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NX 기반의 산업용 기계 및 로봇장비에 대한 Virtual Commissioning

Ko ChangHwan, Siemens Industry Software

Megatrends in the Machinery industry

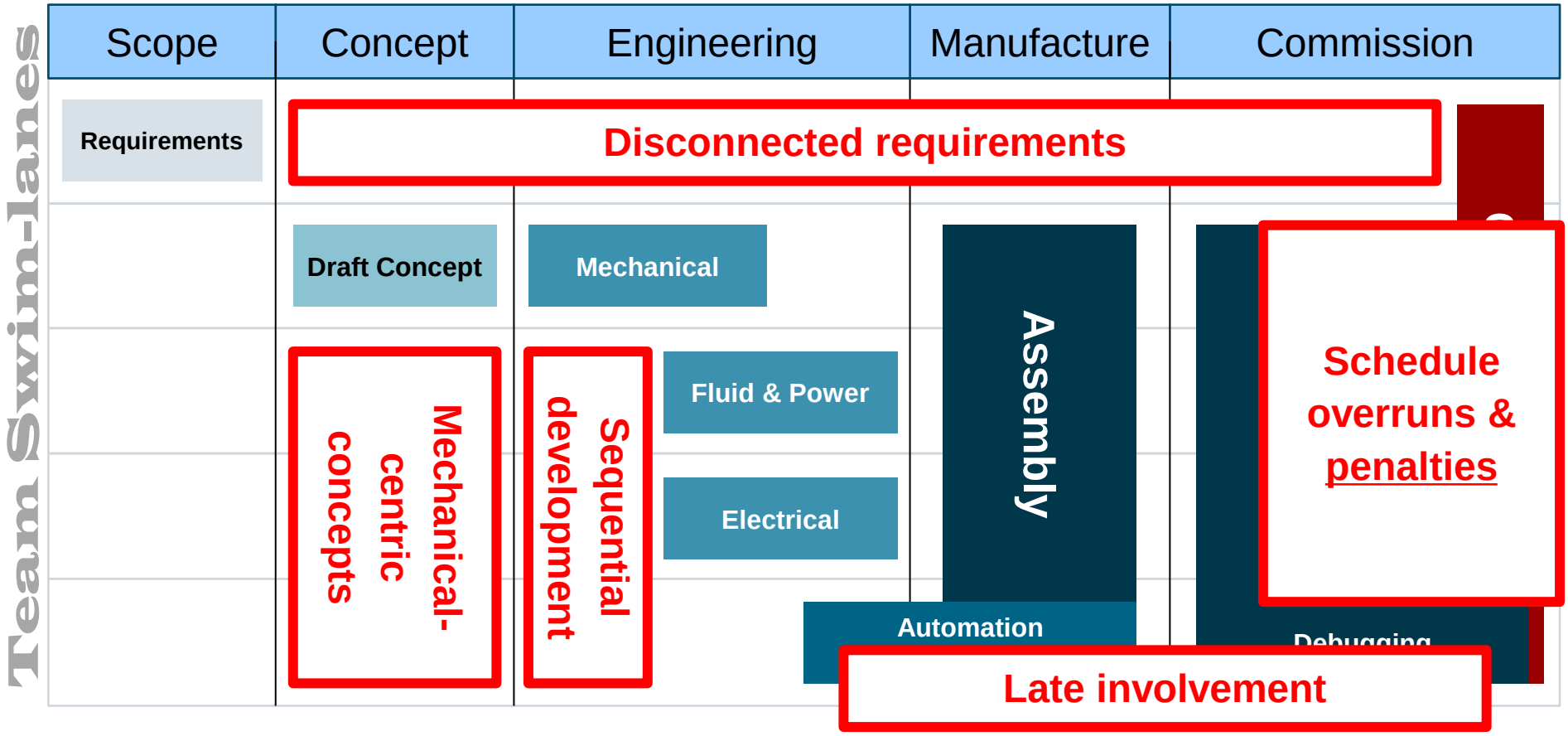
Regulatory & customer pressure driving many aspects of machine design.

Mass customization drives demand for flexible machines.

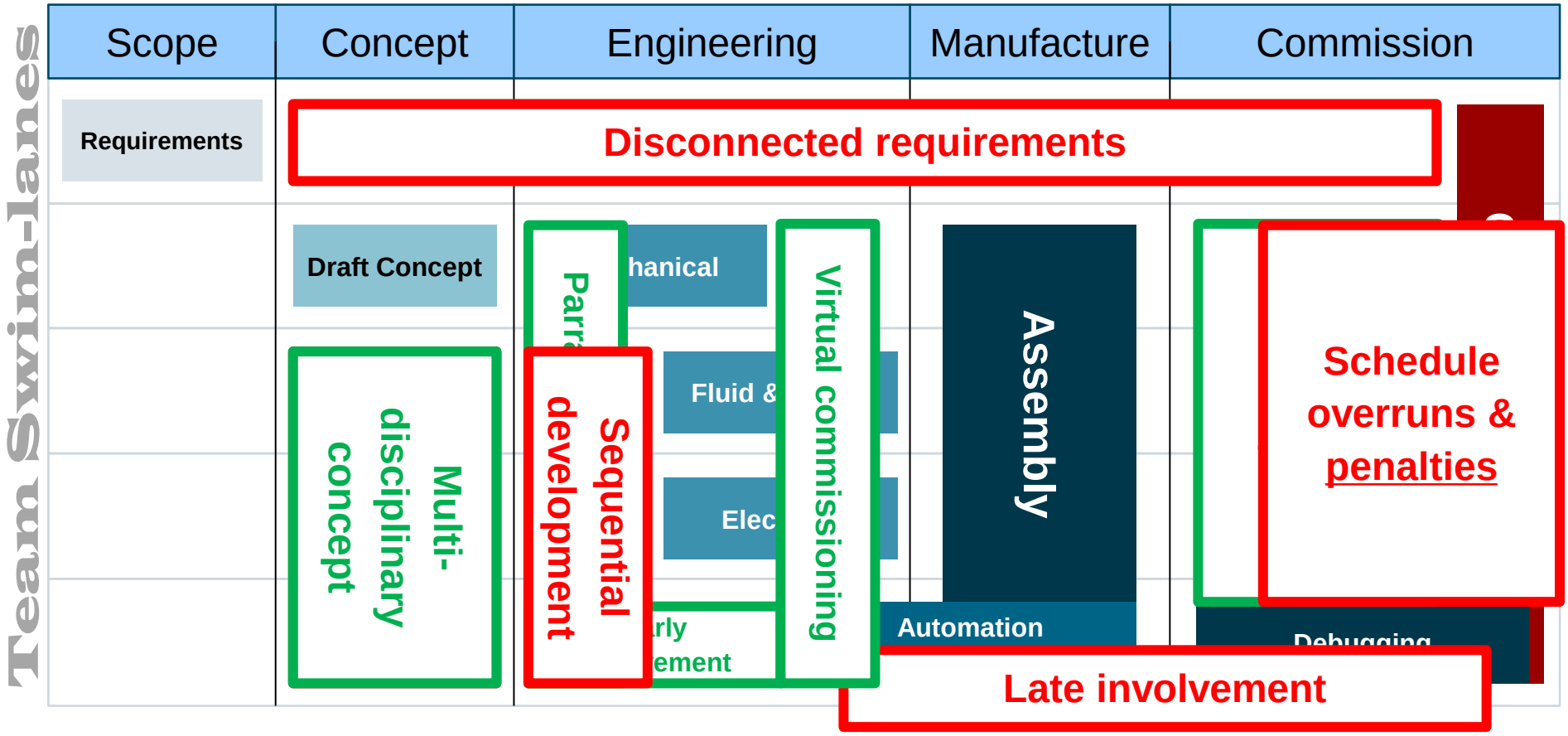
Machines need to be smarter.

