



Edge-based analytics drive smarter operations

Mobile robots outfitted with AI extend the workforce

by Michelle Cloutier

6-minute read



It's Friday night at the manufacturing plant. Lauren, whose job it is to supervise the computers that monitor the sensors on the production machines, has just come on shift.

As she settles in at her desk to watch several screens that display machine telemetries, she thinks about how boring her job is, but she's glad that it is more predictable and relaxing than when she had to inspect every machine herself.

Then, an alarm sounds. An equipment sensor has indicated sudden pressure loss, which means Lauren needs to visually inspect the machine for a possible leak. To do so, she must don a hardhat and goggles and venture deep onto the factory floor. This isn't how she imagined her Friday night shift would go, and she wonders if she should find another, more interesting and technical job.

Lauren is not alone. And manufacturers face problems attracting and keeping good workers like her.

Today's industrial production lines are, in fact, highly technical, with automation and machine telemetry that must be monitored around the clock. All that data must be gathered, either manually by someone with a clipboard or a tablet, or by hundreds or thousands of sensors installed on the equipment itself. Then the data must be analyzed, either manually or through asset monitoring systems. Yet, despite all this automation, often when it comes to identifying and solving problems such as leaks, workers like Lauren still face dangerous conditions.

Spot, a mobile robot
with sensor devices and
analytics on its back,

reduces

costs associated with IoT instrumentation

Spot's routine inspection
routes and follow-up task
assignments

improve

worker efficiency

“Approaching the data problem with fixed sensors is just not scalable given the complexity of the installation process. And manual methods are just not effective or efficient. Neither provides the value that you really want from big data analytics tools.”



Michael Perry, Vice President of Business Development, Boston Dynamics

Industrial dilemma

Industrial facilities have been evolving ever since Henry Ford produced the first Model T automobile on a factory production line. Today, automation and robotics are the norm on the factory floor. But manufacturers and other plant operators must maintain and repair those machines to keep their plants running, which requires constant data collection and analysis.

Michael Perry, Vice President of Business Development at Boston Dynamics, the global leader in mobile robotics, describes the problem: “Automation with traditional robots hasn’t been successful because of the complexity and scale of the sites, which can be limiting for wheeled and tracked robots that struggle with tight spaces, stairs and uneven terrain. Robots gathering data are also most useful when connected to intelligence, which is not just the computing, but also the communication between what’s happening in the field and whatever is processing all the onsite data.”

Over time, companies have largely adopted one of two ways to collect and analyze the data their machines generate.



The more traditional method involves sending technicians throughout the plant to record machine readings on a regular basis. Even if a machine may only exhibit issues once a year, the technician needs to record the data from that machine daily or weekly to spot minor problems before they can become major failures. And workers must maintain and fix equipment, sometimes in hazardous or noisy environments.

The other method is to install sensors on each piece of equipment, then collect and analyze that sensor data with asset management applications. IBM designed its [IBM® Maximo® Application Suite](#) to analyze this sensor data, which is stored in the cloud. However, manufacturers first face high costs to instrument their equipment, further costs to store the data and finally the need to purchase the solution to analyze it. This often puts



full instrumentation beyond the reach of smaller enterprises.

Nancy Greco, Director, DE Research Cognitive IoT Solutions at [IBM Research®](#), explains: “Edge-based sensors generate a massive amount of data going to the cloud. The manufacturers look at their cloud bill and wonder why they’re spending so much money to see that the data is telling them everything is okay, that there’s nothing wrong.”

A third solution is to send in a robot designed to regularly inspect equipment and collect data from its telemetry instruments. This was the inspiration for Spot, the dog-like robot created by Boston Dynamics. Spot can go anywhere a person can go and collect data more frequently and more accurately. However, even with cameras and other sensors, Spot cannot interpret data for itself. The data still needs to be analyzed, so when Spot finds an anomaly, it needs human intervention to resolve the problem.

“Automation with traditional robots hasn’t been successful because of the complexity scale of the sites, which can be limiting for wheeled and tracked robots that struggle with tight spaces, stairs and uneven terrain. Robots gathering data are also most useful when connected to intelligence, which is not just the computing, but also the communication between what’s happening in the field and whatever is processing all the onsite data.”

