CS 6440 Team Project

- Deliverable 4

Team Final Project Presentation

Team member: Ran Ran, Xing Xing, Pingling Hang, Sen Lin, Lu Sun, Jun Zhao

- **Link to presentation**

  https://youtu.be/JRG4b9udBBA

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NOTES:
- Team member: Ran Ran, Xing Xing, Pingling Hang, Sen Lin, Lu Sun, Jun Zhao
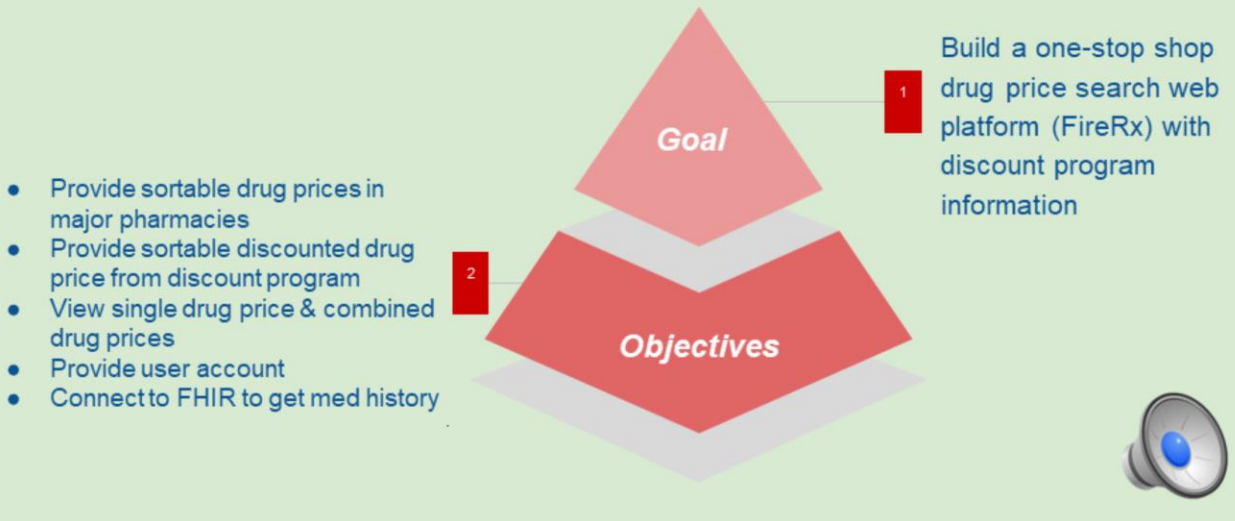
- Our project goal is to build a one-stop shop durg price search web platform with discount program information, we named this app FireRx.
- We have the following objectives:
  - Provide sortable drug prices in major pharmacies
  - Provide sortable discounted drug price from discount program
  - View single drug price & combined drug prices
  - Provide user account
  - Connect to FHIR to get med history

- Two major criteria to evaluate the project successes
  - Achieve our project goal and objectives
  - Achieve major user requirements from our external mentor Dr. Pervaiz and course requirements
- Compared to some similar web app such as WellRx, GoodRx, and bizrate, the unique elements of our app are as followings:
  - User is able to get access to med history from FHIR
  - Our app provides combined drug prices in each pharmacy
  - Our app provides user drug search history

Further Research

- **Verified patient med statement data from HAPI FHIR**
- **Real-time connection between app and HAPI FHIR**

- **Set up Dockerfile to build app**

- **Frontend and backend connection via Flask**

We conducted further research in the following areas:
- Verified patient med statement data from HAPI FHIR. We found since it is not the production server, some data are not complete.
- We learnt ways to use FHIR API and was able to do real-time connection between our app and HAPI FHIR.
- We studied docker and was able to set up dockerfile to build app.
- Flask was new to our team and we did some research on how to connect frontend and backend via Flask.

