

A Digital Twin for each NS passenger-Train



Nederlandse Spoorwegen (Dutch Railways, NS) is a Dutch state-owned company, the principal passenger railway operator in the Netherlands. Founded in 1938, NS provides rail services on the Dutch main rail network. It runs 4,800 scheduled domestic trains a day, daily serving 1.1 million passengers.

Client challenges

From the 00's onwards, NS was rolling out an increasing amount of IT systems and services on its trains - all requiring their own hardware, connectivity, wall side systems, and software maintenance cycles. The complexity of the landscape exploded.

A decade ago, NS struggled to provide consistent travel information to passengers. The number of channels had been growing, but not all systems used the same (real-time) data and passengers could receive conflicting messages through the different channels. The Virtual Train / Intelligent Train (VT/IT) application was initially developed to assure real-time journey information aboard the trains to guarantee consistency across information channels.

In more recent years additional functionality has been added to VT/IT outside the original passenger information domain.

CGI solution

CGI created the VT/IT application for NS which over the years evolved into a digital twin of the majority of the trains within the NS fleet (summing up to more than 700 individual trains currently). The virtual train is utilized for analysis, monitoring/alerting, and easy interfacing. The cloud solution includes Complex Event Processing and consists of two parts:

- 1) Intelligent Train (IT): an on-train (on each train) application that receives sensor information from the train and delivers passenger travel to the train.
- 2) Virtual Train (VT): an on-shore part that exchanges information with all trains that are fitted with this system.



About NS

Passenger rail service

NS strives to provide convenient, fast, safe and affordable travel and to ensure that people can reach their destinations in a sustainable manner. NS is developing into a broad service provider that works with other companies to offer the customer the option of 'smart' travel based on the most up-to-date information. Convenient travel, from door to door.



Although the VT/IT application was initially created to provide real-time passenger information, it evolved and became the basis for a digital twin infrastructure that empowered more and more functionality. This ranges from additional information streams for Real Time Monitoring and location services to more safety critical systems such as a driver warning system that alerts the driver when he/she approaches a signal at a speed that is considered too high.

Benefits & Outcomes Delivered

Usage of the Virtual Train has strengthened customer facing applications such as crowding levels on trains and real time travel information on-board of the train and this had a major effect on the customer satisfaction with passenger information.

Virtual Train contributed to a record-beating KPI performance in 2020 and subsequently NS is in a good position to be awarded a renewed 10-year contract for running the core train services in the Netherlands. Additionally NS has achieved substantial cost savings in train maintenance and less downtime of technical equipment due to the Digital Twin solution

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About CGI

Founded in 1976, CGI is among the largest IT and business consulting services firms in the world.

We are insights-driven and outcomes-based to help accelerate returns on your investments. Across hundreds of locations worldwide, we provide comprehensive, scalable and sustainable IT and business consulting services that are informed globally and delivered locally.

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