React Native 3

CS571: Building User Interfaces

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Today's Warmup

- Download and import today's Postman collection!
- Replace `ENTER_YOUR_BID` with your Badger ID.
- Toy around with it! What's different from the HW6 API? Also, read the docs.

What will we learn today?

- How to pass data using React Navigation?
- How to perform "switch" navigation?
- How to use overlays (modals)?
- How to store secrets on mobile devices?
- How to do advanced gestures and animations?
- How to use sensors?
- How to deploy our apps?

React Navigation

Last time we covered...

- Stack Navigation
- Tabs Navigation
- Drawer Navigation

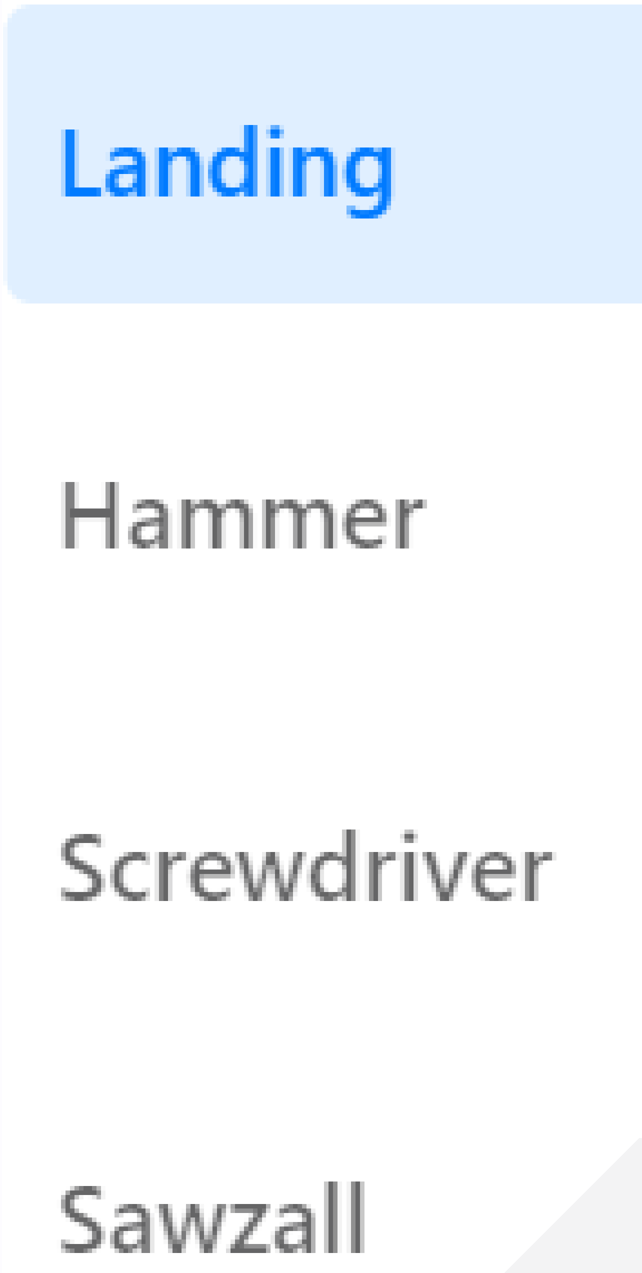
How do we pass data down?

- Using context
- Using render callbacks

Passing Data Down

Problem: Create a drawer with many tools in it.

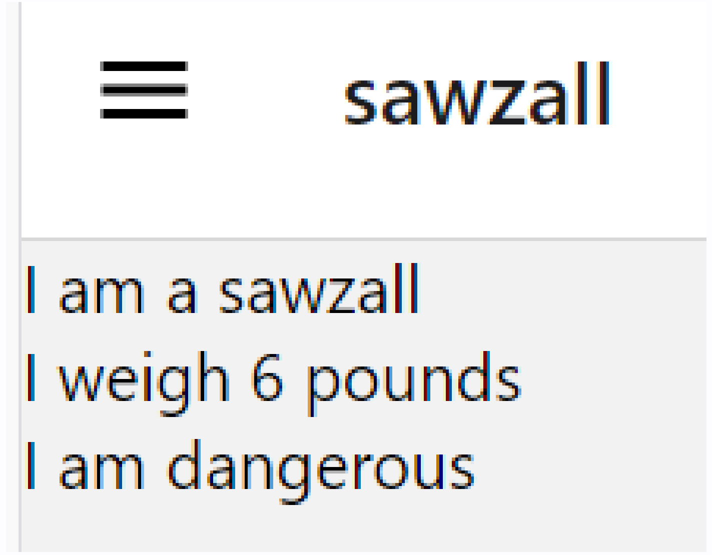
```
const [tools, setTools] = useState([
  { name: 'hammer', weight: 2, dangerous: false },
  { name: 'screwdriver', weight: 1, dangerous: false },
  { name: 'sawzall', weight: 6, dangerous: true }
]);
```



