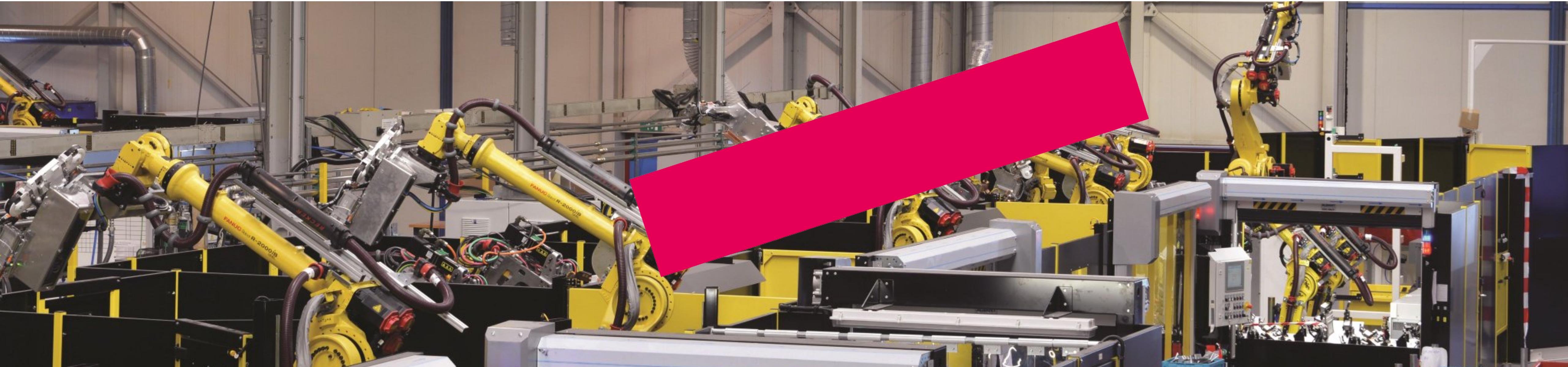


Connected Factories lecture 1/6: Introduction



Associate Degree Smart Industry
Faculty of Engineering and Automotive

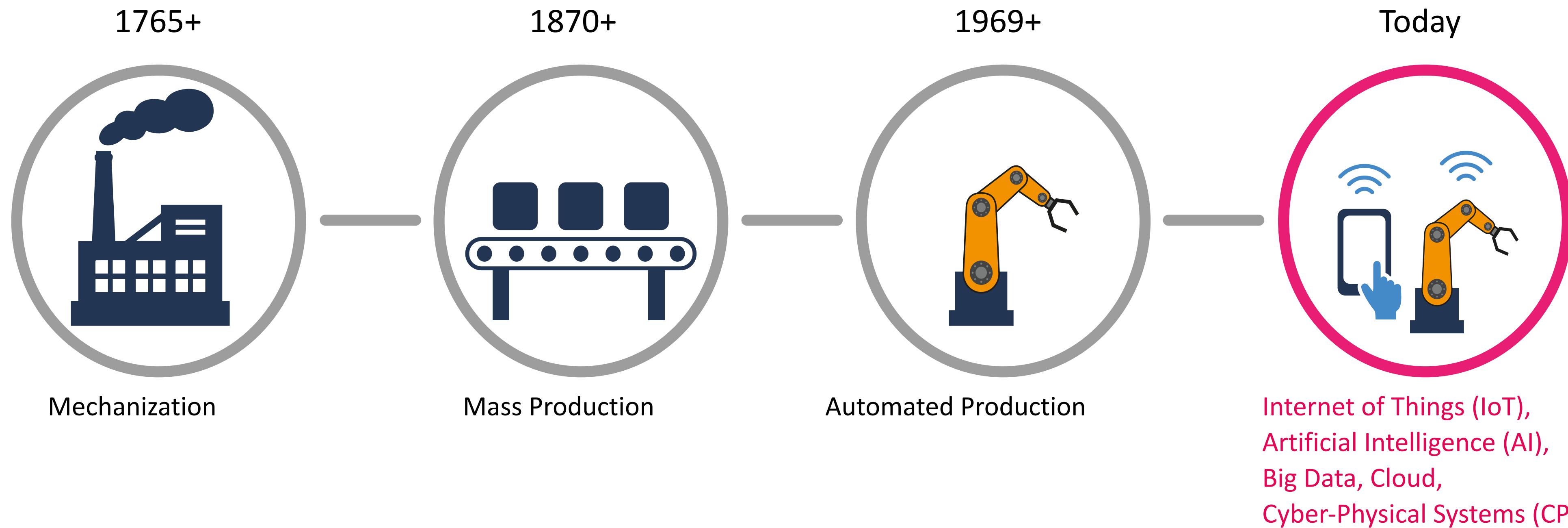
johan.korten@han.nl

V1.0 April 1, 2020

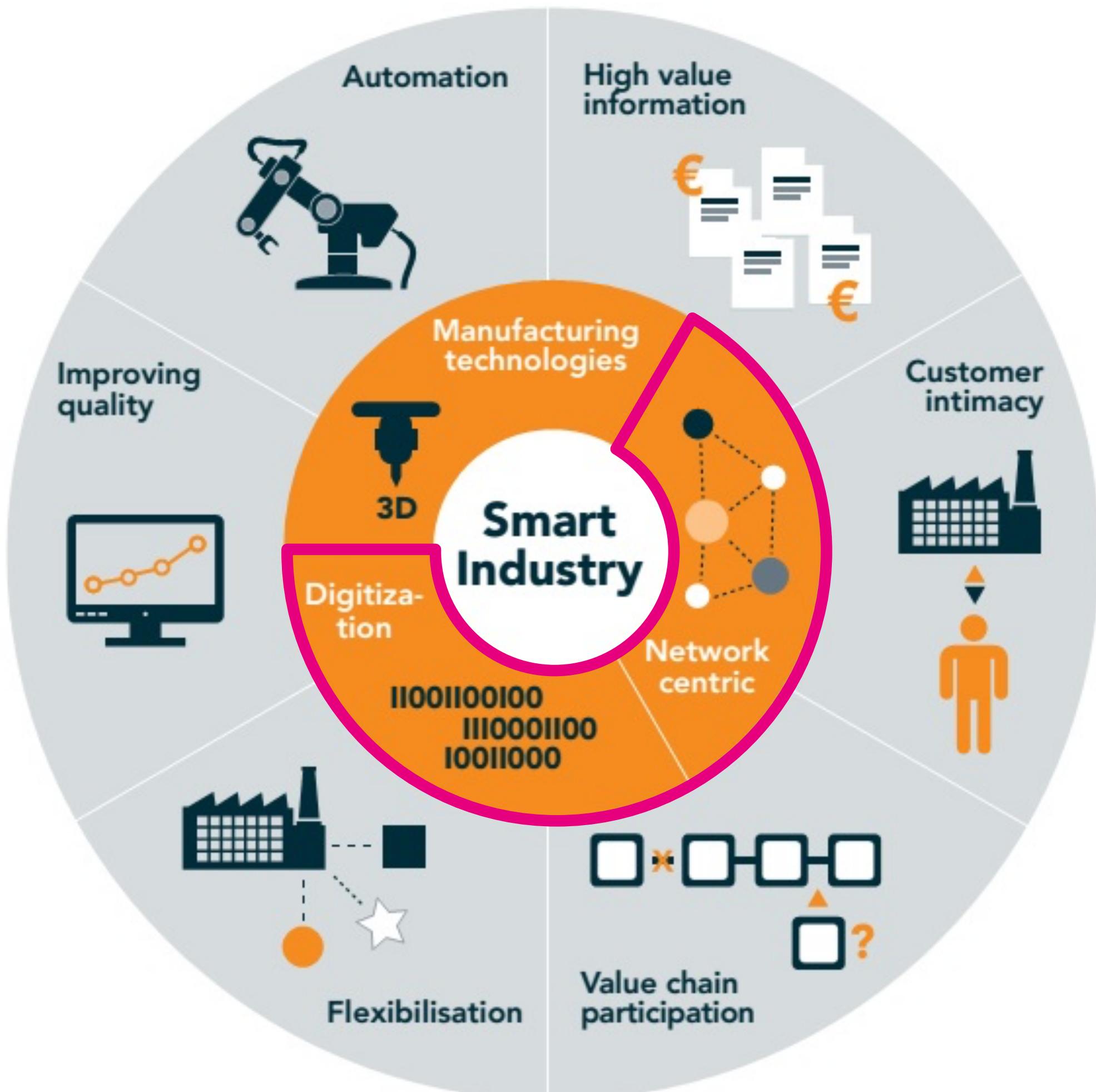
Schedule

	Theme	
Lecture 1	Today: Introduction	
