Lab Assessment 1

Software Process Model & Software Project Management document of the project

Mobile Fog–Based Intelligent Monitoring System.

Slot: L9 + L10
Course Code and Title - BCSE301P, Software Engineering Lab.

Team Members and their roles -
Pushkal Gupta (23BCT0253)–Team Coordinator/System Architect & Fog
Adrivid Mishra (23BCT0264)–Hardware,Firmware & Embedded Systems.
Vaibhav Jain (23BAI0033)–AI & Data Intelligence.
Shagnik Paul (23BCT0266)–UI, Backend, Visualization & Deployment.

1. Project Description.

1.1 Background.

Modern cyber-physical and vehicular systems generate high-frequency sensor data that is often sent directly to the cloud for analysis. This cloud-centric approach introduces latency, bandwidth overhead, and loss of functionality during network outages. In safety-critical environments (vehicles, industrial motors, smart infrastructure), even milliseconds of delay can cause irreversible damage.

1.2 Problem Definition.

Existing monitoring systems: - Depend heavily on cloud availability - React slowly to real-time failures - Transmit large volumes of redundant raw data - Fail during poor or zero network connectivity. Hence, there is a need for a low-latency, resilient, fog-based monitoring architecture capable of
autonomous local decision-making.

1.3 Five major objectives of this project.

1. **Non-Intrusive Energy Monitoring** – Monitor subsystem health using electrical signatures instead of multiple physical sensors.
2. **Fog-Level Autonomous Decision Making** – Enable real-time safety actions at the smartphone fog node without cloud dependency.
3. **Edge Feature Extraction** – Perform R.M.S., F.F.T., and T.H.D. extraction locally to reduce data transmission.
4. **AI-Based Predictive Health Assessment** – Predict component degradation using ML models.
5. **Real-Time Visualization & Digital Twin** – Provide live system status to users via mobile and web dashboards.

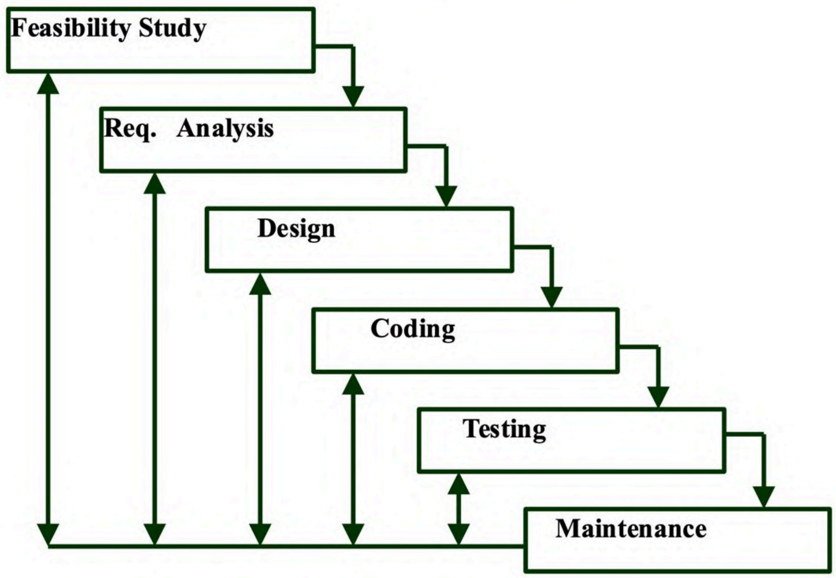
2. Process Model Selection.

The **Iterative Waterfall** model has been chosen as the most appropriate model for our project. The following section gives a detailed explanation as to why it was selected.

2.1 Justification.

The **Iterative Waterfall Model** is selected for this project because the system **has a clearly defined scope**, **known hardware components**, and **well-understood functional requirements**, while still requiring **controlled feedback and refinement between development phases**.

Iterative Waterfall Model



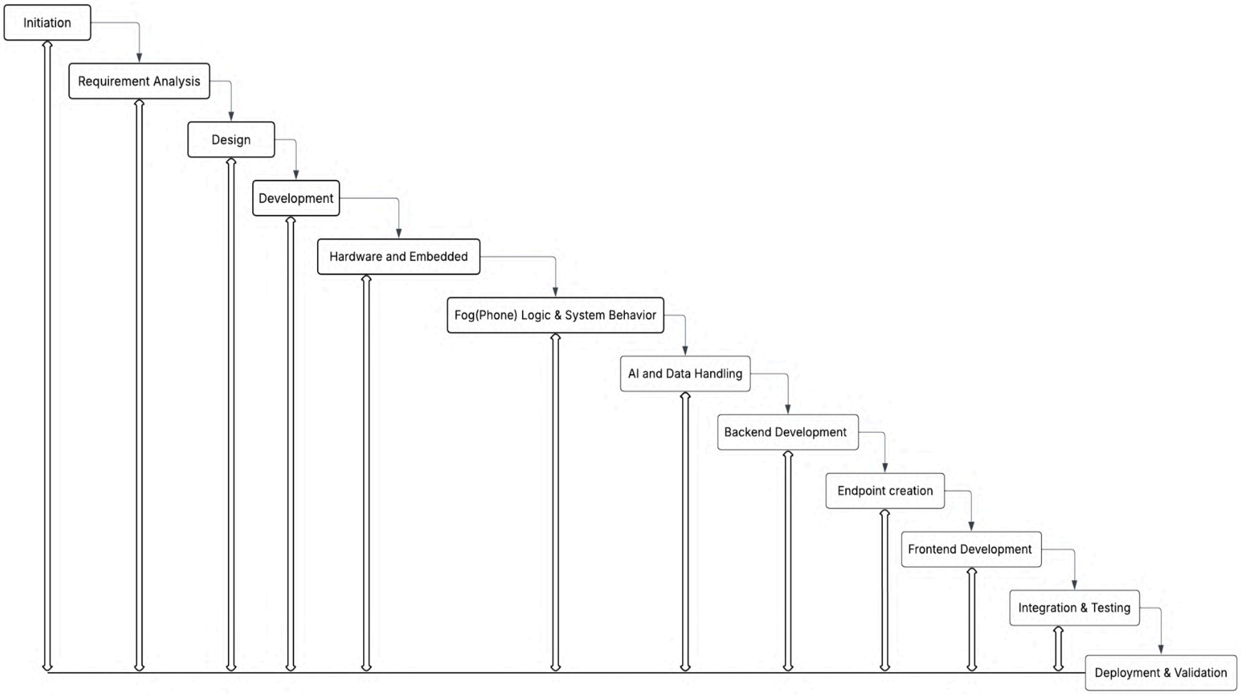
This project is an **academic, system-level implementation** involving embedded hardware, fog computing, AI models, and user interfaces. Although the overall architecture is fixed at the beginning, defects and improvements are expected to be identified during later stages such as coding, testing, and integration. The Iterative Waterfall Model supports this by allowing **backtracking to earlier phases whenever errors are detected**, ensuring correctness before progressing further.

2.2 Suitability to the Project.

The model is suitable because: - Core requirements are identified early and documented clearly - Hardware and software interfaces are predefined - Phase-wise development is required for academic evaluation - Reviews and corrections are expected at every stage

Since none of the listed limitations apply to this project—there is no requirement for incremental delivery, no phase overlap as defined in the Gantt chart, no direct customer involvement due to its patent-oriented nature, and no dependency on risk-driven iterations or code reuse—the constraints of other process models are not relevant. With a well-defined architecture and clearly separated phases, the **Iterative Waterfall model** aligns effectively with the project's execution and final full-scale submission, making it the most appropriate development approach.

2.3 Phase mapping to the Project.



Iterative Waterfall Phase	**Project Activities**
Feasibility Study	Initial project idea, constraints, and tool selection.
Requirement Analysis	Functional and non-functional requirements, SRS.
System Design	Architecture design, data flow, hardware and model selection.
Coding & Unit Testing	ESP32 firmware, fog logic, AI model development.
Integration & System Testing	Device–fog–cloud integration and validation.
Maintenance (Iteration)	Model tuning, threshold adjustment, logic refinement.

3. Tools and Technologies.

Software

- **ESP32 Firmware (C / C++)** – Handles real-time data acquisition from CT sensors, low-level signal processing, and wireless transmission to the fog layer.
- **Fog Layer (Python)** – Performs local feature extraction, safety logic execution, and autonomous decision-making at the fog node.
- **Messaging (MQTT – Eclipse Mosquitto)** – Enables lightweight, low-latency communication between edge devices, fog nodes, and backend services.
- **AI Framework (TensorFlow Lite)** – Runs optimized machine learning models for predictive health monitoring and fault detection on edge and fog devices.
- **Backend (REST APIs)** – Provides structured services for data ingestion, device management, and integration with visualization layers.
- **Database (MongoDB Atlas)** – Stores sensor data, extracted features, system logs, and prediction outputs in a scalable document-based repository.
- **UI (Android – Java/Kotlin, Web – React.js)** – Delivers real-time dashboards, alerts, and system status visualization across mobile and web platforms.

- **Project Management (ProjectLibre)** – Supports task scheduling, dependency tracking, and critical path analysis for effective project planning.

Hardware

- **ESP32 Microcontroller** – Acts as the edge controller for sensor interfacing, data sampling, and communication with the fog node.
- **CT Sensors (Non-Intrusive)** – Monitor electrical current without direct contact, enabling safe and non-invasive subsystem health monitoring.
- **Burden Resistors & Signal Conditioning** – Convert sensor output into stable voltage signals and reduce noise for accurate measurements.
- **Electromechanical Relays** – Enable hardware-level control actions such as isolation or shutdown during fault conditions.
- **Smartphone (Fog Node)** – Functions as the fog computing unit for real-time analytics, AI inference, and local system control.

4. Work Breakdown Structure (WBS).

1.0 Mobile Fog–Based Intelligent Monitoring System

- **1.1 Initiation**
  1.1.1 Project kick-off
  1.1.2 Scope definition
  1.1.3 Risk planning
- **1.2 Requirement Analysis**
  1.2.1 Stakeholder identification
  1.2.2 Functional requirements
  1.2.3 Non-functional requirements
  1.2.4 SRS documentation
- **1.3 Design**
  1.3.1 System architecture

1.3.2 Hardware selection
1.3.3 Model & dataset selection

- **1.4 Development**

  1.4.1 Hardware & embedded firmware
  1.4.2 Fog logic & feature extraction
  1.4.3 AI model training
  1.4.4 Backend services
  1.4.5 Frontend dashboards

- **1.5 Integration & Testing**

  1.5.1 Device-to-fog integration
  1.5.2 Fog-to-cloud integration
  1.5.3 Model integration

- **1.6 Deployment & Validation**

  1.6.1 System testing
  1.6.2 Performance evaluation

  1.6.3 Final Documentation

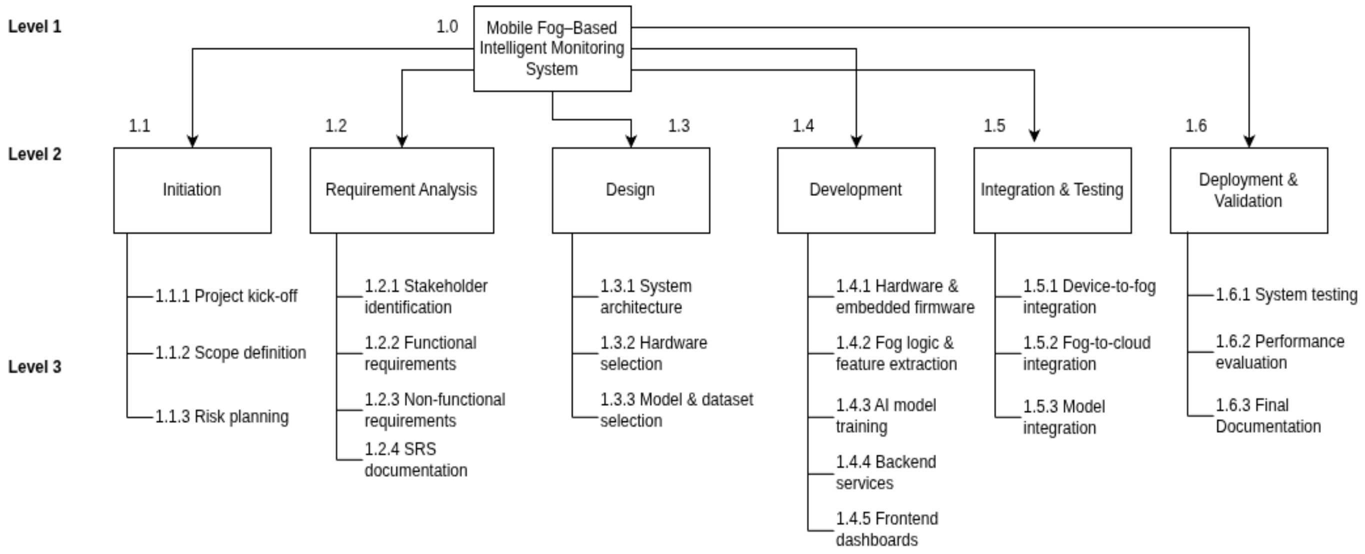
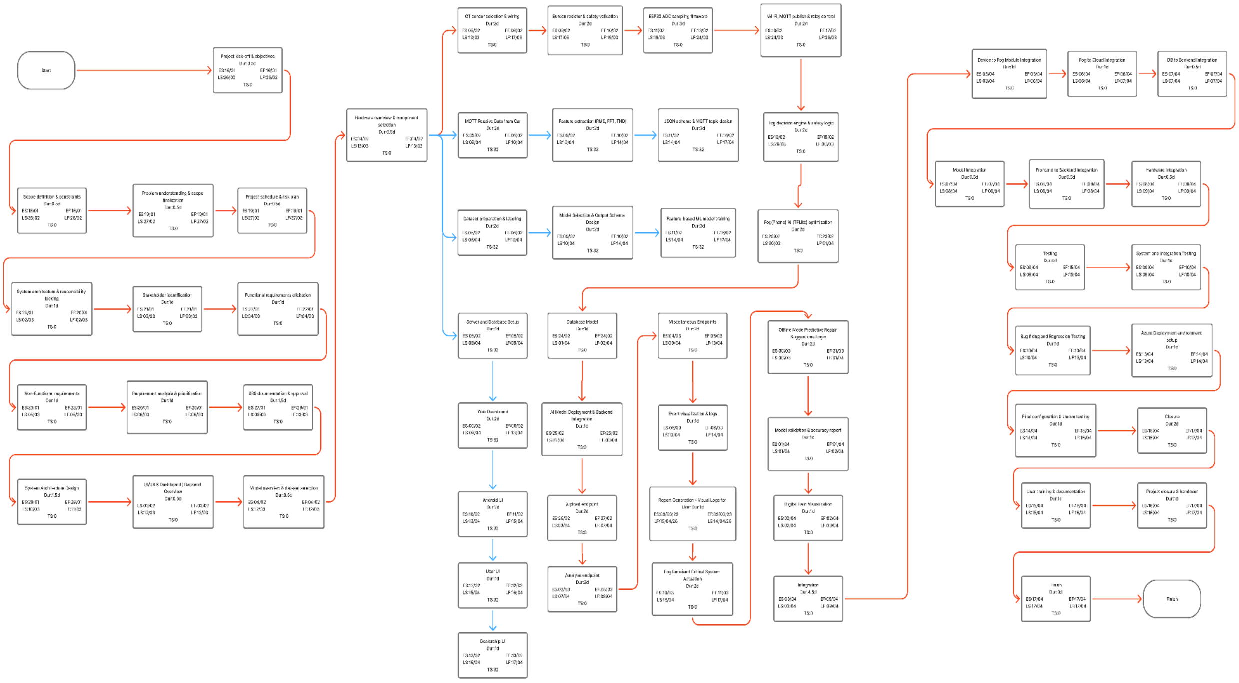

Level 1
1.0
Mobile Fog–Based Intelligent Monitoring System
Level 2
1.1
Initiation
1.2
Requirement Analysis
1.3
Design
1.4
Development
1.5
Integration & Testing
1.6
Deployment & Validation
Level 3
1.1.1 Project kick-off
1.1.2 Scope definition
1.1.3 Risk planning
1.2.1 Stakeholder identification
1.2.2 Functional requirements
1.2.3 Non-functional requirements
1.2.4 SRS documentation
1.3.1 System architecture
1.3.2 Hardware selection
1.3.3 Model & dataset selection
1.4.1 Hardware & embedded firmware
1.4.2 Fog logic & feature extraction
1.4.3 AI model training
1.4.4 Backend services
1.4.5 Frontend dashboards
1.5.1 Device-to-fog integration
1.5.2 Fog-to-cloud integration
1.5.3 Model integration
1.6.1 System testing
1.6.2 Performance evaluation
1.6.3 Final Documentation

Diagram 1 - Work breakdown structure.

5. P.E.R.T. Chart and Critical Path identification.

In this project, **PERT analysis** is applied to map out key activities such as requirement analysis, system design, development, and integration. By analyzing task dependencies and durations, the PERT chart helps identify critical tasks with zero slack that directly impact the overall timeline. This facilitates effective scheduling and resource allocation to ensure timely project delivery.

