React Native

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Outline

- Hello React Native
  - How it works?
  - Components, props, and states
  - Styling
  - Event handling
  - Images and icons
  - Data access
- WeatherMoodMobile
  - NativeBase
  - ScrollView and ListView
  - Navigation
- Animations

Prerequisite:

HTML5

CSS3

ES6

React JS

Redux

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React Native

- A framework that let you write apps in React JS way

Installation Guide

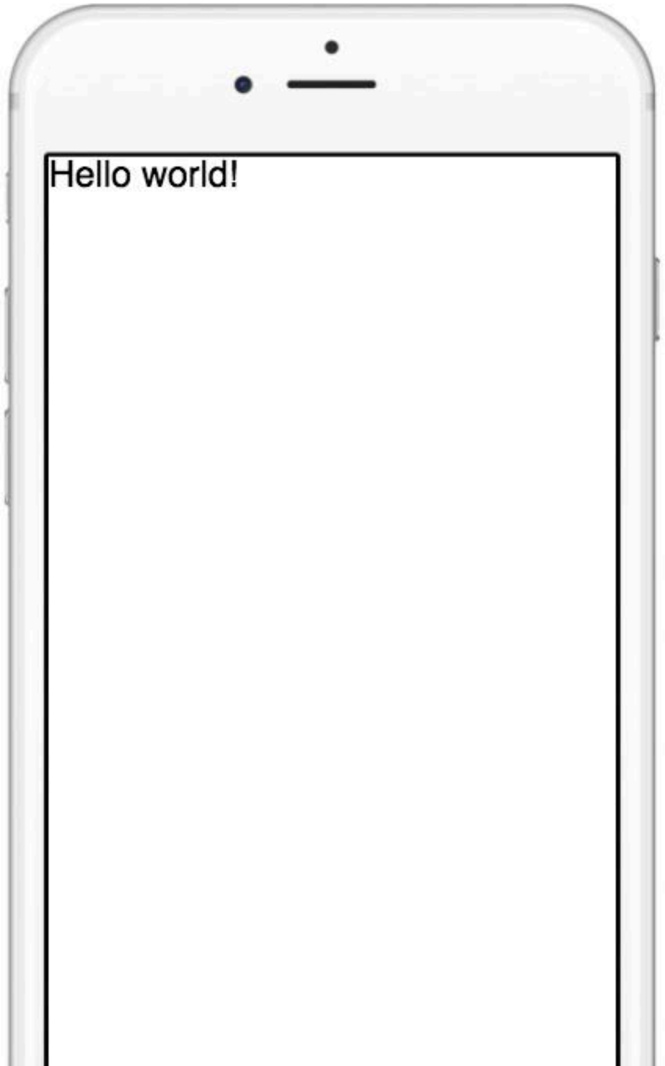
```
> react-native init HelloReactNative

// iOS
> react-native run-ios

// on Android, start AVD first
> react-native run-android
```

HelloReactNative

```
> react-native init HelloReactNative

// in HelloReactNative/index.[ios|android].js
import React from 'react';
import {AppRegistry, Text} from 'react-native';

class MyApp extends React.Component {
  render() {
    return (
      <Text>Hello world!</Text>
    );
  }
}

AppRegistry.registerComponent(
  'HelloReactNative',
  () => MyApp
);
```

- Camel-case convention
- ES6 features
- JSX with RN components
  - *.js files
- AppRegistry instead of ReactDOM

Running and Dynamic Reloading


Hello world!

- Packager is like Webpack
- Reload:
  - Cmd + R (iOS)
  - R + R (Android)
- Dev menu:
  - Cmd + D (iOS)
  - Cmd + M (Android)
- Debugging:
  - `console.log()`
  - `debugger`

Why app written by JS is ***native***?

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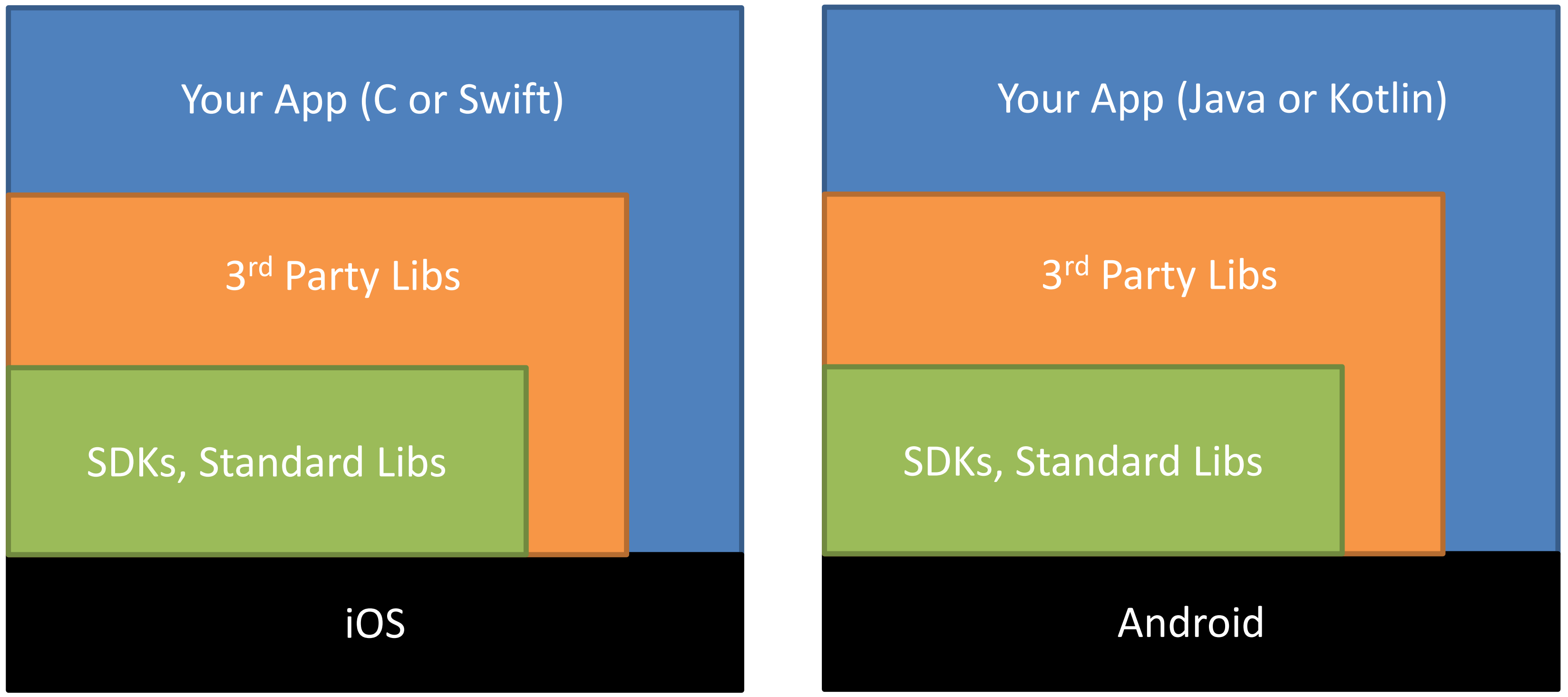
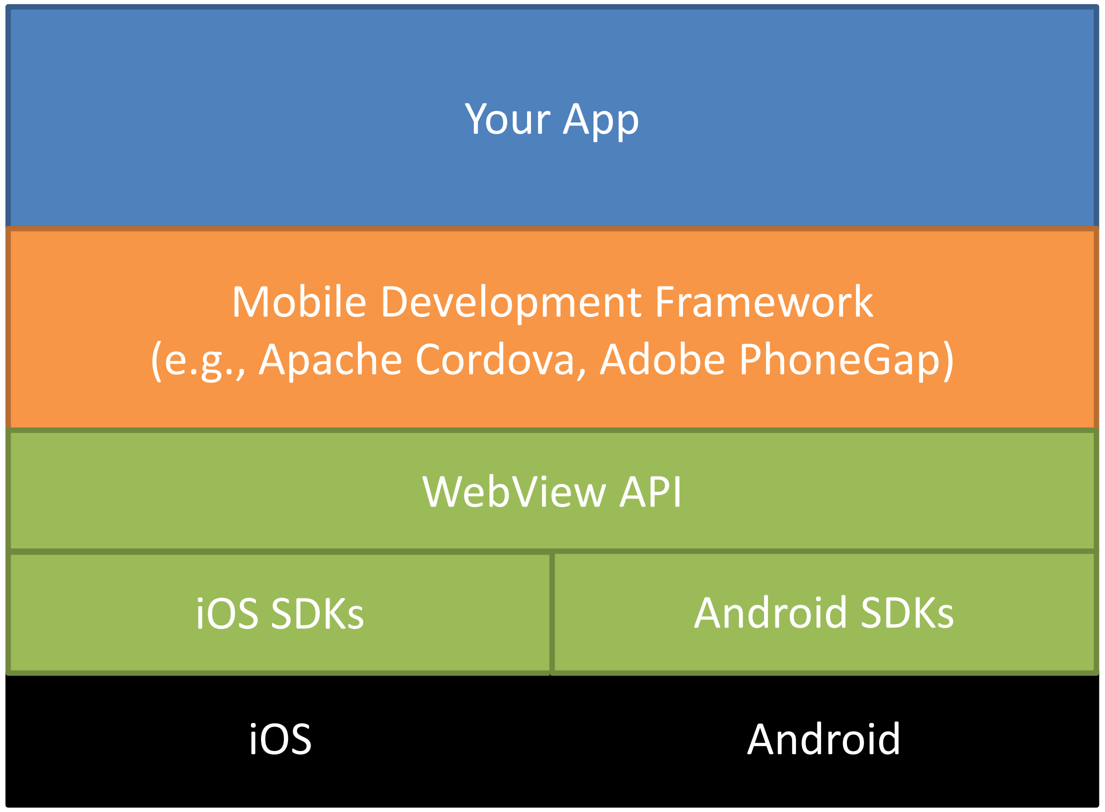
Native Apps



