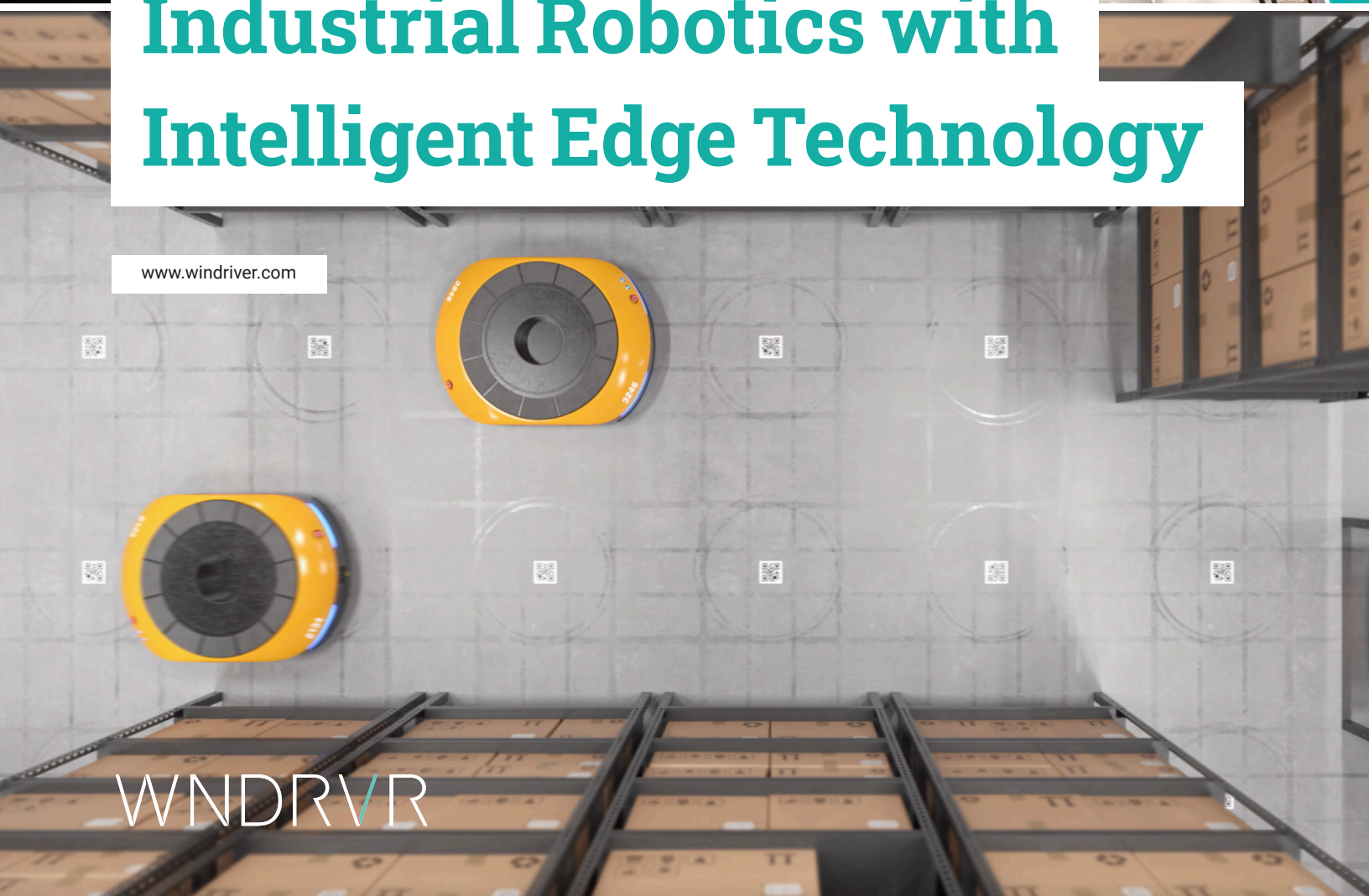


# How to Empower Industrial Robotics with Intelligent Edge Technology



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## Executive Summary

The world of industrial robotics is ripe for innovation and improvement. The use of robotics in everyday devices has become ubiquitous, given the rise of smart homes, voice-activated virtual assistants, and other forms of advanced automation. Now the industry is ready for the next stage.

