

BUILDING RAILWAY OF THE FUTURE

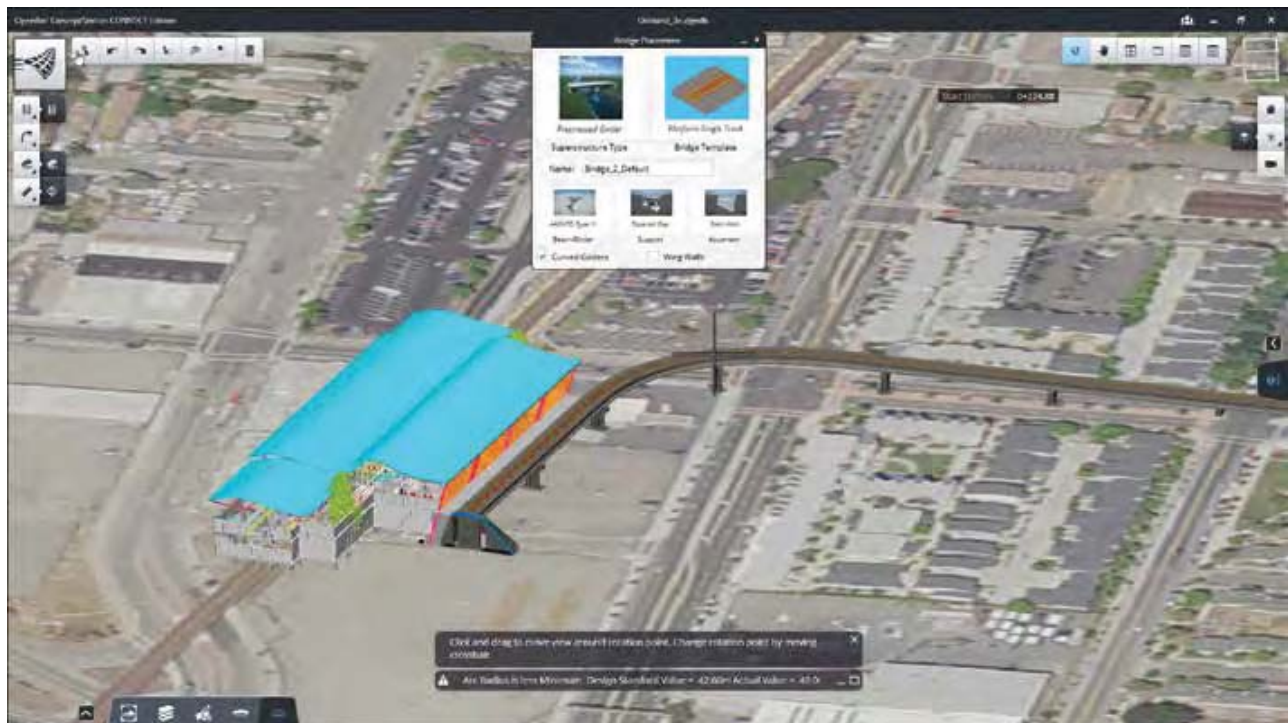
AS RAIL AND TRANSIT IS EXPECTED TO BE ONE OF THE FASTEST GROWING TRANSPORTATION SECTORS IN THE NEXT FEW YEARS, BENTLEY SYSTEMS HAS EXPANDED ITS OPENRAIL INITIATIVE. THE NEW SOLUTION COMPRISES APPLICATIONS AND SERVICES FOR THE COMPREHENSIVE PLANNING, ENGINEERING, PROJECT DELIVERY AND OPERATIONS OF RAIL AND TRANSIT INFRASTRUCTURE, COVERING THE ENTIRE LIFECYCLE.

The foundation of OpenRail system is Bentley's connected data environment (CDE), shared by ProjectWise collaboration services and AssetWise operations services, and for which OpenRail now brings together digital components and digital context, through digital workflows.

OpenRail applications will include OpenRail ConceptStation, now available for conceptual railway planning and design; OpenRail Designer, available in early 2018, for detailed engineering and 3D design of track, overhead line, tunnels, bridges and related civil infrastructure; and AECOSim Station Designer, for the

comprehensive modelling of rail and transit stations.

Greg Bentley, CEO of Bentley Systems said, "Most of our portfolio applications are used on rail projects, and we've advanced BIM for rail, in particular, with our Rail Track offering, rail corridor maintenance optimisation through Optram, and via ComplyPro railway requirements compliance progressive assurance. However, the conception of these specific tools for specific purposes preceded the aspiration for what we now call digital workflows, where engineering deliverables are meant to be reused throughout the asset lifecycle.



OpenRail ConceptStation – one of OpenRail applications - extends BIM capabilities to rail conceptual planning and layout. It allows users to access Components Centre so they can drag and drop digital components into the design to quickly lay out rail lines, bridges, overhead lines, signals, tunnels, etc.

