



Project Summary

Organization

Network Rail

Solution

Rail and Transit

Location

Wales and Western Region,
United Kingdom

Project Objectives

- To advance digital workflows for remote collaboration during the COVID-19 pandemic lockdown.
- To use digital twins for documentation and placement of new railway signaling and signage.

Project Playbook

Descartes, LumenRT, MicroStation®,
OpenRail™ Designer, ProjectWise®

Fast Facts

- Forced to work remotely during COVID-19, Network Rail needed an innovative approach for collaboration in a digital environment.
- They needed to create 3D virtual models of Exeter and Paddington stations for signal sighting and wayfinding purposes.
- They established an open, connected data environment for live, visual design reviews remotely.

ROI

- Network Rail used MicroStation to deliver a comprehensive 3D model of Exeter station in just three days amid the COVID-19 pandemic.
- OpenRail Designer helped perform virtual signal sighting using the visually and technically accurate model.
- Descartes saved 50% in design time by processing extensive point cloud images into a digital twin.
- ProjectWise helped manage the digital models and facilitate transparent communication that optimized issue resolution.

Network Rail Initiates Signaling and Signage Works to Keep U.K. Rail Network Operations on Schedule During COVID-19

Bentley's BIM and Digital Twin Technology Reduces Design Time by 50% Amid Pandemic Lockdown

Adapting to the New Normal During COVID-19

Network Rail is the owner and infrastructure manager of most of the railway network in Great Britain, consisting of 20,000 miles of track; 30,000 bridges, tunnels, and viaducts; and thousands of signals, crossings, and stations. They are responsible for ensuring safe, efficient, and reliable commuter travel, providing an essential service to passengers and communities. However, despite being designated by the government as essential workers during COVID-19, Network Rail's Wales and Western (NR WW) region—comprising of 198 stations—had to comply with pandemic lockdown restrictions, requiring all staff to work from home.

Network Rail moved from an office based-environment, where in-person meetings were paramount, to the required remote lockdown standards. As a result, they faced numerous coordination and collaboration challenges while adapting to the current “new normal” pandemic work mode. In addition, they were in the midst of several projects to promote cleaner, more reliable rail travel. To keep this strategy on schedule and to ensure that the network continued operating safely and efficiently, they needed creative ways to work virtually. “It demanded a different approach that included innovative thinking, agile digital transformation, and strong teamwork to overcome the day-to-day challenges that we faced in the current ‘new normal’,” explained John Nolan, programme manager, BIM at NR WW region.

Collaboration, Visualization, and Design Integration

During the lockdown, Network Rail was tasked with performing works at Exeter and Paddington stations, which required upgrading railway assets and signal sighting reviews to accommodate the network electrification. These projects presented limited information, survey and data collection issues, and complicated asset documentation, compounded by the pandemic restrictions, making traditional work methods ineffective. Specifically, for the Exeter project, Network Rail needed to deliver an accurate 3D model of the station to visualize signal placement along the route. For London's Paddington station, they needed to document over 100

elements of signage for upcoming wayfinding renewals and generate a virtual model of the station to develop and devise new signage.

Having to simultaneously complete both projects during lockdown, the team desired a collaboration platform that enabled them to work remotely without compromising efficiency, quality, and timeliness. Various information sharing platforms were offered as a solution, but none of them provided Network Rail with enough control and integrity of the source data to meet their needs. They realized that they needed integrated modeling and visualization technology in an open connected data environment to facilitate design integration via live and visual design reviews, as well as produce accurate digital deliverables, amid COVID-19 restrictions.

Establishing a Connected Data Environment

Network Rail was already familiar with Bentley applications and decided to use them for these projects. “As part of our common data environment campaign plan, the BIM team began developing and testing online tools and processes to enable lean project delivery with a view toward live design in a virtual controlled environment,” stated Nolan. They selected ProjectWise as their shared, cloud-based platform and established remote digital workflows, enabling them to virtually review and comment on drawings and models in a live, interdisciplinary design environment that optimized issue resolution. The interoperability of the software with mobile applications facilitated integration with the construction management teams, accelerating data collection and quality with forms specifically tailored to the team's projects.

