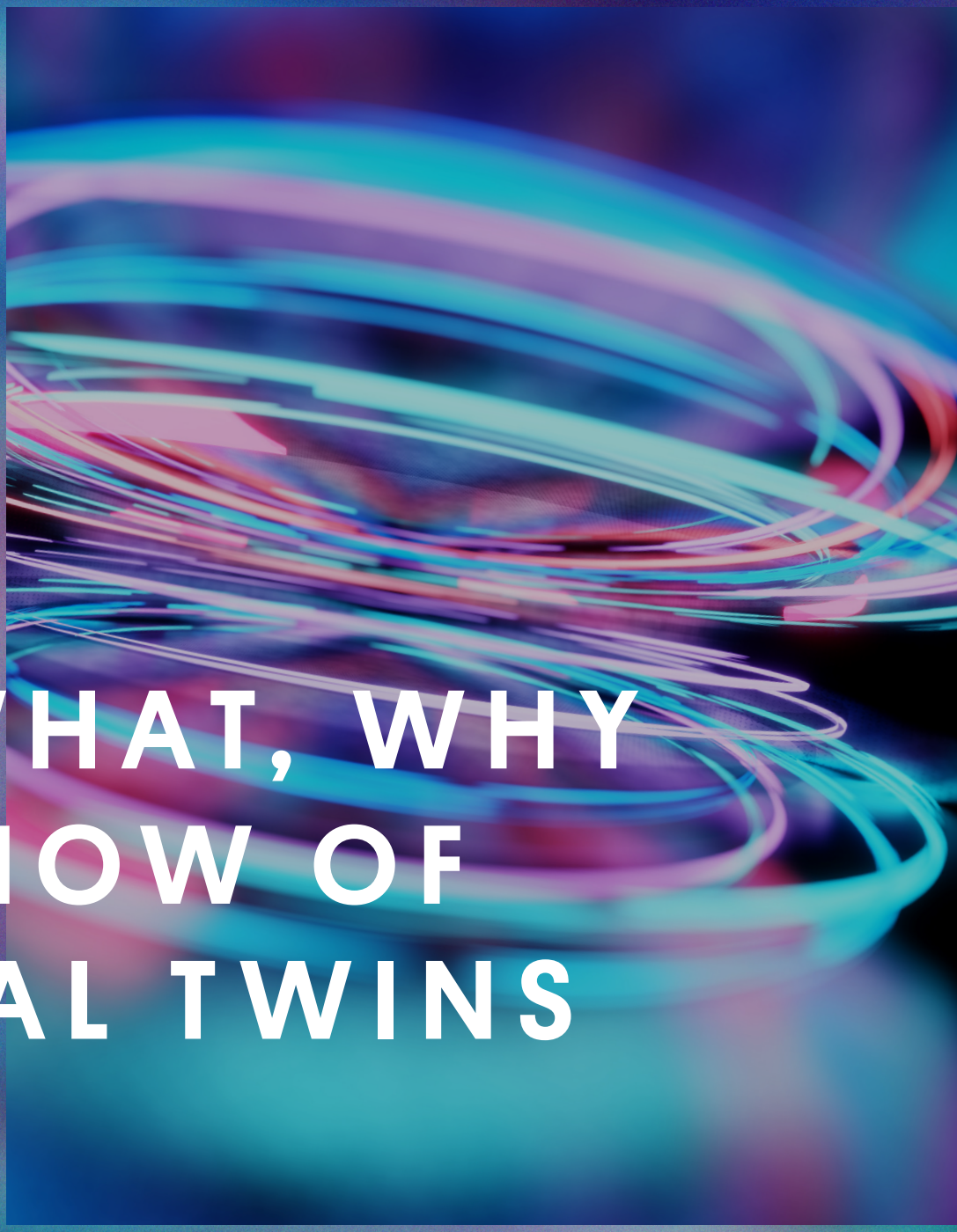
Unity



THE WHAT, WHY AND HOW OF DIGITAL TWINS

DIGITAL TWINS → E-BOOK

Learn how digital twins are helping the world build a smarter, safer and more sustainable reality.