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:

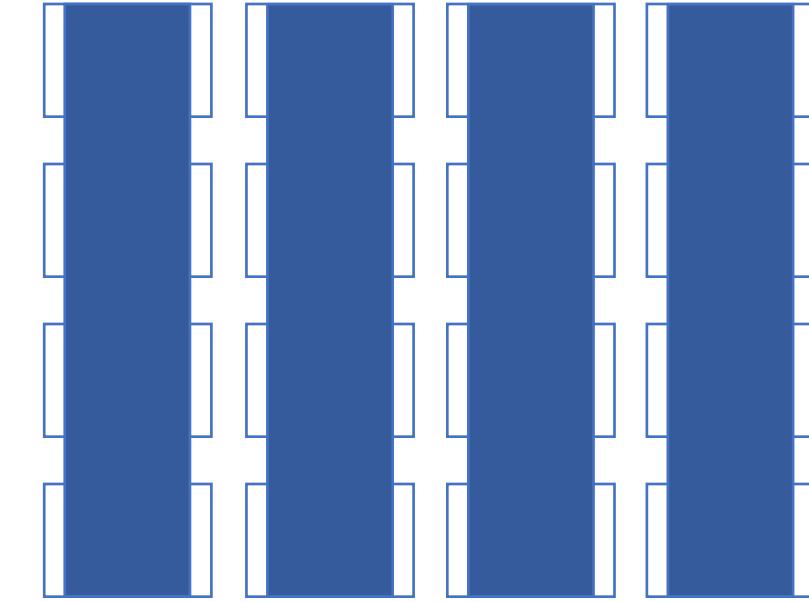
- Implements all required functionality in a single application.
- Perfect for small and less complex environments and systems.
- Strong coupling between data, code processing and presentation.
- Poor scalability.



