Technology deep dive: Industrial Internet of Things

Description of technology

The Industrial Internet of Things (IIoT) allows for the integration of devices, sensors, and machines used for manufacturing processes to enable gathering and analyzing of generated data on a common platform.

Insights can be used to optimize the behavior of devices, sensors, and machines in real time, operationalized by machine-to-machine (M2M) communication, creating a data-driven manufacturing ecosystem.

Technology maturity

Technical maturity: Fundamental research — Mass adoption

By 2025, **50+ billion** connected IIoT devices will be deployed, generating **79.4 zettabytes**[1] of data yearly

1,000× increase in computing power per square millimeter from 2010 to 2020

Industry applicability

Industry applicability: Niche — Industry cross-cutting

What it enables companies to do

Gather real-time information

Connected devices aggregate metadata providing a status quo picture of operations at any point in time (eg, to track and monitor assets)

Enhance analytics capability

Leverage available data to train and improve algorithms on a continuous basis

Make predictions about variables

Reduce uncertainty, enhance planning, and recommend concrete actions (eg, forecasting inventory)

Automate operations

Based on insights, instruct machines how to operate in any given scenario

Generate insights

Understand interdependence of processes, including product development and manufacturing

Main opportunities

Example use cases

I ***Higher-precision operations and improved quality***
Use insights to increase precision of operations through targeted testing and granular calibration for optimal throughput

II ***Increase production flexibility and time to market***
Add functionalities through additional devices and software applications allowing users to adapt production as needed and benefit from reduced set-up time given modularity of IIoT setup

III ***Support decision making and automate operations***
Instruct machines to choose optimal paths, reducing human intervention and automating operations (eg, using robots/cobots[2])

Ensure business continuity
Deploy predictive maintenance to enhance uptime of machines

1. 1 zettabyte = 1 billion terabytes.
2. Collaborative robots.

Source: Expert interviews; F-Secure Attack Landscape 2019; McKinsey analysis

Use case deep dive: Industrial Internet of Things

Proof points

Use case	Situation and approach	Impact
I **Higher-precision operations and improved quality** 	Automotive OEM integrated existing cloud and IT platforms to reinvent and optimize manufacturing and logistics processes Goal was to create a growing industrial ecosystem for partners	Connected **122** factories and **500+** warehouses globally, consolidating real-time data and implementing analytics and machine learning **~30%** improvement in production efficiency by 2025
II **Increase flexibility and time to market** 	Global telco player looking to build a greenfield factory to manufacture 5G radios using best-in-class IT/OT[1] stack and the first wave of use cases using Azure IoT	Factory enables company to have **3×** acceleration of deployment using best practices provided by machine-to-machine (M2M) communication Operations benefitted from **125%** productivity increase compared with existing setup
III **Support decision making and automate operations** 	Cement producer experiencing significant variability in performance for manually controlled processes Wanted to implement IIoT[2] supported by AI to stabilize and improve performance	Solution was able to provide real-time optimization, allowing fine adjustments to process settings in order to stabilize and boost performance by **~10%**

1. Information technology/operations technology.
2. Industrial Internet of Things.

Source: Expert interviews; F-Secure Attack Landscape 2019; McKinsey analysis

Expected technology-development horizons: Industrial Internet of Things

Expected technology-development horizons in next 5 years

OT/IT convergence and IIoT platform integration

Physical convergence as industrial OT is developed or retrofitted with integrated sensors

OT/IT[1] processes, software, and data will integrate to enable complete monitoring and control

Increased integration of IIoT[2] technologies will drive demand for unified framework for interoperability of different IIoT platforms

Hybridization along cloud and edge computing

Proliferation of edge devices with substantial computing power to process real-time data closer to the source

Instead of analyzing data in centralized locations, edge computing returns insights quickly, broadening possibilities of automation

Enables streaming analytics, fewer operating interruptions, and new applications in remote areas

IIoT is able to drive multiple use cases across platforms

AI and machine-learning technologies are operating at scale and regarded as new normal, ie, multiple use cases across data sources and processes

Enabling IIoT use cases such as “digital prescriptive maintenance" in manufacturing

Ability to continuously and autonomously create unsupervised optimizations

Other impactful sources include automated energy optimization, where smaller HTTP requests are bundled into a single larger HTTP request

1. Operations technology/information technology.
2. Industrial Internet of Things.

Source: Expert interviews; IIoT World; Search ITOperations; McKinsey analysis

Enablers

Proliferation of connected devices to increase to 50+ billion by 2025

Continual upgrades of infrastructure due to availability and affordability of computing power, devices, and sensors

Emergence of more advanced connectivity (eg, 5G) leads to better remote connections at reducing costs of megabit/second

Barriers

Complex heterogenous environment of software platforms and hardware, requiring significant integration efforts or trade-offs

Existence of legacy devices and systems hinder data collection and interpretation as no context data available

Scarcity of engineering talent and lack of collaboration between OT and IT given diverging skills and priorities (eg, performance vs security), which also leads to lack of defined business cases

Capital-intensive upgrades needed to utilize full potential and enable all devices, sensors, and machines to work as a unified system