DMMS @ Trenitalia

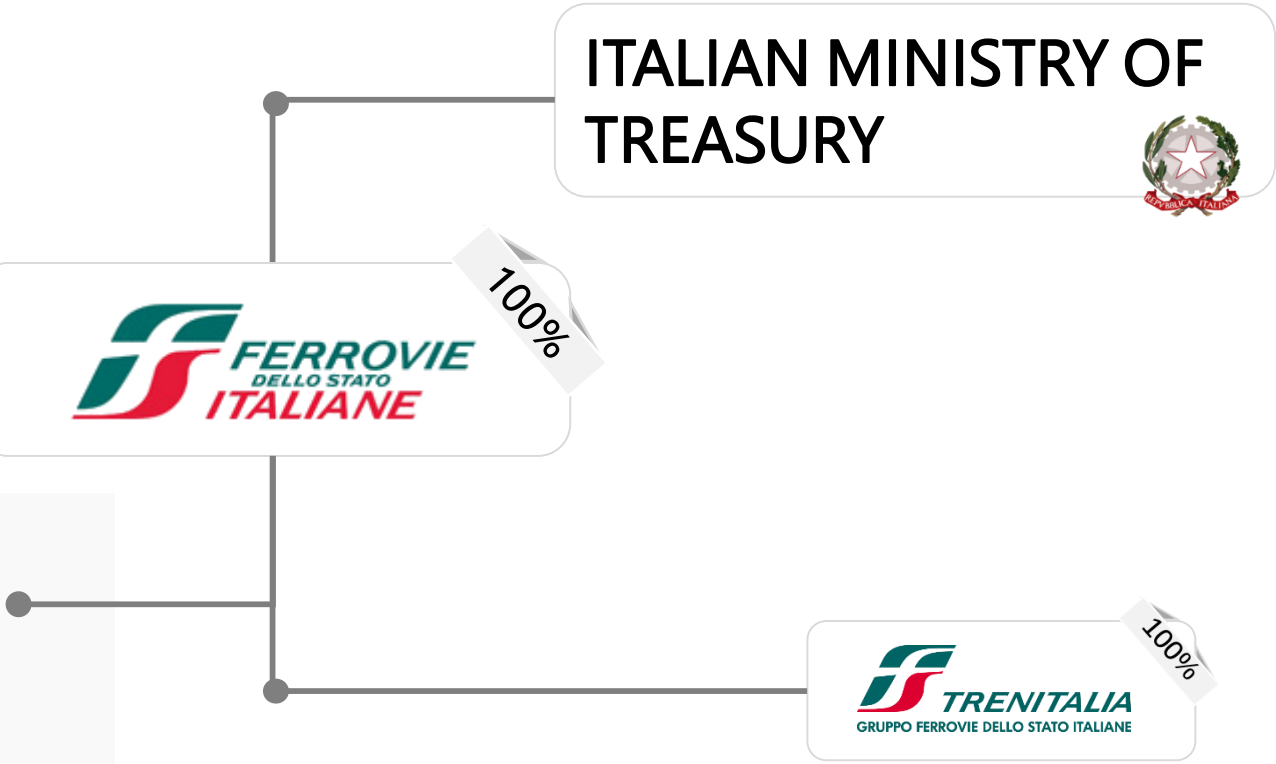
The winning combination of IoT & data

Danilo Gismondi - CIO

TRENITALIA

GRUPPO FERROVIE DELLO STATO ITALIANE

Trenitalia at glance



- RFI (100%)
- FERSERVIZI (100%)
- FERCREDIT (100%)
- ITALFERR (100%)
- FS LOGISTICA (100%)
- BUSITALIA (100)
- FS SISTEMI URBANI (100%)
- CENTO STAZIONI (59,9%)
- GRANDI STAZIONI (59,9%)
- NETINERA (51%)

1.480,5 Mio€
EBTDA

6.300
Trains/day
Regional

28,9%
EBTDA
Margin

241
Trains/day
High speed

20.000 Mio
Passenger
Long Haul

83 Mio
Trains-km
Long Haul

156 Mio
Trains-km
Regional

28K
Employees

Source: Trenitalia.com

Why DMMS?

