



WHO AM I?

# NIKLAS KVARNSTRÖM



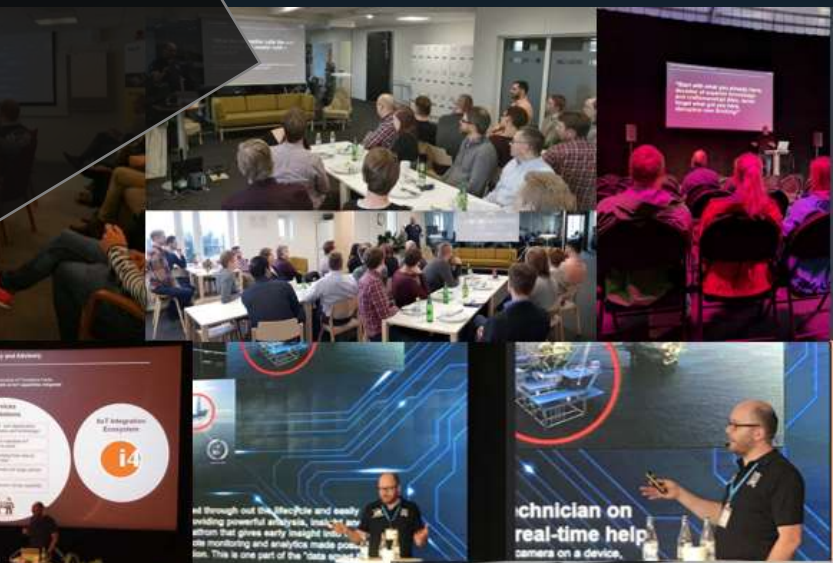
# TOPIC

**"What do edge computing and AI bring to optimize the production process and promote digital transformation?"**



# The Crusade to Find and Understand Disruptive Technologies

3



TALKING SO INDUSTRIES  
UNDERSTAND IS **EVERYTHING!**

1



2

IF YOU WANT ME TO VISIT YOUR  
FACTORY OR DO A PRESENTATION



AGENDA

**NIKLAS KVARNSTRÖM**



**HISTORY**

"Many of us crucify ourselves between two thieves - Regret for the past and fear of the future."

**INTERNET OF THINGS**

"Any sufficiently advanced technology is indistinguishable from magic."

**PRODUCT AS SERVICE**

"Those who live by the sword will be shot by those who don't."

**INDUSTRIAL IOT**

**THE HOLISTIC FACTORY**

"The single biggest reason companies fail is that they overinvest in what is, as opposed to what might be."

**PLATFORMS**

"I program my home computer, beam myself into the future."

**ARTIFICIAL INTELLIGENCE**

"The oldest, longest emotion of mankind is fear, and the oldest and most foolish kind of fear is fear of the future."

**BIG DATA DATA LAKES**

"Without data you're just another person with an opinion."

**DIGITAL TWIN**

"Without deviations from the norm, progress is not possible."

**ARTIFICIAL INCREMENTAL LEARNING**

"To believe in things you can see and touch is a triumph at all, but to believe in things you can't see is a triumph and a triumph is a triumph."

**THE MINDSET**

"What the caterpillar calls the end of the world, the master calls a butterfly!"

**SMALLER, CONNECTED & GLOBAL**

"Out there in some garage is an entrepreneur who's forging a bullet with your company's name on it."

**PROOF OF CONCEPT**

"The electric light did not come from the continuous improvement of candles."

**ATOSIS**

- Ambient
- Technomancy
- Cloud
- Edge
- AI
- IoT
- OT
- IT
- OT
- IT



**REAL WORLD EXAMPLE: HASOPOR.**



ABBREVIATIONS & ACRONYMS TO MADNESS!



CONNECTIVITY



3rd PARTY SPECIFIC SOLUTIONS (AR, VR, AI)



FINANCIAL MICRO TRANSACTION SERVICES

SMART ENERGY SERVICES

HARDWARE, EDGE & ON-PREMISE (GATEWAYS, SERVERS)



HUH? WHERE DO I/WE START?