Passing Data Down

Displaying the tool data.

```
export default function ToolScreen(props) {
  return <View>
    <Text>I am a {props.name}</Text>
    <Text>I weigh {props.weight} pounds</Text>
    {
      props.dangerous ?
        <Text>I am dangerous</Text> :
        <Text>I am not dangerous</Text>
    }
  </View>
}
```



I am a sawzall
I weigh 6 pounds
I am dangerous

Creating Navigator

```
    <NavigationContainer>
      <ToolDrawer.Navigator>
        <ToolDrawer.Screen name="Landing" component={LandingScreen}/>
        <ToolDrawer.Screen name="Hammer" component={ToolScreen}/>
        <ToolDrawer.Screen name="Screwdriver" component={ToolScreen}/>
        <ToolDrawer.Screen name="Sawzall" component={ToolScreen}/>
      </ToolDrawer.Navigator>
    </NavigationContainer>
```

❌ hardcoding tool names

❌ not passing tool data

Snack Example

```
<NavigationContainer>
  <ToolDrawer.Navigator>
    <ToolDrawer.Screen name="Landing" component={LandingScreen}/>
    {
      tools.map(tool => {
        return <ToolDrawer.Screen
          key={tool.name}
          name={tool.name}
          component={ToolScreen}
        />
      })
    }
  </ToolDrawer.Navigator>
</NavigationContainer>
```

Similar Solution: BadgerChat

❌ not passing tool data

```
<NavigationContainer>
  <ToolDrawer.Navigator>
    <ToolDrawer.Screen name="Landing" component={LandingScreen}/>
    {
      tools.map(tool => {
        return <ToolDrawer.Screen key={tool.name} name={tool.name}>
          {(props) => <ToolScreen {...props} {...tool}/>}
        </ToolDrawer.Screen>
      })
    }
  </ToolDrawer.Navigator>
</NavigationContainer>
```

✅ correct way!

Snack Example

Switch Navigation

There is a fourth, "informal" navigation.

⚠️ Do not use the one from React Navigation! It is very out-of-date. It existed in React Navigation < 4.x.

"Switch" Navigation

```
isSignedIn ? (
  <>
    <Stack.Screen name="Home" component={HomeScreen} />
    <Stack.Screen name="Profile" component={ProfileScreen} />
    <Stack.Screen name="Settings" component={SettingsScreen} />
  </>
) : (
  <>
    <Stack.Screen name="SignIn" component={SignInScreen} />
    <Stack.Screen name="SignUp" component={SignUpScreen} />
  </>
);
```

React Navigation AuthFlow

"Switch Navigation"

Premise: perform a conditional render.

If the user is signed in, show them their needs feed.

Else give the user the option to sign in or sign up.

