Comp 322/422 - Software Development for Wireless and Mobile Devices

Fall Semester 2019 - Week 12

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React Native - component usage

lists - FlatList

- React Native provides suggested view components for lists
  - *two primary examples include `FlatList` and `SectionList`*
- `FlatList` is meant to be used for long lists of data
  - *in particular where data items may change during the lifecycle of an app*
- `FlatList` will only render elements currently shown on screen
  - *not all of the available elements at the same time*

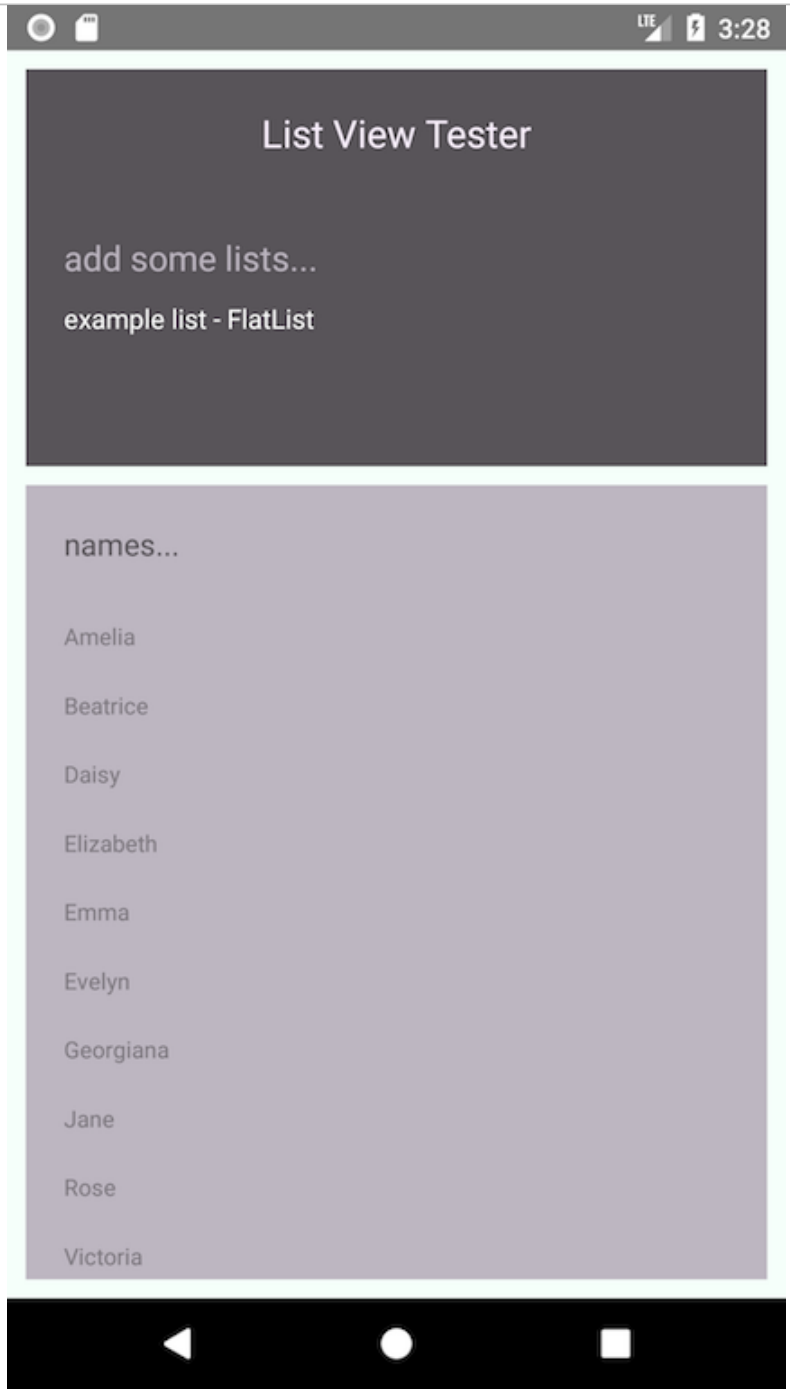
```
<FlatList
    data={[
        {key: 'Amelia'},
        {key: 'Beatrice'},
        {key: 'Daisy'},
    ]
    }
    renderItem={({item}) => <Text style={styles.listItem}>{item.key}</Text>}
/>
```

- component expects two *props*
  - *`data` for the list itself*
  - *`renderItem` to define the output structure for each list item*

```
renderItem={() => <Text></Text>}
```

Image - React Native - Component Usage

lists - FlatList



React Native - FlatList

React Native - component usage

lists - SectionList

- may also create section breaks in a list of data. e.g.

```
<SectionList
  sections={[
        {title: 'a', data:[{key: 1, name: 'Amelia'}]},
        {title: 'b', data:[{key: 1, name: 'Beatrice'}]},
    {title: 'c', data: [{key: 1, name: 'Daisy'}, {key: 2, name: 'Devon'}]},
        {title: 'e', data: [{key: 1, name: 'Elizabeth'}, {key: 2, name: 'Emma'},
        {title: 'g', data:[{key: 1, name: 'Georgiana'}]},
        {title: 'j', data:[{key: 1, name: 'Jane'}]},
        {title: 'r', data:[{key: 1, name: 'Rose'}]},
        {title: 'v', data: [{key: 1, name: 'Victoria'}, {key: 2, name: 'Violet'}]
        {title: 'y', data:[{key: 1, name: 'Yvaine'}]},
    ]}
    //keyExtractor={item => item}
  renderItem={({item}) => <Text style={styles.listItem}>{item.key} - {item.name}<
  renderSectionHeader={({section}) => <Text style={styles.heading4}>{section.titl
/>
```

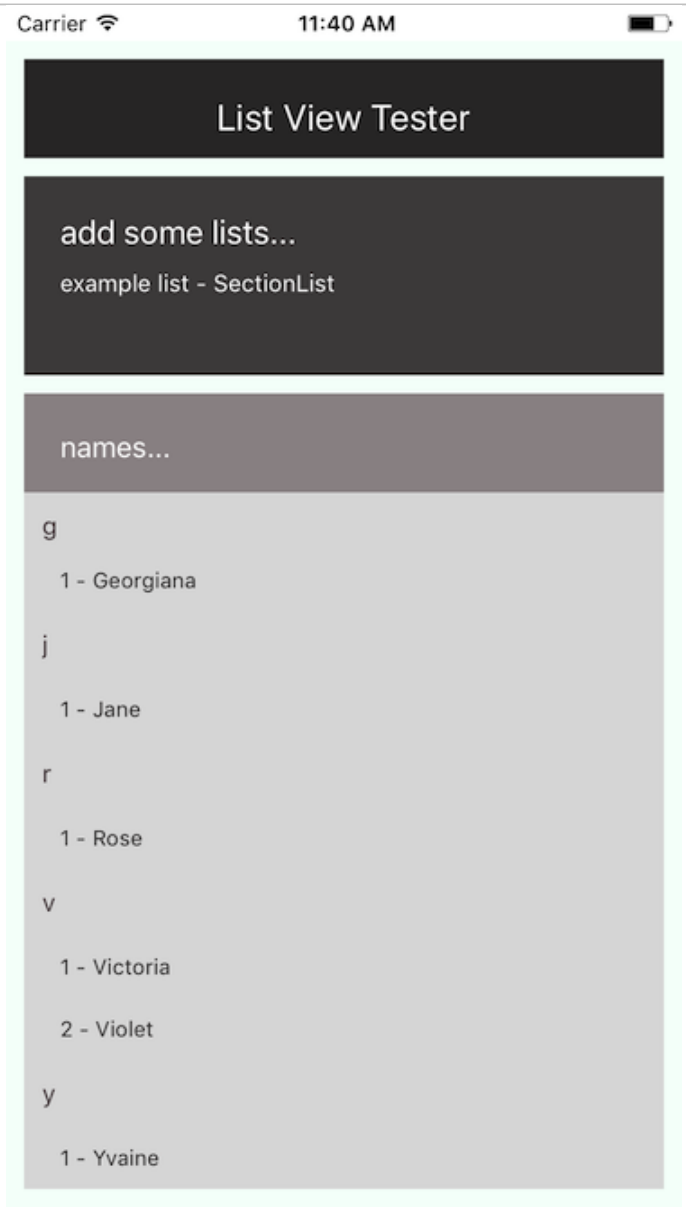
Image - React Native - Component Usage

lists - SectiontList - top

React Native - SectionList - top

Image - React Native - Component Usage

lists - SectiontList - bottom



React Native - SectionList - bottom

React Native - component usage

ScrollView

- scrolling in React Native apps is achieved with a generic scrolling container
  - `ScrollView`
- specific view container can itself accept multiple child components and views
- scrollview container option to specify direction
  - *either horizontal or vertical*
- general usage
  - *add a `ScrollView` using the same general pattern as a standard `View` component*
  - *return a `ScrollView` as eiher the primary container for a component*
  - *or a child of a standard `View`*
  - *an app's screen may either scroll top to bottom*
  - *or simply present a component with scroll features*