The integration of intelligent edge technology in industrial robotics is essential for reducing cost while improving speed, security, and competitiveness. The integration of cloud-based technologies, such as digital twins and open source, has made it possible for companies to streamline operations, improve data management, and remotely monitor and control robotics systems.

Industries including automated manufacturing, logistics and supply chain management, and remote maintenance and repair are all increasingly relying on cloud-based industrial robotics systems. These technologies provide a powerful solution for companies seeking to secure their position in today's rapidly evolving market.



# The Growing Demand for Industrial Robotics Empowered with Intelligent Edge Technology

We are witnessing a unique moment in history, both within industries that leverage robotics systems and within wider human culture, as we explore and discover the many opportunities that come with today's technologies.

Three advancements can now come together in one cohesive and collaborative environment to solve challenges and empower industrial robotics with intelligent edge technology: AI, ML, and cloud computing.

With these three advancements working in unison, industrial robotics systems are in position to use real-time data to offer rapid solutions to industries that are poised to take advantage of this new automated and agile world.

## Intelligent Edge Technologies: Small Challenges, Big Opportunities

Intelligent edge technologies are a cornerstone of the digital transformation of industrial robotics. They provide the necessary tools for creating digital twins, automating manual processes, and integrating robotics and IoT. These technologies include cloud computing, robotics, IoT, artificial intelligence (AI), and machine learning (ML).

While it is not cheap to implement intelligent edge technologies within industrial robotics, prices for such technologies are becoming more affordable every day — and the benefits they provide far outweigh the costs.

According to a recent study, the industrial robotics market is projected to grow from **15.7 billion USD** in 2024 to **30.8 billion USD** by 2027, at a CAGR of 14.3%.<sup>1</sup> This growth is driven by the increasing demand for automation and the integration of advanced technologies across multiple industries.

1. "Industrial Robotics Market by Type, Component, Payload, Application, Industry, and Region," 2024





The main challenge is the full-scale integration of the technologies into existing infrastructure, which requires significant investment in both time and resources. However, this challenge is also an opportunity, as it prompts the improvement of overall systems performance and increased competitiveness.

Implementing intelligent edge technologies also promotes the development of new use cases for cloud-based industrial robotics systems, further enhancing their value.

The AI- and ML-capable cloud-based environment is crucial for automation of processes and the integration of robotics and IoT with devices designed for the intelligent edge. It provides the tools and technologies for intelligent, connected, and responsive industrial robotics systems that can improve speed, efficiency, and competitiveness.

Of course, to empower these systems fully, an organization must first embrace digital transformation.

## TOP 5 INDUSTRY OPPORTUNITIES FOR ROBOTICS SYSTEMS

- Medical and healthcare
- Agriculture
- Automotive
- Industrial
- Military and defense





# Empowering Industrial Robotics Through Digital Transformation

The need for effective manufacturing processes has never been more critical. Industrial robotics have become a key solution for many companies, with the ability to automate processes and increase efficiency.

However, the process of implementing robotics can be complex and requires significant investment. This is where the different phases of the transformation come into play.

## The Three Phases of Robotics Digital Transformation

The development of industrial robotics can be broken down into three stages:

1. Digitization
2. Digitization process
3. Digitization implementation

**Digitization:** The first phase, digitization, involves converting assets to the digital domain. It requires the interaction of OT and IT operations and allowing manufacturing resources to become visible to a larger and broader group of people. This creates the foundation for cost-effective resource integrations, collaboration, and an agile environment.

**Digitization process:** The digitization process then builds on the existing data and creates digital agility and the ability to access and manipulate that data.