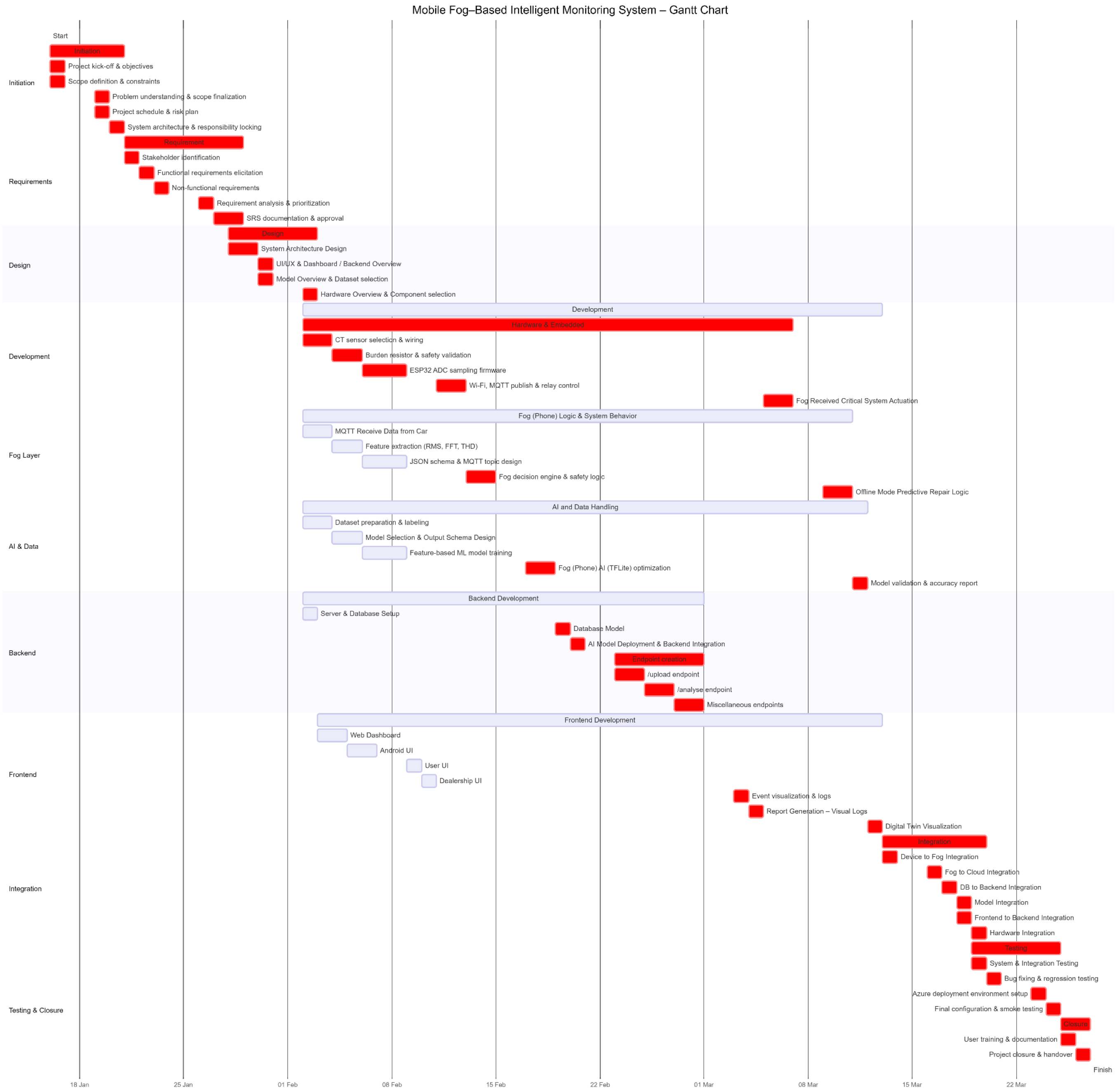
5.1 Manually drawn PERT Chart



Start
Project kick-off & objectives Dur:0.5d ES:16/01 EF:16/01 LS:26/02 LF:26/02 TS:0
Scope definition & constraints Dur:0.5d ES:16/01 EF:16/01 LS:26/02 LF:26/02 TS:0
Problem understanding & scope finalization Dur:0.5d ES:19/01 EF:19/01 LS:27/02 LF:27/02 TS:0
Project schedule & risk plan Dur:0.5d ES:19/01 EF:19/01 LS:27/02 LF:27/02 TS:0
System architecture & responsibility locking Dur:1d ES:20/01 EF:20/01 LS:02/03 LF:02/03 TS:0
Stakeholder identification Dur:1d ES:21/01 EF:21/01 LS:03/03 LF:03/03 TS:0
Functional requirements elicitation Dur:1d ES:22/01 EF:22/01 LS:04/03 LF:04/03 TS:0
Non-functional requirements Dur:1d ES:23/01 EF:23/01 LS:05/03 LF:05/03 TS:0
Requirement analysis & prioritization Dur:1d ES:26/01 EF:26/01 LS:06/03 LF:06/03 TS:0
SRS documentation & approval Dur:1.5d ES:27/01 EF:28/01 LS:09/03 LF:10/03 TS:0
System Architecture Design Dur:1.5d ES:29/01 EF:29/01 LS:10/03 LF:11/03 TS:0
UI/UX & Dashboard / Backend Overview Dur:0.5d LS:03/02 LF:03/02 LS:12/03 LF:12/03 TS:0
Model overview & dataset selection Dur:0.5d ES:04/02 EF:04/02 LS:12/03 LF:12/03 TS:0
Hardware overview & component selection Dur:0.5d ES:04/02 EF:04/02 LS:13/03 LF:13/03 TS:0
CT sensor selection & wiring Dur:2d ES:05/02 EF:06/02 LS:13/03 LF:17/03 TS:0
Burden resistor & safety validation Dur:2d ES:09/02 EF:10/02 LS:17/03 LF:19/03 TS:0
ESP32 ADC sampling firmware Dur:3d ES:11/02 EF:13/02 LS:19/03 LF:24/03 TS:0
Wi-Fi, MQTT publish & relay control Dur:2d ES:16/02 EF:17/02 LS:24/03 LF:26/03 TS:0
MQTT Receive Data from Car Dur:2d ES:05/02 EF:06/02 LS:08/04 LF:10/04 TS:32
Feature extraction (RMS, FFT, THD) Dur:2d ES:09/02 EF:10/02 LS:10/04 LF:14/04 TS:32
JSON schema & MQTT topic design Dur:3d ES:11/02 EF:16/02 LS:14/04 LF:17/04 TS:32
Fog decision engine & safety logic Dur:2d ES:18/02 EF:19/02 LS:26/03 LF:30/03 TS:0
Dataset preparation & labeling Dur:2d ES:05/02 EF:06/02 LS:08/04 LF:10/04 TS:32
Model Selection & Output Schema Design Dur:2d ES:09/02 EF:10/02 LS:10/04 LF:14/04 TS:32
Feature-based ML model training Dur:3d ES:11/02 EF:16/02 LS:14/04 LF:17/04 TS:32
Fog(Phone) AI (TFLite) optimization Dur:2d ES:20/02 EF:23/02 LS:30/03 LF:01/04 TS:0
Server and Database Setup Dur:1d ES:05/02 EF:05/02 LS:08/04 LF:08/04 TS:32
Web Dashboard Dur:2d ES:06/02 EF:09/02 LS:09/04 LF:13/04 TS:32
Android UI Dur:2d ES:10/02 EF:11/02 LS:13/04 LF:15/04 TS:32
User UI Dur:1d ES:12/02 EF:12/02 LS:15/04 LF:16/04 TS:32
Dealership UI Dur:1d ES:13/02 EF:13/02 LS:16/04 LF:17/04 TS:32
Database Model Dur:1d ES:24/02 EF:24/02 LS:01/04 LF:02/04 TS:0
AI Model Deployment & Backend Integration Dur:1d ES:25/02 EF:25/02 LS:02/04 LF:03/04 TS:0
Upload endpoint Dur:2d ES:26/02 EF:27/02 LS:03/04 LF:07/04 TS:0
Analyse endpoint Dur:2d ES:02/03 EF:03/03 LS:07/04 LF:09/04 TS:0
Miscellaneous Endpoints Dur:2d ES:04/03 EF:05/03 LS:09/04 LF:13/04 TS:0
Event visualization & logs Dur:1d ES:06/03 EF:06/03 LS:13/04 LF:14/04 TS:0
Report Generation - Visual Logs for User Dur:1d ES:09/03/26 EF:09/03/26 LF:15/04/26 LS:14/04/26 TS:0
Fog Received Critical System Actuation Dur:2d ES:10/03 EF:11/03 LS:15/04 LF:17/04 TS:0
Offline Mode Predictive Repair Suggestions Logic Dur:2d ES:30/03 EF:31/03 LS:30/03 LF:01/04 TS:0
Model validation & accuracy report Dur:1d ES:01/04 EF:01/04 LS:01/04 LF:02/04 TS:0
Digital Twin Visualization Dur:1d ES:02/04 EF:02/04 LS:02/04 LF:03/04 TS:0
Integration Dur:4.5d ES:03/04 EF:09/04 LS:03/04 LF:09/04 TS:0
Device to Fog Module Integration Dur:1d ES:03/04 EF:03/04 LS:03/04 LF:06/04 TS:0
Fog to Cloud Integration Dur:1d ES:06/04 EF:06/04 LS:06/04 LF:07/04 TS:0
DB to Backend Integration Dur:0.5d ES:07/04 EF:07/04 LS:07/04 LF:07/04 TS:0
Model Integration Dur:0.5d ES:07/04 EF:07/04 LS:08/04 LF:08/04 TS:0
Frontend to Backend Integration Dur:0.5d ES:08/04 EF:08/04 LS:08/04 LF:08/04 TS:0
Hardware Integration Dur:0.5d ES:08/04 EF:08/04 LS:09/04 LF:09/04 TS:0
Testing Dur:4d ES:09/04 EF:15/04 LS:09/04 LF:15/04 TS:0
System and Integration Testing Dur:1d ES:09/04 EF:10/04 LS:09/04 LF:10/04 TS:0
Bug fixing and Regression Testing Dur:1d ES:10/04 EF:13/04 LS:10/04 LF:13/04 TS:0
Azure Deployment environment setup Dur:1d ES:13/04 EF:14/04 LS:13/04 LF:14/04 TS:0
Final configuration & smoke testing Dur:1d ES:14/04 EF:15/04 LS:14/04 LF:15/04 TS:0
Closure Dur:2d ES:15/04 EF:17/04 LS:15/04 LF:17/04 TS:0
User training & documentation Dur:1d ES:15/04 EF:16/04 LS:15/04 LF:16/04 TS:0
Project closure & handover Dur:1d ES:16/04 EF:17/04 LS:16/04 LF:17/04 TS:0
Finish Dur:0d ES:17/04 EF:17/04 LS:17/04 LF:17/04 TS:0
Finish

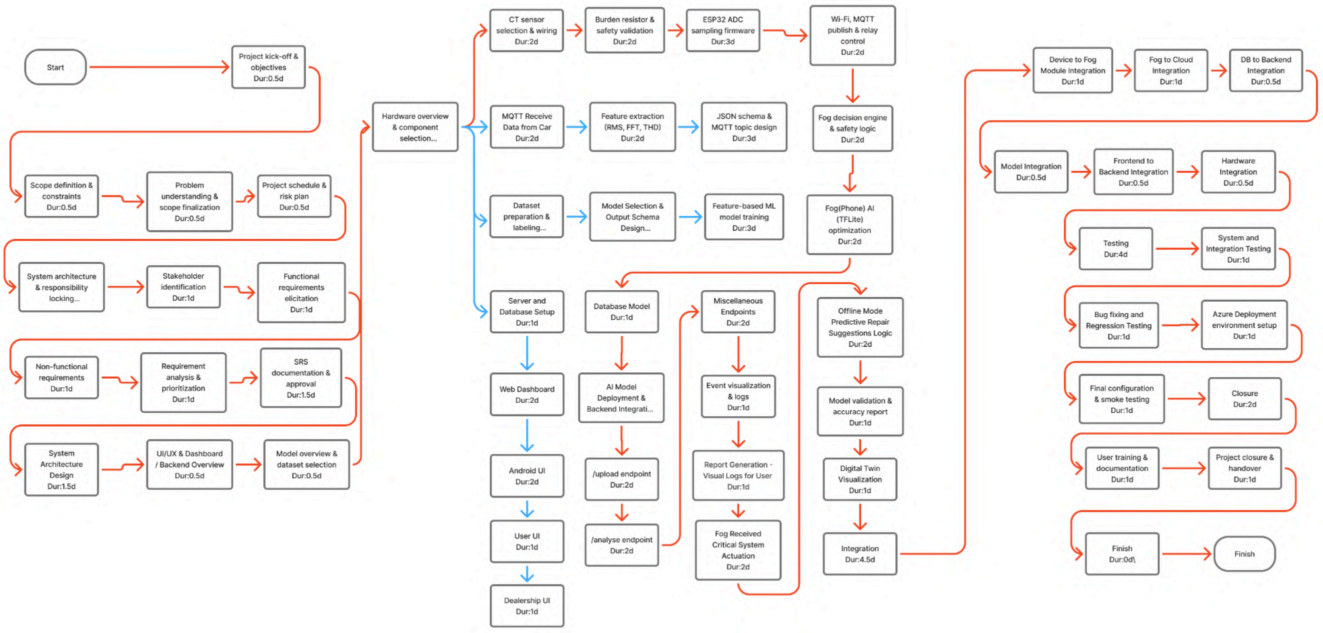
***PERT Chart** for the Project. Visit this link for a higher fidelity diagram in case it is not readable.*

5.2 Manually drawn Gantt Chart.



***Gantt** for the Project. Visit this link for a higher fidelity diagram in case it is not readable.*

5.3 Manually drawn Activity Network.


Start
Project kick-off & objectives Dur:0.5d
Scope definition & constraints Dur:0.5d
Problem understanding & scope finalization Dur:0.5d
Project schedule & risk plan Dur:0.5d
System architecture & responsibility locking...
Stakeholder identification Dur:1d
Functional requirements elicitation Dur:1d
Non-functional requirements Dur:1d
Requirement analysis & prioritization Dur:1d
SRS documentation & approval Dur:1.5d
System Architecture Design Dur:1.5d
UI/UX & Dashboard / Backend Overview Dur:0.5d
Model overview & dataset selection Dur:0.5d
Hardware overview & component selection...
CT sensor selection & wiring Dur:2d
Burden resistor & safety validation Dur:2d
ESP32 ADC sampling firmware Dur:3d
Wi-Fi, MQTT publish & relay control Dur:2d
MQTT Receive Data from Car Dur:2d
Feature extraction (RMS, FFT, THD) Dur:2d
JSON schema & MQTT topic design Dur:3d
Fog decision engine & safety logic Dur:2d
Dataset preparation & labeling...
Model Selection & Output Schema Design...
Feature-based ML model training Dur:3d
Fog(Phone) AI (TFLite) optimization Dur:2d
Server and Database Setup Dur:1d
Web Dashboard Dur:2d
Android UI Dur:2d
User UI Dur:1d
Dealership UI Dur:1d
Database Model Dur:1d
AI Model Deployment & Backend Integrati...
/upload endpoint Dur:2d
/analyse endpoint Dur:2d
Miscellaneous Endpoints Dur:2d
Event visualization & logs Dur:1d
Report Generation - Visual Logs for User Dur:1d
Fog Received Critical System Actuation Dur:2d
Offline Mode Predictive Repair Suggestions Logic Dur:2d
Model validation & accuracy report Dur:1d
Digital Twin Visualization Dur:1d
Integration Dur:4.5d
Device to Fog Module Integration Dur:1d
Fog to Cloud Integration Dur:1d
DB to Backend Integration Dur:0.5d
Model Integration Dur:0.5d
Frontend to Backend Integration Dur:0.5d
Hardware Integration Dur:0.5d
Testing Dur:4d
System and Integration Testing Dur:1d
Bug fixing and Regression Testing Dur:1d
Azure Deployment environment setup Dur:1d
Final configuration & smoke testing Dur:1d
Closure Dur:2d
User training & documentation Dur:1d
Project closure & handover Dur:1d
Finish Dur:0d\
Finish

Activity Network Diagram *for the Project. Visit this [link](#) for a higher fidelity diagram in case it is not readable.*

5.4.1 Deterministic Manual Calculations for ES, EF, LS, LF and Slack time for each task. (CPM)

*Slack Time = LS - ES (or) LF - EF

No.	**Activity Name**	**Duration (days)**	**ES**	**EF**	**LS**	**LF**	**Slack**
1	Start	0	0	0	0	0	0
2	**Initiation**	**3**	**0**	**3**	**0**	**3**	**0**

3	Project kick-off & objectives	0.5	0	0.5	0	0.5	0
4	Scope definition & constraints	0.5	0.5	1	0.5	1	0
5	Problem understanding & scope finalization	0.5	3	3.5	3	3.5	0
6	Project schedule & risk plan	0.5	3.5	4	3.5	4	0
7	System architecture & responsibility locking	1	4	5	4	5	0
8	**Requirement**	**5.5**	**5**	**10.5**	**5**	**10.5**	**0**
9	Stakeholder identification	1	5	6	5	6	0
10	Functional requirements elicitation	1	6	7	6	7	0
11	Non-functional requirements	1	7	8	7	8	0
12	Requirement analysis & prioritization	1	8	9	8	9	0
13	SRS documentation & approval	1.5	9	10.5	9	10.5	0

14	**Design**	**3**	**10.5**	**13.5**	**10.5**	**13.5**	**0**
15	System Architecture Design	1.5	10.5	12	10.5	12	0
16	UI/UX & Dashboard / Backend Overview	0.5	12	12.5	12	12.5	0
17	Model Overview & Dataset selection	0.5	12.5	13	12.5	13	0
18	Hardware Overview & Component selection	0.5	13	13.5	13	13.5	0
19	**Development**	**29**	**13.5**	**42.5**	**23.5**	**52.5**	**10**
20	**Hardware and Embedded**	**25**	**13.5**	**38.5**	**13.5**	**38.5**	**0**
21	CT sensor selection & wiring	2	13.5	15.5	13.5	15.5	0
22	Burden resistor & safety validation	2	15.5	17.5	15.5	17.5	0
23	ESP32 ADC sampling firmware	3	17.5	20.5	17.5	20.5	0
24	Wi-Fi, MQTT publish & relay control	2	20.5	22.5	20.5	22.5	0

25	Fog Received Critical System Actuation	2	38.5	40.5	38.5	40.5	0
26	**Fog(Phone) Logic & System Behavior**	**27**	**13.5**	**40.5**	**25.5**	**52.5**	**12**
27	MQTT Receive Data from Car	2	13.5	15.5	45.5	47.5	32
28	Feature extraction (RMS, FFT, THD)	2	15.5	17.5	47.5	49.5	32
29	JSON schema & MQTT topic design	3	17.5	20.5	49.5	52.5	32
30	Fog decision engine & safety logic	2	22.5	24.5	22.5	24.5	0
31	Offline Mode Predictive Repair Suggestions Logic	2	40.5	42.5	40.5	42.5	0
32	**AI and Data Handling**	**28**	**13.5**	**41.5**	**24.5**	**52.5**	**11**
33	Dataset preparation & labeling	2	13.5	15.5	45.5	47.5	32
34	Model Selection and Output Schema Design	2	15.5	17.5	47.5	49.5	32
35	Feature-based ML model training	3	17.5	20.5	49.5	52.5	32

36	Fog(Phone) AI (TFLite) optimization	2	24.5	26.5	24.5	26.5	0
37	Model validation & accuracy report	1	42.5	43.5	42.5	43.5	0
38	**Backend Development**	**21**	**13.5**	**34.5**	**25.5**	**46.5**	**12**
39	Server and Database Setup	1	13.5	14.5	45.5	46.5	32
40	Database Model	1	26.5	27.5	26.5	27.5	0
41	AI Model Deployment and Backend Integration	1	27.5	28.5	27.5	28.5	0
42	**Endpoint creation**	**6**	**28.5**	**34.5**	**28.5**	**34.5**	**0**
43	/upload endpoint	2	28.5	30.5	28.5	30.5	0
44	/analyse endpoint	2	30.5	32.5	30.5	32.5	0
45	Miscellaneous Endpoints	2	32.5	34.5	32.5	34.5	0
46	**Frontend Development**	**28**	**14.5**	**42.5**	**32.5**	**60.5**	**10**
47	Web Dashboard	2	14.5	16.5	46.5	48.5	32
48	Android UI	2	16.5	18.5	48.5	50.5	32

49	User UI	1	18.5	19.5	50.5	51.5	32
50	Dealership UI	1	19.5	20.5	51.5	52.5	32
51	Event visualization & logs	1	34.5	35.5	34.5	35.5	0
52	Report Generation - Visual Logs	1	35.5	36.5	35.5	36.5	0
53	Digital Twin Visualization	1	43.5	44.5	43.5	44.5	0
54	**Integration**	**4**	**44.5**	**48.5**	**44.5**	**48.5**	**0**
55	Device to Fog Module Integration	1	44.5	45.5	44.5	45.5	0
56	Fog to Cloud Integration	1	45.5	46.5	45.5	46.5	0
57	DB to Backend Integration	0.5	46.5	47	46.5	47	0
58	Model Integration	0.5	47	47.5	47	47.5	0
59	Frontend to Backend Integration	0.5	47.5	48	47.5	48	0
60	Hardware Integration	0.5	48	48.5	48	48.5	0

61	**Testing**	**4**	**48.5**	**52.5**	**48.5**	**52.5**	**0**
62	System and Integration Testing	1	48.5	49.5	48.5	49.5	0
63	Bug fixing and Regression Testing	1	49.5	50.5	49.5	50.5	0
64	Azure Deployment environment setup	1	50.5	51.5	50.5	51.5	0
65	Final configuration & smoke testing	1	51.5	52.5	51.5	52.5	0
66	**Closure**	**2**	**52.5**	**54.5**	**52.5**	**54.5**	**0**
67	User training & documentation	1	52.5	53.5	52.5	53.5	0
68	Project closure & handover	1	53.5	54.5	53.5	54.5	0
69	Finish	0	54.5	54.5	54.5	54.5	0

5.4.2 Probabilistic Manual Calculations for ES, EF, LS, LF and Slack time for each task.(PERT)

*Slack Time = LS - ES (or) LF - EF

Since the CPM analysis of the project is carried out in days, the PERT (probabilistic scheduling) analysis is also represented in days.

