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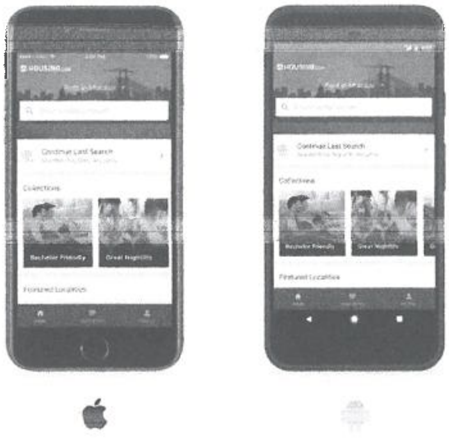
Research: App Set-up

How We Built Our React Native App



housing.com/apps

Last year we launched our PWA with an aim to improve the experience of our users on slow and inconsistent network connections. It was the first step towards the quality of the products we strive for. We received a very positive response from the community as well as our customers and wanted to replicate the same success for our mobile application too.

> *An ideal mobile application should be an extension of the mobile web instead of being a replacement.*

Challenges

- We are building experiences on 3 different platforms, namely: Android, iOS and the web (desktop and mobile).
- This means duplication of business logic across 4 codebases, which is not the best thing to do if you go by DRY.
- It also means introducing new features or modifying existing features requires making the necessary changes across 4 separate codebases. This is not scalable at all and the platforms would soon end up being out of sync.
- Finally, we would have to build and strategically expand 3 separate teams of developers for each of the 3 platforms.

Objectives

To overcome these challenges, we decided to place our bets on the newly emerging breed of cross-platform native apps built with a modern frontend stack in JavaScript. We began implementing the apps with the following main objectives:

- Although the apps would be written in JavaScript, they should not compromise on the experience and responsiveness that users associate with 'native' apps. In simpler words, if you're the user, the app should feel just like any other native app on the App Store or Play Store.
- The app should reuse as much code as possible across Android and iOS. This would be in line with the principle of DRY. It would also imply that maintaining the code is far easier and adding/modifying/removing features means touching the minimum number of files possible.
- Last but not least, the stack used should be familiar to our team of product engineers for the web and the dependence on platform specific native developers should be reduced. This is also in line with increasing the bus factor at Housing.

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Stack

- **react-navigation**—still in its early days but it solves the much debated navigation issue in a declarative manner using the Animated API. It also fits well into our redux based state management system since it's a purely JS based solution. However, we are investigating into other native and hybrid navigation solutions as well.
- **redux-observable**—the JS ecosystem is still figuring the best solution to async state management but in the end, it is more of a 'to each his own' problem. We decided to use redux-observable because it helps us isolate side effects nicely and handle them with the expressive power RxJS operators. This approach also allows us to test our side-effects handling code in an isolated manner.
- **immutable**—we faced nasty and hard to find bugs on previous platforms which arose from mutations caused in our reducers. To mitigate this issue for once and for all, we decided to use immutable data structures throughout the app. This was made possible by a custom reducer factory which converts between immutable and vanilla JS data structures.
- **ramda**—as far as possible, we made it a point to code in a functional, declarative paradigm via pure functions which handle most of our business logic. Ramda has been irreplaceable for us in that regard.
- **redux-persist**—Unlike web apps, native apps have a notion of offline mode and persisted state. This library along with redux-persist-migrate gracefully solved this problem with a backing AsyncStorage layer.

Tooling

Besides the usual suspects—yarn, prettier, eslint and husky, we depend on the following tools as well:

Styleguide (Consistent across Android and iOS)

- **storybook**—it provides excellent support for developing isolated native components. As a result, we were able to code our UI components as a one-to-one mapping of our design guide. We are looking into deploying it internally so that designers have access to actual components as well.

- **codepush**—this is one area where react native apps really shine. We use codepush for releasing unobtrusive over the air updates to our users while completely owning the rollout percentages and target versions.
- **fastlane**—managing different environments (staging, development, production) and automating our builds proved to be a breeze with fastlane. We exposed a parameterized build dashboard on our internal Jenkins CI which manages everything from app secrets, code signing, Test Flight and Crashlytics Beta uploads, registering devices for internal test builds, releasing OTA updates through codepush etc.

Automated End to End Tests in Detox

- **jest** and **detox**—this combination resulted in a delightful testing platform for our app. Jest proved to be slightly cumbersome to set up for react-native given the fact that we had to write mocks for native modules, but it was worth the effort. Detox by the folks at Wix Engineering simplified the end-to-end testing story for us.
- **sentry**—The folks at sentry.io introduced first class support for react-native apps sometime back. The new SDK enriches error reports with a lot of useful device specific data and provides holistic reports with both native and JS stack traces.