CUSTOMER SPECIFIC KNOW-HOW AND MODULES

SOLUTION  
Fictive choices



DIGITAL TRANSFORMATION PARTS NEEDED



PRE-SELECTED PARTS BY THE COMPANY

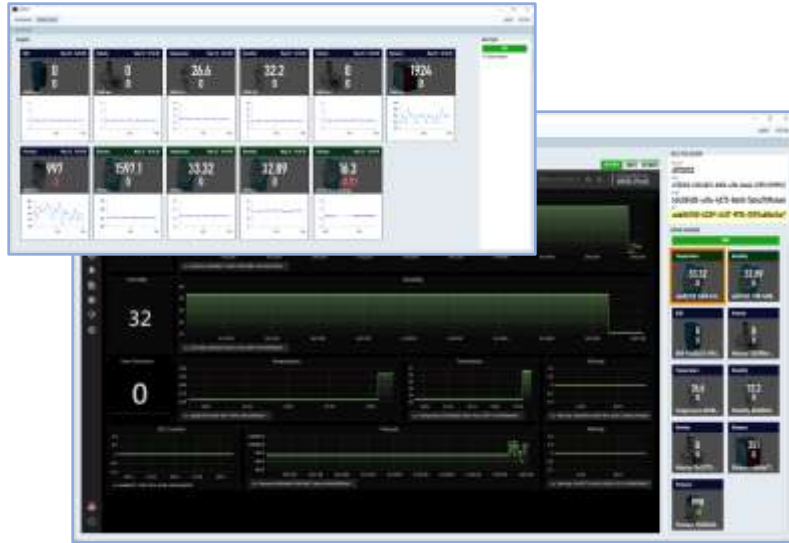


"IOT PLATFORMS"



3rd PARTY IOT FRAMEWORK PROVIDERS (IAAS, PAAS, SAAS)



