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Growing use cases for the ever-evolving digital twin

A look at emerging use cases and keys to successful implementation

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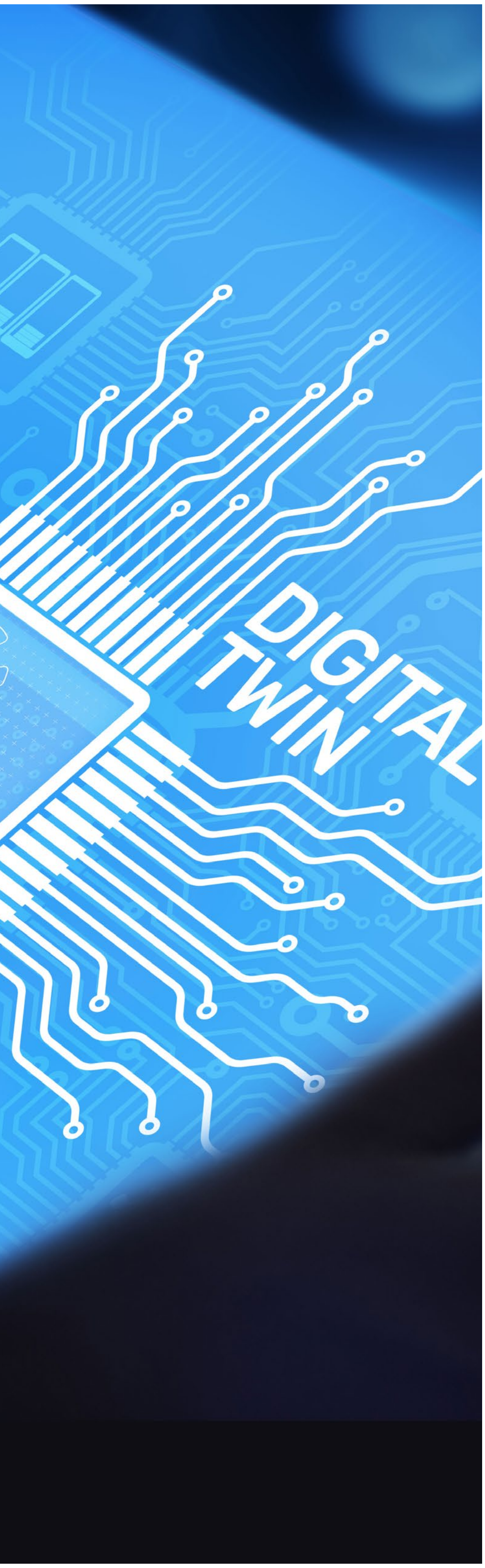

Executive summary

The initial paper in this series, The ever-evolving digital twin, discussed the digital twin's incredible benefits, if fully embraced and integrated within an organization's operations. This paper expands on that initial view to outline the ever-evolving use cases for the digital twin.

The growing universe of use cases

As digital twin technology advances and matures, the number of use cases grows almost exponentially. In fact, the amount of use cases is limited only by the imagination of the organization. As an example, let's look at some key digital twin use cases for an industrial or process manufacturer:

Product design: Combining the digital twin with AI, companies can enable an entirely new, intelligent and resilient product design capability. The physical manifestation of a product can be pushed closer to both the supply chain and the customer. Design and manufacturing cycles shrink from years to weeks, while creativity is unleashed across the supplier and customer ecosystem with realtime customer data feeding back into the design process. The advanced intelligence AI provides reduces costs of operations and inventory. It also enhances how companies respond to clients. For example, machine learning and other AI technologies enhance intelligence gathering, collaboration and logistics and supply chain management.

Product quality: Based on production data, a digital twin can simulate the product to predict the optimal production parameters for further processing steps, to guarantee the planned product quality. Product properties can be logged across its lifetime, making it easy to identify and address quality-related issues, eliminate expensive production steps or reproduce the entire batch.

Repair and maintenance: The execution flow of maintenance and inspection activities creates the potential for gaps, due to the disorganized nature of information among teams, systems and decision makers. This leads to costly, inefficient repair and maintenance activities—sometimes with engineers attending jobs that don't exist. The digital twin breaks down the information silos to gain all necessary information and improve efficiency. Applying AI and machine learning to the digital twin allows for this information to be analyzed for condition-based, predictive or prescriptive maintenance to optimize asset uptime and streamline maintenance operations.

