



**Digital Twin 101  
Introduction to Digital Twins**

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**Intro**

This document will serve as an introduction into digital twins. There will not be an associated activity in Vuforia Studio associated with it; this will be focused on providing background information about digital twins before you dive deeper into digital twin use cases with AR.

**101.1 What is a Digital Twin?**

By definition, a digital twin is a digital model that virtually represents a physical product, operational process, or task. A digital twin is not just a digital copy of something, though. Each digital twin has data associated with it, and without connected data, you do not have a true digital twin. Digital twins are unique to a specific product, process, or task. This means that if you just have a CAD model of a product, say a quadcopter, then you do not have a digital twin. There are hundreds of thousands of quadcopter drones in the world that all look the same. What then would make the CAD model a true digital twin is when data from one specific physical quadcopter is added to the model. It then has data telling the entire digital thread story of the product.

Augmented reality allows you to take a digital representation of a physical object and place it into the real world for data connectivity, which is what you will learn more about as you go through this series of activities. Digital twins can be accessed by scanning a code, which can come in many different forms, on your mobile/wearable device which will load and prepare the experience for viewing in AR. Examples of things that can be scanned are VuMarks, an image that gets a URL encoded in it, much like a QR code, that can be customized for your company’s logo, ThingMarks, PTC-branded VuMarks that come by default with your Vuforia Studio subscription, bar codes, basic QR codes, or any image that can be serialized with a URL.

In addition to the case described above where there were multiple digital twins for the same model of a physical object, augmented reality also allows for multiple digital twin experiences to be placed inside one AR experience. For example, there could be a single AR experience that has one experience for reading one set of data for an object, and then another experience could be about performing maintenance on that same object. These are just a few short examples of digital twin structures; you will learn much more as you continue to go this tutorial series.

**101.2 What is the Digital Thread?**

The digital thread is a single source of data truth creating consistency, collaboration, and alignment across functions by real-time data synchronization of related upstream and downstream derivative information. This scalable common set of democratized data enables enterprise-wide accessibility and continuity across products, processes, and people ([PTC](https://www.ptc.com/en/industry-insights/digital-thread)). In simpler terms, the digital twin is the combination of data from across the lifecycle of a product. It brings homogeneity across product data along its business processes. The typical path along the digital thread follows its design inception through engineering and product lifecycle management, manufacturing instructions, supply chain management, service histories and customer events.

The digital thread is a necessary piece of creating a digital twin. Digital twins take in the data that comes from a real, physical thing’s digital thread and creates a digital representation of that data. Data from the digital thread can then be accessed using that digital twin.

**101.3 What Do Digital Twins Enable?**

Below is a list of just some of the things that digital twins enable:

* Utilizing digital thread data for a physical product in the digital twin
* Storage of product history pertaining to maintenance and work instructions
* Different configurations of the same model
* Intelligent design suggestions based on service history
* Predictive maintenance alerts
* Remote access and much more!

**101.4 Scaling Digital Twin Experiences Series Overview**

*What we need here is an introduction to how this tutorial series will address the subject i.e. scaling digital twins.*

*We should start by talking about the existing Studio experience and how this provides a simple way to create bespoke one-off experiences. The content, the context (targets etc.) are all encapsulated inside the experience. But what happens when we add another product? Or a variant to the product. Do I need a new experience, otr can I take my existing experience and separate the experience itself (the behaviour) from the data.*

*In this series of tutorials, we will show you how to do just this. We will start with a simple experience that begins with the data itself – how to prepare the content that will drive our AR experience. These lessons will show how, using tools like Creo Illustrate or upstream PLM tools like Windchill and Creo Parametric, you can include useful metadata that can later drive the experience. Following this approach, you can write login within the Studio experience that will adapt automatically to the data is loaded.*

*We will then look at how to externalize the data i.e. instead of it being encapsulated into the experience, the data resides in some external data storage. Now, when the experience starts, it downloads the data it is instructed to view.*

*Finally, we will show how to parameterize the experience such that all of these decisions can be made when the experience starts or is running.*

Throughout this series of tutorials, you will learn about the IRS, or identity resolution service, which is used for mapping digital twins to their unique experiences, connecting an AR digital twin to ThingWorx, object configurations, ThingWorx content storage, and more! The sections you will see will be as follows:

* Scaling Digital Twin Experiences 201 – Configurations with Application Parameters
* Scaling Digital Twin Experiences 202 – Configurations with the Identity Resolution Service
* Scaling Digital Twin Experiences 301 – Configurations with ThingWorx and the IRS
* Scaling Digital Twin Experiences 301 – Configurations and Content Storage with ThingWorx