

A photograph of an offshore wind farm. In the foreground, a large white wind turbine blade is shown in profile, extending from the left towards the center. The background shows a vast blue ocean under a clear blue sky, with several other wind turbines visible in the distance. The overall scene is bright and clear, suggesting a sunny day.

# THE ENERGY TRANSITION

HOW REAL-TIME 3D  
TECHNOLOGY CAN SUPPORT  
A LOW-CARBON ECONOMY

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# EXECUTIVE SUMMARY

The energy industry is at a tipping point.

The economy is slouching toward recovery, the path to net zero emissions is strewn with obstacles, and social and political entities are clearly directing both individuals and corporations to reconsider the state of the world.

Imagine a low-carbon future. Imagine a future that values environmental, social and corporate governance (ESG) initiatives, renewable energy, and digital innovation.

Across the energy sector, the top-level business levers supporting success include optimizing capital expenditure (CAPEX) and operational expenditure (OPEX), enhancing safety and security, and establishing leadership in ESG. The primary initiatives specific to each segment of the industry are optimizing production and reserves for upstream companies, optimizing capacity and increasing throughput for midstream companies, increasing efficiencies and uptime for downstream companies, and maximizing margins for retail.

Unity-powered digital twins equip businesses to improve productivity and operational performance, while reducing costs and environmental impact as we build a smarter, safer and more sustainable world. The fusion of data, sensors and digital assets will unlock the power of real-time 3D technology. By leveraging Unity as a system of systems, creators can build highly impactful digital environments and use cases.

Imagine having insights into the workings of the facilities you manage so you can optimize performance and maintenance. Or ensure the safety of your workforce. Digital twin technology opens a window onto the past, present and future by creating a dynamic 3D representation of any system, process, or service through artificial intelligence, machine learning, simulation and analytics to form a live digital simulation of any physical entity.

This e-book establishes the current energy market landscape, the business value and challenges of technological innovation, and a range of viable use cases for digital twin solutions. We'll also share expert tips on taking the first steps toward the industrial metaverse.



## **TIM WONG**

Manager of Pursuit, AECO, Energy & Infrastructure  
Accelerate Solutions, Unity

Tim heads program management for AECO and energy projects as part of Unity's professional services team, Accelerate Solutions. His areas of focus include the delivery of digital twins and helping clients and their creators build the foundations for their journey into the industrial metaverse.

Previously, Tim was Director of Innovation at Finger Food Advanced Technology Group, which was acquired by Unity in May 2020. Finger Food helped companies digitally transform their business using emerging tech.