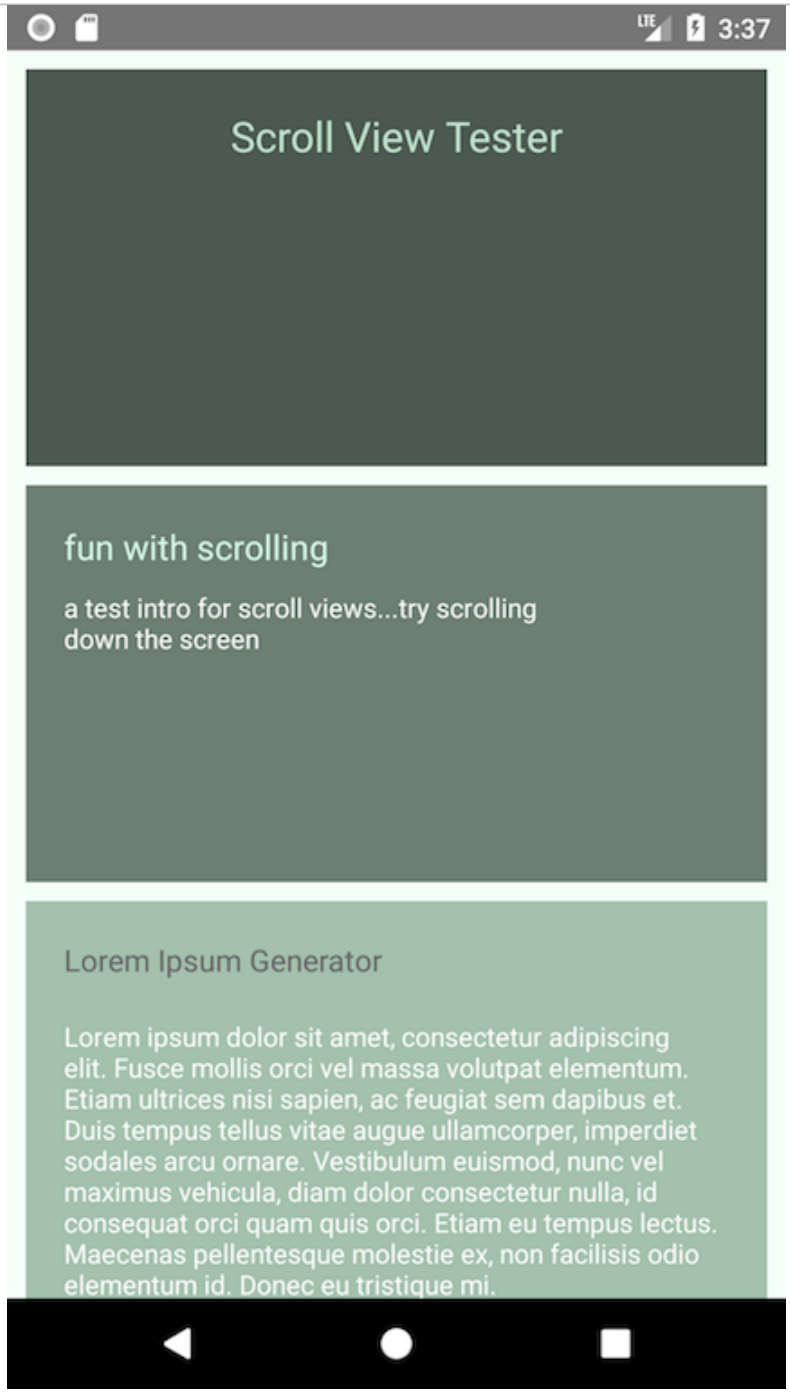
React Native - component usage

ScrollView - example

```
export default class ScrollTester extends Component {
  render() {
    return (
                <View style={styles.container}>
                    <View style={styles.headingBox}>
            <Text style={styles.heading1}>
                Scroll View Tester
            </Text>
            </View>
            <View style={styles.subHeadingBox}>
            <Text style={styles.heading2}>
                {intro.heading}
            </Text>
            <Text style={styles.content}>
                {intro.description}
            </Text>
            </View>
                    <ScrollView>
                    <View style={styles.contentBox}>
            <Text style={styles.heading3}>
                Lorem Ipsum Generator
            </Text>
            <Text style={styles.content}>
                            ...
                        </Text>
            </View>
                    </ScrollView>
        </View>
    );
  }
}
```

Image - React Native - Component Usage

lists - ScrollView



React Native - ScrollView

React Native - Component usage

text input

- a default component to handle user text input
- component `TextInput` is similar to a standard input field
  - *allowing a user to simply enter any required text content*
- to use `TextInput` with an app
  - *need to add the default module from React Native*
  - *add as part of the standard `import` statement*
- `TextInput` component includes a useful *prop*, `onChangeText`
  - *accepts callback function for each time text is changed in input field*
- also includes a complementary *prop*, `onSubmitEditing`
  - *handles text as it is submitted*
  - *again using a defined callback function*

React Native - Component usage

text input - props usage

- might accept user text input for a given value
  - *such as a name, place, &c.*
- then dynamically update the *view*
- e.g.

```
<TextInput
  style={styles.textInput}
  placeholder={this.state.quoteInput}
  onChangeText={(quoteText) => this.setState({quoteText})}
/>
```

React Native - Component usage

text input - props and state

- example relies upon calling and setting state for the app
  - *relative to `TextInput` and various `Text` components*
- simple constructor for this app
  - *pass required `props` and define intial values for `state`*

```
export default class TextUpdater extends Component {
  constructor(props) {
    super(props);
    this.state = {
      quoteInput: 'enter a favourite quotation...',
      quoteText: 'the unexamined life is not worth living...'
    };
  }
}
```

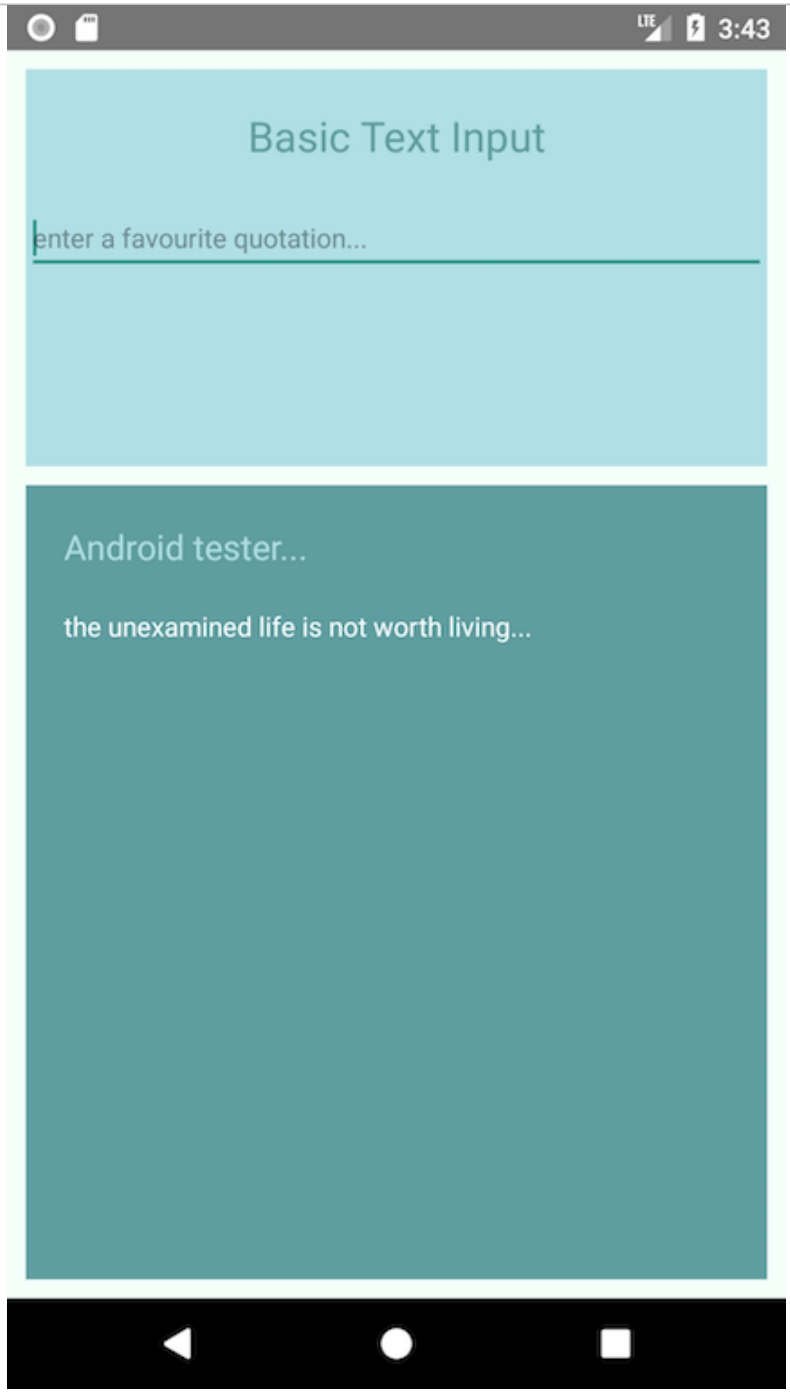
- then use the properties on `state`
  - *to set initial values for the text input field and the text output,*

```
<TextInput
  style={styles.textInput}
  placeholder={this.state.quoteInput}
  onChangeText={(quoteText) => this.setState({quoteText})}
/>
```

```
<Text style={styles.content}>
    {this.state.quoteText}
</Text>
```