Maturity of global markets & competitive pressure.

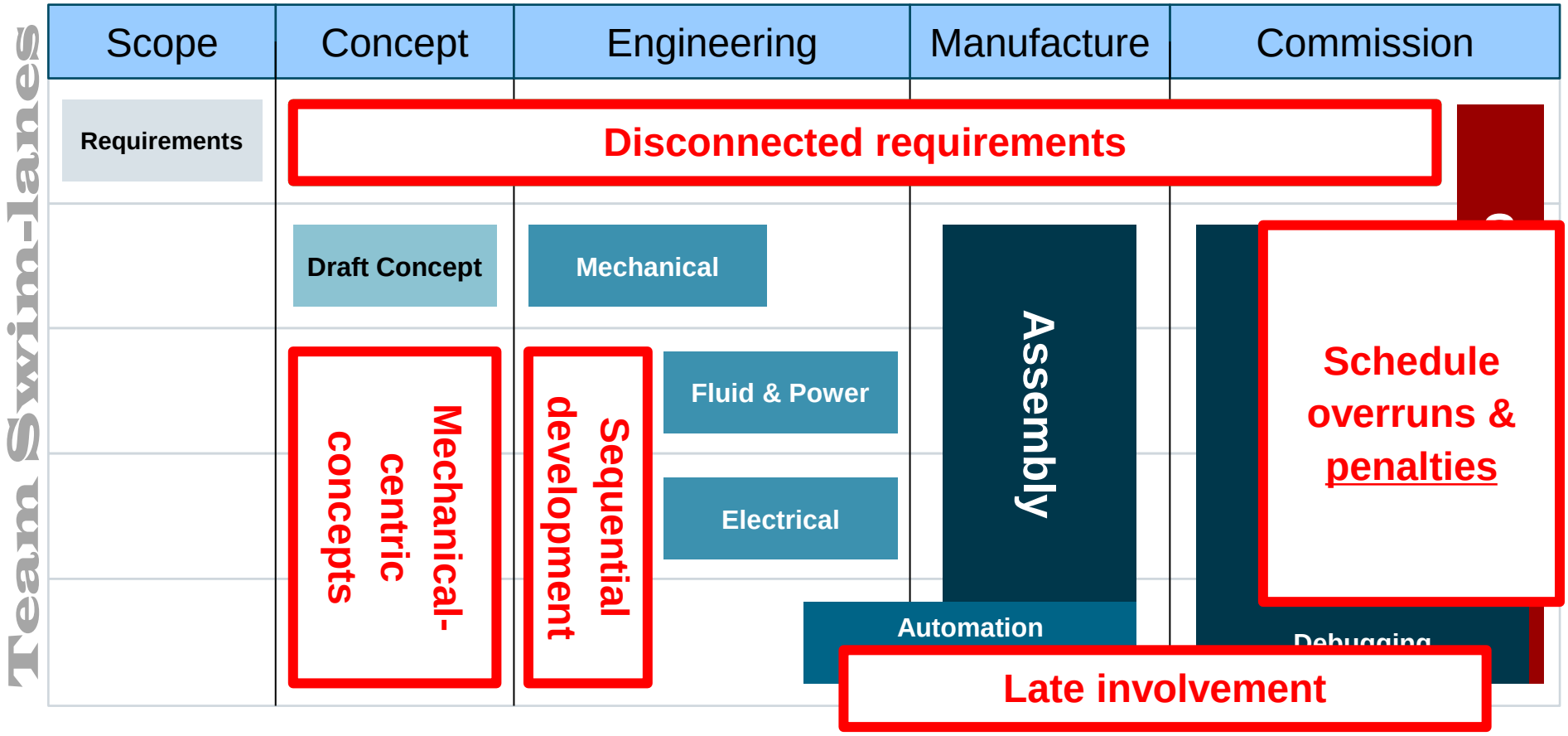
Impact on the traditional development process



Impact on the traditional development process

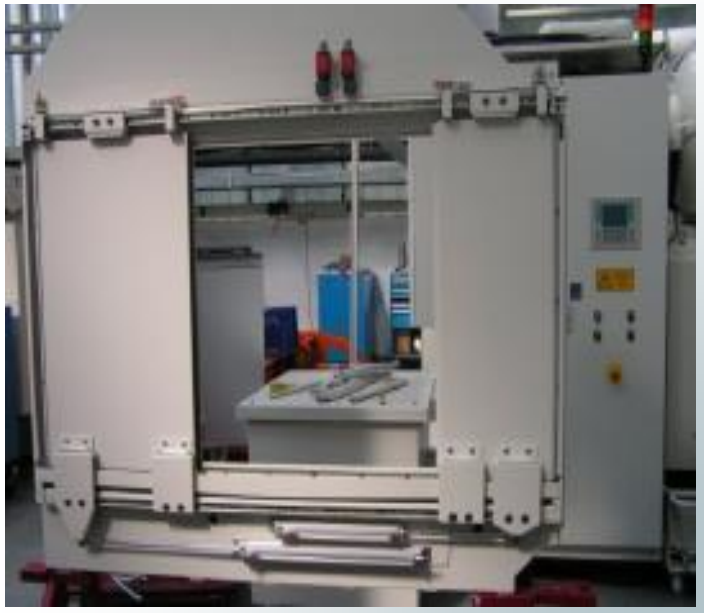


Impact on the traditional development process



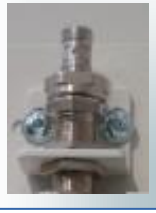
Machine Modular decomposition

Is this “just” a loading door?



