INFRABEL

UIC Energy Efficiency Days 2014

Antwerpen, 16 - 19 June

CATHERINE PONCIN, INFRABEL

FRANS SLATS, NS

DAS – DRIVER ADVISORY SYSTEM

Energy Efficiency, the best fuel to move our trains!

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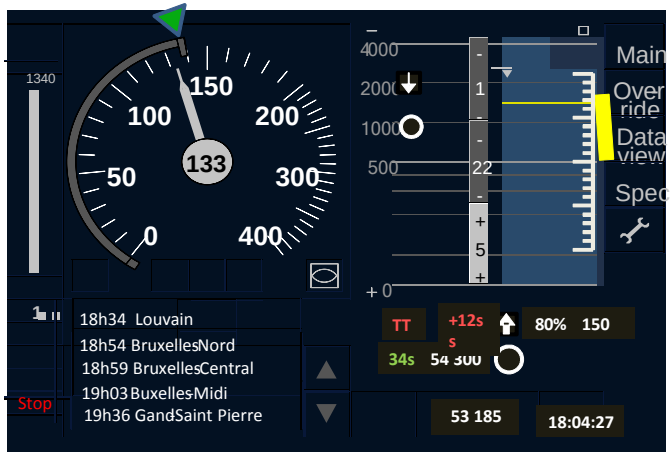
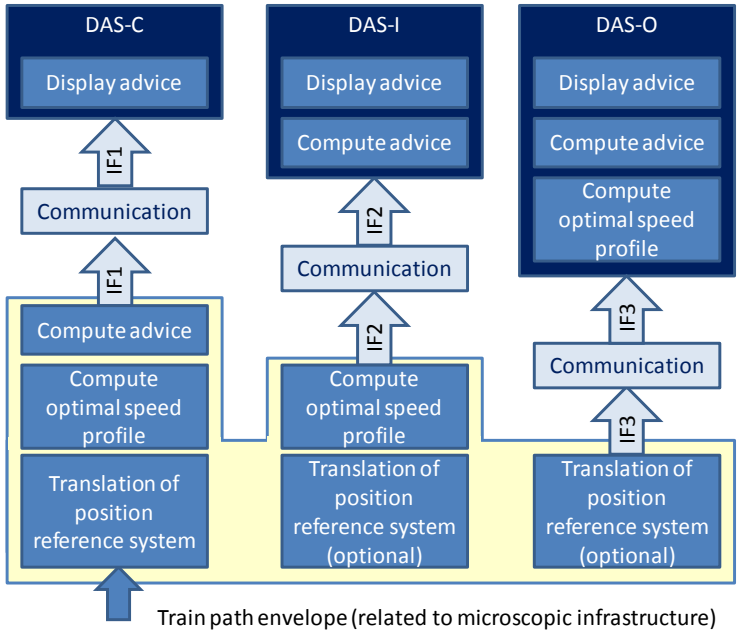


WHAT IS A DAS – DRIVER ADVISORY SYSTEM

The goal of a driver advisory system (DAS) is to enable for an optimized operation of train traffic. The optimization goals can be manifold and even contradicting (minimize travelling time, minimize delay, minimize energy consumption, etc.). Because of that fact, there might be different solutions be employed for implementing a DAS.

(On Time Study)

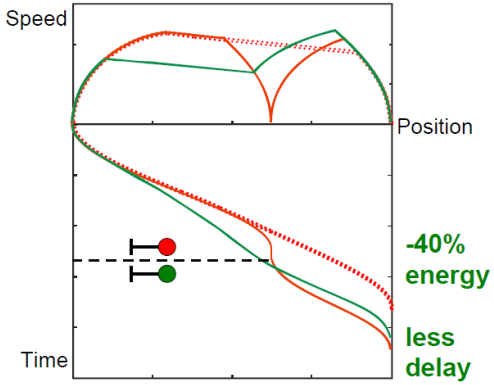
WHAT IS A DAS

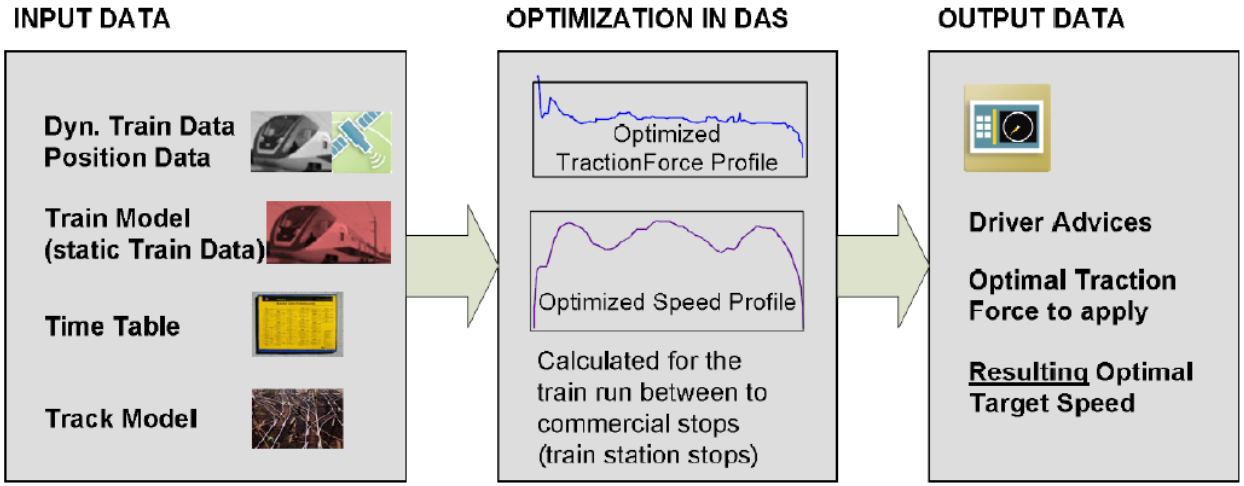


1. **Ideal speed computed within speed limit**
2. **Optimization by algorithms which could be located**
   - Infrastructure side : Ground server (C-connected DAS)
   - On Board (S-stand alone, N-network or C-connected DAS)
   - Or both sides

WHAT IS A DAS – DRIVER ADVISORY SYSTEM

DATA AVAILABLE TO BE SENT ON BOARD
ENERGY CONSUMPTIONS REDUCED





How to classify the DAS - products

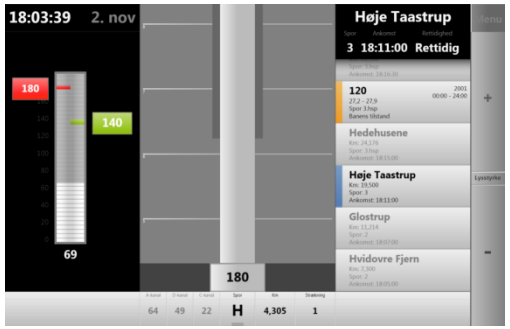
- **type A simple systems providing :**
  - energy efficient driving advices (run, coast, brake, target speed)
  - Interface with driver on screen or paper
  - Pre-computed advices

- **type B provides** the same dynamically at start of mission with advice on how to drive the train in an energy-efficient manner;

- **type C adds** the traffic flow optimization by dynamic re-scheduling of the timetable to avoid conflicts