Snack Solution

HW9 Demo

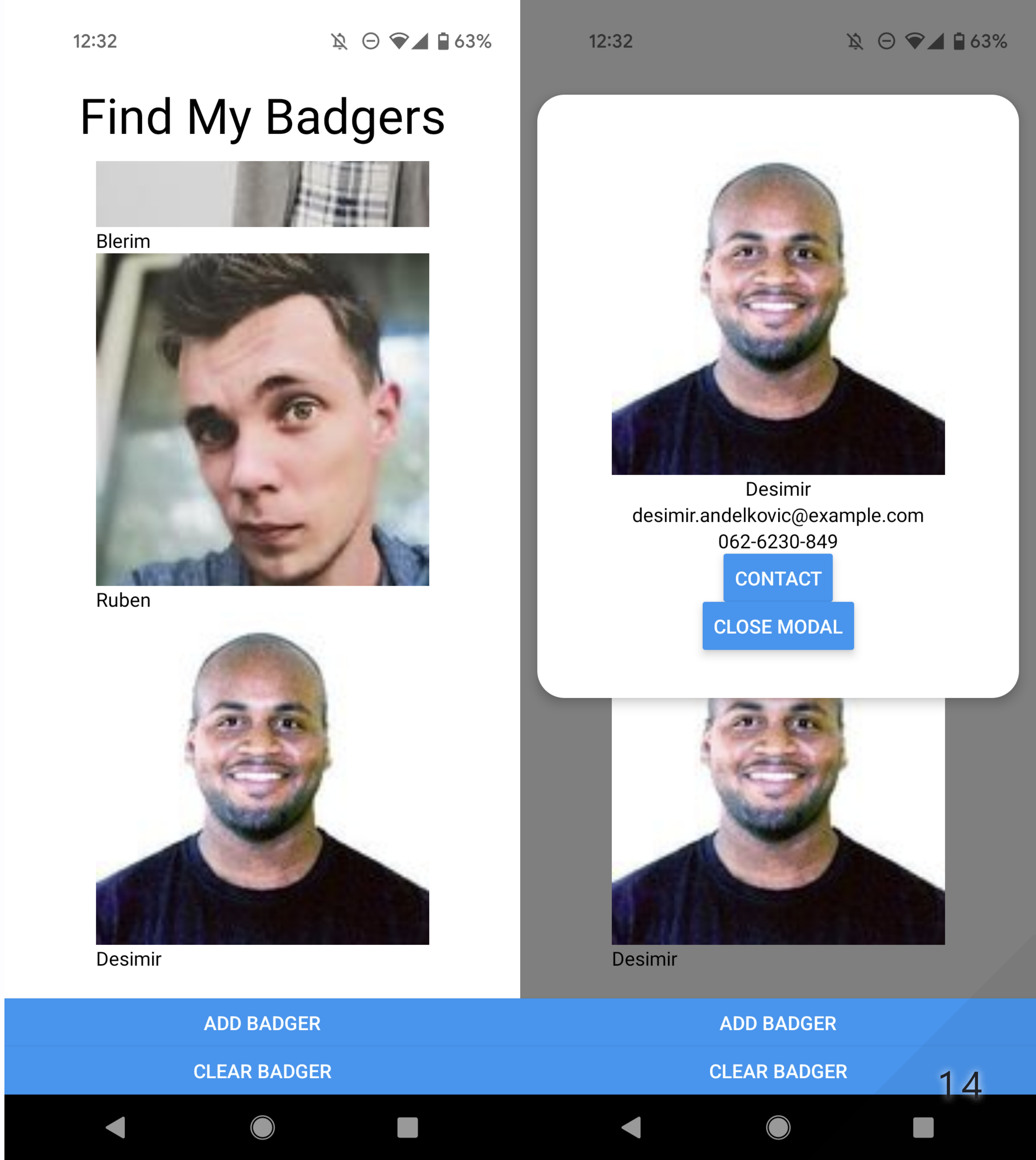
Switch navigation and data passing.

Modal

A secondary window.

```
import { Modal } from 'react-native'
```

Find My Badgers



Modal

What you need...

1. Something to open the modal
2. Some content inside the modal
3. Something to close the modal

We often manage whether the modal is open or closed using a state variable, e.g.

```
const [modalVisible, setModalVisible] = useState(false);
```

Modal

A modal is nothing more than a secondary overlay! You will need to style it.

```
const styles = StyleSheet.create({
  modalView: {
    margin: 20,
    alignItems: 'center',
    shadowColor: '#000',
    shadowOpacity: 0.25,
    shadowRadius: 4,
    elevation: 5,
    // ...
```

Modal Properties

- `animationType` : 'slide', 'fade', 'none'
- `onShow` : callback func
- `onRequestClose` : callback func
- `transparent` : true/false
- `visible` : true/false often handled by a state variable

Modal Docs | Modal Snack

Secure Storage

Storing secrets (asynchronously!)

What's so secret?

A JSON Web Token (JWT)!

```
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.
eyJpZCI6MjgsInVzZXJuYW1lIjoidGVzdDEyN
DU2NyIsImlhdCI6MTY5OTkxNDQxMiwiZXhwIj
oxNjk5OTE4MDEyfQ.Z0WiskxiQUTzEhHocjzg
4y5QaFEOCgg4Zz8sLszSMB0
```

What is this? A signed access token good for a set period of time.

