

SMARTWORLD

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Guide Partner



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SMARTER ASSET MANAGEMENT FOR A MORE EFFICIENT RAIL NETWORK

HOW USING OPERATIONAL DATA IS ENABLING A FRENCH REVOLUTION in future maintenance for SNCF.

AMTRAK PARTNER UP TO USE 'DIGITAL TWINS' to redefine infrastructure asset management.

RAILROADS TURN TO PREDICTIVE ANALYTICS to conquer the last frontier: Downtime.

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Welcome,

Many thanks for downloading '**Smarter Asset Management for a more efficient rail network**' the 29th industry guide from the team at SmartRail World.

An effective asset management programme when executed well can upgrade performance, improve safety and offer greater value for investments. It can also encourage new ways of thinking and operator business models. A full and accurate knowledge of all infrastructure assets, where they are located and what condition they are in, is now essential to effectively manage a modern rail or metro network.

To use just one example from around the world of what asset management offers, Network Rail, the UK rail infrastructure manager, outlines for main areas in their **strategy document**. Firstly, it can focus maintenance, renewal and enhancement activities. Secondly provide an integrating mechanism that crosses boundaries, between organisational functions and asset disciplines, and between the infrastructure manager and supplier organisations. Thirdly it places a greater weight on evidence-based decision-making, using knowledge of how assets both degrade and fail in order to optimise maintenance and renewal intervention. And finally it requires changes past behaviours, with greater focus on customer need and collaboration across functions to create an interdependent and collective responsibility for achieving consistent objectives.

Whilst the benefits are clear, achieving them is not always straightforward. Obsolescence, outdated operating systems, database issues, security challenges and the skills gap are just some of the challenges that can limit efforts to ensure that asset management is the principle tool in delivering an efficient rail network

So to further support rail and metro's further engagement with this approach to working we have spoken to leading experts and practitioners from around the world from both transport agencies and solutions providers to help you improve, develop and maximise the potential of modern asset management solutions.

This digital guide wouldn't have been possible without its sponsor, **OSIsoft**, a leading global supplier of application software for operational data management. With over 35 years of experience in creating digital infrastructure, they lead the way in connecting people with the power of data. One of the rail industries most widely-used technologies for digital transformation, OSIsoft's PI System captures data from sensors, manufacturing equipment and other devices and transforms it into rich, real-time insights to reduce costs, improve overall productivity and/or create new services.

And we are fortunate to gain insights from both the OSIsoft team and from some of their partners for this guide. Thanks also to **SYSTRA** and **Trapeze** for their support and all those who gave their time to myself and the team here.

If you would like to contribute to future features and publications, please e-mail Luke@SmartRailWorld.com.

Regards and thanks,



Luke Upton
SmartRail World, Editor.
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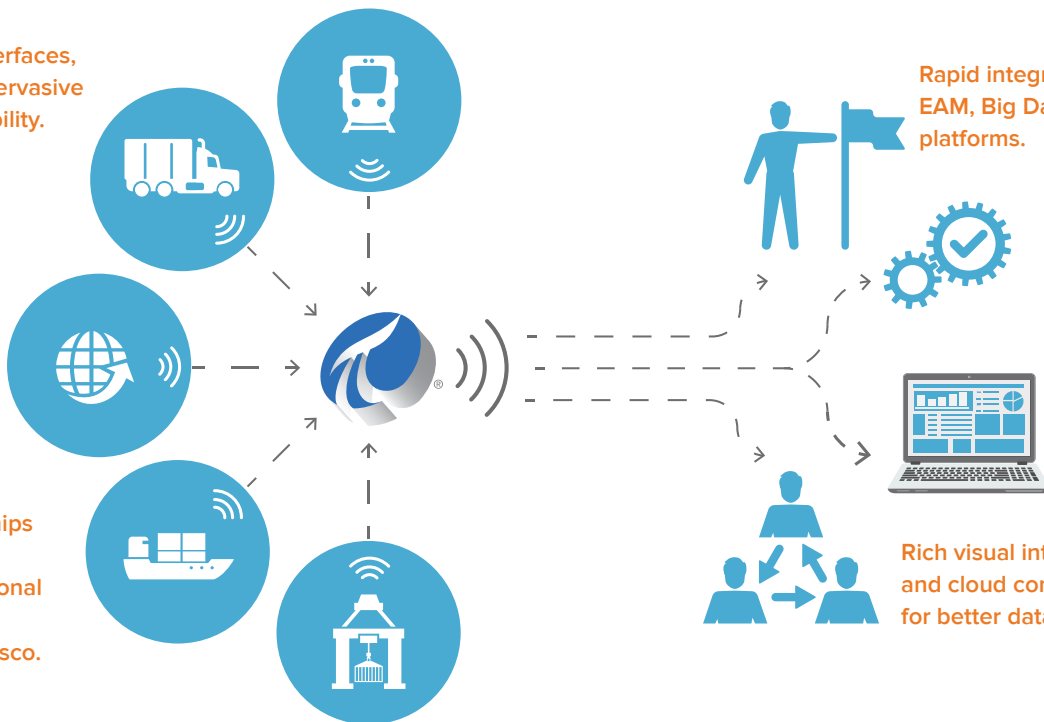
— Michel Plourde, Director of Systems at ArcelorMittal

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How using operational data is enabling a French revolution in future maintenance for SNCF.

Since its formation in 1938, the Société nationale des chemins de fer français (SNCF), France's national state-owned railway company has had a keen focus on innovation.

They are of course best known for their high-speed train, the Train à Grande Vitesse (TGV) that has been in operation since 1980, but other pioneering developments include their 'broken nose' style of electric and diesel locomotives designed by the famous Paul Arzens, being the world's first operator to offer carbon neutral travel at no extra cost to passengers and code-sharing with airlines. Within the SNCF group, it is SNCF Réseau who is responsible for the management and maintenance of the huge railway network which includes 30,000 km of line – over 2,000 of which is high-speed, 15,000 level crossings, 2,200 signal boxes, 1,576 tunnels and 1,201 foot bridges among many other assets.

