



NavIC Applications for Enhancing Safety in Public Transport System of India

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NAVCOM for Indian Railways

ISRO having its own Navigation System (IRNSS) & SATCOM infrastructure has setup a dedicated MSS network for Indian Railways to support NAVCOM requirements & for enhanced Safety in Human Transportation:

- ✓ **Real-time Train-tracking Information System (RTIS)**
- ✓ **Automatic Warning at Un-Manned Level Crossing (UMLC)**



Objective and Salient Feature of the Network :

- △ **Train Tracking** (Periodic Train Position Reporting)
- △ **Event Reporting** (Arrival, Departure, Run-through, Unscheduled Stoppage etc.)
- △ **Two-way Emergency Messaging**
- △ **SoS Feature** (During accidents for awareness to other locomotives in vicinity)
- △ **Emergency Warning Broadcast** (From control station to all locomotives)



MSS Network for RTIS (Real-time Train-tacking Information System)



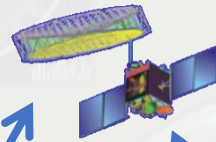
Loco Devices



Outdoor



Indoor



HUB Baseband



Hub at Delhi

SATCOM Link

GPRS

CRIS, Indian Railways Data Center

139 call center

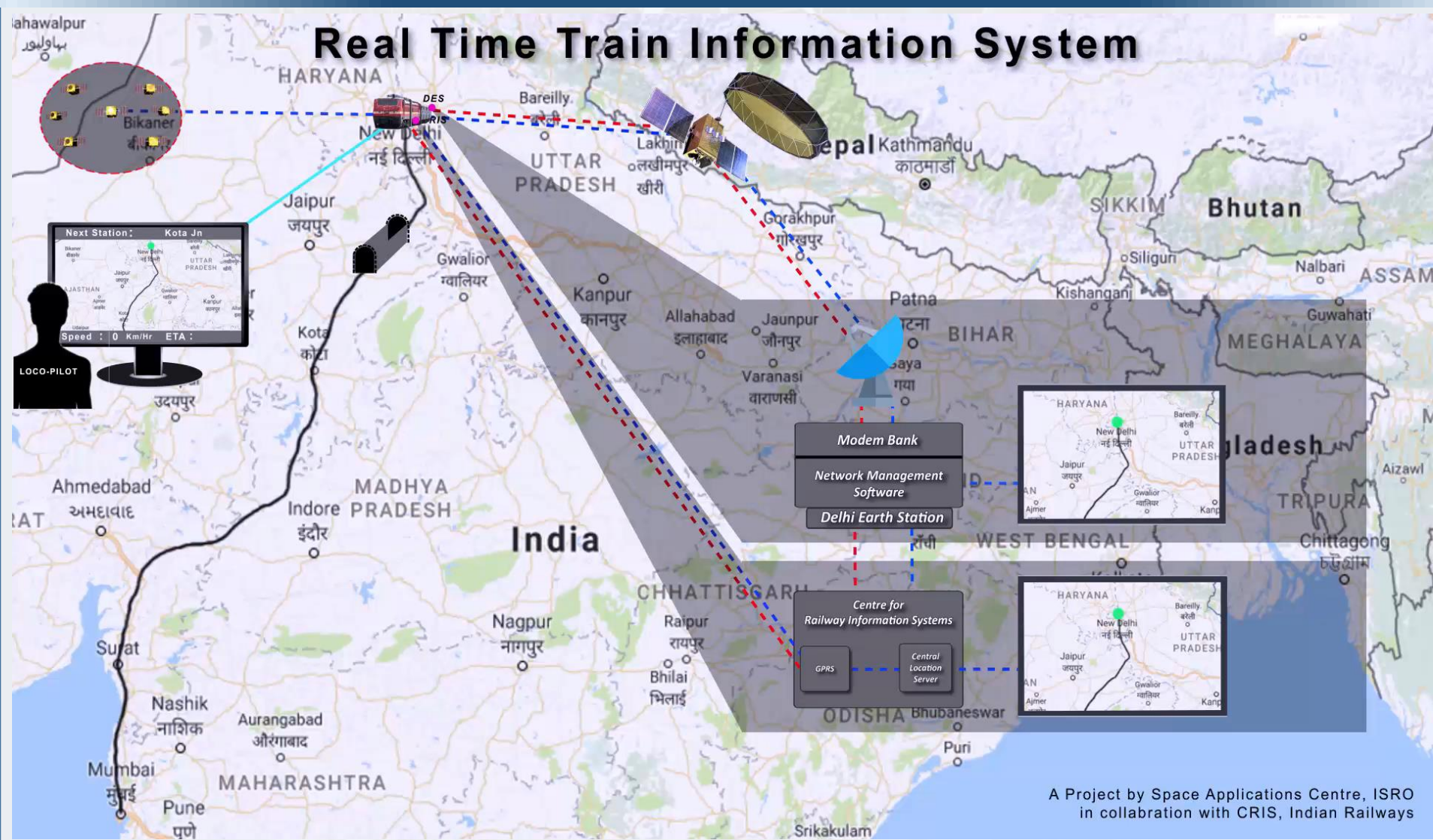
Mobile App

IR Website

Network Features:

- Hybrid SATCOM & Terrestrial N/W
- SATCOM Channel Access is D-TDMA
- Position Reporting every 30 /40 Sec
- Two-way messaging in Aloha Mode
- Network designed for 16K locomotives
- Network implementation supports multi-beam network configuration

CRIS: Centre For Railways Information System
GPRS: General Packet Radio Service



A Project by Space Applications Centre, ISRO
in collaboration with CRIS, Indian Railways

Real-time Train-tacking Information System (RTIS) (Deployment Pictures)



Installed Terminal - Side View



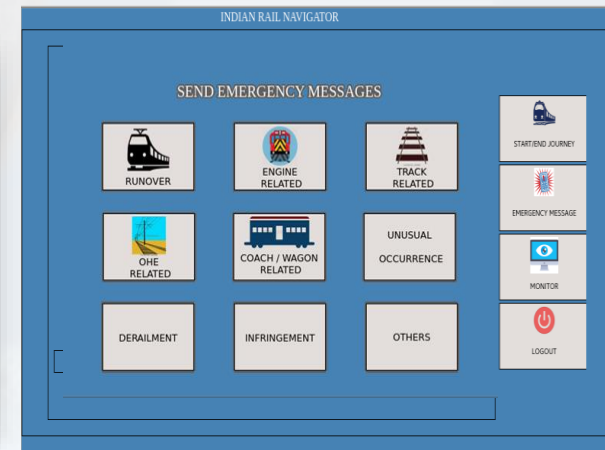
Installed Terminal – Top View



Primary Display in driver cabin (1)



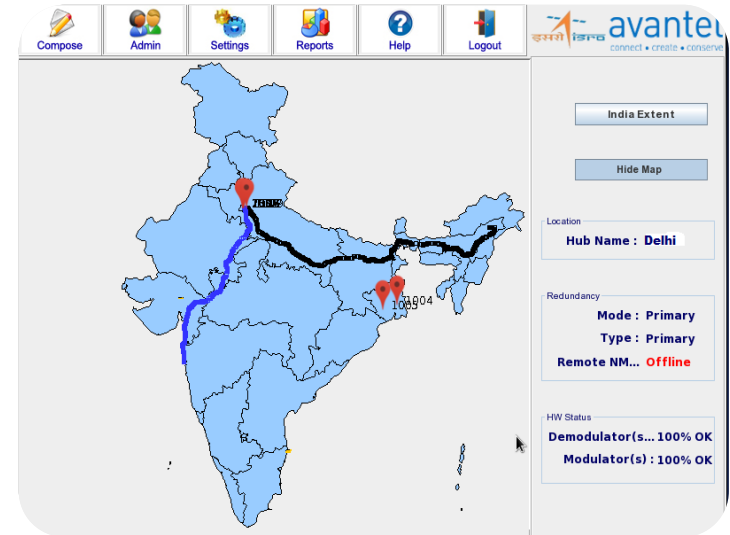
Secondary Display in driver cabin (2)