CUBRIS - GREENSPEED

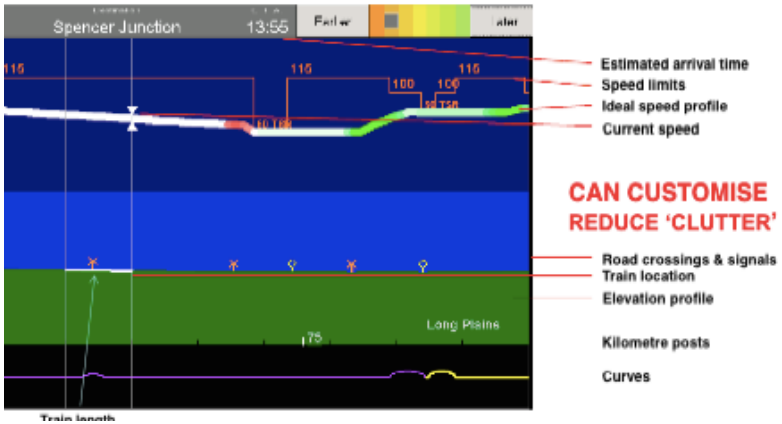
- Denmark



Initiative taken with drivers to develop driving interface
First a all : stand alone DAS which evolutes toward network one – interfacing happens according to ERTMS - subsets

TTG - ENERGYMISER

- Australia – UK - France



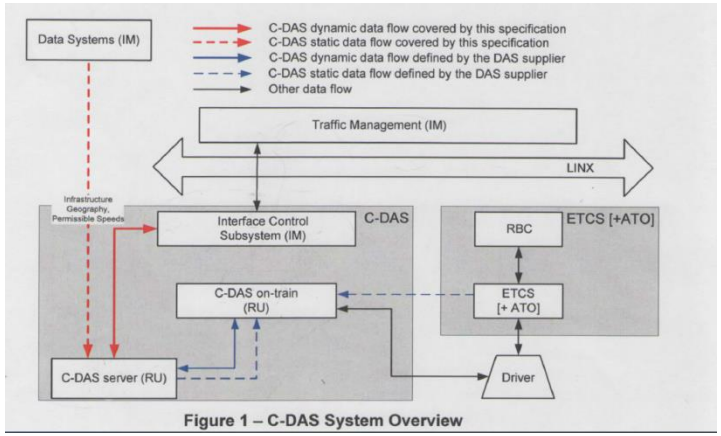


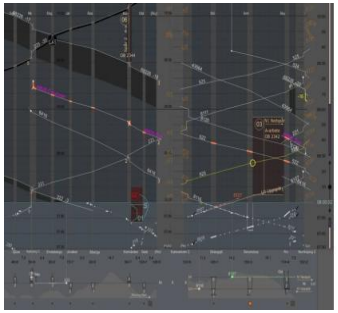
Figure 1 – C-DAS System Overview

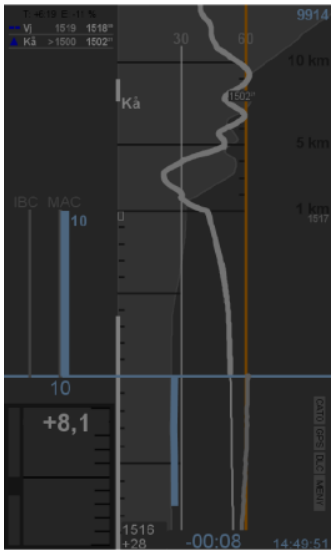
First in Australia – long distance trains
Flexibility and maturity come to developments in UK and France.,
especially in freight lines due to dedicated lines without fixed timetables

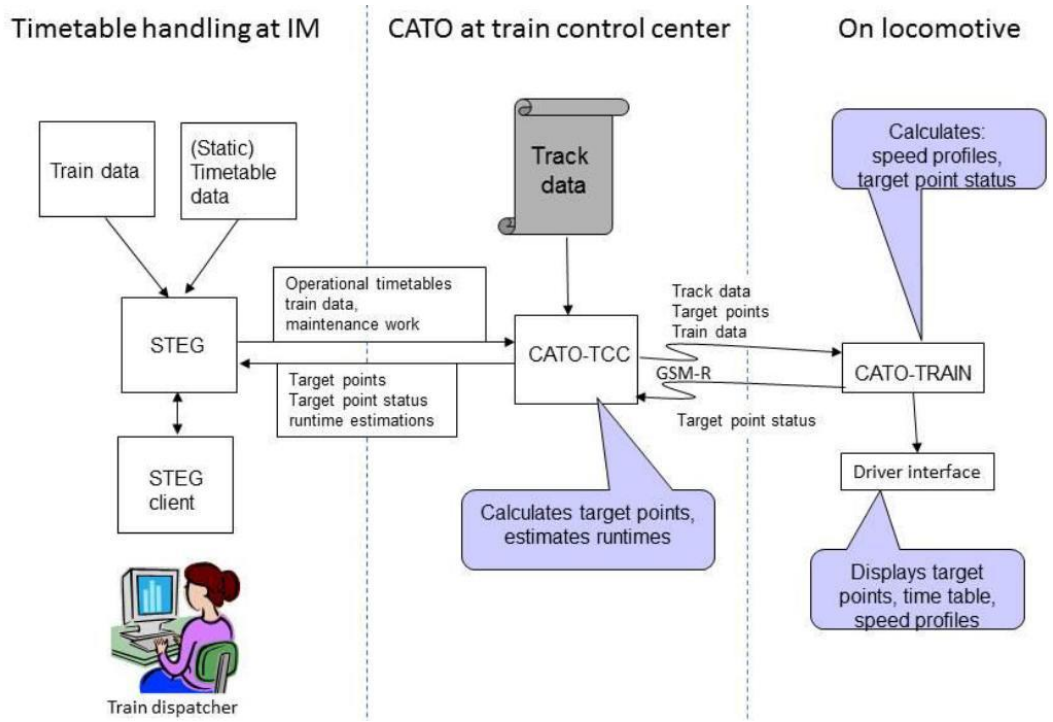
CATO - TRANSRAIL

Large amount of data available – Connected DAS – implemented in freight and urban traffic

- Sweden

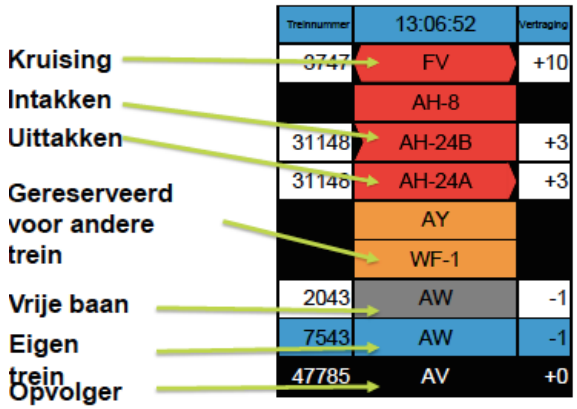






ROUTELINT – UZI – T.O.L.