Image - React Native - Component Usage

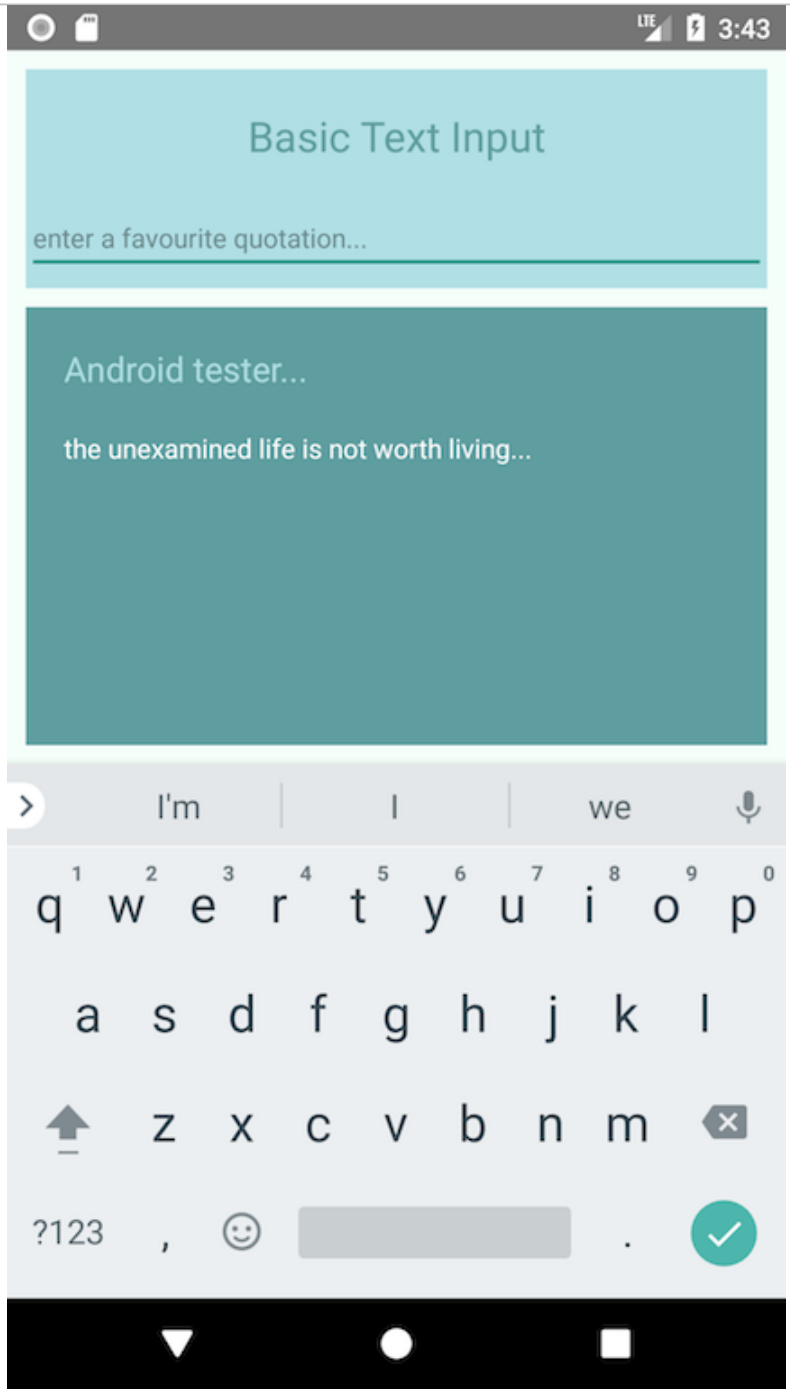
text input



React Native - text input

Image - React Native - Component Usage

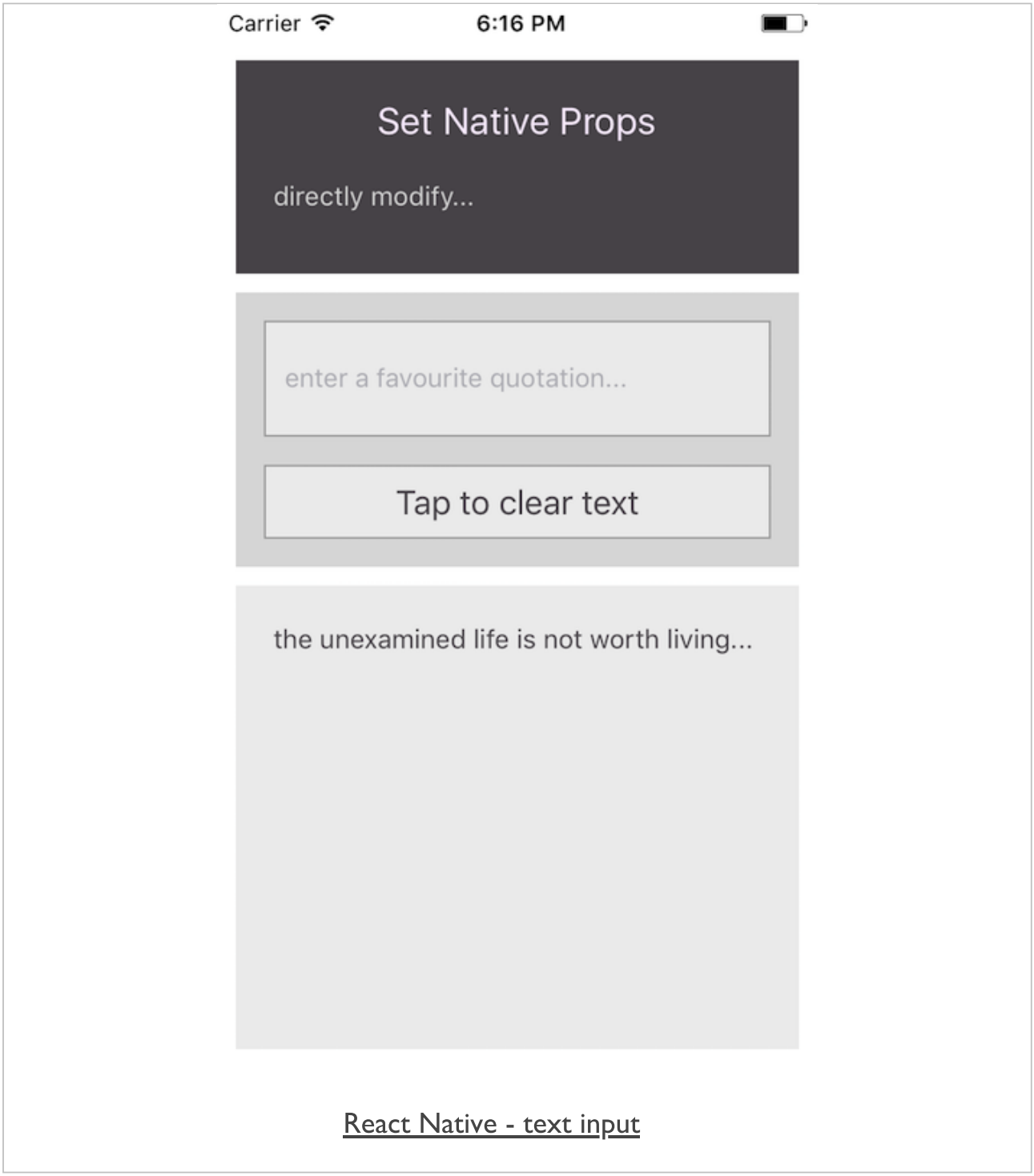
text input



React Native - text input

Image - React Native - Component Usage

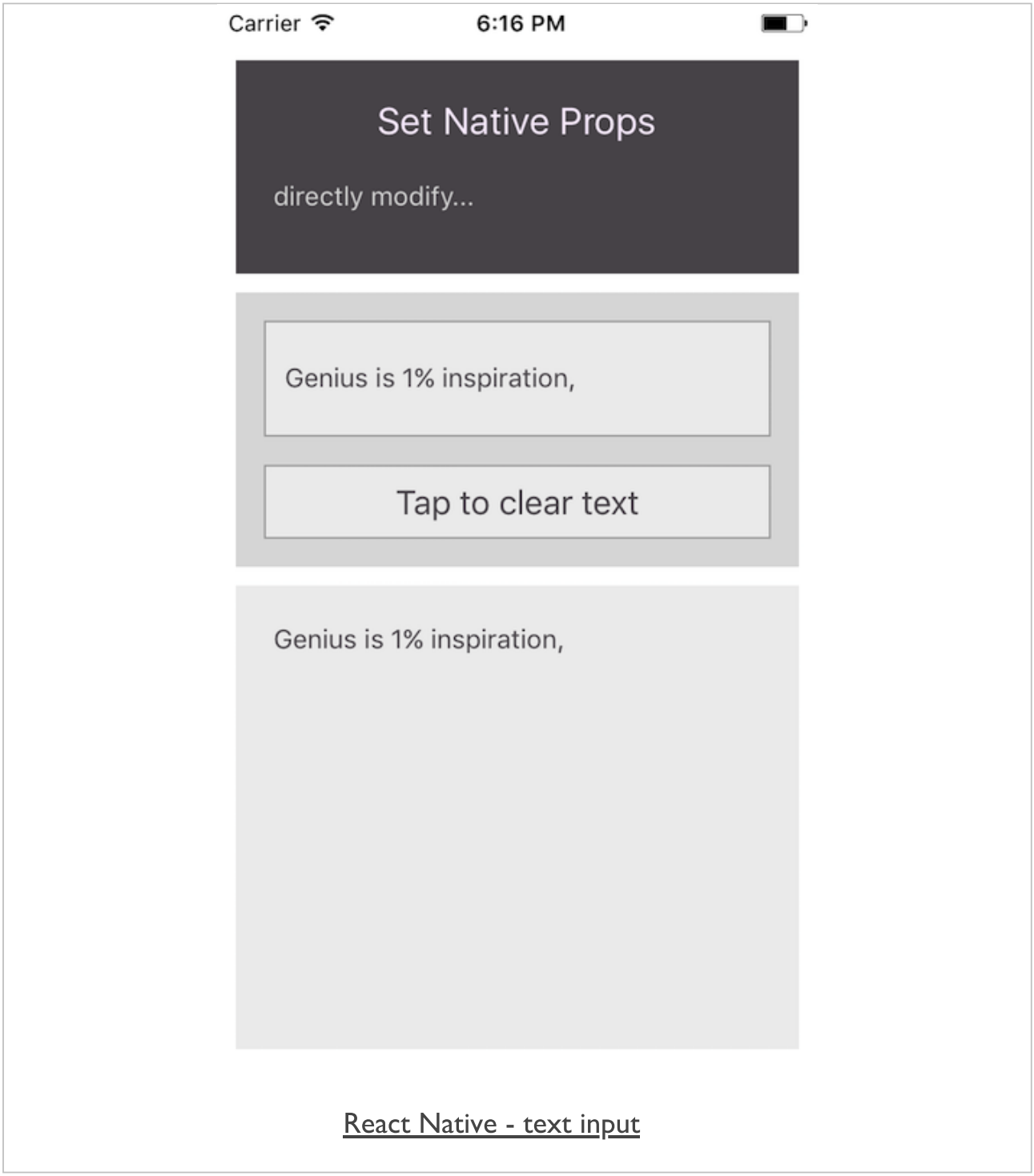
text input - use setNativeProps



React Native - text input

Image - React Native - Component Usage

text input - use setNativeProps



React Native - text input

React Native - component usage

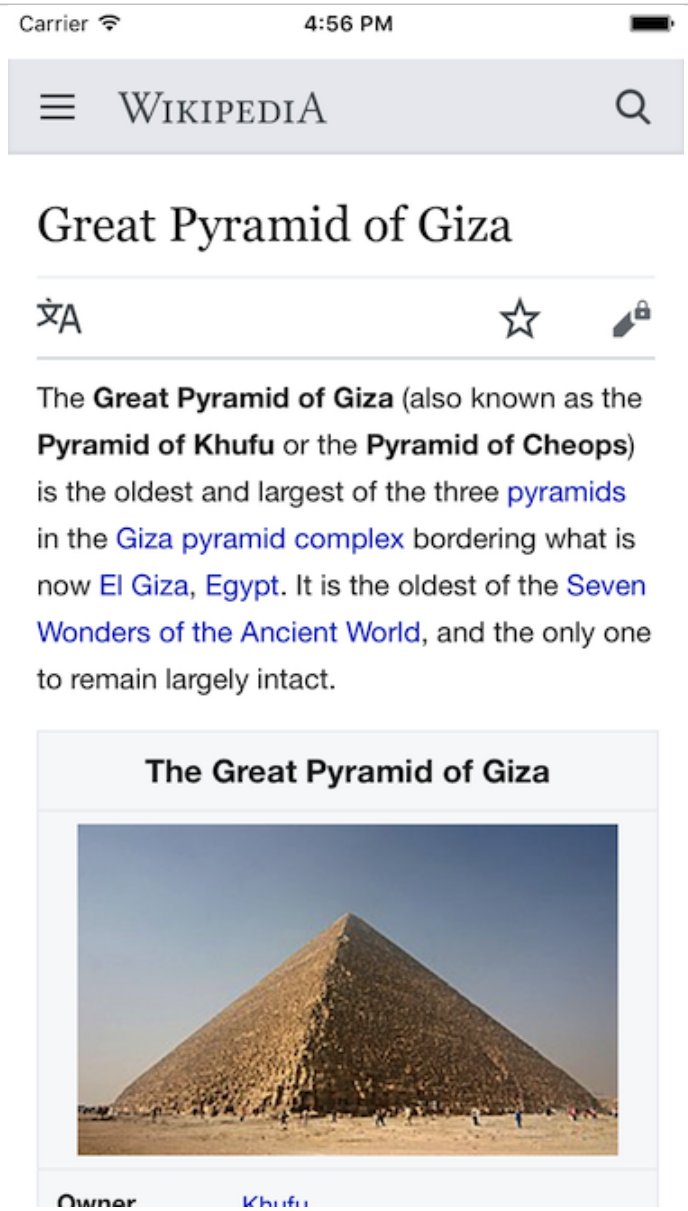
embed web content

- React Native offers a component solution for embedding web content
  - *embedded directly in a WebView*
  - *as a child to an existing view &c.*
- similar functionality to native WebView modules
- `WebView` component provides developers with a variety of props
  - *to help manipulate and structure a rendered web page*
- also use various available callbacks
  - *provide an option to register to specific events*
  - *e.g. error handling, message responses, navigation state change...*

```
<WebView style={styles.web}
  scalesPageToFit
  automaticallyAdjustContentInsets
  source={{
  uri: 'https://en.wikipedia.org/wiki/Great_Pyramid_of_Giza'
  }} />
```

Image - React Native - Component Usage

WebView - load external page &c.