Encouraging mobility and supporting the ensuing increase in traffic is one of the main missions of SNCF Réseau. Over the last 10 years, passenger transport has increased by 50% and is forecast to continue to grow. The French railway network already has a very high level of performance, but has several opportunities for further improvement, and today we focus on one of the most important - its modernization and digitization program to increase the utilization availability of its asset and better plan maintenance and investments. We speak exclusively to Stéphane de Paris, Chief Data Officer of SNCF Réseau and Matt Miller, OSIsoft's Industry Principal for Transportation.

SNCF Réseau is in full transformation mode at the moment, with one of their key aims to optimise the maintenance of the network.

"Key to this is to improve monitoring, carried out through; remote monitoring deployment, new technologies such as sensors, wireless and the internet of things and video technology both fixed and on-board. All this means we have to have tower control, with supervision

centres deploying a new management process across the network. And this new approach to maintenance limits the impacts on traffic, helps us better anticipate incidents and improves our asset management by being able to define and adjust degradation curves, and capitalize on asset knowledge to define new processes" states de Paris.

To achieve this improved approach to maintenance SNCF Réseau in 2014 formed a partnership with OSIsoft, global leaders in turning data into information, first in Île-de-France and now rolling out through the whole country. At that heart of this partnership is OSIsoft's PI System, and Matt Miller tells us more about what it offers.

"For rail and metro operators, how they access and learn from the data that resides in multiple, often incompatible systems across their network is a complex problem. These data sources all compete for attention, and in a changing industry with ever increasing amounts of connected devices and data streams this is only increasing. It is as a result easy to miss crucial data."

"For 35 years across numerous other industries, the PI System has been supporting better data analysis - it offers a simple solution, that is quick and easy to install, collect data from and build upon. Quite simply it connects the data from all your machines and equipment to the people who need to use it. And in rail and metro, it is most powerful in helping operators realise the power of their own real-time data to make their maintenance more efficient" continues Miller.

By using the PI System, SNCF Réseau have been able, through one single accessible platform, to rediscover their assets leverage 10+ years

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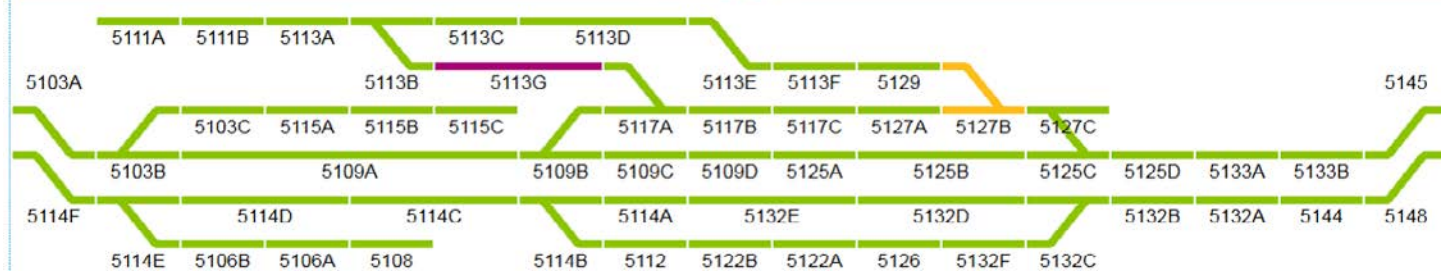
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How using operational data is enabling a French revolution in future maintenance for SNCF. *[cont]*

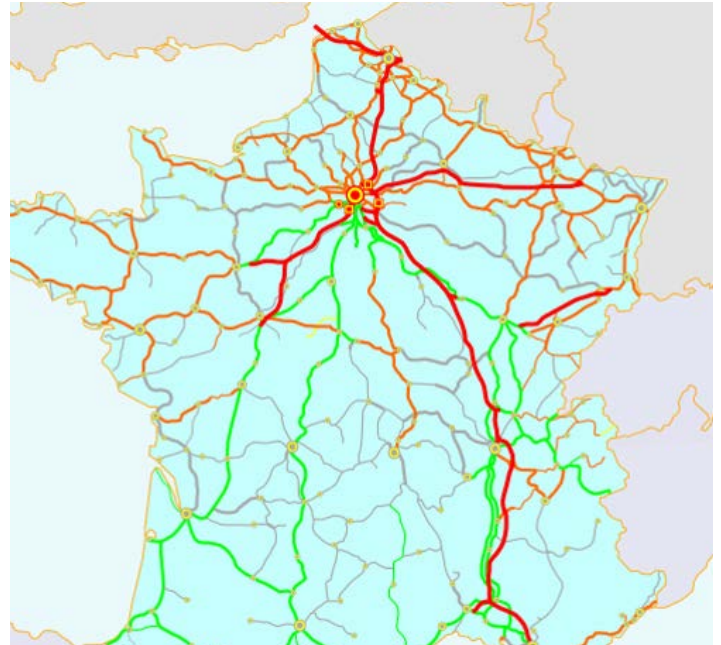
of legacy data collected in the field, set up and deploy new analyses and tools, designed and implemented by and for the maintenance teams, and open up a whole new perspective on smart asset management.

de Paris shares some details; "The evolution led us to enlarge the data we were able to capture, and this in turn opened doors to new internal and external products, allowing us on daily basis to improve our service for our clients and passengers. Before PI System was deployed, the data would be sourced in the field processed within SCADA and the limited information then passed onto the remote monitoring centre and through to field maintenance via telephone. Now, with PI, the field data is allied with achieve data through SCADA allowing a fuller analysis which can then be more easily shared with the maintenance teams through new devices."

