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Embedded a key component in the Vanderlande logistic process automation

Erik van Dartel

Technical lead R&D Vision & Embedded systems

8-Nov-2018

Vanderlande customers

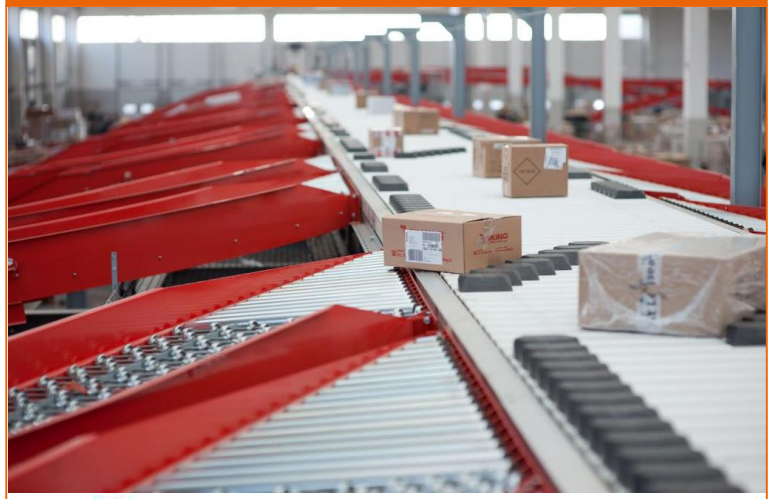
AIRPORTS

Heathrow
Making every journey better.
CHANGI airport singapore
香港 國際機場 HONG KONG INTERNATIONAL AIRPORT
Schiphol
Hartsfield-Jackson Atlanta International Airport

WAREHOUSING

Woolworths
Argos
amazon
H&M
E.Leclerc
NIKE
zalando
Albert Heijn
Alibaba.com

PARCEL



dpd
SWISS POST
POST
ups
Deutsche Post
FedEx
SF EXPRESS
SEUR
CORREOS
DHL

About Vanderlande: Company profile

VANDERLANDE

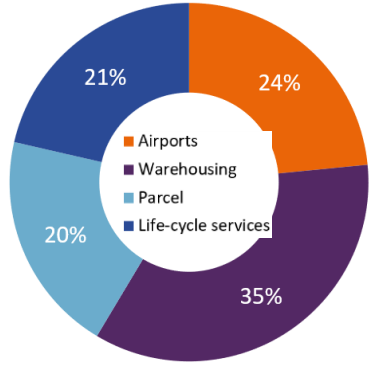
Global market leader

Established since 1949

>5,000 EMPLOYEES

1.1 Billion REVENUE

innovative systems | intelligent software | life-cycle services



AIRPORTS

10.1 million bags per day

600 AIRPORTS INCLUDING 13 OF THE WORLDS TOP 20

- Atlanta Airport
- London Heathrow Airport
- Hong Kong Int. Airport
- Amsterdam Airport Schiphol

WAREHOUSING

Many of the largest global e-commerce players

- Amazon
- TESCO
- Zalando
- ASDA

PARCEL

39 Million parcels sorted every day

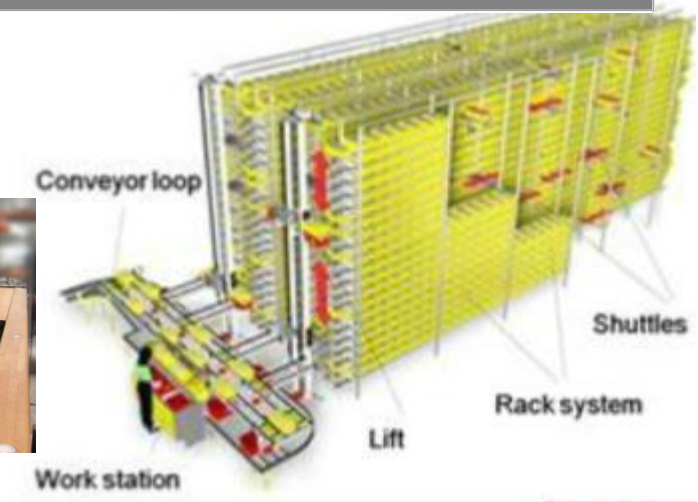
5 Largest parcel and postal companies

- UPS
- Deutsche Post DHL
- TNT
- FedEx
- SF Express

We supply and integrate logistic process automation solutions

VANDERLANDE

- **Our mission: to improve the competitiveness of our customers**
- **We deliver systems that manage the flow of physical objects in airports, warehouses and parcel hubs.**
- **We automate operation processes as moving, sorting, consolidating and storing of physical objects.**



R&D (275 employees worldwide)

