GateMate

Remote Rice Farming

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Problem

- Rice
  - Provides 21% of global human per capita energy
  - Provides 15% of per capita protein
  - US rice production exceeded $3 billion

- Alternate Wetting and Drying
  - Labor intensive
  - Prone to human error
  - Time consuming
  - Errors lead to lost yield, lost profit, and wasted water

- Growing strain on natural resources

Solution

- Mobile interface to raise and lower gates remotely

- Assist with the initial gate placement

- Automatically raises and lowers gates according to
  - Weather
  - Crop life cycle
  - Growth rate of the crop

Updated High-Level Architecture
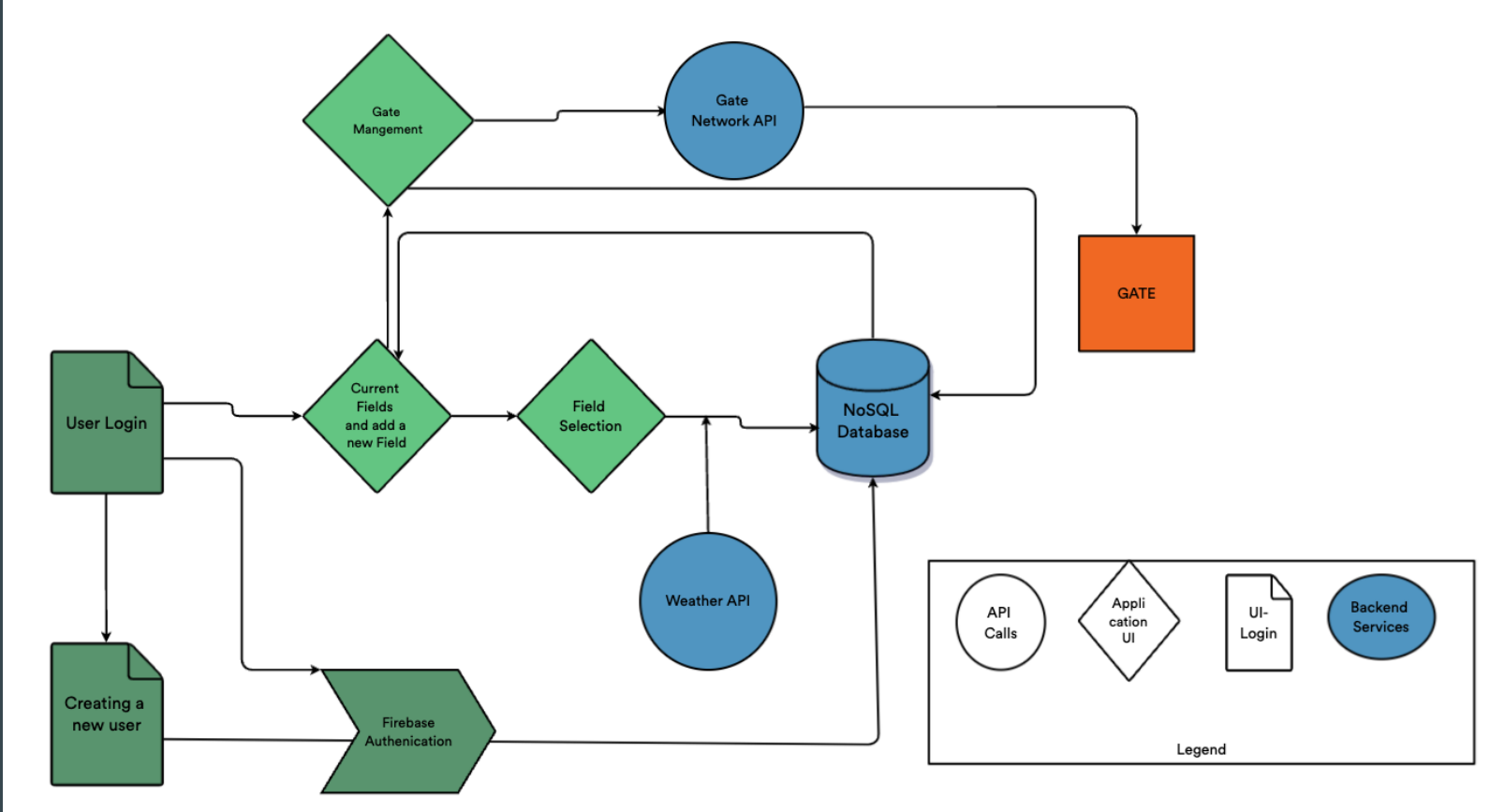
Updated Database Schema

