



**EAST MIDLANDS** TRAINS



# Intelligent Railways via Integrated Satellite Services (IRISS)

Mark Dumville (NSL)

Darren Ward (EMT)



# Challenges & Objectives

## Industry Challenges

- To increase **Capacity** (more passengers, more trains)
- To reducing **Carbon** (reduce fuel)
- To lower the **Cost** of operations (running, maintenance)
- To improve **Customer** Satisfaction (reduced delays)

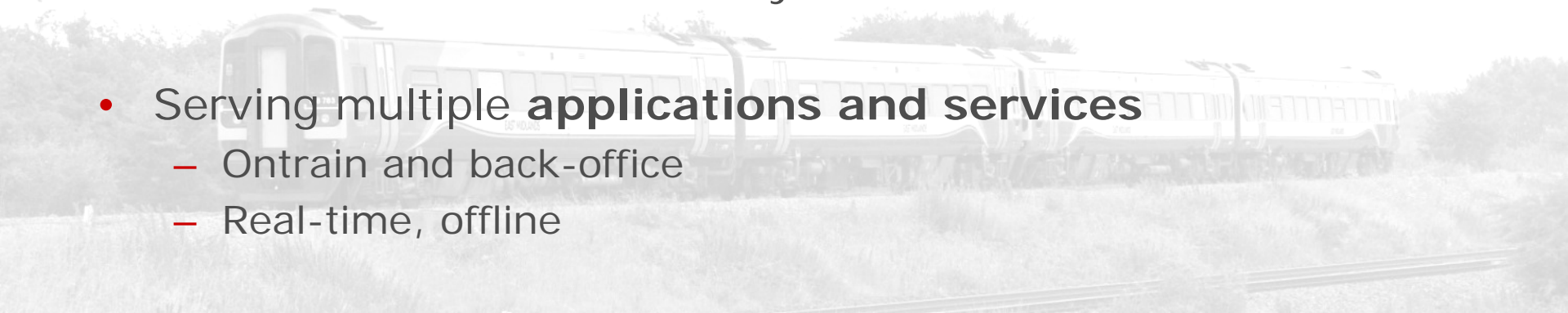
## Our Objectives

- To generate better **driving** style
- To deliver better **information** to support decision making
- To improve the **reliability** of trains
- To provide up-to-date, accurate **timetable** information