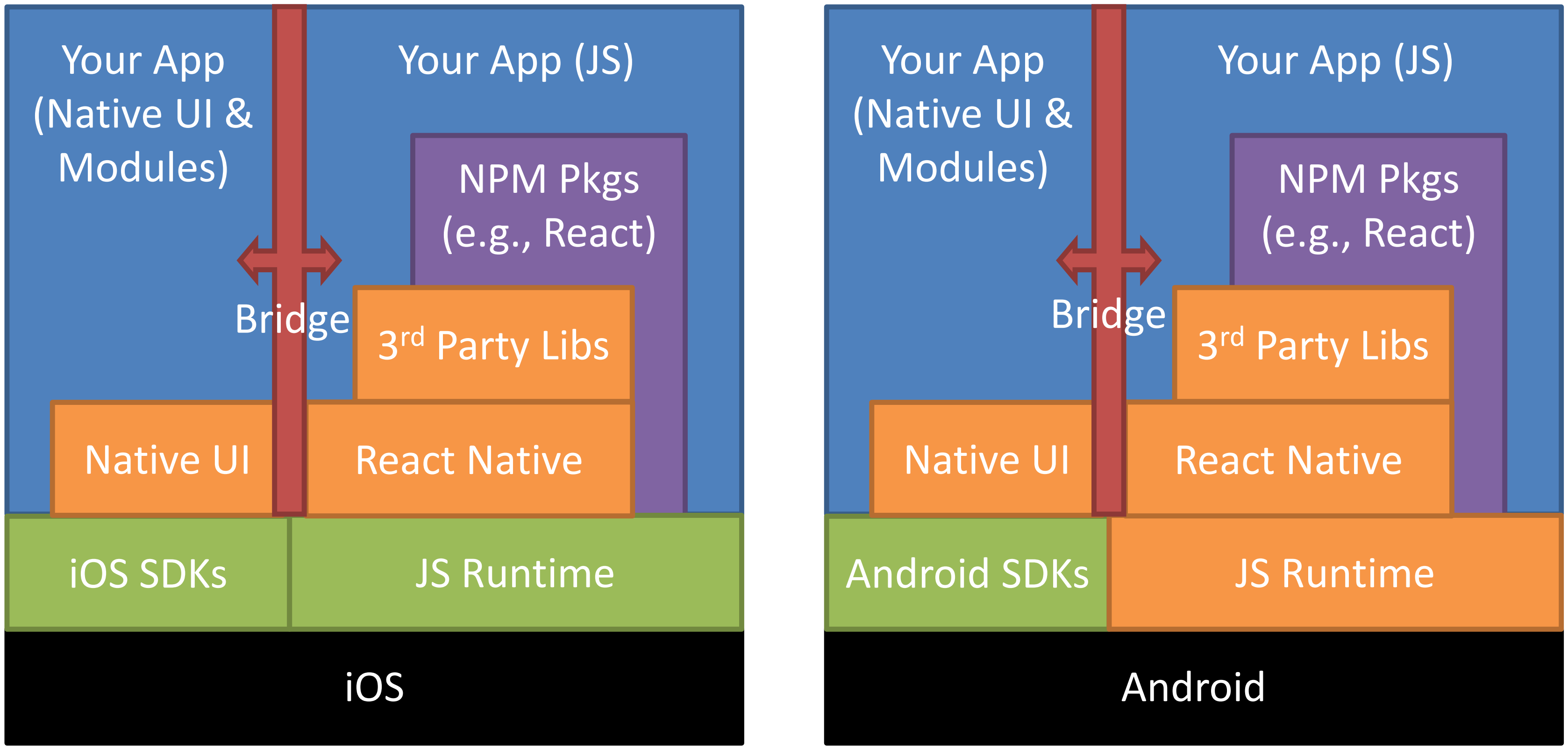
- Different code and ***language*** for different OS's

WebView Apps

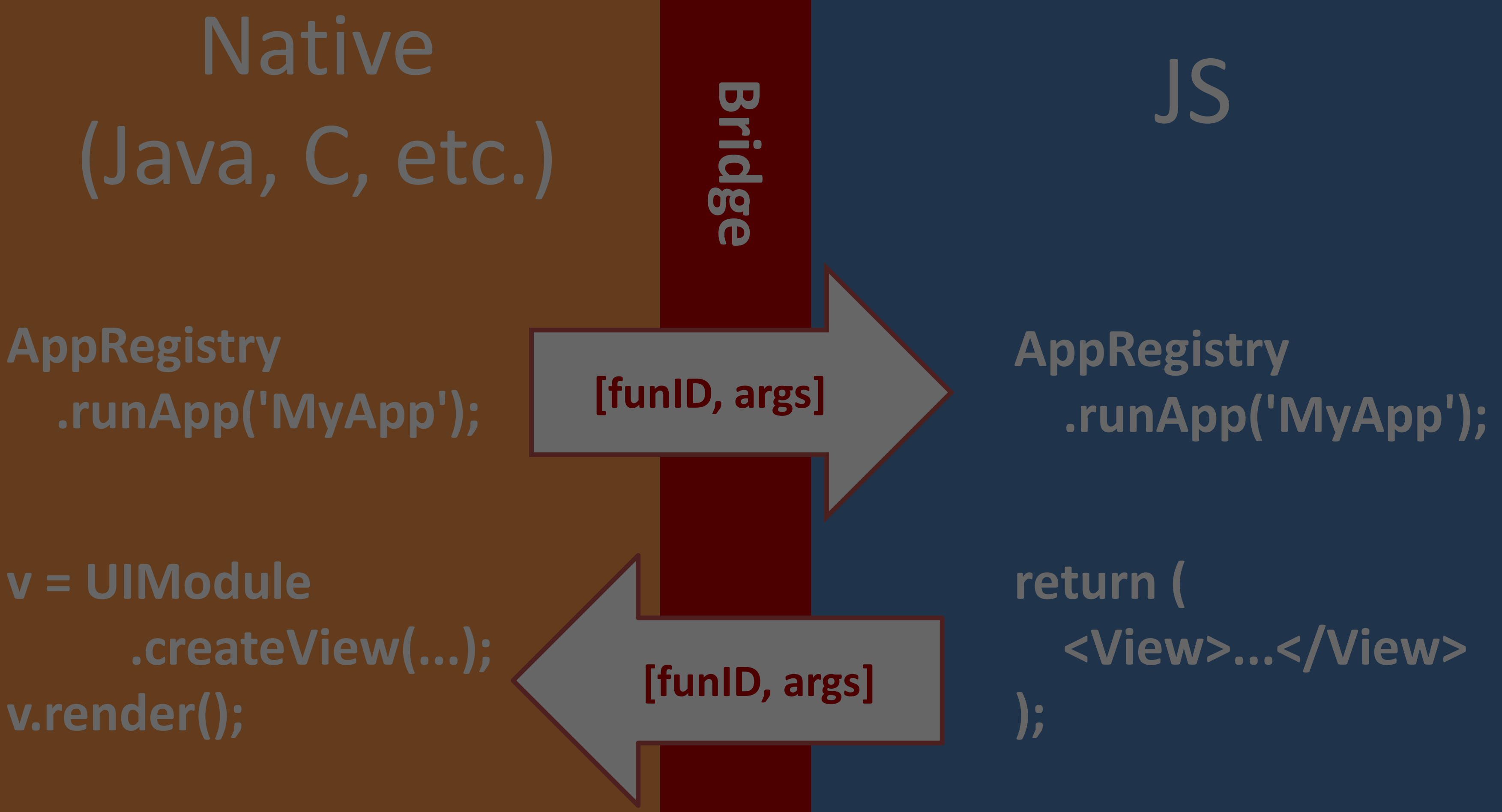

Your App
Mobile Development Framework
(e.g., Apache Cordova, Adobe PhoneGap)
WebView API
iOS SDKs
Android SDKs
iOS
Android

- Write once, run everywhere
- Slow and not feeling native

React-Native Apps



- JS components render as native ones
- Learn once, write everywhere



```
AppRegistry
   .runApp('MyApp');
```

```
v = UIModule
        .createView(...);
v.render();
```

```
AppRegistry
   .runApp('MyApp');
```

```
return (
   <View>...</View>
);
```

- Calls through bridge are
  - *Asynchronous* (event loops are separated)
  - *Batched* (to save overhead)

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RN Components (see Doc)

- `<View>` is like `<div>` in HTML
- `<Text>` is like `<span>`
  - Text must be wrapped in `<Text>...</Text>`
- Custom components:

```
// in MyComponent.js
export defaut class MyComponent extends React.Component {
  render() {
    ...
  }
}
// in App.js
import MyComponent from './MyComponent';
// use <MyComponent /> in render()
```

Props and States, as Usual

```
// in App.js
<MyComponent name={'Bob'} />

// in MyComponent.js
class MyComponent extends React.Component {
  constructor(props) {
    ...
    this.state = {
      isNew: true
    }
  }
  render() {
    const {name} = this.props;
    return (
      <Text>Hello {name}, {
        this.state.isNew ? 'welcome' : 'welcome back'
      }</Text>
    );
  }
}
```