"users"=
{
  "id": {},
  "user_name":,
 "first_name":,
  "last_name":,
  "fields":[]
}

"fields"=
{
  first_point:"",
  second_point:"",
  third_point:"",
  fourth_point:"",
  gates:[]
}

Users Collection	
User ID	number
First Name	string
Last Name	string
Fields	array[number]

Fields Collection	
Field ID	number
User ID	number
Gates	array[number]
Geopoint_1	Object
Geopoint_2	Object
Geopoint_3	Object
Geopoint_4	Object

| Gates Collection	
Gate ID	number
Height	number(meters)
Geopoint	Object

"gates="
{
  "id": {},
  "height": {},
  "geoPoint": {}
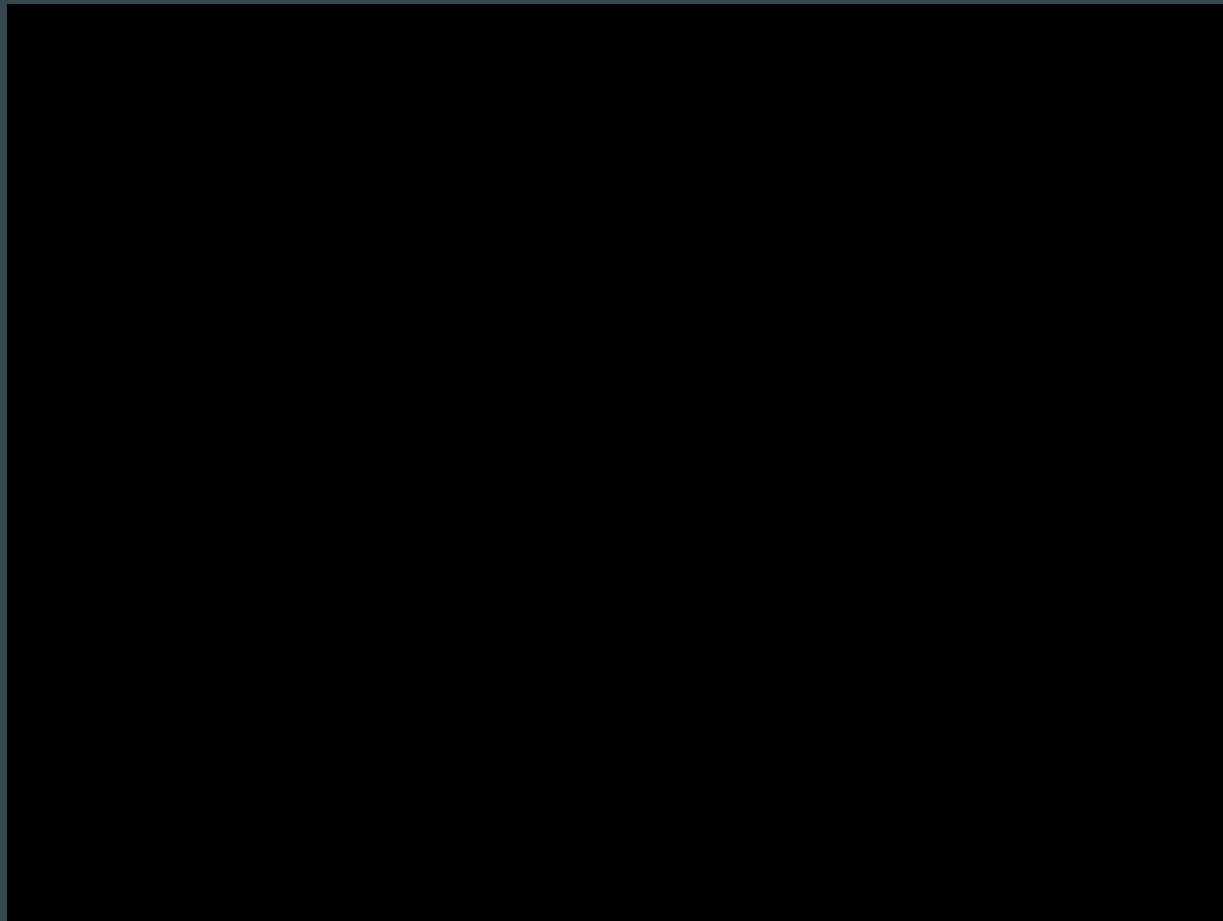 "elevation": {}
}
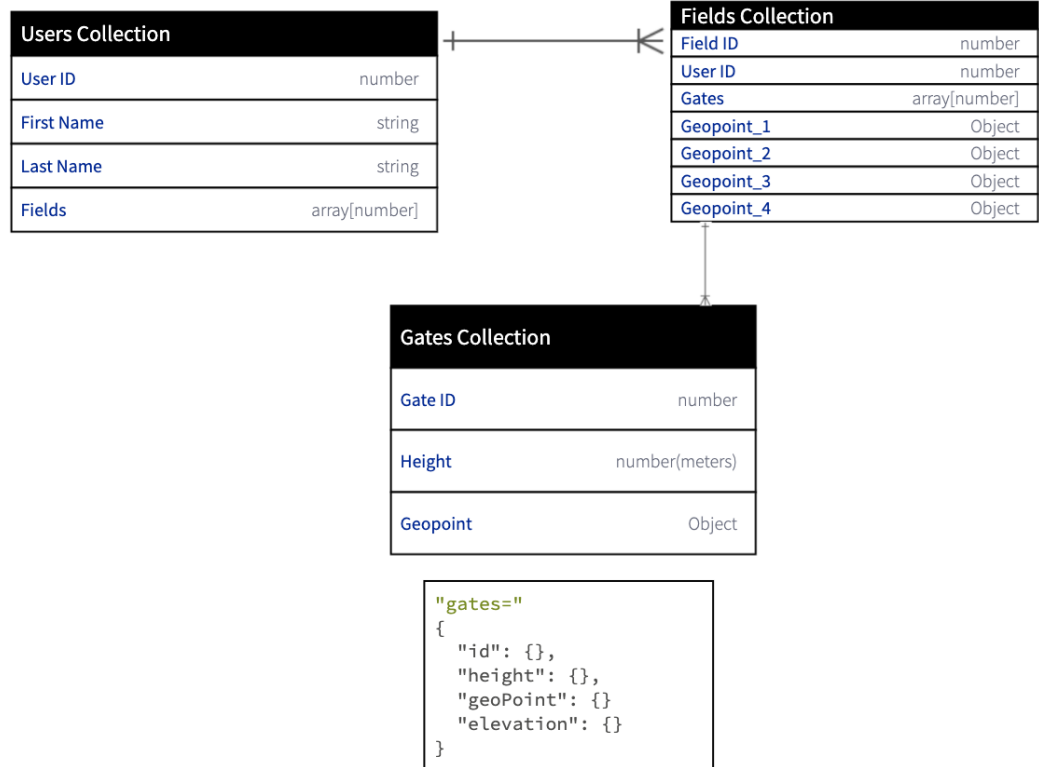
Gate Network Architecture