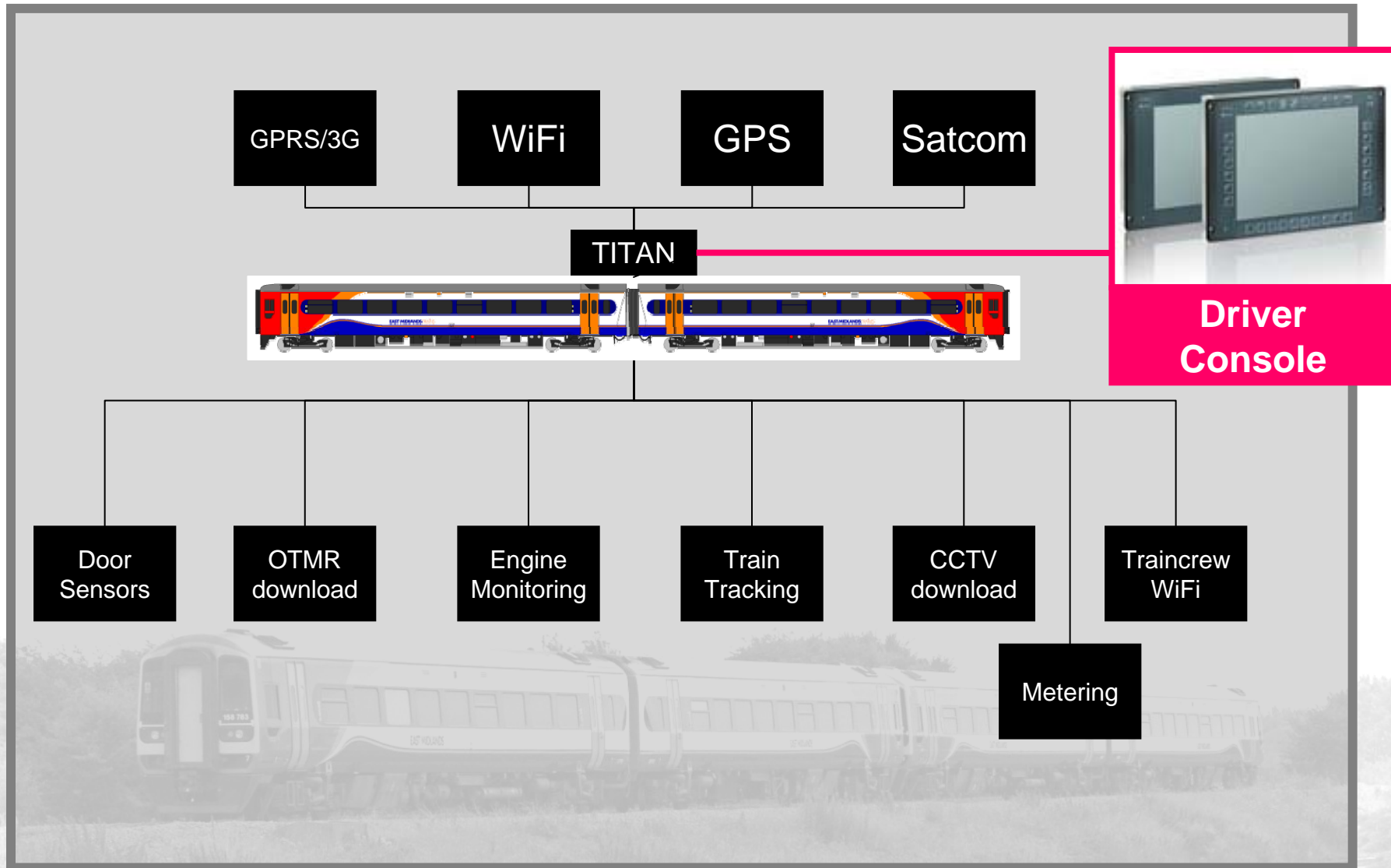


# Project Goals

- **Single, seamless** communications and navigation portal per train, including ontrain system, communication services and back-office utilities
- Provides **two-way communication** services serving multiple ontrain systems with **different bandwidth** requirements
- Provides **accurate train Position, Velocity, Time, Distance and Bearing** to back-office and **provides interface** to other ontrain systems
- Serving multiple **applications and services**
  - Ontrain and back-office
  - Real-time, offline



