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Connecting brownfield facilities with Siemens MindSphere

Making any factory a smart factory – learn how to get it done

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Connecting brownfield environments

Existing manufacturing plants are often filled with old, but still-functional equipment that have several years of service left. Getting these assets connected to a modern, cloud-centric Internet of Things (IoT) system is a necessary step for digitalization and for companies seeking to leverage their current capital factory investments.

However, getting older assets connected to the industrial IoT is a large undertaking that can often seem too complicated. Luckily, three factors are making brownfield – the retrofitting of equipment with sensors to be IoT-ready – digitalization increasingly attractive and accessible to manufacturers:

Advancements in industrial IoT

- Availability of proven, hardened, secure solutions based on mature cloud hyperscale technology
- Prevalence of industrial IoT applications and solutions

Availability of add-on sensors

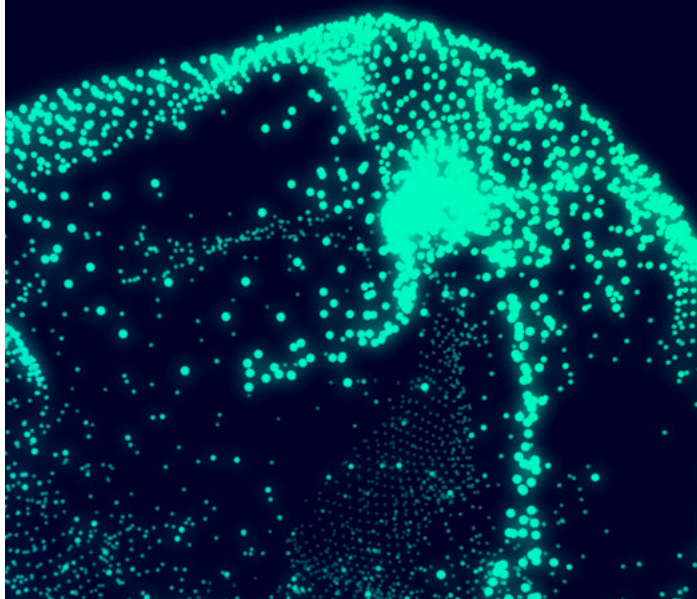
- IoT sensors can be installed on existing assets that don't have them, or that need more
- Sensor cost has declined

Accelerated proof-of-concept (PoC)

- Availability of "pay for what you use" cloud pricing and the low cost of sensors
- Minimal investment needed for companies to create IoT pilots
- Ability to digitalize incrementally rather than all at once

$1.3 billion

Capgemini estimates that building an automotive smart factory from the ground up costs between **$1 billion to $1.3 billion** – around 200 times as much as updating an existing facility[1]



How complicated is brownfield connectivity?

While it's gotten easier to implement the industrial IoT, there are still several challenges that companies face when trying to modernize an existing manufacturing facility. Getting a disparate set of machines connected to a central location is challenging due to...

Legacy equipment with outdated or insufficient sensors – or no sensors at all

Lack of a use case or clear alignment with business objectives, resulting in stalled PoCs

