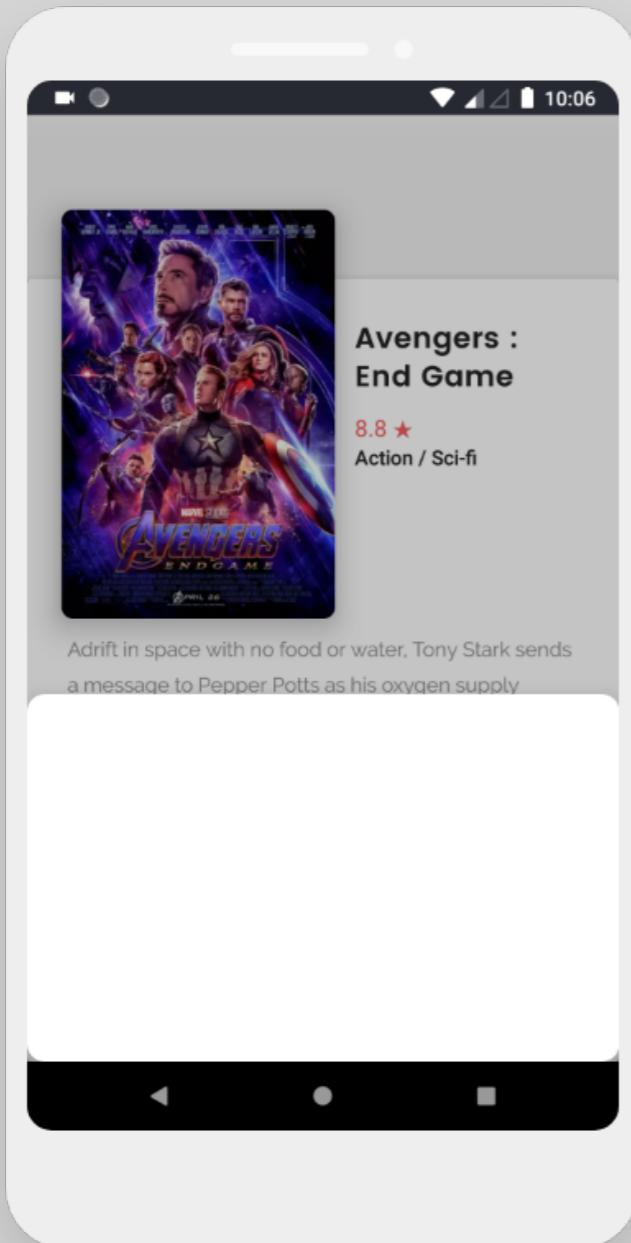
@xml/motion_poster.xml



```
<ConstraintSet  
    android:id="@+id/frame_more_movies_expanded">  
  
</ConstraintSet>
```

End State

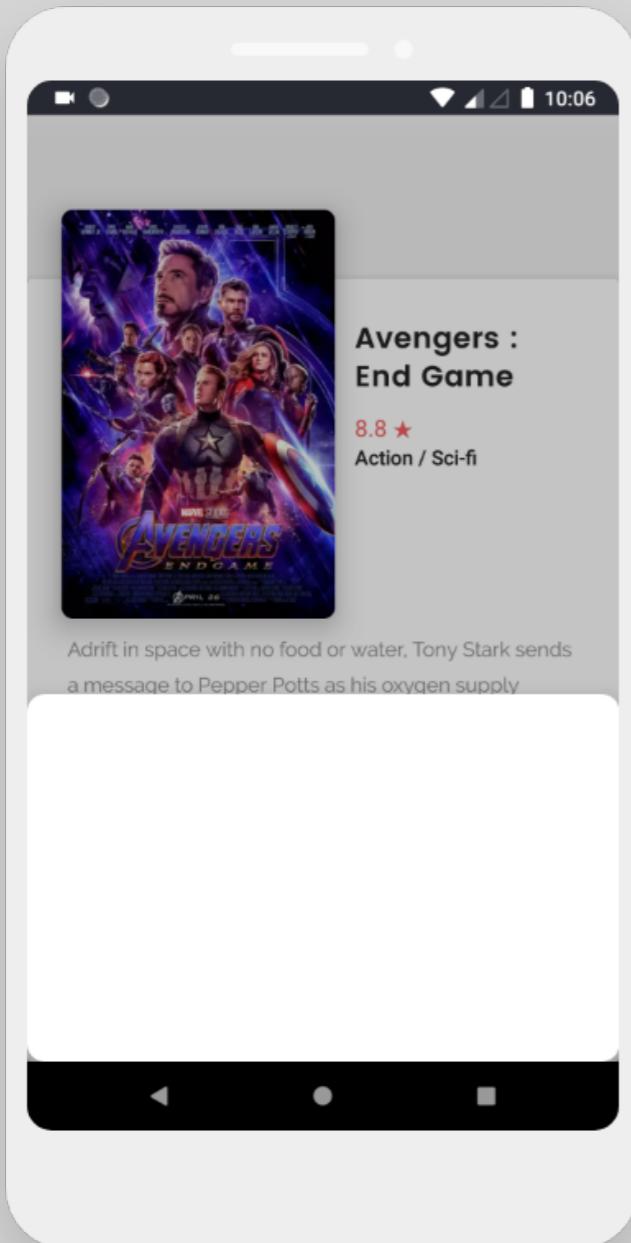
@xml/motion_poster.xml



```
<ConstraintSet  
    app:deriveConstraintsFrom="@+id/frame_poster_top"  
    android:id="@+id/frame_more_movies_expanded">  
  
</ConstraintSet>
```

End State

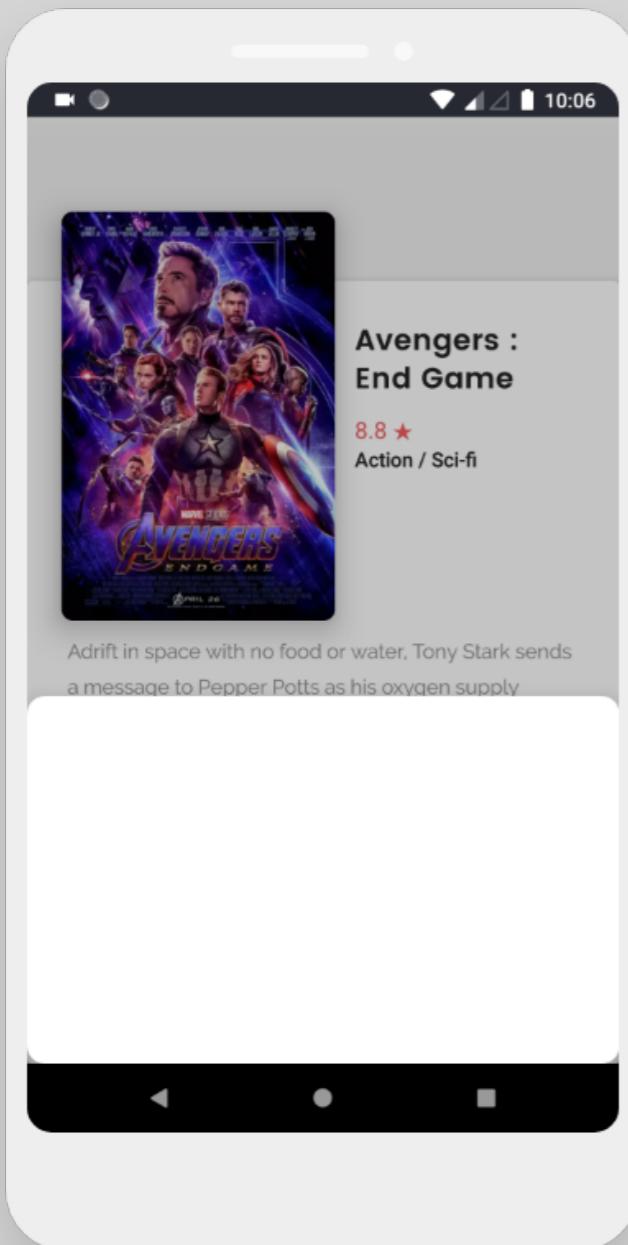
@xml/motion_poster.xml



```
<ConstraintSet  
    app:deriveConstraintsFrom="@+id/frame_poster_top"  
    android:id="@+id/frame_more_movies_expanded">  
  
    <Constraint android:id="@+id/card_more_movies">  
  
    </Constraint>  
  
</ConstraintSet>
```

End State

@xml/motion_poster.xml



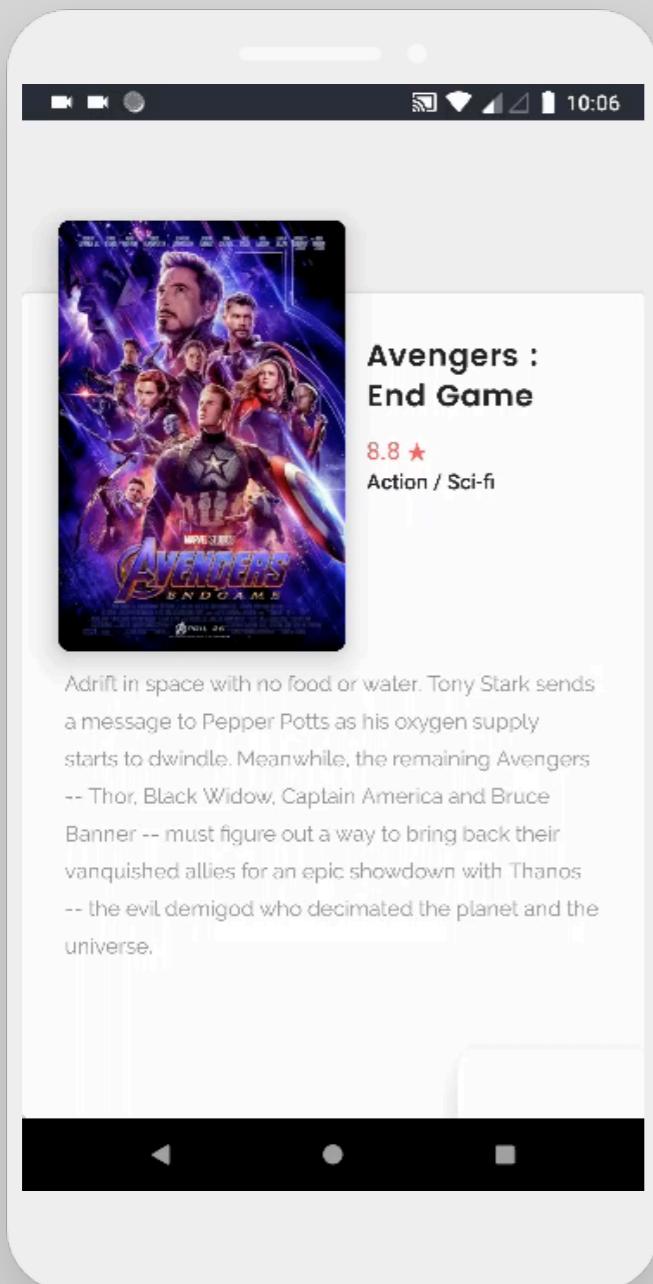
```
<ConstraintSet
    app:deriveConstraintsFrom="@+id/frame_poster_top"
    android:id="@+id/frame_more_movies_expanded">

    <Constraint android:id="@+id/card_more_movies">
        <Layout
            app:layout_constraintBottom_toBottomOf="parent"
            android:layout_width="match_parent"
            android:layout_height="224dp"
        />
    </Constraint>

</ConstraintSet>
```

End State

@xml/motion_poster.xml



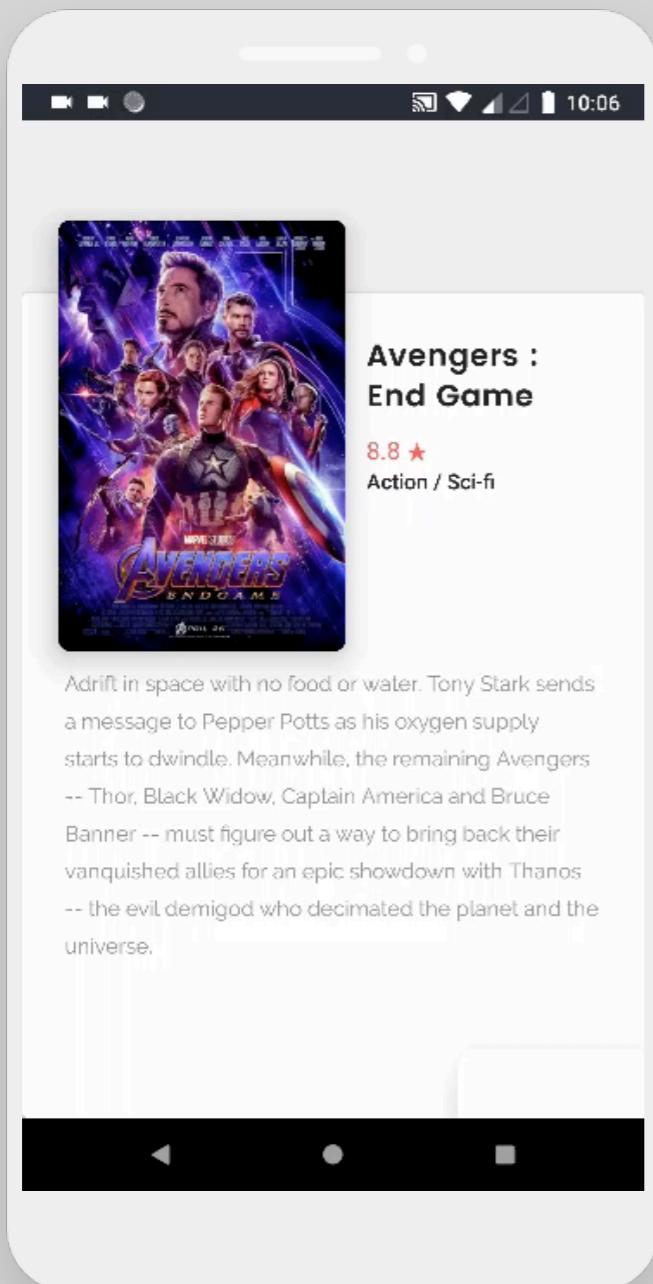
End State

<Transition

```
    android:id="@+id/transition_more_movies"
    app:constraintSetEnd="@+id/frame_more_movies_expanded"
    app:constraintSetStart="@+id/frame_poster_top">
```

