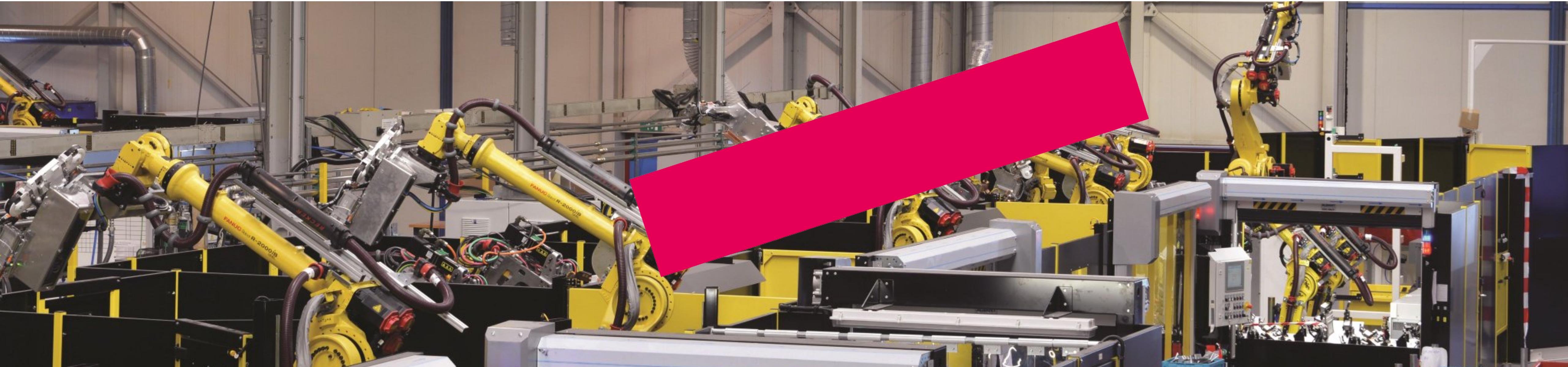


# Connected Factories lecture 1/6: Introduction



Associate Degree Smart Industry  
Faculty of Engineering and Automotive

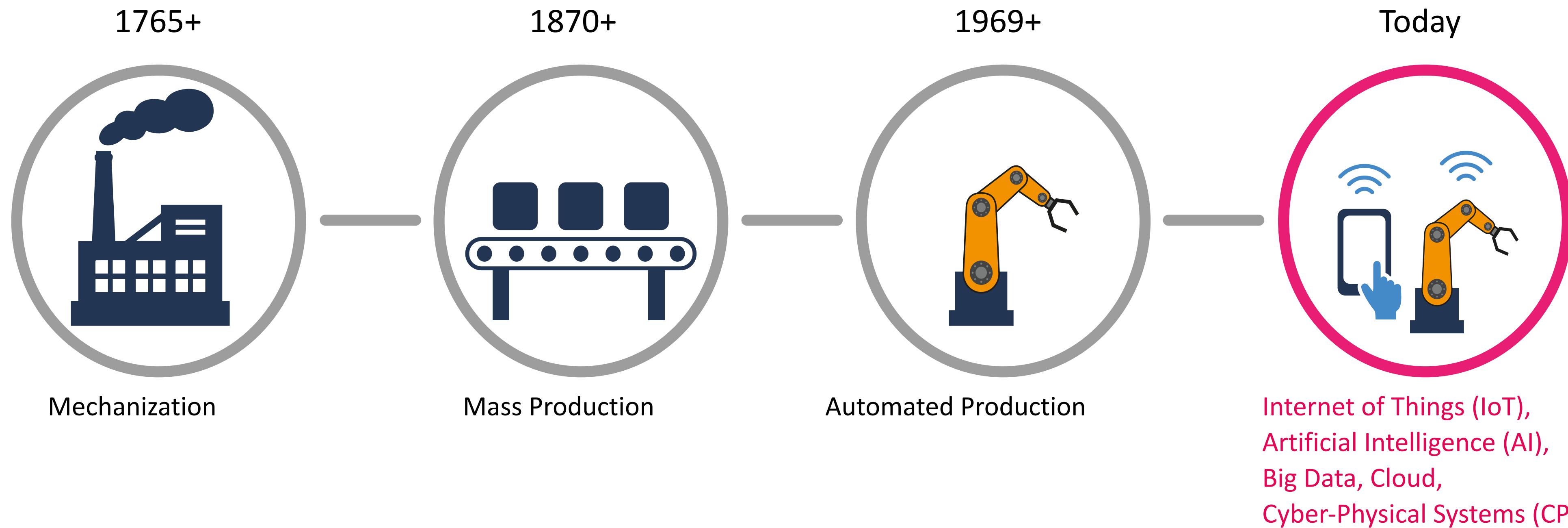
johan.korten@han.nl

V1.0 April 1, 2020

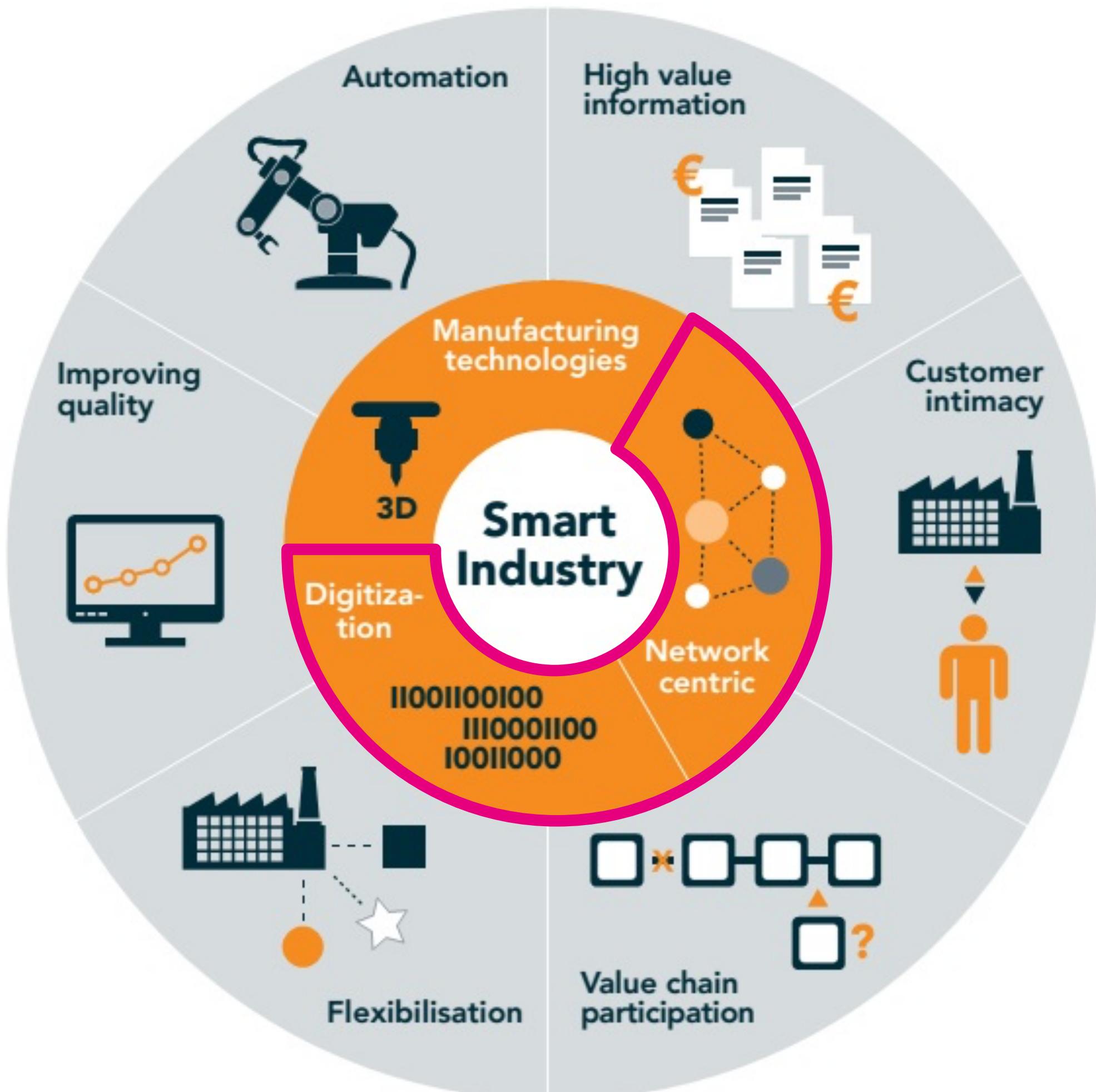
# Schedule

	<b>Theme</b>	
Lecture 1	<b>Today: Introduction</b>	
Lecture 2	Network connections	
Lecture 3	Network protocols	
Lecture 4	Interconnections	
Lecture 5	Security	
Lecture 6	Safety	
Assessment		

