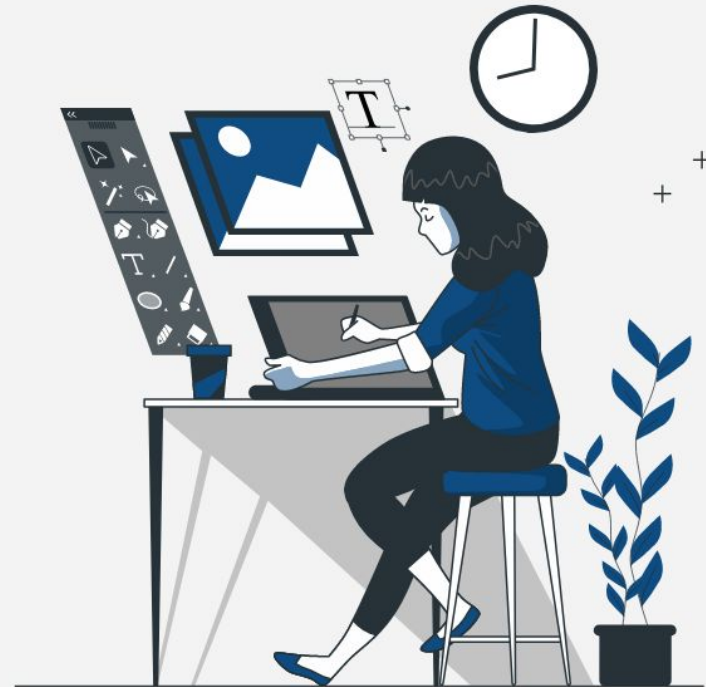


SmartLib

Where Seats Find You

Prepared by Team Xeon



OUR Team



Project Manager
Lead Developer
Front End Developer

- Kenny Voo
- Wilson Tai
- Kong Hou Jing
- Muhammad Irsyad
Bin Redzuan

Back End Developer
Quality Manager
Release Manager

- Zhou ZeYu
- Teo Boon Shuan
- Kong Hou Jing

01. Product Introduction

SmartLib and it's features.

+

02. Design For Maintainability

System Architecture and
design consideration

+

03. Software Quality Assurance

Steps we take to ensure its
quality



04. Project Management

How the team manage the
project and scheduling

+

05. Risk Management

Predict and manage existing
and future risk

°
+

06. Change Management

How to modify the existing
product efficiently

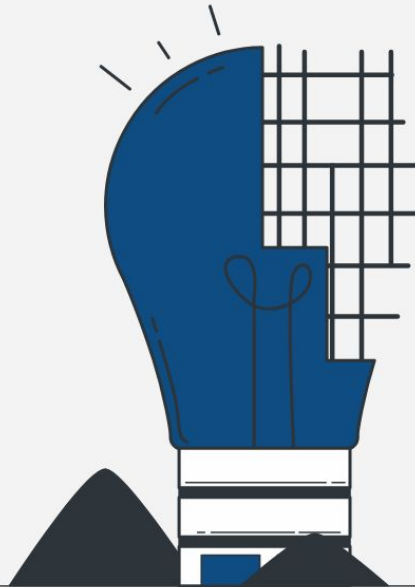
+

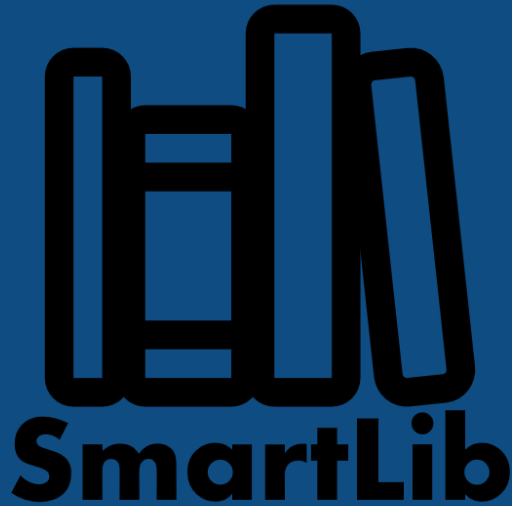
Problem Statement

**1. Trouble/Wasted Time
looking for Seats**

2. Seat Hogging Issue

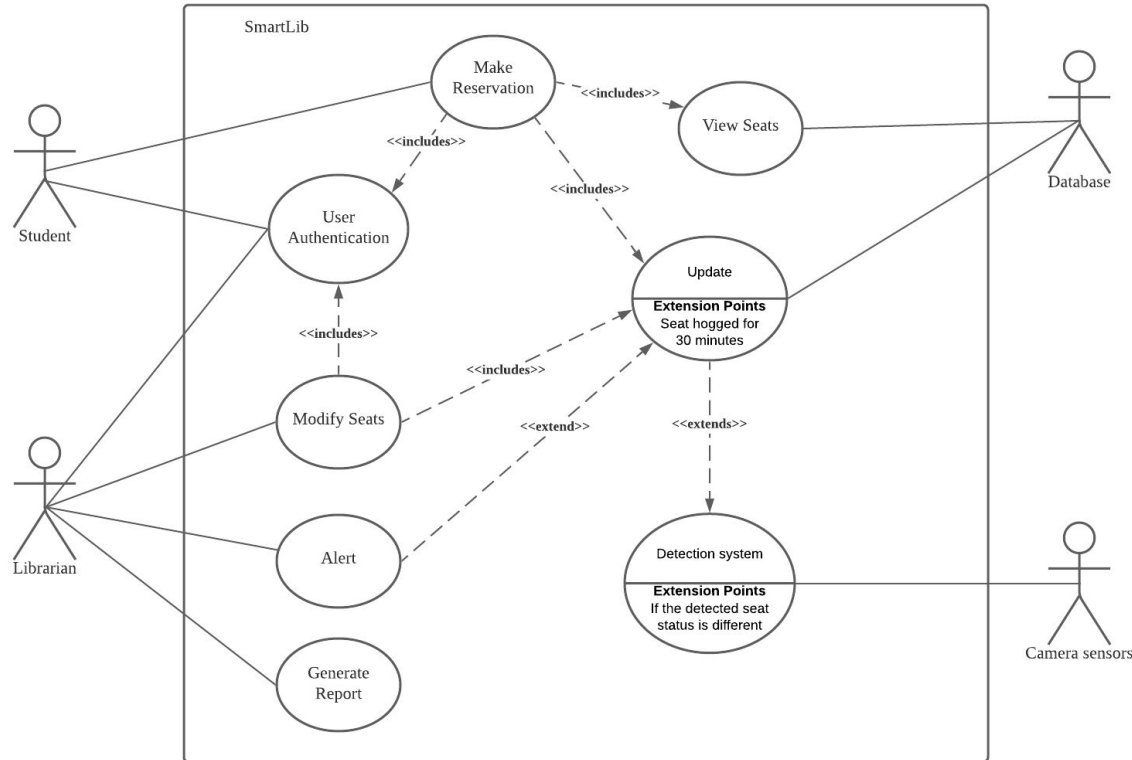
**3. Librarian cannot manage
Library easily**





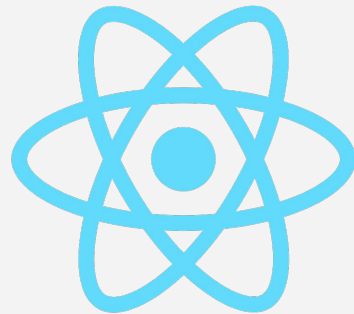
- **Seat Detection System**
 - To detect if seat is available, occupied, hogged
- **Seat Monitoring**
 - Allow users and librarian to monitor all the seat status
- **Seat Reservation**
- **Alert notice**
- **Report generation**
 - Seat status
- **Dynamic Seat Allocation**