DMMS is aimed at deeply transforming the end-to-end maintenance operations to achieve dramatic improvement in effectiveness and efficiency

FROM

- **standard plans** based on measures like time and km where corrective actions are performed when anomalies are detected
- **limited scalability**
- Identification of potential anomalies in **sensor-monitored components**

TO

- Maintenance driven by **life and health of each component**
- **Open, affordable** and **standard-based platform**
- Application of **mathematical methods** and customized **algorithms**

Why SAP and what about its platform?

SAP solutions run most of the critical processes of our Group. Why?

New model of partnership FSI/SAP based on co-innovation and methodical approach

+

In-memory data platform and application of statistical model accelerate business processes

=

To find a smarter way to keep train in top shape

Dynamic Maintenance Management System

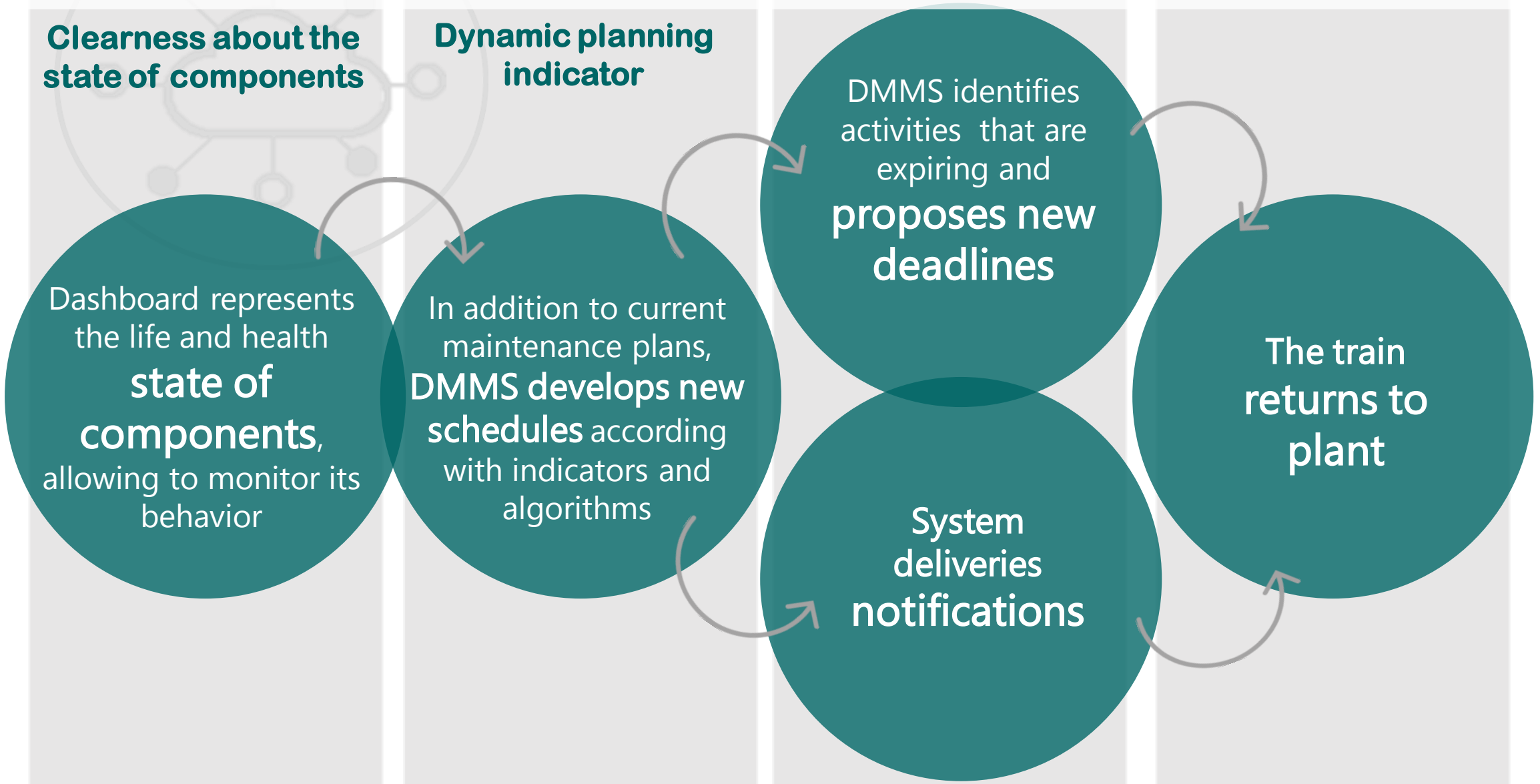
powered by SAP HANA

Business Model

Technological Model

Dynamic Maintenance Management System

Business Model



Dynamic Maintenance Management System

Technological Model

TRAIN

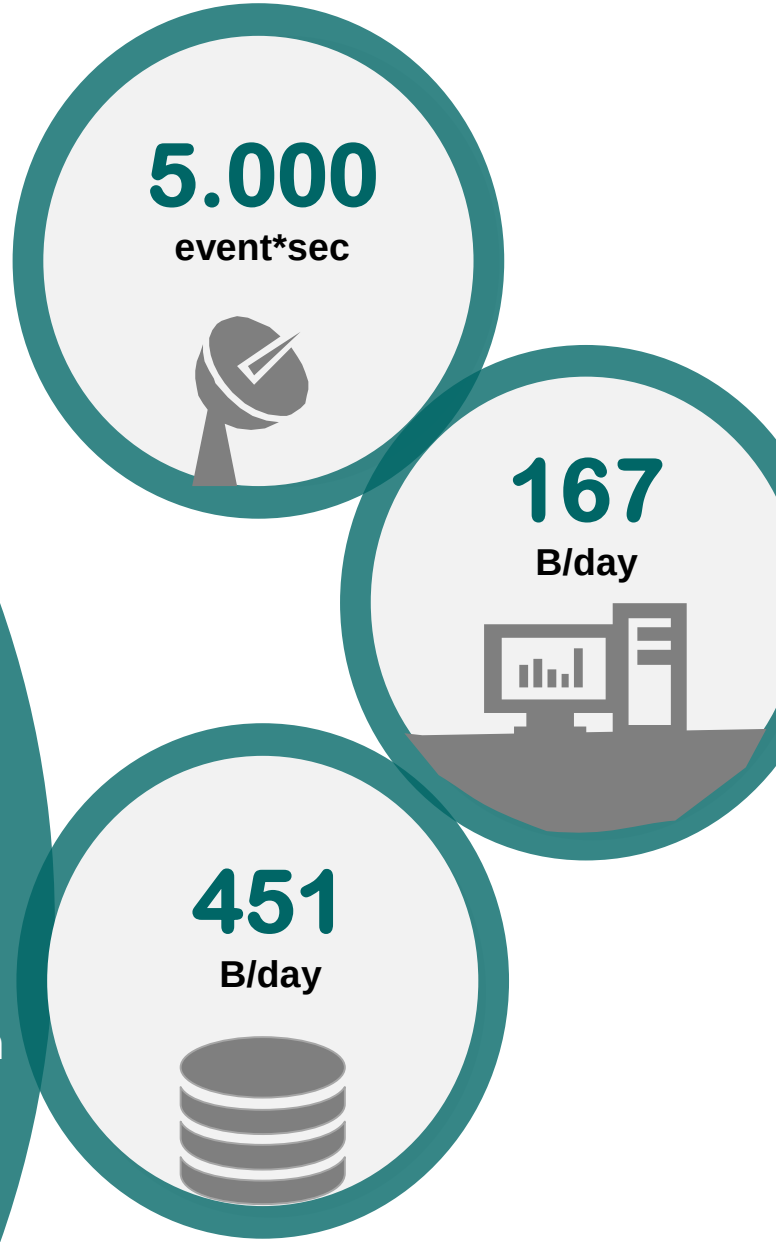
On board sensors **enable** a constant monitoring of the main train components condition

