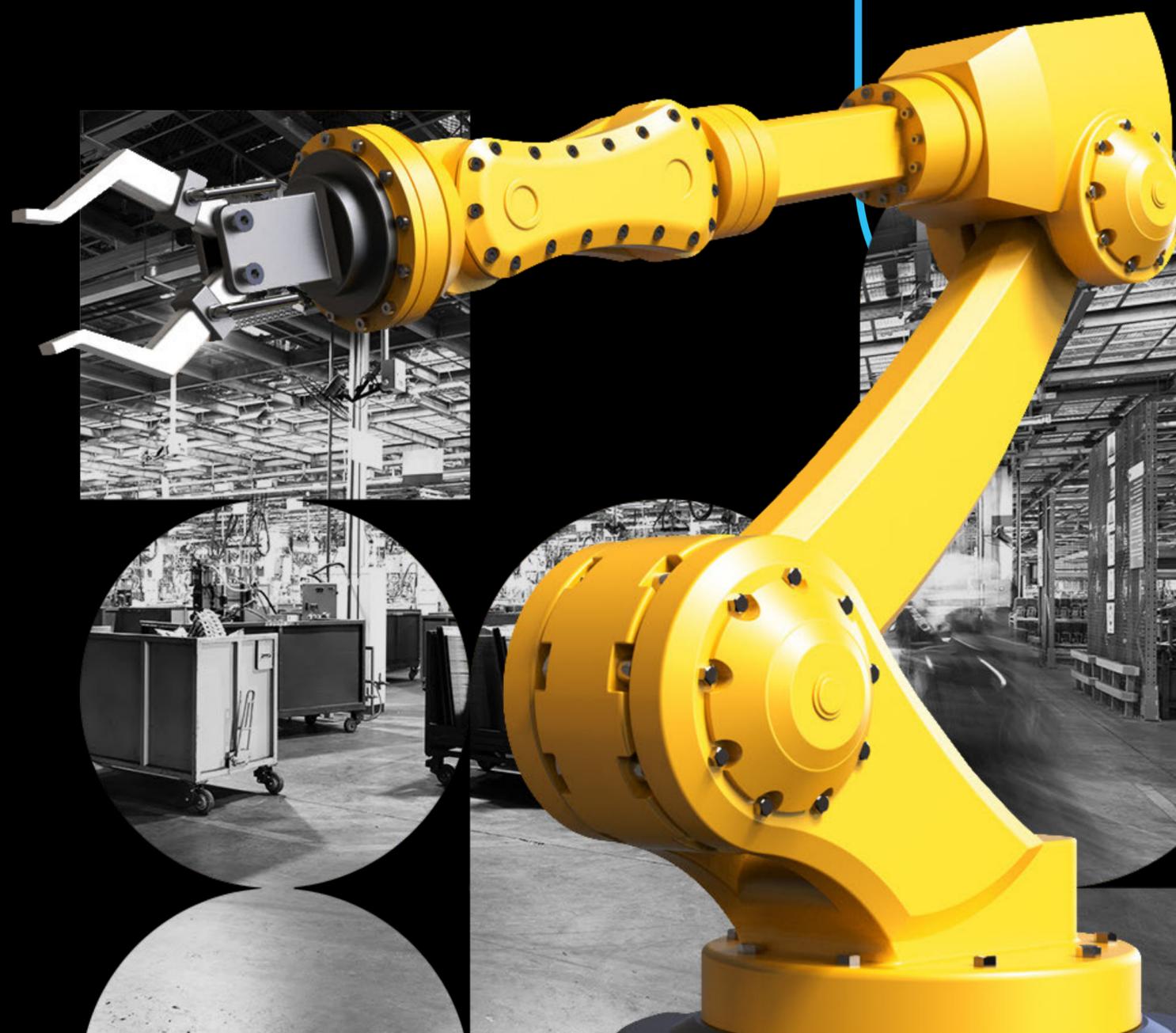




COGNITE

The Robot Data Problem, Solved

Pave the path to automation with Industrial DataOps



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About Cognite

Cognite is a global industrial SaaS company that supports the full-scale digital transformation of asset-heavy industries around the world. Our core Industrial DataOps platform, **Cognite Data Fusion**[®], enables data and domain users to collaborate to quickly and safely develop, operationalize, and scale industrial AI solutions and applications.

Cognite Data Fusion[®] codifies industrial domain knowledge into software that fits into your existing ecosystem and enables scale from proofs of concepts to truly data-driven operations to deliver both profitability and sustainability.

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↘ Introduction

Many tasks in industry are perfect for robots. They are repetitive and boring, located in hazardous or remote environments, and require a great deal of manual data collection.

Unfortunately, robots haven't been perfect for industry. **Until now.**

The development of robotics systems has reached a tipping point. Robots today are capable and secure enough to work in industrial settings, and affordable to the point where the economics of automating certain workflows make sense.

This development couldn't have come at a better time. Asset-heavy industries such as oil and gas, power and utilities, and manufacturing are facing growing pressure to produce more to meet the world's growing demands for energy and goods, yet cut costs, emissions, and waste.

Hardware alone isn't enough to meet these challenges. To incorporate robots into their digital transformation strategies, industrial companies need software that collects the valuable data gathered by robots, processes it, and makes insights available to all data consumers, from control room operators and field workers to data scientists and solution engineers.