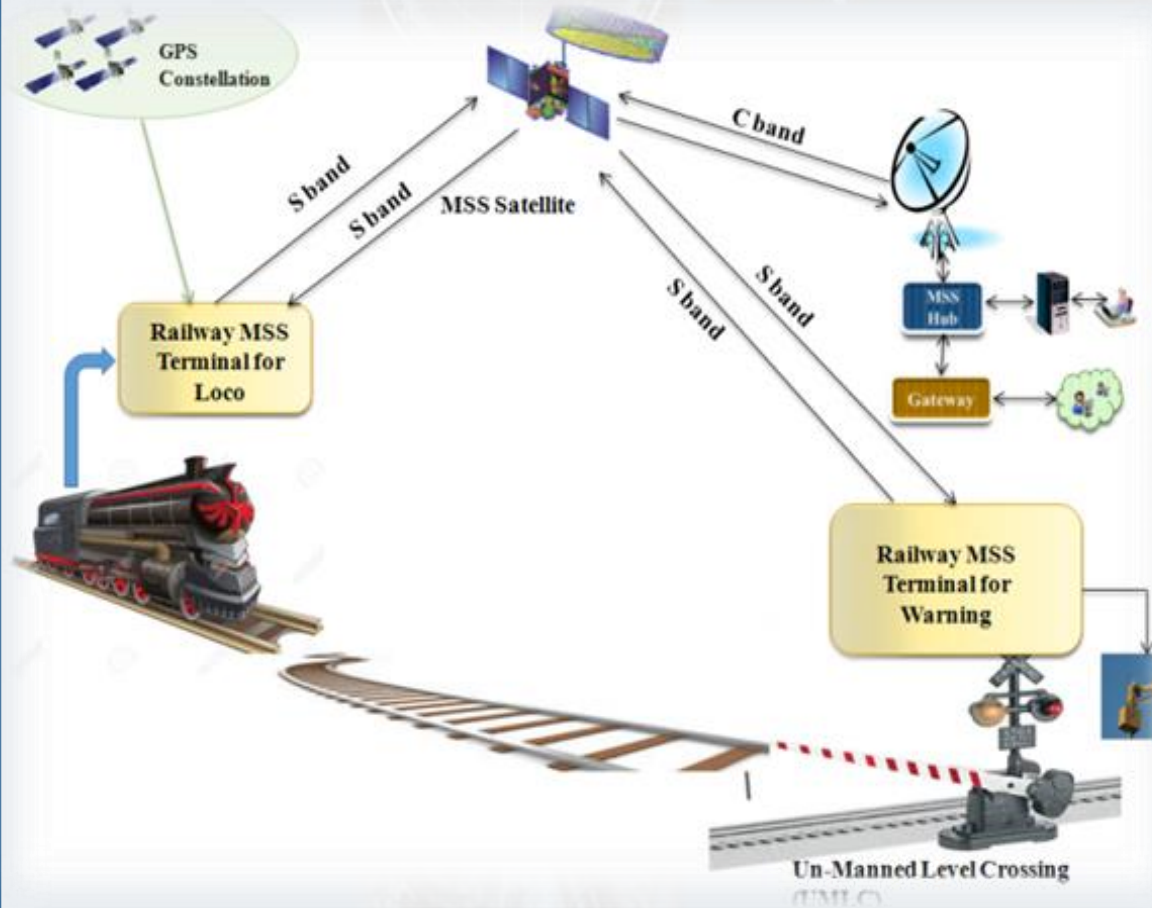
Indian Railway Navigator (IRN)



**Availability of
Arrival/Departure
/Run-through info
99.45%**



DEVICE ID	LOCO ID	Train Number/Name	Route	Run Duration	
				From Time	To Time
1003	30401	12424/NDLS-DBRT RAJDHANI	NDLS-KIR	11-09-2017 16:14	12-09-2017 09:59
Mode Of Communication	No. of A/D/R events Expected	No. of A/D/R events Reported	Percentage of Reported A/D/R		
GPRS1	183	144	78.69		
GPRS2	183	107	58.47		
MSS	183	181	98.91		
Total A/D/R EVENTS	183	182	99.45		



- Automatic Warning at UMLC & in Locomotive when train is 2 Kms away from UMLC
- SOS Feature to avoid follow on accidents
- Remote Health Monitoring of Equipment
- Emergency Broadcast to all
- Emergency small message communication to and from locomotive to control centre
- Navigational aid to loco-pilot

• Proof of Concept Pilot Project done with five(5) UMLC identified in East Central Railways (Hajipur Zone) in Aug-2017.

MSS Terminal & Network designed for IR supports both RTIS & UMLC Project



Setup at UMLC

Highlights of the NAVCOM Application by ISRO & IR :

- ☺ **All weather Navigation System:** More than 2500 locomotives are being tracked in real-time and their Control charts are plotted automatically.
- ☺ **Improved Safety :** Emergency messaging from Loco Pilot to Control Room.
- ☺ **Improved Efficiency:** Accurate train running information leads to optimum crew booking & reduction in pre-departure detention (PDD). Punctuality Monitoring.
- ☺ **Improved User Experience:** Web based real-time loco tracking provided to Loco sheds, Zonal Railways and Passengers



A Joint Initiative by ISRO & Indian Railways

ISRO: In the pursuit to Harness Space Technology for Societal Applications...