</Transition>

@xml/motion_poster.xml



<Transition

```
    android:id="@+id/transition_more_movies"
    app:constraintSetEnd="@+id/frame_more_movies_expanded"
    app:constraintSetStart="@+id/frame_poster_top">
```

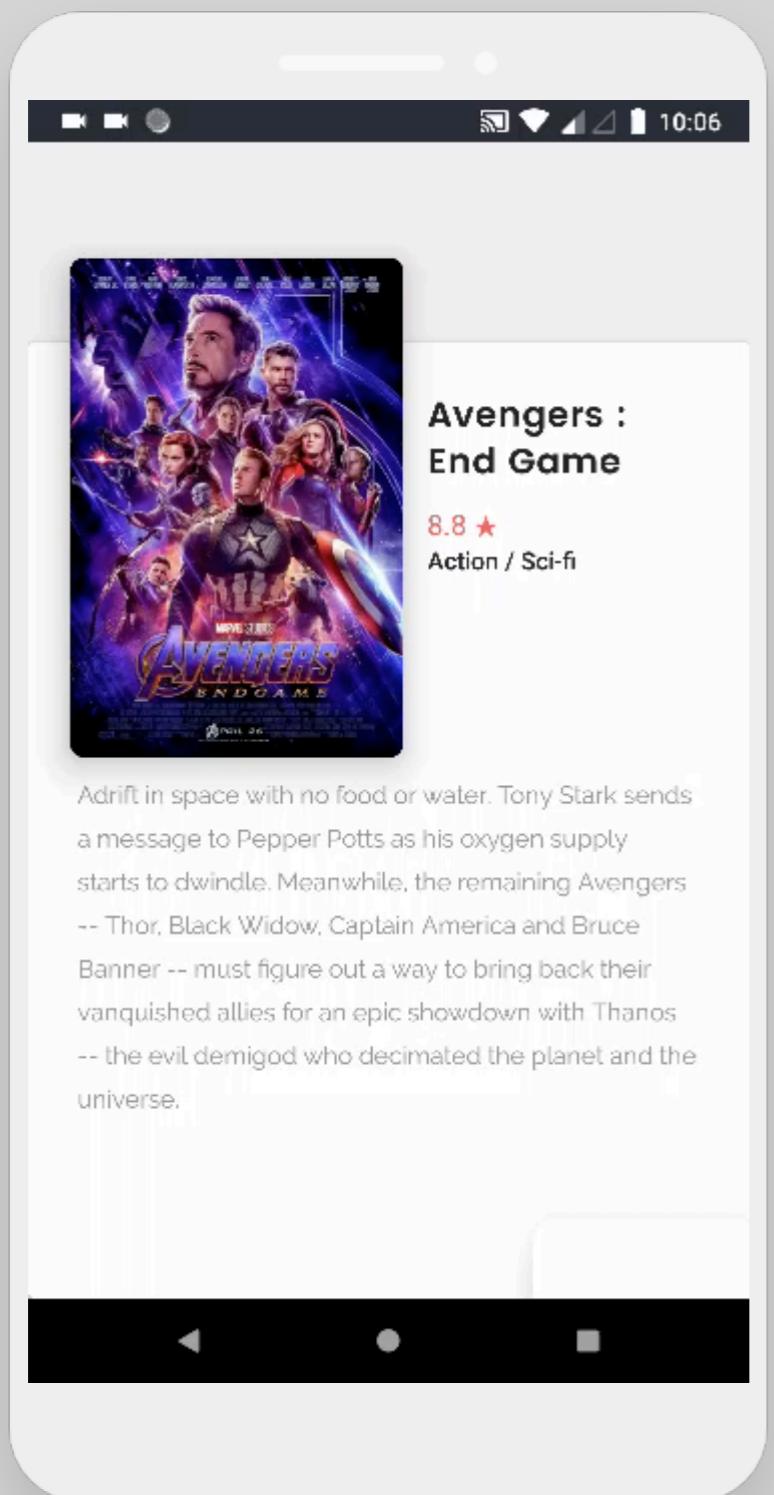
<OnSwipe

```
    app:dragDirection="dragUp"
    app:touchRegionId="@+id/card_more_movies"
    app:touchAnchorId="@+id/card_more_movies"/>
```

</Transition>

Transition

Card for More Movies

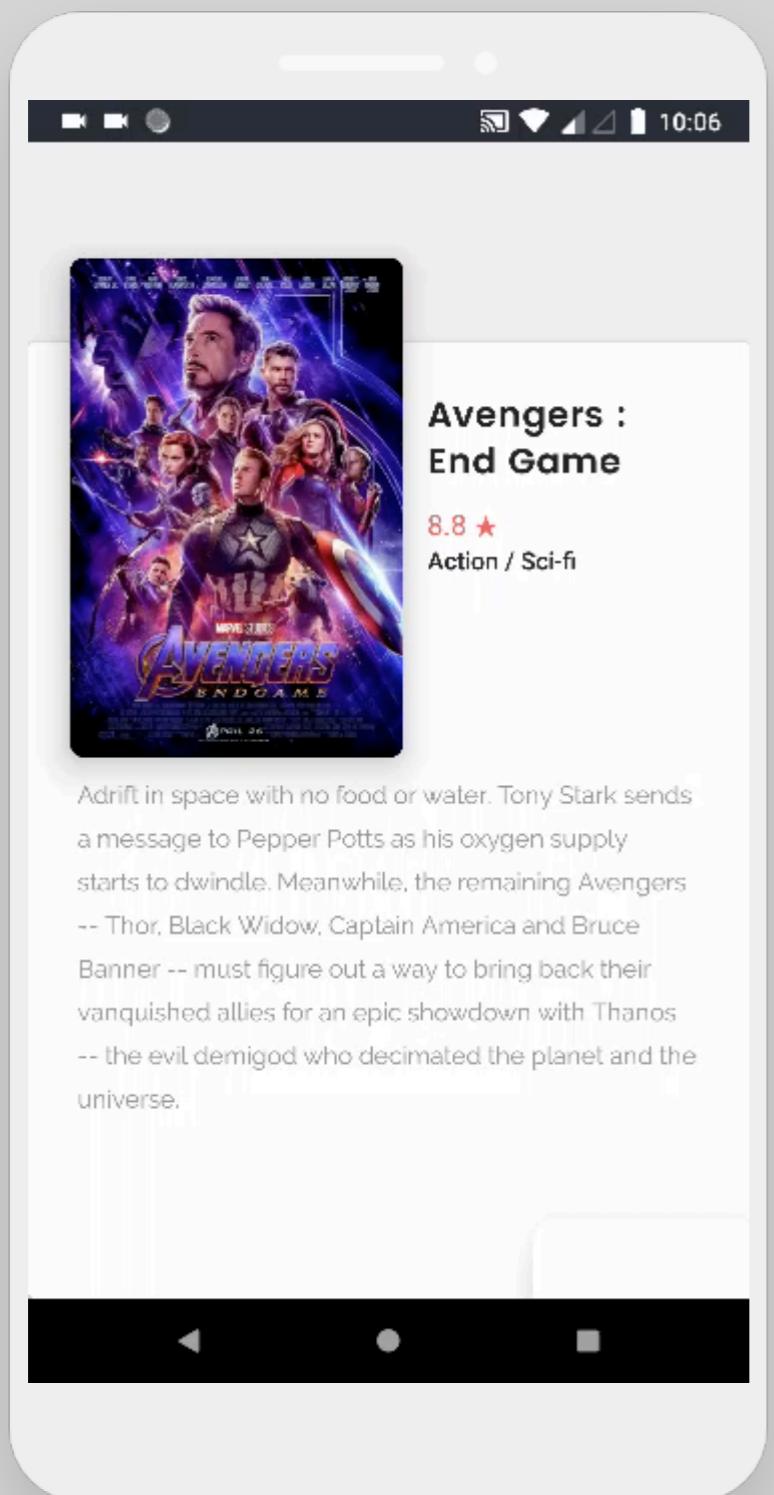


**Avengers :
End Game**

8.8 ★
Action / Sci-fi

Adrift in space with no food or water, Tony Stark sends a message to Pepper Potts as his oxygen supply starts to dwindle. Meanwhile, the remaining Avengers -- Thor, Black Widow, Captain America and Bruce Banner -- must figure out a way to bring back their vanquished allies for an epic showdown with Thanos -- the evil demigod who decimated the planet and the universe.

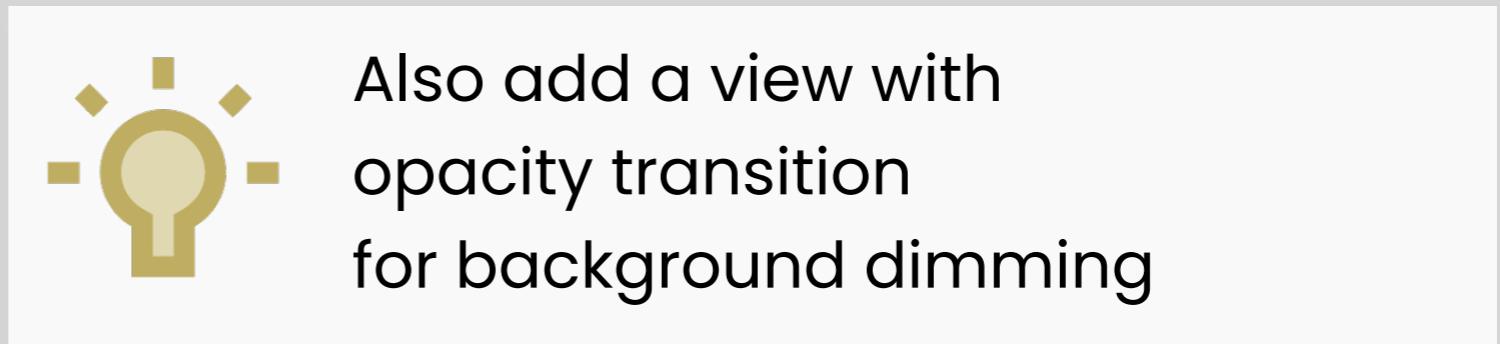
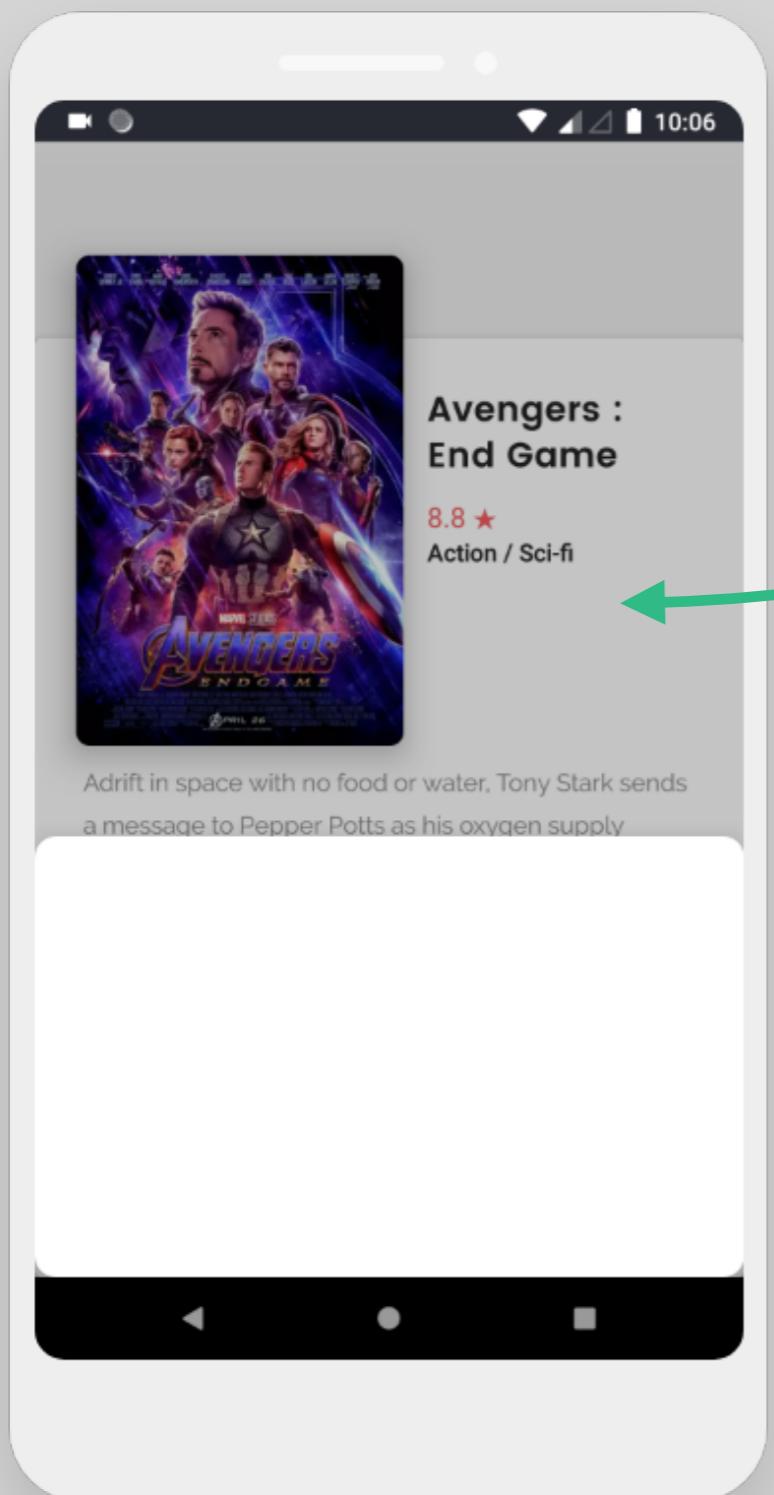
Card for More Movies



