Mobile Dev 1

CS571: Building User Interfaces

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Today's Warmup

- Download Expo for your mobile device (see next slide for details).
- Clone today's code to your machine.
  - Run the command `npm install` inside of the `starter` and `solution` folders.
- **Optional:** Set an environment variable called `EXPO_PUBLIC_CS571_BADGER_ID` to be your Badger ID!
  - This may require a restart.

Download Expo

Download Expo!

- Download for iOS
- Download for Android
- Don't have a smart phone? You can use an emulator like AVD or XCode

Midterm Exam

Results should be available by the end of Spring Break, if not earlier! You will receive an email.

Learning Objectives

- Understand the landscape of mobile development.
- Be able to identify how "true native" development differs from "React Native" development.
- Be able to construct a basic, cross-platform mobile application using React Native & Expo.

Mobile Development

Native development and its alternatives

What is "True Native" Development?

Building specifically for the device (e.g. Android or iOS) that you want to support.

iOS: Objective-C or Swift w/ Cocoapods
Android: Java or Kotlin w/ Maven or Gradle

Pros and Cons of True Native

Pros

- Organic User Experience
- Optimized Apps
- Fine-Grained Control

Cons

- Expensive
- Little Code Reuse
- Less Sense of Abstraction

Alternatives to True Native

No mobile app! Do we really need an app? Could a responsive webpage be just as effective?

WebView! Can we take our existing code and just slap it into a WebView? e.g. Apache Cordova

Cross-Platform! Can we use a library or framework that will make our code work natively on Android *and* iOS? e.g. React Native

Who is using React Native?

- Facebook
- Microsoft
- Shopify
- Coinbase
- Discord
- Dave

... among many others. Other companies may be doing pure-native or hybrid development.

What is React Native?

A JS framework for building native, cross-platform mobile applications using React, developed by Facebook in 2015.

Unlike ReactJS, which was a library, React Native is a framework that includes everything* that we will need to build mobile applications.

React Native supports iOS and Android development.

