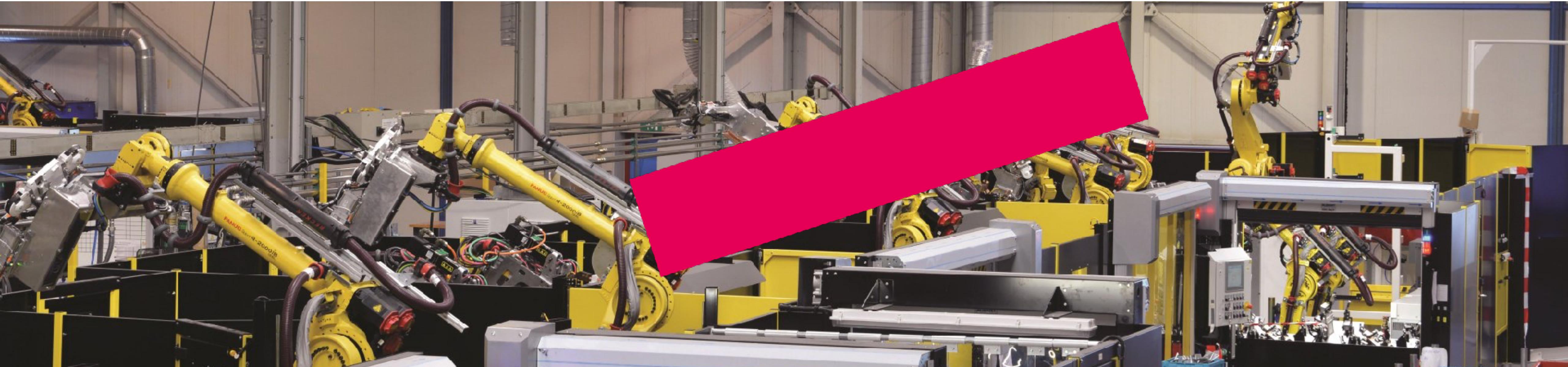


Connected Factories lecture 1/6: Introduction



Associate Degree Smart Industry
Faculty of Engineering and Automotive

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V1.0 April 1, 2020

Originele Leerdoelen (kneden en aanpassen)

De student heeft kennis en begrip van internationale standaarden op het gebied van gekoppelde IT systemen (Cyber Physical Systems). De student heeft kennis van *digitale identificatie* en uitwisseling van objecten als offertes, tekeningen, orders, transportinformatie en facturen conform open industrie standaarden.

De student heeft kennis en begrip van technologieën als blockchain, glasvezelverbindingen en 5G. De student heeft kennis en begrip van juridische contracten (zoals copyrights op sensor data, databankwet, privacy wetgeving, gebruiksrechten op software in equipment). De student kan zijn bedrijf adviseren welke mogelijkheden deze technologieën bieden op het gebied van integrale ketenoptimalisering.