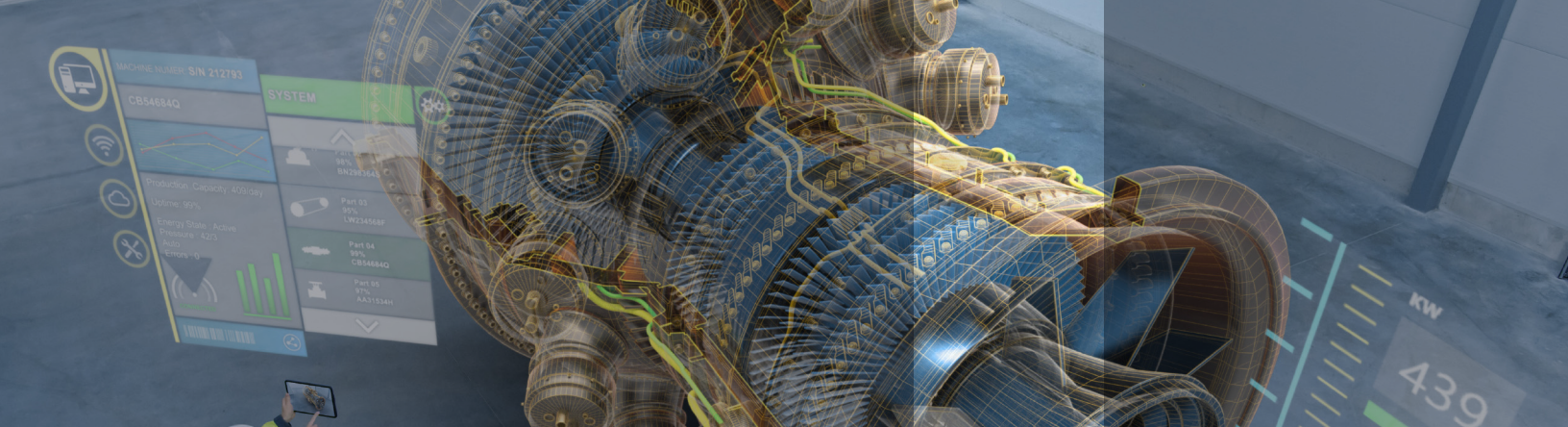
**Digital implementation:** The third phase, digital implementation, brings Big Data analytics into the system and supports digital twins.

## Digital Transformation Technologies Are Empowering Robotics

Cloud technologies have redefined the way we store, process, and extract information from data and how we can further capitalize on that particular information. They have also created an incredible opportunity to use digital twins in simulation so that we can optimize processes even further.

“Cloud-level technologies and the ability to digitize ...have created the ability to create twins or digital twins that are reflective of the manufacturing process, and simulate these things so we can optimize... even further.”

—Joseph Fernando,  
Principal Architect Strategy, Arm



## A Process for Competitive Speed

A successful rollout of intelligent edge technologies in industrial robotics requires a comprehensive approach and process. This begins with the selection of the appropriate technologies for cobots (also known as collaborative robots), including cloud computing, robotics, IoT, AI, and ML.

The next step is the selection of the appropriate open source technologies, which can promote interoperability in the powering of robotics systems.

Finally, the deployment of robotics systems includes their integration into the existing infrastructure, the collection of data, and the ongoing monitoring of system performance to ensure that they are functioning at an optimal level.

As teams identify any areas for improvement, they can iterate within the digital twin environment while developing new tests and strategies to optimize systems.

According to a report by Accenture, by 2035, AI could contribute more than **\$14 trillion** to the global economy.<sup>2</sup>

2. Accenture Report: Artificial Intelligence Has Potential to Increase Corporate Profitability in 16 Industries by an Average of 38 Percent by 2035





# The Intelligent Edge Brings Competitive Speed, Automation, and Better Metrics

## The Intelligent Edge Brings Competitive Speed

Companies that have successfully completed the digital transformation of their industrial robotics systems have seen significant improvements in their competitiveness and efficiency. These companies are often “several times faster” than their competitors in the development of new products, according to Wind River® Principal Technologist Andrei Kholodnyi, and they can respond quickly to changing market conditions.