React Native - WebView

React Native - component usage

iOS - SegmentedControlIOS

- some components in React Native may be specific to a given mobile OS
  - *e.g. Segmented Control component is specific to iOS*
- offers a simple split option to switch between two groupings of content
- e.g. we might use this component as follows

```
<SegmentedControlIOS
  values={['Giza', 'Luxor']}
  selectedIndex={this.state.selectedIndex}
  onChange={(event) => {
    this.setState({selectedIndex: event.nativeEvent.selectedSegmentIndex});
  }}
/>
```

- instead of passing expected `onValueChange` props
  - *we can pass a callback prop for `onChange`*
- prop will receive an event argument
  - *e.g. from `nativeEvent` as shown in this example*
- also abstract this usage to pass in required values for each segment

Mobile Design & Development - More UI Components & Usage

Fun Exercise

Four groups, two apps

- Music - http://linode4.cs.luc.edu/teaching/cs/demos/422/gifs/music/
- Travel Booking - http://linode4.cs.luc.edu/teaching/cs/demos/422/gifs/travelbooking/

For each app, consider the following

- define UI components for the app?
- how is the app using lists for various views?
- how is the app combining multiple components to create the required UI layout?
  - *e.g. various list views, scrolling, text input &c.*
- how are the UI components defining UX for the app?

~ 10 minutes

Cordova & React Native - Data

intro

- already seen data examples for Cordova
  - *including IndexedDB, Native Storage, various APIs...*
- React Native equally capable of accessing data stores
  - *a popular option for object based data storage is Firebase*
- useful to understand how React Native works
  - *with remote queries, fetching data, and authentication...*
- setup and add our own login and authentication for an app
- leverage an existing social provider
  - *e.g. Facebook, GitHub, Google, Microsoft, Twitter...*
- similar patterns and usage to web apps

Cordova & React Native - Data - Firebase

NoSQL options

- other data store and management options now available to us as developers
- depending upon app requirements consider
  - *Firebase*
  - *RethinkDB*
  - *AWS - including Amplify*
  - *MongoDB, Redis...*
- as a data store, Firebase offers a hosted NoSQL database
  - *data store is JSON-based*
  - *offering quick, easy development from webview to data store*
- syncs an app's data across multiple connected devices in milliseconds
  - *available for offline usage as well*
- provides an API for accessing these JSON data stores
  - *real-time for all connected users*
- Firebase as a hosted option more than just data stores and real-time API access
- Firebase has grown a lot over the last year
  - *many new features announced at Google I/O conference in May 2016*
  - *analytics, cloud-based messaging, app authentication*
  - *file storage, test options for Android*
  - *notifications, adverts...*

Cordova & React Native - Data - Firebase

Firebase - intro

- Cordova & React Native do not limit data stores or queries to just Firebase
- Firebase is hosted platform, acquired by Google
  - *provides options for data starage, authentication, real-time database querying...*
- it provides and API for data access
  - *access and query JavaScript object data stores*
  - *query in real-time*
  - *listeners available for all connected apps and users*
  - *synchronisation in milliseconds for most updates...*
  - *notifications*

Cordova & React Native - Data - Firebase

Firebase - Authentication

- **authentication** with Firebase provides various backend services and SDKs
  - *help developers manage authentication for an app*
  - *service supports many different providers, including Facebook, Google, Twitter &c.*
  - *using industry standard **OAuth 2.0** and **OpenID Connect** protocols*
- custom solutions also available per app
  - *email*
  - *telephone*
  - *messaging*
  - ...

Cordova & React Native - Data - Firebase

Firebase - Cloud Storage

- **Cloud Storage** used for uploading, storing, downloading files
  - *accessed by apps for file storage and usage...*
  - *features a useful safety check if and when a user's connection is broken or lost*
  - *files are usually stored in a Google Cloud Storage bucket*
  - *files accessible using either Firebase or Google Cloud*
  - *consider using Google Cloud platform for image filtering, processing, video editing...*
  - *modified files may then become available to Firebase again, and connected apps*
  - *e.g. Google's Cloud Platform*

Cordova & React Native - Data - Firebase

Firebase - Real-time database

- **Real-time Database** offers a hosted NoSQL data store
  - *ability to quickly and easily sync data*
  - *data synchronisation is active across multiple devices, in real-time*
  - *available as and when the data is updated in the cloud database*
- other services and tools available with Firebase
  - *analytics*
  - *advertising services such as adwords*
  - *crash reporting*
  - *notifications*
  - *various testing options...*

Cordova & React Native - Data - Firebase

Firebase - basic setup

- start using Firebase by creating an account with the service
  - *using a standard Google account*
  - *Firebase*
- login to Firebase
  - *choose either Get Started material or navigate to Firebase console*
- at *Console* page, get started by creating a new project
  - *click on the option to* `Add project`
  - *enter the name of this new project*
  - *and select a region*
- then redirected to the *console dashboard* page for the new project
  - *access project settings, config, maintenance...*
- reference documentation for the Firebase Real-Time database,
  - *https://firebase.google.com/docs/reference/js/firebase.database*

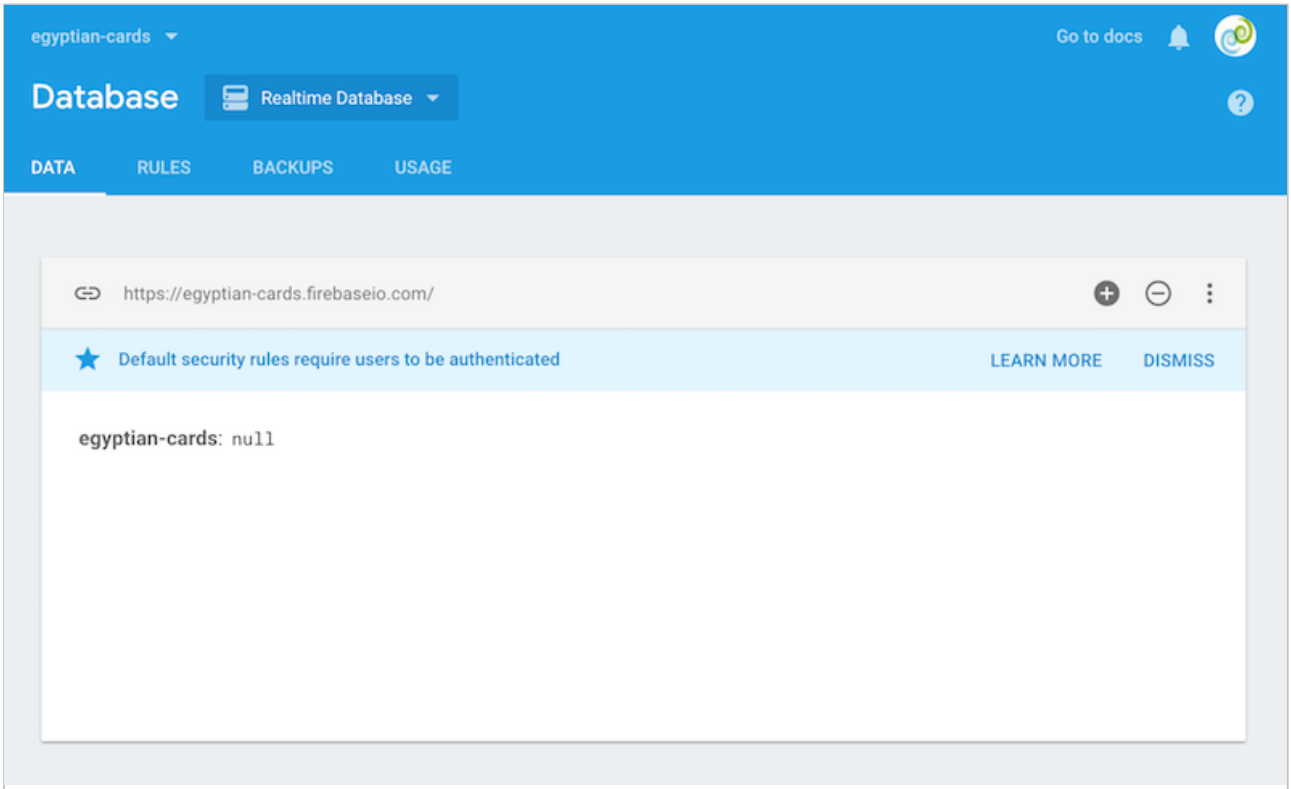
Cordova & React Native - Data - Firebase

Firebase - create real-time database

- now setup a database with Firebase for a test React Native app
- start by selecting *Database* option from left sidebar on the Console Dashboard
  - *available under the DEVELOP option*
- then select *Get Started* for the real-time database
- presents an empty database with an appropriate name to match current project
- data will be stored in a JSON format in the real-time database
- working with Firebase is usually simple and straightforward for most apps
- get started quickly direct from the Firebase console
  - *or import some existing JSON...*