- Mesh WiFi network allows for communication between gates across a vast field

- Gates have uniquely generated ids within the network

- Raspberry Pi module acts as an in-between for network and backend

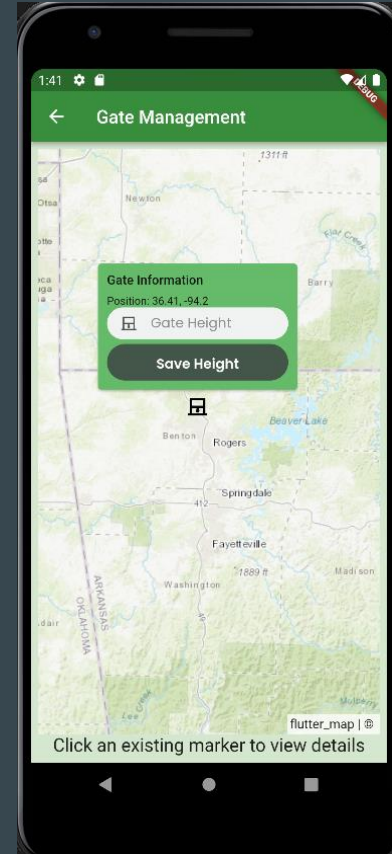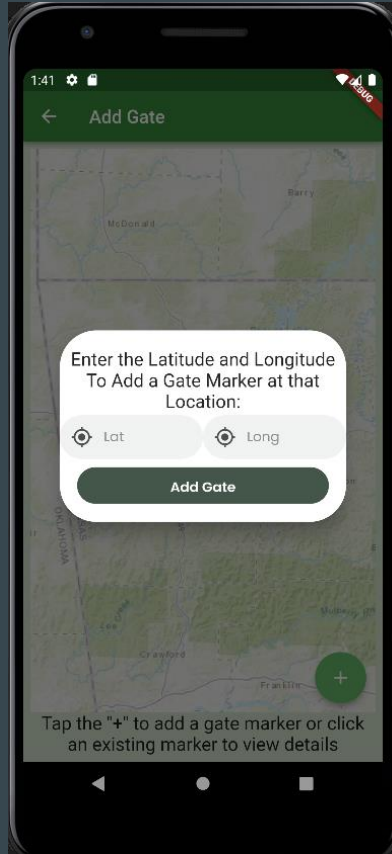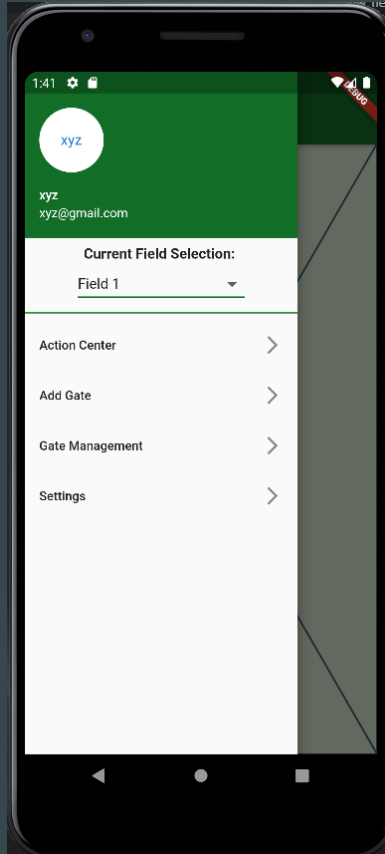Server and DB   Pi Field Module   Field Gate Network
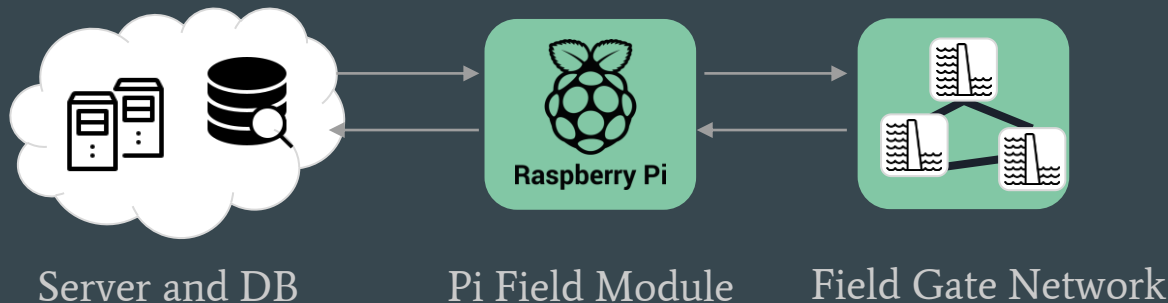
Connection to Front End

