

ACMA4022- SUPPLY CHAIN INFORMATICS

INTERNET OF THINGS

CONNECTING THE SUPPLY CHAIN

SESSION OVERVIEW

Understanding Internet of Things (IoT)

How IoT work

IoT integrations with other technology

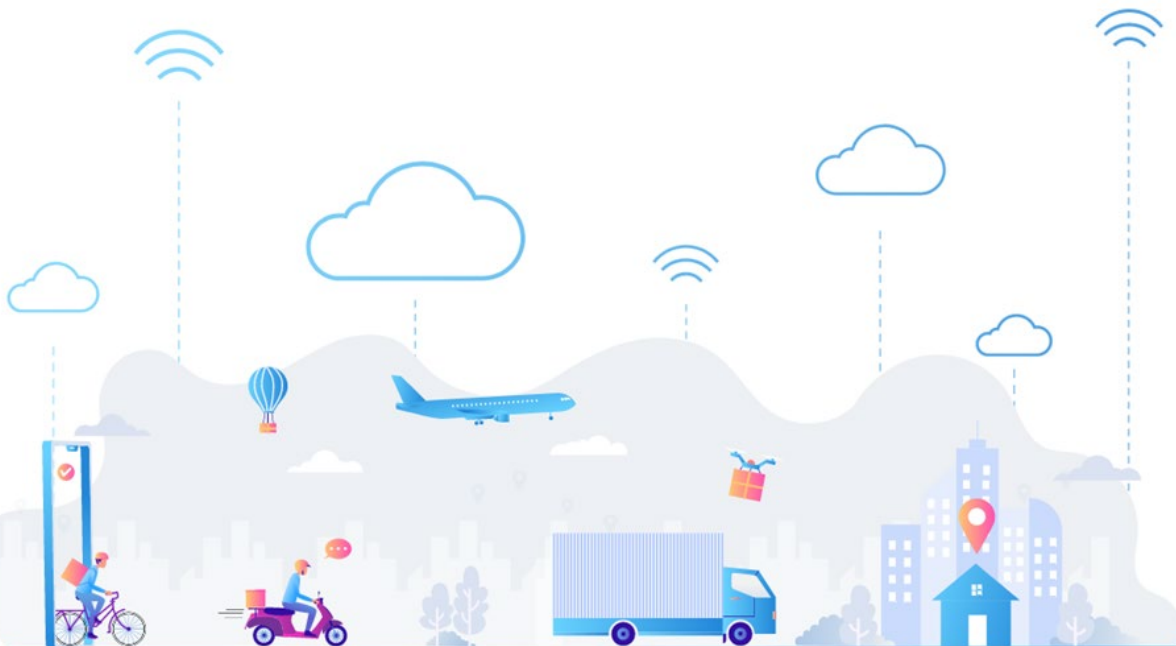
Benefits & Challenges of using IoT

IoT use cases in supply chain & Logistics

Gartner defines “**Internet of Things (IoT)**” as a network of physical **objects** that contain embedded technology to **communicate** and sense or interact with their internal states or to the external environment via **internet**.

IoT devices must be able to monitor their environment and report their status, receive directions and act on information received.

WHAT IS INTERNET OF THINGS?



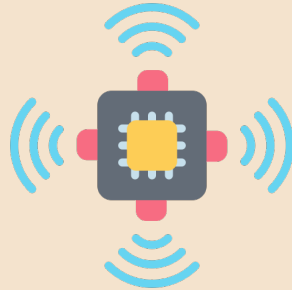
IOT COMPONENTS

To make a device part of IoT

Sensors are embedded into devices capable of sensing the change in their surroundings and note down data of these changes.

The platform performs analysis on data thoroughly then quickly sends back output instructions based on the provided data.

SENSERS



CONNECTIVITY



The connection platform to control over the entire IoT system using for transmitting and store data among IoT devices

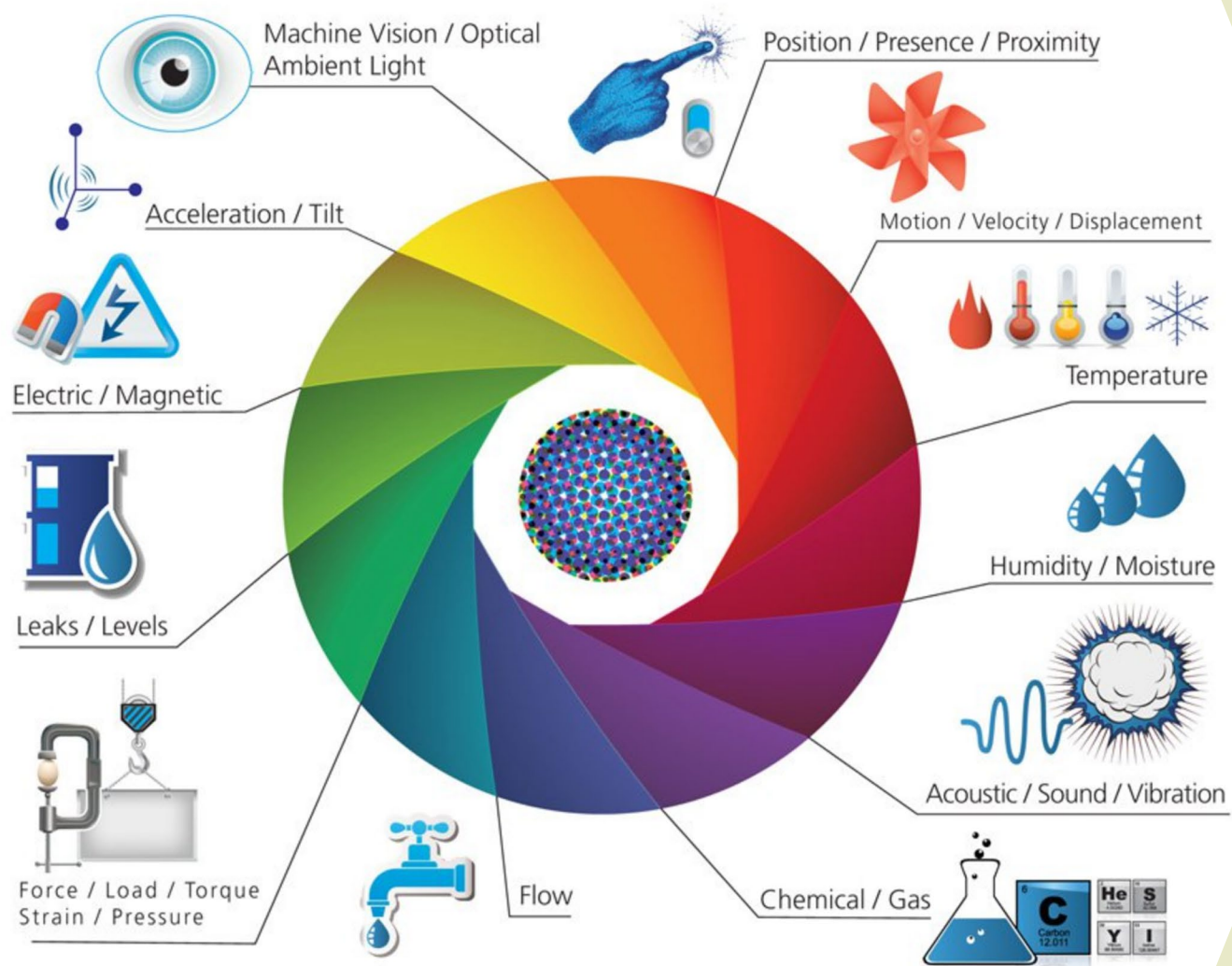
DATA PROCESSING



USER INTERFACE



Directly contacts with the users and presents the output that users see on screen according to its purpose to accomplish.