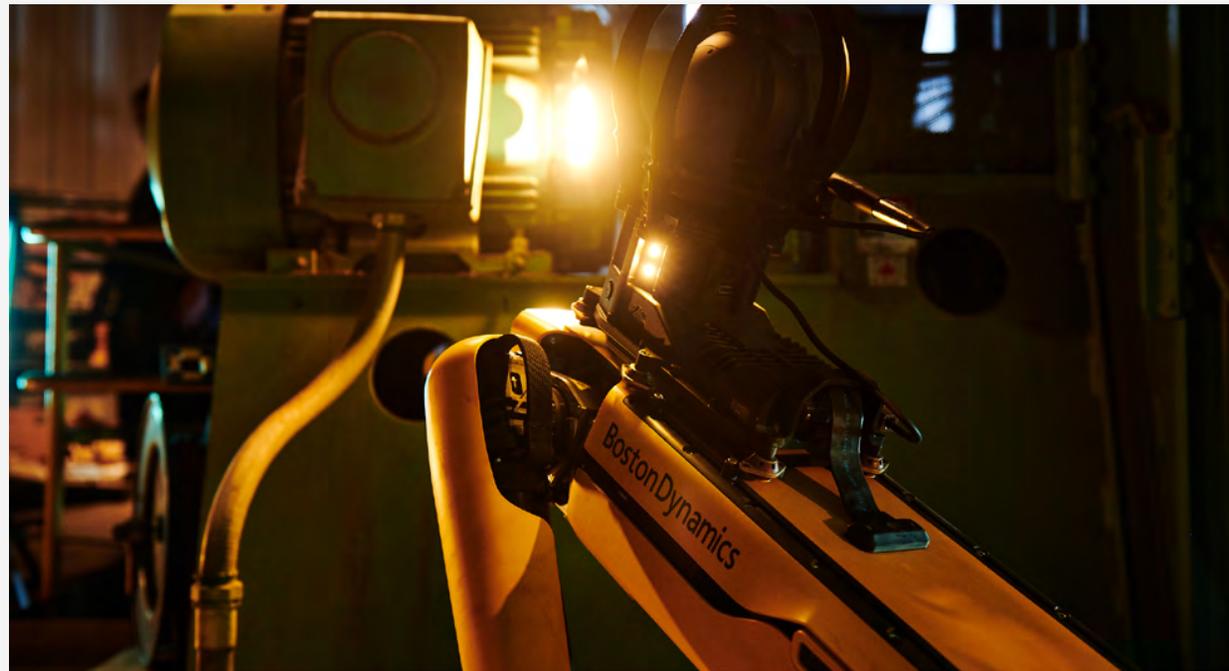
Michael Perry, Vice President of Business Development, Boston Dynamics

Mobile Robots + AI

IBM and Boston Dynamics decided to ask the question: can plant data be safely collected and analyzed at the edge? Could the two companies help eliminate the need for personnel to manually collect data or put themselves in harm's way on factory floors while reducing the requirement, and associated costs, of instrumenting every piece of equipment? The answer was a resounding "yes."

Boston Dynamics and IBM are bringing their technologies together to create an AI-based solution for Spot. "Boston Dynamics and IBM came to the table trying to solve the same combination of data acquisition and data intelligence problems," says Perry. "Both of us were hearing the same questions from our customers. 'How can I get a real, true picture of what's happening on this complicated industrial site?'"

Using Spot already helps eliminate the need to put sensors on every piece of equipment. Now, IBM is adding the power of AI and Maximo solutions to Spot to provide analytics at the edge. With help from IBM, Spot can interpret what it "sees" through its onboard cameras and



sensors. The analytics happens on the robot in real time, reducing the need for separate cloud data storage and analysis. Spot is an extension of the IBM AI@Edge Hybrid Cloud strategy.

"Spot becomes a roaming edge device, carrying a payload of analytics technology

wherever the user needs it to go," says Greco. "It can get into tight spaces. It can climb steps. And it's going to bring all those analytics with it."

Instead of just identifying a problem, highly customizable, optimized AI models help Spot to detect anomalies and



immediately initiate corrective actions. According to Perry, “Spot can go around a site, identify a problem and, using Maximo, automatically generate a work order with next steps to resolution.”

Beyond Maximo, IBM is bringing the full breadth and depth of its experience and expertise in asset management, AI and 5G technology to create this joint offering with Boston Dynamics of Spot with AI capabilities.

[IBM Global Business Services®](#) consultants are providing implementation and support services to Boston Dynamics. They will also provide industry consulting to help address customers’ specific needs. Finally, using [Red Hat®](#) technology means that the analytics are readily deployable, in a cost-effective way, in a hybrid cloud environment.

Perry describes the relationship in this way: “Boston Dynamics is bringing the mobility and the flexibility of Spot as a robotic platform, and IBM is bringing the intelligence of its systems to understand the data that Spot is collecting.”

Going where no human can go

For any industrial customer, keeping production lines up and running is the key to profitability. Most critically, the joint Spot offering helps reduce the time to detect anomalies, spotting them before they can become catastrophic problems. And Spot can do this for companies of any size, allowing small facilities that could not otherwise afford 100% equipment instrumentation or the cost of cloud storage to benefit from the roaming instrumentation that Spot provides.