Risk analysis and planning: Manual asset inspection methods are expensive, time-consuming and labor-intensive and can also pose safety risks. A digital twin can analyze risks to both people and assets to help prevent engineers from performing inspections in hazardous conditions. A digital twin merges asset data collected by IoT sensors and drones with other sources of asset data (such as the ERP or PLM systems) to provide a comprehensive, realtime view that significantly reduces the risk involved in asset operations and maintenance.

Sustainability: The digital twin allows an organization to model its products to ensure it is using the most sustainable materials available. And that it is operating its production facilities and supply chain as close to "net zero" as possible.

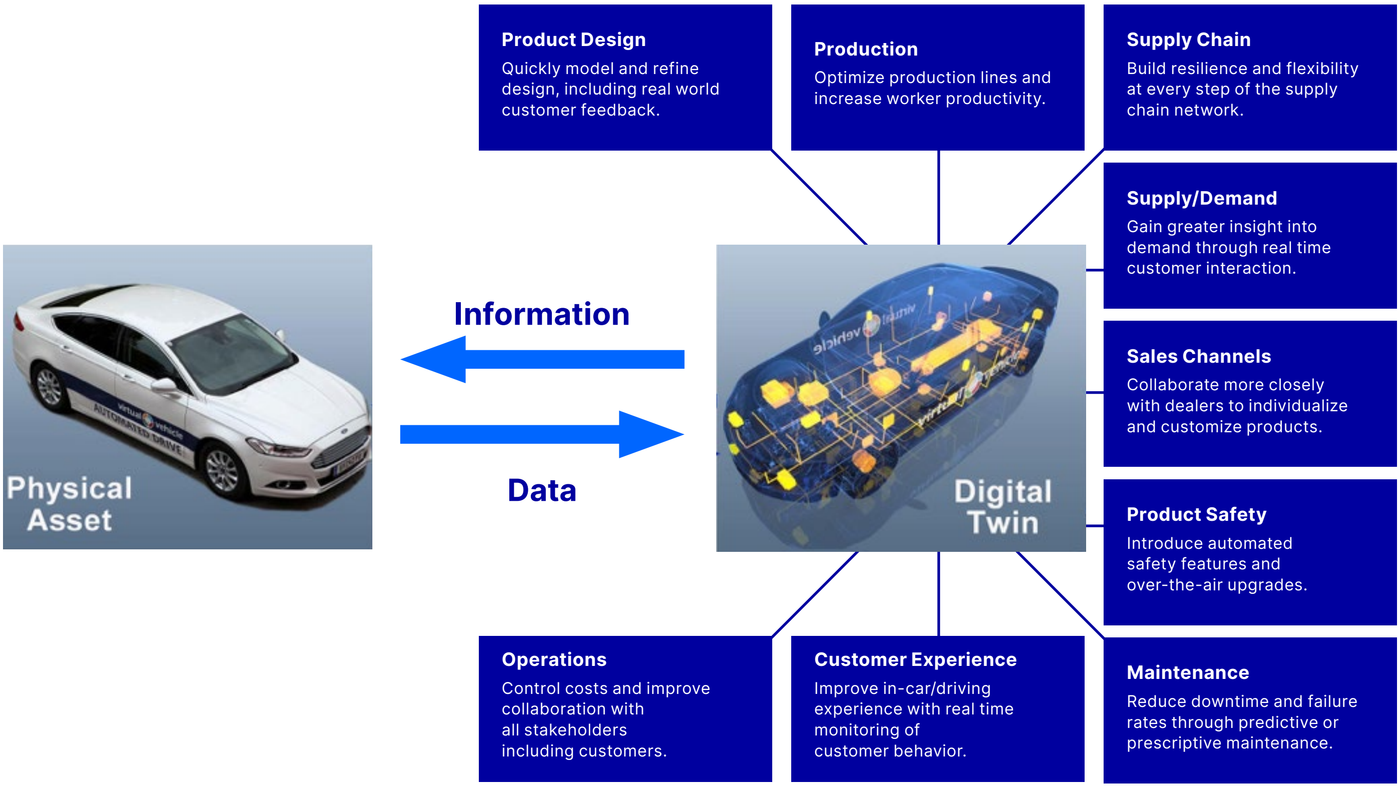

Figure 3: Key use cases in automotive

The challenges of successful deployment

With so many moving parts, deploying a digital twin, or more likely, a portfolio of digital twins is far from straightforward. Key challenges that every organization must address include:

Scalability: Gartner has predicted that the digital twin market will reach $183 billion by 2031,[1] with composite digital twins presenting the largest opportunity. Scalability has been an issue as digital twins move from pilot to production. Composable digital twins allow organizations to build libraries of pre-built functions and templates that can be ported from one twin to another. The result is that digital twin development can focus on capability requirements rather than the underlying technology, enabling the scalability needed for complex use cases.