Add CardView to `layout_poster.xml`
+ Modify `motion_poster.xml`



Card for More Movies

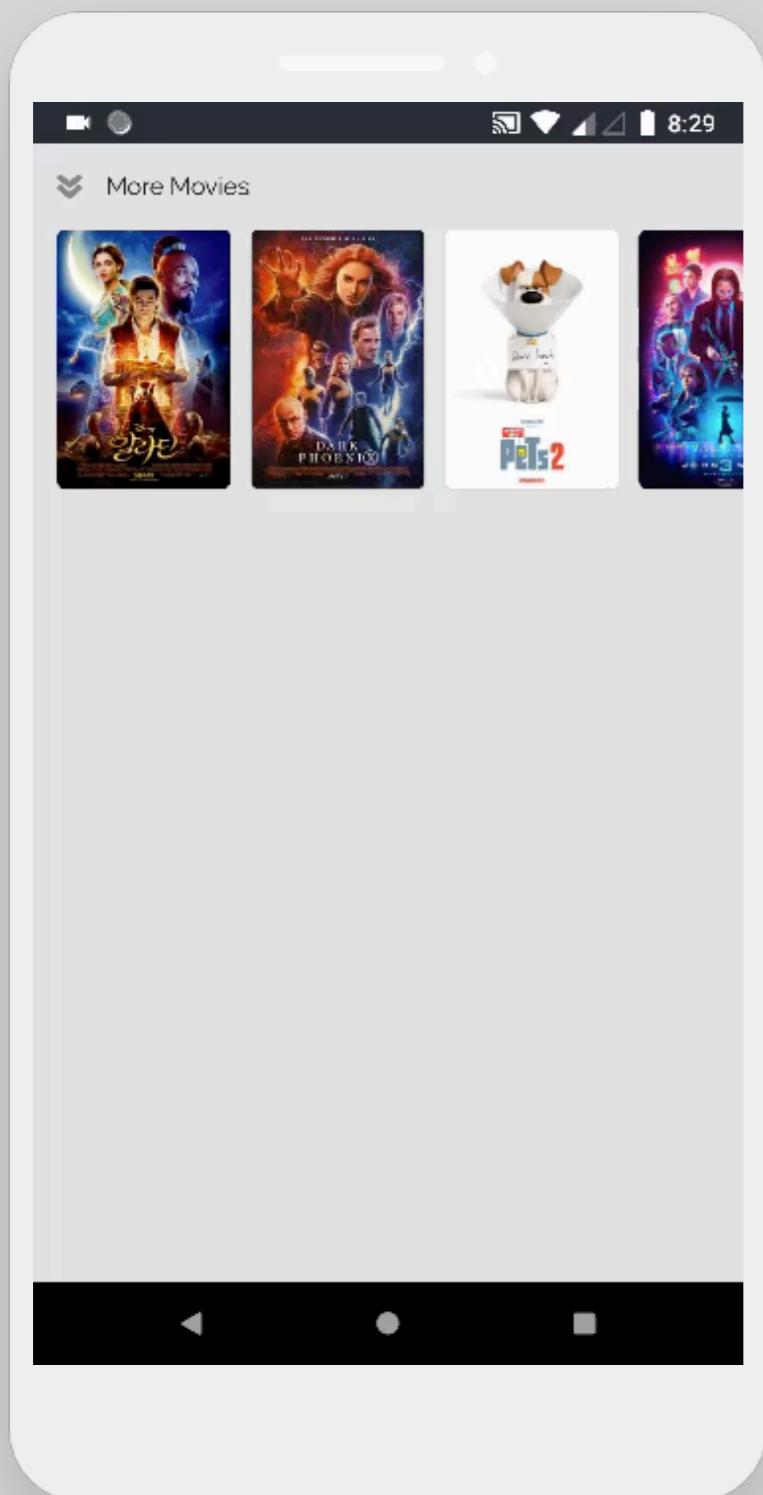


Also add a view with
opacity transition
for background dimming

Add CardView to `layout_poster.xml`
+ Modify `motion_poster.xml`



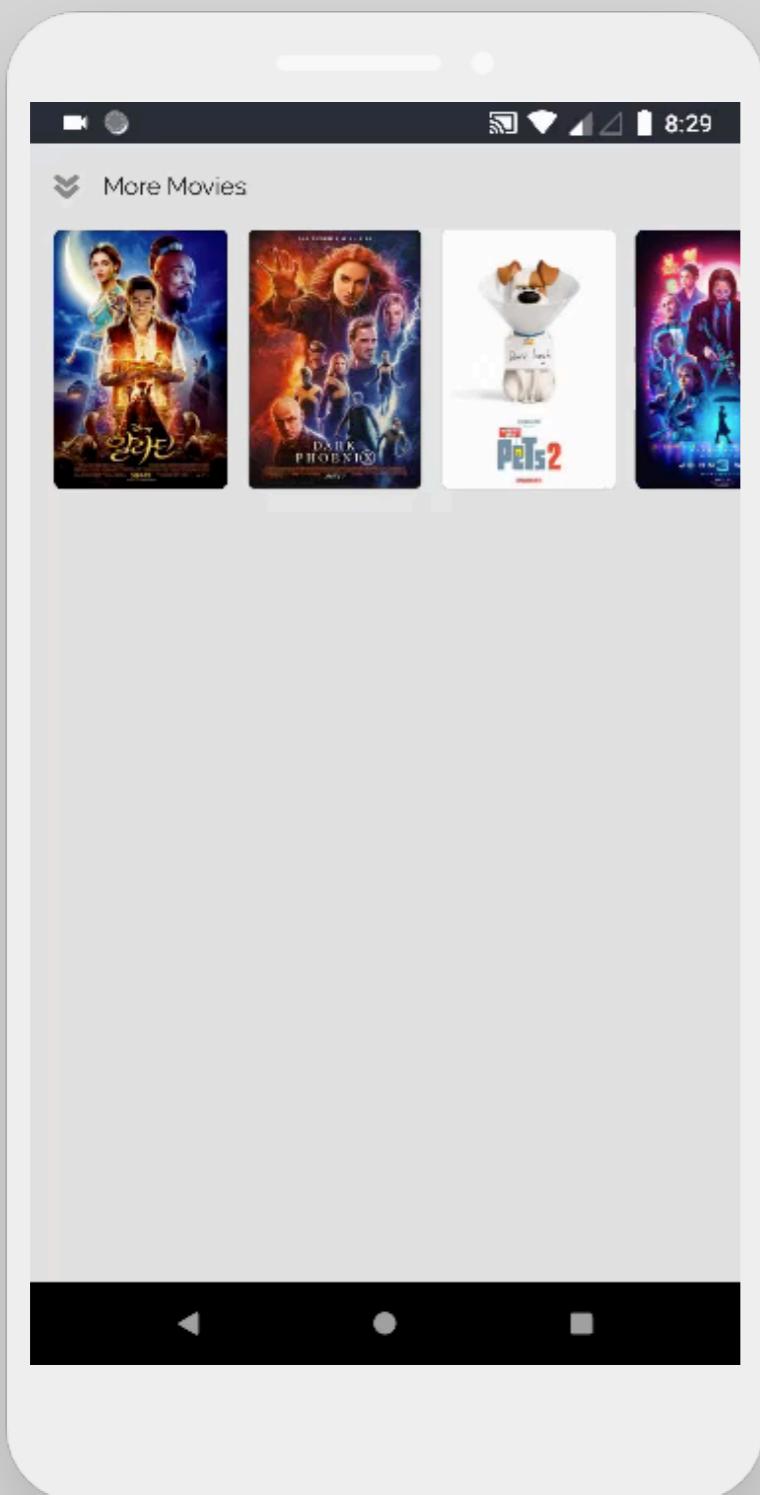
More Movies



@layout/layout_more_movies.xml

@motion/motion_more_movies.xml

@layout/layout_more_movies.xml

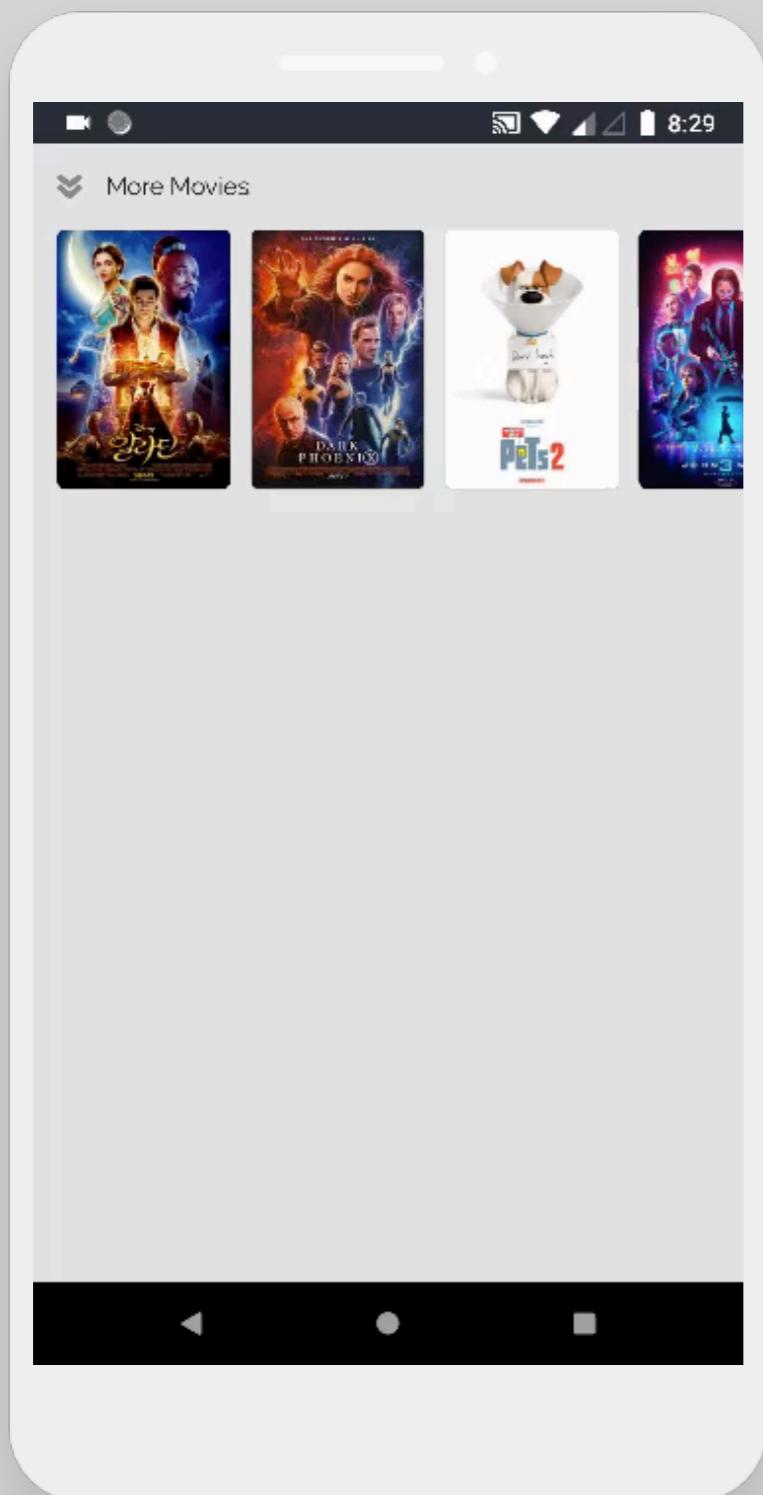


```
<ImageView android:id="@+id/image_arrow"
    ... />

<TextView android:id="@+id/text_more_movies"
    ... />

<androidx.recyclerview.widget.RecyclerView
    android:id="@+id/rv_more_movies"
    ... />
```

