IoT: The 4th Industrial Revolution

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THE POWER TO KNOW.

Internet of things

The 4th industrial revolution

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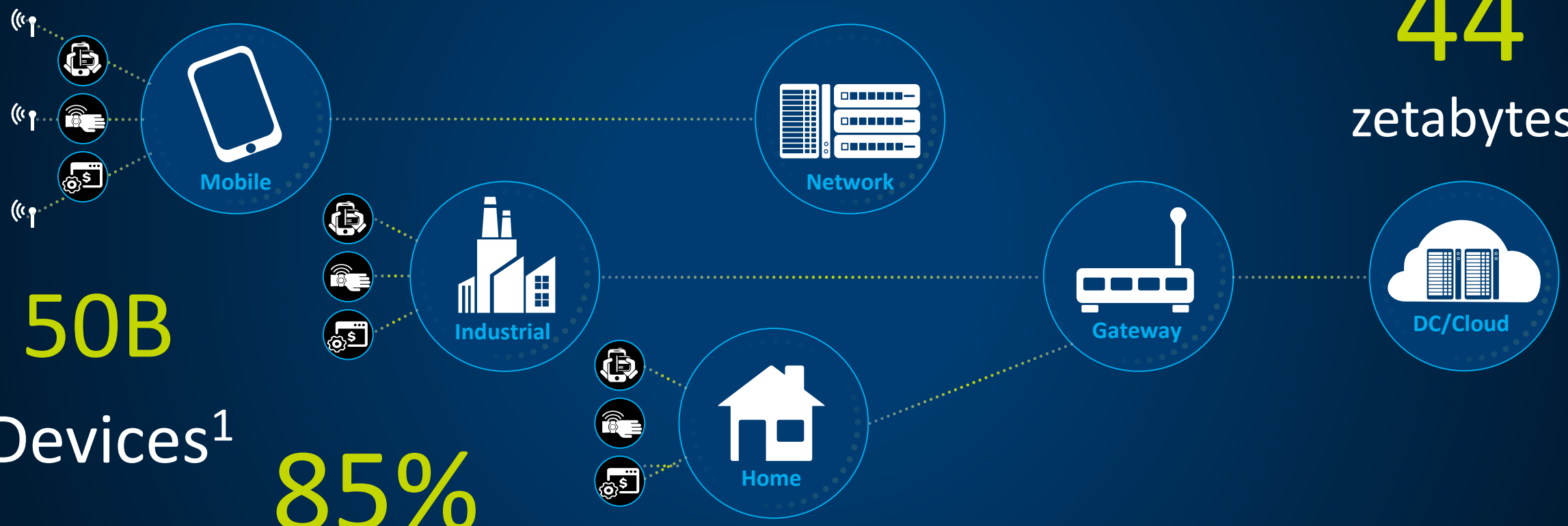
IOT: Why Now?

Market opportunities
IoT opportunities

Impact of IoT

The Internet of Things is:
Pervasive, Real-Time Intelligence



44 zetabytes[2]

50B Devices[1]

85% Unconnected[3]

Source: 1. Cisco 2. IDC Digital Universe, 2014 [3]IDC, IHS, Intel Estimates

The Internet of Things :
WHY NOW?

COST OF SENSORS PAST 10 YEARS[1]

↓ 2X

COST OF BANDWIDTH PAST 10 YEARS[2]

↓ 40X

COST OF PROCESSING PAST 10 YEARS[3]

↓ 60X

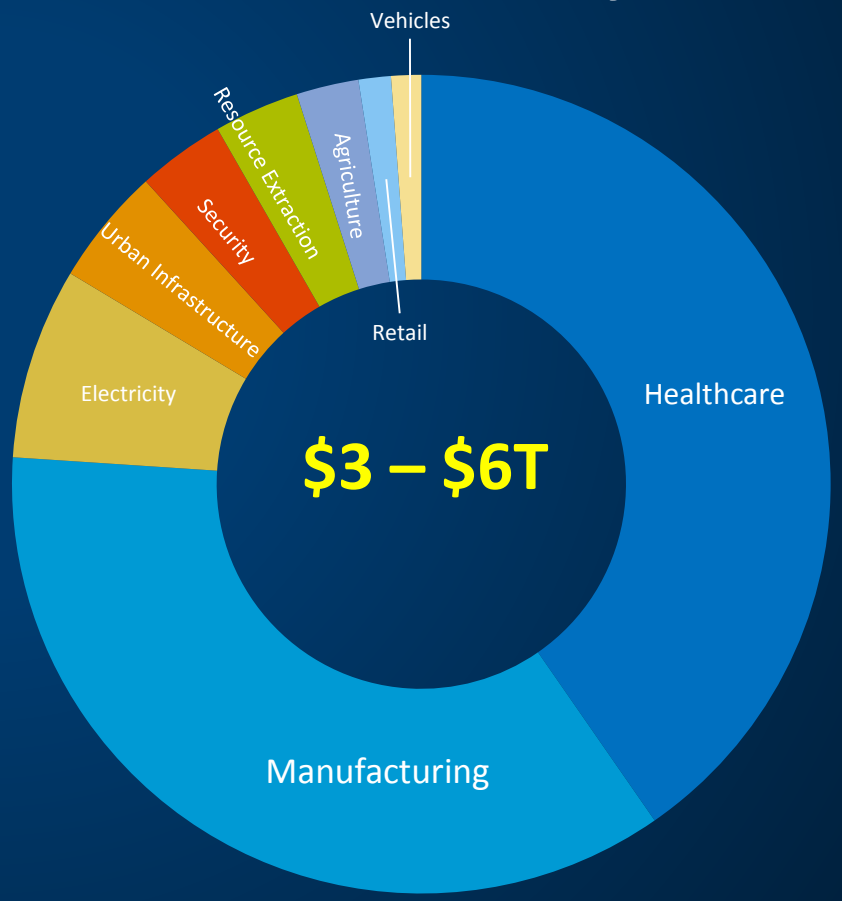
COST OF storage PAST 10 YEARS[4,5]