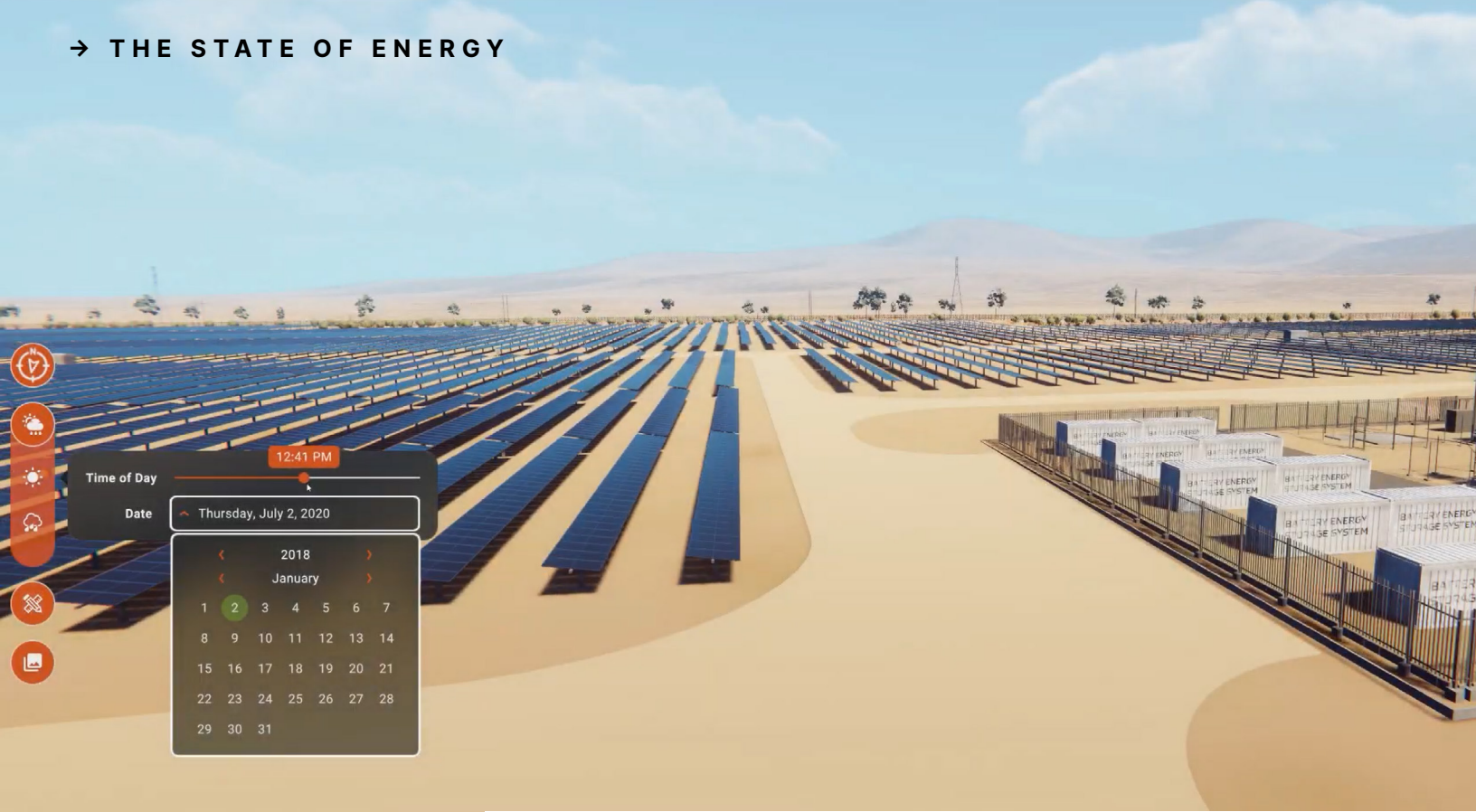
Outside of work, Tim collaborates within his community to drive awareness of Alberta's rapidly growing tech ecosystem and accelerate the momentum to position Alberta as a world-renowned innovation and tech hub.



# THE STATE OF ENERGY

Not long ago, gas prices were at a 30-year low. But the Covid-19 pandemic disrupted business and industry on a massive scale. By 2021, the road to economic recovery generated a surge in demand for energy, while its supply was constrained. As a result, the cost of energy spiked significantly around the world.

For several years, the social and political pressures for businesses to transition towards a low-carbon economy have pushed companies to prioritize their net-zero targets. According to McKinsey's [Global Energy Perspectives 2022](#) report, renewable energy will account for 80% to 90% of power generation globally by 2050. Many companies are leveraging digital technologies to help them get there.



# REIMAGINING THE FUTURE

Given the challenges facing the energy industry today, businesses are asking new and important questions:

- How can companies produce more energy or increase throughput without spending additional capital dollars?
- What does ESG leadership look like?
- How can digital technologies enable collaboration across stakeholder groups, including with communities, indigenous people, and subject matter experts?
- How can energy companies improve their brand image and demonstrate sustainability and innovation to attract the next generation of highly skilled talent?
- How can companies maintain their path-to-zero commitments and ensure a highly safe and secure workplace?

Going forward, the core challenge is to reimagine the future of energy, capital discipline, financial health and performance, and establish leadership in ESG to transform businesses. At Unity, we believe that real-time 3D technology and the ecosystem of creators will be a key driver.