Image - Firebase

create a database



Firebase - create a database

Cordova & React Native - Data - Firebase

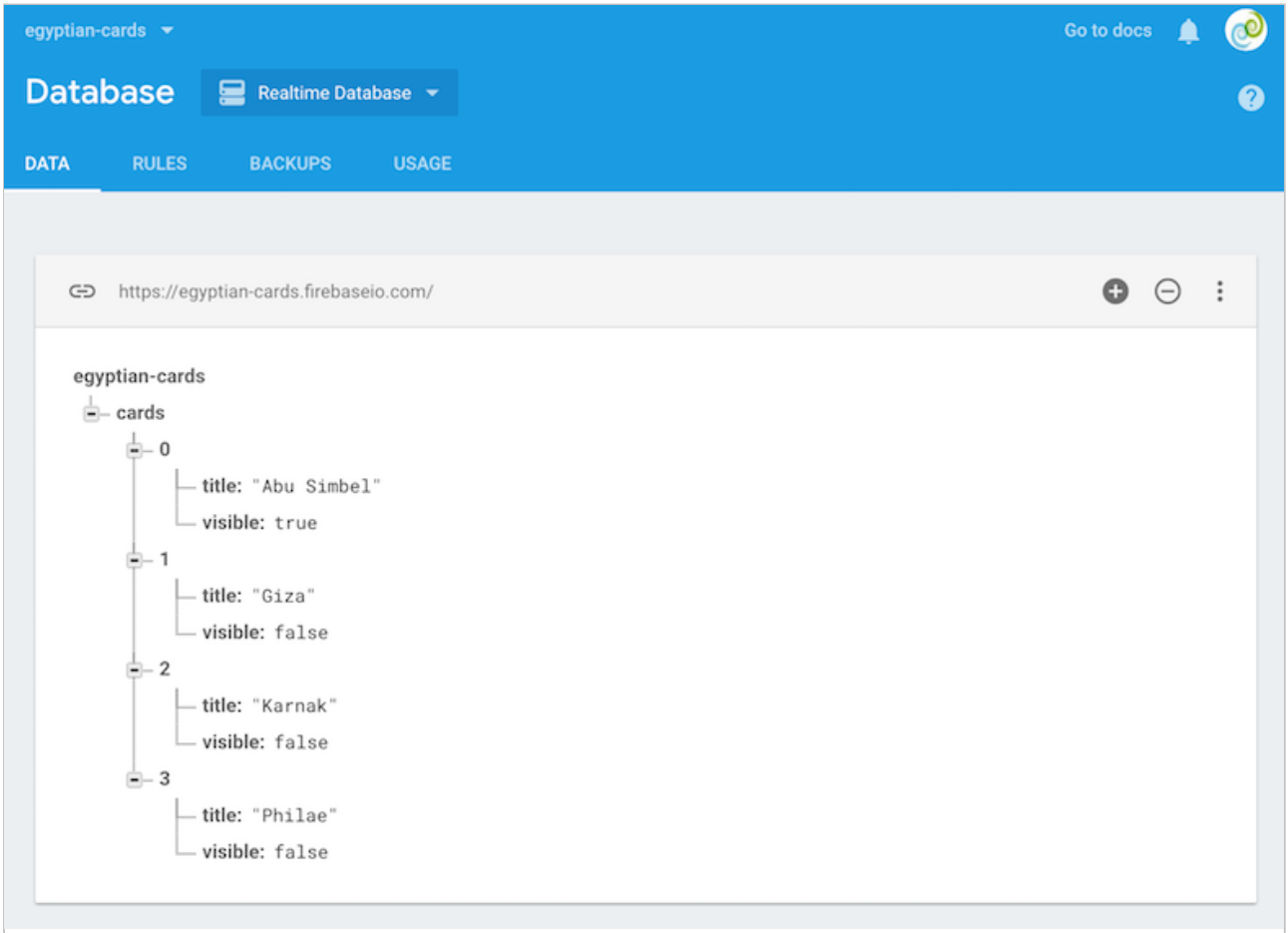
Firebase - import JSON data

- we might start with some simple data to help test Firebase
- import JSON into our test database
  - *then query the data &c. from the app*

```
{
  "cards": [
    {
      "visible": true,
      "title": "Abu Simbel",
      "card": "temple complex built by Ramesses II"
    },
    {
      "visible": false,
      "title": "Amarna",
      "card": "capital city built by Akhenaten"
    },
    {
      "visible": false,
      "title": "Giza",
      "card": "Khufu's pyramid on the Giza plateau outside Cairo"
    },
    {
      "visible": false,
      "title": "Philae",
      "card": "temple complex built during the Ptolemaic period"
    }
  ]
}
```

Image - Firebase

JSON import



Firebase - import JSON file

Cordova & React Native - Data - Firebase

Firebase - permissions

- initial notification in Firebase console after creating a new database
  - *Default security rules require users to be authenticated*
- permissions with Firebase database
  - *select RULES tab for current database*
- lots of options for database rules
  - *Firebase - database rules*
- e.g. for testing initial React Native we might remove authentication rules
- change rules as follows

from

```
{
  "rules": {
    ".read": "auth != null",
    ".write": "auth != null"
  }
}
```

to

```
{
  "rules": {
    ".read": "true",
    ".write": "true"
  }
}
```

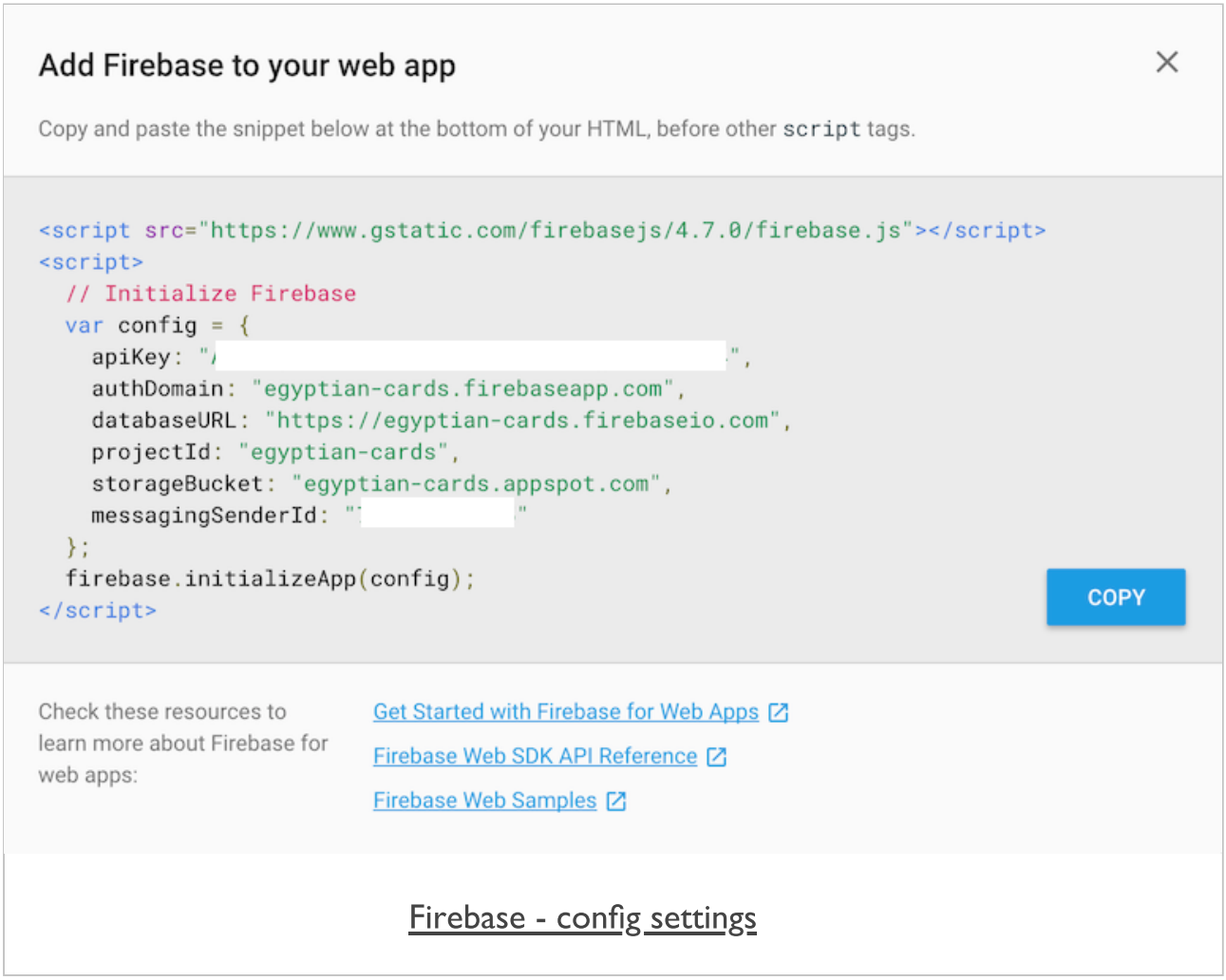
React Native - Data - Firebase

add Firebase to React Native - part 1

- we can now test our new Firebase database with an app
- need to start by getting some useful information from Firebase
  - *select the Project Overview link in the left sidebar*
  - *then click on the icon for Add app*
  - *options for Android and iOS native, plus **JavaScript***
- we can take advantage of the provided JavaScript SDK with React Native
- Firebase console will show us a modal with initialisation settings
  - *config settings for adding Firebase usage to our app*

Image - Firebase

initialisation config settings



Firebase - config settings

React Native - Data - Firebase

add Firebase to React Native - part 2

- start by copying these config values for use with our React Native app
- Firebase runs on a JavaScript thread
  - *certain complex applications, e.g. detailed animations &c.*
  - *may be adversely affected by this structure...*
- might consider using a community package called `react-native-Firebase`
  - *package acts as a wrapper around the Firebase SDK for Android and iOS*
  - *React Native Firebase*
- for most React Native apps we simply integrate Firebase JavaScript SDK
  - *install using NPM or Yarn*

```
npm install firebase --save
```

or

```
yarn add firebase
```

React Native - Data - Firebase

add Firebase to React Native - part 3

- after installing Firebase support for our app
  - *add a new file, `firebase.js`, to a `services` folder in the `src` directory*
- `firebase.js` - specify an initialisation function for working with Firebase services
- working with the initialisation config data provided by Firebase
  - *for the JavaScript SDK for our app*
- need to import the firebase module
  - *then setup a function to handle the initialisation config*

```
import * as firebase from "firebase";

export const initialize = () => firebase.initializeApp({
    apiKey: "__your-api-key__",
    authDomain: "egyptian-cards.firebaseapp.com",
    databaseURL: "https://egyptian-cards.firebaseio.com",
    projectId: "egyptian-cards",
    storageBucket: "egyptian-cards.appspot.com",
    messagingSenderId: "__your-sender-id__"
})
```