↓ 25X

1. Source: IDC; 2. Source: IMC/EDC: The Digital Universe of Opportunities; 3. Source: Goldman Sachs 4. Cost per Gigabyte Update 5. Gartner

Industrial, Energy & Buildings Opportunity

Global Economic Impact of IoT in 2025**
$ Trillion, Annually



Industrial and Energy

$1.2 – $3.1T

** Source: McKinsey Global Institute* analysis

4TH industrial Revolution

1st	2nd	3rd	4th
			
1760's	1860's	Late 1900's	NOW
Steam and Coal, Mechanical Production	**Electrification, Oil, Mass Production**	**IT and Automation**	**IoT**

Industrial customers are asking…..

How can I
capture
knowledge for my
transitioning workforce?

How Can I Better
Innovate?

I need to achieve
Real Time
Visibility

How Do I
Improve **workforce productivity**?

I need to improve

Product Quality.

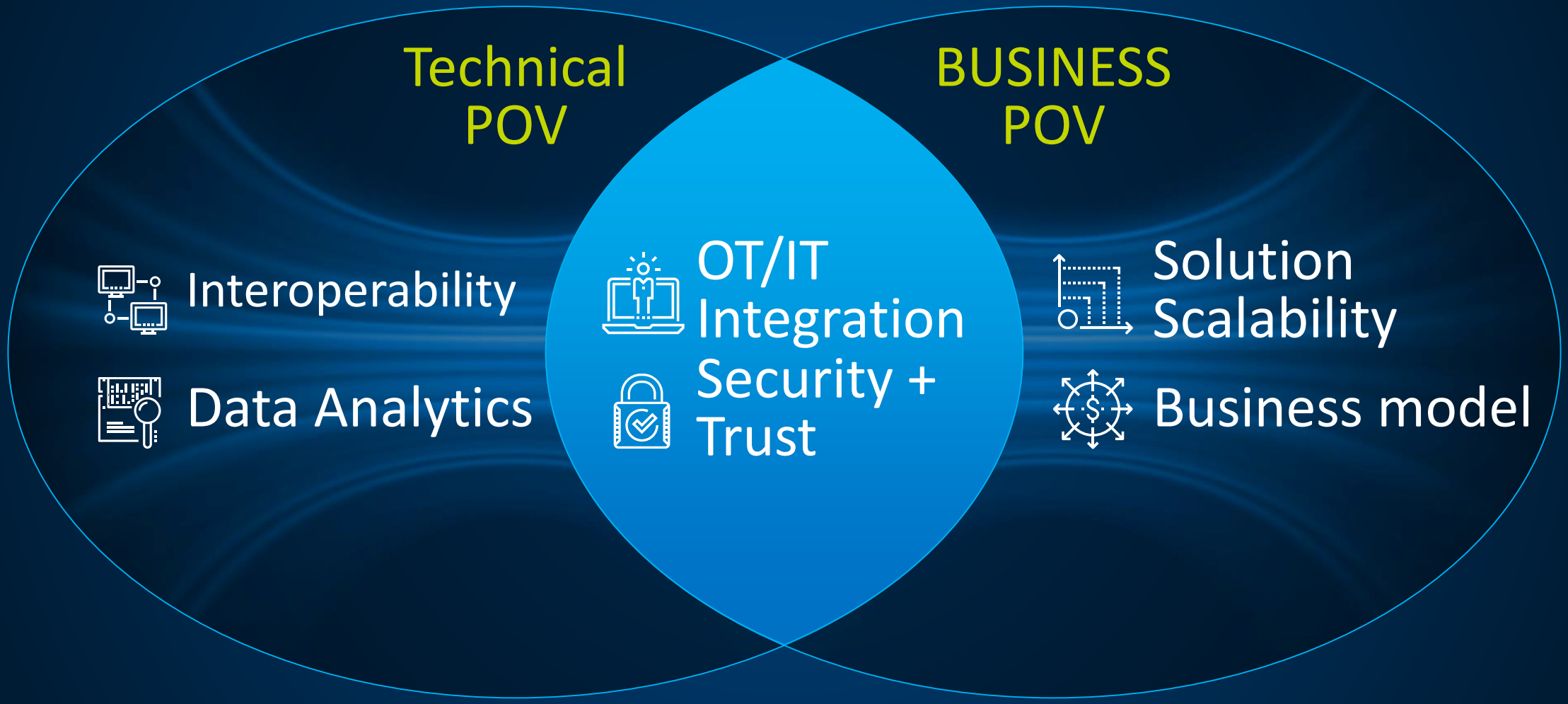
How Can I
Introduce new IOT
solutions faster?