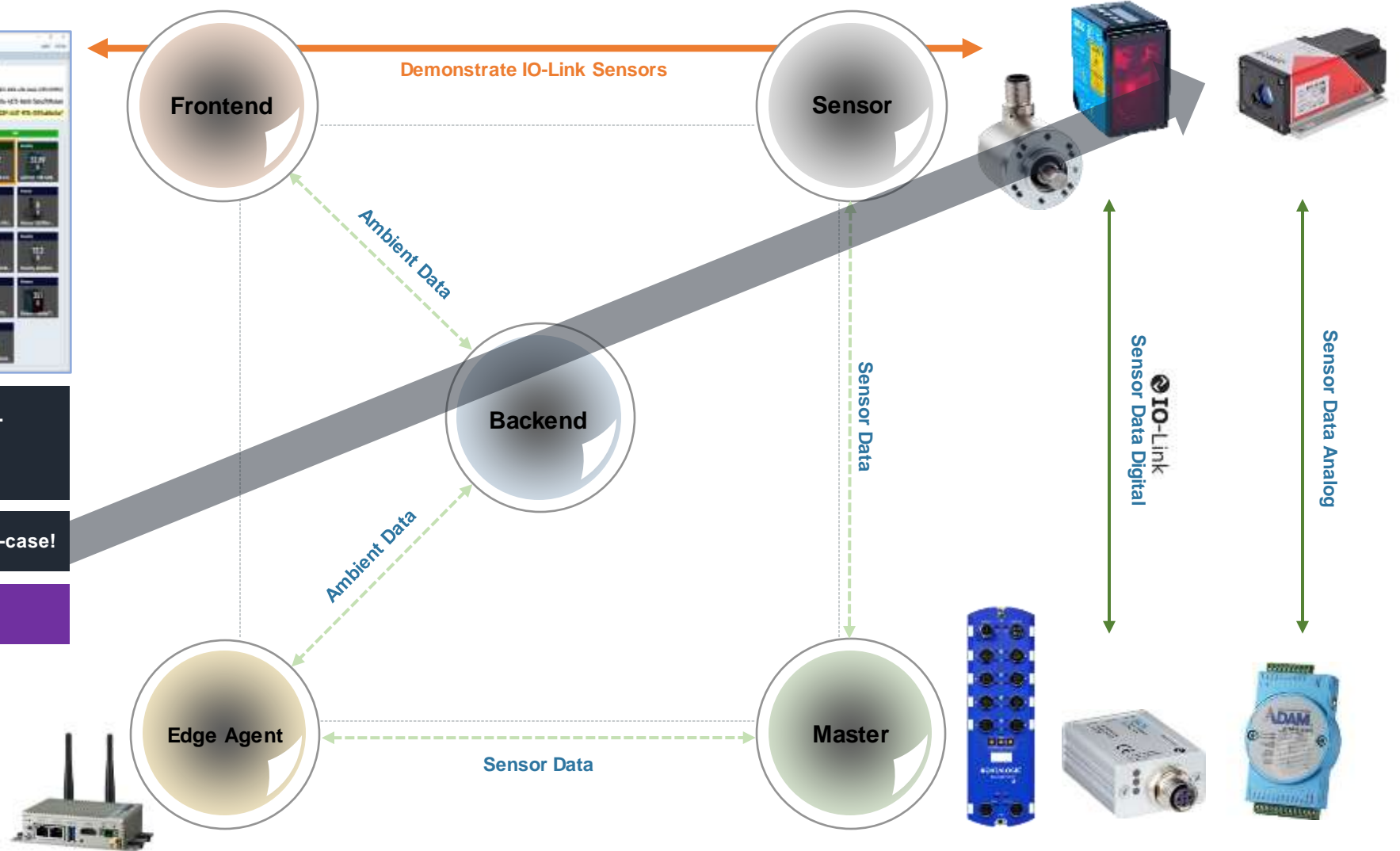


See **TRUE** value and compare sensors on the fly.

Whatever intelligence you apply will only be as good as the data it is built upon!

You need to find the best of breed sensor for you use-case!

But this is only half of the story!



# WHAT IS THE END GOAL?



HOLISTIC FACTORY

### ENTERPRISE RESOURCE PLANNING (ERP)

ESTABLISHING PLANT SCHEDULE, PRODUCTION, MATERIAL USE, DELIVERY AND SHIPPING.

DAY  
MONTH

### MANUFACTURING EXECUTION SYSTEM (MES)

WORKFLOW/RECIPE CONTROL TO PRODUCE END PRODUCTS FROM MATERIALS, OPTIMIZE PROCESS.

SECONDS  
MINUTES  
HOURS  
SHIFT

### PROGRAMMABLE LOGIC CONTROLLER (PLC)

MONITORING, SUPERVISORY CONTROL OF PRODUCTION PROCESS

### SCADA

(Supervisory Control And Data Acquisition)