App Demo

Click the following link to see this demo part. Or watch this part in our final presentation via YouTube.

https://www.youtube.com/watch?v=na0wucNvMGw

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User can search drug with login or without login, let talk with login first, then I will demonstrate search drug without user login.
You can **search drug with login**, **click login button** in upper right corner, it will bring you into login page, Enter Email: "**test1@gatech.edu**" With correct Password: "**123**", it bring you into search page, enter "**zolpidem**", select "tablet", select "5mg", and "tablets", press "search button"
you also can add more drugs to search list. For example, search "**metformin**", select "tablet", select"1000mg", select "30 tablets" and press "Add button". it shows "metformin tablet 1000mg 30 tablets" in the search list. Let add **Prednisone** to the search list.You can **delete drugs Prednisone** from search list click cross, the drug is deleted from the search list. You also can find lowest price, press "**find the lowest price button**" **it will redirect to search result page**, in this page you can view and sort individual drug price. Press "Individual Drug Price tabe" and Press Name/Original Price/With Coupon, you can view individual drug price and be able to sort Name/Original Price/With Coupon. You also can view and sort combined drug price, press "combined Drug Price tab" and press Name/Original Price/With Coupon, you can view combined drug price and be able to sort Name/Original Price/With Coupon. You can also start a new search, press "Start a new search button", it will

redirect to search page again.

You can also view the patients basic information, press "Account tab -> Basic Information tab", it will display the patient's First Name "Archie", Middle Name " ", Last Name "Wang", Birthday "19500730", Email Address "test1@gatech.edu"and FHIR patient ID "2005252".

You can also view Search History, press "Account tab" -> "Search History" tab, it will display searched medication, date, best price and stores. For example, "aspirin tablet 80mg 30 tablets", "20180417", "1.75", "CVS"

You can also view med history, press "Med History Button" and press Medication/Status/Dosage and Usage, it displays medication, status, dosage and usage. We also able to sort Medication/Status/Dosage and Usage. Press logout button, it redirect to search page again.

User also can register . Click the upper right conner "registration" button, it will bring user to registration page.
We did validation check, for example, if you register with empty field, you can only leave the "middle name" and "birthday" field blank. Otherwise, it will display"The field is required" after press "Sign Up Button". If you enter a invalid email address such as "test.com" it will display"Invalid email address". If you enter a invalid birthday format, such as "1950/07/30", it will display"Not a valid date value". Enter password"123" and Retype password"111", it will display "Passwords must match".
Now, Let show you a successful register:
Enter Email: "ol@gatech.edu" First Name: "Olive" Middle Name: ""Last Name: "Lee" Birthday: "19851014" FHIR Patient ID: "2026868" Password: "123" Retype Password: "123" and press "sign up" button, it will bring you to search page again.
Click "**account**" in search page, it will show you patient's basic information. Click "**search history**", the search history is empty now, because user doesn't search any drug yet. Click "**Med history**", it will get all the drug the user current take from **Fhir**.

You can search drugs in our search page without login. For example, you can Enter "**aspirin**", press "Search button" , it shows Select Form, Select Dosage, Select Quantity. The Select Form has dropdown lists: tablet and chewable tablet, I choose tablet, select "81mg" from dosage dropdown and select "30 tablets" from quantity dropdown list. Press "Add button", it shows "aspirin tablet 80mg 30 tablets" in the search list.

You can add more drugs to search list, search "**terbinafine**", select "tablet", select "250mg", and 30 tablets, press "Add Button", it shows "terbinafine tablet 250mg 30 tablets" in the search list.

Press"**Find the lowest price button", it will redirect to search result page**, you can view or sort individual drug price, press "Individual Drug Price tab" and press "Name/Original Price/With Coupon", you can view individual drug price and be able to sort Name/Original Price/With Coupon

