



# The industrial metaverse in the automotive sector

When the real and digital worlds unite



**The automotive factory of the future will undoubtedly be hyperconnected.**

A prime example of this is the digital twin: an exact virtual image of a vehicle or production plant that allows manufacturers to simulate and therefore optimize all processes across the production lifecycle. The industrial metaverse is the next step in collaborating in an immersive environment, and it's ushering in a new digital era. The fusion with environment, and artificial intelligence (AI) is ushering in a new digital era that will change manufacturing.

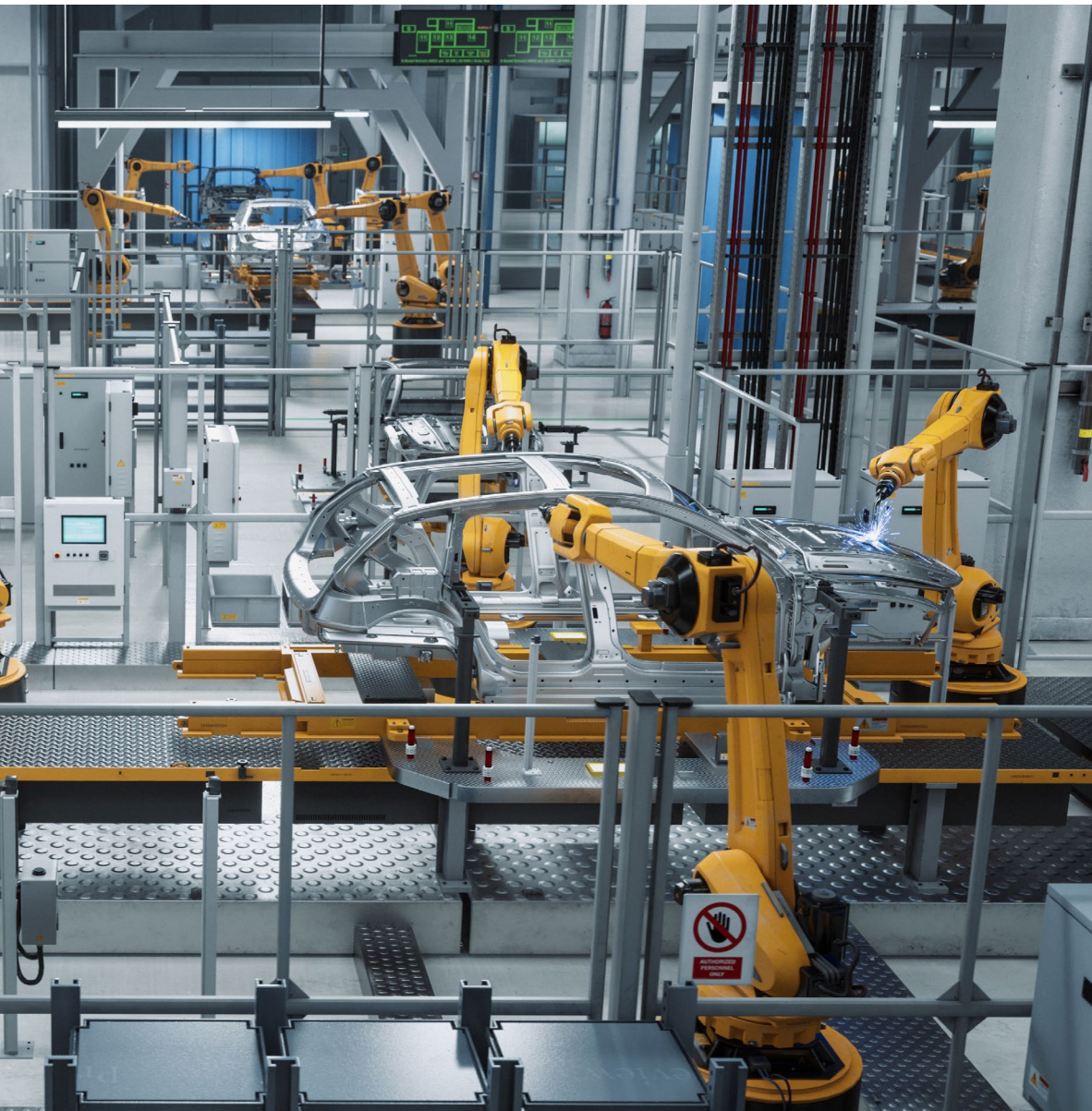


# A shift in focus from efficiency to adaptability

In the networked world of modern factories, machines must do their work as efficiently and sustainably as possible. However, it's becoming increasingly important to be able to adapt quickly to new conditions and share knowledge with other systems.

There are two main reasons for this: one is that the need for flexible production in variable quantities is becoming louder in many branches of industry. The other is that it's only by intelligently linking and evaluating all data collected that production steps can be coordinated flawlessly, resulting in simplified workflows and optimized supply chains.





