Building User Interfaces

React Native 2

Intermediate Concepts

Professor Yuhang Zhao

What we will learn today?

— Mobile Navigation using React Native
— Mobile Input via Gestures using React Native
— Working with Date object in JS

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.

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

[1] More on the History API

When the "forward" button is pressed, it calls the following function.

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

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

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

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

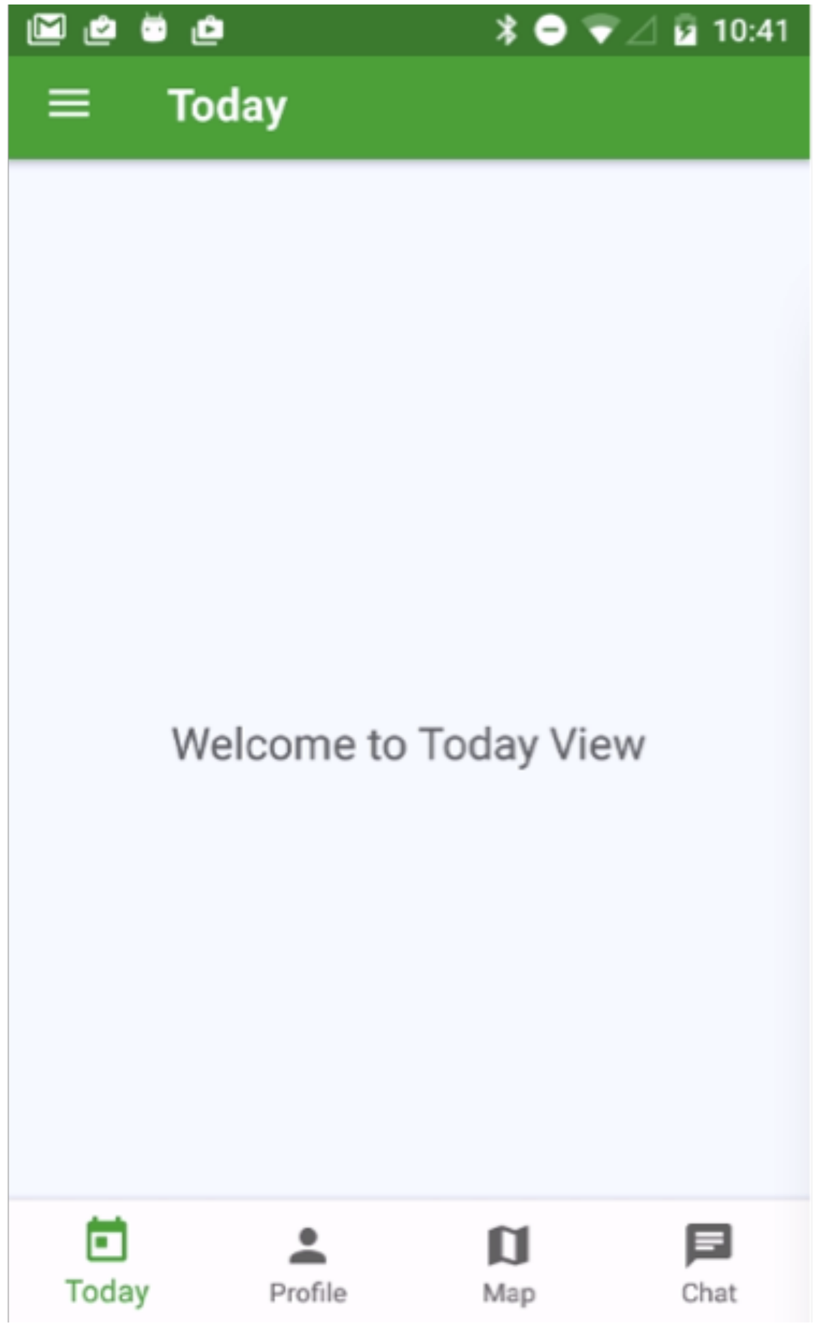
Definition: Enables transition between screens where each screen is placed on a stack, as the History API does. The navigator automatically implements the native transition animations.

