Building User Interfaces

React Native 2

Intermediate Concepts

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What we will learn today?

- Mobile Navigation using React Native
- Mobile Input via Gestures using React Native
- Working with Date object in JS
- Assignment Preview

Mobile Navigation using React Native

The Options

There are two main ways of implementing navigation in RN:

1. Using ReactJS navigation, i.e., `react-navigation`
2. Using RN navigation, i.e., `react-native-navigation`

We will be covering `react-navigation` in depth. `react-native-navigation` is for advanced use, as it involves modifying native components, while `react-navigation` is programmed in JS.

Setting up ReactJS

Install `react-navigation` for RN:

```
npm install @react-navigation/native
```

Install dependencies:

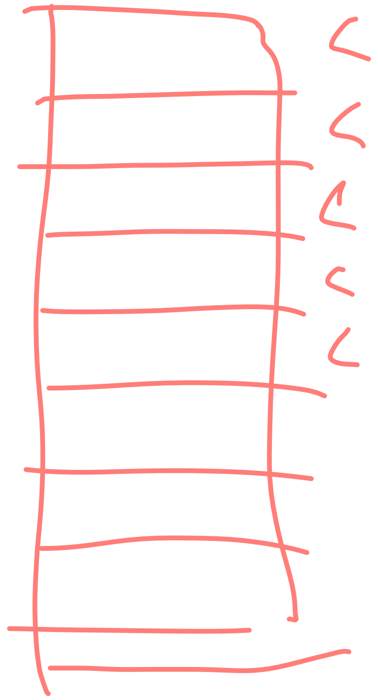
```
npm install react-native-reanimated
    react-native-gesture-handler
    react-native-screens
    react-native-safe-area-context
    @react-native-community/masked-view
```

How does navigation in HTML work?

The History API[1] provides a `Window` object that gives access to a `history` object, which includes a stack of all the pages that the user has previously visited.

When a new link (<a>) is pressed, the current URL is pushed to the history stack. The "back" button calls the following function, which pops the previous URL and pushes the current URL.

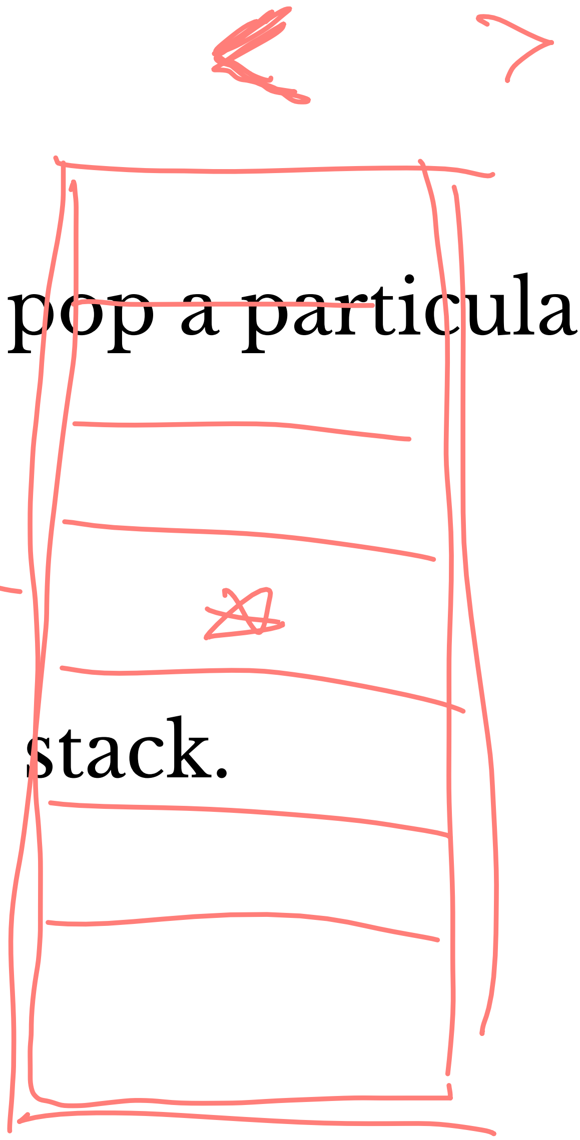
```
window.history.back()
```



[1] More on the History API

When the "forward" button is pressed, it calls the following function, which pushes the current URL in the stack and pops the previous one.

```
window.history.forward()
```



We can also navigate in the stack and pop a particular URL in the history:

```
window.history.go(3);
```

This will push the current URL to the stack.

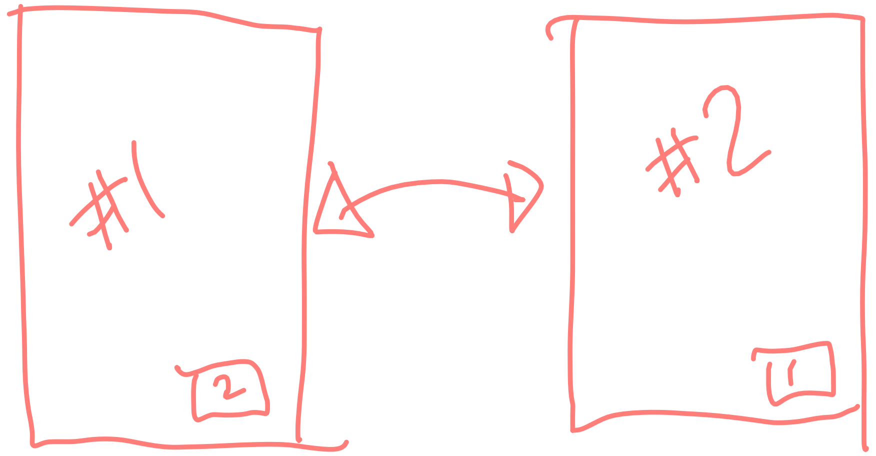
How does navigation in RN work?

RN provides a set of *navigators* that accomplish stack-based and other types of navigation:

1. Switch navigator
2. Stack navigator
3. Tab navigator
4. Drawer navigator

Switch Navigator

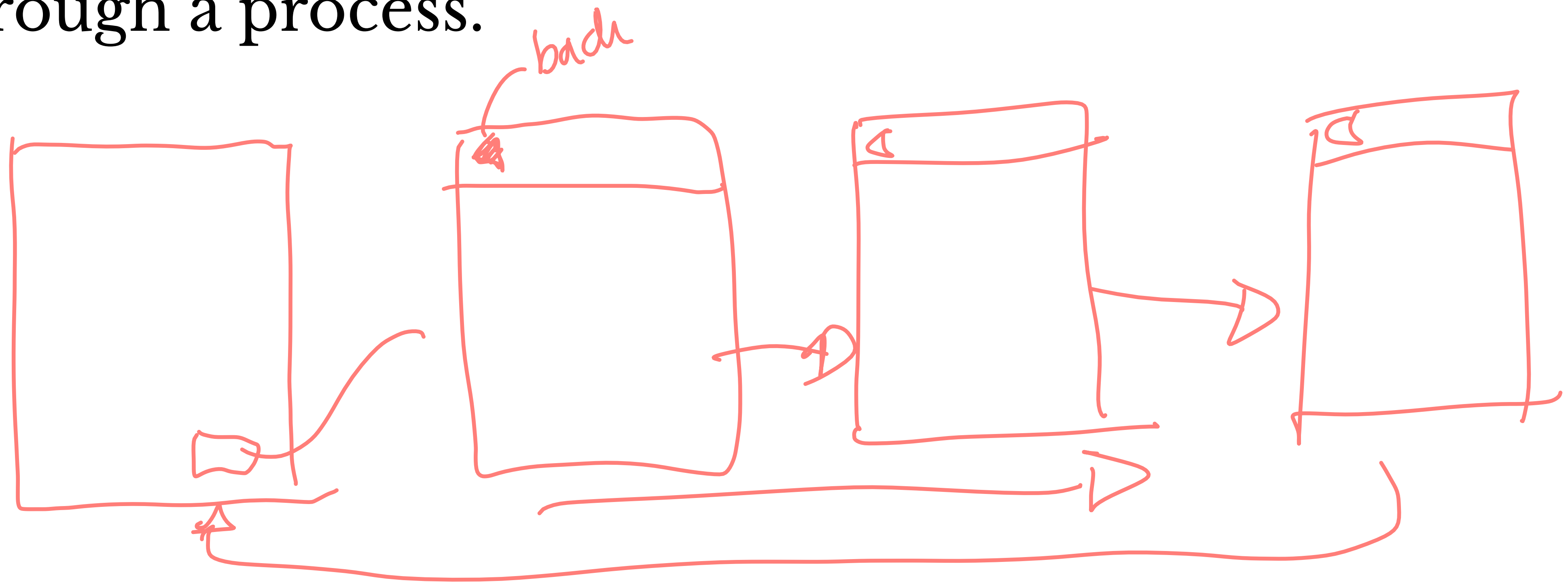
Definition: Enables showing one screen at a time and does not involve "back" actions. Used primarily in authentication flows.



Stack Navigator

Definition: Enables transition between screens where each screen is placed on a stack, as the History API does. The navigator automatically implements the native transition animations.

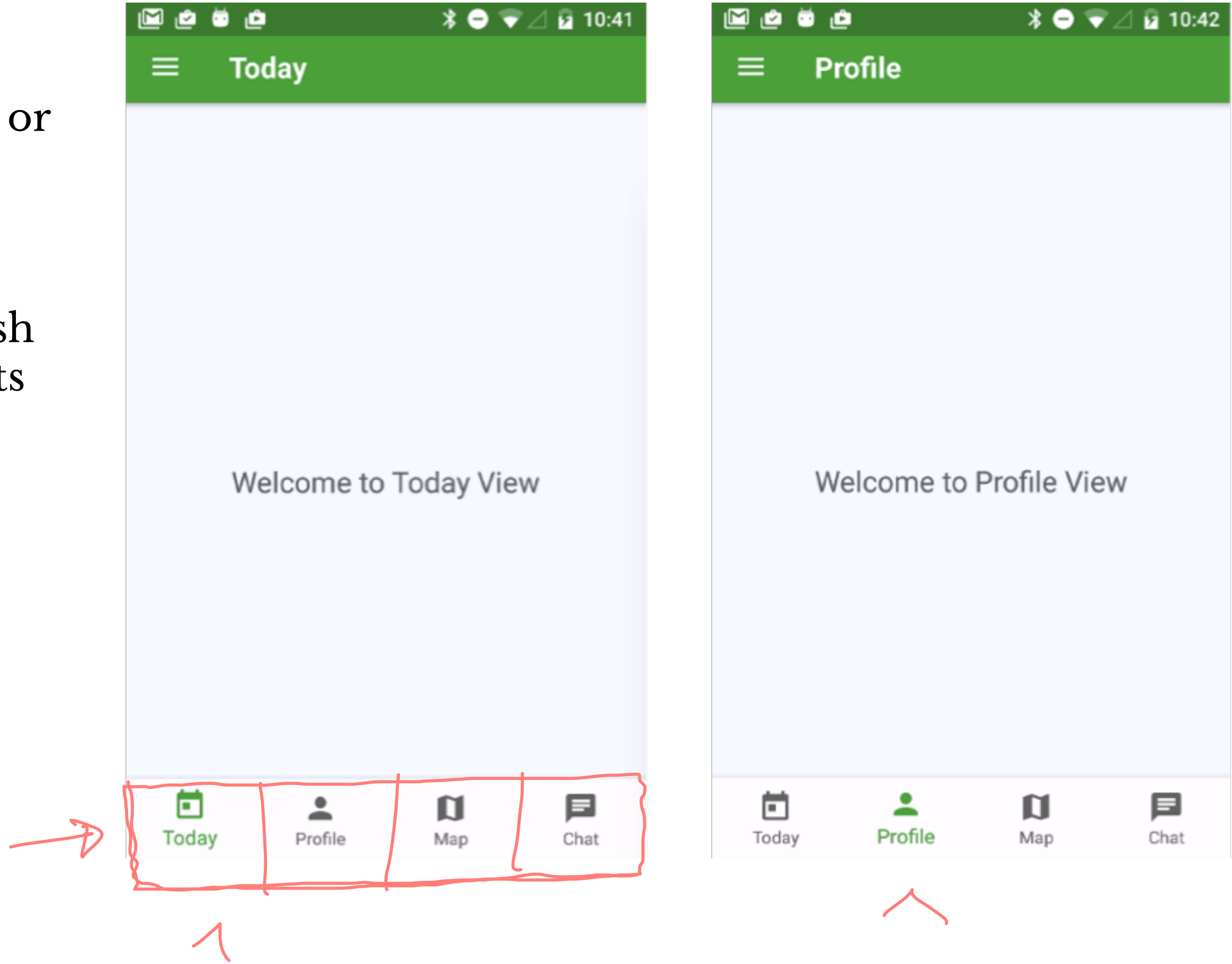
Primarily used to go back and forth between list and detail views or to walk the user through a process.



Tab Navigator[2]

Definition: Implements tabs at the bottom or the top of the screen to enable transitions among them.

Most commonly used navigation to establish a main menu for the different sections/parts of an application.



