State Management

Mendel Rosenblum
Our small, read-only photo app is deceptively simple

- **Model, View, Controller - All setup on startup and static**
  - Can have a nice modular design of view components.
  - Each MVC unit independently fetches their model data.
    - Some duplicate model data fetches (e.g. UserDetail & UserList)

- **Add in Session State and object creation and updating**
  - Things get more complex for our single page app

- **Examples:**
  - User add new comments or photos - model data of one view changed by another view
  - Users logs out and logs in to the app with a different login name - big change in model data
Session state shared between frontend and backend

- Must be kept in sync between the browser app and the server
  - Who, if anyone, is logged in?

- Server will need to reject any requests from users not logged in
  - Model fetching done only at view/controller startup might not work

- Consider transitions of your photo app
  - Login - Not logged in to logged in
    - At app startup most models are not available (e.g. sidenav user list) but become available after login is completed.
  - Logout - Logged in to not logged in
    - Requests to web server that worked before will now fail
Models updates

- Consider what happens when new objects like users, photos, or comments are added.
  - Models change

- Controller fetching model only at startup might not work

- Consider photo app adding a photo or comment
  - Model refresh needed
Components are interested in outside events

- How to keep a modular design but allow controllers to be notified of things happening outside of it?
  - Example: a view component and an add component

- One option: Explicit communication interfaces in components
  - ReactJS: Pass callback functions around to components
    - `<Component commInfo={this.callMeWithInfo.bind(this)}`

- Better option: Listener/emitter pattern
  - Components registers interest (listen) and component detecting change signals (emit)
React listener/emitter pattern: No opinion

- FLUX - Facebook's Application Architecture For Building user interfaces
  - Store state in a "Store" - change with actions, notify view listeners

- Redux [https://redux.js.org/](https://redux.js.org/) - A predictable state container for JavaScript apps

- Relay [https://relay.dev/](https://relay.dev/) - The production-ready GraphQL client for React
Photo App current Model Data Handling

![Diagram showing the current model data handling in a photo app with components UserList, TopBar, UserDetail, and UserPhotos, and their model data connections with a callback.]
Photo App with state management

- TopBar
  - Subscribe: Context

- UserList
  - Subscribe: UserList

- UserDetail
  - Set Current User
  - Subscribe: Current User Detail

- UserPhotos
  - Subscribe: Current Photos

- State Manager

- Web Server

- User Actions

CS142 Lecture Notes - StateManagement
Photo App with offline support

- **TopBar**
  - Subscribe: Context

- **UserList**
  - Subscribe: UserList

- **UserDetail**
  - Set Current User
  - Subscribe: Current User Detail

- **UserPhotos**
  - Subscribe: Current Photos

- **State Manager**

- **Web Server**

- **User Actions**
Dealing with other model changes

What happens if another user adds a photo or comment? Options:

1. **Do nothing: Easy!**
   - User won't see new material until they do something that caused the model to be refreshed
   - Very disconcerting if they don't see their own changes

2. **Poll:** Periodically check for changes or just refetch the model
   - Can provide a UI widget to trigger model refresh

3. **Server push:** Have the server push model changes as soon as they occur
   - User sees updates as soon as possible
   - Might conflict with user changes or be disconcerting for the user
   - Implementation is easier with Web Sockets
ReactJS: Photo App with sessions and input

- App needs to track who (if anyone) is logged in
  - Ideally held in some state store
  - OK to keep in the PhotoShare component state (see ReactJS Context mechanism)

- Need to handle the no one logged-in case
  - Handling deep linking with React Router:
    
    ```jsx
    
    { 
      this.state.userIsLoggedIn ? 
      <Route path="/users/:id" component={UserDetail} /> 
      : 
      <Redirect path="/users/:id" to="/login-register" /> 
    }
    
    ```

- Need to inform component with to refresh their models
  - Again State management is ideal: OK to use callbacks