- Utilizing MVVM to separate design components and data

- Widgets observe data in viewmodels and are rebuilt anytime changes in state occur

- Viewmodels are singletons; accomplished using GetIt package
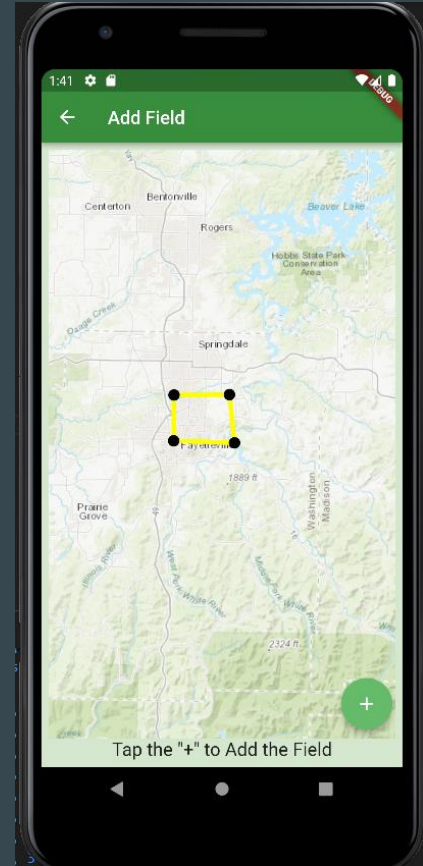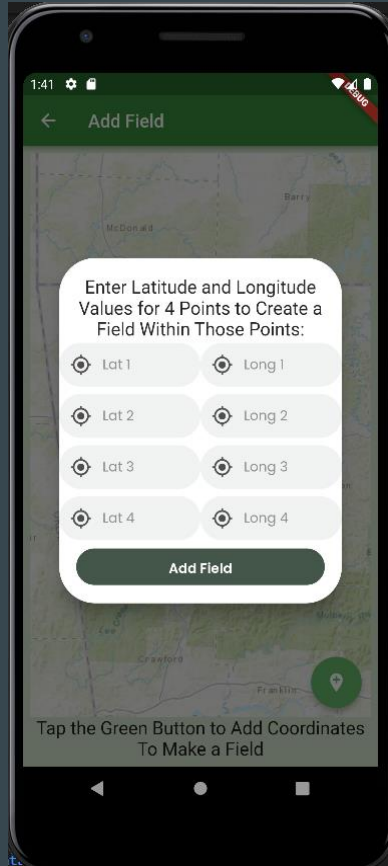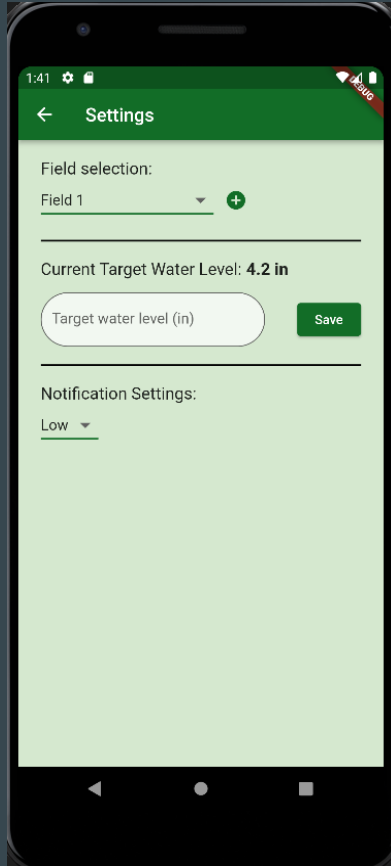
- Connects to Firebase via cloud server

Demo

User Interfaces

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