# THE SHIFT TO RENEWABLES AND ESG

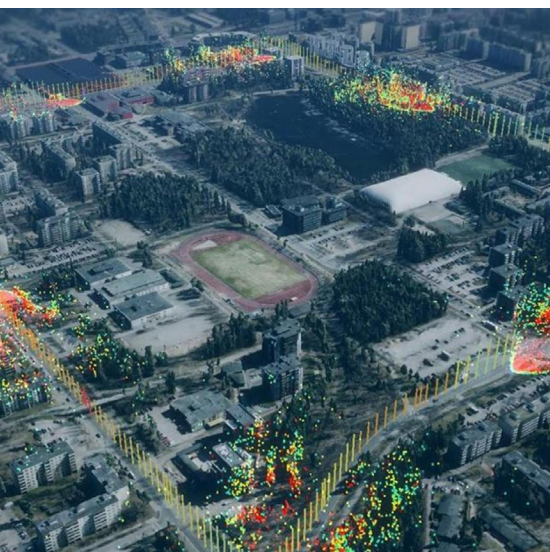


The [energy sector represents 65% of total greenhouse gas \(GHG\) emissions globally](#). Meanwhile, in certain regions like Africa, where access to services is still lacking, energy demand is surging. As the Paris Agreement aims to cut emissions in half by 2030, satisfying energy needs will be a tall order.

Growth in renewable energy will be driven primarily by solar and wind energy, as their production costs are declining. In the past, renewable energy developers and generating companies were motivated by government subsidies, passing costs onto customers, but today, customers are leading the charge in driving the market transition.

Other drivers include:

- Pressure from shareholders to prioritize ESG
- Regulatory pressures
- Competition



Digital technologies are a key enabler in accelerating the path to the adoption and the scaling of renewable energy. Over the last century, technology has drastically changed how we live and disrupted what we thought was possible. The way we produce, transport and consume energy is also changing. Digital technologies will be a core component of reimagining what is possible and transitioning to renewable energy.

Digital technologies are laying the foundation for systems and infrastructure to be more connected, more reliable, more intelligent and more efficient. Energy companies generate a wealth of data, especially as operations are increasingly outfitted with Internet of Things (IoT) sensors, high-definition cameras with artificial intelligence (AI) capabilities, and more. Digital technologies like real-time 3D can harness this data to provide right-time insights, for better-informed decision-making around production, maintenance, safety and security and for optimization, and to create incentive programs to accelerate adoption of renewable technologies and service areas that lack access to power.

# INNOVATE, OR GET LEFT BEHIND

Companies that fail to innovate cannot thrive. Business failure – whether in retail, manufacturing, consumer goods or other industries – is typically not because of a single major event, but due to a series of management decisions over several years that leave a company vulnerable to being overtaken by competition.

Innovation requires both macro and micro views of a company, its competitors, its ecosystem of partners, and market shifts. As market demand and requirements change, a company's roadmap needs to iterate and adapt. For tangible impact in the near term, your business strategy needs to exercise change management, embrace a users-first approach, focus on solving challenges that result in business value, and establish an ecosystem of internal and external partners that will help accelerate time to value.



## CHANGE MANAGEMENT

Change management can make the difference between a widely adopted deployment and a multimillion dollar solution that nobody uses. Some of the challenges in change management include bridging the gap between management and teams on the ground, finding influencers and champions within the organization to bring people on board who can execute changes effectively, and ushering in the next generation of talent into the organization while continuing to drive ongoing operations.

Your approach to designing a solution can support change management from the initial phases. By involving key stakeholders and end users early, they become active participants in addressing their day-to-day pain points. In doing so, the business develops champions within the organization to ease change in support of your goals.



# USERS FIRST

Taking a user-centric approach to building a solution can ensure that it is deployed, adopted and used successfully. You need to know who the key users are. You need to understand their particular business challenges, whether their focus is pipeline integrity, facilities management, or health and safety.

Some examples of common problems that hinder business transformation are listed below:

## DATA

- Disparate and/or siloed data that is difficult to locate and manage
- Lack of a scalable data governance strategy to support innovation
- Lack of visibility to whether data is up to date, accurate or of quality / complete
- Outdated 2D or 3D representation of facilities

## PROCESS

- Siloed workflows across different business units
- PMO process has not adopted agile ways of working and often slows down innovation

## PEOPLE

- Deploying and the adoption of new tech can be time-consuming and difficult throughout an organization
- In many organizations people work in siloed groups
- Companies are having a tough time hiring young talent who are technically knowledgeable and understand 3D space

## TOOLS

- Some organizations are locked into tools and limited to proprietary formats
- Ability to utilize and leverage real-time 3D technology
- Dependency on spreadsheets

From there, identify the main actors who are experiencing the pain points on a daily basis and consider who else is affected. By identifying the impacted parties, you can build personas that represent the key users, which will determine the business value and guide your design. Identify five to eight users that represent the main personas and involve them in the early stages of UX/UI design. You want them to champion the solution you are building.