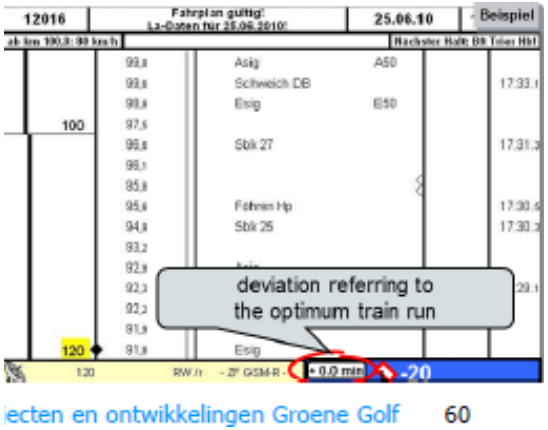
- Nederland



Gives information to drivers about traffic but decision remains in drivers' hands

KNORR – BREMSE

Germany – ZLR – free-floating – in crease capacity

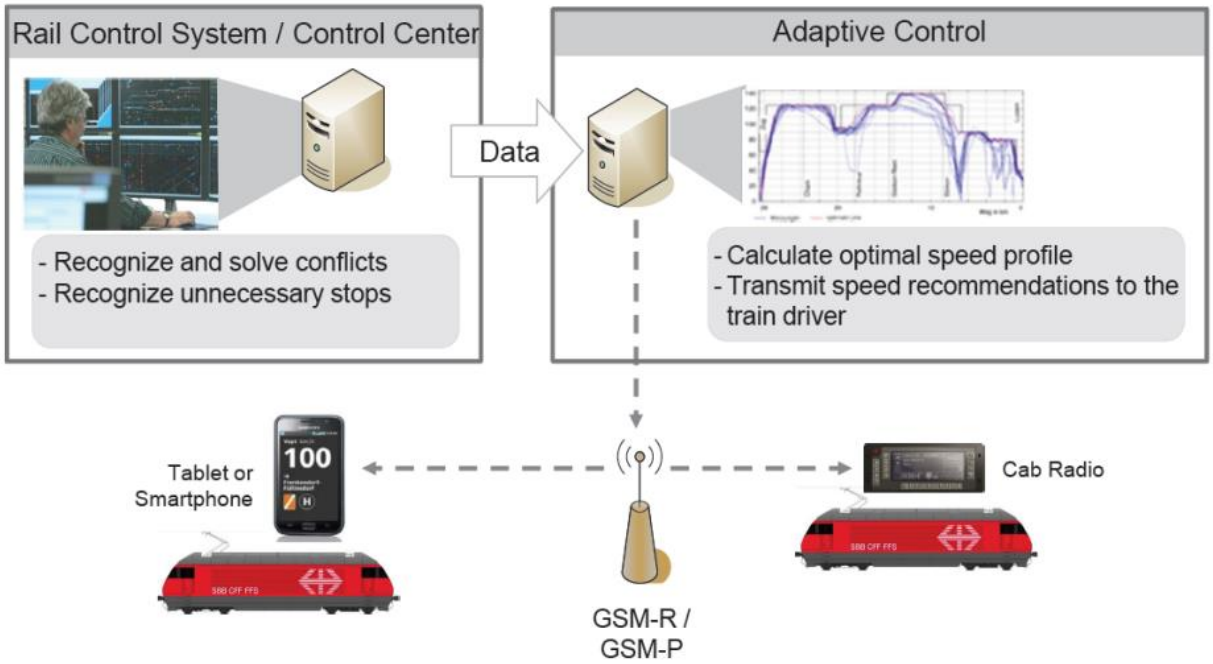


Leader is an American development coming from K-B USA which bought the brand name

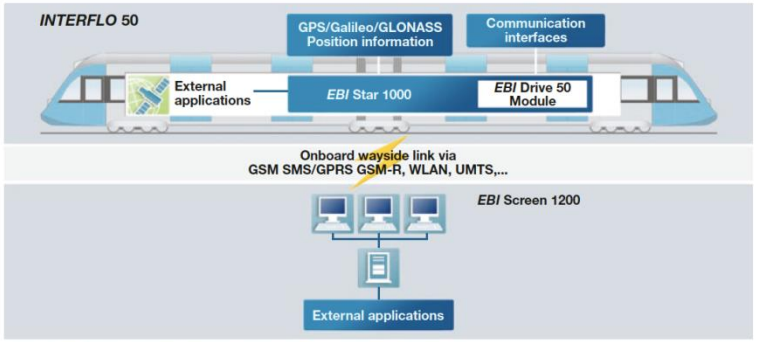
RCS - ADL

From stand alone to connected DAS

- Switzerland

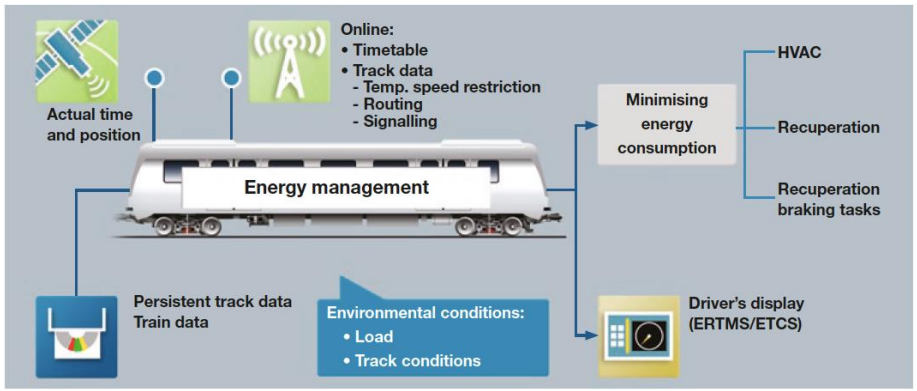


EBI DRIVE 50 - BOMBARDIER



Bombardier's INTERFLO* 50 System, comprising EBI Star 1000, EBI Drive 50 and EBI Screen 1200

The RU should also be convinced about the challenge



EBI Drive 50 – Systems scheme

About the future ?

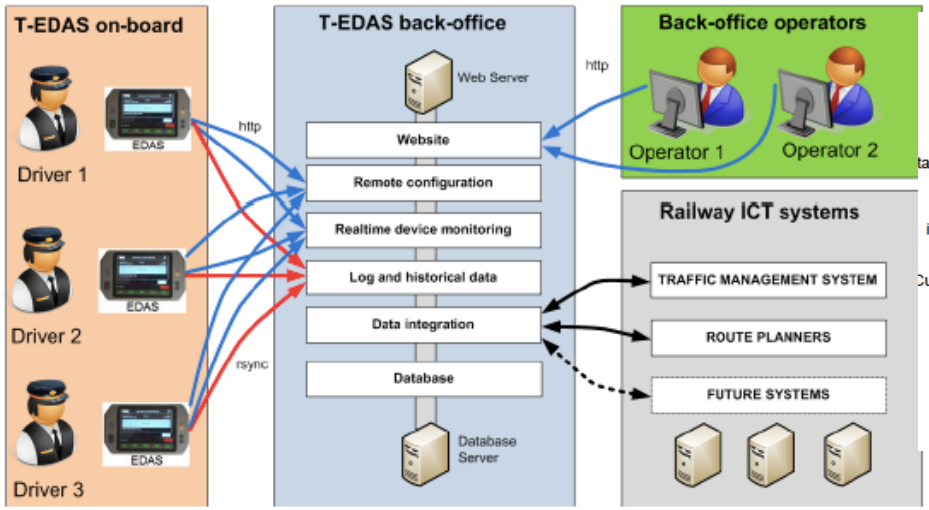
- Implement a DAS is favorable business case when choosing
  - the appropriate level of integration (network, connected or stand alone)
  - the appropriate lines (when the energy consumptions' reduction could be the highest).
- Cost models are changing today due to scarcity of energy and DAS could be the appropriate mean to keep improving financial results.