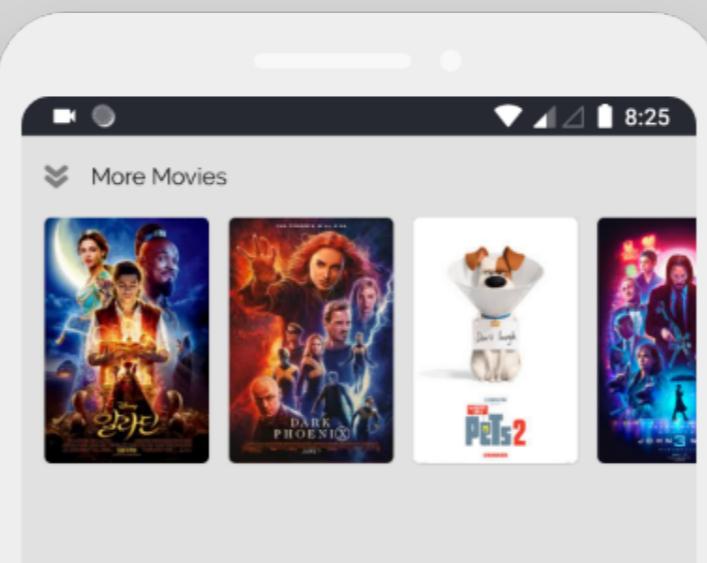
More Movies



@layout/layout_more_movies.xml ✓

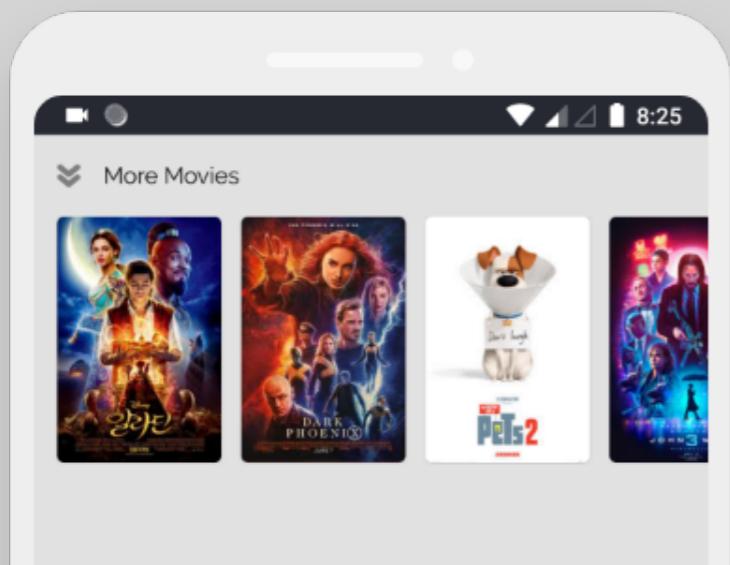
@motion/motion_more_movies.xml

@motion/motion_more_movies.xml



more_movies_expanded
[End State]

@motion/motion_more_movies.xml



more_movies_expanded
[End State]

<MotionScene>

<Transition

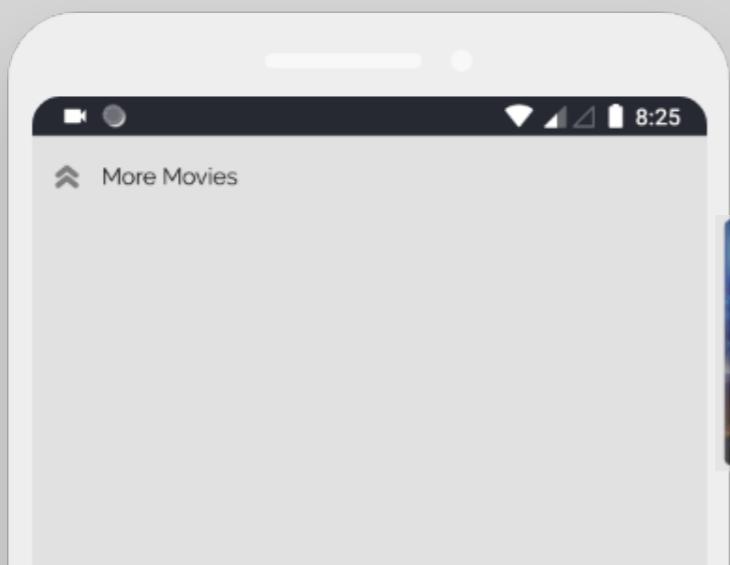
 android:id="@+id/transition" />

<ConstraintSet

 android:id="@+id/more_movies_collapsed" />

<ConstraintSet

 android:id="@+id/more_movies_expanded" />

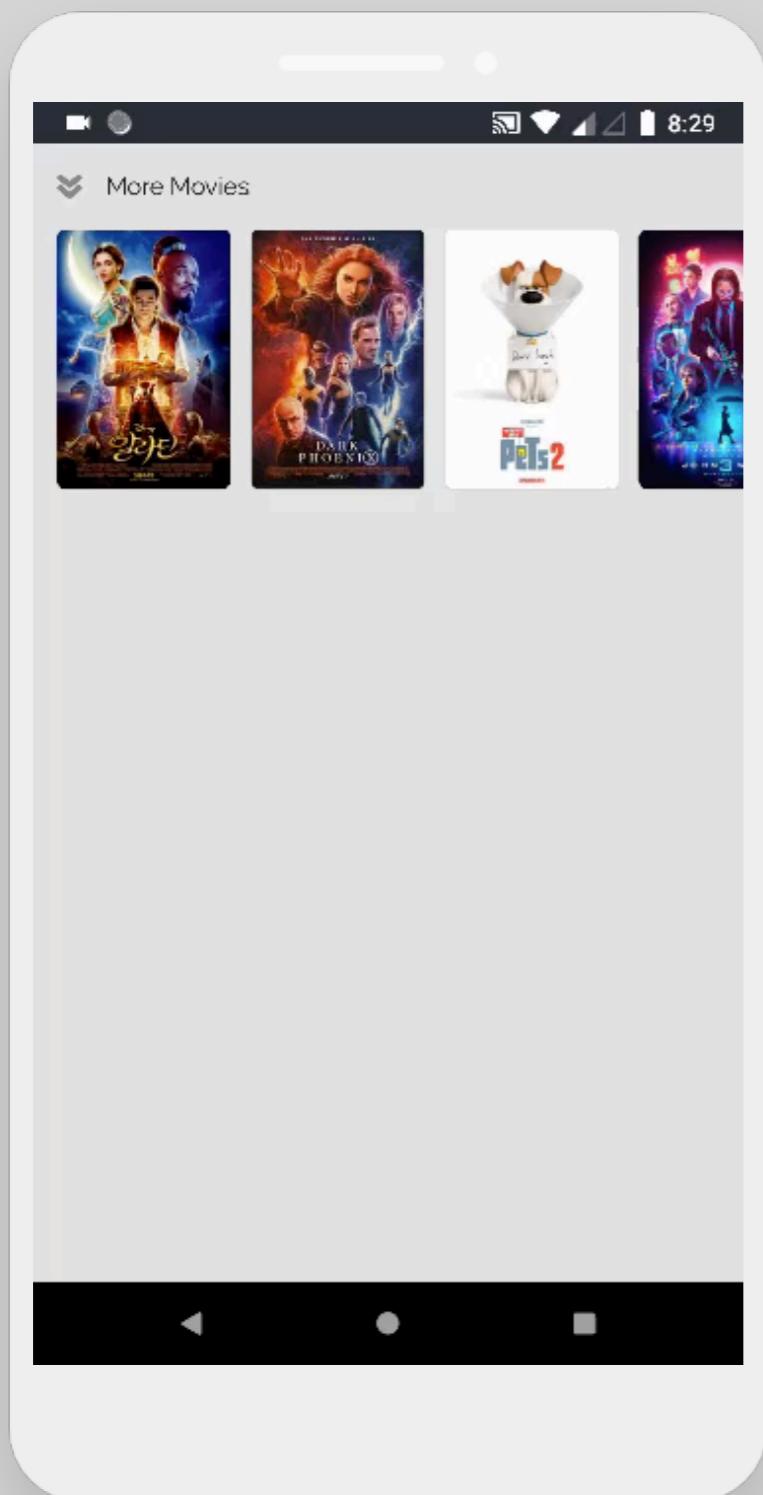


more_movies_collapsed
[Start State]