# Connected Factories



# Connected Factories



# The SARA layer model (technolution.eu)

Sensor and Actuator Reference Architecture

Sensor/actuator systems (IoT systems) link the *physical world* to the *digital (cyber) world*.

HAN Extension: sensor / controller / actuator systems.

# Sensor/controller/actuator systems: Type A. Monolithic

Characteristics:

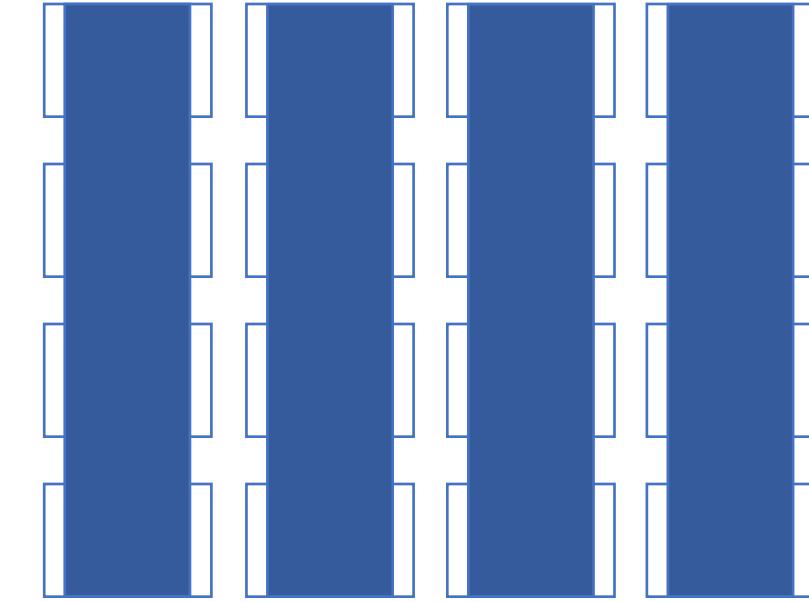
- Implements all required functionality in a single application.
- Perfect for small and less complex environments and systems.
- Strong coupling between data, code processing and presentation.
- Poor scalability.