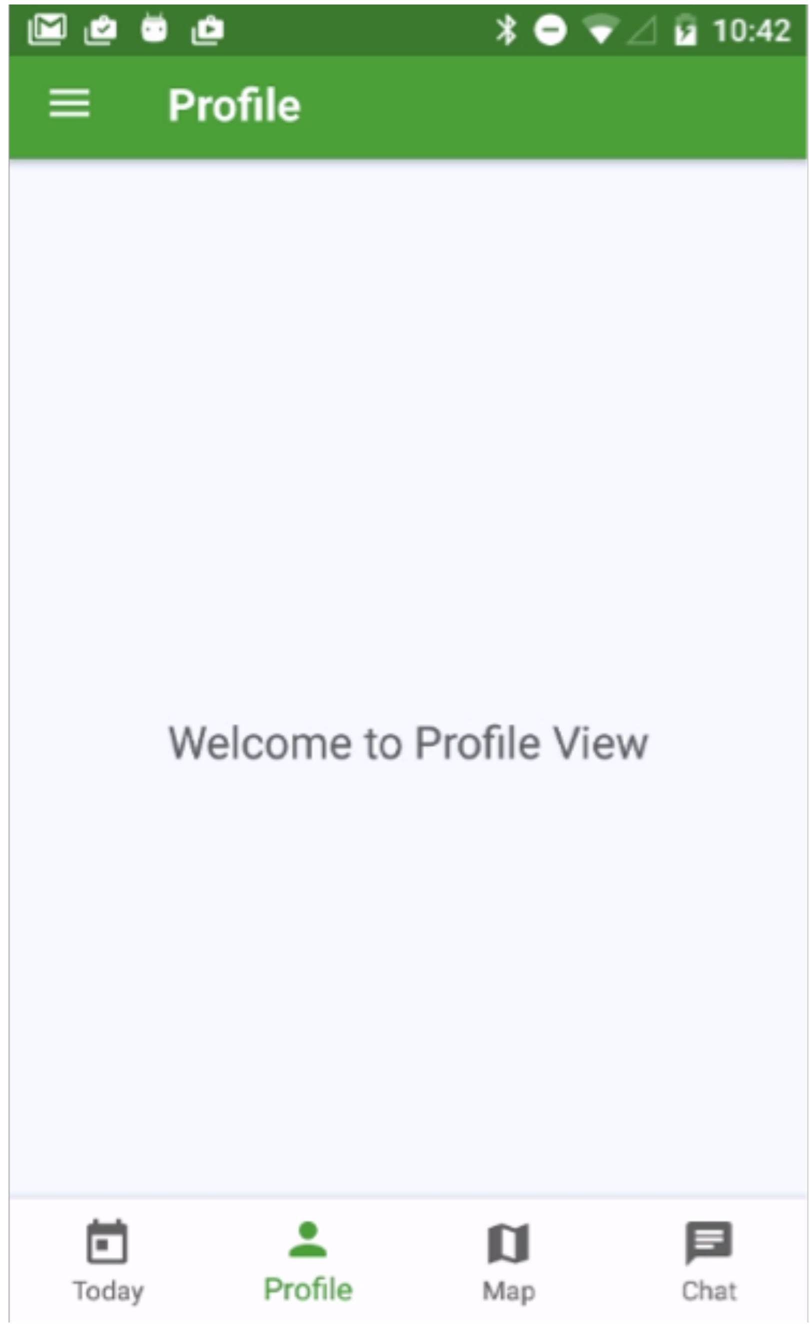
Primarily used to go back and forth between list and detail views or to walk the user through a process.

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.