Welcome to Today View

Welcome to Profile View

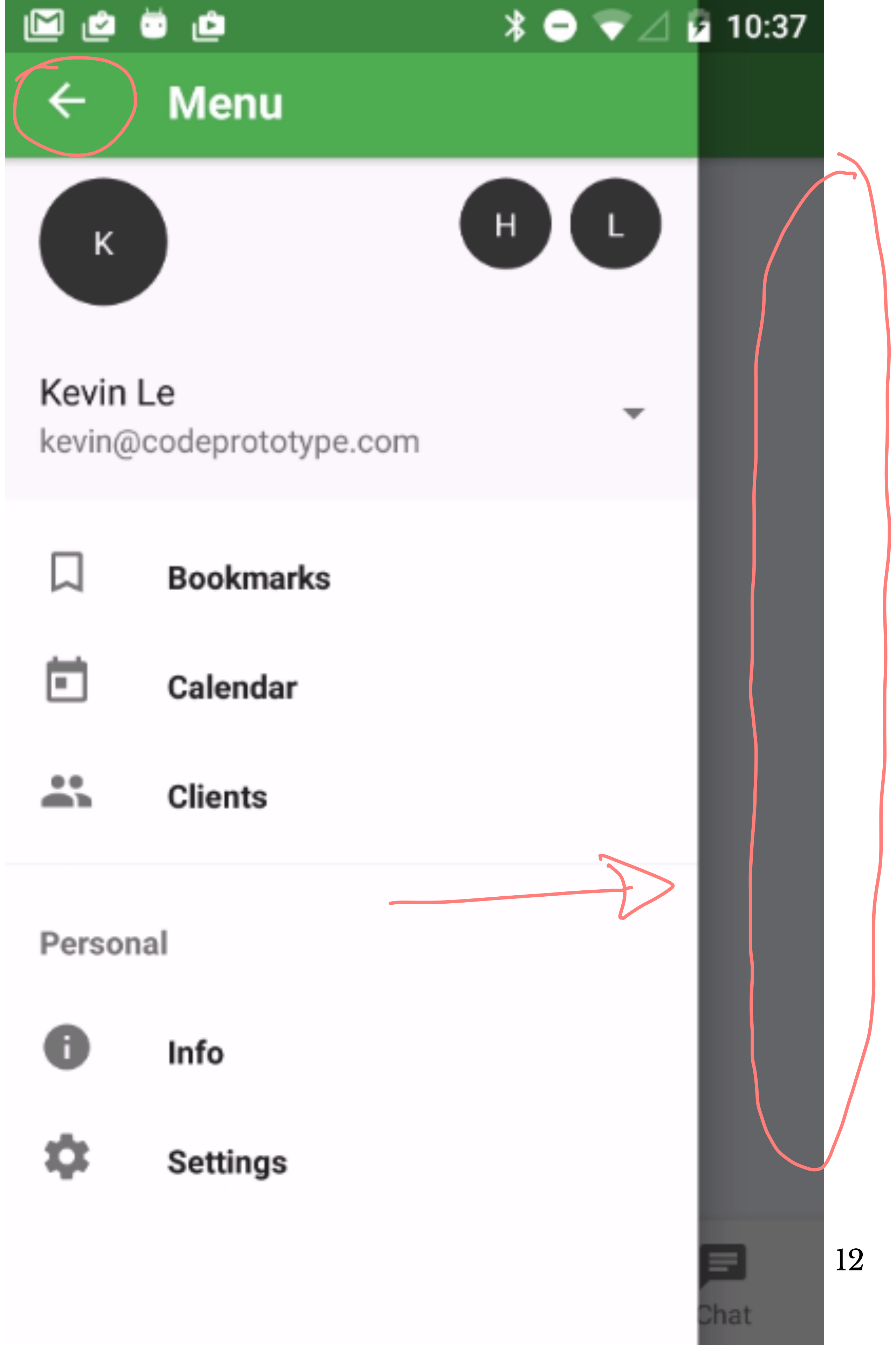
[2] Image source

Drawer Navigator[3]

Definition: Enables tab-like transitions through a hidden drawer that can be exposed and hidden.

Used primarily for options and settings.

drawe



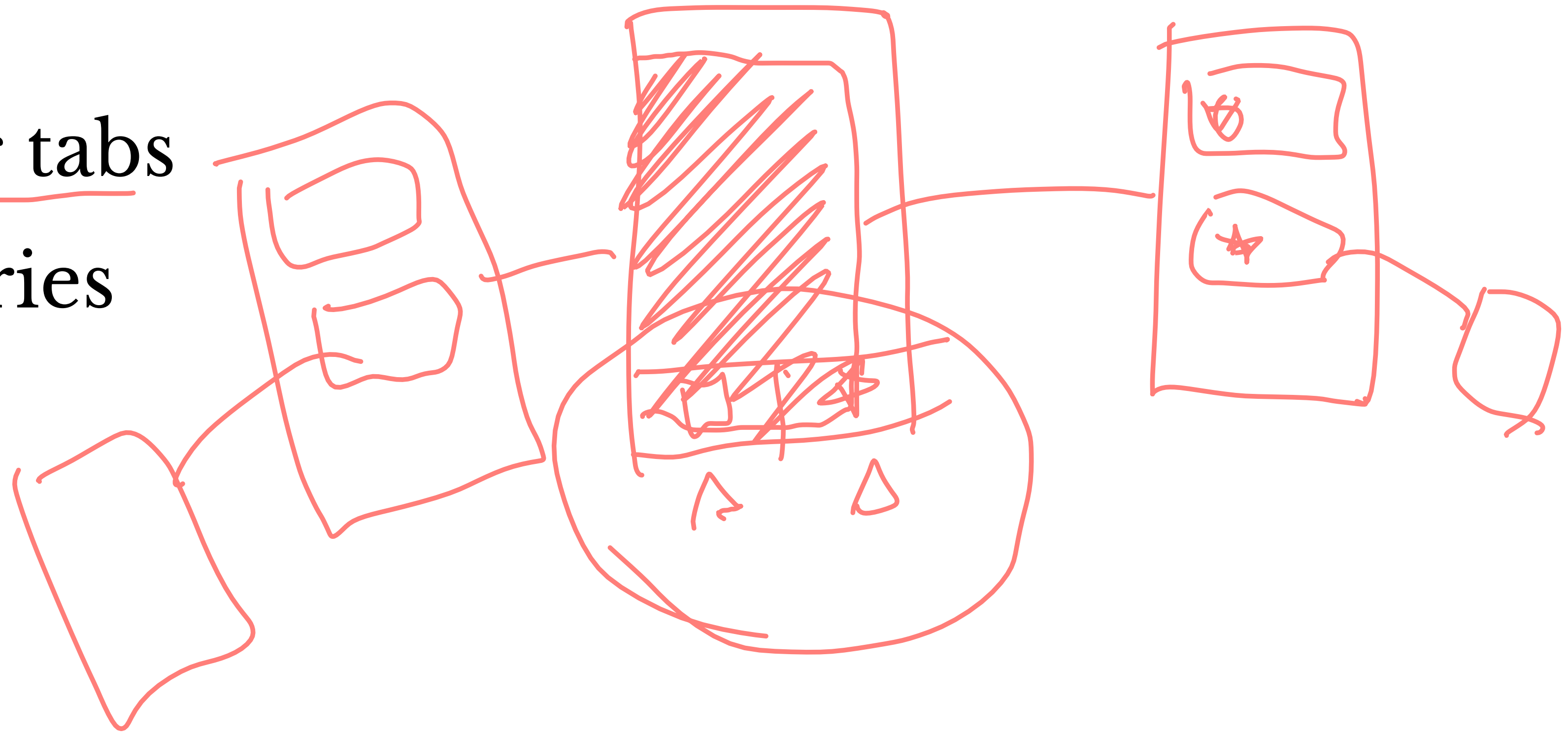
[3] Image source

The Big Picture

Every RN project will use a combination of these navigators.

