

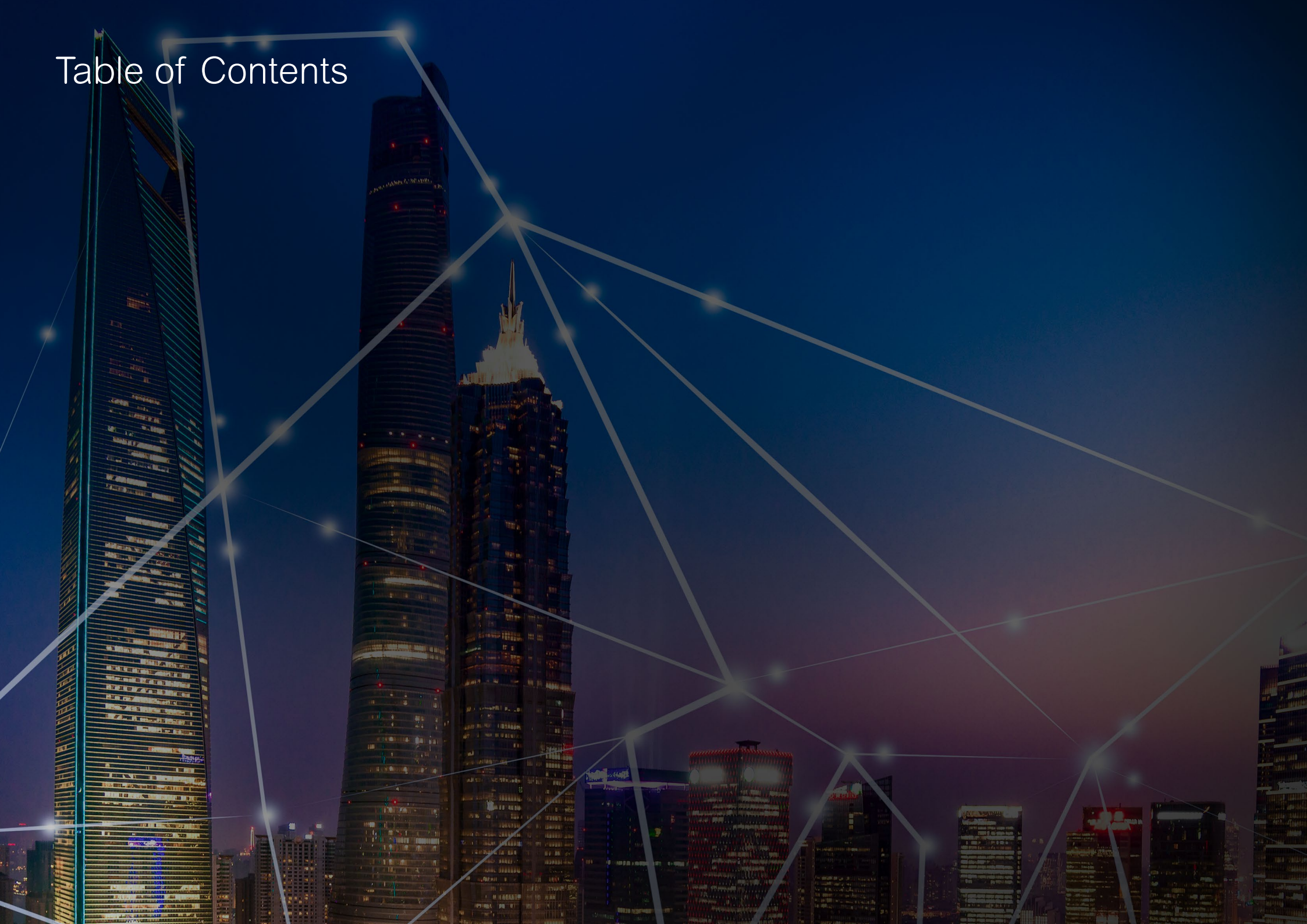
# Capturing the Business Value of the IoT Edge

Life Is On

**Schneider**  
Electric

[schneider-electric.com](https://www.schneider-electric.com)

# Table of Contents



## CHAPTER 1

# Introduction:

Understanding the IoT edge and its strategic implications



The cloud computing market is projected to reach \$411 billion by 2020.<sup>1</sup> Meanwhile, 75% of data is expected to be processed at the edge by 2022.<sup>2</sup>



# 18%

of total spend

*Trending toward the edge at the convergence of IT/OT systems: by 2020, IT spend on edge infrastructure will reach up to 18% of total spend on IoT infrastructure (IDC).<sup>3</sup>*

## A changing digital landscape

Data driven trends such as digitization and the related Internet of Things (IoT) are moving so fast that many of us simply don't know which direction to take in order to optimize business performance. At the same time, the way that data is being captured, stored, and analyzed is changing just as quickly, leading to several possible approaches to seizing data's business value.

### The purpose of this e-guide

This e-guide will give you a sense of how to better manage these sweeping technology trends and marketplace changes to take the lead in the digital economy. The information also will help you to define and advance a clear business-driven IoT edge strategy — one that leverages the data being generated from the wide network of connected, smart assets.



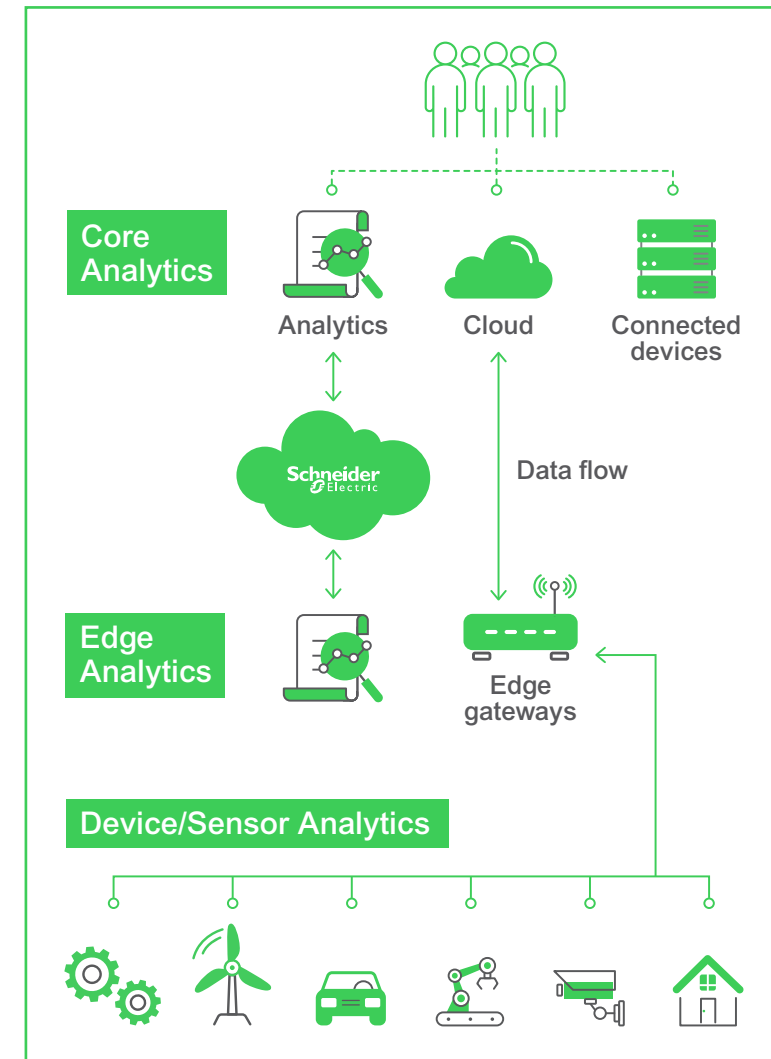
# What is the IoT edge?