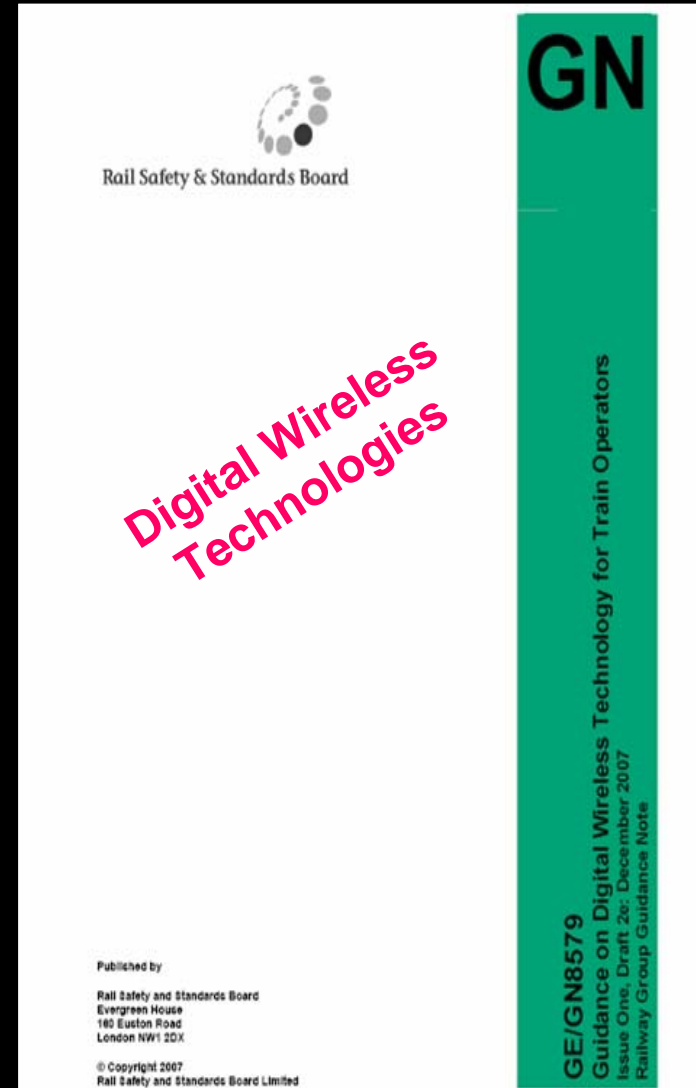
# Overall Concept



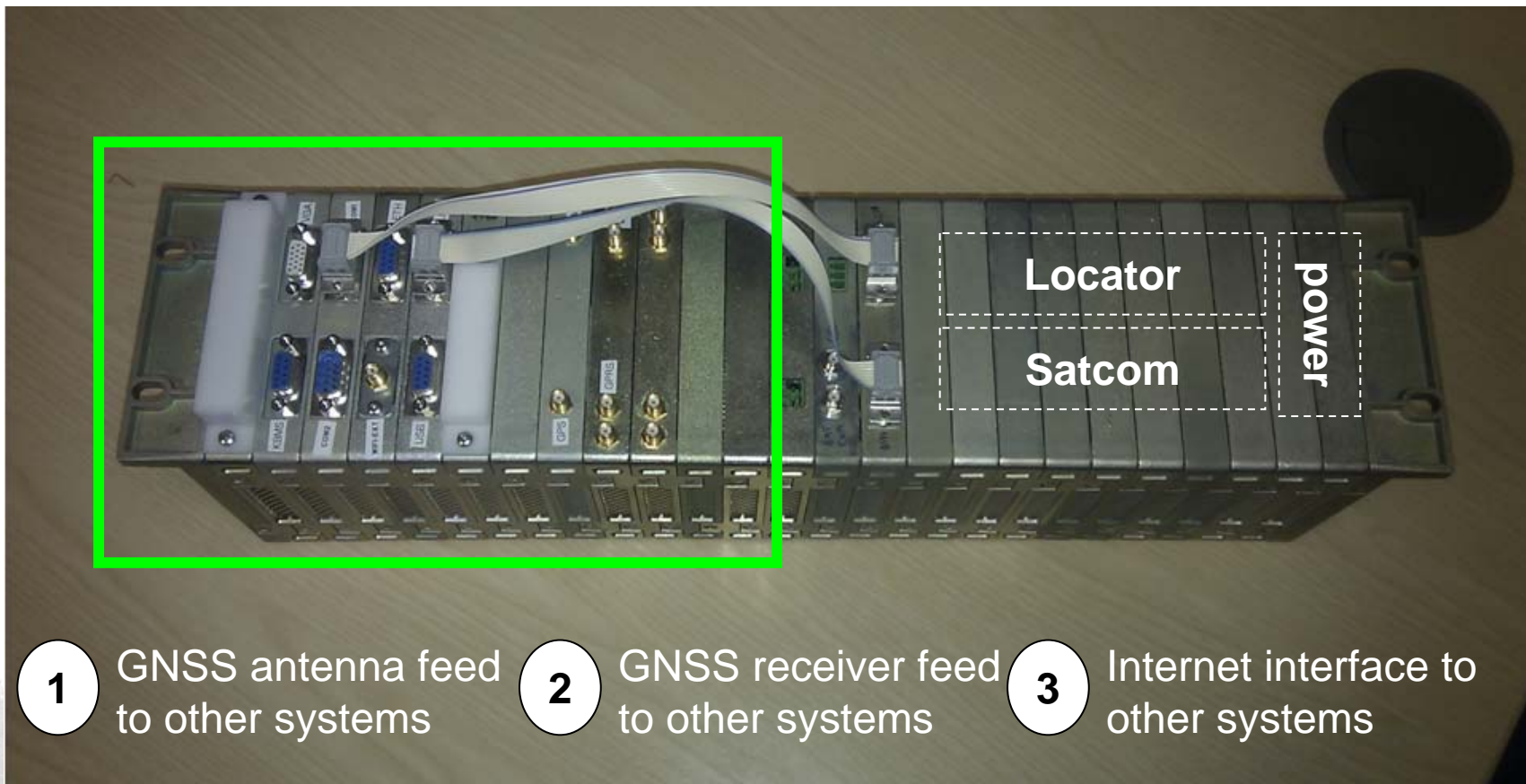


Rail Safety &  
Standards Board

# Supporting Guidance



# TITAN Universal Portal



# Sponsors & Stakeholders

- European Space Agency (ESA)