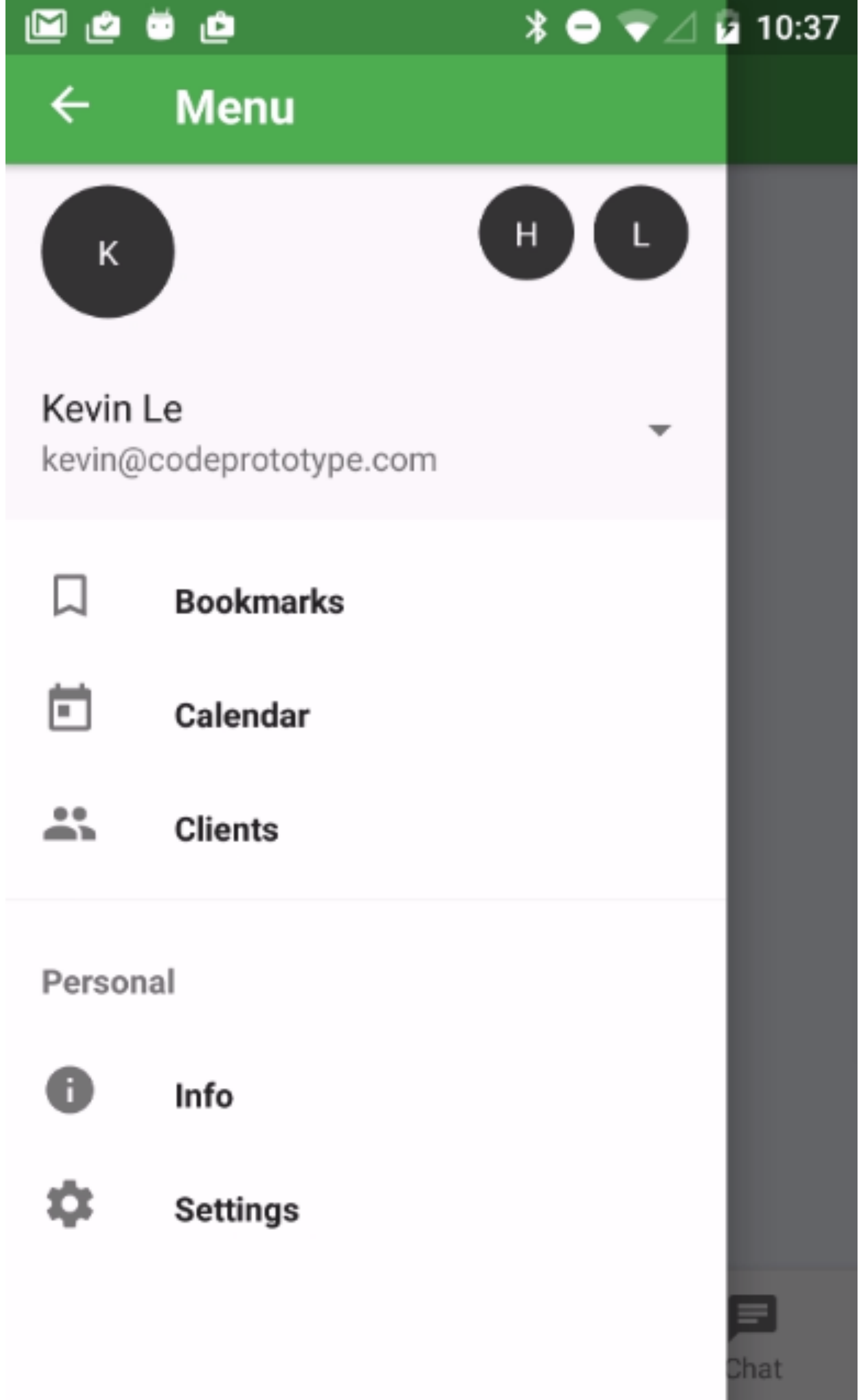


[2] Image source

Drawer Navigator[3]

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

Used primarily for options and settings.