### MACHINES

SENSING THE PRODUCTION PROCESS, MANIPULATING PRODUCTION PROCESS

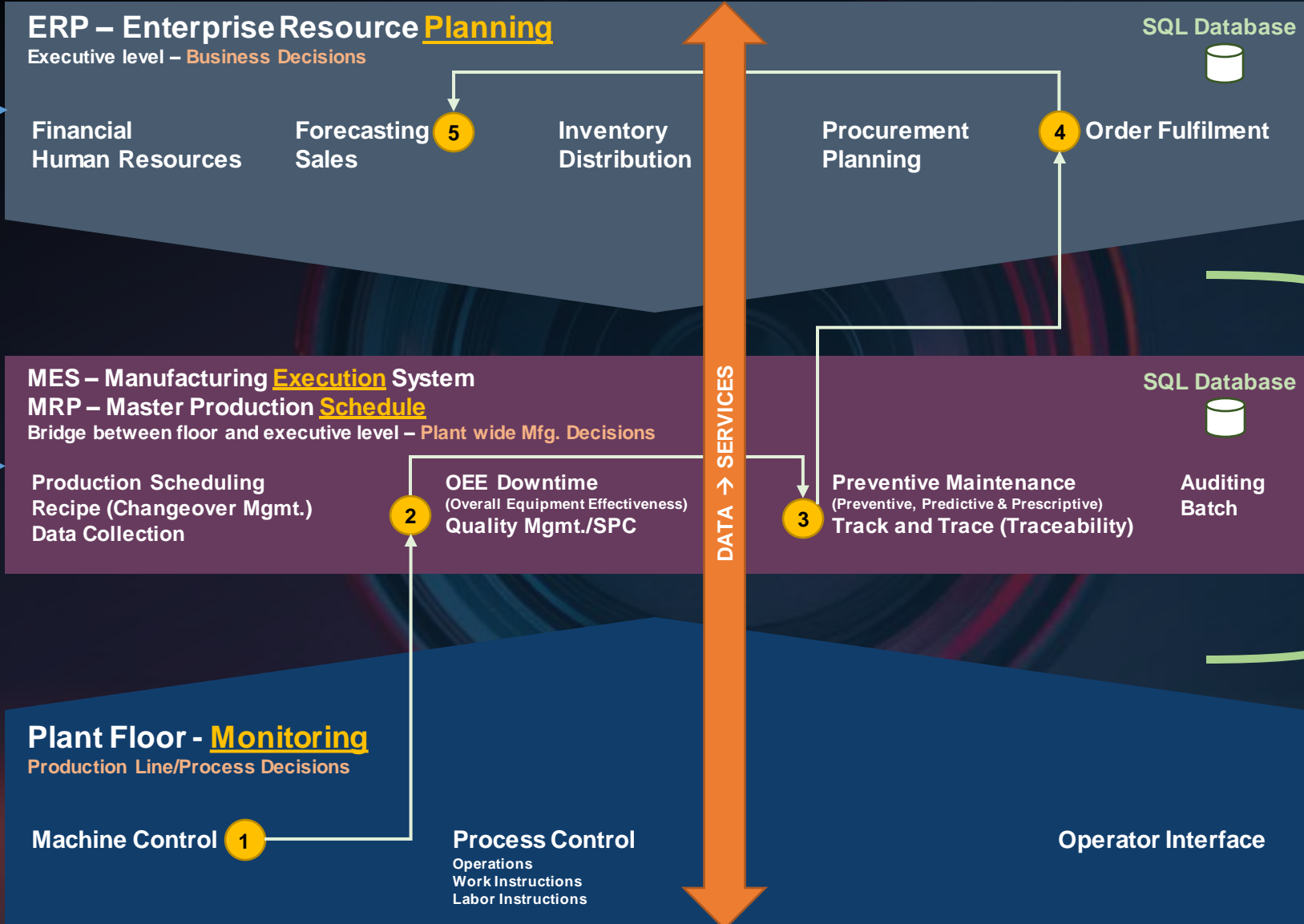
MILLISECONDS  
SECONDS

Factory Floor

Execution Planning



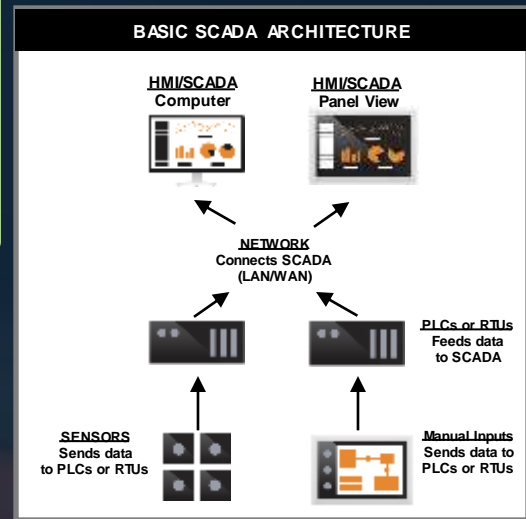
# HOW DOES THIS WORK IN A FACTORY?



## GAPS between Systems (?)

**SCADA**  
Supervisory Control And Data Acquisition

Unnecessary Waste  
Missed Opportunities  
Bad decision making







**PLC (Programmable Logic Controller)**

A PLC is simply a special computer device (with specific software using ladder logic) used for industrial control systems, monitoring different inputs and outputs (normally from a machine).

