Communications
Reality Modeling for Going Digital Strategy
Communications organizations are adopting drones and reality modeling solutions to reduce costs and safety risks

Inspecting communications towers typically requires shutting down the site and an expert rigging team climbing the tower – a costly, time consuming, and dangerous process. If the tower is non-climbable, an elevated work platform must be used to allow close-up inspection of the antennas and equipment. With numerous towers, often in hard-to-reach locations, this process makes it difficult to repeatedly record accurate data, leaving an incomplete understanding of the assets. Capturing imagery with drones can now go beyond just photographs and video. Reality modeling using ContextCapture automatically converts those images into an accurate 3D model of the tower or substation that can be measured, imported into existing engineering applications or linked with asset and inspection records.

Reality modeling is the process of capturing existing conditions to provide real-world digital context. 3D reality models are easily shared and streamed and provide up-to-date information to support asset design, construction, and operations.

Reality modeling streamlines the operations and inspection of communications assets:

- Enables new designs to be incorporated into the existing environment for planning or expansion
- Supports the linking of data and geospatial information for asset management
- Enables comprehensive analysis and identifies equipment
- Assesses corrosion or other problems before performing maintenance operations
- Allows for the capture of assets more frequently – with little or no asset downtime
- Decreases resource hours required for surveying on-site and improves work efficiency
- Reduces health and safety risks associated with manual inspection

Reality modeling is going mainstream and has been credited by the following communications organizations.
Springdale Monopole is a reality modeling project for a cell tower antenna located in Springdale, Pennsylvania. UAV service company Eye-bot Aerial Solutions initiated this project to help achieve improved fidelity and workflows by modeling vertical monopole structures that feature transparent complex cross bracing. Because modeling these towers solely with UAV photogrammetry is extremely difficult, Eye-bot sought to incorporate LiDAR scanning as part of the data-capture process, and needed software to accommodate both survey methods.

The project team used ContextCapture to process images from different data sources and generated a precise 3D reality mesh to share among stakeholders. The reality mesh helps eliminate risks associated with manual inspection, allows for precise measurements of the structure, and enables new designs to be incorporated into the existing environment for planning and expansion. The capabilities of ContextCapture and reality modeling demonstrate tremendous potential for improved efficiencies in the telecommunications industry.

**Project Playbook:** ContextCapture
To determine the optimal site for relocating a transmission tower in the Greater Gwangju Metropolitan Area, South Korea, GeoINT was tasked with surveying and modeling the area surrounding the structure. Tackling the rough terrain was a major challenge. To ensure safety of the surveyors, GeoINT used UAVs to photograph the landscape and obtain accurate terrain information for the client to make an informed decision on where to move the facility.

The project team used ContextCapture to process the photos and generate a 3D reality mesh of the area. Using LumenRT, the project team provided realistic visualizations for the client to help analyze and identify the optimal relocation site. Aerial photogrammetry and ContextCapture reduced resource hours required for surveying on site, improved safety, and enabled the team to build the realistic 3D mesh at 30 percent of actual project costs and deliver the final model in just two weeks.

Project Playbook: ContextCapture, LumenRT
To determine the operating status and develop a maintenance plan for a wireless communication base station and surrounding facilities in the district of Geumcheon-go in Seoul, IANN Soft used reality modeling for accurate data collection and analysis. The virtual reality model of the relay device and communication cables helped identify the status of aging equipment and improved decision making for maintenance planning.

Using ContextCapture, the company created accurate 3D site situations within four hours, reducing resource hours and improving work efficiency by 50 percent, saving an estimated 27 percent in project costs. The team refined the 3D reality mesh using Descartes and modeled replacement devices using MicroStation, which identified problems before performing maintenance operations. With Bentley’s interoperable reality modeling and analysis technology, the team completed the project in just two days.

**Project Playbook:** ContextCapture, Descartes, MicroStation®
ProjectWise made it possible to quickly coordinate the stakeholders, providing telephone network operators with immediate access to up-to-date information and a huge amount of data. For example, a detailed photogrammetric reconstruction with ContextCapture takes around 1,700 40-megapixel photos, up to 30 gigabytes of photos for each RBS, and in excess of 400 terabytes of files for all RBSs. This storage system provides the documentary base intended for continuous asset management.

– Cristiano De Leonardis, CEO and Founder of Seikey S.r.l.

SEIKEY Enterprise Drone Solutions
Caronno Pertusella, Varese, Italy

Cell Tower Inspections 4G and 5G

SEIKEY technological partner of Telecom Italia initiated a data capture and reality modeling project to standardize the inspection of Italy’s 11,800 radio base stations (RBS) and accelerate information exchange among stakeholders for improved plant maintenance and asset management. The 3D real-time modeling approach optimized maintenance and inspection activities, enhancing signal strength of RBS facilities for more effective phone coverage from the operators.

The project team used drones for high-precision aerial capturing of the stations to perform the inspections in just six hours, compared to five days per facility. ContextCapture enabled a detailed photogrammetric reconstruction from more than 400 terabytes of data for each plant. They used MicroStation and OpenCities Map to link data and geospatial information to the model. The reality modeling solution allows for safer, more precise preventative intervention and maintenance, improving operational efficiency and reducing costs.

Project Playbook: ContextCapture, Descartes, MicroStation, OpenCities™ Map, ProjectWise®
Telecommunications tower inspections typically require a site to be shut down and an expert rigging team to climb the tower to allow for close-up assessment of the antenna and equipment. To perform the asset inspection on the Telstra Tower located on Black Mountain in Canberra, Australia, SiteSee deployed UAVs and relied on reality modeling for its project deliverables. The tower, its antenna, and surrounding area were all captured in 3D and modeled, optimizing analysis to deliver an accurate record of the state of the site and tower equipment.