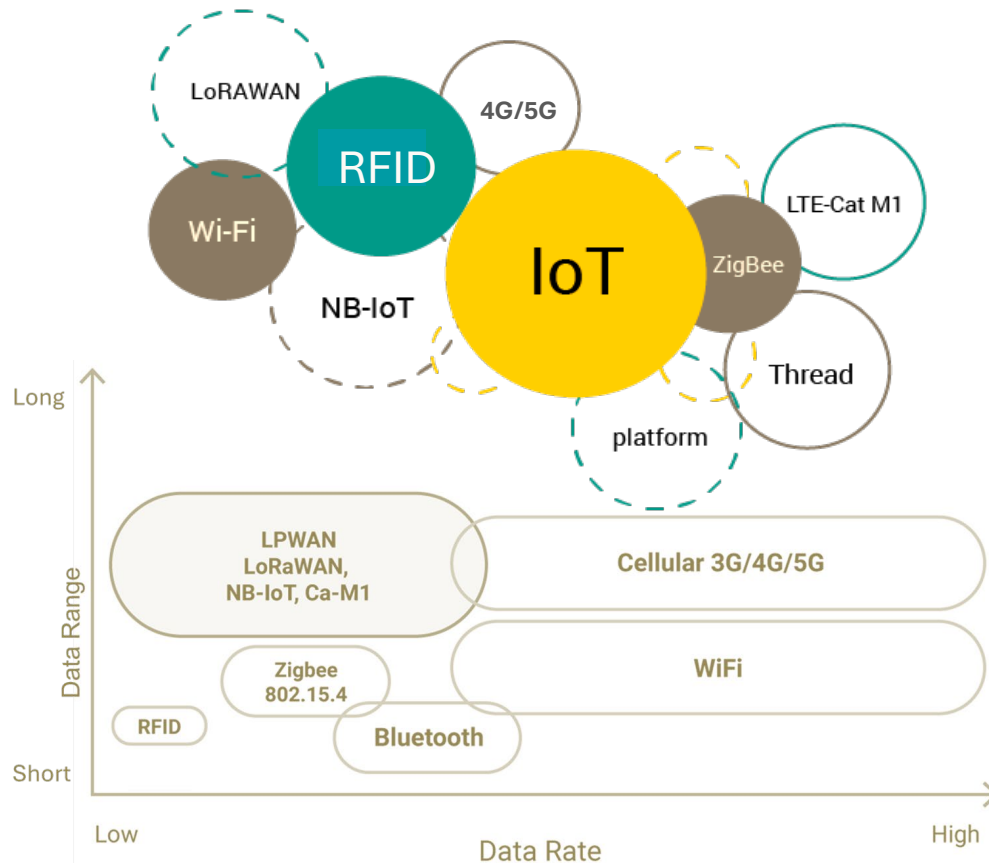
SMART SENSORS

A sensor on something can make that thing “**smart**”

Smart sensors can support both **structured** and **unstructured** data.

IOT PROTOCOLS

A protocol is a set of rules that enable the effective communication or data exchange of distinct machines/devices in a network. The concept is similar to the languages that human use to communicate.

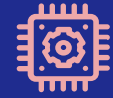


IOT PROTOCOLS



RFID

Using radio frequency
Identify object's location
Easy to deploy with tags
& RFID devices



LoRaWAN

Wide-Area Networking
Low-power consumption
Massive bi-directional
connections



WIFI

General purpose
Indoor & outdoor
Low cost
High power consumption



ZIGBEE

Used in smart home
Low power consumption
High scalability & secure
low data exchange rates



HOW IOT WORKS

Data ingestion
IoT sensors or devices collect data from the environment

Data storage
Data repository to store data collected from IoT ecosystem for future process & analysis

Data transmission
Data is transmitted to the cloud or server via gateways (telemetry devices) by using IoT communication protocols

Data processing & visualization
Data is processed to be useful information and present to users in readable forms

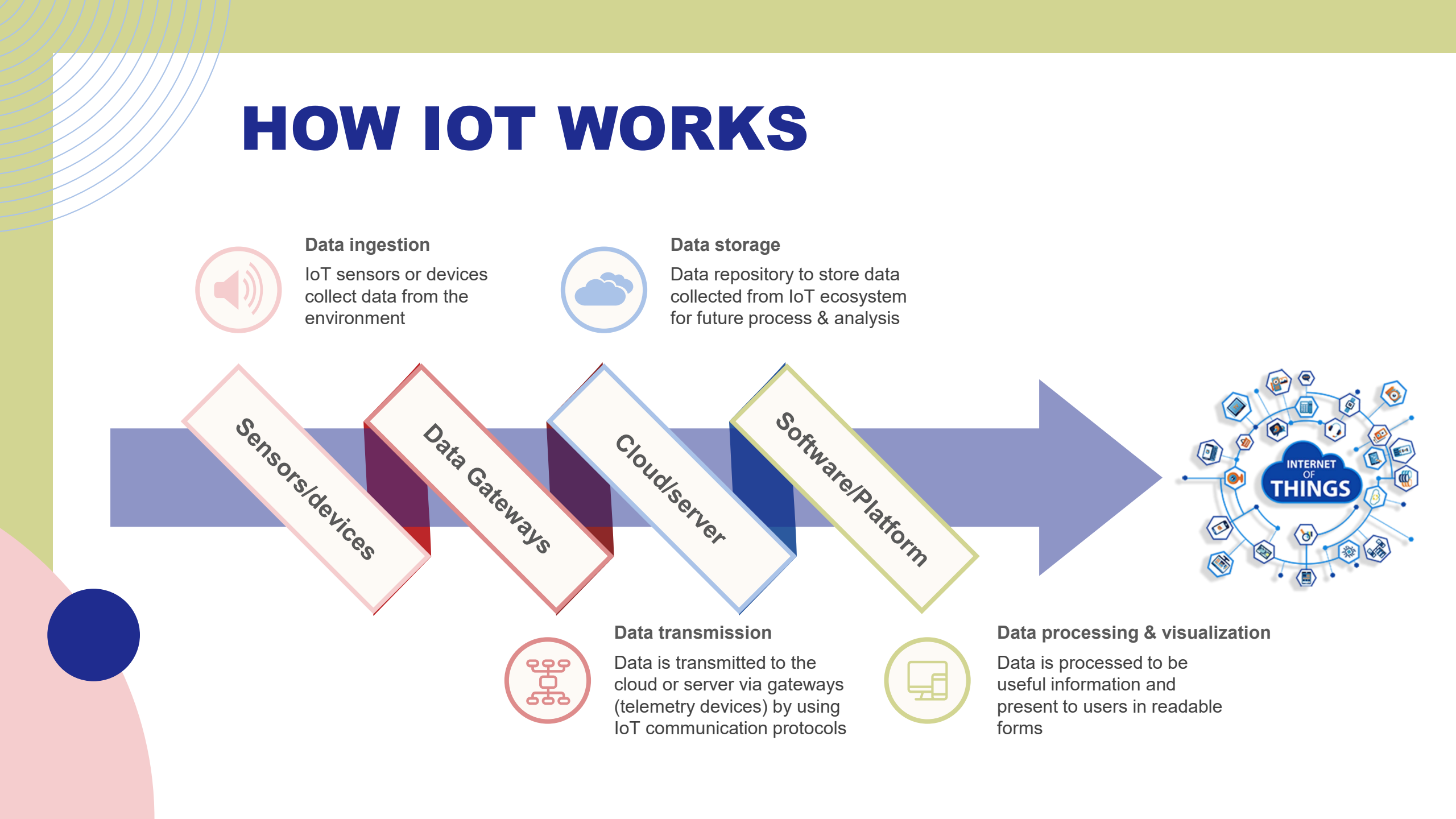
Sensors/devices

Data Gateways

Cloud/server

Software/Platform

INTERNET OF THINGS



WHY IOT MATTER?