[3] Image source

The Big Picture

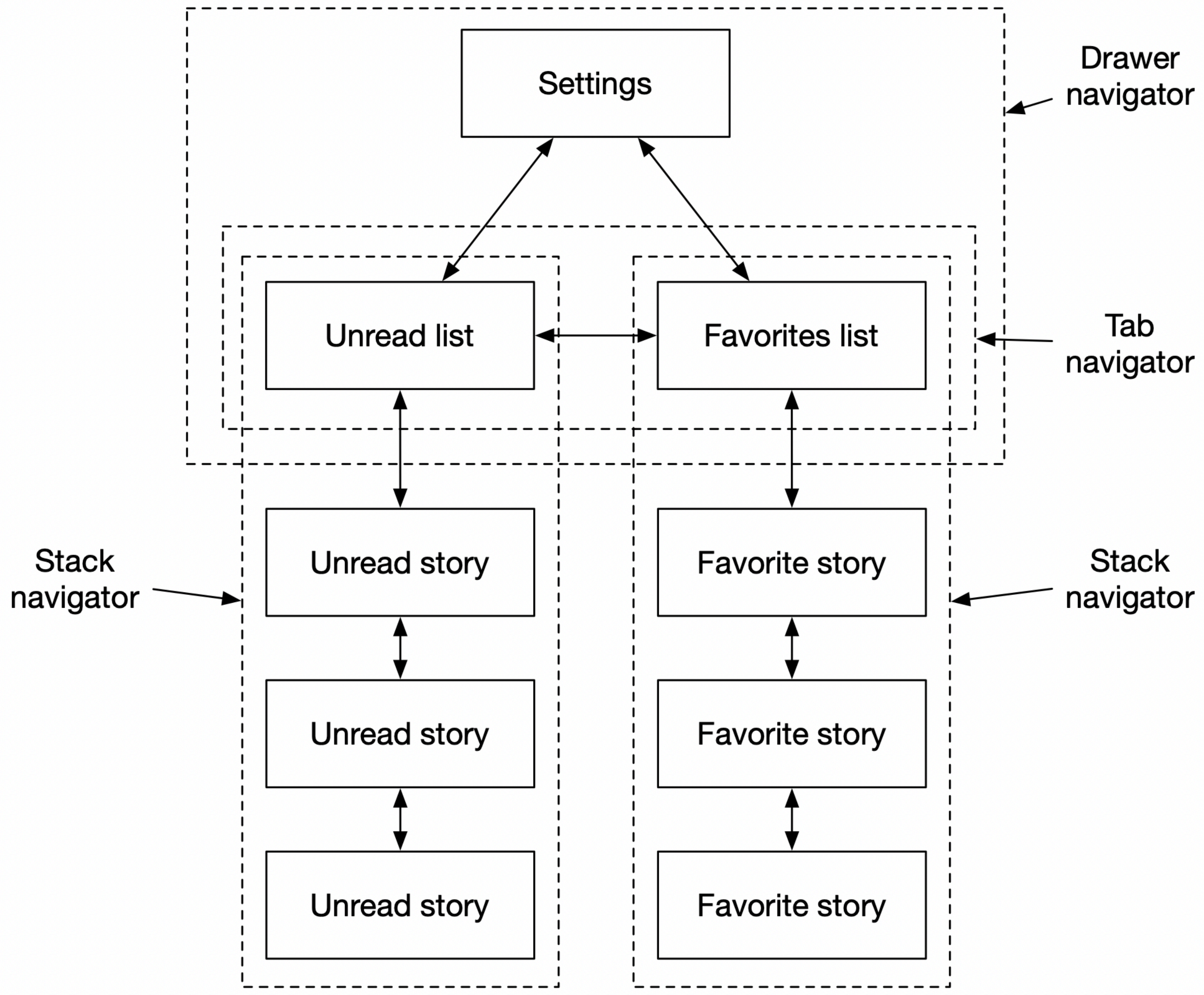
Every RN project will use a combination of these navigators.

