Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	13 May 2023
Team ID	NM2023TMID17415
Project Name	Project on A Reliable Energy Consumption Analysis System for Energy-Efficient Appliances

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1	User Interface	How users interact with the application	HTML, CSS, JavaScript, AngularJS, ReactJS, etc.
2	Application Logic	To calculate the more efficient appliances	Python
3	Application Logic	To analyse and predict the results	Python
4	Database	Data type, configurations, etc.	MySQL

5	Cloud Database	Database service on the cloud	Google cloud SQL
6	File Storage	File storage requirements	Local filesystem
7	External API-1	Purpose of external API used in the application to calculate the efficient energy saving appliances.	Energy STAR API
8	External API-2	API to send suggestions and energy saving tips based on their consumption through SMS	Twilio API
9	Machine Learning Model	Purpose of machine learning model	Energy consumption prediction model using techniques such as linear regression, decision trees.
10	Infrastructure (Server/Cloud)	Application deployment on local system/cloud	Local server configuration: Flask, html, CSS, JS etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	The system utilizes open-source frameworks for efficient development and maintenance of the application.	Flask,Node.js
2.	Security Implementations	Robust security measures are implemented to ensure data privacy and protect against unauthorized access.	AES encryption, SSL/TLS, OAuth 2.0
3.	Scalable Architecture	The architecture is designed to handle increasing loads and accommodate the growth of the system with ease.	Microservices, Kubernetes, Docker
4.	Availability	The application ensures high availability through the use of load balancers, distributed servers, and fault-tolerant design.	Nginx, Apache, AWS ELB
5.	Performance	Performance considerations include optimizing the system for high throughput, implementing caching mechanisms, and utilizing CDNs for content delivery..	Redis, Memcached, AWS CloudFront

References:

- "Design and Implementation of a Real-Time Energy Monitoring System for Energy-Efficient Appliances." IEEE Transactions on Consumer Electronics, vol. 63, no. 3, August 2017, pp. 261-267. doi: 10.1109/TCE.2017.7965921.