The combination of robots and industrial data op-

erations (DataOps) can help industrial companies take an important step toward an autonomous future.

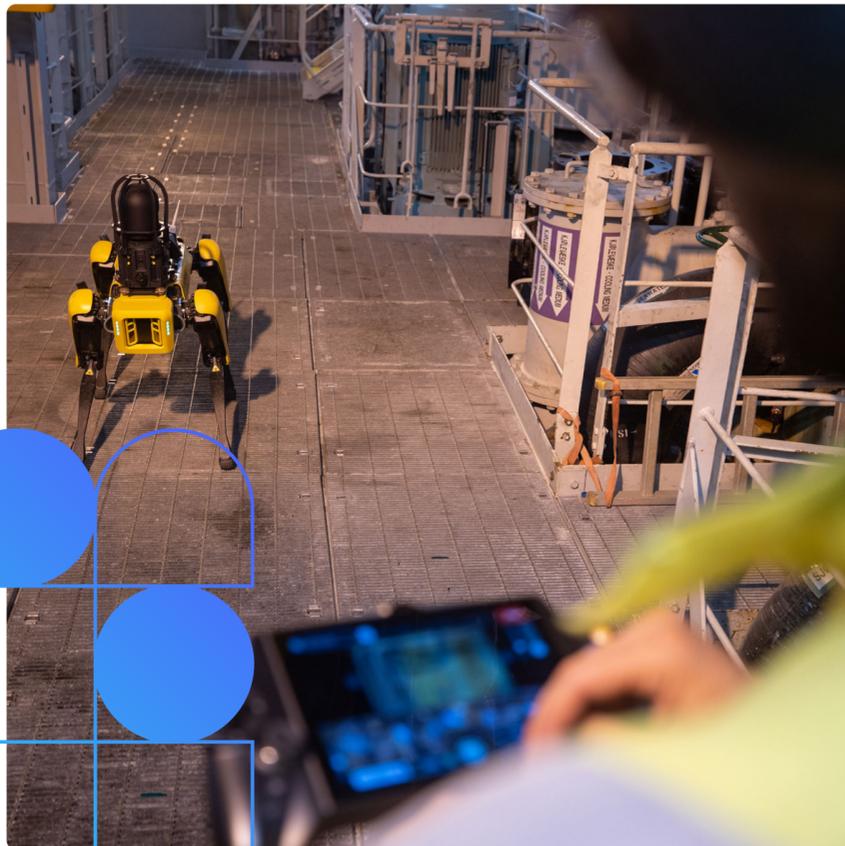
Solve the robot data problem and pave the path to automation with Cognite Data Fusion® , the leading Industrial DataOps platform.



↳ Robots in industry

Industrial Control Systems (ICS) play a critical role in the operations and monitoring of ventilation, heating, and other important functions at industrial sites. However, many issues related to corrosion, leaks, and noise aren't detected and monitored by systems, but by field workers who come across the issues by chance during inspection work.

Robots can help. Robots can complement existing systems and human expertise, monitor known problem areas, and detect new situations before they become a risk to safety and operations.



Why robots?

There's no replacement for human ingenuity. That's why our creativity and problem solving should be reserved for tasks that require these skills.

For everything else, there's robots. Here's why:

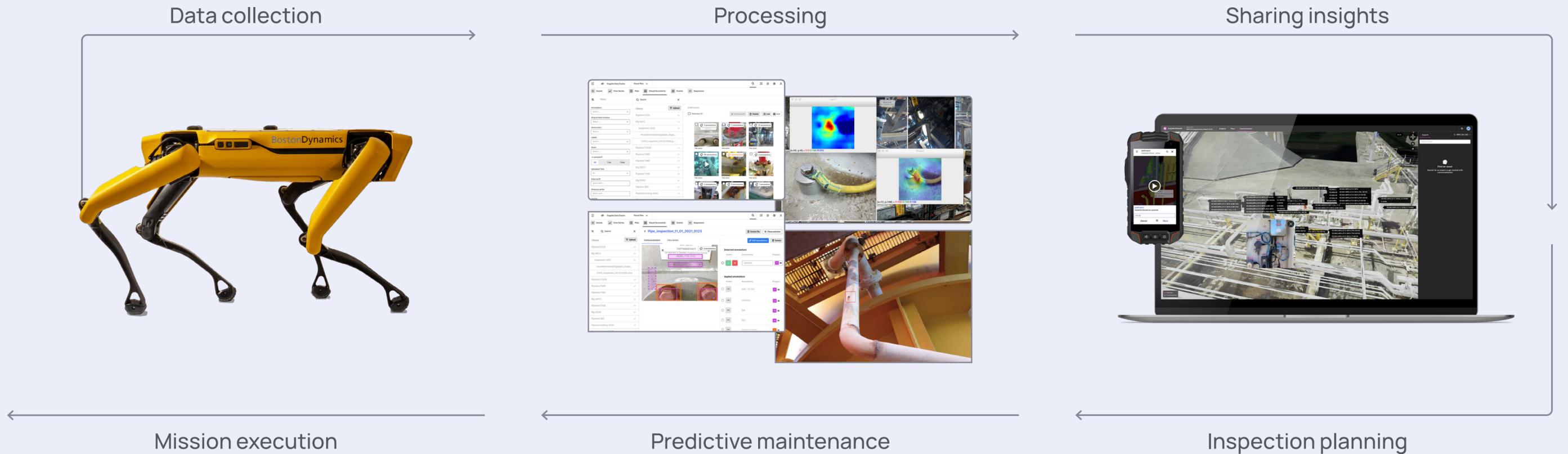
- **Keep people out of harm's way.** Heavy machinery, dizzying heights, explosive gases—industrial sites can be dangerous places to work. But not for robots. For remote, high-risk, or restricted sites, robots can be the eyes and ears for human operators, transmitting high-quality audio and video with millisecond latency.
- **Cut costs, emissions, and waste.** Remotely managing assets and plants through on-site robots means fewer people living offshore or traveling to remote power stations, to mention just two examples. This translates to lower CO2 emissions and downtime related to transportation, and less wear and tear on vehicles, helicopters, and other equipment.
- **Automate routine tasks.** Robots can follow a fixed route every day at the same exact time, reading gauges and monitoring known issues such as corrosion, leaks, and noise. They don't need rest, they can work around the clock, and