</MotionScene>



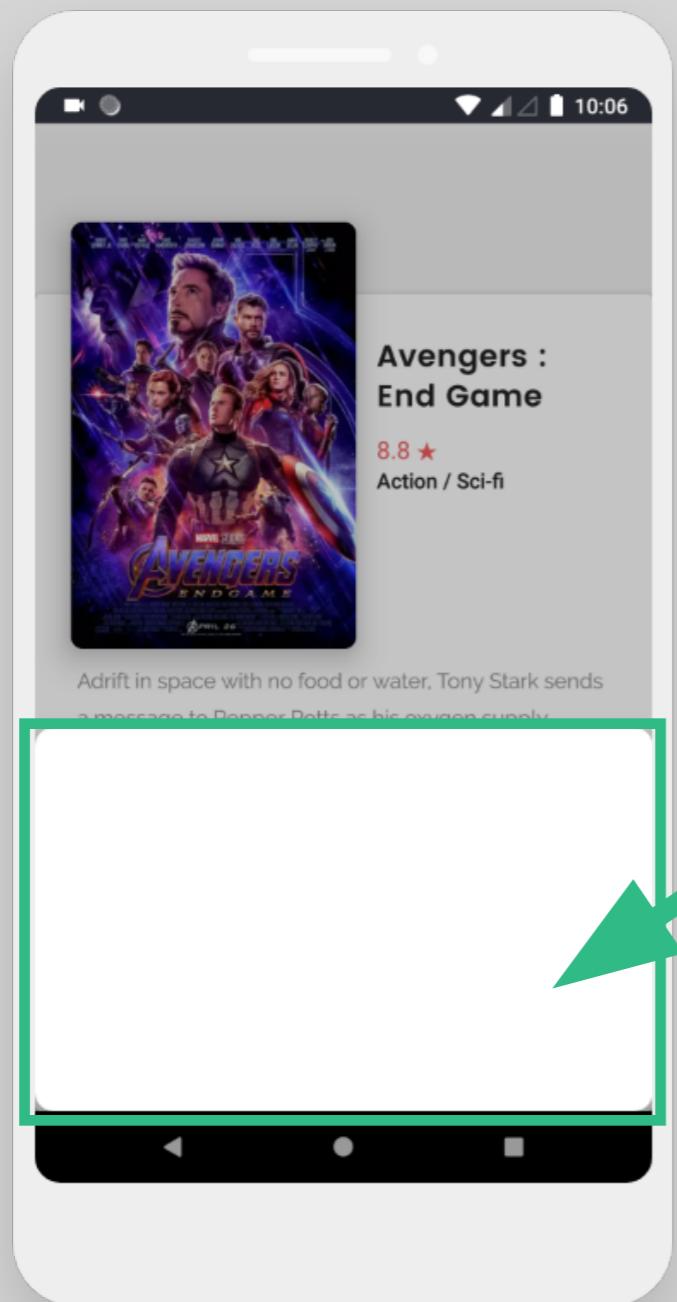
More Movies



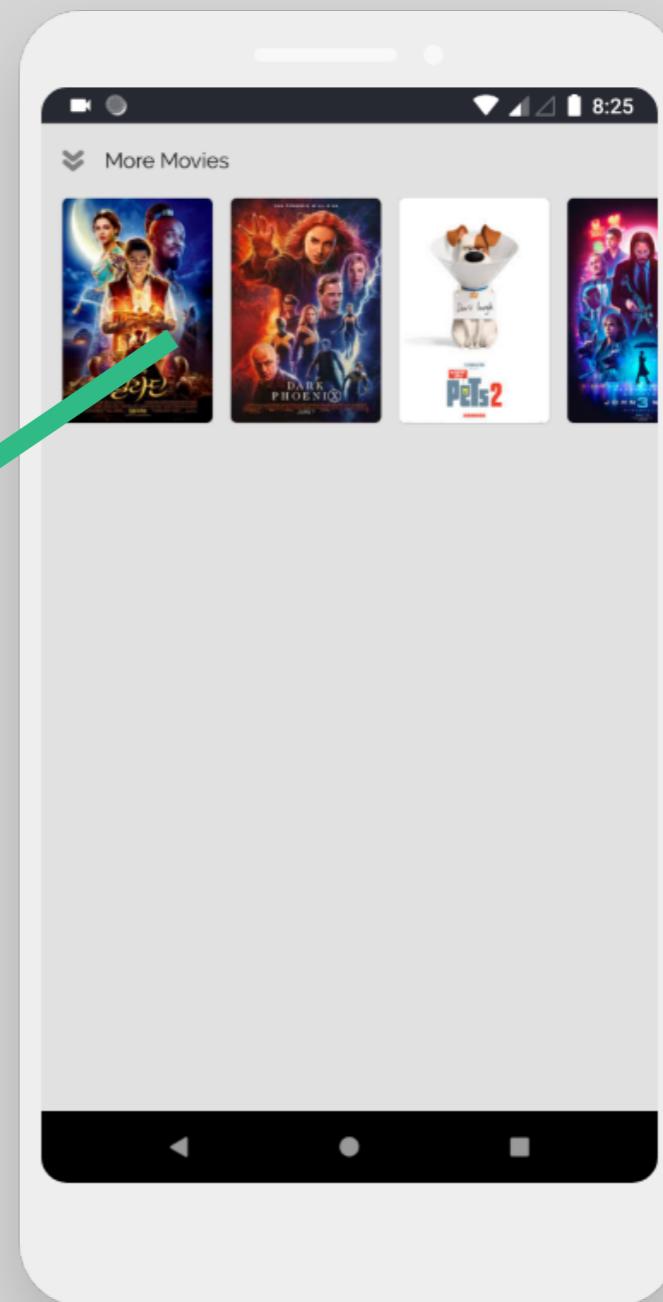
@layout/layout_more_movies.xml ✓

@motion/motion_more_movies.xml ✓

Combine More Movies to UI

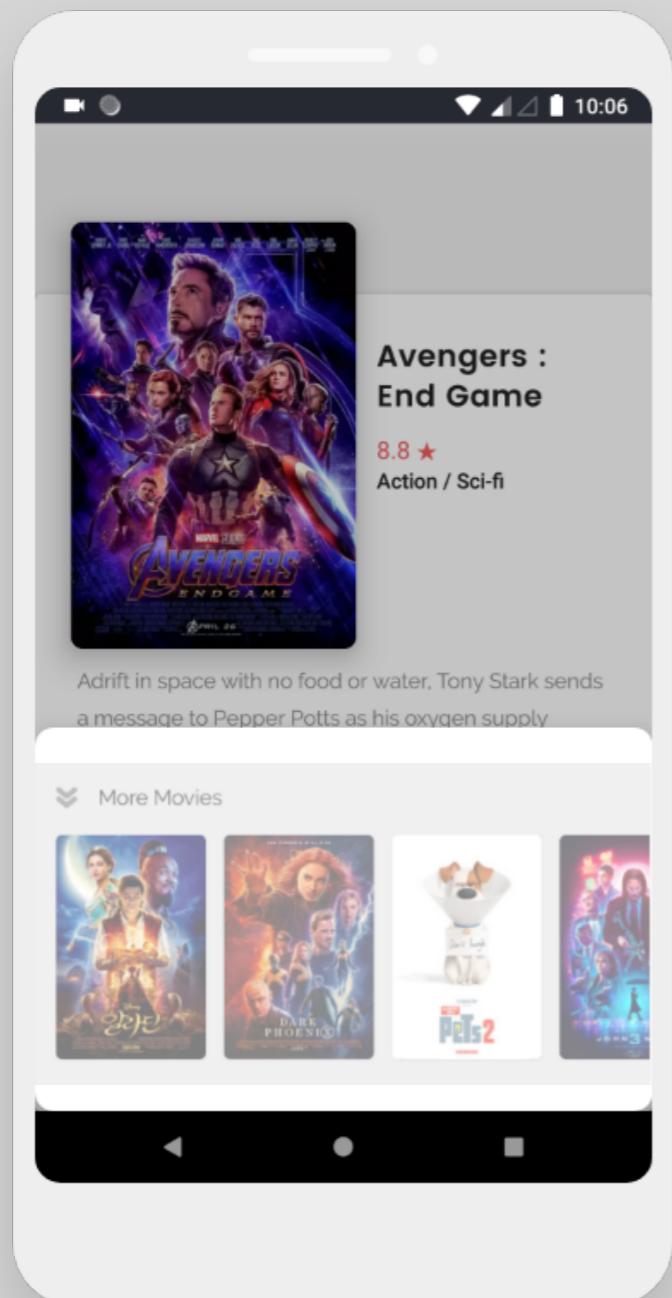


@layout/layout_poster.xml



@layout/layout_more_movies.xml

Combine more movies



```
<com.google.android.material.card.MaterialCardView  
    android:id="@+id/card_more_movies" >  
  
    <include layout="@layout/layout_more_movies"/>  
  
</com.google.android.material.card.MaterialCardView>
```

@layout/layout_poster.xml

Combine more movies

Passing progress to child layout

PosterActivity.kt

```
motionLayoutPoster.setTransitionListener(object : TransitionListener {  
    override fun onTransitionChange(  
        motionLayout: MotionLayout?,  
        startState: Int,  
        endState: Int,  
        progress: Float  
    ) {  
        . . .  
        if(motionLayout?.startState == R.id.frame_poster_top &&  
            motionLayout.endState == R.id.frame_more_movies_expanded){  
  
        }  
    }  
    . . .  
})
```

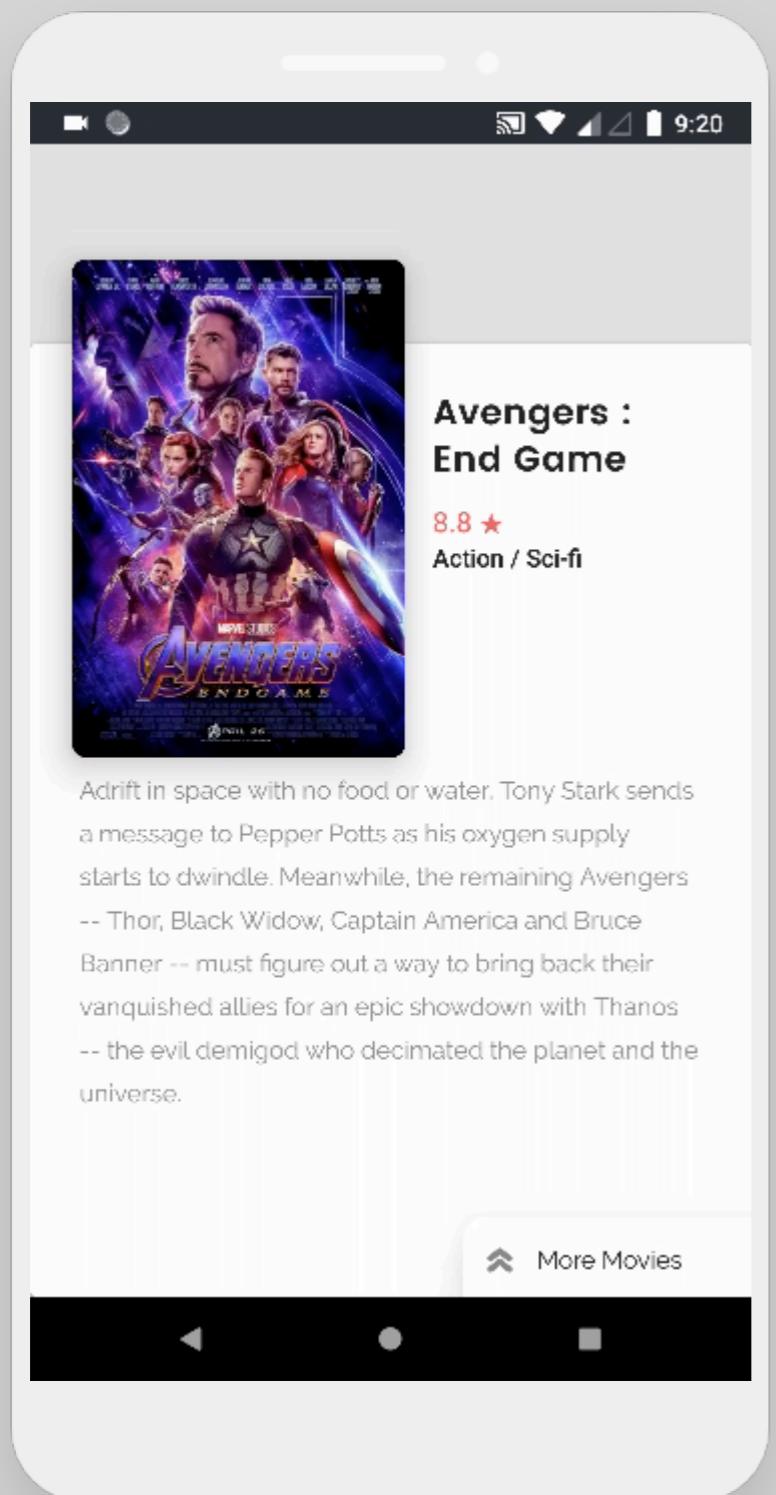
Combine more movies

Passing progress to child layout

PosterActivity.kt

```
motionLayoutPoster.setTransitionListener(object : TransitionListener {  
    override fun onTransitionChange(  
        motionLayout: MotionLayout?,  
        startState: Int,  
        endState: Int,  
        progress: Float  
    ) {  
        . . .  
        if(motionLayout?.startState == R.id.frame_poster_top &&  
            motionLayout.endState == R.id.frame_more_movies_expanded){  
            motion_layout_more_movies.progress = progress  
        }  
    }  
    . . .  
})
```

