Accelerate Bridge Monitoring

and Gain Improved Insights through Digital Twins

Bentley

In the United States, 42% of bridges are at least 50 years old, and 46,000 are structurally deficient.

It is time to modernize and digitize bridge management. It is time to leverage innovative digital technology to improve insights and outcomes, ensuring the safety of our infrastructure assets and community.

Modernizing Bridge Management through Digital Twins

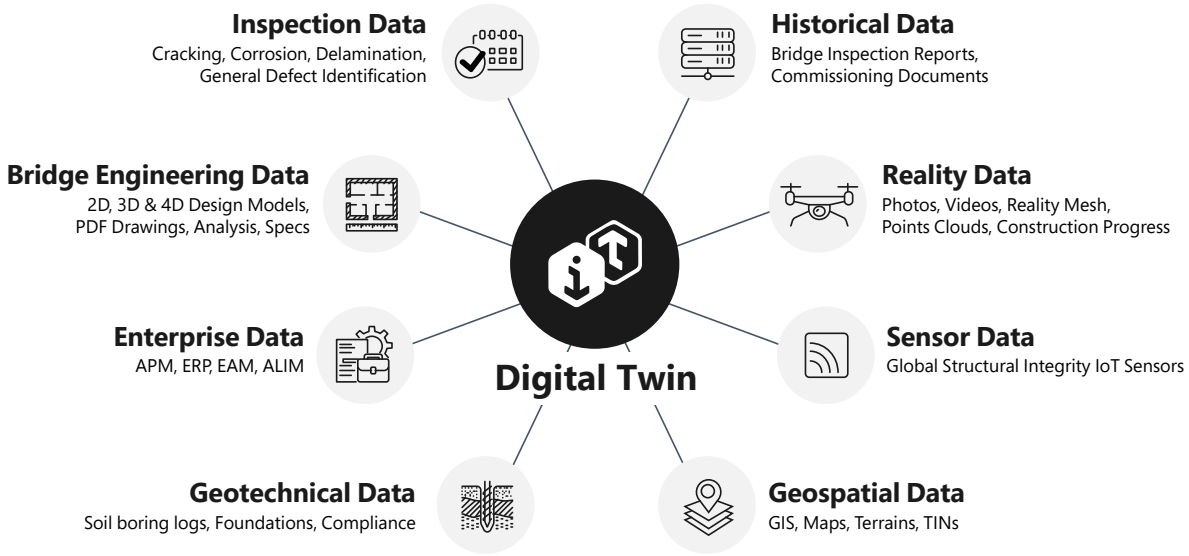
Agencies responsible for monitoring bridges are facing a significant backlog of assets that need maintenance and rehabilitation. Prioritizing repairs based on the most critical needs is becoming increasingly important as maintenance and construction costs increase. A data-rich digital twin empowers professionals to effectively allocate resources where they are needed by providing a more complete picture of the current state of the bridge.