PERT uses three time estimates for each activity:
a = Optimistic time (hours)
m = Most likely time (hours)
b = Pessimistic time (hours)

Expected time:
t_e = (a + 4m + b) / 6

No.	**Activity Name**	**A (days)**	**M (days)**	**B (days)**	**Duration (days)**	**ES**	**EF**	**LS**	**LF**	**Slack**
1	Start	0.0	0.0	0.0	0	0	0	0	0	0
2	**Initiation**	2.7	3.0	3.3	**3**	**0**	**3**	**0**	**3**	**0**
3	Project kick-off & objectives	0.45	0.5	0.55	0.5	0	0.5	0	0.5	0
4	Scope definition & constraints	0.45	0.5	0.55	0.5	0.5	1	0.5	1	0
5	Problem understanding &	0.45	0.5	0.55	0.5	3	3.5	3	3.5	0

	scope finalization									
6	Project schedule & risk plan	0.45	0.5	0.55	0.5	3.5	4	3.5	4	0
7	System architecture & responsibility locking	0.9	1.0	1.1	1	4	5	4	5	0
8	**Requirement**	**4.95**	**5.5**	**6.05**	**5.5**	**5**	**10.5**	**5**	**10.5**	**0**
9	Stakeholder identification	0.9	1.0	1.1	1	5	6	5	6	0
10	Functional requirements elicitation	0.9	1.0	1.1	1	6	7	6	7	0
11	Non-functional requirements	0.9	1.0	1.1	1	7	8	7	8	0
12	Requirement analysis & prioritization	0.9	1.0	1.1	1	8	9	8	9	0
13	SRS documentation & approval	1.35	1.5	1.65	1.5	9	10.5	9	10.5	0

14	**Design**	**2.7**	**3.0**	**3.3**	**3**	**10.5**	**13.5**	**10.5**	**13.5**	**0**
15	System Architecture Design	1.35	1.5	1.65	1.5	10.5	12	10.5	12	0
16	UI/UX & Dashboard / Backend Overview	0.45	0.5	0.55	0.5	12	12.5	12	12.5	0
17	Model Overview & Dataset selection	0.45	0.5	0.55	0.5	12.5	13	12.5	13	0
18	Hardware Overview & Component selection	0.45	0.5	0.55	0.5	13	13.5	13	13.5	0
19	**Development**	**26.1**	**29.0**	**31.9**	**29**	**13.5**	**42.5**	**23.5**	**52.5**	**10**
20	**Hardware and Embedded**	**22.5**	**25.0**	**27.5**	**25**	**13.5**	**38.5**	**13.5**	**38.5**	**0**
21	CT sensor selection & wiring	1.8	2.0	2.2	2	13.5	15.5	13.5	15.5	0

22	Burden resistor & safety validation	1.8	2.0	2.2	2	15.5	17.5	15.5	17.5	0
23	ESP32 ADC sampling firmware	2.7	3.0	3.3	3	17.5	20.5	17.5	20.5	0
24	Wi-Fi, MQTT publish & relay control	1.8	2.0	2.2	2	20.5	22.5	20.5	22.5	0
25	Fog Received Critical System Actuation	1.8	2.0	2.2	2	38.5	40.5	38.5	40.5	0
26	**Fog(Phone) Logic & System Behavior**	**24.3**	**27.0**	**29.7**	**27**	**13.5**	**40.5**	**25.5**	**52.5**	**12**
27	MQTT Receive Data from Car	1.8	2.0	2.2	2	13.5	15.5	45.5	47.5	32
28	Feature extraction (RMS, FFT, THD)	1.8	2.0	2.2	2	15.5	17.5	47.5	49.5	32
29	JSON schema & MQTT topic design	2.7	3.0	3.3	3	17.5	20.5	49.5	52.5	32

30	Fog decision engine & safety logic	1.8	2.0	2.2	2	22.5	24.5	22.5	24.5	0
31	Offline Mode Predictive Repair Suggestions Logic	1.8	2.0	2.2	2	40.5	42.5	40.5	42.5	0
32	**AI and Data Handling**	**25.2**	**28.0**	**30.8**	**28**	**13.5**	**41.5**	**24.5**	**52.5**	**11**
33	Dataset preparation & labeling	1.8	2.0	2.2	2	13.5	15.5	45.5	47.5	32
34	Model Selection and Output Schema Design	1.8	2.0	2.2	2	15.5	17.5	47.5	49.5	32
35	Feature-based ML model training	2.7	3.0	3.3	3	17.5	20.5	49.5	52.5	32
36	Fog(Phone) AI (TFLite) optimization	1.8	2.0	2.2	2	24.5	26.5	24.5	26.5	0
37	Model validation & accuracy report	0.9	1.0	1.1	1	42.5	43.5	42.5	43.5	0

38	**Backend Development**	**18.9**	**21.0**	**23.1**	**21**	**13.5**	**34.5**	**25.5**	**46.5**	**12**
39	Server and Database Setup	0.9	1.0	1.1	1	13.5	14.5	45.5	46.5	32
40	Database Model	0.9	1.0	1.1	1	26.5	27.5	26.5	27.5	0
41	AI Model Deployment and Backend Integration	0.9	1.0	1.1	1	27.5	28.5	27.5	28.5	0
42	**Endpoint creation**	**5.4**	**6.0**	**6.6**	**6**	**28.5**	**34.5**	**28.5**	**34.5**	**0**
43	/upload endpoint	1.8	2.0	2.2	2	28.5	30.5	28.5	30.5	0
44	/analyse endpoint	1.8	2.0	2.2	2	30.5	32.5	30.5	32.5	0
45	Miscellaneous Endpoints	1.8	2.0	2.2	2	32.5	34.5	32.5	34.5	0
46	**Frontend Development**	**25.2**	**28.0**	**30.8**	**28**	**14.5**	**42.5**	**32.5**	**60.5**	**10**
47	Web Dashboard	1.8	2.0	2.2	2	14.5	16.5	46.5	48.5	32

48	Android UI	1.8	2.0	2.2	2	16.5	18.5	48.5	50.5	32
49	User UI	0.9	1.0	1.1	1	18.5	19.5	50.5	51.5	32
50	Dealership UI	0.9	1.0	1.1	1	19.5	20.5	51.5	52.5	32
51	Event visualization & logs	0.9	1.0	1.1	1	34.5	35.5	34.5	35.5	0
52	Report Generation - Visual Logs	0.9	1.0	1.1	1	35.5	36.5	35.5	36.5	0
53	Digital Twin Visualization	0.9	1.0	1.1	1	43.5	44.5	43.5	44.5	0
54	**Integration**	**3.6**	**4.0**	**4.4**	**4**	**44.5**	**48.5**	**44.5**	**48.5**	**0**
55	Device to Fog Module Integration	0.9	1.0	1.1	1	44.5	45.5	44.5	45.5	0
56	Fog to Cloud Integration	0.9	1.0	1.1	1	45.5	46.5	45.5	46.5	0

57	DB to Backend Integration	0.45	0.5	0.55	0.5	46.5	47	46.5	47	0
58	Model Integration	0.45	0.5	0.55	0.5	47	47.5	47	47.5	0
59	Frontend to Backend Integration	0.45	0.5	0.55	0.5	47.5	48	47.5	48	0
60	Hardware Integration	0.45	0.5	0.55	0.5	48	48.5	48	48.5	0
61	**Testing**	**3.6**	**4.0**	**4.4**	**4**	**48.5**	**52.5**	**48.5**	**52.5**	**0**
62	System and Integration Testing	0.9	1.0	1.1	1	48.5	49.5	48.5	49.5	0
63	Bug fixing and Regression Testing	0.9	1.0	1.1	1	49.5	50.5	49.5	50.5	0
64	Azure Deployment environment setup	0.9	1.0	1.1	1	50.5	51.5	50.5	51.5	0
65	Final configuration & smoke testing	0.9	1.0	1.1	1	51.5	52.5	51.5	52.5	0

66	**Closure**	**1.8**	**2.0**	**2.2**	**2**	**52.5**	**54.5**	**52.5**	**54.5**	**0**
67	User training & documentation	0.9	1.0	1.1	1	52.5	53.5	52.5	53.5	0
68	Project closure & handover	0.9	1.0	1.1	1	53.5	54.5	53.5	54.5	0
69	Finish	0.0	0.0	0.0	0	54.5	54.5	54.5	54.5	0

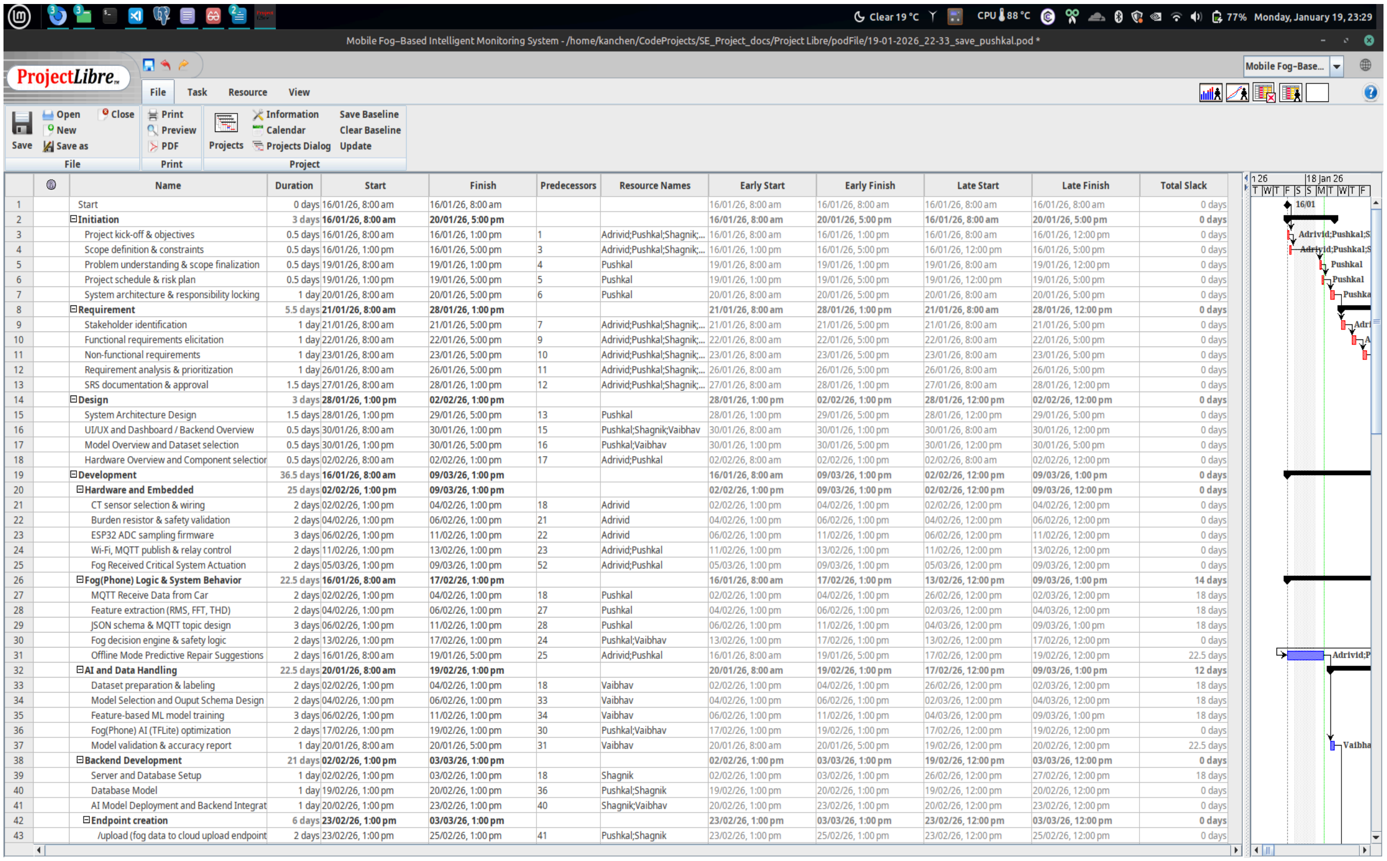
5.5 Critical Activities Identified from manual calculation:

- Start
- Initiation
- Project kick-off & objectives
- Scope definition & constraints
- Problem understanding & scope finalization
- Project schedule & risk plan
- System architecture & responsibility locking
- Requirement (summary)
- Stakeholder identification
- Functional requirements elicitation
- Non-functional requirements
- Requirement analysis & prioritization
- SRS documentation & approval
- Design (summary)
- System Architecture Design
- UI/UX and Dashboard / Backend Overview
- Model Overview and Dataset selection
- Hardware Overview and Component selection
- Hardware and Embedded

- CT sensor selection & wiring
- Burden resistor & safety validation
- ESP32 ADC sampling firmware
- Wi-Fi, MQTT publish & relay control
- Fog Received Critical System Actuation
- Fog decision engine & safety logic
- Offline Mode Predictive Repair Suggestions Logic
- Fog(Phone) AI (TFLite) optimization
- Model validation & accuracy report
- Database Model
- AI Model Deployment and Backend Integration
- Endpoint creation
- /upload endpoint
- /analyse endpoint
- Miscellaneous Endpoints
- Event visualization & logs
- Report Generation – Visual Logs for User
- Digital Twin Visualization
- Integration
- Device to Fog Module Integration
- Fog to Cloud Integration
- DB to Backend Integration
- Model Integration
- Frontend to Backend Integration
- Hardware Integration
- Testing
- System and Integration Testing
- Bug fixing and Regression Testing
- Azure Deployment environment setup
- Final configuration & smoke testing
- Closure
- User training & documentation
- Project closure & handover
- Finish

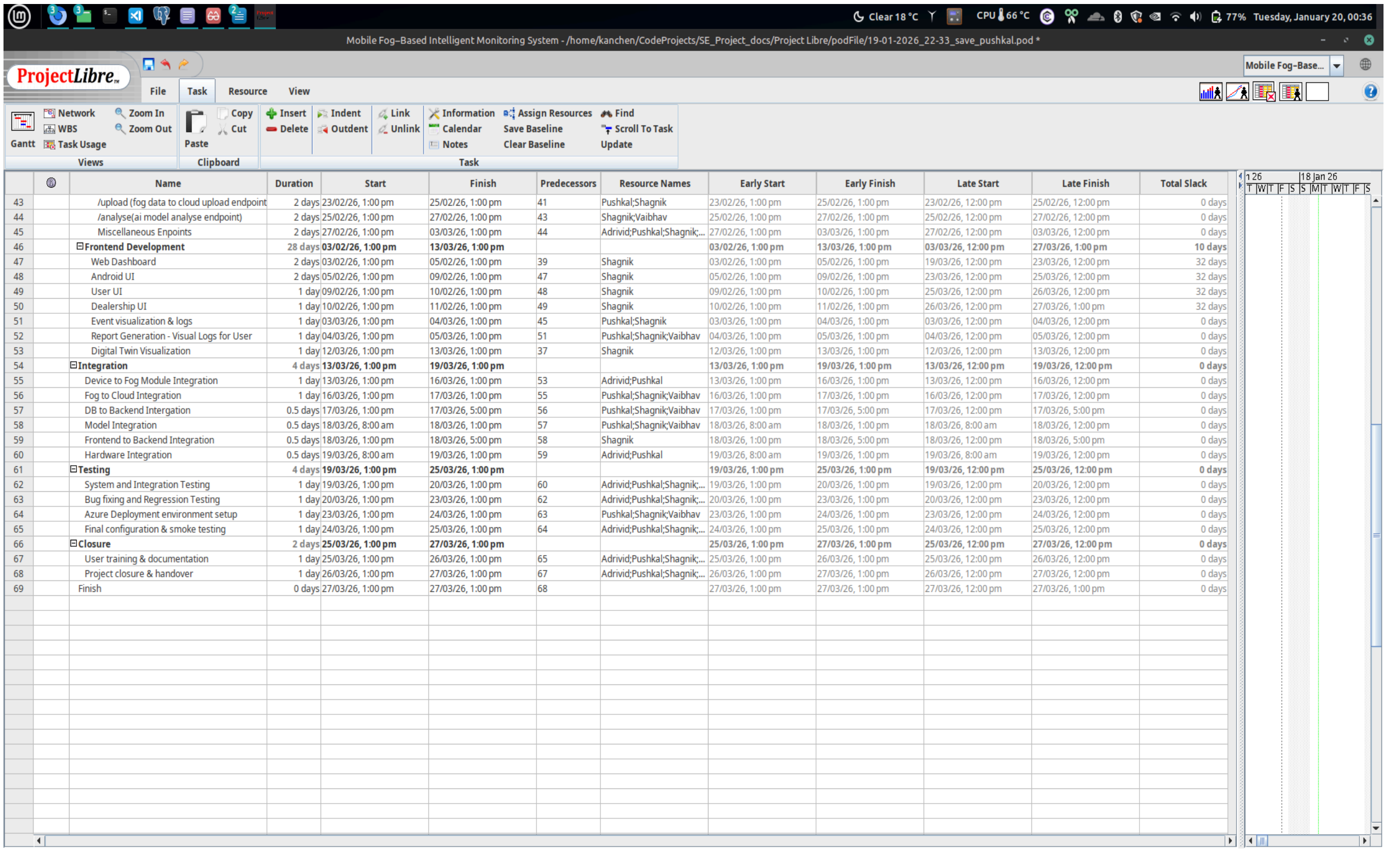
6. Project-Libre Screenshots.

6.1 Activity List Screenshots.



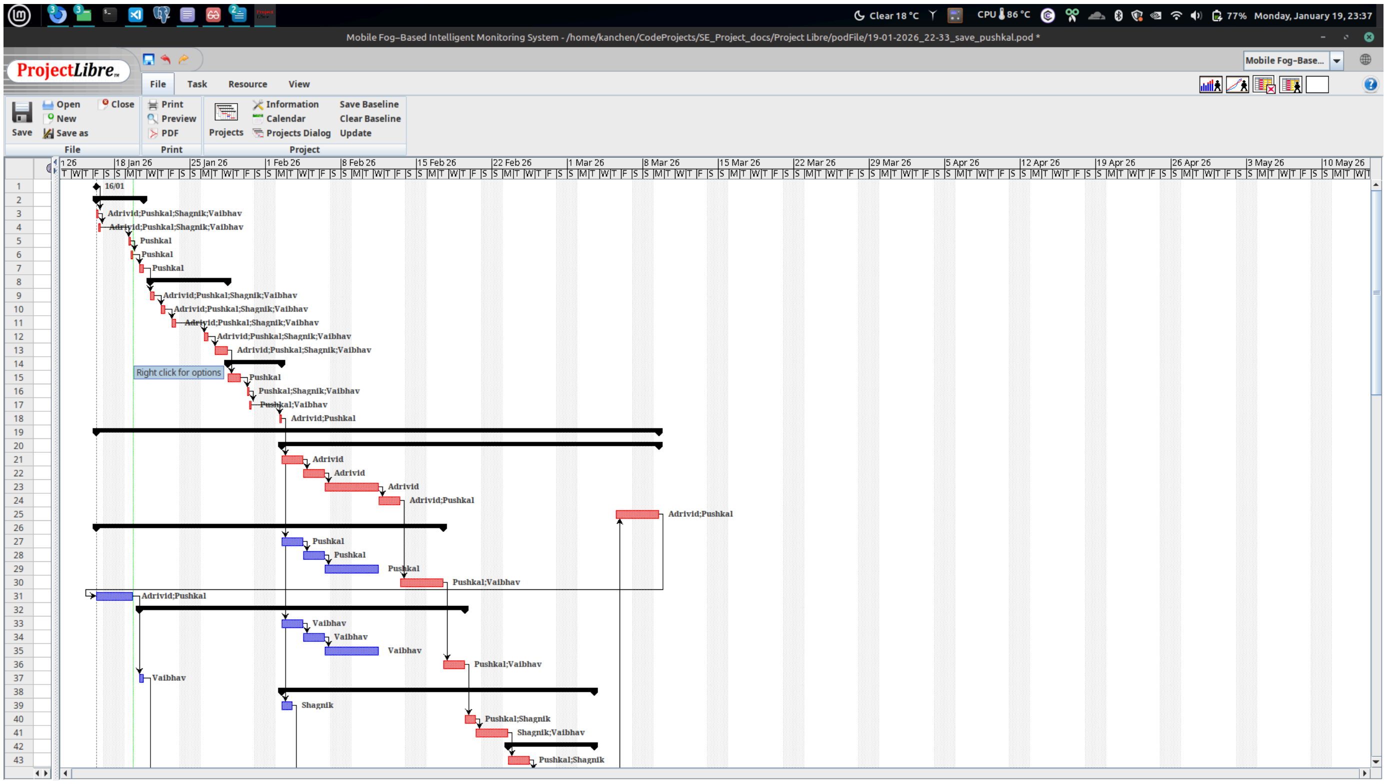
Mobile Fog-Based Intelligent Monitoring System - /home/kanchen/CodeProjects/SE_Project_docs/Project Libre/podFile/19-01-2026_22-33_save_pushkal.pod *