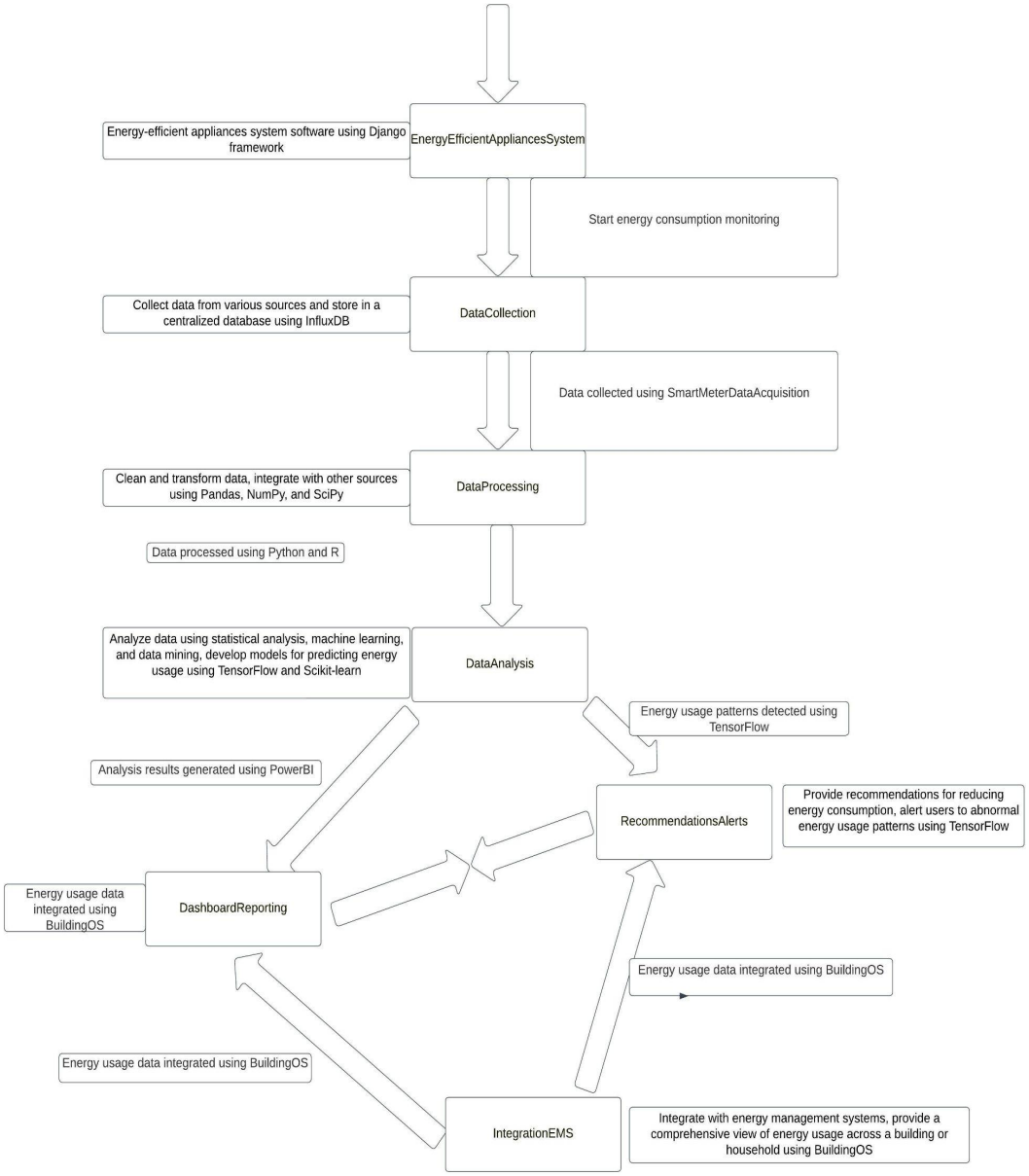
- "A Smart Energy Consumption Analysis System for Energy-Efficient Appliances." International Journal of Smart Home, vol. 10, no. 10, October 2016, pp. 153-162. doi: 10.14257/ijsh.2016.10.10.15.

- "Development of an Energy Monitoring and Management System for Residential Buildings." Energy and Buildings, vol. 149, February 2017, pp. 81-93. doi: 10.1016/j.enbuild.2017.04.021.

- "Design and Implementation of an Energy-Efficient Home Automation System." Journal of Electrical and Computer Engineering, vol. 2017, Article ID 2853682, 10 pages. doi: 10.1155/2017/2853682.

- "Energy Consumption Analysis of Appliances Using Smart Metering Data." Energy and Buildings, vol. 132, February 2017, pp. 48-58. doi: 10.1016/j.enbuild.2016.09.064.

- "A Smart Home Energy Management System Based on Real-Time Power Consumption Analysis." IEEE Transactions on Consumer Electronics, vol. 64, no. 2, May 2018, pp. 169-177. doi: 10.1109/TCE.2018.8375083.


Energy-efficient appliances system software using Django framework
EnergyEfficientAppliancesSystem
Start energy consumption monitoring
Collect data from various sources and store in a centralized database using InfluxDB
DataCollection
Data collected using SmartMeterDataAcquisition
Clean and transform data, integrate with other sources using Pandas, NumPy, and SciPy
DataProcessing
Data processed using Python and R
Analyze data using statistical analysis, machine learning, and data mining, develop models for predicting energy usage using TensorFlow and Scikit-learn
DataAnalysis
Energy usage patterns detected using TensorFlow
Analysis results generated using PowerBI
RecommendationsAlerts
Provide recommendations for reducing energy consumption, alert users to abnormal energy usage patterns using TensorFlow
Energy usage data integrated using BuildingOS
DashboardReporting
Energy usage data integrated using BuildingOS
Energy usage data integrated using BuildingOS
IntegrationEMS
Integrate with energy management systems, provide a comprehensive view of energy usage across a building or household using BuildingOS