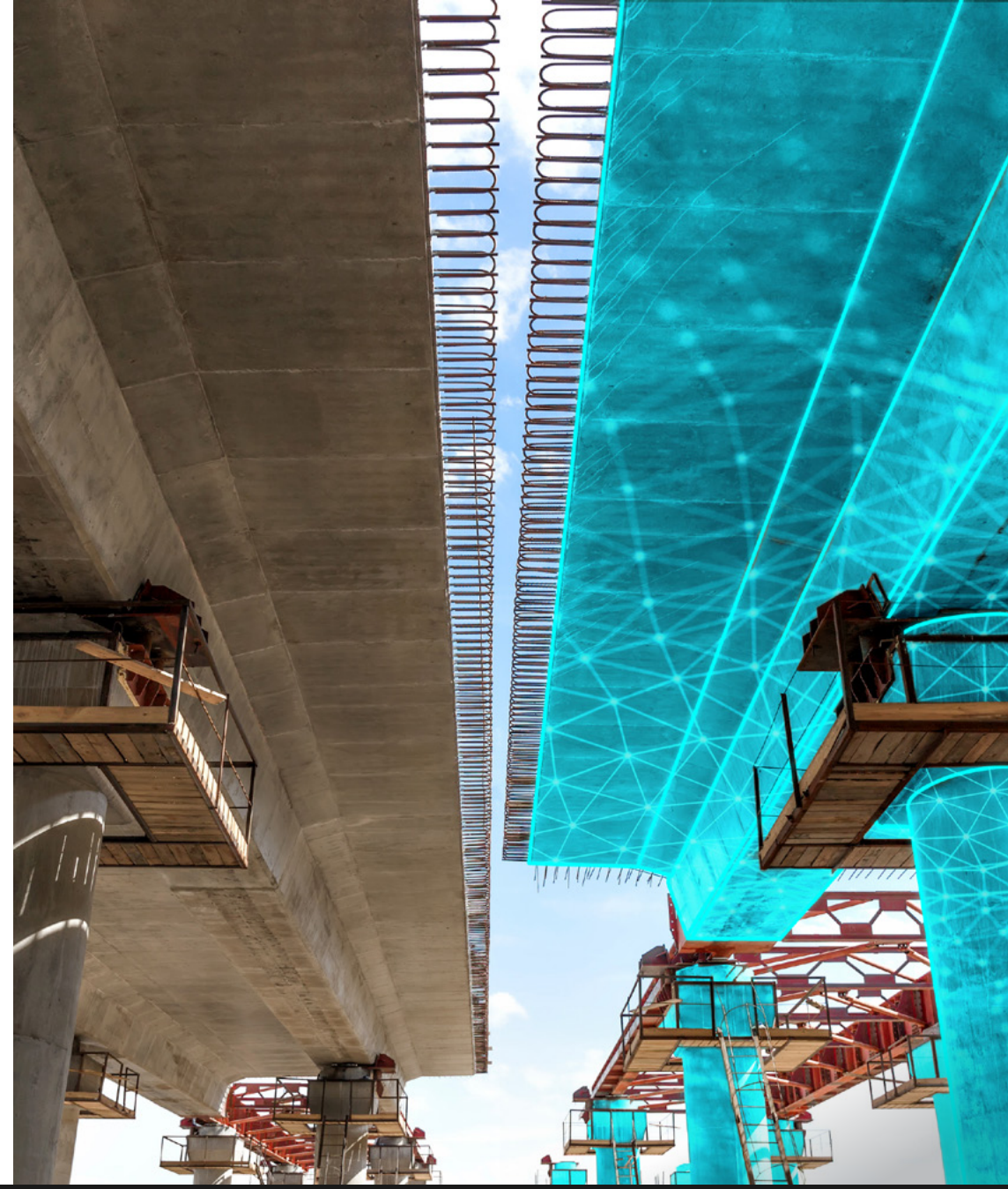
- **Technology can help monitor and analyze bridge health and performance:** Data analytics, sensor technologies, and digital twins can provide insights into how bridges are performing and how they are affected by environmental conditions.
- **Bridge monitoring can inform budget and safety decisions:** By using digital technology to capture and visualize data, stakeholders can prioritize the most critical bridges and allocate resources efficiently and effectively.
- **Artificial intelligence and machine learning can enhance data analysis:** AI and ML can help identify data that falls outside of acceptable limits and behavioral changes that can indicate potential risks or failures.

What Is a Digital Twin

A digital twin is a digital representation of a physical asset, process, or system, as well as the engineering information that allows us to understand and model its performance.

A digital twin is continuously updated with data from multiple sources, including sensors and surveying, to represent its near real-time status, and can incorporate rehabilitation design data. A digital twin enables users to visualize the bridge, check its status, perform analysis, and generate insights to ensure the right work is undertaken at the right time and the right place.

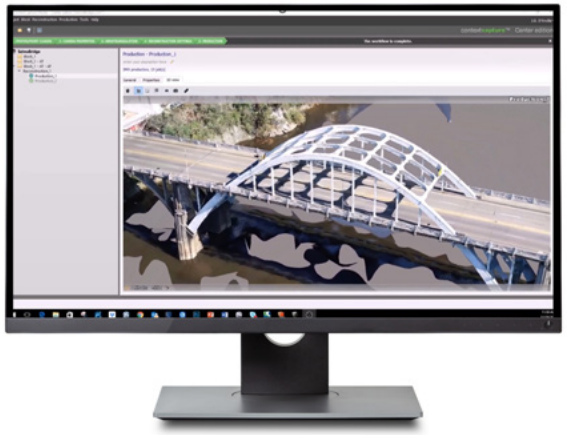




How Bridge Monitoring Can Help Make Critical Decisions

Bentley Systems provides a pioneering digital twin solution that spans the entire bridge asset lifecycle, enabling users to make informed decisions and deliver improved outcomes.