USE CASE



Frontend Development

Kong Hou Jing , Irsyad

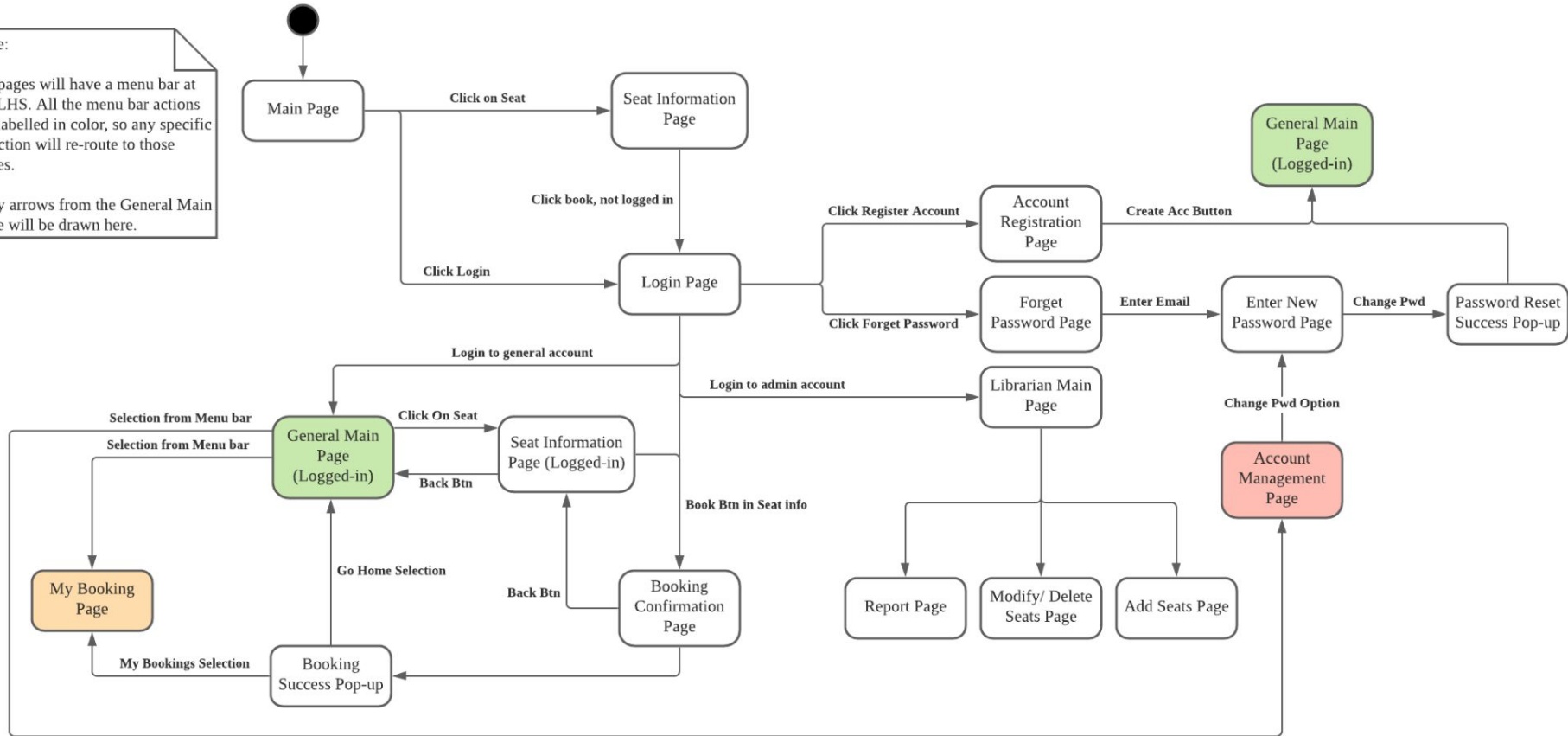


Dialog Map

Note:

All pages will have a menu bar at the LHS. All the menu bar actions are labelled in color, so any specific selection will re-route to those boxes.

Only arrows from the General Main Page will be drawn here.



Live Seat Updates

Statistics

Overall

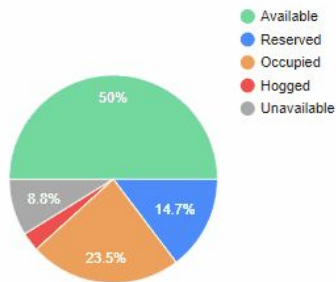
Level 2

Level 3

Level 4

Level 5

Seat Availability: **50.00%**



Status

No. of Seats

Available	17
Reserved	5

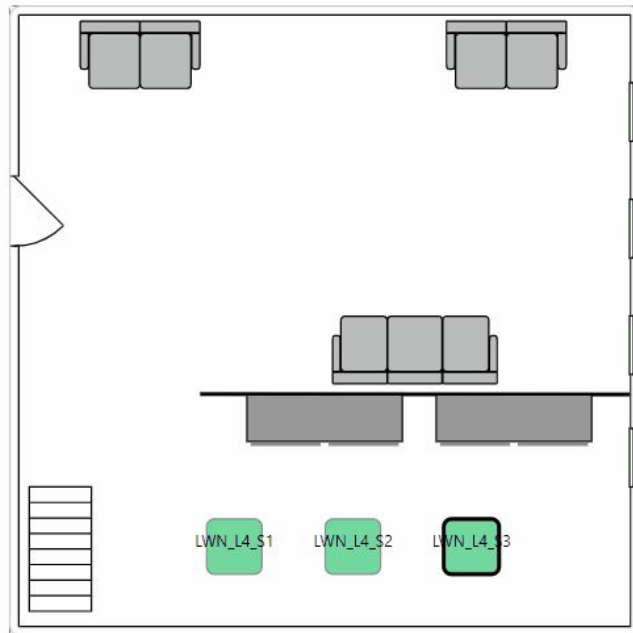
Live Seat Map

Level 2

Level 3

Level 4

Level 5



Available Reserved Occupied Hogged Unavailable

Seat Booking

SmartLib

Home

My Account

A

Welcome to Lee Wee Nam Library

Statistics

Overall

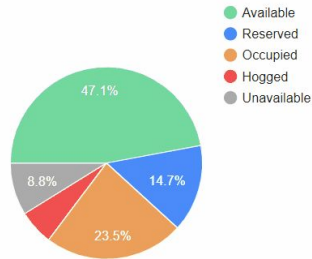
Level 2

Level 3

Level 4

Level 5

Seat Availability: **47.06%**



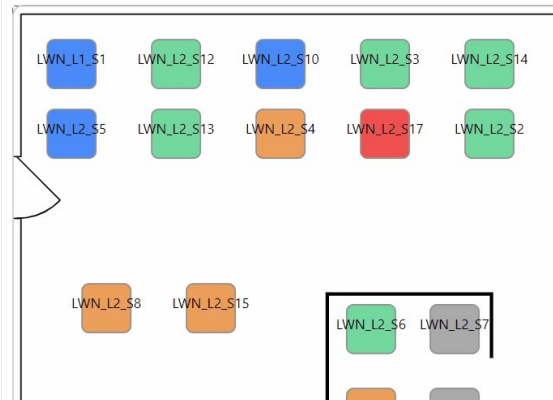
Live Seat Map

Level 2

Level 3

Level 4

Level 5

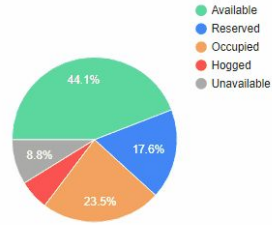


Admin Dashboard

Statistics

Overall	Level 2	Level 3	Level 4	Level 5
---------	---------	---------	---------	---------