“Moreover, our railway engineer users have been persuasive in making the case that a railway - more so than any other infrastructure asset - is a system of connected components, meriting a systems engineering approach from the outset. So, rail has become our company priority for putting everything together - industrialising BIM for project delivery and leveraging digital DNA for asset performance.”

Bentley’s OpenRail system is very comprehensive, due to its “breadth and depth of solutions. It manages all asset disciplines of the whole lifecycle,” said Andrew Smith, solutions director for rail at Bentley Systems. “We have built a complete system here – not just creating sleepers or signals – and this system is expected to be highly reliable that can last for many years.”

“When you can take the information and go across the entire lifecycle, the system adds extra value,” added Jeremy Shaffer, vice president for rail solution at Bentley Systems. “Railway construction is a complex matter, so our system covers more than just the design features, it also takes into account the infrastructural aspects such as the geotechnical requirements.”

Mr Shaffer said that although the OpenRail solution is quite new to the industry, its applications and services have been used individually around the world, including in Asia, such as in the Nagpur metro rail project in India (CDE) and the KVMRT project in Malaysia (ProjectWise and AssetWise).

“There is a great diversity in Asia when it comes to BIM adoption - it’s not a monolithic market,” said Mr Shaffer. “Each country, like Singapore, Vietnam, India and China, is different and presents its own opportunity.”

“The region covers huge spectrums of technology,” said Mr Smith. “When we enter a market, we need to understand the maturity level of that market, not only in terms of technology but also their railway experience and knowledge, so that we can offer the right solution for them.”

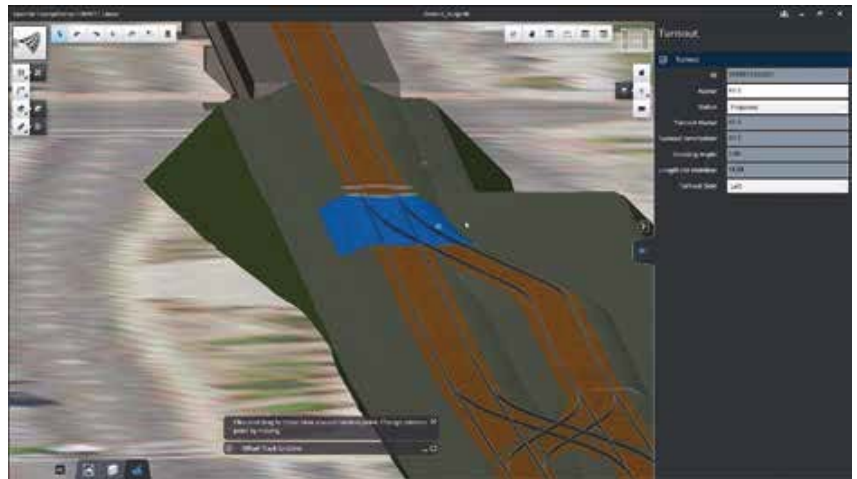
Mr Smith further asserted that the implementation of BIM technology requires a strong collaboration among the stakeholders and “it should be applied right from the start of a project to enjoy the full benefits. Our customers told us they have seen significant values and cost savings through the adoption of BIM technology.”

Connected data environment

OpenRail is based on a connected data



ABOVE: Andrew Smith, solutions director for rail at Bentley Systems.
FAR LEFT: Greg Bentley, CEO of Bentley Systems.
LEFT: Jeremy Shaffer, VP for rail solution at Bentley Systems.



ABOVE AND BELOW: OpenRail ConceptStation can also create innovative designs including switches, crossings and related infrastructure.



environment, comprising the shared services of ProjectWise and AssetWise, as configured specifically for rail systems engineering workflows. During project delivery, ProjectWise facilitates the collaboration among distributed engineering teams, coordination of structured workflows and connected project visibility. For OpenRail, AssetWise provides asset lifecycle information

services for linear, network and geospatial referencing, corridor maintenance decision support, inspection workflows, and reliability and change management.

OpenRail CDE services include Components Centre for digital components, ContextShare for digital context, ComplyPro for progressive assurance, and ConstructSim Systems Completions for accessing operational readiness.

ComplyPro is a market leader in rail globally for governance of collaborative assurance systems of technical and safety requirements from concept to project handover. OpenRail extends this scope to progressive operations assurance and regulatory compliance. ConstructSim Systems Completions automates the inspections process to accelerate systems progress and validate system readiness for efficient project turnover and closeout.