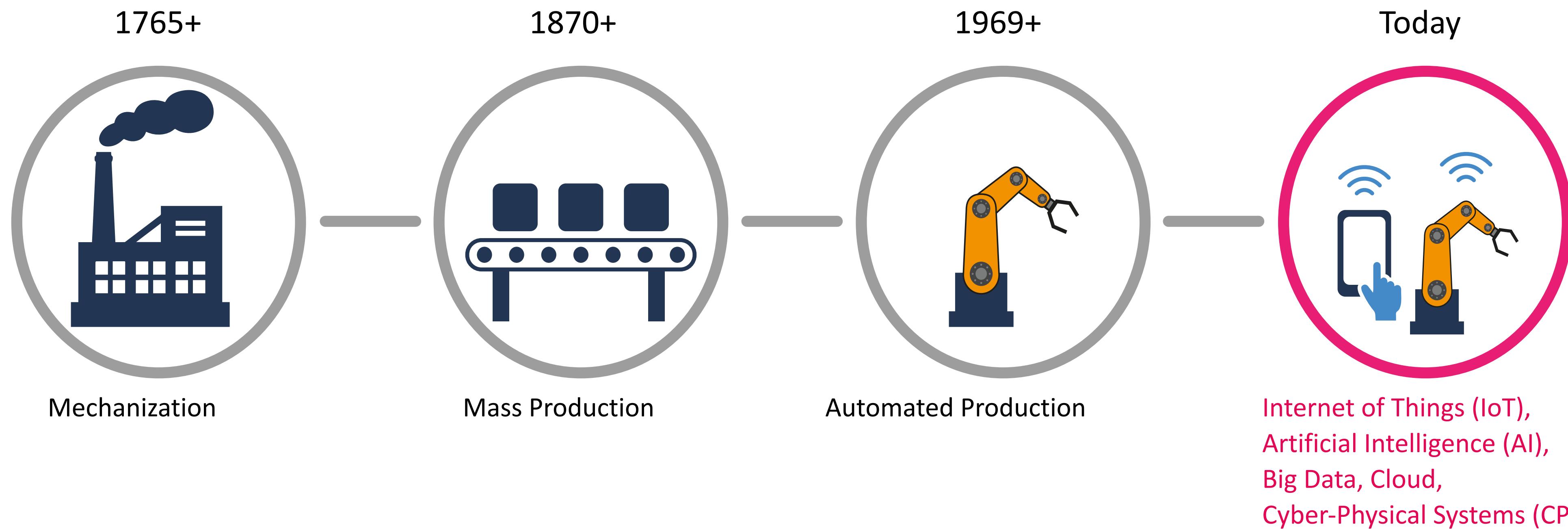
▲ ToDo voor deze les

Koppelen naar Cisco (aangeven welke onderdelen huiswerk zijn).

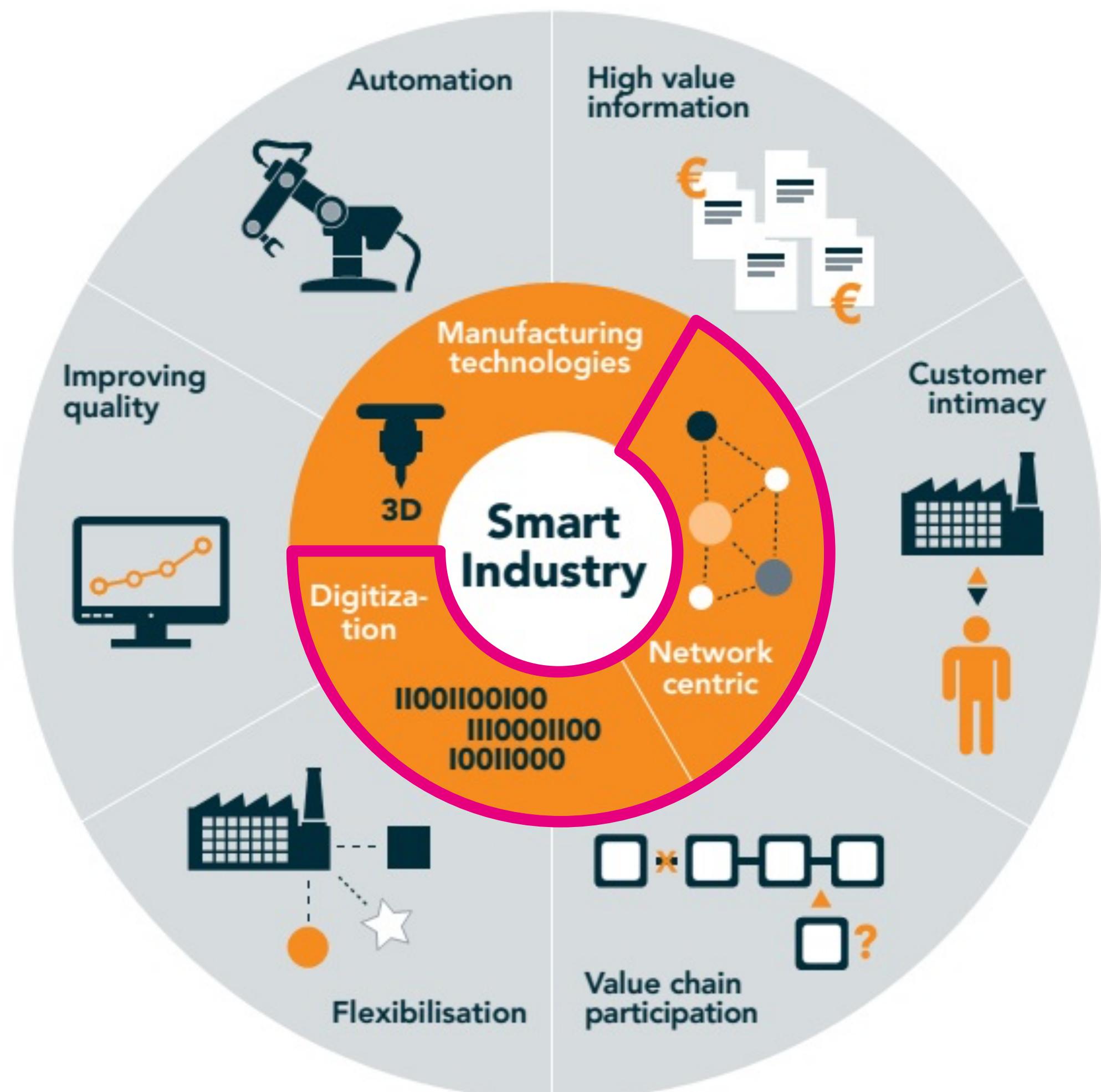
Schedule

	Theme	
Lecture 1	Today: Introduction	
Lecture 2	Network connections	
Lecture 3	Network protocols	
Lecture 4	Interconnection	
Lecture 5	Integration	
Lecture 6	Trusting the Network	
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:

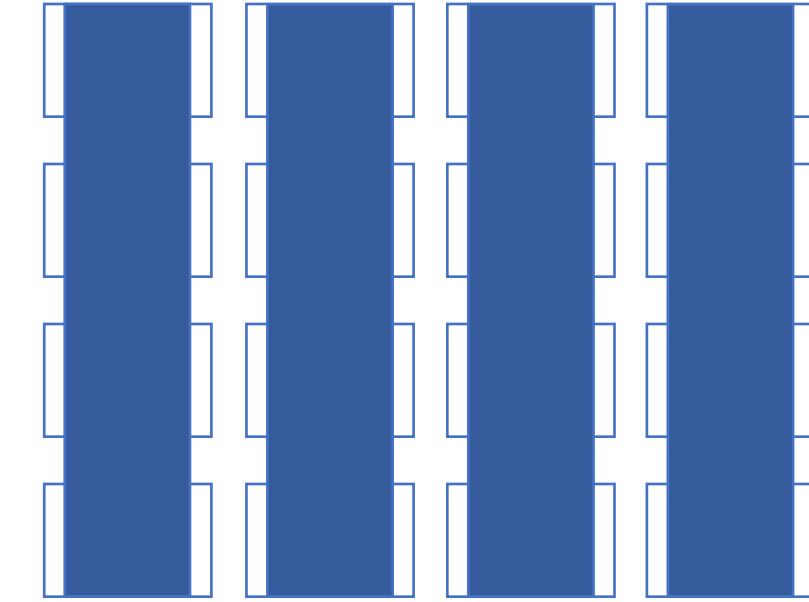
- Implements all required functionality in a single application.
- Perfect for small and less complex environments and systems.
- Strong coupling between data, code processing and presentation.
- Poor scalability.



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

Characteristics:

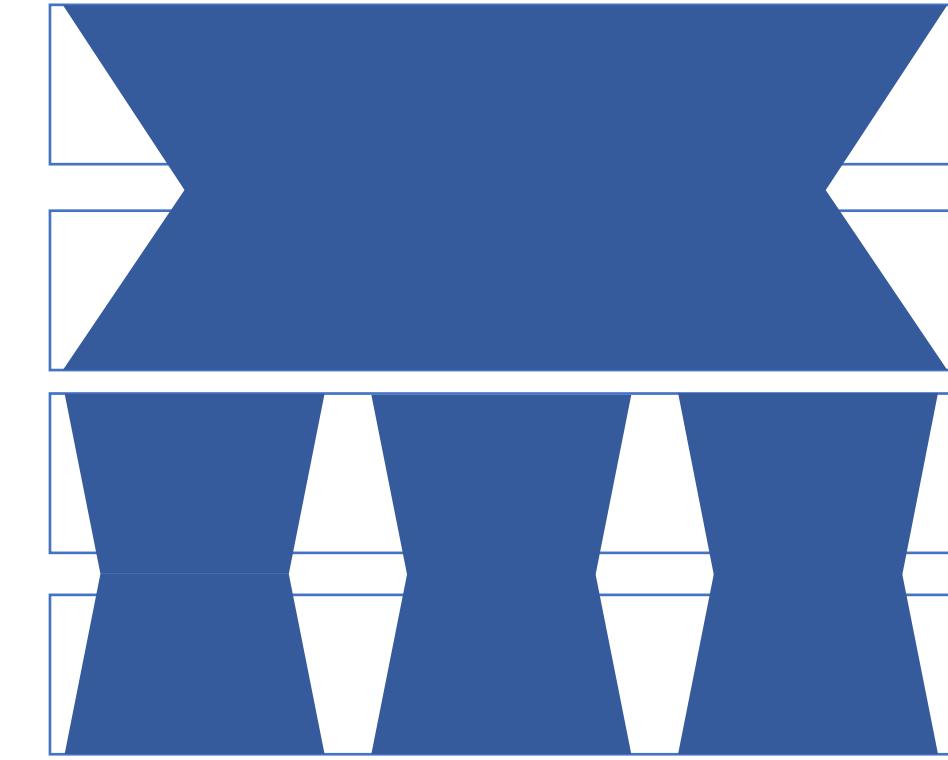
- Stacked software blocks.
- Functionality focused on single kind of sensor and/or data stream.
- Often single software supplier:
whole chain managed by same supplier.
- Limited data flexibility.
- Often impossible to add additional sensors and/or data streams from/by other parties.