Revolutionizing supply chain

“Internet of Things” driving demand for real-time data processing and visibility. IoT enable devices/machines to be smart & can communicate through internet. IoT become data points for collection, management & control from anywhere.

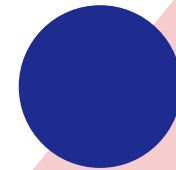
The technology enable better control over ongoing processes lead to operation excellence & greater competitive advantage.



IOT INTEGRATIONS

IoT integration refers to the process of seamlessly connecting IoT devices and systems to work harmoniously, sharing data and insights.

There are many opportunities for IoT capabilities to integrate with other technology to provide business solutions that can enhance overall functionality and efficiency.



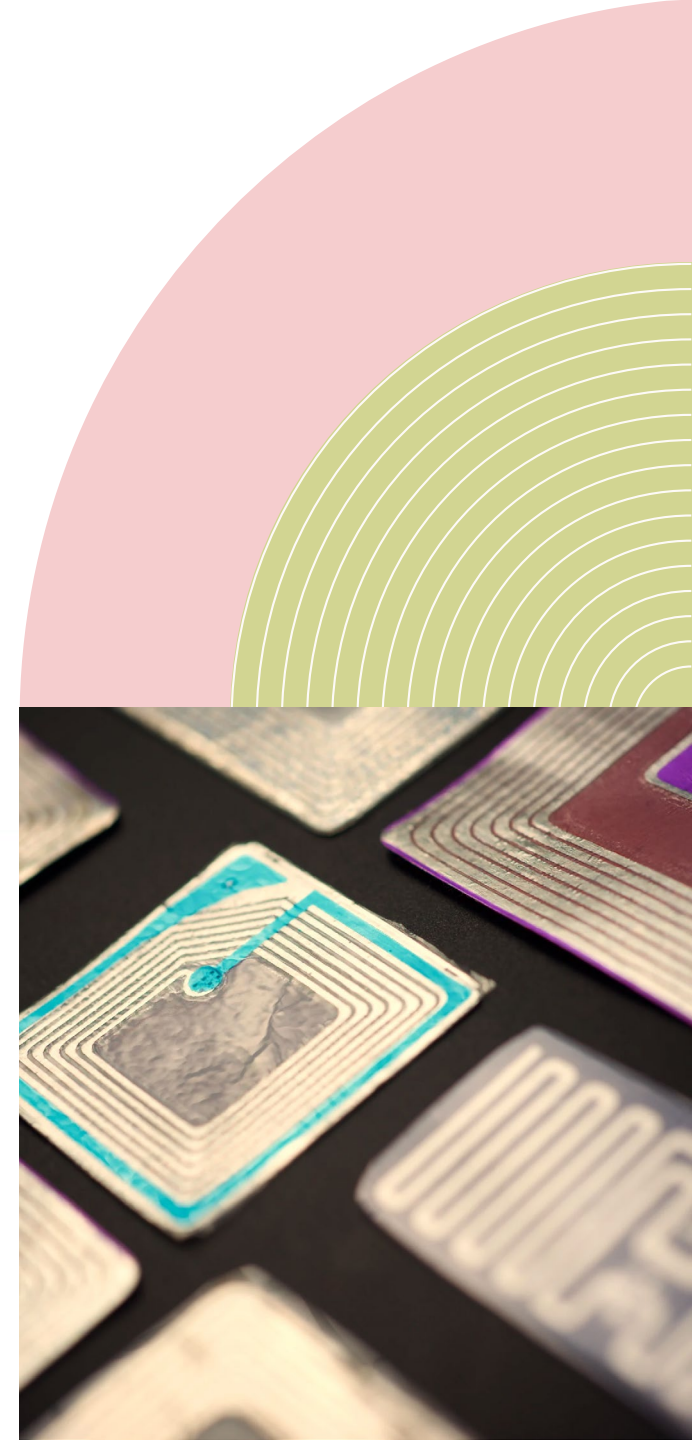
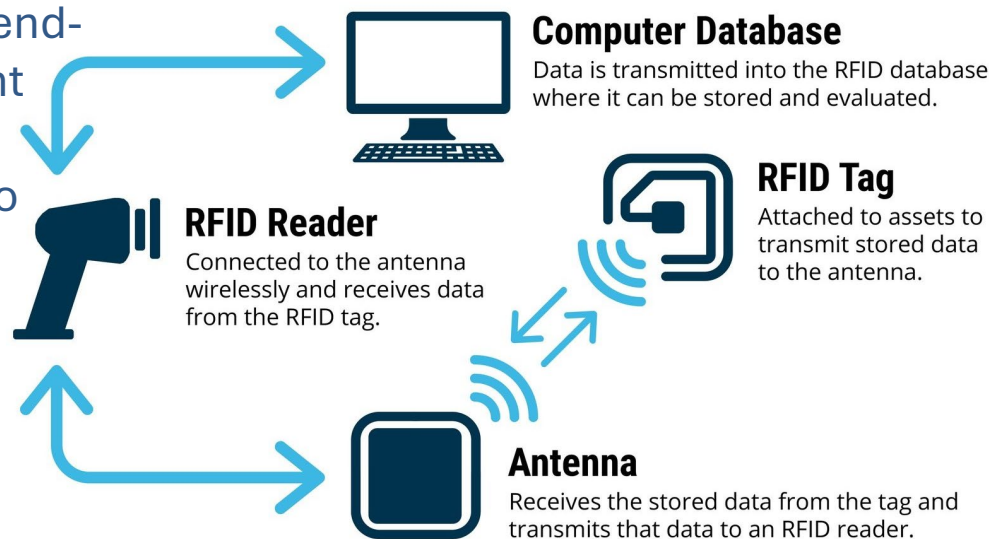
IOT INTEGRATION

RFID as a sensor

RFID (Radio Frequency Identification) has facilitated new means of data collection, to accurately identify and track tagged items.

RFID as sensors, a sensing component is added inside the tag. Data sharing is done through RFID reader terminal and store that data in RFID software.

By integrating RFID tag with IoT sensors & GPS trackers enable real-time end-to-end visibility into the movement And status of goods, inventory management, anti-thefts & able to enhance customer's experience.



