



Digital twins for supercharged decision-making

Private 5G networks enabling new use cases for government and business

Foreword

The realisation of digital twins is a combination of imagination and reality.

In the 1960s, we imagined going into outer space. A digital twin was just one of the tools used to make that happen: to ensure informed decision-making, supported by data, was available at important steps throughout each space exploration mission. That application drove the continued development of digital twins.

Today, what was imagined is now a reality and rockets are launched regularly into space.

Fast forward to our future, and digital twins will evolve to become an important tool for industries like cyber, health, manufacturing, infrastructure and planning that manage large, interactive systems requiring information in real time.

We are proud to be at the forefront of digital innovation: delivering multiple realities, powered by the 5G network, driven by imagination.

I trust this white paper provides you with useful insights and food for thought about your own innovation agenda.



Rob Le Busque

Regional Vice President

Asia Pacific, Verizon Business Group





What is a digital twin?

A digital twin is a virtual replica of a physical object, process or real-world system. It can mirror its counterpart in real time, or at least near-real time, using data from sensors in the physical system.

A digital twin can represent a building, logistics system, city, manufacturing process or even a person. The model can be updated and adjusted with incoming data sets, allowing it to represent actual conditions and enable informed decision-making.

Data from multiple models can also be blended to form a view across several real-world systems, leading to richer insights for business and government.

The evolution of digital twins

Digital models are not a new concept. NASA used the digital twin concept in its 1960s space program to create replicas of spaceships that carefully mirrored each decision made during missions. These digital models have become more sophisticated since then, with improved telecommunications and digitisation technologies enabling increased control and quicker reflection of the real world and associated scenarios.

Bridging the physical and virtual worlds using 5G-enabled sensors, Internet of Things (IoT) and data will lead to powerful connections delivering smart cities and smart industry solutions.

“The maturing and evolution of digital twins over the past 60 years is mainly down to the speed of the process,” said Rob Le Busque, Regional Vice President, Asia Pacific, at Verizon. “Digital twins started as static solutions that weren’t designed for efficiency. The model was built, then data was applied, then the analysis was undertaken manually.

“Fast forward to the 21st century, and 5G, Mobile Edge Computing (MEC) and ubiquitous IoT sensors will enable the instant classification and sorting of real-time data, which in turn enables interactive digital twins that turn this data into powerful decision-making tools.”

Why use digital twins?

The use cases for digital twins are many and varied, across both the public and private sectors. Digital twin technology is helping several industries reduce operational costs, increase productivity, improve performance and innovate new ways to operate.

One of the main uses of digital twins is running “what if” scenarios: to model what would happen, for example, if you run a production machine for a few more hours per day or rearrange the layout of a factory floor. This can enable companies to accurately predict the impact of changes more quickly and cost-effectively than running physical tests.

Digital twins enabled by 5G leverage a powerful combination of AI, data and digitalisation, creating seamless information for real-time decision-making. Public sector agencies, for example, can take advantage of real-time 5G modelling with digital twins beyond static infrastructure models. The overlay of new data allows access to greater potential from cities, citizens and critical infrastructure.

“Interconnecting digital twins may sound like science fiction, but they’re already being leveraged in commercial solutions for increased insights, greater efficiencies and cost savings,” Le Busque said. “We really are diving into virtual realms of possibility when we consider the applications of digital twins.”



Applications of digital twins

Digital twins have been used in the manufacturing industry for some time to assess impacts and identify issues on production lines. They are also used to stress test manufactured products for reliability and performance.

5G-enabled manufacturing digital twins will be able to aggregate design, manufacturing, production planning, maintenance, repair and operations data to allow complete simulation of an actual production process and enable “on the fly” decision-making, which in turn can generate more opportunities to reduce waste, speed up processes and limit energy use.

Governments are looking at digital twin technology for a long-term view of their cities. Interactive digital twins allow them to understand the impact of development decisions for years, or even decades, to come. Digital twins are also helping governments make better decisions on maintenance and where to invest in infrastructure.

For local councils, 5G modelling with digital twins allows the near-real-time analysis of event management and more accurate forecasting by modelling traffic congestion and population service needs. 5G-enabled digital twins can collect near real-time feeds from devices, sensors, citizens and infrastructure to provide this information instantly and accurately.

Retailers can now apply sensors to all aspects of their value chain, allowing for the monitoring of people and footfall in stores and among individual product lines, for insights into what people are purchasing. Accrued data enables near real-time decisions about discounting the price or increasing the stock of certain items.

The building and construction industry uses digital twins to support its safety-first objective and overcome issues stemming from changes or delays due to supply chain issues. Smart construction companies are using digital twins coupled with multiple on-site sensors and drones to assess development progress and the impact of potential changes.

Digital twin technology provides situational awareness for first responders, giving near real-time feeds from sensors that indicate weather conditions during natural disasters or civil unrest issues in law enforcement situations. Connecting first responders to existing digital twins can provide immediate situational awareness in a crisis. For example, a university with a digital twin model of crowd flows and facility usage could deliver real-time data to address incidents such as large protests, fire emergencies, or medical crises on campus, enabling faster and more informed response strategies.



\$120B

committed by the Australian Government for a 10-year infrastructure digitisation plan.²

Digital twins for complex problem-solving

Governments globally are under pressure to address complex challenges such as urban development and escalating cybercrime. Many are turning to digital solutions. The Australian government, for example, has committed \$12.9 billion to 110 strategically significant digital projects to enhance public services and infrastructure.¹

Digital twins enable seamless collaboration and information sharing across a range of stakeholders, from regulatory agencies to asset managers. They can also help governments better understand the costs of maintaining and updating critical infrastructure by using sensors to collect data in real time, then analyse these datasets without the need for inefficient manual measurement and human intervention.

