

Project Radius

Problem description

Currently monitoring of railway signalling assets is based on:

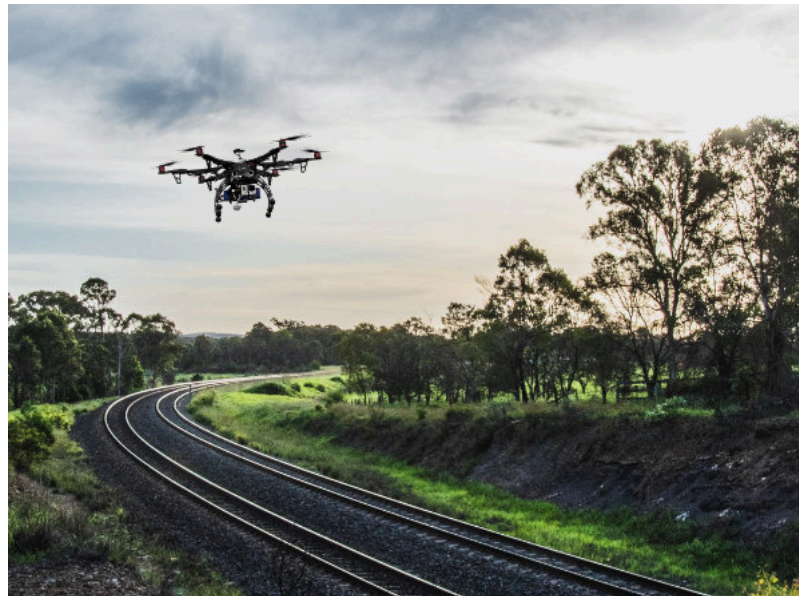
- on-demand or programmed human maintenance activities
- wired solutions
- active surveying using custom trains equipped with monitoring technologies

Each of these solutions has important drawbacks. Human maintenance activities are highly demanding in terms of direct personnel costs and operational constraints: teams are composed of two or three persons for safety purposes and maintenance activities disrupt the section being maintained, limiting or completely eliminating traffic, removing power, etc.

Wired solutions are very expensive, and the cables used need maintenance by themselves, increasing the equipment to be maintained. More importantly, due to bandwidth limitations a small subset of diagnostic data can be monitored.

To overcome these limitations, diagnostic trains have been designed and deployed, incurring in heavy investments. These trains acquire track-side and signalling asset diagnostic data during their runs. However, they normally run at lower speed than commercial trains, implying temporary performance limitations on the assessed lines. Diagnostic trains are technologically complex requiring their own maintenance and very experienced personnel to operate them.

It is important to note that in-situ human intervention is generally required, even if using wired or train based solutions, to perform reparations and visual inspections before declaring the completion of the maintenance activities and resuming train operations.



RADIUS approach

RADIUS proposes to use Unmanned Aerial Systems (UAS) to execute a large part of the inspections and a limited range of maintenance activities like tuning, re-calibration, activation of special functions, etc.

The objective of RADIUS is to develop a UAS-based technology

- to monitor the physical status and electronic functionality of both non-safety-critical and safety-critical railway signalling assets and
- to execute specific maintenance activities to pave the road to efficient and reliable unmanned activities.

The RADIUS automation will allow increased inspection frequency and constitutes a true new paradigm for railway inspection and maintenance limiting activities carried out by human teams and improving the global railway operational service in terms of availability, reliability and performance.

Project scope

Design and develop UAS solution

- Identify the UAS technologies to be used in the railway sector considering the signalling assets to be monitored, the characteristics of the lines, the distances to be covered and the maintenance actions planned
- Design and integrate the payload (sensors), wireless technology to connect the UAS with the signalling assets and the data and command links between the UAS and the remote pilot station
- Develop solutions based on EGNSS to improve navigation and positioning such as EGNOS (SBAS) and GALILEO
- Data transmission solutions to guarantee efficient, reliable and secure data exchange between drones and ground control infrastructure

Railway asset adaptation/redesign

- Focus on elements most affected by low Mean Time between failure (MTBF) or highest frequencies of maintenance, tuning, or re-calibration actions
- Design of a docking station capable to host the UA during maintenance actions and to charge its batteries

Interfaces with IAMS and TMS

- Interaction with existing Intelligent Asset Management Systems (IAMS) to guarantee a seamless integration of RADIUS in the current railway maintenance operations and to optimise the processing power of the RADIUS system taking advantage of the processing power of IAMS

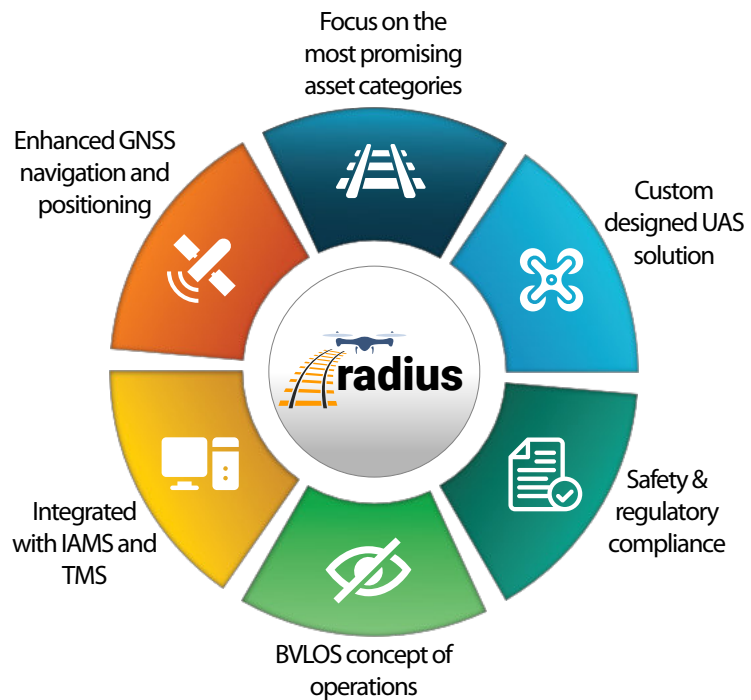
- Interaction with current Traffic Management Systems (TMS) to improve the safe movements of drones within the railway and reduce, or possibly eliminate the need for railway track possession

Mission planning, safety and regulatory compliance

- Definition of a Beyond Visual Line of Sight (BVLOS) concept of operations (ConOps)
- Ensure the compliance with all aviation and railway regulations as well as with the complexity and peculiarities of the railway environment

System demonstration

RADIUS will include a practical demonstration of the solution developed into a prototype in a railway relevant environment, achieving a TRL 6



Radius solution highlights

Project Consortium

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