Cross-Domain systems require Cross - Domain Solutions

Limit switch



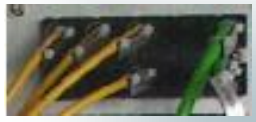
Safety relay

Interface

I/O signals

Cabinet

Cable, hose, pipe



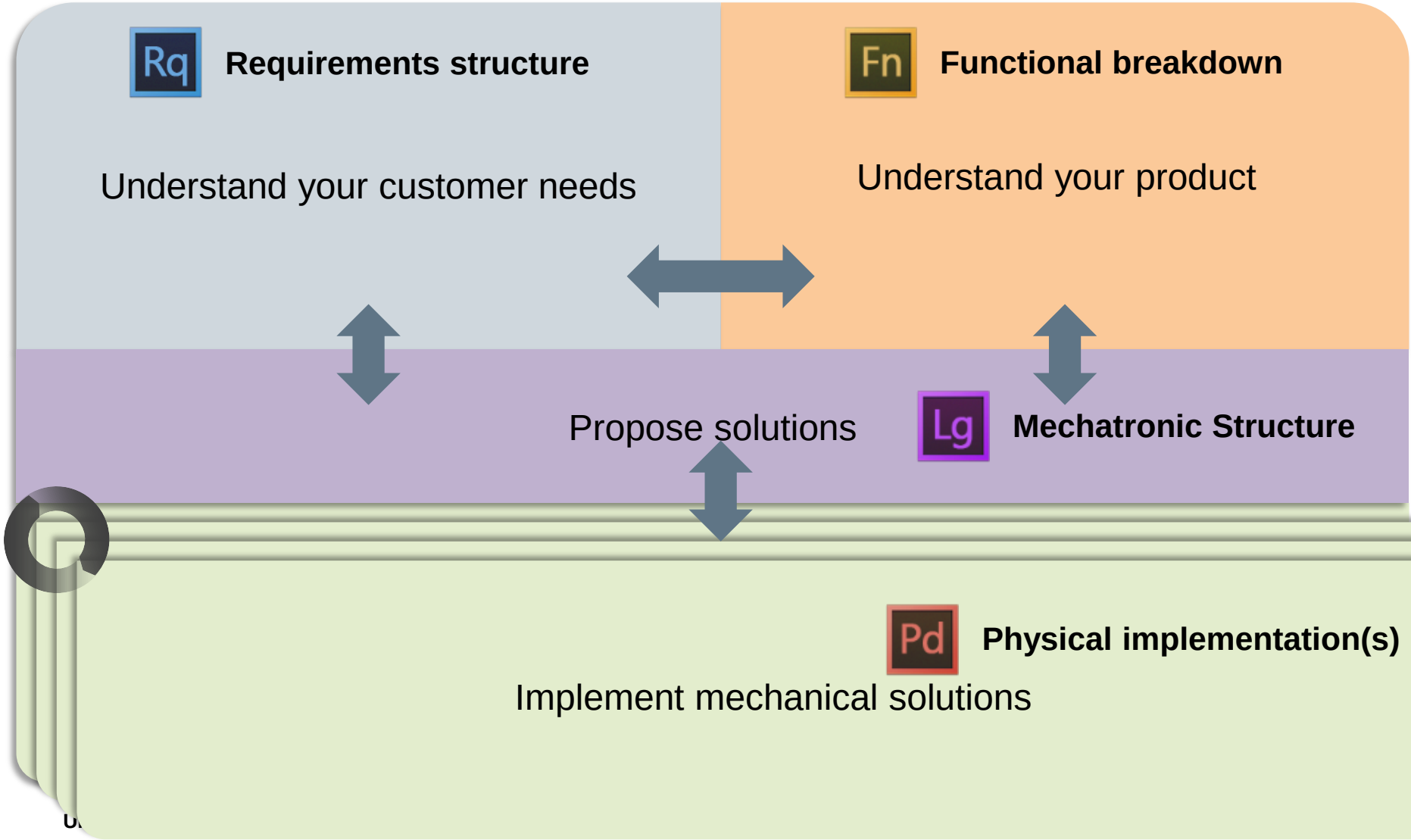
Safety limit switch

PLC Software

Pneumatic cylinder

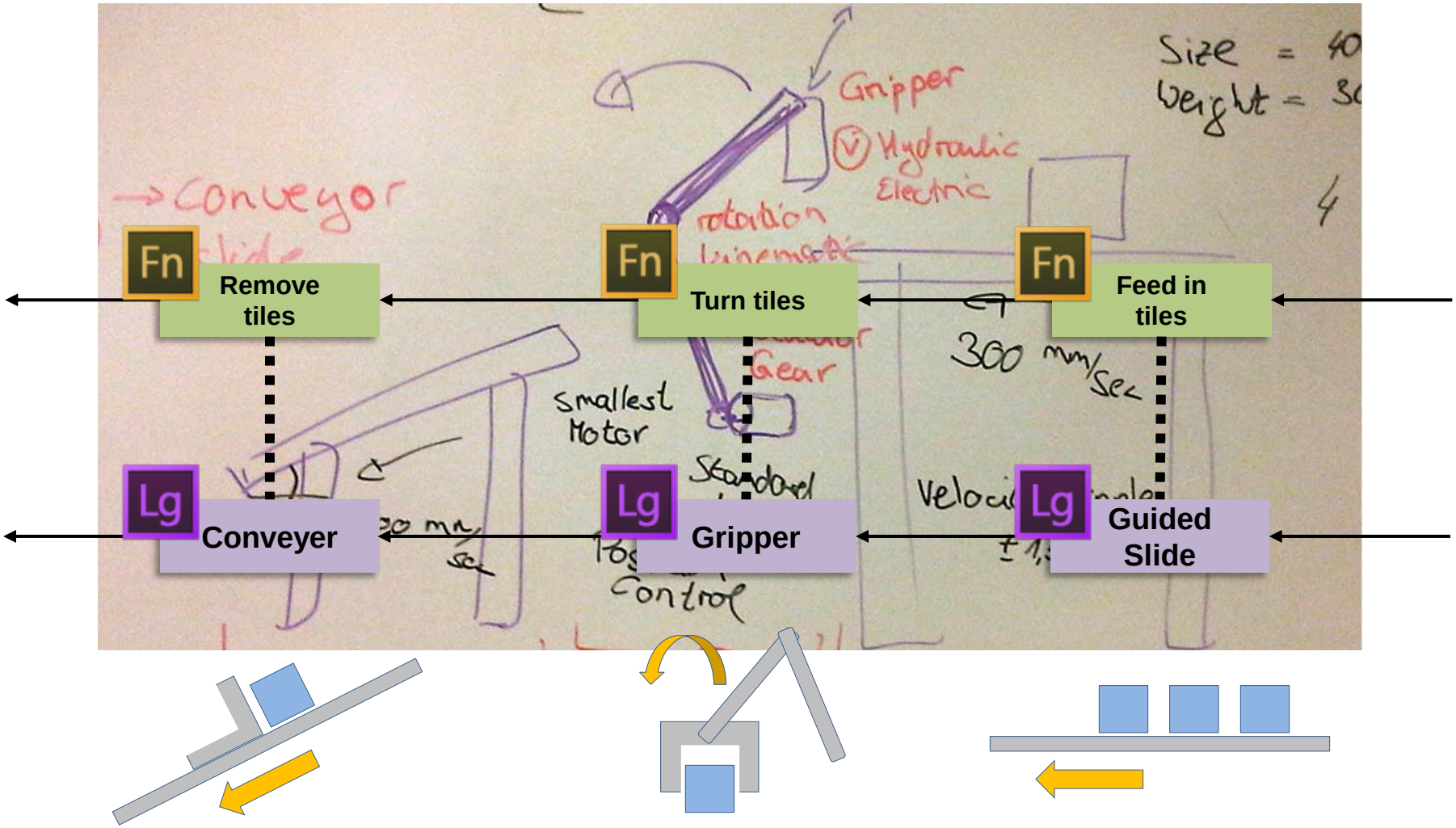
Air and valves unit

Understanding the needs
Why break down your machine?

