SYMPOSIUM ON INTEGRATED APPLICATIONS (B5)
Tools and Technology in support of Integrated Applications (2)

Author: Dr. Michiel Kruijff
SERCO/ESA, The Netherlands

Dr. Mark Dumville
Nottingham Scientific Ltd, United Kingdom
Mr. Amnon Ginati
European Space Agency (ESA), The Netherlands

TITAN, A SYSTEM FOR INTELLIGENT RAILWAYS VIA INTEGRATED SATELLITE SERVICES (IRISS)

Abstract

Train passengers and authorities demand trains' timeliness, comfort, safety and energy efficiency. Train fleets, over their multiple-decade lifetimes, will therefore typically undergo various modernizations, in order to improve fleet monitoring and management. It is then advantageous if additional equipment is highly integrated due to lack of on-train space. The IRISS (Intelligent Railways via Integrated Satellite Services) project proposes such an integrated service. It provides Train Operating Companies with essentially uninterrupted monitoring of train stock based on terrestrial and satellite communications, satellite navigation and conventional train metering. IRISS is a recently completed feasibility study initiated by the European Space Agency's Integrated Applications Programme.

The involved user, East Midland Trains (EMT, a UK Train Operating Company), has expressed the need for affordable and continuous tracking of their trains, as well as communication between their control center and rolling stock. Information to be exchanged are e.g. messages alerts, train location, diagnostic data, and camera footage (CCTV), both in real-time (to reduce service interruptions) and historical (e.g. to resolve disputes and optimize energy efficiency and maintenance). IRISS has investigated whether space assets can add value where conventional technologies face limitations. For example the current train location system based on so-called 'balises' provides low accuracy, while backcountry routes may still have poor communications coverage by terrestrial networks. Nottingham Scientific Ltd. has defined a service architecture centered around the Titan on-board unit that integrates satellite navigation (GPS, EGNOS, GLONASS), with satellite and terrestrial communication and that is fed by on-train sensors and CCTV. EMT's control center collects the Titan real-time and historical data (using 3G/GPRS, SatCom, Wifi), tagged with time and location. The data can be retrieved and displayed for asset management, incident investigation and driver training purposes, whereas messages, alerts and commands can be exchanged with on-train personnel equipped with PDA's.

IRISS has resulted in a successful proof of concept demonstration of the TITAN system on both a rural train and a high-speed train in the East Midlands. The added value of Iridium satellite communication as compared to terrestrial networks has been assessed, as well as the continuity and coverage of GPS and EGNOS based navigation capability for railway applications. The development of a pre-operational service together with the involved users is foreseen as a next step.