IOT INTEGRATION

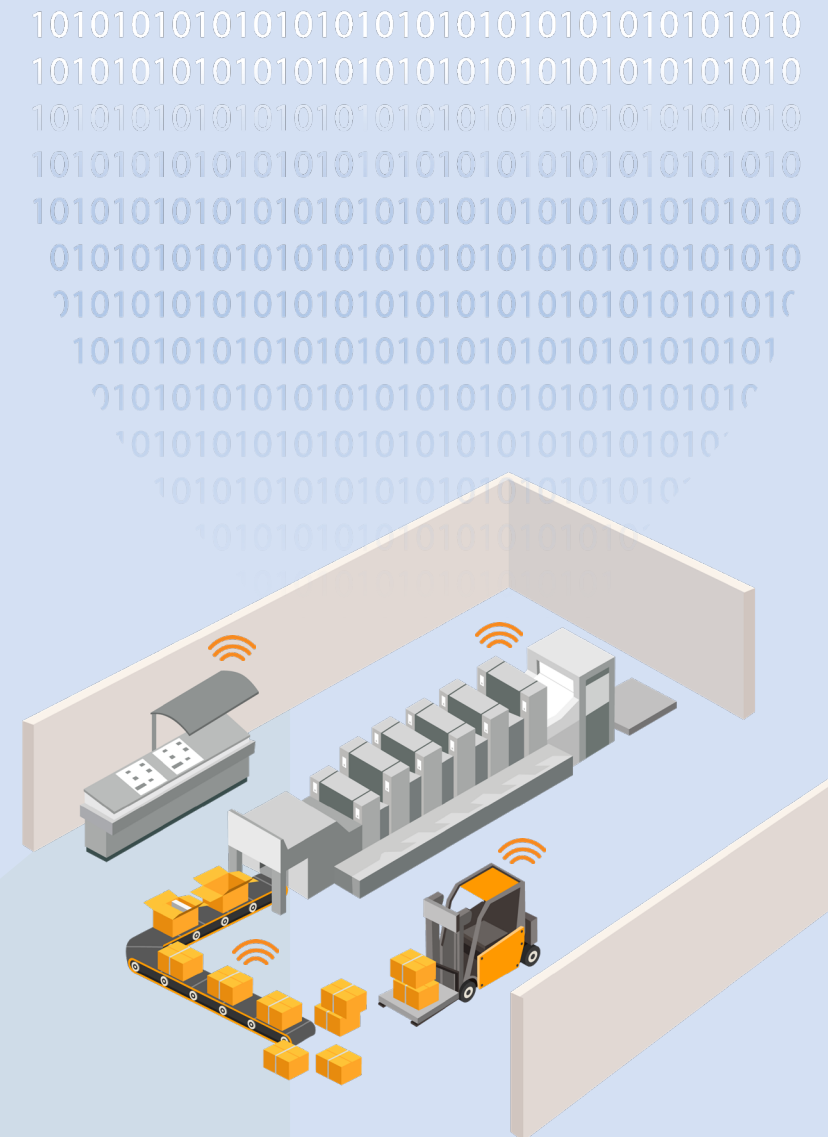
IoT Data is Big Data

Made up of **millions of events and data points**, to support some of the fastest-growing areas in global business

- » **Analytics**
- » **BI**
- » **Predictive Analytics**

The mechanics of deriving analytics from the Internet of Things can be simplified into 4 basic steps:

1. Collect data from IoT devices/machines
2. Transmit data to a central storage repository
3. Analyse information and achieve real-time insights
4. Visualization graphical presentation of data collected & analysed from IoT devices



IOT INTEGRATION

Internet of Robotic Things

Robotics is about reducing human involvement. The technology is developed to delegate human tasks to machines that can assist or even replace humans in doing tasks.

IoT manages objects interacting with the Internet whereas **AI** causes the objects to learn from their experience and act without human intervention.

The merger of these technologies has created the **Internet of Robotics Things (IoRT)** to represent intelligent devices that can monitor events, gather data through sensors and determine the best action accordingly.



IOT INTEGRATION

IoT with blockchain

Blockchain technology facilitate security for IoT-connected devices.

Blockchain enables IoT devices to be tamper-proof and have access to secure lines of communication between smart objects

Blockchain-based smart contracts eliminate the need for a third-party validation and trigger actions upon an approved agreement almost immediately