Ultimately, complex issues, such as smart cities, require these integrated and data-driven approaches to enable long-term outcomes.

Digital twins for enhanced security

Digital twin technology is being used to improve security by better modelling the impact of cybersecurity attacks, mitigating risks to physical infrastructure and assets and supporting defence decision-making.

Cybersecurity threats are rising and new ways to mitigate the risk to physical infrastructure are required. Ultimately, a cross-border, multi-stakeholder and cross-domain approach is critical to tackle future cyber threats to cities, governments and citizens.

“Cyberhubs, like those introduced by the Australian federal government in preparation for the centralisation of its networks, aim to understand cyber threat impacts by digitising critical infrastructure and constructing models around it,” Le Busque said.

“The government has been piloting cyberhubs to inform a future whole-of-government operating model, and now, by leveraging digital twins, these models can help further strengthen network defences with greater insights and a more informed and enhanced decision-making process around cyberattacks.”

While digital twin technology is a security enabler, the increased number of connected devices in turn increases the attack surface vector, meaning security at the point of design is key.

“Naturally, by providing access to information that hasn’t been connected before, we’re widening the attack surface,” Le Busque said. “Security and resilience, in the form of systems that help mitigate risk by monitoring the entire network for malicious activity, are paramount considerations for connected digital twins.”

Verizon’s expertise in securing and ensuring resilient networks for enterprise and governments supports secure digital twin development.

Digital twins for supercharged decision-making

Meshing 5G, IoT and data to create blended worlds is supercharging decision-making for industry and government.

There are growing use cases and resulting benefits of interconnected digital twins, enabled by secure 5G networks.

Real-time 5G modelling with digital twins and the linking of digital and physical worlds, both public and private networks, has the potential to provide leaders with seamless information for real-time decision-making across natural disaster management, critical infrastructure and cybercrime impact modelling.

As the gap between the physical and digital worlds closes, 5G is generating exponentially more opportunities for improved security, operational performance and enhanced decision-making.

Digital twins and 5G-enabled innovation will continue to help transform business operations globally.

How 5G enables a more connected world

Unlocking the extremely high-bandwidth and low-latency connectivity of 5G is enabling more people, devices, sensors and data than ever to be connected.

“Previous network generations, like 4G, sometimes have difficulty handling many devices in the same location,” Le Busque said. “5G solves this issue by intelligently transmitting to each device, with high precision, which enables it to handle as many as 1 million devices per square kilometre.”³

5G will enable the spatial interplay of digital models with their real-world locations, so the physical world can be re-enacted digitally in almost real-time. IoT sensor devices will gradually become embedded within digital twin ecosystems.

“With the number of connected devices increasing at about 24% per year,⁴ 5G enablement will be critical, particularly for densely populated areas such as metropolitan cities,” Le Busque said.



24%

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Public vs. private 5G networks

Businesses are weighing public and private 5G network solutions, but the reality is that a combination of both will be required for certain digital twins to work effectively.

Private 5G networks deliver immediate benefits for enterprise and government applications where security and network performance are critical. They offer greater operational flexibility, lower latency and easier management.

The security requirements for many digital twin applications mean they may likely rely primarily on private 5G network solutions.

However, with public 5G networks now extending beyond metropolitan areas to suburban and select rural regions, they enable digital twins to connect with broader community systems. This helps to facilitate real-time data exchange with public infrastructure, services and stakeholders for enhanced decision-making.

A good example is Verizon's work with Associated British Ports (ABP) in the UK. ABP needed to streamline processes, have a consistent view of operations and enable new technology. In short, it was looking to move toward the faster, smarter decision-making. And, it started with a private 5G solution.

Stevedores drive new imports off the ships and into large parking decks for temporary storage. Ideally, staff used handheld devices to scan each car and track its arrival and parking location. But without consistent connectivity, staff had to log key pieces of information manually.

With the superior coverage provided by Private 5G Network, ABP can keep track of where every vehicle is, allowing the port authority to move cars off ships, into parking and out to buyers far more efficiently.⁵

Similarly, in the US, Verizon works with first responders to deploy 5G mobile towers and create a perimeter for a small private 5G network environment, but Verizon still relies on the public 5G network to communicate externally about the status of the incident.

Organisations could be considering how the power of 5G, IoT and real-time data for smart, fast, accurate and long-ranging predictions with a Private 5G Network can help them now, without waiting for a public 5G rollout.



The Verizon team were instrumental in not only allowing us to conceptualise the idea of our Private 5G Network, but also in the planning, the solution, the design and the application for spectrum in the UK.”⁵

Scott Sier

Head of Technology and Digital Experience, ABP



5 truths on your journey to private 5G

It's not just about speed

Private 5G networks are inherently secure and their connectivity can also enable you to monitor, analyse and improve on every aspect of your business operations.

It's not the same as public 5G

With a private 5G network, every business has its dedicated spectrum, which helps reduce interference and assures greater privacy and security for your operations.

It's not the same as Wi-Fi

Its mobile signal covers your entire premises evenly, indoors and outdoors.

It's not only for innovations

While a private 5G network can enable revolutionary changes, it can also be used to fundamentally improve the connectivity of your existing business operations.

It doesn't have to replace your existing infrastructure

There's no need to rip and replace everything. You can add 5G-ready devices to existing infrastructure.

For more information

For more information about a strong digital foundation that can help enable digital twins, including Private 5G Networks, contact your Verizon Business Account Representative.

Email apaccontactus@verizon.com. Or, visit [verizon.com/business/en-au/contact-us/](https://www.verizon.com/business/en-au/contact-us/)

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