2ND UIC DIGITAL AWARDS

TRAXENS

real data for logistics excellence

www.traxens.com

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About TRAXENS

TRAXENS was created in 2012 with the objective of creating a multimodal container visibility solution also known as a “Smart Container” solution. TRAXENS’ breakthrough hardware and software technology, innovative business plan, and strong management team attracted two of the world’s three largest shipping lines as customers and as shareholders: CMA CGM and MSC. This means that TRAXENS’ Smart Container solution is supported by companies transporting 25% of the world’s containerized cargo.

TRAXENS launched the first Smart Container services with shippers in the summer of 2017 and has a backlog for the deployment of 100,000 Smart Containers before the end of 2018.

In parallel TRAXENS started working with SNCF Logistics because the technology and market approach developed for shipping containers is perfectly adapted to rail wagons. They have very similar technical constraints, and also a similarly structured ecosystem. After the first prototypes and successful trials, SNCF Logistics and TRAXENS launched "The Digital Freight Train" in May 2017 during the exhibition "Transport Logistic" in Munich for a launch later in 2017.

TRAXENS is based in Marseille and has grown rapidly to reach a staff of 80 people as of October 2017. TRAXENS is still clearly a start-up based on its rate of growth, financing, innovative technology, and business model (see Start-Up on Wikipedia)

The problem to be solved: Lack of data for rail freight

Rail wagons, in the same way as shipping containers, have remained largely absent from the digital connected world. A rail wagon does not generate any data itself, which means that any data used to manage it must be generated manually. The result is that data about rail wagons is costly to gather, incomplete, and not totally reliable.

Implications of the lack of complete, reliable, low-cost data

Managing a complex rail system without timely and reliable data on rail wagons results in operational inefficiencies which impact the cost and level of service. The data required to analyze weaknesses is not available, and the feedback data to evaluate the effectiveness of changes is not as easy to obtain as it should be.

Despite the many advantages of rail freight over road transport, these inefficiencies have contributed to the migration of traffic from rail to road.

Constraints of the rail environment

If the need for gathering data from rail wagons is so great, why has no simple solution been found? Many companies already offer solutions to track rail wagons, but the uptake has been low to date. This is because the rail environment imposes some tough constraints on potential solutions, which mean that none have been developed at a cost which allows massive deployment.

These constraints of the rail environment are:

- Rail wagons, in general, do not have a power source. Changing or recharging batteries frequently would be very costly so any solution much use as little power as possible.
- Rail wagons travel over vast distances, including areas not covered by the global GSM mobile phone network.
- Rail wagons are subject to harsh and extreme meteorological conditions, as well as dirt and shocks.

These constraints are exactly the same as those for shipping containers, which is why TRAXENS' solution is a good fit for rail with reasonably few modifications. In addition to these constraints, rail wagons share another important characteristic with shipping containers: they are in usually surrounded by other rail wagons. This characteristic has been used to design an optimised solution which suits both environments.

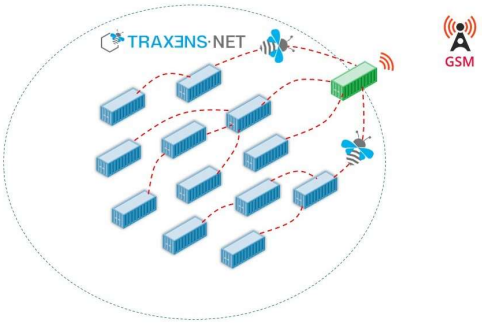
Beyond the technical constraints, the rail freight ecosystem and the intermodal container ecosystem share a similar and complex structure: asset owners, lessors, operators, cargo owners who sometimes own or lease wagons, infrastructure owners and operators.

TRAXENS' Solution

TRAXENS' solution was developed to address these specific constraints and complexity. The first three years of the company were entirely dedicated to developing breakthrough technology and concepts, leading to several patents.