**HMI (Human Machine Interface)**

An HMI is a software application that presents information to an operator or user about the state of a process, and to accept and implement the operators control instructions.

**RTU (Remote Terminal Unit)**

RTU is a microprocessor device that controls Field Devices. Good vs. environment tolerances, backup power options, remote locations and autonomy. Can use web interfaces, input streams and output streams etc. Basic, Visual Basic or C# as languages exist.

**Rectifiers**

A rectifier is an electrical device that converts alternating current, which periodically reverses direction, to direct current, which flows in only one direction.

**SCADA (Supervisory Control and Data Acquisition)**

Supervisory control and data acquisition is a control system architecture that uses computers, networked data communications and graphical user interfaces for high-level process supervisory management.

**ERP (Enterprise Resource Planning)**

Enterprise resource planning is the integrated management of core business processes, often in real-time and mediated by software and technology.

**CRM (Customer Relationship Management)**

CRM software are applications designed to help businesses manage many business processes: customer data, customer interaction, access business information, automate sales.

**MQTT (Enterprise Resource Planning)**

MQTT is an ISO standard publish-subscribe-based messaging protocol. It works on top of the TCP/IP protocol.

**OPC UA (Unified Architecture)**

OPC Unified Architecture (OPC UA) is a machine to machine communication protocol for industrial automation. Focus on communicating with industrial equipment and systems for data collection and control.



**Background and Characteristics of the 1<sup>st</sup>-4<sup>th</sup> Industrial Revolutions**

1<sup>st</sup> Industrial Revolution

2<sup>nd</sup> Industrial Revolution

3<sup>rd</sup> Industrial Revolution

4<sup>th</sup> Industrial Revolution

**Keywords for National Policies Regarding the Fourth Industrial Revolution**

Germany

USA

China

Japan



Industry 4.0

Advanced Manufacturing

Made in China 2025,  
Internet Plus

New Robot Strategy

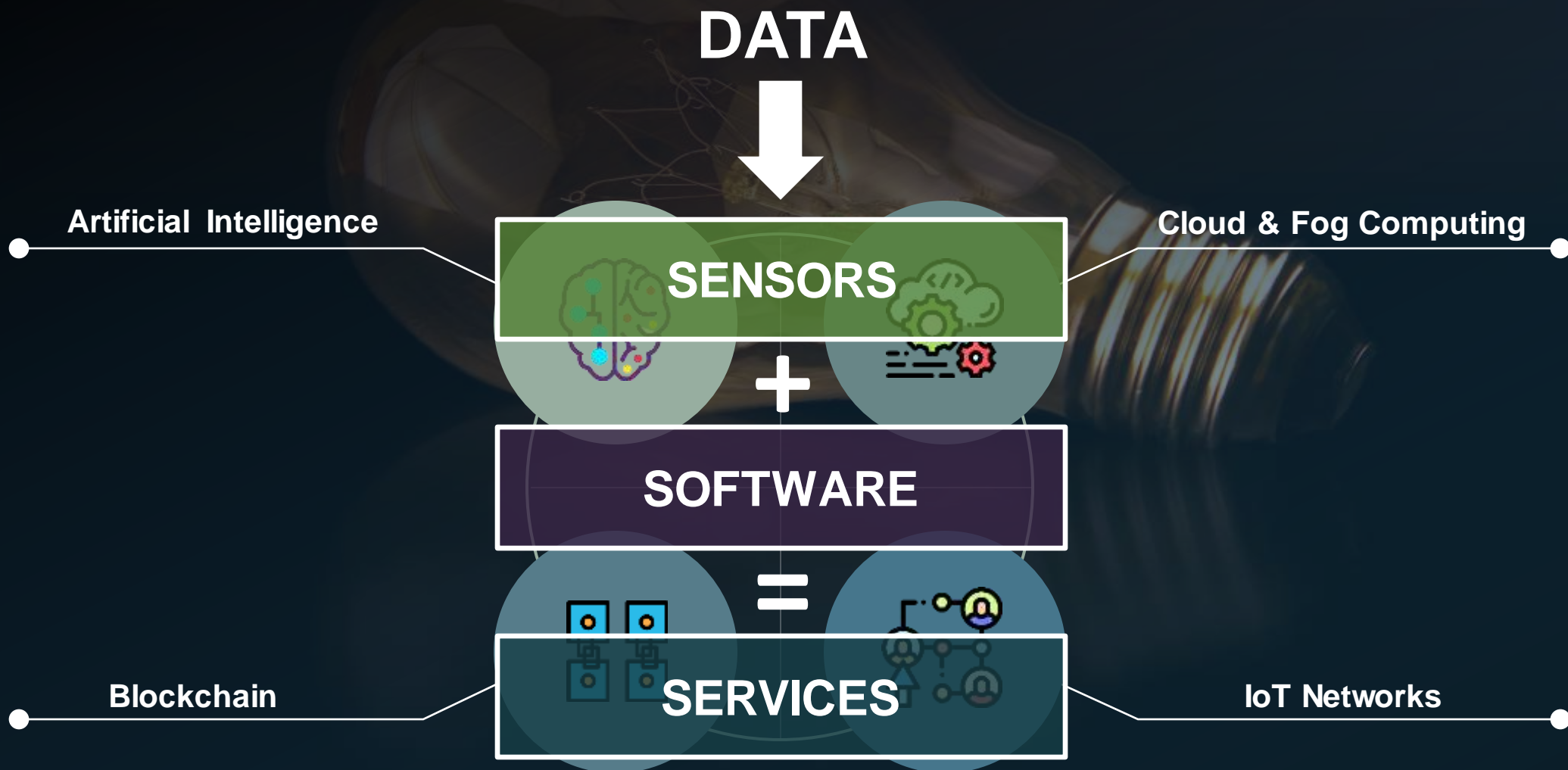
Cyber Physical System (CPS)  
smart factory