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

Characteristics:

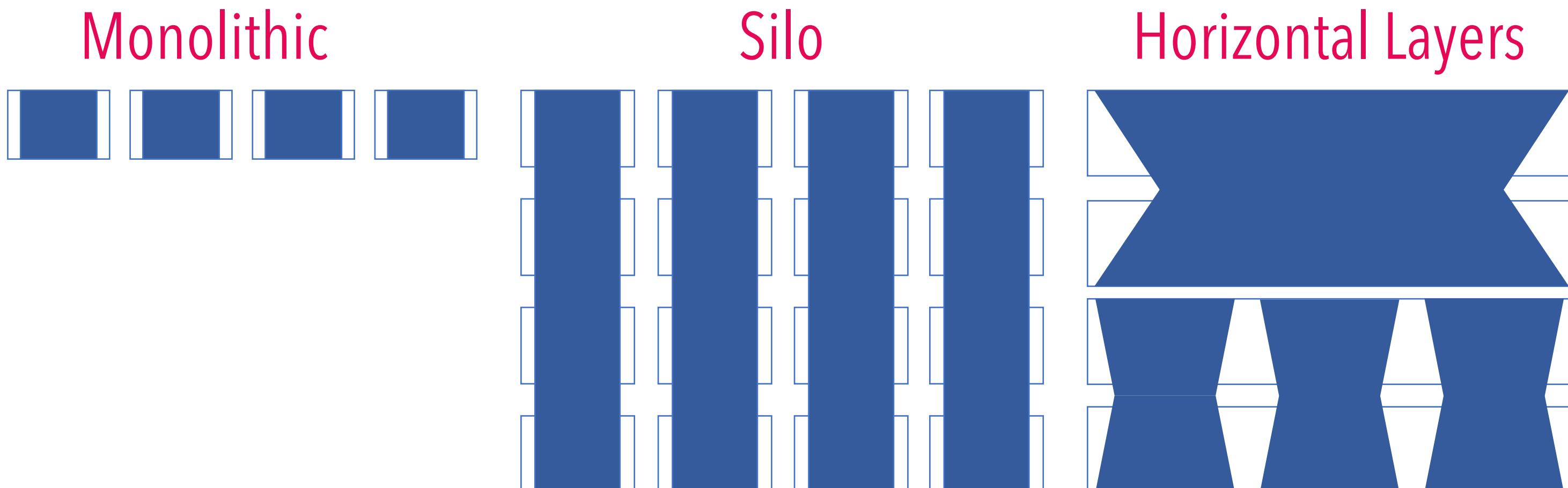
- Detached, horizontal layers with unique functionality.
- Implementation with state-of-the-art technology, most suitable for particular layer.
- Great and enduring flexibility.
- Several technologies alongside each other.
- Correlation of information and processes.
- Disadvantage: lot of direction required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