Bentley's bridge monitoring and inspection solution supports organizations and professionals that monitor, inspect, and repair bridges around the world. Using data captured from drones through iTwin® Capture, as well as real-time Internet of Things (IoT) sensor data through iTwin IoT, you can quickly create a 3D digital twin of your bridge to speed up the inspection process and improve decision-making. Using an open digital twin approach to gain operational insights into bridge infrastructure with iTwin Experience will help improve deliverables, promote safety, and increase efficiency.



iTwin Capture

Capture reality as the digital context for design, build, and operations workflows

iTwin Capture quickly creates a highly detailed 3D reality mesh of your reality data using simple photographs or point clouds created from any digital camera, scanner, or mobile mapping device. The 3D model provides designers full visibility to existing conditions, enabling better and faster design recommendations.

iTwin IoT

Gain performance insights to critical infrastructure with IoT health and condition monitoring

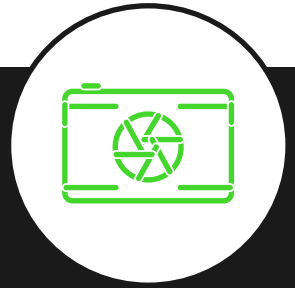
iTwin IoT gathers near real-time data and insights on your structures with field sensors to improve decision-making. By connecting IoT sensors to the digital twin, you can monitor the status of your bridge in real time to get an up-to-date view of asset health. Infrastructure IoT can be used effectively for real-time safety and risk monitoring in operations and construction activities.

iTwin Experience

Connect engineering, spatial, and enterprise data to create immersive digital twins

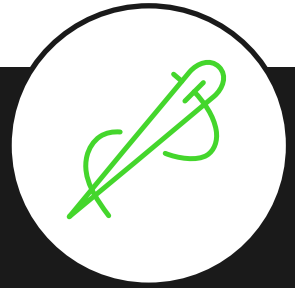
iTwin Experience empowers insights into critical infrastructure by visualizing your digital twin and helping you navigate within it. The application acts as a "single pane of glass" that overlays engineering technology (ET), operations technology (OT), and information technology (IT) to visualize and analyze infrastructure digital twins in their full context, at any level of granularity, at any scale, all geocoordinated and fully searchable.

Bridge Monitoring Workflow



Capture

Easier, consistent capture from a variety of devices and sensors



Federate

Quickly stitch together data from multiple directions or data systems

Inspect

Empower inspections with AI/ML, improved QA/QC, and spatial IoT

Capture

- **Empower your staff** – Capture more information in the field.
- **Improve context** – The project sense of scale, proximity, and item reference may be better understood later in the project lifecycle.
- **Compile data easier** – Integrating information from various vendors into a unified environment can help improve decision-making.

Federate

- **Holistic view of data** – From reality capture to BIM models and IoT sensors, you can pull information from multiple software vendors and systems into one environment.
- **Make it easier** – With a simplified environment, connecting data and systems is easier.
- **Accelerate decisions** – When all data is in one place with structure, access, and permissions, you can make decisions faster.

Inspect

- **Improve productivity** – Streamline collaboration, conduct more detailed inspections, increase stakeholder engagement, and reduce asset outages and impact to the public.
- **Promote safety** – Reduce risk for inspectors by reducing project risk and time on site as a result of bringing all relevant data together in context.
- **Increase efficiency** – Improve the inspection process and streamline maintenance while also providing a total view of the asset's condition for future repair and design.

Industry Leaders Trust Bentley's Bridge Monitoring Solution

Maintaining and Preserving an Iconic Bridge

Robert Street Bridge, Minnesota

Registered as a historic place, Robert Street Bridge had significant structural deterioration. The Minnesota Department of Transportation and Collins Engineers, Inc. initiated a rehabilitation project and performed a detailed bridge inspection. Combining conventional workflows with digital twins and artificial intelligence reduced inspection time by 30% and saved 20% in construction costs while improving safety and quality.

Watch Video

Image courtesy of Collins Engineers

Image courtesy of Collins Engineers

Rehabilitating a Historic Bridge Landmark

Stone Arch Bridge, Minnesota

Spanning the Mississippi River in downtown Minneapolis, the 140-year-old Stone Arch Bridge is a former railroad crossing recognized as a national civil engineering landmark. To ensure public safety and cultural value, MnDOT hired Collins Engineers, Inc. to assess and restore the structural integrity of the bridge. They leveraged digital twin applications to save 20% in field inspection time and improve decision-making to reduce risks and cost.