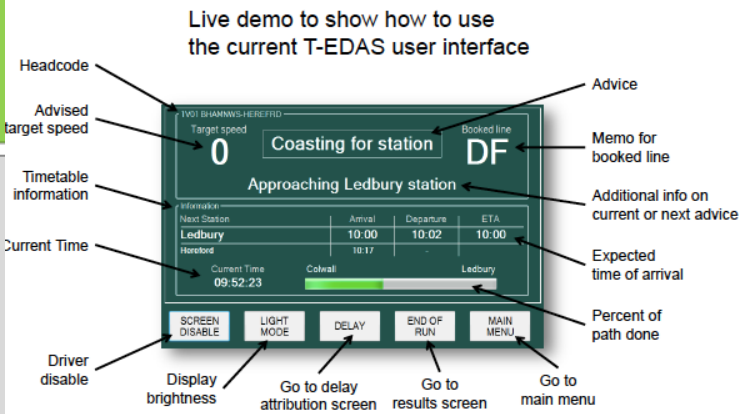
FROM ENERGY METERING TO DAS - UNICONTROLS

Developments of devices – wide train controls' applications

SAIRA - T-EDAS

Architecture: logical view

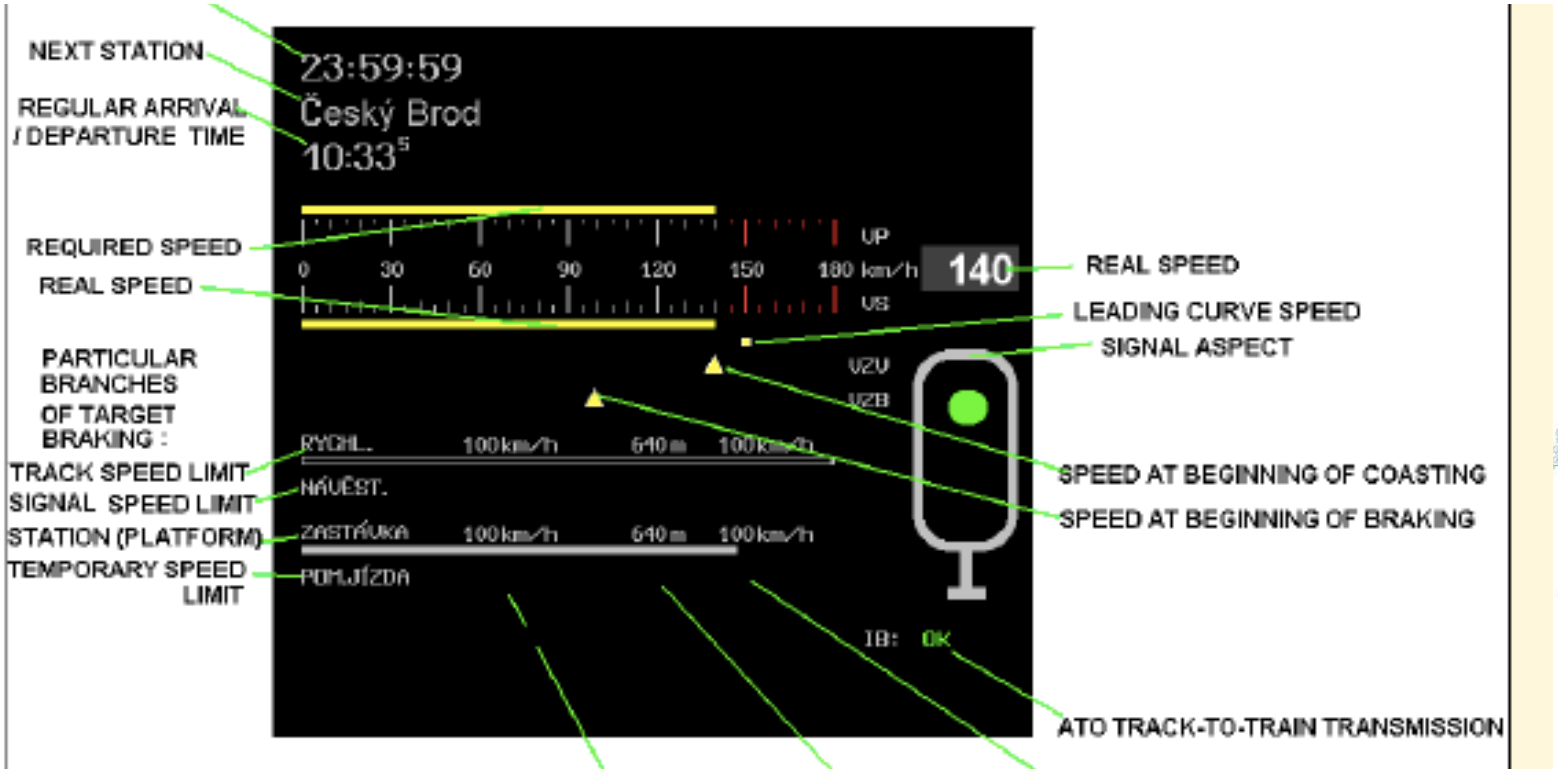




From energy competence toward driving advisory system =>
By interfacing and software layers

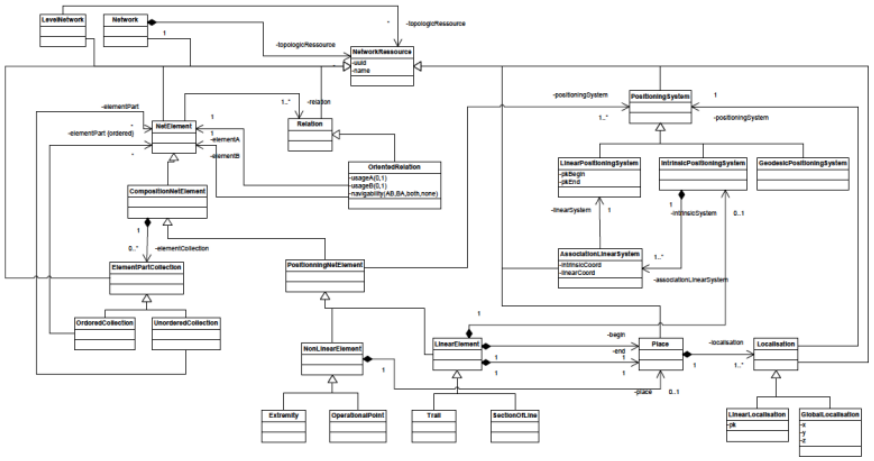
AZD – Czech Republic

Using the ERTMS data to start with a DAS – ATO as an advisory system



Transmission of the data

"Do not open the pandora box – remember how difficult it has been to fix everything " A ERTMS Founder



Develop RailML - interface language in UIC –project 'Smoother Train Traffic' in order to communicate on board by GSM-R text messaging or TCP/IP

- The driver could not perform with two IHM
  - Merge is compulsory to implement DAS when train is ERTMS equipped
  - Connected and network DAS required a link between
    - DAS and TMS – Ground Serveur
    - Data available (TMS developped)

QUESTIONS TO DEBATE :

TIMING - OPPORTUNITIES

- To implement a DAS is a choice based on the network situation and especially the network available data transmitted on board
- It remains an advisory system but it can help training more efficiently and more quickly new young drivers
- Connected DAS implies a protection system in order to avoid contradictory information to drivers

INFRABEL UIC

UIC ENERGY EFFICIENCY DAYS 2014

ANTWERPEN, 16 - 19 JUNE

Driver Advisory System Development and Introduction into Operational Service

Mark Wardell
FirstGroup UK Rail Division
January 2014

Energy Efficiency, the best fuel to move our trains!