Using MicroStation and Descartes, Network Rail created a comprehensive 3D model of the Exeter station. With OpenRail Designer, they performed signal sighting in the visually and technically accurate model. Unable to conduct an on-site survey and review of the existing signs and signaling at Paddington station, they performed an extensive laser scan and used Descartes to generate a digital twin from point cloud images, providing a realistic

“As a result of producing a digital twin of Paddington station, Network Rail ensured that future resource hours needed for tasks such as surveys, site visits, and design work are significantly reduced, which, in turn, saves costs.”

*— John Nolan,
Programme Manager BIM,
Network Rail Wales
and Western Region*

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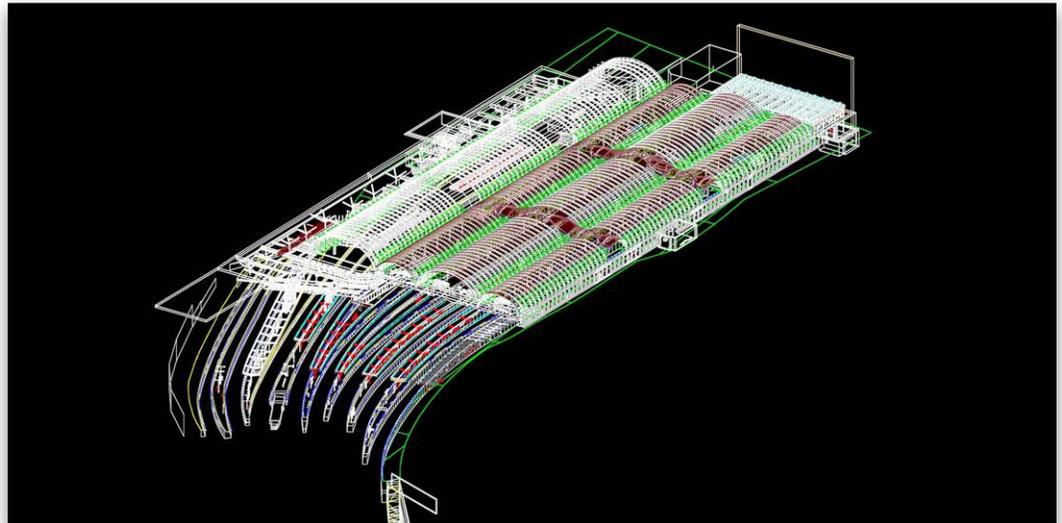
representation of existing signage and multiple signaling options, accommodating railway electrification requirements. Working in a connected data environment, they controlled all the models and data through the ProjectWise platform, enabling stakeholder engagement and making informed decisions without people leaving their homes.

Digital Twins Advance Workflows

With Bentley’s integrated BIM applications, Network Rail generated a 3D model of Exeter station in just three days, allowing virtual and accurate site visits. “Over the course of three days, a comprehensive model was created, which was both visually and technically accurate and would not have been possible without the variety of time-saving tools available across the Bentley software range,” commented Nolan. Furthermore, the use of digital workflows in Descartes cut the time to manipulate the voluminous point cloud data in half, delivering the Paddington digital twin one month early. Working in a virtual environment also mitigated safety issues when accessing a live

rail network, as well as streamlined remote collaboration. Using Bentley’s 3D modeling and digital twin technology, Network Rail demonstrated that even during a global pandemic, they could provide services that went above and beyond client and stakeholder expectations.

Relying on Bentley applications accelerated the successful delivery of digital models that have made the NR WW team the go-to source for railway model creation within the Network Rail organization, securing a role in future development projects. The digital twin for Paddington has become a proof of concept across the region, replacing current methods of site inspection and providing a means for remotely and accurately inspecting rail assets, which is crucial for industries that are globally affected by the COVID-19 pandemic. The model not only addressed the requirements, but also provided a digital asset to produce highly detailed visualization, driver route learning videos, and comprehensive signal sightings, providing future cost and time savings.



Network Rail used Bentley applications to deliver a 3D model of Exeter station in just three days and a digital twin of Paddington station one month early.