Railway Radio

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Date 17th November 2010

Building a Next Generation Network

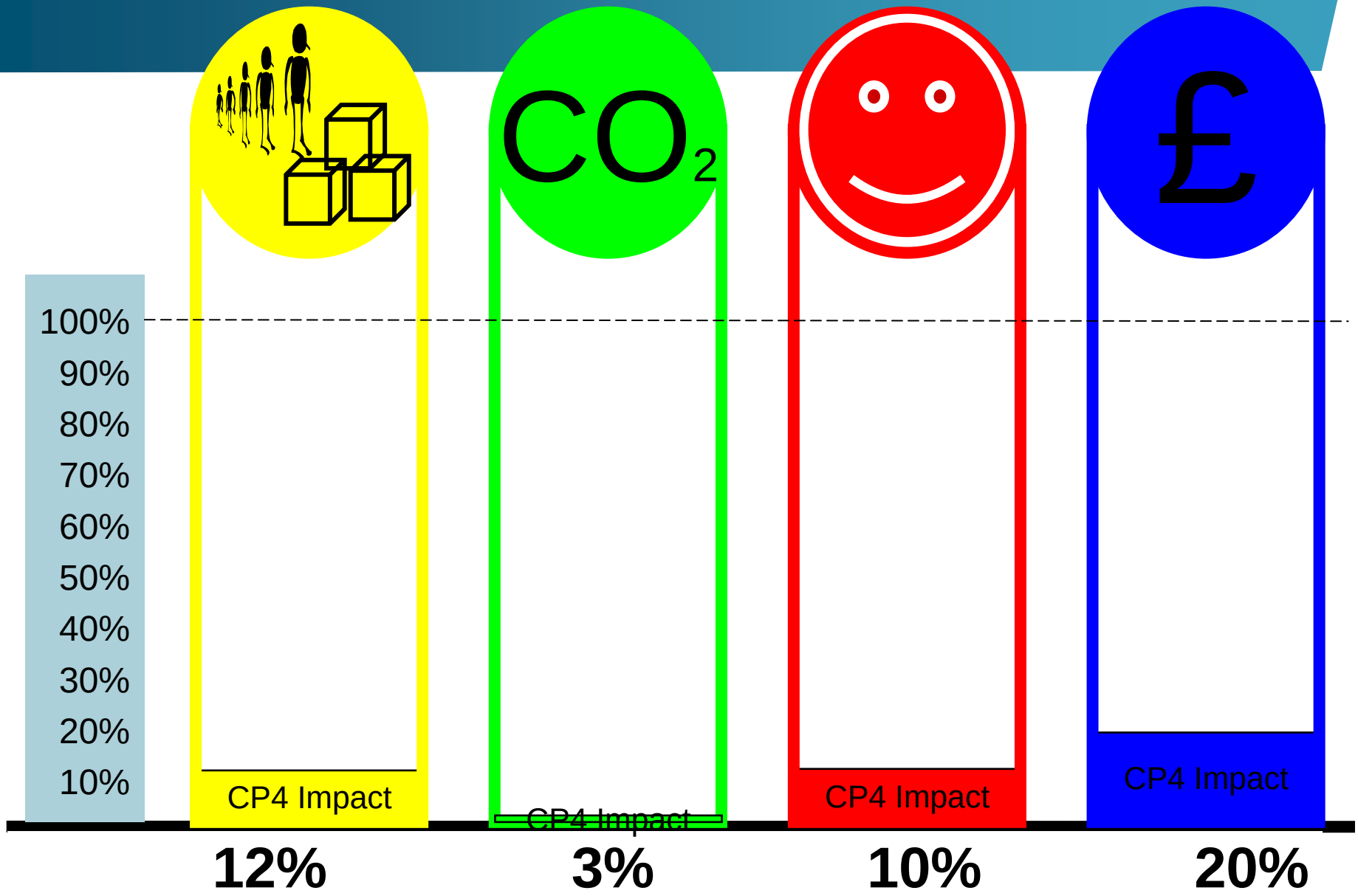
The Industry Challenge – The 4Cs

Capacity – More trains, more often, more of the day.

Carbon – Build upon an already strong position.

Customer – Punctuality, reliability, information.