The co-operation with OSIsoft can be plotted on SNCF Réseau's maintenance policy maturity beginning with corrective maintenance moving onwards to preventative maintenance (based on running hours or calendar-based) then condition based maintenance (based on measurements) and now predictive maintenance (extrapolated predictions based on analyses / assessment of data related to wear).

"SNCF RESEAU is demonstrating their leadership in digitalization and has been visionary in bringing all their stakeholders on the digital journey around industrial data. The maintenance and asset management teams and their needs are at the center of everything. OSIsoft believes this approach will expedite adoption and is pleased to be supporting them in reaching their operational goals" – Matthew Miller

And this partnership is essential in helping SNCF Réseau achieve their ambitious goals to further modernise the network throughout France, integrate the LGV high-speed lines into the national railway network and ensure that their 15,000 daily trains, 5 million passengers and 250,000 tonnes of freight they transport are part of fast, on-time and comfortable journeys.



"For rail and metro operators, how they access and learn from the data that resides in multiple, often incompatible systems across their network is a complex problem."

For more on how OSIsoft work with the rail industry [click here](#) or contact transportation@osisoft.com Want to make better use of your available data, and see how mature your current use is, [OSIsoft offer an assessment](#) and receive a benchmark report to create some momentum towards your own transformative data strategy.



Asset management in rail: cognitive computing.

The variables in the rail industry, especially in rail infra are numerous. Asset management in rail with all the variables in a reliable way is a challenge. However cognitive computing which has recently become available can make a big difference. In this guest post from Marcel Van Velthoven CEO of **ZNAPZ**, we see a compelling perspective on how cognitive computing can assist asset management in rail and this articles below is described what kind of questions can be asked and what answers and reliable information can be obtained.

Assets just don't break or fail as a coincidence. Something has happened that has started or accelerated the deterioration process. Identifying what has happened or is happening becomes one of the standard possibilities with today's assets. This information can be obtained and with **cognitive computing**, a realistic prediction becomes possible. The challenge is to combine many different data sources and to develop a realistic pattern of the ageing of the asset.

Some examples:

It is well known that the rail and the rail system, switches, power lines are affected by the traffic. What was the speed of the train, what was the load of the train, what was the weather condition and what was the quality of the bogies that contacted the rail? Getting this data together, preferably in real time was, until recently absolutely impossible, however, it is **becoming standard** today.

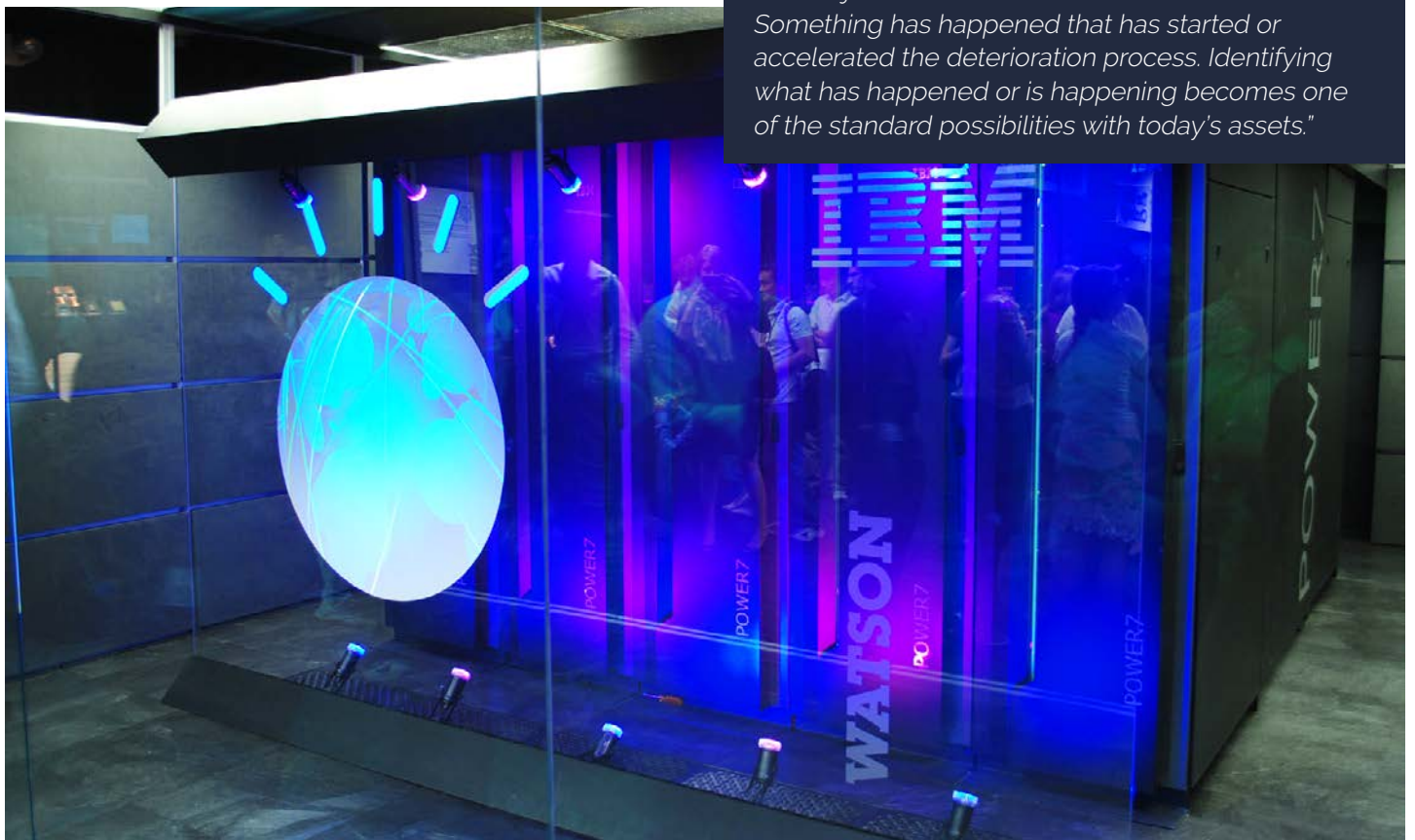
On today's tracks, the temperature of the track is permanently measured, as well as the vibration. This varies of course when a train passes. A train passing gives the first pattern of vibration and temperature of the track.