Finished : More Movies



Recap

@layout/layout_movie_info.xml

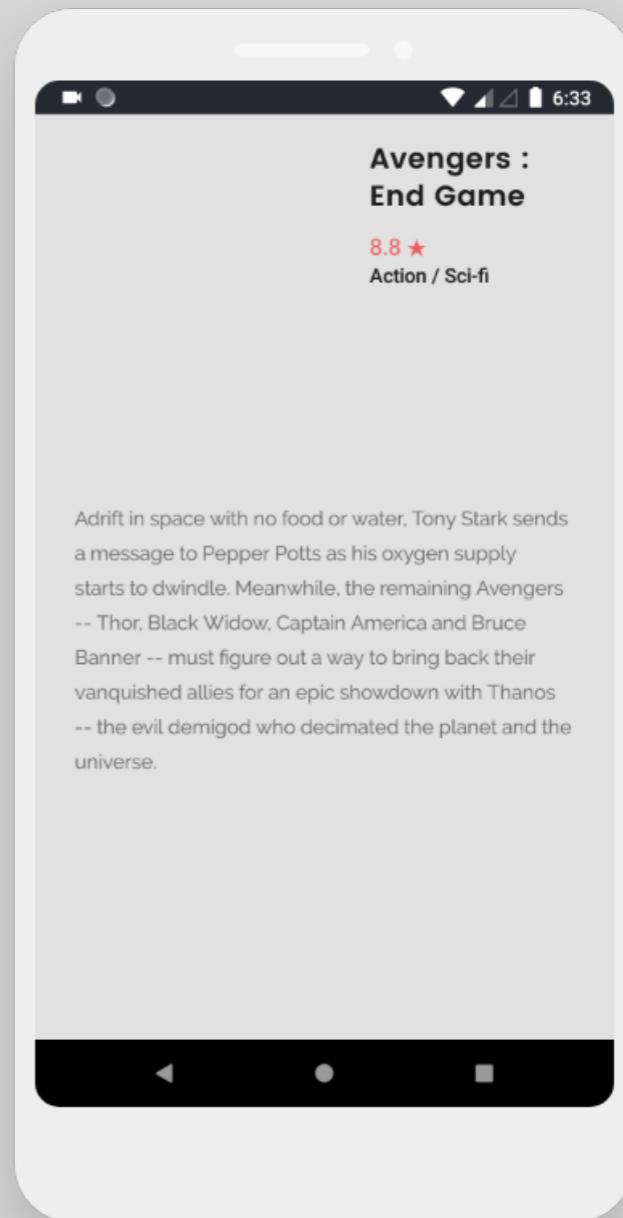
@xml/motion_movie_info.xml

@layout/layout_more_movies.xml

@xml/motion_more_movies.xml

@layout/layout_poster.xml

@xml/motion_poster.xml



Recap

@layout/layout_movie_info.xml

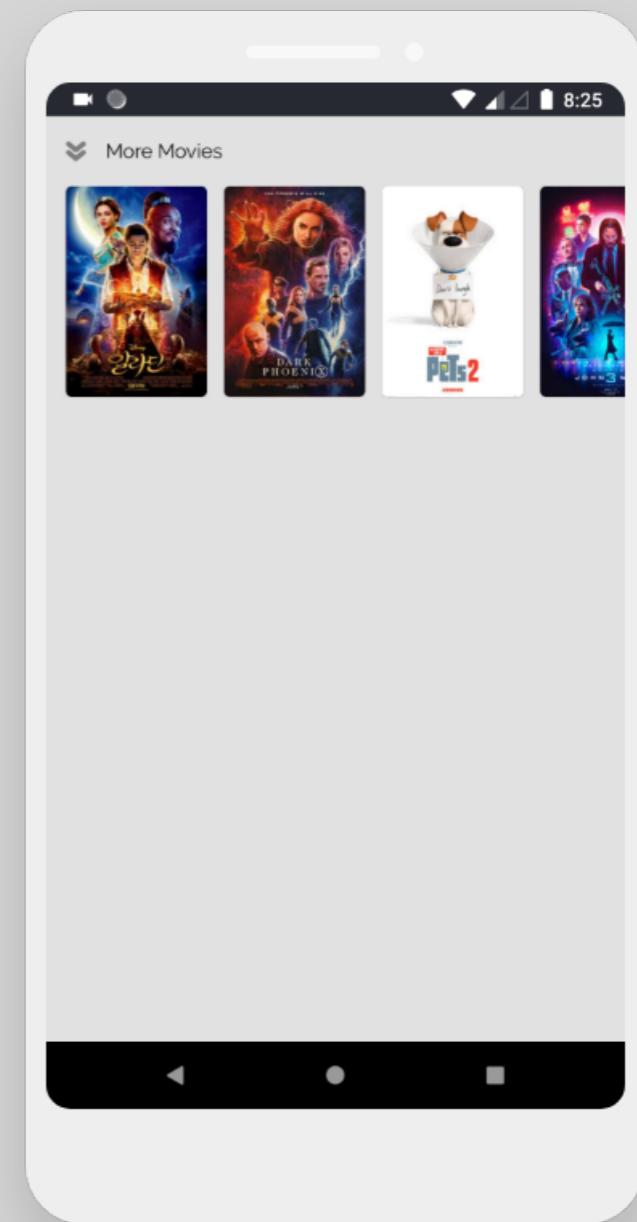
@xml/motion_movie_info.xml

@layout/layout_more_movies.xml

@xml/motion_more_movies.xml

@layout/layout_poster.xml

@xml/motion_poster.xml



Recap

@layout/layout_movie_info.xml

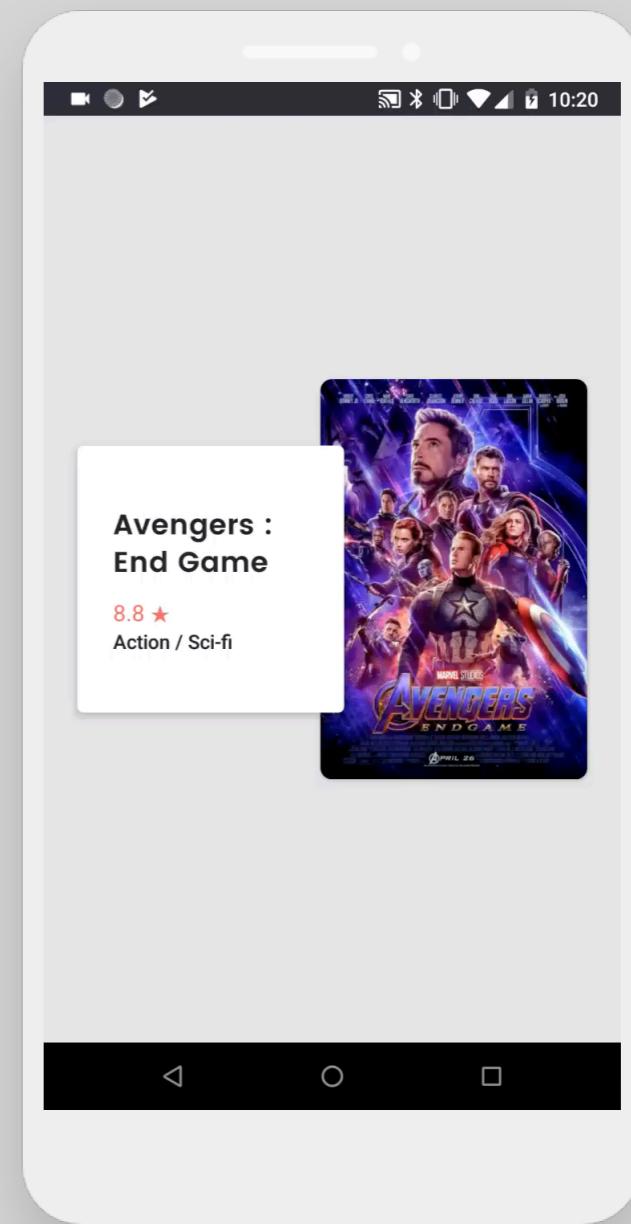
@xml/motion_movie_info.xml

@layout/layout_more_movies.xml

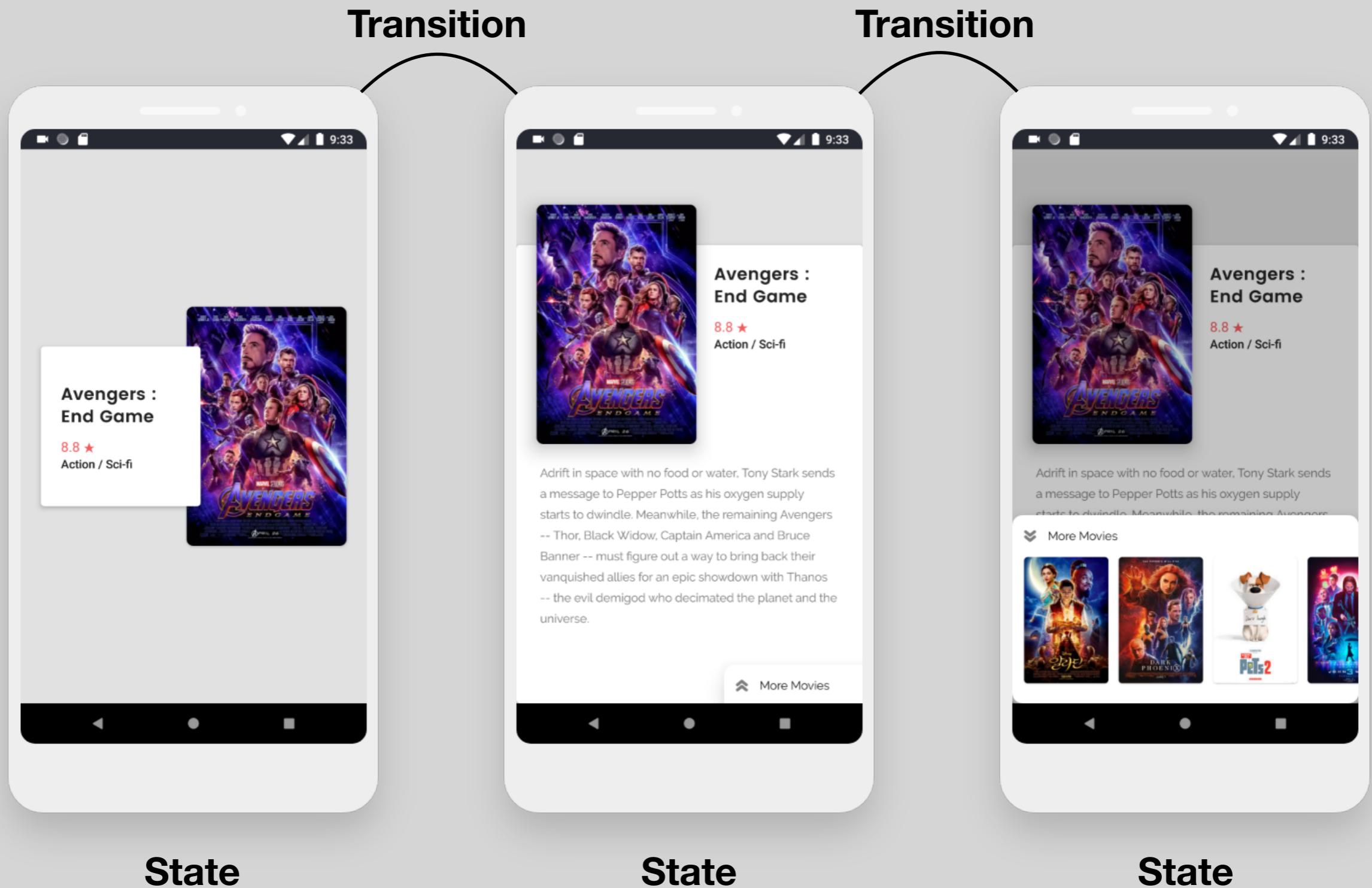