Cost – Cheaper to Government and Fare Payer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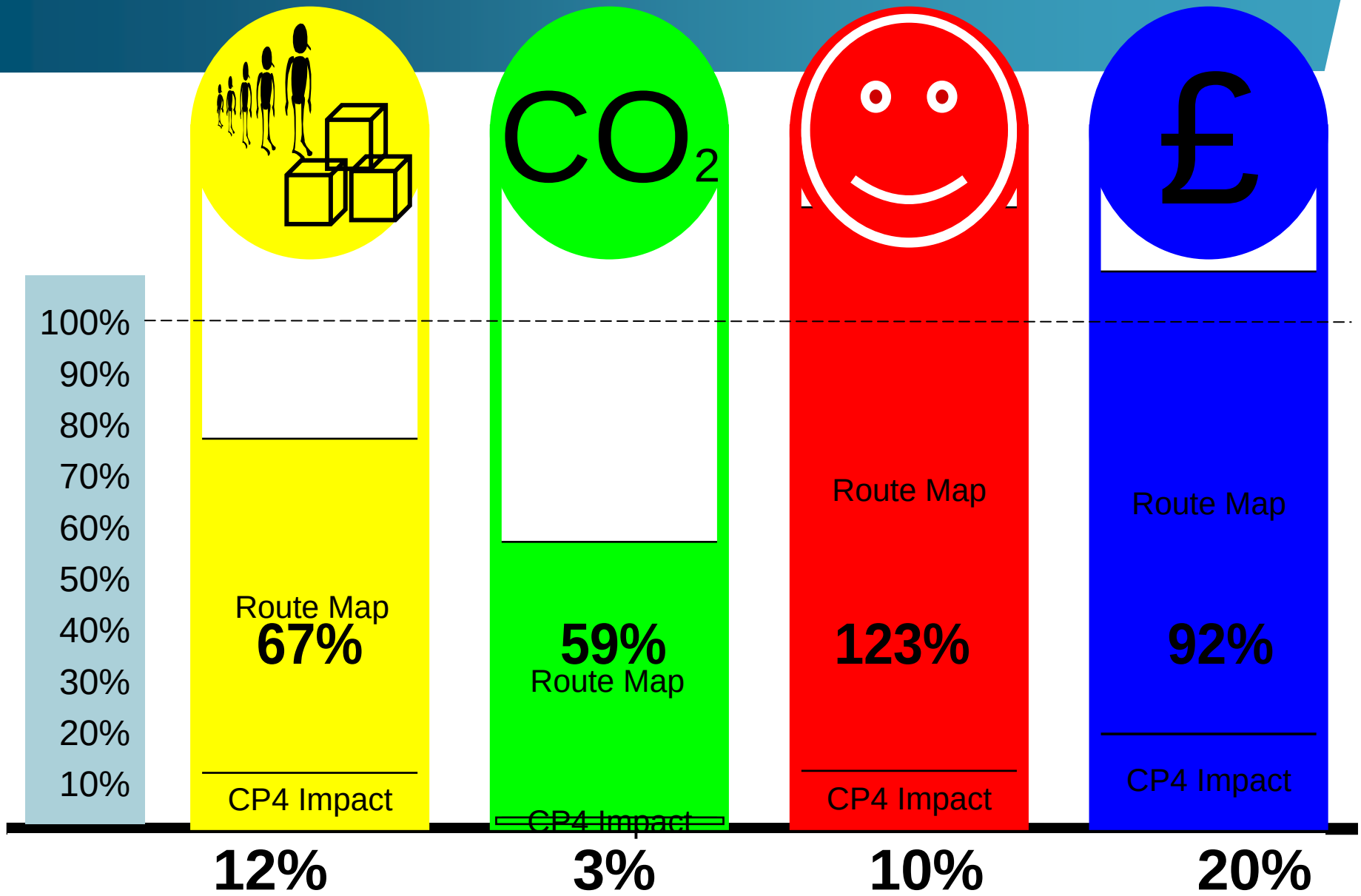
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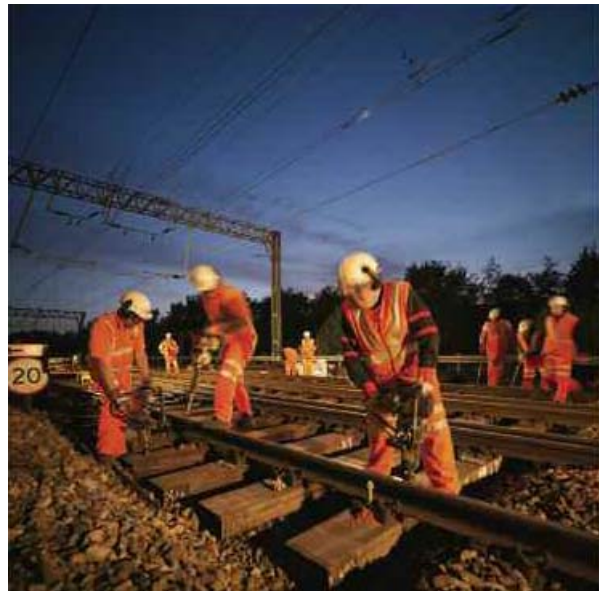
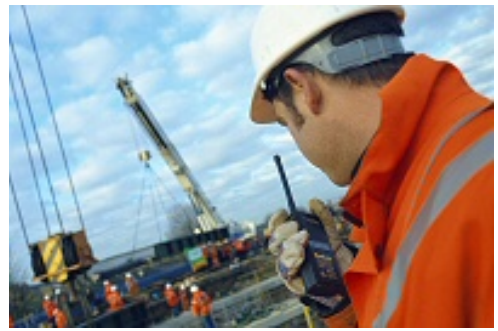
Infrastructure Management Challenge