This can be combined with the train speed and load and the weather conditions. This combination gives a good first impression of the effect of the passing train, on the quality of the track.

Taking it, a step further can per bogie be identified what the quality of the wheels, the roundness, is. Even a non-significant deviation does already have a significant effect on the rail track quality and life expectation. All this data can easily be sent to a central computer which makes profiles of the train journey, speed and load and the quality of the relevant assets in the train affecting the asset life of the track.

Looking ahead, when it comes to cognitive computing and Internet of things (IoT), real-time information can be interpreted and analysed. Taking into account all factors, e.g. customer delay minutes, asset life, maintenance cost and capabilities, we can generate a real-time signal identifying what the train speed should be along the trajectory that the train should take.

"Assets just don't break or fail as a coincidence. Something has happened that has started or accelerated the deterioration process. Identifying what has happened or is happening becomes one of the standard possibilities with today's assets."



Asset management in rail: cognitive computing. [cont]

It will become a dynamic journey, taking into account the trains time schedule and physical status of the train and the track.

Firstly, we can focus on asset life and deterioration, but soon we can identify how special conditions lead to a shorter or longer asset life and how this can be optimised, taking into account the specific speed of the train under these specific circumstances.

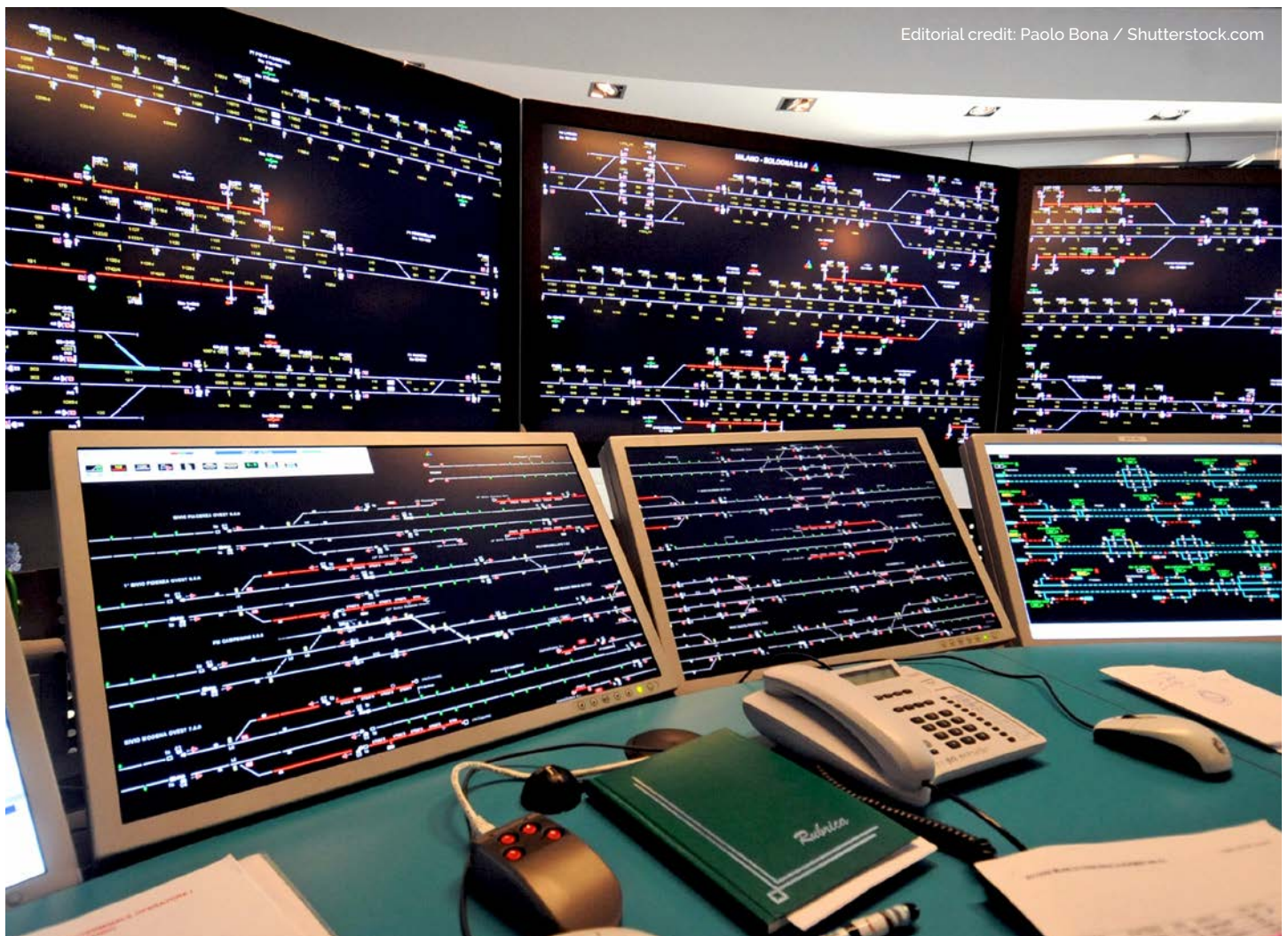
Watson can make these predictions today. Even better with all the variables, even variables we may not think of today, Watson, the cognitive computer from IBM will be able to **recognise patterns over time** and dynamically adjust the recommended driving conditions for the train. A combination of trains driving close to each other may have an effect that currently isn't taken in account and also a passing train could have an effect.