- A proprietary mesh radio network, called TRAXENS-NET, which yielded the best performance/power consumption ratio and therefore yielding the lowest operational cost.
- An information architecture where the devices (TRAXENS-BOXes) are equipped with enough computational power and contextual information to make intelligent use of power-hungry communication resources while optimizing the usefulness of the data generated and transmitted. TRAXENS-BOXes are permanently attached to the rail wagons and can communicate through GSM and TRAXENS-NET
- A Big Data platform which gathers the data from up to millions of TRAXENS-BOXes and distributes it across a complex Supply Chain ecosystem for optimal monetization. (TRAXENS-HUB)

TRAXENS-NET is an ultra-low power consumption mesh radio network for an optimal performance/power consumption ratio for the unique container or rail environment. It uses much lower frequencies than those used by Bluetooth and is more resistant in environments which have a lot of metal and humidity. It also consumes much less power for a given volume of data.



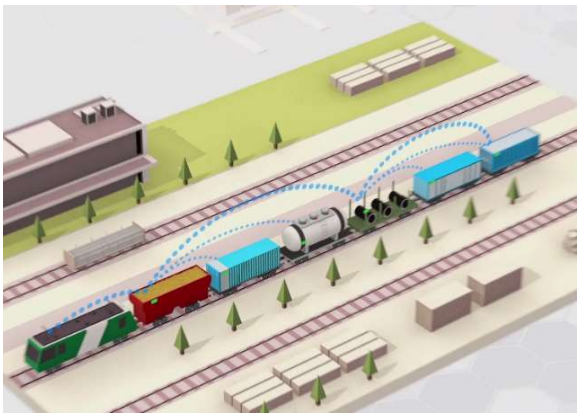
Rail wagons spend much of their time surrounded by other rail wagons. TRAXENS-NET saves battery power by automatically grouping wagons in a "cluster" with only one wagon, called the head of the cluster, using a power hungry GSM connection. The head of the cluster is chosen dynamically so that use of battery is evenly spread over all wagons.

The exchange of data between wagons using TRAXENS-NET consumes a tiny fraction of the power needed for a GSM connection. This means that 10 wagons in a TRAXENS-NET cluster with only one communicating through GSM, would collectively use just 10% of the energy used if each wagon communicated in isolation.

A cluster of connected wagons can span several kilometers

In zones where many wagons are often grouped even more battery power can be saved by positioning TRAXENS-GATE devices.

TRAXENS-GATE is a powered device which automatically becomes the head of the cluster and then communicated through other network technologies like Bluetooth, Wi-Fi, or Satellite.

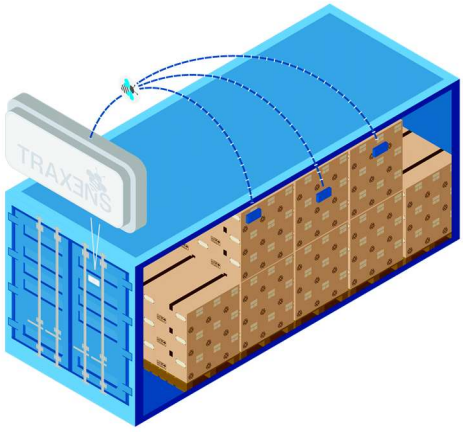


Typically TRAXENS-GATEs can be positioned in the locomotive and plugged into the locomotives power supply. This means all the TRAXENS-BOXes in the train can save battery power by only using TRAXENS-NET. It also means that the rail personnel access to technical data generated from the whole train using any standard smartphone or tablet via the TRAXENS-GATE Bluetooth connection.

TRAXENS·BOX

The TRAXENS-BOX is a monitoring device which can be used on all wagon types.

The TRAXENS-BOX is permanently attached and collects data such as GPS position, temperature, impacts, movement, and vibration and transmits it in the most energy-efficient way to TRAXENS-HUB, the TRAXENS data platform.



Additional data can be gathered through remote sensors wirelessly connected to the TRAXENS-BOX through TRAXENS-NET.

Sensors can measure parameters associated with the wagon or parameters associated with the cargo. For instance humidity, temperate and pressure for cargo, and brake sensors for wagons.

As the architecture of the system allows the addition of up to 16 sensors for each wagon, new sensors can be developed and deployed to capture new useful sources of data later on.