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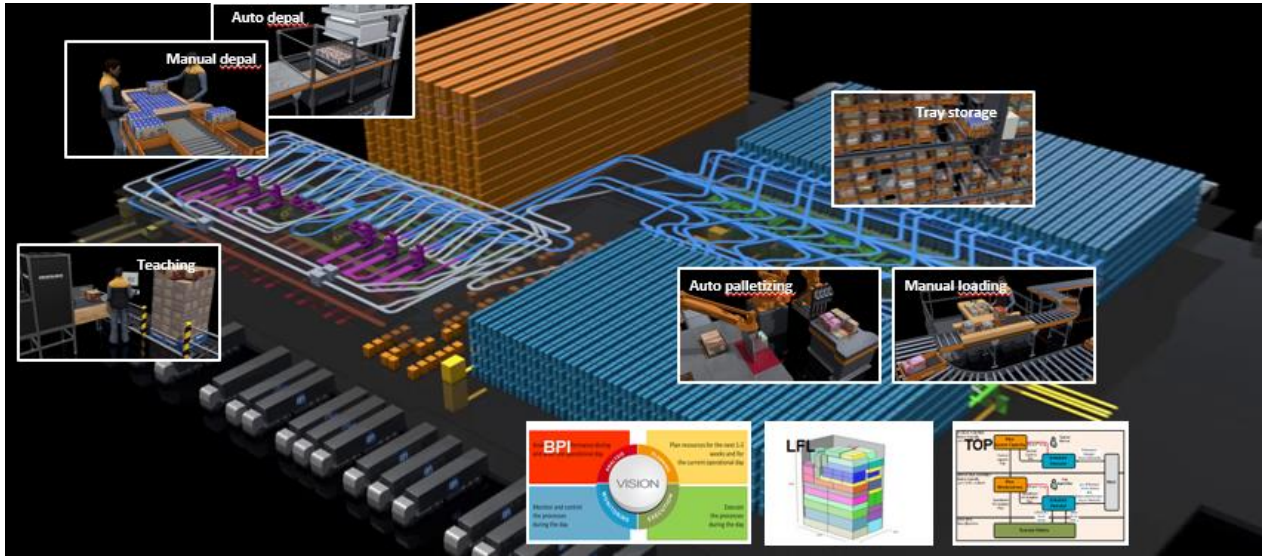
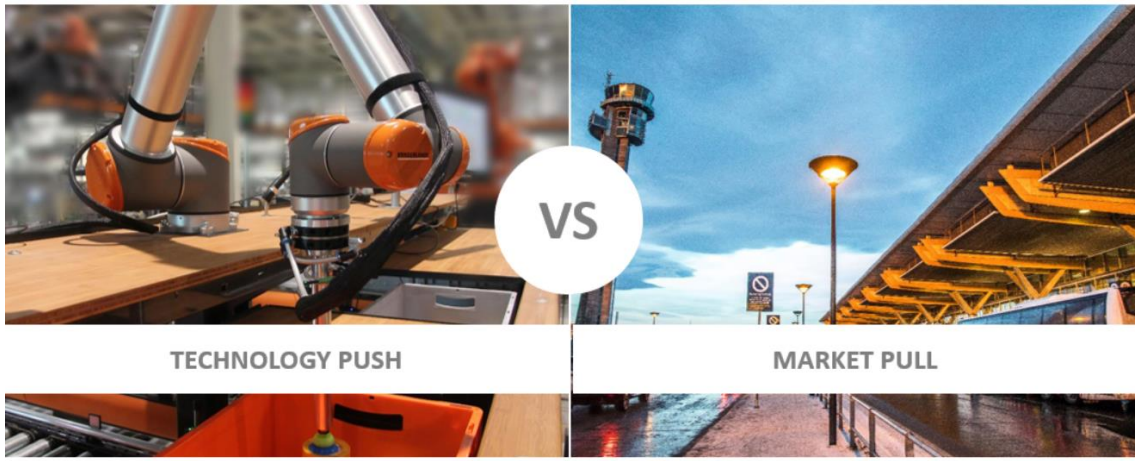
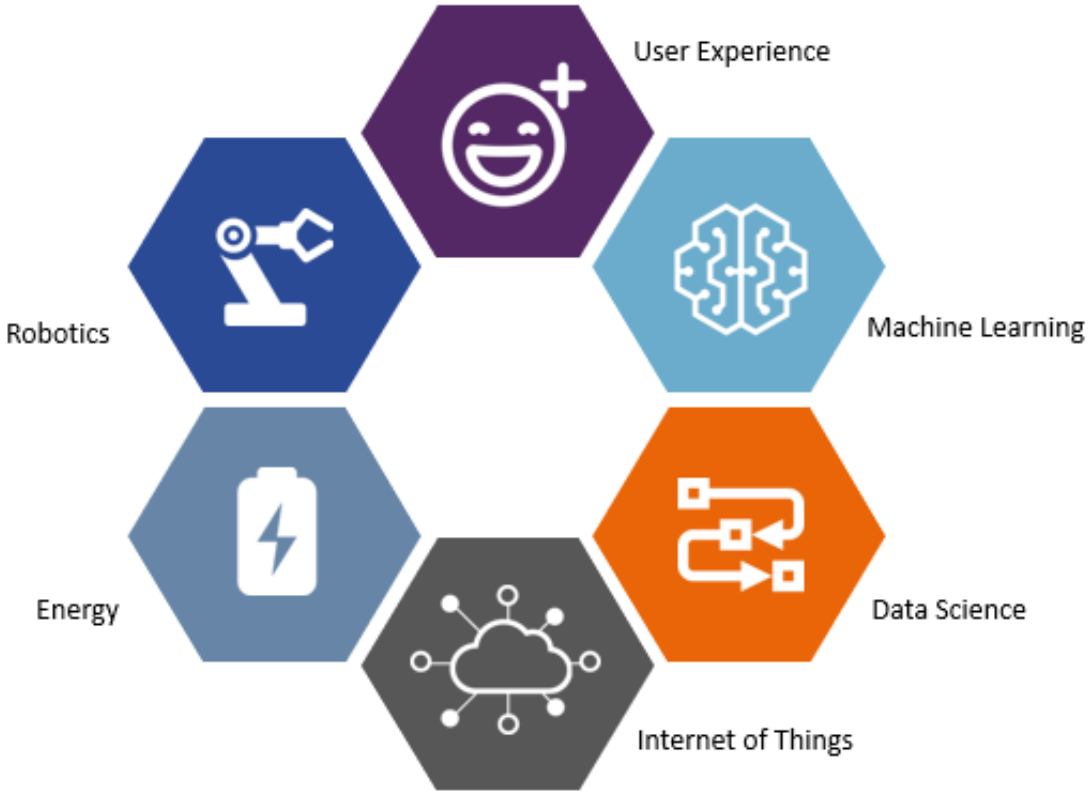


