A Smarter Chair
Customizable Personal Environments

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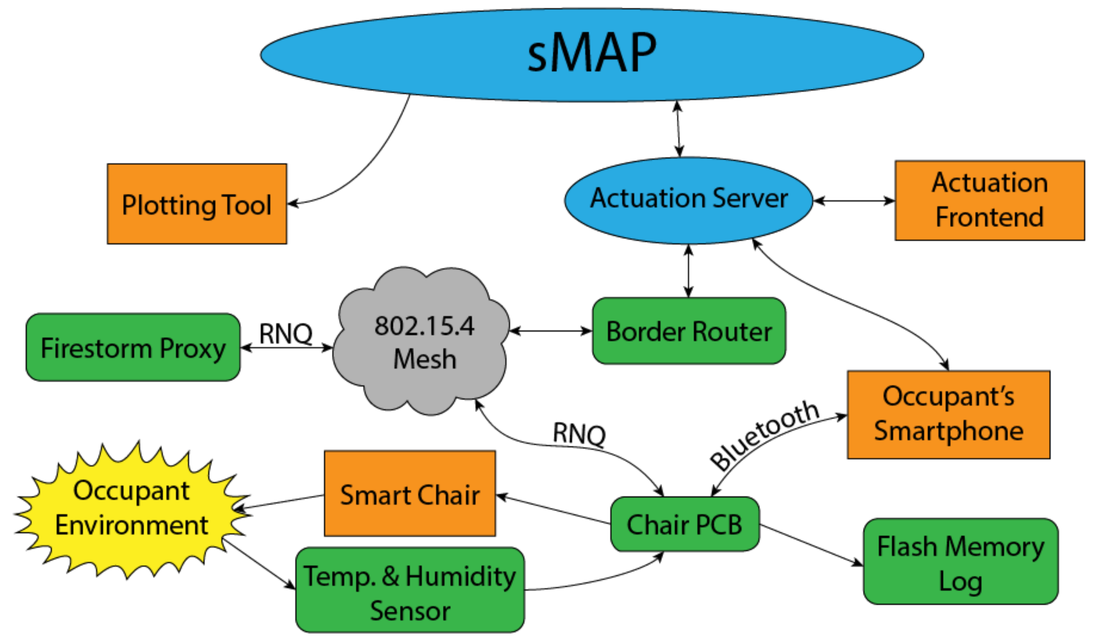
Goals

- Learn about user behavior with respect to thermal environments
  - Log this information on server-side
  - Adjust building/personal environments to maximize energy savings
- Provide adjustable personal environments
  - Users can turn on fans and heaters on the chair from their own smartphones
  - Chair detects when the user occupies the chair, and can remotely actuate devices accordingly
  - Chair remembers users' last settings and restores them upon return

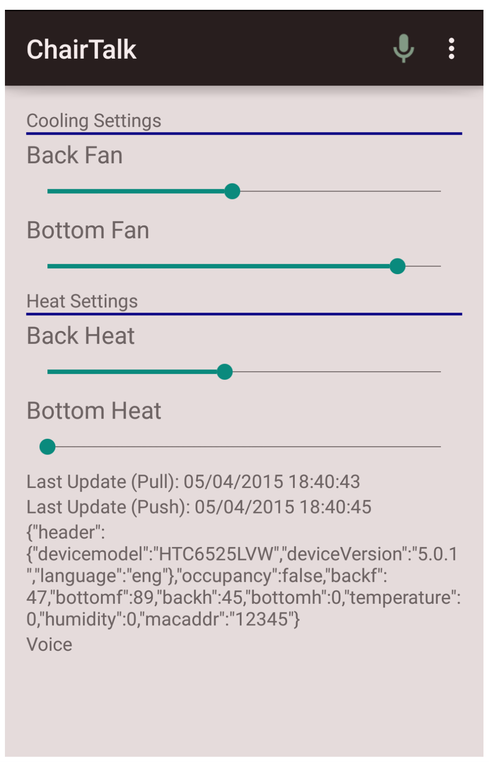
Architecture



Reliable Delivery, Communication and Logging

User Interaction

- Users control the chair via phone apps, which connects to the chair via both Bluetooth and Wifi
  - Both Android and iOS implementations
  - Webapp version too
- Intuitive, slider elements for controlling chair
  - User can control fans and heaters on the back and bottom of the chair independently
- (Some) voice command functionality (Android only)
- Application can notify user of sitting in chair for extended periods of time to promote activity



Data Flow

- Chair periodically logs current state (occupancy, fan state, heater state, temperature)
  - Chair stores this in flash (persistent storage) for recovery in case of failure
  - State in flash is flushed to remote servers
- Chair sends logged data to sMAP over 15.4 via a Firestorm Proxy implementing a reliable network queue
- Phone app also relays data should a link in the Wifi connection fail
- Phone app relays current time to chair for maintaining timestamps for logging in flash storage
- There are two physical paths for data to get from the chair to sMAP for reliable delivery should a link fail

Initialization/Setup

- User scans QR code or taps NFC tag (NFC on Android only)
- User reaches appropriate location for app download
- In app, user scans QR code again or taps NFC tag
- App automatically configures chair communication over Bluetooth and communication with the server

Future Work

- Learn user preferences and adapt personal environments accordingly
- Algorithmically minimize energy usage through adjusting microclimates as well as building HVACs
- Use occupancy to set indicators to let others know if user is in office
- Track total sedentary activity and provide relevant health information
- Automatically set up desk equipment when user sits down (turning on computer, desk lamp, etc.)
- Integrate tightly with building, so building can minimize energy savings when it notices that no chairs are occupied (such as turning off heaters and lights)