- East Midlands Trains / Angel / Porterbrook

**EAST MIDLANDS TRAINS**



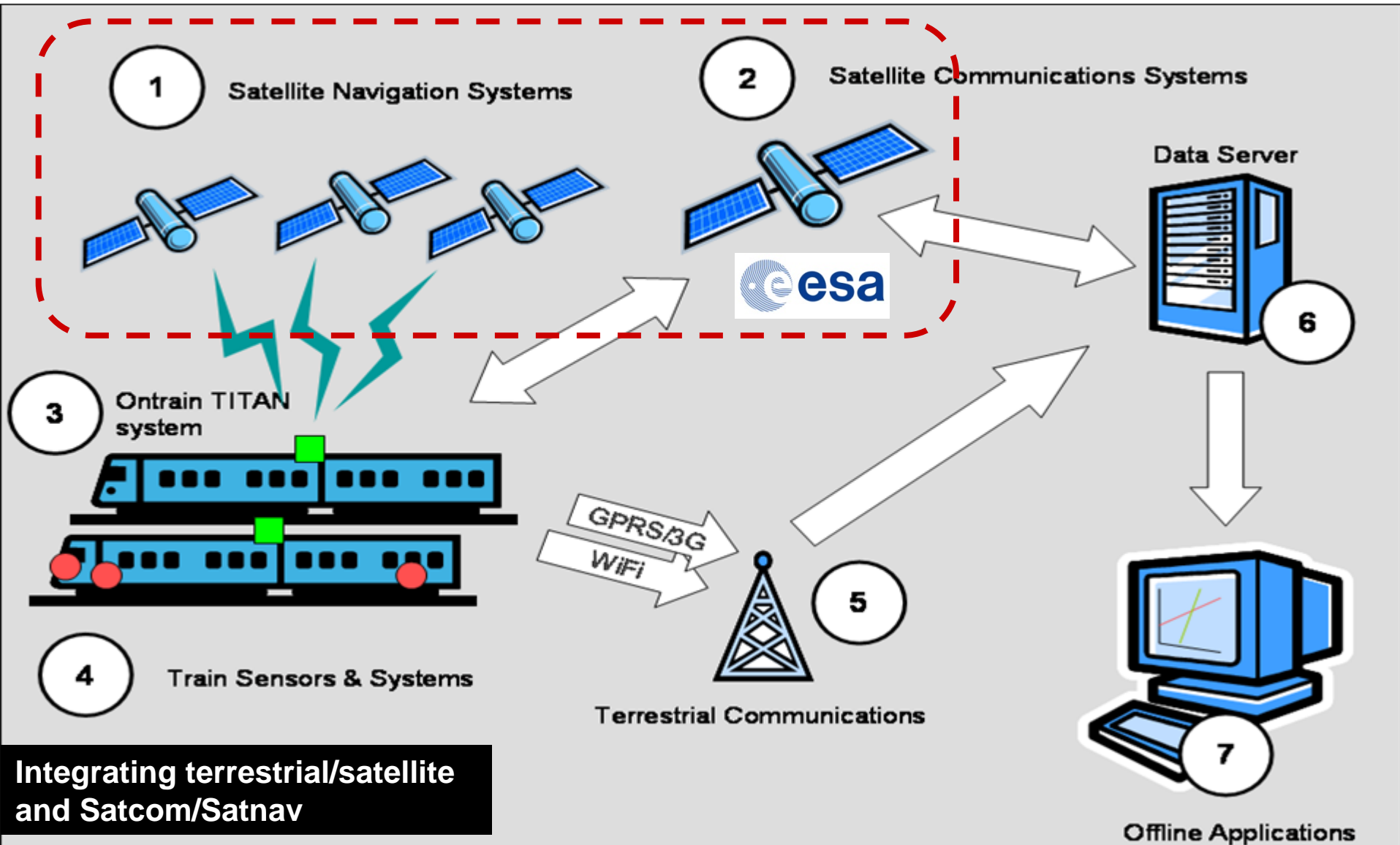
**angel** Trains

- Future Communications and Positioning Systems Working Group (FCPS)



Department for  
**Transport**

# System Architecture



# Trains & Routes



## Class 158

- Rural routes (extensive)
- <90 mph
- Many stations
- 15–25 years old
- Angel Trains Finance

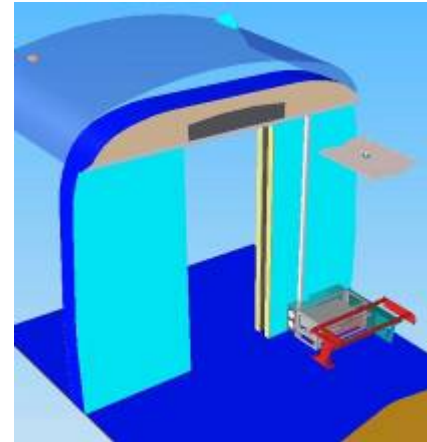


## High Speed Train

- Mainline Routes
- 125 mph
- Leeds - London
- 15–25 years old
- Porterbrook Rail Finance