IoT advancements enable a continuous information loop where data from devices at the edge of the network, meaning “on-premise” or “on the field,” can link up to cloud-based enterprise applications, thereby driving efficiency and productivity at the speed of the business. How? By turning data into actionable business insights across every relevant level of the organization: from shop floor to the executive level.

The edge of the IoT is a critical component of this information loop enabling local devices to capture data that can be analyzed quickly on the spot to support critical decision making (e.g., on the production line of an industrial processing plant) — regardless of the level of network connectivity. By reducing network latency (or, in some cases, by bypassing connectivity altogether in places such as vast irrigation fields or incredibly remote oil fields), this proximity makes fast decisions possible. Some additional benefits include the lessening of the overall burden on networks and lowering network processing expenses.

This value doesn't stop with quick, real-time local analytics, however. Data collected at the edge can feed into cloud-based, back-office enterprise resource planning (ERP) applications (such as systems for supply chain management, including inventory control and computerized maintenance management systems, or CMMS) to drive new levels of responsiveness and service. This edge/ERP convergence, for example, enables preventive maintenance of factory machines to improve performance while preserving uptime. After all, what good is data that indicates that a machine is about to fail if that data doesn't also prompt a part order or field service request? This continuous loop makes that data relevant to your business.

## Internet of Things – Edge Analytics



# Why adopt IoT at the edge?



## Quick decision making:

Capturing and analyzing data near its source allows for quick, on-the-spot decision making. Network latency is reduced for quick access to data.



## Data aggregation and quality:

You can optimize data flow to cloud-based applications and publish only clean data and with the right resolution to allow usage in the cloud (e.g., analytics, remote troubleshooting).



## Offline access to data insights:

Edge applications can bypass connectivity altogether in places such as vast irrigation fields or incredibly remote oil fields. This proximity to data offline makes fast decisions possible.



## Flexibility:

Leverage the ability to manage a fleet of devices remotely and securely (e.g., for firmware updates and/or application updates based on model learned in the cloud).



## What's an edge device?

Devices range from small footprint handheld devices and gateways to industrial machines and autonomous vehicles. These edge devices enable the use of local information to improve control over efficiency, reliability, and safety risk variables.



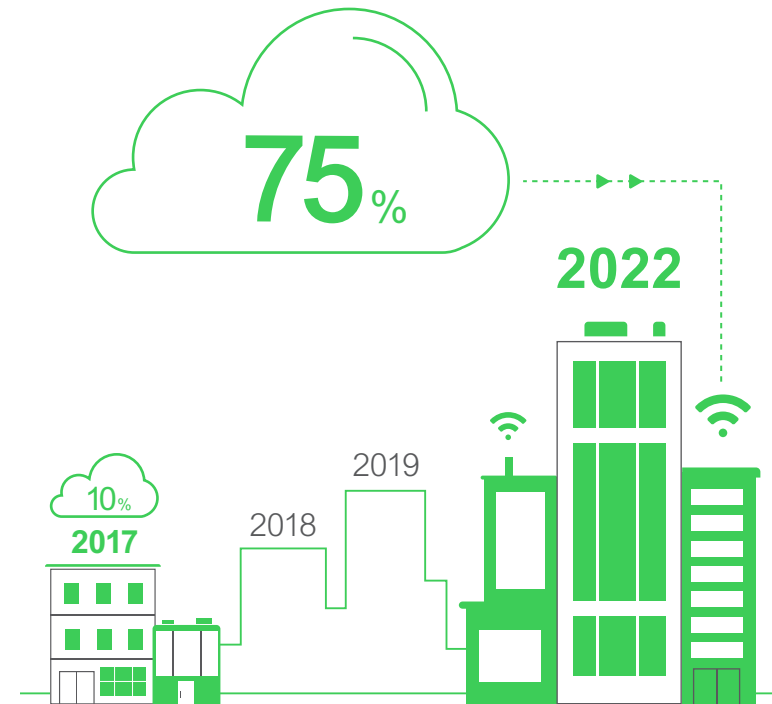
## Why stakeholders are implementing IoT at the edge now

McKinsey projects \$500 billion in growth for IoT through 2020, with 1/4 directly related to edge technology. Why? Real-time data processing, enabled by local analytics, is essential for enterprises to be able to translate and, in many cases, automate data in a meaningful, secure way. This approach drives productivity, efficiency, and business growth.<sup>4</sup>

 **5 billion+** devices will need edge computing solutions by 2020

BI Intelligence predicts that these devices, including inventory-control and safety-monitoring tools, will require edge solutions because they must collect and process data in real-time.<sup>5</sup>

By 2022, 75% of enterprise-generated data is predicted to be processed outside a traditional centralized data center or cloud (up from 10% in 2017).<sup>6</sup>



# How can you capture the business value?

IoT at the edge deployments can:

01

Reduce network latency where and when decision-making is critical.

02

Enable local data decisions and the transmission of data to the cloud.

03

Facilitate broader business decision making and/or more advanced analytics over time.

04

Drive productivity, save money, and simplify business processes.

05

Lower the fees associated with consistently transmitting volumes of data in real-time across networks.

06

Close the gap between old and new devices and systems.

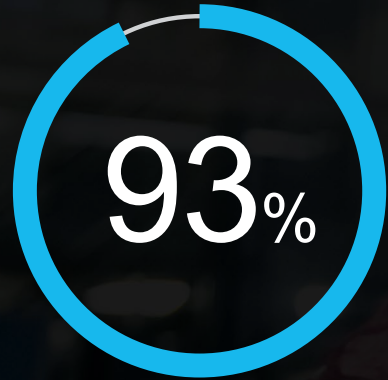
Let's look at how businesses can create and adopt an appropriate IoT strategy that addresses their particular needs ...



## CHAPTER 2

# From insights to strategies:

Cloud, edge, and hybrid environments



93% of industrial stakeholders agree that both edge and cloud processing will form the basis of their industrial automation infrastructure.<sup>7</sup>

Knowing how to balance cloud, edge, and hybrid environments begins with a fundamental understanding of the roles of each.

## Leveraging the scalability of the cloud

Compared to traditional processing systems, cloud-based systems have proven to be quicker to roll out and easier to customize. They also can accelerate the speed and volume of collaboration between suppliers and distributors.