React Native - Data - Firebase

add Firebase to React Native - part 4

- need to export the `initialize` function from `firebase.js`
  - *use in a central config file for API usage*
- create a new file for API config management in the `src/services` directory
- config file helps manage multiple services and APIs within a project's structure
- import the `initialize` function for Firebase

```
import { initialize } from './firebase';
```

- then export the functionality for Firebase

```
export const initApi = () => initialize();
```

React Native - Data - Firebase

add Firebase to React Native - part 5

- need to setup Firebase usage in our application root, `App.js`
- use the `componentDidMount` lifecycle hook to call the `initApi()` function
- ensure Firebase is ready and available for our app

```
export default class extends Component {
    componentDidMount() {
        initApi();
    }

    render() {
        return (
          ...
        )
    }
}
```

React Native - Data - Firebase

add Firebase to React Native - part 6

- after setup and initialisation, we can start to consider working with our Firebase database
- benefits of Firebase is that the SDK allows our apps and database to be in sync
  - *as and when updates are registered*
- we need to setup database listeners to ensure the state of our app is updated
  - *whenever a database is modified on Firebase...*
- add such listeners to our `firebase.js` file

```
// setup listener for firebase updates
export const setListener = (endpoint, updaterFn) => {
    firebase.database().ref(endpoint).on('value', updaterFn);
    return () => firebase.database().ref(endpoint).off();
}
```

- using this function to perform two key tasks
- after passing arguments for `endpoint` and `updateFn`
  - *get reference to endpoint for our Firebase database*

```
firebase.database().ref(endpoint)
```

- we can send other required endpoints for our app and Firebase database
  - *such as `cards` in our current example*
- then call the `on()` function allowing us to pass `udpaterFn`
  - *passed as we call the `setListener` function in our app*
- then return a function to allow us to remove the attached listener later in our app

React Native - Data - Firebase

add Firebase to React Native - part 7

- start to use such listeners and functionality in our app
- create a `getCards()` function in `api.js` file
  - *use the `setListener` we created in `firebase.js`*

```
// get cards from current firebase database
export const getCards = (updaterFn) => setListener('cards', updaterFn);
```

- then import this function for a given screen in our app, such as the Card screen,

```
import { getCards } from '../services/api';
```

- then set our state to use this function, and the cards from the database

```
componentDidMount() {
  this.unsubscribeGetCards = getCards((snapshot) => {
    this.setState({
      messages: Object.values(snapshot.val())
    })
  })
}
```

React Native - Data - Firebase

add Firebase to React Native - part 8

- in `componentDidMount()` lifecycle hook
  - *use `Object.values` on Firebase `snapshot.val()`*
  - *`FlatList` component we're using for rendering expects an array*
  - *Firebase returns an object for the values*
- `getCards` is calling `setListener`
  - *returns a function for a remove listener*

```
firebase.database().ref(endpoint).off();
```

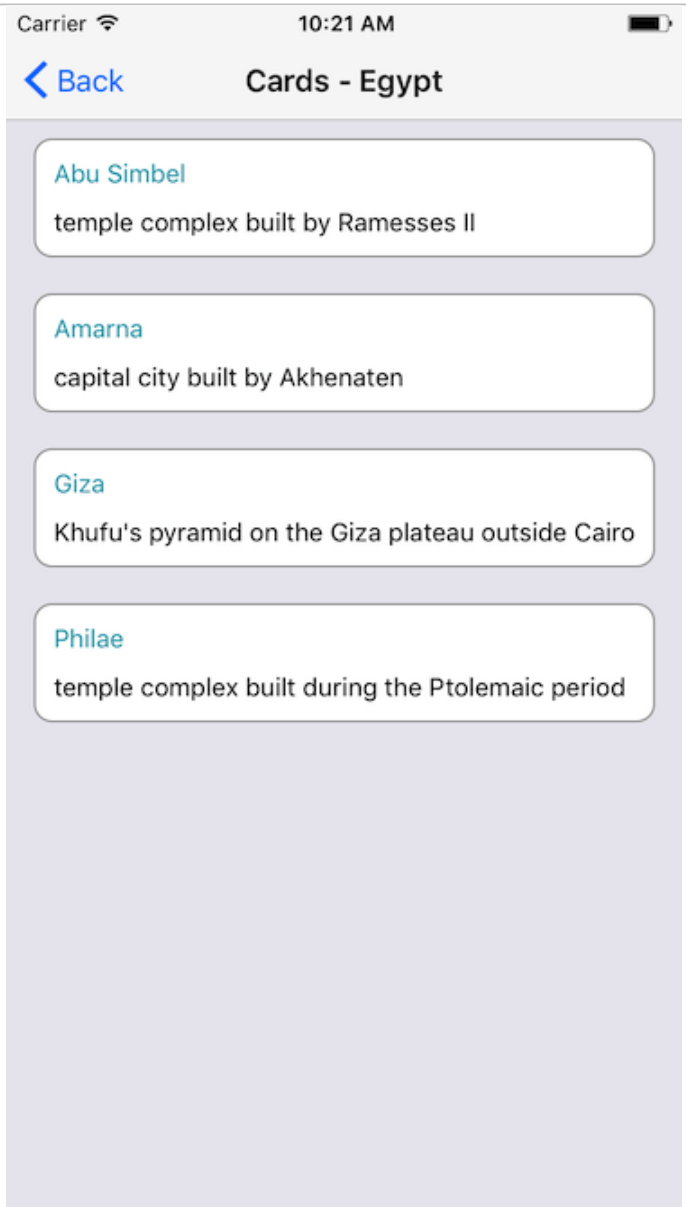
- set the result for `getCards` to `this.unsubscribeGetCards`
- then later call it as necessary in the lifecycle hook for `componentWillUnmount`
- might also add a single call, instead of constantly checking for updates

```
firebase.database().ref(endpoint).once('value')
```

- returns a *promise*
  - *we can use in a standard manner, or chain with `then()`...*

Image - Firebase

render data from database



Firebase - render data

Cordova & React Native - Data - Firebase

add data with plain JS objects

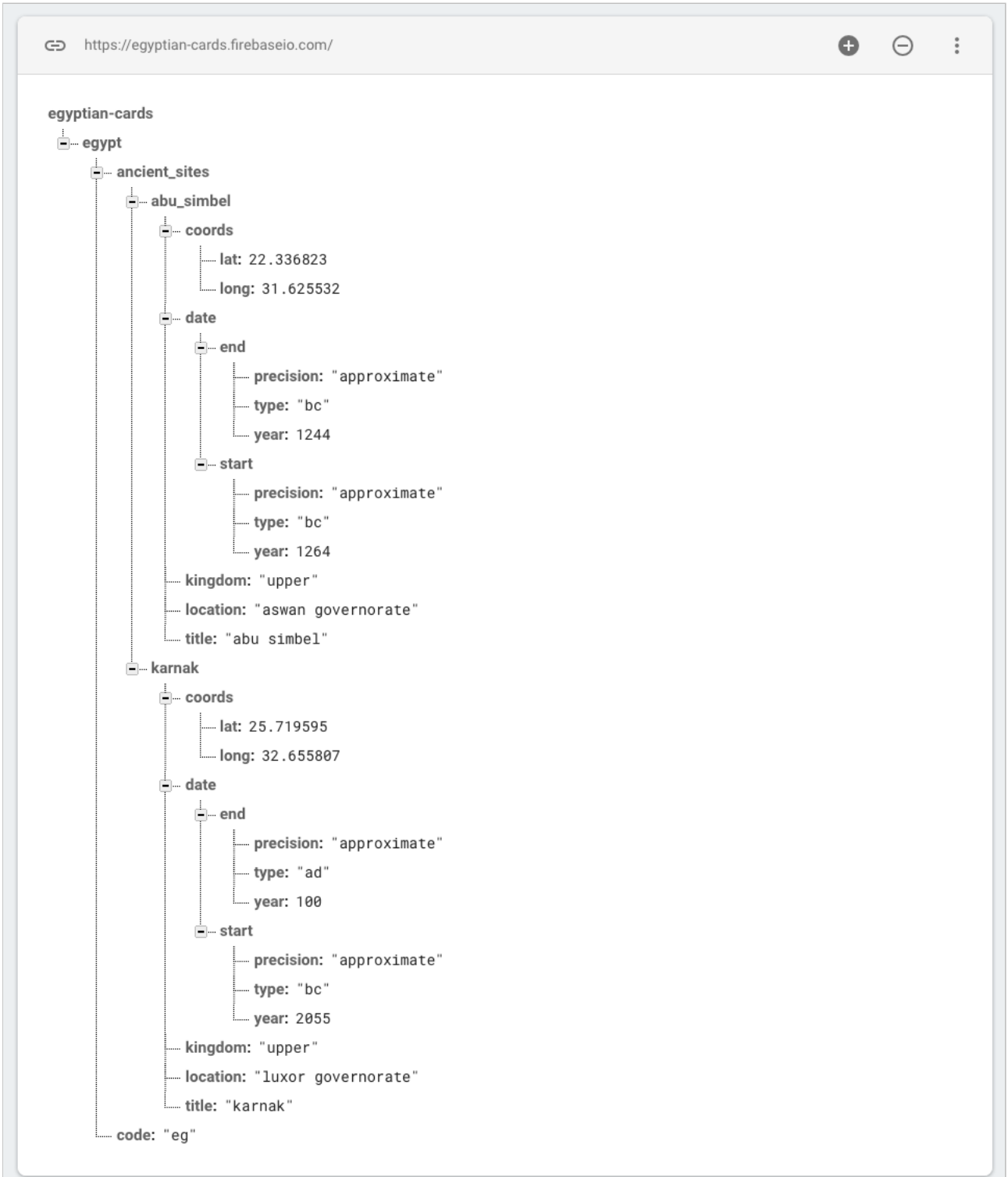
- plain objects as standard Firebase storage
  - *helps with data updating*
  - *helps with auto-increment pushes of data...*

```
{
  "egypt": {
    "code": "eg",
    "ancient_sites": {
      "abu_simbel": {
        "title": "abu simbel",
        "kingdom": "upper",
        "location": "aswan governorate",
        "coords": {
          "lat": 22.336823,
          "long": 31.625532
        },
        "date": {
          "start": {
            "type": "bc",
            "precision": "approximate",
            "year": 1264
          },
          "end": {
            "type": "bc",
            "precision": "approximate",
            "year": 1244
          }
        }
      },
      "karnak": {
        "title": "karnak",
        "kingdom": "upper",
        "location": "luxor governorate",
        "coords": {
          "lat": 25.719595,
          "long": 32.655807
        },
        "date": {
          "start": {
            "type": "bc",
            "precision": "approximate",
```

```
            "year": 2055
          },
          "end": {
            "type": "ad",
            "precision": "approximate",
            "year": 100
          }
        }
      }
    }
  }
}
```

Image - Firebase

JSON import



Firebase - import JSON file

Cordova - Data - Firebase

add to app's `index.html`

- start testing Cordova setup with default config in app's `index.html` file
  - e.g.

```
<!-- JS - Firebase app -->
<script src="https://www.gstatic.com/firebasejs/5.5.8/firebase.js"></script>
<script>
  // Initialize Firebase
  var config = {
    apiKey: "YOUR_API_KEY",
    authDomain: "422cards.firebaseapp.com",
    databaseURL: "https://422cards.firebaseio.com",
    projectId: "422cards",
    storageBucket: "422cards.appspot.com",
    messagingSenderId: "282356174766"
  };
  firebase.initializeApp(config);
</script>
```

- example includes initialisation information so the SDK has access to
  - *Authentication*
  - *Cloud storage*
- Realtime Database
- Cloud Firestore

n.b. don't forget to modify the above values to match your own account and database...