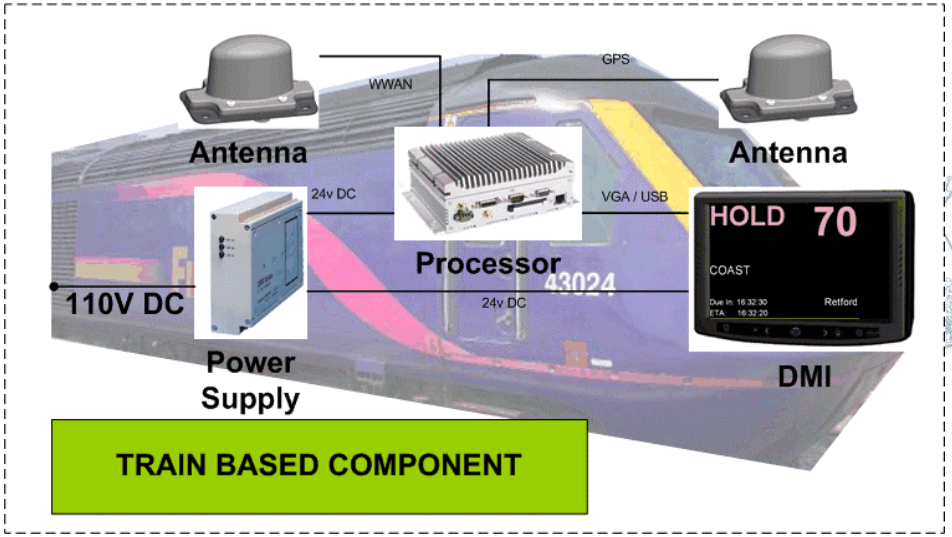
Our Challenge

- To establish if DAS could be applied to UK mainline passenger service trains
- To trial and identify potential benefits
- Build a business case for fleet fitment
- Integrate with existing culture and safety case
- Future proof equipment to ensure a smooth integration into a Traffic Management System (C-DAS)

- Pre-requisite Data loaded into system:
  - Route characteristics (line speeds, gradients, curvature)
  - Train characteristics (Mass, power, TE and RR)
  - Working Timetable
- System continuously recalculates most efficient driving style to take the train from its current location to reach next timing point on-time
- Advice given is **sectional speed** and **coast point**
- A shore based system is provided to:
  - Update route characteristics (e.g. temporary speed restrictions)
  - Daily timetable updates
  - Host the database of data logs downloaded from the trains

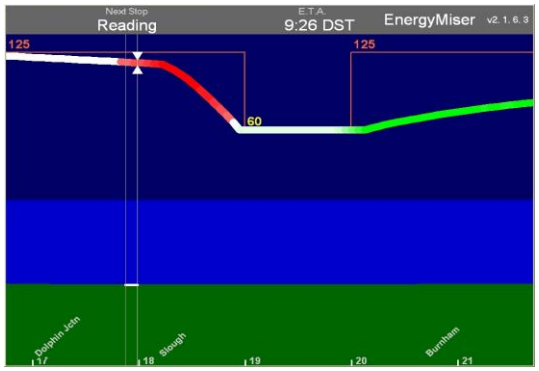
- DAS has been fitted to First Hull Trains fleet since November 2010 providing a development platform for further FirstGroup fleet fitment
- Extensive work has been carried-out between First and TTG to develop a safety compliant system and method of operation
- FHT DAS fully operational since May 2012
- 119 FGW HST Power Cars fitted during 2011/2012
- FGW DAS fully operational since May 2012
- FSR 118 Cl170 DMU fleet fitment completed mid 2013
- Evaluating other fleets within First to priority for fitment within franchise

- History of successful use for heavy haul freight in USA & Australia
- On-board equipment comprises:
  - Processor unit
  - Drivers' display
  - GPS antenna
  - Radio link
  - Power supply

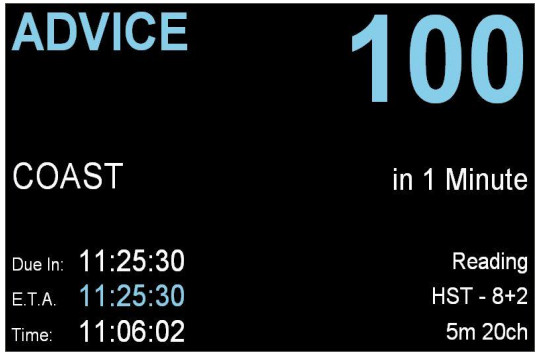


- PDA style touch screen (DMI)
- Screen size dependant on location, ergonomics and human factors assessments
- Top photograph shows DMI location in FSR Cl170 cab
- Lower photograph shows DMI location in FGW HST cab

- The display was changed to ensure that maximum information is displayed in a non intrusive fashion

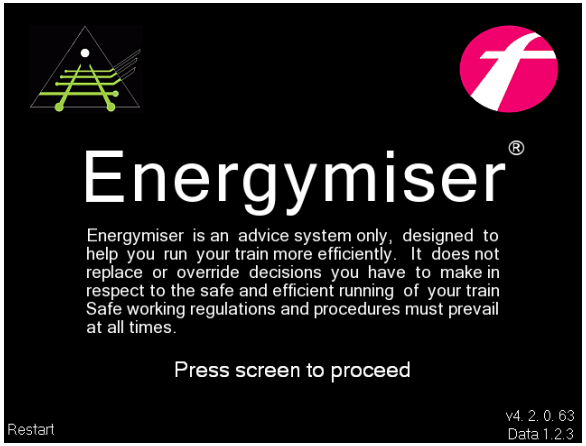


Original Energymiser display complicated and distracting

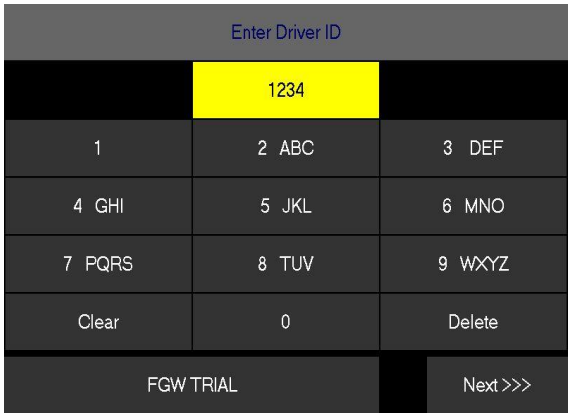


Simplified display still contains core advice but also includes additional service information

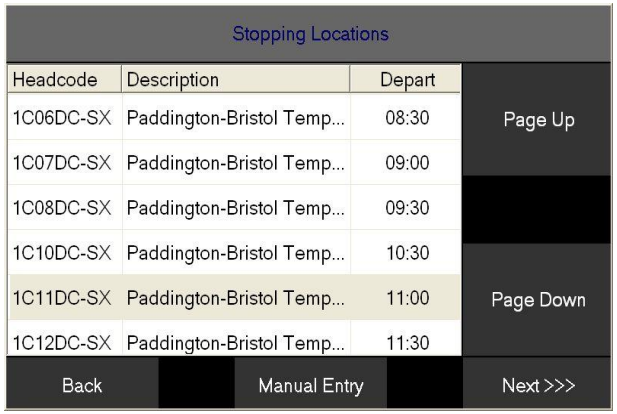
- Start up screen
  - Energised via master switch
  - System set up approximately 30 seconds



