OCTAVE

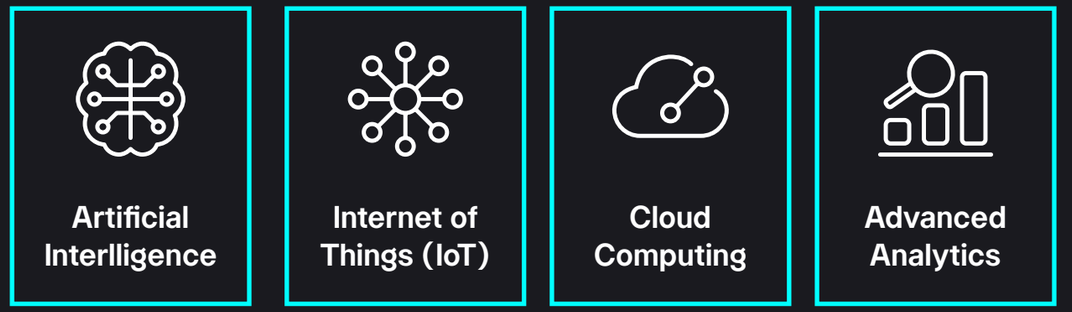
EBOOK

Harnessing the power of digital twins

The utilities and communications industry are in the middle of a technological revolution.

Major disruptors are driving these changes and converging such that companies must modernize their infrastructure quickly – or be left behind. Utility providers are facing pressure to explore renewable and distributed energy resources (DERs) and distributed energy storage systems; fiber networks must continually evolve to increase both speed and capacity.

Modern technologies like...



are disrupting traditional practices, enabling smarter infrastructure management, predictive maintenance and better customer service and experience.

Quality, accessible data is the key

The foundation of any utilities and communications company lies in maintaining an accurate, up-to-date model and topology of its physical networks and assets. This digital representation touches every aspect of the business, from network reliability to safety and customer service. These companies manage and maintain large, spatially distributed networks of physical assets that require complex fieldwork to deploy, inspect and repair, and business capabilities depend on the availability of these assets.

But if that model is inaccurate, all downstream business processes, workflows and activities are compromised, resulting in inefficiency, suboptimal decision-making and missed opportunities.

GIS is not enough

In the past, utilities and communications companies have relied on a traditional geographic information system (GIS) or legacy solutions to manage their networks, but these solutions are not equipped to meet the challenges caused by the many disruptions impacting the industry. They cannot enable intelligent planning and operations and lack the functionality needed to help companies digitally transform. Companies need modern solutions that provide a detailed, complete view of their assets so they can unlock the power of their asset data and gain access to the right information at the right time.

Digital twins are the answer

In recent years, the way in which infrastructure is visualized and analyzed has evolved rapidly, thanks to digital twin technology. Companies need GIS-based geospatial asset management solutions that provide a full digital twin – a digital representation, system of record of a network model, topology, associated assets and surrounding environment.

By integrating GIS with digital twins, companies can put their asset data to work, enabling real-time monitoring, simulations and predictive maintenance. This integration allows companies to realize better asset management, reduce downtime, optimize resource allocation and enhance overall network reliability.

Robust digital twin network models are the cornerstone of building out intelligent operations. They're one of the most critical asset management tools available to utilities and communications companies looking to modernize quickly.

With a digital twin, companies can:

Minimize downtime and reduce costs

Monitor assets in real time by integrating IoT and sensor data and other information and, by simulating the behavior of a physical asset, predict maintenance needs, detect anomalies and prevent potential failures.

Forecast areas prone to fiber degradation due to environmental factors or predict potential cable failures based on usage patterns. Maintenance schedules can be optimized based on this predictive analysis, reducing downtime and minimizing service disruptions.

Optimize operations

Simulate and anticipate different operational scenarios to optimize processes, improve efficiency and make informed decisions regarding resource allocation and usage.

Simulate and evaluate an electrical grid's resilience during extreme weather events, identifying critical points of failure and recommending redundancy measures to maintain service continuity. Additionally, contingency plans and response strategies for emergencies or unexpected events can be developed and tested within the digital twin, ensuring rapid response and minimal disruption in the case of a grid disturbance.

Enhance reliability and service quality

Continuously collect and analyze data to gain insights into an asset's performance over time, identifying patterns, trends and areas for improvement. A digital twin helps prevent major impacts by anticipating complex behaviors.

Model a meshed electric network, where the failure of one transformer station can start a cascading effect, leading to the failure of all other transformer stations. Experiment with preventative actions in the safety of a simulated environment.

Improve planning

Simulate the impact of changes or upgrades before implementation when planning expansions and assessing the feasibility of new projects, understanding potential outcomes without disrupting operations.