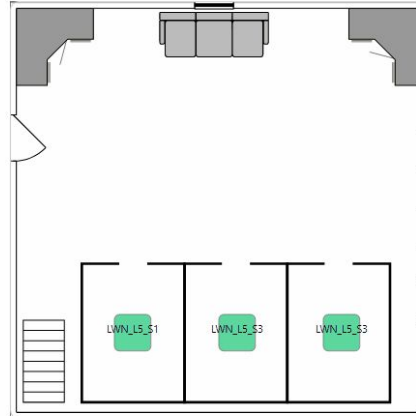
Seat Availability: **44.12%**



Status	No. of Seats
Available	15
Reserved	6
Occupied	8
Hogged	2
Unavailable	3
<u>Total Seats</u>	<u>34</u>

Live Status

Level 2	Level 3	Level 4	Level 5
---------	---------	---------	---------



Alerts

- ⚠ Seat LWN_L4_S1 is Hogged
- ⚠ Seat LWN_L2_S17 is Hogged

Modify Seats

Modify / Delete Seat

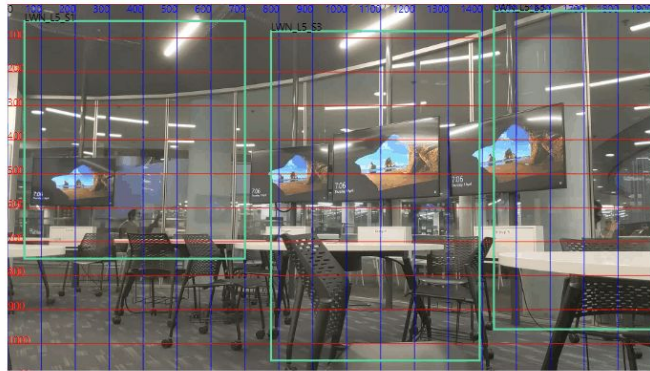
Level 2

Level 3

Level 4

Level 5

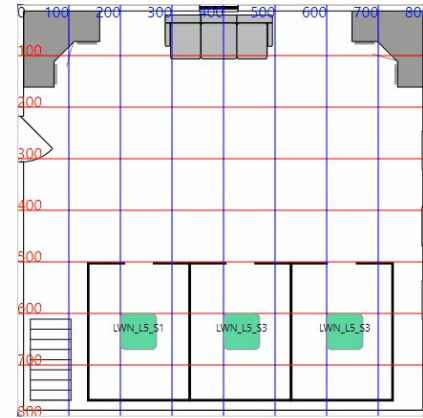
Selected Seat ID: Level: 5 Seat Name:



cameraId: x1img: 0 y1img: 0 x2img: 0 y2img: 0

cameraId: x1: y1: x2: y2:

eg. LWN_L2_C1 0 0 0 0



id: level: seatName:

xLoc: 0 yLoc: 0 status: unavailable: false

id: Level: Seat Name:

 2-5 eg. LWN-L2-13

xLoc: yLoc: Status:

0 0 Available ☐ Unavailable

Preview

Reset

Modify Seat

Delete Seat

Add Seats⁺

Add New Seat

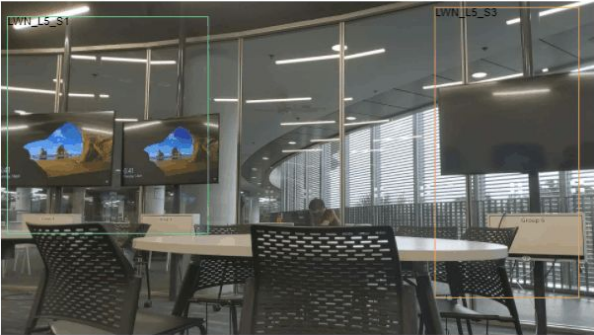
Level 2

Level 3

Level 4

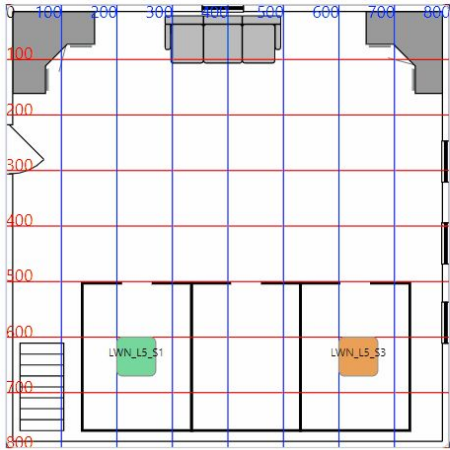
Level 5

Hint: Click and drag to draw bounding box



cameraId: x1mg: 1317 y1mg: 951 x2img: 1317 y2img: 952

cameraId : x1 : y1 : x2 : y2 :
eg. LWN_L2_C2 1317 951 1317 952



id: 20 level: 5 seatName:
xLoc: 400 yLoc: 600 status: Available unavailable: false

id : Level : Seat Name :
20 5 eg. LWN-L2-13

xLoc : yLoc : Status:
400 600 Available ☐ Unavailable

Preview

Reset

Add Seat

Report Generation

SmartLib

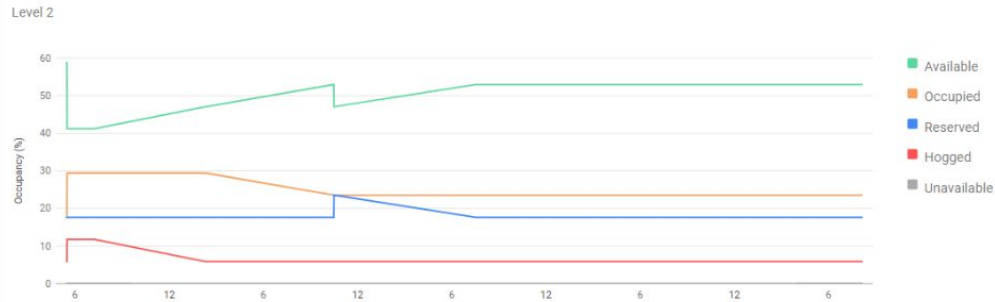
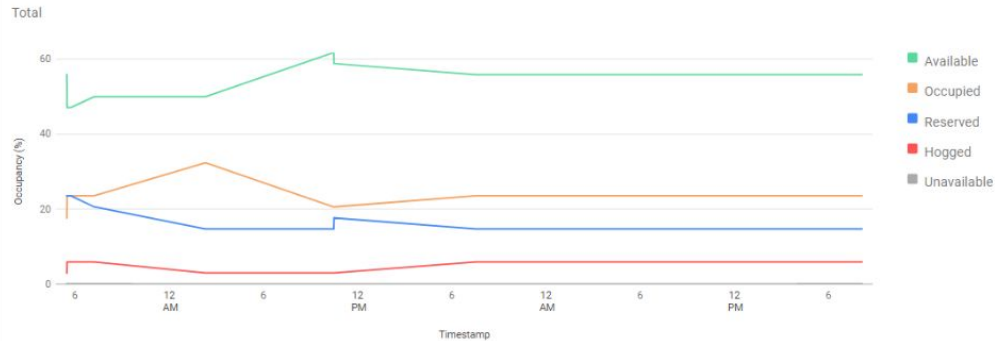
Home