### Cloud implementations help manufacturers:



Drive productivity



Capture and apply company-wide intelligence and knowledge through the use of analytics



Deploy business intelligence (BI) and rules engines

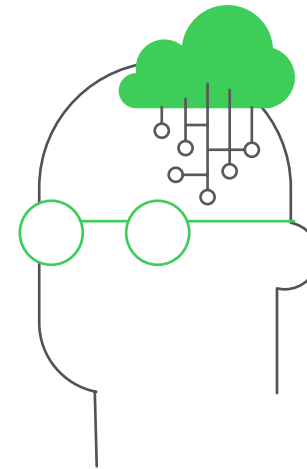


Achieve a higher quality of customer service and customer engagement (e.g., through online order status inquiries, and via distributed order management and pricing)



Scale quickly when users attempt to onboard thousands of connected devices at speed

Deploying analytics and artificial intelligence (AI) applications that exploit the massive amounts of data from multiple sources work only if a cloud infrastructure is provided.



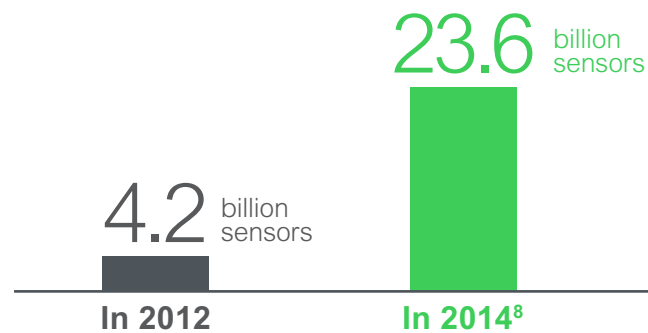
## Edge emerging as a cost-effective and flexible supplement

Local connected devices generate data that can yield insights on-premise instead of having to rely solely on the cloud for heavy computing and analysis. This approach reduces both latency issues and cost while protecting the sensitivity of collected data. Currently, much of the data being generated from industrial machines is not captured, or if it is captured is not used to gain competitive advantage. Compared to traditional “edge software,” edge combines the benefit of local data decisions plus a greater level of flexibility and scalability. With edge capabilities, moreover, you can manage a fleet of devices remotely and securely (e.g., control, update, revoke).

### Get a handle on data

Think about the volume of data generated at the edge from an industrial process such as the mixing of dangerous chemicals in tanks. These require the measurement of temperatures every two seconds so that a quick change in trend can be observed and acted upon. Capturing this volume of data requires bandwidth levels that can overwhelm available resources.

## Sensors shipped for industrial use has skyrocketed!



But is data being leveraged well for analytics?

On average, **60-73%** of all data within an enterprise goes unused for analytics<sup>9</sup>

### Why the disparity between data collected and data analyzed?

Until now, one significant reason for the disparity of data collection and data use is the fear of latency and the expense of moving data around networks. The new generation of edge devices opens new doors by addressing the latency problem. More data will become available to gain insights, and then stakeholders can act quickly on those insights locally and autonomously.



# The strengths of a hybrid approach

Drawing from the strengths of both cloud and IoT edge, a “hybrid” approach implies a blending of both cloud and edge data processing schemes. At the edge of the IoT, strategies such as summarizing, sampling, aggregating, or compressing local data are implemented prior to the transmission of data over to the cloud.

In a hybrid approach, the cloud itself is utilized as a resource for the orchestration of data. That is, the cloud leverages its ability to access large pools of data across domains. Data is transmitted when a change of state occurs, for instance.



## How you can save

Within corporate facilities and manufacturing sites thousands of connected, networked devices (e.g., meters, local SCADA and control systems, electrical distribution equipment, and various assets being monitored) represent millions of dollars in potential savings. Rather than paying for a constant stream of networked data, edge computing allows users to pay for less frequent network connections to either the cloud or enterprise applications. This is the essence of leveraging a hybrid edge/cloud approach.

## Use case: smart thermostats

A connected smart thermometer provides a good example of how edge applications can reduce corporate data processing costs:

- It's controllable from a mobile application, but it also reports its own status constantly because it's checking against weather feeds (i.e., will the outdoor temperature drop in the next 15 minutes).
- It adjusts the temperature set points at a person's home in an attempt to save the most amount of energy.
- These devices have a direct cloud connection and tell the cloud "I'm at 26 °C" at intervals of every 12 seconds. This pattern continues until some outside variable in the thermometer triggers a change in data.

This is not a productive use of a hyperscale cloud data center from an end user cost perspective.



## How the edge processing portion of the hybrid approach overcomes this issue:



The device reports to the massive hyperscale data center only when there is a change required or detected.



When a given device reports a change in state (such as a rise in temperature) then the cloud resource is engaged.



Thus, the cloud compute resource is required far less frequently and more of that work is pushed to the edge framework.



# Why OT/IT convergence?

## The role of enterprise applications

Some applications can require centralizing core business logic and transactional databases within enterprise systems (such as an Enterprise Resource Planning, or ERP, system) while the presentation layer and some business logic and database functionality move to an edge platform. Implementing a distributed application service at the edge requires overcoming numerous challenges, including security, distributed load-balancing and resource management, accounting and billing, deployment, testing, debugging, and monitoring.

## How IoT edge meets ERP

The “back office” to edge is a critical element for exploiting the advantages of hybrid edge/cloud/enterprise system environments.

### 01

Device gets connected to the network through an IoT sensor and starts producing data (such as a device that reports back its operating condition from a preventative maintenance standpoint).

### 02

Message gets generated back to the enterprise application (e.g., supply chain management) and customer relationship management (CRM) system.

### 03

The ERP system takes over: for example, opening a ticket to order the spare part flagged by the edge sensor as about to fail, strengthening the digital customer experience.

---

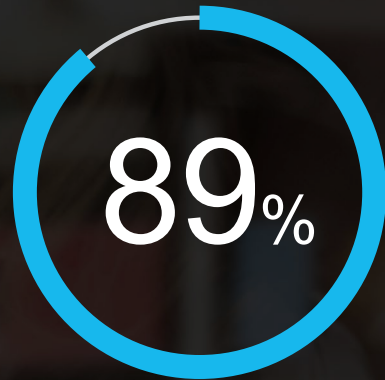
Let's take a deep dive at how an edge strategy can unlock business efficiency and growth across markets ...



## CHAPTER 3

# Solving challenges:

Unlocking efficiency, productivity, and new business models



89% increase in overall equipment effectiveness from predictive maintenance with edge computing.<sup>10</sup>

## Solving some cross-industry challenges

New software algorithms are being created that can be managed remotely and that can apply modifications to a multitude of edge hardware devices across the globe. Today, if you need to upgrade an existing edge node, you have to physically go on site to each location and perform the upgrade. Within the context of the new edge framework, devices can be managed from a single remote location (e.g., firmware updates, installed base modifications).

The idea is to have a robust way of managing edge systems or devices. The framework software tools will also come with built-in cybersecurity. As a result, end users don't have to manage the task of acquiring cybersecurity certifications and maintaining the proper cybersecurity levels.

