



## Case Study

# H2-Rail & APR222ac: On-board connectivity launched on the Spanish high-speed railway network.

H2-Rail & APR222ac: Communications platform aimed at railways, with LTE and WiFi and a railway access point for on-board Wi-Fi. These are specifically designed to withstand vibration and an extended operating temperature range.

# H2-Rail & APR222ac: On-board connectivity launched on the Spanish high-speed railway network



## Client Summary

The client is Spain's main railway operator with national and international presence, and its mission is to safely provide passenger and freight services with maximum quality, efficiency, profitability and sustainable innovation and to secure an increase in the Spanish rail market as a benchmark railway operator.

The Spanish Railway operator has various types of fleets, from freight or local trains to medium and long-haul. Spain's prominent high-speed train is specially designed for the long-haul routes (covering more than 3,000 km in distance) where it can achieve speeds of up to 310km/hr.



### Challenge

▶ To supply the high-speed trains with on-board connectivity and offer their passengers quality entertainment and WiFi services, over a platform capable of delivering LTE and WiFi.

### Solution

▶ H2-Rail & APR222ac: specifically designed for railways and compliant with railway regulations for on-board installations (EN 50155, EN 50121-3-2, EN 301 511, EN 301 908-1).

### Why Teldat

▶ The combination of the high quality and performance of Teldat routers, their flexibility to provide a suitable solution and Teldat's experience (fully demonstrated in earlier projects) were the driving force behind the choice to take on this scheme.



## Challenge

Several players took part in this project, with the operator acting as end customer technology partner. The client has sought to incorporate a large scale of the latest generation solutions, in response to previously unmet goals, by combining satellite and 4G technology. The aim was to offer quality connectivity to the 35 million plus customers.

The main challenge our end customer faced, regarding connectivity, was the need to supply their high-speed trains passengers with a superior 'à la carte' WiFi service, which included an extensive range of products and live content streaming.

The difficulty lay in preparing the communications platform to adapt to the specific characteristics at hand, which were to achieve connectivity on a fast-moving train (traveling at some 310 km per hour): not an easy task. Furthermore, the trains would be traveling through poorly covered areas that called for satellite connectivity to prevent passengers from experiencing loss of signal.

Moreover, the communications platform had to comply with railway regulations on the design of the hardware to protect it from vibrations and noise emissions (and to tolerate a wide range of temperatures).



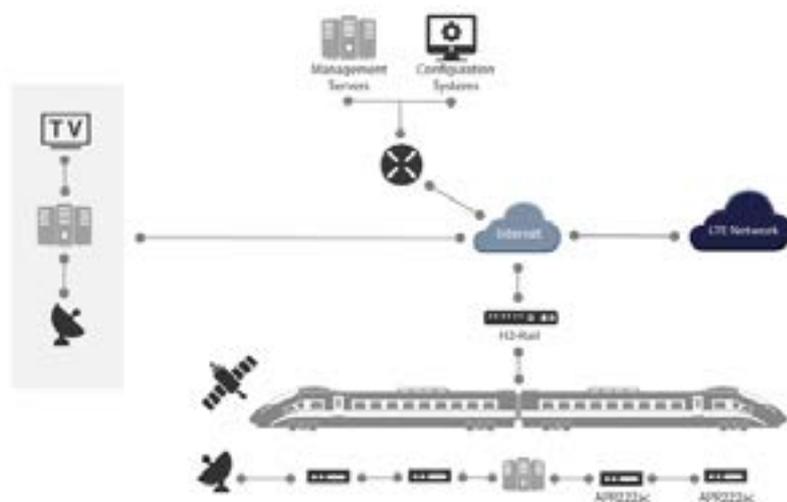
## Solution

Teldat installed H2-Rail routers and APR222ac access points in coaches. The H2-Rail device is in charge of providing ground-to-train communication and onboard connectivity. It has been specifically designed for high-speed trains and has the necessary certifications (i.e. EN 50155) to fully operate in a wide-range of scenarios. Thanks to its rugged hardware design, it is fully protected against vibrations and can withstand extreme temperatures ranging from -25 °C to 70 °C. As a result, the device passed all standardization tests and met the project's strict requirements. To improve access to the mobile network, H2-Rail routers are equipped with up to four LTE modules. In this particular case, the device had an additional satellite link.