Redux, as Usual

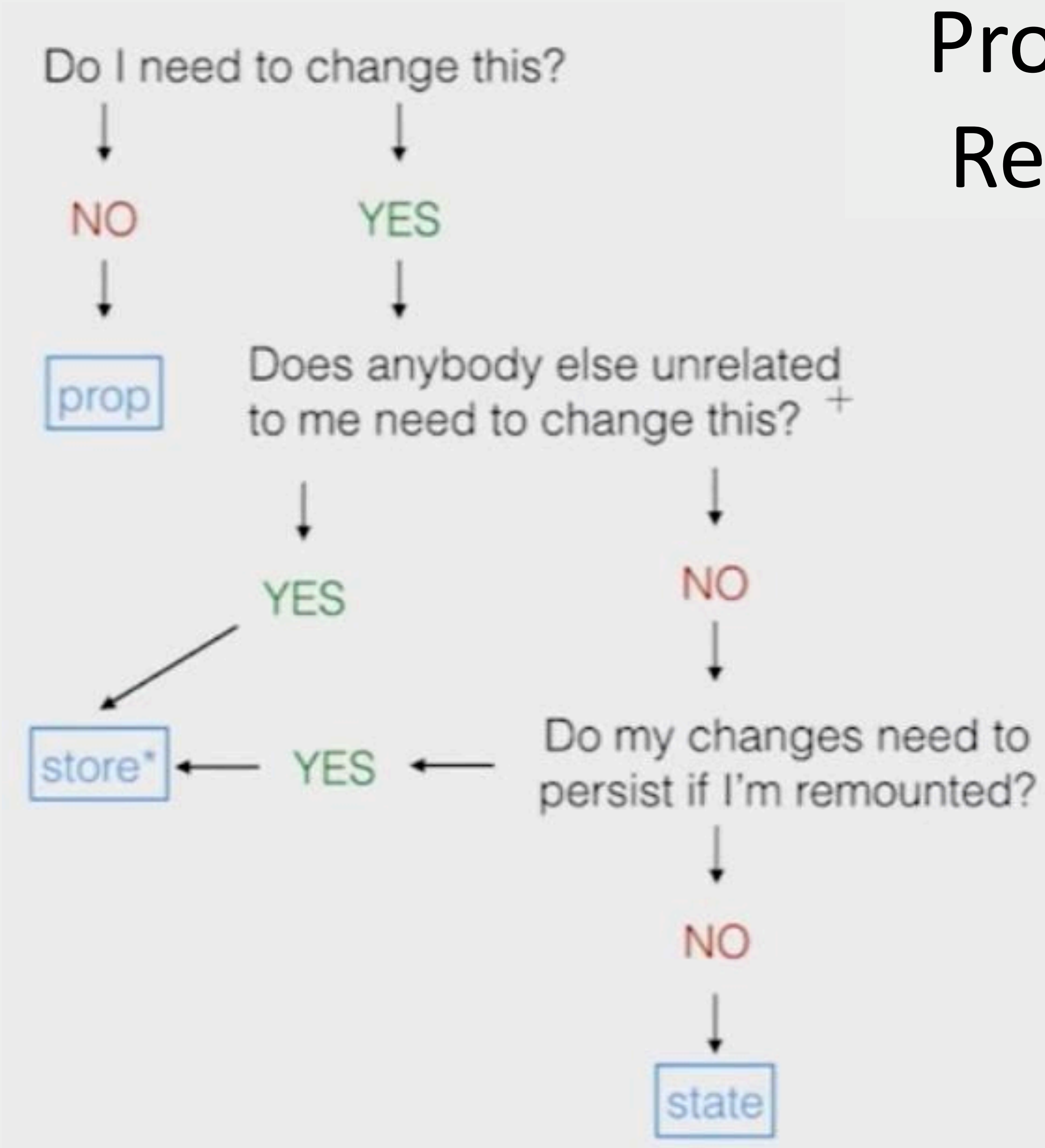
```
import {connect} from 'react-redux';

class MyComponent extends React.Component {
  render() {
    const {name, isNew} = this.props;
    return (
      <Text>Hello {name}, {
        isNew ? 'welcome' : 'welcome back'
      }</Text>

    );
  }
}

export default connect(state => ({
  isNew: state.user.isNew  // 'user' reducer
}))(MyComponent);
```

Prop, State, or Redux Store?


Do I need to change this?
NO
YES
prop
Does anybody else unrelated to me need to change this?
YES
NO
store*
YES
Do my changes need to persist if I'm remounted?
NO
state

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Styling in RN

- No CSS
- Instead, assign `style` prop to components

```
render() {
  return (
    <View>
      <Text style={{color: 'blue'}}>...</Text>
      <Text style={styles.red}>...</Text>
      // cascade
      <Text style={[styles.red, styles.title]}>...</Text>
    </View>
  );
}
const styles = {
  red: {color: 'red'},
  title: {fontSize: 24}
};
```

- List of supported styles
- Values have no unit

StyleSheet

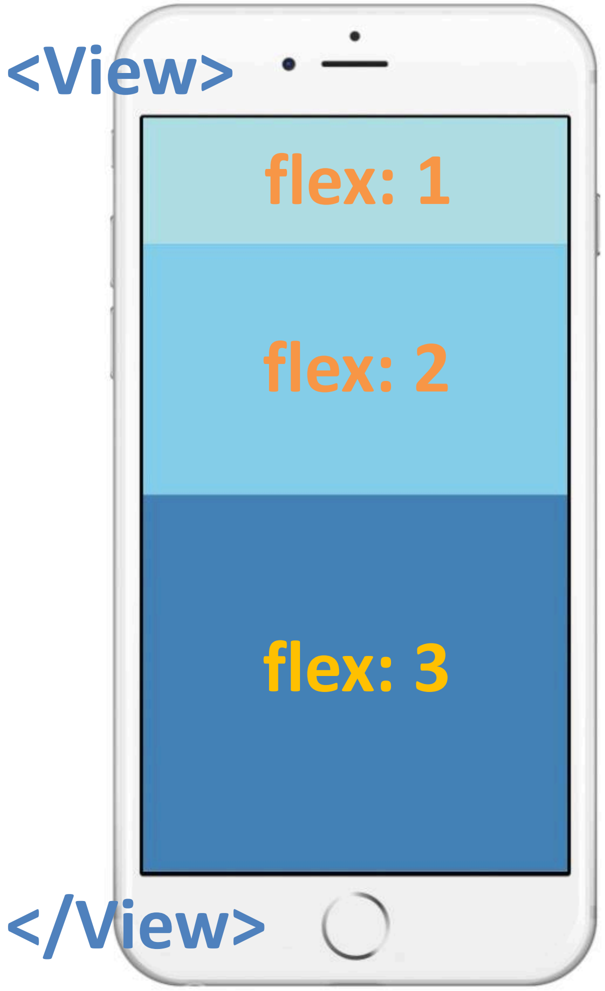
```
import {StyleSheet} from
  'react-native';

render() {
  return (
    <View>
      <View style={styles.listItem}>...</View>
      <View style={styles.listItem}>...</View>
      ...
      <View style={styles.listItem}>...</View>
    </View>
  );
}
const styles = StyleSheet.create({
  listItem: {...}
});
```

- Allows multiple native components to refer to same style object (by ID)
  - Useful for, e.g., list items

Sizing and Layout

- Every "container" component (e.g., View) is a flexbox
  - flexDirection: 'column' by default
  - justifyContent: 'flex-start'
  - alignItems: 'stretch'
- Contained component:
  - alignSelf
  - width/height: number
  - ***flex***: number
- Use inspector at runtime



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Event Handling

```
render() {
  return (
    <TouchableHighlight
      onPress={this.handlePress}
      onLongPress={() => alert('Yo')}>
      <View>
        <Text>Press me!</Text>
      </View>
    </TouchableHighlight>
  );
}
```

- TouchableHighlight
- TouchableOpacity
- TouachableNativeFeedback (Android only)

Controlled Components

```
render() {
  return (
    <TextInput
      placeHolder='Type here'

      value={this.state.text} // controlled component
      onChangeText={text => this.setState({text})}

      ref={el => this.inputEl}
      onEndEditing={() => {
        ...
        this.inputEl.clear();
      }}
    />
  );
}
```

How are native events handled in JS?