the more data they collect, the more the process can be improved.

- **Detect slow changes.** Humans get used to gradual changes. Robots don't. By reviewing high-resolution images captured by robots during inspection rounds, operators can answer questions such as: Was this wet spot here yesterday? How fast is this corrosion developing? For how long has that crack been there?
- **Remember the data.** Handwritten notes can get lost, and people sometimes forget what they saw. Robots can collect all the inspection data they generate in a single location, where it can be used to power applications and models that improve operations and maintenance processes.

These examples are just some of the benefits that robots bring to industrial operations. **Without the right industrial software, however, a robot is just another siloed system.**

↘ Cognite Data Fusion® and robotics



To incorporate robots into their digital transformation strategies, industrial companies need software that solves the data problem—collecting and connecting the valuable data gathered by robots, contextualizing it with other existing data from IT, OT, and ET systems, and making the data available and understandable to all data consumers, from control room operators and field workers to data scientists and solution engineers. The way to do that is via the digital twin.

Cognite Data Fusion® helps industrial companies build operational digital twins of physical assets,

delivering real-time insights, accurate forecasting, and intelligent decision-making. Together, this creates a robust foundation for automation and use of robots.



An operational digital twin is the aggregation of all possible data types and data sets, both historical and real-time, directly or indirectly related to a given physical asset or set of assets in a single, unified location. The collected data must be clean and contextualized, linked in a way that mirrors how things are or would be linked in the real world, and made consumable depending on the use case.

The digital twin bridges the gap between the physical and the digital world. It brings data from around the organization—whether it’s operational data, CRM data, or planning data—into a centralized location to provide context, understanding, and action to assets, sites, and processes.

Industrial DataOps, as a component of digital twins, unlocks data from individual silos and contributes to an open ecosystem of interoperable data and analytics technologies. By using this open approach, more data consumers are empowered with more data, and innovation can thrive.

Cognite Data Fusion® enables robots to navigate industrial facilities based on data in the digital twin. This close connection between hardware and software adds human-like meaning and association to the thousands of images, sensor readings, and other data that fill key gaps by providing:

- **Two-way context to both the robots and the operators**, enabling robots to construct, view, and add to the digital operating environment, while converting data into information that can more easily be interpreted by humans. With a fully contextualized digital twin composed of images, scans, sensor data, and more, robots not only have visual access to the environment but all additional data and metadata pertaining to their surroundings.
- **Fluid handoffs between subprocesses** so that data and even some decisions can be exchanged

Spot goes offshore

In 2020, Cognite and Aker BP, one of the largest independent oil companies in Europe, partnered to deploy Spot, the quadruped robot developed by Boston Dynamics, to pioneer remote-controlled offshore missions on the Skarv installation, a floating production, storage, and offloading (FPSO) unit located 210 kilometers offshore in the North Sea.

Cognite Data Fusion® served as the data infrastructure for the offshore test, which collected images, scans, and sensor readings from robotics systems and then shared the data across Aker BP via a dashboard to make it actionable. Tasks included autonomous inspection, high-quality

from the original point of analysis to the commissioning of a work order without losing quality or integrity. This minimizes error and inconsistencies in what is a manually demanding process that often leaves inspection data under-analyzed. With this barrier lessened or removed, operations and analytics teams can shift their efforts away from data overhead and toward valuable decision-making.

- **Connection to broader digital infrastructure** so that inspection data can be reused across the organization for other analysis, including planning, reporting, prediction, and optimization. This

data capture, and automatic report generation.

The mobility of Spot offshore, and the communication between Spot, Cognite Data Fusion®, and Aker BP were both verified and tested. Data from Spot was available and sorted in Cognite Data Fusion® in milliseconds, and Spot was remote-controlled from a home office onshore, demonstrating the synergies between robots and digital twins.