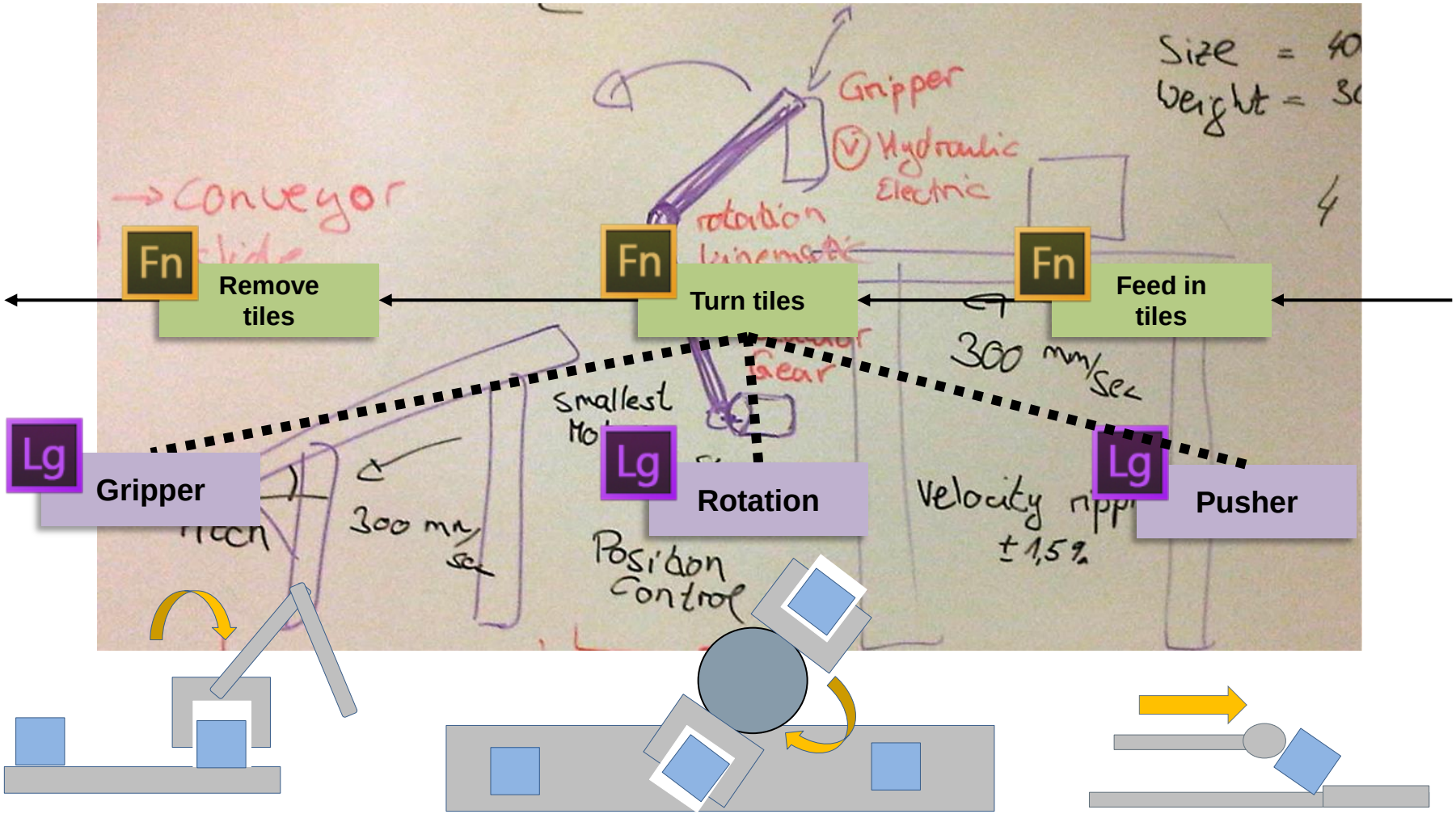


Mechatronic structure

Describe the way the function can be implemented



Mechatronic structure
Capture alternative implementations



Mechatronic structure
Capture multi-discipline aspect of each implementation

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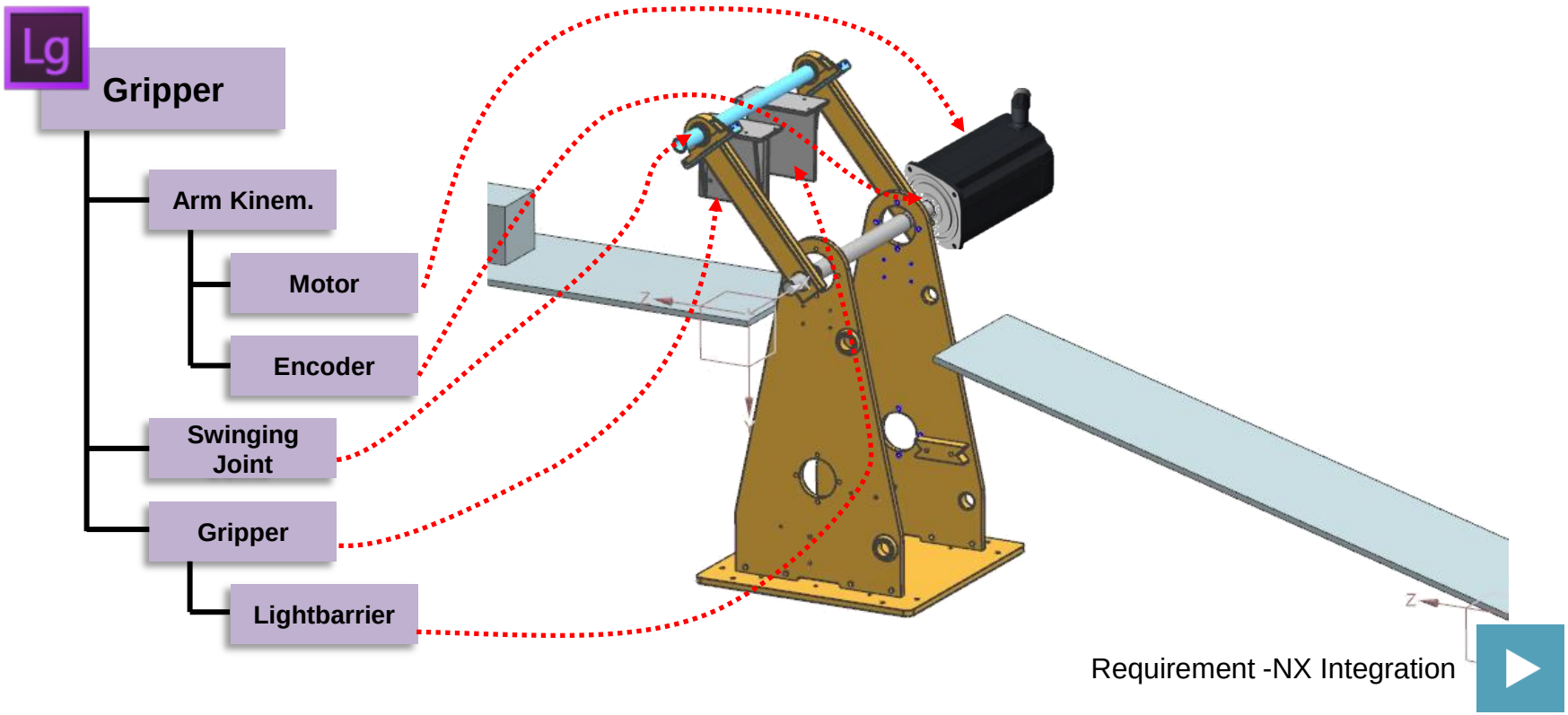
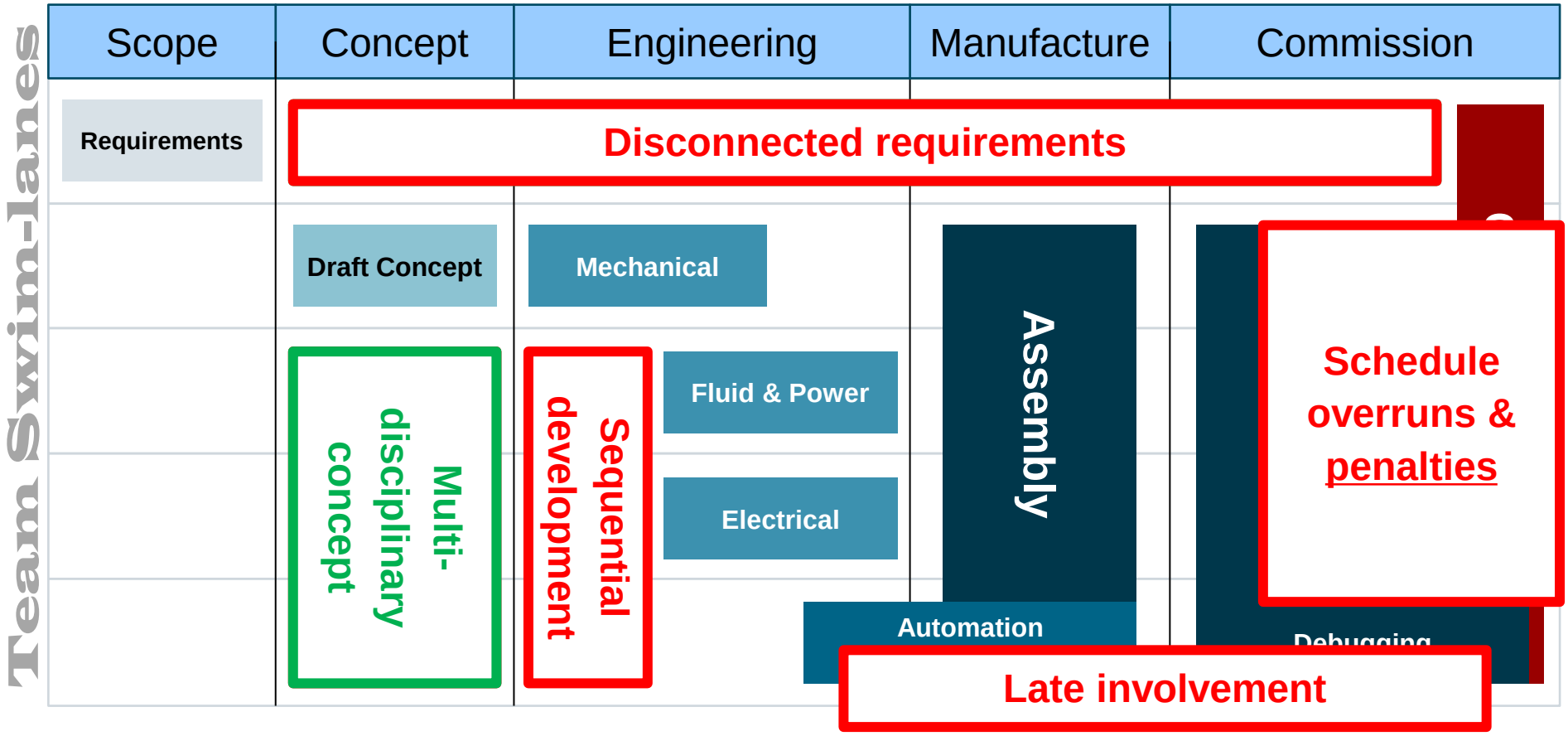
Solutions are rarely only about mechanics