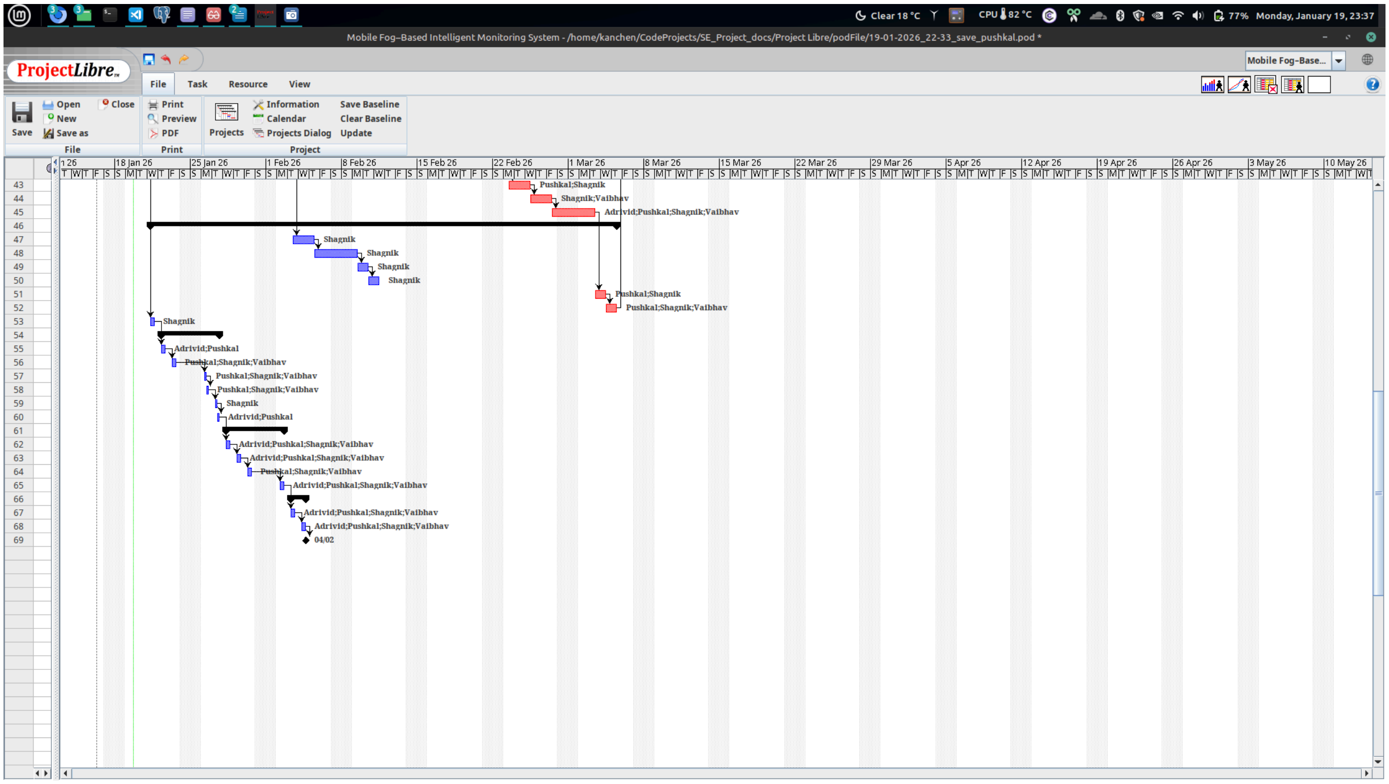
	Name	Duration	Start	Finish	Predecessors	Resource Names	Early Start	Early Finish	Late Start	Late Finish	Total Slack
1	Start	0 days	16/01/26, 8:00 am	16/01/26, 8:00 am			16/01/26, 8:00 am	16/01/26, 8:00 am	16/01/26, 8:00 am	16/01/26, 8:00 am	0 days
2	⊟Initiation	3 days	16/01/26, 8:00 am	20/01/26, 5:00 pm			16/01/26, 8:00 am	20/01/26, 5:00 pm	16/01/26, 8:00 am	20/01/26, 5:00 pm	0 days
3	Project kick-off & objectives	0.5 days	16/01/26, 8:00 am	16/01/26, 1:00 pm	1	Adrivid;Pushkal;Shagnik;...	16/01/26, 8:00 am	16/01/26, 1:00 pm	16/01/26, 8:00 am	16/01/26, 12:00 pm	0 days
4	Scope definition & constraints	0.5 days	16/01/26, 1:00 pm	16/01/26, 5:00 pm	3	Adrivid;Pushkal;Shagnik;...	16/01/26, 1:00 pm	16/01/26, 5:00 pm	16/01/26, 12:00 pm	16/01/26, 5:00 pm	0 days
5	Problem understanding & scope finalization	0.5 days	19/01/26, 8:00 am	19/01/26, 1:00 pm	4	Pushkal	19/01/26, 8:00 am	19/01/26, 1:00 pm	19/01/26, 8:00 am	19/01/26, 12:00 pm	0 days
6	Project schedule & risk plan	0.5 days	19/01/26, 1:00 pm	19/01/26, 5:00 pm	5	Pushkal	19/01/26, 1:00 pm	19/01/26, 5:00 pm	19/01/26, 12:00 pm	19/01/26, 5:00 pm	0 days
7	System architecture & responsibility locking	1 day	20/01/26, 8:00 am	20/01/26, 5:00 pm	6	Pushkal	20/01/26, 8:00 am	20/01/26, 5:00 pm	20/01/26, 8:00 am	20/01/26, 5:00 pm	0 days
8	⊟Requirement	5.5 days	21/01/26, 8:00 am	28/01/26, 1:00 pm			21/01/26, 8:00 am	28/01/26, 1:00 pm	21/01/26, 8:00 am	28/01/26, 12:00 pm	0 days
9	Stakeholder identification	1 day	21/01/26, 8:00 am	21/01/26, 5:00 pm	7	Adrivid;Pushkal;Shagnik;...	21/01/26, 8:00 am	21/01/26, 5:00 pm	21/01/26, 8:00 am	21/01/26, 5:00 pm	0 days
10	Functional requirements elicitation	1 day	22/01/26, 8:00 am	22/01/26, 5:00 pm	9	Adrivid;Pushkal;Shagnik;...	22/01/26, 8:00 am	22/01/26, 5:00 pm	22/01/26, 8:00 am	22/01/26, 5:00 pm	0 days
11	Non-functional requirements	1 day	23/01/26, 8:00 am	23/01/26, 5:00 pm	10	Adrivid;Pushkal;Shagnik;...	23/01/26, 8:00 am	23/01/26, 5:00 pm	23/01/26, 8:00 am	23/01/26, 5:00 pm	0 days
12	Requirement analysis & prioritization	1 day	26/01/26, 8:00 am	26/01/26, 5:00 pm	11	Adrivid;Pushkal;Shagnik;...	26/01/26, 8:00 am	26/01/26, 5:00 pm	26/01/26, 8:00 am	26/01/26, 5:00 pm	0 days
13	SRS documentation & approval	1.5 days	27/01/26, 8:00 am	28/01/26, 1:00 pm	12	Adrivid;Pushkal;Shagnik;...	27/01/26, 8:00 am	28/01/26, 1:00 pm	27/01/26, 8:00 am	28/01/26, 12:00 pm	0 days
14	⊟Design	3 days	28/01/26, 1:00 pm	02/02/26, 1:00 pm			28/01/26, 1:00 pm	02/02/26, 1:00 pm	28/01/26, 12:00 pm	02/02/26, 12:00 pm	0 days
15	System Architecture Design	1.5 days	28/01/26, 1:00 pm	29/01/26, 5:00 pm	13	Pushkal	28/01/26, 1:00 pm	29/01/26, 5:00 pm	28/01/26, 12:00 pm	29/01/26, 5:00 pm	0 days
16	UI/UX and Dashboard / Backend Overview	0.5 days	30/01/26, 8:00 am	30/01/26, 1:00 pm	15	Pushkal;Shagnik;Vaibhav	30/01/26, 8:00 am	30/01/26, 1:00 pm	30/01/26, 8:00 am	30/01/26, 12:00 pm	0 days
17	Model Overview and Dataset selection	0.5 days	30/01/26, 1:00 pm	30/01/26, 5:00 pm	16	Pushkal;Vaibhav	30/01/26, 1:00 pm	30/01/26, 5:00 pm	30/01/26, 12:00 pm	30/01/26, 5:00 pm	0 days
18	Hardware Overview and Component selectior	0.5 days	02/02/26, 8:00 am	02/02/26, 1:00 pm	17	Adrivid;Pushkal	02/02/26, 8:00 am	02/02/26, 1:00 pm	02/02/26, 8:00 am	02/02/26, 12:00 pm	0 days
19	⊟Development	36.5 days	16/01/26, 8:00 am	09/03/26, 1:00 pm			16/01/26, 8:00 am	09/03/26, 1:00 pm	02/02/26, 12:00 pm	09/03/26, 1:00 pm	0 days
20	⊟Hardware and Embedded	25 days	02/02/26, 1:00 pm	09/03/26, 1:00 pm			02/02/26, 1:00 pm	09/03/26, 1:00 pm	02/02/26, 12:00 pm	09/03/26, 12:00 pm	0 days
21	CT sensor selection & wiring	2 days	02/02/26, 1:00 pm	04/02/26, 1:00 pm	18	Adrivid	02/02/26, 1:00 pm	04/02/26, 1:00 pm	02/02/26, 12:00 pm	04/02/26, 12:00 pm	0 days
22	Burden resistor & safety validation	2 days	04/02/26, 1:00 pm	06/02/26, 1:00 pm	21	Adrivid	04/02/26, 1:00 pm	06/02/26, 1:00 pm	04/02/26, 12:00 pm	06/02/26, 12:00 pm	0 days
23	ESP32 ADC sampling firmware	3 days	06/02/26, 1:00 pm	11/02/26, 1:00 pm	22	Adrivid	06/02/26, 1:00 pm	11/02/26, 1:00 pm	06/02/26, 12:00 pm	11/02/26, 12:00 pm	0 days
24	Wi-Fi, MQTT publish & relay control	2 days	11/02/26, 1:00 pm	13/02/26, 1:00 pm	23	Adrivid;Pushkal	11/02/26, 1:00 pm	13/02/26, 1:00 pm	11/02/26, 12:00 pm	13/02/26, 12:00 pm	0 days
25	Fog Received Critical System Actuation	2 days	05/03/26, 1:00 pm	09/03/26, 1:00 pm	52	Adrivid;Pushkal	05/03/26, 1:00 pm	09/03/26, 1:00 pm	05/03/26, 12:00 pm	09/03/26, 12:00 pm	0 days
26	⊟Fog(Phone) Logic & System Behavior	22.5 days	16/01/26, 8:00 am	17/02/26, 1:00 pm			16/01/26, 8:00 am	17/02/26, 1:00 pm	13/02/26, 12:00 pm	09/03/26, 1:00 pm	14 days
27	MQTT Receive Data from Car	2 days	02/02/26, 1:00 pm	04/02/26, 1:00 pm	18	Pushkal	02/02/26, 1:00 pm	04/02/26, 1:00 pm	26/02/26, 12:00 pm	02/03/26, 12:00 pm	18 days
28	Feature extraction (RMS, FFT, THD)	2 days	04/02/26, 1:00 pm	06/02/26, 1:00 pm	27	Pushkal	04/02/26, 1:00 pm	06/02/26, 1:00 pm	02/03/26, 12:00 pm	04/03/26, 12:00 pm	18 days
29	JSON schema & MQTT topic design	3 days	06/02/26, 1:00 pm	11/02/26, 1:00 pm	28	Pushkal	06/02/26, 1:00 pm	11/02/26, 1:00 pm	04/03/26, 12:00 pm	09/03/26, 1:00 pm	18 days
30	Fog decision engine & safety logic	2 days	13/02/26, 1:00 pm	17/02/26, 1:00 pm	24	Pushkal;Vaibhav	13/02/26, 1:00 pm	17/02/26, 1:00 pm	13/02/26, 12:00 pm	17/02/26, 12:00 pm	0 days
31	Offline Mode Predictive Repair Suggestions	2 days	16/01/26, 8:00 am	19/01/26, 5:00 pm	25	Adrivid;Pushkal	16/01/26, 8:00 am	19/01/26, 5:00 pm	17/02/26, 12:00 pm	19/02/26, 12:00 pm	22.5 days
32	⊟AI and Data Handling	22.5 days	20/01/26, 8:00 am	19/02/26, 1:00 pm			20/01/26, 8:00 am	19/02/26, 1:00 pm	17/02/26, 12:00 pm	09/03/26, 1:00 pm	12 days
33	Dataset preparation & labeling	2 days	02/02/26, 1:00 pm	04/02/26, 1:00 pm	18	Vaibhav	02/02/26, 1:00 pm	04/02/26, 1:00 pm	26/02/26, 12:00 pm	02/03/26, 12:00 pm	18 days
34	Model Selection and Ouput Schema Design	2 days	04/02/26, 1:00 pm	06/02/26, 1:00 pm	33	Vaibhav	04/02/26, 1:00 pm	06/02/26, 1:00 pm	02/03/26, 12:00 pm	04/03/26, 12:00 pm	18 days
35	Feature-based ML model training	3 days	06/02/26, 1:00 pm	11/02/26, 1:00 pm	34	Vaibhav	06/02/26, 1:00 pm	11/02/26, 1:00 pm	04/03/26, 12:00 pm	09/03/26, 1:00 pm	18 days
36	Fog(Phone) AI (TFLite) optimization	2 days	17/02/26, 1:00 pm	19/02/26, 1:00 pm	30	Pushkal;Vaibhav	17/02/26, 1:00 pm	19/02/26, 1:00 pm	17/02/26, 12:00 pm	19/02/26, 12:00 pm	0 days
37	Model validation & accuracy report	1 day	20/01/26, 8:00 am	20/01/26, 5:00 pm	31	Vaibhav	20/01/26, 8:00 am	20/01/26, 5:00 pm	19/02/26, 12:00 pm	20/02/26, 12:00 pm	22.5 days
38	⊟Backend Development	21 days	02/02/26, 1:00 pm	03/03/26, 1:00 pm			02/02/26, 1:00 pm	03/03/26, 1:00 pm	19/02/26, 12:00 pm	03/03/26, 12:00 pm	0 days
39	Server and Database Setup	1 day	02/02/26, 1:00 pm	03/02/26, 1:00 pm	18	Shagnik	02/02/26, 1:00 pm	03/02/26, 1:00 pm	26/02/26, 12:00 pm	27/02/26, 12:00 pm	18 days
40	Database Model	1 day	19/02/26, 1:00 pm	20/02/26, 1:00 pm	36	Pushkal;Shagnik	19/02/26, 1:00 pm	20/02/26, 1:00 pm	19/02/26, 12:00 pm	20/02/26, 12:00 pm	0 days
41	AI Model Deployment and Backend Integrat	1 day	20/02/26, 1:00 pm	23/02/26, 1:00 pm	40	Shagnik;Vaibhav	20/02/26, 1:00 pm	23/02/26, 1:00 pm	20/02/26, 12:00 pm	23/02/26, 12:00 pm	0 days
42	⊟Endpoint creation	6 days	23/02/26, 1:00 pm	03/03/26, 1:00 pm			23/02/26, 1:00 pm	03/03/26, 1:00 pm	23/02/26, 12:00 pm	03/03/26, 12:00 pm	0 days
43	/upload (fog data to cloud upload endpoint	2 days	23/02/26, 1:00 pm	25/02/26, 1:00 pm	41	Pushkal;Shagnik	23/02/26, 1:00 pm	25/02/26, 1:00 pm	23/02/26, 12:00 pm	25/02/26, 12:00 pm	0 days



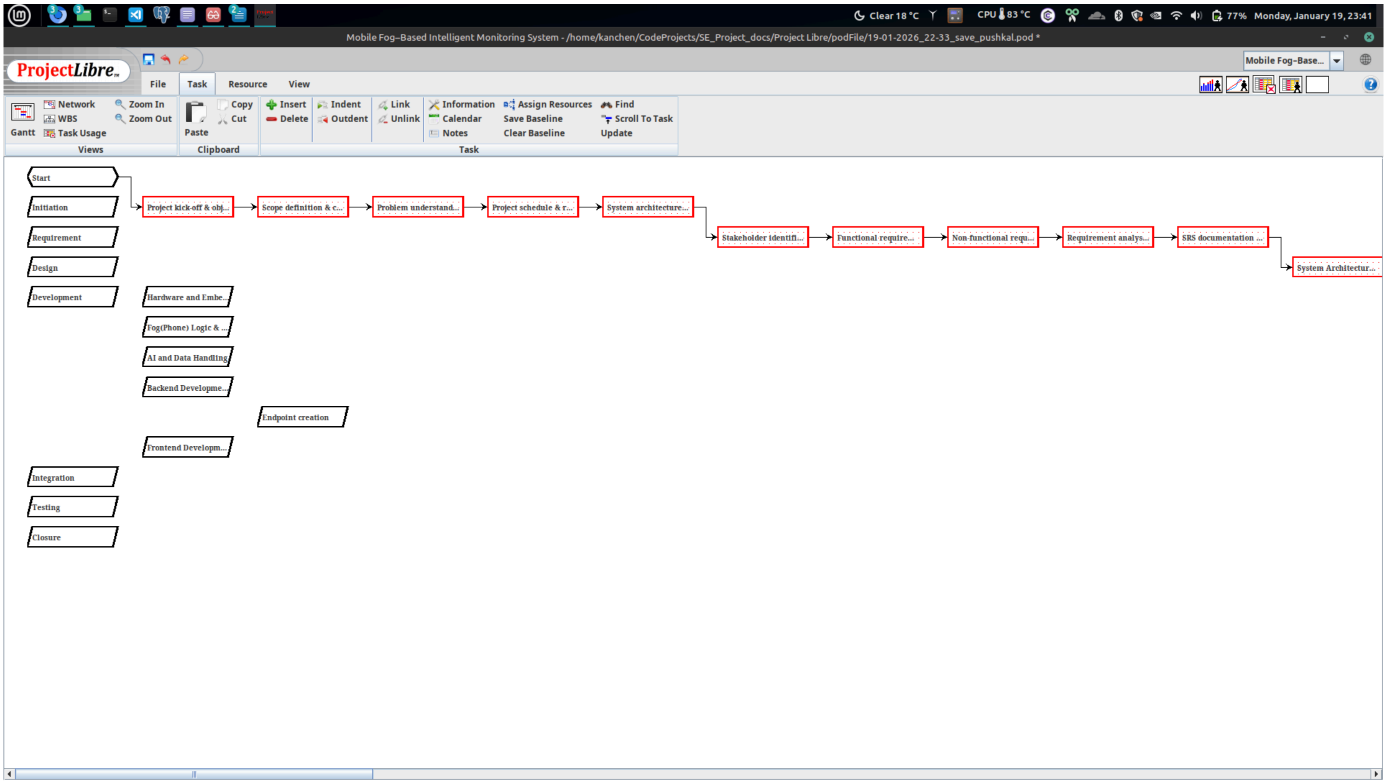
		Name	Duration	Start	Finish	Predecessors	Resource Names	Early Start	Early Finish	Late Start	Late Finish	Total Slack
43		/upload (fog data to cloud upload endpoint	2 days	23/02/26, 1:00 pm	25/02/26, 1:00 pm	41	Pushkal;Shagnik	23/02/26, 1:00 pm	25/02/26, 1:00 pm	23/02/26, 12:00 pm	25/02/26, 12:00 pm	0 days
44		/analyse(ai model analyse endpoint)	2 days	25/02/26, 1:00 pm	27/02/26, 1:00 pm	43	Shagnik;Vaibhav	25/02/26, 1:00 pm	27/02/26, 1:00 pm	25/02/26, 12:00 pm	27/02/26, 12:00 pm	0 days
45		Miscellaneous Enpoints	2 days	27/02/26, 1:00 pm	03/03/26, 1:00 pm	44	Adrivid;Pushkal;Shagnik;...	27/02/26, 1:00 pm	03/03/26, 1:00 pm	27/02/26, 12:00 pm	03/03/26, 12:00 pm	0 days
46		⊟**Frontend Development**	28 days	**03/02/26, 1:00 pm**	**13/03/26, 1:00 pm**			**03/02/26, 1:00 pm**	**13/03/26, 1:00 pm**	**03/03/26, 12:00 pm**	**27/03/26, 1:00 pm**	**10 days**
47		Web Dashboard	2 days	03/02/26, 1:00 pm	05/02/26, 1:00 pm	39	Shagnik	03/02/26, 1:00 pm	05/02/26, 1:00 pm	19/03/26, 12:00 pm	23/03/26, 12:00 pm	32 days
48		Android UI	2 days	05/02/26, 1:00 pm	09/02/26, 1:00 pm	47	Shagnik	05/02/26, 1:00 pm	09/02/26, 1:00 pm	23/03/26, 12:00 pm	25/03/26, 12:00 pm	32 days
49		User UI	1 day	09/02/26, 1:00 pm	10/02/26, 1:00 pm	48	Shagnik	09/02/26, 1:00 pm	10/02/26, 1:00 pm	25/03/26, 12:00 pm	26/03/26, 12:00 pm	32 days
50		Dealership UI	1 day	10/02/26, 1:00 pm	11/02/26, 1:00 pm	49	Shagnik	10/02/26, 1:00 pm	11/02/26, 1:00 pm	26/03/26, 12:00 pm	27/03/26, 1:00 pm	32 days
51		Event visualization & logs	1 day	03/03/26, 1:00 pm	04/03/26, 1:00 pm	45	Pushkal;Shagnik	03/03/26, 1:00 pm	04/03/26, 1:00 pm	03/03/26, 12:00 pm	04/03/26, 12:00 pm	0 days
52		Report Generation - Visual Logs for User	1 day	04/03/26, 1:00 pm	05/03/26, 1:00 pm	51	Pushkal;Shagnik;Vaibhav	04/03/26, 1:00 pm	05/03/26, 1:00 pm	04/03/26, 12:00 pm	05/03/26, 12:00 pm	0 days
53		Digital Twin Visualization	1 day	12/03/26, 1:00 pm	13/03/26, 1:00 pm	37	Shagnik	12/03/26, 1:00 pm	13/03/26, 1:00 pm	12/03/26, 12:00 pm	13/03/26, 12:00 pm	0 days
54		⊟**Integration**	4 days	**13/03/26, 1:00 pm**	**19/03/26, 1:00 pm**			**13/03/26, 1:00 pm**	**19/03/26, 1:00 pm**	**13/03/26, 12:00 pm**	**19/03/26, 12:00 pm**	**0 days**
55		Device to Fog Module Integration	1 day	13/03/26, 1:00 pm	16/03/26, 1:00 pm	53	Adrivid;Pushkal	13/03/26, 1:00 pm	16/03/26, 1:00 pm	13/03/26, 12:00 pm	16/03/26, 12:00 pm	0 days
56		Fog to Cloud Integration	1 day	16/03/26, 1:00 pm	17/03/26, 1:00 pm	55	Pushkal;Shagnik;Vaibhav	16/03/26, 1:00 pm	17/03/26, 1:00 pm	16/03/26, 12:00 pm	17/03/26, 12:00 pm	0 days
57		DB to Backend Intergation	0.5 days	17/03/26, 1:00 pm	17/03/26, 5:00 pm	56	Pushkal;Shagnik;Vaibhav	17/03/26, 1:00 pm	17/03/26, 5:00 pm	17/03/26, 12:00 pm	17/03/26, 5:00 pm	0 days
58		Model Integration	0.5 days	18/03/26, 8:00 am	18/03/26, 1:00 pm	57	Pushkal;Shagnik;Vaibhav	18/03/26, 8:00 am	18/03/26, 1:00 pm	18/03/26, 8:00 am	18/03/26, 12:00 pm	0 days
59		Frontend to Backend Integration	0.5 days	18/03/26, 1:00 pm	18/03/26, 5:00 pm	58	Shagnik	18/03/26, 1:00 pm	18/03/26, 5:00 pm	18/03/26, 12:00 pm	18/03/26, 5:00 pm	0 days
60		Hardware Integration	0.5 days	19/03/26, 8:00 am	19/03/26, 1:00 pm	59	Adrivid;Pushkal	19/03/26, 8:00 am	19/03/26, 1:00 pm	19/03/26, 8:00 am	19/03/26, 12:00 pm	0 days
61		⊟**Testing**	4 days	**19/03/26, 1:00 pm**	**25/03/26, 1:00 pm**			**19/03/26, 1:00 pm**	**25/03/26, 1:00 pm**	**19/03/26, 12:00 pm**	**25/03/26, 12:00 pm**	**0 days**
62		System and Integration Testing	1 day	19/03/26, 1:00 pm	20/03/26, 1:00 pm	60	Adrivid;Pushkal;Shagnik;...	19/03/26, 1:00 pm	20/03/26, 1:00 pm	19/03/26, 12:00 pm	20/03/26, 12:00 pm	0 days
63		Bug fixing and Regression Testing	1 day	20/03/26, 1:00 pm	23/03/26, 1:00 pm	62	Adrivid;Pushkal;Shagnik;...	20/03/26, 1:00 pm	23/03/26, 1:00 pm	20/03/26, 12:00 pm	23/03/26, 12:00 pm	0 days
64		Azure Deployment environment setup	1 day	23/03/26, 1:00 pm	24/03/26, 1:00 pm	63	Pushkal;Shagnik;Vaibhav	23/03/26, 1:00 pm	24/03/26, 1:00 pm	23/03/26, 12:00 pm	24/03/26, 12:00 pm	0 days
65		Final configuration & smoke testing	1 day	24/03/26, 1:00 pm	25/03/26, 1:00 pm	64	Adrivid;Pushkal;Shagnik;...	24/03/26, 1:00 pm	25/03/26, 1:00 pm	24/03/26, 12:00 pm	25/03/26, 12:00 pm	0 days
66		⊟**Closure**	2 days	**25/03/26, 1:00 pm**	**27/03/26, 1:00 pm**			**25/03/26, 1:00 pm**	**27/03/26, 1:00 pm**	**25/03/26, 12:00 pm**	**27/03/26, 12:00 pm**	**0 days**
67		User training & documentation	1 day	25/03/26, 1:00 pm	26/03/26, 1:00 pm	65	Adrivid;Pushkal;Shagnik;...	25/03/26, 1:00 pm	26/03/26, 1:00 pm	25/03/26, 12:00 pm	26/03/26, 12:00 pm	0 days
68		Project closure & handover	1 day	26/03/26, 1:00 pm	27/03/26, 1:00 pm	67	Adrivid;Pushkal;Shagnik;...	26/03/26, 1:00 pm	27/03/26, 1:00 pm	26/03/26, 12:00 pm	27/03/26, 12:00 pm	0 days
69		Finish	0 days	27/03/26, 1:00 pm	27/03/26, 1:00 pm	68		27/03/26, 1:00 pm	27/03/26, 1:00 pm	27/03/26, 12:00 pm	27/03/26, 1:00 pm	0 days