My Account



Seat Occupancy Report

Download Report



Mobile Interface

Welcome to Lee Wee Nam Library

Statistics

Overall Level 2 Level 3 Level 4 Level 5

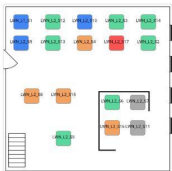
Seat Availability: **42.42%**



Status	No. of Seats
Available	14
Reserved	6
Occupied	8
Hogged	2
Unavailable	3
Total Seats	33

Live Seat Map

Level 2 Level 3 Level 4 Level 5



Seat Reservation

Selected Seat: None

Level: 2

[Book](#)

Admin Homepage

Statistics

Overall Level 2 Level 3 Level 4 Level 5

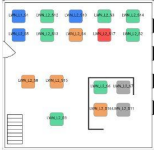
Seat Availability: **42.42%**



Status	No. of Seats
Available	14
Reserved	6
Occupied	8
Hogged	2
Unavailable	3
Total Seats	33

Live Status

Level 2 Level 3 Level 4 Level 5



Available Reserved Occupied Hogged Unavailable

Alerts

⚠ Seat LWN_L4_S1 is Hogged

⚠ Seat LWN_L2_S17 is Hogged

Modify / Delete Seat

Level 2 Level 3 Level 4 Level 5

Selected Seat ID:

Level: 2 Seat Name:



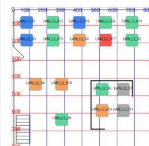
cameraId: x1img: 0 y1img: 0

x2img: 0 y2img: 0

cameraId: x1:
eg: LWN_L2_S1 0

y1: x2:
0 0

y2:
0



id: level:

seatName:

xLoc: 0 yLoc: 0

status: unavailable:
false

id: Level:
SID 2-5

Seat Name:

eg: LWN_L2_S1

xLoc: yLoc:
0 0

Status:
Available Unavailable

[Preview](#)

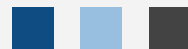
[Reset](#)

[Modify Seat](#)

[Delete Seat](#)

Backend Development

Zhou ZeYu



Firebase

express



Backend Feature



Firebase Authentication

+

01

Authentication



+

02

Email Notification



Cloud Firestore

+

03

NoSQL database
(Implemented C.R.U.D)



+

04

Report Generation

01

Authentication



Firebase Authentication

- Registration
- Login
- Passwords Recovering

02

Email Notification



Confirmation - Seat Reservation



noreply.smartlib@gmail.com <noreply.smartlib@gmail.com>

15:09

收件人: #ZHOU ZEYU#

To:

ZHOU ZEYU

I am pleased to inform you that your booking of Seat LWN_L2_S12 has been confirmed.

This is a computer generated email

03

NoSQL Database

Cloud Firestore

[Data](#) [Rules](#) [Indexes](#) [Usage](#)Prototype and test end-to-end with the Local Emulator Suite, now with Firebase Authentication [Get started](#)

🏠 > Seats > 1		
smartlib-66322	Seats	1
+ Start collection	+ Add document	+ Start collection
Seats >	1 >	+ Add field
User_Booking	10	cameraId: "LWN_L3_C1"
seatLog	11	id: "1"
	12	level: "3"
	13	seatName: "LWN_L3_S4"
	14	status: "Available"
	15	unavailable: false
	16	x1Img: 653
	17	x2Img: 867
	18	xLoc: "350"
	19	y1Img: 557
	2	y2Img: 780
	21	yLoc: "100"
	22	
	23	
	24	

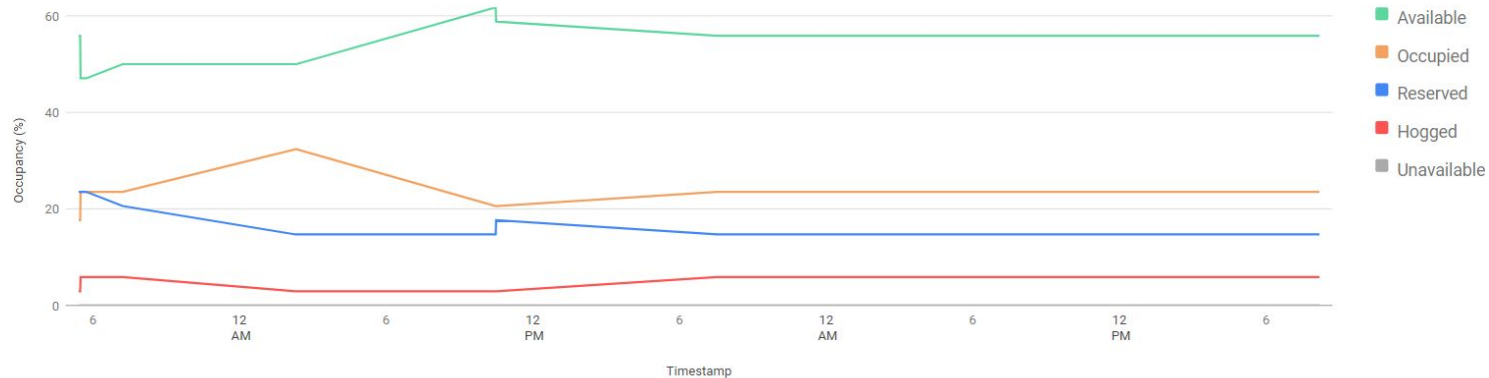
Cloud Firestore location: asia-southeast2

04

Report Generation

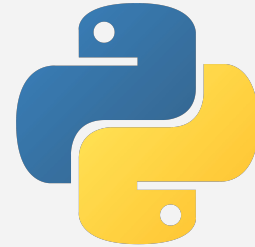
Seat Occupancy Report

Total

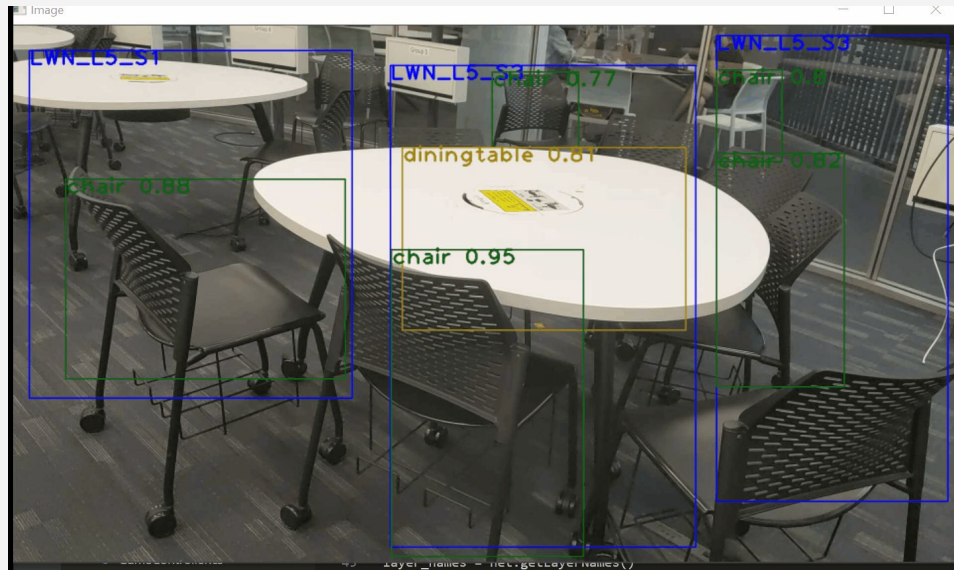


Level 2

Detection System



Detection System



- YOLO V3 (Pretrained model)
- Support multiple camera
- Retrieve and update Seat information to Firestore
- Seat status
 - Human = Occupied
 - Belonging = Detected
 - Belonging(30 minutes)=Hogged
 - Empty = Available