BENEFITS OF USING IOT

Reductions



Out of
Service for
Repairs

Unplanned Downtime

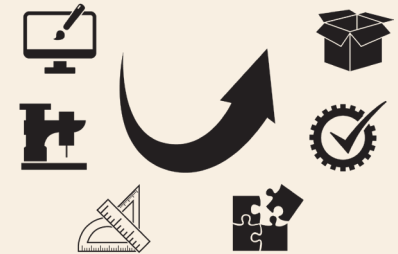


Maintenance Cost

Improvements



Machine Efficiencies



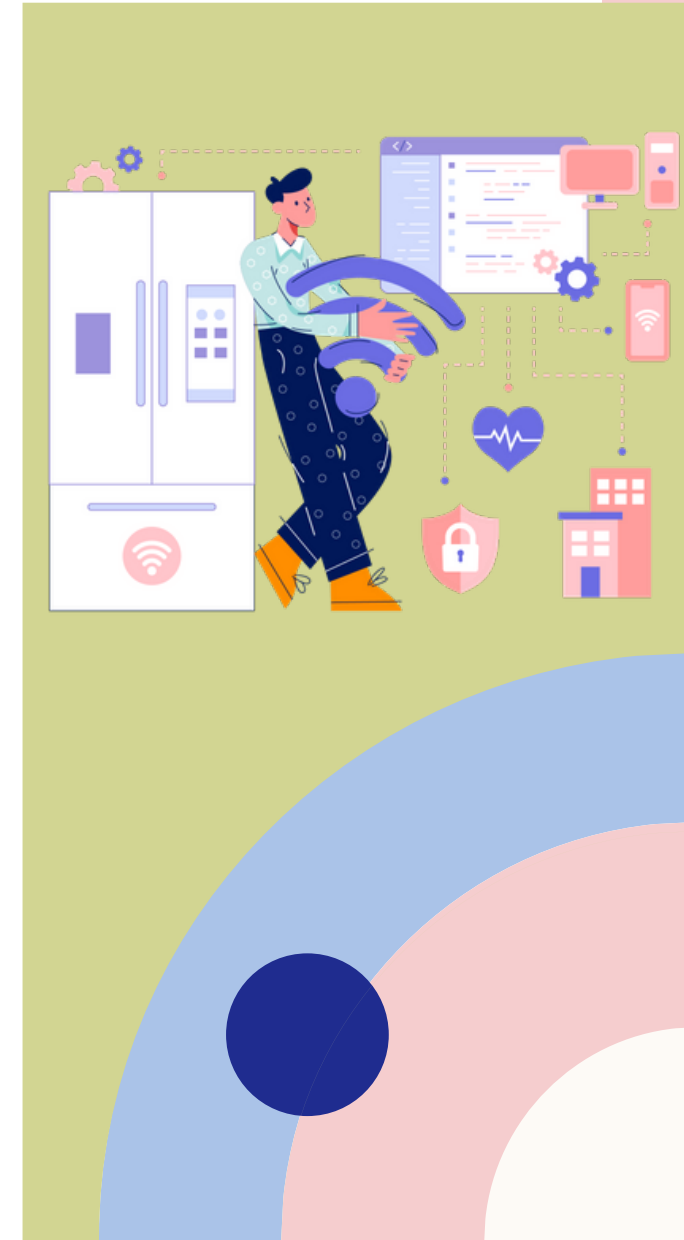
Manufacturing Processes

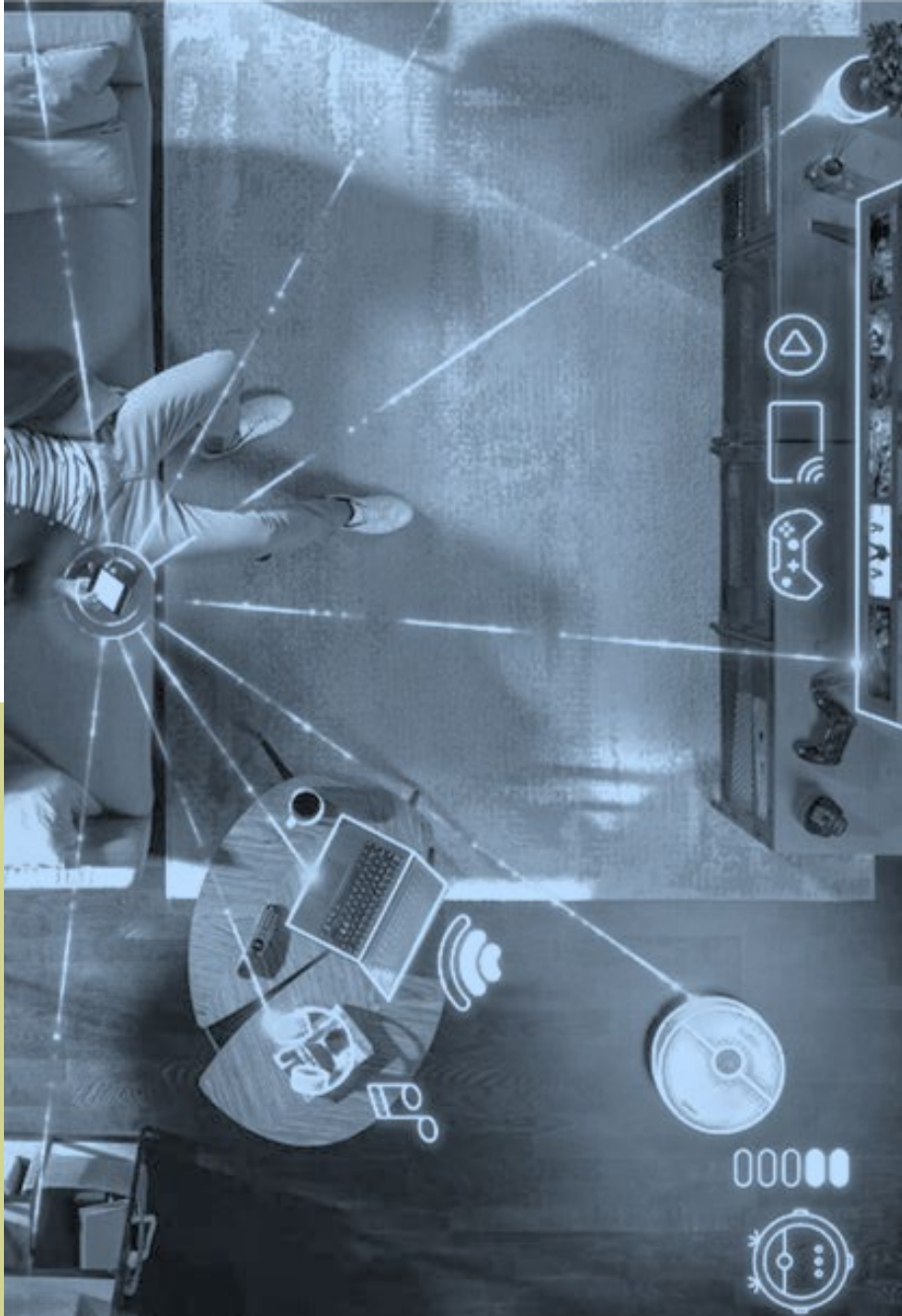


Increased Productivity!

BENEFITS OF USING IOT

Increased Production and Quality		Streamlined Maintenance	
Paper manufacturer used sensors in the kilns to automatically adjust the flame shape	Result: Increased production by 5% and improved product quality	Networked sensors embedded in the bodies of airplanes, monitor the wear and tear of airplanes	Result: Improved proactive maintenance activities
Better Service Levels		Improved Customer relationship	
Logistics managers adjusted vehicle routes using weather and traffic condition sensors	Result: Lowered congestion costs, while increasing network capacity	E-charging station with complementary customer loyalty services offers convenient services with secured contactless payment using smart card	Result: Improved customer services & data security





CHALLENGES OF IOT ADOPTION



Connecting quality



Data security



Data storage issues



Standardization & interoperability issues



Privacy concern



Worldwide
USE CASES
INTERNET OF THINGS

IOT USE CASES IN INDUSTRIES



Transportation

- Telematics
- Industrial fleet management
- Proactive monitoring
- In-vehicle entertainment
- Vehicle navigation
- Safety services
- Remote engine diagnostics



Manufacturing

- Materials management
- Asset, cargo and container management
- Geofencing
- Machine diagnostics
- Machine telemetry
- Inventory control
- Industrial automation control
- Real-time equipment monitoring



Retail & Finance

- Smart payments
- Smart shelves
- Smart loyalty card
- Point-of-sale terminals
- ATM & kiosk monitoring
- Vending machine monitoring
- Fraud detection
- Customer analytics



Security

- Electronic surveillance
- Video surveillance
- Video-enhanced industrial security
- Enterprise security sensor monitoring
- Security alerts
- Smoke/gas detection
- CCTV operations



Consumers well-being

- Smart home appliances
- Connected home electronics and devices
- Home security services
- Home alerts
- Remote home thermostat control
- Continuous glucose monitoring tools

BARCODE & RFID

01

Radio frequency identification (RFID) technology is used to track inventory in warehouses, enabling efficient management of stock levels.

02

Barcodes are used to identify and track products in warehouses, providing accurate data for inventory management.

03

RFID technology can also be used to automate processes such as picking, packing, and shipping, reducing manual labor and increasing efficiency.

04

Barcodes can be used to automate the process of receiving goods, ensuring accuracy and reducing the time required to process incoming shipments.



SIMILARITIES

RFID



- Used for Identifying and Tracking Objects or Products
- Encodes Data in a Machine-Readable Format
- Can Be Incorporated Into Inventory Management, Supply Chain, and Retail Systems to Enhance Efficiency and Accuracy

BARCODE



BARCODE 	VS	RFID 
TECHNOLOGY		
Optical laser		Radio frequency
LINE OF SIGHT		
Required		Not required (in most cases)
EFFICIENCY		
Manual time consuming reading of individual barcodes		Automated pulse reading of several hundred tags with fixed readers
READ / WRITE		
Barcode information is permanent and can only be read		RFID tags are read / write capable and can be modified / rewritten
DURABILITY		
Surface of barcode labels can easily be damaged or soiled		RFID tags are reusable. Their plastic coating makes them highly durable
INTERFERENCE		
Obstructed, torn or dirt-covered barcodes can't be read		Metals or liquids can interfere
COSTS		
Low costs and simple to produce		RFID tags and readers are much more expensive than those for barcoding

SMART LABELS



RFID tags do not need to be visible
RFID offers the ability to fully trace an item
– including provide information using NFC
without barcode scanners

IoT enhances customer's experience
providing personalized information
based on customer preferences

TRACKING RETURNABLE ITEMS

TURCK

KNOWING WHERE

RFID makes production and logistics processes highly transparent, from incoming goods to production and warehousing right through to shipping – an ideal solution also for the efficient management of returnable transport items (RTIs).

► With UHF readers and displays on forklifts, there are no more blind spots even when transporting multiple containers in production or in the warehouse.