Cordova - Data - Firebase

customise API usage

- possible to customise required components per app
- allows us to include only features required for each app
  - *e.g. the only **required** component is*
- `firebase-app` - core Firebase client (required component)

```
<!-- Firebase App is always required and must be first -->
<script src="https://www.gstatic.com/firebasejs/5.5.8/firebase-app.js"></script>
```

- we may add a mix of the following optional components,
- `firebase-auth` - various authentication options
- `firebase-database` - realtime database
- `firebase-firestore` - cloud Firestore
- `firebase-functions` - cloud based function for Firebase
- `firebase-storage` - cloud storage
- `firebase-messaging` - Firebase cloud messaging

Cordova - Data - Firebase

modify JS in app's `index.html`

```
<!-- Add additional services that you want to use -->
<script src="https://www.gstatic.com/firebasejs/5.5.3/firebase-auth.js"></script>
<script src="https://www.gstatic.com/firebasejs/5.5.3/firebase-database.js"></scr
<script src="https://www.gstatic.com/firebasejs/5.5.3/firebase-firestore.js"></sc
<script src="https://www.gstatic.com/firebasejs/5.5.3/firebase-messaging.js"></sc
<script src="https://www.gstatic.com/firebasejs/5.5.3/firebase-storage.js"></scri

<script src="https://www.gstatic.com/firebasejs/5.5.3/firebase-functions.js"></sc
```

- then define an object for the `config` of the required services and options,

```
var config = {
  // add API key, services &c.
};
firebase.initializeApp(config);
```

Cordova - Data - Firebase

initial app usage - DB connection

- after defining required config and initialisation
  - *start to add required listeners and calls to app's JS*

define DB connection

- we can establish a connection to our Firebase DB as follows,

```
const db = firebase.database();
```

- then use this reference to connect and query our database

Cordova - Data - Firebase

initial app usage - `ref()` method

- with the connection to the database
  - *we may then call the `ref()`, or reference, method*
  - *use this method to read, write &c. data in the database*
- by default, if we call `ref()` with no arguments
  - *our query will be relative to the root of the database*
  - *e.g. reading, writing &c. relative to the whole database*
- we may also request a specific reference in the database
  - *pass a location path, e.g.*

```
db.ref('egypt/ancient_sites/abu_simbel/title').set('Abydos');
```

- allows us to create multiple parts of the Firebase database
- such parts might include,
  - *multiple objects, properties, and values &c.*
- a quick and easy option for organising and distributing data

Cordova & React - Data - Firebase

write data - intro

- also write data to the connected database
  - *again from a JavaScript based application*
- Firebase supports many different JavaScript datatypes, including
  - *strings*
  - *numbers*
  - *booleans*
  - *objects*
  - *arrays*
  - ...
- i.e. any values and data types we add to JSON
  - *n.b. Firebase may not maintain the native structure upon import*
  - *e.g. arrays will be converted to plain JavaScript objects in Firebase*

Cordova & React - Data - Firebase

write data - set all data

- `set` data for the whole database by calling the `ref()` method at the *root*
  - e.g.

```
db.ref().set({
  site: 'abu-simbel',
  title: 'Abu Simbel',
  date: 'c.1264 B.C.',
  visible: true,
  location: {
    country: 'Egypt',
    code: 'EG',
    address: 'aswan'
  }
  coords: {
    lat: '22.336823',
    long: '31.625532'
  }
});
```

Cordova & React - Data - Firebase

write data - set data for a specific data location

- also write data to a specific location in the database
- add an argument to the `ref()` method
  - *specifying required location in the database*
  - *e.g.*

```
db.ref('egypt/ancient_sites/abu_simbel/location').set('near aswan');
```

- `ref()` may be called relative to any depth in the database from the *root*
- allows us to update anything from whole DB to single property value

Cordova & React - Data - Firebase

Promises with Firebase

- Firebase includes native support for Promises and associated chains.
  - *we do not need to create our own custom Promises*
- we may work with a return Promise object from Firebase
  - *using a standard chain, methods...*
- e.g. when we call the `set()` method
  - *Firebase will return a Promise object for the method execution*
- `set()` method will not explicitly return anything except for success or error
  - *we can simply check the return promise as follows,*

```
db.ref('egypt/ancient_sites/abu_simbel/title')
  .set('Abu Simbel')
  .then(() => {
    // log data set success to console
    console.log('data set...');
  })
  .catch((e) => {
    // catch error from Firebase - error logged to console
    console.log('error returned', e);
  });
```

Cordova & React - Data - Firebase

remove data - intro

- we may lso delete and remove data from the connected database
- various options for removing such data, including
  - *specific location*
  - *all data*
  - *`set()` with `null`*
  - *by updating data*
  - *...*

remove data - specify location

- we may also delete data at a specific location in the connected database
  - e.g.

```
db.ref('egypt/ancient_sites/abu_simbel/kingdom')
  .remove()
  .then(() => {
    // log data removed success to console
    console.log('data removed...');
  })
  .catch((e) => {
    // catch error from Firebase - error logged to console
    console.log('error returned', e);
  });
```

Cordova & React - Data - Firebase

remove data - all data

- also remove all of the data in the connected database
  - e.g.

```
db.ref()
  .remove()
  .then(() => {
    // log data removed success to console
    console.log('data removed...');
  })
  .catch((e) => {
    // catch error from Firebase - error logged to console
    console.log('error returned', e);
  });
```

Cordova & React - Data - Firebase

remove data - `set()` with null

- another option specified in the Firebase docs for deleting data
  - *by using `set()` method with a `null` value*
  - *e.g.*

```
db.ref('egypt/ancient_sites/abu_simbel/kingdom')
  .set(null)
  .then(() => {
    // log data removed success to console
    console.log('data set to null...');
  })
  .catch((e) => {
    // catch error from Firebase - error logged to console
    console.log('error returned', e);
  });
```

update data - intro

- also combine setting and removing data in a single pattern
  - *using the `update()` method call to the defined database reference*
- meant to be used to update multiple items in database in a single call
- we must pass an object as the argument to the `update()` method

update data - existing properties

- to update multiple existing properties
  - e.g.

```
db.ref('egypt/ancient_sites/abu_simbel/').update({
  title: 'The temple of Abu Simbel',
  visible: false
});
```

Cordova & React - Data - Firebase

update data - add new properties

- also add a new property to a specific location in the database

```
db.ref('egypt/ancient_sites/abu_simbel/').update({
  title: 'The temple of Abu Simbel',
  visible: false,
  date: 'c.1264 B.C.'
});
```

- still set new values for the two existing properties
  - *`title` and `visible`*
- add a new property and value for `data`
- `update()` method will only update the specific properties
  - *does not override everything at the reference location*
  - *compare with the `set()` method...*

update data - remove properties

- also combine these updates with option to remove an existing property
  - *e.g.*

```
db.ref('egypt/ancient_sites/abu_simbel/').update({
  card: null,
  title: 'The temple of Abu Simbel',
  visible: false,
  date: 'c.1264 B.C.',
});
```

- `null` used to delete specific property from reference location in DB
- at the reference loaction in the DB, we're able to combine
  - *creating new property*
  - *updating a property*
  - *deleting existing properties*

Cordova & React - Data - Firebase

update data - multiple properties at different locations

- also combine updating data in multiple objects at different locations
  - *locations relative to initial passed reference location*
  - *e.g.*

```
db.ref().update({
  'egypt/ancient_sites/abu_simbel/visible': true,
  'egypt/ancient_sites/karnak/visible': false
});
```

- relative to the root of the dabatase
  - *now updated multiple `title` properties in different objects*
- *n.b.* update is only for child objects relative to specified ref location
  - *due to character restrictions on the property name*
  - *e.g. the name may not begin with `.`, `/` &c.*

update data - Promise chain

- `update()` method will also return a Promise object
  - *allows us to chain the standard methods*
  - *e.g.*

```
db.ref().update({
  'egypt/ancient_sites/abu_simbel/visible': true,
  'egypt/ancient_sites/karnak/visible': false
}).then(() => {
  console.log('update success...');
}).catch((e) => {
  console.log('error = ', e);
});
```

- as with `set()` and `remove()`
  - *Promise object itself will return success or error for method call*

Cordova & React - Data - Firebase

read data - intro

- fetch data from the connected database in many different ways, e.g.
  - *all of the data*
  - *or a single specific part of the data*
- also connect and retrieve data once
- another option is to setup a listener
  - *used for polling the database for live updates...*

Cordova & React - Data - Firebase

read data - all data, once

- retrieve all data from the database a single time

```
// ALL DATA ONCE - request all data ONCE
// - returns Promise value
db.ref().once('value')
  .then((snapshot) => {
    // snapshot of the data - request the return value for the data at the time o
    const data = snapshot.val();
    console.log('data = ', data);
  })
  .catch((e) => {
    console.log('error returned - ', e);
  });
```

Cordova & React - Data - Firebase

read data - single data, once

- we may query the database once for a single specific value
  - e.g.

```
// SINGLE DATA - ONCE
db.ref('egypt/ancient_sites/abu_simbel/').once('value')
  .then((snapshot) => {
    // snapshot of the data - request the return value for the data at the time o
    const data = snapshot.val();
    console.log('single data = ', data);
  })
  .catch((e) => {
    console.log('error returned - ', e);
  });
```

- returns value for object at the specified location
  - *egypt/ancient_sites/abu_simbel/*

Cordova & React - Data - Firebase

read data - listener for changes - subscribe

- also setup listeners for changes to the connected database
  - *then continue to poll the DB for any subsequent changes*
  - *e.g.*

```
// LISTENER - poll DB for data changes
// - any changes in the data
db.ref().on('value', (snapshot) => {
  console.log('listener update = ', snapshot.val());
});
```

- `on()` method polls the DB for any changes in `value`
- then get the current snapshot value for the data stored
- any change in data in the online database
  - *listener will automatically execute defined success callback function*

Cordova & React - Data - Firebase

read data - listener for changes - subscribe - error handling

- also add some initial error handling for subscription callback
  - e.g.

```
// LISTENER - SUBSCRIBE
// - poll DB for data changes
// - any changes in the data
db.ref().on('value', (snapshot) => {
  console.log('listener update = ', snapshot.val());
}, (e) => {
  console.log('error reading db', e);
});
```

Cordova & React - Data - Firebase

read data - listener - why not use a Promise?

