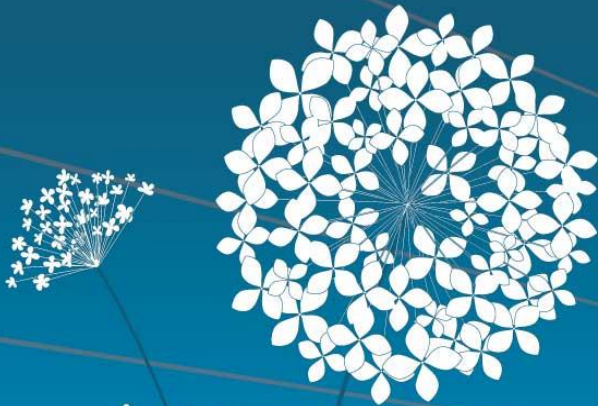


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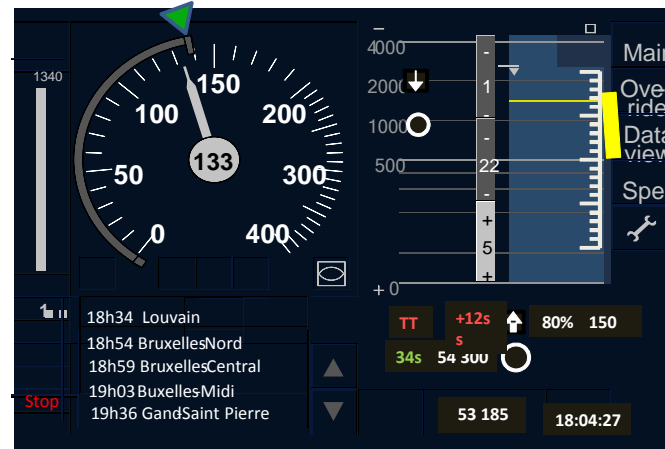
**CATHERINE PONCIN,
INFRABEL
FRANS SLATS, NS**

DAS – DRIVER ADVISORY SYSTEM

Energy Efficiency, the best fuel to move our trains!

TABLE OF CONTENTS

- What is a DAS
- Overview DAS products
- Related aspects



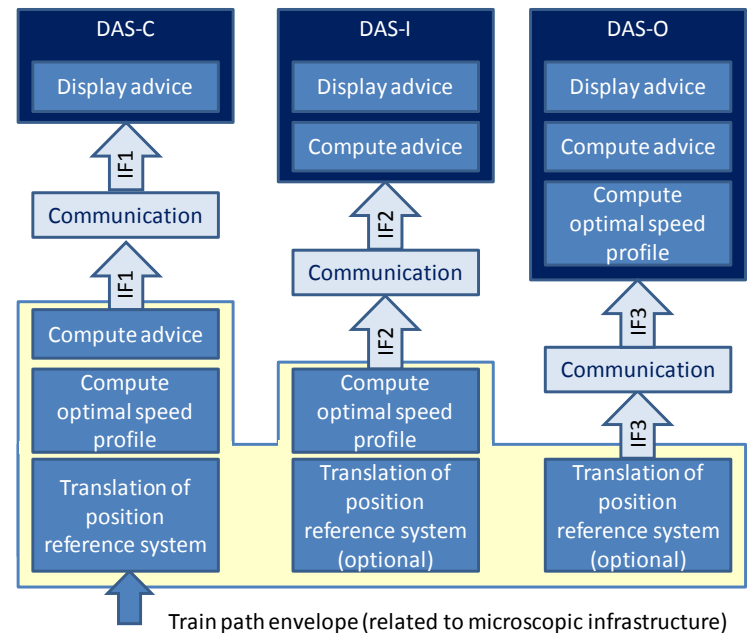
WHAT IS A DAS – DRIVER ADVISORY SYSTEM

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)