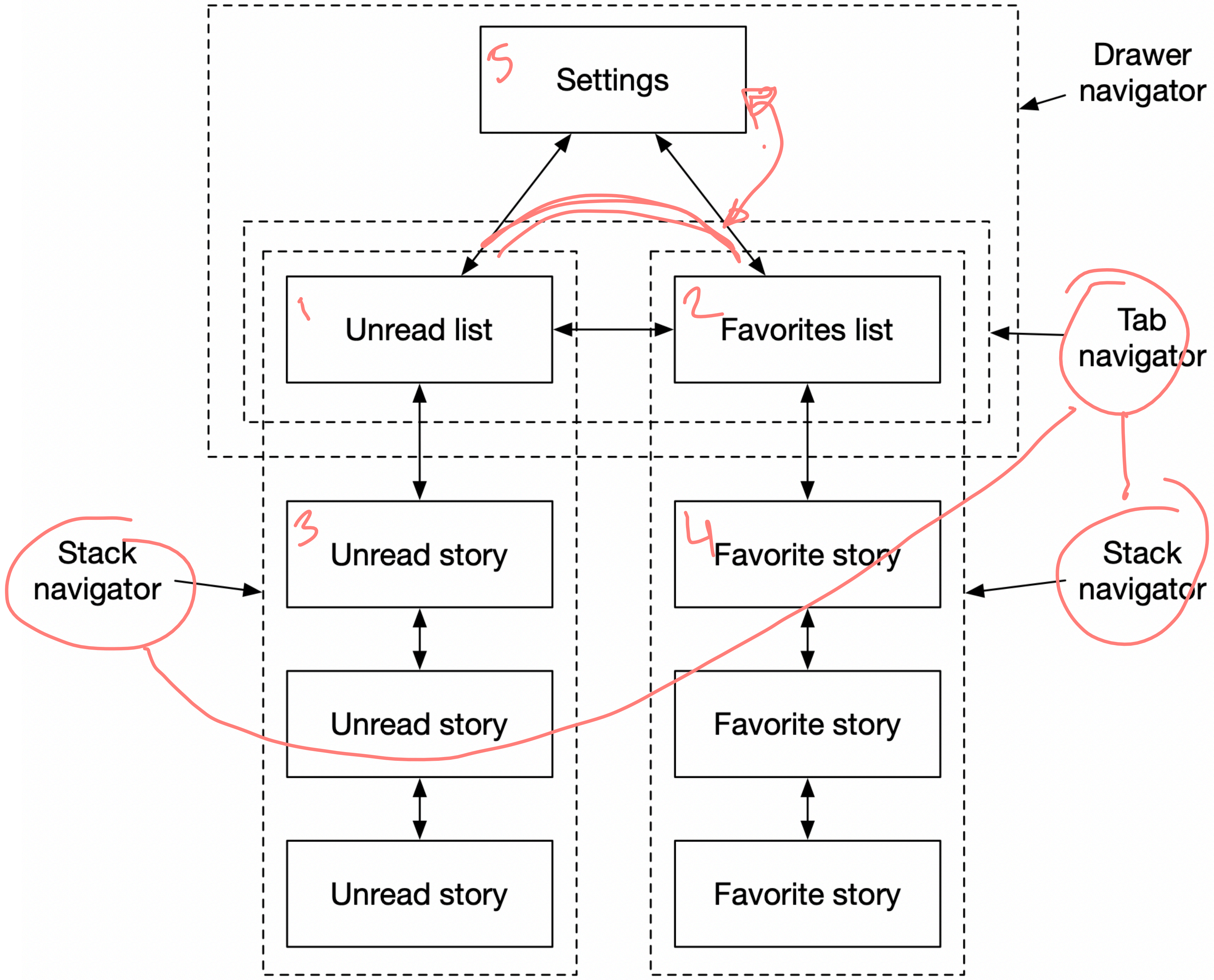
As a working example, let's imagine a *news/RSS reader* app with the following specifications:

1. Landing page with *unread* and *favorites* tabs
2. Pages to show unread and favorite stories
3. Settings to change reading mode

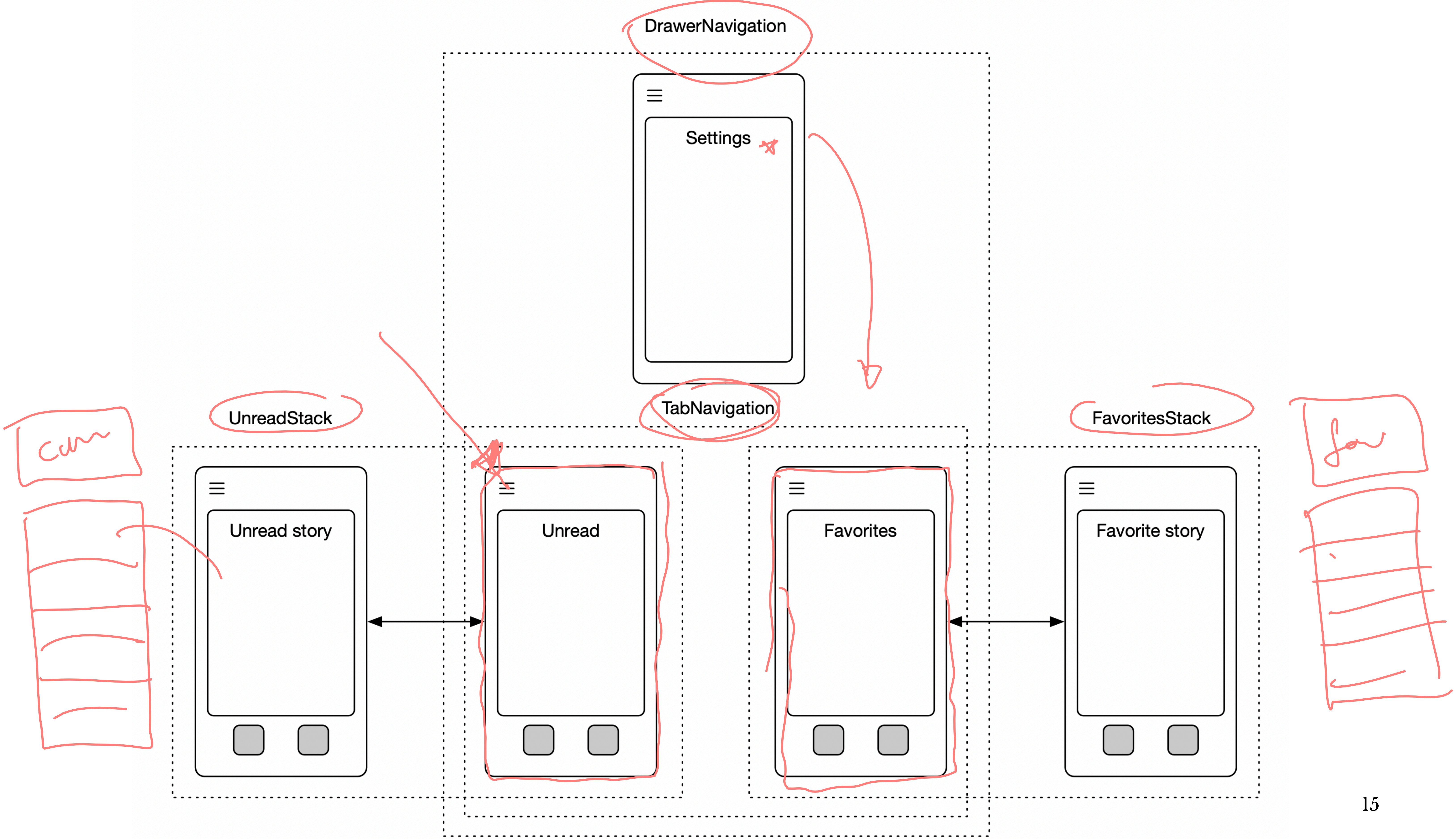


My implementation should include:[4]

1. Tab navigator for the unread and favorites pages
2. Stack navigators for the unread and favorite stories
3. Drawer navigator for the drawer and the tabbed pages



[4] See example on Snack



DrawerNavigation

Settings

TabNavigation

UnreadStack

FavoritesStack

Unread story

Unread

Favorites

Favorite story

Screens

Screens can be defined as a React class component with the elements we would like on them.

```
class UnreadScreen extends React.Component {
  render() {
    return (
      <View>
        <Text>Unread Stories</Text>
          ...
      </View>
    );
  }
}
```

Screens can also be defined as functions:

```
function UnreadScreen() {
  return (
    <View>
      <Text>Unread Stories</Text>
          ...
    </View>
  );
}
```

JSX

← Navigation Container
— Navigator <
— Screen <

And placed inside a `NavigationContainer`:

```
const Stack = createStackNavigator();

export default function App() {
  return (
    <NavigationContainer>
      <Stack.Navigator>
        <Stack.Screen name="Unread" component={UnreadScreen} />
      </Stack.Navigator>
    </NavigationContainer>
  );
}
```