Innovation



Technology themes



R&D: Vision & Embedded systems

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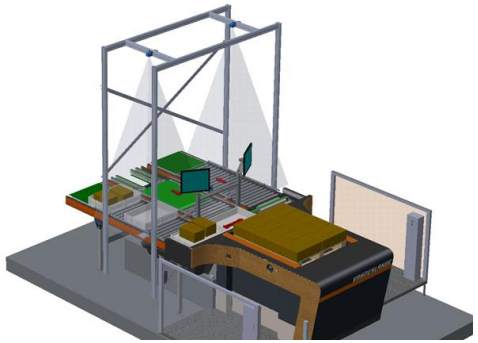
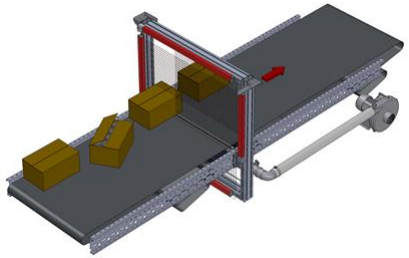
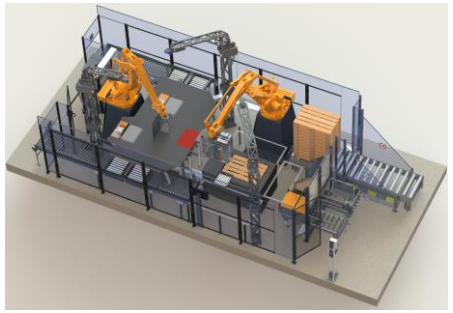
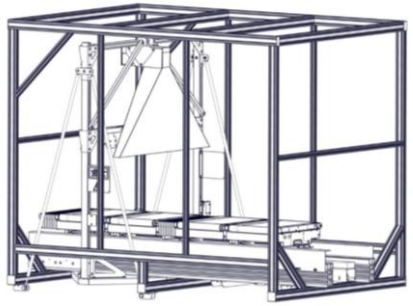
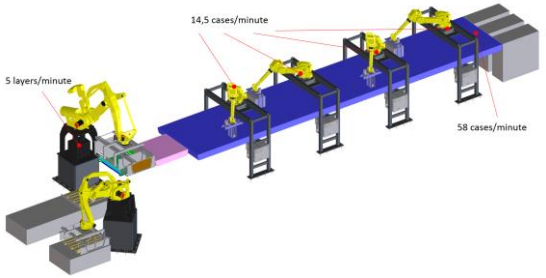
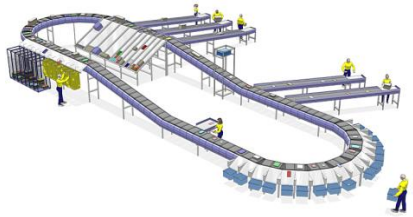
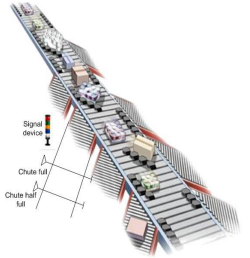
Technical Lead: Erik van Dartel







Team:

Fixed:	16	(6 PC, 8 EC)
Contractor:	6	(5 PC, 1 EC)
Students:	3	

Core Competences: Mechatronics, MBD, Matlab, algorithms, camera's, electronics, drives, software, code generation