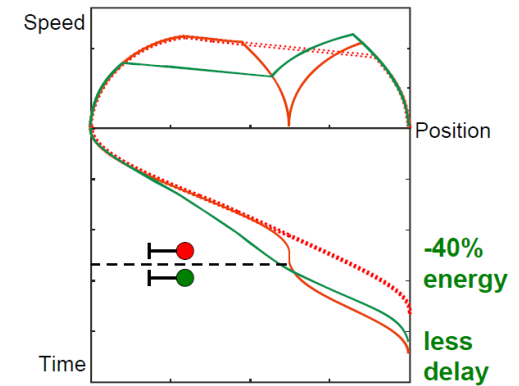
WHAT IS A DAS



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

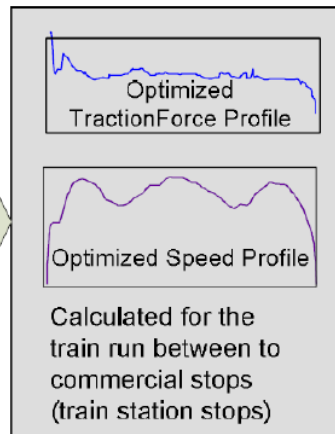
DATA AVAILABLE TO BE SENT ON BOARD
ENERGY CONSUMPTIONS REDUCED



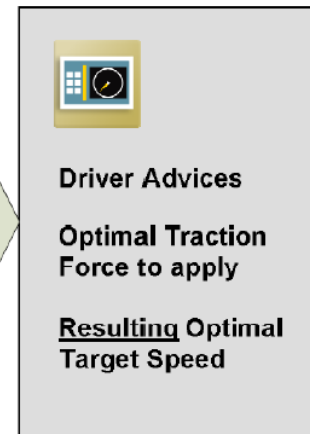
INPUT DATA



OPTIMIZATION IN DAS



OUTPUT DATA



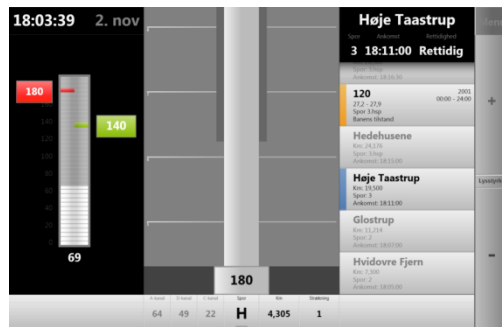
HOW TO CLASSIFY THE DAS - PRODUCTS

- **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



A little GreenSpeed history

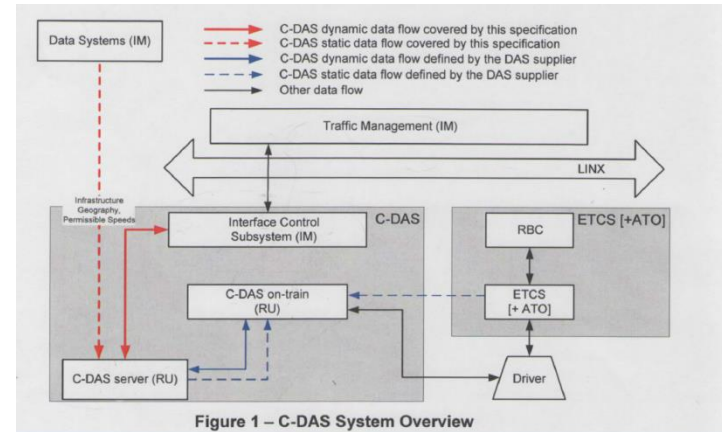
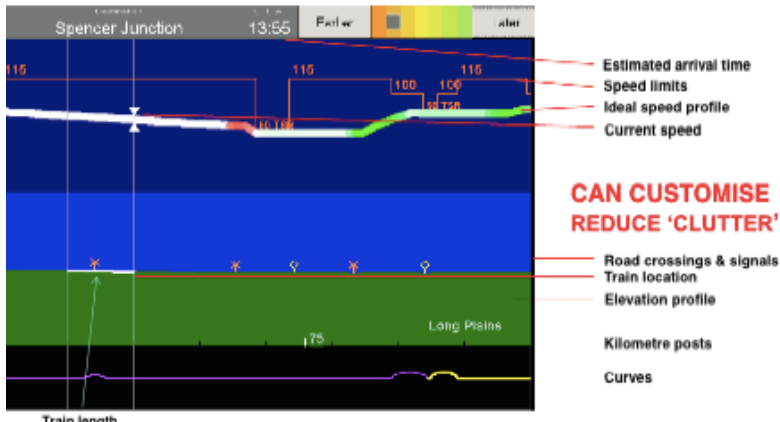
The first prototype, called GEKKO was developed and tested at DSB and SNCF during the period 2006-2008.



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 - ENERGYSER

- Australia – UK - France

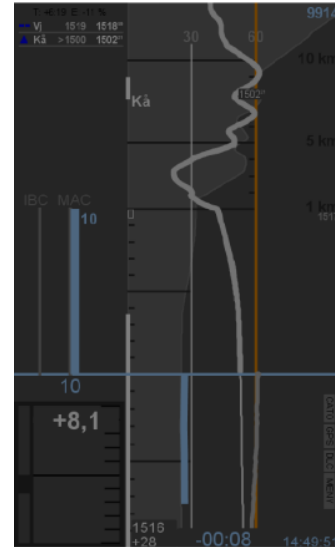
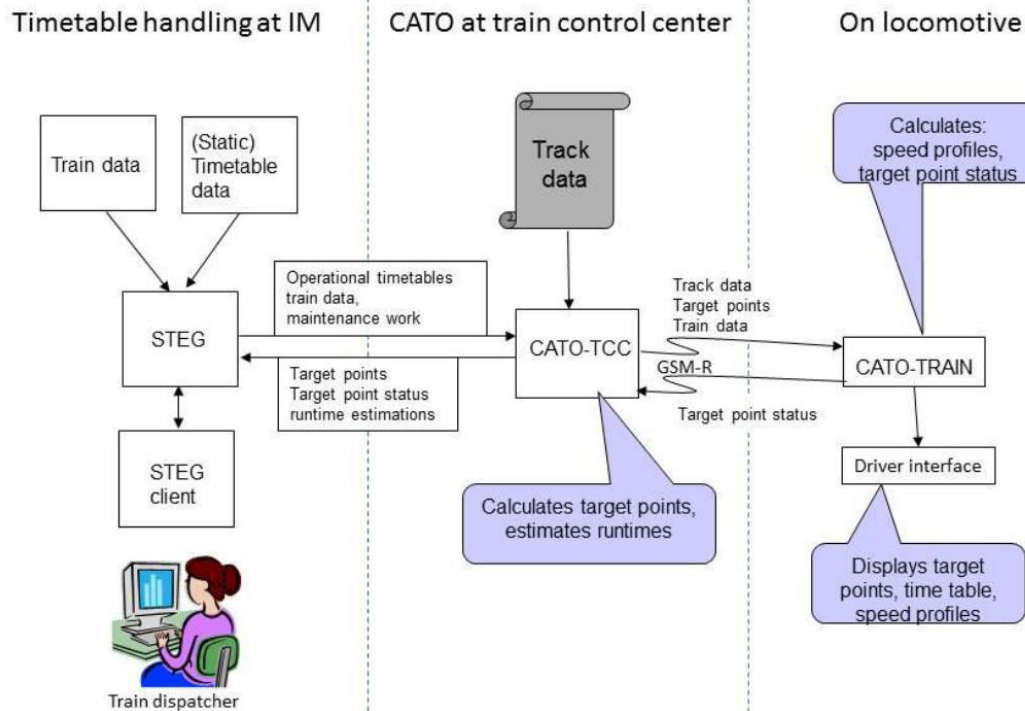


First in Australia – long distance trains
Flexibility and maturity come to developments in UK and France.,
especially in freight lines due to dedicated lines without fixed timetables

CATO - TRANSRAIL

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

- Sweden



ROUTELINT – UZI – T.O.L.

- Nederland



	Treinnummer	13:06:52	Vertraging
Kruising	3747	FV	+10
Intakken		AH-8	
Uittakken	31148	AH-24B	+3
	31148	AH-24A	+3
Gereserveerd voor andere trein		AY	
		WF-1	
Vrije baan	2043	AW	-1
Eigen	7543	AW	-1
trein Opvolger	47785	AV	+0

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



Rit informatie		10 sep 07	08:48,15
BRD-I			
KPH	TSB		max 70
KPH			
KPH			
KPHAZ-KR	GO 13404	+20	
ZWD-U			
ZWD-I	V 08:56		
ZWD-I			
DOR-U			max 120
DOR-2	V 08:53		
	A 08:48		
	MAT 7210	-0	
			90



KNORR – BREMSE



Germany – ZLR – free-floating – in crease capacity



12016	Fahrplan gültig!	25.06.10	Beispiel
La-Baden für 25.06.2010!			
ab km 100,8: 90 km/h			Nächster Halt: 100 Teller Hst
99,8	Asig	A50	17:33.1
99,8	Schweich DB		
99,8	Esig	B50	
97,5			
99,8	Stik 27		17:31.2
99,8			
95,8	Felmen Hp		17:30.4
94,8	Stik 25		17:30.2
93,2			
92,8			
92,3			
92,3			
91,8			
91,8	Esig		29.1
120			
120	RW 11	-2" GSM-R	-0.9 min -20

deviation referring to the optimum train run

LEADER® ON-BOARD
The intuitive display layout provides drivers with all the important information without distracting them.