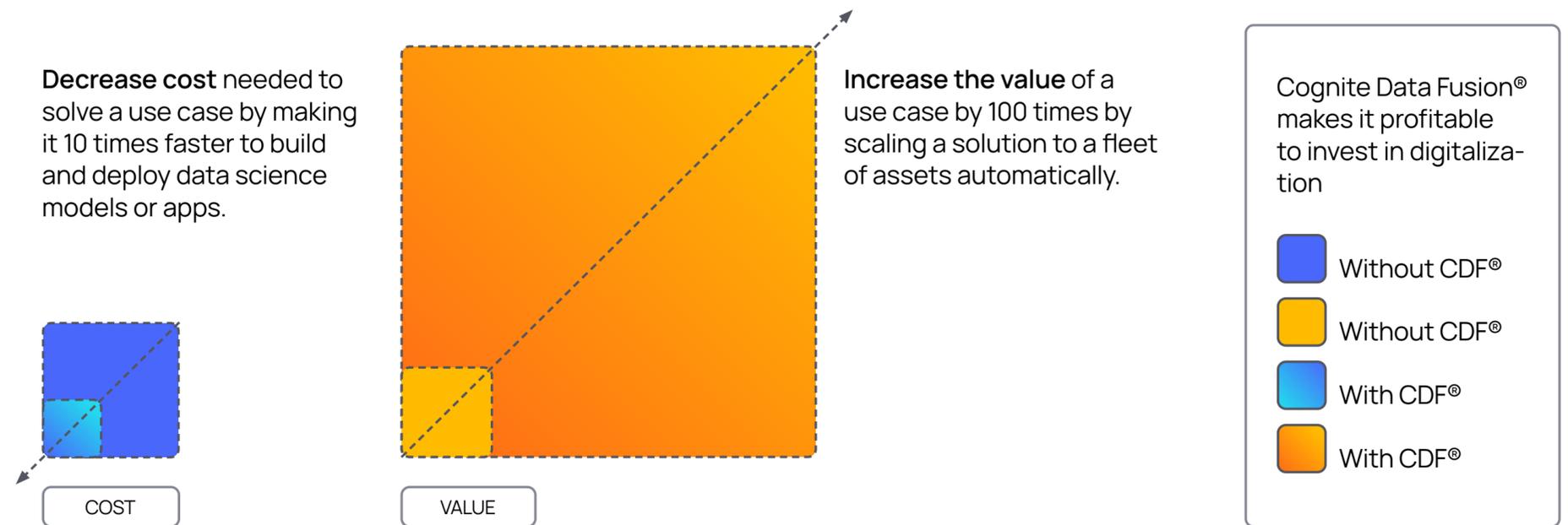
The deployment was an important step toward greater use of robots in the oil and gas industry, demonstrating how remote operations with robots can make offshore operations safer, more efficient, and more sustainable.

connection can also be used to trigger inspections. For example, if a system detects a pressure anomaly in a pump, Cognite Data Fusion® can send a robot to the pump to provide audio and visuals to support troubleshooting.

By using these pillars, this contextualized operating environment becomes the true driver of sustainable automation for robot- and drone-based inspections because it exists as a living entity.

It can be **updated daily**, or even hourly, with new images taken from exactly the same viewpoints; it can be **contextualized** with live operational data from across the organization, and it can be **leveraged for decision-making** applications and work order automation. It also **facilitates scale**, making it easy to scale to other sites, payloads, and missions without significant system redesign or other major overhead.

With Cognite Data Fusion[®], the business case for solving digitalization use cases becomes profitable.



Expand the scope of autonomous missions with Cognite Data Fusion[®]

From:

Go check the status of every pump...

To:

Go check the status of every pump...

...from a certain manufacturer...

+ Installed base records

...with RPMs above 10,000...

+ Operational data

...that have not been inspected in the last month.

+ Work order history

[Learn more about Cognite Data Fusion[®]](#) →

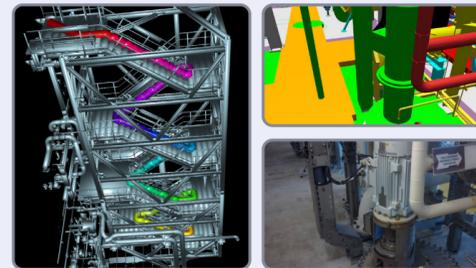
↙ Cognite Data Fusion® in action



Telepresence:

Robots can be the eyes and ears for human operators at remote, high-risk, or restricted sites.

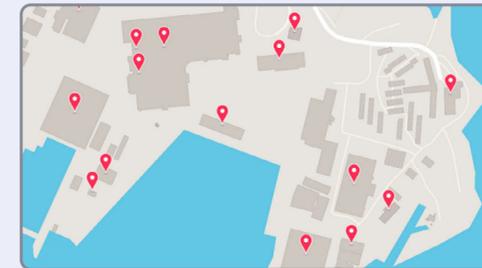
Benefits: Safer operations, reduced personnel costs.



3D scanning:

Robots can make daily 3D scans of industrial sites, keeping 3D models up to date and trustworthy for remote operations.

Benefits: Updated information, better decision-making.



Maintenance planning

Robots can give real-time and accurate information needed for high-quality maintenance planning from a remote location.

Benefits: Automatically generated and event-driven work orders.



Autonomous inspection:

Robots can replace operators during inspections rounds, night shifts, and other repetitive tasks.

Benefits: Reduced costs and more time for in-depth tasks.



Asset tracking:

Robots can keep track of movable assets such as containers, barrels, materials, trucks, lifts, and more—and make every physical object on site searchable.

Benefits: Reduced costs and risk in building projects.

Robots and Industrial DataOps: cutting emissions in the power and utilities industry

Challenge: In the power and utilities industry, manual inspections and maintenance performed in remote locations by humans can get time-consuming and expensive. Additionally, trips to remote locations comprise a significant part of grid operators' climate gas emissions.