With the dynamic guidance of Watson and the recommended speed, the train could be guided to pass the other train at the best-chosen area. This demonstrates how artificial intelligence will make its entree in the rail infra world enabling the rail infra company to take appropriate actions, to generate the highest value from its rail assets over the lifetime, while managing risk and cost.

The non-standard deviations if the track can be identified using modern technology, such as drones or also measurement trains. The data gathered from these inspections can be interpreted by Watson, after a learning period, where Watson has been through what is the right condition of the track and what is an abnormal condition.

Bends, curves, corrosion, corrosion frequency and acoustic information can be analysed to create the most accurate profile of the status of the track.

Watson will support the asset operator to optimise rail performance while minimising risk and cost in a real-time fashion. This dynamically against all the measurable variable conditions that can occur. The first step is the asset operator should identify how Watson will be educated. Watson is the next step in rail asset performance.



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Chennai Metro's problems to be aided by better asset management.

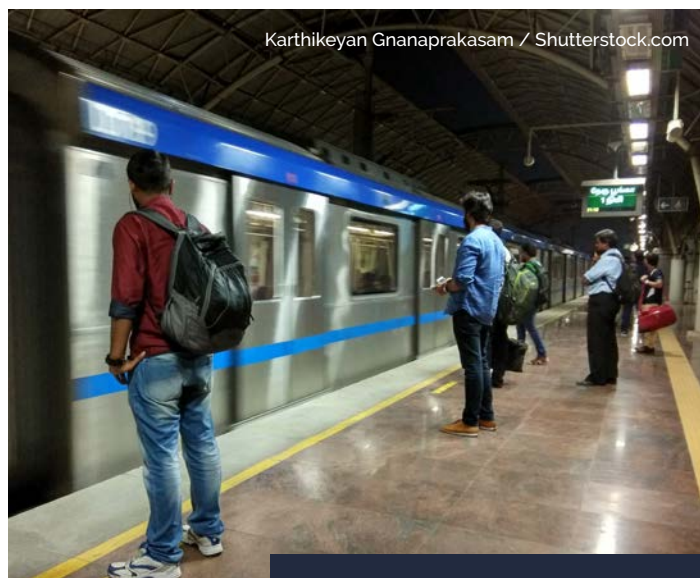
Chennai Metro Rail is to introduce an asset management system across its two-line network that will enable operators to remotely fix operational problems in minutes, keeping trains moving and cutting delays.

Currently, in most instances trains suffering from technical issues or system failures that force them to grind to a halt can only be fixed with a visit from an engineer or trained member of staff – a process that can lead to trains lying in wait on the tracks for an hour or more.

Offering a solution that can dramatically reduce this time to as little as five minutes, affected trains on the Chennai Metro will soon be contacted directly by trained operative who can deliver precise information that can get the train on the move. The asset management system works by gathering and transmitting specific train parameters and data, using it to fire real-time service alerts while the train is running to a maintenance server at the main depot.

A spokesperson from the Chennai Metro told The Hindu: "Even if I sit in one part of the world, all I need to know is the system's user id and password to access the data and solve the problem; it will be restricted and confidential and only a few people will have access to it.

"What may take about half hour to even an hour can be solved within 5-10 minutes. Instead of sending in a person, we can give instructions to the train operator and solve the problem." The latest system, which has been introduced in "10-15" trains so far will eventually be installed across the entire fleet of 42 trains for "phase I" of the project. Details on the predicted cost and installation time are yet to be released.



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"What may take about half hour to even an hour can be solved within 5-10 minutes."



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Amtrak partner up to use 'digital twins' to redefine infrastructure asset management.

Amtrak, the US passenger railroad service have engaged with EAMS Group to redefine their Infrastructure and Mechanical (Rolling Stock) engineering and asset management teams for the 21st Century.

Amtrak's asset management strategy is to develop a set of detailed best-practice processes and industry solutions which will enable full lifecycle management of their complete asset base. Referencing and enhancing existing information models and asset databases, they are creating a digital twin of the Northeast rail corridor asset base that Amtrak owns and maintains.

What a digital twin? Increasingly being used in the rail industry, it is a representation of your physical assets, documented and mapped within the digital world. It's not just a picture though; the technology understands the links between assets and can explore them as systems providing new ways of modelling and simulating the performance of the whole system from the safety and comfort of the office. In a correctly implemented system this digital twin will be updated in real-time, so any changes, faults or issues occurring in the real world are automatically registered and visible in the digital world.

Harnessing the power of Virtual Reality and Augmented Reality this digital world can now be explored. Engineers and workers can explore the environment from the comfort of the office – all research and preparation can be conducted before they arrive on-site and staff are

able to select any asset they choose and automatically see all details, history and information about it. Any repairs that may cause a disruption to a service can now be minimised, staff will be well-informed, and when they turn up on site they are prepared for the issue.

The output of this partnership between Amtrak and EAMS will be one of the most advanced and comprehensive cross-asset enterprise wide linear asset models in the world.

The model is the foundation for all of the infrastructure asset management assets and will enable the advanced virtual reality modelling and cognitive & predictive maintenance modelling needed for the present and future railway.

The process and asset hierarchy design works undertaken as part of the Mechanical work-stream are directly aligned with the approach taken in the Infrastructure work-stream and will manage the transition of over 2,000 passenger cars, locomotives and switch engines into the new Enterprise Asset Management system.

"Any repairs that may cause a disruption to a service can now be minimised, staff will be well-informed, and when they turn up on site they are prepared for the issue."





“Trapeze has a rail transit solution that fits our various types of equipment right out of the box.”
Tim Elsberry, Director, Maintenance of Way, Metropolitan Atlanta Rapid Transit Authority (MARTA)

Are You Falling Behind or On Track to Revitalize the Industry?

No one can predict the future, but it is easy to understand there is a shift happening in the public transit world. New technologies, regulations, and rider expectations mean your agency has a lot of changes ahead of it.