<div>

UnreadStack & FavoritesStack

To create a stack navigator, we can use `createStackNavigator`:

```
import { createStackNavigator } from '@react-navigation/stack';

const FavoritesStack = createStackNavigator();

function CreateFavoritesStack() {
 return (
  <FavoritesStack.Navigator initialRouteName="FavoritesStack">
   <FavoritesStack.Screen name="Favorites" component={FavoritesScreen}/>
   <FavoritesStack.Screen name="FavoriteStory" component={FavoriteStory}/>
  </FavoritesStack.Navigator>
 );
}
```

React component

function

Navigators come with a set of screen options:

```
<FavoritesStack.Navigator
      initialRouteName="Favorites"
      screenOptions={{
        gestureEnabled: false,
        headerTintColor: 'white',
        headerStyle: { backgroundColor: 'tomato'}
      }}
>
```

We can also set options for each screen:

```
<FavoritesStack.Screen
        name="Favorites"
        component={FavoritesScreen}
        options={{
          title: 'Favorite Stories',
        }}
/>
```

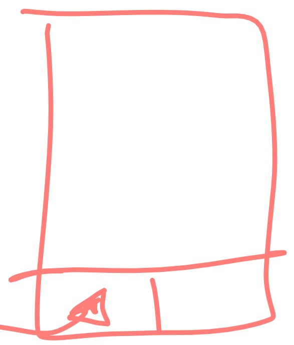
TabNavigation

To create a tab navigator, we can use `createBottomTabNavigator`:

```
import { createBottomTabNavigator } from '@react-navigation/bottom-tabs';

const TabNavigation = createBottomTabNavigator();

function MyTabs() {
  return (
    <TabNavigation.Navigator>
      <TabNavigation.Screen name="Unread" component={CreateUnreadStack} />
      <TabNavigation.Screen name="Favorites" component={CreateFavoritesStack} />
    </TabNavigation.Navigator>
  );
}
```



navigator

navigator

DrawerNavigation

To create the drawer navigation for settings, we can use `createDrawerNavigator`:

```
import { createDrawerNavigator } from '@react-navigation/drawer';

const DrawerNavigator = createDrawerNavigator();

function CreateDrawerNavigator() {
  return (
    <DrawerNavigator.Navigator initialRouteName="Home">
      <DrawerNavigator.Screen name="Home"
        component={CreateTabNavigationStackNavigator}
        options={{ drawerLabel: 'Home' }} />
      <DrawerNavigator.Screen name="Settings"
        component={CreateSettingsStackNavigator}
        options={{ drawerLabel: 'Settings' }} />
    </DrawerNavigator.Navigator>
  );
}
```

navigation prop[5]

Each screen is automatically provided with a `navigation` prop (no need to use `constructor()` for the `navigation` prop) that provides access to parameters and actions, e.g., `navigate`, `goBack`, `state`.

```
<Button
    style={styles.button}
    color="tomato"
    title="Read"
    onPress={() => this.props.navigation.navigate('FavoriteStory')}
/>
```

[5] Read more on `navigation` prop

Navigator actions

Each navigator has a set of specialized actions associated with them that provide low-level access to the navigation behavior of the navigator:

— `CommonActions` include `navigate`, `reset`, `goBack`, `setParams`

— `StackActions` include `replace`, `push`, `pop`, `popToTop`

— `TabActions` include `jumpTo`

— `DrawerActions` include `openDrawer`, `closeDrawer`, `toggleDrawer`, `jumpTo`

Scrollable `View` Components

For content that does not fit into the device screen, we use `useScrollToTop` with a scrollable component, such as `ScrollView`.

View → ScrollView

```
import * as React from 'react';
import { ScrollView } from 'react-native';
import { useScrollToTop } from '@react-navigation/native';

function Albums() {
  const ref = React.useRef(null);

  useScrollToTop(ref);

  return <ScrollView ref={ref}>{
    Lorem ipsum dolor sit amet, consectetur adipiscing elit,
    sed do eiusmod tempor incididunt ut labore et dolore magna...
  }</ScrollView>;
}
```

Quiz 1

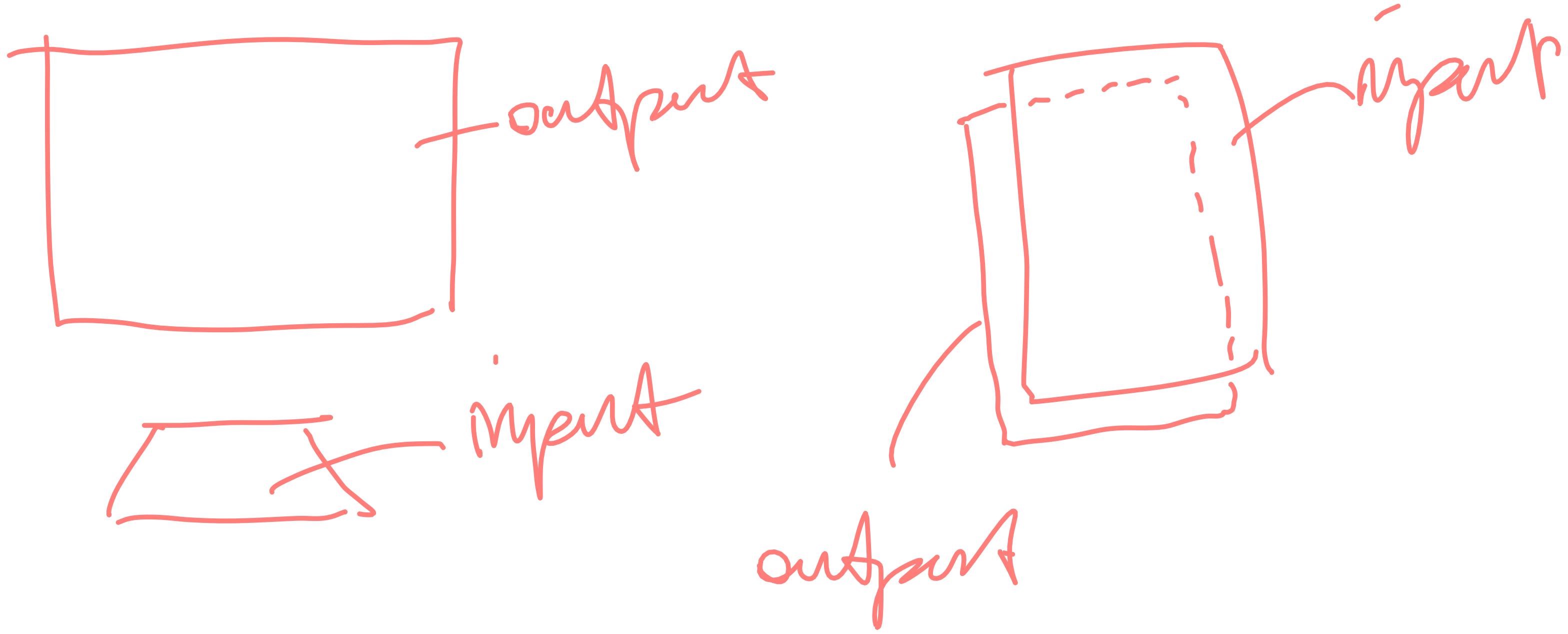
Complete the Canvas quiz.

Mobile Input via Gestures using React Native

Why worry about gesture?