How can I
Reduce Downtime?

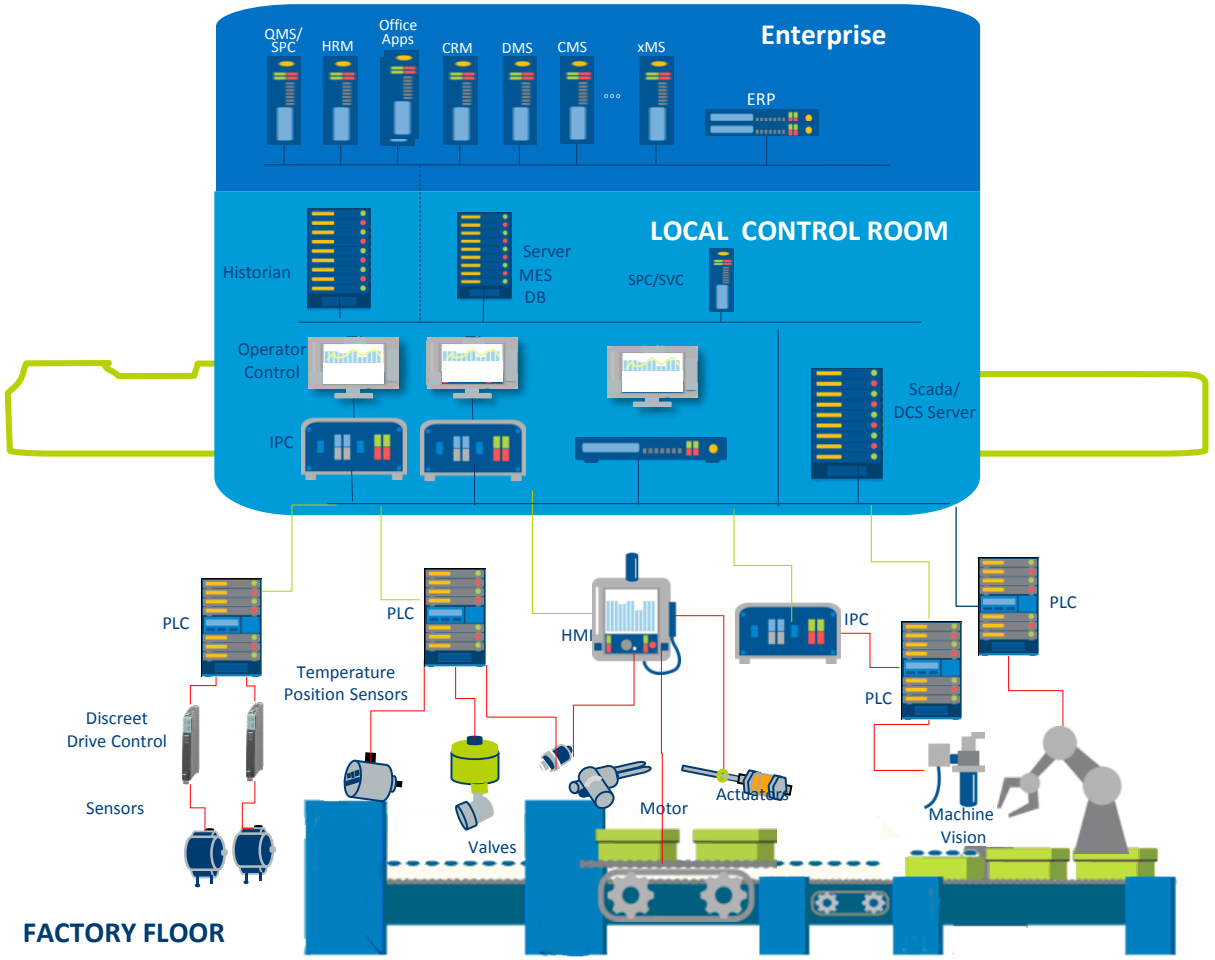
How can I have better visibility to
manage my

Global Supply Chain?

CUSTOMER CHALLENGES



Today's Factory - and the Barriers to Smart Factory



Preserve infrastructure

Can't Forklift be upgraded!

Customize Solution Scale

No one size fits all,
Small/Medium/Large requirements

Talking the talk, Interoperability

40+ Fieldbus protocols
Different Middleware
Heterogeneous devices

Increasing Complexity

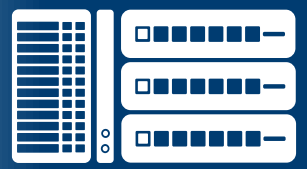
Complexity of Industry 4.0

Enterprise Security

Direct intrusion in to the Enterprise

Intel's IoT Approach: Things Through Cloud

Things



network

cloud

Approach

Create Vertical Solutions + Build on Horizontal Platform & Products + build Strong Ecosystem

Why Choose Intel-based Technology for **Industrial IoT/Industry 4.0**

Open Platform

built with interfaces and APIs that enable integration with legacy systems and devices and with platforms from multiple vendors.