Thanks to a **Big Data System**, data related to components condition are constantly gathered and updated

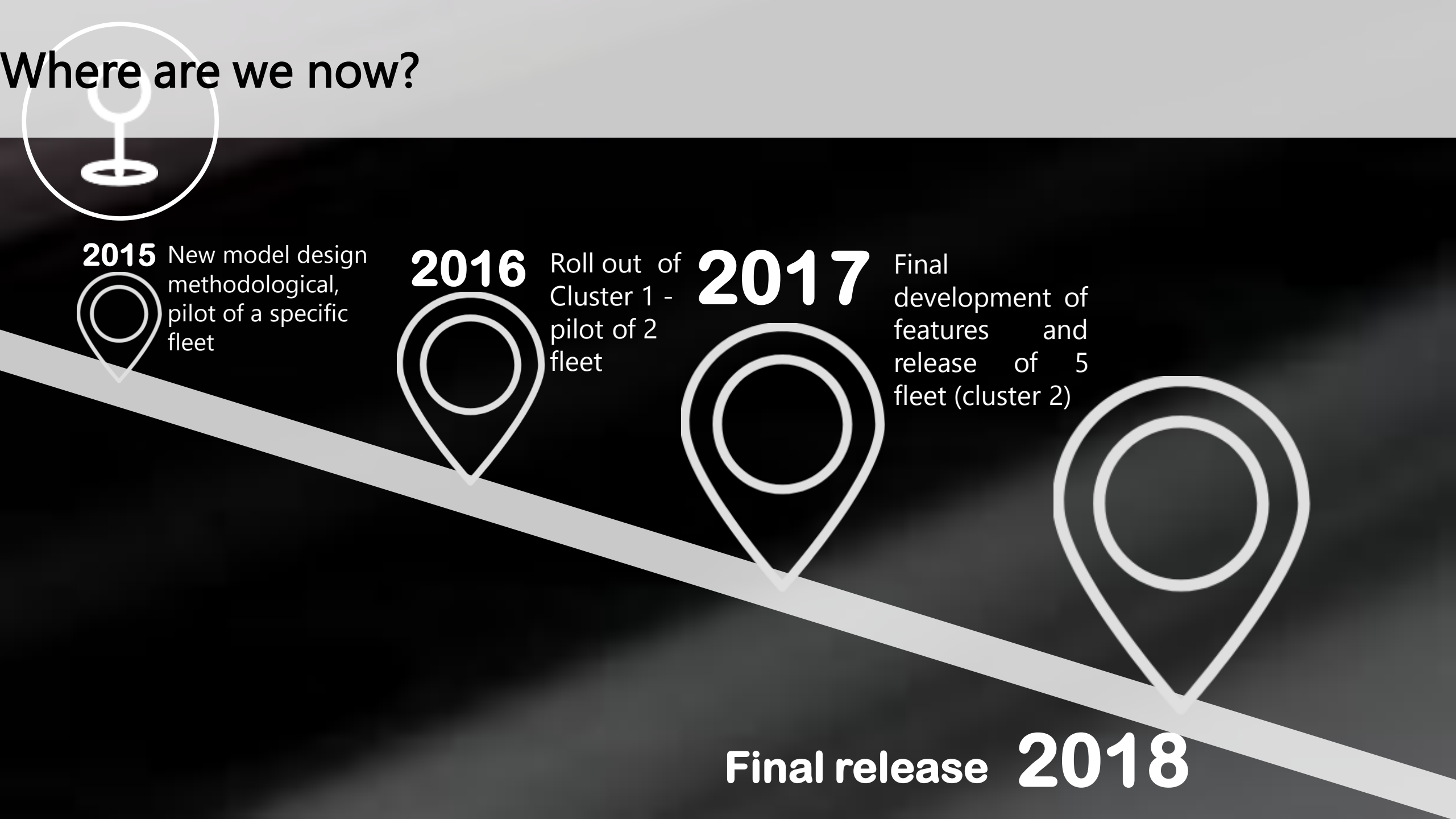
Deep interaction with maintainers to prevent incoming anomalies and faults enabled by the use of Tablet device to share documents, photos and feedback

Special algorithms and health **indicators** are computed in order to foresee future components condition and create more efficient maintenance cycles

The train returns to plant and is checked thorough technological diagnostic tools



Where are we now?