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

Characteristics:

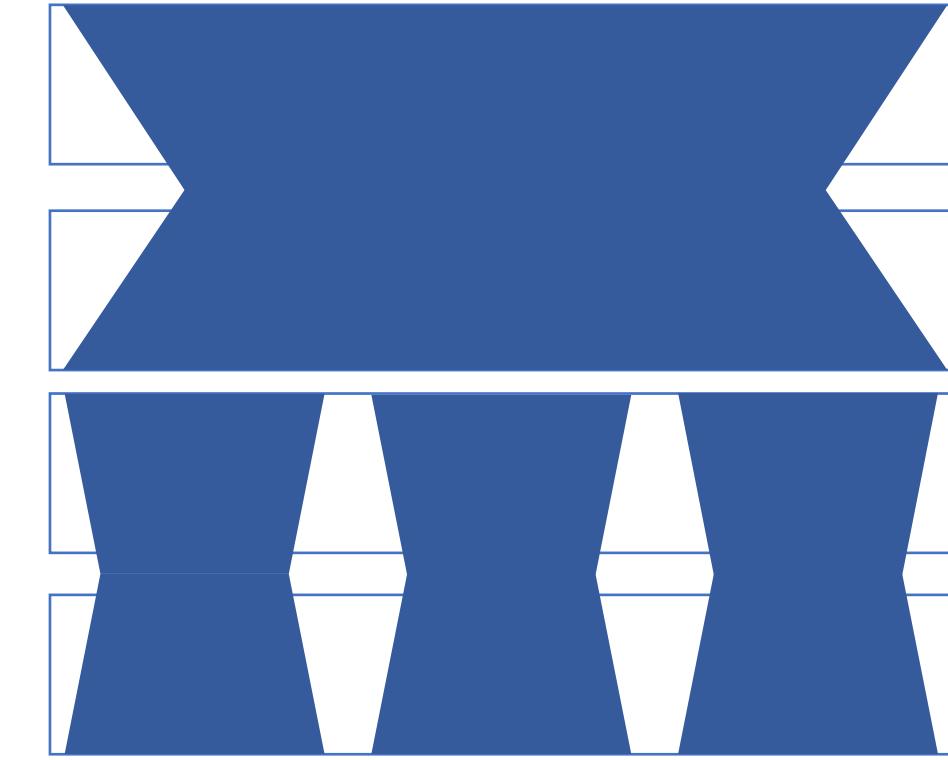
- Stacked software blocks.
- Functionality focused on single kind of sensor and/or data stream.
- Often single software supplier:
whole chain managed by same supplier.
- Limited data flexibility.
- Often impossible to add additional sensors and/or data streams from/by other parties.



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

Characteristics:

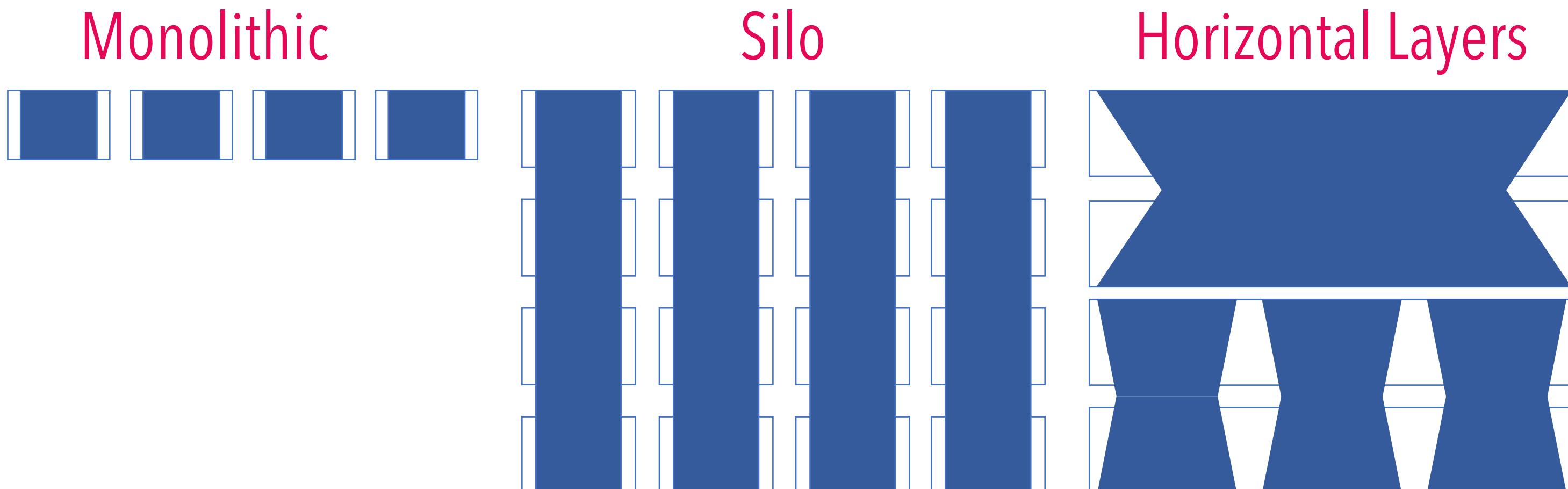
- Detached, horizontal layers with unique functionality.
- Implementation with state-of-the-art technology, most suitable for particular layer.
- Great and enduring flexibility.
- Several technologies alongside each other.
- Correlation of information and processes.
- Disadvantage: lot of direction required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