TRAXENS-HUB is the Big Data platform that gathers all the data from the TRAXENS-BOXes and delivers it in the most useful form. It is built to be scalable to manage millions of containers or wagons and an unlimited number of users.

It uses novel data structures to allow secure partitioning of data to allow each actor to have access to only the data he needs. One person could have access to the position and ambient temperature of a wagon, another could have access only to data on shocks, and yet another only the data about the humidity of the cargo.

How does the TRAXENS solution benefit the rail industry?

The quickest way to understand the overall value of the TRAXENS solution to the rail industry is to watch the "Digital Freight Train" video by following the link below.

Digital Freight Train Video (2 minutes 59 seconds)

See: http://vimeo.com/traxens/DigitalFreightTrain

The solution provides a new source of data about the position and condition of rolling stock and cargo. This data can be put to many different uses which benefit operations, security, and service. The video above lists several obvious use cases but as with all digitalization initiatives more will be discovered or invented over time.

Testing Brakes

One particular example of the way that data can be used to improve operational efficiency is by automating brake tests. This is again best understood by following the link to the following video:

Brake test video (2 minutes 57 seconds)

See https://vimeo.com/traxens/BrakeTest

The brake test application is made possible by a specific sensor which is linked to the TRAXENS system via TRAXENS-NET to the TRAXENS-BOX on each wagon. The TRAXENS-BOX for each wagon is linked to the TRAXENS-GATE in the locomotive. This allows the train staff to have access to brake information locally, even in areas not covered by the GSM network.

This application can cut the pre-trip brake inspection from a typical 45 minutes to 15 minutes. It can require less personnel and require less walking around the tracks, and still provide a more reliable testing process. It participates to operational efficiency, cost reduction, and security and also produces data that can be collected and analyzed for a better understanding of the frequency and cause of inspection failures.

Another benefit of the brake sensor application derives from the fact that it can also detect if the handbrake is applied or not, and therefore create an alert, locally or at a distance, is the handbrake is position is incoherent with the current activity.

The same sensor can also be used to detect whether the wagon is loaded or empty. If an additional sensor which detects the position of the loaded/empty lever is deployed, the system can automatically create an alert if the lever is incorrectly positioned.

Others use cases and benefits

- Knowing the position of all wagons at anytime
  - Better fleet management and planning for operators
  - Better supply chain management for freight customers
- Automatic measurement of full and empty distances, and shocks
  - Allows preventive maintenance according to real wear and tear rather than a fixed time period
  - Allow wagons maintenance to be planned in advance allowing better planning and distribution of spare parts.
  - Allows automatic calculation of CO2 consumption per cargo or per customer.
  - Automatic proof of conformity to regulations.
  - Allows big data analysis of all wagons to identify design weaknesses, network hazard areas, and to gauge the effectiveness of any training or network modification.
- Remote reading of hatch, door and gate status for security and streamlined operations.
- Remote activation of hatch, door and gate opening mechanisms to allow more operations to be performed automatically or at a distance.
- Having the up-to-date data about wagon availability and position allowing improved planning flexibility and reactivity.
- Allowing freight customers to have real-time visibility of the position and condition of their cargo allowing them to improve their supply chain management and also reducing the cost of customer service for the rail operator.

The list of use cases that can be implemented today is long. More will be made possible as new sensors are developed and even more will be imagined by accumulating and cross analyzing this rich new source of data.

Contact details

- First name: Tim
- Last name: Baker
- Company name of your start-ups: TRAXENS
- Mail: t.baker@traxens.com
- Phone: +33 685 934 134
- Address: 15 rue Marc Donadille
  Les Baronnies, Bâtiment C
  13013 Marseille
- Country: France

- Categories selected for prizes: The TRAXENS solution addresses the digitalization of rail freight and this has an impact on services, productivity and safety issues, as discussed in the text above. We would prefer to place our application in all three categories, but if we have to choose one, we would opt for the benefits of operational productivity.
  - SERVICES ☑
  - PRODUCTIVITY ☑
  - SAFETY ☑

Annexe

Extracts from Perspectives Fret N° 34 July 2017 from SNCF Logistics

No. 34_JULY 2017

PERSPECTIVES FRET

The freight players' magazine

WWW.FRET.SNCF.COM

MAIN STORY:

FREIGHT TRAINS GO DIGITAL

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"GOING DIGITAL IS A FANTASTIC OPPORTUNITY TO TRANSFORM OUR SERVICES AND INDUSTRY." P.03

BERTRAND MINARY,
Innovation & Digital Director (Fret SNCF)

SNCF LOGISTICS

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SNCF Logistics
Rail and intermodal business Unit
communication.fret.sncf@sncf.fr
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Delegator Director: Philippe Moritz
Editor in Chief: Nafi Mbaye
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CROSS-PERSPECTIVE

CHALLENGES OF THE DIGITAL TRANSFORMATION OF RAILWAY FREIGHT

FRANCIS BEDEL
DIGITAL DIRECTOR OF THE UIC, THE WORLDWIDE RAILWAY ORGANISATION

BERTRAND MINARY
INNOVATION & DIGITAL DIRECTOR OF FRET SNCF

The high point in going digital at Fret SNCF will involves establishing the digital freight train project with help from TRAXƎNS. Rolled out in September 2017. It is a flagship programme that will improve the performance of rail freight. UIC, the worldwide railway association with nearly 200 corporate members, is working on ensuring new digital services which could be interoperable between both carriers and infrastructure managers.

What are the benefits of going digital for rail freight?
Bertrand MINARY: To Fret SNCF, going digital represents a lever of performance and new services and acts as a catalyst for reinventing our business. Employees of Fret SNCF as well as drivers and operators on the ground have already been given the most advanced tablets to facilitate real-time communication and information transferred within our in-house circuits. To further improve the productivity and efficiency of our services to customers, we have chosen to seek resources outside of the rail industry from companies able to adapt their technological expertise to our needs in a very short amount of time.

How does your partnership with TRAXƎNS embody this new development?
B.M.: TRAXƎNS a company based in Marseille, France, that has invented smart containers capable of transmitting a great deal of traceability data to the ground using emitters placed on the containers. In late 2015, at our request, TRAXƎNS tweaked its technology for freight cars, and in April 2016, we tested the concept on four railcars equipped with sensors to automate brake testing.
Six months later, we tested it on fifty other railcars under live conditions. Now we are launching the digital freight train with the intent of placing the equipment in thousands of wagons in the near future *(see main story, p. 7–9)*.

Why is UIC interested in using digital services in freight?
Francis BEDEL: Rail freight is most useful in transporting goods over long distances. When it comes to European freight corridors, for example, going digital can help smooth the flow of information between rail companies and infrastructure managers. Going digital also improves quality considerably by making customer relations and relationships between partners more stable.
Our flagship project at the moment is e-Wag, an initiative led by UIC in which Fret SNCF plays a role. The programme ensures interoperability – UIC's historical mission and a goal now more relevant than ever – between wagons that communicate using a variety of devices in a single train.
We are also piloting the e-RailFreight programme to digitise rail transport documents. Organised jointly with Fret SNCF and other UIC proponents of "seamless transport," the programme aims to go paperless, especially when it comes to waybills, which are now available online and can be updated during transport. Previously, they represented an obstacle to interoperability.

What are each of you focusing on in the near term?
F. B.: UIC's actions – and thus its digital platform – revolve around the concept of openness. One of the major topics we are pursuing this year is cybersecurity, a major priority when it comes to going digital. UIC's role is to anticipate things like the impact on organisations, business models as well as the safety and security aspects of the new possibilities offered by the digital world, by suggesting methods and approaches to "manage" the revolution. For that reason, we have published cybersecurity guidelines specifically targeted to rail companies.
B. M.: Priority is being given to digital freight train, with the goal of enhancing products with new features and rolling out solutions that the market wants.

360°

SUCCESS IN MUNICH

SNCF Logistics had a strong turnout in May at the transport and logistics expo, held every two years in Munich. All of SNCF's businesses were represented at a single booth of over 200 square meters. Highlights included the unveiling of digital freight trains by SNCF Logistics and TRAXƎNS teams *(see p. 7–9)*. Representatives from rail and intermodal transport companies initiated and concluded service and collaboration deals with a number of customers and partners attending the major event.