Impact on the traditional development process



Multi-disciplinary concept selection

Capture multi-disciplinary aspects right from the start

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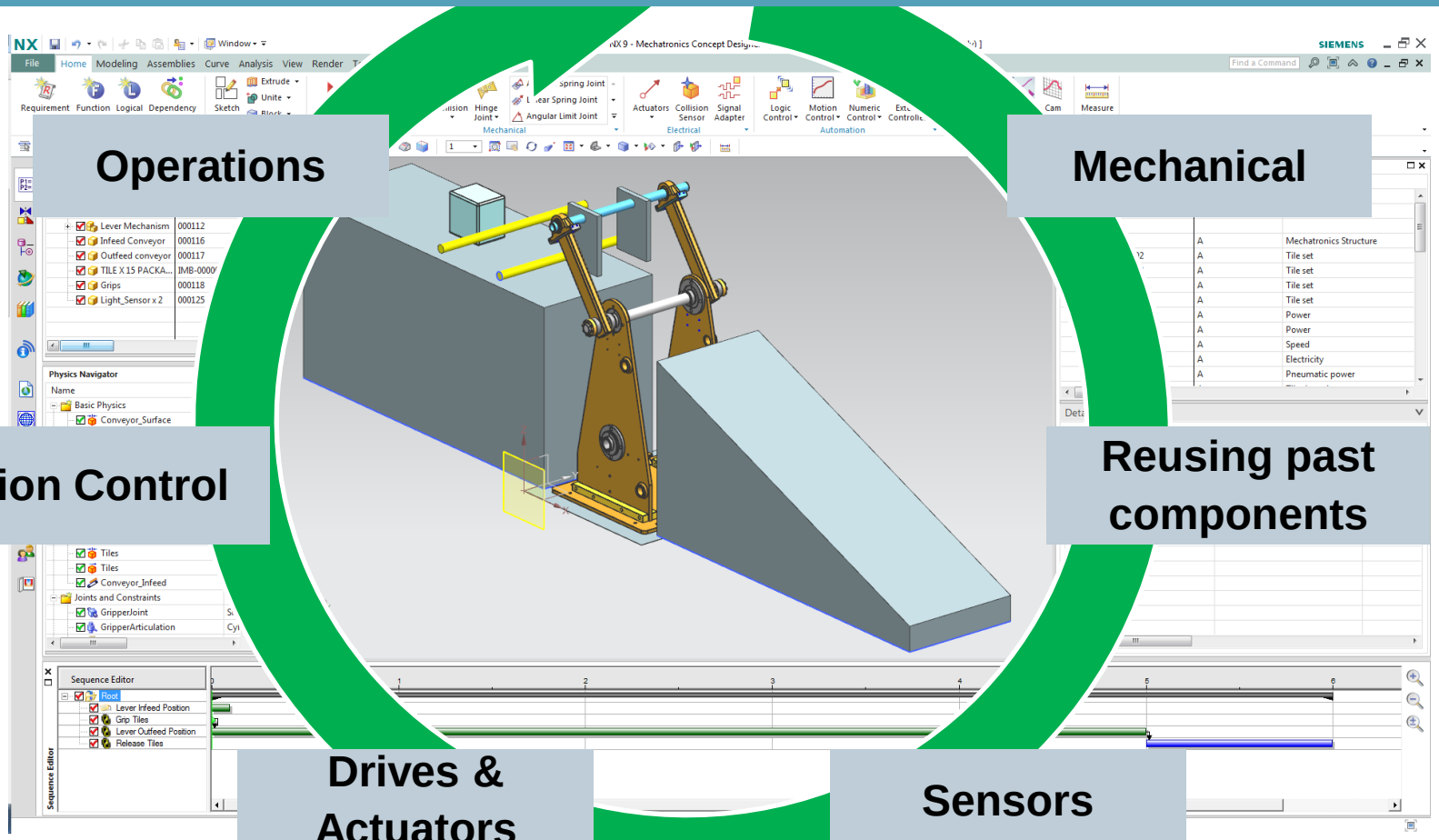
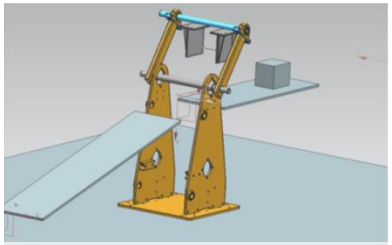
How is the machine supposed to work?