Different sections offer the driver:

- Clear recommendations for required actions
- Most important track information, such as milepost and gradients, as well as upcoming stations with estimated arrival time

BACK OFFICE
The LEADER® back-office solution combines real-time database and upload functions with advanced analysis features.

Real-time dynamic data is available, as are comprehensive statistical reports. The back-office function is capable of managing bi-directional data flows between a single central server terminal and an entire train fleet. The connection to the on-board unit is via GPRS or other communication standards.

SIMULATOR
As part of the Knorr-Bremse Group, Sydac offers a wide range of highly sophisticated simulators for driver training.

Simulators can be combined with the LEADER® system:

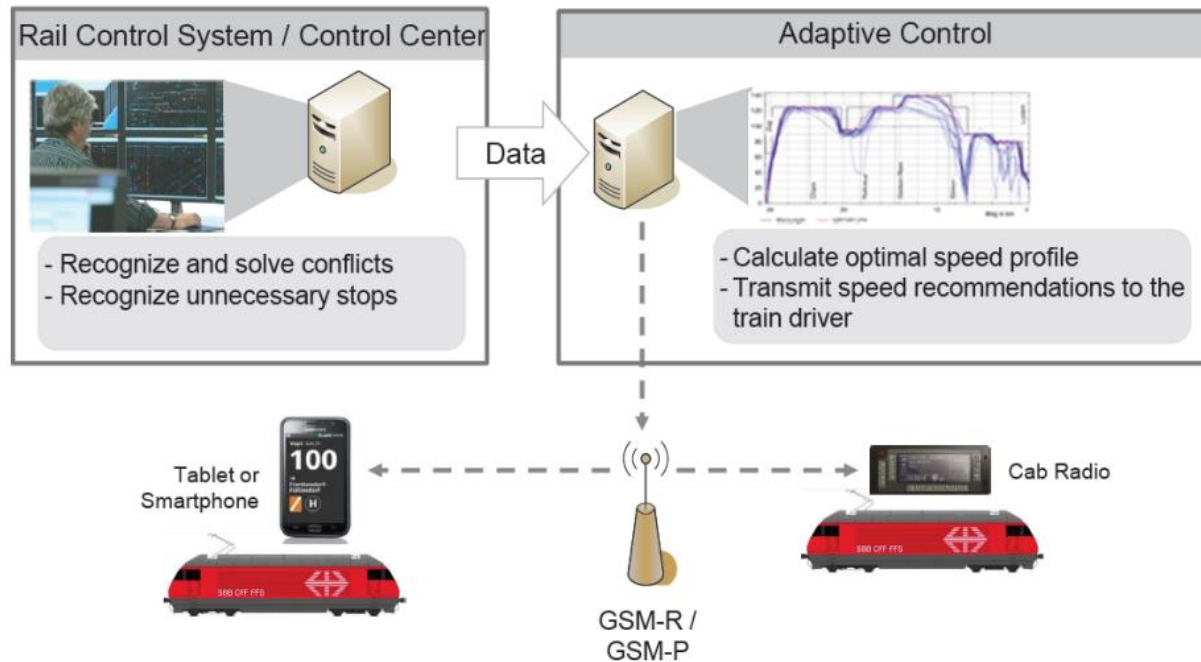
- Before LEADER® is introduced into a fleet, to facilitate workshops defining the layout and functions of the driver assistant system
- During series application, with the LEADER® system being used to re-run critical and exemplary trips that have been identified by back-office evaluation

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

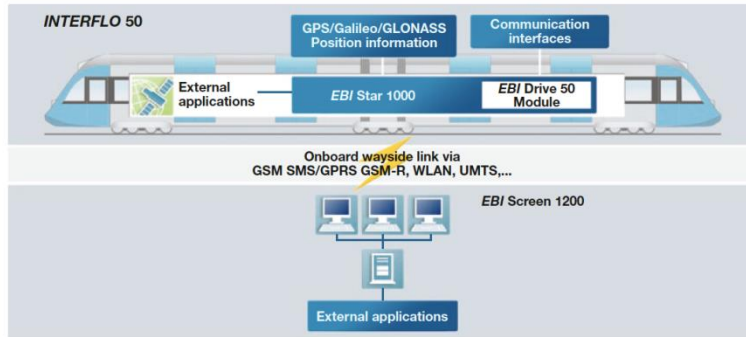
RCS - ADL

From stand alone to connected DAS

- Switzerland

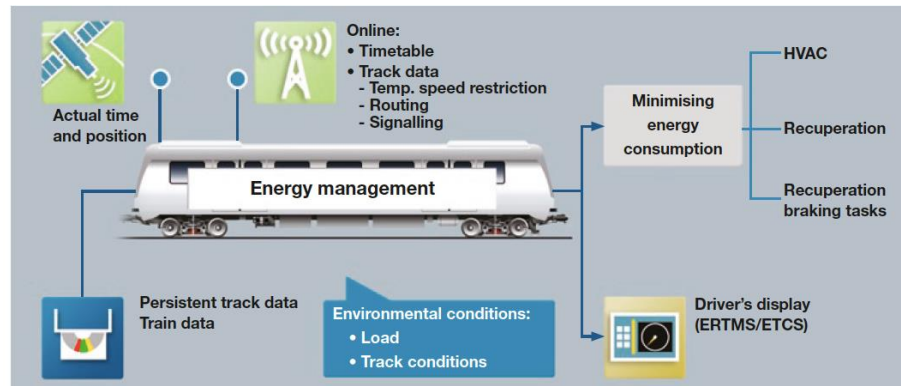


EBI DRIVE 50 - BOMBARDIER



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.