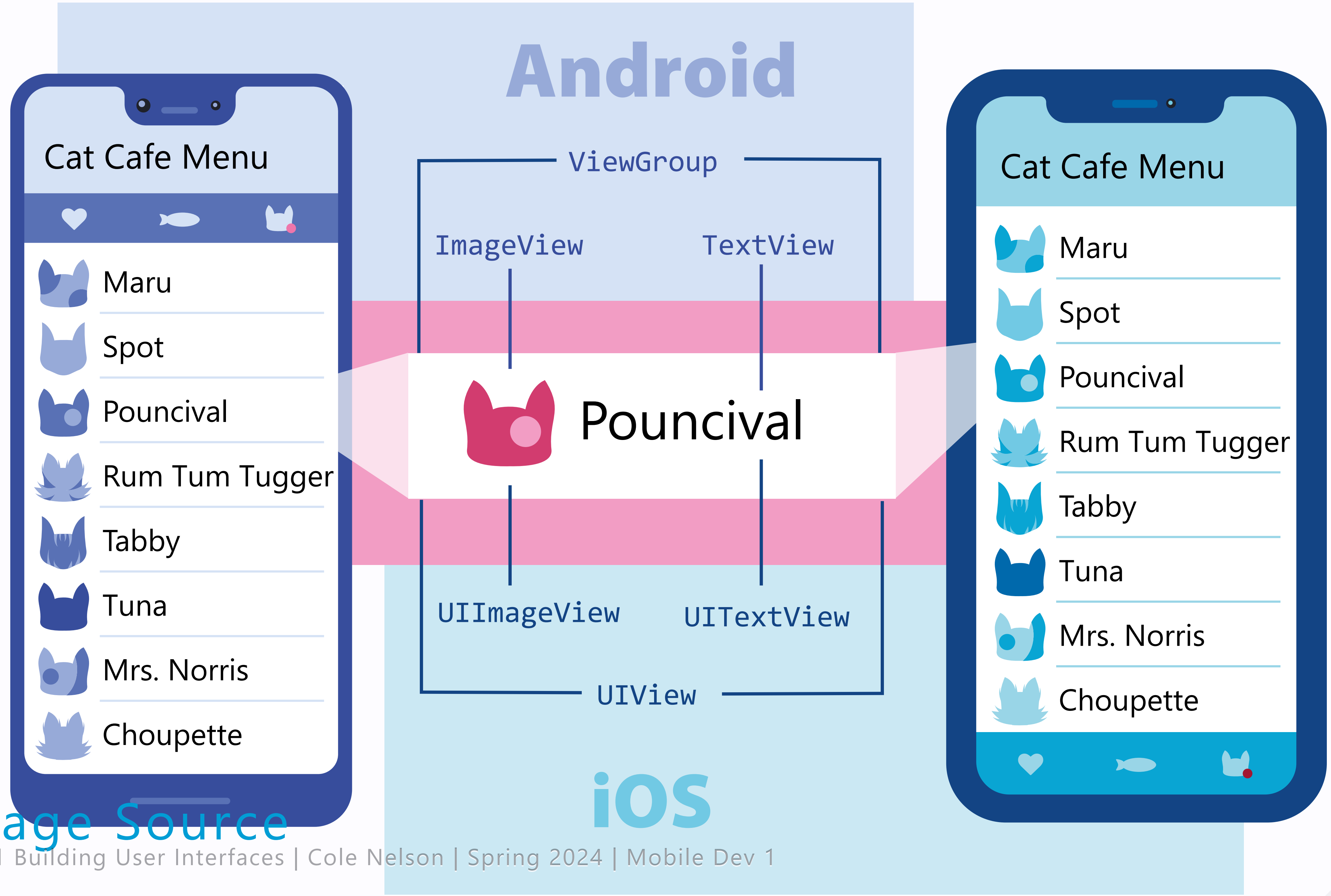


Image Source

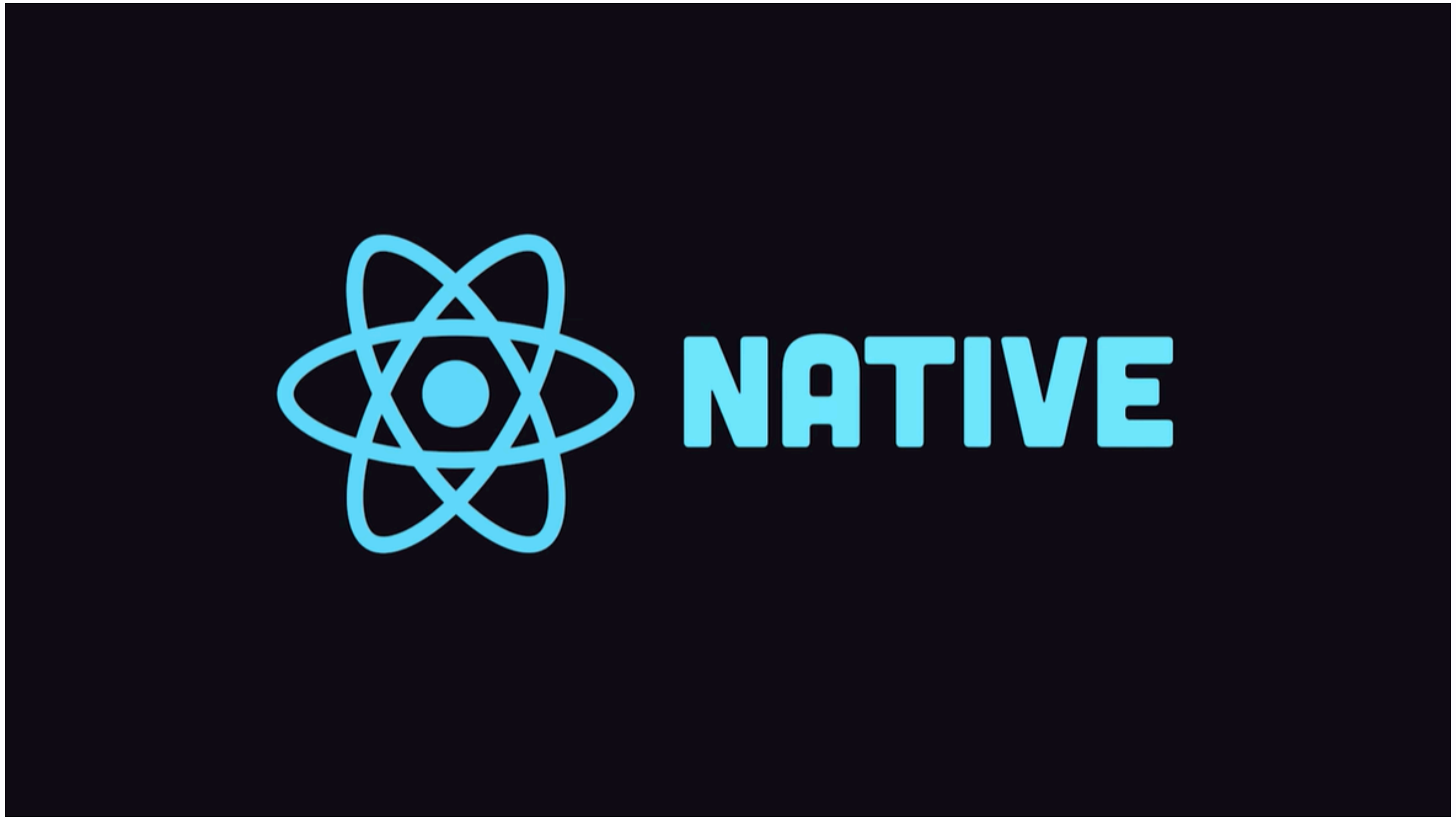
React Native

- No more browser!
- No more DOM!
- Hermes is used to translate your JS components to iOS/Android components.

Image Source

React Native

React for Mobile Devices!



React Native in 100 seconds

A Review of *Implementation* So Far

Lecture	Takeaway
Intro	The web runs on HTTP
WDB1	Basics of HTML, CSS, and JS
WDB2	APIs and Asynchronous Programming
WDB3	Declarative Programming and Bootstrap

A Review of *Implementation* So Far

Lecture	Takeaway
React 1	Intro, useState, and useEffect
React 2	Many Components and Controlled Inputs
React 3	State Management, Context, and Routing
React 4	Complex APIs and Secret Management
React 5	Memoization, Deployment, and NPM