Interoperability

is designed into IA CPUs to offer backward compatibility to help SW and application reuse thus reducing development time and resources.

Performance at the Edge

that enables near-real-time analytics, local decision making, and tighter process controls.

Advanced Security

for trusted data from edge to cloud and protection from costly attacks.

Scalability

for varying levels of gateway performance, with a broad range of support from Intel® Quark™, Intel® Atom™, Intel® Core™ and Intel® Xeon® processor D and E families.

Manageability

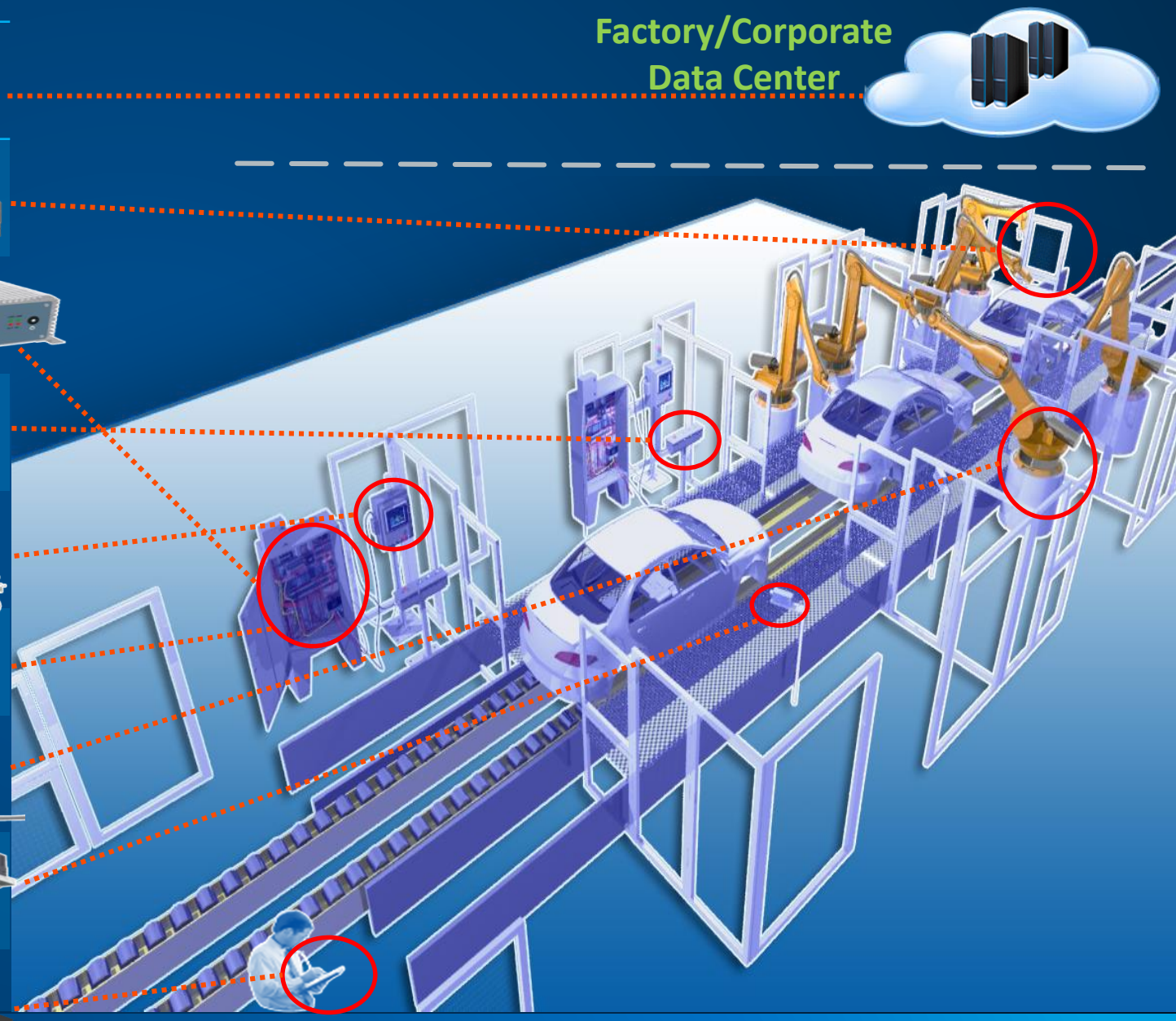
for secure remote upgrades and services.