Manufacturing reshoring

Integration of informatization  
and industrialization

Robot-based new industrial  
revolution







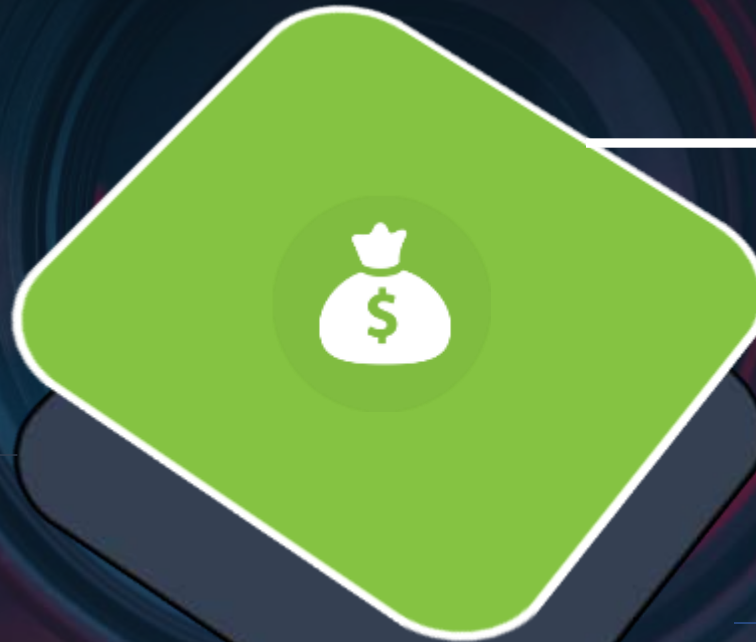
## Fact

Most IoT initiatives today fail.

1. Cisco reports that only 26% of IoT projects survive the pilot stage.
2. McKinsey and the World Economic Forum report that 71% of Industry 4.0 (IIoT) firms are stuck in **Pilot Purgatory**.