# Sensor/controller/actuator systems: Type B. Vertical Silo

Characteristics:

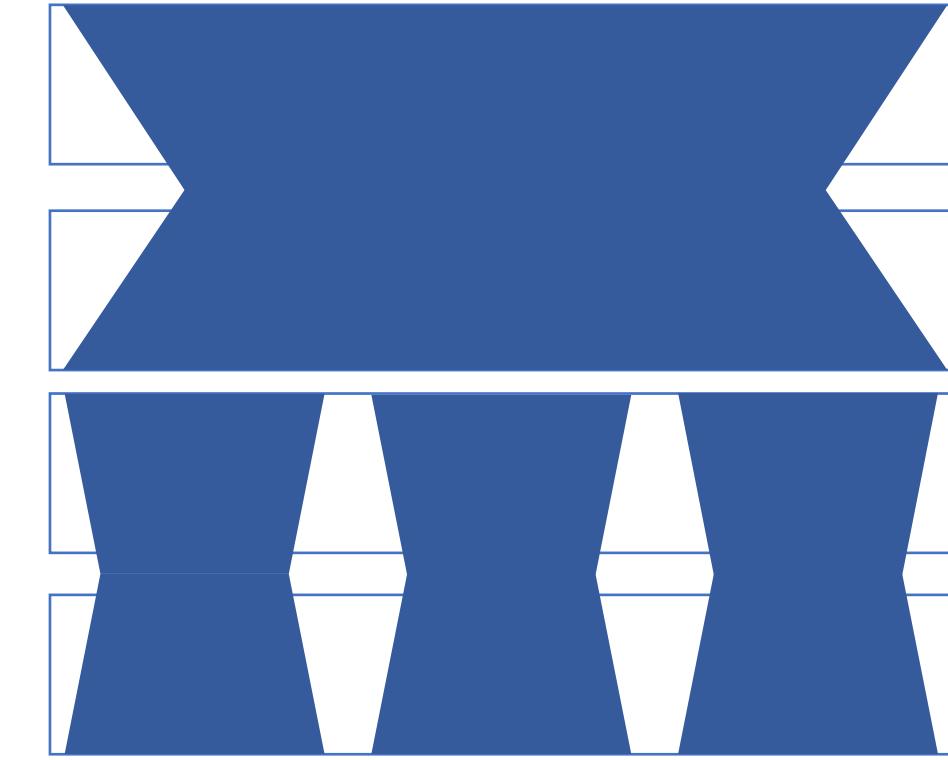
- Stacked software blocks.
- Functionality focused on single kind of sensor and/or data stream.
- Often single software supplier:  
whole chain managed by same supplier.
- Limited data flexibility.
- Often impossible to add additional sensors and/or data streams from/by other parties.



# Sensor/controller/actuator systems: Type C. Horizontal Layers

Characteristics:

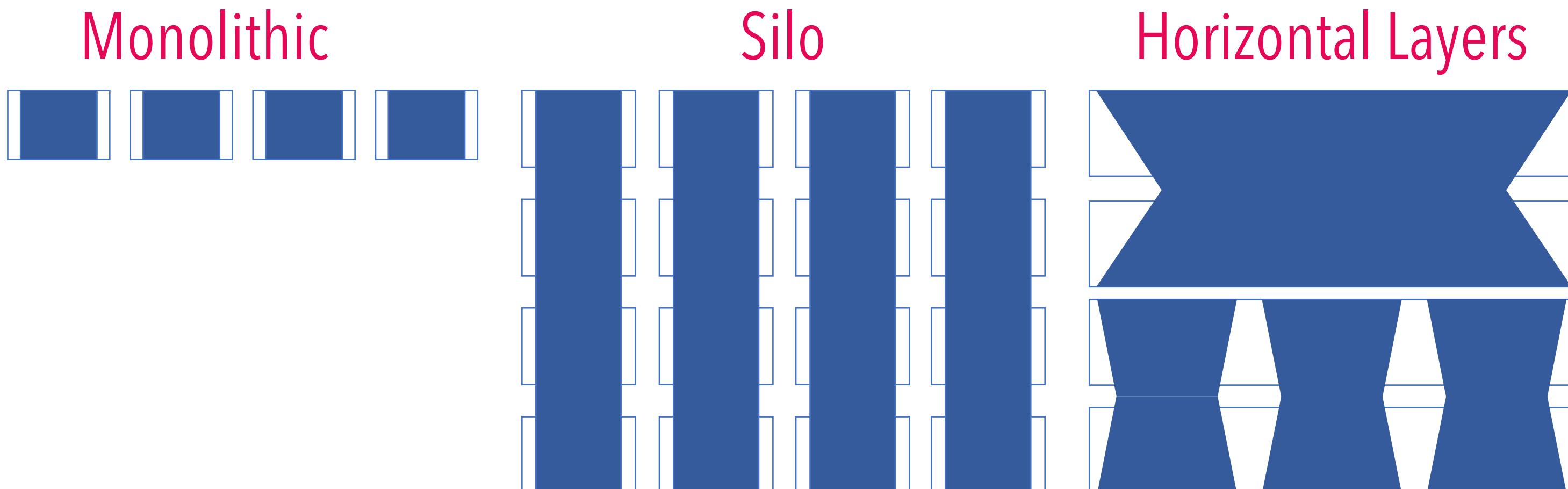
- Detached, horizontal layers with unique functionality.
- Implementation with state-of-the-art technology, most suitable for particular layer.
- Great and enduring flexibility.
- Several technologies alongside each other.
- Correlation of information and processes.
- Disadvantage: lot of direction required as functionality and interfaces of layers need to be permanently monitored and assessed.