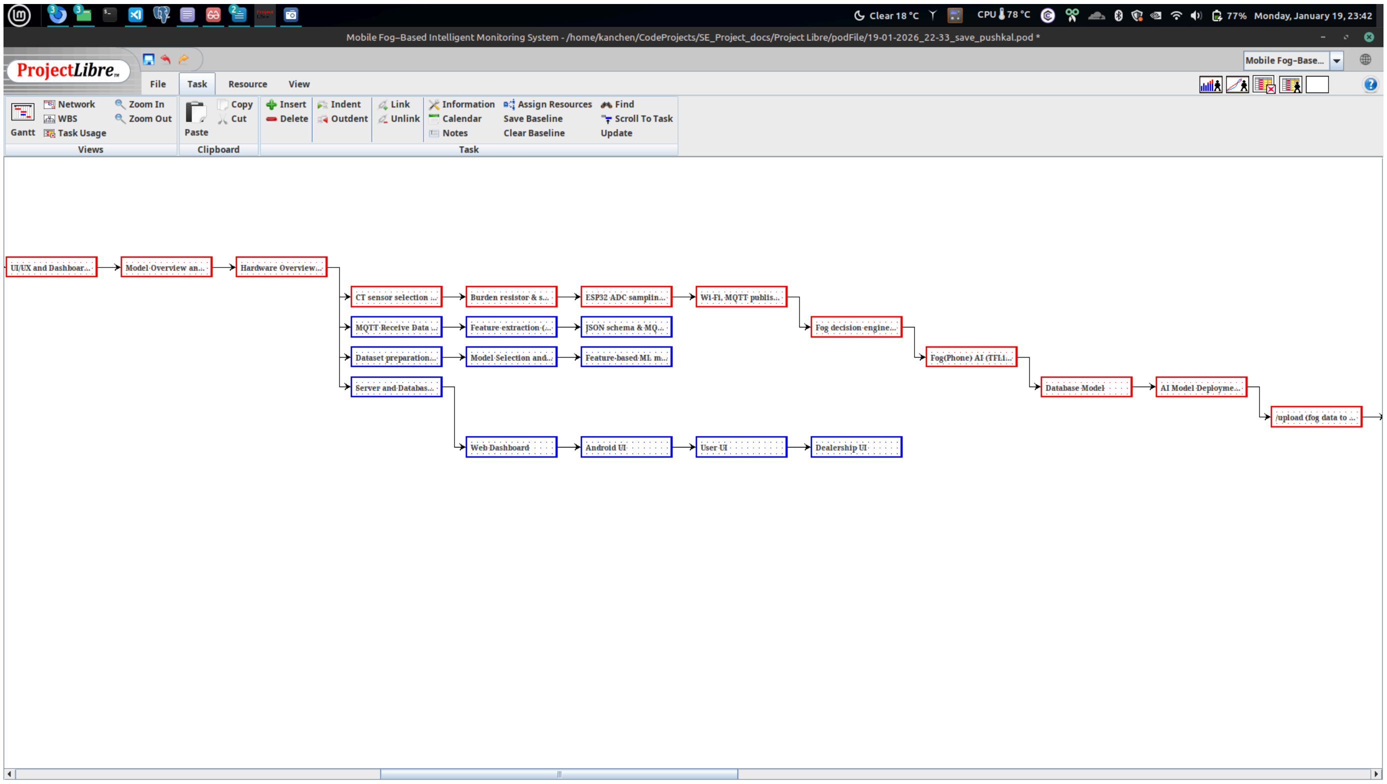
6.2 Gantt Chart.

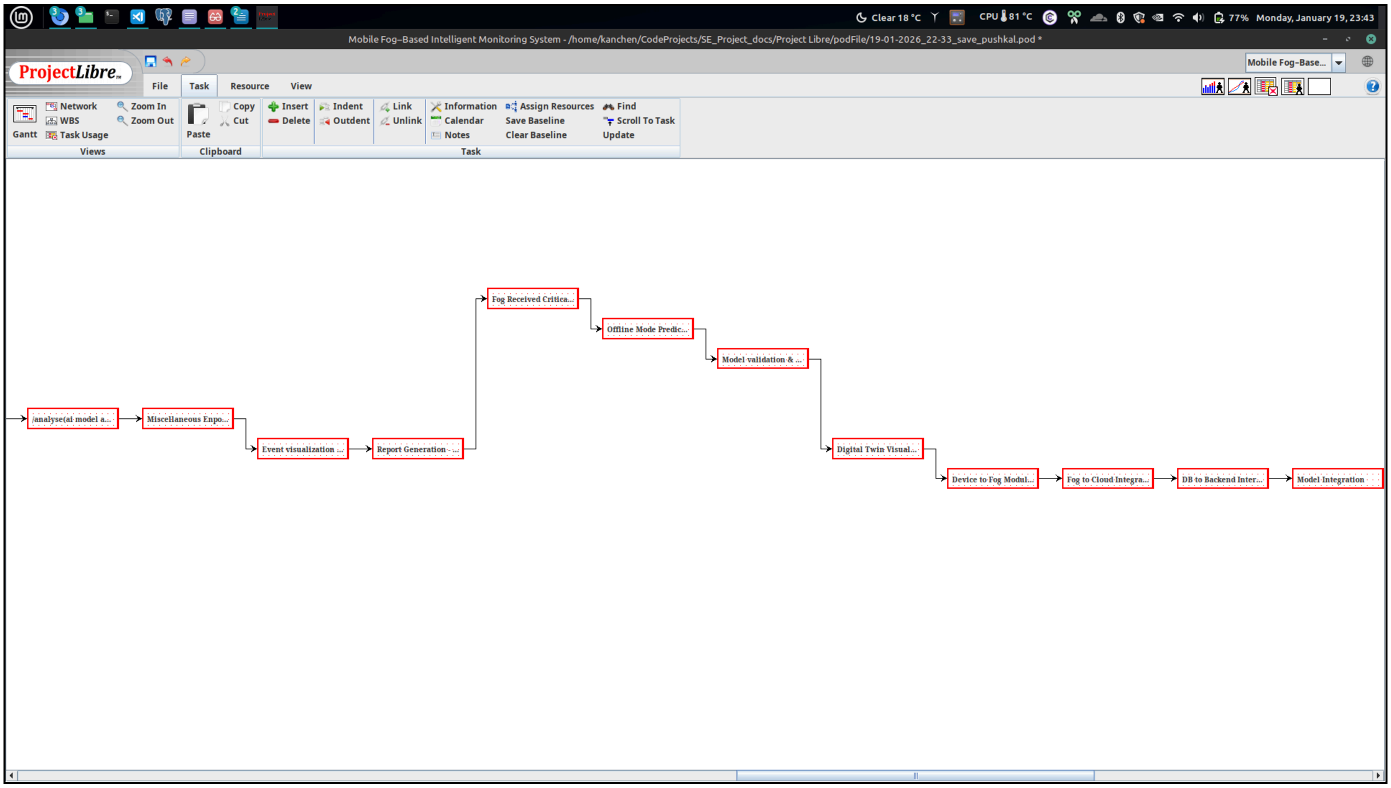


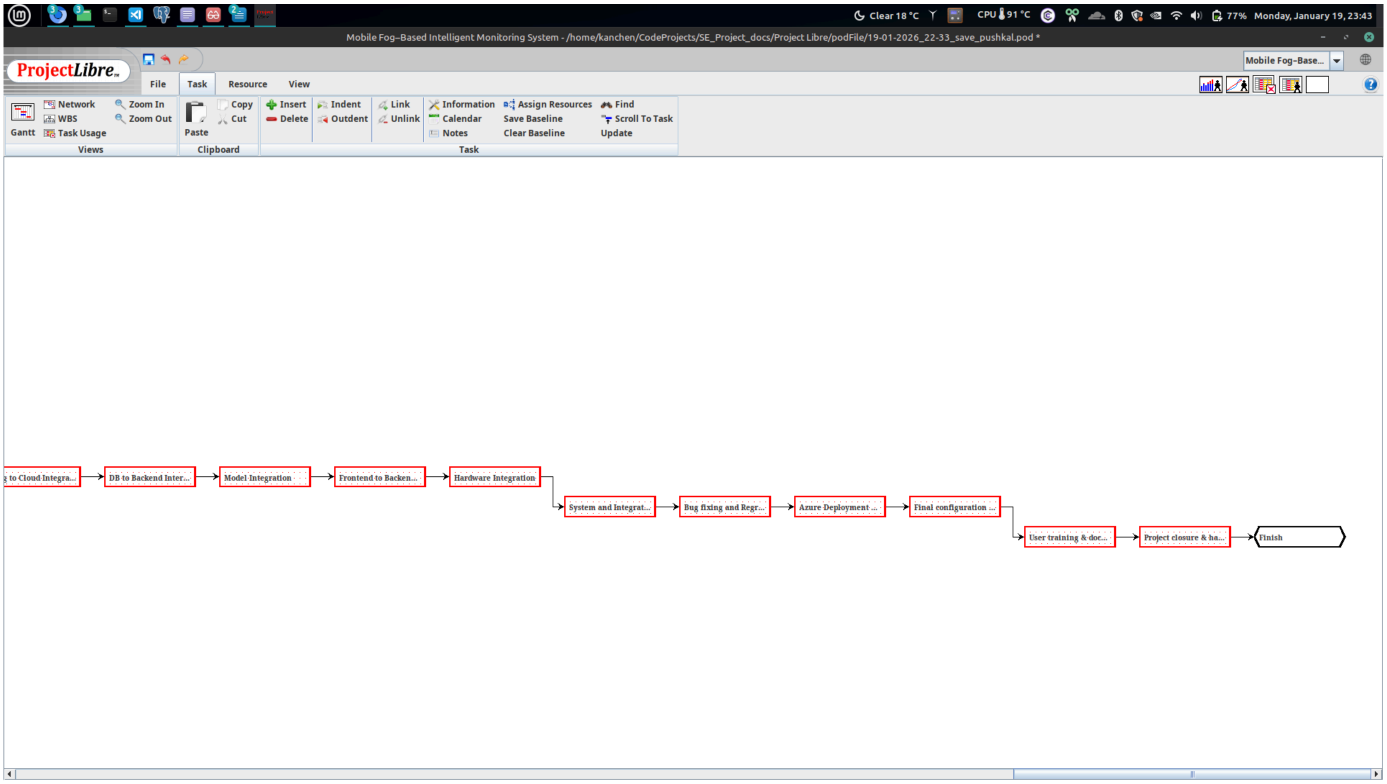

Clear 18 °C
CPU 82 °C
77% Monday, January 19, 23:37
Mobile Fog-Based Intelligent Monitoring System - /home/kanchen/CodeProjects/SE_Project_docs/Project Libre/podFile/19-01-2026_22-33_save_pushkal.pod *
ProjectLibre
Mobile Fog-Base...
Pushkal;Shagnik
Shagnik;Vaibhav
Adrivid;Pushkal;Shagnik;Vaibhav
Shagnik
Shagnik
Shagnik
Shagnik
Pushkal;Shagnik
Pushkal;Shagnik;Vaibhav
Shagnik
Adrivid;Pushkal
Pushkal;Shagnik;Vaibhav
Pushkal;Shagnik;Vaibhav
Pushkal;Shagnik;Vaibhav
Shagnik
Adrivid;Pushkal
Adrivid;Pushkal;Shagnik;Vaibhav
Adrivid;Pushkal;Shagnik;Vaibhav
Pushkal;Shagnik;Vaibhav
Adrivid;Pushkal;Shagnik;Vaibhav
Adrivid;Pushkal;Shagnik;Vaibhav
Adrivid;Pushkal;Shagnik;Vaibhav
04/02

6.3 Activity Network.

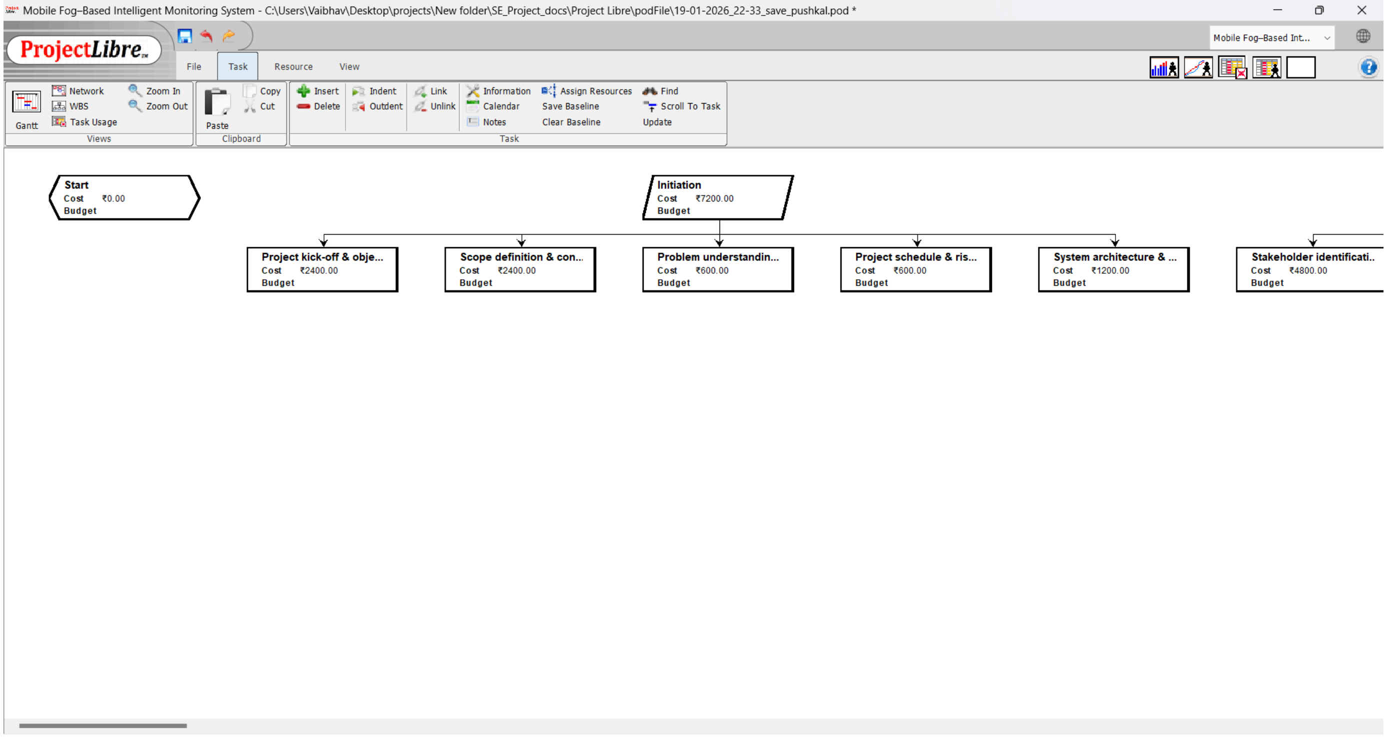





Mobile Fog-Based Intelligent Monitoring System - /home/kanchen/CodeProjects/SE_Project_docs/Project Libre/podFile/19-01-2026_22-33_save_pushkal.pod *
ProjectLibre
File
Task
Resource
View
Network
WBS
Task Usage
Gantt
Zoom In
Zoom Out
Views
Paste
Copy
Cut
Clipboard
Insert
Delete
Indent
Outdent
Link
Unlink
Information
Calendar
Notes
Assign Resources
Save Baseline
Clear Baseline
Find
Scroll To Task
Update
Task
/analyse(ai model a...
Miscellaneous Enpo...
Event visualization ...
Report Generation - ...
Fog Received Critica...
Offline Mode Predic...
Model validation & ...
Digital Twin Visual...
Device to Fog Modul...
Fog to Cloud Integra...
DB to Backend Inter...
Model Integration