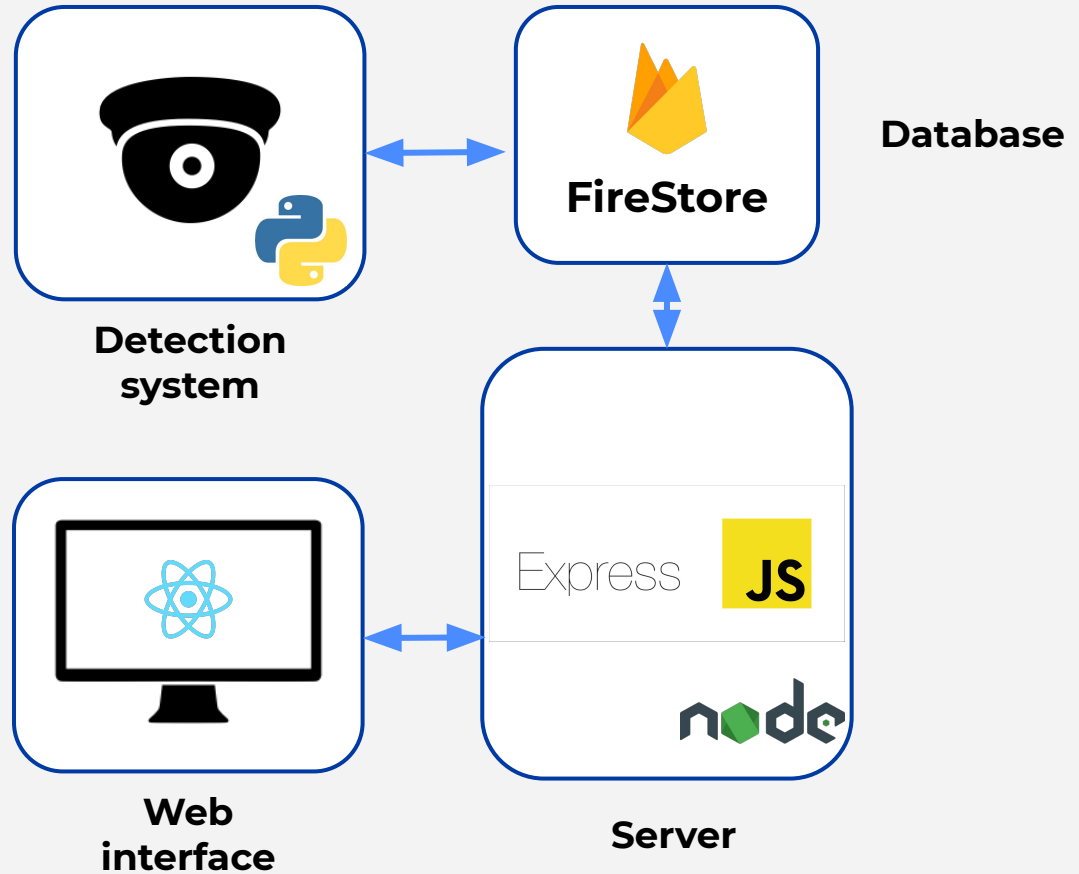


DESIGN FOR MAINTAINABILITY

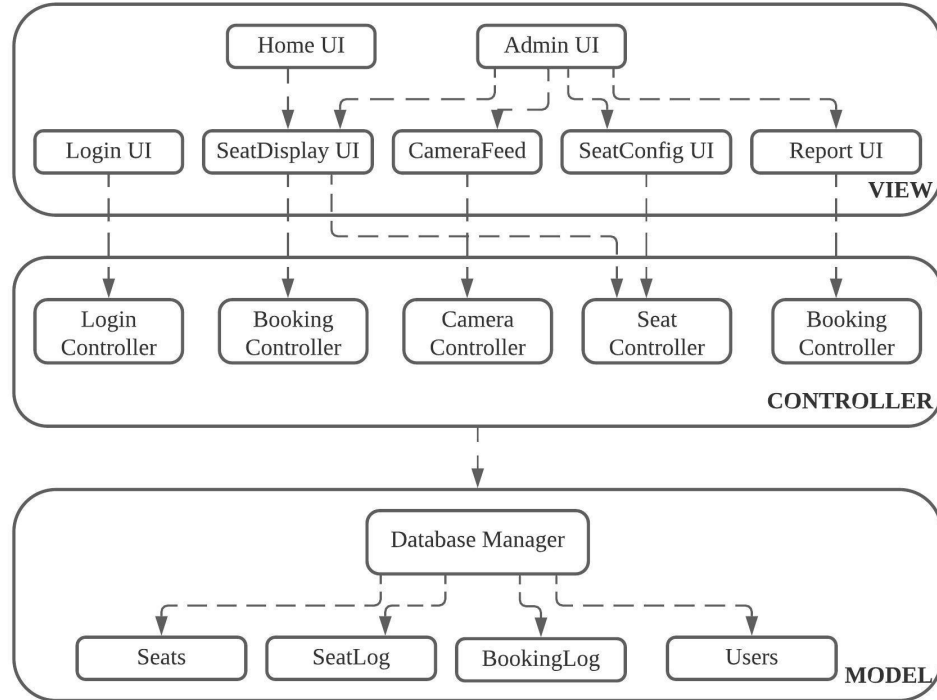
Design Pattern and System Architecture

Architecture

- **F**irebase
- **E**xpress
- **R**ead
- **N**ode js



Design Pattern - MVC



03

Quality Management



Quality Assurance

- We used the ISO 25010 standard as a guideline
- We conducted test automation to ensure all test cases are met and bugs fixed



ISO 25010



Testing

We automated our testing of the
ReactJS web application using
the testing stack and
documentation provided by
ReactJS.