# Sensor/controller/actuator systems

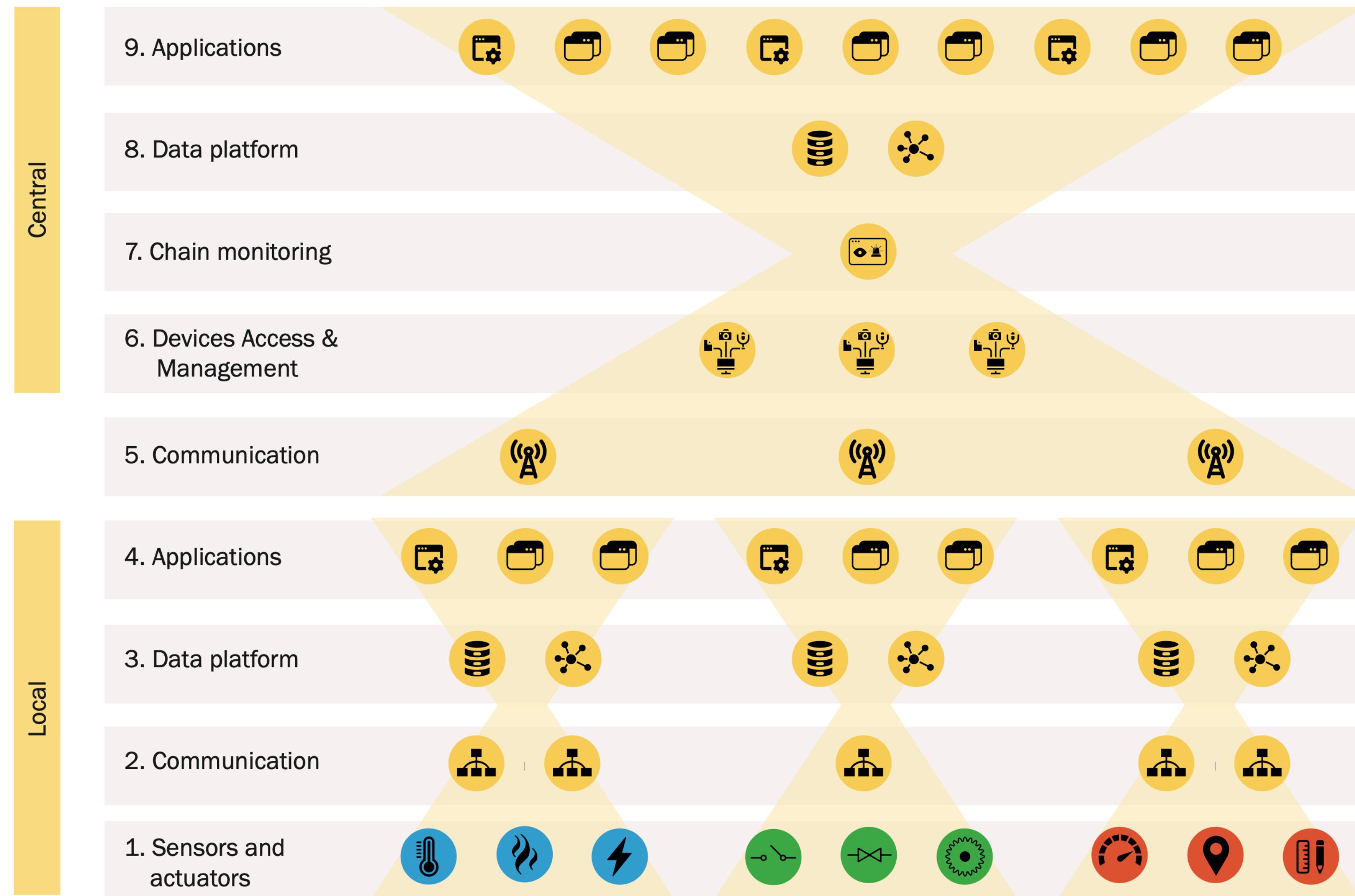
Questions to ask:

- What type of sensor & actuator system does our organization resemble most?
- What would fit the needs of our organization best?
- What type of sensor & actuator system would fit Industry 4.0 requirements best?