Sensor/controller/actuator systems

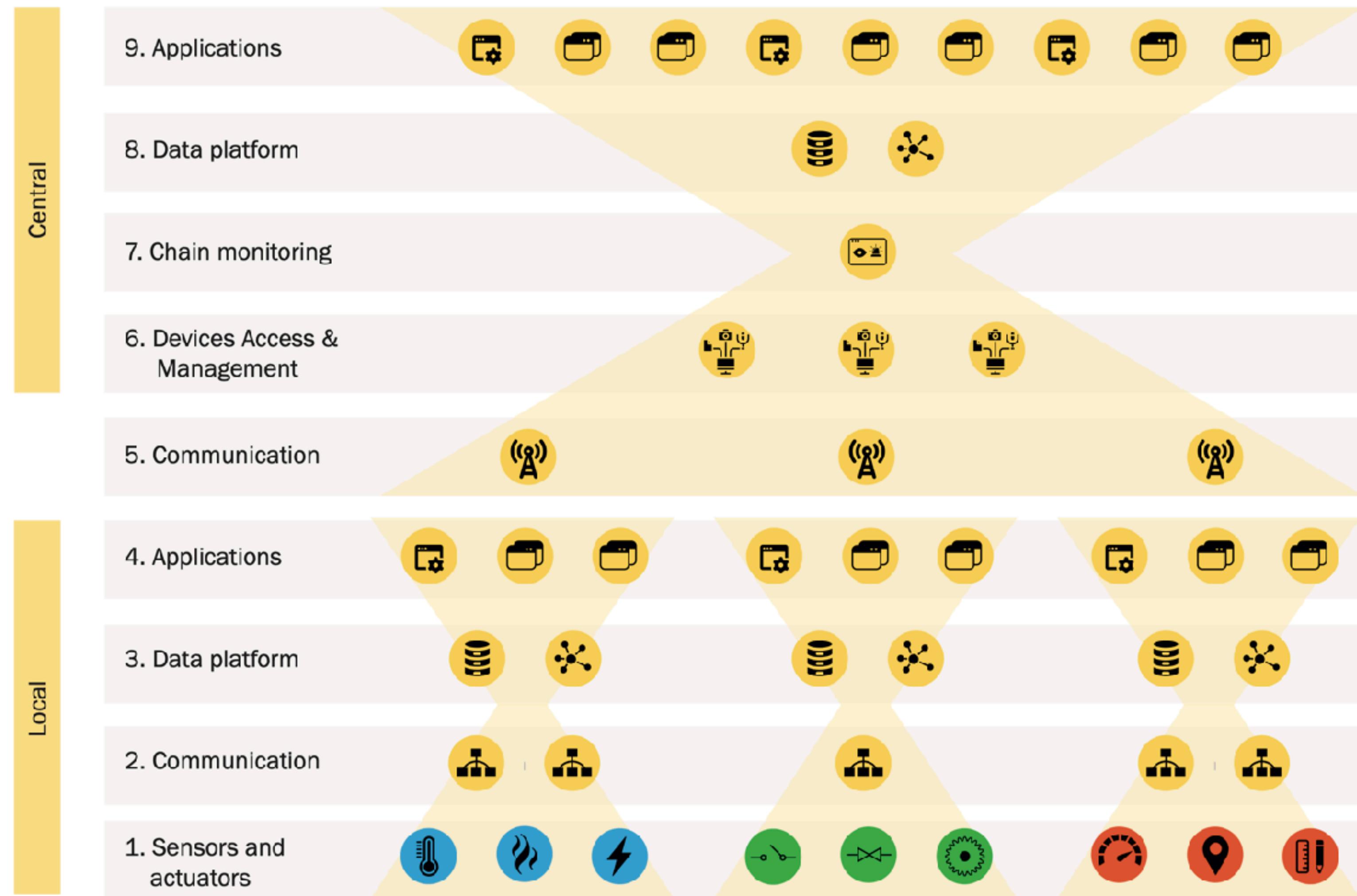
Questions to ask:

- 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?