## The Intelligent Edge Brings Automation

Intelligent edge technology in industrial robotics can also enable automation of manual processes.

Automated systems support the efficient and cost-effective production of goods, improving manufacturing speed and efficiency. This is particularly important in industries such as logistics and supply chain management, where real-time monitoring and control of goods is crucial.

As the demand for automation increases, companies must embrace these technologies to stay ahead of the competition and meet the ever-evolving needs of their customers.

“Companies who did this digital transformation — they are several times faster than their competitors in the way they develop.”

—Andrei Kholodnyi,  
Principal Technologist, Wind River



## The Intelligent Edge Brings Improved Metrics

A key benefit of using intelligent edge technology in industrial robotics is the ability to digitize and create digital twins of physical assets, such as machines and equipment. This technology provides real-time monitoring and control, reducing downtime and improving overall efficiency.

A recent survey found that companies that have embraced digital twin technology have seen a 15% improvement in metrics such as operational efficiency and turnaround time, and a 25% improvement in system performance.<sup>3</sup>

The edge computing market is expected to grow from **\$44.7 billion** in 2024 to **\$101.3 billion** by 2027, at a CAGR of 17.8%.<sup>4</sup>

<sup>3</sup>. Reflecting Reality – Digital Twins: Adding Intelligence to the Real World, Capgemini, 2024

<sup>4</sup>. "Edge Computing Market by Component (Hardware, Software, and Services), Application (Smart Cities, Remote Monitoring, IIoT, AR and VR, Content Delivery), Organization Size (Large Enterprises and SMEs), Vertical and Region – Global Forecast to 2027," MarketsandMarkets, 2024



A close-up photograph of an industrial robotic arm with a black and silver gripper, positioned over a white perforated metal tray. The gripper is holding a small, green, rectangular object. The background shows more of the industrial environment, including other trays and components.

# Leveraging Open Source Robotics Communities and Ensuring Interoperability

As companies seek to improve efficiency and access to cutting-edge tools and technologies, the integration of open source technologies in industrial robotics is on the rise.

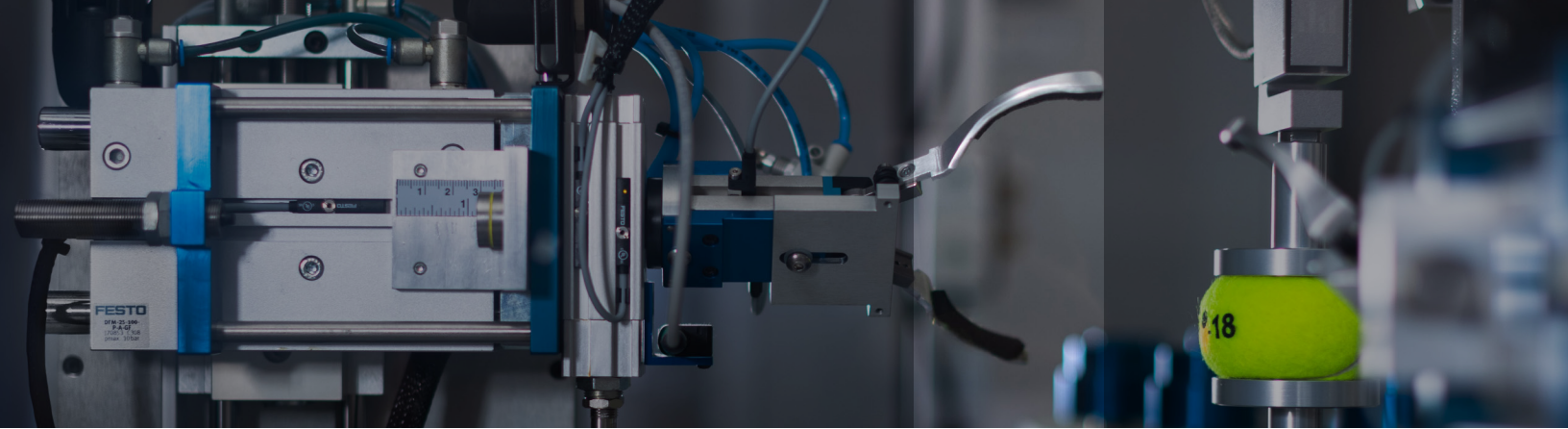
In fact, the global market for open source software is expected to reach 50 billion USD by 2026,<sup>5</sup> fueled by the ability to provide a wide range of options for development and innovation that allow companies to customize and optimize their systems.