## Use case: Better fleet management

One major value of IoT at the edge is the ability to remotely manage, at scale, a large fleet of devices. In addition to managing firmware updates, you can deploy functions with datasets securely available in the cloud and then deploy the model at the level of one device or a fleet of devices, transforming maintenance with predictive capabilities. In the same way IT components are managed, edge nodes/devices will follow the same rules for better management of the cybersecurity of devices, as well as streamlined administration of devices in a case to case way (i.e., depending on the domain, the application, and/or the location).





# Where do IoT edge deployments provide business value?

The business issues of time-to-market, response agility, and marketplace competitive advantage all take on different characteristics depending upon the industry. Edge implementations designed to help address these issues are as unique as the applications they support.

In order to compare differences, consider four distinct environments where you can realize business value: a manufacturing facility, a remote oil and gas operation, an electric utility, and a commercial building.

## ~10%

reduction in maintenance costs

*of industrial equipment with predictive maintenance.<sup>1</sup>*

## Manufacturing: Improving productivity at the edge

As intelligent devices move into areas of manufacturing operations that used to be “dark,” these applications are designed to provide local workers (think of machine operators and on-site engineers) with the power and intelligence, artificial or otherwise, to respond faster and to make better decisions. Local analysis and decision making are necessary in order for one machine to coordinate with other machines and systems. The local control ensures that these traditionally autonomous systems are operating in a manner that supports the dynamic business needs.

## Better monitoring of plant parameters

Edge analytics that monitor parameters such as temperature, humidity, and pressure, can be leveraged to enable adoptive process control—the ability to arrive at optimal process parameter set points and tolerances based on environmental conditions. In plant operations such as paint production, this capability can bring consistent quality and significantly increase yield.



## Oil & Gas: Managing remote, widespread assets

Within the Oil & Gas industry, where assets are spread out geographically in typically very remote areas, IoT at the edge enables remote site monitoring and more accurate asset alarms and responses to problems and risks. IoT gateways bypass the need for reliable—or any—connectivity while supporting analytics and machine learning where the assets live.



Learn more about a refinery application.

New real-time optimization methods enable operators and managers of petrochemical processes, for example, to react quickly and precisely to changing market pressures, feed and energy costs, and equipment performance needs. Real-time optimization targets are available for control set points including: feed rate and composition, olesteam to hydrocarbon ratios, pressure specifications, and temperature controls. This optimization enables the system to make the proper economic trade-offs.

## Optimizing output with sensors and edge analytics

**Goal:** Optimize temperature and flow to align with profitability targets



### Before IoT

Operator relies on his/her expertise/experience to change temperature while breaking down oil into popular by-products:

- 8-hour delay to know whether adjustment is successful based on seeing the impact.
- Operator won't receive feedback surrounding the value of his/her decision (profitability) until the end of the month, at the earliest.



### With IoT at the edge

An integrated architecture connects devices, edge control (i.e., in a refinery, feed control or DCS control) and the software apps:

- The impact of real-time operator adjustments is available immediately.
- Profitability information is available at hand, too, allowing the operator to make any immediate readjustment to maintain (or even surpass) profitability targets.



# Electric Utilities: Driving efficiency with new business models

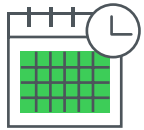
As electrical distribution networks undergo a shift from a traditional, centralized, linear structure (from power plants out to the world) to a more decentralized model (downstream, renewable energy sources, and prosumers who generate their own power), distribution utilities have a great deal

more network complexity to manage than in the past. Smart, connected edge devices can deliver the real-time visibility they now need to operate, maintain, and plan their grids in an optimal way. Smart meters, for example, are one way utilities collect important data.

## Old-school vs. smart metering with IoT

---

In addition to the remote data collection, smart and connected meters yield data that can lead to new services and stronger customer engagement when using analytics software.



**1** reading  
per month  
(or every 2 months) per meter

vs.



**15-, 30-, or 60-minute**  
readings  
producing 1,000 to 10,000 X more data



# How can edge devices benefit utilities?

Edge devices deployed across the grid can help utility companies:



Communicate and provide data useful for end customers (e.g., smart meters that help customers flexibly manage their electricity demand and optimize costs).



Improve substation control as feeder automation, located in substations, a front-line technology for advanced fault detection, distribution network control and the monitoring of low voltage (LV) and medium voltage (MV) current flows.

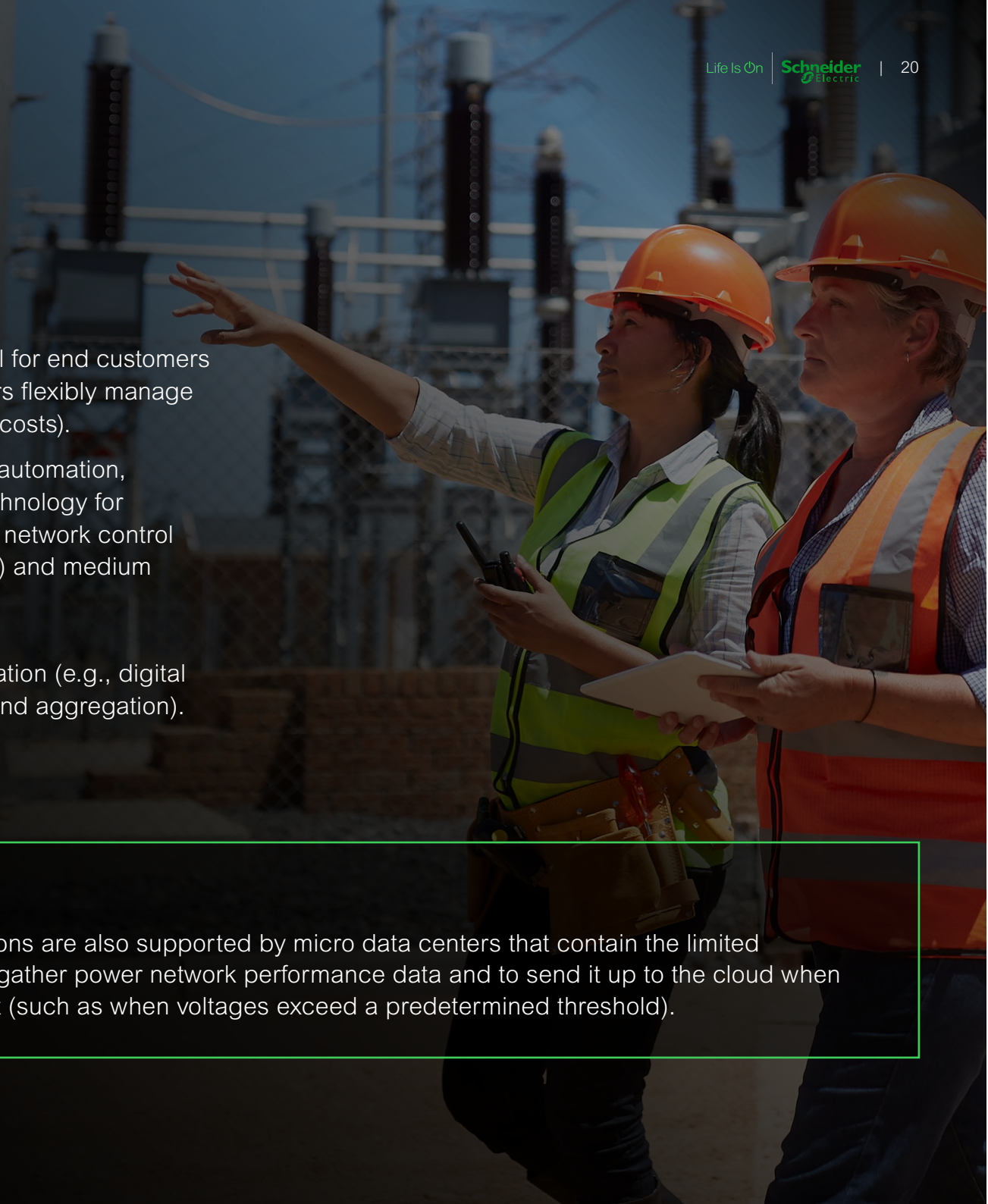


Enhance grid management and operation (e.g., digital platforms that focus on optimization and aggregation).