Data quality: As the digital twin becomes more complex, the number of sources and volume of information grows. Of course, neither the underlying models nor any AI or analytical capabilities will function properly if they are fed bad data. The process of readying data to drive the digital twin is a massive challenge. It involves data extraction, synchronization and harmonization to deliver the level of interoperability needed to support various models and AI and analytics platforms, as well as to facilitate the realtime exchange of information with other enterprise and operations systems and digital twins. For many, the solution will be to create data lakes, where enterprise information management capabilities can be applied to prepare and manage the information needed to power the portfolio of digital twins.

1 Gartner, Emerging technologies: Projected revenue opportunities for digital twins. (February 2022)

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Deployment options: Early digital twins—especially parts-level twins—tended to be deployed at the edge (a range or networks at or near the user). If there was little need for intelligence, then the edge provided a cost-effective solution. More advanced twins are usually deployed to the cloud for performance and security reasons. Today, hybrid twin deployments that combine both edge and cloud-based digital twins are becoming more prominent. Deployment considerations are likely to be based on latency and performance requirements, security and control and the need to interoperate with other systems and applications.

Portfolio management: As organizations start rolling out digital twins at scale across many facilities and geographic locations, portfolio management is becoming increasingly important. It is estimated that large organizations could have more than 100,000 models and more than one million instances of digital twins in the next few years.11 These have to be controlled and managed like any other large-scale information communications technology program—with the model management, configuration management, version control and many other system management capabilities of large-scale complex systems.

The role of an identity-centric IoT platform

Many organizations focus on the process of connecting their physical assets through IoT sensors and devices. With a digital twin, the organization is effectively creating a digital ecosystem of which IoT is only one component. It also comprises connected people, systems and things.

Connected people	Connected systems	Connected things
The identity personas and lifecycle of everyone that interacts with digital assets and connected products: employees, suppliers, customers	The secure sharing of information between systems in the right format at the right time and to the right device.	Advanced IoT services for the many devices and things that need to connect and exchange information.

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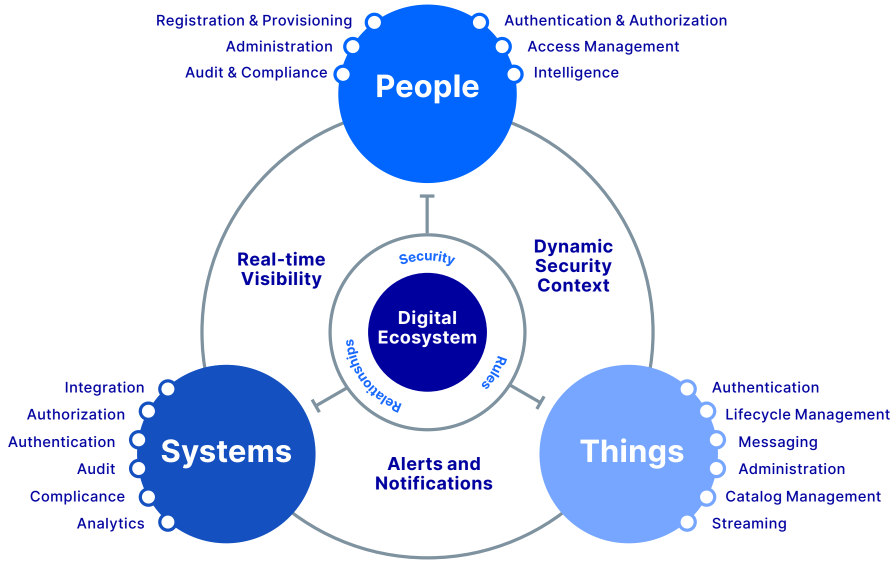

Figure 4: The "digital ecosystem"

This digital ecosystem must be built around a single digital backbone that connects and integrates with any person, device or enterprise system. It must support bringing together the big data, information management, IoT, analytics and AI needed to support modern business cases.

The basis for deploying and managing a digital ecosystem is the enterprise-wide IoT platform. The key for those looking to exploit a cloud-based IoT platform to drive their digital twin deployment is delivering security for the entire digital ecosystem, while ensuring that everyone who needs it has access.