OPTIFRET

Previously referred to as the freight car "coupon", Optifret is a Fret SNCF service that allows customers to reserve excess room in goods trains chartered by other customers. The service particularly appeals to customers who normally resort to transport by river or road. Following a test on the Hauts-de-France/Grand Est line, Optifret is expected to expand across France and to primary international lines in 2017.

REFRIGERATED TRANSPORT ACROSS EUROPE

In late April, VIIA, a multimodal operator of SNCF Logistics, tested a traffic pattern for refrigerated train containers of foodstuffs travelling between Moerdijk, The Netherlands, and Valencia, Spain. The test was a full-scale experiment for the customer Frigo Breda and required cooperation between four rail companies of SNCF Logistics: Captrain Netherlands, Captrain Belgium, Fret SNCF and COMSA Rail Transport. The traffic pattern may be rolled out this autumn.

INFORMATIONS
www.fret.sncf.com

VIIA BRITANICA RESUMES SERVICE

"Rail highway" VIIA Britanica, which runs between the port of Calais and Le Boulou in southern France, reopened on February 7. Initially launched in March 2016, the service was suspended three months later due to safety and security issues on arrival at the port of Calais. As Europe's longest rail highway, VIIA Britanica allows up to 40 semi trailers to be transported by train, eliminating 1,200 km of road transport and reducing travel time. Service has resumed with daily round trips five days a week and is expected to gradually increase.

2017 LOADERS' SURVEY

The fifth loaders' opinion survey on rail transport, conducted by Eurogroup Consulting, revealed that a mere 36% of loaders were satisfied or very satisfied with conventional rail transport. Combined rail/road transport fared best, with an 83% satisfaction rate. Another piece of good news was that 93% of those surveyed said they would transport more goods by rail if cost, timeliness, tracking, and flexibility were improved.

93%

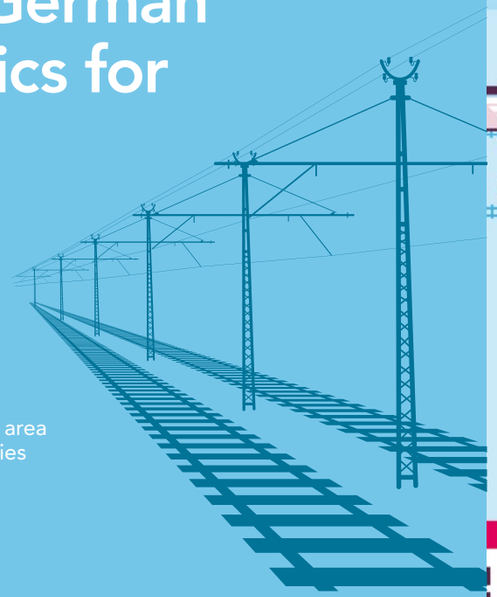
SYLVIE CHARLES
GENERAL MANAGER
OF SNCF LOGISTICS RAIL
AND INTERMODAL BUSINESS UNIT

REINVENTING RAIL FREIGHT THROUGH DIGITAL

As with many other industries, the goods transport industry will undergo rapid changes thanks to the advances in new digital tools. For rail freight, digital technologies represents an outstanding opportunity to position the industry as a premium "solution of the future" within loaders' logistics chains. When it comes to digital tools, the highly anticipated geolocation and tracking services, both domestic and international, come to mind immediately. But the levers for improving service go well beyond that. At SNCF Logistics, we have chosen to use digital technologies as a catalyst for progress for all members of the freight ecosystem. The decision to use technology developed by TRAXƎNS was based on the firm's ability to integrate a variety of sensors into an open-source system flexible enough for its specific needs and capacity to offer as many features as necessary. Given the collaboration result of the collaboration between our teams and those at TRAXƎNS, digital freight trains now offer new services that add value for loaders as well as for rail companies that haul trains and for railcar managers. These services are already positioning digital freight trains as an excellent emerging solution that will necessarily become part of a European interconnection standard.