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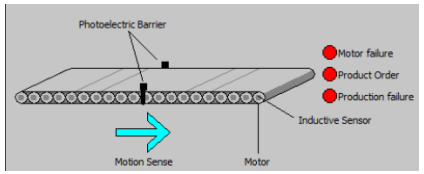
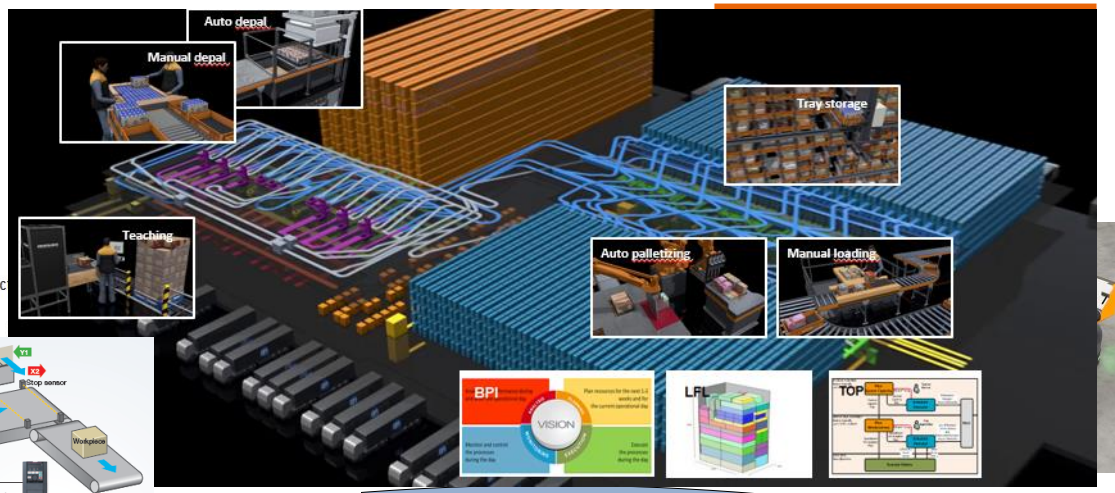
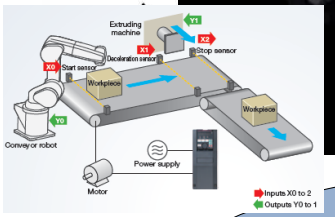
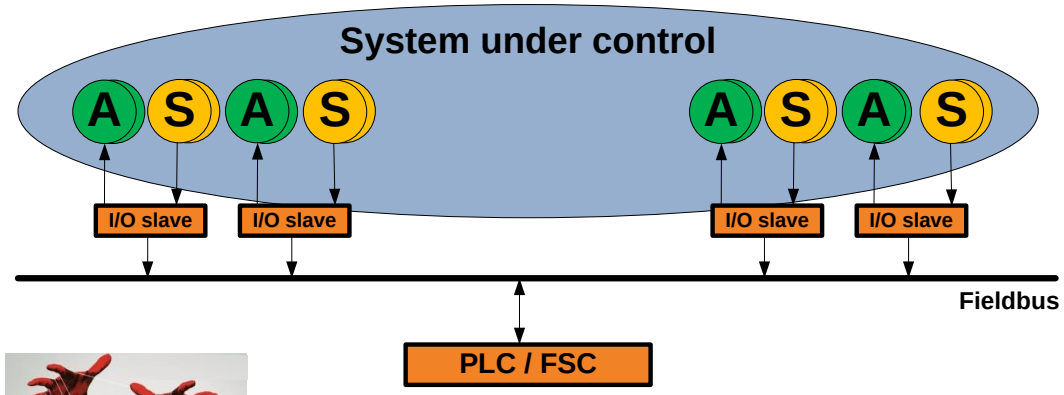
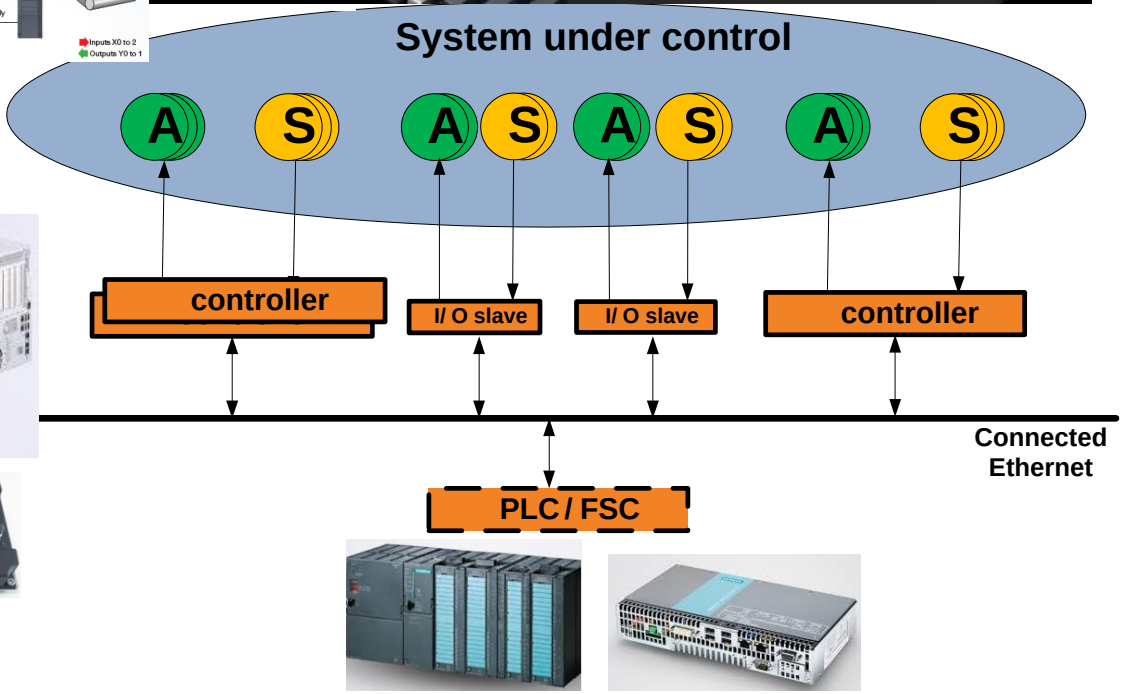
Trend: Shift to decentral smart control (functional modules)











Smart products that get more and more connected

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Data exchange becomes key

- **Horizontal (number of different controllers that together perform a decentral task)**
- **Vertical (f.i. information to the cloud to enable predictive maintenance)**

- **Preference: devices use the same protocols to exchange data**
- **We can not prescribe the market**
- **We invested in the used Ethernet protocols (Profinet, Ethernet/Ip)**

Where has it brought us so far?

Data exchange horiz/vert based on standard protocol

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UX stakeholders:
Assembly
Installation
Commissioning
Service
R&D

Benefits Predictive Maintenance

- Increase equipment uptime
- Decrease unscheduled maintenance
- Reduced spare parts inventory
- Maintenance costs down
- Overhaul and repair time down
- Increase system knowledge (big data)