That's why the power and utility industry is exploring the use of robotics. By incorporating robots into inspection workflows for remote sites, grid operators would be able to reduce their climate gas emissions, ensure higher uptime through data-driven maintenance, and keep people out of harm's way.

Solution: Cognite worked with a major national grid operator to explore how the combination of Cognite Data Fusion® and robots such as Boston Dynamics' Spot can minimize the need to travel to remote, unmanned locations in the power and utilities industry.

The grid operator's experts put Spot to use at one of its indoor substations. By ingesting images, sensor readings, and other data collected by the robot into Cognite Data Fusion®, the grid operator was able to deploy daily autonomous inspection missions, generate 3D models, and create an operational digital twin of the facility—all in just two days. The solution easily scales across assets and locations.

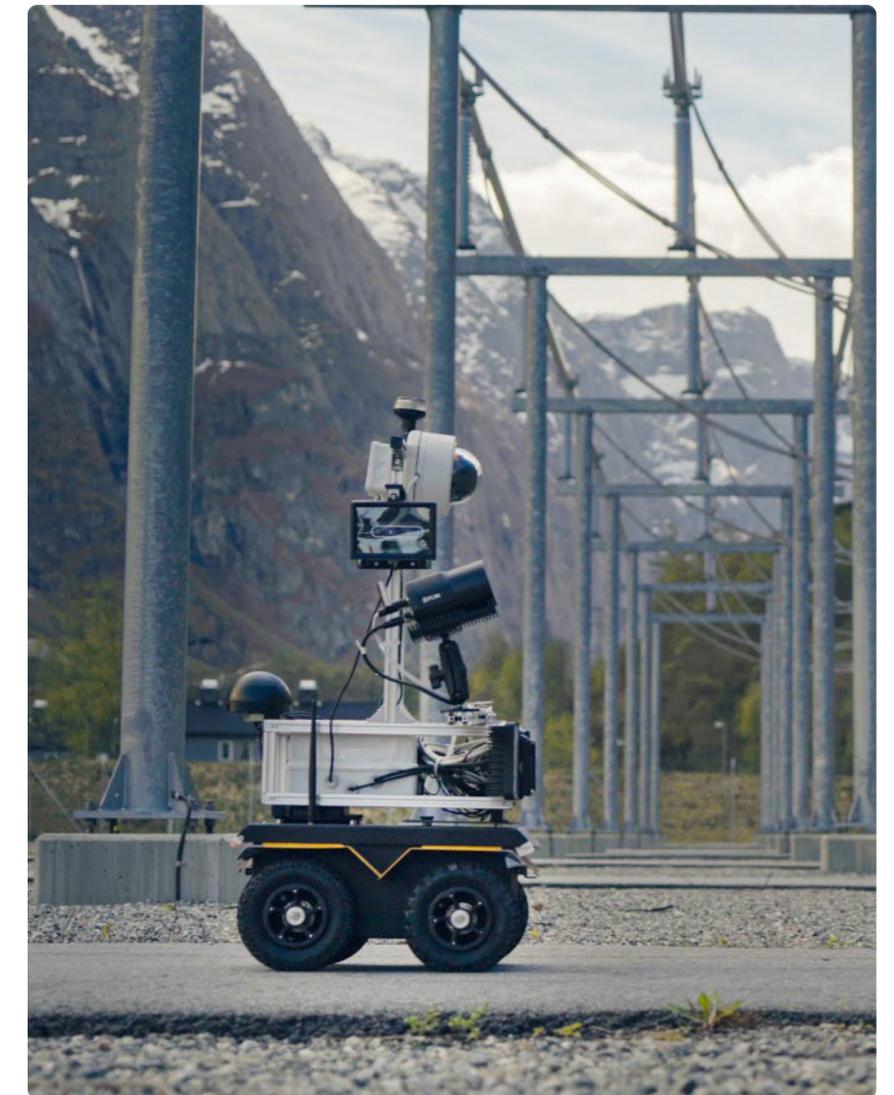
In addition to planned inspection missions, the grid operator also tested how robots perform in unexpected situations that require immediate attention, for example if a sensor at a remote, unmanned facility detects a gas leak. Using software developed by Cognite in combination with ground-based robots and a flying drone, employees were able to inspect three different assets at three different locations while working from home.

Impact: The combination of hardware and Cognite Data Fusion® enables any system or any person to navigate a robot from anywhere in the world to collect data. The data is then automatically converted to actionable information and contextualized to the operational digital twin.

The grid operator's robotics project highlights the potential of robots in the power and utilities industry. After a quick tutorial, anyone in the organization can remotely operate any robot, outdoors, indoors, on the ground, and in the air. This reduces time, costs, and emissions associated with inspections and maintenance work in remote locations. It also makes better use of subject-matter experts. Without having to travel long distances to perform inspections, the grid operator's experts can be in multiple locations in one day, easily comparing between sites and performing more in-depth analyses.

The grid operator has set an ambitious goal of cutting its climate gas emissions by 25% by 2025. This includes sulfur hexafluoride, a potent green-

house gas that is used to insulate electrical equipment. An analysis shows that using cameras—for example mounted on robots—is a cost-effective way of remotely reading analog gauges and monitoring SF6 gas levels at its facilities, which will help the grid operator reach its emissions target.



Robots and Industrial DataOps: monitoring everything at industrial sites

Challenge: Construction yards are vast, dynamic environments where the occupancy changes every day due to the tools, vehicles, equipment, and materials that are used as part of the construction process. These items often disappear and lead to project delays and increased costs, as the items have to be replaced.