Native
UI (Main) Thread

Event Queue

Native
Modules Thread

Event Queue

JS Thread

Event Queue

Threads and Queues

Native UI (Main) Thread

Event Queue

Event

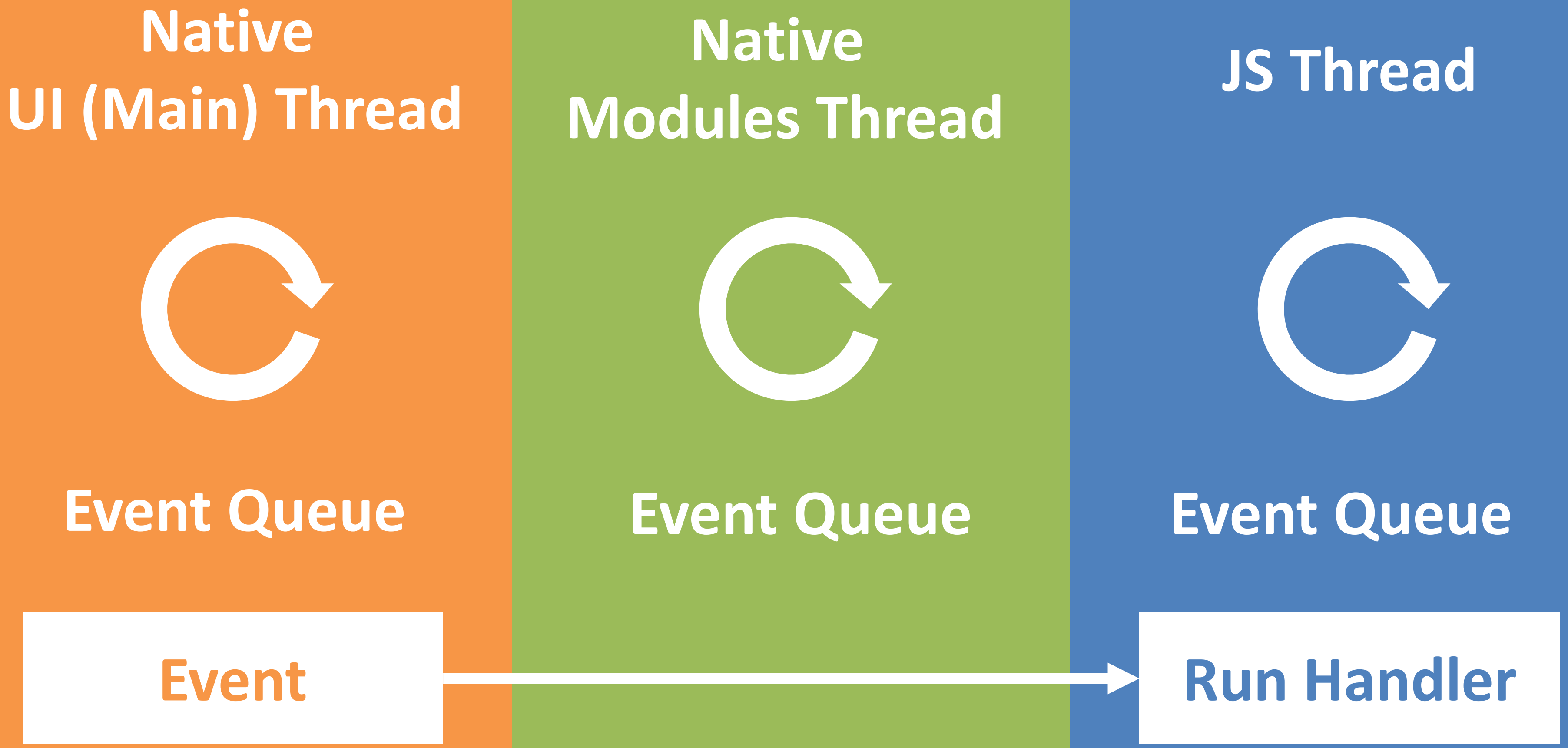
Native Modules Thread

Event Queue

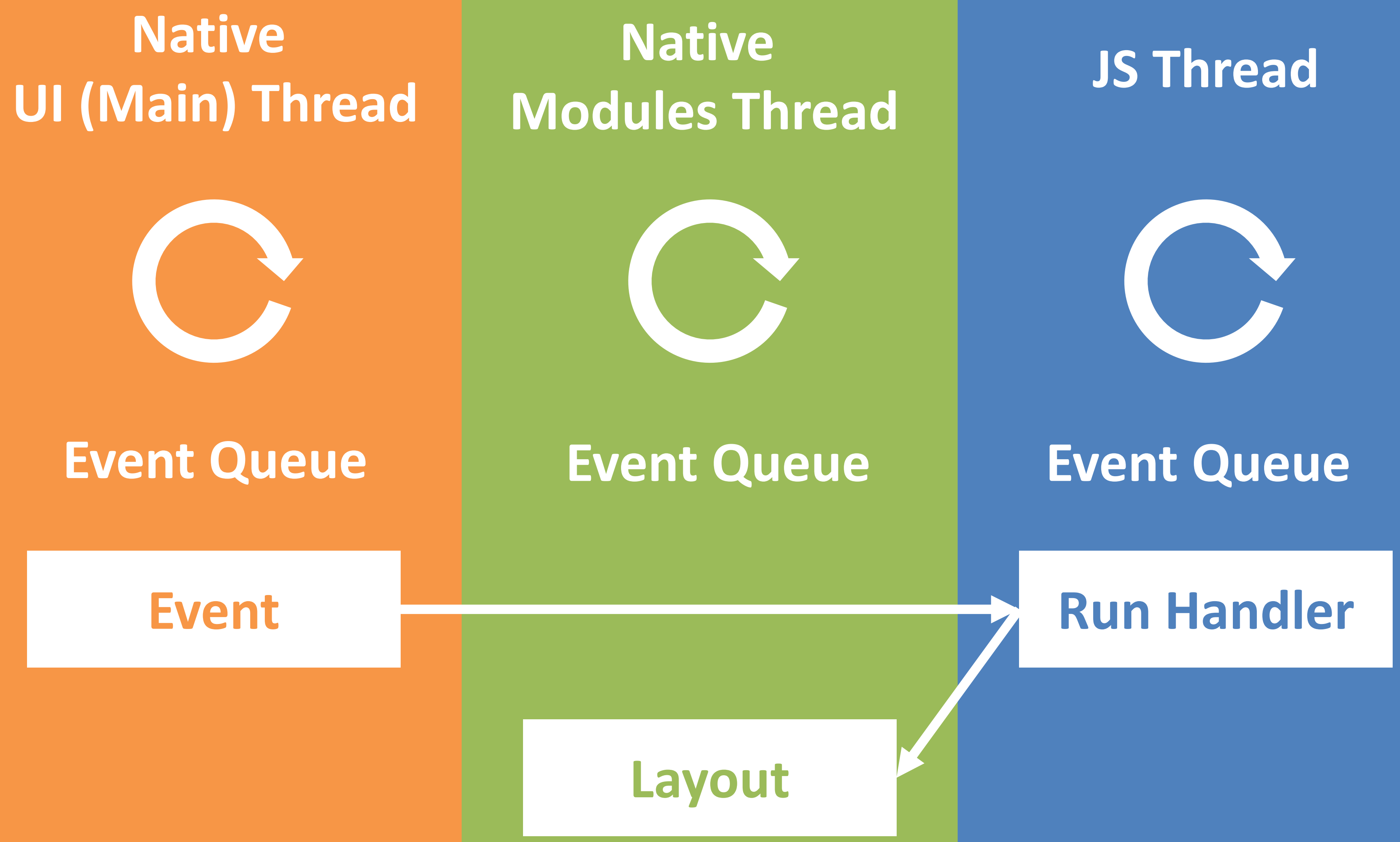
JS Thread

Event Queue

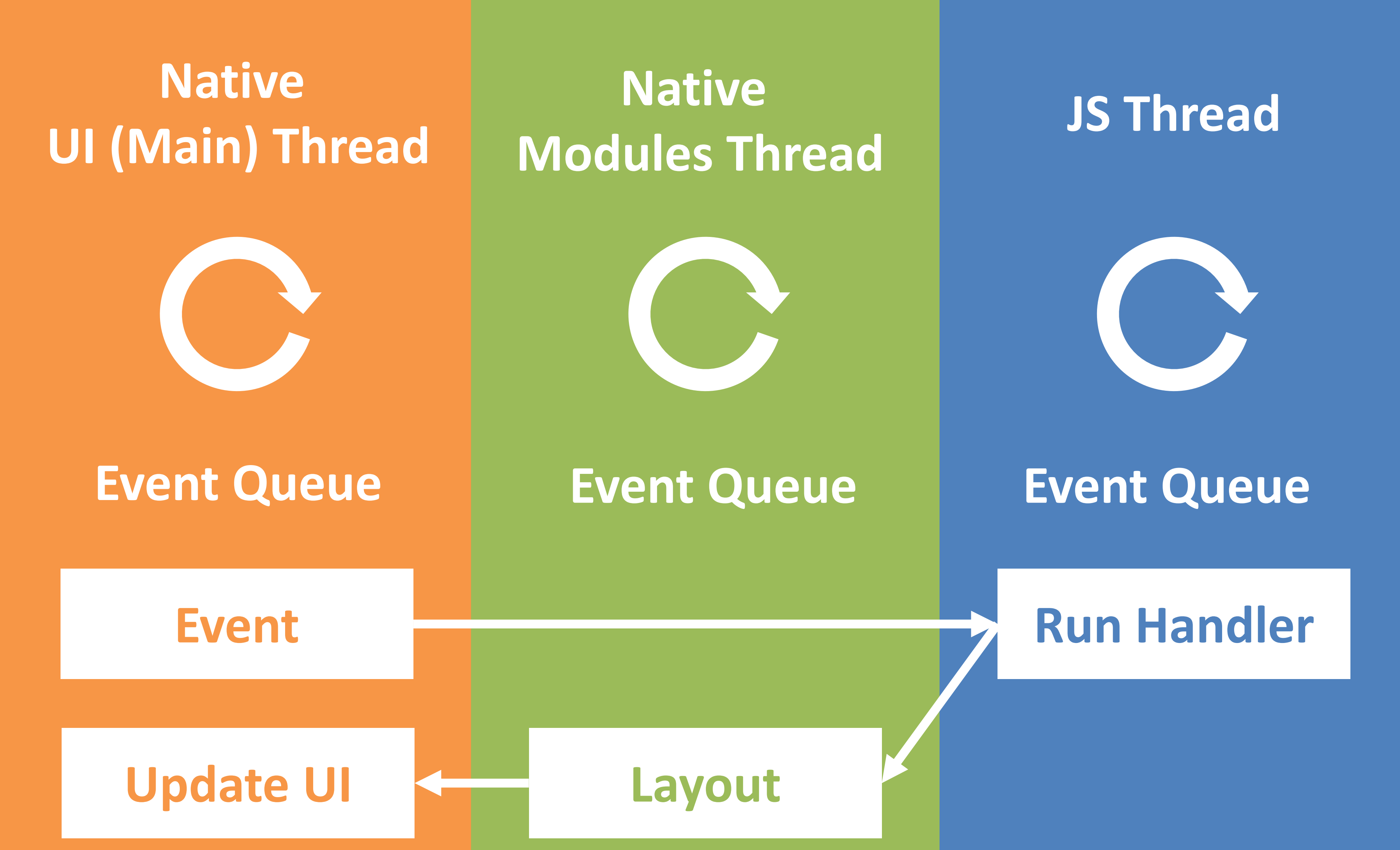
- E.g., touch, I/O, or networking event



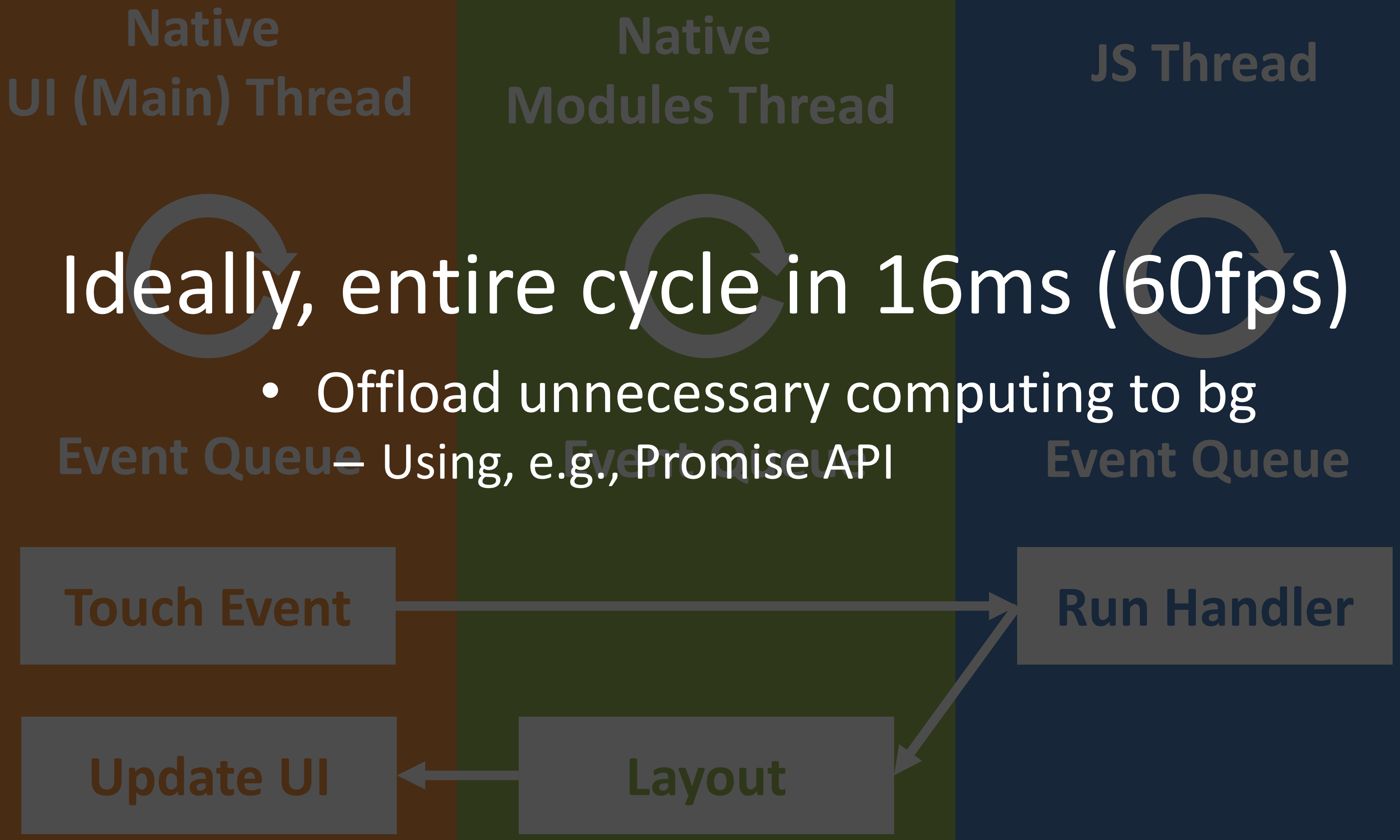
- JS thread calls your handler via the bridge



- If UI changed in JS, module thread performs layout first (e.g., measuring size of text)



- Then, UI thread renders components



Ideally, entire cycle in 16ms (60fps)

- Offload unnecessary computing to bg
  - Using, e.g., Promise API

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Images

```
// JSX
<Image source={require('dir/image.png')} style={{...}} />

// in dir
image@2x.png // iPhone 7
image@3x.png // iPhone 7 Plus or Nexus 5
```

- RN handles ***off-thread*** decoding for you
- Size inferred from source file by default
  - To scale image dynamically (with `flex`), set `width` and `height` to `undefined`
- Background image?

```
<Image source={...} resizeMode='cover' style={{...}}>
  <View>...</View>
</Image>
```

Network Images

```
<Image
  source={{
    uri: 'https://.../image.png',
    cache: 'reload' // or 'force-cache' or 'only-if-cached'
  }}
  style={{width: 200, height: 200}}
  onLoad={...}
/>
```

- RN handles caching for you
- But you need to specify size manually
- It's a good practice to display a static placeholder before loaded

```
// in JSX
{this.state.isLoaded ?
  <Image source={{uri: ...}}
    onLoad={() => this.setState({isLoaded: true})} /> :
  <Image source={require('dir/placeholder.png')}>}
```

Font Icons

```
> npm install --save react-native-vector-icons
> react-native link

// in JS
import Icon from 'react-native-vector-icons/FontAwesome';
// JSX
<Icon name="rocket" size={30} color="#900" />
```

- See more supported fonts and features

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Networking

```
// GET
fetch('https://...')
  .then((res) => {