“Anticipo Diagnostica” - State of the vehicle

Stato	Flotta	Complesso	Treno	Ultimo Contatto	Motori	Blocco Porte	IR	Gruppi Statici	KMT	Antincendio	Caricabatterie	Compressori	Clima	Posizione	Velocità	Descrizione Ultimo Evento
	ETR425	001												---		
	ETR425	002		27/11/2015 9.50.35	M1 M3 M2 M4		IR	GS1 GS2 GS3			BT1 BT2 BT3	CP1 CP2	SAL CAB	---	0	
	ETR425	003												---		
	ETR425	004												---		
	ETR425	005	*******	25/11/2015 8.51.45	M1 M3 M2 M4		IR	GS1 GS2 GS3			BT1 BT2 BT3	CP1 CP2	SAL CAB	ANCONA	0	
	ETR425	006	21692	27/11/2015 15.49.57	M1 M3 M2 M4		IR	GS1 GS2 GS3			BT1 BT2 BT3	CP1 CP2	SAL CAB	GENGA (2.86 km. da)	30	N.AV. IS115-M: Annuncio audio richiesto dall'OBOE correttamente diffuso dagli altoparlanti del treno WC54-M:EV refill GWT (Y11) IS99-M: richiesta di annuncio automatico OBOEnon correttamente diffuso negli altoparlanti
	ETR425	007												---		
	ETR425	008	6729	27/11/2015 14.49.19	M1 M3 M2 M4		IR	GS1 GS2 GS3			BT1 BT2 BT3	CP1 CP2	SAL CAB	TERONTOLA	0	TZ371 : Stacco trazione per manipolatore freno fuori 0 su A41 N.AV. IS99-M: richiesta di annuncio automatico OBOEnon correttamente diffuso negli altoparlanti IS115-M: Annuncio audio richiesto dall'OBOE correttamente diffuso dagli altoparlanti del treno

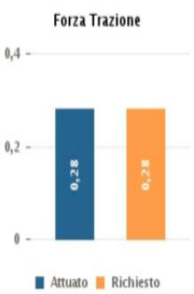
“Anticipo Diagnostica”- Traction

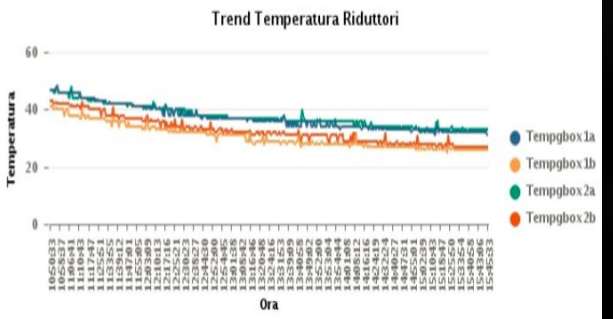
Motore	Stato	Descrizione evento	TM	TR
M1		0	0	31
M2		0	0	26
M3		0	0	33
M4		0	0	27

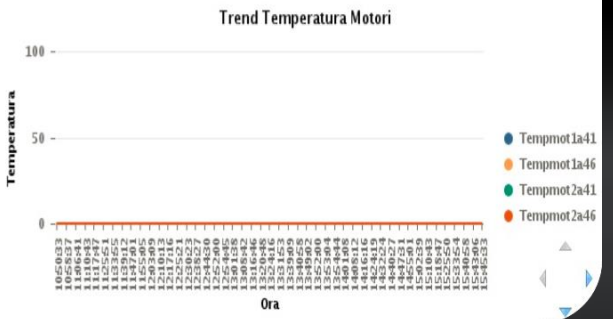
	Master	Slave
Corrente di Linea	0	0
Tensione di Linea	3.720	3.720
Tensione di Filtro	3.990	3.990