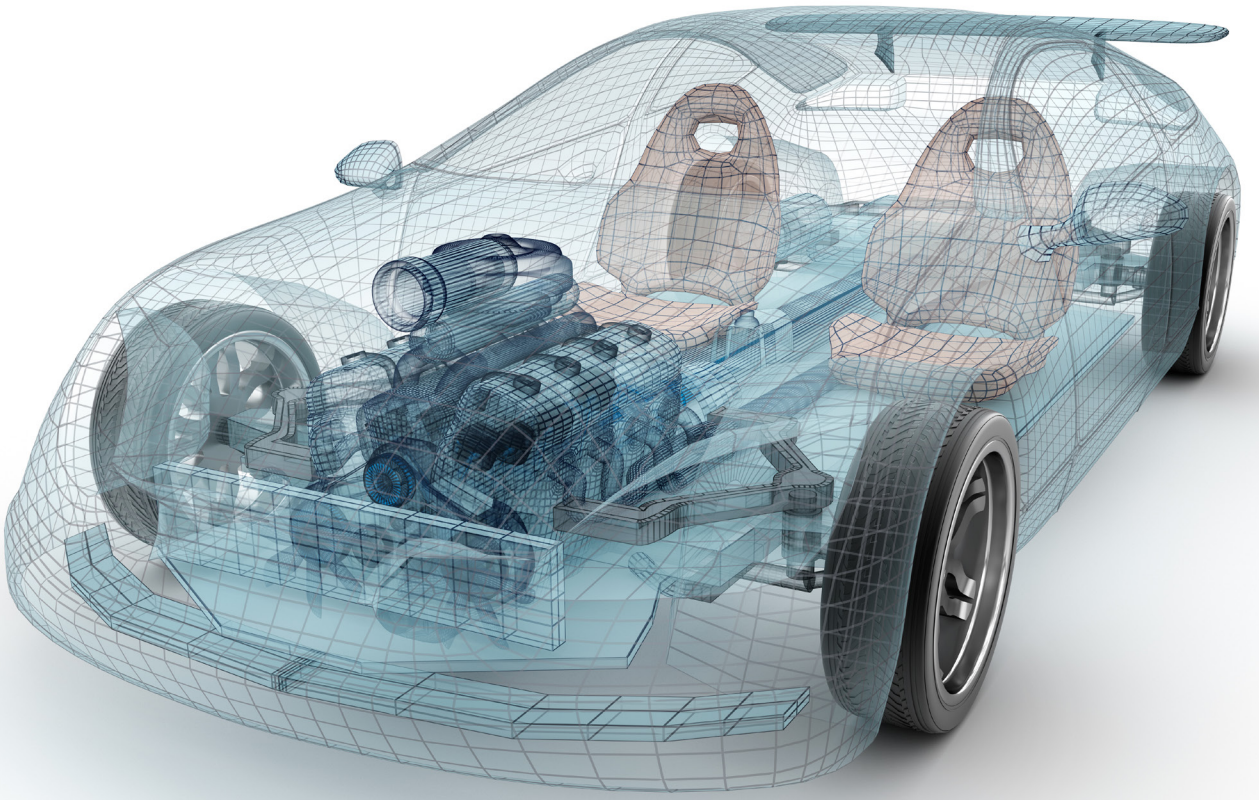
WHAT'S INSIDE

WHAT IS A DIGITAL TWIN?

RESOURCES

WHAT IS A DIGITAL TWIN?

A digital twin is a dynamic virtual copy of a physical asset, process, system or environment that looks like and behaves identically to its real-world counterpart. A digital twin ingests data and replicates processes so you can predict possible performance outcomes and issues that the real-world product might undergo.



HOW DOES A DIGITAL TWIN WORK?

The power of digital twins comes from connecting real-world assets with real-world data, so you can better visualize them. Digital twins enable cross-functional teams to collaboratively design, build, test, deploy and operate complex systems in interactive and immersive ways. They help companies understand the past, view present conditions, and prevent future problems. They inform decision-making through insight, analysis, simulation and prediction.

HOW ARE DIGITAL TWINS CREATED?