- Driver PIN entry



- Head code selection
  - Defaults to nearest timed service



- Formation
  - Driver selects formation
  - e.g. 2 - 12

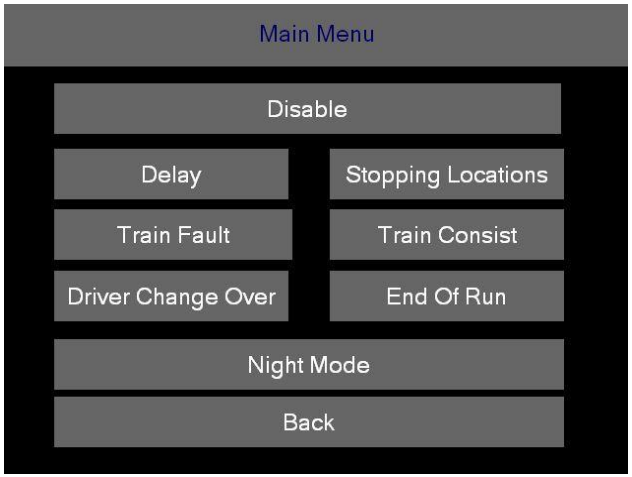
- Departure screen
  - Remains blank until train 2 miles out from station
  - Information kept to minimum

  - Due out time
  - Real time clock
  - Next station stop
  - Formation
  - Location in miles and chains

- Advice screen
  - Advice speed
  - Numeric countdown for change of advice
  - Due in time
  - ETA
  - Real-time clock
  - Next stopping point
  - Formation
  - Actual location

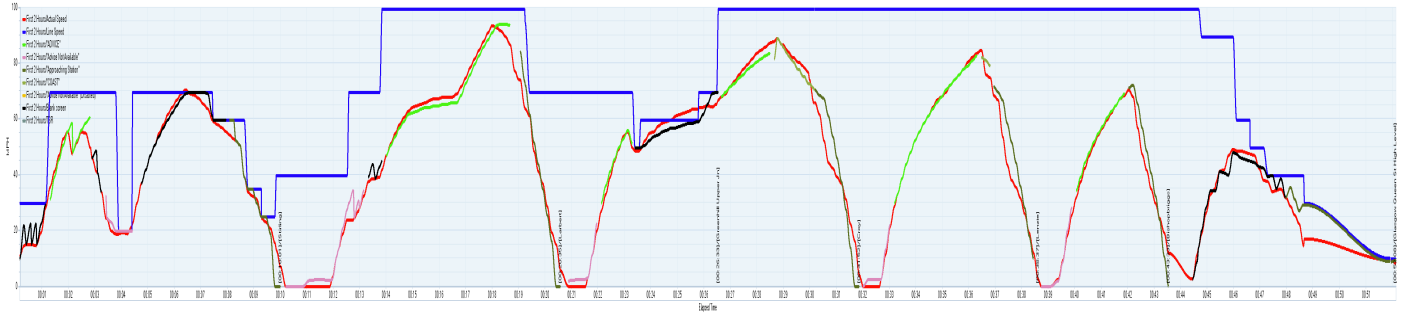
- TSR’s/ESR’s can be uploaded via the back office
- Actual TSR/ESR speeds have been suppressed to minimise wrong side failures
- Drivers are still expected to follow current rules and regulations

- The main menu allows the driver to access additional functions while the train is stationary

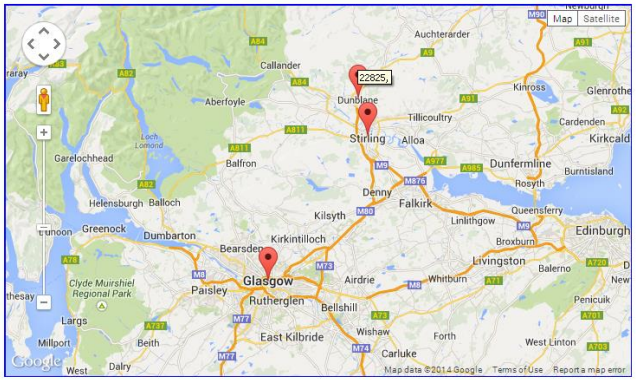


- Only the ‘Disable’ and ‘Night Mode’ functions are accessible while the train is moving

- Driver Journey Information (Energy Efficiency)



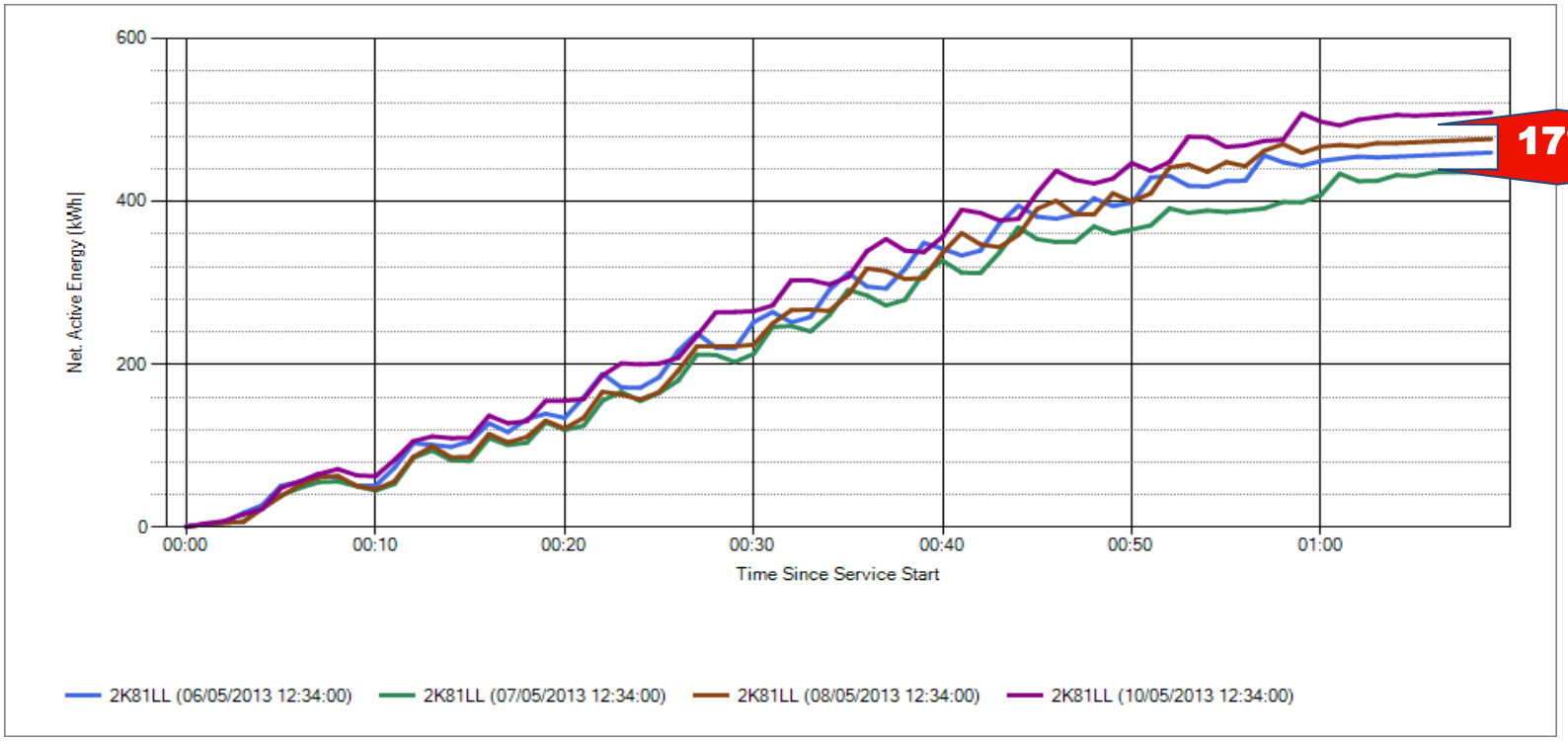
- Journey Delays (Delay Investigation Investigation)