Taking an identity-centric approach to IoT allows for the development of an IoT platform based on the following capabilities:

- Secure device management: Protects all operating assets by automatically and securely provisioning, managing and retiring IoT devices across your asset base.
- Ecosystem integration: Integrates and delivers seamless information flow across industrial enterprise systems. This enables the seamless exchange of sensor-based information with key business systems (such as ERP, WMS and TMS) and with people inside and outside the organization.
- Unified messaging: Aggregates information from disparate systems to obtain a single data feed to enable any-to-any communication. This provides complete transparency, governance, data tracking and visibility.
- Actionable insights: Applies artificial intelligence and machine learning to monitor condition, boost performance and maximize availability of serviceable equipment and assets.

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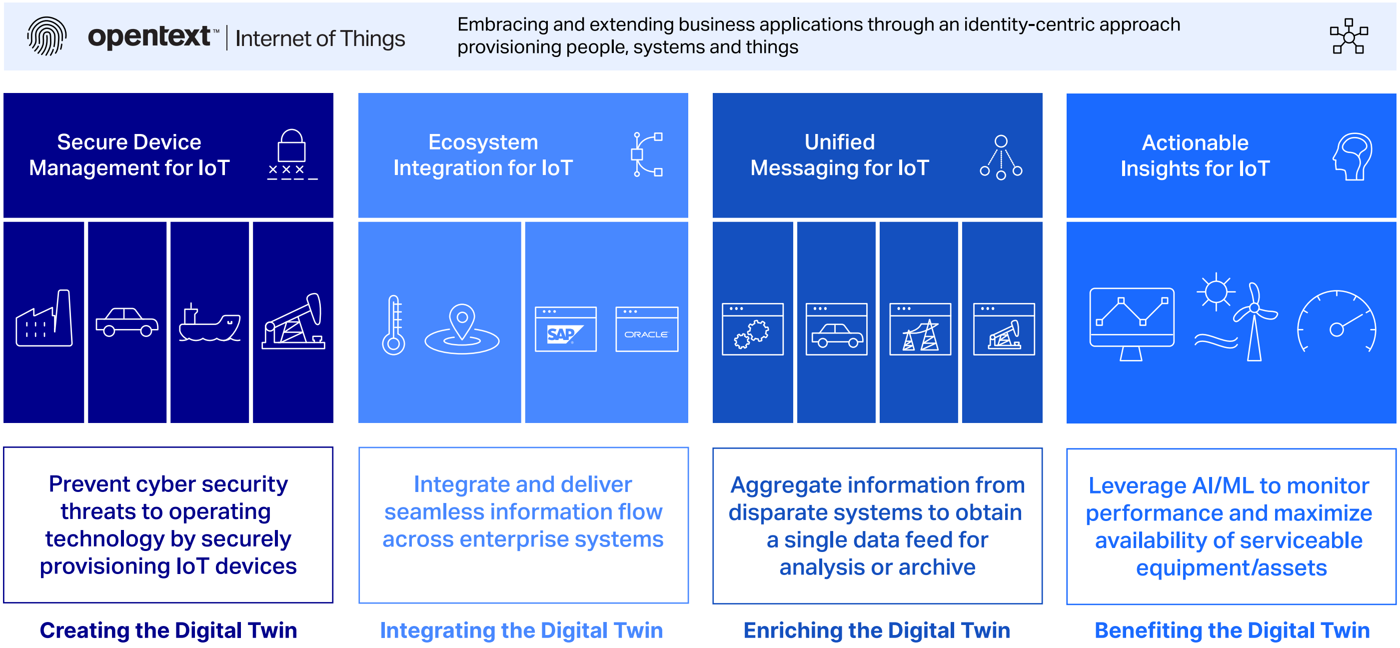

Figure 5: The IAM-driven IoT platform

Learn how to get started with digital twins:

- Read The ever-evolving digital twin, the first paper in this series
- How do you create a digital twin? blog
- The OpenText Internet of Things Product Overview

Ready to get started?

- Check out the IoT Developer Trial!
- Contact us

The digital twin: A minimum requirement

The digital twin is becoming a pivotal element as organizations worldwide continue their digital transformation journey. Technologies such as AI, IoT and big data have gained a good deal of attention for the potential value they can deliver to an organization. The digital twin is, in essence, a convergence of all these transformative technologies within a single, digital solution. This gives it the power and flexibility to address almost any business case in ways that no single technology could achieve.

This is becoming a minimum requirement—and any organization that hasn't begun investing in the digital twin should start without delay.

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