JSON Web Token

Base64 *encoded* (this is **NOT** *encryption*) segments separated by periods. These consist of a "header", "claims", and "signature"

What is Base64? An alphabet (much like binary) of 64 characters: `[A-Za-z0-9]`, `+`, `/`. `=` as a suffix.

base64encode.org | base64decode.org

JSON Web Token

Header

```
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9
```

Claims

```
eyJpZCI6MjgsInVzZXJuYW1lIjoidGVzdDEyNDU2NyIsImlhdCI6MTY5OTkxNDQxMiwiZXhwIjoxNjk5OTE4MDEyfQ
```

Signature

```
Z0WiskxiQUTzEhHocjzg4y5QaFEOCgg4Zz8sLszSMB0
```

JSON Web Token

Header

```
{"alg": "HS256", "typ": "JWT"}
```

Claims

```
{"id": 28, "username": "test124567",
"iat": 1699914412, "exp": 1699918012 }
```

Signature

Signed using `alg` with some server secret.

Authentication

JWT is just one form of authentication, known as *stateless* authentication.

Session UUIDs are another popular way to handle authentication, e.g.

```
642e4f9a-0d7a-44e5-ba60-e86822b4a8ac
```

This is *stateful*, a database maps this UUID to the corresponding claims.

Discuss & Debate

Stateless vs. stateful authentication...

- From the view of a user
- From the view of a frontend developer
- From the view of a backend developer

Authentication

Web Development

- Interface with the *user's browser.*
- Prefer `HTTP-Only` cookies.

Mobile Development

- Interface with the *user's operating system*.
- Prefer OS-level secure encrypted storage.

Authentication

Web: Specify *option* `include: 'credentials'`

```
fetch("https://example.com/api/submit", {
  method: "POST",
  credentials: "include",
  // ...
```

Authentication

Mobile: Specify...

- *header* `Authorization`
- *value* `Bearer <JWT>`

```
fetch("https://example.com/api/submit", {
  method: "POST",
  headers: {
    "Authorization": "Bearer eyJhbGciOiJIUzI1NiIs..."
  // ...
```

If the request has a body, don't forget `Content-Type`!

HW9 Demo

Secrets and `Authorization`

Download and import today's Postman collection.

Secure Storage

Uh oh! We have to store a JWT?

- React has no built-in way to handle credentials! 😮
- expo-secure-store
    - Only works on Android and iOS -- not web!
- Stores key/value pairs to *persistent* storage.
- Up to 2KB of data per value (small!)
- Cannot store emojis 😔
- Additional options for passcode 🔒 and biometrics 👉

Secure Storage

Secure storage is asynchronous in nature.

- `getItemAsync(key)`
- `setItemAsync(key, val)`
- `deleteItemAsync(key)`

Note: Key refers to a storage key (think HashMap) *not* an encryption key!

Secure Storage

expo-secure-store shows an example of `async` / `await` ... What is this?...

Same thing as `then` and `catch` on a `Promise` (think `fetch`)... just a slightly different syntax!

We'll cover `async` / `await` in DialogFlow!

Secure Storage

CS571-ifying the expo-secure-store example.

Use your phone, not the web!