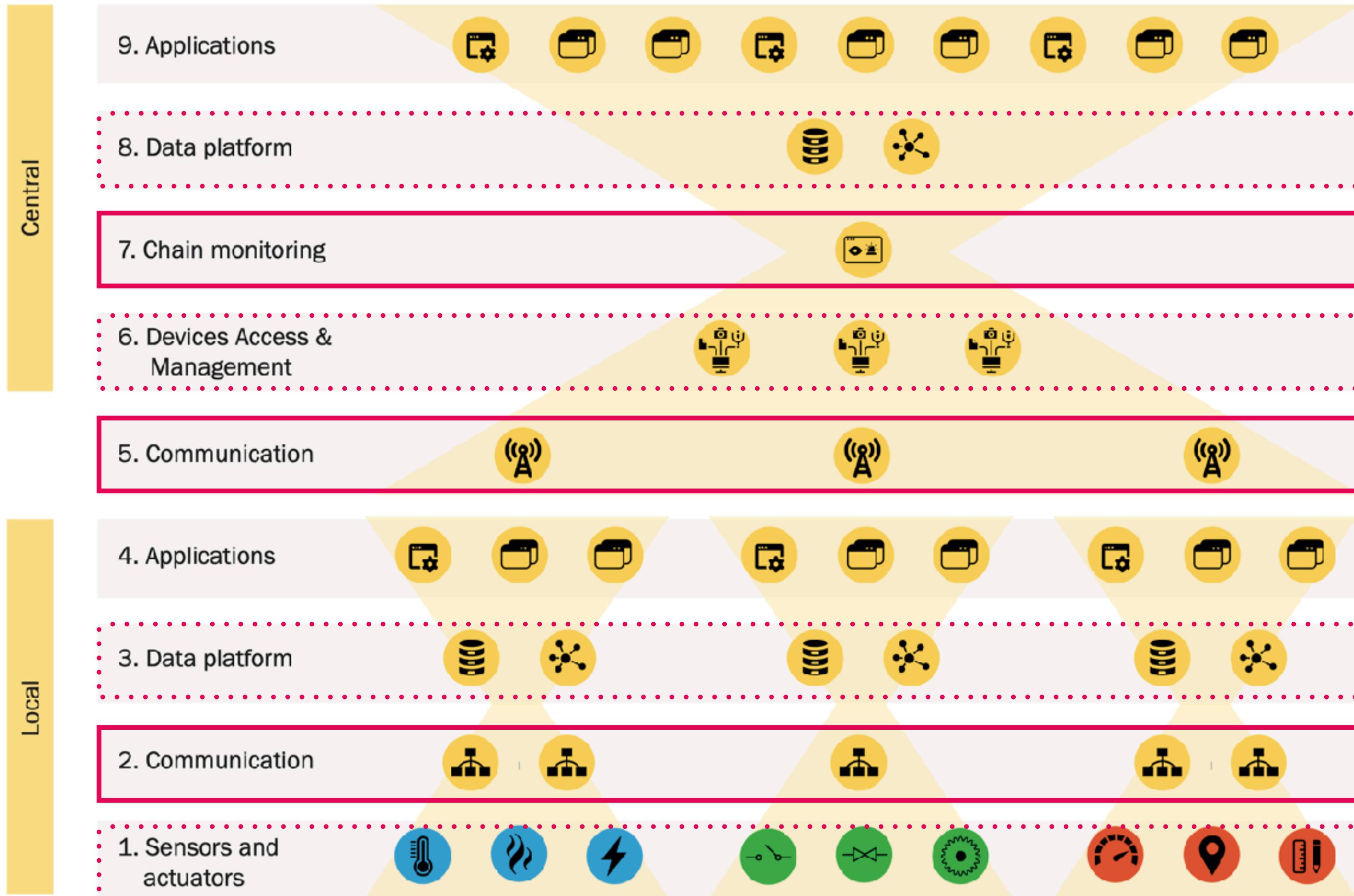
Source: <https://www.technolution.eu/>

The SARA layer model (technolution.eu)