This lack of oversight means yard operators often have a limited understanding of how items are used and whether there is room for optimization. Smarter tracking of construction materials and tools would help yard operators keep track of inventory, potentially helping them reduce costs and the chance of delays.

Solution: Cognite worked with an engineering company that provides integrated solutions, products, and services to the global energy industry to create a digital twin of one of the company's 173-acre construction yards. The digital twin enables a number of different use cases, including an overview of where vehicles, equipment, materials, and other individual assets are located at any time.

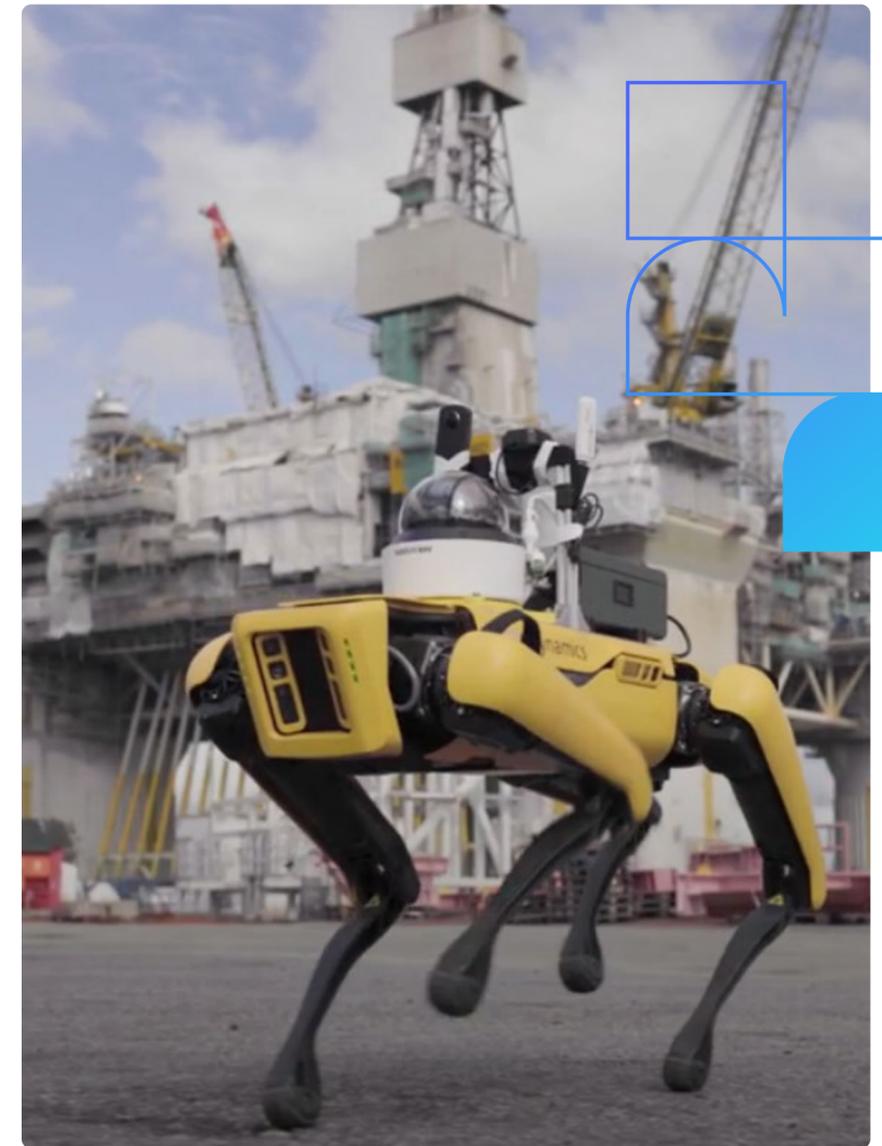
To create the overview of the construction yard, Cognite and the engineering company combined three main components in Cognite Data Fusion® : scans taken by a flying drone for a bird's-eye view of the site, instrumented assets such as forklifts

equipped with GPS sensors, and data gathered regularly by robots using cameras that capture 360-degree images. The data was then turned into coordinates and presented to users in a graphic interface that resembles Google Maps. Using computer vision, the engineering company can now track individual assets at the yard.

Impact: The digital twin creates a virtual representation of the physical reality at the construction yard, providing regularly updated location information about key items and enabling users to quickly locate what they need.

An independent consulting firm has estimated that maintaining an overview of all assets, tools, and equipment used in a typical topside project generates about \$.27 per pound in savings. For large projects, this adds up to millions of dollars in savings.

Data collection via robots and other devices keeps the information in the digital twin current without increasing the workload of employees at the yard. With up-to-date information about materials, vehicles, equipment, and more at their fingertips, all 3,000 employees at the site can make data-driven operational decisions that reduce costs and risk in building projects, for example improving logistics with vehicle tracking and using drone scans for precise measurements of the yard.



Robots and Industrial DataOps: lowering the barrier to smart 3D modeling

Challenge: Locating technical rooms and sensors in commercial buildings and industrial installations can be difficult due to the complexity of these sites and the sheer number of rooms and sensors that need to be checked on a regular basis. This means crews conducting maintenance, inspection, and other tasks often spend a considerable amount of time locating individual sensors before they can begin the task they were assigned to complete.