Sensor/controller/actuator systems

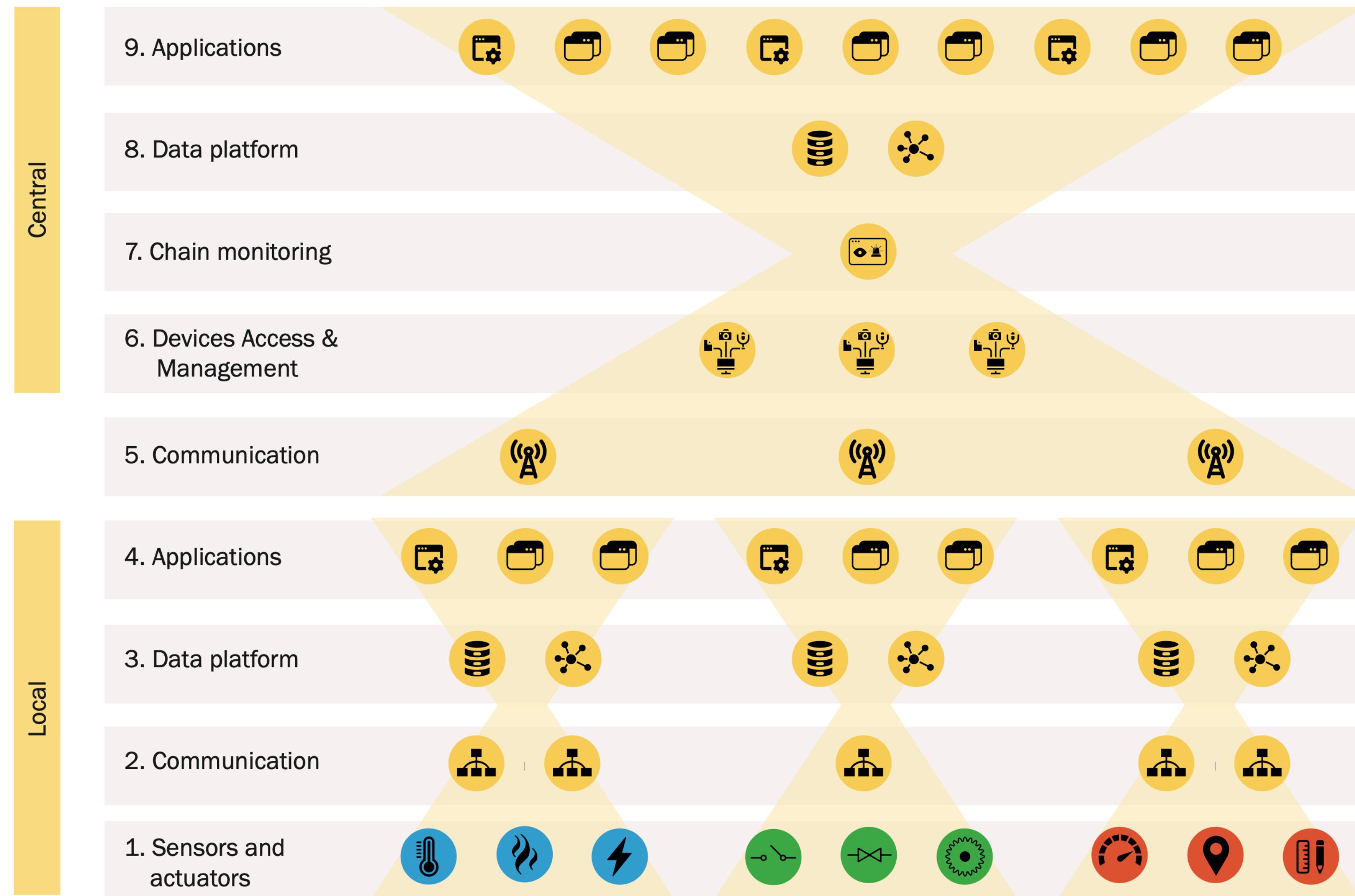
Questions to ask:

- 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?