Ultimi 10 eventi (Profondità 48h)

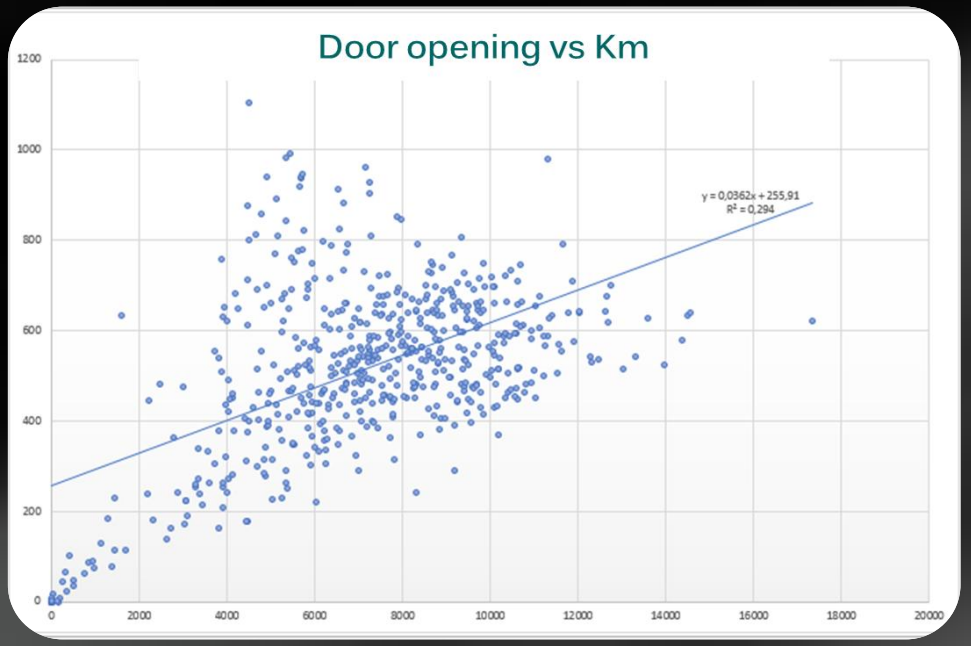
Data	Severity	Fault
27/11/15 09:36:09	A	TZ372 : Stacco trazione per manipolatore freno fuori 0 su A46
27/11/15 09:12:24	A	TZ371 : Stacco trazione per manipolatore freno fuori 0 su A41
27/11/15 08:42:25	B	TZ604-M: guasto dello Switch odd , inverter in frenatura A46
27/11/15 08:42:25	B	TZ605-M: Guasto di frenatura elettrica inefficace A46
27/11/15 08:42:24	C	TZ165: Frenatura elettrica inibita dall' Unità di Controllo Trazione 2
27/11/15 05:21:31	B	TZ399-M:Richiesta scarica filtro1 A41
27/11/15 05:21:31	B	TZ414-M: Richiesta di scarica del filtro 2 A41
27/11/15 05:21:30	B	TZ542-M: Richiesta di scarica filtro 1 A46
27/11/15 05:21:30	B	TZ557-M: Richiesta di scarica filtro 2 A46







Door opening vs Km



Project benefits

REDUCE COSTS OF OPERATIONS (estimated 8%)

- Avoid any unnecessary activities, even when planned according to the current scheduling
- Plan in advance and in detail for any intervention, ensuring availability of spare parts, facilities, tools and trained resources

REDUCE UNPLANNED DOWNTIME

- Prevent breakdowns while trains are in operations
- Prevent extended maintenance downtime due to unforeseen activities

Tips & Tricks

Data can be complicated, messy … and expensive!

1. To understand data increasing ROI
2. To use customized algorithms optimizing the processes
3. To choose the right Team … Business, IT, Data Scientist

TRENITALIA

GRUPPO FERROVIE DELLO STATO ITALIANE

Thank you & get in touch!

d.gismondi@trenitalia.it