UNICONTROLS

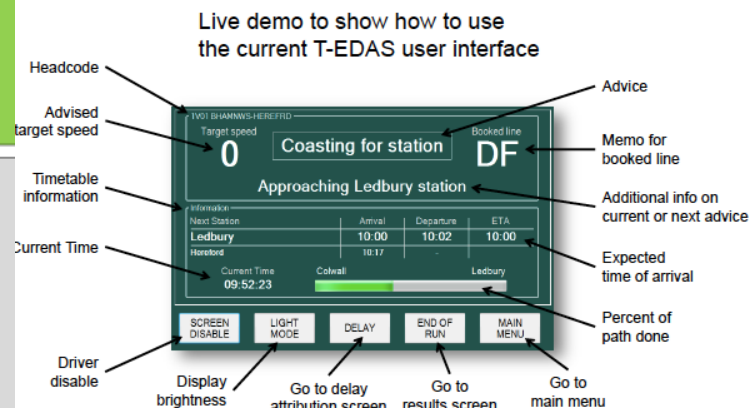
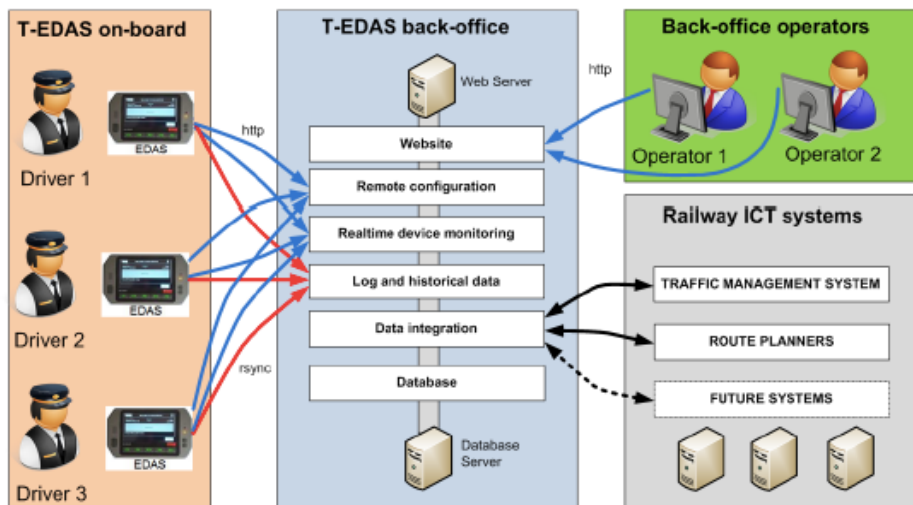


Developments of devices – wide train controls' applications

SAIRA - T-EDAS



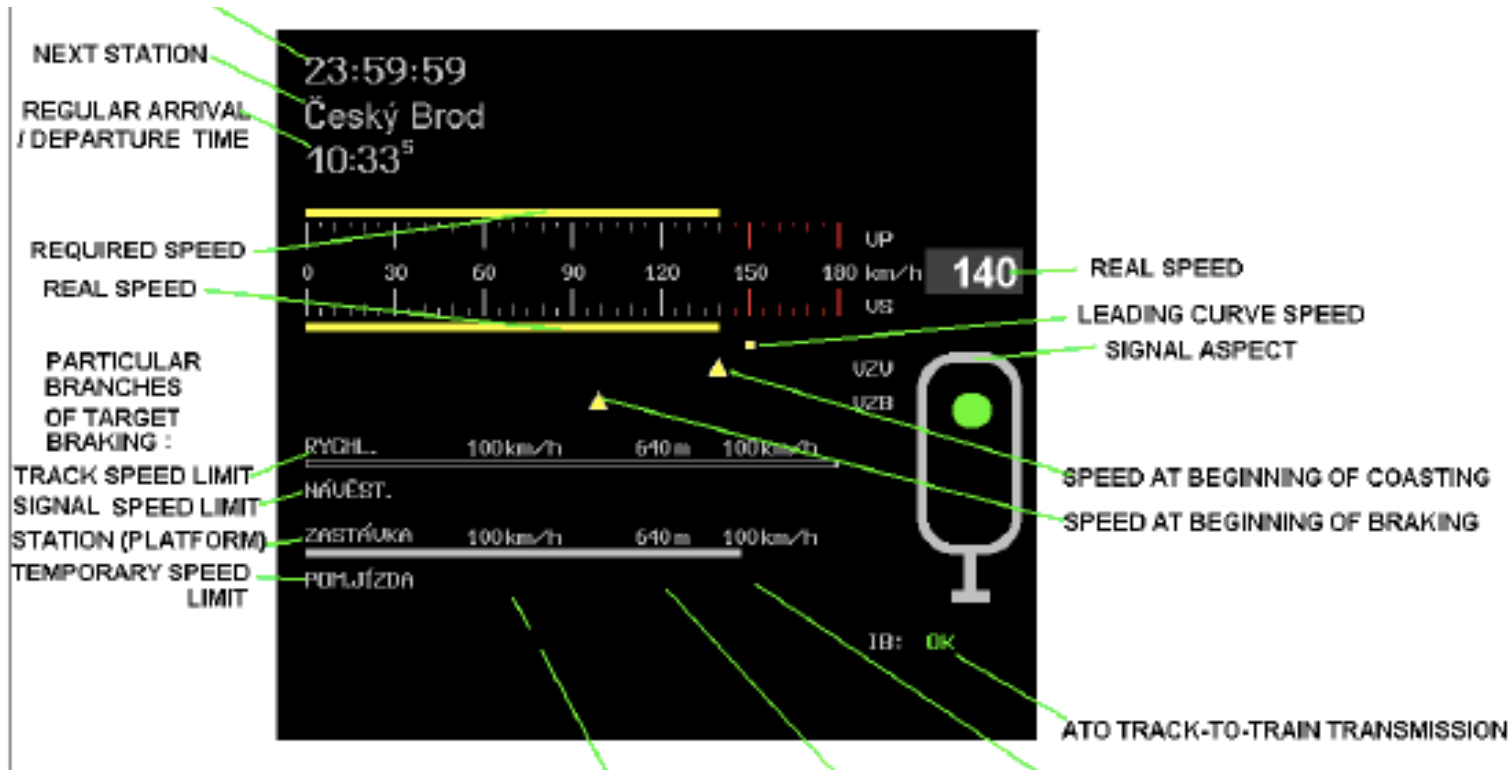
Architecture: logical view



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

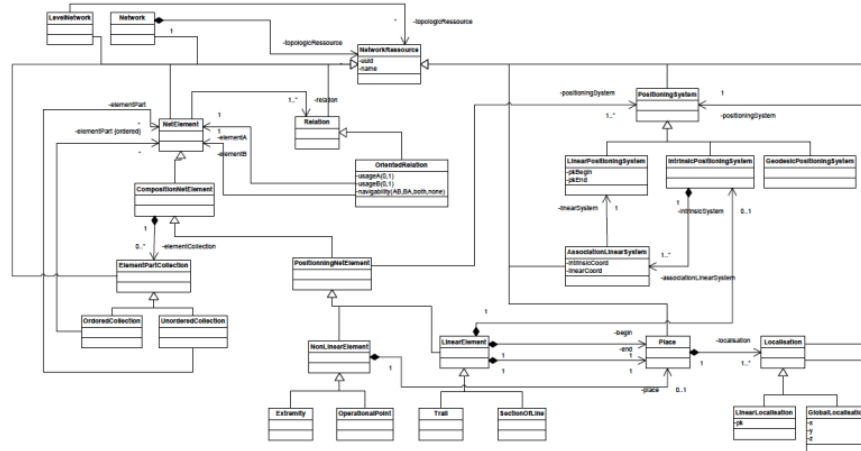
AZD – Czech Republic

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)