Heterogeneity: different machine types and brands – all with different protocols

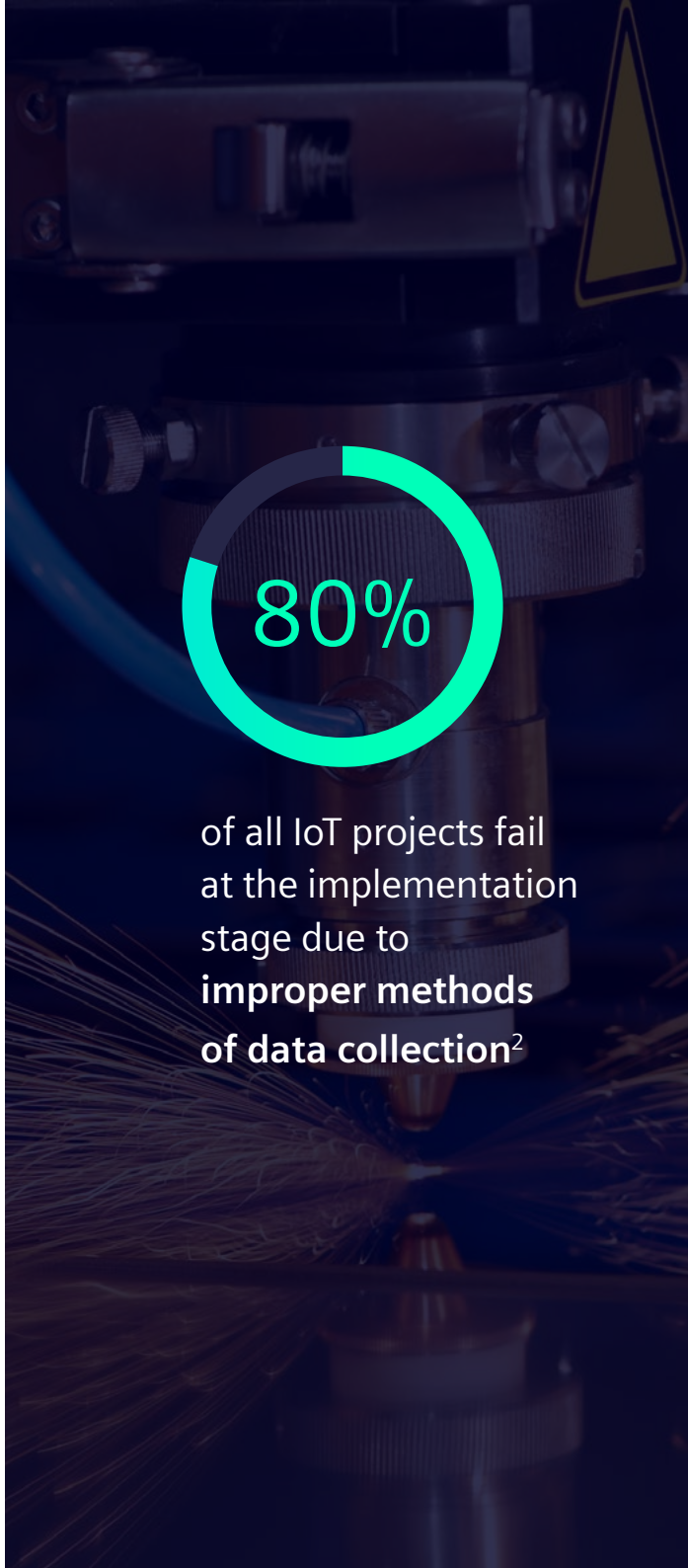
Processing systems that connect locally, but not to the cloud

Disconnected, siloed production lines and factories

Security concerns

Lack of IT or ops skillsets

While there are plenty of challenges, some IoT solutions have been developed to specifically address these obstacles. MindSphere®, the industrial IoT as a service solution from Siemens, tackles the connectivity of disparate, old machines in a very flexible and secure manner.



How MindSphere connects your brownfield environments

With access to decades of industrial expertise, the MindSphere solution leverages a broad spectrum of Siemens' technology and business partnerships, offering innovative connection options for the most diverse environments. Uniquely, MindSphere offers:

Secure asset on-boarding

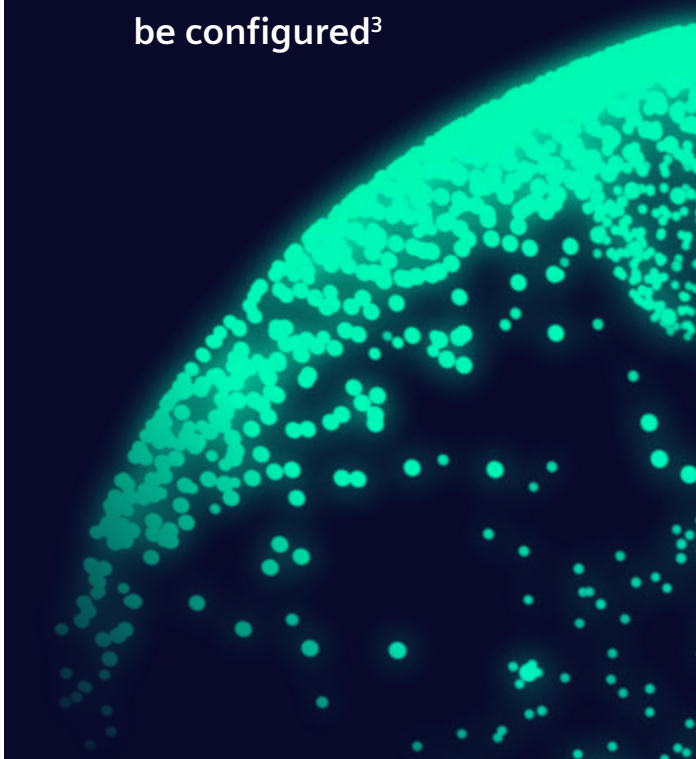
Bi-directional encrypted data communication

Data transformation and analytics at the edge and in the cloud

Available and ready-to-deploy applications and solutions to realize quick ROI, lower costs and increase quality

Let's take a look at how MindSphere does this.

We've seen up to **80 percent of a shop floor connected out-of-the-box with MindSphere** connectivity solutions – and the rest was able to be configured[3]

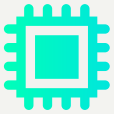


The layers of connectivity

To get your machines, products and parts connected to the industrial IoT, you need to enable several layers of connectivity, including the asset, local network and cloud.

The Siemens MindSphere MindConnect® suite of solutions provides realistic options to get you connected quickly, flexibly and securely with every layer.