Assess the impact of an EV charging station deployment on the local electrical grid, including power demand, potential grid congestion and required upgrades to support increased energy demand from EVs.

With a digital twin, companies can:

Monitoring and control assets remotely

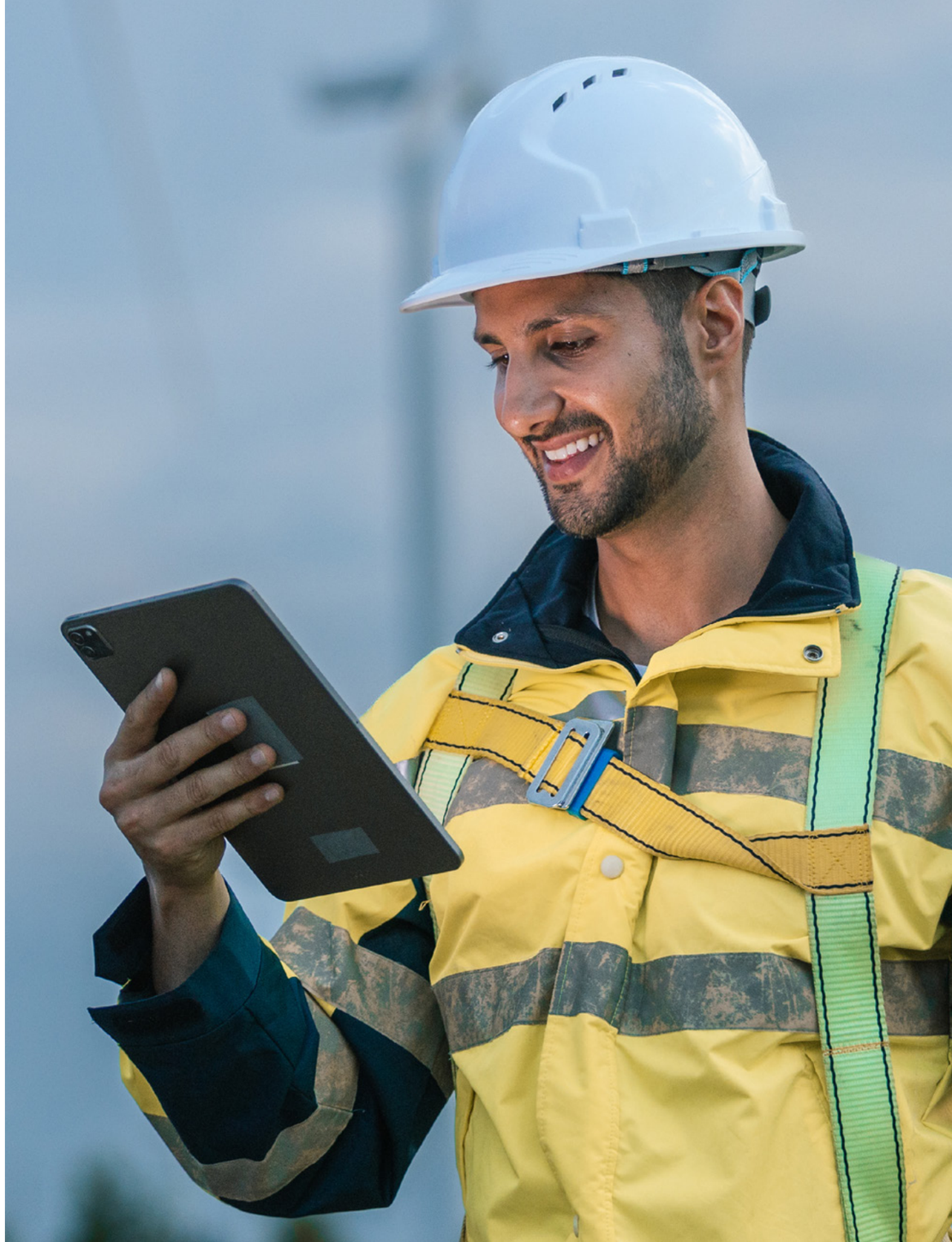
Access and manage assets, make adjustments and perform diagnostics without being on-site – this is particularly valuable when it comes to widely distributed infrastructure.

Manage an expansive fiber optic grid. If there are network issues or disruptions, it can aid in pinpointing the exact location of the problem withing the network, facilitating rapid troubleshooting. This helps resolve issues efficiently and doesn't require technicians to be physically present at the site.

Share knowledge

Familiarize users with equipment, systems or processes in a risk-free environment and share knowledge by providing a common platform for collaboration and information exchange.