. . .

> *More than 90% of the app's source code is in JavaScript while not compromising on performance and quality.*

. . .

Learnings

React Native is a **relatively** young platform. The community around it is still deliberating on best practices and the *right way* to do certain things.

As a starting point, however, the official docs are the best resource we have come across. Here are some things we learnt along the way:

- **InteractionManager**—This is your best friend when it comes to perf. There has been a considerable effort by the community to move expensive things to run on native threads since JS is single threaded. There are times when you need to do expensive stuff in JS without affecting the perf of your animations/transitions/user interactions. InteractionManager provides a nice scheduling API to defer this expensive stuff until after said animations/transitions/interactions have completed.
- **requestAnimationFrame**—This one is borrowed from the web and works identically. A particular use case is the ripple effect on Android devices. The usual approach of using a `TouchableNativeFeedback` with an apt `onPress` handler does not always work here. At times, you might not see the ripple. Instead, if you wrap your `onPress` handler in a `requestAnimationFrame` block, you'll notice the animations are visible perfectly.

Make it smooth

- **MessageQueue**—*React Native works by communicating between* the JS and native realms over a bridge. As a result, there is constant chit-chat over this bridge which can affect performance adversely if not moderated properly. The `spy` method on `MessageQueue`, as the name suggest, lets you spy on this chit-chat and see what's being sent across. This might help you understand what's actually happening underneath and improve performance.

if performance is slow

```
MessageQueue.spy(true)
```

- **setNativeProps**—From the official docs—“ `setNativeProps` is the React Native equivalent to setting properties directly on a DOM node”. At times, for reasons only known to you, you might want to manipulate the underlying native view that backs your JS view while short-circuiting the react render cycle. We used this only in a couple of places because everything else just did not work well enough. Avoid using it or use it very wisely if you must.

- **Structuring**—From the get go, we followed a simple organization structure for our repo. We separated our dumb UI components from stateful views. State management was all taken care of in our epics and reducers. We observed that randomly scattered side-effect generating code becomes the bottleneck in keeping our codebase performant and testable. Our approach with redux-observable helped us mitigate some of those pains. Consider the following example:

```
export default function localitySelect(action$, store,
  return action$
    .ofType('LOCALITY_AUTOCOMPLETE')
    .debounceTime(150)
    .distinctUntilChanged()
    .switchMap(({ payload: { text, cursor } }) => {
      return ajax
        .getJSON(
          `${api.searchSuggest}&cursor=${cursor}&strin
        )
        .retry(2)
        .map(({ response }) => ({
          type: 'LOCALITY_SUGGEST',
          payload: { data: response }
        }))
        .catch(error =>
          Observable.of({
            type: 'LOCALITY_SUGGEST',
            payload: { error },
            error: true
          })
        )
    })
}
```

localitySuggest.js hosted with ♥ by GitHub view raw

We were able to contain most of the side-effect code in a single function rather than piggy-backing on component filecycle methods. Also, we injected the side-effect making dependency— `ajax` in this case, into the function itself. This can be replaced by something that just mocks the network requests in a test environment.

- **Redux Middleware**—Since the entire app state lives in redux including navigation, redux middleware become indispensable in executing code in response to actions. In our case, we delegated the analytics (screen tracking), logging, error reporting, modifying the device status bar and memory management to dedicated middleware. This effectively removes this code from individual views and keeps them lean. Here's an example that switches between a dark or light status bar on iOS based on the current screen:

```
const statusBarMiddleware = ({ getState }) => next =>
  if (!Object.values(NavigationActions).includes(actio
    return next(action)
  }
  const currentScreen = getCurrentRouteName(getState()
  const result = next(action)
  const nextScreen = getCurrentRouteName(getState().ro
  if (nextScreen !== currentScreen && Platform.OS ===
    setStyleForRoute(nextScreen)
  }
  return result
}
```

