**Project Design Phase-I**

**Proposed Solution Template**

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| Date | 19 September 2022 |
| Team ID | PNT2022TMID23524 |
| Project Name | SMART SOLUTION FOR RAILWAYS |
| Maximum Marks | 2 Marks |

**Proposed Solution Template:**

Project team shall fill the following information in proposed solution template.

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| **S.No.** | **Parameter** | **Description** |
|  | Problem Statement (Problem to be solved) | To meet the new system of GSM-R that lacks the  capacity to transmit the volumes of data needed today. Although the railway supply industry has guaranteed continued support for GSM-R until 2030, a new one has to be prepared and rolled out in a test mode before the end of GSM-R  sufficiency .The advent of 5G communications after the long term evolution (LTE) and LTE-Advanced (LTE-A) systems provides several technological advances to address these challenges. In this paper, after reviewing the main 5G communication aspects for modern railways, we describe seven main challenges faced by train connectivity, and discuss appropriate solutions. Specifically, we elaborate on techniques for ensuring connectivity and energy efficiency for the passengers’ user equipment (UE) through the use of mobile relays (MRs) on top of the train wagons in conjunction with intelligent resource allocation.  These challenges pertain to confidentiality, authentication, integrity, non-repudiation, location privacy, identity privacy, anonymity, certificate revocation, and certificate resolution. This article aims to propose a novel taxonomy of security and privacy issues and solutions in ITS.  Many challenges were identified to achieve a fully functional, practical and ITS network. Some of these challenges include coordination with different stakeholders, adopting different countries' ITS systems, keeping up with the technology, integration with existing systems, and budget constraints. |
|  | Idea / Solution description | Indian Railways (IR) is moving towards the adoption of automation and instrumentation in its maintenance practices for detecting defects/deficiencies in rolling assets. The objective is to achieve machine-assisted automatic identification of defects in the Rolling Stock. This will lead to a paradigm shift in maintenance practices of Rolling Stock of Indian Railways from ‘Time Based Maintenance’ to ‘Condition Based Predictive Maintenance’ with a view to enhance reliability and availability along with improved safety of Rolling Stock during run. Although railway accidents happen rarely, their consequences sometimes are catastrophic. The reason for many cases is often human error caused by maintenance of the train, railroad equipment, and infrastructure, as well as an abundance of paperwork that the railway staff handles daily.  The main advantage of the mobile applications for engineers and technicians on the railroad is a real-time connection between the control centre and maintenance staff. It significantly simplifies and improves the maintenance of the railroad, offering the staff not no wait for scheduled maintenance, but to fix the issue if it is needed. It allows maintenance staff to receive, review, and action faults as they occur, decreasing response and repair time and increasing network performance, the efficiency of resource usage, and uptime. However, this is also possible if the train has the Internet of Things sensors. |
|  | Novelty / Uniqueness | Growing populations and rising congestion in urban centre have made traditional railway infrastructure, which takes up a lot of space, difficult to implement. In densely populated urban locations, constructing new metro rail lines costs too much in terms of land acquisition, inspection and levelling , and eventual construction. These projects also take several years to complete, leaving urban cities in a state of congestion for a prolonged period.  Indian start up Prime rail Infralabs designs and develops novel urban transit solutions. Apart from providing existing mainline railway, rapid transit, and urban transportation with services like surveys, inspections, and design, they also develop radical solutions. PSC Plinths and Bi ebus are two of their patent-pending systems that stand to benefit urban transportation by reducing the costs of laying tracks. |
|  | Social Impact / Customer Satisfaction | We found that the construction and operation of the railways has degraded, fragmented and destroyed key ecosystems. It increased soil erosion, land degradation, flooding and habitat destruction. It also affected water bodies and wildlife movement. The railways gave people the ability to travel around the country quickly and made different areas more accessible. The railways made India mobile and opened up new vistas and opportunities for its people. It brought in new expertise and trades, new technology and above all, it gave the people a sense of freedom. As the railways grew, their role transformed from a mere provider of transport to something significantly larger. |
|  | Business Model (Revenue Model) | Increasing fuel prices and spiralling road congestion has meant that rail travel is experiencing something of a renaissance.  To enable rail transportation companies to optimise their rail networks, IBM recently unveiled the IBM Travel and Transportation (T&T) Framework.  It combines software products to make more intelligent use of all rail assets, from tracks to trains, so companies can meet the increasing consumer demand for more efficient and safer services.  The system is made up of elements such as IBM’s new customer-centric reservation system, more efficient operations control and smart vision, and parts of it are already operational within some rail networks. |
|  | Scalability of the Solution | The main driver behind Smart Railways is efficiency. Advanced technologies such as automation, artificial intelligence (AI), and machine learning have the potential to revolutionize the railway industry. The implementation of digital technologies will lead to operational efficiency, cost benefits, higher customer value, and faster and better services in the railway sector. Integrated security, predictive maintenance, and asset management are a few of the new areas of technology deployment. |