Deciphering

FowardNet: a French-German service by SNCF logistics for single wagon load



WAGON LOAD

The ForwardNet network was launched in December 2016 by Forwardis, the freight forwarder of SNCF Logistics specialising in rail. An alternative network for single wagon load , ForwardNet connects French train stations served by Fret SNCF's Multi-lots Multi-clients (MLMC) service to primary German industrial centres. Single wagon loaders in the chemical and steel industries can now cross rail borders more easily to reach the Ruhr area in Germany and beyond, into central and eastern European countries (CEECs) and Scandinavia.

MULTIFUNCTION HUBS

Loaders undergo six weekly rotations between the Fret SNCF's MLMC hub in Woippy and the Forwardis hubs in Duisburg-Wedau and Köln-Eifeltor. There, wagons are sorted, sent to stations in the Ruhr area, and dispatched to distant regions of Germany and to Scandinavia, Poland, and southern CEECs by direct trains.

WINNING ALTERNATIVES

Door-to-door transport plans are being developed to meet individual customer needs. Forwardis has formed partnerships with multiple rail operators offering alternative wagon grouping services and combined operators willing to open up their trains in order to increase frequency. Forwardis may also use bulk transport that travels regularly along a corridor to form alternative solutions.

D'INFOS
www.fret.sncf.com

END-TO-END ENGAGEMENT

With help from ForwardNet and operating structures of Forwardis, Fret SNCF receives cutting-edge expertise on European markets and can oversee a transport plan from end to end within timeframes that are more reliable. The ordering and planning processes are handled by Fret SNCF's MLMC line managers who have integrated the ForwardNet network into their information systems. Customers are able to see all the traffic circulating on the ForwardNet network in one place – a feature especially important when transporting sensitive goods.

EXPANDING SERVICES

The next step is to increase the frequency of rotations and expand network routes, which in addition to the chemical and steel industries may be of interest to both combined-transport operators and industries such as the automotive industry, agricultural products, constructors, and consumer goods.

The launch of the digital freight train in the second half of 2017 will modernise rail freight's economic model, introduce new production and maintenance engineering processes, and advance security monitoring for convoys. It will also improve the integration of rail transport into the loader logistics chain. The project was unveiled to loaders in Munich on May 10 at the international transport and logistics expo.

DIGITAL FREIGHT TRAINS: RAIL FREIGHT AT THE DAWN OF A NEW ERA

When evaluating a goods transport service, the two primary criteria are traceability and the availability of reliable dispatch information. But rail freight companies often have difficulty meeting both criteria. Enter digital freight trains, first unveiled in Munich [1] on May 10 by SNCF Logistics and TRAXENS. A startup from Marseilles, France, established in 2012, TRAXENS designed a "smart container" capable of delivering important information (location, temperature, government status, etc.) in real-time. Using this technology, the two partners worked together and conducted trials to improve rail transport performance. Today, the results of their labour have taken the form of a new solution: smart devices capable of communicating with each other using a wireless digital network. •••

During the conference in Munich (from left to right: D. Zindo, CEO of Ermewa, M. Fallah, chairman of TRAXENS, S. Charles, CEO of the Rail and Intermodal Goods Transport unit, B. Mazur, sales director of Captrain Deutschland, G. Perrot, Head of Land Logistics Purchasing (Europe) of ArcelorMittal, and D. Frohriep, moderator).

ACCESSIBILITY, SIMPLICITY AND EVOLUTION

Until now, smart rail freight was deployed only at the individual wagon level, not throughout the entire train. Thanks to innovation by SNCF Logistics and TRAXENS, it is now possible to use onboard intelligence to control train-wide operations and pool energy used by the smart devices, allowing lighter batteries to be installed, thus reducing operating costs.
"One of the solution's greatest strengths is how simple it is to implement and its ability to evolve," explained Luc Débant, project manager of the digital freight train in Fret SNCF's innovation division. What are some of the applications of digital freight trains?
First, the ability to geolocate wagons and to precisely track the mileage covered when empty or loaded. As the customer, the loader receives instantaneous and continual data on the state of its merchandise and on events that may affect its goods, such as impacts, leaks, or stopped convoys.
The wagon owner can access the necessary information to optimise maintenance engineering, which includes both ensuring safety and security and avoiding "overmaintenance."