Returnable transport items, such as pallets, grid boxes or plastic boxes are the pack horses of many production and logistics chains. However, logistics systems are not transparent if the movements and positions of RTIs are not continuously recorded. This results in excessive costs due to the buildup of spares and buffer stocks as well as expensive shipping. The use of RFID technology ensures the efficient management of an RTI pool over the entire process chain of production. An end-to-end tracking concept improves transparency and control in load carrier management and thus creates added value in production logistics, which increases pool transparency and minimizes shrinkage and loss.

SMART WAREHOUSE

IoT when integrated with **WMS** can enhanced visibility and real-time inventory tracking, enable better inventory management, allow predictive maintenance of warehouse MHE.

IoT can help warehouses reduce operational costs by optimizing operations, reducing waste, and enabling more efficient resource allocation.

DHL IMPLEMENTS SMART WAREHOUSE INITIATIVE

WAREHOUSE DIGITAL TWIN IMPROVES SAFETY AND PRODUCTIVITY FOR TETRA PAK OPERATIONS IN SINGAPORE



DHL has been at the forefront in testing the use of IoT in its warehouses since 2015 with various partners.

6 KEY ELEMENTS OF DHL SMART WAREHOUSE INITIATIVE

1

Minimum 16% efficiency gain with reduced congestion, improved resource planning, and workload allocation.



2

Live site access monitoring: Management alerts for controlled areas with restricted access.



3

Real time monitoring of environmental temperature systems.



4

Full traffic movement visibility for slotting optimization.



5

Real time operational data enables supervisors to make informed decisions, coach teams and ultimately improve operational team performance.



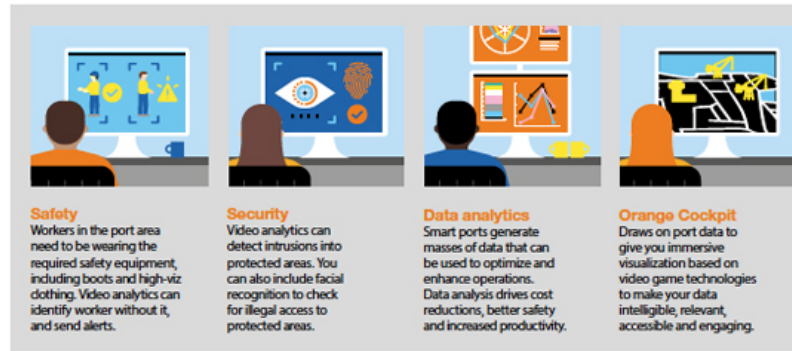
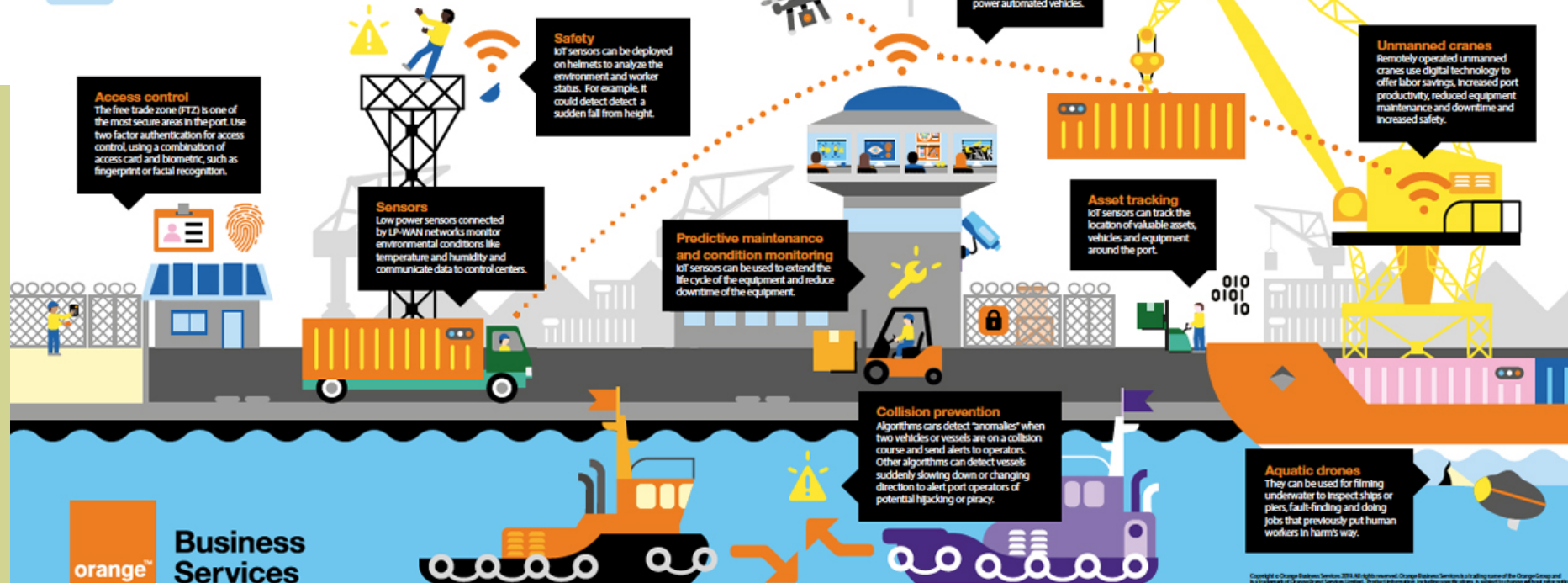
6

Enhanced MHE safety, with proximity sensors, providing enhanced spatial awareness, reducing potential collision risk.



A walk around a next generation smart port

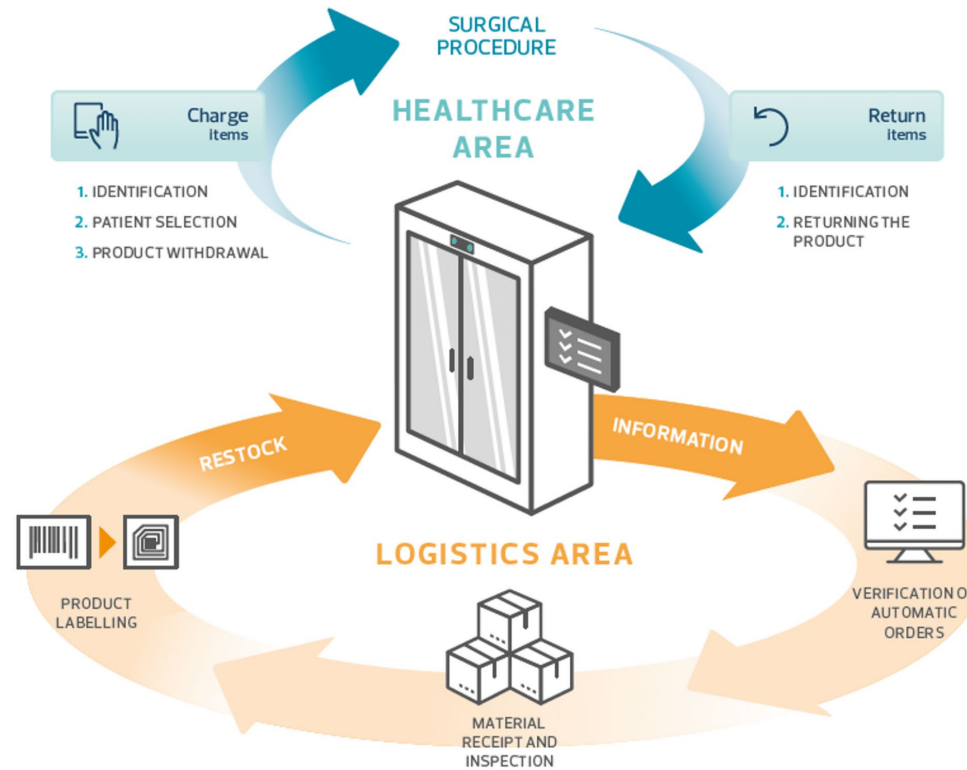
Maritime companies face unique challenges in today's ports: land and sea space constraints, limited resources, time limitations and high operating costs. Smart ports use digital tools to make operations more productive, safer, efficient and profitable. Automation, digitalization, artificial intelligence (AI) and data analytics are all part of the new maritime vision.