## Did you know?

Many of these edge applications are also supported by micro data centers that contain the limited processing power needed to gather power network performance data and to send it up to the cloud when particular parameters are met (such as when voltages exceed a predetermined threshold).



# 66%

reduced interruption

*Institute of Electrical and Electronics Engineers (IEEE) statistics show that an effective electrical maintenance program can reduce the risk of electrical distribution system-induced business interruption by as much as 66%.<sup>12</sup>*

## Commercial buildings: Lowering cost and complexity

Maintenance of buildings is an expensive proposition. In traditional environments when a problem occurs in the electrical distribution system, a repair crew has to be dispatched multiple times to first diagnose the problem and then perform the necessary repairs (which can often lead to an extended shutdown of parts of the building).

Smart power panels add value by lowering the cost and complexity of commercial building asset management. For example, electrical panels (those grey metal boxes that house circuit breakers and power meters and that are also known as switchboards) are now beginning to be shipped with the ability to gather electrical component data and to connect to the cloud in order to provide its key operational conditions. When a electrical outage is likely to occur (or has occurred), electrical panels will be able to notify both edge and cloud applications in the fastest manner.



## How can smart panels become edge devices?

### 01

Smart panels enable the remote monitoring of components such as circuit breakers and power meters.

### 02

Performance data can be gathered locally.

### 03

This data is then analyzed for anomalies.

### 04

Edge data also can be compared to cloud data, so that decisions involving predictive maintenance can be highly accurate.

### 05

Edge-driven predictive analysis can head off power outages before they occur.

### 06

Operator gains better management of when particular electrical components need to be replaced.



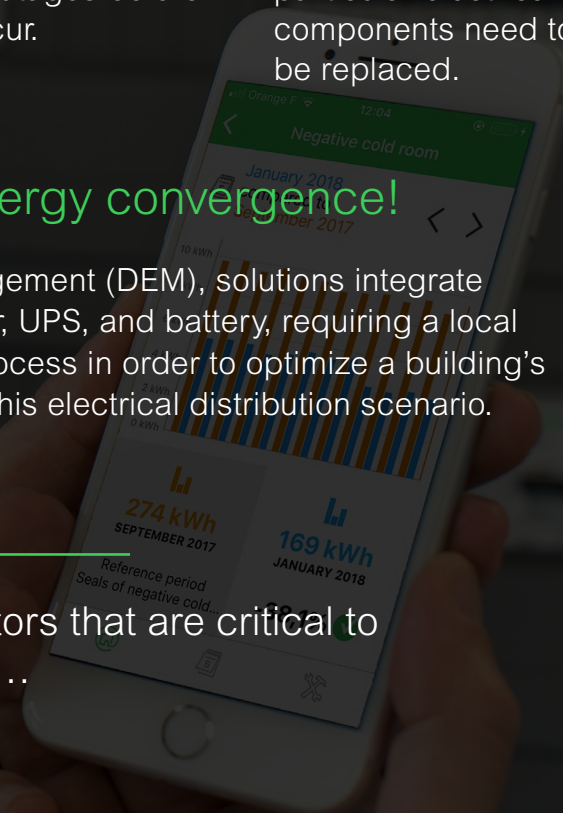
### The benefit?

This process all adds up to significant asset management cost savings. Such devices also provide a much higher degree of energy management, so that building energy consumption costs can be more easily controlled.

## Get ready for edge and energy convergence!

Microgrid, or Distributed Energy Management (DEM), solutions integrate photovoltaic, combined heat and power, UPS, and battery, requiring a local business logic and decision making process in order to optimize a building's energy footprint. Smart panels enable this electrical distribution scenario.

Let's consider a few factors that are critical to successful deployment ...



## CHAPTER 4

# Critical success factors:

People, skills, collaboration, and deployment

2x

According to Gartner, by 2023 midsize enterprises that integrate proven digital workplace strategies are two times as likely to emerge as top performers.<sup>13</sup>

# Best practices for evolving a digital workforce

One of the biggest challenges surrounding business transformation is keeping a workforce up to speed with the current skills necessary to participate in the digital change. For example, domain experts now need to work in collaboration with data scientists and computer specialists as part of a solid IoT business strategy.

## 01

### **Merging IT and OT skill sets**

– Organizations will require Operations Technology (OT) hardware developers for programming IoT devices, software developers proficient in cloud technologies, and developers with specialized programming language skills, such as in machine learning, stream analytics, and artificial intelligence.

## 02

**A premium on developing analytical skills** – Leveraging IoT decision support benefits through edge environments depends heavily on improved analytical, modeling, and reporting capabilities. The use of predictive and prescriptive analytics tools across key functional processes will accelerate rapidly.

## 03

**Closer IT and Line of Business collaboration** – Both IT and LoB stakeholders will be challenged to support each other to cut through the information overload inherent to understanding the nuances of marketplace changes and the impact on technology development and edge deployments.



# Deployment considerations for a successful strategy

Transforming a business through new advancements offered by IoT edge integration can be streamlined by adopting several deployment best practices and lessons learned. Scroll through these considerations:

01

## Keep a customer-centric goal in mind

The motivation for deployment of edge solutions should not be a hollow attempt to keep up with technology trends. As part of the overall digital transformation of the company, the reason for deployment should focus on issues such as:

- Improving customer experience
- Becoming a leader in service across a particular category
- Implementing significant improvements in the overall supply chain

---

Let's take a look at how advancements in artificial intelligence and machine learning are driving business value of IoT at the edge ...

# Deployment considerations for a successful strategy

Transforming a business through new advancements offered by IoT edge integration can be streamlined by adopting several deployment best practices and lessons learned. Scroll through these considerations:

02

## Anticipate manageable complexity

While distributing code to the edge provides a number of advantages, it can introduce operational complexity and management issues that can be handled upfront:

- Acquire tools that enable the distribution of analysis components so that they run closer to sensors, actuators, and sources of data
- Look for software that simplifies the deployment of edge features on devices, gateways, and also on virtual appliances

---

Let's take a look at how advancements in artificial intelligence and machine learning are driving business value of IoT at the edge ...