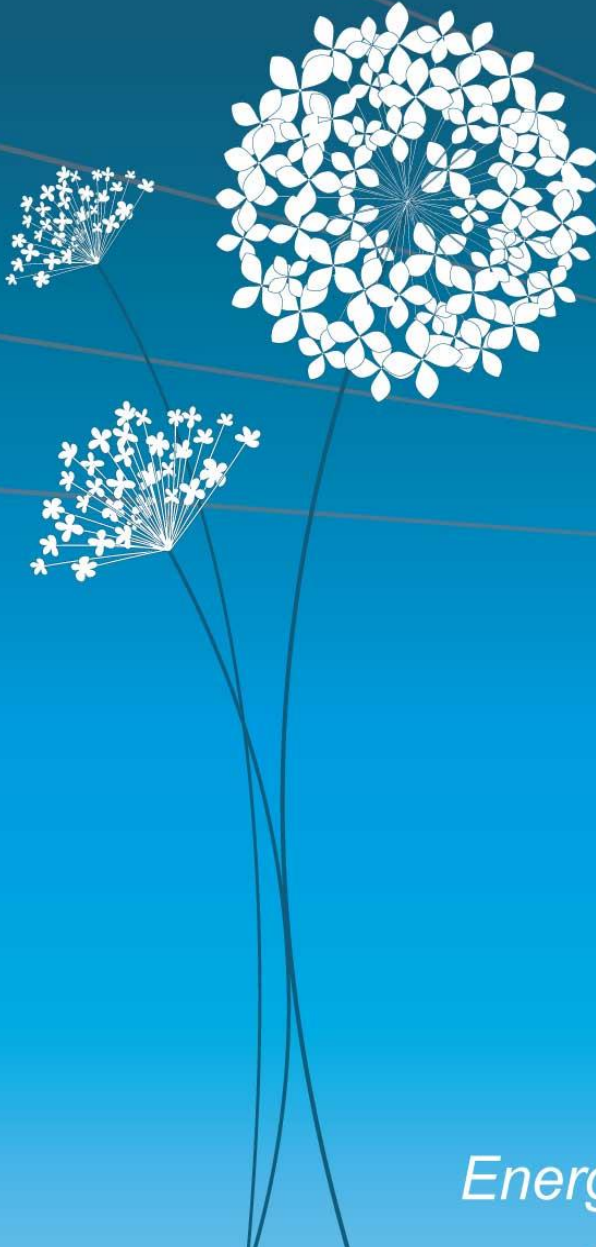
QUESTIONS TO DEBATE :

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



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)



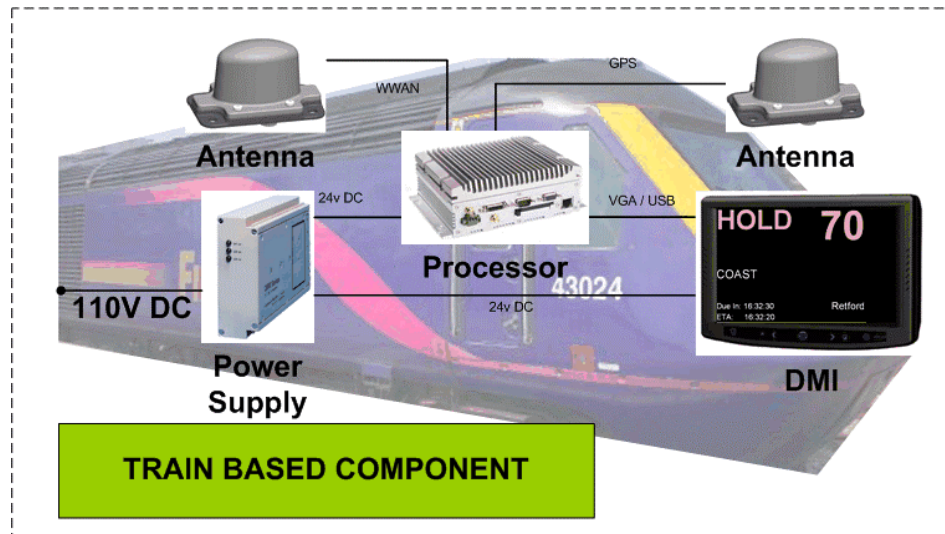
- Pre-requisite Data loaded into system:
 - Route characteristics (line speeds, gradients, curvature)
 - Train characteristics (Mass, power, TE and RR)
 - Working Timetable
- System continuously recalculates most efficient driving style to take the train from its current location to reach next timing 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 CI170 DMU fleet fitment completed mid 2013
- Evaluating other fleets within First to priority for fitment within franchise



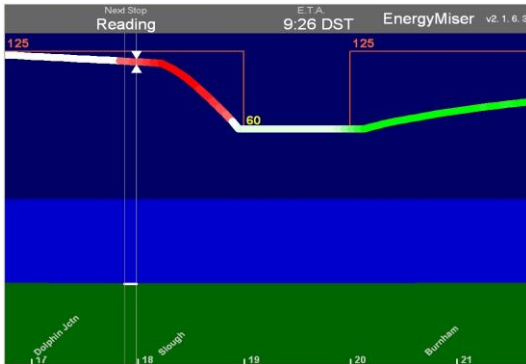
- History of successful use for heavy haul freight in USA & Australia
- On-board equipment comprises:
 - Processor unit
 - Drivers' display
 - GPS antenna
 - Radio link
 - Power supply



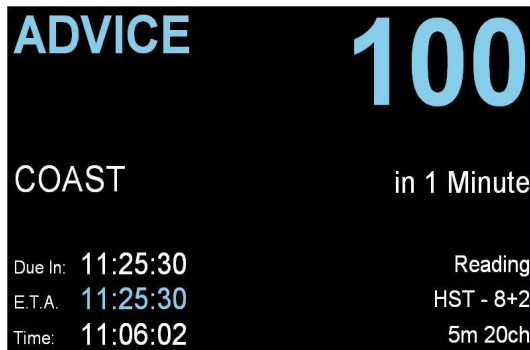
- PDA style touch screen (DMI)
- Screen size dependant on location, ergonomics and human factors assessments
- Top photograph shows DMI location in FSR CI170 cab
- Lower photograph shows DMI location in FGW HST cab



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



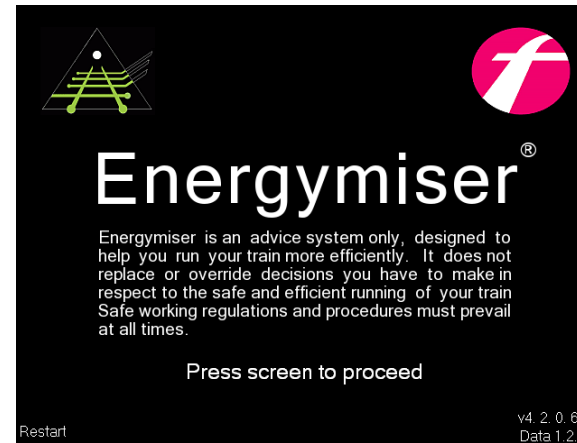
Original Energymiser display complicated and distracting