# Testing & Approvals





# External Installation

GPS, GLONASS,  
Galileo, GSM, WiFi  
Antenna

Iridium SatCom  
Antenna



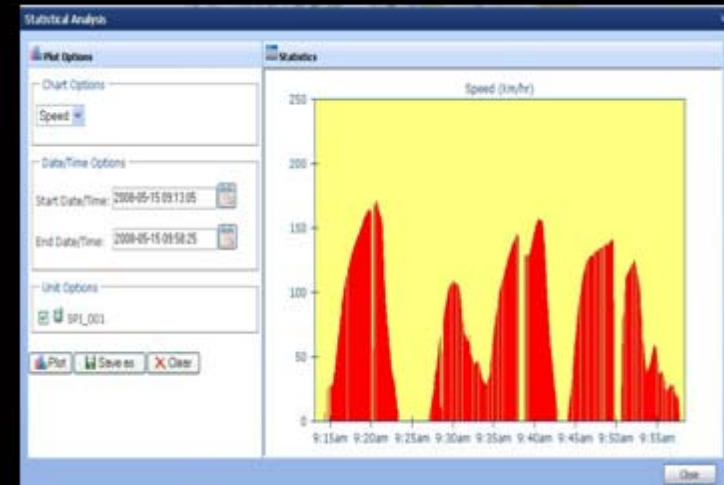
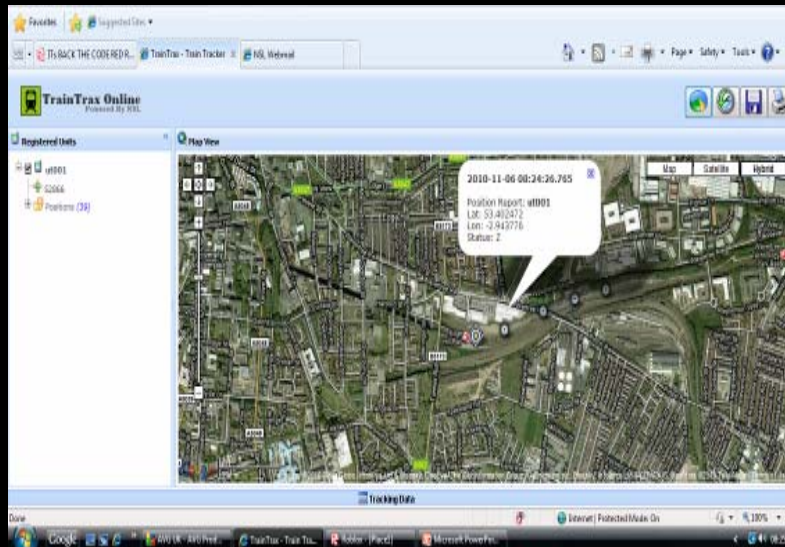
- External antennas fitted off centreline of vehicle
- GPS antenna is 0.5m from internally mounted GPS antenna for CCTV
- And at least 1m away from the future GSM-R antenna fitment

# IRISS Applications

1. OTMR download
2. CCTV download
3. Image extraction
4. Ontrain Metering
5. Train Tracking
6. Driver Monitoring
7. WiFi Paging / Messaging
8. GNSS feed