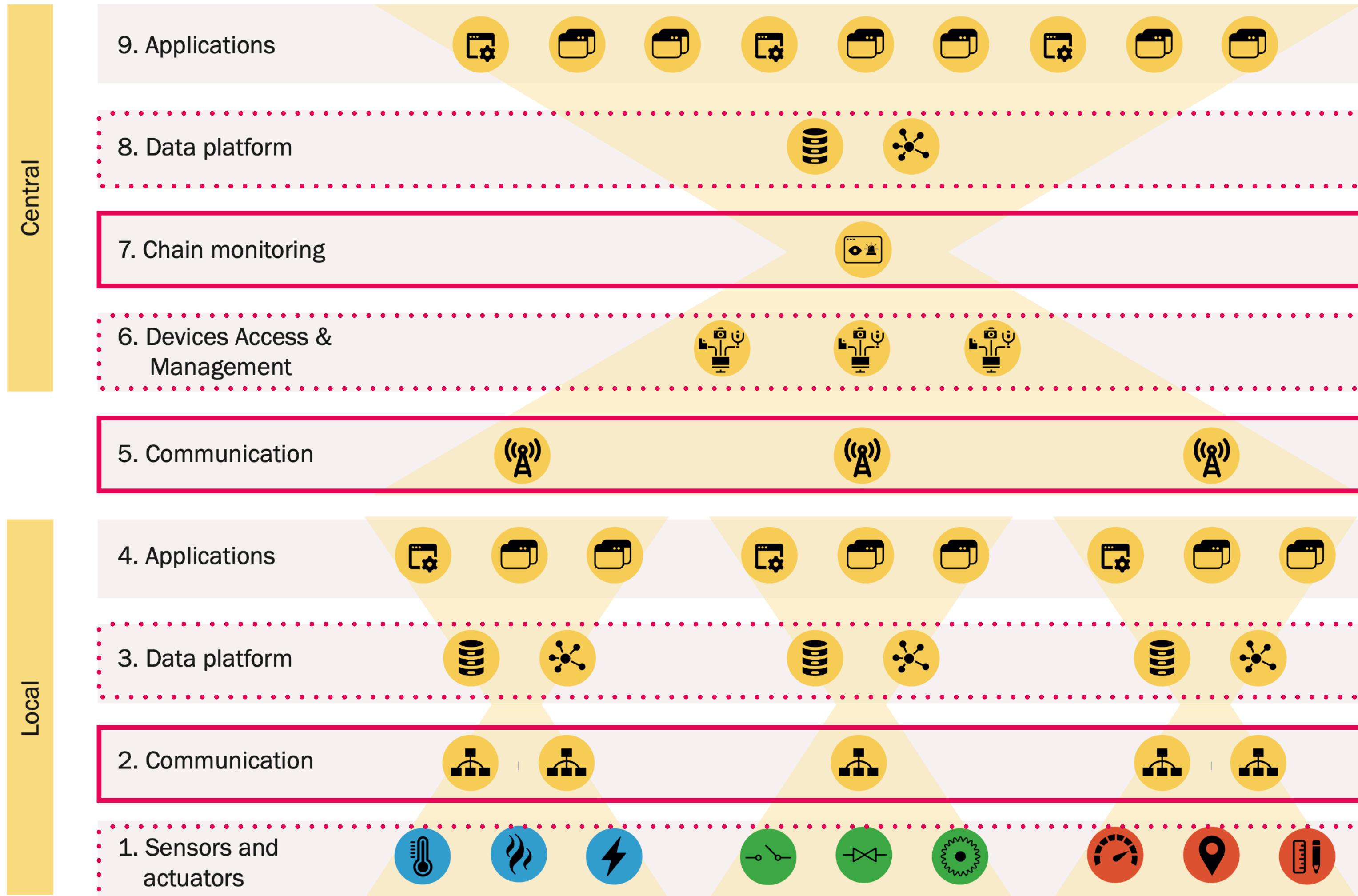
Source: <https://www.technolution.eu/>

The SARA layer model (technolution.eu)



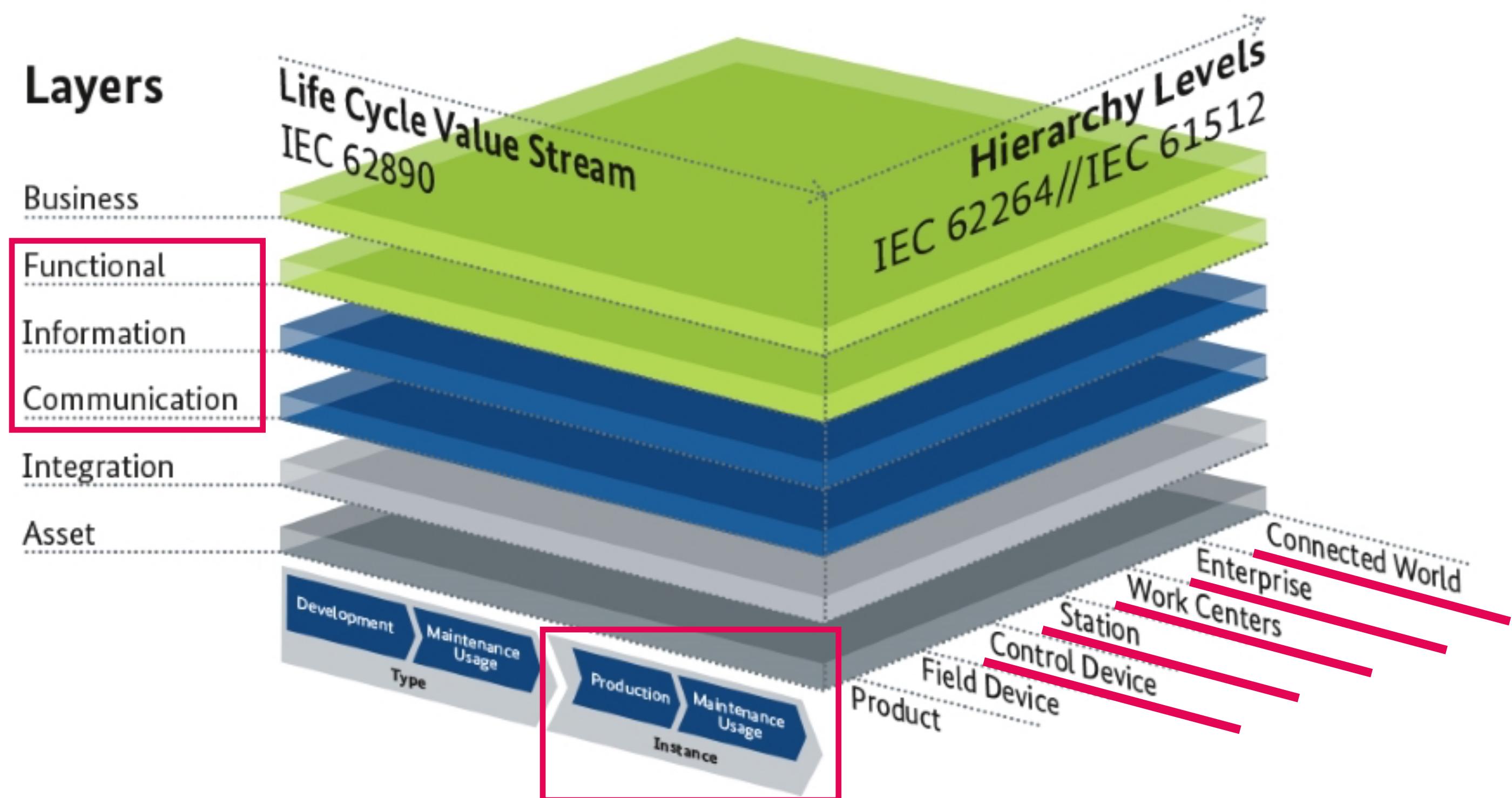
Source: <https://www.technolution.eu/>

Focus of Connected Factories course:

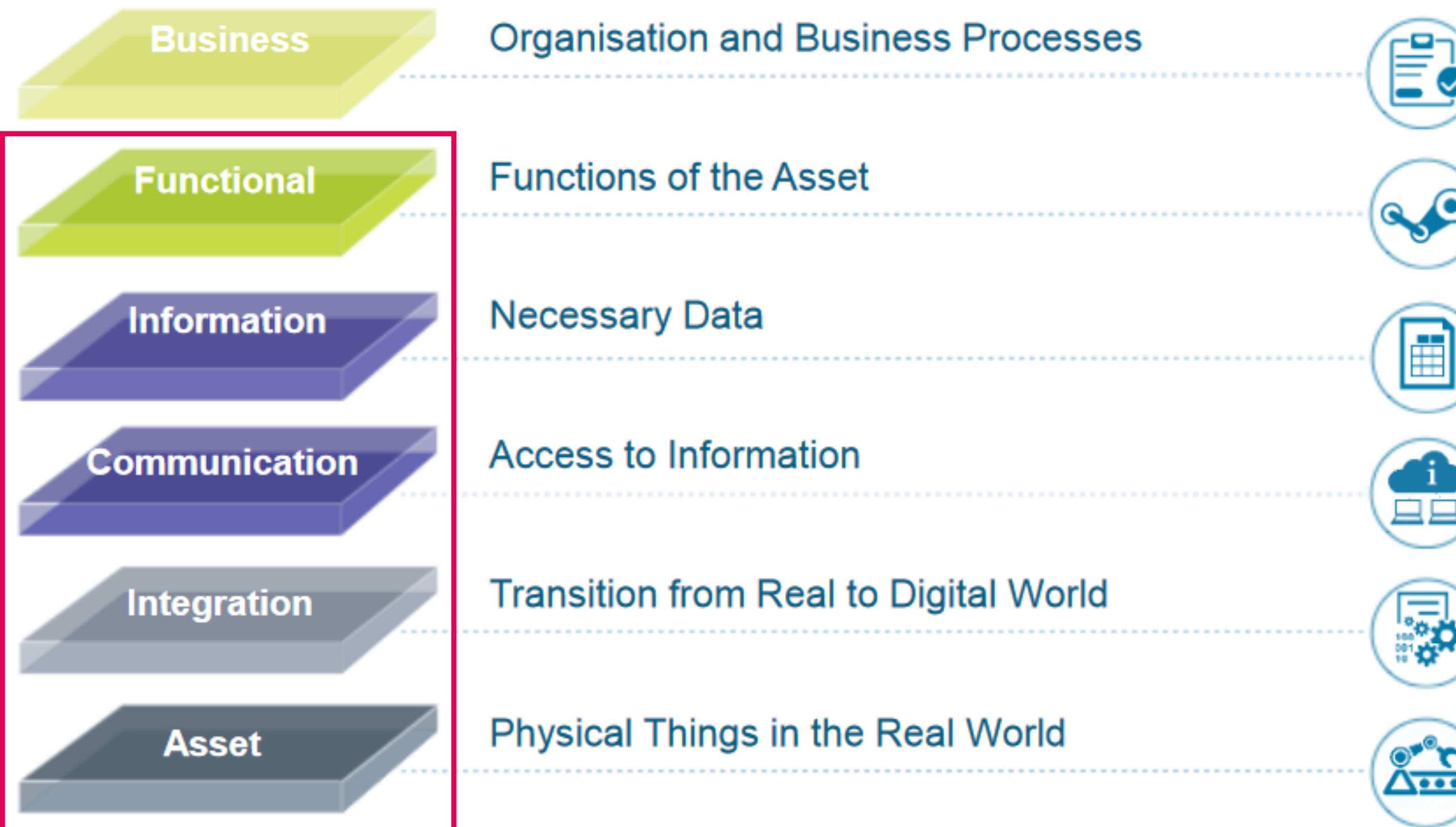


Source: <https://www.technolution.eu/>

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>

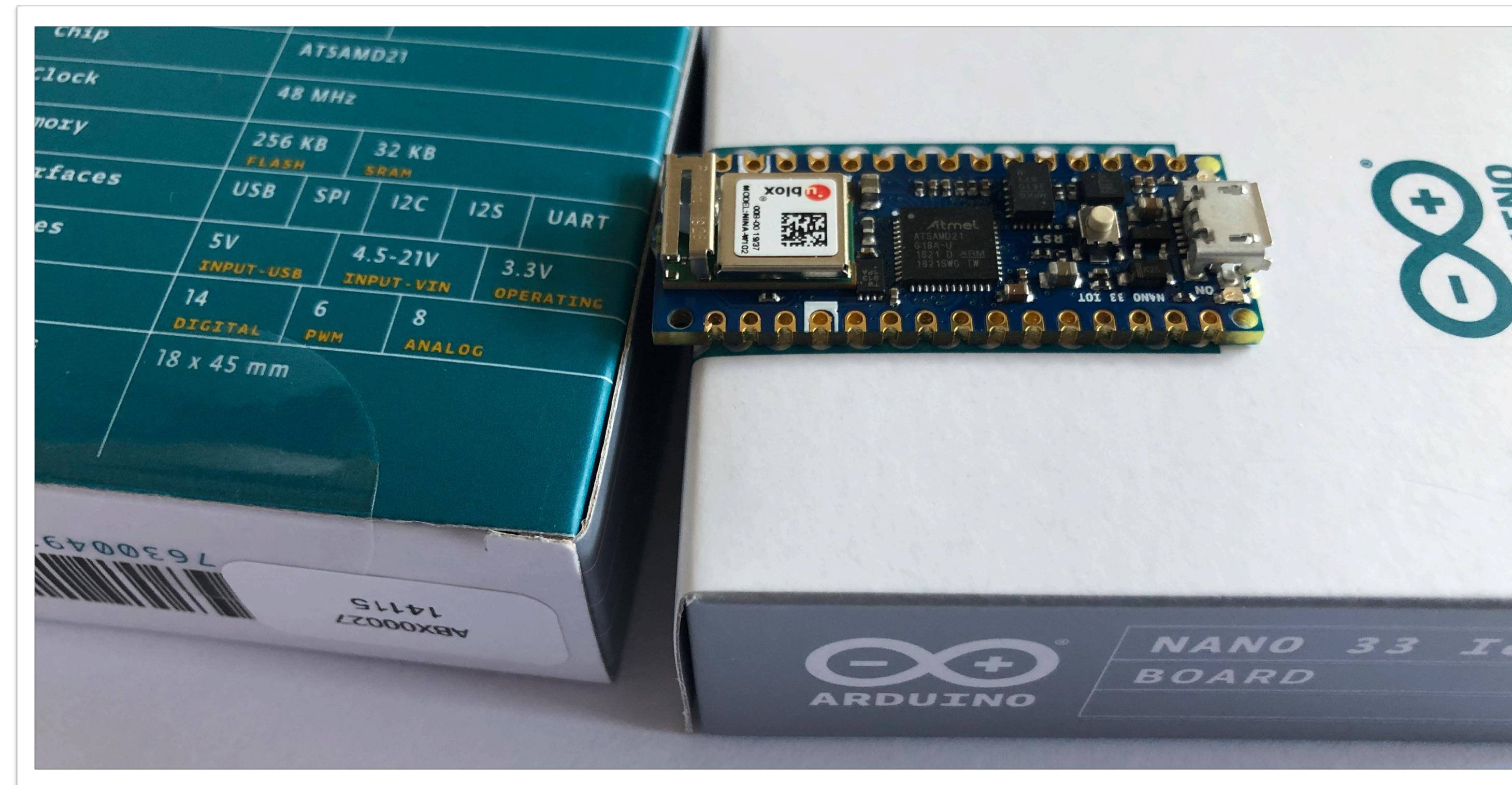
Homework for next session:

(optionele opdrachten hoeven niet)