<https://youtu.be/6kiZxJojYg?si=IKfSjfb-DPIJQujO>



SMART CABINET



Reliability

Consistent reading performance throughout its storage volume.



Warnings

Light and sound system indicating unlocked or accidentally opened doors.



Usability

Intuitive touchscreen interface.



Traceability

Product expiry alerts. Product identification in the event of a health alert.



Patients

Ability to assign to a patient or service from the same cabinet.



Access to information

Automatic order replenishment, periodic consumption reports and sending of information to generate implant logs.



Access control

Password or personal card identification. User access and movement logs.



24/7 information

Real-time information from any device connected to the hospital network.



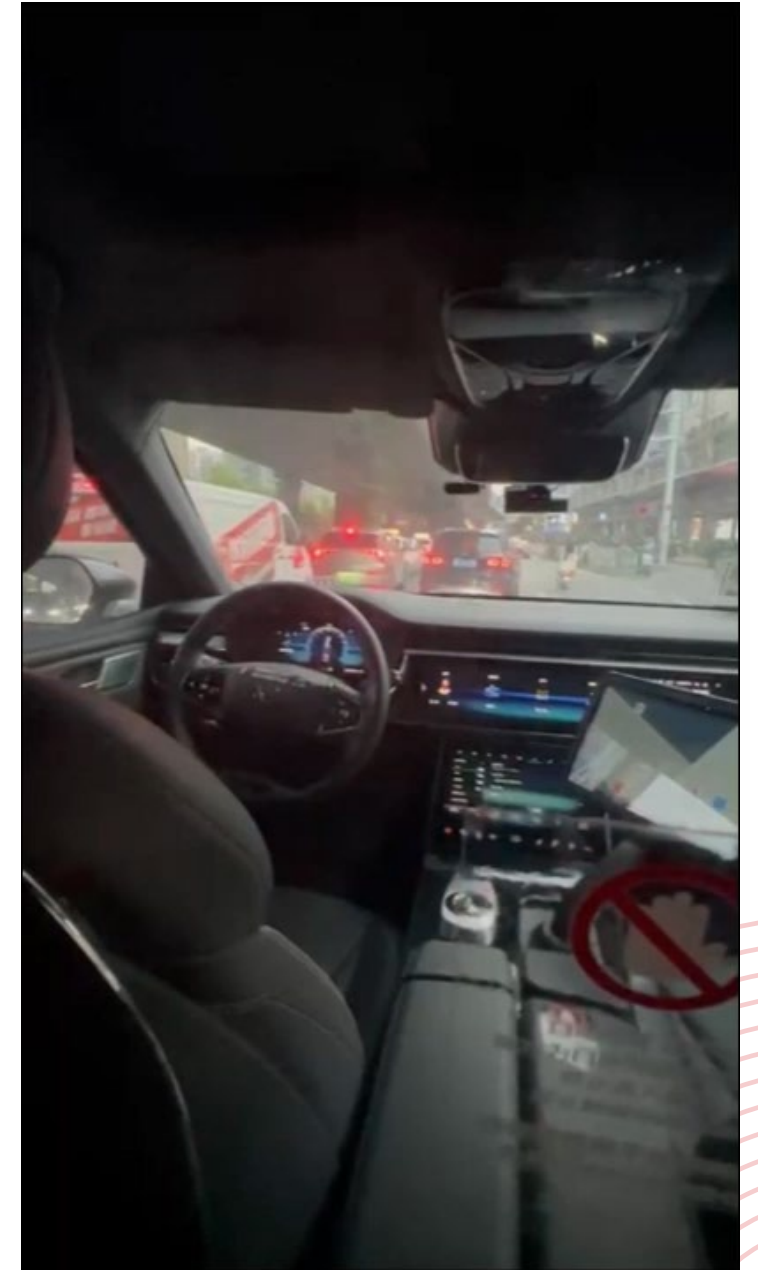
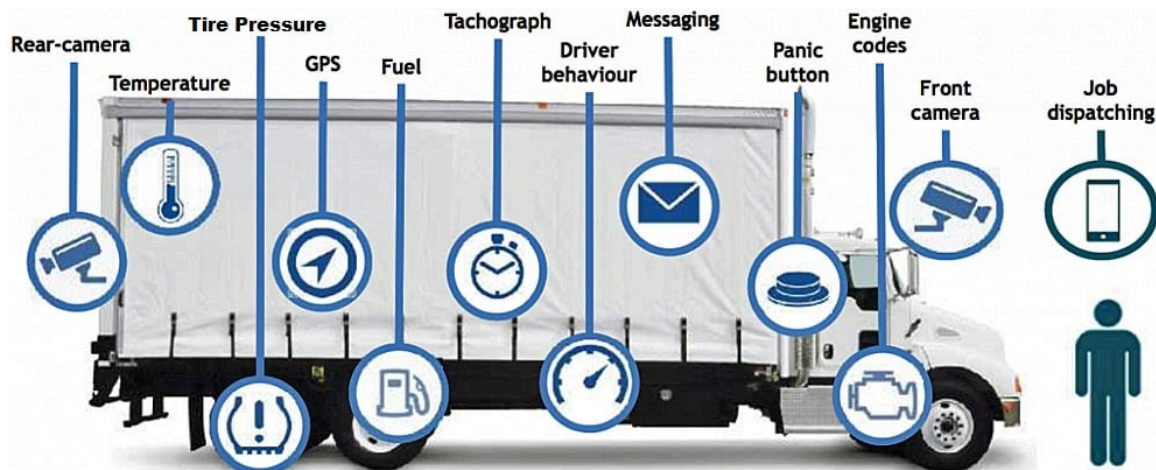
Modular system

Flexible internal settings and possibility to increase storage volume.

SMART VEHICLES

Telematics sensors & cameras in trucks and multisensory tags on items transmit data on location & condition

IoT creates **fleet efficiency & visibility**
Providing valuable information to improve route planning, loading consolidation and drivers' performance.