# TrainTrax ("GPS Train Tracking")



Search History Records

Search Options

Date/Time Options

Start Date/Time: 2010-11-06 03:15:00

End Date/Time: 2010-11-06 08:15:06

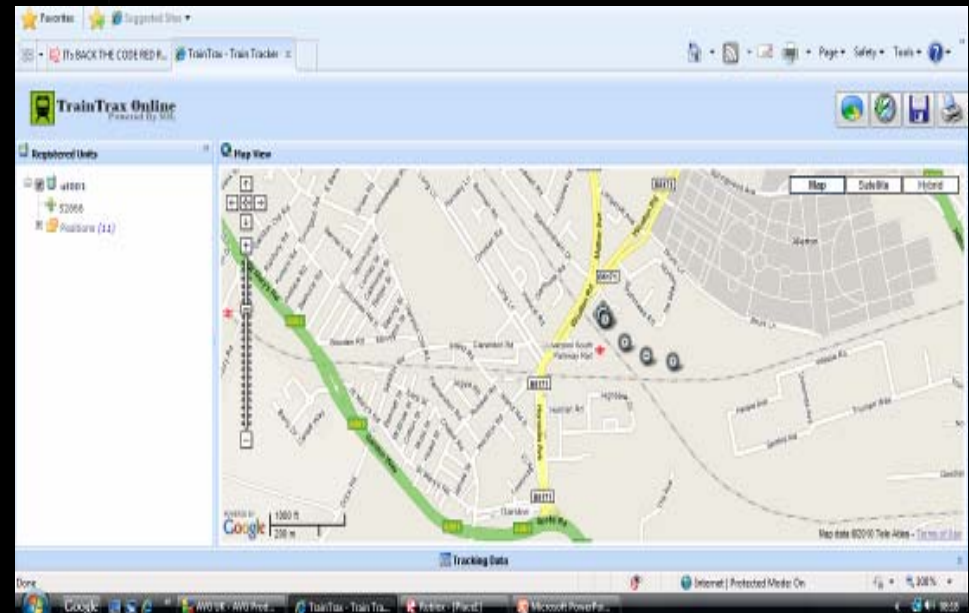
Unit Options

☒ ut001

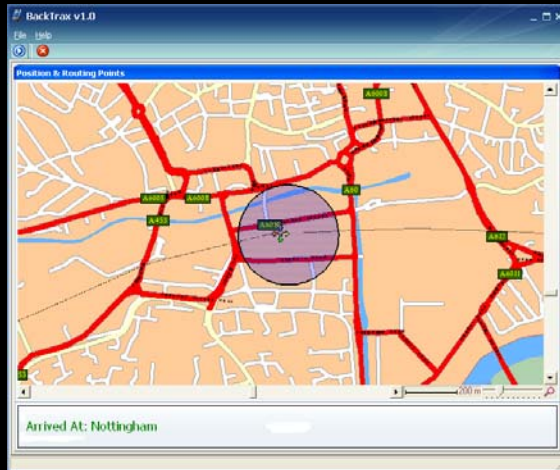
Search Save as Clear

Tracking Data

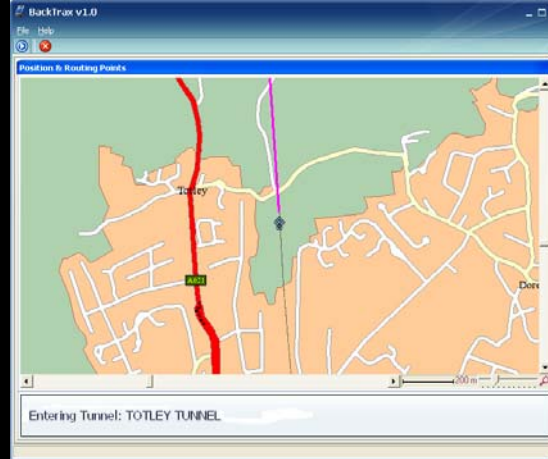
Unit ID	Message Reason	GPS Fix	GPS Date	GPS Time	Easting	Northing	Speed(kph)	Heading	No. Satellites	HR
ut001	Z	3	06/11/2010	05:27:14	454994	339819	47	329	9	
ut001	Z	3	06/11/2010	05:28:08	455516	339138	47	308	9	
ut001	Z	3	06/11/2010	05:25:29	455916	338837	47	297	9	
ut001	Z	3	06/11/2010	08:11:06	342525	385062	48	256	8	
ut001	Z	3	06/11/2010	07:12:51	391774	386917	48	311	11	
ut001	Z	3	06/11/2010	07:11:57	392341	386470	48	289	11	
ut001	Z	3	06/11/2010	07:11:44	392513	386435	48	277	11	
ut001	Z	3	06/11/2010	06:45:43	418552	383030	48	288	11	
ut001	Z	3	06/11/2010	06:45:29	418731	382982	48	282	11	
ut001	Z	3	06/11/2010	05:34:36	447857	340656	48	355	9	
ut001	Z	3	06/11/2010	05:27:40	454884	340142	48	355	9	
ut001	Z	3	06/11/2010	05:26:35	455257	339393	48	325	9	
ut001	Z	3	06/11/2010	08:11:45	342007	384941	49	256	8	
ut001	Z	3	06/11/2010	08:11:32	342176	384981	49	256	8	
ut001	Z	3	06/11/2010	08:11:19	342352	385023	49	256	8	
ut001	Z	3	06/11/2010	07:38:55	382876	397540	49	243	9	
ut001	Z	3	06/11/2010	07:24:00	389071	390313	49	334	11	