- as listener is notified of updates to the online database
  - *we need the callback function to be executed*
- callback may need to be executed multiple times
  - *e.g. for many updates to the stored data*
- a Promise may only be resolved a single time
  - *with either* `resolve` *or* `reject`
- to use a Promise in this context
  - *we would need to instantiate a new Promise for each update*
  - *would not work as expected*
  - *therefore, we use a standard callback function*
- a callback may be executed as needed
  - *each and every time there is an update to the DB*

Cordova & React - Data - Firebase

read data - listener for changes - unsubscribe

- need to *unsubscribe* from all or specific changes in online database
  - e.g.

```
db.ref().off();
```

- removes *all* current subscriptions to defined DB connection

Cordova & React - Data - Firebase

read data - listener for changes - unsubscribe

- also *unsubscribe* a specific subscription by passing callback
  - *callback as used for the original subscription*
- abstract the callback function
  - *pass it to both `on()` and `off()` methods for database `ref()` method*
  - *e.g.*

```
// abstract callback
const valChange = (snapshot) => {
  console.log('listener update = ', snapshot.val());
};
```

Cordova & React - Data - Firebase

read data - listener for changes - unsubscribe

- then pass this variable as callback argument
  - *for both subscribe and unsubscribe events*
  - *e.g.*

```
// subscribe
db.ref().on('value', valChange);
// unsubscribe
db.ref().off(valChange);
```

- allows our app to maintain the DB connection
  - *and unsubscribe a specific subscription*

Cordova & React - Data - Firebase

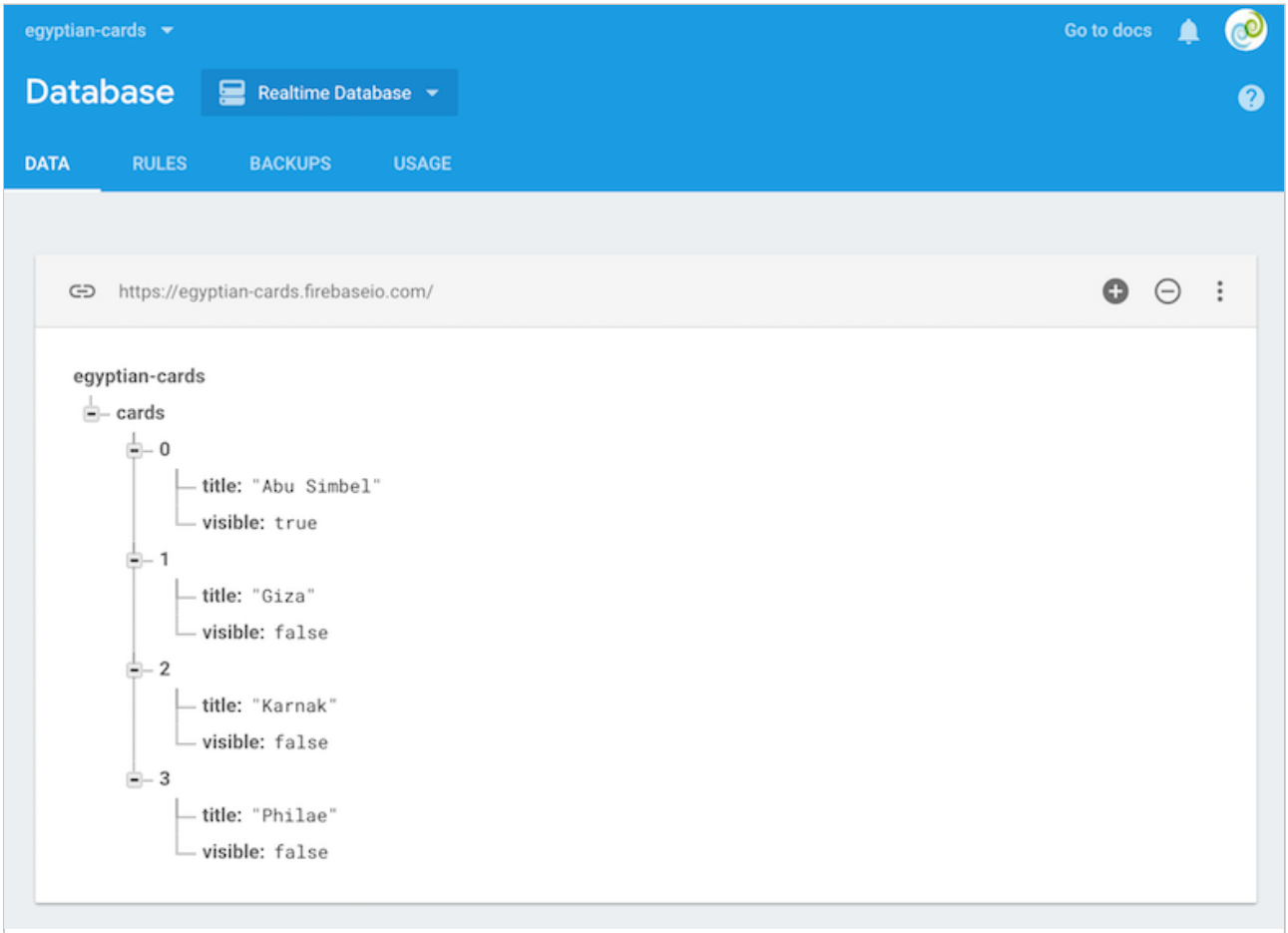
working with arrays

- Firebase does not explicitly support array data structures
  - *converts array objects to plain JavaScript objects*
- e.g. import the following JSON with an array

```
{
  "cards": [
    {
      "visible": true,
      "title": "Abu Simbel",
      "card": "temple complex built by Ramesses II"
    },
    {
      "visible": false,
      "title": "Amarna",
      "card": "capital city built by Akhenaten"
    },
    {
      "visible": false,
      "title": "Giza",
      "card": "Khufu's pyramid on the Giza plateau outside Cairo"
    },
    {
      "visible": false,
      "title": "Philae",
      "card": "temple complex built during the Ptolemaic period"
    }
  ]
}
```

Image - Firebase

JSON import with array



Firebase - import JSON file

Cordova & React - Data - Firebase

working with arrays - index values

- each index value will now be stored as a plain object
  - *with an auto-increment value for the property*
  - *e.g.*

```
cards: {
  0: {
    card: "temple complex built by Ramesses II",
    title: "Abu Simbel",
    visible: "true"
  }
}
```

Cordova & React - Data - Firebase

working with arrays - access index values

- we may still access each index value from the original array object
  - *without easy access to pre-defined, known unique references*
- e.g. to access the title value of a given card
  - *need to know its auto-generated property value in Firebase*

```
db.ref('cards/0')
```

- reference will be the path to the required object
  - *then access a given property on the object*
- even if we add a unique reference property to each card
  - *still need to know assigned property value in Firebase*

Cordova & React - Data - Firebase

working with arrays - `push()` method

- add new content to an existing Firebase datastore
- we may use the `push()` method to add this data
- a unique property value will be auto-generated for pushed data
  - e.g.

```
// push new data to specific reference in db
db.ref('egypt/ancient_sites/').push({
  "philae": {
    "kingdom": "upper",
    "visible": false
  }
});
```

- new data created with auto-generated ID for parent object
  - e.g.

```
LPcdS31H_u9NOdIn27_
```

- may be useful for dynamic content pushed to a datastore
- e.g. notes, tasks, calendar dates &c.

Cordova & React - Data - Firebase

working with arrays - Firebase `snapshot` methods

- various data snapshot methods in the Firebase documentation
- commonly used method with `snapshot` is the `val()` method
- many additional methods specified in API documentation for *DataSnapshot*
  - *e.g. `forEach()` - iterator for plain objects from Firebase*
  - *Firebase Docs - DataSnapshot*

Cordova & React - Data - Firebase

working with arrays - create array from Firebase data

- as we store data as plain objects in Firebase
  - *need to consider how we may work with array-like structures*
  - *i.e. for technologies and patterns that require array data structures*
  - *e.g. Redux*
- need to get data from Firebase, then prepare it for use as an array
- to help us work with Firebase object data and arrays
  - *we may call `forEach()` method on the return `snapshot`*
  - *provides required iterator for plain objects stored in Firebase*
  - *e.g.*

```
// get ref in db once
// call forEach() on return snapshot
// push values to local array
// unique id for each DB parent object is `key` property on snapshot
db.ref('egypt/ancient_sites')
  .once('value')
  .then((snapshot) => {
    const sites = [];
    snapshot.forEach((siteSnapshot) => {
      sites.push({
        id: siteSnapshot.key,
        ...siteSnapshot.val()
      });
    });
    console.log('sites array = ', sites);
  });
```

Image - Firebase

snapshot `forEach()` - creating a local array

Firebase - local array

- we now have a local array from the Firebase object data
  - *use with options such as Redux...*

Cordova & React - Data - Firebase

add listeners for value changes

- as we modify objects, properties, values &c. in Firebase
  - *set listeners to return notifications for such updates*
  - *e.g. add a single listener for any update relative to full datastore*

```
// LISTENER - SUBSCRIBE - v.2
// - get all data & then push return data to local array...
db.ref('egypt').on('value', (snapshot) => {
  const sites = [];
  snapshot.forEach((siteSnapshot) => {
    sites.push({
      id: siteSnapshot.key,
      ...siteSnapshot.val()
    });
  });
  console.log('sites array after update = ', sites);
});
```

- the on( ) method does not return a Promise object
  - *we need to define a callback for the return data*

References

- React Native
  - *React DevTools*
  - *React Native - Layout Props*
  - *React Native - StatusBar*
- Various
  - *Axios JS library*
  - *Firebase*
  - *Firebase - database rules*
  - *Firebase Docs - DataSnapshot*
  - *Firebase docs - `on()` events*
  - *Google's Cloud Platform*
  - *MDN - Fetch API*
  - *XMLHttpRequest*
  - *Yarn - Firebase*