## BUSINESS VALUE

Innovation is more than the [metaverse](#), [digital twins](#), or blockchain. These buzzwords represent enabling technologies. If you focus on the technology instead of the business problem you risk building a solution that doesn't provide immediate business value. This has a downstream effect on change management and adoption. You also risk boiling the ocean in terms of feature requests. Focus on a set of outcomes that the teams can rally behind and prioritize.

So how do you start your digital transformation journey? Understand your current pain points and use metrics to identify where the business value lies. A digital twin that helps generate more revenue through optimization simulation without investing in building more capacity is exponentially more valuable than creating a virtual reality (VR) digital twin with no real use cases behind it.

### SAMPLE METRICS TO DETERMINE BUSINESS VALUE

- potential revenue opportunity
- cost of unplanned shutdowns
- incidents reported over a recent period
- emissions target



## BUILDING THE ECOSYSTEM

Innovation that makes an impact takes an ecosystem. You need partners to support and accelerate your velocity and that can execute in areas for which you don't have internal resources. Ecosystem partners can also help establish build vs buy solutions.

Rather than investing in highly customized solutions that require specific skill sets, choosing a platform may be a more effective and feasible approach to meeting your business's needs. Unity works closely with partners across industries. So whether you need to integrate with a specific physics engine, create a data pipeline with your cloud service provider, or ingest file formats from other platforms, Unity acts as a system of systems for your digital twin and enables deployment across platforms.



# JOURNEY INTO THE INDUSTRIAL METAVERSE

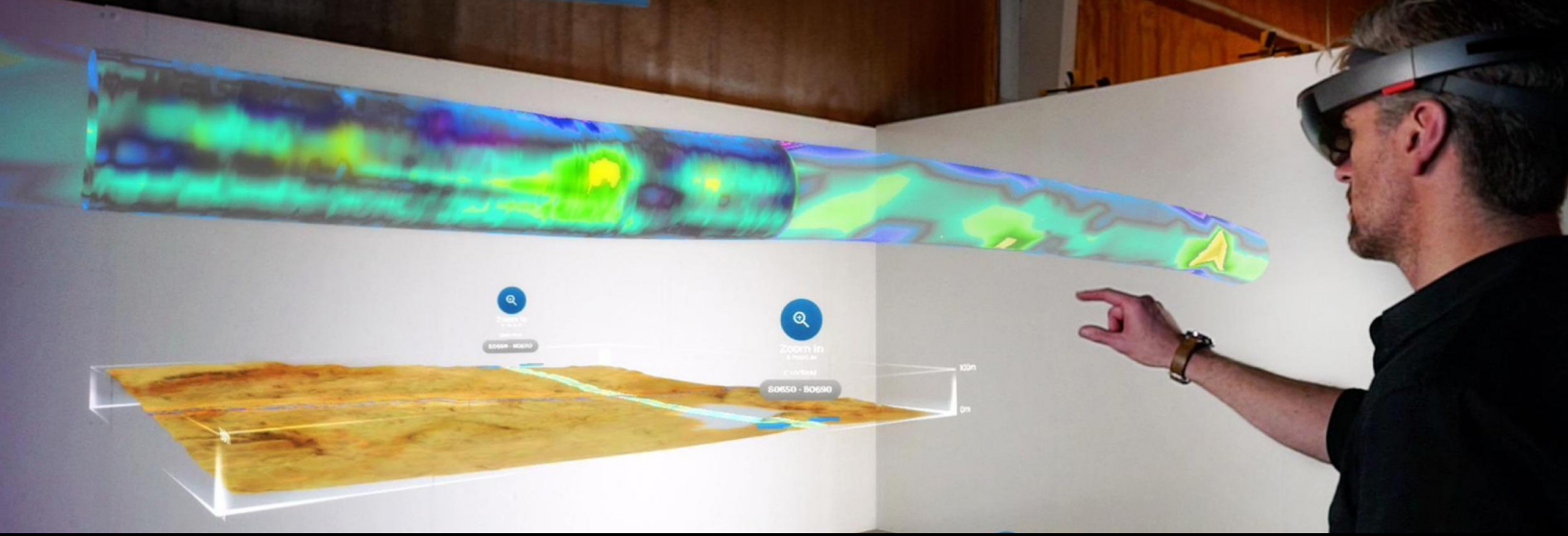
The metaverse is still taking shape, and its potential is still being imagined. Broadly, the metaverse is a network of digital twins, enabling social interaction, collaboration and transactions across platforms. Digital twins are digital representations of physical objects, people, processes, and environments that are connected to right-time data and enable informed decision-making through insight, analysis, simulation and prediction.