Sent/Retrieve option, subscribe and use

Sent/Collect data

Describe data + subscribe options

4 GUI

BPI 5

Data

3

Interface

2

1 MV | Robot | FCS/PLC | Embedded Cntrl. | 3rd party

Interface

Functional module

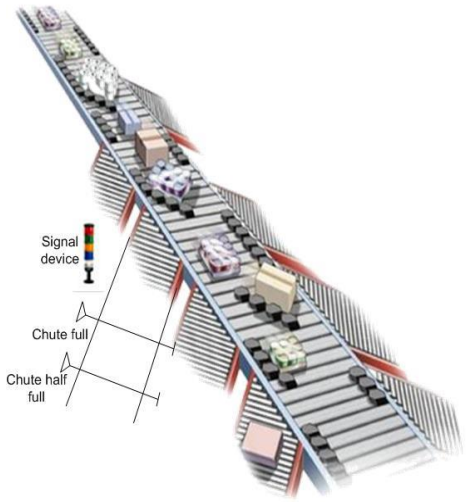
Functional modules

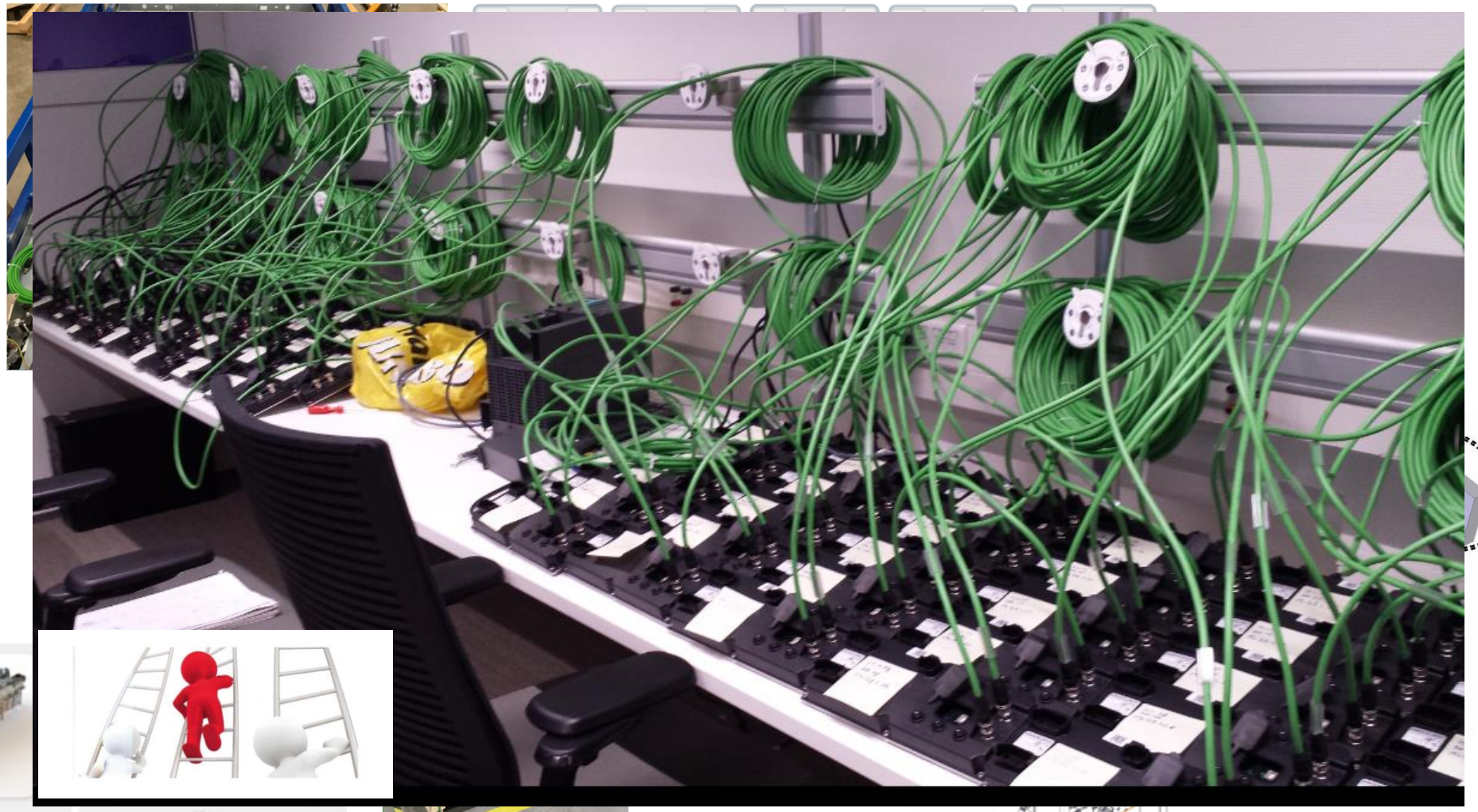
Retrieve option, subscribe and use

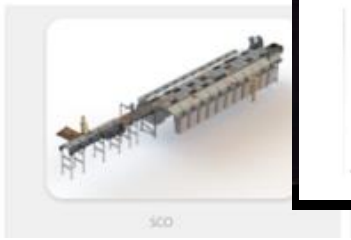
Collect data

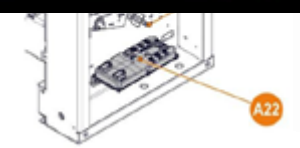
Describe data + subscribe options

Vertical: Focus on UX for product life cycle