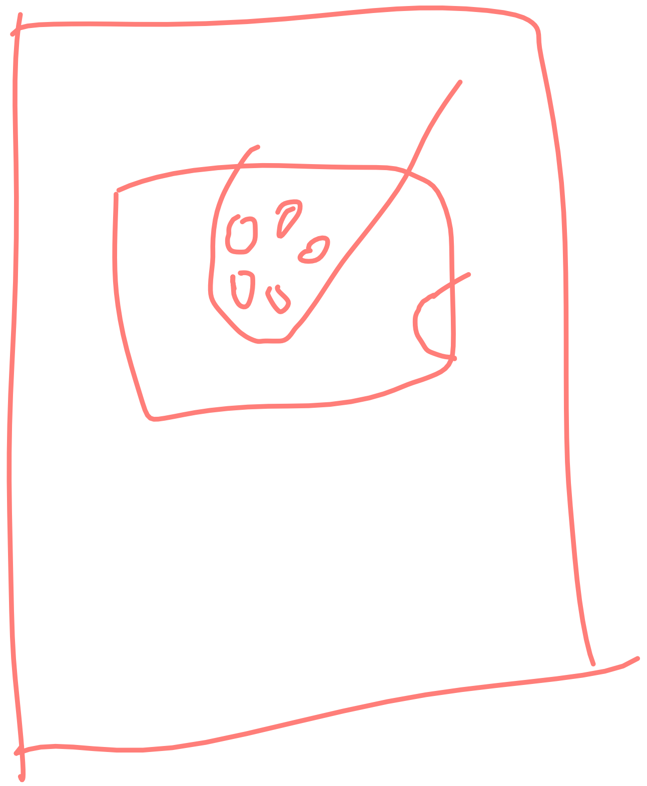
Because of the direct/absolute mapping between input space and the screen space and the touch-sensitive input capabilities, gestures are a resource for mobile development. A number of RN packages provide access to gestures:

- Gesture Responder System
- PanResponder
- React Native Gesture Handler
- React Native Swipe Gestures
- React Native Swipeout



Handling Gestures Using `PanResponder`

`PanResponder` uses the core gesture responder system to reconcile several touches into a single gesture that can be used to recognize multi-touch gestures.



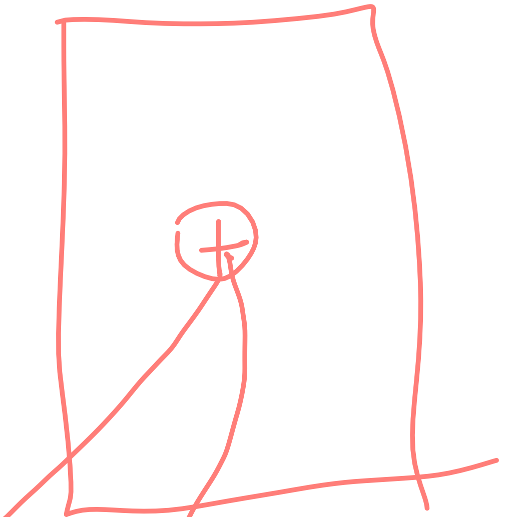
To initialize, we create a `PanResponder` object with event handlers:

```
import { PanResponder } from 'react-native';
...
this._panResponder = PanResponder.create({
    onStartShouldSetPanResponder: (evt, gestureState) => true,
    onStartShouldSetPanResponderCapture: (evt, gestureState) => true,
    onMoveShouldSetPanResponder: (evt, gestureState) => true,
    onMoveShouldSetPanResponderCapture: (evt, gestureState) => true,
    onPanResponderGrant: (evt, gestureState) => { },
    onPanResponderMove: (evt, gestureState) => { },
    onPanResponderTerminationRequest: (evt, gestureState) => true,
    onPanResponderRelease: (evt, gestureState) => { },
    onPanResponderTerminate: (evt, gestureState) => { },
    onShouldBlockNativeResponder: (evt, gestureState) => { return true; },
});
```

PanResponder Event Handlers

Event handlers utilize `nativeEvent` and `gestureState` objects:

```
onPanResponderMove: (event, gestureState) => {}
```



`nativeEvent` object provides properties such as `locationX` and `locationY` (position of the touch with respect to the element).

`gestureState` object provides properties about the gesture, such as `vx` and `vy` (velocity of the gesture).

```
onPanResponderGrant: (evt, gestureState) => { }
```

Indicates that the gesture has started. The screen should provide the user with visual feedback on what's happening.

```
onPanResponderMove: (evt, gestureState) => { }
```

`gestureState` provides access to the most recent move distance (`gestureState.move{X,Y}`) and the accumulated gesture distance (`gestureState.d{x,y}`).

```
onPanResponderRelease: (evt, gestureState) => { }
```

Indicates that the user has released all touches while this view is the responder.

```
onPanResponderTerminate: (evt, gestureState) => { }
```

Indicates that another component has become the responder, so this gesture should be cancelled.

```
onShouldBlockNativeResponder: (evt, gestureState) => { return true; }
```

Returns whether this component should block native components from becoming the JS responder (only on Android).

Associating Gestures with Screens[6]

We provide `panHandlers` as a `prop` into the component:

```
<View style={styles.container} {...this._panResponder.panHandlers}>
    // ...
</View>
```

[6] See example 1, example 2 in Snack

Quiz 2

Complete the Canvas quiz.

Are we done? *No.*

<component ~ {panhandler }>

We need to be able to respond to the gestures with appropriate behaviors on the interface, and that's done using animation packages, particularly:

- `Animated` ✓
- `LayoutAnimation` ✓

Animated

The `Animated` library provides the ability to create time-based animation using a number of methods.

```
this.state = { // Create Animated.Value
    fadeValue: new Animated.Value(0) // Connect it to style attributes
};

_start = () => {
  Animated.timing(this.state.fadeValue, { // Animate
    toValue: 1,
    duration: 1000 ms
  }).start();
};
```

The core workflow involves using `Animated.Value`, connecting it to style attributes, and driving it using `Animated.timing()`, but other methods include:[7]

- `Animated.sequence()` allows sequencing several animations.
- `Animated.spring()` animates attributes without a set time in different motion styles, e.g., `velocity`, `bounciness`, `speed`, `tension`, `friction`.
- `Animated.interpolate()` maps input ranges to output ranges using linear interpolation.
- `Easing` functions help in gradual acceleration or deceleration (e.g., `easing: Easing.back()`).

[7] See example in Snack

`LayoutAnimation`

The `LayoutAnimation` library animates the entire screen when there are changes in the layout, e.g., when an element is removed from the screen.

`LayoutAnimation` is used before `setState()` is called.