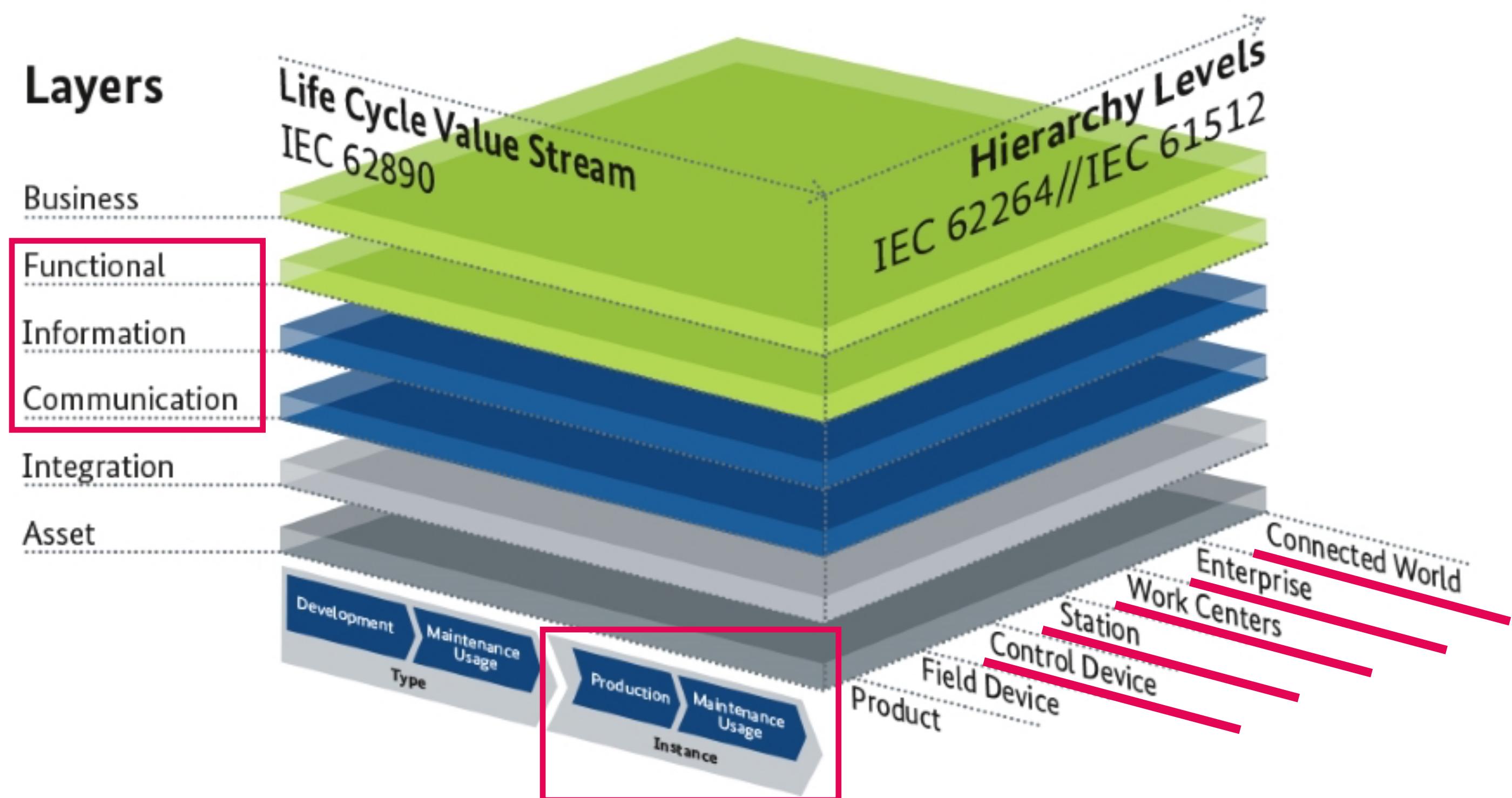
Source: <https://www.technolution.eu/>

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>

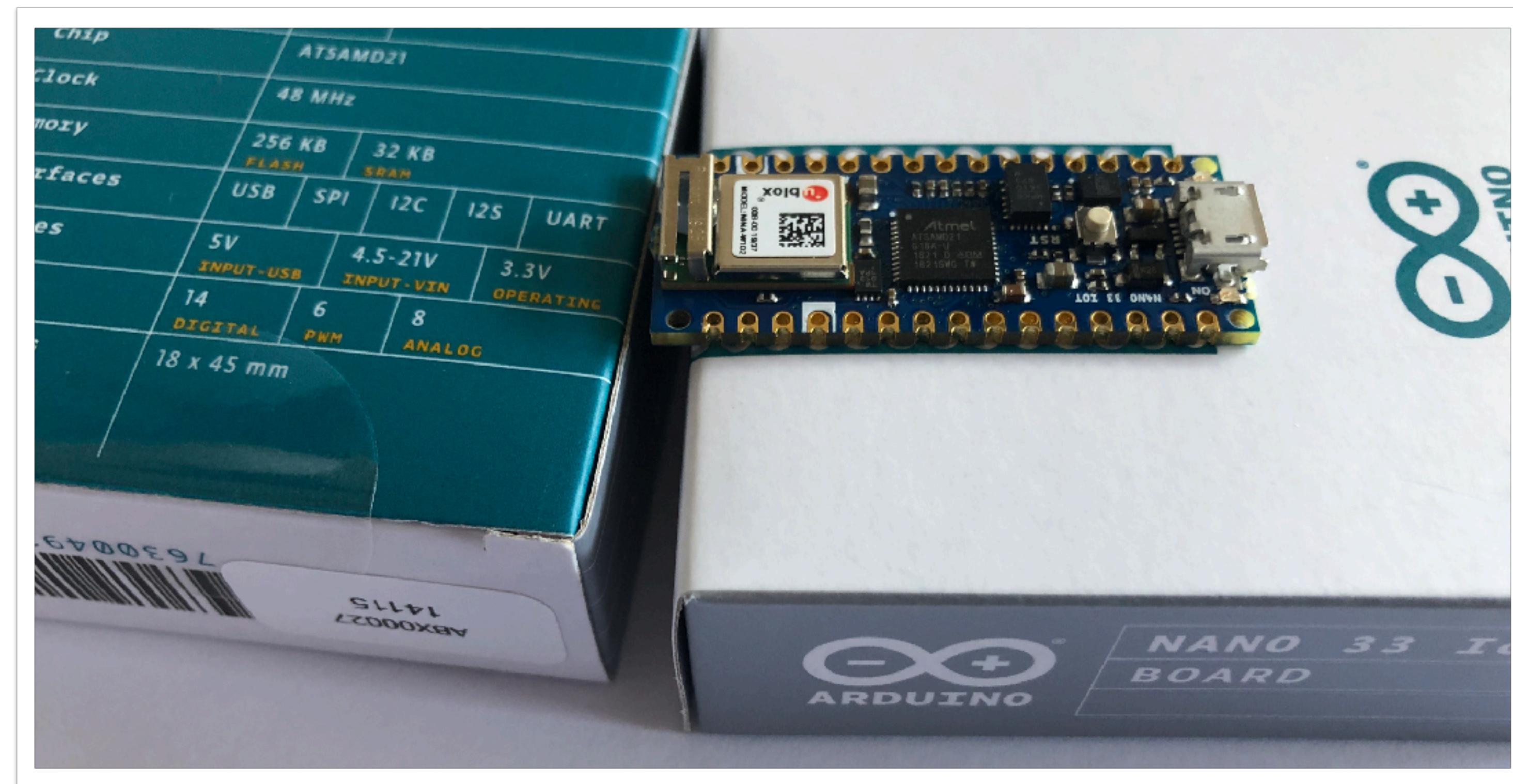
Homework for next session:

(optionele opdrachten hoeven niet)

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

Towards your own IoT / MQTT device.