Multidisciplinary collaboration
Distributing information from the concept

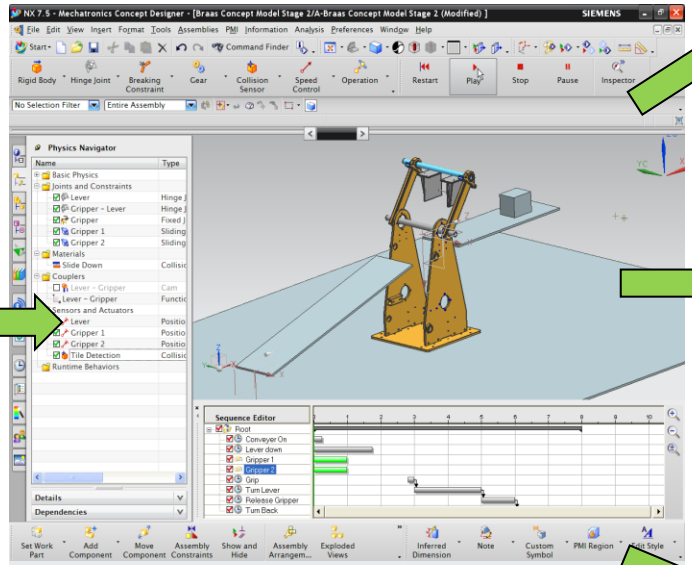
Concept Creation



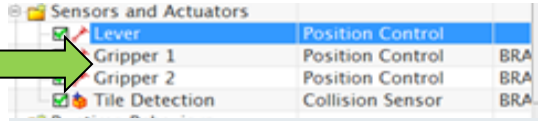
Geometry, physics

- Function
  - H1 – Produce Tiles
    - K1 – Produce Tiles
    - U1 – Supply Energy
    - G2 – Package Tiles
      - A1 – Charge Package Station
        - A1 – Conveyor 1
        - A2 – Flip Station
          - A1 – Base
          - A2 – Gripper
            - A1 – Actuator
            - A2 – Sensor
            - A3 – Closing Mechanism
          - A3 – Rotary Unit
            - A1 – Rotary Drive
            - A2 – Rotary Arm
        - A3 – Conveyor 2
        - A2 – Bundle Tiles
        - A3 – Wrap Tiles
      - F1 – Safety
        - F1 – Emergency Stop