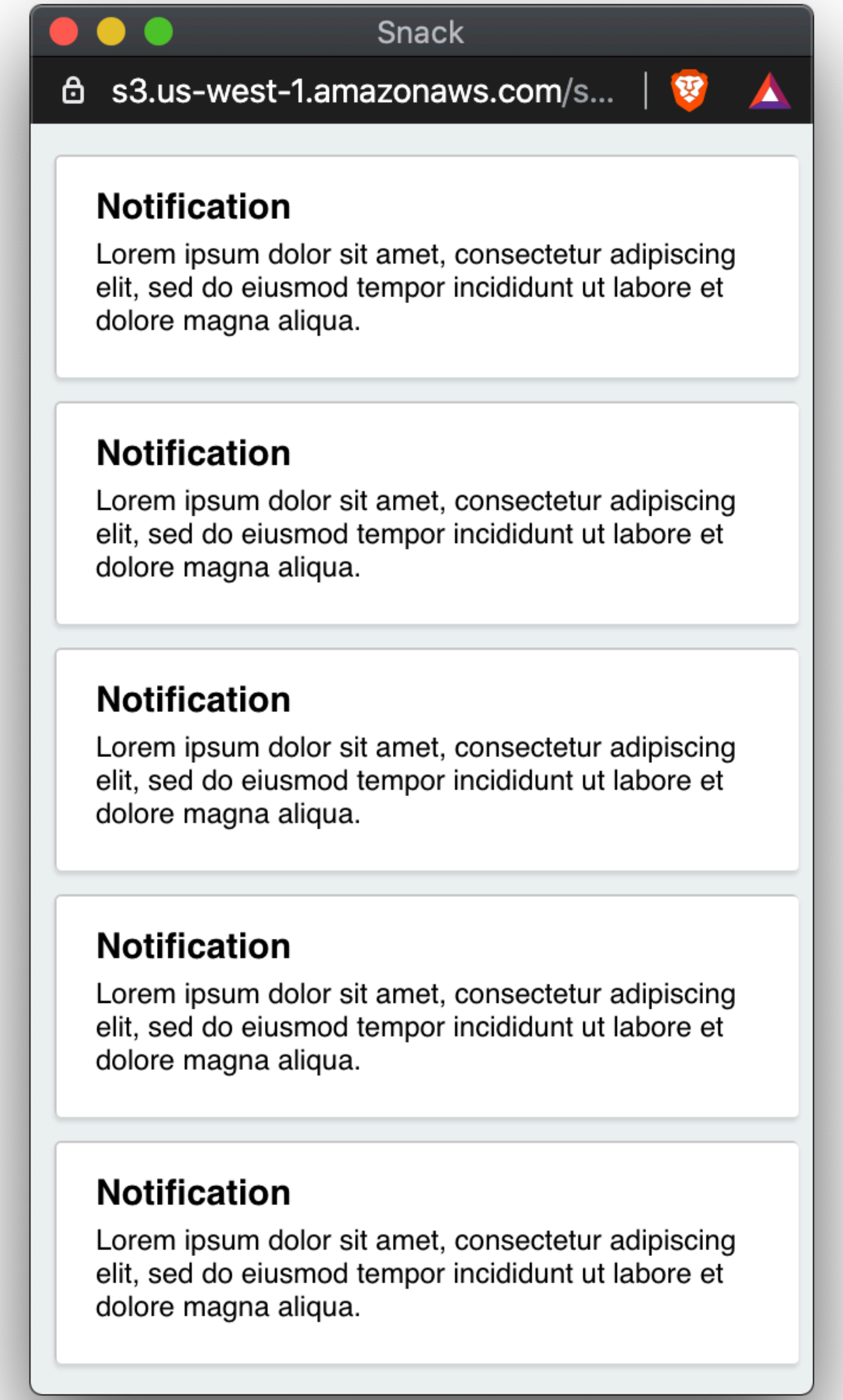
`Animated` animates specific components without changing the layout of the screen, while `LayoutAnimation` animates all components on the screen when the layout changes.

[8]

```
import { UIManager, LayoutAnimation } from 'react-native';
...
<TouchableOpacity
    onPress={() => {
        LayoutAnimation.configureNext(LayoutAnimation.Presets.spring);
        this.setState({expanded: !this.state.expanded}); }}>
  <Text>{this.state.expanded ? 'Expanded text' : 'Collapsed text'}</Text>
</TouchableOpacity>
```

[8] See example in Snack

Notifications example[9]



Notification

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Notification

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[9] See combined example in Snack

Quiz 3

Complete the Canvas quiz.

Working with Date Objects in JS

Date

The `Date` object represents a single moment in time in a platform-independent format. We need to use the object in ways that are meaningful both for the server API and for the user.

Users would like to see something like:

```
Thu Nov 07 2019 11:53:47 GMT-0600 (Central Standard Time)
```

While the server expects something like:[10]

```
2019-11-07T11:53:47-06:00
```

[10] ISO 8601 Standard for Date and Time Formats

Good news: We can serialize `Date` object into the ISO 8601 format.

```
var date = new Date();
console.log(date); // Thu Nov 07 2019 11:58:58 GMT-0600 (Central Standard Time)

var json = JSON.stringify(date);
console.log(json);  // "2019-11-07T17:58:58.487Z"
```

Bad news: There is no good method to deserialize back to a date format.

```
var json = "\"2019-11-07T17:58:58.487Z\"";

var dateStr = JSON.parse(json);
console.log(dateStr); // 2019-11-07T17:58:58.487Z
```

The trick: We can use the `Date` constructor for this translation.

```
var json = "\"2019-11-07T17:58:58.487Z\"";

var dateStr = JSON.parse(json);
console.log(dateStr); // 2019-11-07T17:58:58.487Z

var date = new Date(dateStr);
console.log(date);  // Thu Nov 07 2019 11:58:58 GMT-0600 (Central Standard Time)
```

Assignment Preview

React Native 1 + 2

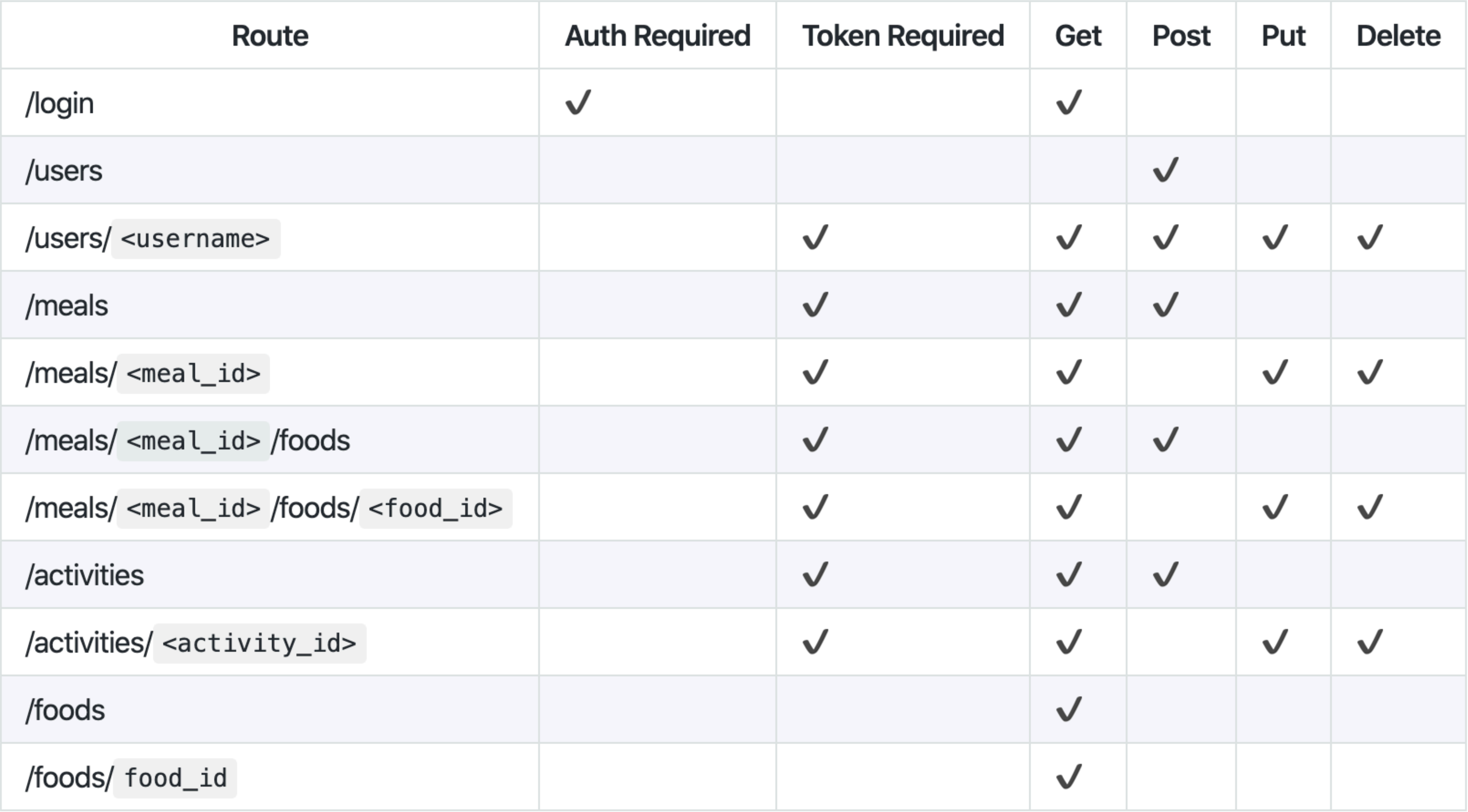
Design a calorie tracking application, supporting:

- User login/profile
- Exercise and Planning
- Recipes and Foods

React Native 1 $_\alpha$ α

- Create a “Login” view with username and password input fields
- Create a “Create User” view with username and password fields
- Create a profile view that allows the logged-in user to view and edit their name and goals
- Clean and clear code/interface

The following API can be accessed at `https://mysqlcs639.cs.wisc.edu`.

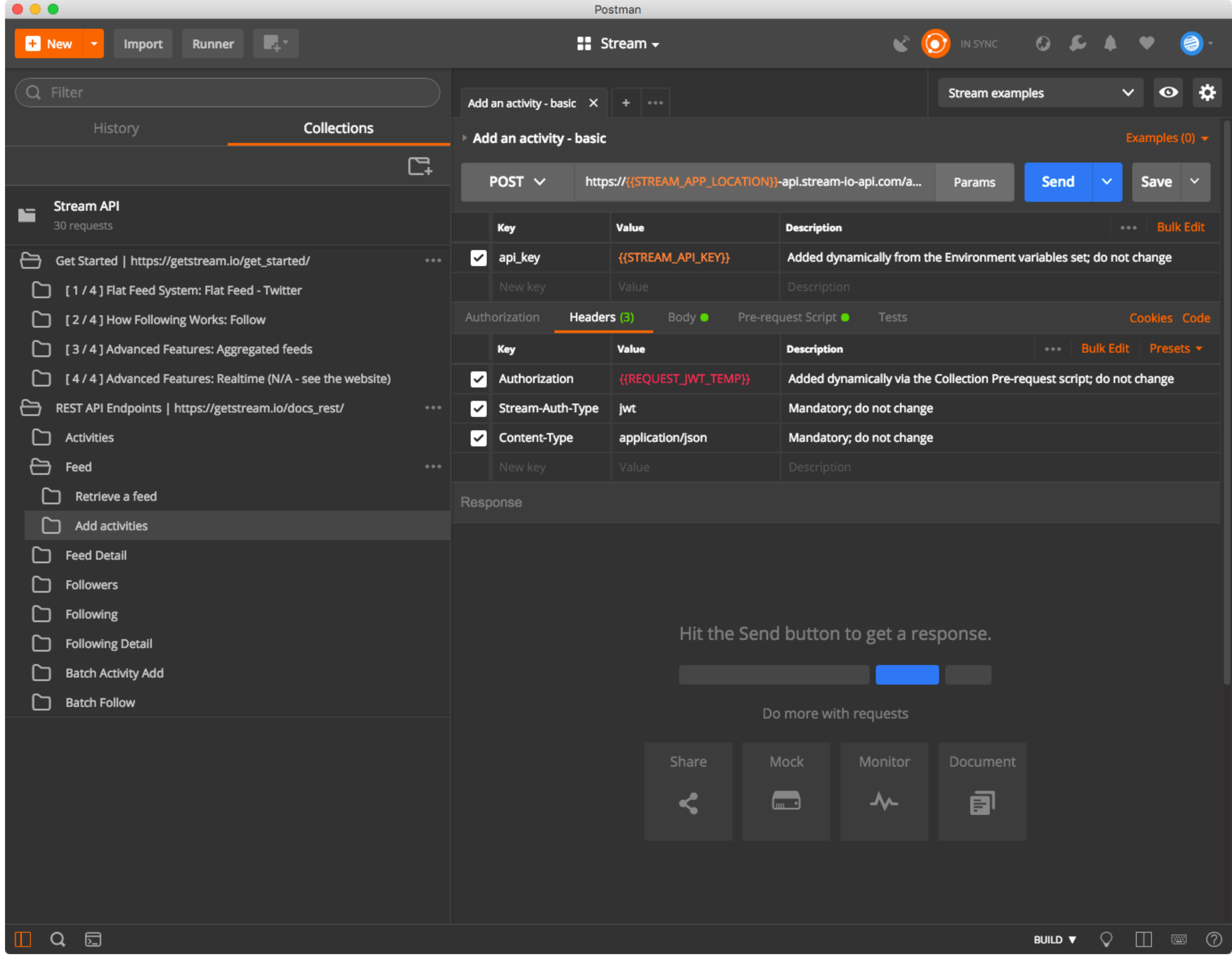


Route	Auth Required	Token Required	Get	Post	Put	Delete
/login	✓		✓			
/users				✓		
/users/ `<username>`		✓	✓	✓	✓	✓
/meals		✓	✓	✓		
/meals/ `<meal_id>`		✓	✓		✓	✓
/meals/ `<meal_id>` /foods		✓	✓	✓		
/meals/ `<meal_id>` /foods/ `<food_id>`		✓	✓		✓	✓
/activities		✓	✓	✓		
/activities/ `<activity_id>`		✓	✓		✓	✓
/foods			✓			
/foods/ `food_id`			✓			

A Few Tips

- The passwords may not be secure, so do not use a password you use for other accounts.
- Do not create too many accounts.
- Postman demo…

Cole's open office hours



Stream API
30 requests

- Get Started | https://getstream.io/get_started/
  - [1 / 4] Flat Feed System: Flat Feed - Twitter
  - [2 / 4] How Following Works: Follow
  - [3 / 4] Advanced Features: Aggregated feeds
  - [4 / 4] Advanced Features: Realtime (N/A - see the website)
- REST API Endpoints | https://getstream.io/docs_rest/
  - Activities
  - Feed
    - Retrieve a feed
    - Add activities
  - Feed Detail
  - Followers
  - Following
  - Following Detail
  - Batch Activity Add
  - Batch Follow

Add an activity - basic

POST https://{{STREAM_APP_LOCATION}}-api.stream-io-api.com/a...

	Key	Value	Description
☑	api_key	{{STREAM_API_KEY}}	Added dynamically from the Environment variables set; do not change
	New key	Value	Description

	Key	Value	Description
☑	Authorization	{{REQUEST_JWT_TEMP}}	Added dynamically via the Collection Pre-request script; do not change
☑	Stream-Auth-Type	jwt	Mandatory; do not change
☑	Content-Type	application/json	Mandatory; do not change
	New key	Value	Description

What did we learn today?

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- Mobile Input via Gestures using React Native
- Working with Date object in JS
- Assignment Preview