- 30,000km Track (12,000)
- 37,000 Bridges
- 450 Tunnels (>300km)
- 2,500 Stations (18 Major)
- 36,000 Staff
- 800 Control Locations
- 20,000 Sets of Points
- 35,000 Signals (1,500)
- 7,000 Level Crossings





A few more industry figures……

Per Day:

- 24,000 Passenger Trains
- 3m Passenger Journeys

Per Year:

- 100m Tonnes of Goods
- 1.8m Tonnes Railway Ballast
- 850,000 Sleepers (+600,000↺)

Communications supports the Industry

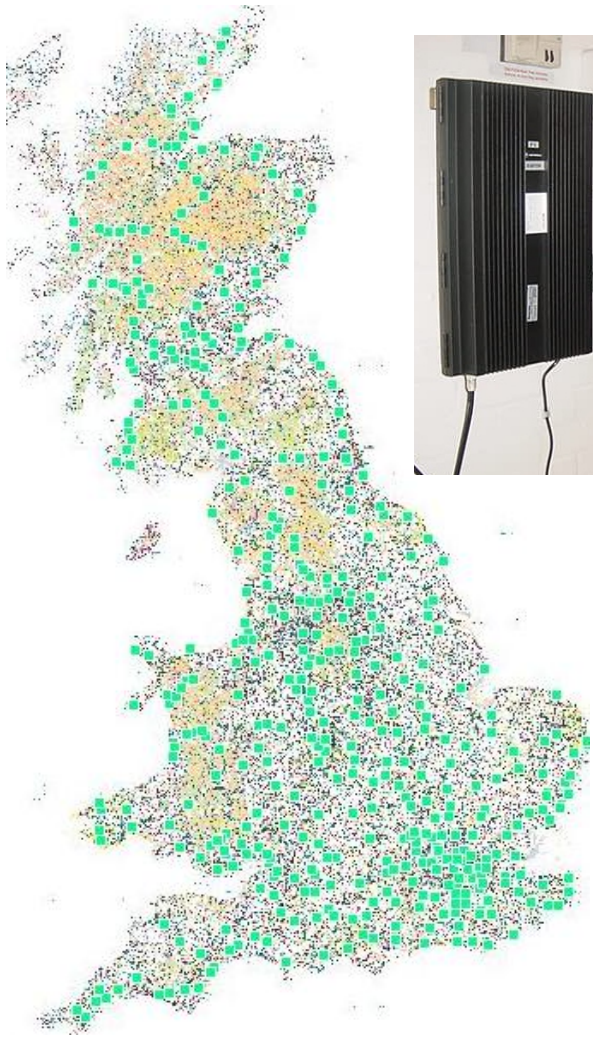
- Lineside Cabling (fibre 8,500km and 14,000km copper)
- Cabled transmission systems (PDH and SDH)
- Microwave link (resilience bearer and access layer)
- Office telephony (PABX and VOIP)
- IT MPLS Network (800 IM people)
- Control centre telephone systems (50,000 lines)
- Legacy Radio

Cab Secure Radio (CSR)

- DOO Enabler
- MPT1327 Special (BR1845)
- 130 Signalling-Aligned Systems
- "100% coverage”
- 1,000 trackside fixed stations
- 19 national channels in UHF1/2
- Channel, timeslot and CTCSS managed
- Spectrum re-use potential