# Deployment considerations for a successful strategy

Transforming a business through new advancements offered by IoT edge integration can be streamlined by adopting several deployment best practices and lessons learned. Scroll through these considerations:

03

## Look to partnerships to save on the expense of going it alone

Working carefully with qualified vendors or partners who have tools and global knowledge (with local expertise) of how to:

- Simplify deployments of edge solutions to jumpstart activity
- Help businesses get smart quickly about how to more cost effectively leverage their data
- Fill expertise gaps and engage a higher percentage of best-in-breed elements

---

Let's take a look at how advancements in artificial intelligence and machine learning are driving business value of IoT at the edge ...

# Deployment considerations for a successful strategy

Transforming a business through new advancements offered by IoT edge integration can be streamlined by adopting several deployment best practices and lessons learned. Scroll through these considerations:

04

## Safeguard system uptime

Just as the cloud can provide redundancy to traditional data centers that remain on-site, edge implementations also will need to consider the level of redundancy required to fulfill the needs of the local application, such as:

- The redundancy of traditional power systems (UPS, distribution), which often are 1N and thereby decrease availability and eliminate the ability to keep systems up and running when maintenance is performed
- Level of site criticality: if the edge site is critical, redundant power paths for concurrent maintainability should be considered

Let's take a look at how advancements in artificial intelligence and machine learning are driving business value of IoT at the edge ...

# Deployment considerations for a successful strategy

Transforming a business through new advancements offered by IoT edge integration can be streamlined by adopting several deployment best practices and lessons learned. Scroll through these considerations:

## 05 Deploy a unifying architecture

Across edge environments, an open and interoperable system architecture that incorporates connectivity, edge control, apps, analytics, and services, such as Schneider Electric's IoT-enabled EcoStruxure™ architecture, helps to:

- Ease the burden of managing and protecting both cloud, on-premise, and edge networks
- Streamline the management and maintenance of the new digitized hybrid environments
- Address the supervisory, execution and quality control challenges with compatible, connected tools along with the integrated products and precise project management

Let's take a look at how advancements in artificial intelligence and machine learning are driving business value of IoT at the edge ...

# Deployment considerations for a successful strategy

Transforming a business through new advancements offered by IoT edge integration can be streamlined by adopting several deployment best practices and lessons learned. Scroll through these considerations:

## Consider micro data center solutions

Over time, the data from edge devices will have to be stored locally. Moving an IT stack from an enterprise level to the edge of the network is no longer a complex endeavor thanks to the emergence of micro data centers. Micro data center solutions from Schneider Electric, for example:

- Include all the “must-haves” of power protection, battery back-up, cooling, environmental monitoring, and remote management to ensure consistent, reliable access to business-critical cloud services
- Minimize downtime risks with rack-enclosed power and cooling solutions
- Can accommodate rugged, harsh, and/or remote environments

06

Let's take a look at how advancements in artificial intelligence and machine learning are driving business value of IoT at the edge ...

# Deployment considerations for a successful strategy

Transforming a business through new advancements offered by IoT edge integration can be streamlined by adopting several deployment best practices and lessons learned. Scroll through these considerations:

## Account for physical security

At the edge, IT assets may be in the corner of an office building, a hospital room, or in a busy retail environment, exposed to both people and the outside elements. Monitoring and automation software integrated with video surveillance and sensors, along with training and education programs, can:

- Provide a layer of physical security of environment and assets
- Reduce the occurrence of security and human error-related downtime problems in these small, distributed edge environments

07

Let's take a look at how advancements in artificial intelligence and machine learning are driving business value of IoT at the edge ...

# Deployment considerations for a successful strategy

Transforming a business through new advancements offered by IoT edge integration can be streamlined by adopting several deployment best practices and lessons learned. Scroll through these considerations:

## Implement a cybersecurity framework

In a world where more and more systems are connected to the internet, a layered-approach to cybersecurity is essential. Traditional perimeter defenses, while helpful, may no longer provide the depth of cyber protection required. Consider a framework that enables you to:

- Identify threats (i.e., register risks)
- Protect people, assets, and technology by deploying digital lock capabilities
- Detect risk and threats by monitoring through a security operations center
- Respond quickly by neutralizing a cyberattack once discovered
- Recover by continuously revisiting and adapting cyber protection to minimize future risks to reduce vulnerabilities and limit business interruption

08

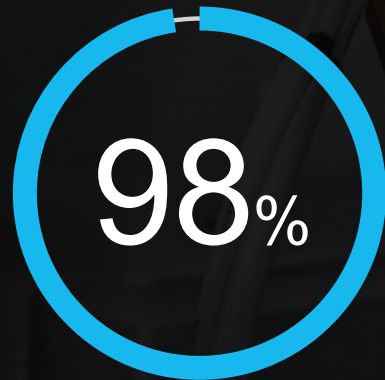
Let's take a look at how advancements in artificial intelligence and machine learning are driving business value of IoT at the edge ...



## CHAPTER 5

# A look ahead:

The impact of machine learning and AI at the edge



98% of industrial companies expect to increase efficiency by 2020 with digital technologies, including predictive maintenance and augmented reality.<sup>14</sup>

## From sensor to business sense

Profound technology innovations such as artificial intelligence (AI) are redefining the boundaries and expectations for new edge applications. We see it every day in the growing use of digital technologies to generate revenue, improve partnerships, and replace/evolve processes. With the help of AI, data can be analyzed in real-time. The end result can be tighter control over profitability and better compliance with local regulations.

## Real-time decision making

Edge processing needs to make the best possible decision based on a statistically relevant model that's always updating in the cloud. For example, if you're trying to determine the efficiency of an air compressor, analyzing data from only one or two local compressors is statistically insignificant.

## Making data meaningful



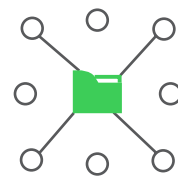
### Sensor data

Artificial intelligence (AI)-driven decisions derived from only two data points are not helpful. Analyzing that restricted data set over time helps a little, but it does not present a robust base for making critical decisions.



### Data lake analysis

If, however, data from 2,000 air compressors can be pooled via the cloud in a data lake, a statistically relevant model now exists and the decision can be pushed from the cloud right back to the edge node.



### Edge analysis

The edge node then only needs 2 to 3 data points from the local data set to determine whether or not the compressor is experiencing a potential problem.

# 47%

---

*47% of respondents surveyed cite uptime improvement as the primary goal for adopting a predictive maintenance strategy.<sup>15</sup>*

## An extra layer of security

When an edge node is added to a network, it is certificate-secured in its communication to both the cloud and local devices and machine learning models are utilized to recognize instances of abnormal behavior. No physical point can be used to access the data on that edge node. An edge gateway, for example, is capturing and transmitting data in small subsets. There is not much data to steal and there are limited storage devices. Because transactions are bidirectionally secure from the edge node to the cloud, there is no way to breach that data unless a hacker has penetrated all of the cloud firewalls.

If a device is being monitored or has monitoring capabilities, it can use machine learning models to understand the characteristics of normal behavior and operation and can recognize when it is being compromised.