[https://reactjs.org/docs/testing.h
tml](https://reactjs.org/docs/testing.html)

Testing

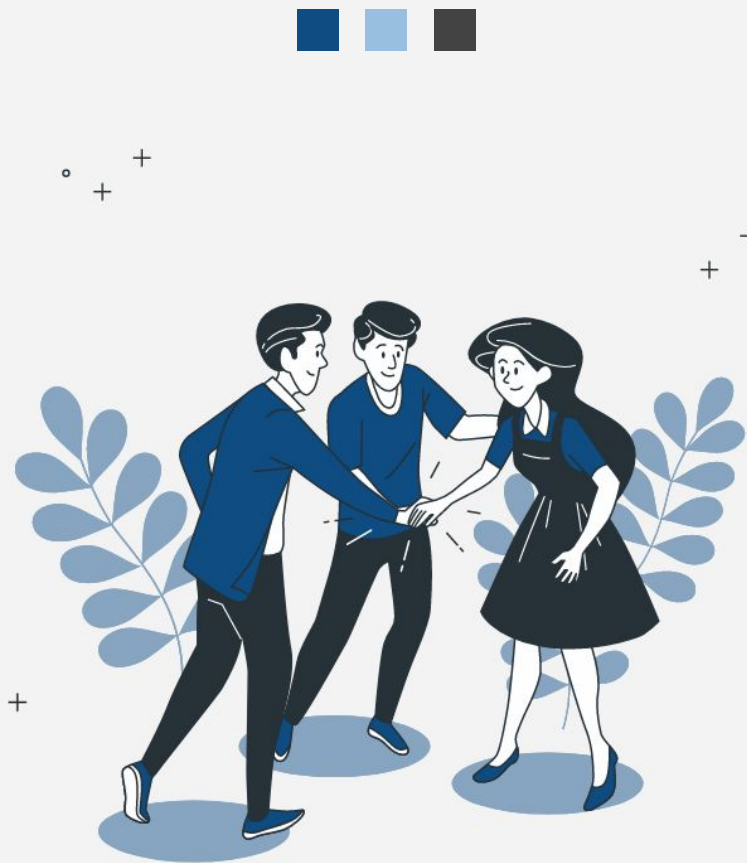
White Box Testing: Case 2 - 'Hogging' Detection

Step	Test Steps	Test Data	Expected Result	Actual Result	Status (Pass/Fail)	Notes
1	Click on a camera	N/A	Administrator should be able to see the seat statuses; represented by the bounding boxes.	Seat statuses are displayed at the bottom left of the bounding box	Pass	
2	Place an object within the bounding box, but without any person	N/A	Administrators should be able to see that the camera detects an object within the bounding box, and the seat is deemed as 'hogged'.	Seat status is deemed as 'hogged'	Pass	

04

Project Management

Kenny Voo



Agile Methodology

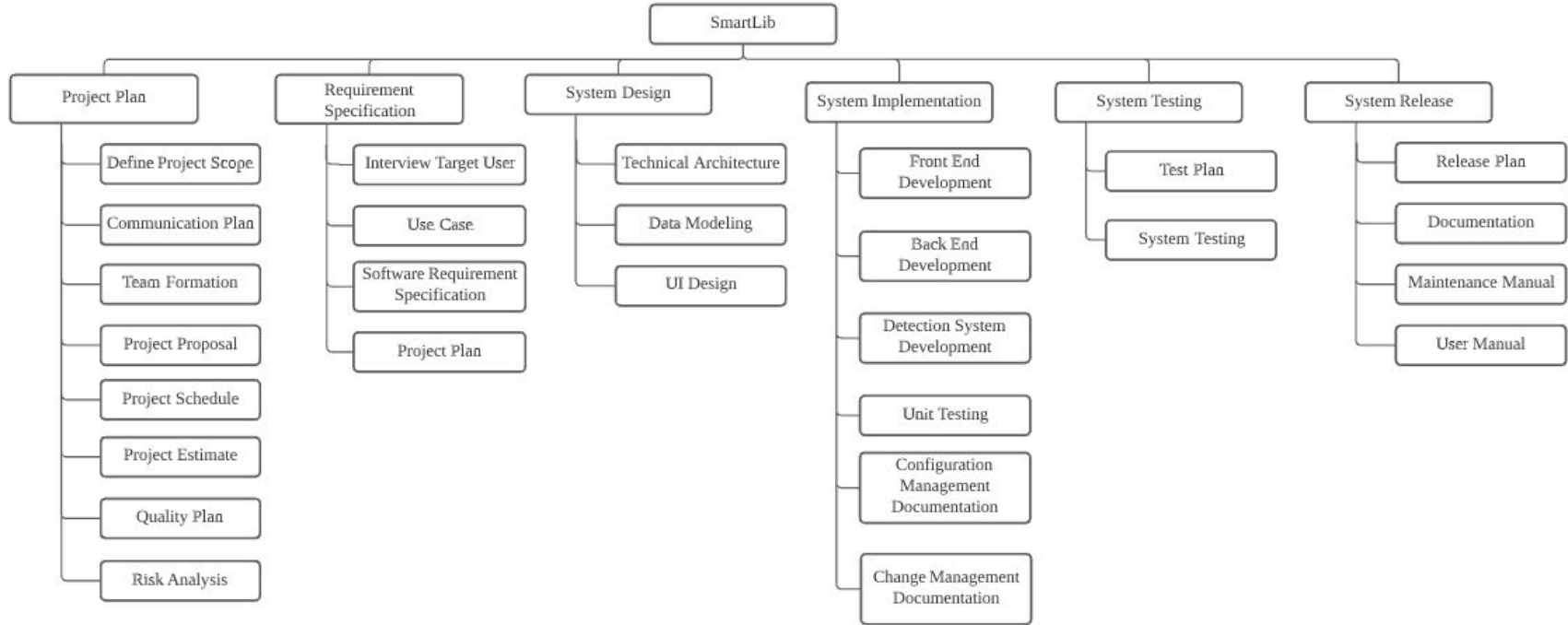




Project Management

- Prepare Work-breakdown structure (WBS)
- Estimate the Project cost, resources and time taken
- Ensure work schedules and deliverables are met

WORK-BREAKDOWN STRUCTURE (WBS)



Project Estimation - Function Point

Student:

- Save new student account to the database (Registration)
- Retrieve login information from the database
- View the availability of individual seats in the library
- Make seat reservation
- View past booking information

Administrator:

- Modify the seat status and update to external database
- Alert if the seat is hogged
- Generate report for the librarians

Detection System:

- Detect and update the seat status to external database (Python)

Project Estimation - Evaluation of Complexity

Element	Complexity	Detail
Inputs	Low	Registration
	Low	Make Seat Reservation
	Medium	Modify seat status
Outputs	Medium	Generate report
	Low	Alert if the seat is hogged
Inquiries	Low	View the availability of individual seats in the library
	Low	Login
	Low	View Past Booking Information
Logical Files	Low	Registration
	Low	Make Seat Reservation
	Low	Admin update seat status
	Medium	Detection system update seat status (Python)
Interfaces	Low	modify and update seat status to external database
	Low	detect and update seat status to external database (Python)

Project Estimation - Total Unadjusted Function Point

Characteristic	Low		Medium		High	
Inputs	2	× 3	1	× 4	0	× 6
Outputs	1	× 4	1	× 5	0	× 7
Inquiries	3	× 3	0	× 4	0	× 6
Logical Files	3	× 7	1	× 10	0	× 15
Interfaces	2	× 5	0	× 7	0	× 10
Unadjusted FP	50		19		0	
Total=L+M+H	69					

Project Estimate - Influence Factors

Influence Factors	Score
Data Communications	4
Distributed Functions	4
Performance	3
Heavily used	2
Transaction rate	4
On-line data entry	5
End-user efficiency	2
On-line data update	3
Complex processing	1
Reusability	4

Installation Ease	1
Operational Ease	1
Multiple sites	0
Facilitate change	3
Total score	37
Influence Multiplier $= \text{Total score} \times 0.01 + 0.65 = 37 \times 0.01 + 0.65 = 1.02$	
Adjusted FP $= \text{Unadjusted FP} \times \text{Influence Multiplier} = 69 \times 1.02 = 70.38$	

Project Estimation- FP TO LOC

Line Of Code per Function Point

- Python : 24
- Javascript : 53

$$\begin{aligned}\text{Total} &= \text{Adjusted of Python FP} \times 24 + \text{Adjusted of Javascript FP} \times 53 \\ &= 3277.74\end{aligned}$$

Project Estimation

Working days include 5 days in a week.