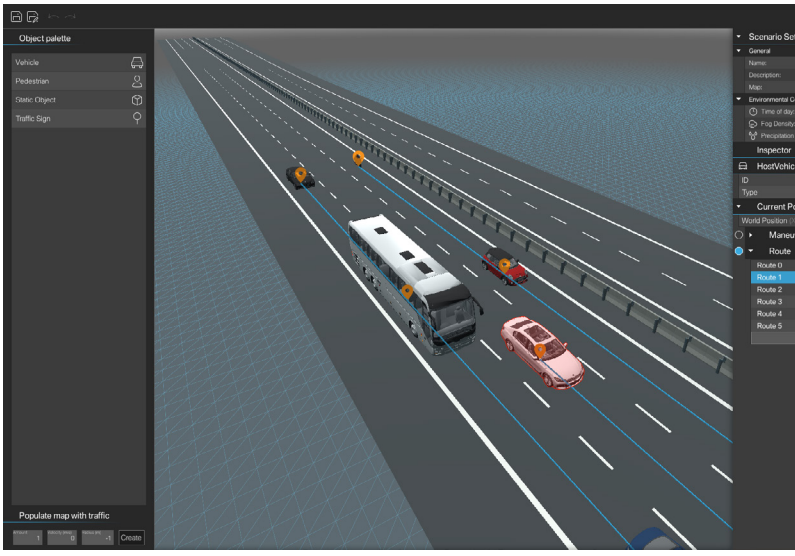
Digital twins are created by importing conceptual models (via BIM, CAD, or GIS) or scanning physical entities in the real world to visualize and analyze them in combination with enterprise and Internet of Things (IoT) data. A digital twin that is powered by real-time 3D – a computer graphics technology that generates interactive content faster than human perception – can also curate, organize and present multiple sources of data (both information and models) as lifelike, interactive visualizations.

Digital twins are virtual representations of the movements, forces, and interactions that assets can undergo in the physical world. This lets users engage with dynamic content that is three-dimensional and responsive to their actions in real-time. In this virtual environment, they can effectively simulate real-world conditions, what-if scenarios and any circumstance imaginable, and visualize the outcomes instantly on any platform, including mobile devices, computers, and augmented, mixed and virtual reality (AR/MR/VR) devices.

EACH DIGITAL TWIN DEPLOYMENT IS UNIQUE.

Deployments often occur in stages, with each phase increasing in complexity and business impact. A digital twin can range from a 3D model of a product component to a precise representation of a network or system as vast as a city, with each of its components dynamically linked to engineering, construction and operational data.

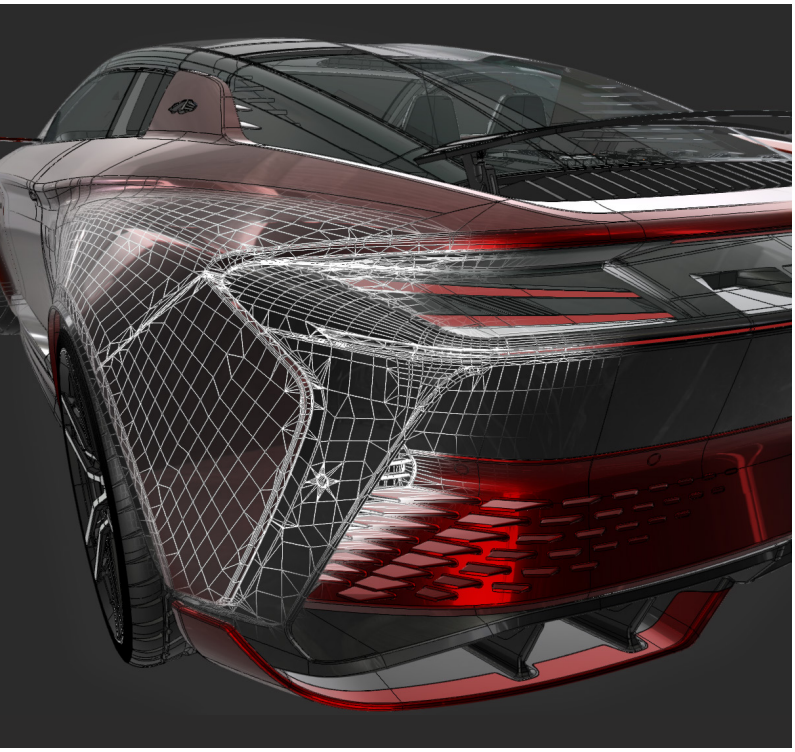
As teams across disciplines and locations design, engineer, build, sell and eventually operate and maintain complex builds, digital twins inform their decision-making at every stage of the lifecycle.



