Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	03 October 2022
Team ID	PNT2022TMID51648
Project Name	Smart Solutions for Railways
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Authentication	Authentication with OTP via SMS/email Authentication via social networks
FR-4	User authorization	Role based access control (RBAC), open ID authorization
FR-5	External interfaces	Interaction logic between the user and the software Software interfaces are: IBM Cloud, IBM Watson IoT Platform, functions on the model
FR-6	Reporting	SMS notifications for reports/alerts Email notifications for reports/alerts

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	A new system should empower the railway industry to better leverage the potential given by modern communication technology. Unlike ERTMS, FRMCS will decouple applications, services and transport to allow independence and transport bearer flexibility.
NFR-2	**Security**	Integrated the Simple Modeling Language for Embedded Systems (SMoLES) with the Security Model Analysis Language (SMAL). SMAL provides security extensions to the composition meta-model of the Domain Specific Modeling Language (DSML)and can express access control policies for IoT applications. The resulting framework is called SMoLES Security (SMoLES-SEC).
NFR-3	**Reliability**	Achieving an increase in reliability and safety parametersby even a few percentage points is a rare statistical event 1. Monitoring of failure-prone systems on locomotives, such as the engine or electrical systems can increase the reliability significantly 2. Monitoring of bridges regarding material stress ordynamic behavior to detect changes indicating future failure

NFR-4	**Performance**	• Speed acceleration • Improvement of operations, efficiency of scheduling and increased energy efficiency
NFR-5	**Scalability**	• This model can reduce the man power

		cost savings, increase the capacity of the railway network, higher punctuality, reduced journey time
NFR-5	**Availability**	• Advanced Driver Assistance System for Railway Operators • Positive Train Control Systems for Railway Operators • Smart Railway Solutions • Intelligent Transportation Systems (ITS) • IoT-Based Fleet Management • Intel & ADLINK: Smarter, Safer Railways
NFR-6	**Scalability**	The operating costs involved in loading, transporting, and unloading materials from mining and other industries continue to rise as road travel is often prone to delays, especially for hauling heavy materials. Traditional truck hauling is expensive and contributes to the significant carbon footprint of such industries.