Mobile Fog-Based Intelligent Monitoring System - /home/kanchen/CodeProjects/SE_Project_docs/Project Libre/podFile/19-01-2026_22-33_save_pushkal.pod *
ProjectLibre
File
Task
Resource
View
Network
WBS
Task Usage
Gantt
Zoom In
Zoom Out
Views
Paste
Copy
Cut
Clipboard
Insert
Delete
Indent
Outdent
Link
Unlink
Information
Calendar
Notes
Assign Resources
Save Baseline
Clear Baseline
Find
Scroll To Task
Update
Task
g to Cloud Integra...
DB to Backend Inter...
Model Integration
Frontend to Backen...
Hardware Integration
System and Integrat...
Bug fixing and Regr...
Azure Deployment ...
Final configuration ...
User training & doc...
Project closure & ha...
Finish

6.4 WBS



Mobile Fog-Based Intelligent Monitoring System - C:\Users\Vaibhav\Desktop\projects\New folder\SE_Project_docs\Project Libre\podFile\19-01-2026_22-33_save_pushkal.pod *

Start
Cost ₹0.00
Budget

Initiation
Cost ₹7200.00
Budget

Project kick-off & obje...
Cost ₹2400.00
Budget

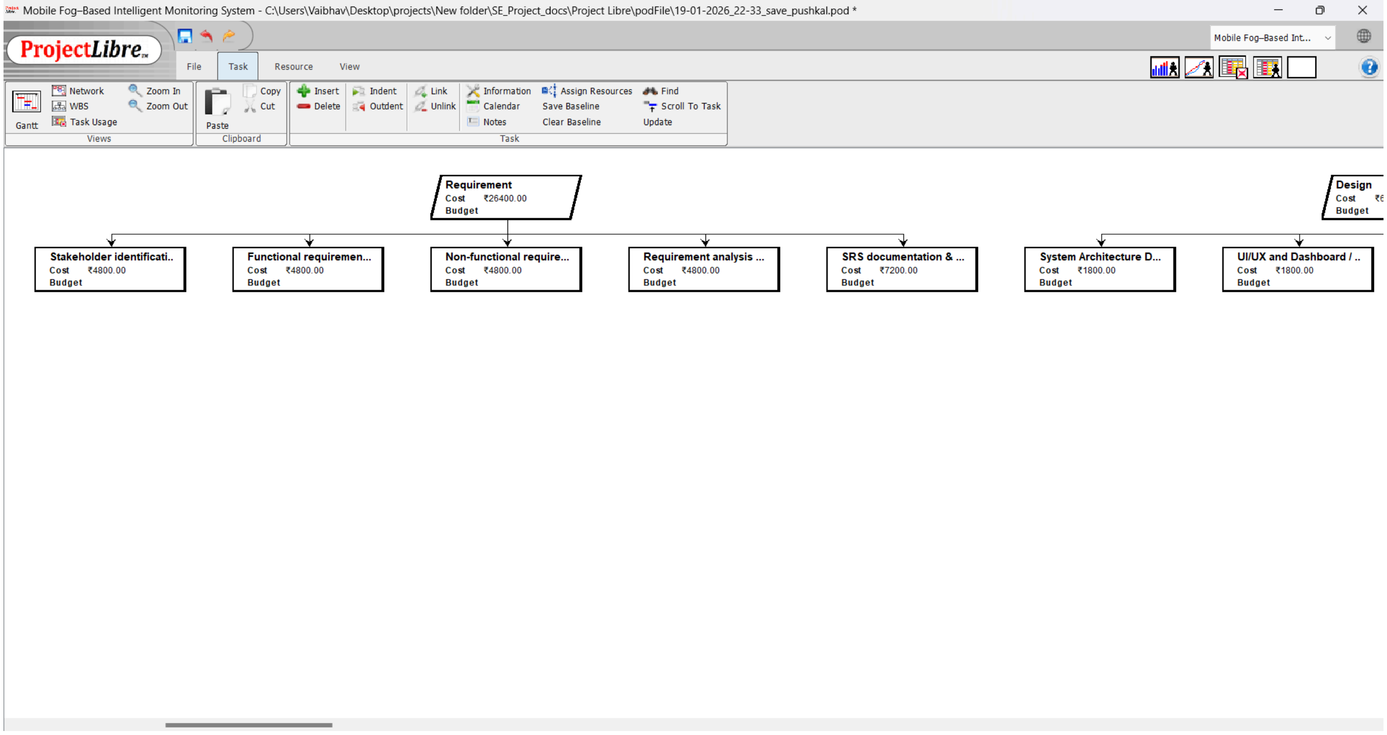
Scope definition & con...
Cost ₹2400.00
Budget

Problem understandin...
Cost ₹600.00
Budget

Project schedule & ris...
Cost ₹600.00
Budget

System architecture & ...
Cost ₹1200.00
Budget

Stakeholder identificati..
Cost ₹4800.00
Budget



Mobile Fog-Based Intelligent Monitoring System - C:\Users\Vaibhav\Desktop\projects\New folder\SE_Project_docs\Project Libre\podFile\19-01-2026_22-33_save_pushkal.pod *

Requirement
Cost ₹26400.00
Budget

Design
Cost ₹6
Budget

Stakeholder identificati..
Cost ₹4800.00
Budget

Functional requiremen...
Cost ₹4800.00
Budget

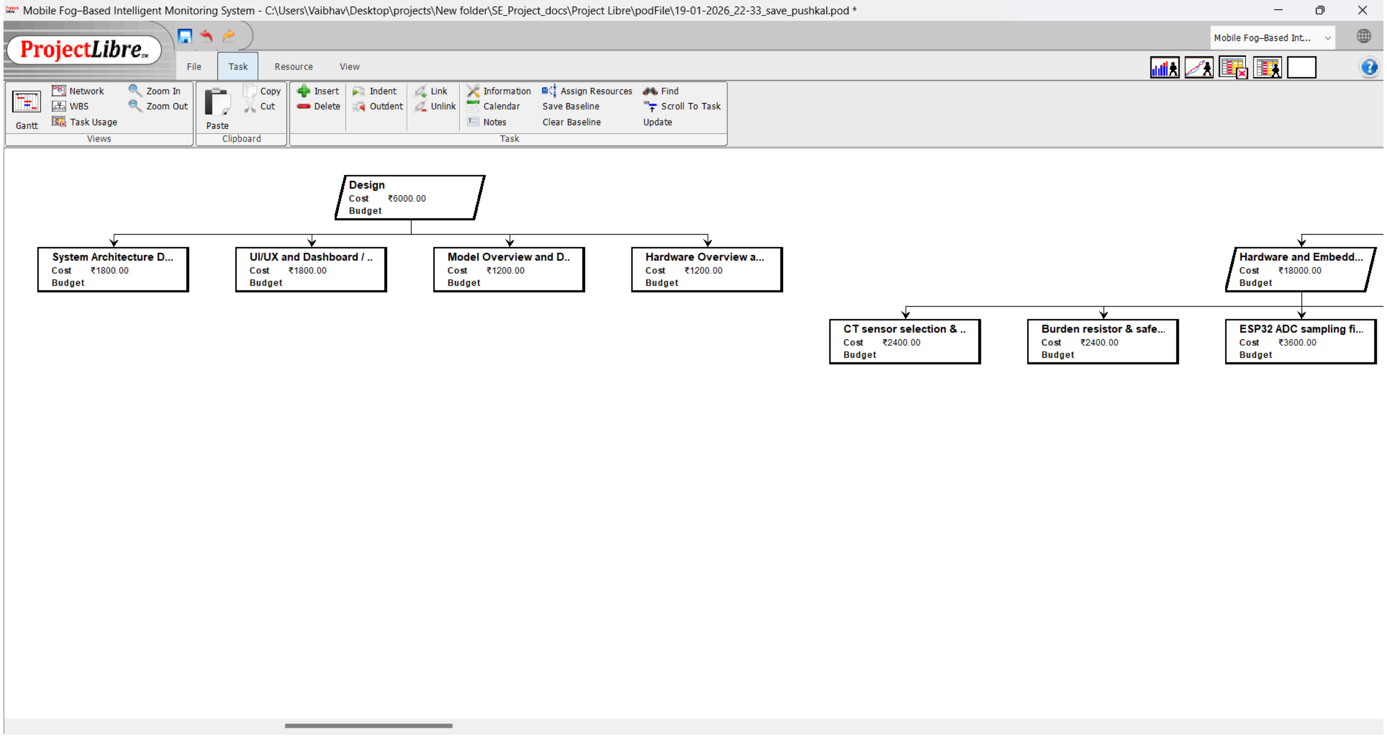
Non-functional require...
Cost ₹4800.00
Budget

Requirement analysis ...
Cost ₹4800.00
Budget

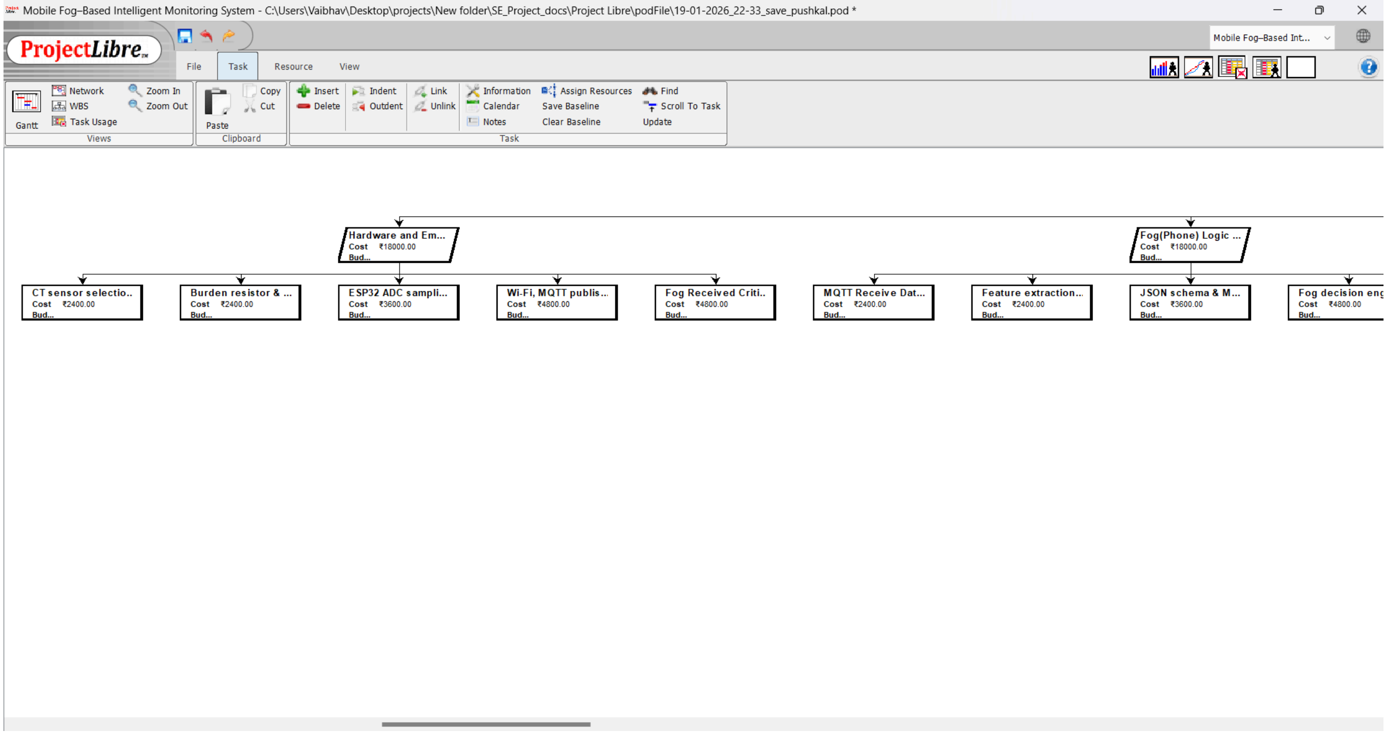
SRS documentation & ...
Cost ₹7200.00
Budget

System Architecture D...
Cost ₹1800.00
Budget

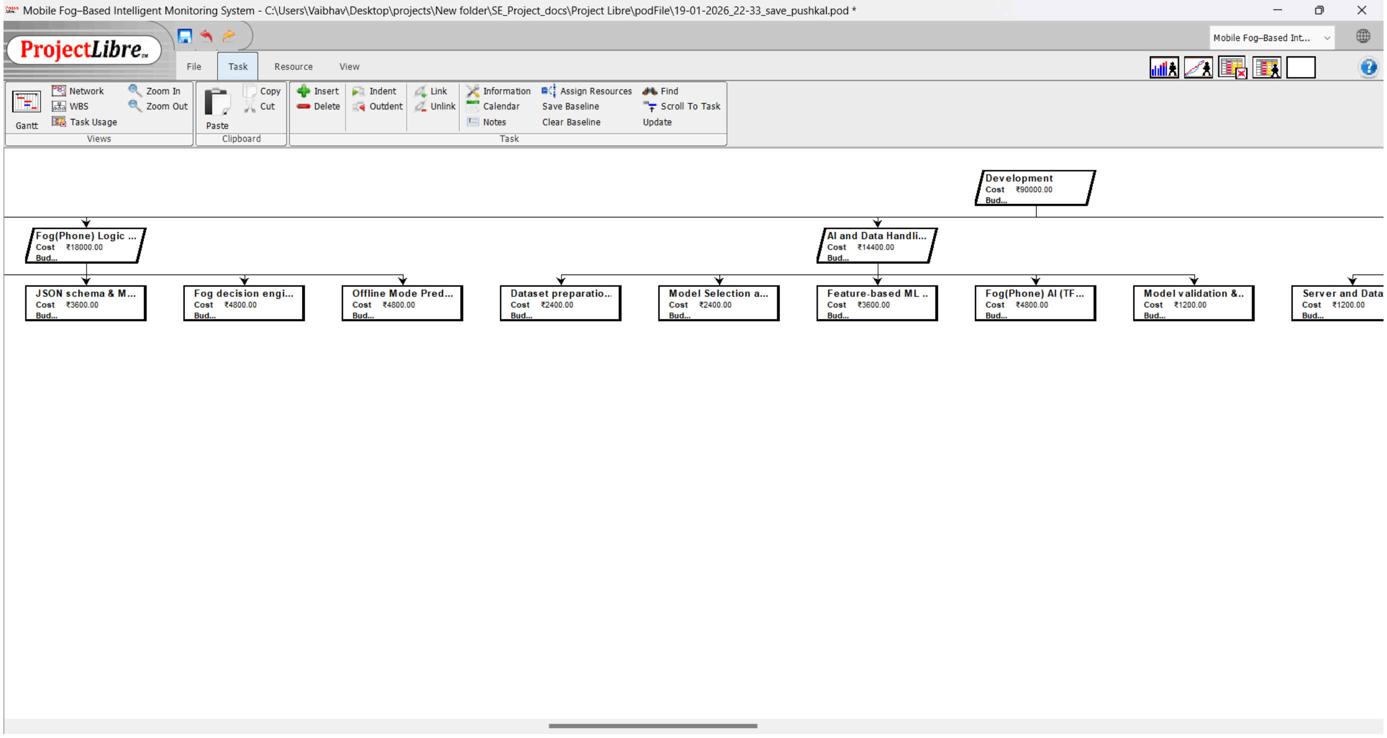
UI/UX and Dashboard / ..
Cost ₹1800.00
Budget



Mobile Fog–Based Intelligent Monitoring System - C:\Users\Vaibhav\Desktop\projects\New folder\SE_Project_docs\Project Libre\podFile\19-01-2026_22-33_save_pushkal.pod *



Mobile Fog–Based Intelligent Monitoring System - C:\Users\Vaibhav\Desktop\projects\New folder\SE_Project_docs\Project Libre\podFile\19-01-2026_22-33_save_pushkal.pod *



Development
Cost ₹90000.00
Bud...

Fog(Phone) Logic ...
Cost ₹18000.00
Bud...

AI and Data Handli...
Cost ₹14400.00
Bud...

JSON schema & M...
Cost ₹3600.00
Bud...

Fog decision engi...
Cost ₹4800.00
Bud...

Offline Mode Pred...
Cost ₹4800.00
Bud...

Dataset preparatio...
Cost ₹2400.00
Bud...

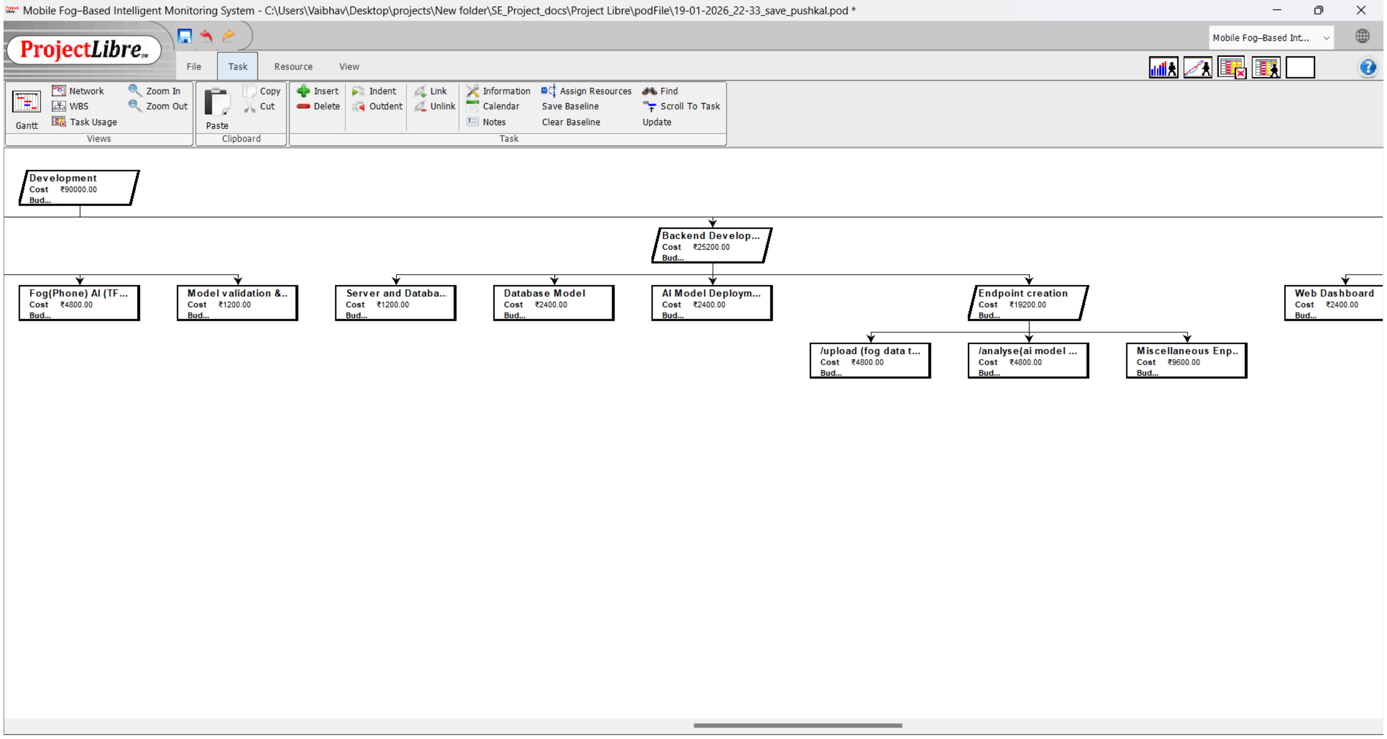
Model Selection a...
Cost ₹2400.00
Bud...

Feature-based ML ..
Cost ₹3600.00
Bud...

Fog(Phone) AI (TF...
Cost ₹4800.00
Bud...

Model validation &..
Cost ₹1200.00
Bud...

Server and Data
Cost ₹1200.00
Bud...



Development
Cost ₹90000.00
Bud...

Backend Develop...
Cost ₹25200.00
Bud...

Fog(Phone) AI (TF...
Cost ₹4800.00
Bud...

Model validation &..
Cost ₹1200.00
Bud...

Server and Databa...
Cost ₹1200.00
Bud...

Database Model
Cost ₹2400.00
Bud...

AI Model Deploym...
Cost ₹2400.00
Bud...

