Railway Network Optimization Solution

**Railway Signaling Challenges**
- Centralized control system for railway network
- Increased velocity of network communication
- Collision avoidance
- Efficient usage of tracks and avoidance of unnecessary delays

**Solutions Features**
- Centralized Railway Signaling
  - Track Management
  - Safety Control (Avoid Collisions)
- Locomotive Control
  - Network Traffic Management
  - Real-time location update
- Wayside Equipment Knowledge
  - Asset utilization

**Overview**
- Real-time monitoring and control of trains and interlocking
  - Set up the railway infrastructure with trains, tracks, wayside sensors, actuators and controllers
  - Wi-Fi based client server architecture between control station and railway infrastructure
- Control algorithm for movement of trains and for actuators to switch tracks at interlocking through LTE/4G communication between the Predix UI and ground station
- UI for real-time visualization of train and actuator positions using Predix services with the following parameters: train state, speed, position and track routing at interlockings.

**Architecture**

[Diagram showing railway network optimization solution with various components like Actuator, IR Sensor, C MCU, Train Speed, Direction, Track Change Control, On-Premise, Predix Cloud, Centralize Railway Signaling, Locomotive Control, Wayside Equipment Knowledge, Train, MCU, Location, Track, Predix UI and ground station.]
**Technology**

**Controller / Platform**
- Raspberry Pi, Linux (Raspbian, Ubuntu), C, GNU tool chain

**UI/UX**
- Socket programming (TCP/IP, HTTP)

**Protocol**
- **Modules**
  - **System Overview**
    - Collision Avoidance
    - Increased velocity of network
    - Automated Railway transportation
  - **Unit Overview**
    - Train Speed control
    - Interlock switching control
    - Real-time data collection
  - **Train/Actuator History**
    - Number of stops
    - Number of collision avoidance
    - Number of speed changes
    - Number of track switching
  - **Health**
    - Overall status and performance of railway network

**Benefits**
- Real-time monitoring and control of trains and interlocking
- Minimize manual intervention for train and interlocking operations and hence minimize human errors
- Improve asset and rail performance
- Increase network velocity and optimize network performance
- Enhance asset utilization
- Better decision-making powered with real-time network data

**About QuEST Global Digital Solutions**
QuEST Global Digital Solutions practice is 2100+ engineers strong and is spread across U.S., Europe & Asia. Our core knowledge of engineering physics and our experience across product life cycle, combined with our capabilities in software and analytics gives us a unique position to support engineering companies in their digital transformation journey. We provide solutions such as software development and sustenance, knowledge based engineering, migration to Industrial Internet platforms, MBE (Model Based Enterprise) transformation and data analytics. We are part of the GE’s Digital Alliance program striving to make a robust Industrial Internet ecosystem.

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