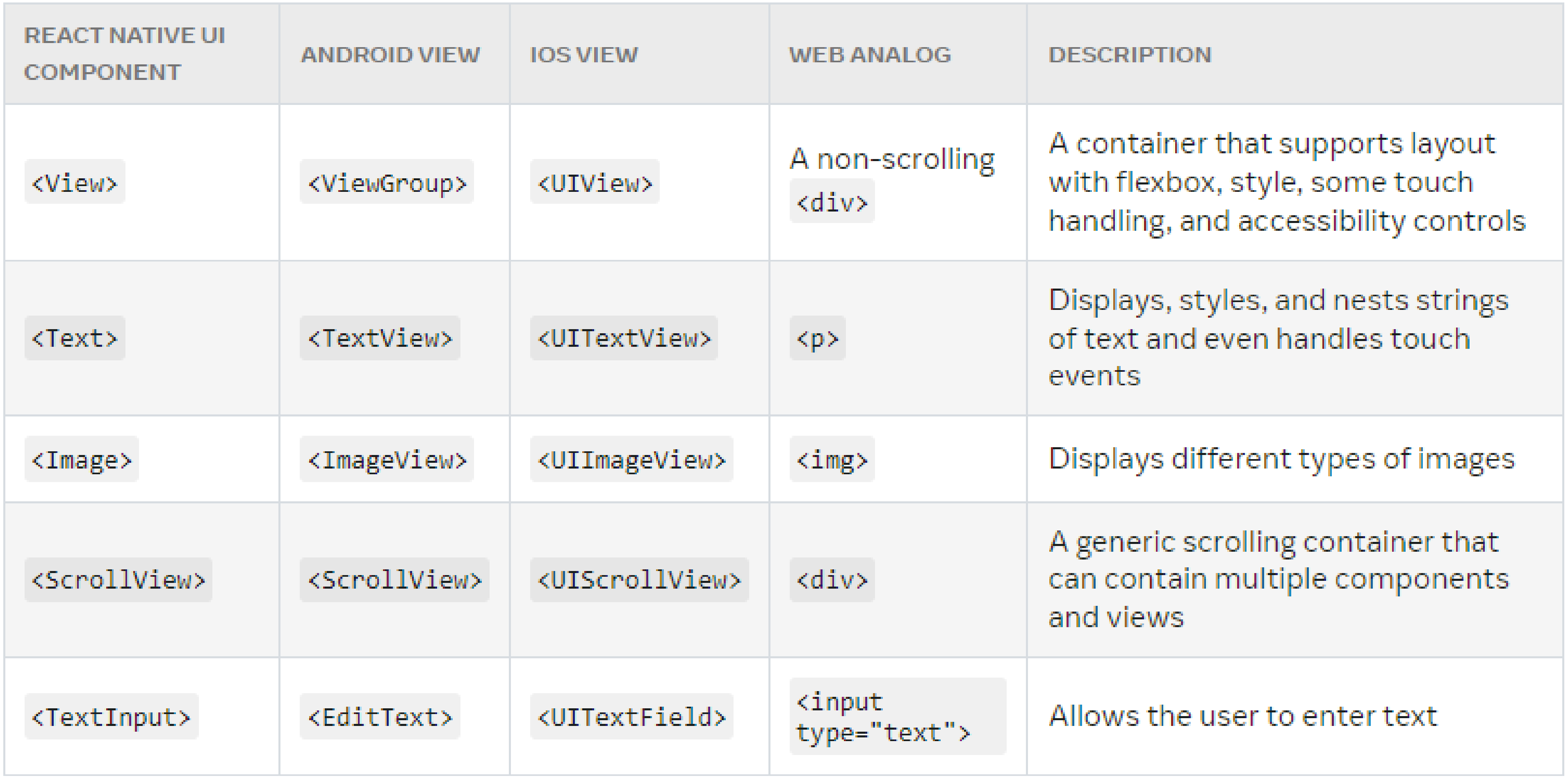
What stays the same?

- Using NPM for our library management
- Using complex APIs
- Core React features
    - React Hooks (useEffect, useState, etc.)
    - Passing props and state management
    - Controlled vs Uncontrolled Inputs
    - Memoization

What changes?

- This isn't a browser!
    - No more DOM!
    - No more CSS!
        - No more Bootstrap!
    - No more sessionStorage, localStorage, or cookies.
- Wider variety of inputs
    - Sensors
    - Gestures
- React Navigation vs React Router

Conversions to Know



REACT NATIVE UI COMPONENT	ANDROID VIEW	IOS VIEW	WEB ANALOG	DESCRIPTION
`<View>`	`<ViewGroup>`	`<UIView>`	A non-scrolling `<div>`	A container that supports layout with flexbox, style, some touch handling, and accessibility controls
`<Text>`	`<TextView>`	`<UITextView>`	`<p>`	Displays, styles, and nests strings of text and even handles touch events
`<Image>`	`<ImageView>`	`<UIImageView>`	`<img>`	Displays different types of images
`<ScrollView>`	`<ScrollView>`	`<UIScrollView>`	`<div>`	A generic scrolling container that can contain multiple components and views
`<TextInput>`	`<EditText>`	`<UITextField>`	`<input type="text">`	Allows the user to enter text

Image Source

Other Good Questions to Ask…

- Can we declaratively program using RN? **YES**
- Can we use JSX with RN? **YES**
- Can we use React hooks in RN? **YES**
- Can we do styling in RN? **YES**-ish
- Is it *truly* cross-platform? **MAYBE**-ish

Hello World!

```
import React from 'react';
import { Text, View } from 'react-native';

function MyApp() {
  return (
    <View style={{ flex: 1, justifyContent: "center", alignItems: "center" }}>
      <Text>
        Try editing me! 🎉
      </Text>
    </View>
  );
}

export default MyApp;
```

Expo Snack

React Native for React Devs

How can we write our mobile apps with React Native?