Journey Date	Timetable	Driver (final)	Delay ID	Delay Start Time	Delay Attribution	Location	Delay - Elapsed Time
07.05.2014	1A87 18:41 Glasgow Queen St High Level-Aberdeen	LESLIE, G	22805	19:07:07	Stopped at Signal	Stirling	00:04:03
	2J50 18:24 Glasgow Queen St High Level-Falkirk Grahamston	BUCHAN, A	22780	18:25:00	Stopped at Signal	Glasgow Queen St High Level	00:03:27
	2P96 23:09 Dunblane-Edinburgh	ADAM, L	22825	23:11:07	Stopped at Signal	Dunblane	00:03:17
	Result						00:10:47

- Sectional Running Times (Performance Improvement)

- Energy Use - Driver Comparison (Energy Efficiency)



- Improved Safety
  - Train regulated to WTT - Fewer restrictive signals
  - Real-time train location – Drivers able to report exact location to the signaller
  - Next stopping point – Reduction in station ‘failure to call’ incidents
  - Advanced warnings of TSR and ESR
  - Lower PSR/station approach speeds with extended coasting
  - Reduction in TPWS overspeed activations
- ‘Right Time’ Railway achievement
- Improved Passenger perception through not waiting at signals
- Improved Fuel Efficiency
- Delay Attribution Data
- Improved Wear and Tear
  - Reduced braking/lower speed
  - Lower running speeds

- Timetable optimisation (N-DAS/C-DAS)
  - Energy efficiency
  - Regulation
  - Enhanced capacity
- Integration into TMS (C-DAS)
  - System can accept real-time timetable updates from shore base
  - Modified arrival times at key junctions – slightly later, or earlier
  - Potential to regulate traffic through key nodes
- Integration into ETCS DMI (C-DAS)
  - Thameslink Project

Thank you for your attention

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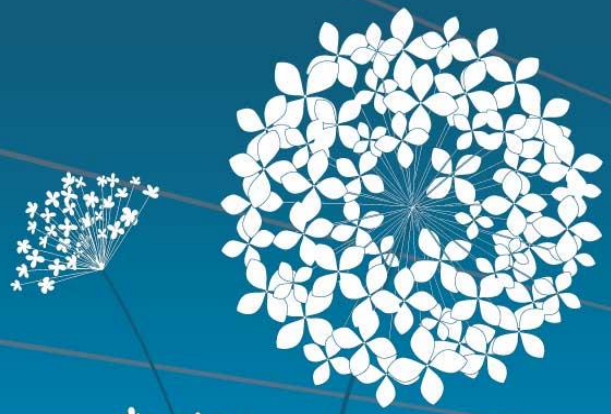


TRAIN ON LINE; SPEEDADVISE AND CONTEXTINFO FOR THE DRIVER

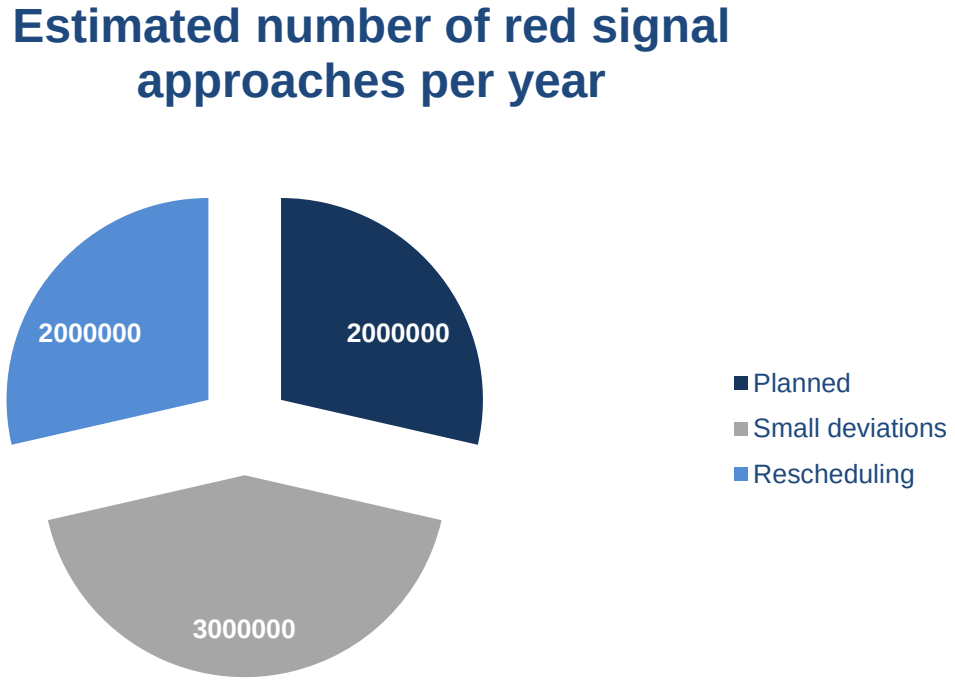
JOKE KNIJFF, PRORAIL

RAMON LENTINK, NETHERLANDS RAILWAYS

JUNE 2014

Energy Efficiency, the best fuel to move our trains!