You can view and sort combined drug price, press "Combined Drug Price tab" and Press Name/Original Price/With Coupon, and View combined drug price and be able to sort Name/Original Price/With Coupon.
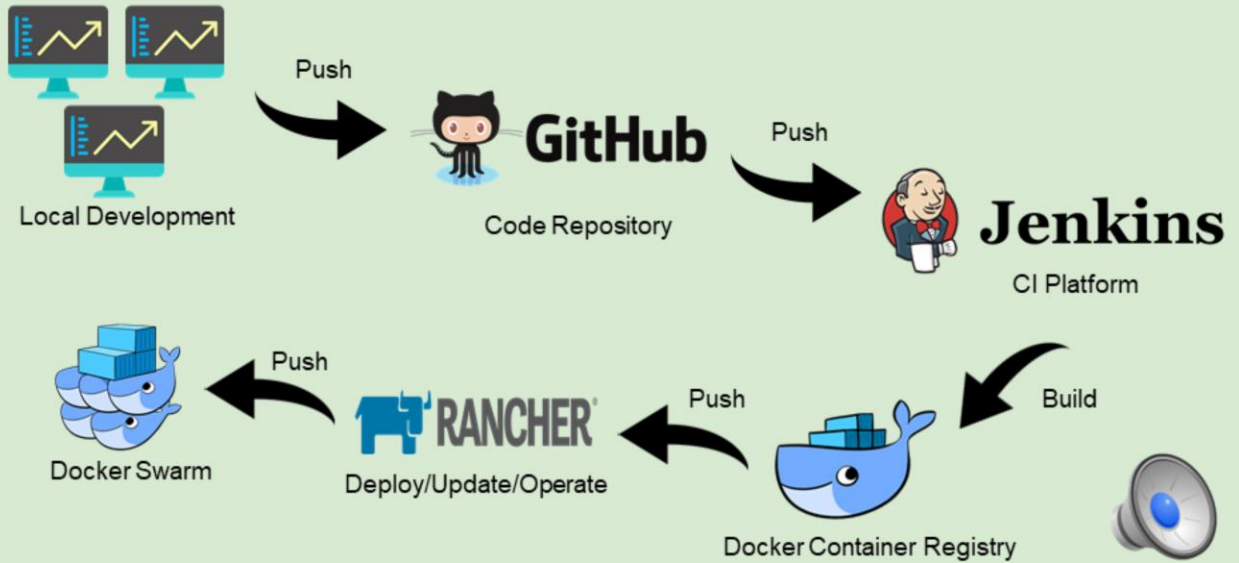
You can start a new search and press "Start a new search button", it redirects to index.
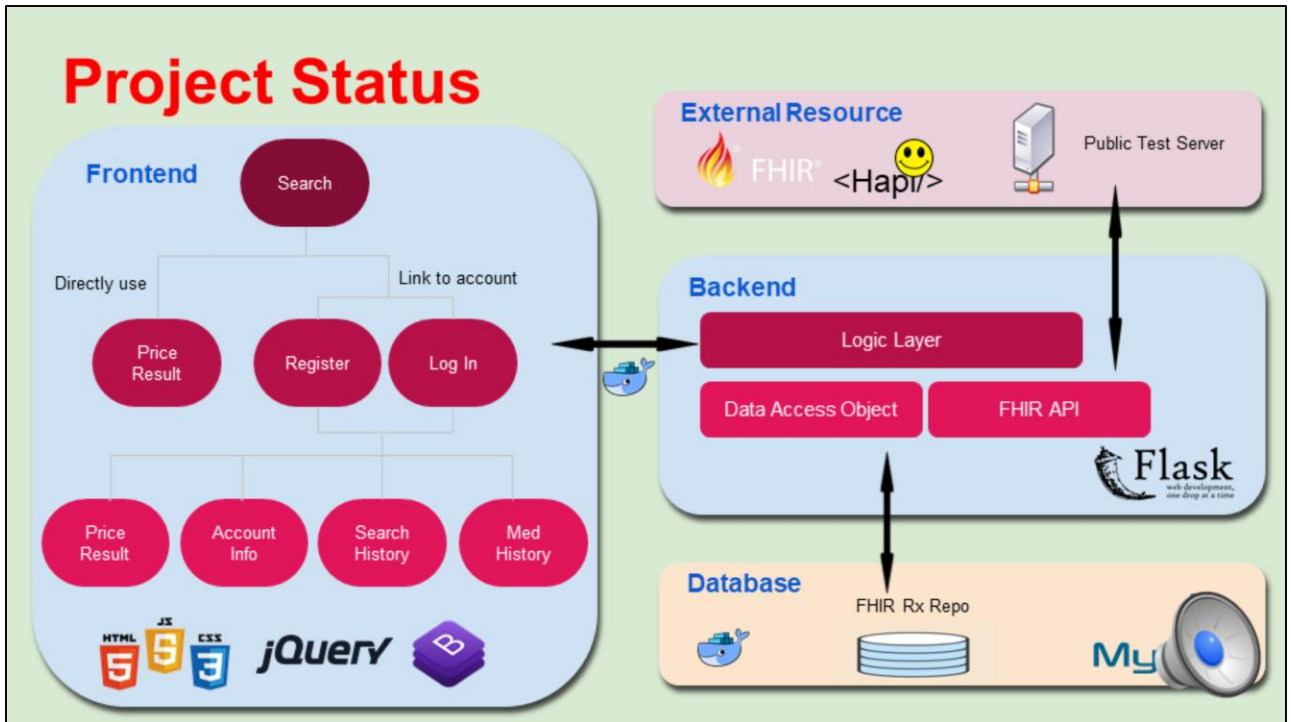
This diagram represents our final system architecture. Starting from frontend, at our home page, the user could directly search medication and get the lowest price result. On the other side, the user can link to account via registration or logging in. Then, the user can access his/her personal information and FHIR medication history. Also, all searched drug information will be automatically saved in search history page. In the frontend section, we utilized html, javascript, css, jQuery, and bootstrap. Backend is linked to frontend by logic layer using Flask, and our first Docker container consists of both frontend and backend. We have one database repo built by MySQL, which links to backend via Data Access Object. The database consists of our second Docker container. For the external resource, we took full advantage of public test server via Hapi Fhir, and our app links the server via API. Overall, we realized all five objectives mentioned before.