At Trapeze, we are exclusively focused on transit. Offering a full suite of tools for the operations and technical side of the house allows us to keep up with all the current rail trends and help you revitalize the industry.

Keep up with the [top rail trends here](#)



Railroads turn to predictive analytics to conquer the last frontier: Downtime.

Despite a modest uptick in carload traffic this year, railroads continue to face financial pressure. Running longer trains, shuttering switching yards and furloughing more workers have helped relieve some pressure. But now railroads are taking aim to eliminate their costliest problem in light of uncertainty: downtime writes **Joe Becker**, director of industrial analytics at **Uptake**, a leading predictive analytics software company in Chicago.

To do it, they are turning to predictive analytics software that forecasts problems before they happen, so operations can be more productive, reliable, safe and secure.

Today's modern locomotives generate thousands of signals, which provide insight into the locomotive's status and physical location. In the past, most of that data was never harvested. Real-time readings from on-board gauges often sufficed. If data was stored, it was often only reviewed periodically, if at all.

Now, data can be transferred wirelessly for processing and stored inexpensively in the cloud. Insights derived from these data sets can be delivered directly to the technicians and engineers who need them when they need them. By empowering the workforce with prognostic, actionable insights, they are able to take action that results in more efficient and reliable operations without sacrificing safety or security.

Across the globe, railroads are beginning to tap into their data to improve their operations. A major Class 1 in North America has been using predictive analytics software with real, valuable results. Through two months of use, the software has prevented more than 50 road failures from occurring, creating well over \$1 million in value for this operator.

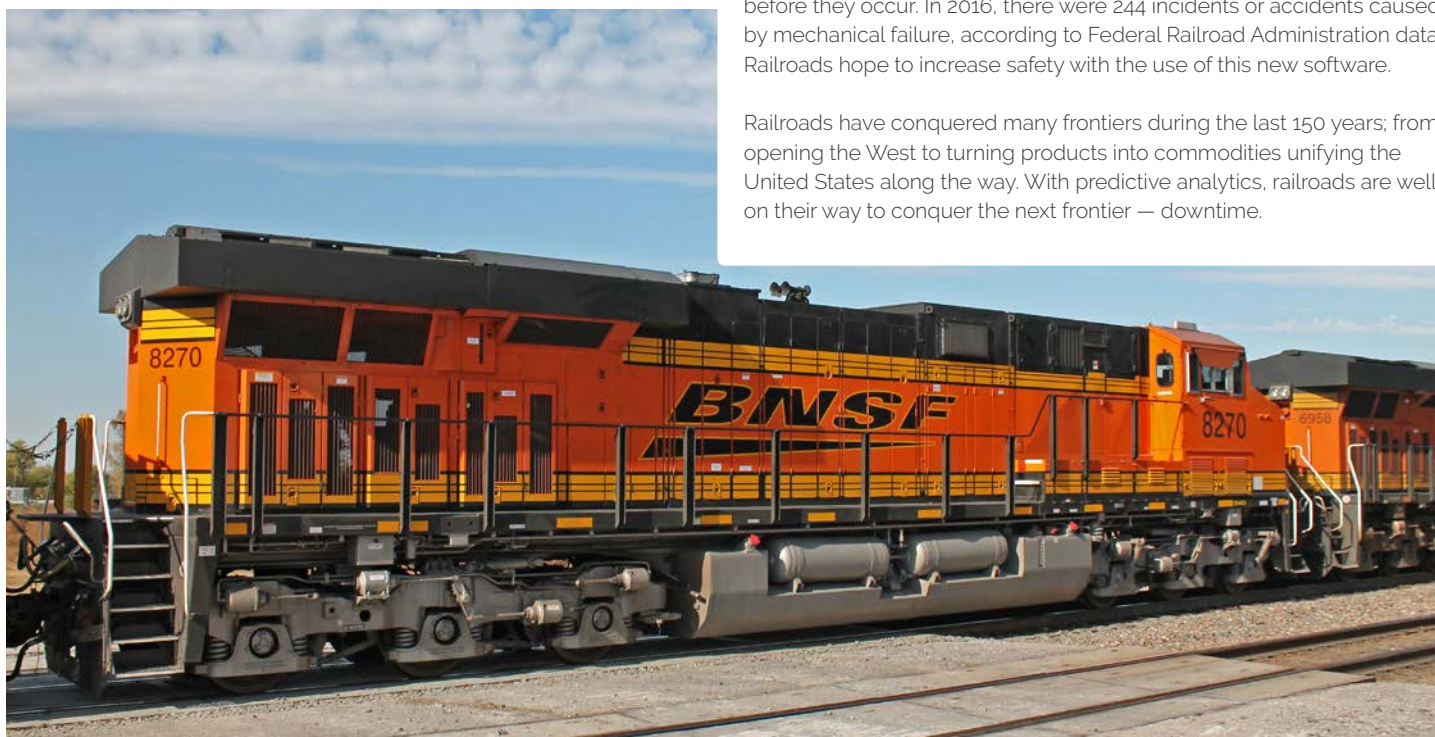
Railroads can measure these insights and the impact they create across the entire operation in three key areas. First, on the track. These insights help maintenance technicians make informed decisions based on a locomotive's status, performance and shop history. Real-time prognostic alerts increase locomotive availability. Perhaps even more importantly, it prevents a failure that causes a locomotive from breaking down on the tracks disrupting the network and delaying tens of millions of goods from arriving on time.

Predictive analytics is also being used to reduce the time it takes to build trains in the yard (coupling of rail cars together with a locomotive). When locomotives aren't moving, railroads aren't making money. By knowing the locomotives health and readiness, a technician can match the locomotive to the right mission ensuring the highest priority trains are well served.

Another North American Class 1 railroad has been using the same software to eliminate costly manual tests in the shop. Through the use of the software, this railroad has saved more than 35,000 gallons of diesel and over 1500 man-hours over the course of six months at one shop.