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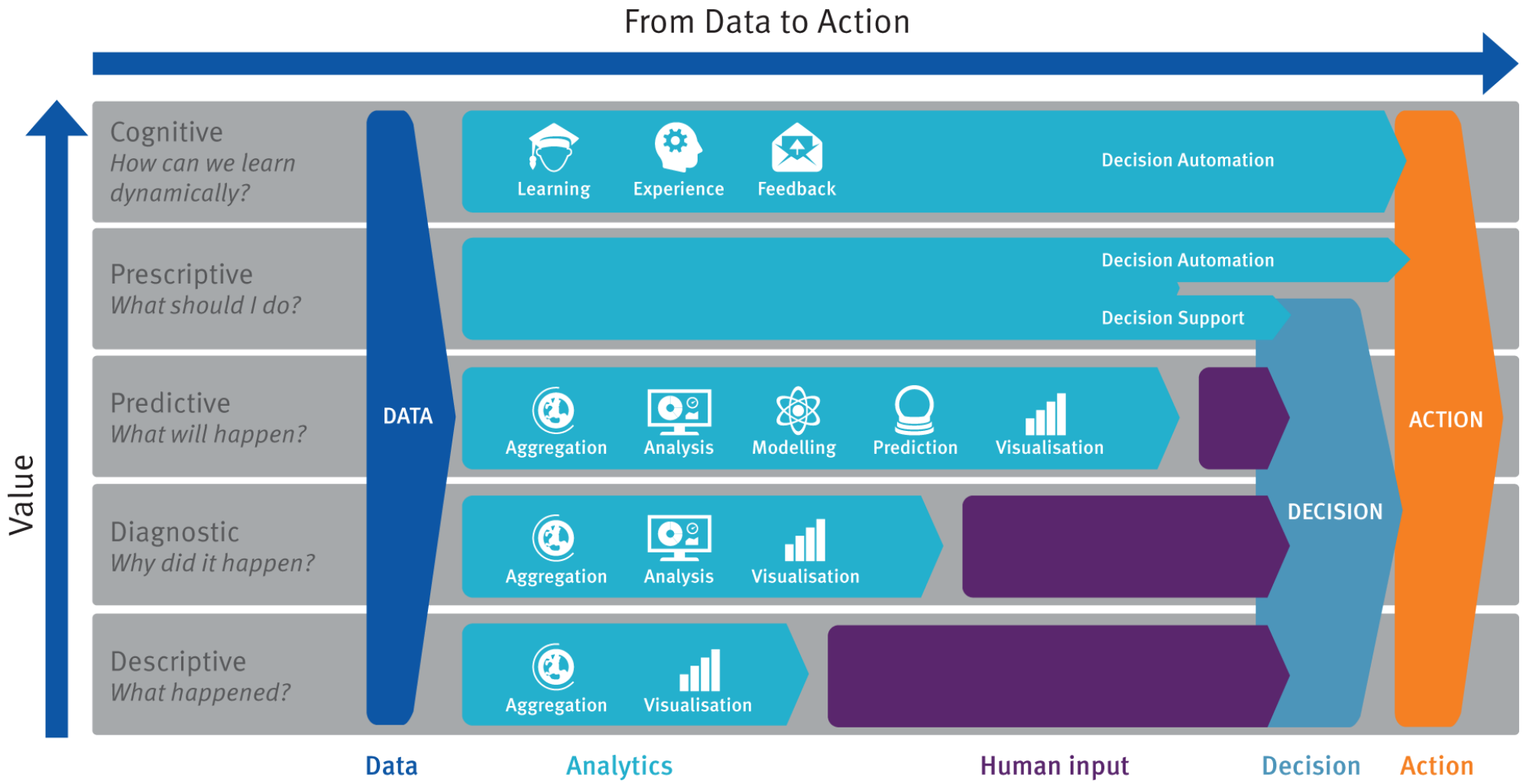
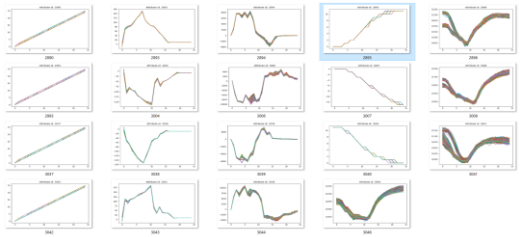
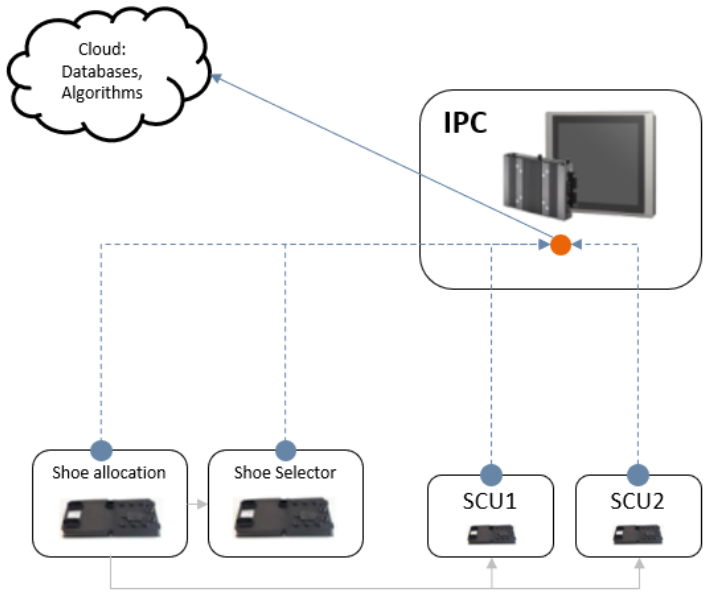
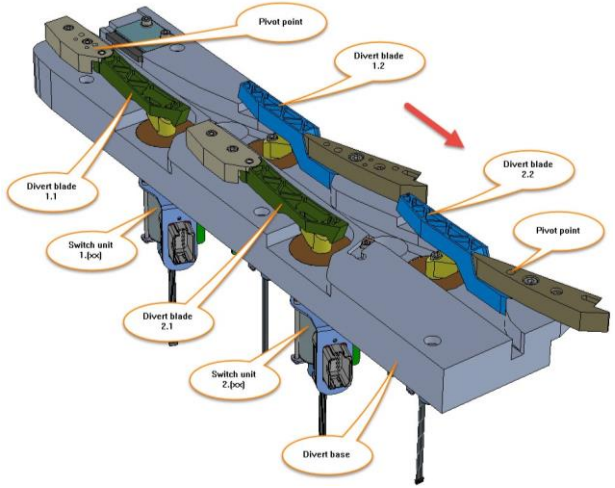
Data Science - From fundamentals to added value

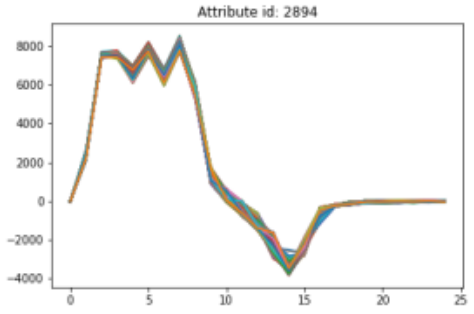


Predictive maintenance

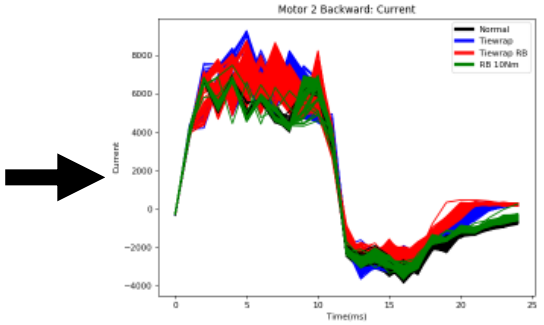




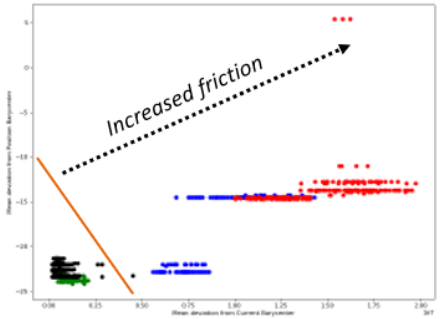




Normal behavior



more friction caused by pollution



separate normal from abnormal behavior (orange line)