The reality is, emerging technologies in 5G infrastructure, Web3 and real-time 3D present an opportunity for the industrial sector to define what the metaverse means for their business. Understanding current pain points and envisioning a future state are key to building a smarter, safer and more sustainable world.

For the energy industry, specific business objectives include:

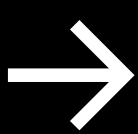
- leveraging the metaverse to increase revenue without increasing CAPEX
- becoming a leader in ESG initiatives and reducing carbon emissions
- increasing safety in the workplace
- accelerating path to zero initiatives
- enhancing collaboration across the business and breaking down siloed workflows

At Unity, we believe the world is a better place with more creators in it. Unity provides the building blocks for the metaverse in the form of real-time 3D software. With the right tools and technology, creators can build fully interactive experiences that help companies understand the past, view present conditions, and prevent future problems. This is the foundation of the industrial metaverse.



# FIVE TIPS ON GETTING STARTED

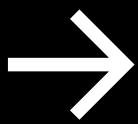
With an innovation mindset and five key steps, your energy transition journey begins here.



# 1

## CONSIDER YOUR USERS.

Taking a user-centric approach will help identify the end users and understand their pain points and core business challenges. Allowing the end users to be engaged and be a part of solutioning will help drive change management and establish internal champions to accelerate adoption.



# 2

## UNDERSTAND YOUR CURRENT STATE.

A user-centric approach will help you home in on key pain points that have a direct impact on the day-to-day activities of your workforce, as opposed to defining general business challenges that may net endless solution options that are not as impactful.

It is often helpful to categorize the components of your current state according to the following buckets:

→ **People**

Identify pain points related to people including skill sets, culture, experience, and roles.

→ **Process**

Identify processes that are causing pain points such as productivity loss, duplicate tasks, and impacts to safety.

→ **Data**

Identify data-related pain points including data governance (or lack of), access to specific data, data quality, and data ownership.

→ **Tools (or technology)**

Identify the different tools or technologies that are contributing to the pain points and preventing you from achieving your targets. This may include tools that are redundant or tools that are extended beyond their intended use (e.g., Excel).

By understanding your current state and who your key users are, you can begin designing a solution that will maximize value to your end users, which will boost user adoption and help you hit your target key performance indicators.

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→ **3**

**DEFINE YOUR NORTH STAR.**

Painting a picture of the desired future state will help you identify the path to realizing your vision. This includes making technical decisions around the platform, forming ecosystem partnerships, building internal capabilities, and sustaining the solution. Having a vision of the North Star will also help align the team and clarify the potential ROI.

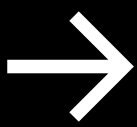
You can also break down the North Star into People, Process, Data and Tools to readily see the gaps between the current and future states in each of those areas.

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→ **4**

**BUILD A SOLID FOUNDATION.**

The requirements you gathered will inform the digital twin you build. As a foundation, it must be adaptable and highly scalable; the goal is not to accumulate a mountain of technical debt. Identify quick wins by mapping out tasks with low effort but high value. Your teams can then prioritize features and build out the roadmap for the next 3–5 years.



# 5

## SCALE.

To scale your digital twin solution, you need to consider many strategic decisions, including:

→ **Internal capabilities**

Are you interested in building your own internal capabilities through upskilling or hiring, or would you prefer to leverage your vendor ecosystem to do the development work?