Getting Started

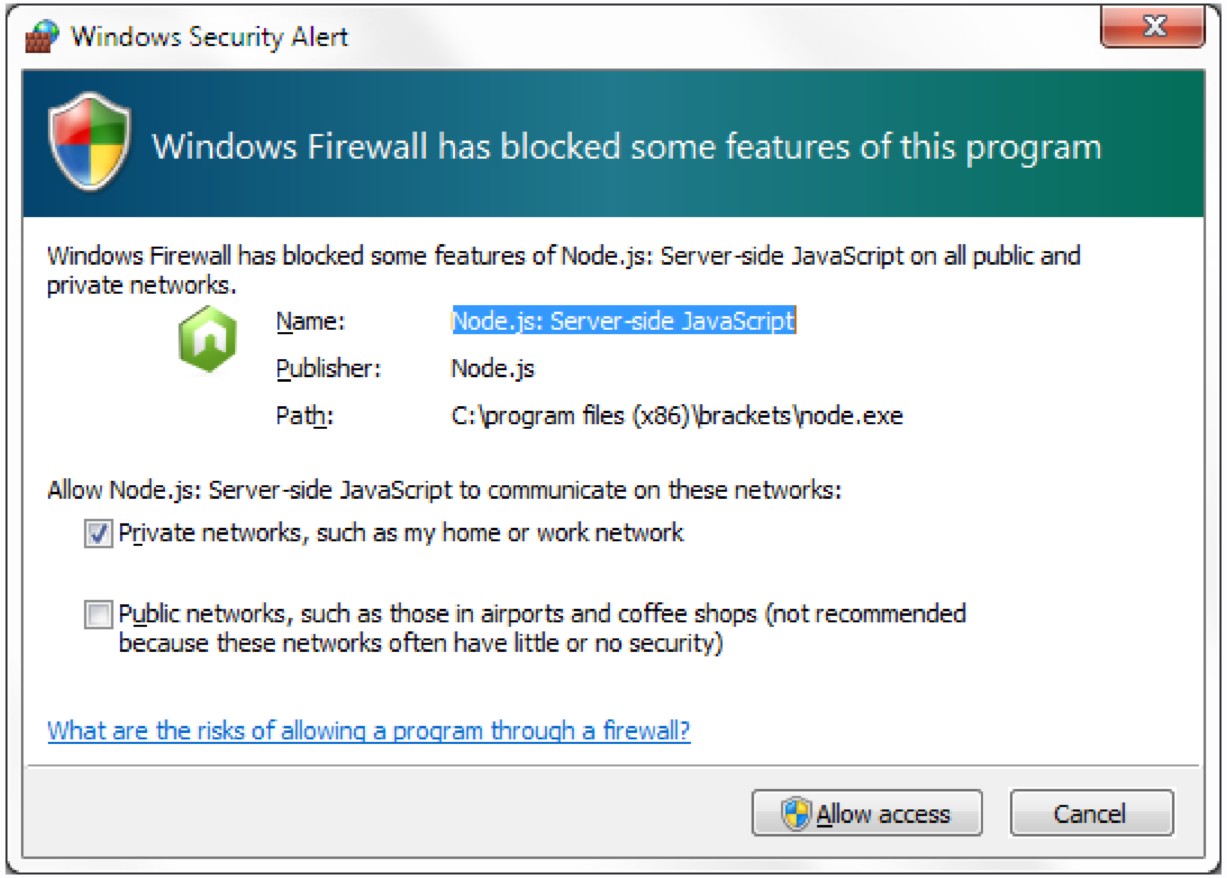
Using Expo, similar to vite!