    if (res.status !== 200) throw new Error('...');
    return res.json();
  })
  .then(data => ...)
  .catch(err => ...)

// POST
fetch('https://...', {
  method: 'POST',
  headers: {
    Accept: 'application/json',
    'Content-Type': 'application/json',
    ...
  }
  body: JSON.stringify(...)
})
```

- Fetch API
- Plaintext HTTP requests will be blocked on iOS
  - Apps on Apple's App Store shall use HTTPS

App Transport Security (ATS) Exception

```
// in [PROJ_ROOT]/ios/[PROJ_NAME]/Info.plist
<key>NSAppTransportSecurity</key>
<dict>
  <key>NSExceptionDomains</key>
  <dict>
    ...
    <key>yourdomain.com</key>
    <dict>
      <!--Include to allow subdomains-->
      <key>NSIncludesSubdomains</key>
      <true/>
      <!--Include to allow HTTP requests-->
      <key>NSTemporaryExceptionAllowsInsecureHTTPLoads</key>
      <true/>
    </dict>
  </dict>
</dict>
```

- Re-run `react-native run-ios`

Persistent Storage

- In mobile landscape, Internet may ***not*** always be available
- It's a good practice to allow offline data access
- AsyncStorage (global to app):

```
// API similar to HTML5 LocalStorage
AsyncStorage.setItem(key, value); // strings
AsyncStorage.mergeItem(key, delta);
AsyncStorage.getItem(key).then(value => ...);
AsyncStorage.multiGet(keys).then(values => ...);
```

Persisting Redux States

```
// save when any state changes
store.subscribe(() => {
  AsyncStorage.setItem('states',
    JSON.stringify(store.getState()));
});

// load
AsyncStorage.getItem('states').then(value => {
  store = createStore(
    combineReducers(...),
    JSON.parse(value),
    compose(...)
  );
});
```

- You can persist partial states

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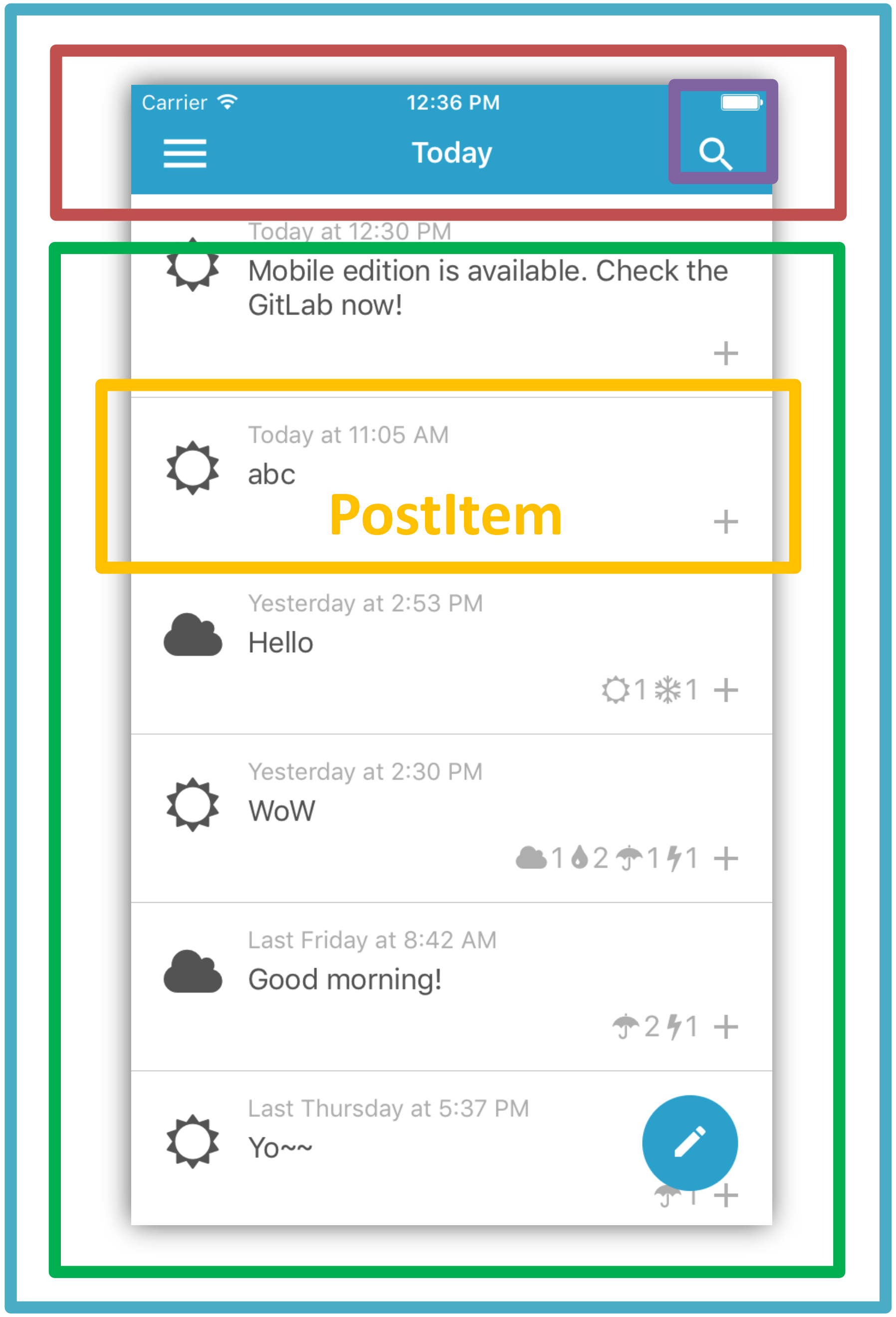
Clone WeatherMoodMobile

- Checkout the `redux-post` branch

```
> npm install --save \
  native-base color \
  react-native-infinite-scroll-view \
  react-navigation
> react-native link
```

- NativeBase and Color for UI
- RN Infinite Scroll View
- React Navigation for client-side routing

Components



Today at 12:30 PM
Mobile edition is available. Check the GitLab now!