## Reducing downtime through predictive maintenance

By acquiring, monitoring, and analyzing data at the local component level, edge analytics can identify a potential problem before its effect materializes. Rather than identifying and analyzing *an effect* (excessive motor bearing vibration, for example), edge models identify and analyze *a cause* at a granular level (a voltage leak that is causing a bearing temperature spike, degrading the other bearings or causing vibration). Proactivity vs. reactivity now is possible.

### The business value of predictive maintenance (Deloitte research)<sup>16</sup>



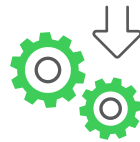
25%

increase in productivity



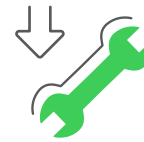
10-20%

increased equipment uptime by predicting failures via analytics



70%

reduction in breakdowns



5-10%

reduced maintenance costs

## Use case: machine learning a mile deep

Rod pumps (also called “pump jacks”) are the iconic pivoting pumps that dot oil fields around the world. They often run autonomously in remote locations where no humans are watching them. They pull oil from the ground and do so on a continuous basis. Traditionally, oil companies would regularly schedule crew visits (every 6 months or so) to the pump jacks to make sure they were running. This was an expensive process. Oftentimes parts would get replaced whether or not they needed replacing. Certain pump jacks would be malfunctioning (and may have been malfunctioning for quite a long time). Others would begin to malfunction shortly after repair crews left. There was no way to monitor their behavior.

### How local analysis creates value

Realift™ Rod Pump Control allow these pump jacks to record data locally so that operational history can be accessed remotely.



Data collected by a local system goes to the cloud on an infrequent schedule unless a pump experiences distress.



An AI engine allows these pumps to send more accurate messages to alert the repair crew to cut down on unnecessary crew visits.



This approach reduces losses by limiting downtime and boosting the efficiency of repair crews, who no longer have to attend to false alarms in remote locations.

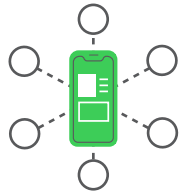
# A longer-term vision for edge

The proliferation of edge devices means enterprises now will be able to generate even greater insights into the state of their business operations. The edge represents the natural evolution of the Internet of Things.

## Realizing IoT's benefits with edge integration



local processing and local analytics that help reduce cost



a smaller overall connectivity footprint



reduced latency and traffic to and from the cloud



the ability to make decisions closer to both the process and the line of business leaders

In fact, edge is acting as a miniature revolution inside the IoT evolution; however, those deploying edge projects need not be pioneers. Today's users can reduce the risk and time of deploying these technologies by looking to others who have already done so. By observing how projects have progressed, they can then assimilate the lessons learned in order to optimize their own implementation.

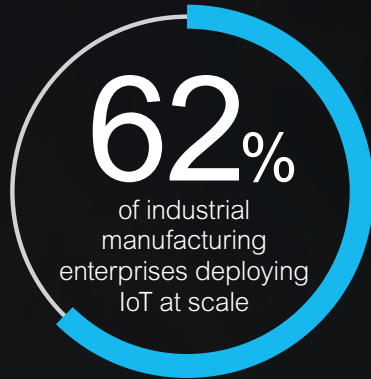
---

Discover how Schneider Electric can support your edge strategy.