NEW HIGH ADDED VALUE SERVICES

The promise of digital freight trains is also a promise to improve the efficiency of certain train management tasks. "The automation of brake testing is a miniature revolution," Debant said. "In addition to making traffic safer, it makes transport plans more robust and paves the way for better use of time by operators on the ground." Other tasks, like digitising braking sheets, consist lists, and emergency stops, may also become automated. The list of potential uses is nearly limitless. The developed solution is intended to be open-source, an obvious choice when wagons from across Europe belonging to different companies using different sensors are united in the same train. Hence, the system must be compatible with any future alternative developments – a concern that SNCF Logistics and TRAXENS are already working on.

(1) At the international transport and logistics expo on May 9–12, 2017.

VIEWPOINT

PAUL SESSEGO,
CHARBON & ACIER FREIGHT DIRECTOR AND "DIGITAL CHAMPION" OF FRET SNCF

"Fret SNCF is constantly seeking greater efficiency, but it has run up against the slow evolution and the tediousness of tasks performed by production operators on the ground. For example, hooking up wagons and verifying brake performance currently takes two people forty-five minutes to complete. The adventure of digital freight trains began by asking the question: if an automated brake test could be performed by a single agent, would that be a vector for improvement? The tests we conducted said yes. And not only technically speaking, but financially speaking. Enhanced productivity meant we could reduce installations of wireless digital networks on freight trains. What digital trains do for freight workers is improve, performance with higher satety. Instead of taking forty-five minutes to reattach carriages, it now only takes about fifteen – and the brake check process is improved at the same time. Digital trains also modernise our processes. Not only will we eliminate the tedious task of checking the brake function, on foot, of freight trains as long as 750 metres. But in the near future, wagons will also be equipped with fully automated hatches and valves. The benefits of digital trains can also be measured in terms of employee safety and a reduction in tedious tasks. All of these prospects will add to the competitiveness of rail versus other modes of transport, including road transport."

GAINS IN PRODUCTIVITY FROM DIGITAL TRAINS MAKES IT POSSIBLE TO MODERNIZE RAIL FREIGHT.

3 QUESTIONS FOR

MICHEL FALLAH,
President and founder of TRAXENS

What was your vision in founding TRAXENS?
The goal at the beginning was to help supply chains cross a bridge in digitising their processes. Because nearly all of the world's supply chain uses freight containers, containers seemed like the perfect gateway for our project. We believed that digitising containers would ensure we received support from transport companies everywhere, giving us the opportunity to create a worldwide standard. Another reason is that we believed we had a technical solution that would improve the visibility and security of goods traffic in the form of a quality service offered at an affordable price.