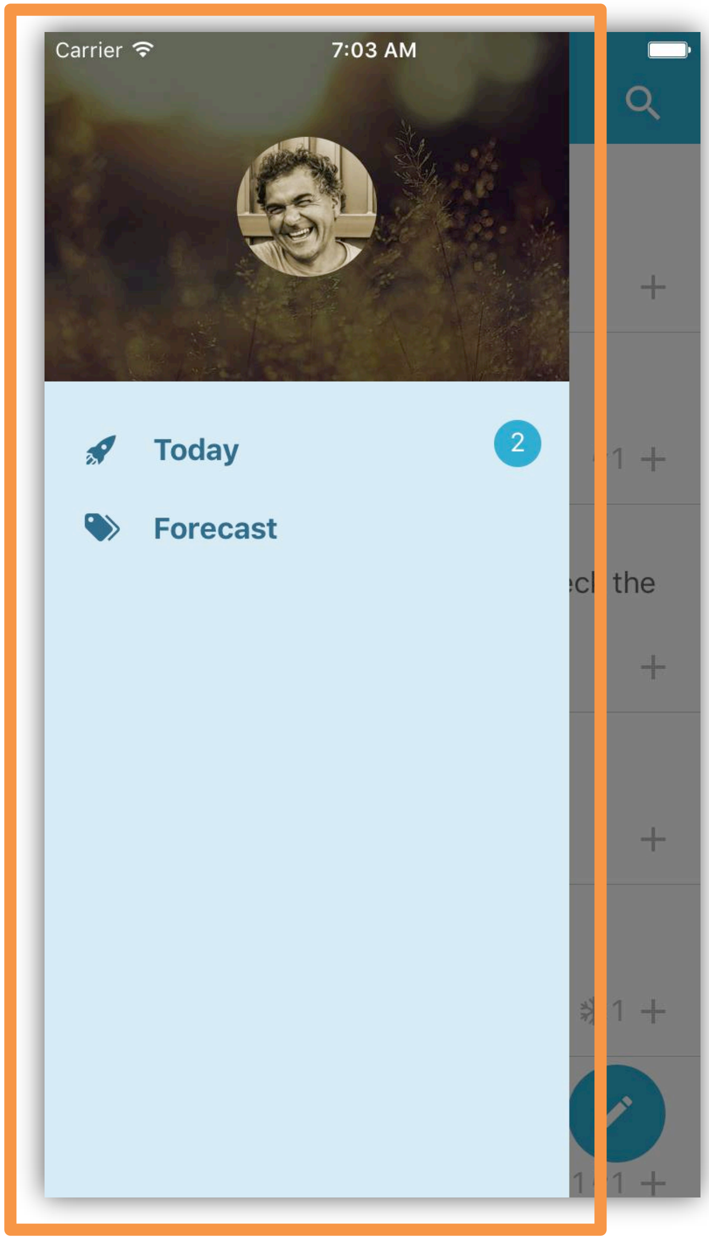
Today at 11:05 AM
abc

Yesterday at 2:53 PM
Hello
1 1

Yesterday at 2:30 PM
WoW
1 2 1 1

Last Friday at 8:42 AM
Good morning!
2 1

Last Thursday at 5:37 PM
Yo~~



Components

DrawerSideBar

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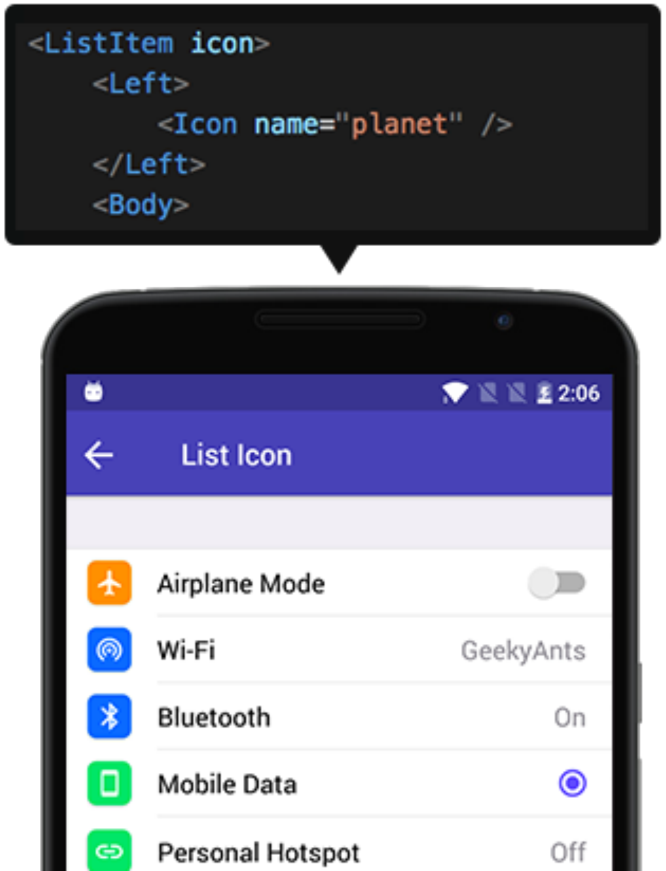
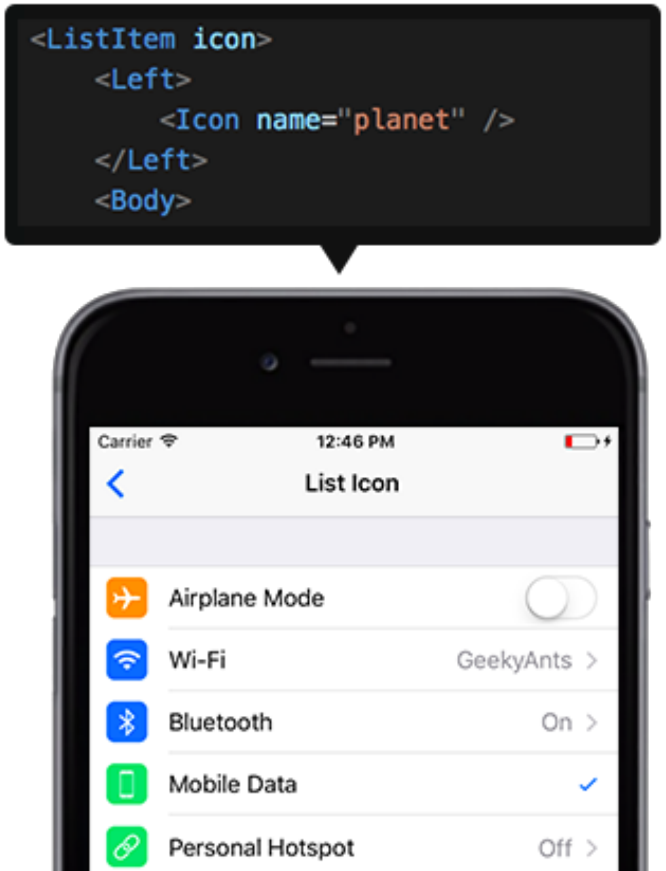
NativeBase

- Same component, different (native) looks



```
<ListItem icon>
    <Left>
        <Icon name="planet" />
    </Left>
    <Body>
```

Airplane Mode
Wi-Fi GeekyAnts
Bluetooth On
Mobile Data
Personal Hotspot Off



```
<ListItem icon>
    <Left>
        <Icon name="planet" />
    </Left>
    <Body>
```

Airplane Mode
Wi-Fi GeekyAnts
Bluetooth On
Mobile Data ✓
Personal Hotspot Off

Theme Customization

```
> node node_modules/native-base/ejectTheme.js
> vim native-base-theme/variables/platform.js

// in app.js
import {StyleProvider} from 'native-base';
import getTheme from '../native-base-theme/components';
import platform from
  '../native-base-theme/variables/platform';

class MyApp extends React.Component {
  render() {
    return (
      <StyleProvider style={getTheme(platform)}>
        <View>...</View>
      </StyleProvider>
    );
  }
}
```

- Read more about customization

Platform-Specific Code

- Platform-specific files:

```
index.ios.js
index.android.js

images/banner@2x.ios.jpg
images/banner@2x.android.jpg
```

- Or use Platform:

```
import {Platform} from 'react-native';

// in JS
const styles = StyleSheet.create({
  toolbar: {
    height: (Platform.OS === 'ios') ? 64 : 56
  }
});
```

Flat Style Objects

```
import {Button} from
  'native-base';

class MyComponent extends React.Component {
  render() {
    return (
      <Button style={**styles.btn**}>  // error
        <Text>...</Text>
      </Button>
    );
  }
}
const styles = StyleSheet.create({
  btn: {...}
});
```

- NB components create StyleSheets automatically
  - Use plain objects, or
  - `Stylesheet.flatten(styles.btn)`