Requirements, Functional & Logical breakdowns



Mechatronic concepts

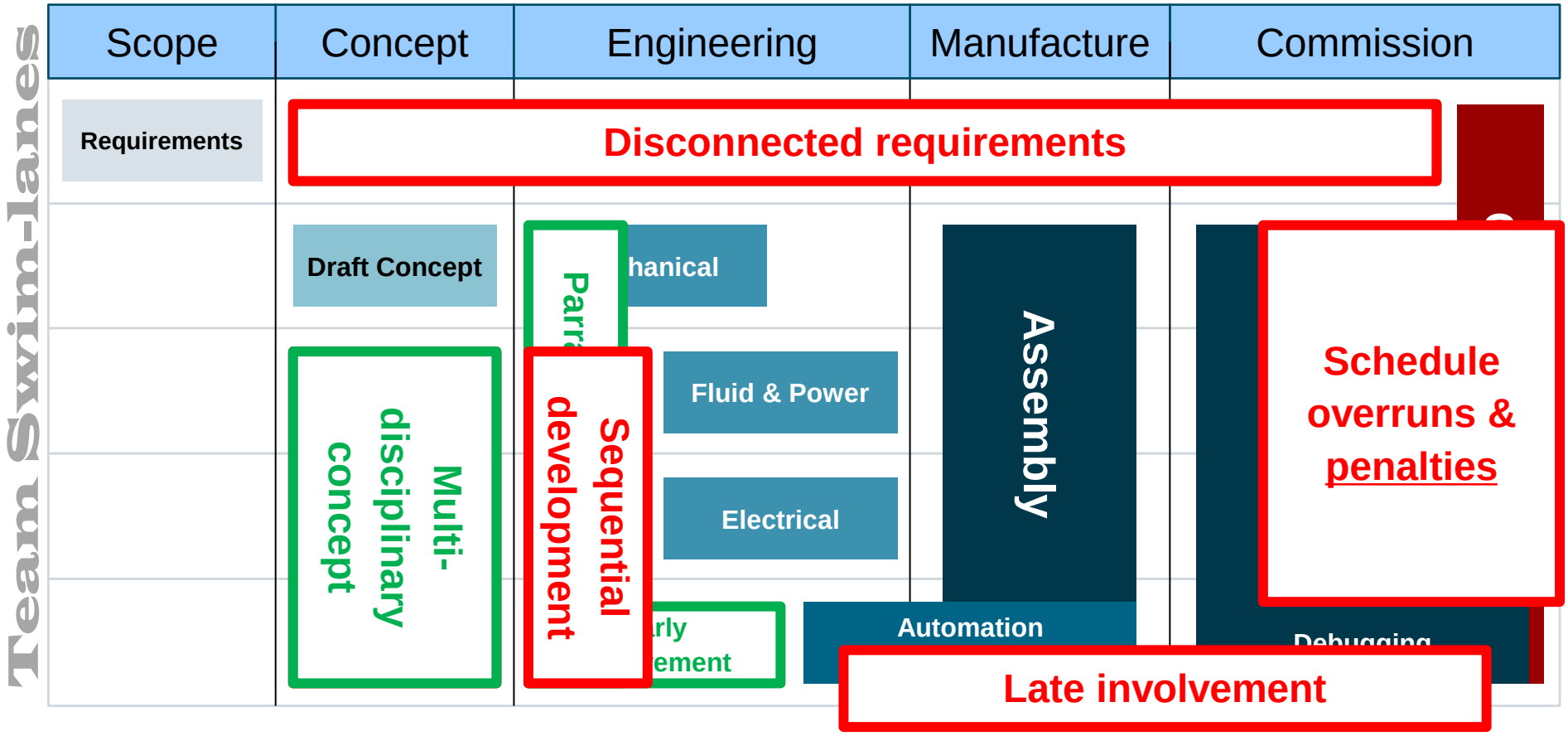


Sensors & actuators

Sequences, event-based actions

Requirements | **Concepts** | **Detail Engineering**

Impact on the traditional development process



Actuators sizing
Mechanical-centric collaboration

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Mechanical

Description of the mechanical system

Scope of the integration with MCD

Engineering motors and gearboxes

Electrical

Engineering converters/motor starters

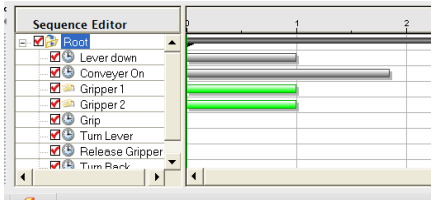
Accessories

Automation

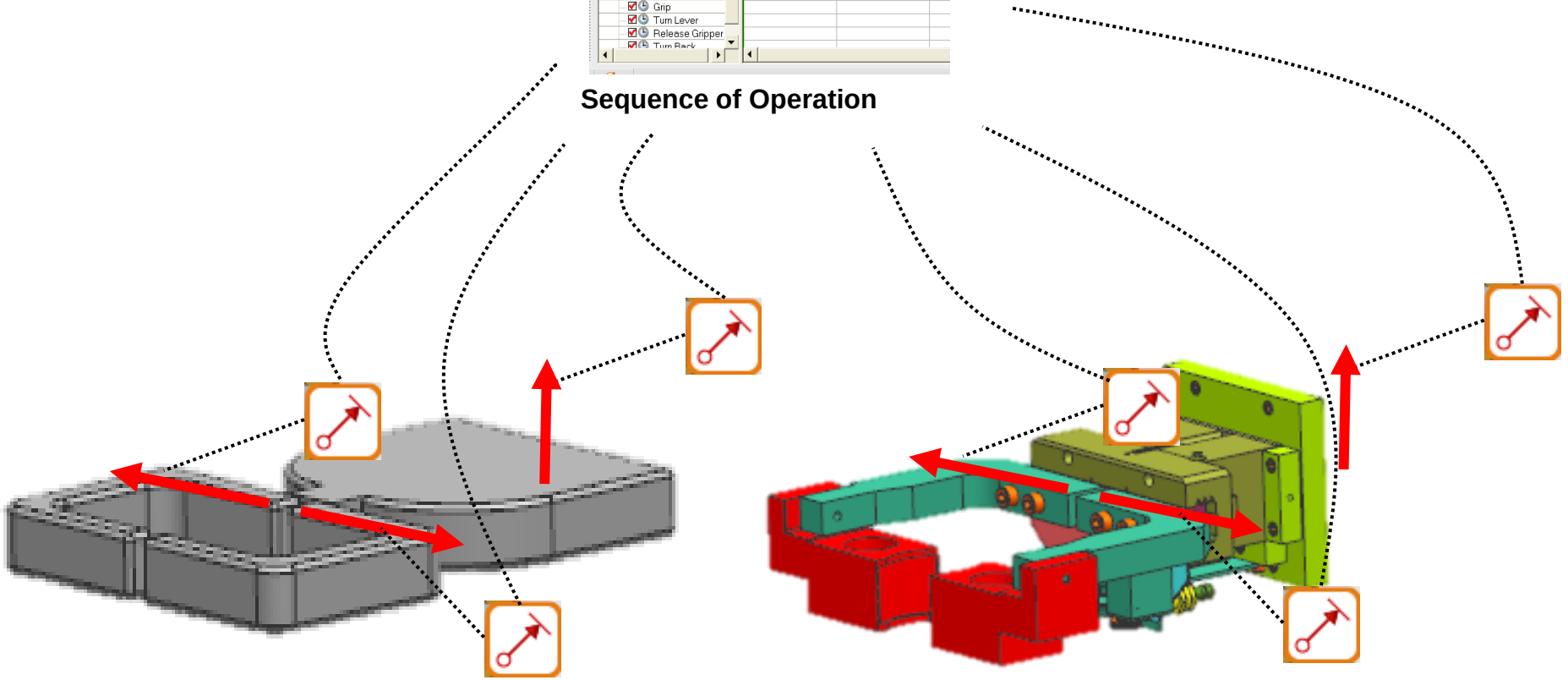
Engineering open-loop/ closed-loop control

Mechatronical reuse wizard

Replacing concept geometry with detailed mechanism

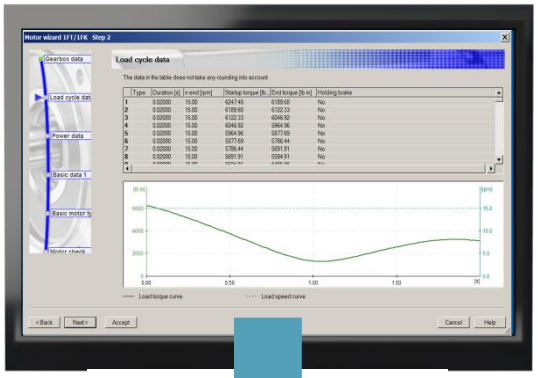


Sequence of Operation

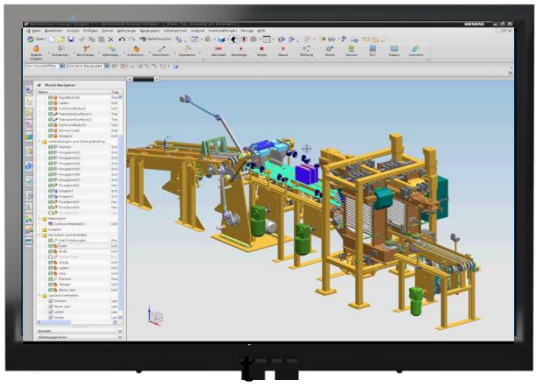


Mechanical Replacement

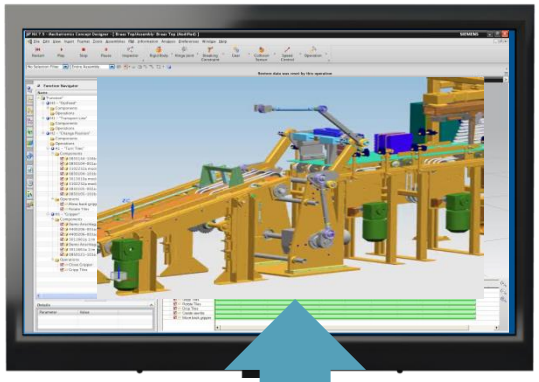
NX & SIZER collaboration
Mechanical-centric collaboration



Sieme Sizer



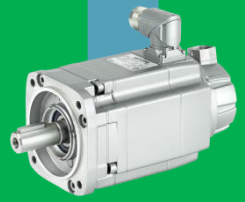
Mechatronic Simulation



Mech cal

SIEMENS SIZ
CAD Creato

ENTER



Reuse existing/preferred drive or launch New Part Introduction process

Siemens SIZER / Eplan interface
Electrical-centric collaboration

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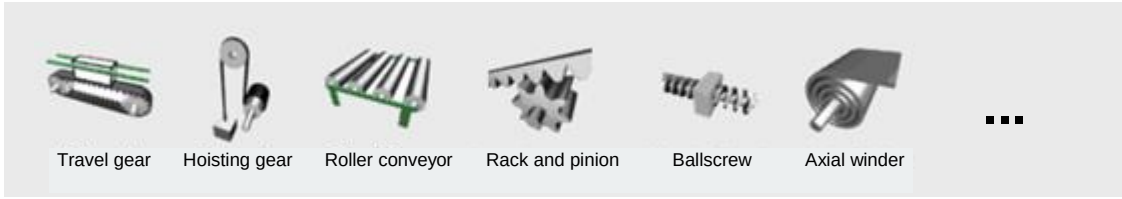
Overview

Mechanical

Description of the mechanical system



Engineering motors and gearboxes

Electrical

Engineering converters/motor starters

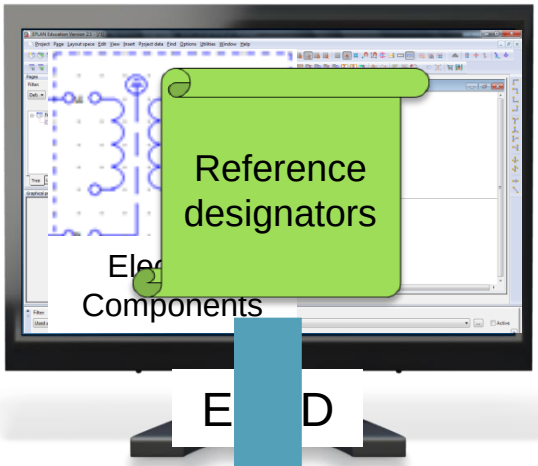
ePlan Interface with Sizer

Accessories

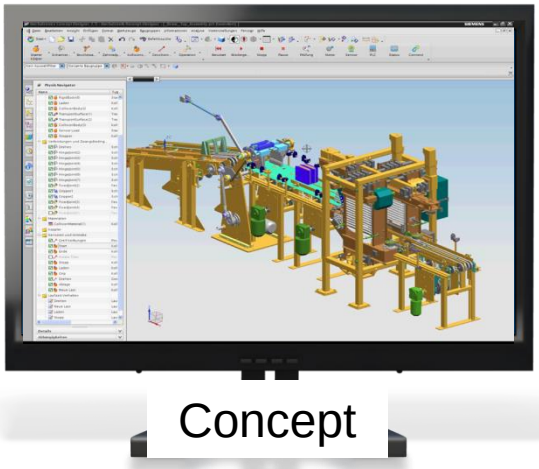
Automation

Engineering open-loop/ closed-loop control

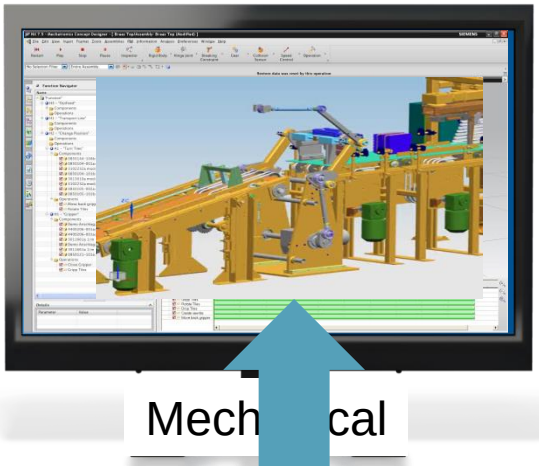
Electrical Components selection
Electrical-centric collaboration