For deployment strategy, we first locally build codes, and then push to code repository. Jenkins, as continuous integration platform, pulls codes from GitHub, and build two Docker containers of our application. After building Docker images, Rancher pull codes for deployment, updates, and operation. Then, push codes to Docker Swarm for end users.

Future Plans

- Build tools to encourage publishers and users to crowd-sourcing coupon and drug information

- Consolidate data from different sources to be consistent with healthcare industry standard

- Develop open API to share data

Our future plans are:
- Build tools to encourage publishers and users to crowd-sourcing coupon and drug information
- Consolidate data from different sources to be consistent with healthcare industry standard
- Develop open API to share data
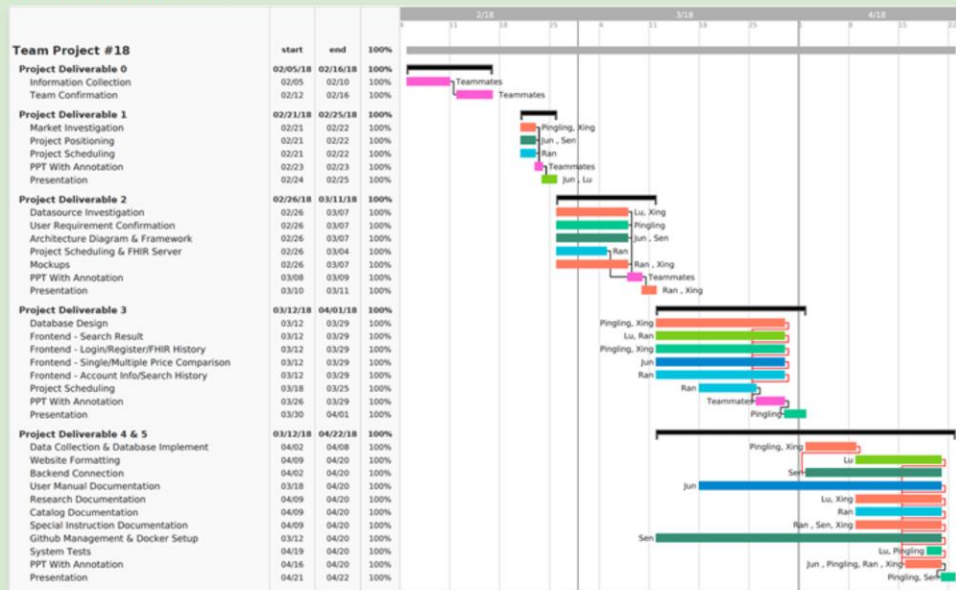
For this final deliverable, we tried hard to complete all tasks as best as we could. Each teammate has multiple assignments, and here summarizes important ones those we paid a very close attention during these three weeks. Jun and Ran mainly focused on web function implementation and documentation. Sen worked on connection of application and Docker set-up. Xing and Pingling concentrated on database implementation and application testing. Lu worked on website formatting and data research report.

Team Member Contributions

Jun	Sen	Xing	Pingling	Lu	Ran
❖ PM ❖ FE Dev ❖ Doc	❖ BE Dev ❖ Docker ❖ GitHub	❖ Research ❖ UI Design ❖ FE/DB Dev	❖ DB Dev ❖ FE Dev ❖ QA	❖ Research ❖ FE Dev ❖ QA	❖ UI Design ❖ FE Dev ❖ Planning/Doc

All our team members served in multiple roles during the whole project. In details, Jun is the PM, and mainly worked on frontend development, project documentation, and meeting arrangement. Sen focused on backend development for application connection, Docker file set-up, and GitHub management. Xing and Pingling worked as a group on database and frontend development. Besides, Xing did customer survey at the beginning and Pingling proceeded system tests of our website. Lu tried to obtain data resource API, and also he worked as a frontend developer and quality assurance. Ran worked with Xing to design the user interface, and also she focused on frontend development, project scheduling, and some documentation. We are super glad to be a member of Health Hacker!

Image resources:http://www.freelogovectors.net