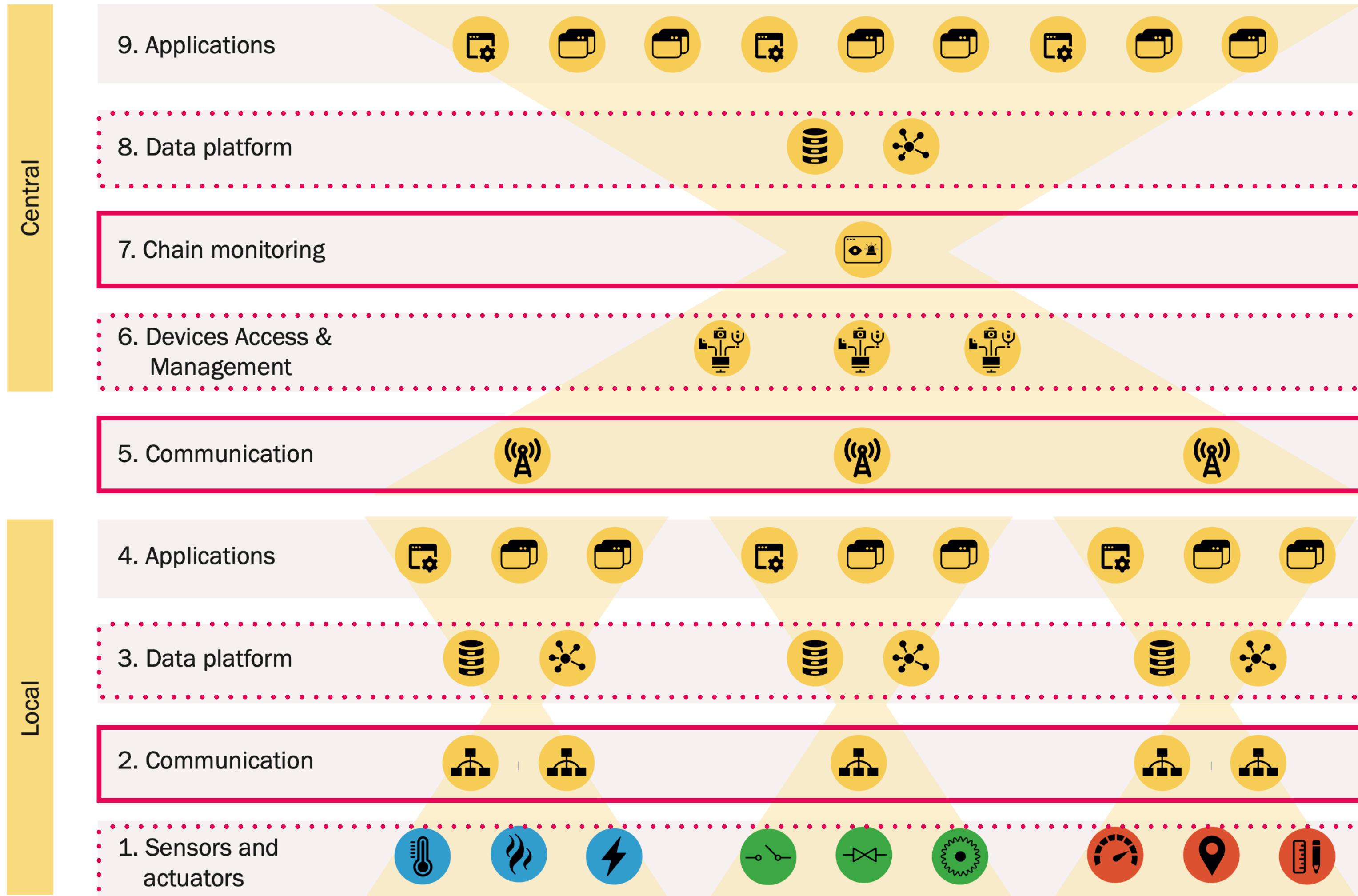
Source: <https://www.technolution.eu/>

# The SARA layer model (technolution.eu)



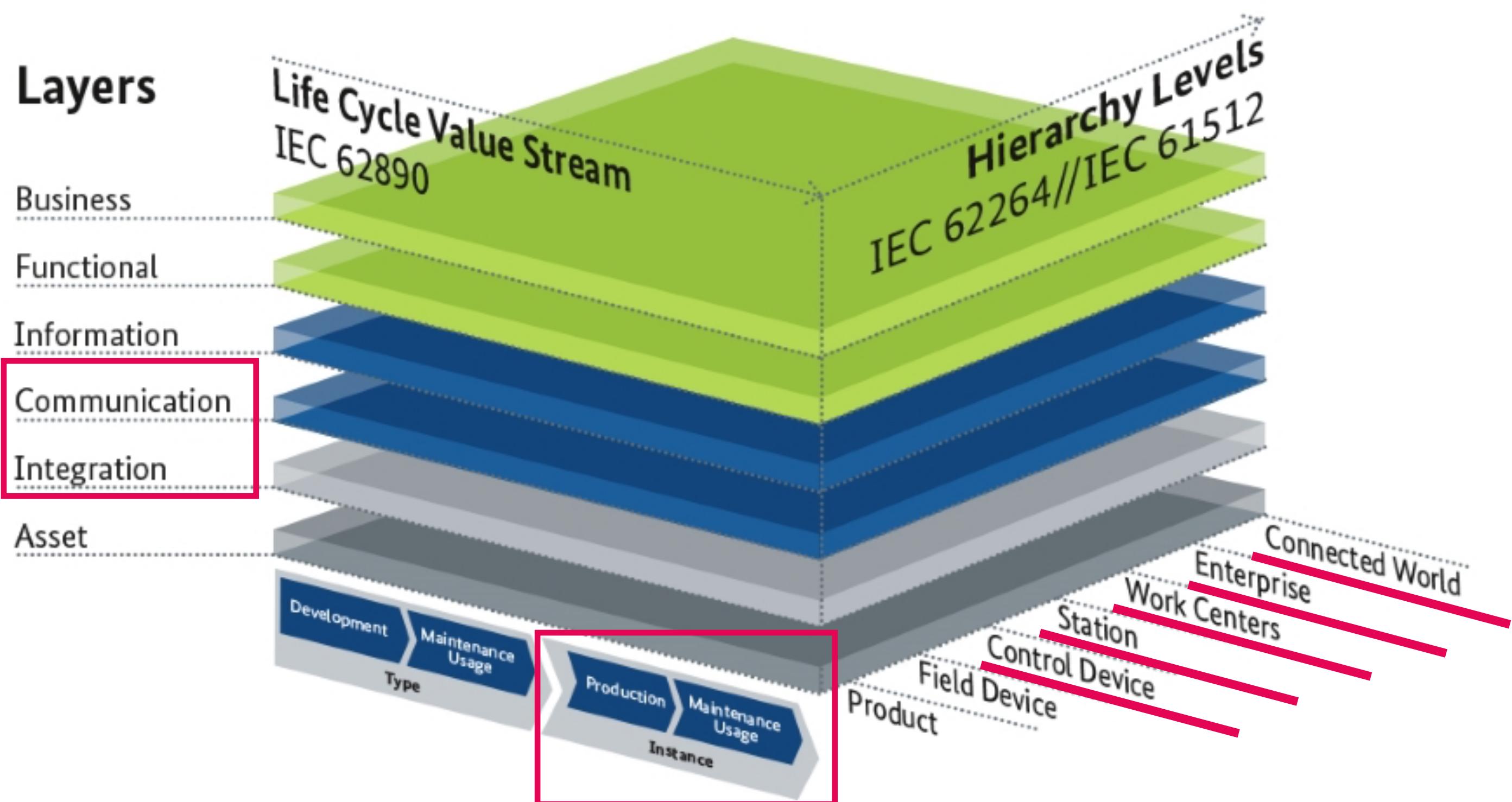
Source: <https://www.technolution.eu/>

# Focus of Connected Factories course:

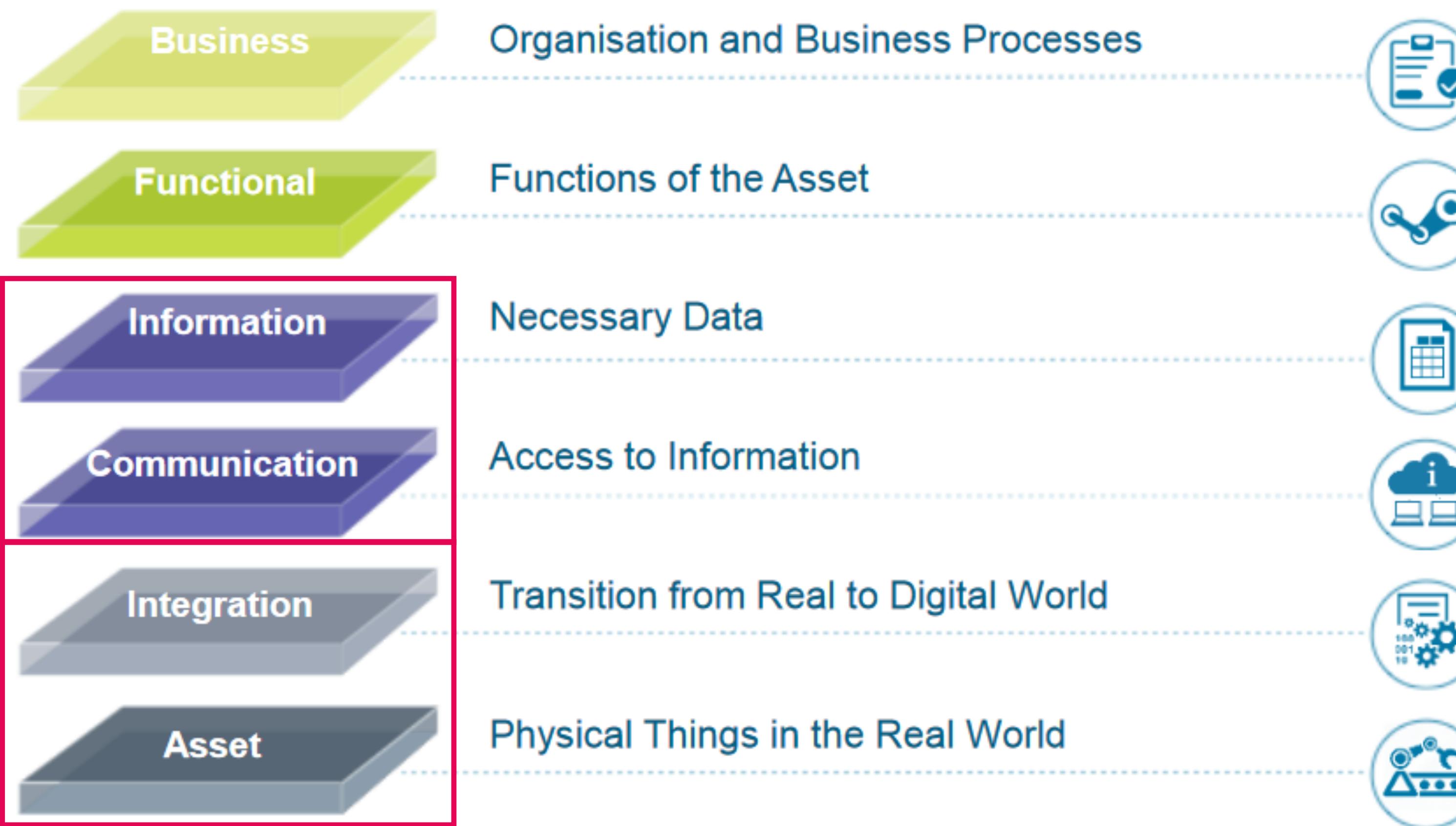


Source: <https://www.technolution.eu/>

# RAMI 4.0 - The Reference Architectural Model for Industry 4.0



# Layers



# Important themes for Connected Factories:

Network infrastructure