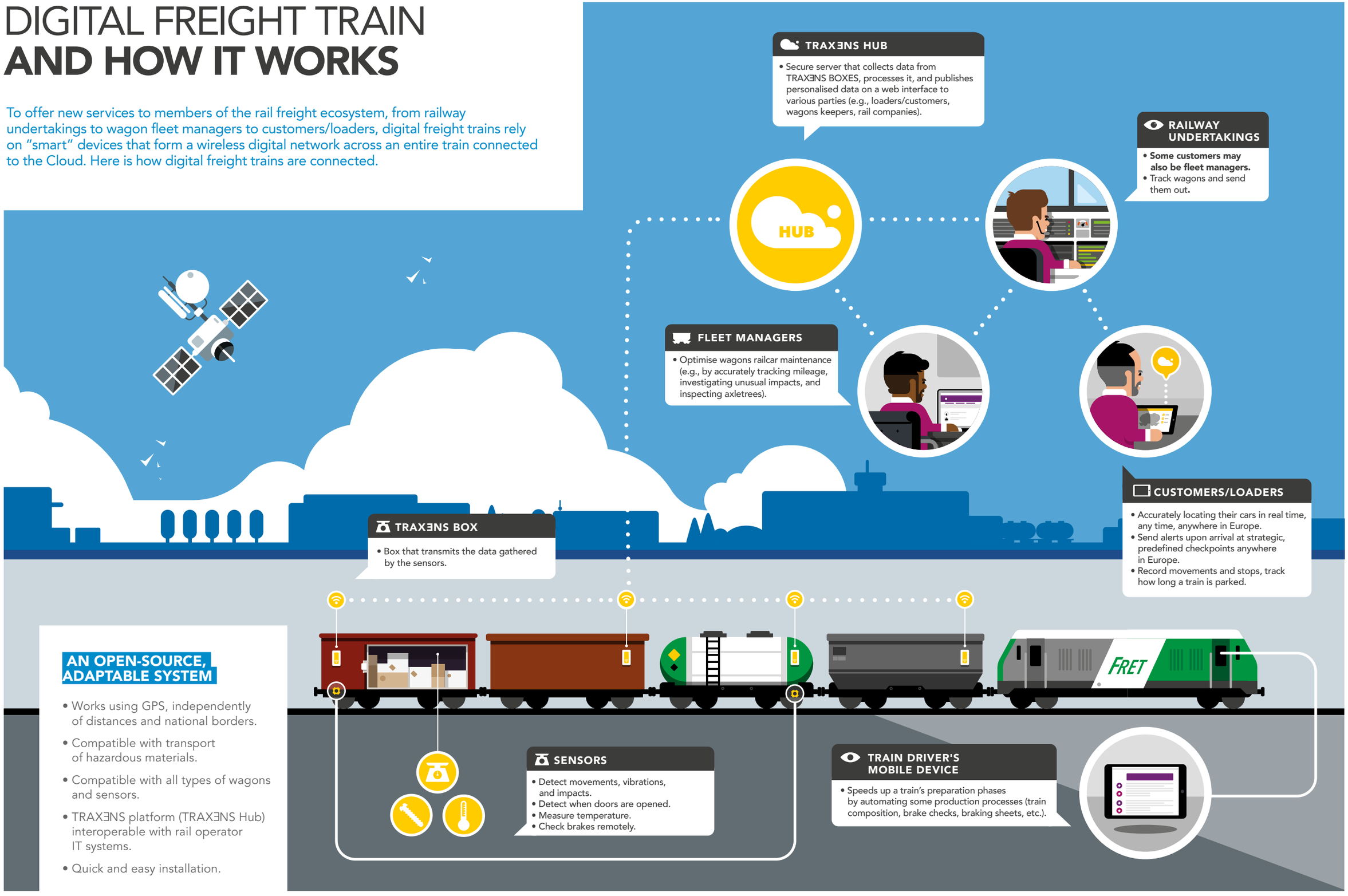
What business model does your solution use?
Throughout its transit, a container or wagon goes through the hands of a number of agents: loaders, logistics companies, forwarding agents, transport brokers, customs, end customers, etc. For parties to be able to use the container most appropriately for its own interests and responsibilities, they must receive relevant information at the right time. Thanks to our solution, data can be distributed correctly and paid for by users. This distribution of costs is key to making the service accessible.
I should add that we expect to deploy the service over an incredibly wide range of goods. Volume is central to our financial equation.

How do you feel about your collaboration with Fret SNCF?
Whereas many companies are content to simply buy technology, Fret SNCF opted for a true partnership of innovation with TRAXENS. The result is visible in how well the product is suited to the world of rail as it currently stands, in the dynamics of prototype testing, and in the close, trusting relationship formed between the two companies. Our challenge now is to make wagons from different keepers work together via their sensors so that our solution can be rolled out as widely as possible!

***"OUR CHALLENGE: ROLLING OUT THE SOLUTION** AS WIDELY AS POSSIBLE."*

DIGITAL FREIGHT TRAIN **AND HOW IT WORKS**

To offer new services to members of the rail freight ecosystem, from railway undertakings to wagon fleet managers to customers/loaders, digital freight trains rely on "smart" devices that form a wireless digital network across an entire train connected to the Cloud. Here is how digital freight trains are connected.



AN OPEN-SOURCE, ADAPTABLE SYSTEM

- Works using GPS, independently of distances and national borders.
- Compatible with transport of hazardous materials.
- Compatible with all types of wagons and sensors.
- TRAXENS platform (TRAXENS Hub) interoperable with rail operator IT systems.
- Quick and easy installation.