Read Case Study

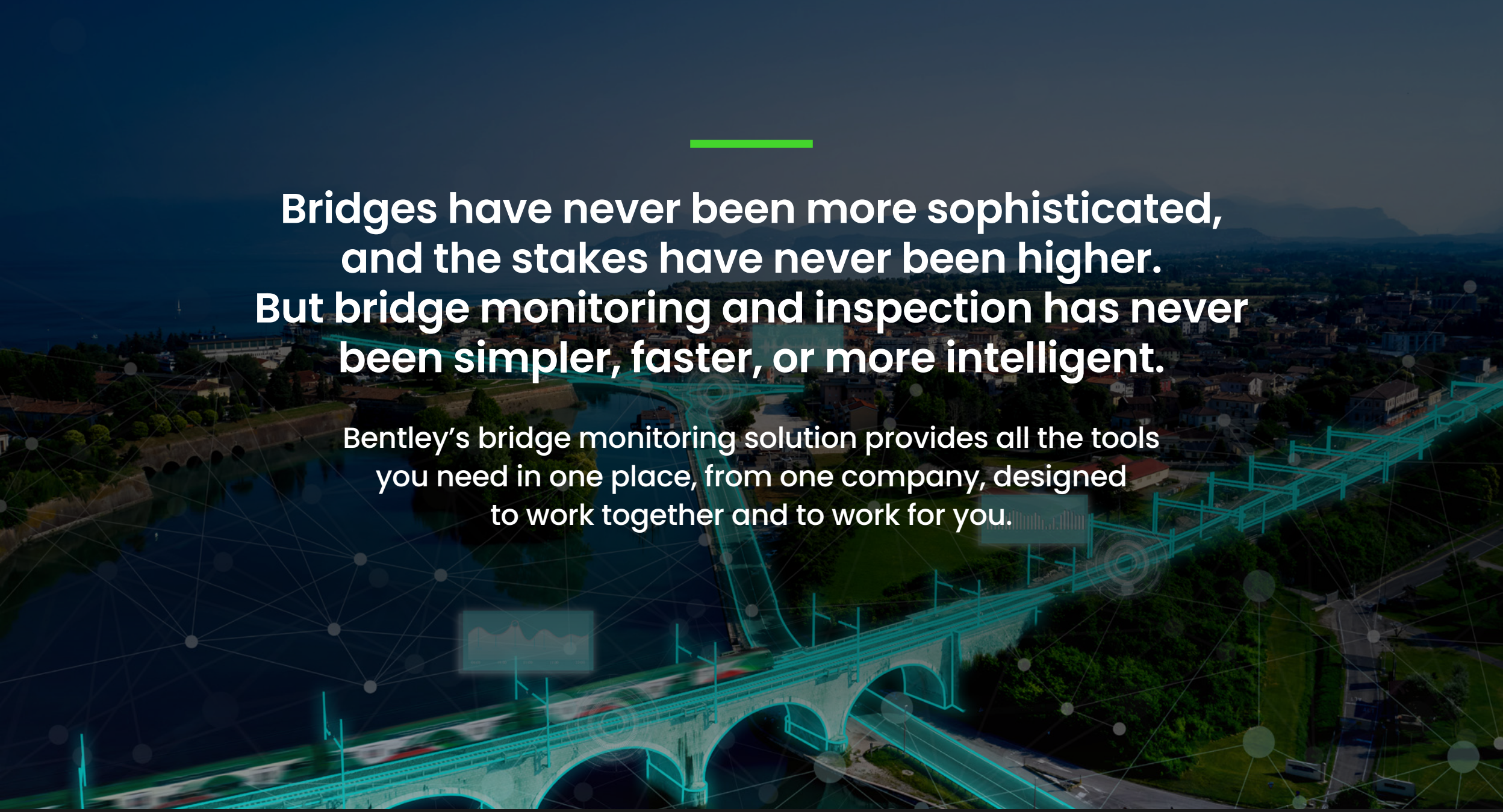
Image courtesy of Collins Engineers

Intelligent Infrastructure Monitoring to Improve Bridge Inspections

Highland Bridge, Colorado

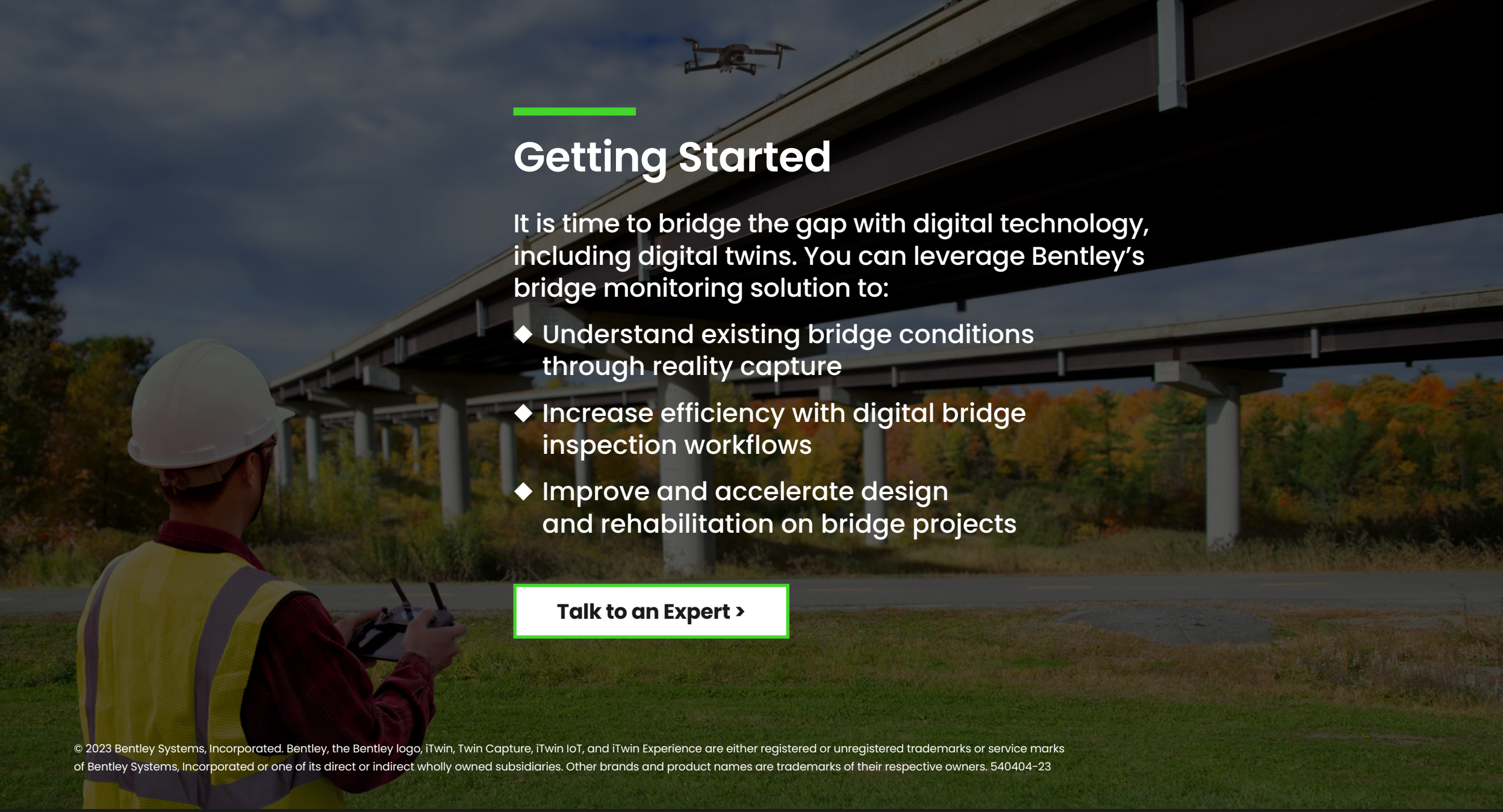
Highland Bridge is one of the most distinctive pedestrian bridges in Denver. However, its unique design produces unusual maintenance considerations. Stantec, a global leader in sustainable design and engineering, leveraged real-time sensor data to ensure the reliability of the link to downtown Denver. Deploying iTwin IoT on the Highland Bridge helped the City and County of Denver improve their decision-making and address issues that arise so they would not have to make costly repairs.

Watch the video



Bridges have never been more sophisticated, and the stakes have never been higher. But bridge monitoring and inspection has never been simpler, faster, or more intelligent.

Bentley's bridge monitoring solution provides all the tools you need in one place, from one company, designed to work together and to work for you.



Getting Started

It is time to bridge the gap with digital technology, including digital twins. You can leverage Bentley's bridge monitoring solution to:

- Understand existing bridge conditions through reality capture
- Increase efficiency with digital bridge inspection workflows
- Improve and accelerate design and rehabilitation on bridge projects

Talk to an Expert >