Predictive analytics solutions are proven to help major railroads become more reliable, efficient and safer by alerting users of critical failures before they occur. In 2016, there were 244 incidents or accidents caused by mechanical failure, according to Federal Railroad Administration data. Railroads hope to increase safety with the use of this new software.

Railroads have conquered many frontiers during the last 150 years; from opening the West to turning products into commodities unifying the United States along the way. With predictive analytics, railroads are well on their way to conquer the next frontier — downtime.



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The Last Word With... Marcelo Bravo, Director, Rail Solutions, Trapeze Group.

"Ultimately, working closely with our customers helps us become better at what we do. Not only do we get to share our industry expertise, we also learn..."

There are few companies that can offer as expert a view on our industry than Trapeze Group. For over 25 years they have helped evolve journeys on public transport, working with hundreds of government and commercial organizations across North America, Europe and Asia Pacific. With a reputation as the providers of some of the most advanced software, intelligent transportation systems and mobile technologies in the industry, Luke Upton recently caught up with Marcelo Bravo, their Director of Rail Solutions to talk about understanding the customer, autonomous vehicles, future plans and of course, his favourite rail journey...

Luke Upton (LU): Many thanks for the time today Marcelo, Trapeze's tag line is 'Here for the Journey', so what has led you to a career in the transportation industry?

Marcelo Bravo (MB): The short answer is my father, Raul Bravo. He started in the automotive industry and moved almost exclusively over to rail in the mid-70s. I remember my father taking me to his office and special business events. Particular VIP events I recall included when Amtrak first began to look at higher speed trains for the Northeast Corridor (NEC), a service today known as ACELA. Major railcar builders including ABB and Siemens brought high speed rail equipment from Europe to demonstrate not only features but viability of operating on the corridor. I remember then riding the X2000 and ICE trains, including passenger cars stripped and loaded with data gathering systems which measured various aspects of ride comfort and quality, lateral and vertical accelerations, forces, loads, vibrations, among other things. Exciting stuff!

Before chasing my girlfriend (now wife) to Denmark in 1993, I spent a few years with my father's consulting firm and established a preliminary foundation about the rail industry which I serve still today. Later in my career, I spent another 11 years with Raul V Bravo + Associates (RVB+A) and can honestly say that most of what I know about the rail industry, my father taught me.

LU: What's Trapeze's major focus at the moment?

MB: There are many. But, one which is true to my heart, is a major investment in rail. Before joining Trapeze Group I honestly had no idea the extent to which Trapeze was established in rail. One aspect of the investment is to showcase how well established we already are in the rail space.

Beyond that, we're working hard to keep well-informed of rail industry needs to ensure our products are continuously enhanced to fit an evolving rail industry. For example, in the U.S., a major concern is the FTA's Final Rule and how rail agencies are going to deal with State of Good Repair (SGR). Being ahead of the game, we made sure to implement a SGR module into our current EAM system. We are also keen on making sure that agencies are aware that, since Trapeze is transit-specific, we offer a whole enterprise suite – from operations, scheduling and planning, faring, asset maintenance (as mentioned above), workforce management, passenger information and much more.



LU: What do you enjoy most about your role?

MB: My favourite part of my role here at Trapeze (@trapezegroup) is working closely with customers to understand their needs and their day to day challenges. I like to solve problems and find even greater satisfaction in helping people solve theirs. Ultimately, working closely with our customers helps us become better at what we do. Not only do we get to share our industry expertise, we also learn from our customers. Understanding customers' strengths and challenges leads to trends, helping us improve our products, which eventually results in our customers' ability to more effectively carry out their work.

LU: What is the biggest professional challenge you've faced?

MB: When I was with Adtranz Denmark, responsible for introducing our Flexliner DMU rail vehicles to North America, we determined the best way to enter the market was to prove value and viability by actually bringing and operating vehicles into North America. A couple of major challenges had to be tackled immediately, including where we get the equipment, and how to get the FRA to waive at least some U.S. rolling stock requirements.

Leasing back from an existing customer was the only economically viable solution. But, which one would be willing? Which vehicles were best suited based on interior configuration and climate requirements? Ultimately, we worked out an arrangement with the Israeli Railways (PRA) to lease back two three-car DMUs in exchange for buying two highly discounted DMUs. With some clear direction from the FRA, we carved out some space and time from our Israeli final assembly plant and started re-configuring the vehicles to meet FRA requirements, along with other configurations we felt would be expected from North American passengers.

The vehicles were transported to Haifa, shipped to Baltimore, and re-assembled prior to doing a VIP tour at key locations throughout the market.

The Last Word With... Marcelo Bravo, Director, Rail Solutions, Trapeze Group. *[cont]*

As planned, the vehicles were used by Amtrak for several months carrying passengers from Los Angeles to San Diego, and later by VIA Rail Canada from Toronto to outlying suburbs.

LU: What will be some of the biggest differences between rail now and in 10 years' time?

MB: With all the hype surrounding autonomous vehicles, Uber and other developing alternatives, I'm certain there will be a place for rail transit as we know it for decades to come. This is not to say that I'm against autonomous vehicles, actually I support the idea of them. I'm just cautious about which parts of the transportation challenge they will help to solve.

As we've been discussing for decades, autonomous vehicles are just another piece of the puzzle. The biggest difference will be that transit will feed an integrated network of modes. Modes working seamlessly together is the target and something I expect to see more of in the coming 10 years.

Additionally, due to PTC and SGR requirements, I'm also confident that collisions and derailments will be significantly reduced 10 years down the road. While experts agree that PTC is not the solution for avoiding all collisions and accidents, it's certainly a step in the right direction. Regarding derailments, I'd like to think that that better and more effective care of rail

and infrastructure assets will result in fewer derailments. The result will be safer railroads and thereby passenger journeys for all.

LU: What's your favorite rail journey?