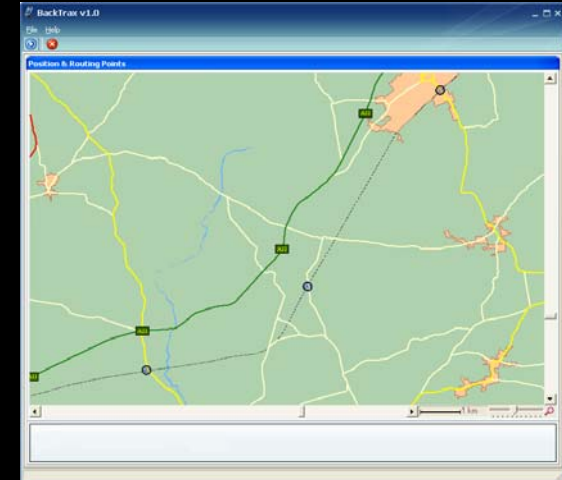
# NavTrax ("SatNav for Trains")



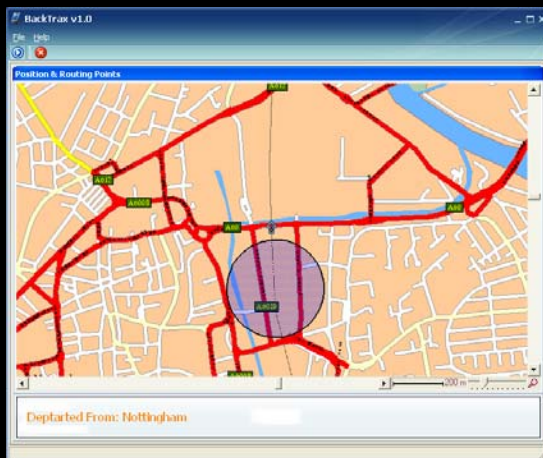
Entering "zones of interest"



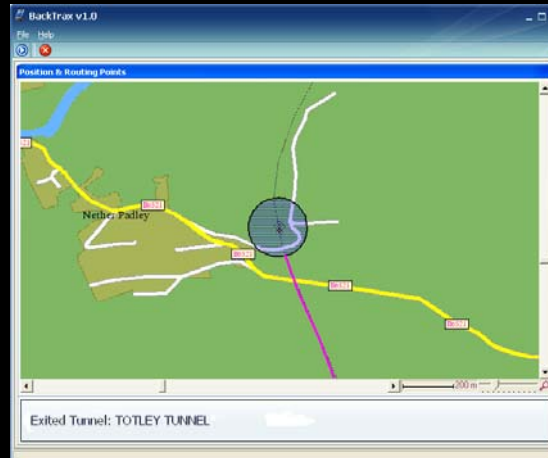
Entering "sections of interest"



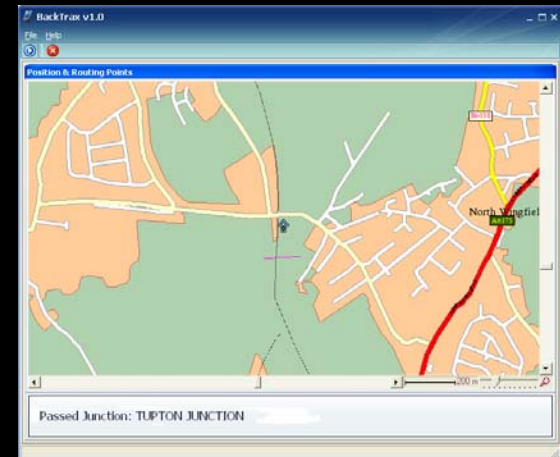
Virtual TRUST points



Exiting "zones of interest"