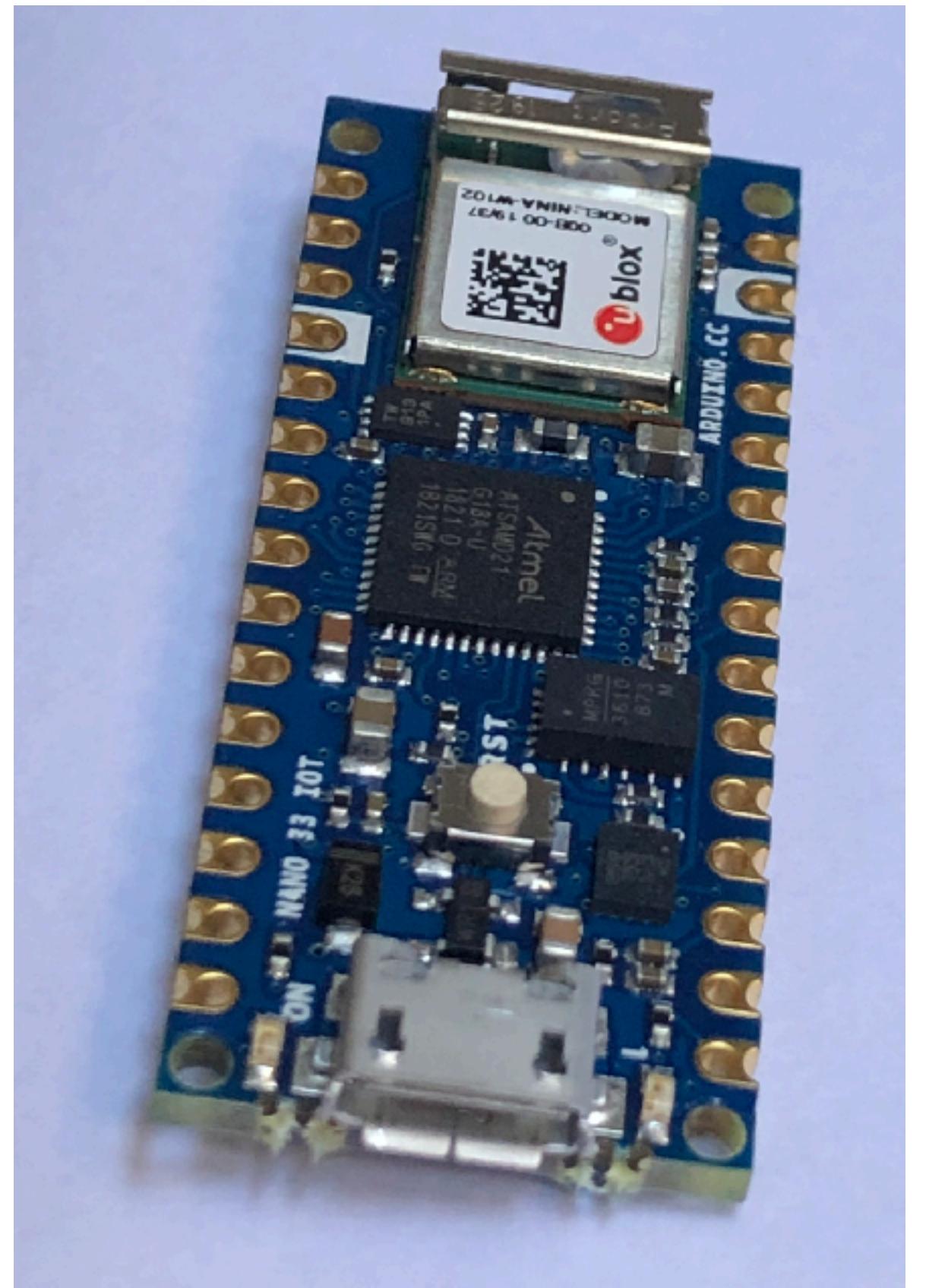
Practical: connecting your Nano 33 IoT Board to your local WiFi network.



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.

- [Arduino Installation etc](#) (see menu cheat sheet on next slide)
- [Your first IoT application](#)
- [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>

“

Questions?