Effort = Size / Production Rate = (3277.74 LOC) / (39 LOC/PD) = 84 PD

Duration = $3 \times (\text{Effort})^{1/3} = 3 \times (84)^{1/3} = 13.14 \text{ Days}$

Initial schedule = 13.14 Days / 5 days a week = 2.628 Weeks

Team size = 84 PD / 13.14 D = 6.39 P = 7 Persons

Working hours include 8 hours in a working day.

Total person-hours (PH) = 84 PD \times 8 hours = 672 PH

Project Cost Estimation

Staff:

Project Manager	\$30,000
Team Members (System Developers and Quality & Release Managers)	\$96,000
	Total \$126,000

Stationary:

Paper, photocopying and other miscellaneous cost	\$50
--	------

Software:

Software License Provided by Third Party:

Microsoft Office 2020	\$161.00
Microsoft Visual Studio Code	\$0.00
Firebase Cloud Database	\$1,500.00

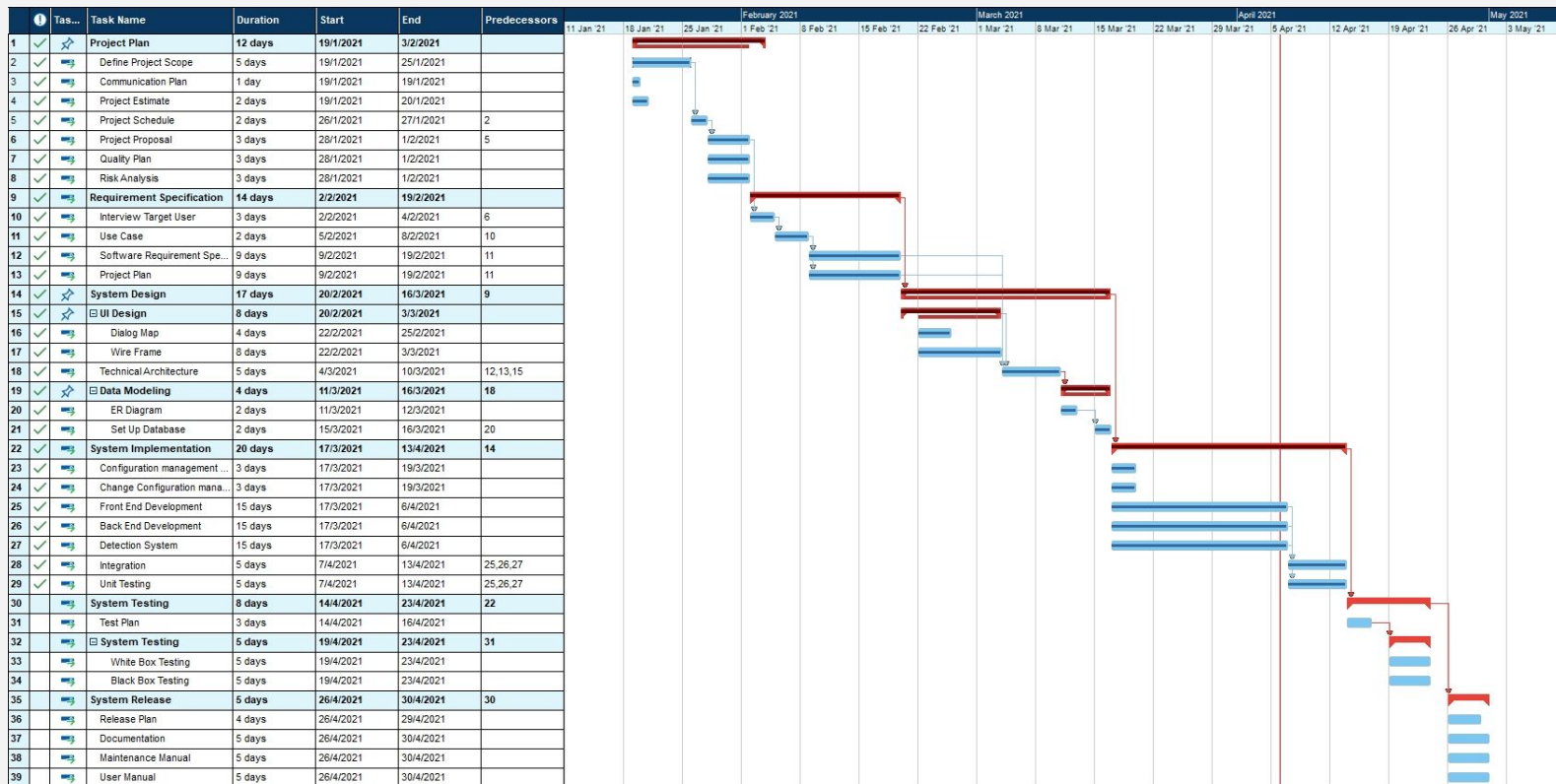
Hardware:

Developer workstations:

6 - Dell Precision Workstation 3930	Total \$6,000.00
Intel Xeon 6-core 2.4GHz processor	
16 GB RAM	
256 GB SSD storage	