## STANDARDS

Machines  
Back-End  
Interfaces  
Protocols



## ROI

Return of Investment  
Business  
Incremental value < Incremental Cost



## SECURITY

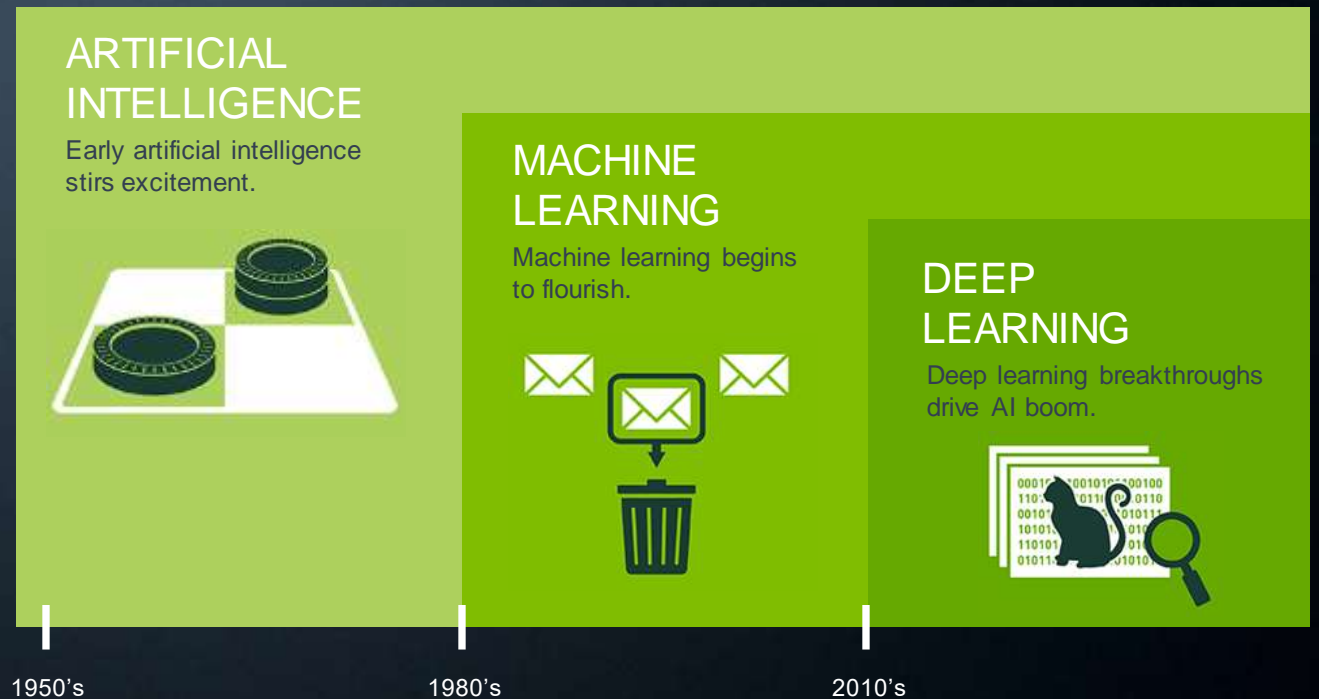
Identity Access Management  
Device Management  
Authorization  
Authentication





Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have **created ever larger disruptions**.

**Data analysis**, also known as **analysis of data** or **data analytics**, is a process of inspecting, cleansing, transforming, and modeling data with the goal of **discovering useful information**, **suggesting conclusions**, and **supporting decision-making**.



**You can only optimize what you can measure!**

Every day you do not save data is a day lost when the data is needed.

Save data intelligently, at the edge and in the cloud.

# IoT + AI = A match made in heaven!

Data from sensors (environment) needs to be sorted and handled by intelligent decisions...

## Processing



Processing power exploded by the introduction of GPUs (Graphical Processing Units, 24 trillion operations), parallel processing and a huge enabler for linear algebra.

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Example: 1 such chip from Nvidia can do the same workload as 150 MacBook Pros.

## Algorithms



Machine Learning, i.e. learning systems. Approach classifications, expert systems – coded rules –. To many rules → Deep Learning, with algorithms. This needs a lot of data.