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ScrollView

```
<ScrollView
  horizontal={true}
  onScroll={e => {
    const y = e.nativeEvent.contentOffset.y;
    ...
  }}
  style={{flex: 1}} // or set height directly
>
  <View>...</View>
  <Image>...</Image>
  <Text>...</Text>
  ...
</ScrollView>
```

- Elements can be heterogeneous
- Horizontal or vertical scroll
- Unbounded child height → must have bounded height

ListView

```
// in a component
constructor(props) {
  ...
  const ds = new ListView.DataSource({
    rowHasChanged: (r1, r2) => r1.id !== r2.id
  });
  this.state = {
    dataSource: ds.cloneWithRows([{/* r1 */}, ...])
  }
}
```

- Optimized for large #items:
  - Lazy and rate-limited row rendering
  - Only re-renders changed rows

```
render() {
  return (
    ...
    <ListView
      ... // props of ScrollView
      dataSource={this.state.dataSource}
      renderRow={r => <Text>r.text</Text>}
    />
  );
}
```

Refreshing & Scrolling

```
import RefreshControl from 'react-native';
import InfiniteScrollView from
  'react-native-infinite-scroll-view';


// in JSX
<ListView
  dataSource={...}
  renderRow={...}
  refreshControl={
    <RefreshControl refreshing={this.state.refreshing}
      onRefresh={() => ... /* list posts */} />
  }
  rederScrollComponent={
    props => <InfiniteScrollView {...props} />
  }
  distanceToLoadMore={300}
  canLoadMore={this.state.hasMoreRows}
  onLoadMoreAsync={() => ... /* list more posts */}
/>
```

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Navigation

```
// in app.js
import {StackNavigator} from
  'react-navigation';
const App = StackNavigator({
  Home: {screen: HomeScreen},
  Contact: {screen: ContactScreen}
});
```

```
class HomeScreen extends React.Component {
  render() {
    const {navigate} = this.props.navigation;
    return (
      <Button onPress={() => navigate('Contact')}>...</Button>
    );
  }
}
```

```
class ContactScreen extends React.Component {
  render() {
    const {goBack} = this.props.navigation;
    return (
      <Button onPress={() => goBack()}>...</Button>
    );
  }
}
```

- Supports Redux integration

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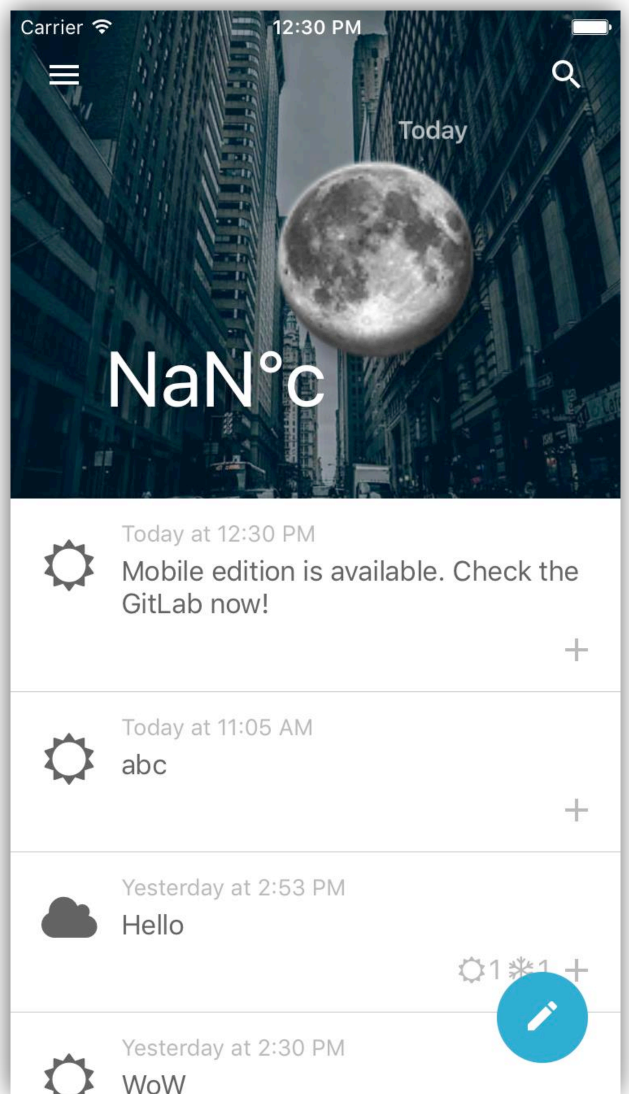
People expect great UX from apps...

So, animation is a “must”

WeatherMoodMobile

- Checkout the `parallax-header` branch



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Hello

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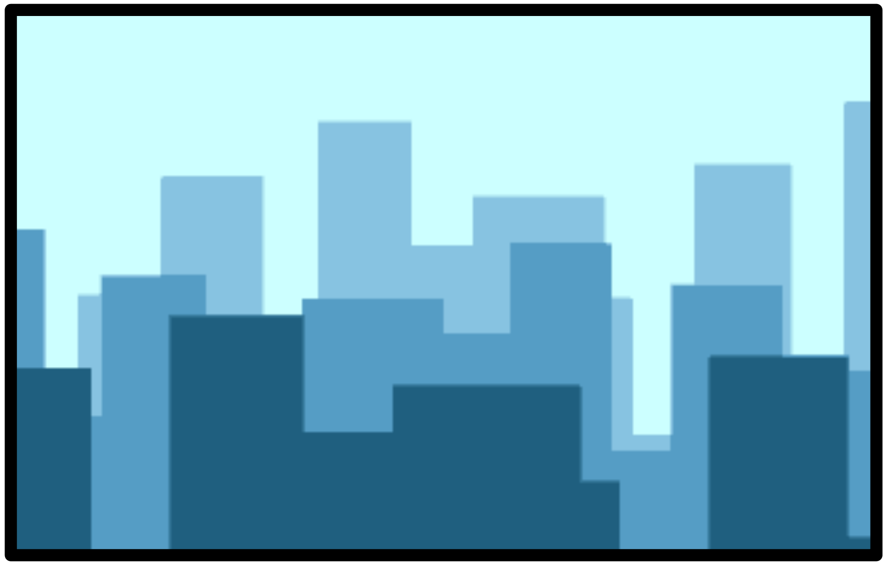
WoW

What does “parallax” mean?



Animations

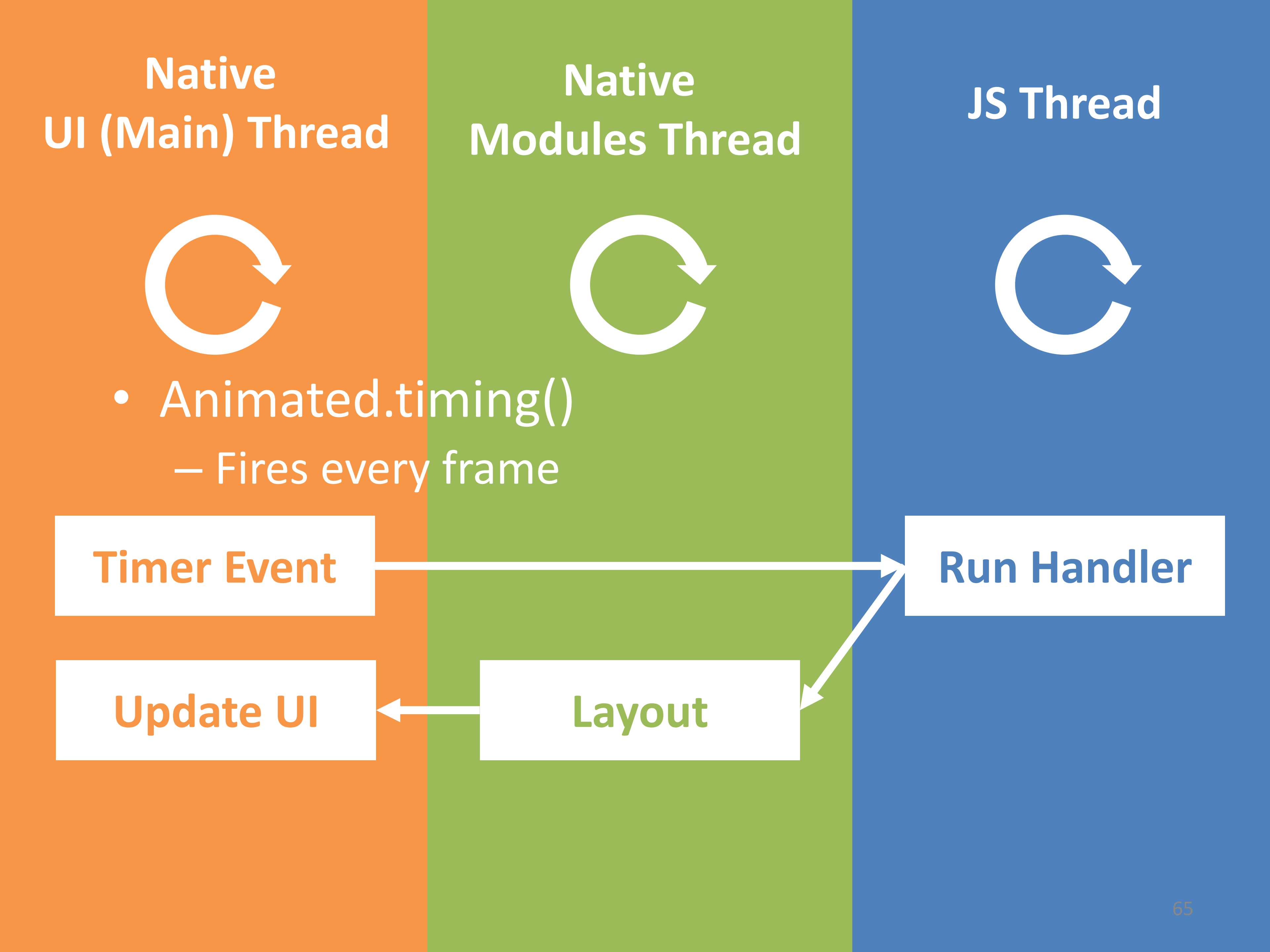
```
import {Animated, Easing} from 'react-native';

class FadeInComponent extends React.Component {
  constructor(props) {
    ...
    this.opacityAnim = new Animated.value(0);
  }
  componentDidMount() {
    Animated.timing(this.opacityAnim, {
      toValue: 1,
      easing: Easing.back // or bounce, etc.
      duration: 1000 // in ms,
      useNativeDriver: true
    }).start();
  }
  render() {
    return (
      <Animated.View style={{opacity: this.opacityAnim}}>
        ...
      </Animated.View>
    );
  }
}
```

