Digital Twin: Bridging the physical and the digital worlds

Solution Brief

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The Digital Twin Consortium

The Digital Twin Consortium™ was formed under the Object Management Group to enable cross industry collaboration, to learn from one another and to help develop and apply best practices. Among other activities, the Consortium:

- Coalesces industry, government and academia to drive consistency in vocabulary, architecture, security and interoperability of digital twin technology
- Advances the use of digital twin technology in manufacturing, infrastructure, aerospace and natural resources, among other industries.
- Support focused teams working to accelerate projects like taxonomy types, platform stacks, security and trustworthiness, and the development of uses cases within the key industry sectors of aerospace and defense, infrastructure, natural resources, and manufacturing.
- Influences standards by deriving requirements that will be submitted to international standards development organizations, such as Object Management Group and ISO/IEC.

Digital Twin Consortium is open to any business, organization or entity with an interest in digital twins. Its global membership is committed to using digital twins throughout their operations and supply chains and capturing best practices and standards requirements for themselves and their clients.

Accelerating digital transformation

Digital twins, the virtual counterparts of physical assets, are created as digitized duplicates of machines, equipment, physical sites and more. These digital assets can be created even before an actual asset is built physically. When combined with real-time, historical or simulated data, digital twins can provide valuable insights into the design, operation or decisions relevant to that object, system or organization.

The Digital Twin Consortium characterizes the digital twin concept as a bridge between the physical and the digital worlds. This concept is not new, but the underlying technology has sufficiently advanced to provide extremely high-fidelity twins with capabilities previously unimaginable. Industry analysts predict that within the next few years, digital twins will represent a significant increase in products and processes.

Digital twins draw on a wide range of enabling digital technologies, including artificial intelligence, machine learning, modeling and simulation, the Industrial Internet of Things (IIoT), 5G communications networks, and new compute models, including Edge computing.

The use cases

Digital twin use cases span all industries. They have been used in aviation, the Mars rover, smart cities, the human heart, supply chains, pharmaceutical development, and more use cases are being adopted every day. A digital twin can be a representation of a physical asset or a logical representation of a system, such as a supply chain. Digital twins provide a single solution that integrates design insights, predictive maintenance, factory visibility and supply chain optimization throughout the entire product lifecycle.

In general, every industry can benefit from digital twins. Early adopters leveraged digital twins to accelerate time to market by mitigating the risks associated with cost, safety and prototyping that previously required physical assets to be built.

For example:

- Aerospace companies use digital twins to reduce physical prototyping and maintenance costs, improve airplane performance, and speed decision cycles.
- Manufacturers use digital twin to accelerate product development, reduce defects, troubleshoot equipment and decrease manufacturing costs.
- Healthcare organizations use digital twins to simulate the human body for personalized treatment, monitor vitals remotely and enable remote diagnosis.

The enabling technologies

At a foundational level, technological advances in computing, data storage and communications networks have been the tipping point for digital twin adoption. At a more granular level, advances in other enabling technologies have cleared the way: Artificial intelligence and machine learning; advanced modeling and simulation; augmented reality (AR) and virtual reality (VR); security; and of course, Edge/IIoT.

Edge computing, by which we mean bringing compute power closer to where data is being generated and processed, is a topic that has the attention of many organizations. Business leaders are looking to make faster decisions and effectively manage their cloud spend. While it is true that longer term retention of streaming data and the requirements of AI/ML systems often benefit from pooled data, we are noting a new trend – deployments which leverage a hybrid approach driven by data persistence requirements. While low latency applications, data sovereignty or regulatory requirements may mandate local storage, new technologies like 5G and Wi-Fi 6 connectivity, along with on-premises offerings by service providers, are enabling a distributed edge architecture that can extend from the traditional edge to the cloud.

When designing and deploying digital twins for manufacturing and industry, there are two types of Edge computing that are very helpful.

The first is computing at the Industrial Edge, which often requires hardened devices that sit on the plant floor and can operate in ruggedized environments. These systems are used to connect to and pull data from the plant floor, which is used to maintain a dynamic model that reflects operational conditions.

The second type is the Enterprise Edge, where on-premises, enterprise-grade compute, storage and networking infrastructure is needed to handle the data and compute workloads required for implementing a digital twin. Increasingly though, we are seeing deployments that leverage a hybrid approach driven by data persistence requirements. Low latency applications, data sovereignty or regulatory requirements may mandate local storage, while technologies like 5G and Wi-Fi 6 connectivity, along with service provider cloud offerings, are contributing to a distributed Edge architecture.

Modern data storage requirements will increasingly be distributed in nature extending from the far edge to the private/public cloud. As the number of digital twins in operations increase; security, latency, bandwidth restrictions and cost will drive a broad range of storage architectures. These include newer hybrid enterprise/cloud storage, streaming data, object data stores along with high-performance storage in support of AI/ML and advanced analytics.

Dell Technologies and the Digital Twin Consortium

Dell Technologies is one of the founders of the Digital Twin Consortium. With a seat on the board, co-chairs of three working groups, and participating customers and partners, Dell Technologies has a leadership role in the Consortium. This position offers opportunities to set the vision, influence the scope and support customers in deploying digital twins successfully.

“Dell Technologies is proud to be one of the founding members of Digital Twin Consortium,” says Vish Nandlall, Vice President, Technology Strategy and Ecosystems, Dell Technologies. “As the rate of digital transformation continues to accelerate, industry-standard methods for digital twins are enabling large scale, highly efficient product development and lifecycle management, while also unlocking opportunities for new value creation.”

To learn more

For additional information, please visit: DellTechnologies.com/Edge.