Design Doc Template

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# Introduction

## Summary

Our problem statement is “Robot/Drone based system to clean railway tracks”.

## Background

The main issue that we are trying to solve is to clean the railway tracks. The main problem with existing system is that it is of huge size, requires lot of time to clean, man power and power consumption is more.

Our solution/tool requires less power consumption, less manpower, faster cleaning, easily movable, less cost and is of less size when compared to existing system.

## Definitions, Acronyms, and Abbreviations

Drone/Robot: This consists of a sensor which helps in detecting the garbage on the tracks.

Sensor: An ultrasonic sensor helps us to detect the garbage.

Bluetooth: This helps in pairing with the mobile device.

Suction machine: This has similar functionality of vacuum cleaner.

# Design Overview

## Requirements

This requires a vehicle which is flexible to run on the railway tracks and a person to operate it.

### Documentation

If the project requires any wiki pages, code comments, presentations, etc. that information should be included here

## Minimum Viable Product

A detailed description of the deliverable for this project, this is the minimal functionality required for the project to be considered successful and should not include stretch goals or future work.

## Stretch goals

Stretch goals include functionality beyond the scope of the minimum viable product that should be include in the project should time and budget permit. Unlike future work, stretch goals would be smaller tasks for features in support of the minimum viable product.

## Future work

This may include ongoing support, expansion of the original scope, work that requires transitions in project ownership, or details of projects designed to be broken up into multiple phases.

# Architectural Diagrams

Bluetooth

Drone with sensors

Information passing to stay connected with robot

For communication

Operator

Suction machine which is upon a vehicle

To operate

# System Diagrams

Mobile device

(Operator)

Vehicle

Drone with sensors

Track

Cleaner system

Suction machine

# Application Programming Interface

The main interfaces in our product are Ultrasonic sensor and Bluetooth. The sensor is used to detect the garbage and the Bluetooth is for communication process.

## Recommendations

Using a versioned endpoint simplifies the process of making future backwards incompatible API changes;

# User Interface



Forward-B

Right-R

Left-L

Stop-S

# Data Models and Storage

For projects requiring messages queue such as Kafka, MySQL, etc.

Kafka

* How many partitions are needed for this topic?
* How many days of retention will be needed?
* What will the partitioning key become?
* How much data will be written to the topic during peak hours?
* What type of Kafka cluster will be needed? (E.g. aggregate, queuing, tracking, metrics, logging)

MySQL

* What does the table schema look like and how are they all tied together (provide a UML)?
* What sort of updates will be made to the tables?
* How will users make queries to the tables? (e.g. Complex joins, pre-filtering, single record gets)
* What the strategy for indexing?

# Service Operability

## Key Performance Indicators

Key performance indicators (KPI), describe how a service should be monitored and how its performance can be gauged. This would typically include an overview of the types of metrics an application will need to emit, call time, error rate, etc.

## Service Level Objectives

Service level objectives (SLOs), set targets for various KPI through alerts via email or SMS, these targets may provide early indicators of approaching a capacity limit, changes in load patterns through various phases of an application, changes in duration of offline processing, etc.

# Project Overview

## Communication and Tracking

Arduino Bluetooth Controller application is used for communication purpose.

## Risk

Our product depends on the arrival and departure of the train. So, there may be possibilities that train may get delayed.

## Milestones

First week consists of survey and basic component gathering. In second week all the components will be designed and connected. During third week product testing is done. Other 2 weeks will be for reviews, feedbacks, surveys. Last week we will deploy the product.

## Project Phases

For projects that are better tracked and reported on in multiple phases because of extended timelines, external dependencies, etc.

## Cost

We can develop the system in the reasonable time as all the resources are available in the market but there may be a delay in approval from government.

# Frequently Asked Question

# References

Links to any supporting documentation, other projects, or reference material

# Addendum

Additional diagrams or details that do not particularly belong in the body of the design doc. This could also be a place to describe additional examples that would otherwise bloat the introduction section. More specifics on APIs could also be placed here for engineers to reference.