- Or, try canned animations

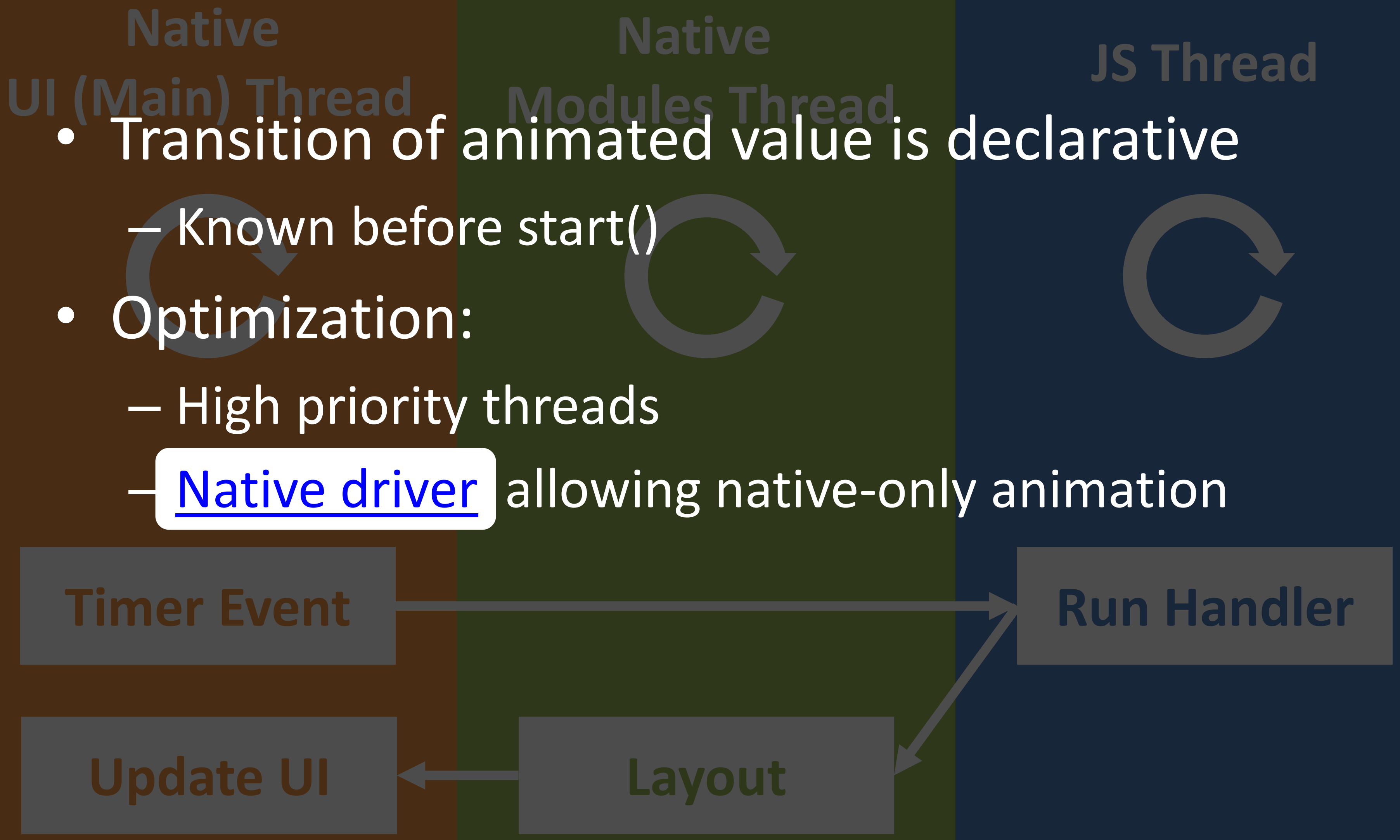
Why not use state?

```
class FadeInComponent extends React.Component {
  constructor(props) {
    ...
    this.state = {
      opacity: 0
    };
  }
  componentDidMount() {
    this.fadeInId = setTimeout(() => {
      if (this.state.opacity < 1.0)
        this.setState({opacity: this.state.opacity + 0.0167});
      else clearTimeout(this.fadeInId);
    }, 16); // 60 fps
  }
  render() {
    return (
      <View style={{opacity: this.state.opacity}}>
        ...
      </>
    );
  }
}
```



- Animated.timing()
  - Fires every frame

- Transition of animated value is declarative
  - Known before start()
- Optimization:
  - High priority threads
  - Native driver allowing native-only animation



Interpolation of Animated Values

```
componentDidMount() {
  Animated.timing(this.opacityAnim, {
    toValue: 1,
    ...
  }).start();
}
render() {
  return (
    <Animated.View style={{
      opacity: this.opacityAnim, // fade in
      transform: [{
        translateY: this.opacityAnim.interpolate({ // slide in
          inputRange: [0, 1],  // or [0, 0.5, 1],
          outputRange: [150, 0],  // or [150, 50, 0]
          extrapolate: 'clamp' // or 'extend'
        })
      }]
    }}>
      ...
    </Animated.View>
  );
}
```

- Also supports multiple segments

Tracking Gestures

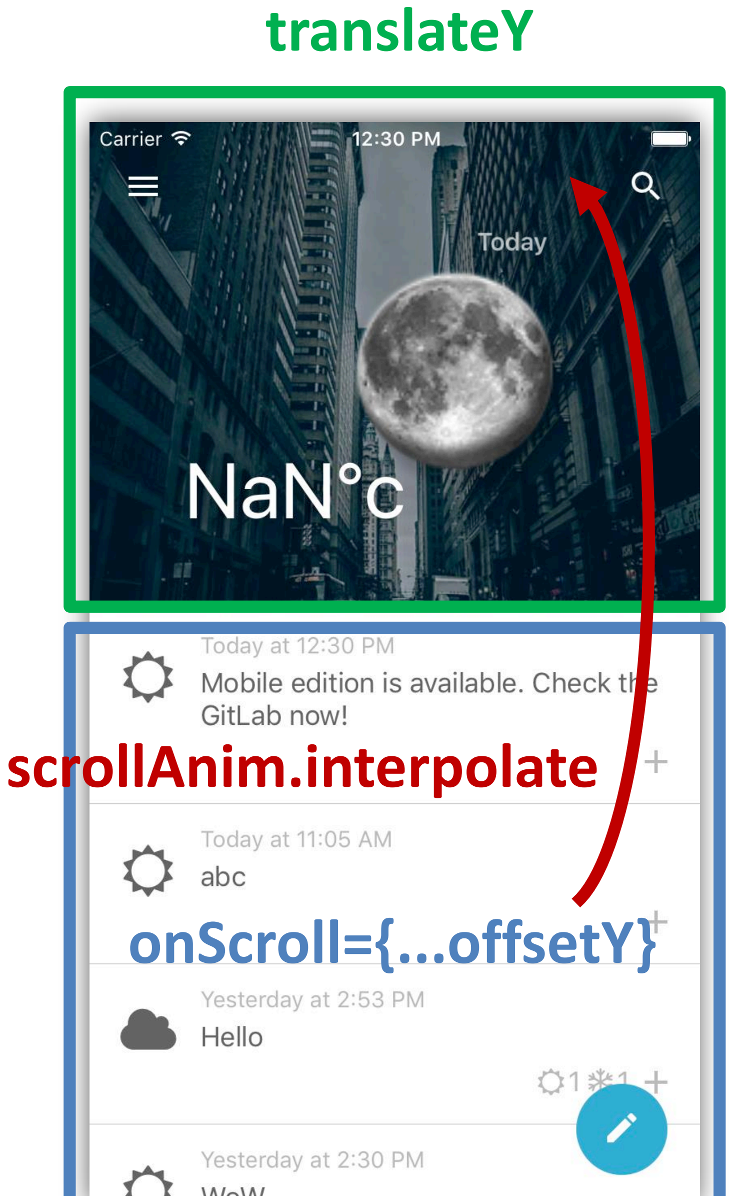
```
// in constructor
this.scrollAnim = new Animated.Value(0);

// in JSX
<ListView
  ...
  onScroll={e => {
    const y = e.nativeEvent.contentOffset.y;
    this.scrollAnim.setValue(y);
  }}
/>     Animated.event(
         [{nativeEvent:{contentOffset: {y: this.scrollAnim}}}],
         {useNativeDriver: true}
       )

<Animated.View
  style={{
    opacity: this.scrollAnim.interpolate(
      inputRange: [0, 200],
      outputRange: [1, 0],
      extrapolate: 'clamp'
    )
  }}
>...</Animated.View>
```

- Declarative transition of animated value?

Parallax Header



Today at 12:30 PM
Mobile edition is available. Check the GitLab now!

Today at 11:05 AM
abc

Yesterday at 2:53 PM
Hello

Yesterday at 2:30 PM
WoW

- Pitfall: the scroll view itself is translating
- Fluctuate content offset (y)
  - y depends not only on gesture
- Solution: average multiple y's within a small window

Readings

- Official Guides
- RN internals
  - Android
  - iOS
- Awesome React Native

Publishing

- Apple's App Store:
  - Checklist
- Google Play Store:
  - Sign your APK first
  - Checklist