Physical floor plans can help crews navigate buildings, but the plans can be unwieldy or difficult to interpret and may become outdated over time. Digitalizing the process of locating sensors would help technicians, custodians, and operators find the data they need faster, reducing operational costs and the time needed to identify and correct issues.

Unfortunately, the time and effort required to manually digitalize the process represent major barriers. With robots, however, inspection and maintenance crews can efficiently collect the data they need to build and maintain high-quality 3D models.

Solution: Cognite worked with a solution provider for HVAC systems in commercial buildings to create photorealistic 3D models of technical rooms, where live sensor data is overlaid on the sensor's placement in real life. The 3D model enables users to

filter information by moving around in the 3D model. Images for the 3D models can be captured manually, but robots can perform the task more efficiently and as part of regularly scheduled inspection rounds. The images, as well as the sensor data, are ingested into Cognite Data Fusion®, and Cognite's web viewer SDK, REVEAL, easily integrates the 3D model into any web-based application. This makes the data available on computers and mobile devices, enabling experts to quickly look up information.

Impact: Photorealistic 3D models of technical rooms combined with live sensor data help technicians, custodians, and operators perform tasks more efficiently and independently, which reduces operational costs and potentially increases the quality of their work. Additionally, offloading the task of collecting images to robots both frees up time for employees and keeps the 3D models continuously updated.



Conclusion

The Fourth Industrial Revolution is here, promising enormous transformation. This transformation will be powered by data.

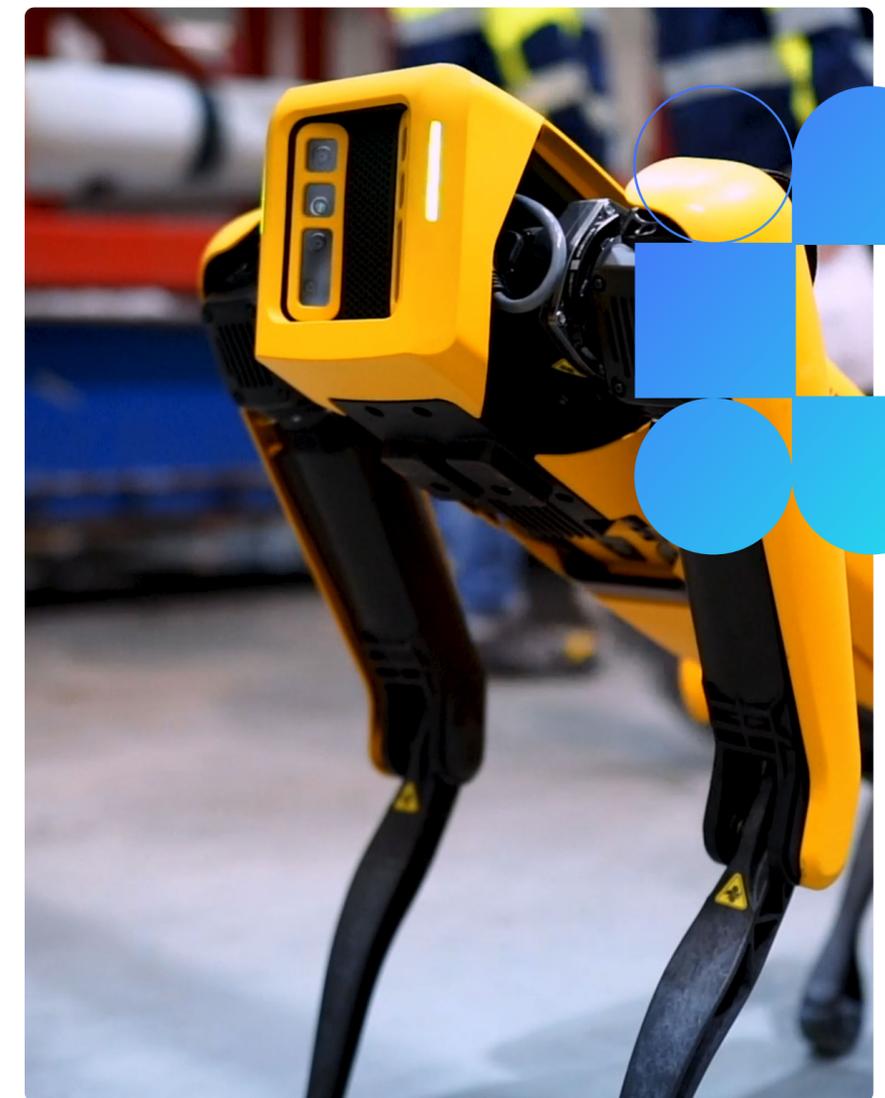
Industrial workers will play a major role in shaping the future of industry. To succeed, they need access to the best tools and the best data.

Robots can help industrial workers be in more places at once, track more changes over time, and use more data in their decision-making processes. **This will require software that gets data to experts in a form they can understand and act on.**

Industrial DataOps provides a new, more contextualized way for industry to consume data and accelerate digitalization. It puts humans over tools and processes, working analytics over comprehensive documentation, and experimentation, iteration, and feedback over extensive upfront design.