Run for each new project...

```
npx create-expo-app my-cool-app
cd my-cool-app
npm start
```

Getting Started: A Special Note

By default, Expo uses "lan" to host your app. Your computer will act like a server for your phone; be sure to allow connections!



Windows Firewall has blocked some features of Node.js: Server-side JavaScript on all public and private networks.

Name: Node.js: Server-side JavaScript
Publisher: Node.js
Path: C:\program files (x86)\brackets\node.exe

Allow Node.js: Server-side JavaScript to communicate on these networks:

[✓] Private networks, such as my home or work network

[ ] Public networks, such as those in airports and coffee shops (not recommended because these networks often have little or no security)

What are the risks of allowing a program through a firewall?

Getting Started: A Special Note

This may cause issues on certain networks. Try using "localhost" or "tunnel" by modifying scripts of `package.json` ...

```
"scripts": {
  "start": "expo start --localhost",
  "android": "expo start --android",
  "ios": "expo start --ios",
  "web": "expo start --web"
}
```

You will need to be wired in to your computer!

Styling

Because React Native does not use a "browser", we can't use CSS styles. Instead, we create JavaScript stylesheets. **These try to emulate CSS.**

```
const styles = StyleSheet.create({
  container: {
    flex: 1,
    justifyContent: 'center',
    backgroundColor: '#ecf0f1',
    padding: 40,
  },
  ...
});
```

Styling

Style definitions can be done inline or via stylesheets. You can also combine both methods.

```
<View>
 <Text style={styles.label}>First label</Text>
 <Text style={{fontSize: 28, color:'tomato'}}>Second label</Text>
 <Text style={[styles.label, {fontSize: 20, color:'gray'}]}>Third label</Text>
</View>
```

Snack Solution

Images

`Image` not `img` (must be imported!)

Must specify a width and height: the default is 0!

`source` not `src` which takes an object (not a string)

```
<Image
  style={{
    width: 100,
    height: 100
  }}
  source={{
    uri: "https://example.com/me.png"
  }}
/>
```

Buttons

Some minor changes...

- `title` is specified with a prop
- `onPress` rather than `onClick`
- Cannot be styled

```
<Button title="Speak!" onPress={doSpeak}/>
```

Also, anything can be made a `Pressable` ... we'll cover this in a bit!

Your Turn!

Using today's starter code...

1. Get your expo app running!
2. Display the bio data to the phone screen.
3. When the button is pressed, display a message from the API.

```
https://cs571.org/api/s24/ice/mascot
https://cs571.org/api/s24/ice/mascot-messages
```

Cross-Platform: By Size

Mobile devices vary significantly in screen size, and we open need to obtain screen dimensions of the device using the `Dimensions` class in `react-native`.

```
const getScreenSize = () => {
 const screenWidth = Math.round(Dimensions.get('window').width);
 const screenHeight = Math.round(Dimensions.get('window').height);
 return { screenWidth: screenWidth, screenHeight: screenHeight };
}
```

Snack Solution

Cross-Platform: By Platform

React Native provides a number of components that utilize platform capabilities that may not be available in other platforms, thus for cross-platform development, we need to utilize multiple platform-specific components.

e.g. `TouchableNativeFeedback` only works on Android; a *similar* effect can be achieved using `TouchableHighlight` on iOS.

Cross-Platform: By Platform

```
if (Platform.OS === 'android') {
  return (
    <TouchableNativeFeedback> ... </TouchableNativeFeedback>
  );
} else {
  return (
    <TouchableHighlight> ... </TouchableHighlight>
  );
}
```

Optionally, create two components e.g. `MyButton.ios.js` and `MyButton.android.js`.

Snack Solution

Pressable

The cross-platform variant! May contain any children that can be "pressed"

```
<Pressable onPress={props.onPress}>
  <Image
    style={{ width: 100, height: 100 }}
    source={{
      uri: "https://example.com/me.png"
    }}
  />
  <Text>Press me!</Text>
</Pressable>
```

Pressable

Your Turn!