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

Enter Driver ID		
	1234	
1	2 ABC	3 DEF
4 GHI	5 JKL	6 MNO
7 PQRS	8 TUV	9 WXYZ
Clear	0	Delete
FGW TRIAL		Next >>>



- Head code selection
 - Defaults to nearest timed service

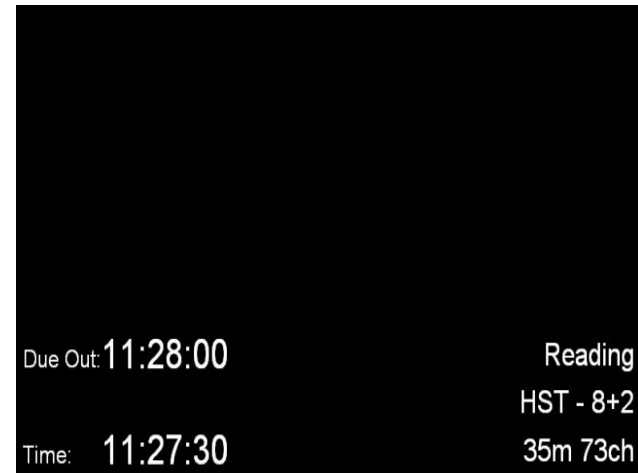
Stopping Locations			
Headcode	Description	Depart	
1C06DC-SX	Paddington-Bristol Temp...	08:30	Page Up
1C07DC-SX	Paddington-Bristol Temp...	09:00	
1C08DC-SX	Paddington-Bristol Temp...	09:30	Page Down
1C10DC-SX	Paddington-Bristol Temp...	10:30	
1C11DC-SX	Paddington-Bristol Temp...	11:00	
1C12DC-SX	Paddington-Bristol Temp...	11:30	
Back		Manual Entry	Next >>>

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

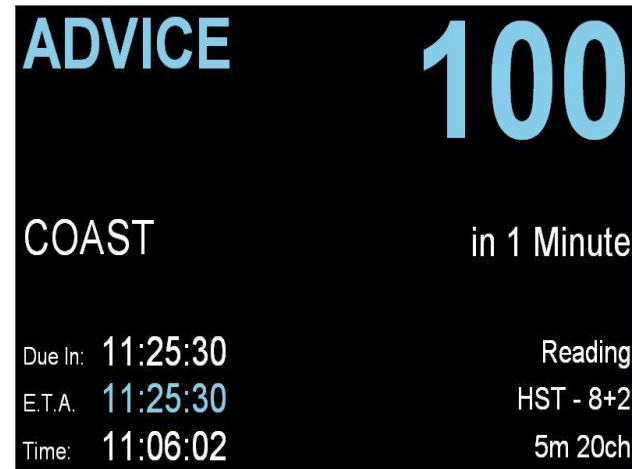
Train Consist	
HST 7+2	
HST 8+2	
HST 9+2	
Back	
Next >>>	



- 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



The image shows a digital display for an 'ADVICE' screen. The word 'ADVICE' is in large, bold, blue letters at the top left. To its right is a large blue number '100'. Below 'ADVICE' is the word 'COAST' in white. To the right of 'COAST' is the text 'in 1 Minute' in white. At the bottom left, there are three lines of white text: 'Due In: 11:25:30', 'E.T.A. 11:25:30', and 'Time: 11:06:02'. At the bottom right, there are two lines of white text: 'Reading' and 'HST - 8+2', followed by '5m 20ch'.

Field	Value
ADVICE	100
COAST	in 1 Minute
Due In:	11:25:30
E.T.A.	11:25:30
Time:	11:06:02
Reading	HST - 8+2
	5m 20ch



- 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

COAST

TSR 50 in 3 seconds

Due In: 10:56:00	Reading
Time: 10:47:22	HST 8+2 22m 40ch

TSR

ADVICE 50 in 2 Minutes

Due In: 12:41:00	Bath Spa
E.T.A. 12:42:00	HST - 8+2
Time: 12:38:41	109m 0ch



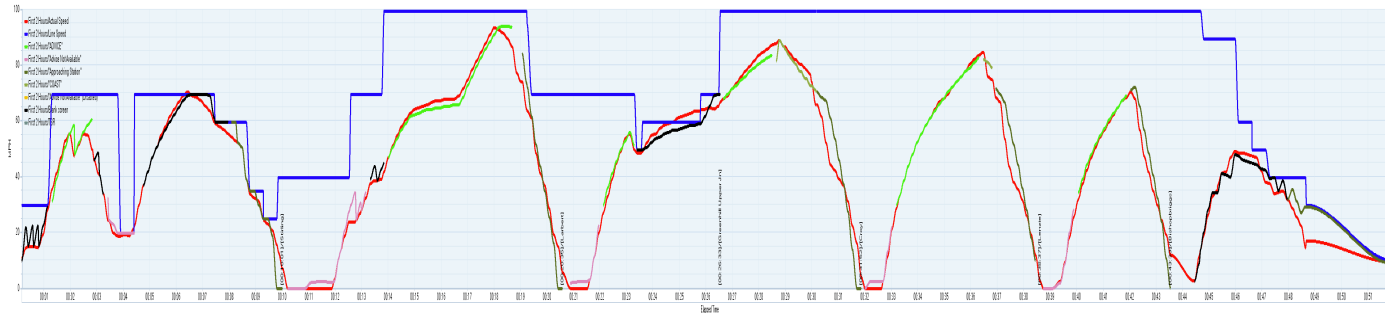
- The main menu allows the driver to access additional functions while the train is stationary



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

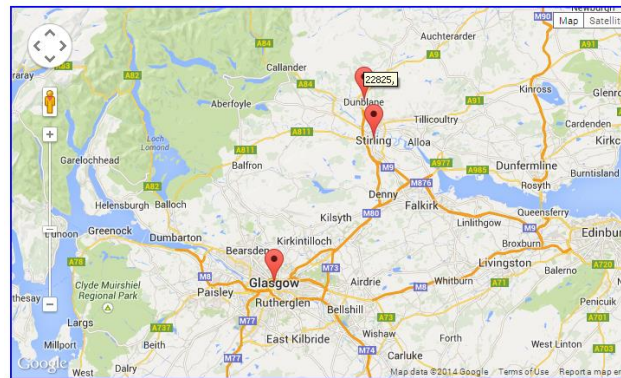


- Driver Journey Information (Energy Efficiency)