THE HISTORY OF DIGITAL TWIN TECHNOLOGY

The concept of using a digital twin as a means of studying a physical object was first pioneered by NASA during its space exploration missions in the 1960s. Each spacecraft was replicated at ground level to match the systems in space and used for study and simulation purposes. This technology was notably demonstrated in the Apollo 13 mission. Through the connected twins, Mission Control was able to quickly adapt and modify the simulations to match the conditions of the damaged spacecraft and troubleshoot strategies to bring the astronauts safely home.

In the early 1970s, mainframe computers were used as digital twin-esque systems to monitor large facilities such as power plants. In the 1980s, 2D CAD systems like AutoCAD emerged to produce technical drawings, making it possible to design anything with a computer, and were quickly adopted by



millions of designers and engineers.
By the 2000s, 3D CAD with parametric modeling and simulation enabled the design of more complex assemblies in more intelligent ways, like a database of interconnected objects.
Fast-forward to the mid-2010s when all leading 3D CAD vendors launched cloud-connected solutions, primarily for collaboration and project management, and gradually for generative design, although CAD tools remained desktop-based.

Our present day marks the genesis of the age of real-time 3D powered digital twins, going beyond dashboards and 3D models to unlock data from multiple sources on any device or platform for better collaboration, visualization, and decision-making.

BENEFITS OF A DIGITAL TWIN

With digital twin deployments, customers immediately realize improved access to data. As a digital twin matures, other benefits include reduced maintenance costs, more informed process change decisions with large potential savings, and improvements in maintenance and operational efficiency. Having better designs from the start pays dividends over a project's lifetime, as 80–90% of costs incurred during the production, use, and maintenance of a facility are determined at the design stage.

Using digital twins in the design industry has improved multiuser collaboration and communication. Preconstruction clients experience seamless aggregation of data and trade coordination.

The safety training, quality assurance and quality control that's possible with digital twins have significantly reduced accidents and mistakes in the construction industry. When digital twin initiatives are used for maintenance and operations, the benefits include optimized operations, reduced downtime, and decreased maintenance and personnel costs.

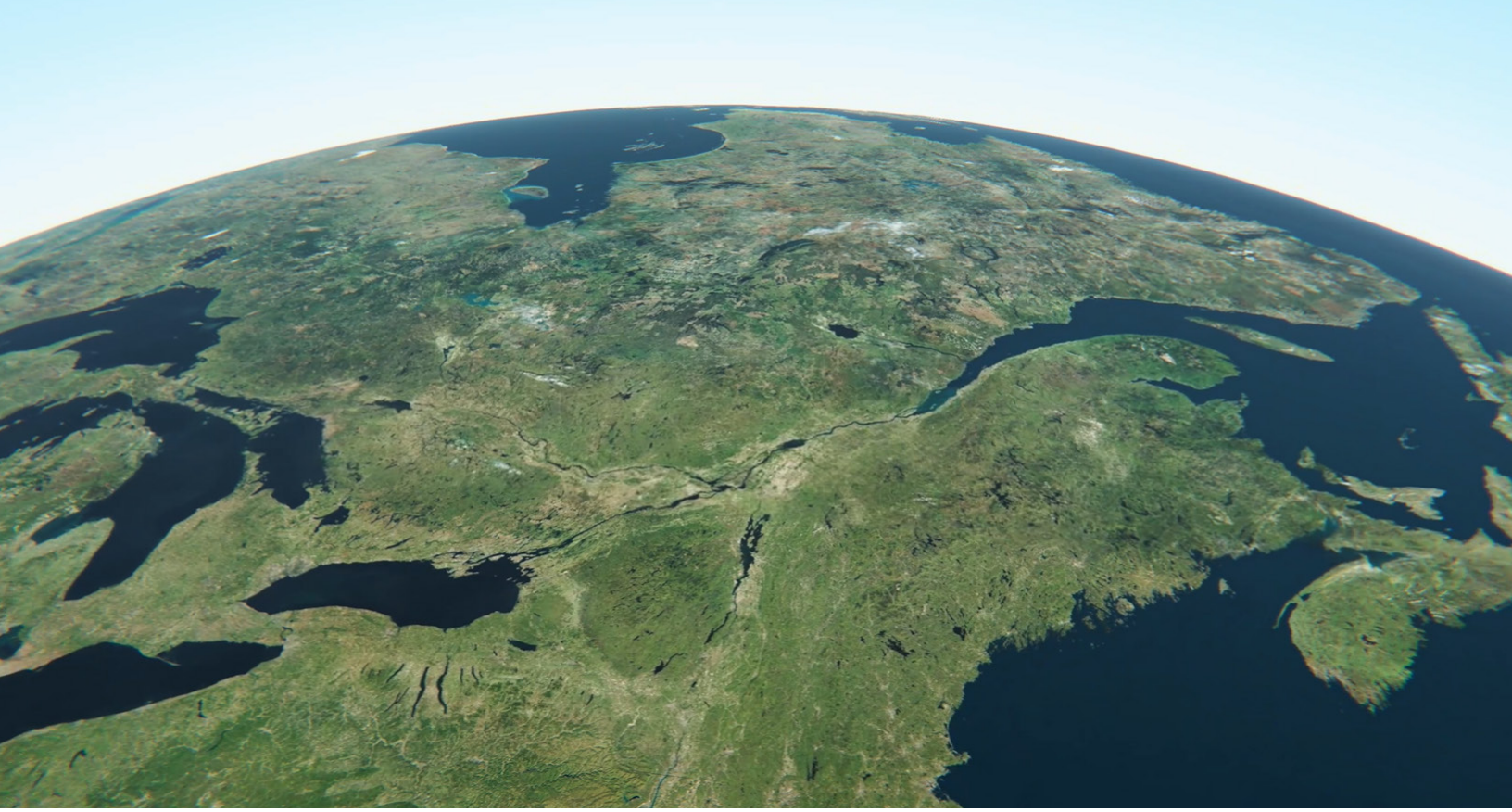
The ability to interact with data in real-time is changing the way people make design, operations, and maintenance decisions. The power to visualize and simulate complex operations in real-time 3D has elevated how people interact with their assets, transforming the way every physical space and asset on the planet is created, built, and operated.