“Our clients needed an affordable way to reduce the risk, to make sure their machines don’t go down,” says Greco. “Now they can do that in an affordable manner, reducing the amount of instrumentation, reducing the amount of data movement and latency, and improving data security.”

With its embedded IBM Maximo analytics, Spot can help increase equipment uptime. Not only can it identify anomalies; it can



interpret their probable cause and suggest remedies. It can create work orders for major problems or take a second look at minor issues. “Spot connected to IBM services can provide a lot of insight, so

that customers can run these assets for longer periods of time, catch problems before they happen and avoid downtime so that they can keep their assets up and running,” says Perry.

Spot isn't meant to replace human workers. It's meant to help keep them safe and make them more efficient. Instead of Lauren gearing up to inspect a possible leak, she can send Spot to inspect it and schedule maintenance as needed. Like a search and rescue dog that augments its handler's effectiveness by going where they cannot go, an agile, mobile Spot can enter dangerous environments where today, workers cannot go because of chemicals or noise or other hazards.

Using Spot to detect and repair problems will not replace workers, but it may provide an opportunity for companies to elevate their workforce to roles that better use workers' skills. Greco calls Spot a "co-bot" because it works with the human, much as the search dog works with its handler. A technician such as Lauren can

now handle and train Spot to roam the factory and fix problems. Or she may move on to other, critical high-tech jobs that the manufacturer hasn't been able to fill.

"It's better to leverage the capabilities of people to problem solve ... rather than having to spend the time and energy and potentially risk their health doing very tedious, menial tasks," says Perry. "This is an opportunity to take some of those mundane, repetitive tasks, some of those dangerous-environment tasks, and use Spot, freeing the human to go and get more high-value training."

As IBM and Boston Dynamics further develop Spot with AI capabilities, the excitement at both companies is palpable. Teams throughout IBM are bringing use cases that they feel could benefit from

using Spot and IBM analytics to the team working on this project. IBM is exploring working with ecosystem partners in areas such as 5G to use their capabilities to bring the latest technology to Spot, creating the greatest value for IBM and Boston Dynamics' clients.

Boston Dynamics will continue to augment Spot's capabilities, and IBM will continue to build more accurate models. IBM Research will bring a continuous pipeline of new analytics to the relationship with Boston Dynamics, including acoustics, smell, compositional analysis and more.

In the case of Spot, "The combination of robotics and intelligence are driving innovation. It's not just the ability to sense the world, but to sense the world and interact with it," concludes Perry.

“The combination of robotics and intelligence is driving innovation. It's not just the ability to sense the world, but to sense the world and interact with it.”

Michael Perry, Vice President of Business Development, Boston Dynamics



About Boston Dynamics

[Boston Dynamics](#) (external link) is the global leader in developing and deploying highly mobile robots capable of tackling the toughest robotics challenges. The company's core mission is to lead the creation and delivery of advanced robots designed to positively impact society. Founded in 1992, Boston Dynamics spun out of the MIT Leg Lab and is one of Inc. Magazine's Best Workplaces of 2020.

Solution components

- IBM® Global Business Services®
- IBM Maximo® Application Suite
- IBM Research®
- Red Hat®

© Copyright IBM Corporation 2021. IBM Corporation, Global Business Services, New Orchard Road, Armonk, NY 10504

Produced in the United States of America, May 2021.

IBM, the IBM logo, ibm.com, Global Business Services, IBM Research, and Maximo are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at "Copyright and trademark information" at www.ibm.com/legal/copytrade.shtml.

Red Hat®, JBoss®, OpenShift®, Fedora®, Hibernate®, Ansible®, CloudForms®, RHCA®, RHCE®, RHCSA®, Ceph®, and Gluster® are trademarks or registered trademarks of Red Hat, Inc. or its subsidiaries in the United States and other countries.

This document is current as of the initial date of publication and may be changed by IBM at any time. IBM Business Partners set their own prices, which may vary. Not all offerings are available in every country in which IBM operates.

Spot is not an IBM product or offering. Spot is sold or licensed, as the case may be, to users under Boston Dynamic's terms and conditions, which are provided with the product or offering. Availability, and any and all warranties, services and support for Spot, is the direct responsibility of, and is provided directly to users by Boston Dynamics.

The performance data and client examples cited are presented for illustrative purposes only. Actual performance results may vary depending on specific configurations and operating conditions. THE INFORMATION IN THIS DOCUMENT IS PROVIDED "AS IS" WITHOUT ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING WITHOUT ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND ANY WARRANTY OR CONDITION OF NON-INFRINGEMENT. IBM products are warranted according to the terms and conditions of the agreements under which they are provided.