If you want to build your own internal capabilities, you need to identify the high-priority skill sets (e.g., product owner, scrum master, UX/UI designer, Unity developer, etc.). You can also consider a hybrid scenario where you leverage niche vendors for specific skill sets that will augment your core team.

→ **Ecosystem**

Do you have vendors and partners that can help you accelerate velocity and cover any gaps (in skills or technology) in your organization?

Does your ecosystem include a blend of system integrators (SIs) and niche vendors with highly specialized skills?

→ **Use cases**

Are you carefully considering the business value of your solution? You need to repeat the first four steps continually to build an inventory of use cases that can scale and maximize impact.

→ **Technology**

Does your solution leverage a platform that will have long-term support, is extensible and includes low-code options? Choosing the right platform to build on is critical for scalability to capture ROI. Make sure you have the foresight to choose technology that you can grow with, and that offers customer support, should you need it in the future.



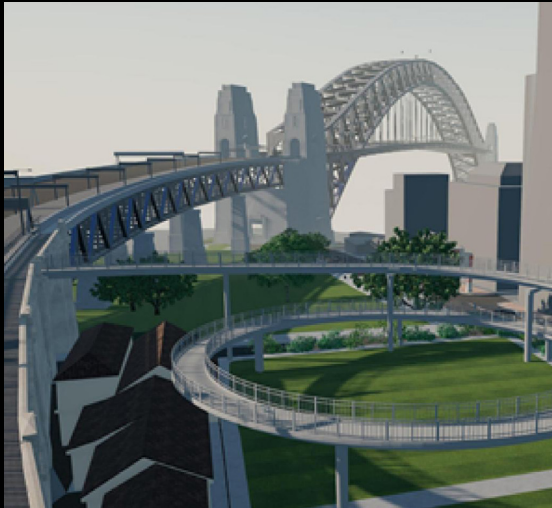
# SAMPLE USE CASES

## WIND FARM DIGITAL TWIN

Establish a digital twin of a wind farm by combining geospatial data, IoT, 3D assets, asset management system and more. Enable real-time alerts and access to historical data through connecting to cloud services, whether it is through Azure, AWS or GCP. By adding 3D context to the vast amounts of data and an intuitive UI tailored to its users, engineers have a digital platform to share important information and collaborate. Leverage historical information and synthetic data to run simulations to become more proactive and predictive in decisions around maintenance, operations and optimization.

## PIPELINE INTEGRITY

Bring together datasets such as in-line inspection data, inclinometer readings, and geographical information system (GIS) data to create a pipeline integrity solution that will provide insights to assess pipe defects and highlight areas of interest to conduct root cause analysis on cracks, dents and corrosion.



## SYSTEM OPTIMIZATION AND VALUE CHAIN OPTIMIZATION

Build a digital twin of your entire system of facilities and streams of operations, create a workflow to digitize your piping and instrumentation diagram (P&ID), and solve optimization challenges through an AI-enabled digital twin that will increase throughput and maximize revenue in your operations.

## VR TRAINING

Leverage your library of 3D assets and digital twin to create VR training modules to train workers before they arrive onsite so they better understand standard operating procedure (SOP), enhancing safety in the workplace. Connect the VR training module to your learning management system (LMS) to track key analytics. Create your own VR training module through low-code tools and deploy to industry-standard devices.

## ROBOTICS

Increase safety and productivity by leveraging robotics to perform specific tasks. Teleoperate a robot to maneuver into hazardous areas to perform assessments. Leverage your digital twin for mission planning and deploy missions to the robots. Leverage robots to patrol secured areas and capture necessary data to update the 3D digital twin.





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# ABOUT UNITY

Unity is the world's leading platform for creating and operating interactive, real-time 3D content. Creators, ranging from game developers and architects to automotive designers, filmmakers, and more, use Unity to make their creations come to life. Unity's platform provides a comprehensive set of software solutions to create, operate and monetize interactive, real-time 2D and 3D content for mobile phones, tablets, PCs, consoles, and augmented and virtual reality devices.

The Unity Accelerate Solutions team offers custom development solutions for businesses in any vertical that need assistance. This world-class software development team collaborates with customers to architect robust, scalable digital twin solutions – based on Unity's products and platform – from ideation to delivery and support.

[Contact us](#) to learn more.



[unity.com](https://unity.com)