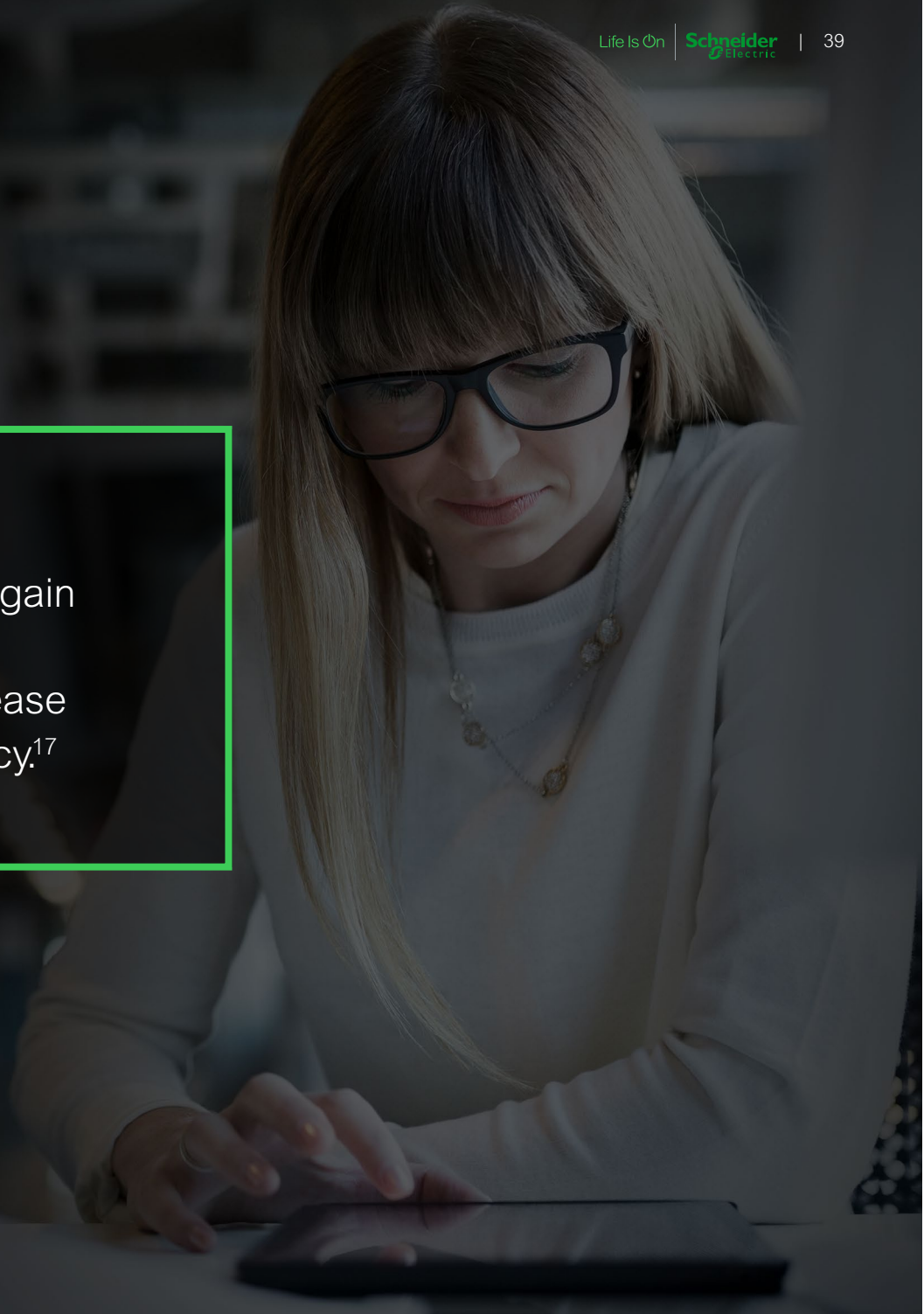
## CHAPTER 6

# Getting started:

a sensible approach



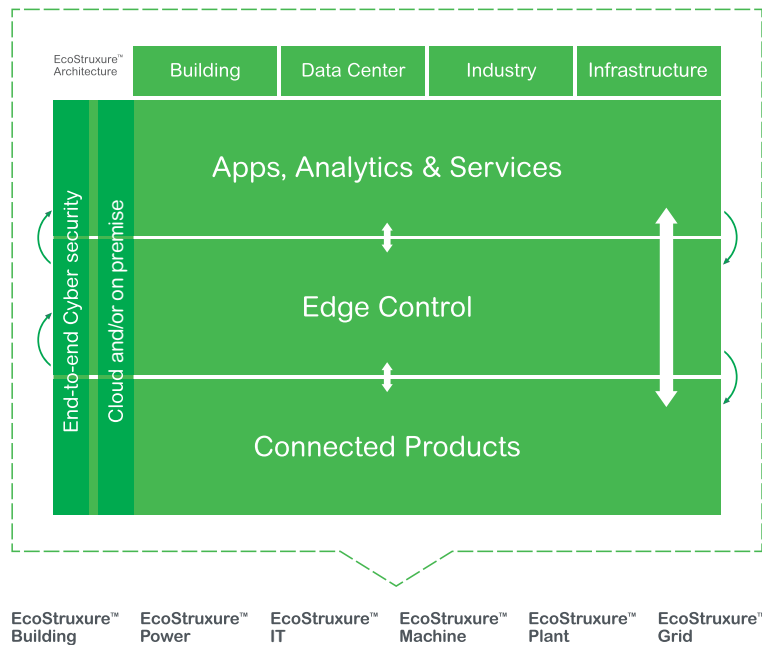
Where are you going to seize the value of IoT to gain a competitive edge? IoT edge adoption can increase productivity and efficiency.<sup>17</sup>



# Learn how to get started with a sensible approach

Schneider Electric has developed a framework for edge integration within its IoT-enabled [EcoStruxure™](#) architecture.

## EcoStruxure™ Innovation At Every Level



### 01

**Edge framework will bring cloud connectivity as a basic value proposition**

Smart devices have sensors and/or actuators embedded that are connected over a local network and that interact with their surrounding physical world. Many of these devices connect to the cloud either directly or via a gateway.

### 02

**Gateways that act as intermediaries to the cloud**

Edge gateways mediate between a set of devices and act as a bridge between the local devices and the cloud. They can be transparent or they can implement logic such as aggregation, analytics, store and forward, and related functions. Gateways can be implemented in physical hardware or can operate virtually in a virtual machine (VM) or similar runtime environment.

### 03

**Fully integrated cybersecurity from the device to the cloud**

Whether managing a large fleet at scale for the configuration and administration of the devices, deployments of applications/functions remotely, or monitoring of the devices, Schneider Electric's edge solutions integrate an end-to-end cybersecurity framework. This approach includes a Secure Development Lifecycle process for products.





- <sup>1</sup> Forbes, Cloud Computing Market Projected to Reach \$411B by 2020, Forbes, October 2017.
- <sup>2</sup> van der Meulen, Rob, Gartner, "What Edge Computing Means for Infrastructure and Operations Leaders, Gartner. Originally published October 18, 2017; updated October 3, 2018 to reflect new research. <https://www.gartner.com/smarterwithgartner/what-edge-computing-means-for-infrastructure-and-operations-leaders/>
- <sup>3</sup> Oct 2017 - IDC FutureScape - Doc # US43161517, IDC FutureScape: Worldwide IoT 2018 Predictions.
- <sup>4</sup> Arul Elumalai, Kara Sprague, Sid Tandon, and Lareina Yee, "Ten trends redefining enterprise IT infrastructure." McKinsey. November 2017. <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/ten-trends-redefining-enterprise-it-infrastructure?cid=other-eml-nsl-mip-mck-oth-1712-nct&hlkid=5f6fc5a54e4649ebbf477b479f31ae2c&hctky=9709527&hdpid=3f3e754a-6aac-41d6-9dc8-f5ff75ac8c73#>
- <sup>5</sup> Nicholas Shields, "Microsoft brings IoT to the edge." Business Insider. May 12, 2017. <https://www.businessinsider.com/microsoft-brings-iot-to-the-edge-2017-5>
- <sup>6</sup> Van der Meulen, Rob, Gartner, "What Edge Computing Means for Infrastructure and Operations Leaders, Gartner. Originally published October 18, 2017; updated October 3, 2018 to reflect new research. <https://www.gartner.com/smarterwithgartner/what-edge-computing-means-for-infrastructure-and-operations-leaders/>
- <sup>7</sup> ARC, "Is IIoT Living on the Edge in Industrial Environments?," November 2017. Cited in <https://iiot-world.com/reports/is-iiot-living-on-the-edge-in-industrial-environments/>
- <sup>8</sup> Industrial Internet of Things: Unleashing the Potential of Connected Products and Services, World Economic Forum Report, in conjunction with Accenture. State of the Market. <http://reports.weforum.org/industrial-internet-of-things/general-findings/2-1-the-state-of-the-market/>
- <sup>9</sup> Mike Gualtieri, Vice President, Principal Analyst, Forrester, <https://go.forrester.com/blogs/hadoop-is-datas-darling-for-a-reason/>
- <sup>10</sup> Aberdeen Group research cited in "Unlocking the benefits of predictive maintenance with edge computing," Dell/Intel White Paper, January 2017. Available: <https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/benefits-predictive-maintenance-edge-computing-white-paper.pdf>
- <sup>11</sup> McKinsey & Company. [Smartening up with Artificial Intelligence \(AI\) – What's in it for Germany and its Industrial Sector?](#) April 2017
- <sup>12</sup> Institute of Electrical and Electronics Engineers (IEEE): <http://www.ieee.org/index.html>
- <sup>13</sup> Kasey Panetta, Gartner, Build Your Digital Workforce for Success, May 31, 2018. <https://www.gartner.com/smarterwithgartner/build-your-digital-workforce-for-success/>
- <sup>14</sup> PwC, Digital Factories 2020. May 2017. <https://www.pwc.com/gx/en/industries/industrial-manufacturing/publications/digital-factories-2020.html>
- <sup>15</sup> PWC, "Predictive Maintenance 4.0. Predict the unpredictable," June 2017.
- <sup>16</sup> Capgemini Digital Transformation Institute, IoT in Operations Survey, October 2017. Cited in <https://www.forbes.com/sites/louiscolombus/2018/03/18/where-iiot-can-deliver-the-most-value-in-2018/#5bfa019e42fa>
- <sup>17</sup> U.S. Department of Energy, Federal Energy Management Program "Operations & Maintenance Best Practices: A Guide to Achieving Operational Efficiency," August 2010.

➤ [Click to go back to original page](#)



To learn more about EcoStruxure™, visit [Schneider Electric Internet of Things](#)

[schneider-electric.com](https://schneider-electric.com)