DIGITAL TWIN CHALLENGES

It's one thing to gather extensive data, but it's quite another to consume it in an intelligent way. The best decisions are made using data, but your data is only as good as your ability to bring it to life to simulate and predict business scenarios.

Every enterprise going through a digital transformation risks drowning in raw data before finding a way to process and leverage it. Today, capturing raw data is less of a challenge than processing it, filtering the useless parts, combining it, and transforming it into information that makes sense to the user in the context of their application.

The main challenge is unlocking the power of information. Enterprise and IoT data has been buried in databases, spreadsheets, and models (CAD, BIM, GIS). Real-time 3D digital twins can bring that data to life.



THE FUTURE OF DIGITAL TWINS

Increasingly, products, equipment, factories, buildings, and cities are no longer merely things in the physical world – they have accurate virtual counterparts. Even people have digital twins. We will experience the next iteration of the internet – and the connectedness of systems, devices, people – in the metaverse via real-time 3D.

The metaverse is unlocking a new economy with countless opportunities for immersive experiences in cross-digital and hybrid reality spaces, whether it's to manage facility updates or customize a vehicle purchase.

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As teams across disciplines and locations design, engineer, build, sell and eventually operate and maintain complex builds, digital twins inform their decision-making at every stage of the lifecycle.

EXAMPLES OF A DIGITAL TWIN

Creating smart, sustainable and safe cities

Learn how Sitowise is rethinking future infrastructure and buildings to create safer environments for daily living using digital twin simulations.

Read more

Reimagining Paris with the power of real-time 3D

The evolving digital twin of Paris is casting the city in a new light, deeply engaging its citizens in its urban development.

Read more

JUMPSTART YOUR DIGITAL TWIN TRANSFORMATION

Find everything you need to support your product or building lifecycle. Check out some of Unity's products and services for digital twins

Unity Industrial Collection

Purpose-built for customers in industry, this suite of foundational tools makes it easy to prepare data from 3D design and modeling software.

Unity Reflect

A suite of products to create digital twin and real-time 3D experiences, including AR and VR, from BIM models to enable more impactful decision-making.

Pixyz

Pixyz provides best-in-class solutions to easily import and optimize large CAD, point cloud, and mesh models for creating real-time experiences in Unity.

Don't know where to start? Our Accelerate Solutions team of world-class designers, developers and industry experts can kickstart your digital twin transformation and bring your concept to life. Contact our team to find the solution that's right for you.

Unity Digital Twin