statusBarMiddleware.js hosted with ♥ by GitHub view raw

Build Pipeline

Pipe lines aren't interesting at my stage
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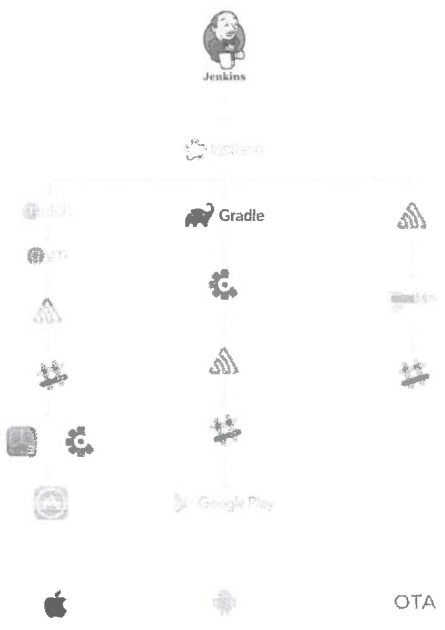
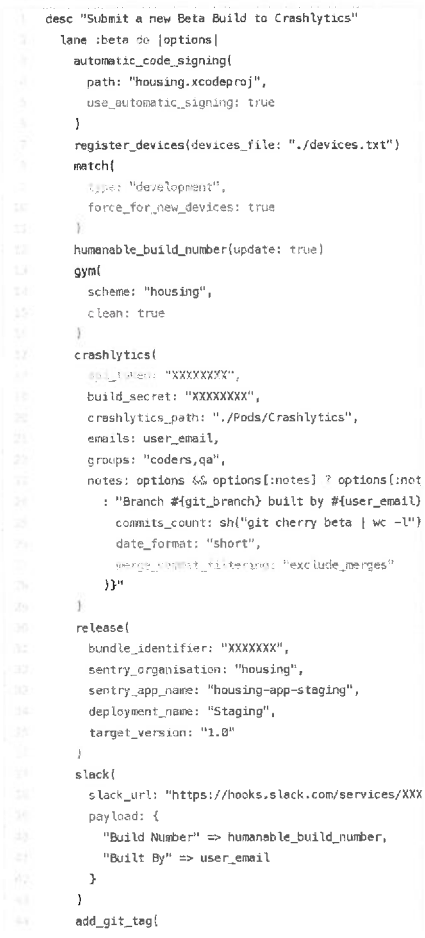


Build Pipeline

The official docs provide a plethora of insight into the API and the platform itself. In the end, however, you need to deploy your new shiny app. This also involves challenges like maintaining multiple environments for testing and staging, incorporating different credentials in an unobtrusive manner, generating release notes and notifying all stakeholders (product managers, testers and designers). After experimenting and struggling with a bunch of approaches, we moved to

Fastlane to automate this entire process. Following is an abridged version of our beta release cycle on iOS:



```
desc "Submit a new Beta Build to Crashlytics"
  lane :beta do |options|
    automatic_code_signing(
      path: "housing.xcodeproj",
      use_automatic_signing: true
    )
    register_devices(devices_file: "./devices.txt")
    match(
      type: "development",
      force_for_new_devices: true
    )
    humanable_build_number(update: true)
    gym(
      scheme: "housing",
      clean: true
    )
    crashlytics(
      api_token: "XXXXXXXX",
      build_secret: "XXXXXXXX",
      crashlytics_path: "./Pods/Crashlytics",
      emails: user_email,
      groups: "coders,qa",
      notes: options && options[:notes] ? options[:not
        : "Branch #{git_branch} built by #{user_email}
          commits_count: sh("git cherry beta | wc -l")
          date_format: "short",
          merge_commit_filtering: "exclude_merges"
        })"
    )
    release(
      bundle_identifier: "XXXXXXX",
      sentry_organisation: "housing",
      sentry_app_name: "housing-app-staging",
      deployment_name: "Staging",
      target_version: "1.0"
    )
    slack(
      slack_url: "https://hooks.slack.com/services/XXX
      payload: {
        "Build Number" => humanable_build_number,
        "Built By" => user_email
      }
    )
    add_git_tag(
        grouping: "ios",
        prefix: "v",
        build_number: humanable_build_number
      )
    end
```

crashlytics.rb hosted with ♥ by GitHub   view raw

This piece of code handles code-signing, registering devices for testing, incrementing build numbers, building the app, uploading it to Crashlytics Beta, generating release notes, releasing it on code-push and uploading the source-maps to sentry, notifying on a slack channel and finally adding a release tag on GitHub. You can potentially do anything that pertains to building here. This code sits beside the main application code. Since the CI pulls in a fresh version of our repo before each build, it is ridiculously easy to modify the build pipeline without breaking the CI.

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Pro-Tips

1. Read the docs as well as the release notes.
2. `yarn start — —reset-cache` — for when you installed something and it does not work/can't be found.
3. react-native-debugger—The standalone app based on official debugger of React Native, and includes React Inspector / Redux DevTools.
4. Make the bundled Perf Monitor your best friend.
5. Always test on a real device.
6. Knowing React is a pre-requisite.

best take aways
of this document

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Footnote

If this post got you excited about the kind of work we're doing here, we're hiring. Find us on Twitter @HousingEngg.

Siddharth, Bhavir, Ritesh, Vikas, Rahul, Amandeep and Dron worked in the React Native Apps Team. Rohit and Harish handled QA.

Disclaimer: We don't advocate for any of the tools, libraries, coding practices or software development philosophies mentioned here. You are welcome to read, learn, accept, reject and critique however you see fit.