Faster, More Flexible Deployment

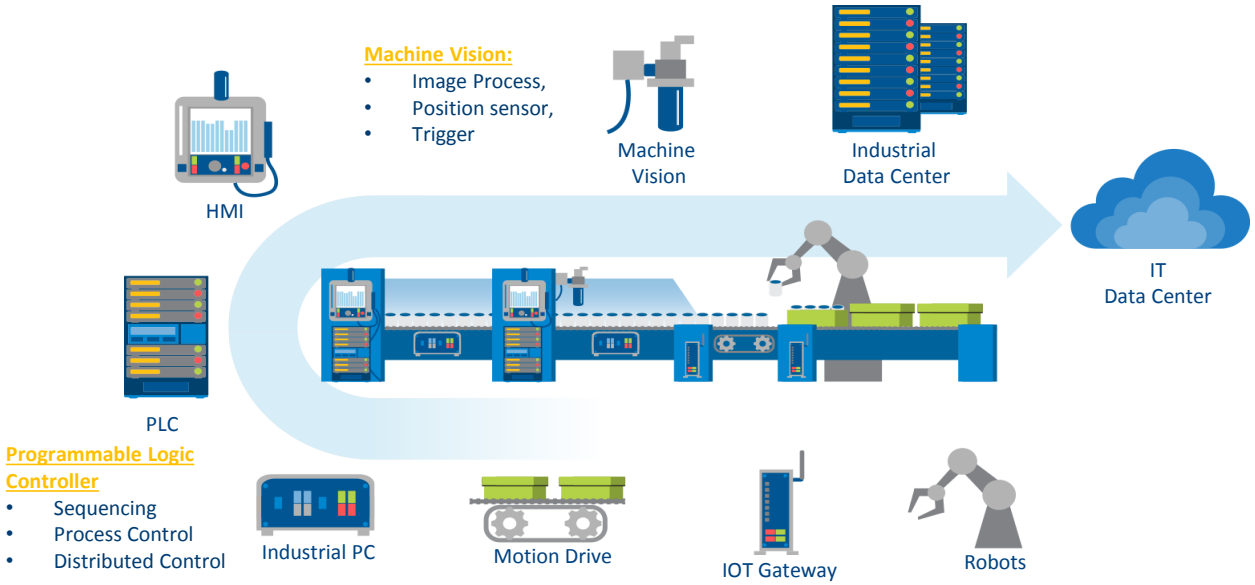
with a platform that supports your choice of operating systems and ecosystem applications.

Intel ingredients in Industrial Automation

Data Center	**Compute Performance** **I/O intensive**
Factory server	Compute Performance I/O intensive
Industrial PC	Compute Performance Visualization/ UX RT Perf
PLC/PAC	I/O intensive Form Factor Sensitive RT Perf
HMI	Compute Performance Visualization/ UX Form Factor Sensitive
Remote IO	I/O intensive RT Perf
Robots	Compute Performance I/O intensive RT Perf
Machine visions	Compute Performance Form Factor Sensitive
Mobile workforce	Visualization/ UX Form Factor Sensitive



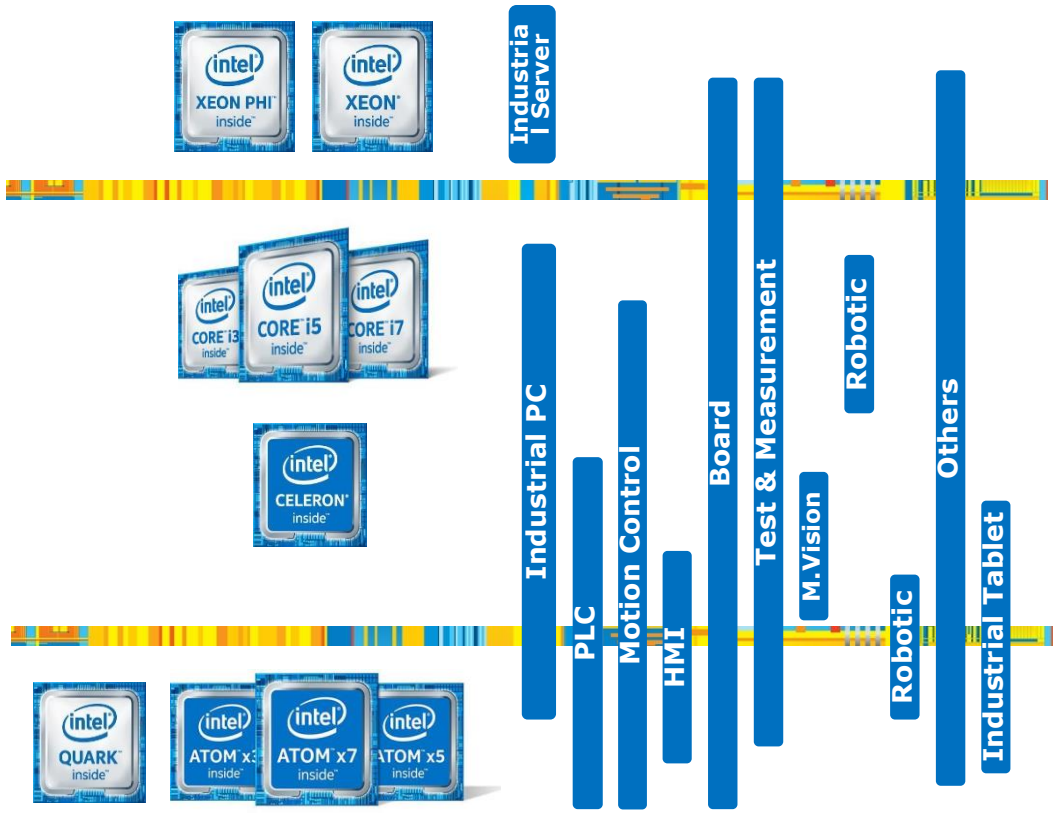
Scalable product roadmap that spans the Smart Factory



Test and Measurement
- Compute Intensive
- "Analog" and Digital Data:
- Often a IA host controller.
- Many modular IA blades.