Total : \$163,711

PROJECT TIMELINE



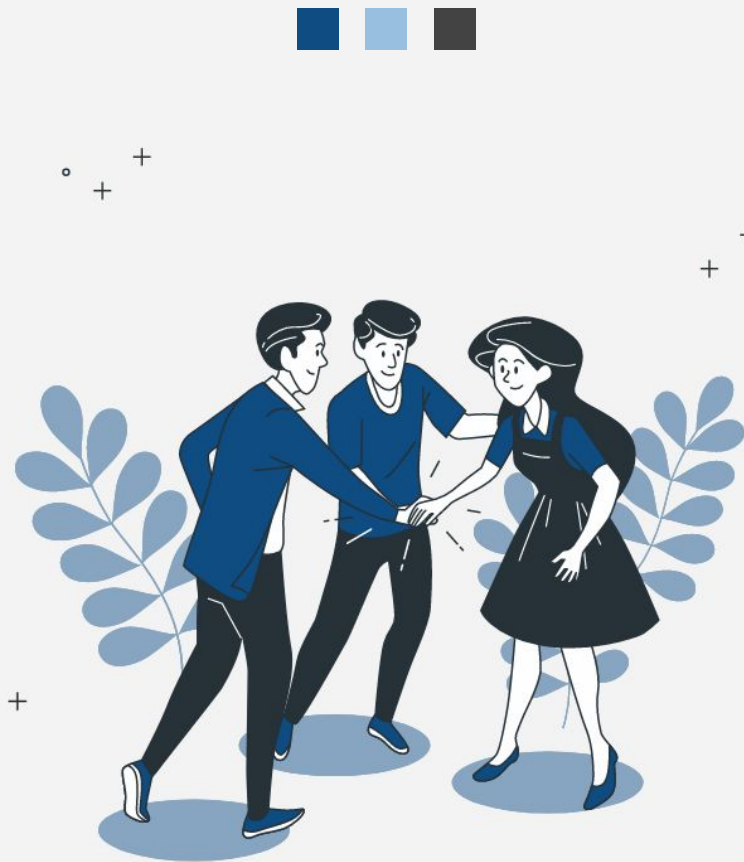
PROJECT TIMELINE

	!	Tas...	Task Name	Duration	Start	End
1	✓	✚	Project Plan	12 days	19/1/2021	3/2/2021
2	✓	➡	Define Project Scope	5 days	19/1/2021	25/1/2021
3	✓	➡	Communication Plan	1 day	19/1/2021	19/1/2021
4	✓	➡	Project Estimate	2 days	19/1/2021	20/1/2021
5	✓	➡	Project Schedule	2 days	26/1/2021	27/1/2021
6	✓	➡	Project Proposal	3 days	28/1/2021	1/2/2021
7	✓	➡	Quality Plan	3 days	28/1/2021	1/2/2021
8	✓	➡	Risk Analysis	3 days	28/1/2021	1/2/2021
9	✓	➡	Requirement Specification	14 days	2/2/2021	19/2/2021
10	✓	➡	Interview Target User	3 days	2/2/2021	4/2/2021
11	✓	➡	Use Case	2 days	5/2/2021	8/2/2021
12	✓	➡	Software Requirement Spe...	9 days	9/2/2021	19/2/2021
13	✓	➡	Project Plan	9 days	9/2/2021	19/2/2021
14	✓	✚	System Design	17 days	20/2/2021	16/3/2021
15	✓	✚	<input type="checkbox"/> UI Design	8 days	20/2/2021	3/3/2021
16	✓	➡	Dialog Map	4 days	22/2/2021	25/2/2021
17	✓	➡	Wire Frame	8 days	22/2/2021	3/3/2021
18	✓	➡	Technical Architecture	5 days	4/3/2021	10/3/2021
19	✓	✚	<input type="checkbox"/> Data Modeling	4 days	11/3/2021	16/3/2021
20	✓	➡	ER Diagram	2 days	11/3/2021	12/3/2021
21	✓	➡	Set Up Database	2 days	15/3/2021	16/3/2021

22	✓	➡	System Implementation	20 days	17/3/2021	13/4/2021
23	✓	➡	Configuration management ...	3 days	17/3/2021	19/3/2021
24	✓	➡	Change Configuration mana...	3 days	17/3/2021	19/3/2021
25	✓	➡	Front End Development	15 days	17/3/2021	6/4/2021
26	✓	➡	Back End Development	15 days	17/3/2021	6/4/2021
27	✓	➡	Detection System	15 days	17/3/2021	6/4/2021
28	✓	➡	Integration	5 days	7/4/2021	13/4/2021
29	✓	➡	Unit Testing	5 days	7/4/2021	13/4/2021
30		➡	System Testing	8 days	14/4/2021	23/4/2021
31		➡	Test Plan	3 days	14/4/2021	16/4/2021
32		➡	<input type="checkbox"/> System Testing	5 days	19/4/2021	23/4/2021
33		➡	White Box Testing	5 days	19/4/2021	23/4/2021
34		➡	Black Box Testing	5 days	19/4/2021	23/4/2021
35		➡	System Release	5 days	26/4/2021	30/4/2021
36		➡	Release Plan	4 days	26/4/2021	29/4/2021
37		➡	Documentation	5 days	26/4/2021	30/4/2021
38		➡	Maintenance Manual	5 days	26/4/2021	30/4/2021
39		➡	User Manual	5 days	26/4/2021	30/4/2021

05

Risk Management



Risk Management

- 1. Identify the Risks**
- 2. Risk Analysis**
- 3. Risk Planning**
- 4. Risk Monitoring**

Risk Identification

The 7 Areas of Risk:

1. Project Deliverable
2. Cost/Effort Estimate
3. Resource Planning
4. Assumptions
5. Scheduling
6. Environmental
7. Technical

Qualitative Risk Analysis

Probability

- High
 - >80%
- Medium
 - 20% - 80%
- Low
 - <20%

Impact

- High
 - Greatly impact
- Medium
 - Slightly impact
- Low
 - Little impact

Risk Type

- Schedule risk
- Budget risk
- Operational risk
- Technical risk
- Programmatic risk

Qualitative Risk Analysis

Impact	High			
	Medium			
	Low			
		Low	Medium	High
	Probability			

Zone Type

- RED zone - High severity
- YELLOW zone - Medium Severity
- GREEN zone - Low severity

Risk Planning

1. AVOID
2. MITIGATE
3. ACCEPT
4. TRANSFER

Risk Log

Risks	Type	Probability	Impact	Zone	Approach
Requirements inflation which introduces new features which were not identified during planning phase. These new features threaten project time estimations.	Technical	High	High		Mitigation. Project Manager has to communicate effectively with project sponsors as well as project team to ensure that new requirements are suitable and does not severely impact project timeline.

Risk Log

Risk	Type	Probability	Impact	Zone	Approach
Health issues which may result in missing key team members during critical times, which may affect code quality and efficiency.	Management	Low	Medium		Acceptance. It is not possible to have all team members be healthy and illnesses may arise due to global events or flu season. However, the impact can be mitigated by adopting code sharing practices and pair coding to ensure that the project does not suffer derailment should a key member be unavailable.

Quantitative Risk Management

ID	Risk	Risk Rating (Probability x Impact)
1	Miscommunication	$2.0 \times 3.0 = 6.0$
2	Equipment Breakdown	$1.0 \times 3.0 = 3.0$
3	Requirements Inflation	$3.0 \times 3.0 = 9.0$
4	Staff Absence	$2.0 \times 2.0 = 4.0$
5	Underestimation of Schedule	$3.0 \times 3.0 = 9.0$
6	Version Control Conflict	$3.0 \times 2.0 = 6.0$
7	Stack Obsolescence	$1.0 \times 3.0 = 3.0$
8	Insufficient Budget	$2.0 \times 3.0 = 6.0$

Risk Monitoring

Step 1: Monitor the Risk Response Plan

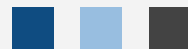
Step 2: Track Identified Risks

Step 3: Identify and Analyse new Risks

Step 4: Evaluate Risk Process Effectiveness

05

Change Management



Change Request Process Flow

Generate

Submit Change Request (CR) form to Change Manager.
Change log will be updated accordingly

Evaluate

Review CR and estimate level of effort to process, and
develop a proposed solution for the suggested change

Authorize

Approve/Reject suggested change & its solution

Implement

Make necessary adjustments to the product & update
CR status to submitter and stakeholders

TECHNICAL ANALYSIS OF CHANGE

CHANGE MANAGER:

ENTER NAME

DATE OF CREATION: #####



PROJECT NAME:

Enter project name here

PRODUCT:

Enter product name



REQUESTER NAME:

Enter your address here

PRODUCT VERSION:

Enter product version

REQUESTER PHONE: Enter Phone Number

REQUESTER EMAIL: Enter your email here



CHANGE TITLE:

Enter the title for the requested change

CHANGE DESCRIPTION:

Enter a brief description of the proposed change

REASON FOR CHANGE:

Enter a valid reason for the change

TECHNICAL ANALYSIS OF CHANGE

CHANGE ANALYZER:

ENTER NAME

DATE OF CREATION:

DATE

COMPONENTS AFFECTED:

List the components affected if the change were to be

BENEFITS:

List the benefits the change brings to the product

Configuration Management



GitHub

Shared Source Code
Management



Google Drive

Shared space for
documentation
management



Zoom

Online meetings and
discussions



CONCLUSION

End Product and Learning
Objectives

PROJECT GOALS

SmartLib System

Met our objectives and managed to create a robust system

Software Tools

Firestore, React and Object detection knowledge acquired



Learning Objectives

Understood the different management process that exist in the Software Development Lifecycle

Experience

Working as a team, coordinating work, ups and downfalls, recovery

THANK YOU !

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