Next step plug and play deployment

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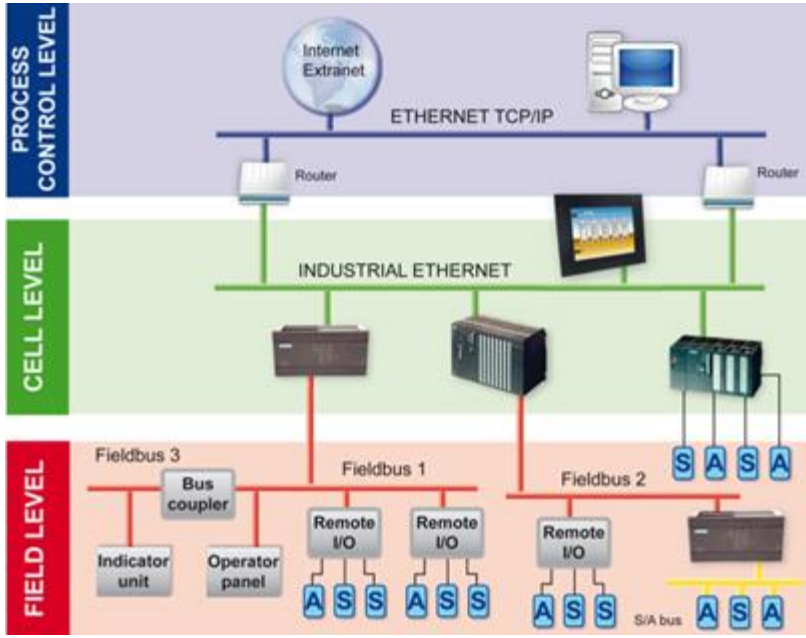
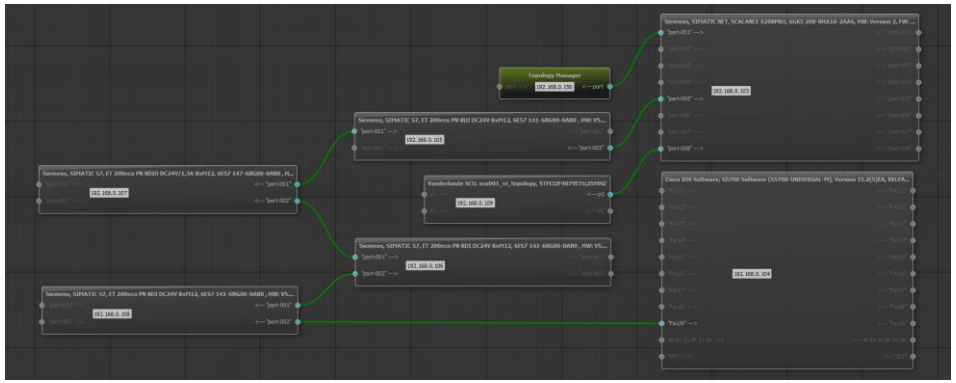
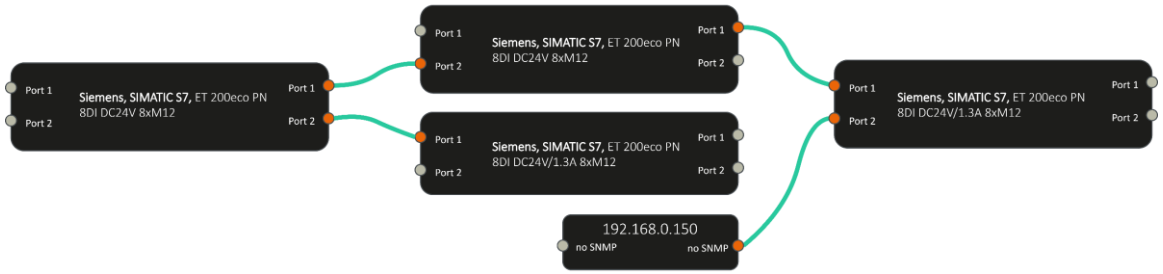
1. **By standardizing we can support our own and 3th party products.**
    1. Scan the network (detection of all controllers)
    2. Selection and firmware download
    3. Topology detection
    4. Future: plug and play deployment







Model based design

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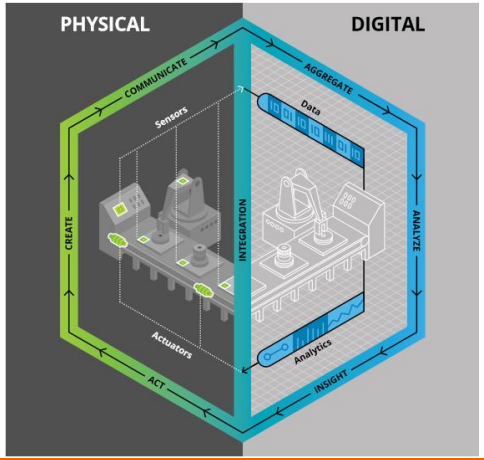
Design and code generation from Matlab

Future:

To develop, test and produce new products in an entirely virtual space before they are actually produced.