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Example: IA – Intelligence augmentation and AI – Artificial intelligence → avoid feelings and human errors and work with huge amounts of data at high speed.

## A Lot of Data



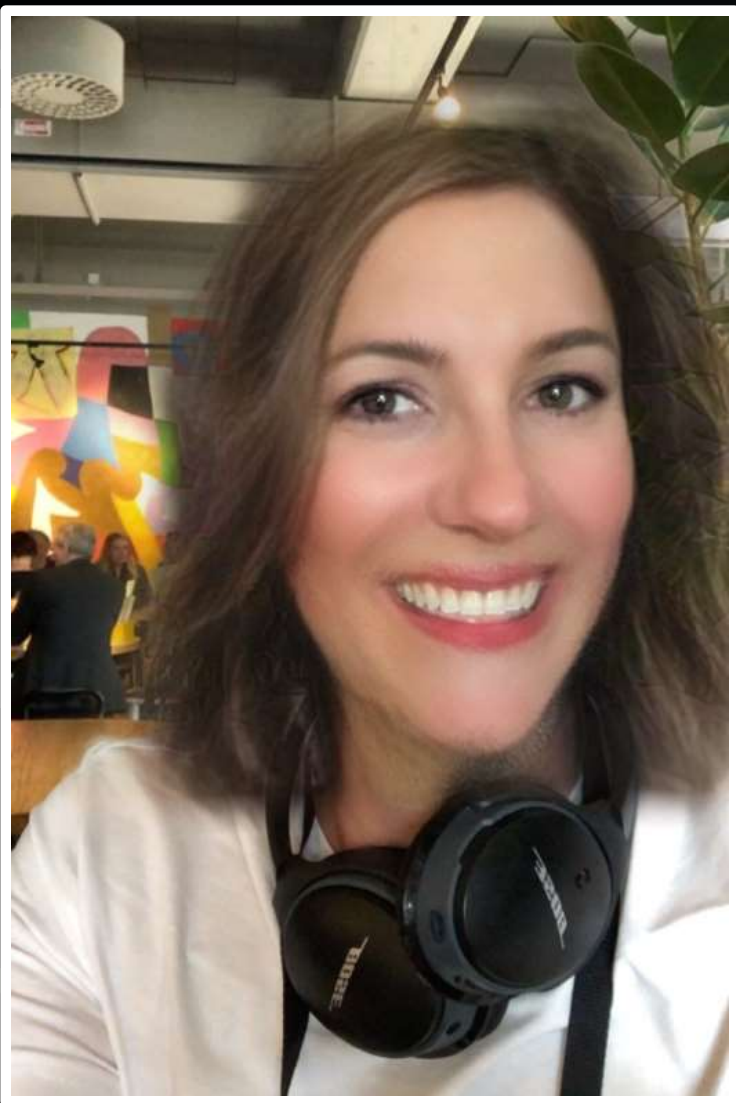
More data today than even before. Amazon, Google, Facebook and other big companies happily open source their algorithms... but not their data, i.e. buy pattern data, search data, social data.

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**How can we get lots of data... IoT, real-time data of who we are, what we do, how we sleep and what not!**







PREVENTIVE

DESCRIPTIVE

DIAGNOSTIC

PREDICTIVE

PRESCRIPTIVE

ENTERPRISE



Which plant performed the best?



Why is site "A" throughput behind plan?



I predict that site "A" will be behind plan soon.



What action should I take to avoid site "A" from falling behind plan?

SYSTEM



Is "Line 1" running OK?



Why is "Line 1" quality poor?



I predict that "Line 1" quality is moving out of tolerance.



What action should the operator take to avoid poor quality?

DEVICE



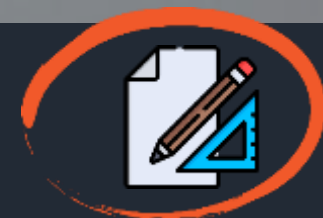
Am I running OK?



Why did a fault happen?



I predict a fault will happen soon.



What action should be taken to avoid the fault?



**iFactory iApps Examples**