Machine Vision:
- Control
- Motion
- Safety

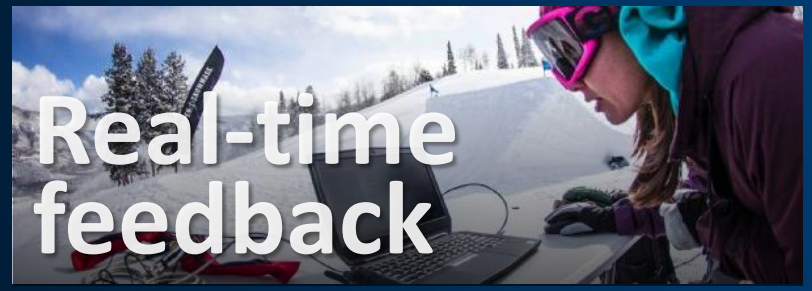
Robotics
- Determinism
- Safety



the “eye” for smart manufacturing

Machine Vision

CHALLENGES FACING



Industrial vision solutions

- All-in-one industrial smart camera and embedded vision system

- Wide range of referenced platforms - IA only, IA+FGPA or Movidius
- Video analytics with ML/DL capability

Intel® Media SDK
Intel® Computer Vision SDK
Intel® Machine Learning SDK

Intel: Partnering with the Entire Ecosystem

* Other names and brands may be claimed as the property of others.

Intel & sas partnership

Analytic Modernization – Intel & SAS

Our collaboration

- Joint Engineering for features & performance optimization
  - SAS uses Intel Parallel Studio for performance optimization
  - SAS ships custom built libraries based on Intel Math Kernel Library as part of their distribution, providing math functions that are highly tuned for Intel processor silicon
- Joint product enablement to take advantage of complementary advances between SAS & Intel

"More capable analytics are giving businesses the ability to innovate on a foundation of insight. By revealing patterns and significance in data, solutions based on SAS and Intel® architecture help decision makers to better understand the past, fine-tune the present, and anticipate the future."

– Lisa Davis, Vice President and General Manager, IT Modernization Group, Intel

Analytic Modernization – Intel & SAS

Business value:

- ✓ **Customers can run more complex analysis in even less time . . .**
- ✓ **. . . across large data sets - to gain deep insight into critical business issues.**

Note: The SAS tasks being used in the SAS mixed analytic workloads represents the type of SAS processing used today by roughly 60 percent of SAS customers.

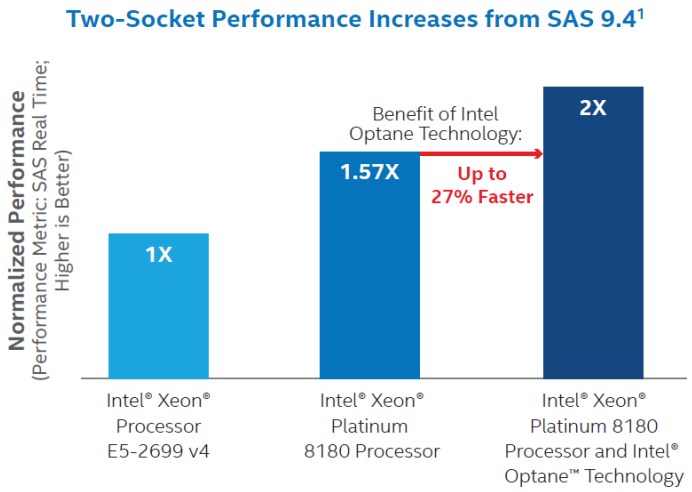
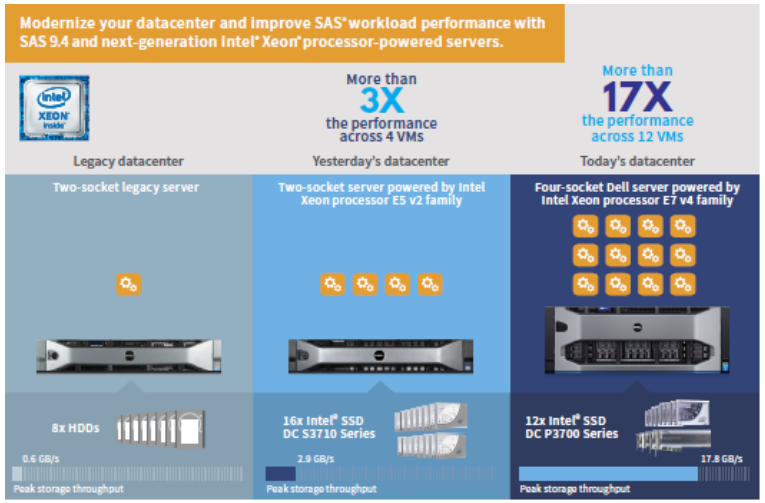