National Radio Network (NRN)

- MPT1327 Storno Starnet 1985-90
- 21 Control Systems
- 90% coverage excl Tunnels and Deep Cuttings
- 400 railway & 3rd party sites
- 500 fixed stations
- 100 remote test transponders
- 31 Band 3 channels
- 2012/2015 Switch-off



Radio Electronic Token Block (RETB)

- Rural Control & Communications
- Simplified NRN-like system
- Repeater and Fixed Station Chains
- Direct signalling interconnection
- 95% General Coverage
- "100% coverage" of token exchange points
- Re-engineering due to severe obsolescence issues

Railway GSM (GSM-R)

- GSM + EIRENE (European Harmonised System)
  - Functional Numbering
  - Priority & Pre-emption
  - Group & Broadcast Calls
- 2 core nodes (Fully dual geo redundant & moving to live-live)
- 2,500 trackside BTS sites
- 1,000 dispatcher terminals
- 2 x 4MHz below GSM

New Challenges

- Increased demand and expectations of railway termini and their staff.
- Whole Journey expectation with information at customers' fingertips.
- Protecting the fragility of CNI from an increasingly sophisticated security threat.
- Increased vehicle and infrastructure monitoring on an "uncoppered" railway.
- Orders of magnitude increase in bandwidth to and from train.

Innovation – Blue Skies and Red Signals

- Driving Efficiencies.
- Increasing Capacity.
- Improving Service.
- Following Demand
- Tracking “People” Changes
- Whilst Maintaining Safety

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....and all this using an infrastructure built to a 19th Century view of customer demand