# The automotive industry is driving the development of smart factories

The automotive industry is playing a pioneering role in developing smart factories. Original equipment manufacturers (OEMs), such as BMW, Daimler and Volkswagen, and major suppliers, such as Bosch and Siemens, have a high demand for the traceability of components across the various production stages.

Then there's extensive pressure to optimize the entire value chain to such an extent that, for example, all process steps are seamlessly interlinked through accurate predictions.

These factors have led to major players in the automotive sector having to deal with the concept of the smart factory at a very early stage.

# Strong competition compels continuous improvements

Given the nature of the industry, ongoing improvement is a must. A good example is the launch of a new vehicle model: it can take months before the production chain for a new car is technically in place, from the supplier to final assembly.

This is because many machines are designed and built for a specific product, and software is often rigidly coupled to equipment, so it's difficult to transfer to new processes.

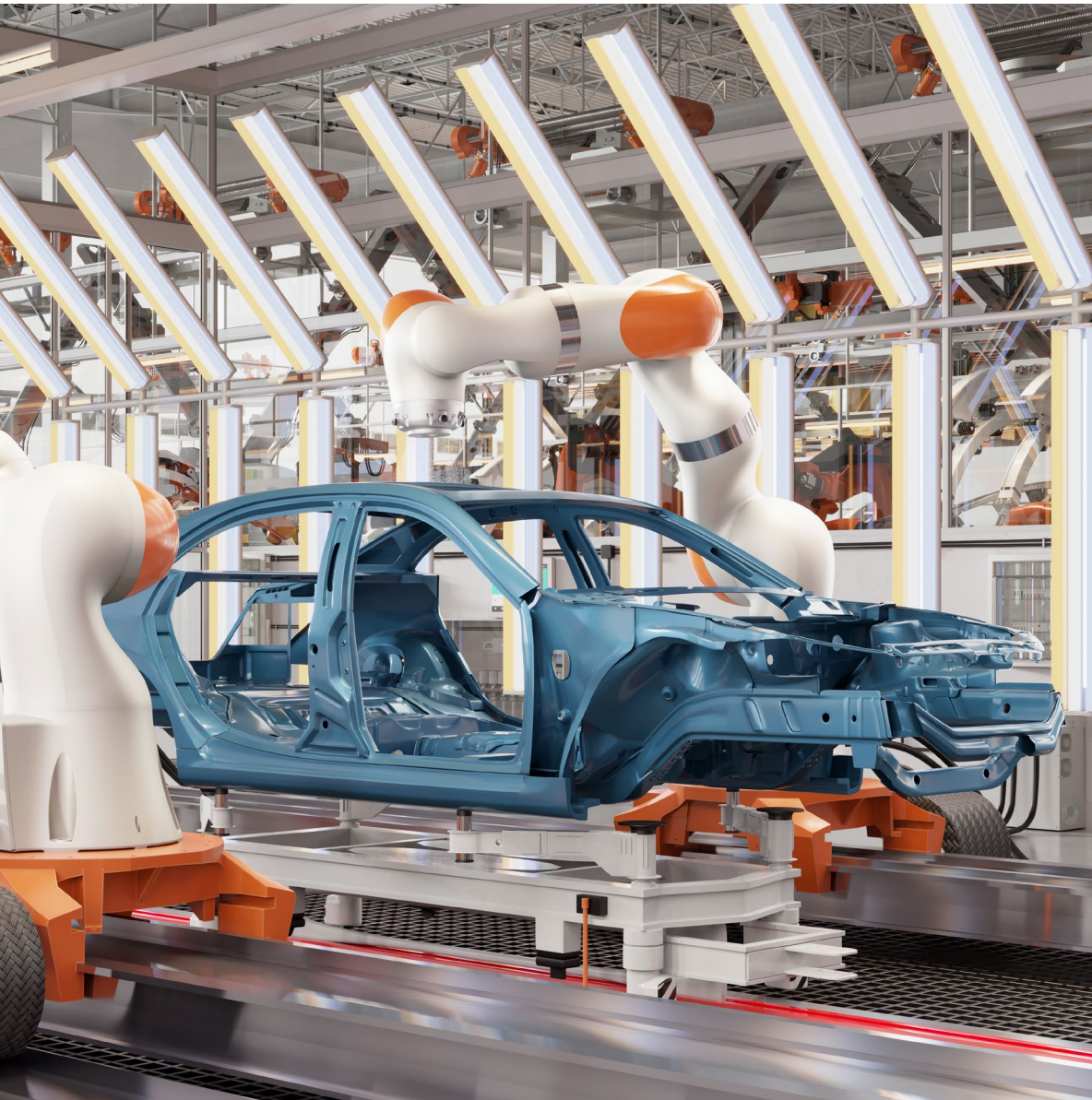
Apart from classic production lines, programming a robotics system for multiple scenarios takes weeks, if not months.