Simulate scenarios and allow users to learn how equipment functions and understand its behavior in different conditions without the risk of real-world system disruptions or damage. Collaborative learning sessions allow multiple stakeholders to interact simultaneously within the digital twin to facilitate USE CASE problem-solving.



Digital twins support the entire lifecycle of an asset

Design

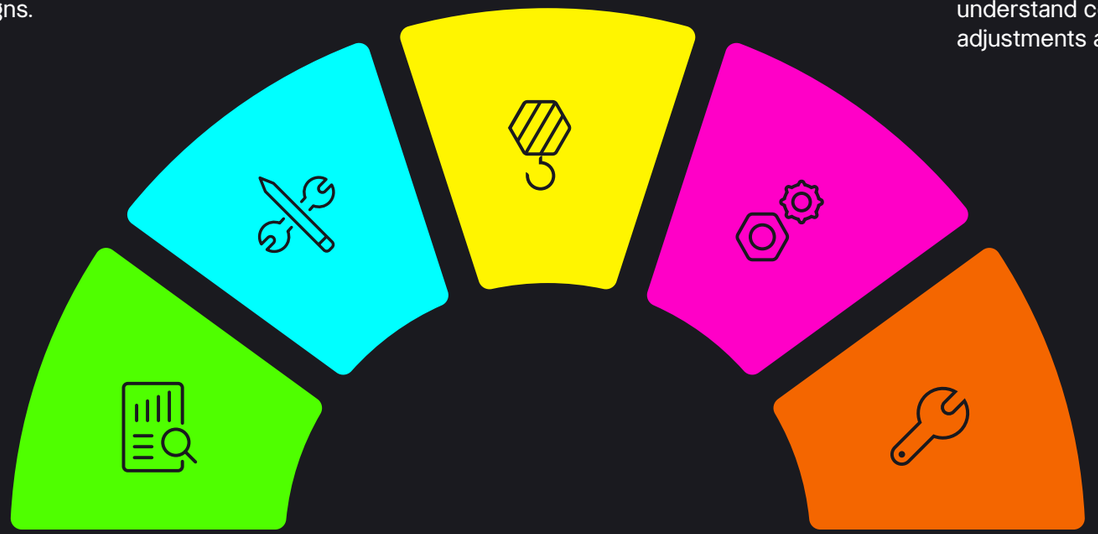
Data is used to create detailed plans and specifications for the construction of assets, including determining optimal locations, materials and configurations. Companies can use data-driven simulations and modeling techniques to test the efficiency, reliability and performance of proposed designs.

Construction

Companies leverage data on material sourcing, procurement and logistics to ensure timely delivery of required components, and use data analytics and project management tools to monitor progress and manage resources effectively.

Operations

Companies can install sensors and IoT devices to collect real-time data on asset performance, energy consumption and operational parameters; analyze data patterns to predict potential failures or maintenance needs, optimizing asset performance and reducing downtime; and use customer usage data to optimize service delivery, understand consumption patterns and make adjustments as necessary.



Planning

Companies gather data related to demographics, geography, existing infrastructure and market demands to assess the need for new or improved assets. They can also use historical data and predictive analytics to forecast future demand, growth patterns and potential areas for infrastructure development.

Maintenance

Companies continuously collect and analyze data on asset conditions to identify maintenance needs and prioritize repairs or replacements. They can also analyze historical maintenance data to refine maintenance schedules, improve asset longevity and reduce operational costs.

Octave NetWorks

Octave NetWorks (formerly HxGN NetWorks) is a GIS-based geospatial asset management solution for utilities and communications that provides a foundational digital twin and access to a single source of accurate, up-to-date data. Its lifecycle management capabilities span all phases, enabling organizations to design, build, manage and maintain physical networks for electric, gas, water, wastewater, multiutility and fiber.

NetWorks in the cloud, the only fully managed, SaaS geospatial asset management solution for utilities and communications, provides all the features and functions of the on-premises Networks portfolio and includes hosted IT infrastructure as well as preventive and corrective maintenance services. Benefit from robust cybersecurity features and better store and analyze large amounts of data generated by smart grid devices.

NetWorks is a GIS-based geospatial asset management solution for utilities and communications that provides a foundational digital twin and access to a single source of accurate, up-to-date data. It responds intuitively to the needs of each phase in the asset management lifecycle.

About Octave

Octave is a leader in enterprise software, turning data into decisive action and intelligence into your edge. Our software solves for and simplifies complexity, from the design and build to operations and protection of people, property, and assets– for any scope, at any scale. For decades, we've partnered with customers to sharpen performance, elevate efficiency, and amplify results. From factory floors to entire cities, our solutions are tuned to scale up what's possible from day one onward.

OCTAVE