Network technologies

Network standards for industrial applications

Topology (structure of the network) including cloud vs. fog vs. edge

Interconnectivity

Identification

# Cisco modules

Enroll here: IoT Cursus van Cisco.

Course is here: <https://www.netacad.com/portal/learning>

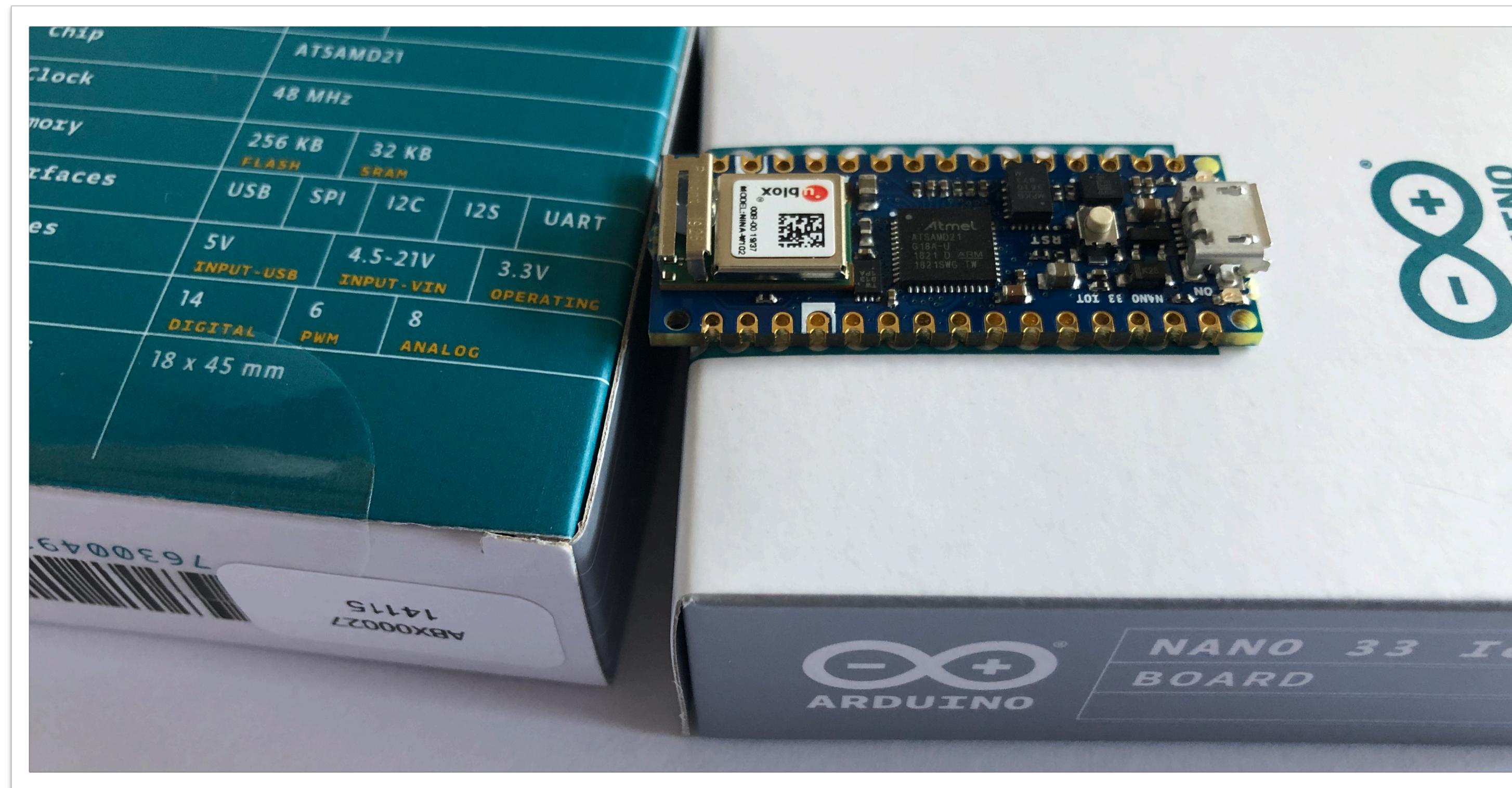
Homework for next session:

(optionele opdrachten hoeven niet)

- Les 1. Digitale transformatie (voorbereiding)
- Les 2. Netwerken liggen aan de basis

# Towards your own IoT / MQTT device.

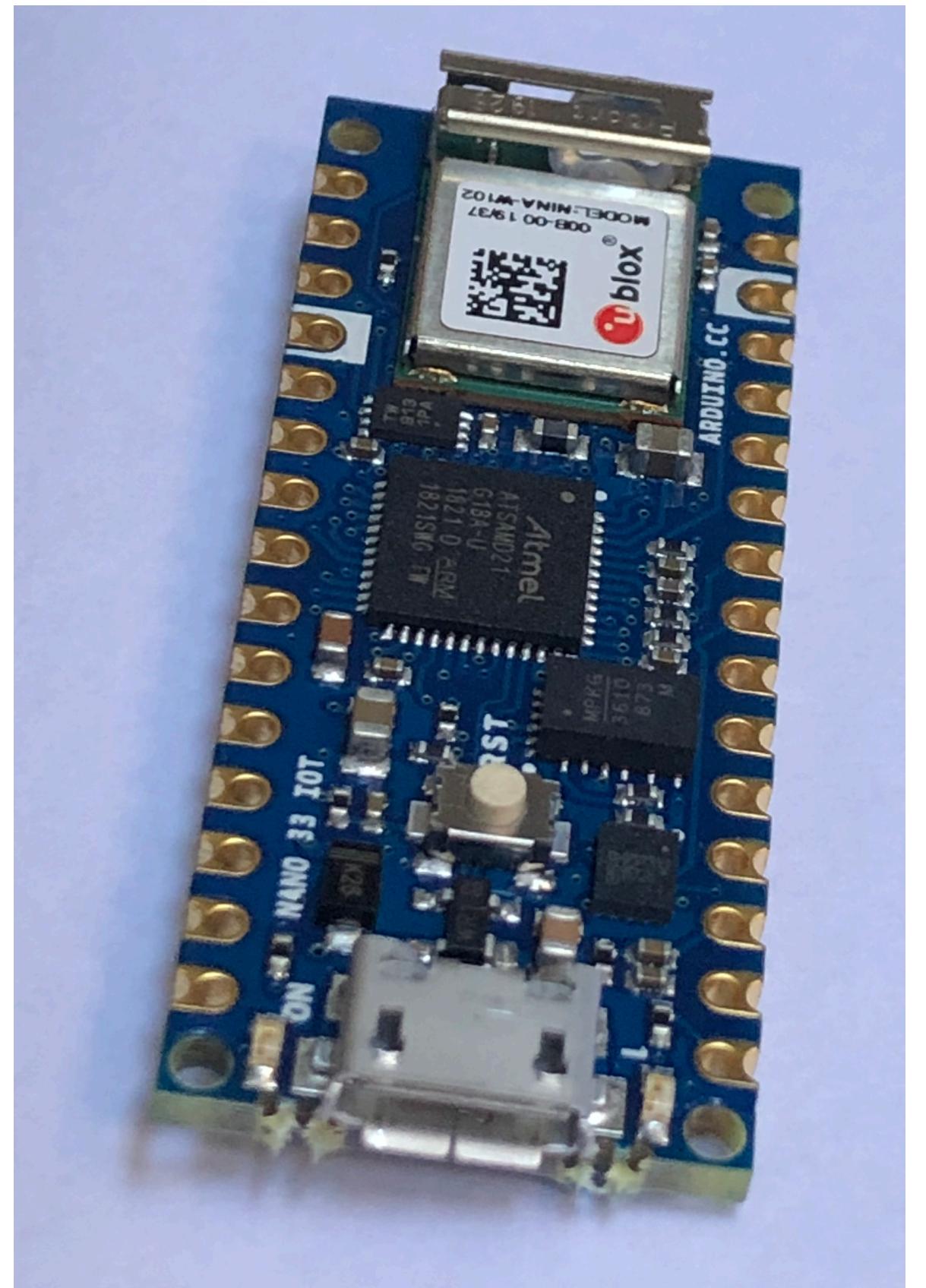
Practical: connecting your Nano 33 IoT Board to your local WiFi network.