Here's a closer look at what the layers entail:



Assets: Every asset you monitor must have sensors connected for each parameter you want to measure.

Local network: Sensors send data to an aggregator or gateway, which is often a programmable logic controller (PLC) or specific gateway device.

Local data collection, transformation and analytics: Analysis of aggregated data can occur at the edge for speed-critical decisions. Meanwhile, data is also sent to the cloud for aggregation across multiple locations and higher-level analytics such as model optimizations.

Cloud: Data that arrives from one or more gateways can be securely partitioned and/or federated with other factory and system data for more complex analytics and optimization. Moving data to the cloud provides greater compute, storage and memory resources that are fast, powerful and cost-effective.

Implementing connectivity layers with MindSphere

1

Sensors

Sensors come with a large variety of protocols – with MindSphere, this doesn't matter. Use the sensors you have and/or install the ones of your choice.

2

Gateway

MindConnect provides software and hardware solutions that support a large range of protocols.

3

Deployment

- **Cloud:** Deploy MindSphere how and where you want: on the public cloud through hyperscalers, such as AWS, Azure and Alibaba Cloud; on a private virtual cloud; on a private local cloud (with the Siemens IBM Redhat turnkey solution); or on a hybrid cloud environment.
- **Edge:** Run analytics at the edge for low-latency analytics
- **On-premise**

MindSphere supported protocols

Protocols supported out-of-the-box by MindSphere:

- **OPC-UA**
- **ModBus/RTU and ModBus/TCP**
- **REST**
- **MQTT**
- **CANBus**
- **Siemens S7+**
- **GPMC (nand), MMC, SPI, I2C, CAN**
- **McASP, MMC, 4 Timers, XDMA interrupt**
- **GSM/GPRS/HSPA**
- **GNSS (GPS/GLONASS/Galileo)**
- **Embedded IP functionality**
- **Fanuc Focas**
- **Sinumerik PL**
- **IEC 61850**
- **MT Connect**
- **+ new ones constantly being configured**

Hardware and software gateways: A closer look

Siemens offers a number of hardware and software gateways to meet the needs of any manufacturer.

Hardware

MindConnect IoT 2040: An entry-level, pre-configured device for collecting and transferring data to MindSphere. With a data reading cycle of up to 30 data points per second, the MindConnect IoT 2040 is well adapted to smaller production environments.

MindConnect Nano: A pre-configured device for collecting and transferring data to MindSphere. It has a data reading cycle of up to 250 data points per second, allowing for constant monitoring of the industrial process and near real-time business insight.

Learn more about MindSphere connectivity options.

Software

MindConnect LIB: MindConnect LIB is a software development kit (SDK) that enables self-programming of customer or use case specific connectivity agents. It supports encrypted transmission of on-site data to MindSphere through a secure internet connection, to enable cloud-based applications and services. It enables connectivity for almost every asset creating flexibility that can drive deeper insights into your business.

MindConnect Software Agent: A cost-effective, virtual representation of the MindConnect firmware that can be installed on a Windows 10 system that supports Hyper-V. It allows you to connect all existing hardware to MindSphere.

MindConnect Edge Analytics: Collects a huge amount of data (up to 50Khz) from a wide range of data providers and calculates KPIs on the edge. Send the calculated KPIs and preprocessed data into MindSphere for further calculations and analysis.

MindConnect Integration: Enables connection of multiple data systems to MindSphere. Using browser-based tools to graphically configure data value mapping, MindConnect Integration provides flexible tools to bring enterprise systems and data historians into context with MindSphere.

MindConnect IoT Extension: A connectivity layer that expands the number of protocols that can communicate directly with MindSphere. Various field protocols are supported along with an increased range of hardware connectivity agents that create direct connections to assets in the production environment.

The right solution for brownfield connectivity

Siemens MindSphere offers connectivity options with software, hardware and professional services that are designed to maximize the capital investment in your existing equipment by enabling you to integrate it into the connected factory and keep it up-to-date throughout its entire lifecycle.

Using advanced analytics and AI, MindSphere powers IoT solutions from the edge to the cloud with data from connected products, plants and systems to optimize operations, create better quality products and deploy new business models.

See how easy it is to connect a device, get a MindSphere free trial account.

About Siemens Digital Industries Software

Siemens Digital Industries Software is driving transformation to enable a digital enterprise where engineering, manufacturing and electronics design meet tomorrow. Xcelerator, our comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, helps companies of all sizes create and leverage a comprehensive digital twin that provides organizations with new insights, opportunities and levels of automation to drive innovation. For more information on Siemens Digital Industries Software products and services, visit siemens.com/software or follow us on LinkedIn, Twitter, Facebook and Instagram. Siemens Digital Industries Software – Where today meets tomorrow.

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For additional numbers, click here.

1 Automotive Smart Factories, Capgemini, 2018.

2 IFC White Paper, IoT 2020: Smart and Secure IoT Platform

3 Internal Siemens expert

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