In addition, open source technologies are often more affordable than proprietary competitors, making them a more accessible solution for many companies. This not only helps to reduce costs but also allows companies to focus on other areas of development, such as improving their products or expanding their operations.

Another key advantage of using open source technologies is the ability to integrate and interoperate with a wide range of vendors, systems, and technologies. This means that companies can easily integrate their systems with other technologies, such as IoT devices, cloud computing systems, and AI algorithms, to create a truly connected and responsive industrial robotics system. This level of interoperability is crucial for improving efficiency and competitiveness in the industry.

One of the key advantages of using open source technologies is the ability to integrate and interoperate with a wide range of vendors, systems, and technologies.

5. "Open Source Services Market with COVID-19 Impact, by Service Type (Professional Services and Managed Services), Vertical (Manufacturing, BFSI, Telecommunications, Healthcare and Life Sciences, IT & ITeS ), and Region - Global Forecast to 2026," Research and Markets



## Use Cases for Cloud-Based Industrial Robotics Systems

From a use case perspective, we're at a tipping point in the robotics space. There is a high degree of variability in the items being manufactured, and we're no longer asking, "How can we use this?" Instead, we're asking, "How can we use this in a more dexterous and intelligent way?" Today's robotics systems engineers are making Widget A one day, and the next they're making Widget B with slightly different variations.

Even now, however, cloud-based industrial robotics systems provide a range of benefits for companies, including increased efficiency, improved data management, and the ability to remotely monitor and control robotics systems. Some of the most common use cases for cloud-based industrial robotics systems include:

- **Automated manufacturing:** Automated manufacturing systems support efficient and cost-effective production of goods. Cloud-based industrial robotics systems provide a range of tools for automating manual processes, improving manufacturing speed and efficiency.
- **Logistics and supply chain management:** Cloud-based industrial robotics systems can improve logistics and supply chain management, providing real-time monitoring and control of goods as they are transported and stored.
- **Remote maintenance and repair:** Remote monitoring and repair are possible with cloud-based industrial robotics systems, which reduces downtime and improves overall system performance.

"These automation systems [cobots] will become extremely flexible and adapt their behavior automatically to maximize outputs."

—Andrei Kholodnyi,  
Principal Technologist, Wind River





# The Integration of Intelligent Edge Technologies in Industrial Robotics

Integrating intelligent edge technologies into industrial robotics is a powerful way to increase speed, efficiency, and competitiveness in this field. From the development of digital twins to the automation of manual processes, cloud-based industrial robotics systems provide a range of benefits to companies in a variety of industries.

Whether in automated manufacturing, logistics and supply chain management, or remote maintenance and repair, the use of cloud-based industrial robotics systems is becoming an increasingly important part of the digital transformation of industrial robotics.

To learn more, visit [windriver.com/studio](https://windriver.com/studio).

## COLLABORATIVE ROBOT COWORKERS

Also known as cobots, collaborative robotics systems can now execute highly variable tasks in many industries. Advances in AI and sensor technologies allow robotics systems to cope with a high degree of task variability.

Wind River is a global leader of software for the intelligent edge. Its technology has been powering the safest, most secure devices since 1981 and is in billions of products. Wind River is accelerating the digital transformation of mission-critical intelligent systems that demand the highest levels of security, safety, and reliability.  
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