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

Towards your own IoT / MQTT device.

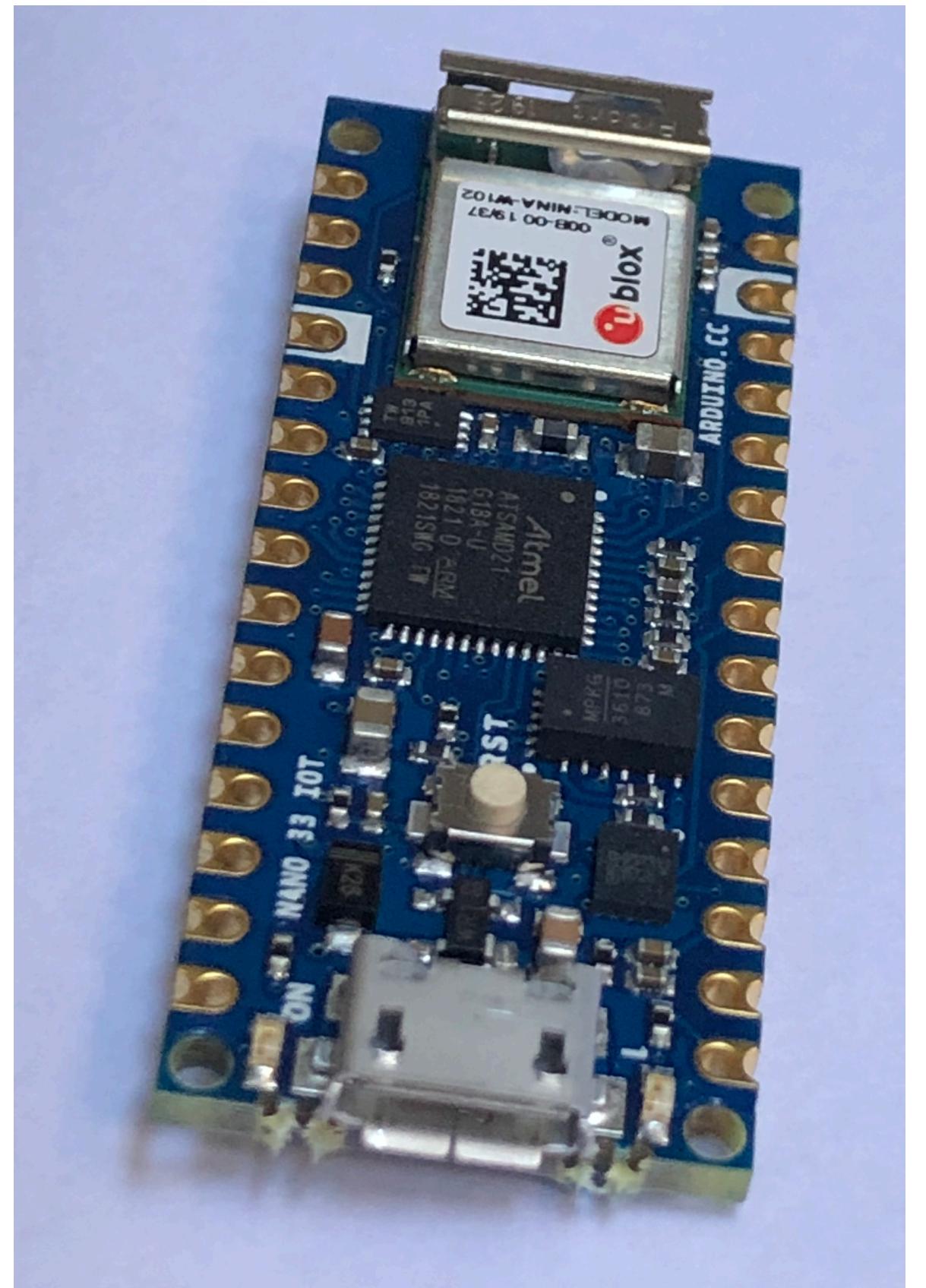
Practical: connecting your Nano 33 IoT Board to your local WiFi network.