The Open Link Aggregation (OLA) functionality, developed by Teldat, was used to optimize and better combine the different WAN links available. This feature allows for the simultaneous use of WAN interfaces, meaning the available bandwidths in each link can be shared to improve the internal network's quality of service. The main characteristics of this software functionality are: advance monitoring options for WAN links available (thus guaranteeing bandwidth optimization), smart load balancing, standard-based design, continuity of applications and security that relies on IPSec technology.

Moreover, APR222ac access points were displayed to offer Wi-Fi connectivity to passengers. These devices are equipped with two Wi-Fi 802.11ac modules that can run at the same time (making them the best option in scenarios with a great number of concurrent users). Thanks to their design, the access point can operate at top speed and offer a wide range of features even if users are connected at all times. Access points also have a rugged design (in accordance with railway regulations for high-speed trains) and have been EN 50155-certified, meaning they meet the relevant requirements on temperature, vibration and emissions.

By combining these two products, Teldat's solution offers the link aggregation, load balancing and redundancy needed to improve the quality of user connections in high-speed trains.



## Results

Teldat has managed to successfully meet the goals and requirements of the customer, providing connectivity to the client's high-speed trains. As a result, the customer has managed to improve the user experience of passengers by offering a highly reliable and top-quality service without connection drops (even if the train goes through areas with little coverage or passengers switch from one coach to the next).

The project was launched in December 2016 and gradually implemented during 2017. The customer can pride itself on offering one of the best and most-reliable services in the world, with over 1,600 km of high-speed rail network successfully connected.

## Why Teldat?

Being able to combine satellite and LTE/4G technologies was key when addressing the challenge faced by the railway operator. Teldat had the advantage of offering devices that were specifically designed for a railway scenario, meaning our routers were always able to guarantee the reliability of communications.

Moreover, Teldat could tweak its solution to better fit the project's needs (obtaining the required certificates and authorizations along the way) and the company's strong capabilities and vast experience in similar projects proved key.

# FLEXIBLE

## COMMUNICATION SOLUTIONS

### THAT GROW WITH YOU.

## H2-Rail

Multi-service Communication Platform for Train-to-Ground communications.



- ▶ Multi-service communications platform.
- ▶ Multiple WWAN (bandwidth aggregation & loadbalancing).
- ▶ Compliant with railway regulations.
- ▶ Geo-fencing: GPS-based dynamic configuration.
- ▶ Standard-based service isolation.
- ▶ Built-in switch for connection to other systems.
- ▶ Complete Wi-Fi solution (management, hotspot & APs).

The H2-Rail router is a multi-service communications platform for railway environments. It provides reliable 4G/LTE broadband and Wi-Fi communications with redundancy options, bandwidth aggregation and advanced network security mechanisms.

The hardware design is compliant with railway regulations for installations on lightweight and high-speed trains or trams, is EN 50155 certified to meet vibration and emission requirements and offers an extended operating temperature range.

## APR222ac

WLAN Access Point for application in rolling stocks.



- ▶ WLAN access for passengers and staff.
- ▶ Secure wireless wagon-to-wagon communication.
- ▶ Fulfilled the strong railway standards according EN 50155-T3.
- ▶ Design to withstand high vibration and extreme temperatures.
- ▶ Robust railway proven M12 connectors.

Teldat APR222ac is designed to provide a Wi-Fi connection on board trains. It supports the new 802.11ac wireless standard so the dual radios allow for simultaneous operation in both the 2.4 GHz and 5 GHz frequency bands. Teldat APR222ac ensures that the client is always connected to the Access Point being able to operate at maximum speed and offering a wide range of features at the highest performance. The hardware design is compliant with railway regulations for installations on lightweight and high-speed trains or trams, is EN 50155 certified to meet vibration and emission requirements, and offers an extended operating temperature range.

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