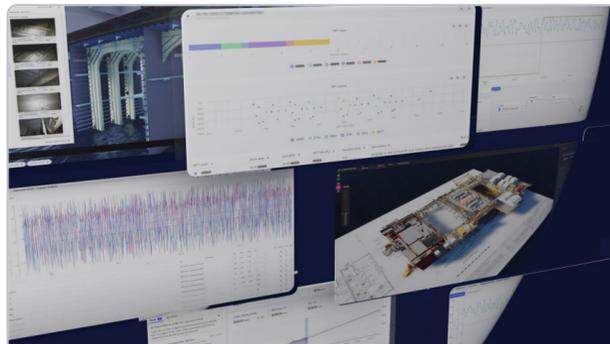
For robots, Industrial DataOps takes automation from concept to scale, creating an interoperable ecosystem of robots, drones, data, analytics, and empowered human operators—all working in concert.

Solve the robot data problem and pave the path to automation with Cognite Data Fusion®, the leading Industrial DataOps platform.



Want to know more about our product?

Explore more insights from Cognite



PRODUCT TOUR

Learn from Cognite customers and product managers how Cognite Data Fusion® simplifies and streamlines the data experience of a subject matter expert.

[WATCH NOW →](#)



CUSTOMER STORIES

Discover how Cognite Data Fusion® makes data more accessible and meaningful, driving insights that unlock opportunities in real-time, reduce costs, and improve the integrity and sustainability of your operations.

[GO TO STORIES →](#)



ANALYST REPORT

Customer interviews and financial analysis reveal an ROI of 400% and total benefits of \$21.56M over three years for the Cognite Data Fusion® platform.

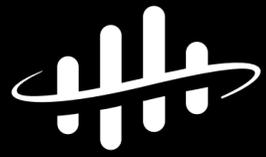
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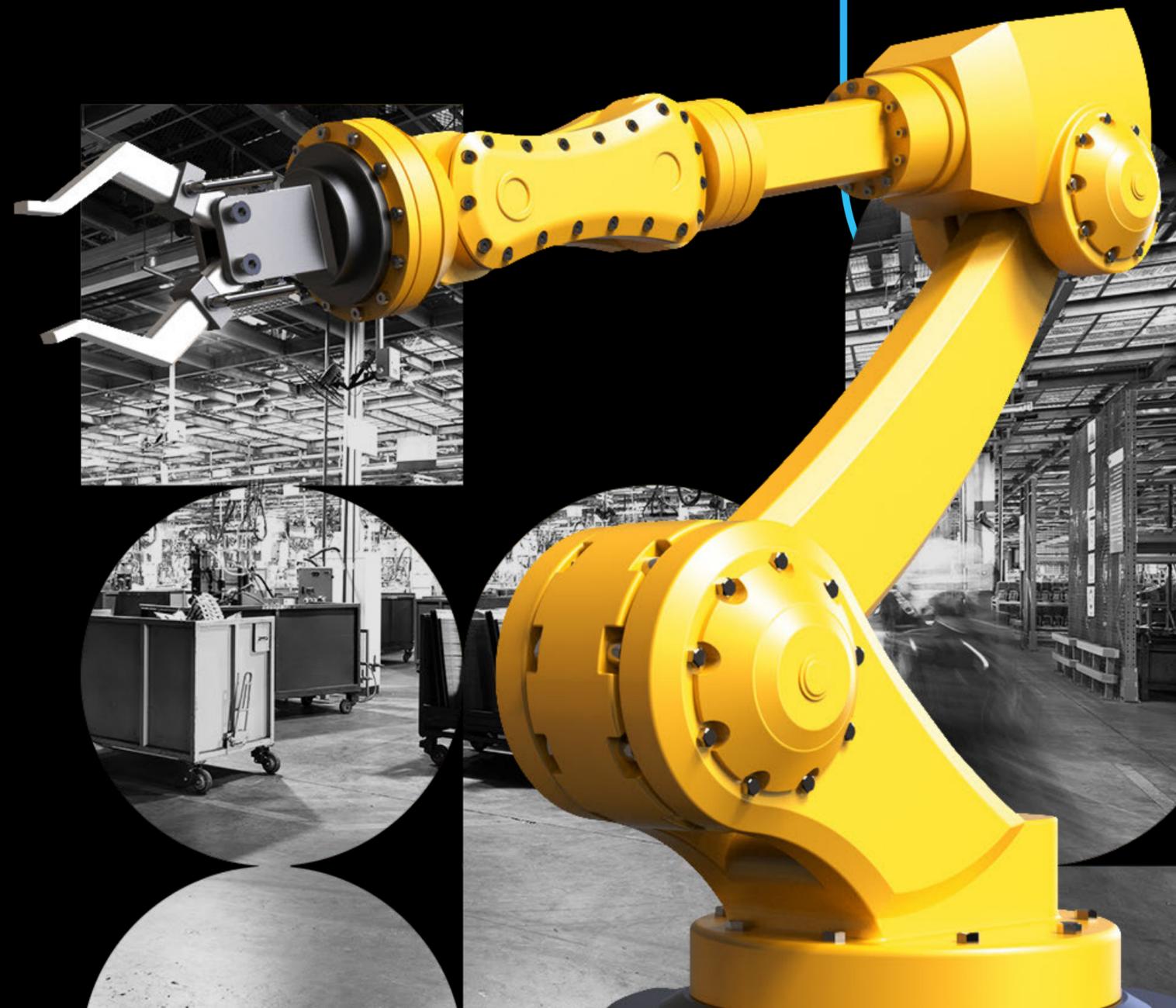
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