SiteSee used ContextCapture to produce a detailed 3D engineering-ready reality mesh of the infrastructure assets and surrounding area from the UAV imagery. The software enabled the project team to export a dense point cloud for further comprehensive analysis and identify antenna equipment and asset corrosion. The collaborative approach reduced asset inspection and maintenance costs by 69 percent and reduced project delivery time by 86 percent.

**Project Playbook:** ContextCapture

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**SiteSee**
Brisbane, Queensland, Australia

*Automated Recognition of Antenna on a Cell Tower*
We faithfully believe that using ContextCapture in network survey projects can reduce time and costs by 85 percent. For example, in a 1,000-kilometer project, a company will be able to finish the work in four months instead of the current 26 months.

— Sergio Wojtiuk, CEO, WHY Inc.

WHY Inc. currently helps telecommunication network providers develop integral solutions to improve their work processes and profits. The company initiated a project in Mexico City, to optimize workflow for surveying and designing telecommunication networks through more efficient and accurate digital collection and representation of client and field data. The goal is to get the industry to adopt reality modeling within current workflows to gather precise and reliable data and information, quickly and efficiently, which can then be displayed and analyzed in a virtual environment for optimal network planning and design.

The surveyors digitally capture pictures and videos and send them to the digitization team to create 3D models using ContextCapture. The models are then oriented, scaled, and geo-referenced in MicroStation where additional features of the assigned zones are drawn before being imported through OpenCities Map. Using Bentley’s integrated technology accelerated and streamlined the workflow, which is estimated to reduce costs by 85 percent.

Project Playbook: ContextCapture, MicroStation, OpenCities Map

WHY Inc.
Mexico City, Mexico

ContextCapture for Comms
The wind power plant being built in Kaifeng, Henan, China covers almost 7 square kilometers along a 4.15-kilometer roadway and is comprised of five communication towers measuring 30 meters in height. Liaoning Provincial College of Communications is responsible for designing the communication towers and roadway using BIM advancements. The CNY 6 million project requires digital survey and design methods to deliver a highly accurate model and accommodate the short construction period.

The team used unmanned aerial vehicles to survey the site and ContextCapture to generate a reality mesh of the roadway. MicroStation and STAAD were used to model the communication towers. Using Bentley’s 3D BIM and reality modeling technology for survey and design enabled the simultaneous production of communication and road designs. The application of reality modeling provided an intuitive and accurate context to design the site. The integrated digital solution shortened the construction period by 15 days to save CNY 100,000.

Project Playbook: ContextCapture, LumenRT, STAAD®
Sky Solutions needed to survey and inventory more than 50 telecommunications towers in Mexico City. WHY Inc. was tasked with helping to facilitate the process using reality modeling to automate data capture and monitor the towers, equipment, and antennas.

WHY used ContextCapture to process drone-captured imagery and generate 3D reality meshes of the towers. Using ContextCapture and MicroStation, the team classified the tower equipment, created automated templates to report on the spatial variables and other information, and uploaded the reports to a web viewer for interactive client viewing. Bentley's integrated digital modeling and visualization solution automated previous manual processes, significantly reducing work time and eliminating the need for the client to download large file reports, accelerating delivery time. The ability for WHY to use ContextCapture to deliver the reports saved the client up to USD 10,000, which would have been used to purchase their own web-based viewer.

**Project Playbook:** ContextCapture, MicroStation
In Beijing, China a transmission line is under renovation. Shanghai Kanrong Information Technology was tasked with assisting on the YER 1 million project. To better understand the line selection and terrain, the project adopted BIM and reality modeling.

The team used MicroStation to create the power transmission tower, perform reality modeling with ContextCapture, and deliver an animated rendering of the project with LumenRT. Bentley’s integrated modeling applications provided a detailed understanding of the line route to optimize the transmission scheme. The reality modeling solution reduced risks during field survey and generated an accurate visual reproduction of the terrain and line selection.

**Project Playbook:** ContextCapture, Descartes, MicroStation
About Bentley Systems

Bentley Systems is a leading global provider of software solutions to engineers, architects, geospatial professionals, constructors, and owner-operators for the design, construction, and operations of infrastructure. Bentley’s MicroStation-based engineering and BIM applications, and its digital twin cloud services, advance the project delivery (ProjectWise) and the asset performance (AssetWise) of transportation and other public works, utilities, industrial and resources plants, and commercial and institutional facilities.

Bentley Systems employs more than 3,500 colleagues and generates annual revenues of more than $700 million in 172 countries. From inception in 1984, the company has remained majority-owned by its five founding Bentley brothers.

For additional information, visit www.bentley.com.

About ContextCapture

ContextCapture is Bentley’s reality modeling software that can quickly produce 3D models of existing conditions for infrastructure projects of all types, derived from simple photographs and/or point cloud. Without the need for expensive or specialized equipment, ContextCapture enables users to quickly create and use these highly detailed 3D engineering-ready reality meshes to provide precise real-world context for design, construction, and operations decisions throughout the lifecycle of projects. Project teams can easily and consistently share reality modeling information, consumable and accessible, on desktop and mobile devices, in many formats, including native use within MicroStation for any engineering, operations, maintenance, or GIS workflow.

For additional information, visit www.bentley.com/ContextCapture.