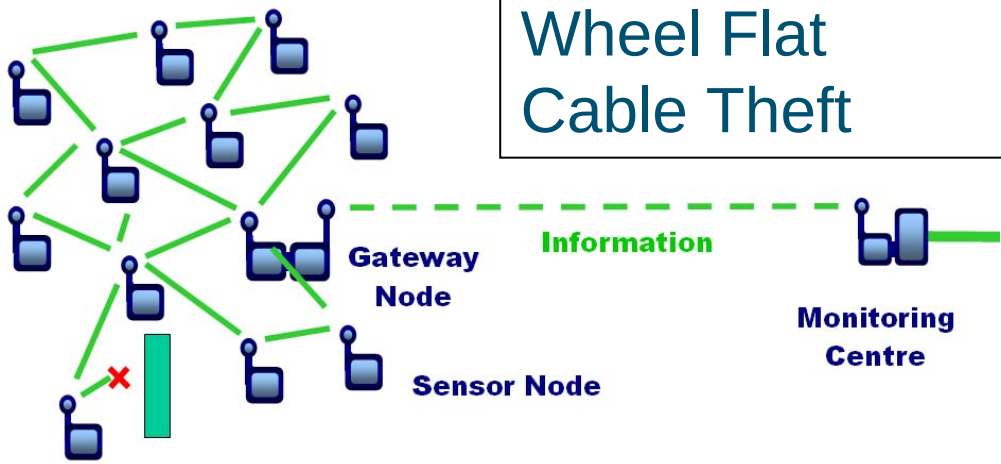
Innovation 1 – Embankment Monitoring

Pass of Brander

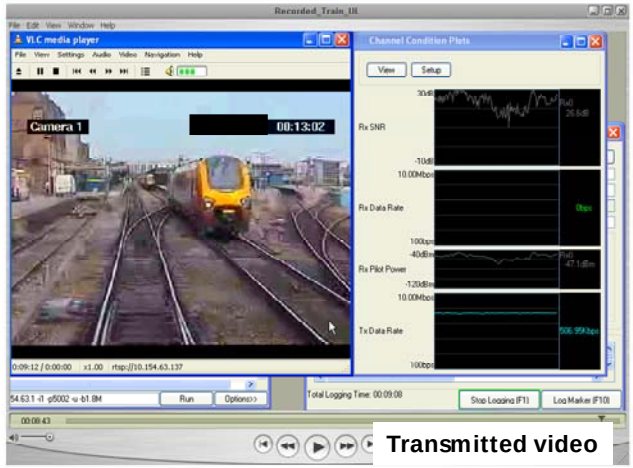
Rock Fall

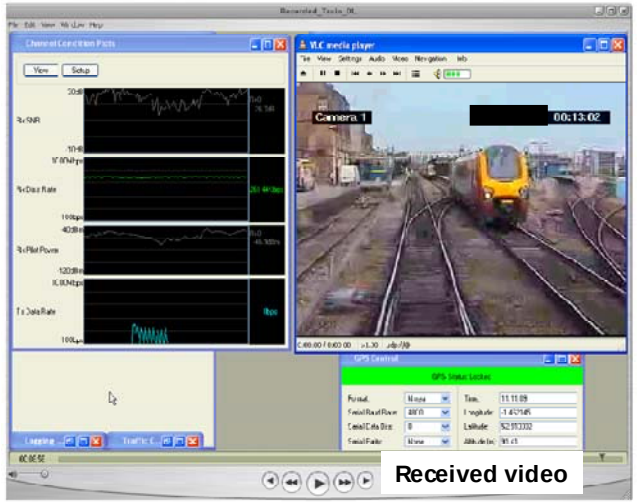
6 June 2010

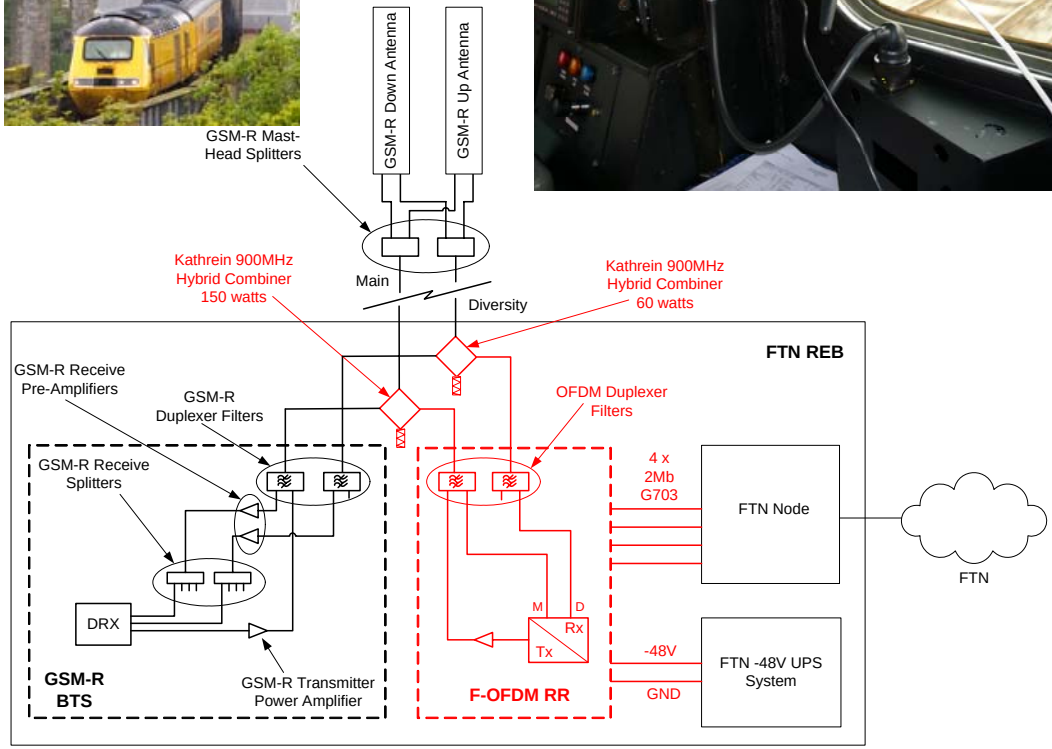
…also:
Rail Temperature
Leaf Fall
Bridge "Bash"
Points Condition
Hot Axle Box
Wheel Flat
Cable Theft