GOAL TRAIN ON LINE:
A SAFER TRAIN OPERATION



ROADMAP

ERTMS

Speedadvise
Benchmark/pilots

MMI

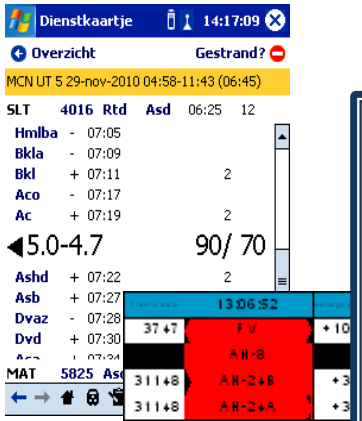
TMS

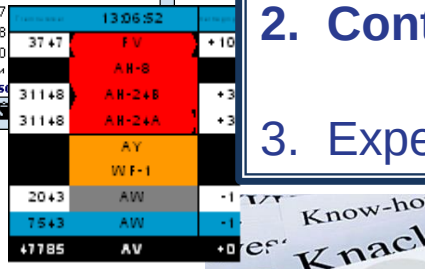
Result 1
1. Eco driving information

2. **Contextinformation = Routelint**

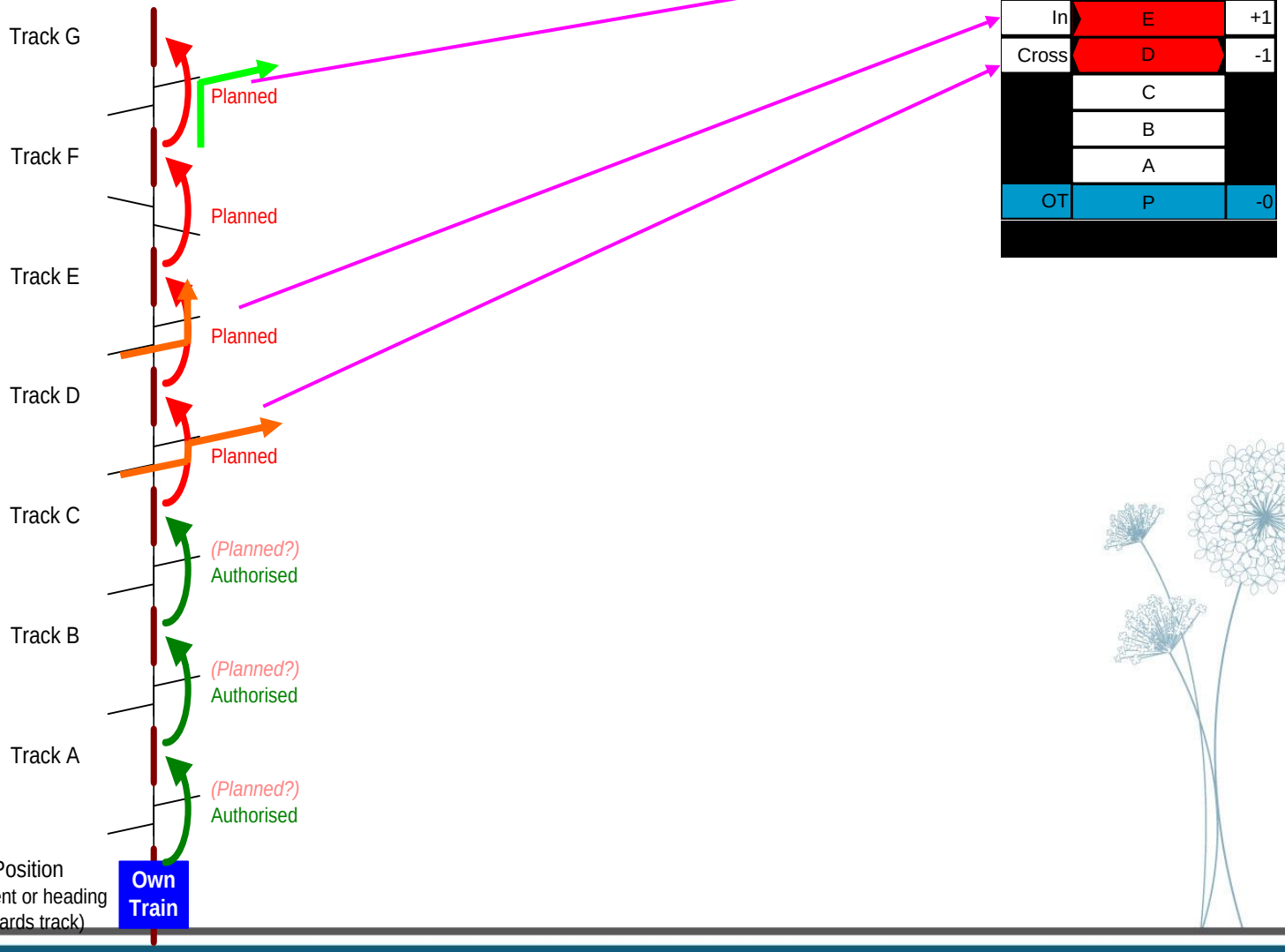
3. Expertise (driver/dispatcher)

Result 2
Speed-advise



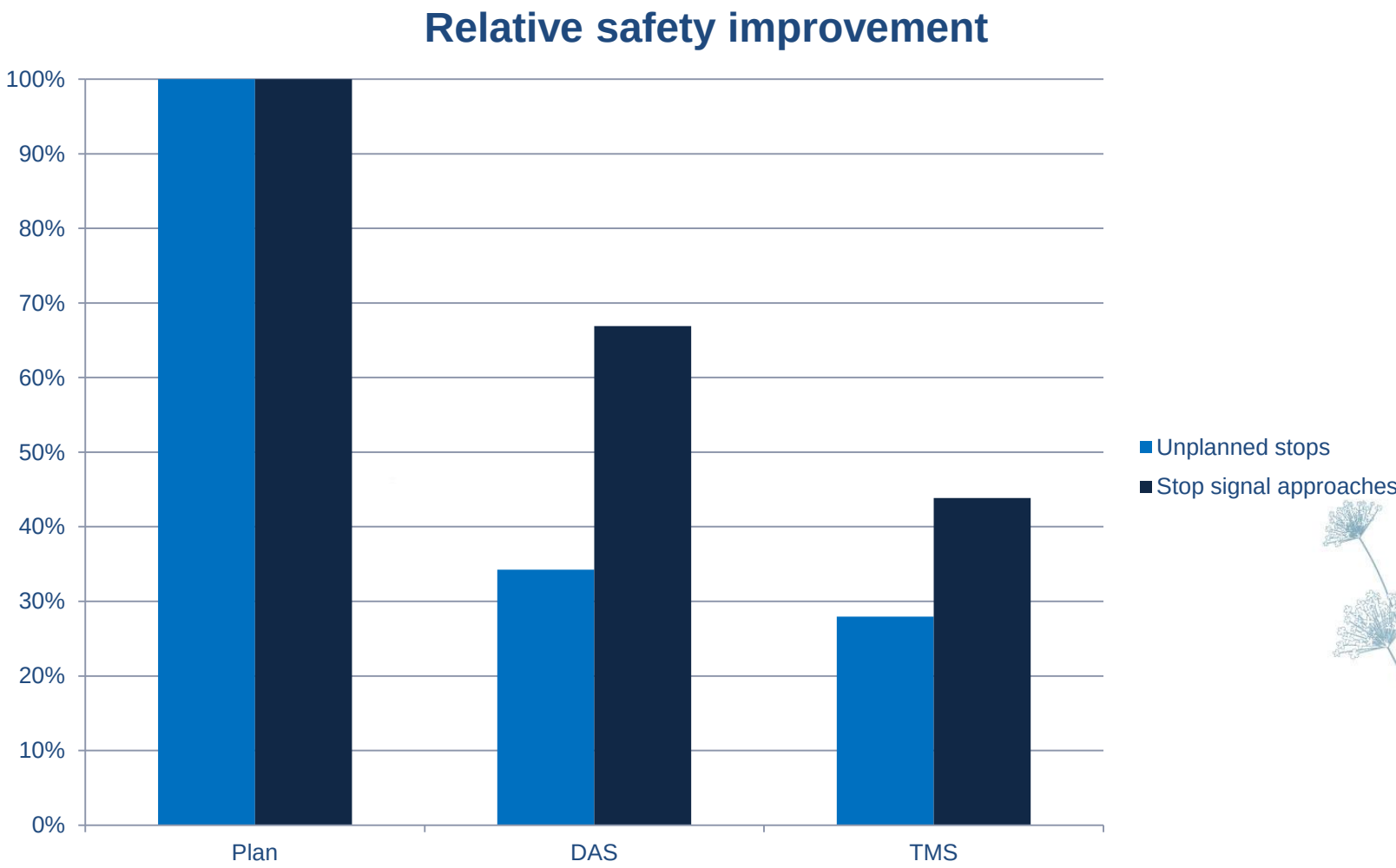


RESULT 1: ROUTELINT



NETWORK AND SIMULATED AREAS

SIMULATION RESULTS



ECO DRIVING DEVELOPMENTS

- Eco driving management targets in effect
- Ownership and control at all levels within NS
- Development of individual feedback
- Eco driving incorporated in yearly training of drivers and conductors
- Manual UZI eco driving results in 4% reduction per yearly