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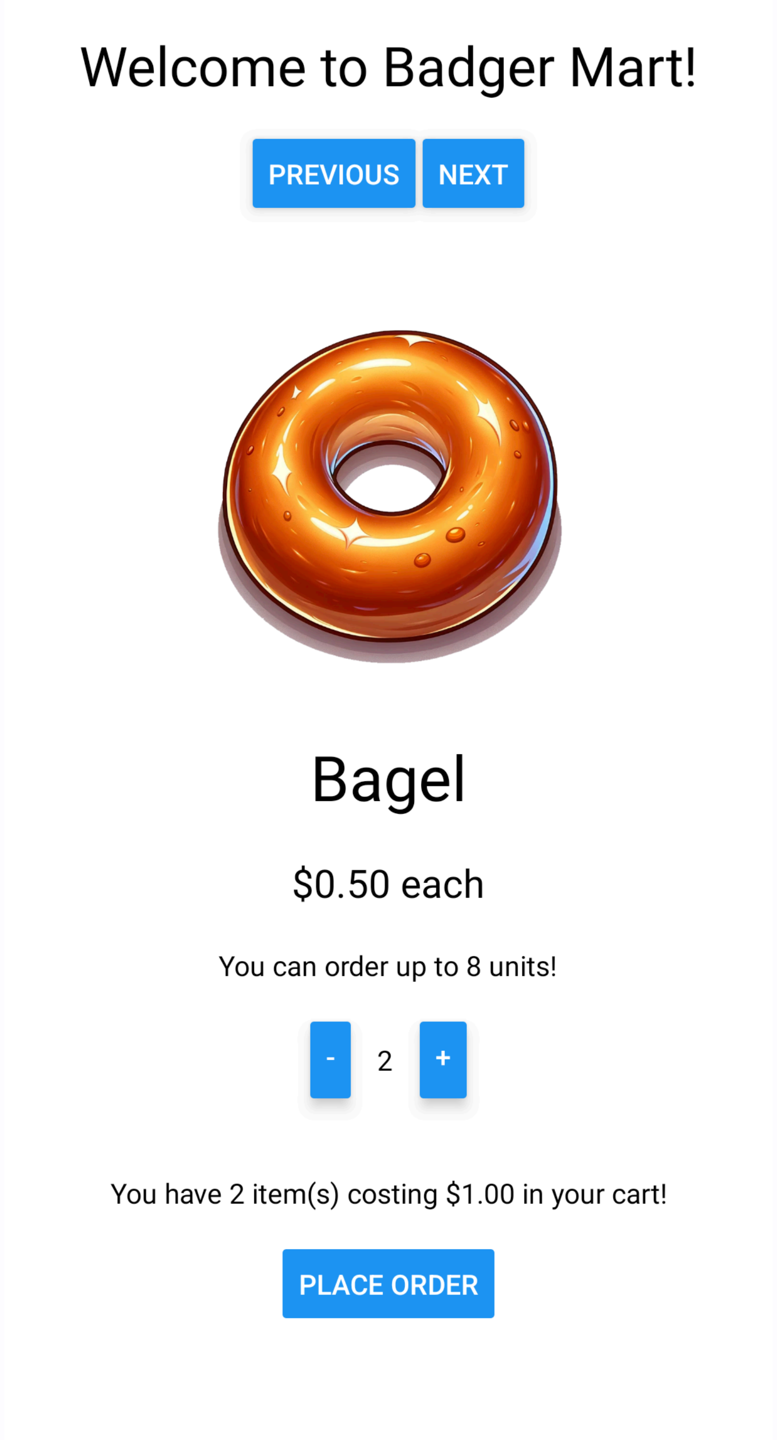
```

Mobile Dev HWs

It's difficult to test cross-platform; show us how it works on your device via a demo!



Welcome to Badger Mart!

Bagel

$0.50 each

You can order up to 8 units!

You have 2 item(s) costing $1.00 in your cart!

Expo Demo

Tackling HW7...

Questions?