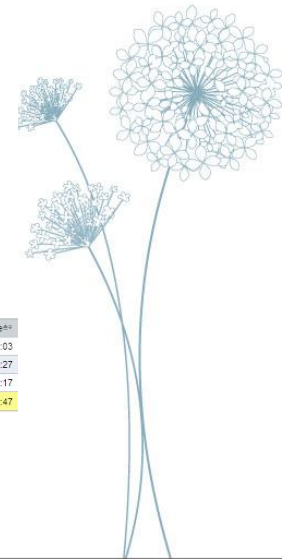


- Journey Delays (Delay Investigation Investigation)

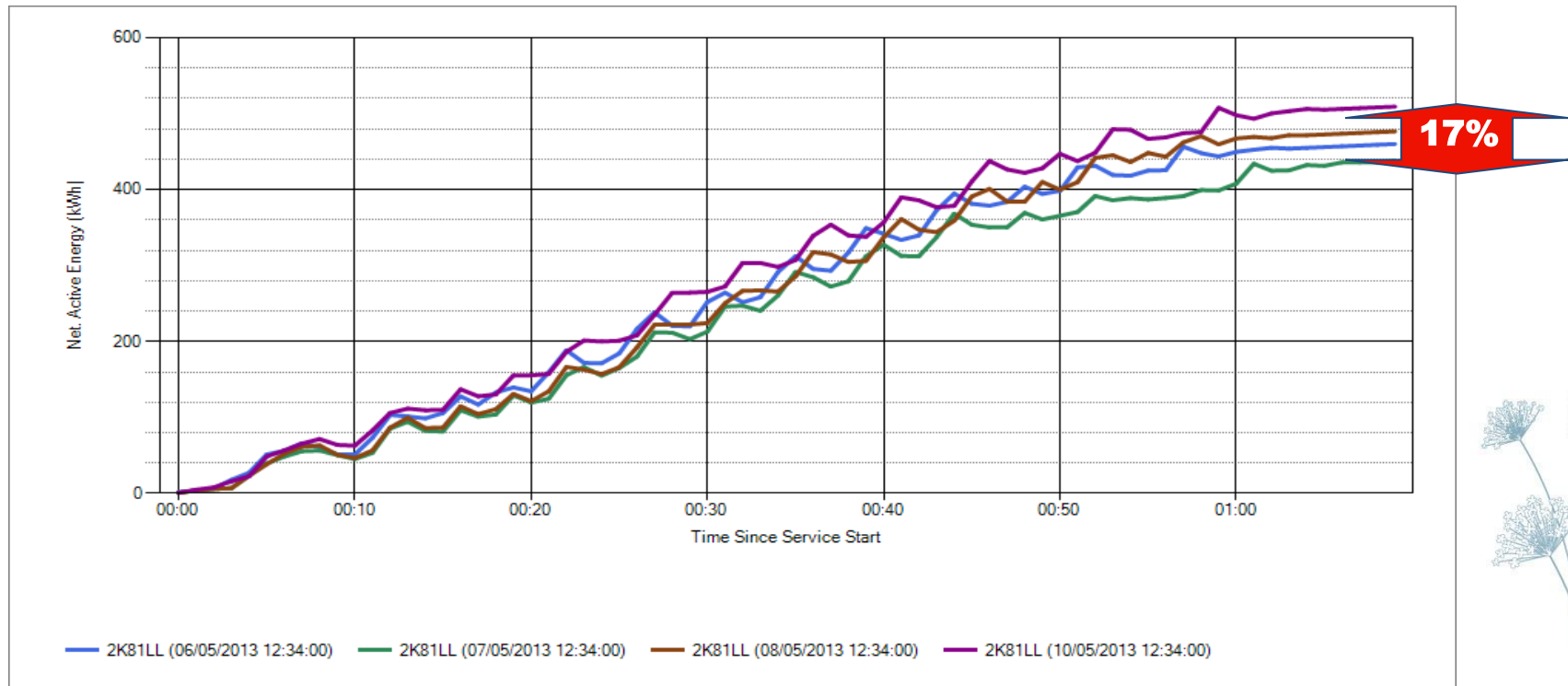
- Sectional Running Times (Performance Improvement)



Journey Date ¹	Timetable ²	Driver (final) ³	Delay ID ⁴	Delay Start Time ⁵	Delay Attribution ⁶	Location ⁷	Delay - Elapsed Time ⁸
07.05.2014	14:57 18:41 Glasgow Queen St High Level-Aberdeen	LESLIE, G	22805	19:07:07	Stopped at Signal	Stirling	00:04:03
	2:50 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
	2:56 23:09 Dunblane-Edinburgh	ADAM, L	22825	23:11:07	Stopped at Signal	Dunblane	00:03:17
Result							00:10:47



- 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



ANTWERPEN, 16 - 19 JUNE



TRAIN ON LINE; SPEEDADVISE AND CONTEXTINFO FOR THE DRIVER

JOKE KNIJFF, PRORAIL

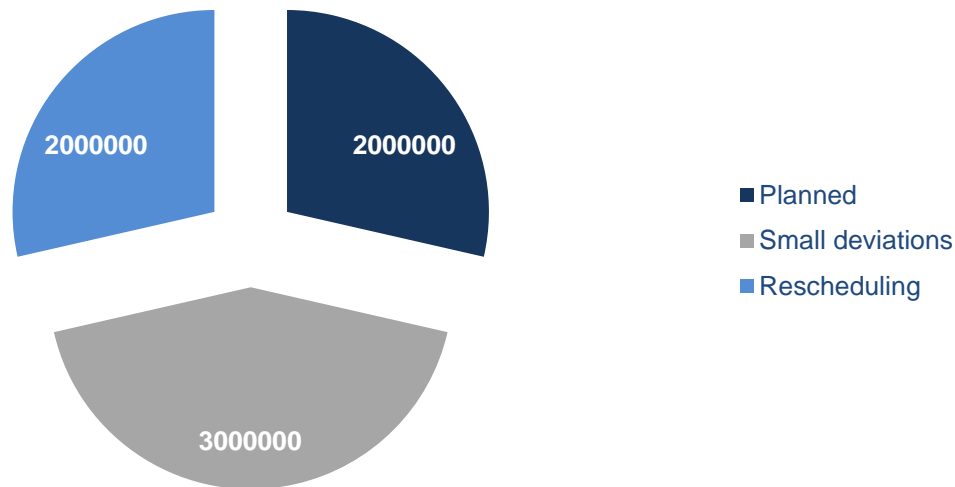
RAMON LENTINK, NETHERLANDS RAILWAYS

JUNE 2014

Energy Efficiency, the best fuel to move our trains!