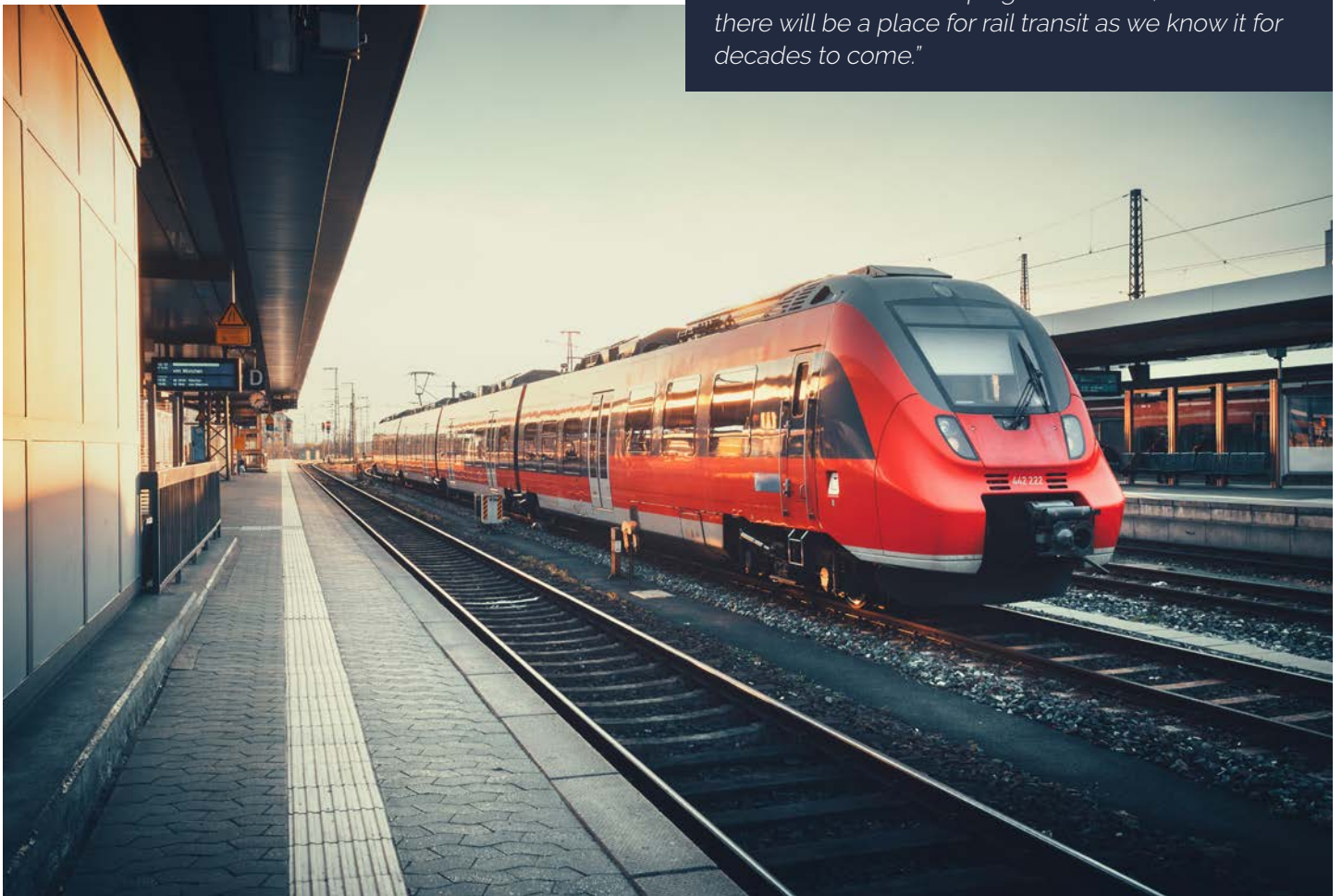
MB: I've been on many rail lines and modes from streetcars to high-speed rail all over the world (from Shinkansen in Japan, ICE in Germany, TGV in France, to name a few), but I'd have to say my favorites have to be certain stretches of the Alaska Railroad (pictured left) both North and South of Anchorage where the views and scenes are incredible.

The other favorite I have is more nostalgic due to the number of times I ran the line from Copenhagen to Aarhus in Denmark. Not more than 20 years ago, the trains would actually roll aboard a ferry to cross the Great Belt between the islands of Sjælland and Fyn.

Even today with the tunnel and bridge, the excitement and views are still incredible when crossing the Great Belt.

LU: Many thanks for the time, and good luck with the upcoming projects!

"With all the hype surrounding autonomous vehicles, Uber and other developing alternatives, I'm certain there will be a place for rail transit as we know it for decades to come."



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Industry Guide - Middle East Mobility 2.0 – the digital revolution.	Friday 16th February	26th February
Industry Guide - Insider's Guide: Successfully managing IT change within rail.	Friday 2nd March	12th March

SMARTRAIL EUROPE (17TH-18TH APRIL)

Industry Guide - Understanding the key threats and trends in transport security. (In partnership with Transport Security World)	Friday 20th April	30th April
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Bespoke Industry Guide *Available for Partnership*	Friday 25th May	4th June
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SAFERAIL AND TRANSPORT SECURITY WORLD (11TH-12TH JUNE)

Industry Guide: Smarter ticketing for increased revenue.	Friday 29th June	9th July
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Industry Guide: Mobility as a Service – seizing the opportunity.	Friday 20th July	30th July
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Rail and Metro Innovation Guide 2019.	Friday 17th August	5th September.
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INNOTRANS 18-21ST SEPTEMBER

Industry Guide: How mobile technology can deliver for operators and passengers	Friday 5th October	15th October
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Industry Guide: Asian Focus: The next generation of Projects and Technologies	Friday 9th November	19th November
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Bespoke Industry Guide *Available for Partnership*	Friday 30th November	Monday 10th December
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CONTACT US TODAY
TO DISCUSS HOW WE
CAN WORK WITH YOU!



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