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.

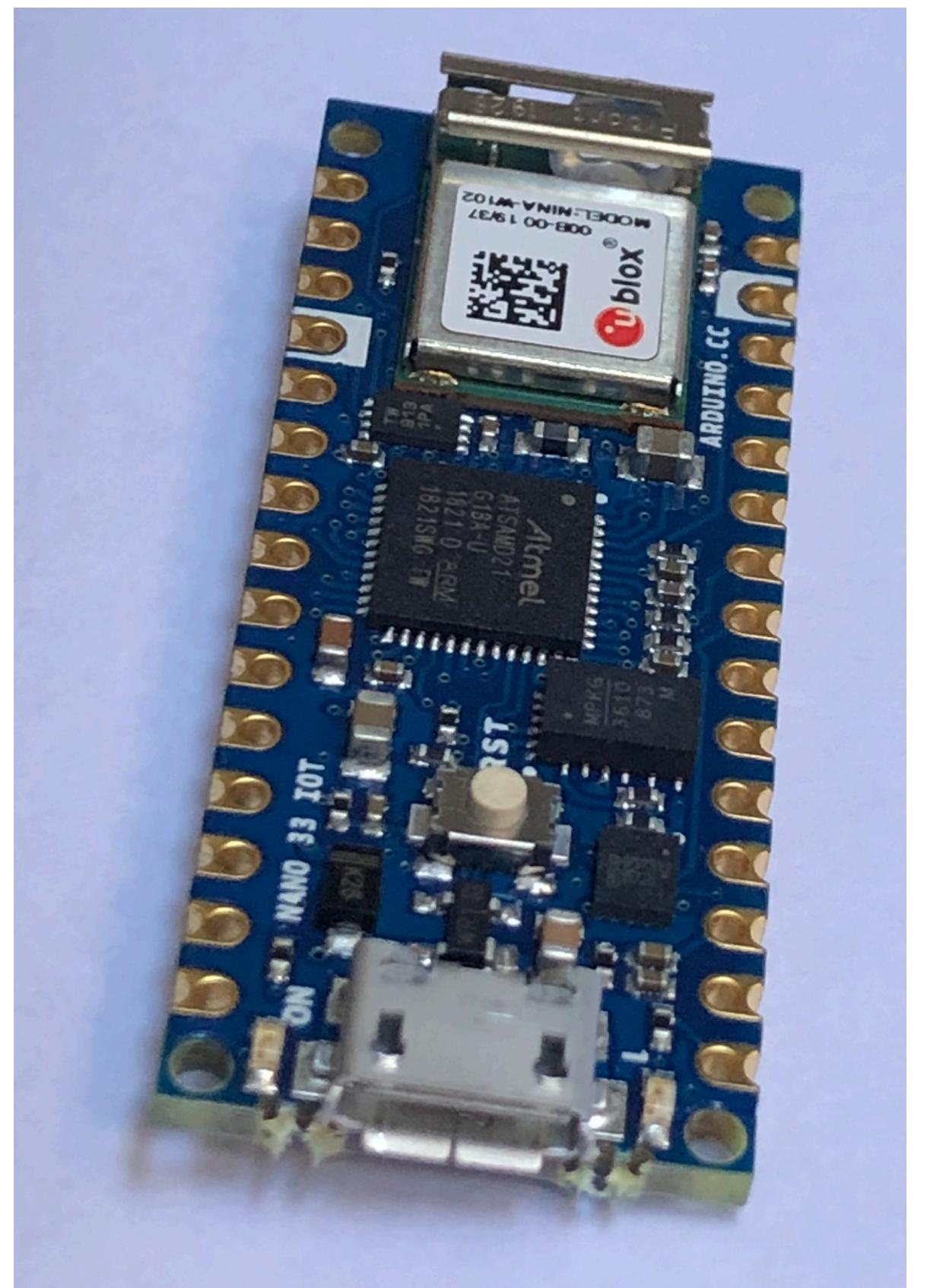
During online session we will do this live, but you can also do it for yourself.

- 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>

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Questions?