

ECGR 5090 **(Internet of Things)**

Project: Smart Home Automation System

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Assumptions:

- The most important thing for this project assumed is that three users belonging to 3 different profiles namely Customer, Utility Company and Power Generator are all connected in the same network and running on corresponding three different servers, once the XAMPP Server has been started.
- The person(user) is either a Customer, Utility Company, Power Generator and has completed the registration through the 49er Sense App.
- Only one Consumer is logs into the Android App with valid credentials as used during the registration.
- In the Constants.java file appropriate IP addresses have been entered for all the devices running different user functionalities.
- There are 3 Servers running simultaneously and all the .php files are stored in the htdocs folder of lampp and will be working for each user.
- From the php we have given the default functionalities to the various appliances when the user log in.
- Weather App provides the forecast of 5 days if its connected to an Internet.
- Video Streaming works when there is video already stored in the device and retrieved from it.
- Live feed needs to have an App (IP Webcam) or Camera running continuously.
- Raspberry Pi fetches the data from MySQL database with the delay of 8 seconds as provided in our case.

Design Details

- Using Android App we provided user interface to three kinds of users namely Customer, Utility Company and Power Generator taking the reference of the existing CPI Home Security System on Android.
- Once the user do registration specifying his role the username, password and role will be updated in SQL database which will be useful in user validation during login.
- Android App redirects Customer, Utility Company and Power Generator to their particular Home pages depending upon the roles they selected while registration.
- Android App for Consumer gives him the control over various sensors and actuators like Security System, Garage Doors, Thermostat, Lights, Locks, Window Sensor, Motion Detector and Electrical Appliances such as Fan, Refrigerator with different functionalities and default values set for them. There have been default values provided to all the appliances through the php scripts which is accessible to user in the App.
- Customer can view the Live Feed and stored Video of his home through the 49er Sense App. Live feed was channelized by using IP webcam from the mobile phone and calling a particular URL with specified port number, while he can retrieve the video which is already stored in raw folder of the Android App.
- Customer would also get to know status of all Home Appliances mentioned above in his Android App and can update them accordingly which would be stored in SQL Database which is implemented using LAMPP Server and updated periodically depending on the changes made for the appliances.
- Through 49erSense app Customer can also view Weather forecast for the upcoming five days which we implemented using the 'Weatherbit' API.
- Utility Company user logs in putting his respective username and password after validation he can get the access to Customer home appliances and actuators status by putting the username for the specified Customer. For this php scripts has been written which will fetch current status for all actuators and sensors and show it in the 49erSense application.
- 49erSense App also has the third user namely Power Generator. User for this logs in through the app and can see the real-time Barchart for power consumed by the appliances in the Customer home by putting the username of the registered Customer.
- The data for power consumption is fetched from the Customer MySQL database depending on the status of the appliance and simulated accordingly. In our case there were 3 Servers implemented separately each fetching the data via Raspberry Pi.
- The coding in Raspberry Pi was done by using NetBeans software and getting remote login through the vncserver and remmina or using Xming software followed by PuTTY.

- Simulation code for the breadboard integration was also written on Raspberry Pi which was carried out by using GPIO pins 4 and 5 for only one functionality that is for Garage Doors which have Door 1 and Door 2 respectively, where: 0 represents CLOSED (LED OFF) and 1 represents OPEN (LED ON).

Software Requirements:

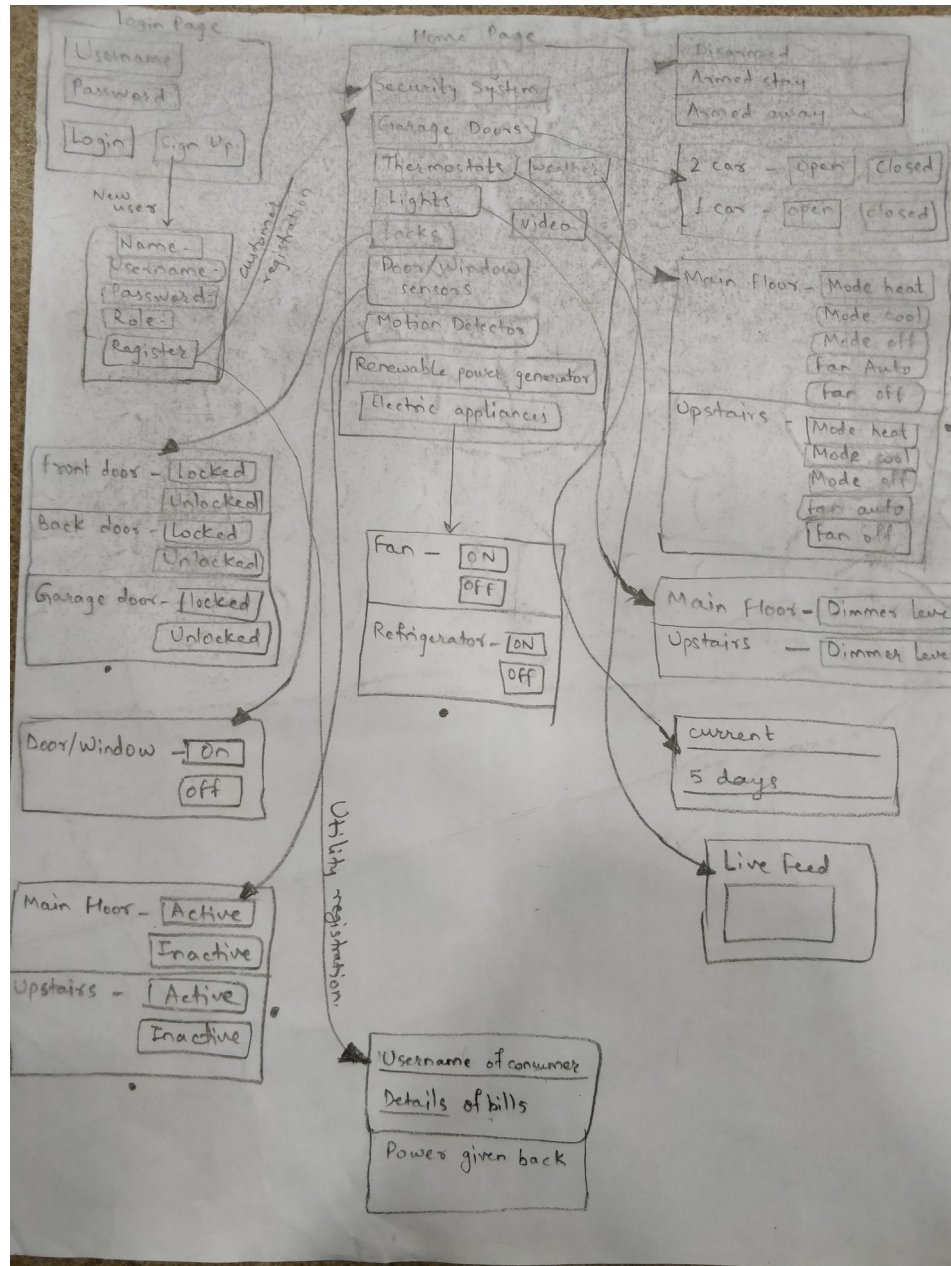
Android Studio, Android Phone, Lampp Server, PhpStorm (for writing php scripts in our case), Postman, Remmina Remote Desktop Client, PuTTY, Xming, Netbeans on Raspberry Pi, IP webcam App, VncServer, Virtual Box.

Running the Codes:

- Firstly we have to install the Android App “49erSense” in an Android Phone running the code which is written in Android Studio.
- Then we need to start the LAMPP server installed over in a laptop and open the <http://localhost/phpmyadmin/> link to see the database for the users and corresponding tables.
- In our case there are 3 servers are running separately for Customer, Utility Company, Power Generator.
- We have to ensure that all the devices are connected over in the same network so that the changes made to any status of Appliances will be viewable to Customer, Utility Company and Power generator users when they login.
- For viewing the Live Feed functionally for the Customer we need to first start IP Webcam Application in one of the Android Phone and the URL provided by it will be called in the code of Live Feed to view it in a Browser.
- For just retrieving the saved video we need to save the Video in the “raw” folder of resources folder in Android Studio which will be viewable to the Customer once he clicks the Video button in the Spinner.
- On the Raspberry Pi the code should be running which will fetch the status of the actuators and sensors and will display it to the Utility Company user once he login through 49erSense App and enter the username of the Customer for whom he needs to see data.
- Power Generator will also be polling the status of the appliances according to the changes made by Customer and will give the BarChart of Power Consumption.

Distribution of Work:

Initially we started with designing of Android App “49erSense” first by drawing out the layout that we did by having a group meeting which is as follows:



App Design and Flow	Ajinkya, Gautham, Laukik
Android App Login and Registration page for Customer with php scripts in PhpStorm	Gautham, Laukik
Homepage for Customer with Spinner and all appliances with installation of Lampp Server and making database in it	Ajinkya
Customer Sensors and their status php scripts (Garage Doors, Security System)	Gautham, Ajinkya
Customer actuators and sensors (Thermostat, Motion Detectors, Electric Appliances, Lights, Locks) with php scripts and database in phpmyadmin	Laukik
Postman Application for GET and POST to the server	Gautham
Making IP address static for Raspberry Pi and Bootup	Ajinkya
Having an remote access to Raspberry Pi through vncserver, Remmina Remote Client Access and using Linux	Laukik
Having an remote access to Raspberry Pi through Xming, PuTTY and VirtualBox	Gautham
Live Feed, Viewing the stored Video	Laukik
Weather Forecast for 5 days	Gautham
Android App Login and Registration code for Utility Company to have access to Customer	Gautham, Ajinkya
Displaying the status of all the Appliances in TextView in Android App fetching from SQL database	Laukik
Downloading NetBeans and Writing code in it for communication between 2 servers	Gautham, Ajinkya, Laukik
Breadboard Simulation for Garage Doors	Ajinkya, Gautham
Real-time Barchart graph basic idea	Ajinkya
Writing code to fetch the status from database of Customer and calculating Power Consumption	Gautham, Laukik

Consumer