Figure 1. Increased two-socket performance on the SAS Mixed Analytics workload using SAS 9.4.[1]

"Harnessing the power of Intel innovation, SAS customers are using a modernized analytics platform to quickly turn their data into insights and make confident decisions. The new Intel® Xeon® Scalable processor and Intel® Optane™ technology help make analytics faster, easier, and more powerful in cutting-edge areas such as artificial intelligence, IoT, and machine learning."

– Craig Rubendall, Vice President of Platform R&D at SAS



Speed time to insight for better decision making

Analytic Modernization – Intel & SAS

Accelerate completion of parallel analytics tasks by up to 2X[1] on SAS 9.4* applications with the Intel® Xeon® Platinum 8180 processor and Intel® Optane™ technology.

Running SAS business applications on servers powered by the Intel® Xeon® Scalable processors and an Intel® Optane™ SSD sets the stage for potentially transformative analytics:

- Run more complex analyses, putting sophisticated models to work for the business.
- Embrace larger data sets without bogging down, including both structured and unstructured data.
- Gain greater insights, to better understand the state of the business and how to drive it forward.

Today's businesses are saturated in data, in myriad forms and from sources of every description. Turning it rapidly and effectively into actionable insights that drive timely decisions is a critical key to success. While the sheer volume and complexity of that data can present daunting challenges, the right infrastructure for both batch and real-time analytics can pave the way to opportunity.

SAS 9.4* is the basis for the company's suite of analytics software, which helps access, manage, analyze, and report on data to aid in decision-making. Ongoing co-engineering by SAS and Intel produces complementary building blocks that combine into powerful analytics solution stacks. Businesses across industries use these solution stacks as the basis for applications that turn massive data sets into insight and competitive advantage.

Accelerate Performance for the Evolving Enterprise

In a test environment, Intel performance engineers produced a generation-to-generation speedup of up to 1.57X on two-socket servers based on the Intel® Xeon® Platinum 8180 processor, as illustrated in Figure 1.[1] Using local storage accelerated using Intel® Optane™ technology increases the benefit by up to an additional 1.27X, for a total performance increase of up to 2X compared to the previous generation of hardware.[1]

This testing uses a SAS Mixed Analytics* workload, which is designed to simulate a typical customer production SAS analytics environment. This test instance simulates 30 simultaneous users running data intensive and analytics tasks in parallel It stresses the system by simultaneously generating extremely high, prolonged processor utilization and heavy large-block sequential IO demands in addition to small, random reads and writes.

Running SAS 9.4 on servers based on Intel® Xeon® Scalable processors and Intel Optane SSDs improves throughput for analytics, enabling customers to run more complex analyses in aggregate across larger data sets, with lower time requirements. As a result, workloads can deliver deeper insights, powering improved decision making for critical business actions. For example, companies that use SAS 9.4 for risk management are able to accelerate execution of regulatory and pricing-related scenarios, potentially allowing them to run these workloads more frequently, more effectively mitigating various types of risk.

sas — THE POWER TO KNOW. intel

Bringing stronger, faster analytics to your organization

with SAS® analytics on Intel® architecture

Increase your predictive decision-making with SAS and Intel

Any organization that collects data can improve its predictive power—as long as it has a strong analytics foundation. With Analytic Modernization, SAS and Intel have partnered to help you build that foundation by bringing you closer to your data so you can build a more complete, connected vision of your organization. By combining advanced analytics from SAS with modern computing and storage technologies from Intel, you can make your analytics faster, easier and more powerful.

In today's analytics economy, data, people and machines work together to accelerate the pace of innovation, allowing organizations to make more informed decisions that improve their business strategies. SAS, the premier provider of analytics solutions, and Intel, the definitive leader in computer processing, have 20 years of collaborative problem-solving experience in the world of analytics. They use that experience to deliver powerful analytics solutions for organizations whose priority is providing better service to their customers. Solutions from this partnership can help businesses across a variety of industries generate greater value from their data. And considering the unprecedented amount of available information, you need a powerful system capable of providing fast, accurate insights in order to take timely and effective actions.

Running SAS analytics software on Intel architecture can help your organization overcome these challenges. SAS analytics collect your business' data and provide insights on where and how to improve your strategies. With a better understanding of the insights your data holds, you can capitalize on artificial intelligence to better predict, prevent and provide for your customers.

It only makes sense to reshape your IT infrastructure to fit the modern world. SAS and Intel can help you do just that.