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

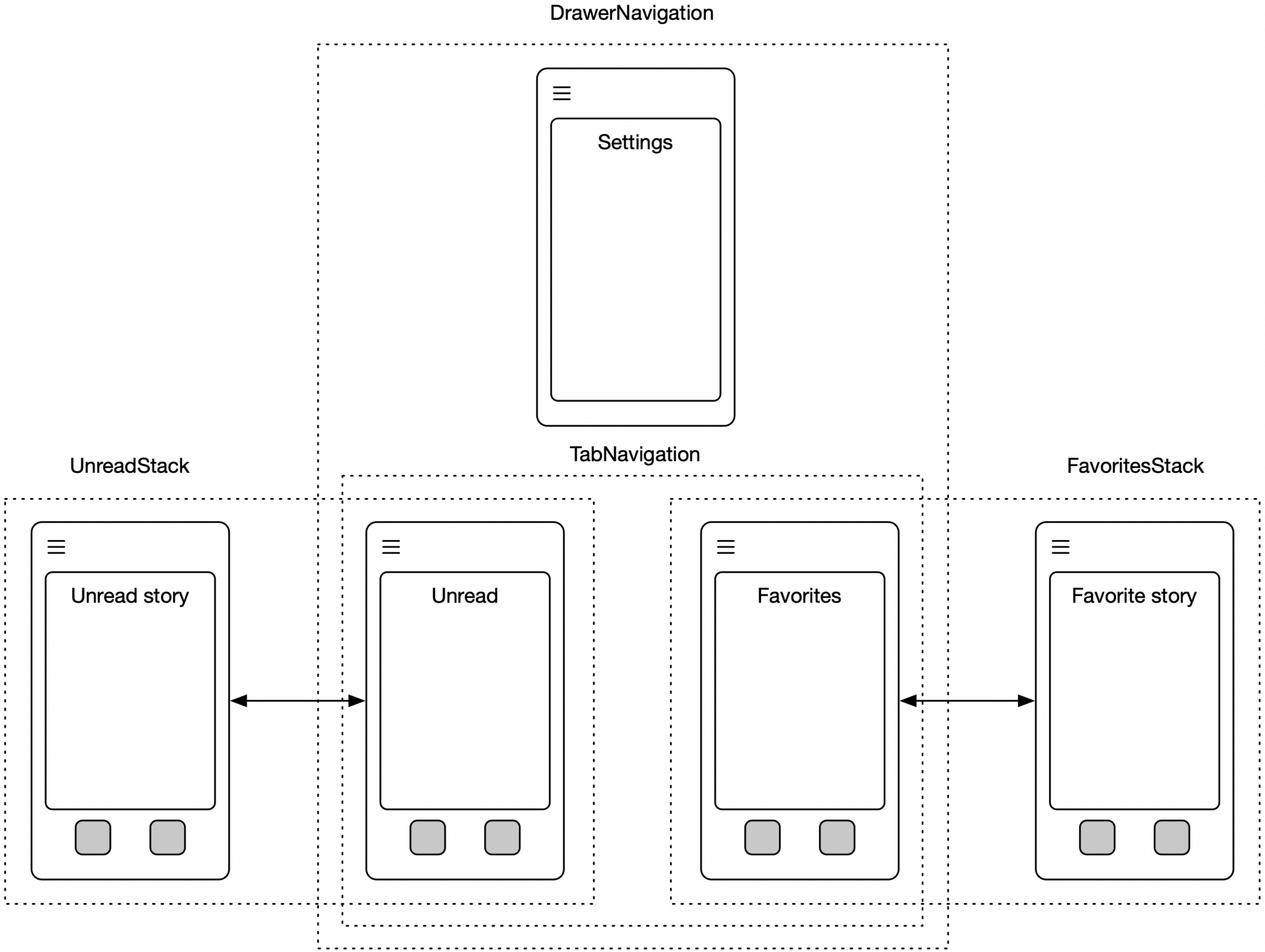
1. Landing page with *unread* and *favorites* tabs
2. Pages to show unread and favorite stories
3. Settings to change reading mode

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>
  );
}
```

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>
  );
}
```

`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="Favorites">
      <FavoritesStack.Screen name="Favorites" component={FavoritesScreen}/>
      <FavoritesStack.Screen name="FavoriteStory" component={FavoriteStory}/>
    </FavoritesStack.Navigator>
  );
}
```

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>
  );
}
```

`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`

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.

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

Are we done? *No*.

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
  }).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.