Considering the investment required for such a transition, it's clear to see how these factors affect both time to market and return on investment (ROI).

It's not much different when it comes to replanning a factory: without modern tools, potential problems – such as concrete columns interfering with radio coverage – are difficult to identify in advance, which means that time-consuming and cost-intensive improvements have to be made later.

To overcome all these challenges and continue to produce high-quality vehicles, automotive manufacturers are looking to simulate a realistic planning and deployment lifecycle for each factory within their global production network – and this is where the industrial metaverse comes into play.





## What is the industrial metaverse?

The industrial metaverse is a fusion of the digital and physical worlds to increase efficiency in engineering and manufacturing.

The vision is to enable real-time collaboration and spatial contexts in industrial environments. Key technologies include the digital twin, but other building blocks such as robotics, IoT, immersive engineering design, and augmented and virtual reality (AR/VR) play a critical role, along with AI-powered simulations.

# Real-time flow of information between physical and digital environments

Computer-aided design (CAD) has been around since the 1950s; computer-aided manufacturing (CAM) followed soon thereafter. So, it would be wrong to say that this technology is entirely new.

What is new, however, is the seamless communication between the two worlds.

Instead of designing a product digitally then moving to a physical prototype, information can now flow both ways. Prototypes can be tested virtually with VR headsets or AR goggles while physical objects are scanned and manipulated on a computer screen. Data flows from the physical environment to the virtual, and virtual instances can control their real-world counterparts – all in real time.

The advantages of this approach are clear:

## Faster solutions

The industrial metaverse can create an instant digital twin that allows experts in any location to work together on a manufacturing plant or vehicle model with access to the same data and digital history – and to the same degree of accuracy – as if they were there in person. This type of collaboration enables faster decision-making and, therefore problem-resolution. In addition, by removing barriers like cumbersome manual processes or a lack of knowledge of the space or various objects in that space, it also allows previously unsolvable problems to be solved. The result is a smaller margin of error in production, shorter lead times and fewer returns.

## Lower cost

Automakers can use the industrial metaverse to evaluate the most efficient layout and deployment of equipment – and gain significant savings. A well-designed factory floor, for example, minimizes transportation distances for materials and enables workers to perform their tasks more safely and efficiently. In some cases, smarter design may mean less equipment is required. By leveraging acquired data with AI and other software, a range of use cases can be realized in the areas of planning, real-time response, maintenance, optimization, agile product development and quality improvement.

## Reduced environmental impact

The industrial metaverse can help to reduce the manufacturer's carbon footprint in many ways. Any object that can be simulated instead of manufactured and transported in the real world saves carbon emissions, water and other critical resources. Field technicians can solve a problem remotely by walking through the digital twin with the operator on-site, reducing the need for travel. In addition, spatial analysis provides manufacturers with insights into operations and performance that were not previously available. Based on the data gathered, intelligent software can identify ways to make sense of processes and operate machines more energy-efficiently.

## NVIDIA Omniverse

A leading solution for real-time collaboration is NVIDIA's Omniverse platform. This scalable, end-to-end platform enables organizations to create custom 3D pipelines based on Universal Scene Description and create physically accurate, photorealistic simulations for industrial use cases. The ability to merge live data from all relevant databases into a common simulation makes obstacles such as interface loss, compatibility issues and data reimport a thing of the past.



# Ensuring your IT supports innovation, end to end

Implementing a solution for the industrial metaverse requires considerable investment – just imagine what's required to integrate production machines and sensors into a campus 5G network, for example.

Then there's the requirement to protect individual components from cyberattacks.

Although a private 5G network increases security through its self-contained design, protective measures can also be implemented individually and specifically. However, the increasing number of networked devices significantly increases the threat landscape. If production-critical data falls into the wrong hands, there is a risk of intellectual property being lost and production facilities coming to a standstill. The digital twin, for example, usually knows the complete data history and has access rights to all important systems. With this information, criminals can cause serious damage.

The situation is further complicated by the fact that an evolved landscape of applications and solutions is in use, especially on the factory floor. This leads to data silos that make seamless communication between the various systems difficult.

A key success factor for digitization is therefore the dissolution of data islands and the merging and harmonization of data.

To transform from a production plant to a smart factory, manufacturers should therefore work with an experienced IT partner that can provide an end-to-end solution that covers everything from the infrastructure to the application layer to security.

## NTT DATA collaborates with KI Park

An important strategic partner of NTT DATA is KI Park e.V., an open ecosystem of research institutions, startups, established companies, capital providers, and social and political actors in the field of artificial intelligence. Their common goal is the promotion and implementation of concrete AI applications, from the digital twin in the industrial metaverse to 5G campus platforms.