SMART FACTORY

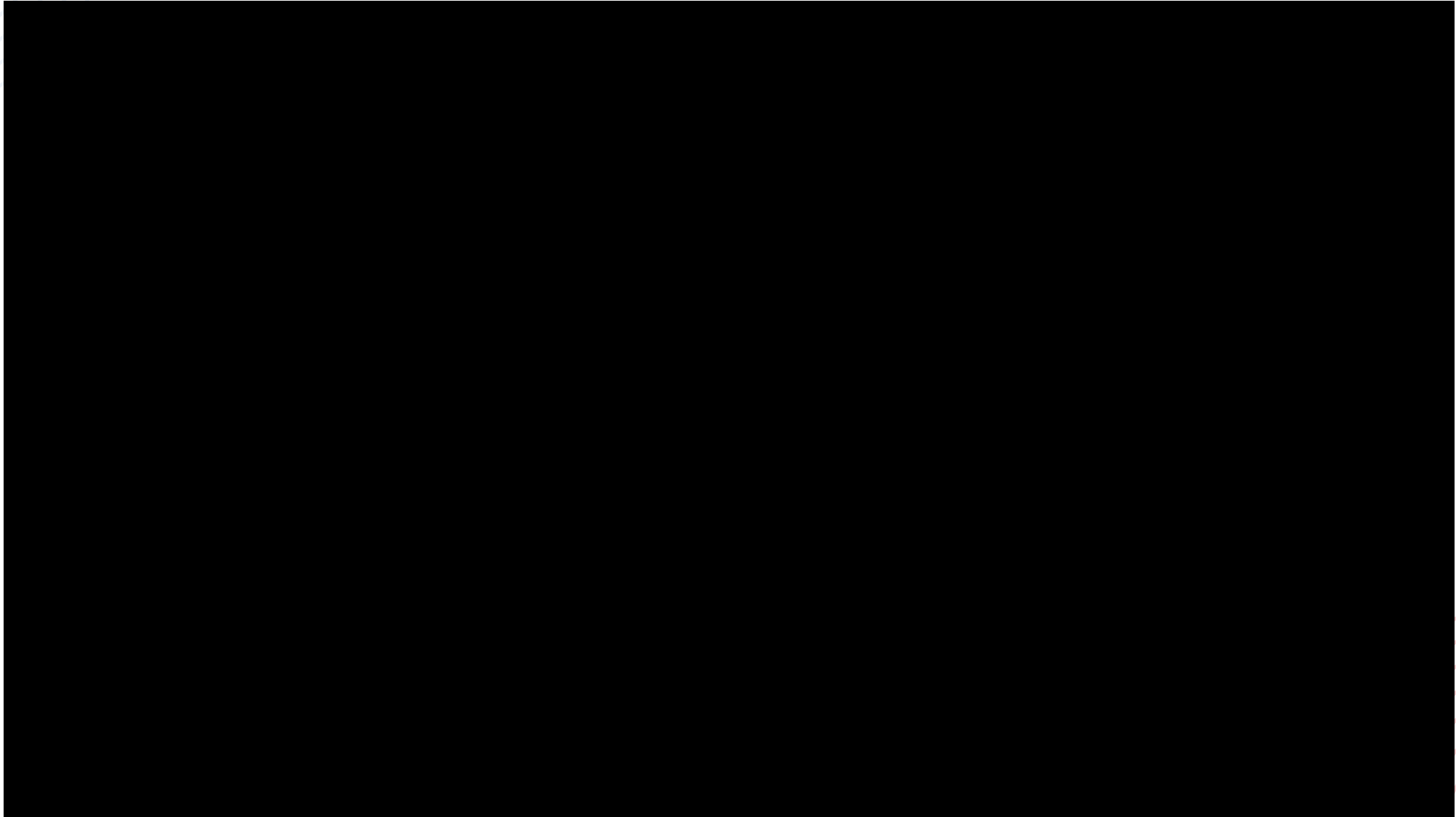


Industrial Internet of Things combining several technology such as IoT, Robotics, BI and Machine Learning.

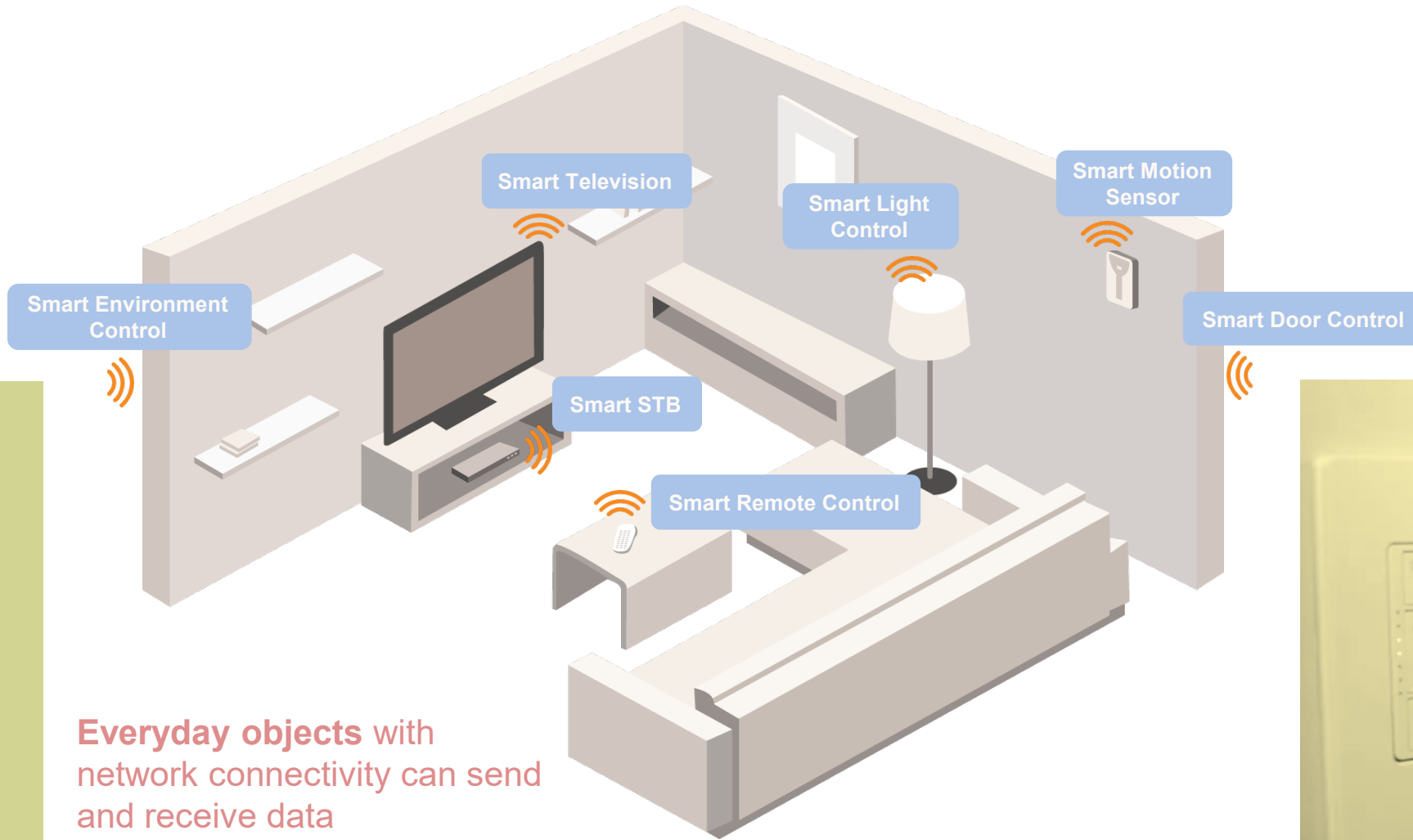
Bosch has smart software to connect all the diverse data streams called **Nexeed** to read out data from more than 60,000 sensors in the factory and delivers the relevant information in real time.



SMART BUILDING : THE EDGE



DAILY LIFE AND DOMOTICS



Everyday objects with network connectivity can send and receive data



SMART GROCERY : AMAZON GO

Amazon Go Revolutionizing Retail with IoT

Unique shopping experience by a sophisticated and well-connected network of IoT devices and technologies such as Computer Vision, RFID, Sensors, and Edge Computing.

**Just
Walk Out**





THANK YOU