# Towards your own IoT / MQTT device.

During online session we will do this live, but you can also do it for yourself.

- Install Arduino IDE
- Install Library for Nano 33 IoT board
- Change network credentials in the example program
- Connect to your network
- Toggle LED (on/off)
- Evaluate results in the Arduino Terminal



# Towards your own IoT / MQTT device.

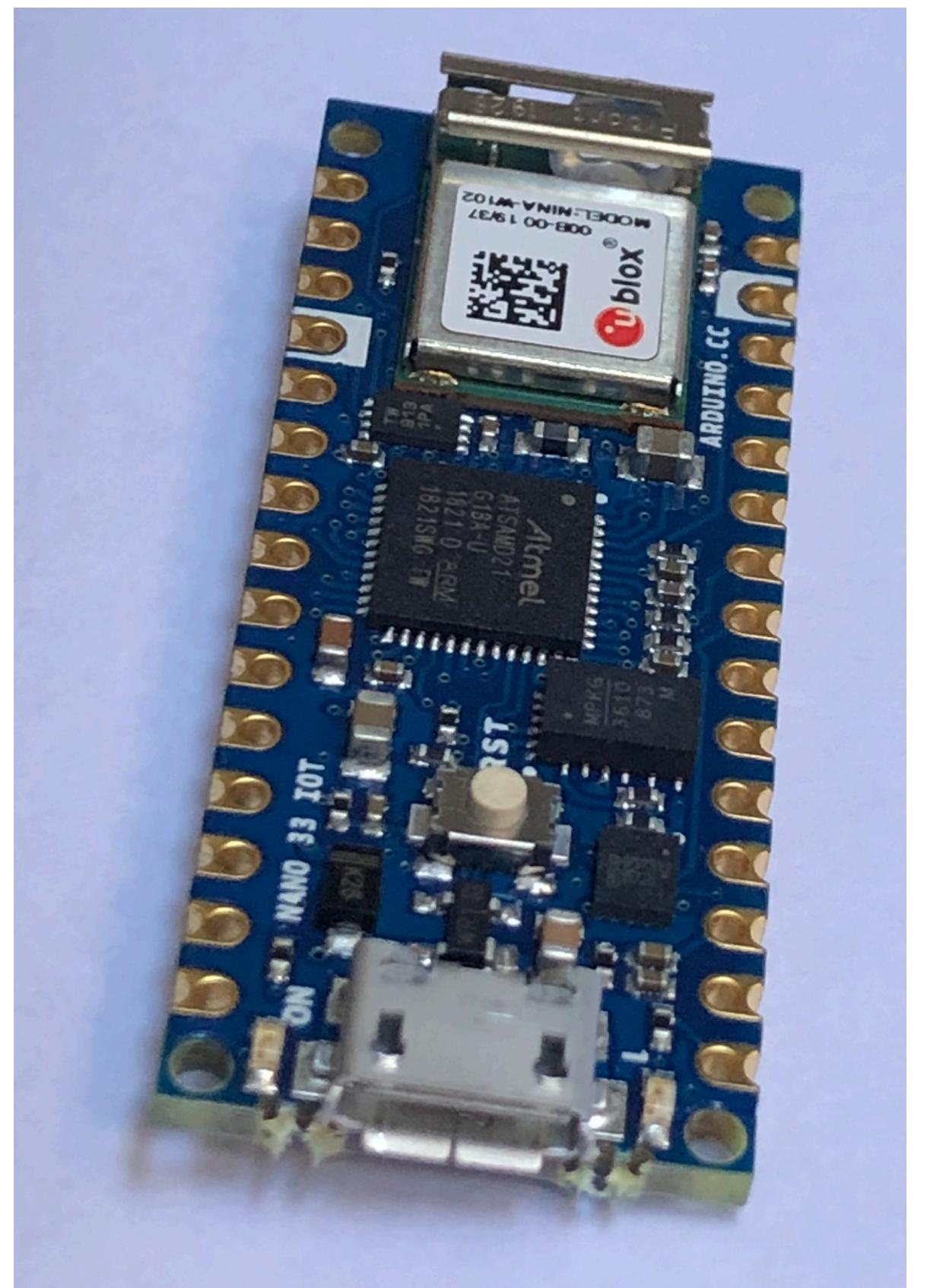
During online session we will do this live, but you can also do it for yourself.

- Video 1.1 [Arduino Installation etc](#)

(Note: see menu cheat sheet on next slide)

- Video 1.2 [Your first IoT application](#)

- Git [Source code](#)



# Arduino Menu cheat sheet... (not entirely visible in videos)



# References

White-paper Sensor/Actuator networks:

<https://www.technolution.eu/uploads/2019/07/architecturen-voor-sensor-actuator-netwerken.pdf> (Dutch)

<https://www.technolution.eu/uploads/2019/11/architectures-for-sensor-actuator-systems.pdf> (English)

Arduino Nano 33 IoT:

<https://www.arduino.cc/en/Guide/NANO33IoT>

# Final assignment

## Meerdere mogelijkheden:

- Optie A: Neem een of meer van de zaken die aan bod gekomen zijn en werk dat uit voor jou bedrijfscontext.
- Optie B: als bedrijfscontext te ingewikkeld is in deze tijd mag je ook iets rond smart home / domotica uitwerken.
- Optie C: opdracht 8 uit de Cisco serie (liefst ook koppelen aan je bedrijfscontext).

## Voor elke assignment:

- Doe een korte analyse van hoe eea in je bedrijf toepasbaar zou zijn
- Maak een beperkt ontwerp van je oplossing
- Werk met de Raspberry Pi en/of Nano 33 IoT een proof of concept uit
- Neem vlog op waarin je analyse, ontwerp en uitwerking aan bod komen (Youtube, verborgen, alleen link delen).

“

# Questions?