GOAL TRAIN ON LINE: A SAFER TRAIN OPERATION

Estimated number of red signal
approaches per year



ROADMAP

Dienstkaartje 14:17:09

Overzicht Gestrand?

MCN UT 5 29-nov-2010 04:58-11:43 (06:45)

SLT	4016	Rtd	Asd	06:25	12
Hmlba	-	07:05			
Bkla	-	07:09			
Bkl	+	07:11	2		
Aco	-	07:17			
Ac	+	07:19	2		
5.0-4.7		90/70			
Ashd	+	07:22	2		
Asb	+	07:27			
Dvaz	-	07:28			
Dvd	+	07:30			
MAT	5825	Asd			

Speedadvise
Benchmark/pilots

MMI

Result 1

1. Eco driving information
2. Contextinformation = Routelint
3. Expertise (driver/dispatcher)

Result 2
Speed-advise

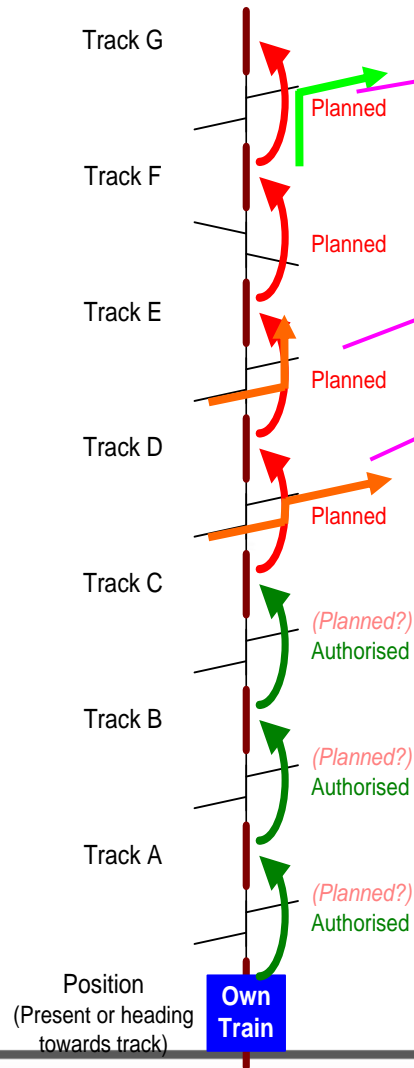
TMS

ERTMS

Know-how
Knack
Expertise
Proficiency
Ability



RESULT 1: ROUTELINT



Treinnnummer	13:06:52	Vertraging
Out	G	+2
	F	
In	E	+1
Cross	D	-1
	C	
	B	
	A	
OT	P	-0

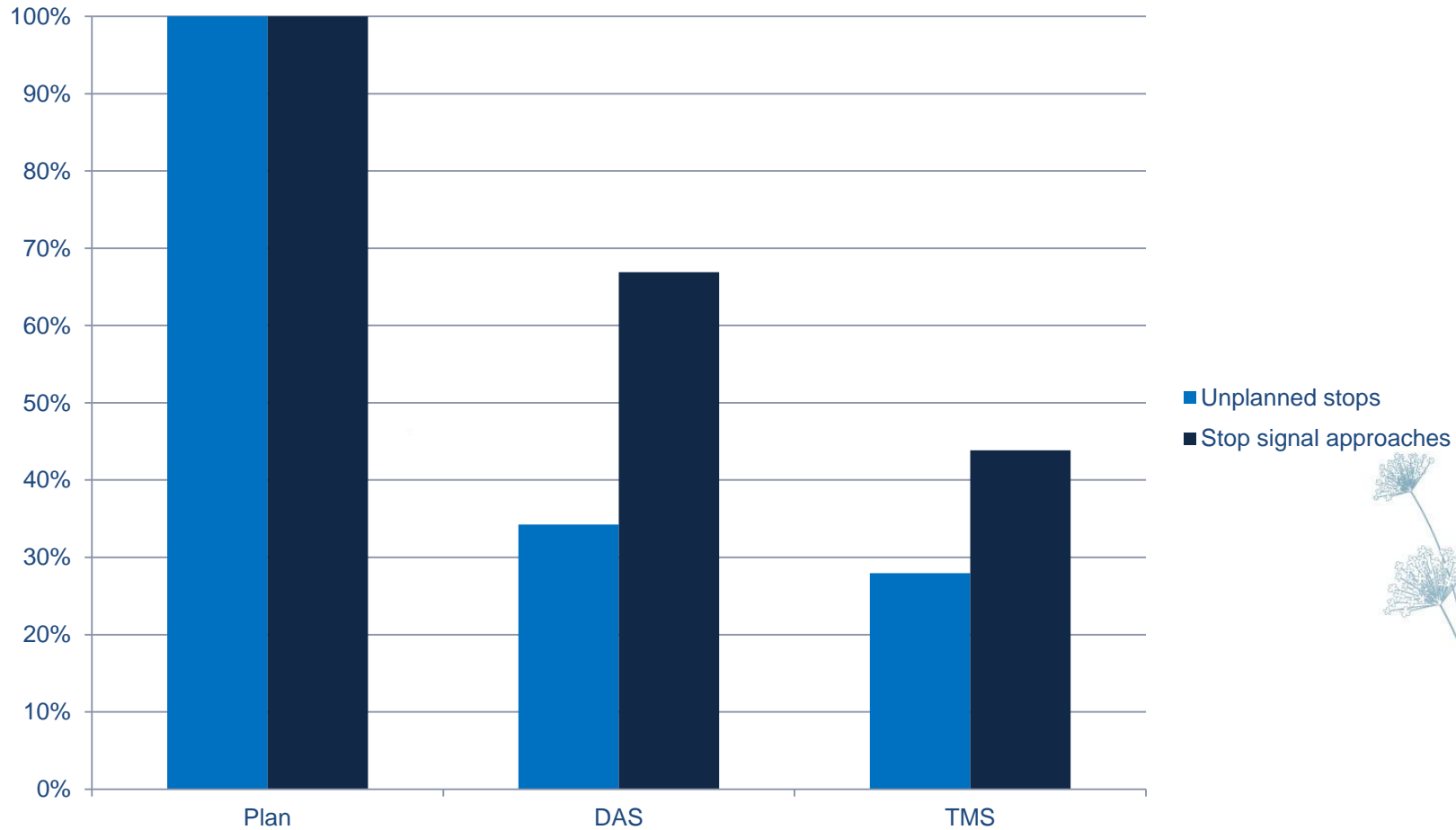


NETWORK AND SIMULATED AREAS



SIMULATION RESULTS

Relative safety improvement



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