@xml/motion_more_movies.xml

@layout/layout_poster.xml

@xml/motion_poster.xml



@xml/motion_poster.xml



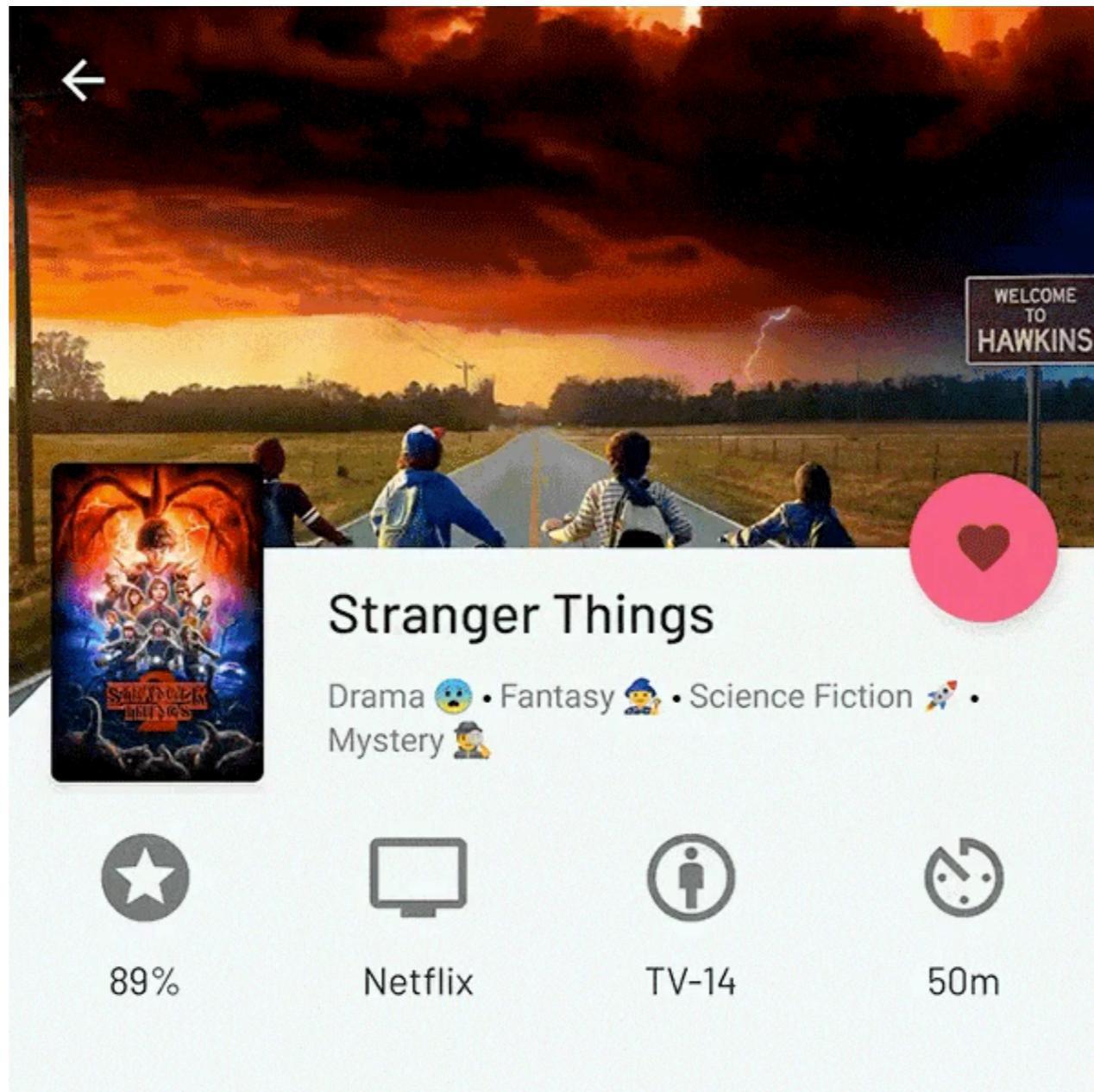
**Avengers :
End Game**

8.8 ★

Action / Sci-fi

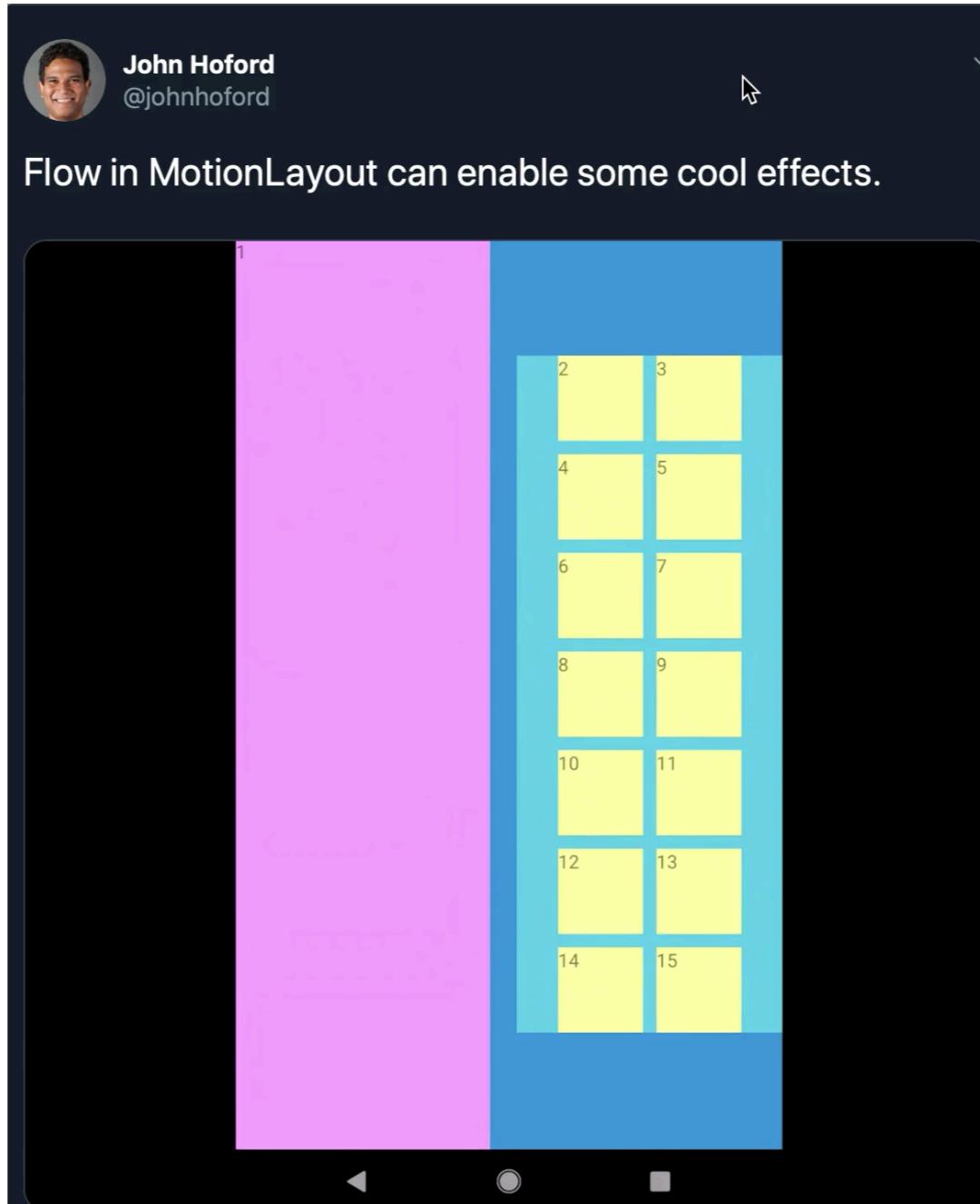


Some Examples



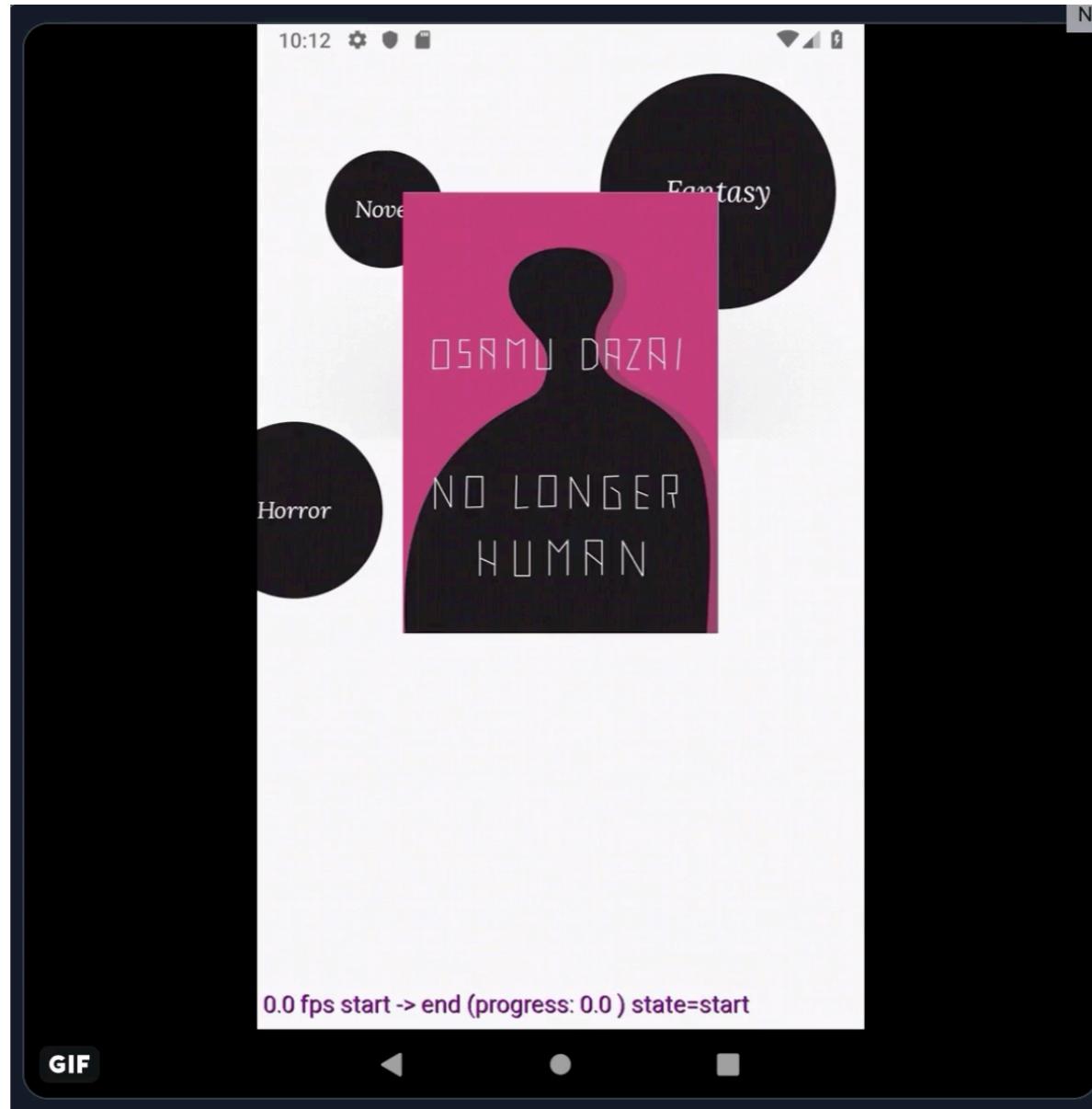
By @chrisbanes

Some Examples



By @johnhoford

Some Examples



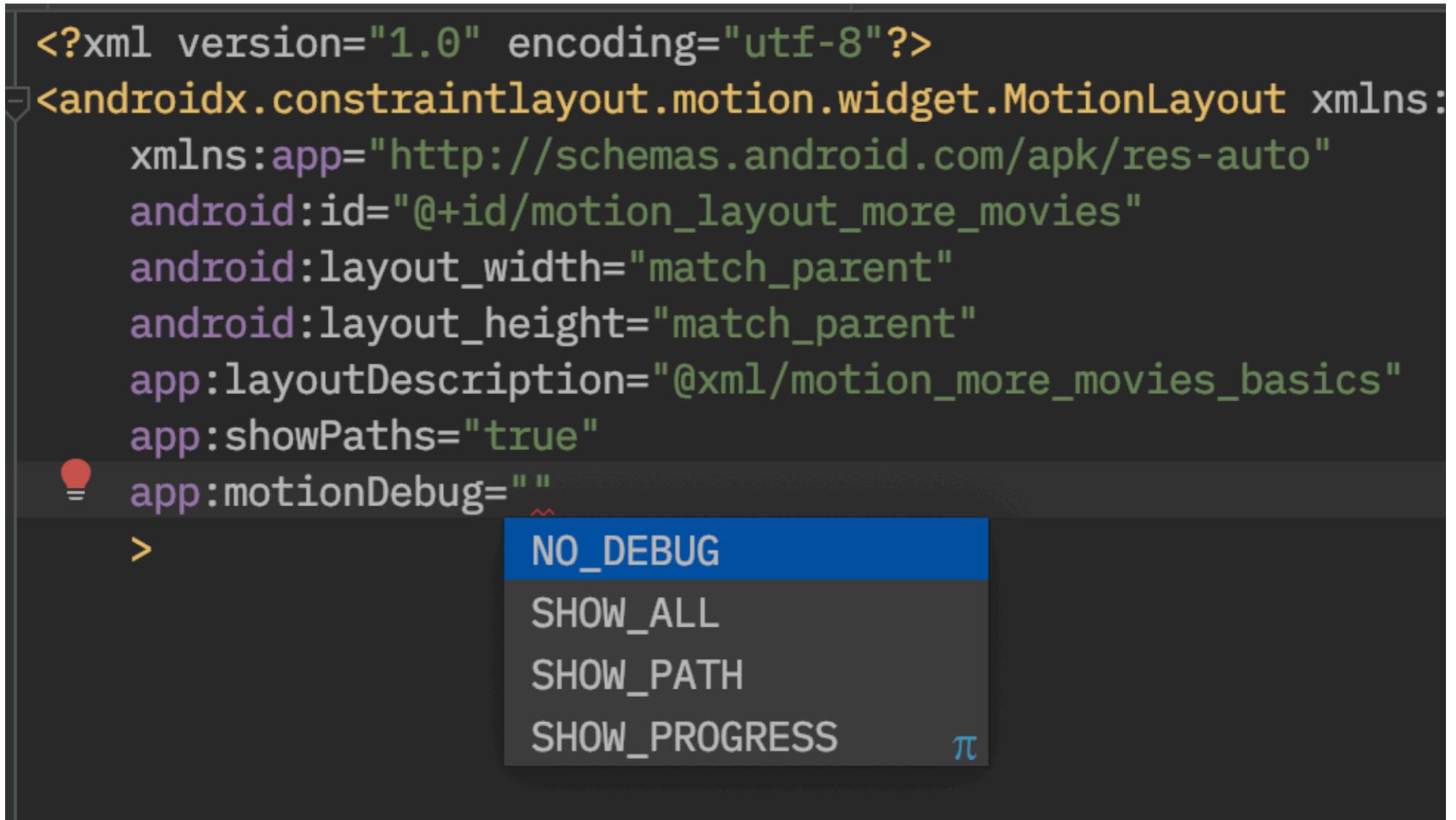
By @MikeScamell

Tips #1

Debugging Motion Layout

Tips #1

Debugging Motion Layout



A screenshot of an Android Studio XML editor showing a context menu for the `app:motionDebug` attribute. The XML code is as follows:

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.motion.widget.MotionLayout xmlns:android="http://schemas.android.com/apk/res-auto"
    android:id="@+id/motion_layout_more_movies"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    app:layoutDescription="@xml/motion_more_movies_basics"
    app:showPaths="true"
    app:motionDebug="">
```

The context menu is open at the end of the `app:motionDebug` attribute value, showing the following options:

- NO_DEBUG
- SHOW_ALL
- SHOW_PATH
- SHOW_PROGRESS

Tips #2

Slow down transition

Tips #2

Slow down transition

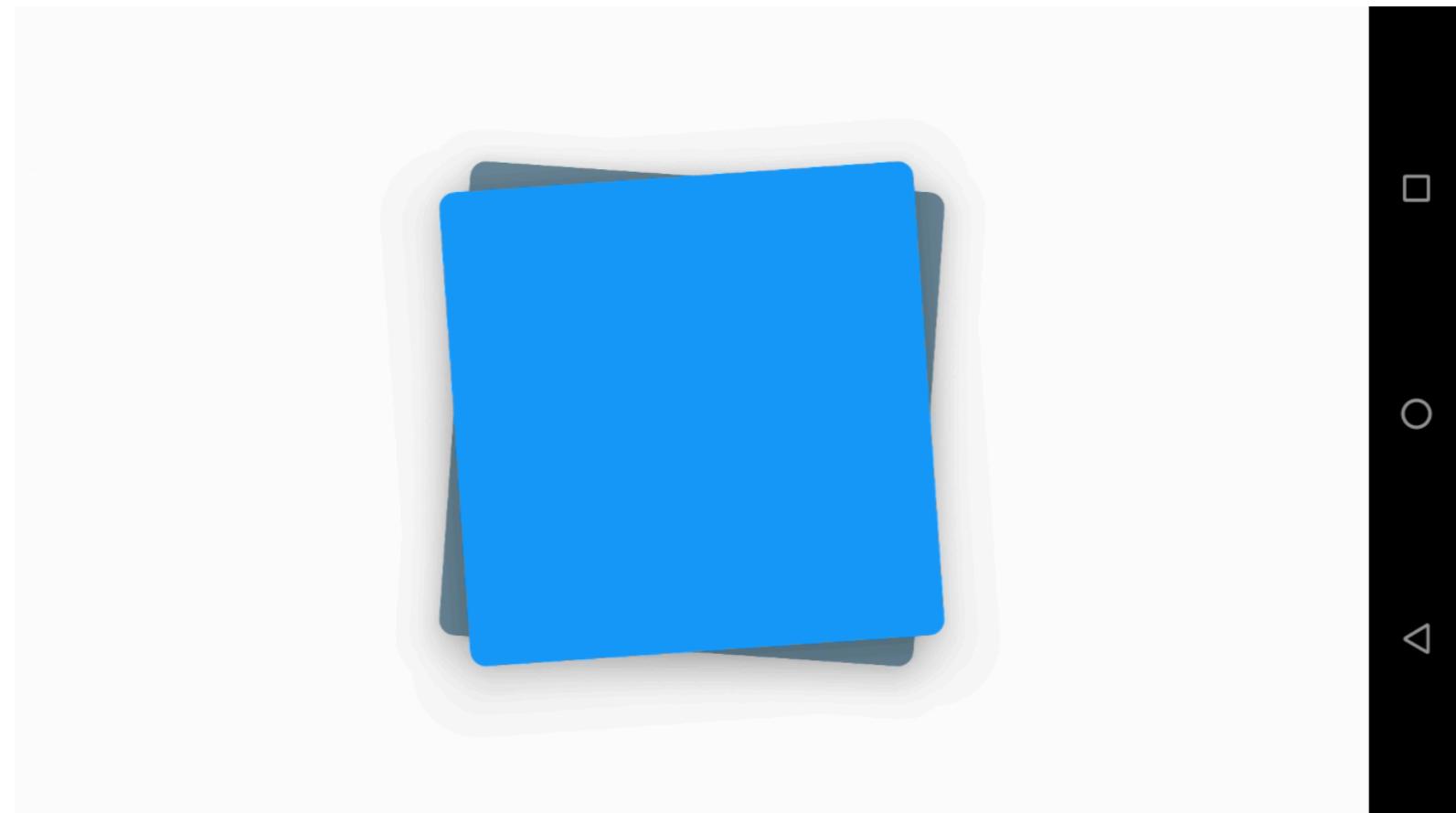
```
<Transition  
    android:id="@+id/transition"  
    app:duration="5000"  
    app:constraintSetEnd="@+id/more_movies_expanded"  
    app:constraintSetStart="@+id/more_movies_collapsed">
```

Tips #3

Programmatic API

Tips #3

Programmatic API



<https://developer.android.com/reference/android/support/constraint/motion/MotionLayout.html#public-methods>

Steps to learn Motion Layout

- 1. Learn Constraint Layout**
- 2. Find UI inspiration**
- 3. Make experiments with Motion Layout**

- 4. Draw your own design [Optional]**



Figma



Adobe XD

- 5. Add transitions [Optional]**



Adobe XD

Add Motion Layout to the app

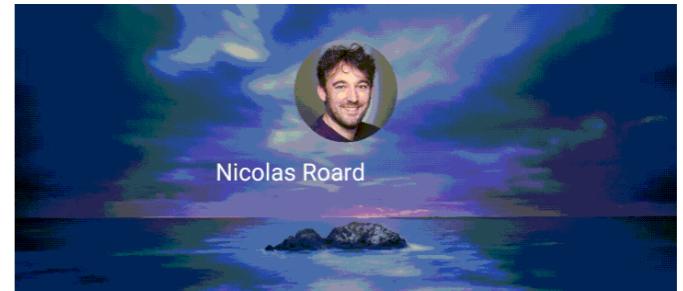
androidx.constraintlayout:constraintlayout:2.0.0-beta2

Add Motion Layout to the app

1. Define frames, UI components
2. Define motions
3. Collaborate with designers
4. Implement
5. Polish

Refactor existing animation to Motion Layout

1. Collapsing Toolbar



Material is the metaphor.

A material metaphor is the unifying theory of a rationalized space and a system of motion. The material is grounded in tactile reality, inspired by the study of paper and ink, yet technologically advanced and open to imagination and magic.

Surfaces and edges of the material provide visual cues that are grounded in reality. The use of familiar tactile attributes helps users quickly understand affordances. Yet the flexibility of the material creates new affordances that supersede those in the physical world, without breaking the rules of physics.

The fundamentals of light, surface, and movement are key to conveying how objects move, interact, and exist in space and in relation to each other. Realistic lighting shows seams, divides space, and indicates moving parts.

Bold, graphic, intentional.

The foundational elements of print based design typography, grids, space, scale, color, and use of imagery guide visual treatments. These elements do far more than please the eye. They create hierarchy, meaning, and focus. Deliberate color choices, edge to edge imagery, large scale typography, and intentional white space create a bold and graphic interface that immerse the user in the experience. An emphasis on user actions makes core functionality immediately apparent and provides waypoints for the user.

Motion provides meaning.

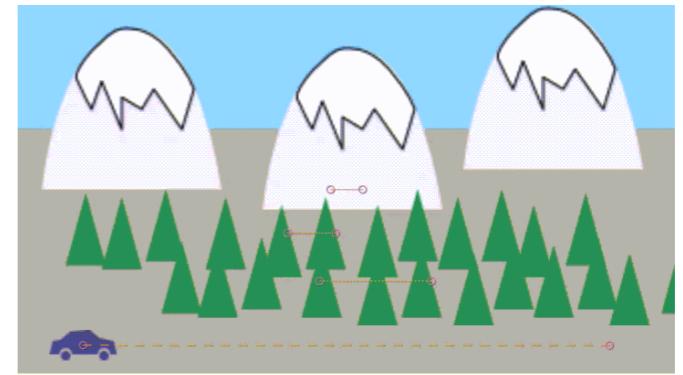
Motion respects and reinforces the user as the prime mover. Primary user actions are inflection points that initiate motion, transforming the whole design.

All action takes place in a single environment. Objects are



Refactor existing animation to Motion Layout

1. Collapsing Toolbar
2. ViewPager



Page 1

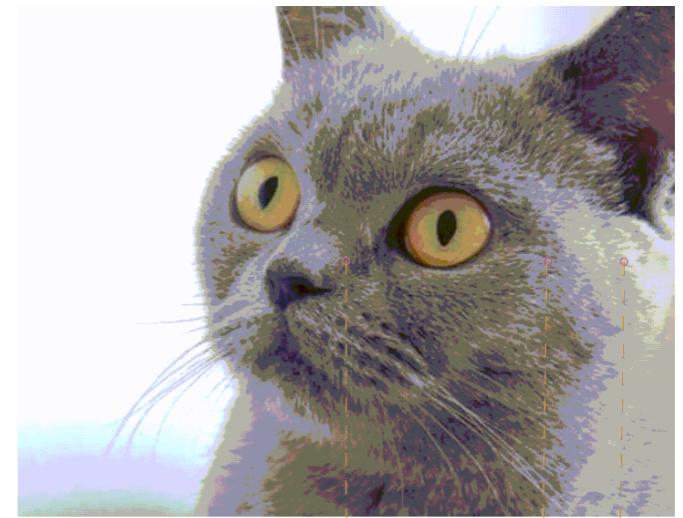


Refactor existing animation to Motion Layout

1. Collapsing Toolbar

2. ViewPager

3. Gesture based transitions



Cat

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.



Refactor existing animation to Motion Layout

1. Collapsing Toolbar



Material is the metaphor.

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Motion provides meaning.

Motion respects and reinforces the user as the prime mover. Primary user actions are inflection points that initiate motion, transforming the whole design.

All action takes place in a single environment. Objects are

2. ViewPager

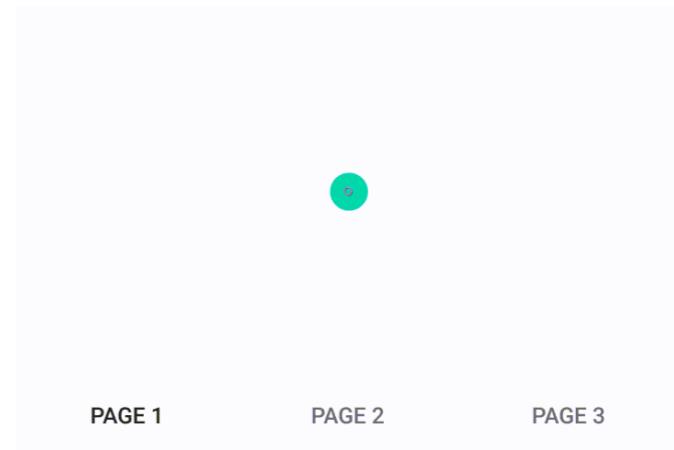
3. Gesture based transitions

4. Navigation view with custom behaviors

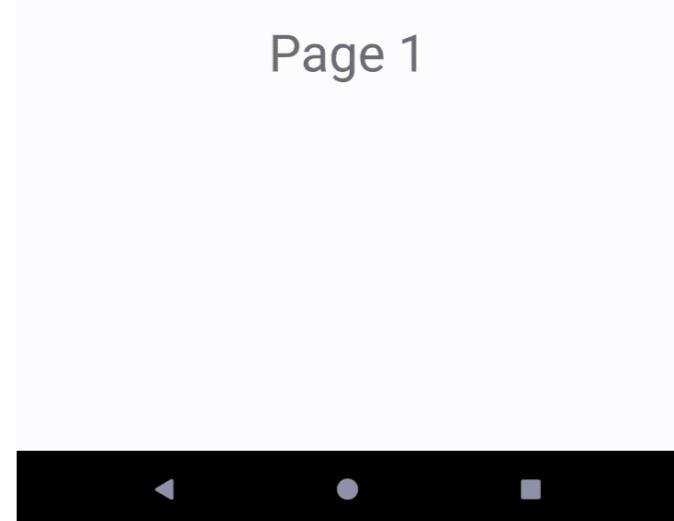


Refactor existing animation to Motion Layout

1. Collapsing Toolbar



2. ViewPager

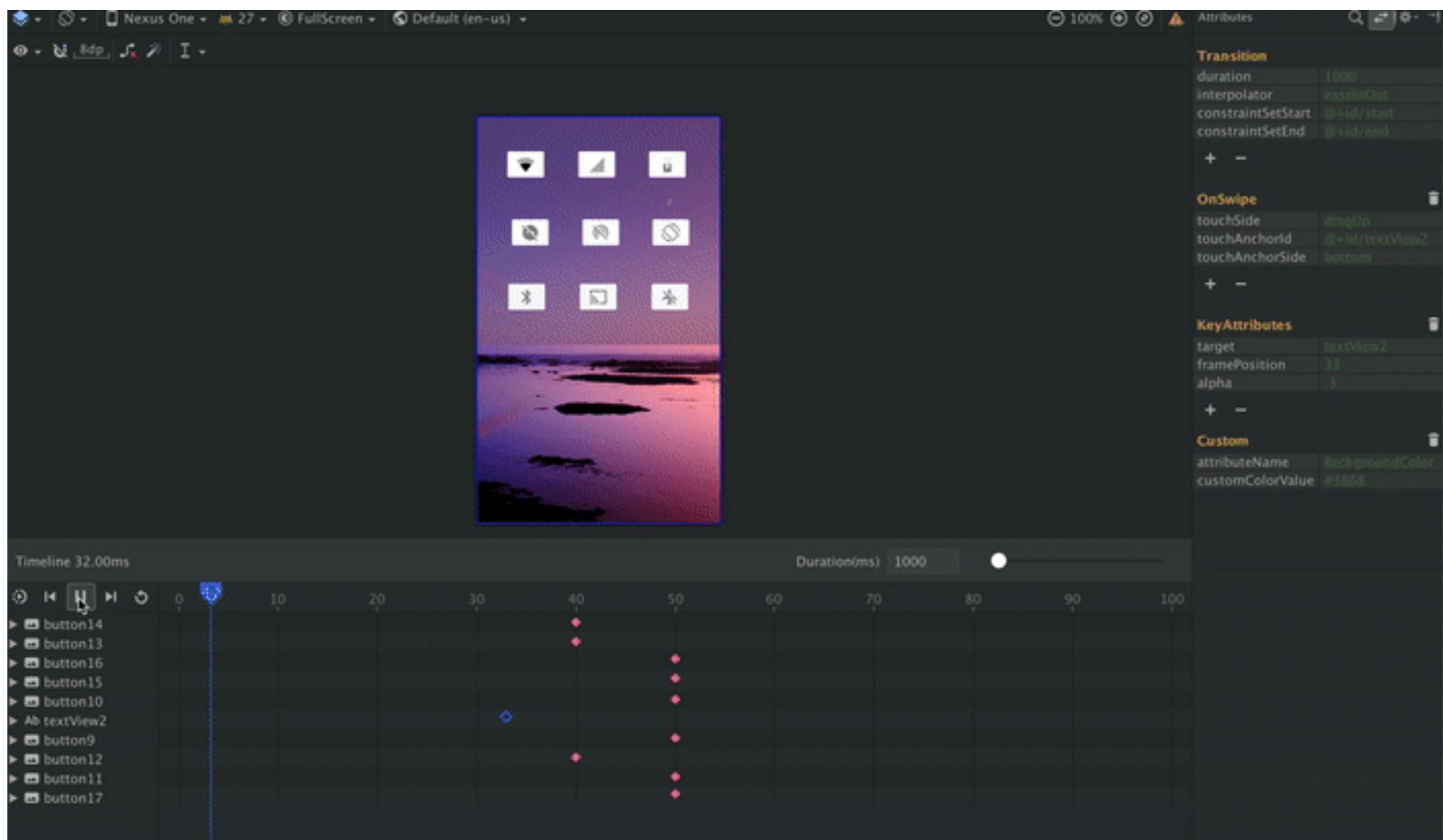


3. Gesture based transitions

4. Navigation view with
custom behaviors

5. Progress based views

The Future



Motion Layout Editor In Development

Learning Resources

Introduction to MotionLayout series

<https://medium.com/google-developers/introduction-to-motionlayout-part-i-29208674b10d>

Official Docs

<https://developer.android.com/reference/android/support/constraint/motion/MotionLayout>

What's new in ConstraintLayout

<https://www.youtube.com/watch?v=2ggLAGom6Gk>

Official Samples on Github

<https://github.com/googlesamples/android-ConstraintLayoutExamples>

Learning Resources Cont'd

Constraint Layout Guide

<https://constraintlayout.com>

Twitter #motionlayout

<https://twitter.com/search?q=%23motionlayout>

Optimizing UIs using Constraint Layout (Google I/O extended 2018)

<https://speakerdeck.com/hashlin/optimizing-uis-using-constraint-layout>

Source codes for this talk

<https://github.com/hashlin/DroidYangonMoviesApp>

Q & A

Motion Layout :
Make your apps move auto-magically

@Linminphyoel