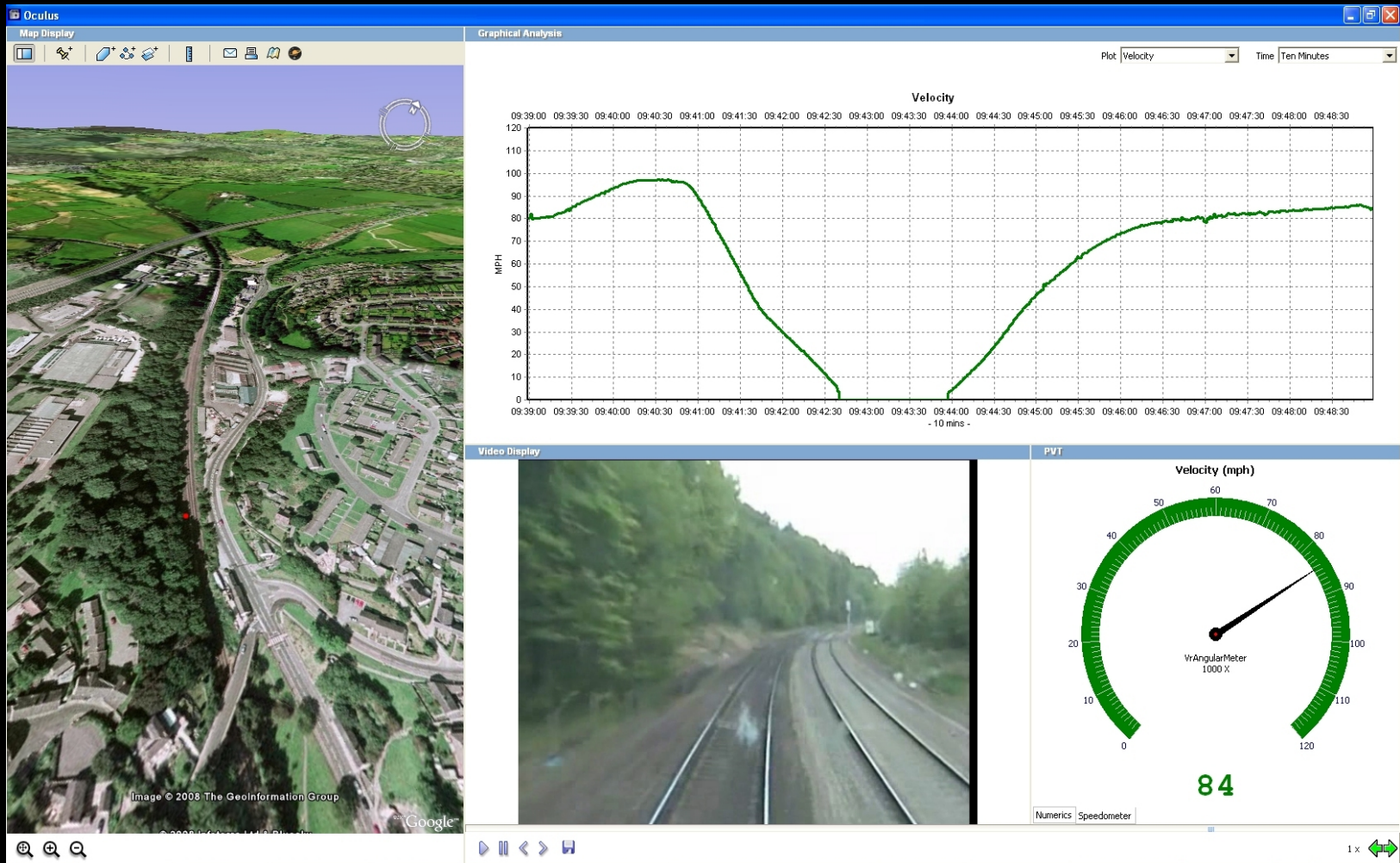


Exiting "sections of interest"



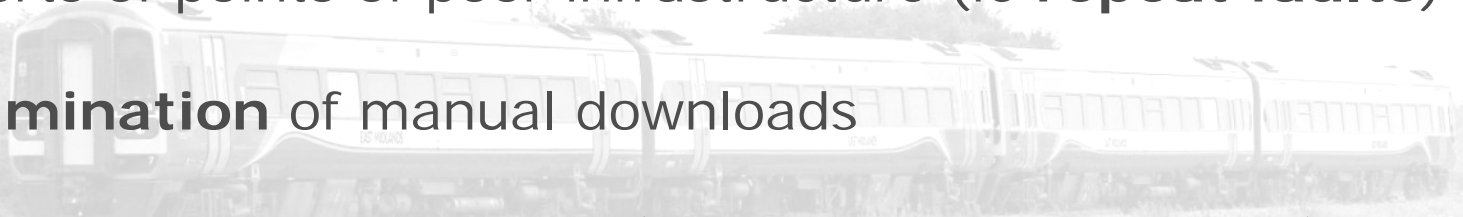
"points of interest"

# Driver Training



# Expected Benefits

- Better information to **customers**
- Improved maintenance (**records & alerts**)
- **Reduced** cancellations & delays
- Enhanced **Performance**
- Moving to **condition-based maintenance** regime
- Better **use of energy/fuel**
- Alerts of points of poor infrastructure (ie **repeat faults**)
- **Elimination** of manual downloads
- Information **on-demand** (support decision making)





**NSL**

**EAST MIDLANDS** TRAINS



Department for  
**Transport**



Rail Safety &  
Standards Board

angel <sup>Trains</sup>



thank you