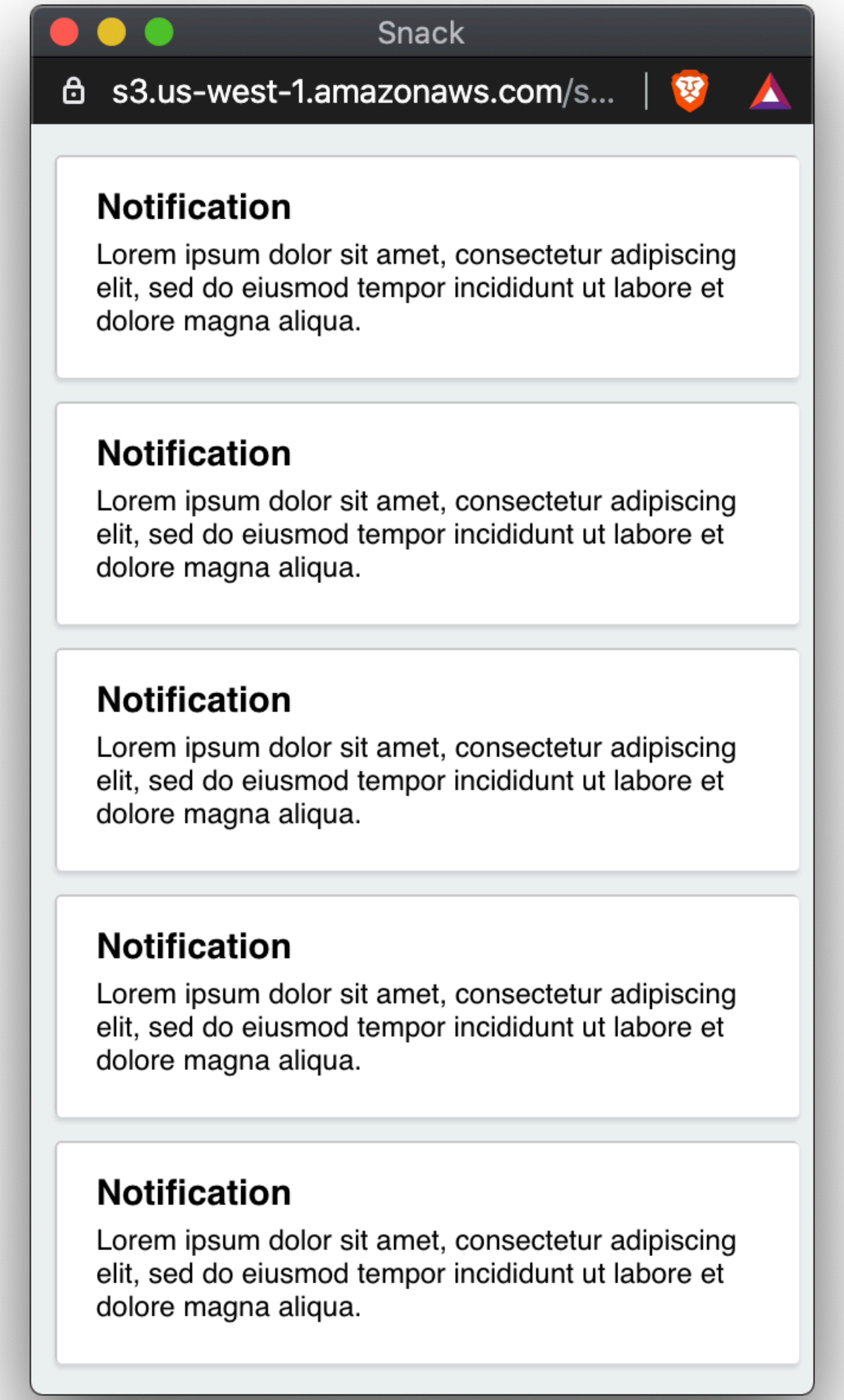
`Animated` animates specific components without changing the layout of the screen, while `LayoutAnimation` animates all components on the screen when the layout changes.

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
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Notification
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Notification
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Notification
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Notification
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

[9] See combined example in Snack

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.