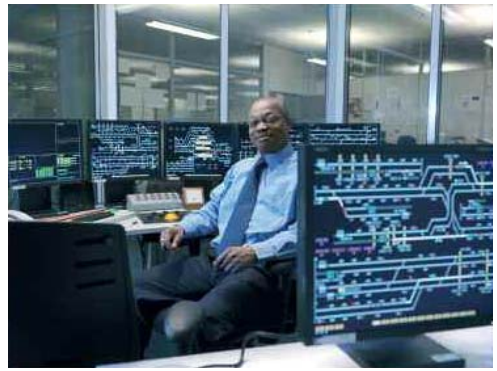
Innovation 2 – Next Gen Train Comms



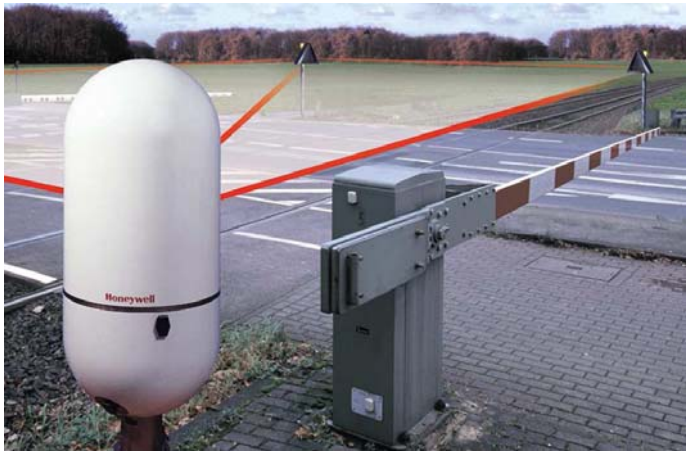




Innovation 3 – SMS & DMR / dPMR



Innovation 4 – Level Crossing Issues

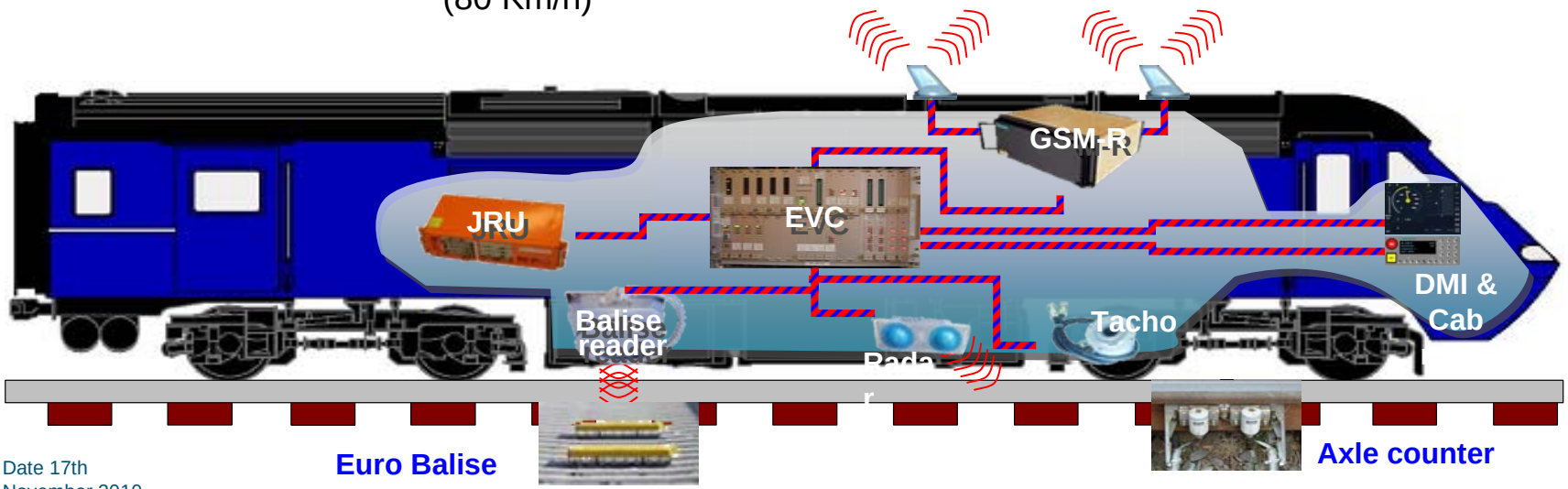


- Power Harvesting
- Human Factors
- Vandalism & Theft
- Remote Monitoring
- Standardised Interfaces

Innovation 5 – Rapid Deployment Site

Innovation 6 – ERTMS Evolution

- 4.8kb/s Continuous Data.
- GSM-R CSD Moving to GPRS.
- Automatic Train Operation in Longer Term?



Spectrum – The Common Denominator

- Usable
  - Quality
  - Bandwidth (1MB/s – 10MB/s – 100MB/s - ?)
  - Propagation (2,500 sites spaced for 900MHz)
  - Interoperability -  

- Obtainable
  - Fragmented Railway vs Commercial at auction?
- Sustainable
  - Typically 25 years standardisation and investment cycle

How Critical is Our National Infrastructure?