Bringing value to your business

It takes equal parts analytics expertise and processing power to give your decision-makers the information they need to act. For this reason, the SAS and Intel partnership provides an innovative processing and memory architecture uniquely designed to make full use of SAS analytics. The SAS Platform, composed of SAS 9.4 with SAS Viya™, is adaptive to any infrastructure and level of expertise, empowering users of all knowledge levels to explore insights and giving them space for experimentation. This platform benefits from the performance and responsiveness of Intel® Xeon® Scalable processors and Intel® Optane™ SSDs for fast data storage and retrieval. The result is a cutting-edge analysis engine for real-time, predictive analytics that can bring out the best in your business.

Why the SAS Platform makes sense

Businesses using the SAS Platform to power their analytics environments gain three immediate advantages: scalability, diversity and trust.

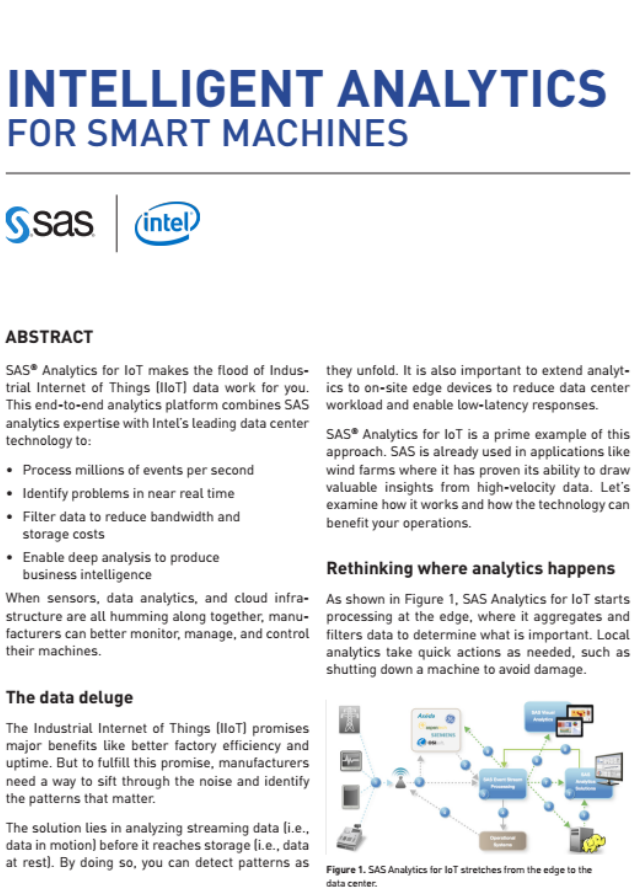
The SAS Platform scales from small to big data, in motion and at rest, at the edge and in the cloud. The platform also provides a rich set of interfaces that cater to users of varying analytic experience. And because of its superior processing power optimized for analytics, the SAS Platform is built to withstand failover.

BAMA and the SAS Viya Adoption Workshop: Modernize for the next era of analytics

Knowing where to begin modernizing your analytics environment can be difficult. For organizations seeking guidance, SAS offers a Business Analytics Modernization Assessment (BAMA) and SAS Viya Adoption Workshop.

The BAMA examines your business analytics requirements, processes and objectives to deliver key findings showing what you do well and where you must improve. Through interactive sessions with both business and IT teams, the BAMA provides a holistic view of your strengths and weaknesses across people, processes, data and technologies. The output delivers a series of actionable recommendations and best practices to ensure your business can implement efficient analytics solutions now and in the future.

The one-day SAS Viya Adoption Workshop helps you build on your existing investment in analytics and discover areas where SAS Viya can help shape your company's analytic future, providing an overview of how SAS Viya extends the SAS Platform into new capabilities and areas. In collaboration with business and IT, the workshop explores uses cases applicable to SAS Viya. Then, it determines the business value and success metrics for each use case so you can prioritize your future efforts.



INTELLIGENT ANALYTICS
FOR SMART MACHINES

sas | intel

ABSTRACT

SAS® Analytics for IoT makes the flood of Industrial Internet of Things (IIoT) data work for you. This end-to-end analytics platform combines SAS analytics expertise with Intel's leading data center technology to:

- Process millions of events per second
- Identify problems in near real time
- Filter data to reduce bandwidth and storage costs
- Enable deep analysis to produce business intelligence

When sensors, data analytics, and cloud infrastructure are all humming along together, manufacturers can better monitor, manage, and control their machines.

The data deluge

The Industrial Internet of Things (IIoT) promises major benefits like better factory efficiency and uptime. But to fulfill this promise, manufacturers need a way to sift through the noise and identify the patterns that matter.

The solution lies in analyzing streaming data (i.e., data in motion) before it reaches storage (i.e., data at rest). By doing so, you can detect patterns as they unfold. It is also important to extend analytics to on-site edge devices to reduce data center workload and enable low-latency responses.

SAS® Analytics for IoT is a prime example of this approach. SAS is already used in applications like wind farms where it has proven its ability to draw valuable insights from high-velocity data. Let's examine how it works and how the technology can benefit your operations.

Rethinking where analytics happens

As shown in Figure 1, SAS Analytics for IoT starts processing at the edge, where it aggregates and filters data to determine what is important. Local analytics take quick actions as needed, such as shutting down a machine to avoid damage.

Figure 1. SAS Analytics for IoT stretches from the edge to the data center.

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