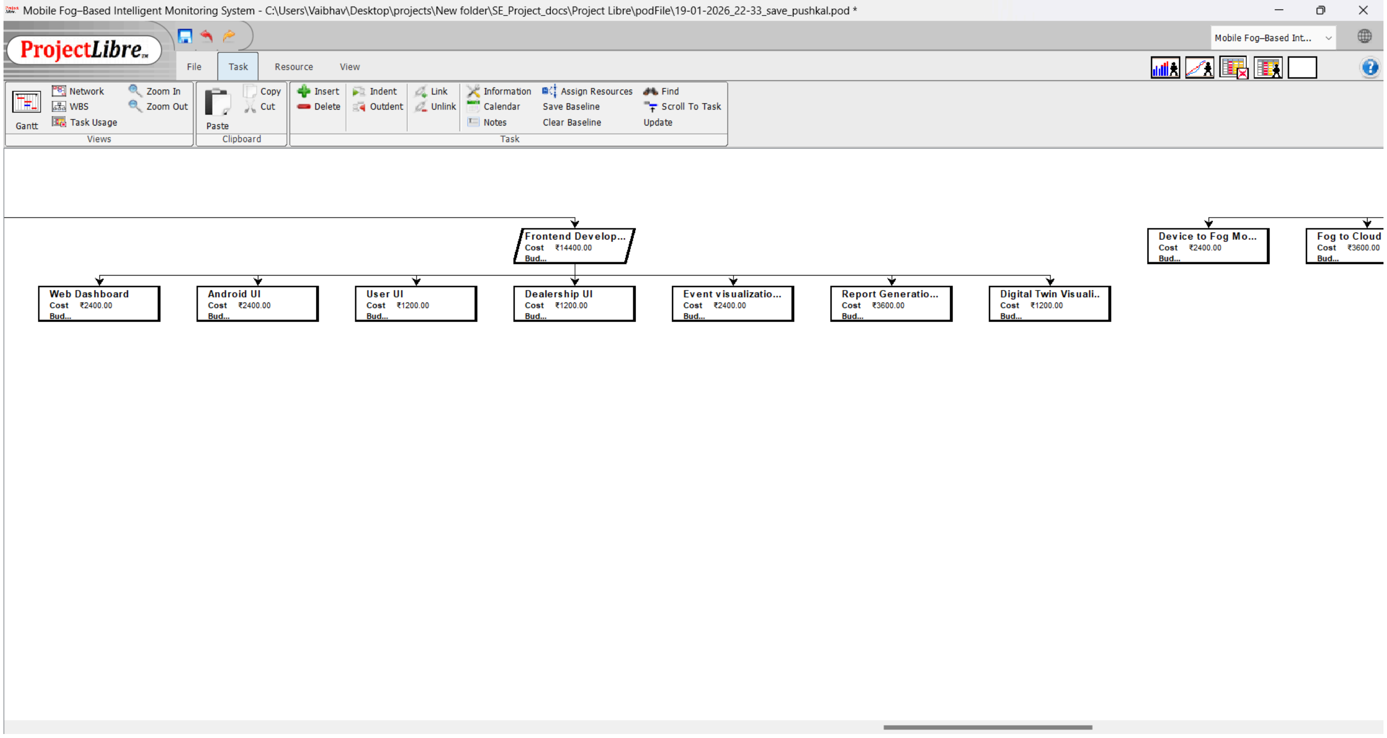
Endpoint creation
Cost ₹19200.00
Bud...

Web Dashboard
Cost ₹2400.00
Bud...

/upload (fog data t...
Cost ₹4800.00
Bud...

/analyse(ai model ...
Cost ₹4800.00
Bud...

Miscellaneous Enp..
Cost ₹9600.00
Bud...



Mobile Fog–Based Intelligent Monitoring System - C:\Users\Vaibhav\Desktop\projects\New folder\SE_Project_docs\Project Libre\podFile\19-01-2026_22-33_save_pushkal.pod *

Frontend Develop...
Cost ₹14400.00
Bud...

Web Dashboard
Cost ₹2400.00
Bud...

Android UI
Cost ₹2400.00
Bud...

User UI
Cost ₹1200.00
Bud...

Dealership UI
Cost ₹1200.00
Bud...

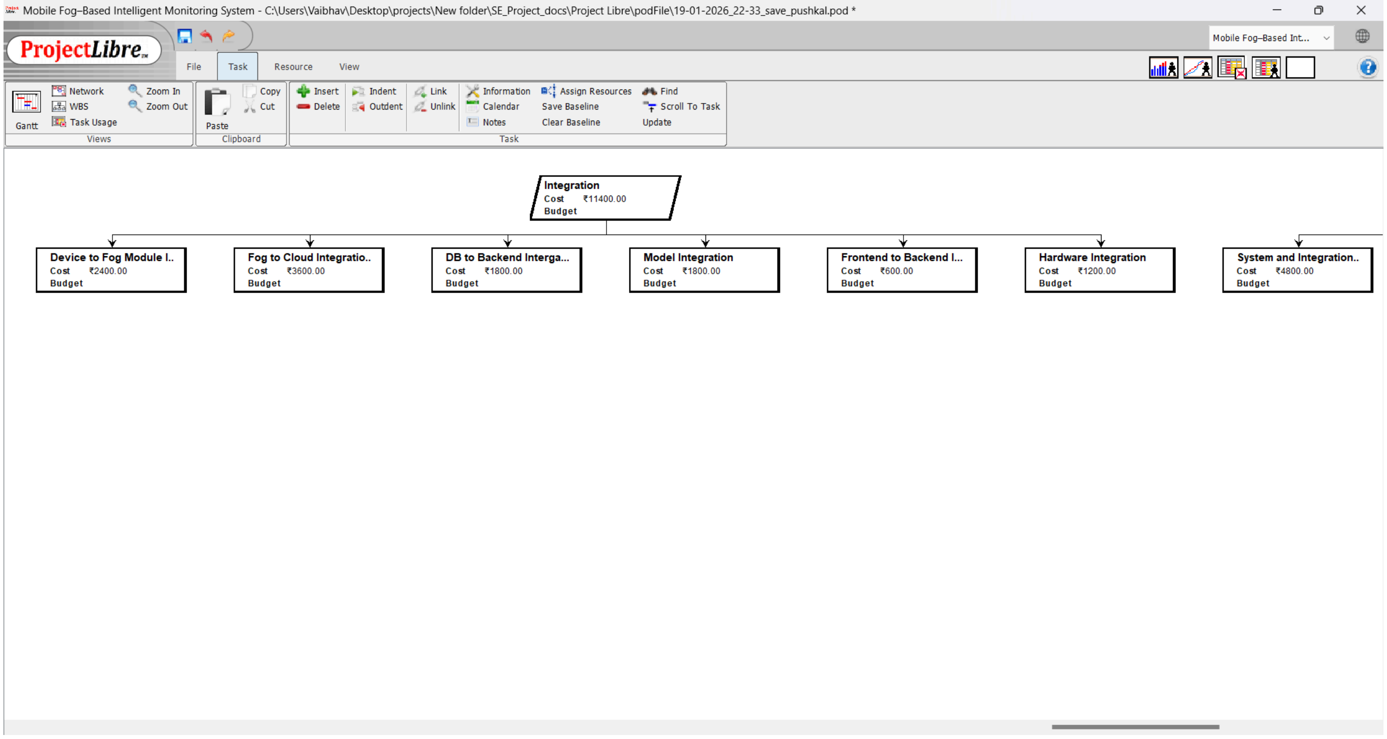
Event visualizatio...
Cost ₹2400.00
Bud...

Report Generatio...
Cost ₹3600.00
Bud...

Digital Twin Visuali..
Cost ₹1200.00
Bud...

Device to Fog Mo...
Cost ₹2400.00
Bud...

Fog to Cloud
Cost ₹3600.00
Bud...



Mobile Fog–Based Intelligent Monitoring System - C:\Users\Vaibhav\Desktop\projects\New folder\SE_Project_docs\Project Libre\podFile\19-01-2026_22-33_save_pushkal.pod *

Integration
Cost ₹11400.00
Budget

Device to Fog Module I..
Cost ₹2400.00
Budget

Fog to Cloud Integratio..
Cost ₹3600.00
Budget

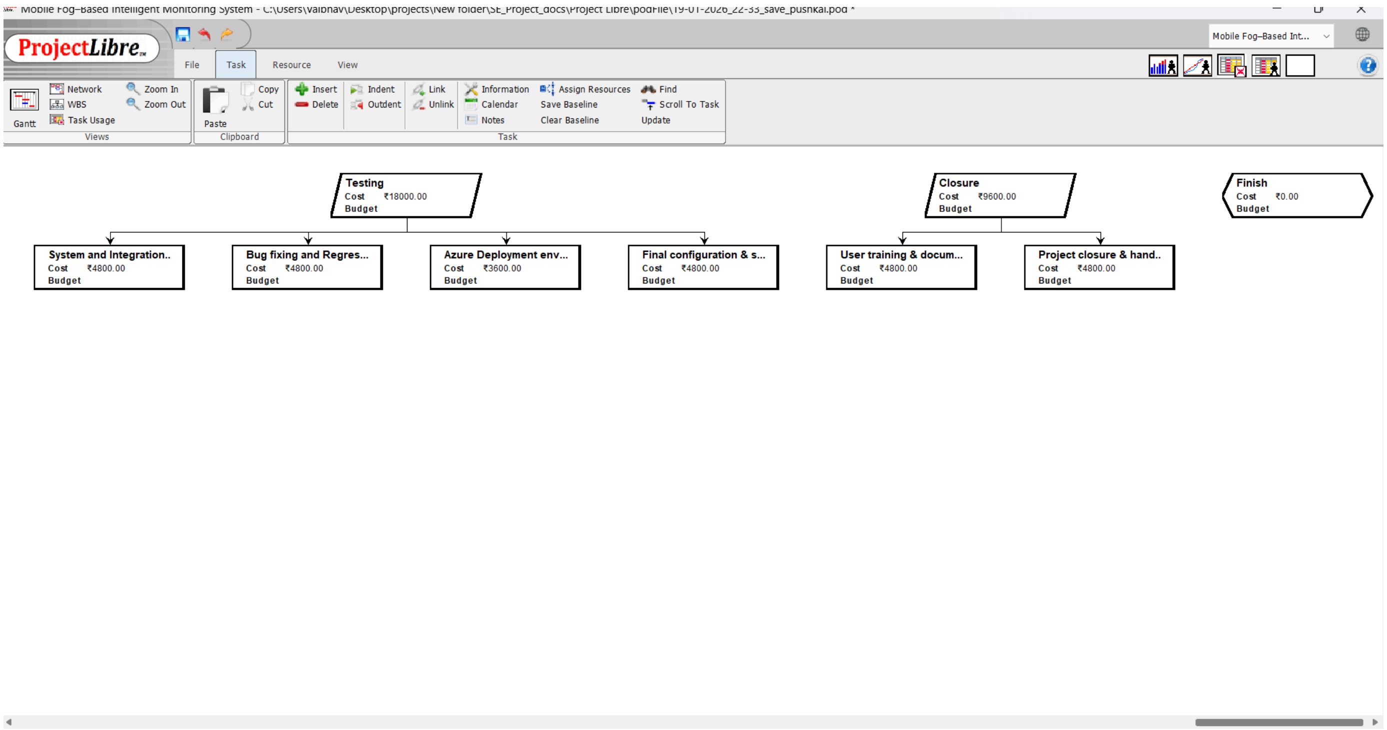
DB to Backend Interga...
Cost ₹1800.00
Budget

Model Integration
Cost ₹1800.00
Budget

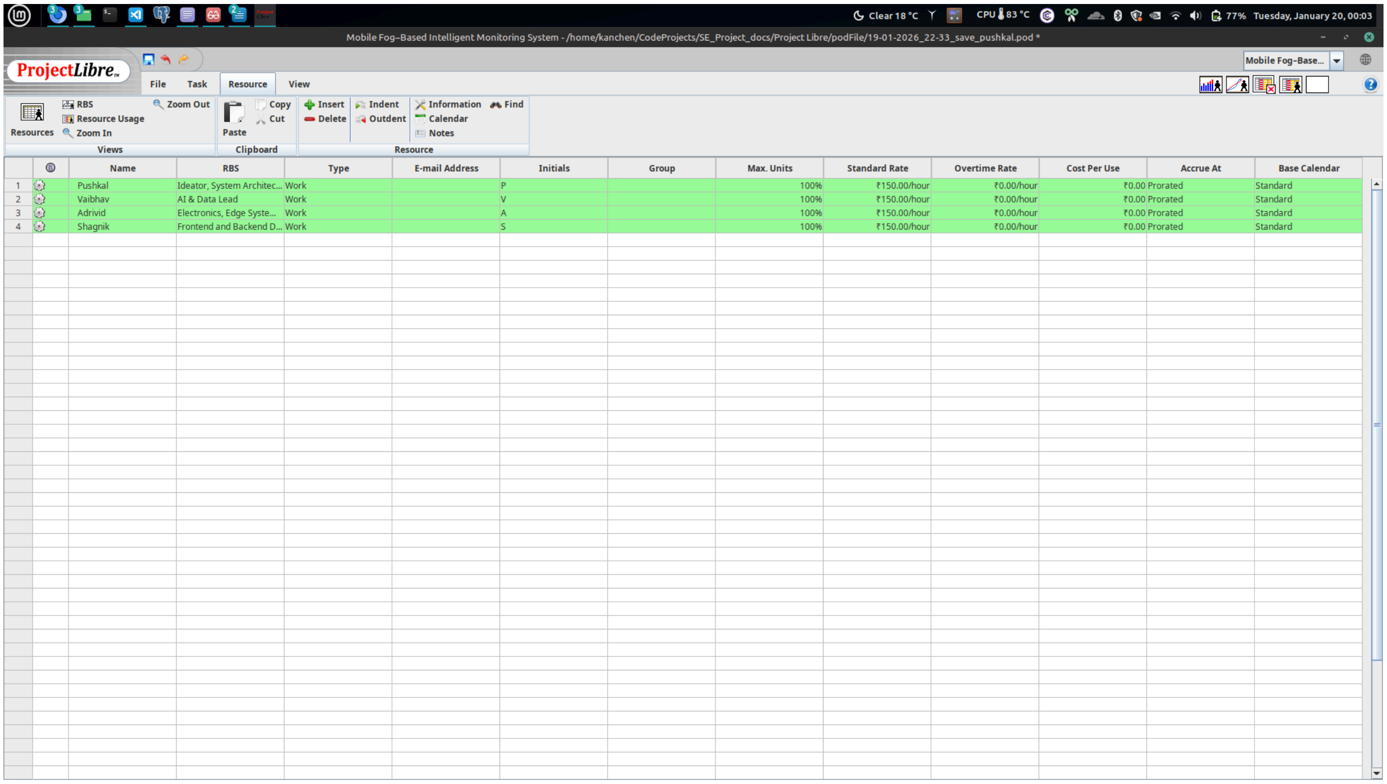
Frontend to Backend I...
Cost ₹600.00
Budget

Hardware Integration
Cost ₹1200.00
Budget

System and Integration..
Cost ₹4800.00
Budget


Mobile Fog-Based Intelligent Monitoring System - C:\Users\vaibhav\Desktop\projects\New folder\SE_Project_docs\Project Libre\podFile\19-01-2026_22-33_save_pushkal.pod *
ProjectLibre
File
Task
Resource
View
Mobile Fog-Based Int...
Gantt
Network
WBS
Task Usage
Zoom In
Zoom Out
Views
Paste
Copy
Cut
Clipboard
Insert
Delete
Indent
Outdent
Link
Unlink
Information
Calendar
Notes
Assign Resources
Save Baseline
Clear Baseline
Find
Scroll To Task
Update
Task
Testing
Cost ₹18000.00
Budget
Closure
Cost ₹9600.00
Budget
Finish
Cost ₹0.00
Budget
System and Integration..
Cost ₹4800.00
Budget
Bug fixing and Regres...
Cost ₹4800.00
Budget
Azure Deployment env...
Cost ₹3600.00
Budget
Final configuration & s...
Cost ₹4800.00
Budget
User training & docum...
Cost ₹4800.00
Budget
Project closure & hand..
Cost ₹4800.00
Budget

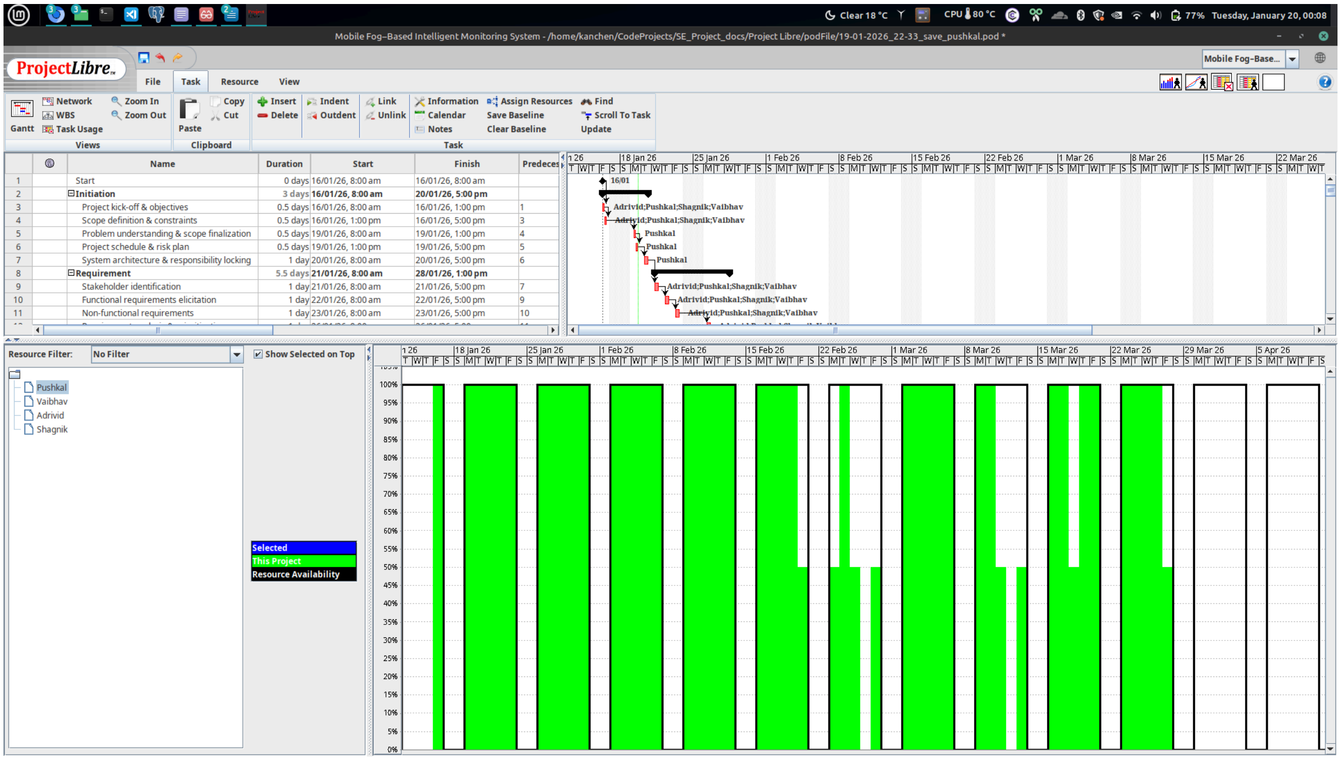
6.5 Resources List



	ⓘ	Name	RBS	Type	E-mail Address	Initials	Group	Max. Units	Standard Rate	Overtime Rate	Cost Per Use	Accrue At	Base Calendar
1		Pushkal	Ideator, System Architec...	Work		P		100%	₹150.00/hour	₹0.00/hour	₹0.00	Prorated	Standard
2		Vaibhav	AI & Data Lead	Work		V		100%	₹150.00/hour	₹0.00/hour	₹0.00	Prorated	Standard
3		Adrivid	Electronics, Edge Syste...	Work		A		100%	₹150.00/hour	₹0.00/hour	₹0.00	Prorated	Standard
4		Shagnik	Frontend and Backend D...	Work		S		100%	₹150.00/hour	₹0.00/hour	₹0.00	Prorated	Standard

6.6 Resource Allocation Histogram

Pushkal Gupta



Mobile Fog–Based Intelligent Monitoring System - /home/kanchen/CodeProjects/SE_Project_docs/Project Libre/podFile/19-01-2026_22-33_save_pushkal.pod *