Advanced Gestures

Making use of diverse mobile inputs ✌️ ☝️ ✋ 👌 👍

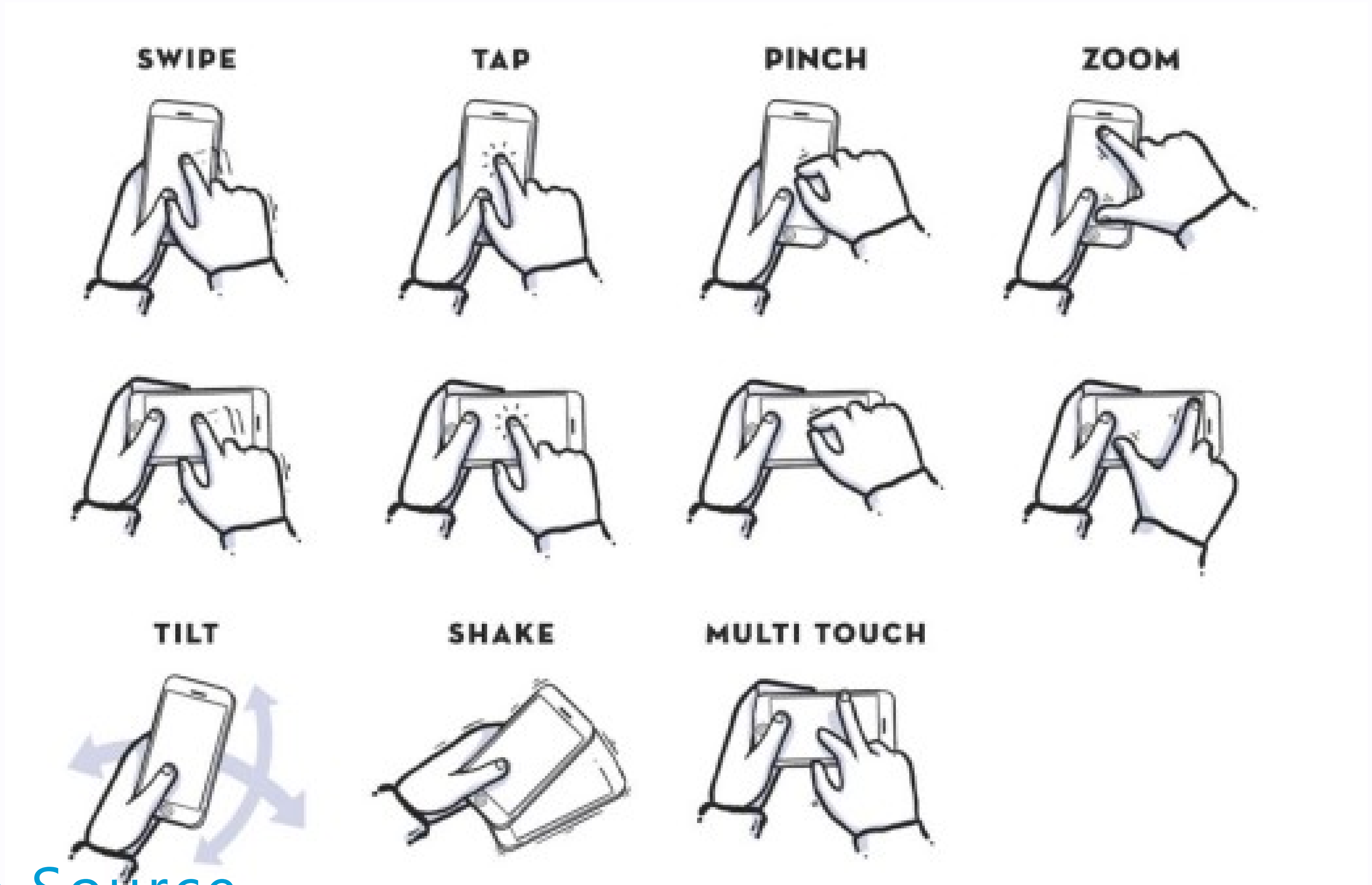


Image Source

Gestures

React Native provides methods to detect when and where the user's fingers move.

Higher-level gesture response libraries...

- react-native's PanResponder
  - See S22 Example
- react-native-gesture-handler
  - See S23 Example
- component libraries, e.g. react-native-paper

Component Library Gestures

react-native's Button `onPress`

react-native-paper's Card `onPress` and `onLongPress`

react-native-elements' Slider `onSliding`

react-native-maps' Marker `onDrag`

react-navigation's Drawer gesture

Sensors

Use `expo-sensors` instead of `react-native-sensors`

- Accelerometer
- Barometer
- Gyroscope
- LightSensor
- Magnetometer
- Pedometer

Not all devices have all sensors!

Other Sensors

- `expo-camera`
- `expo-battery`
- `expo-haptics`
- `expo-av`
- `expo-brightness`

Beware of permissions!

Deployment

Getting your app to a production environment.

Deployment

iOS vs Android Market Share

Region	iOS	Android	Other
USA	54%	45%	1%
North America	52%	47%	1%
Asia	16%	83%	1%
Worldwide	28%	71%	1%

Source: GlobalStatCounter

Deployment

Use Expo Application Services (EAS)

```
npm install -g eas-cli
```

```
eas build -p android
eas build -p ios
```

An `.apk` gets deployed to the Google Play Store

An `.ipa` gets deployed to the iOS App Store

Deployment

No web server for deployment! Hosted on Google Play Store or iOS App Store.

App goes through a review process.

- **Google Play Store:** Hours to Days
- **iOS App Store:** Days to Weeks

Deployment Considerations

- Reliability
- Performance
- Monitoring
- Business Value of Delivery
- App Store Optimization (ASO)

What did we learn today?

- How to pass data using React Navigation?
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Questions?