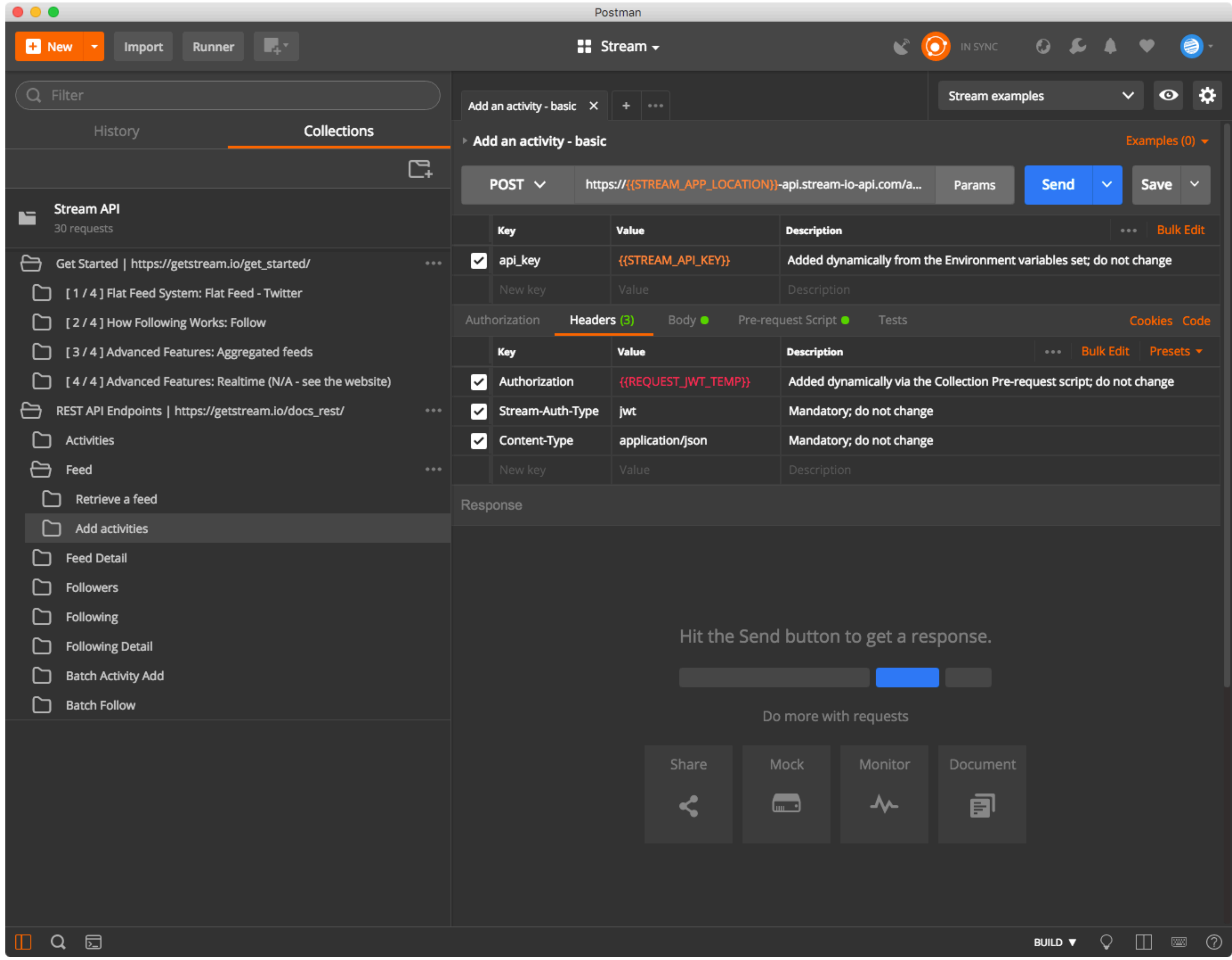
```
var json = "\"2019-11-07T17:58:58.487Z\"";

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)
```

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...



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

Hit the Send button to get a response.

Do more with requests

What did we learn today?

- Mobile Navigation using React Native
- Mobile Input via Gestures using React Native
- Working with Date object in JS
- Postman Demo