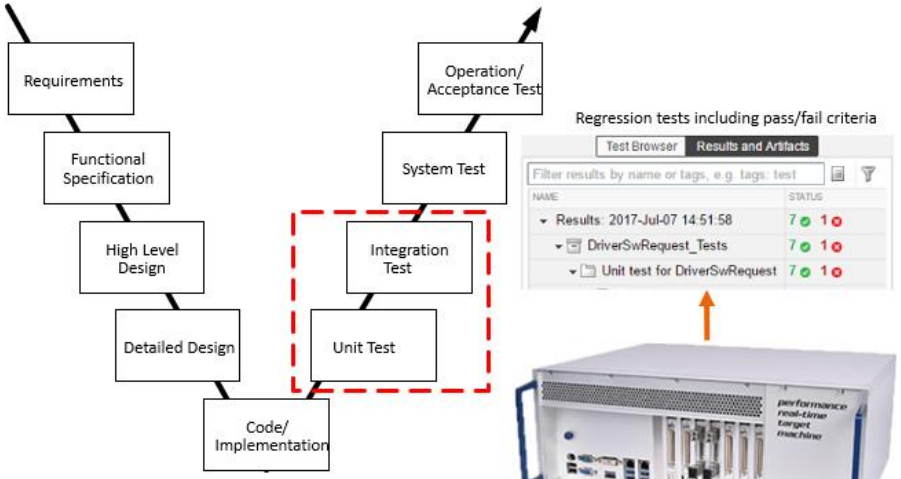
To improve products with data out the field.



Test with plant models

Speedgoat: real-time simulation

Fast validation and verification of new hard- and software without the need of the real system.



Regression tests including pass/fail criteria

Virtual System

Physical Components

Benefits

- Early integration
- Testing hardware failures:
  Beyond range and exception testing without risking damage to equipment.
- Combine virtual and physical system:
  Possibility to combine virtual and actual hardware.
- Reproducibility:
  Every run using the same input results in the same output.
- Adaptability:
  Virtual model and I/O interface can be up/down scaled easily.

Conclusion

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1. **Shift to decentral smart control**
2. **Smart connected: data exchange becomes key**
    1. Functional modules
    2. UX during different product life cycle
    3. Data science: from Descriptive to Predictive to Cognitive
3. **MBD for test and development**


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Questions

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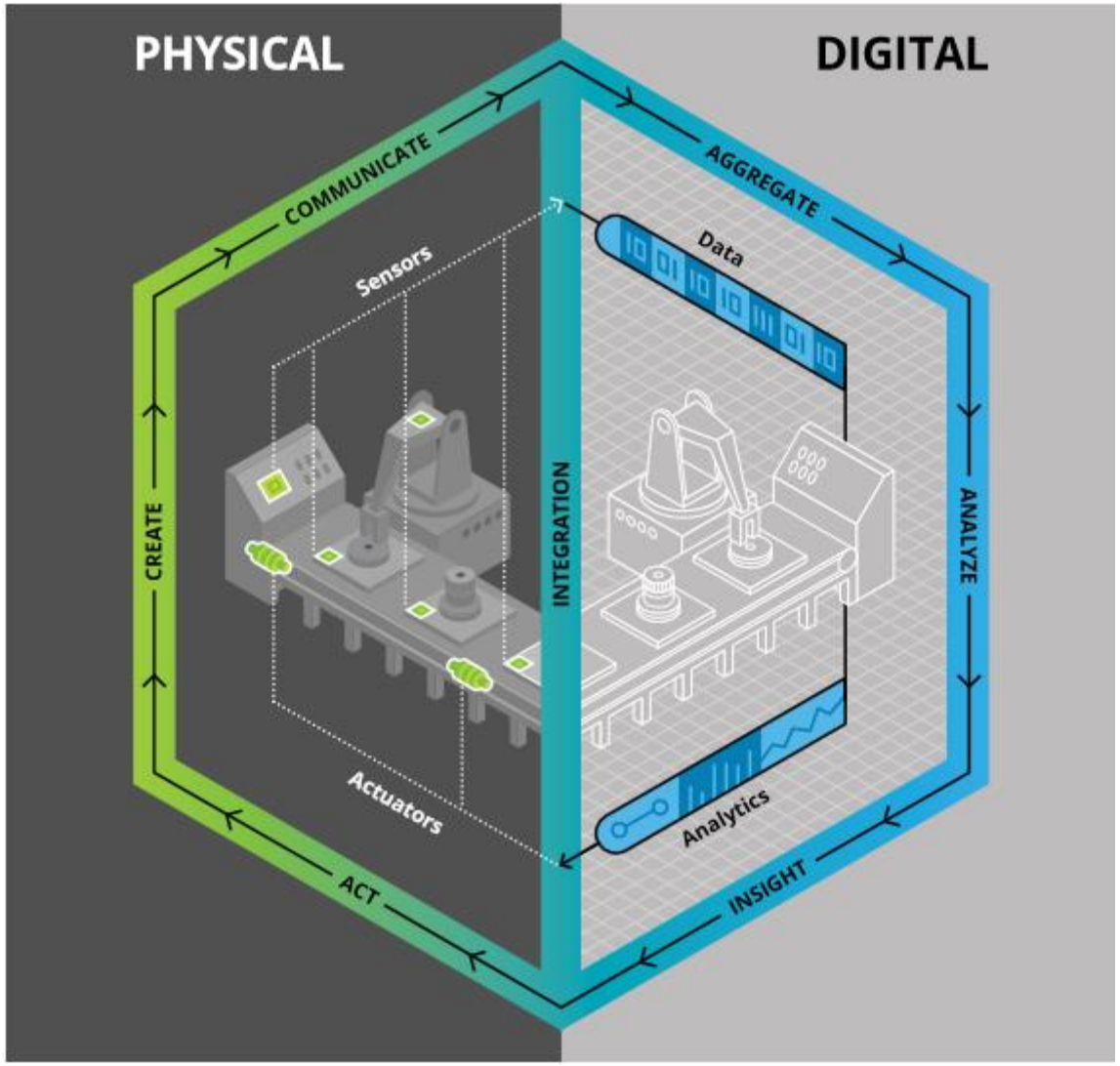
Virtual system



The Digital Twin

- A complex system produces massive amounts of data. Connect a group of systems together through the internet, and the data increases exponentially. All of the data coming off of these devices is descriptive. That is, the data tells you what happened and when it happened. Data analytics extends the data to be predictive and tell you when something will happen — a failure, for instance. But data analytics doesn't tell you how to improve the product to avoid the failure. However, a digital twin — a 3-D digital model of a physical system — can do this!