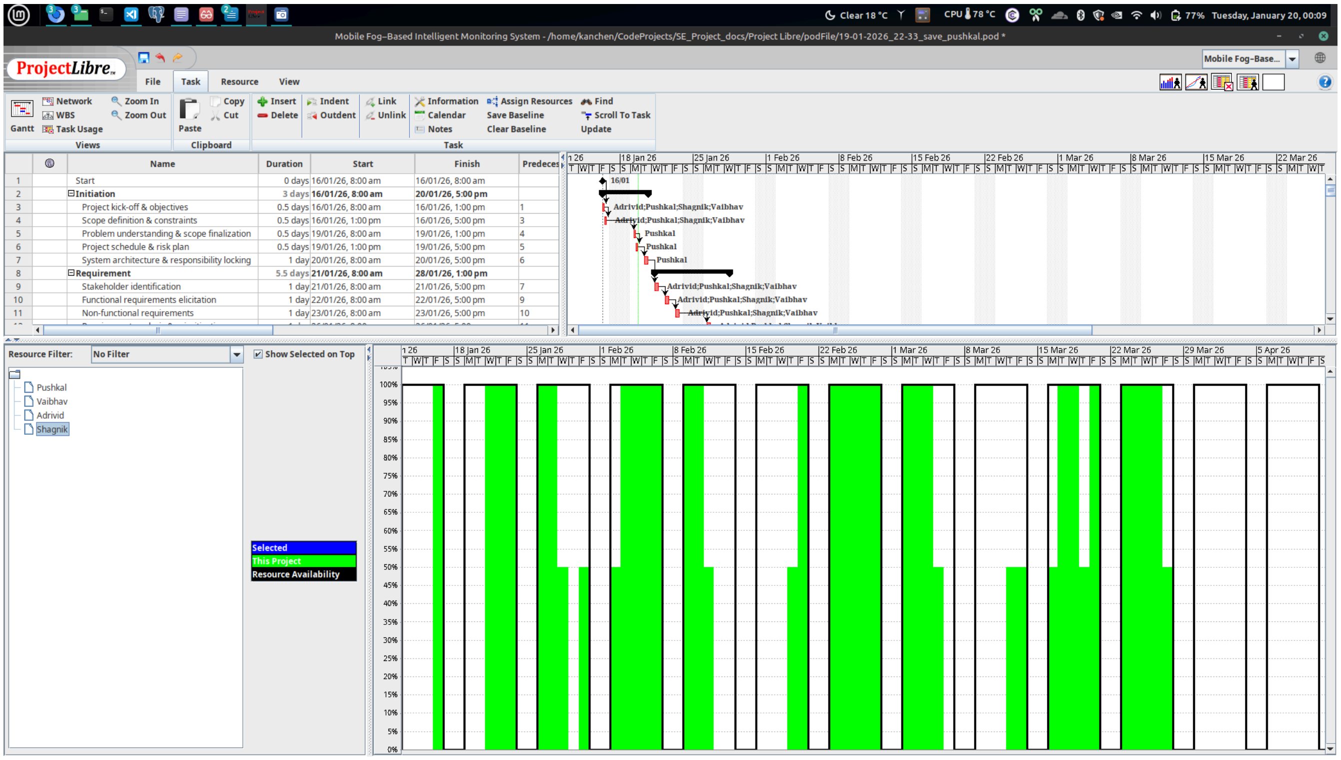
		Name	Duration	Start	Finish	Predeces
1		Start	0 days	16/01/26, 8:00 am	16/01/26, 8:00 am	
2		⊟**Initiation**	3 days	**16/01/26, 8:00 am**	**20/01/26, 5:00 pm**	
3		Project kick-off & objectives	0.5 days	16/01/26, 8:00 am	16/01/26, 1:00 pm	1
4		Scope definition & constraints	0.5 days	16/01/26, 1:00 pm	16/01/26, 5:00 pm	3
5		Problem understanding & scope finalization	0.5 days	19/01/26, 8:00 am	19/01/26, 1:00 pm	4
6		Project schedule & risk plan	0.5 days	19/01/26, 1:00 pm	19/01/26, 5:00 pm	5
7		System architecture & responsibility locking	1 day	20/01/26, 8:00 am	20/01/26, 5:00 pm	6
8		⊟**Requirement**	5.5 days	**21/01/26, 8:00 am**	**28/01/26, 1:00 pm**	
9		Stakeholder identification	1 day	21/01/26, 8:00 am	21/01/26, 5:00 pm	7
10		Functional requirements elicitation	1 day	22/01/26, 8:00 am	22/01/26, 5:00 pm	9
11		Non-functional requirements	1 day	23/01/26, 8:00 am	23/01/26, 5:00 pm	10

Resource Filter: No Filter

☑ Show Selected on Top

- Pushkal
- Vaibhav
- Adrivid
- Shagnik

Shagnik Paul



Mobile Fog–Based Intelligent Monitoring System - /home/kanchen/CodeProjects/SE_Project_docs/Project Libre/podFile/19-01-2026_22-33_save_pushkal.pod *

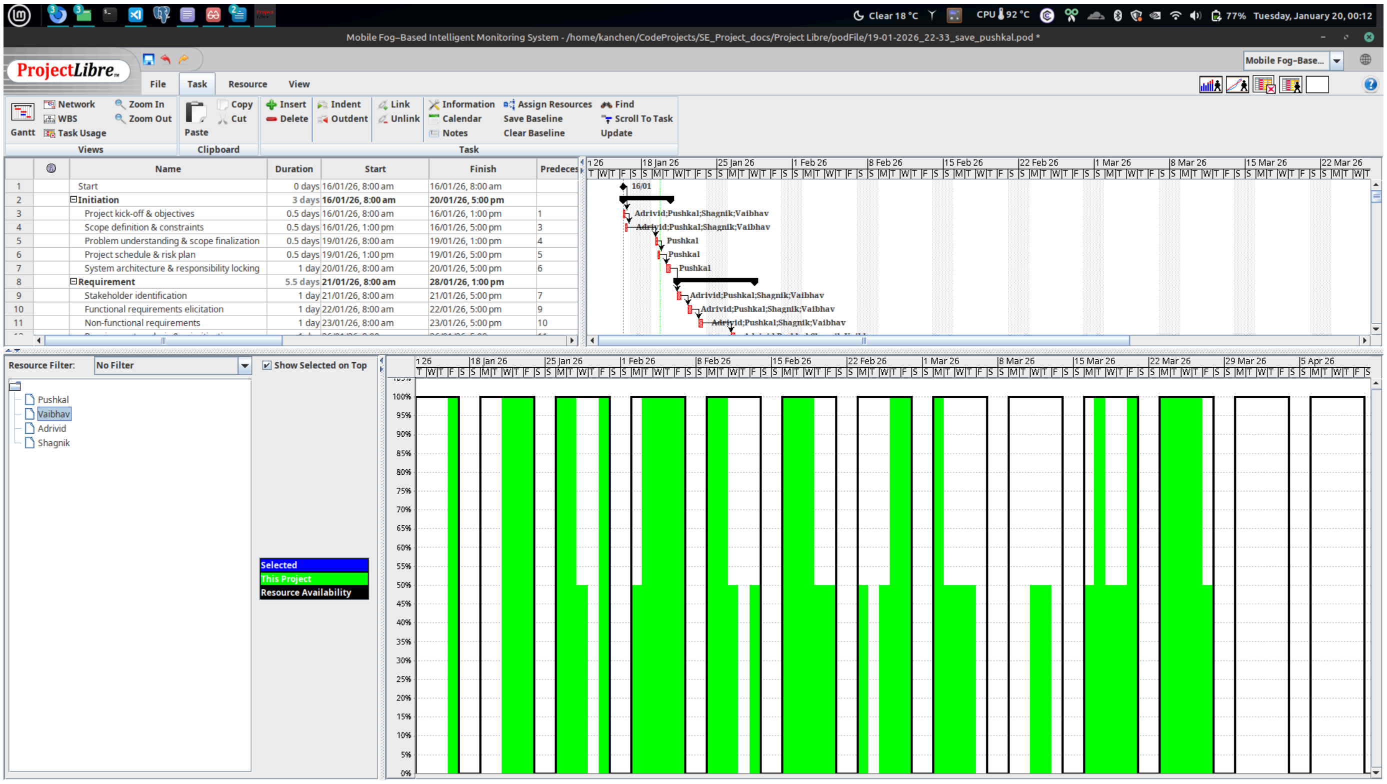
		Name	Duration	Start	Finish	Predeces
1		Start	0 days	16/01/26, 8:00 am	16/01/26, 8:00 am	
2		⊟**Initiation**	3 days	**16/01/26, 8:00 am**	**20/01/26, 5:00 pm**	
3		Project kick-off & objectives	0.5 days	16/01/26, 8:00 am	16/01/26, 1:00 pm	1
4		Scope definition & constraints	0.5 days	16/01/26, 1:00 pm	16/01/26, 5:00 pm	3
5		Problem understanding & scope finalization	0.5 days	19/01/26, 8:00 am	19/01/26, 1:00 pm	4
6		Project schedule & risk plan	0.5 days	19/01/26, 1:00 pm	19/01/26, 5:00 pm	5
7		System architecture & responsibility locking	1 day	20/01/26, 8:00 am	20/01/26, 5:00 pm	6
8		⊟**Requirement**	5.5 days	**21/01/26, 8:00 am**	**28/01/26, 1:00 pm**	
9		Stakeholder identification	1 day	21/01/26, 8:00 am	21/01/26, 5:00 pm	7
10		Functional requirements elicitation	1 day	22/01/26, 8:00 am	22/01/26, 5:00 pm	9
11		Non-functional requirements	1 day	23/01/26, 8:00 am	23/01/26, 5:00 pm	10

Resource Filter: No Filter

☑ Show Selected on Top

- Pushkal
- Vaibhav
- Adrivid
- Shagnik

Vaibhav Jain

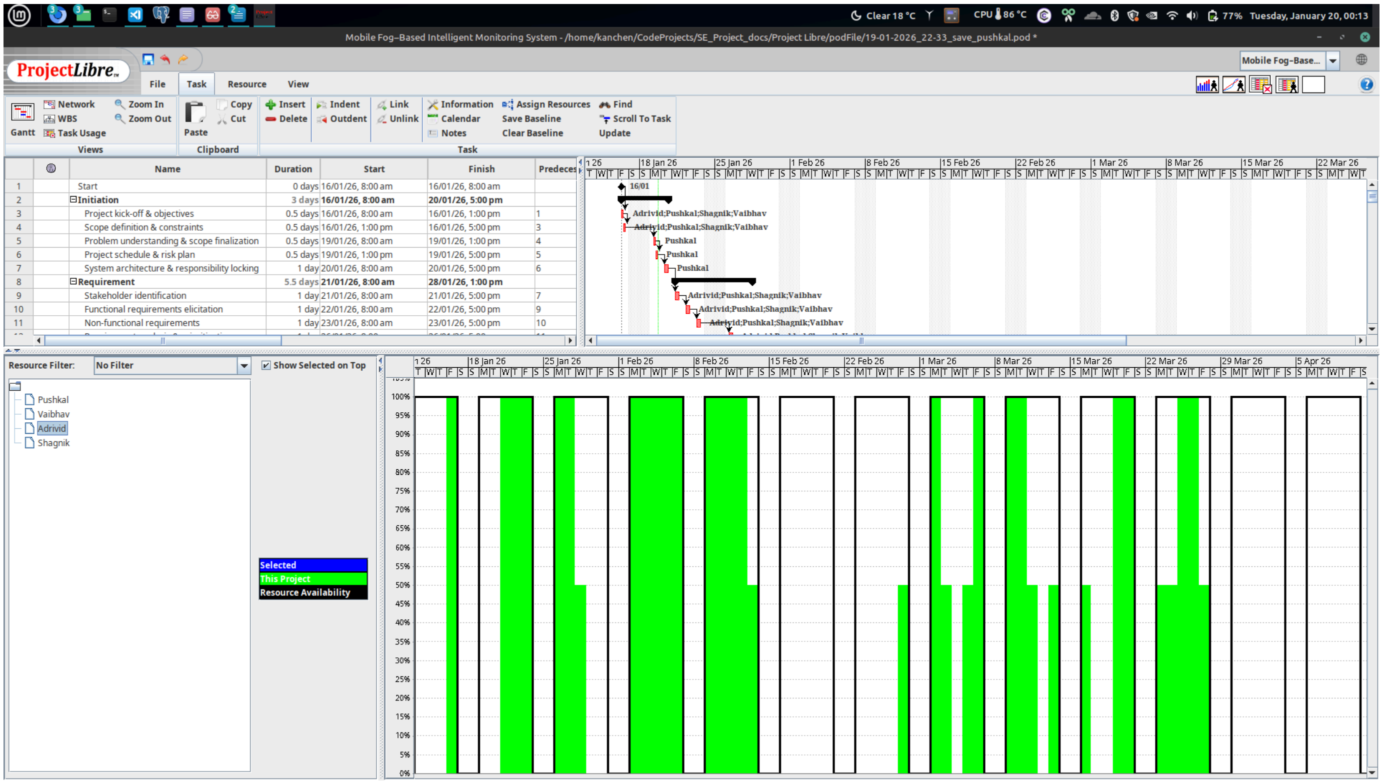


Mobile Fog-Based Intelligent Monitoring System - /home/kanchen/CodeProjects/SE_Project_docs/Project Libre/podFile/19-01-2026_22-33_save_pushkal.pod *

	Name	Duration	Start	Finish	Predeces
1	Start	0 days	16/01/26, 8:00 am	16/01/26, 8:00 am	
2	**Initiation**	3 days	**16/01/26, 8:00 am**	**20/01/26, 5:00 pm**	
3	Project kick-off & objectives	0.5 days	16/01/26, 8:00 am	16/01/26, 1:00 pm	1
4	Scope definition & constraints	0.5 days	16/01/26, 1:00 pm	16/01/26, 5:00 pm	3
5	Problem understanding & scope finalization	0.5 days	19/01/26, 8:00 am	19/01/26, 1:00 pm	4
6	Project schedule & risk plan	0.5 days	19/01/26, 1:00 pm	19/01/26, 5:00 pm	5
7	System architecture & responsibility locking	1 day	20/01/26, 8:00 am	20/01/26, 5:00 pm	6
8	**Requirement**	5.5 days	**21/01/26, 8:00 am**	**28/01/26, 1:00 pm**	
9	Stakeholder identification	1 day	21/01/26, 8:00 am	21/01/26, 5:00 pm	7
10	Functional requirements elicitation	1 day	22/01/26, 8:00 am	22/01/26, 5:00 pm	9
11	Non-functional requirements	1 day	23/01/26, 8:00 am	23/01/26, 5:00 pm	10

Resource Filter: No Filter ☑ Show Selected on Top

Adrivid Mishra



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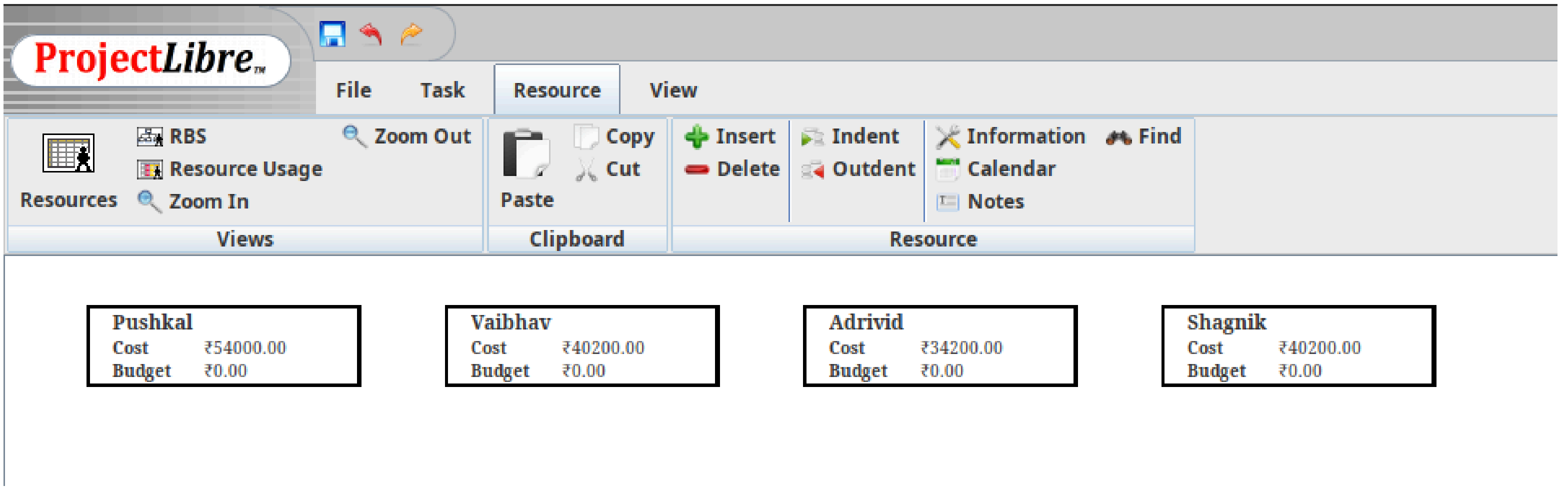
Resource Filter: No Filter ☑ Show Selected on Top

6.7 R.B.S.



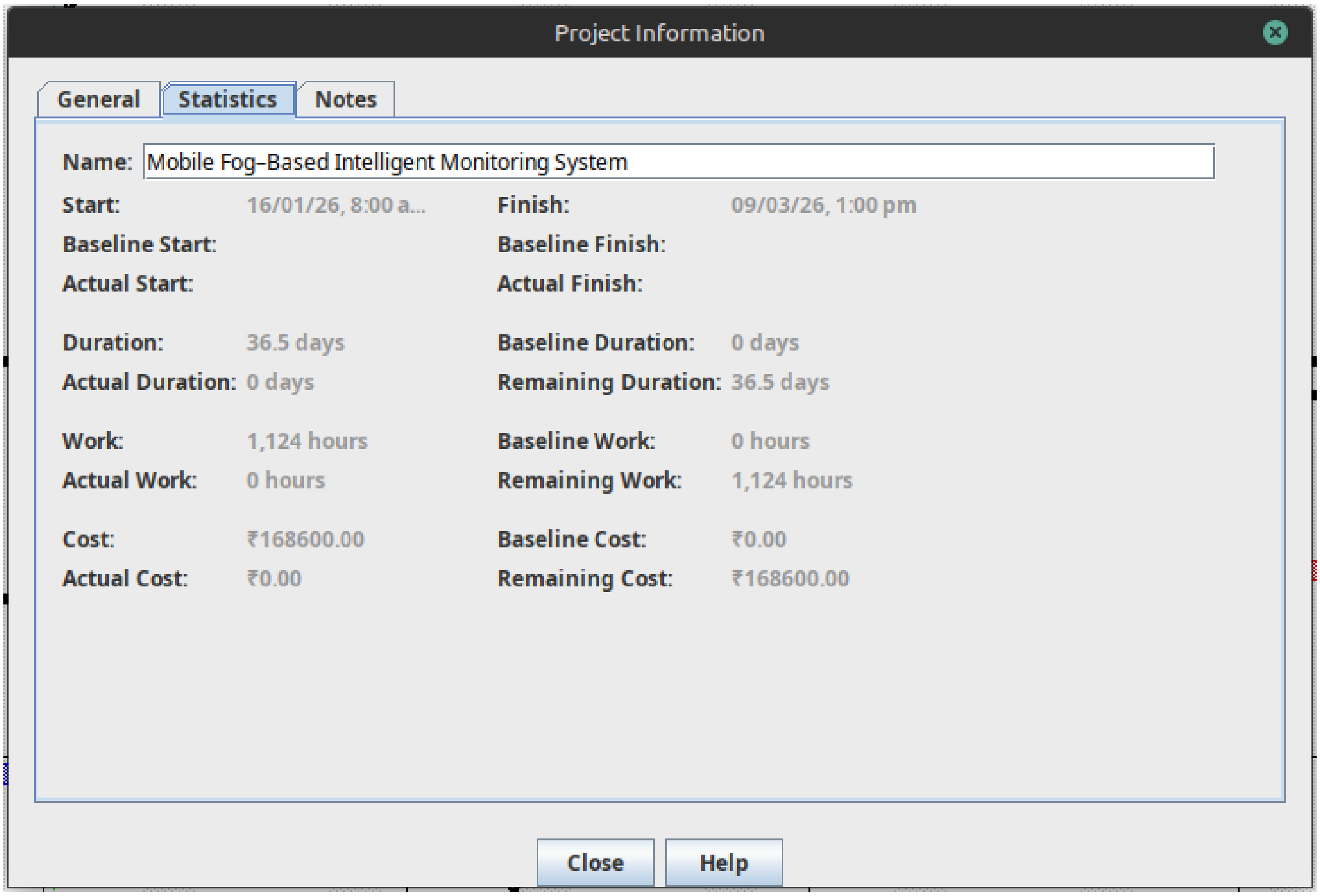
Pushkal
Cost ₹54000.00
Budget ₹0.00

Vaibhav
Cost ₹40200.00
Budget ₹0.00

Adrivid
Cost ₹34200.00
Budget ₹0.00

Shagnik
Cost ₹40200.00
Budget ₹0.00

6.8 Project Information (Statistics)



Name: Mobile Fog-Based Intelligent Monitoring System

Start:	16/01/26, 8:00 a...	Finish:	09/03/26, 1:00 pm
Baseline Start:		Baseline Finish:	
Actual Start:		Actual Finish:	
Duration:	36.5 days	Baseline Duration:	0 days
Actual Duration:	0 days	Remaining Duration:	36.5 days
Work:	1,124 hours	Baseline Work:	0 hours
Actual Work:	0 hours	Remaining Work:	1,124 hours
Cost:	₹168600.00	Baseline Cost:	₹0.00
Actual Cost:	₹0.00	Remaining Cost:	₹168600.00