proposed solution for smart solution railways

Domain:Internet of Things

Team ID:PNT2022TMID38287

ABSTRACT:

- Digital Railway Solution. ...
- Digital Twin— Digital platform for railways and airways. ...
- Role of sensors in predictive maintenance. ...
- Predictive maintenance and CMMS. ...
- The IoT-connected trains. ...
- Big Data analytics for smart railways.

Transportation systems are complex with respect to technology and operations due to the involvement of a wide range of human actors, organisations and technical solutions. There is a need to apply intelligent computerised systems for the operation and control of such complex environments, such as computerised traffic control systems for coordinating advanced transportation.

Digital Railway Solution

The digital railway programme is focussed mainly on digital signalling technology, which aims to enhance safety and speed up train movement in a congested network. If all data from signalling, rolling stock and passenger traffic control systems is

brought together on a common platform, the entire network will be able to communicate seamlessly and instantaneously. The key to digitisation is the interoperability of systems while retaining a critical approach to data security.

Digital Twin— Digital platform for railways and airways

A digital twin refers to a virtual replica of a physical asset, like an aircraft engine or a rail engine. It is a vital element of the digital rail solution that is continually updated as per the rail network. It enables engineers to test detailed what-if scenarios that could help in decision-making around the planning of enhancement and maintenance programmes. It could identify the most-valued solution that would have the greatest efficiencies and minimise disruptions.

Role of sensors in predictive maintenance

Sensors use a reaction-based approach to manage and maintain an asset and maximise its use potential. A wide range of sensors is available to collect huge amounts of data from all possible systems of a single train and then analyse it in real time to detect problems before these actually occur. Constant monitoring of equipment through the measuring of all relevant variables such as temperature, vibrations, oil levels and the like help anticipate the optimal timing for maintenance.

Predictive maintenance and CMMS

Modern, next-generation asset and maintenance management

starts with the adoption of a smart computerised maintenance management system (CMMS). Reliable railway maintenance is required to improve critical issues like safety, delays and overall system capacity. It is expected to rely on smart transportation systems and interconnected solutions such as predictive maintenance. An interconnected CMMS can help maintain, manage and connect tracks, terminals, rolling stocks and communications infrastructure. It can identify maintenance issues before these impact safety, operations or revenue. It collects, stores and analyses data to prevent breakdowns and issue predictive maintenance algorithms to extend equipment life.

The IoT-connected trains

The IoT can interconnect all objects and devices that were previously not part of a network for predictive analytics. Its application increases safety, efficiency and ease of use with train management systems. Control and surveillance systems reduce the risk of collisions and regulate speed. Advanced consumer technologies help maximise connectivity and allow passengers to continue their activities on smart devices while travelling. Train-to-train communication through the cloud enables operators to transmit data about equipment, tracks and stations among themselves.

Big Data analytics for smart railways

The complete Big Data architecture includes the IoT and cloud

computing devices. These work together to create smart railways that have self-learning capabilities to predict failure, make diagnoses and trigger maintenance actions. The architecture utilises multiple data sources to extract relevant information. It helps users to know what happened when, so they can go back and do the root cause analysis from the data, and take appropriate corrective action. Big Data analytics in railways lead to predictive analytics and make decisions based on huge amounts of data. These involve data collection, analysis, visualisation and decision-making for assets.