Digital components

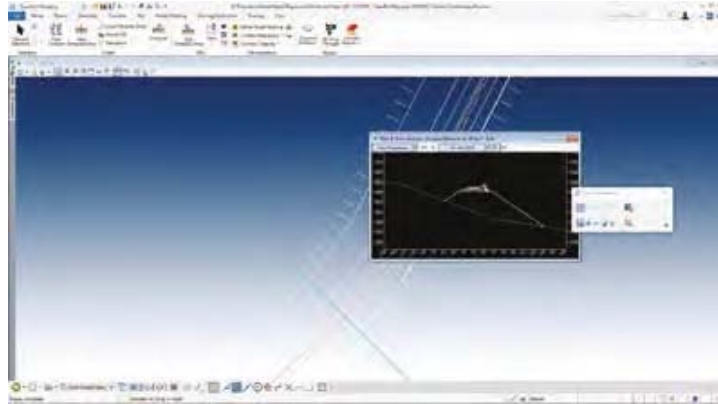
ComponentsCentre is an Azure cloud service of libraries which align, across disciplines and applications, the semantic content of catalogued components, potentially including vendor data, fabrication details, component requirements (for example, electrical specifications and connections), reliability characteristics and representational views required for documentation (e.g. 3D, plan, schematic, etc). A digital component is reused across BIM workflows in design modelling, analytical modelling, construction modelling and asset registries - from catalogued component, to engineered component, to installed component, to operated component.

The OpenRail Components Centre is being initialised with libraries of generic rail components with appropriate intelligence, and libraries from significant providers such as Siemens, but is intended to be maintained and extended by user organisations.

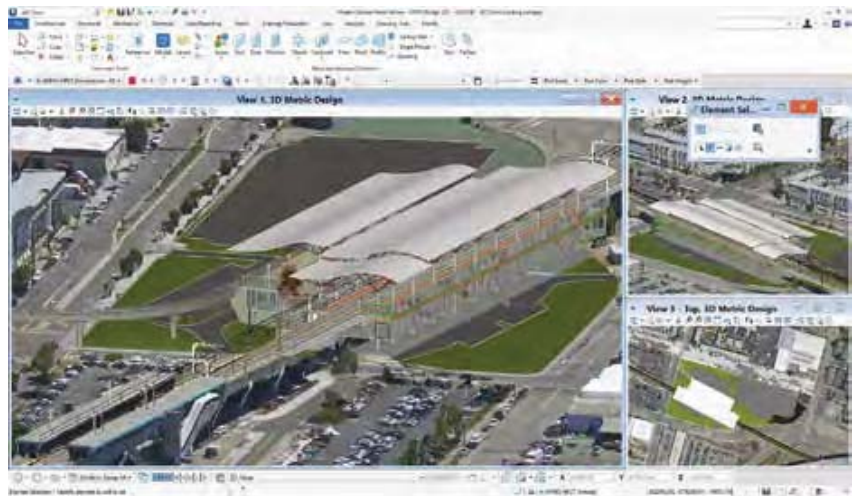
Digital context

Reality modelling incorporates digital context in the rail infrastructure workflow. Bentley's ContextCapture processes digital photography and/or laser scans, from UAVs or hand-held or train-mounted devices, to produce an engineering-ready 'reality mesh' accurately representing the continuously surveyed conditions of a railway corridor, site or station.

Throughout detailed design, the reality mesh, for example, can be used to consider sight lines for signal siting. Because the reality mesh can be captured continuously, construction progress can be tracked and compared to the expected progress of the detailed design. In operations, the reality mesh can be used to compare the as-operated 3D model with the as-designed model, and serve as an immersive 3D environment with hyperlinks to equipment sensors for operations visibility and emergency response training.



LEFT AND BELOW: Another OpenRail application, OpenRail Designer, enables detailed engineering and 3D design of track, overhead line, tunnels, bridges and related civil infrastructure.



OpenRail ConceptStation

OpenRail ConceptStation, enabled by the combination of OpenRail's digital components and digital context, extends BIM capabilities to rail conceptual planning and layout. Working in the 3D design environment of the geo-coordinated reality mesh as the digital context of the rail corridor, the user can access Components Centre to drag and drop digital components into the design to quickly lay out rail lines, bridges, overhead lines, signals, tunnels, etc.

With the context of the terrain, and the intelligence of the digital components, OpenRail ConceptStation can quickly calculate quantities of railway elements such as track, ballast, sleepers, contact and catenary wire, equipment, bridge decking, concrete and steel, as well as the cut-and-fill earthwork required for the conceptual design, and interactively produce a preliminary cost estimate to evaluate feasibility. All the design information, components and context in the conceptual design can be reused in a digital workflow to OpenRail Designer for detailed design of the railway infrastructure.

Digital workflows

In digital workflows, data captured or created for one purpose is accessed by computer programmes for other purposes, saving time, minimising rework and improving data quality over the asset lifecycle. Digital workflows can also converge the work of different disciplines for additional advancements in project delivery and asset performance. Examples enabled by digital workflows include conceptioneering, constructioneering, inspectioneering and operationeering. Each of these workflows represents new opportunities for engineers and their work to add value beyond their traditional role in design, to include contributions to construction, inspections and operations.

The advancement of digital workflows in OpenRail will help users to achieve faster delivery, system-wide visibility, assured compliance and better decisions in design, construction and operations of rail infrastructure. ■

Website: www.bentley.com/en/solutions/industries/openrail