E D



Concept



Mech cal

Teamcenter Eplan Connector

TEAMCENTER

Electrical Component (Geometry)

Sensors/Actuators List

ware

Drive Automation choice
Automation-centric collaboration

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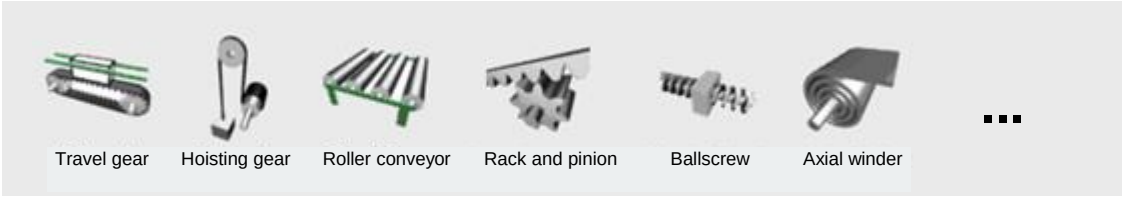
Overview

Mechanical

Description of the mechanical system

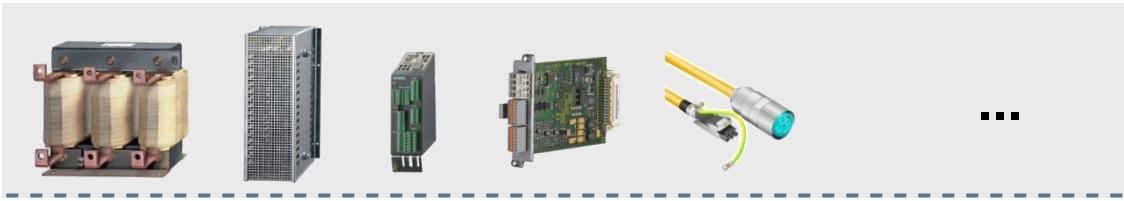


Engineering motors and gearboxes

Electrical

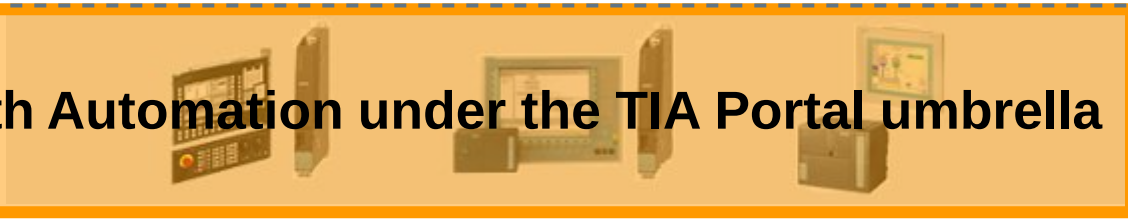
Engineering converters/motor starters

Accessories



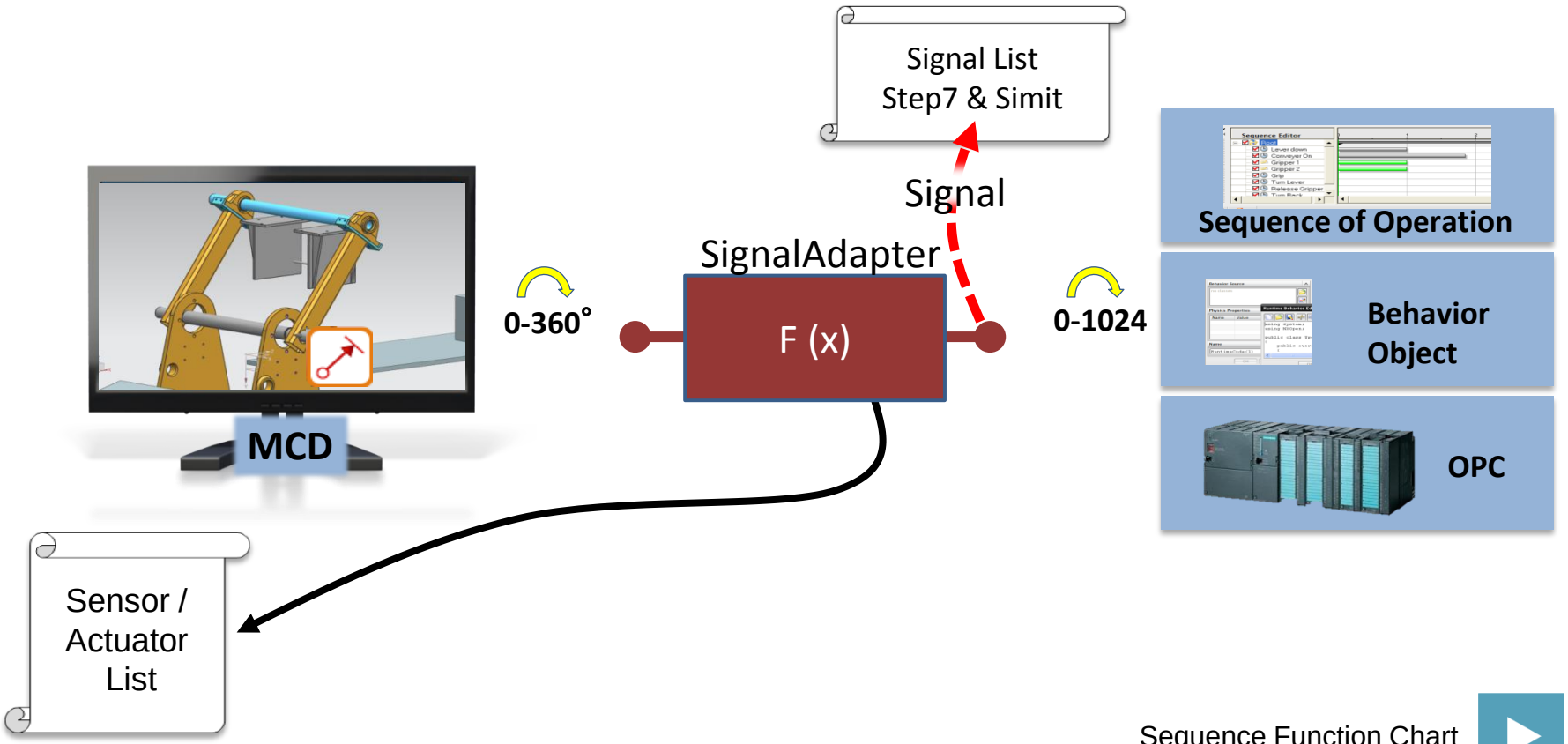
Automation

Engineering open-loop/ closed-loop control



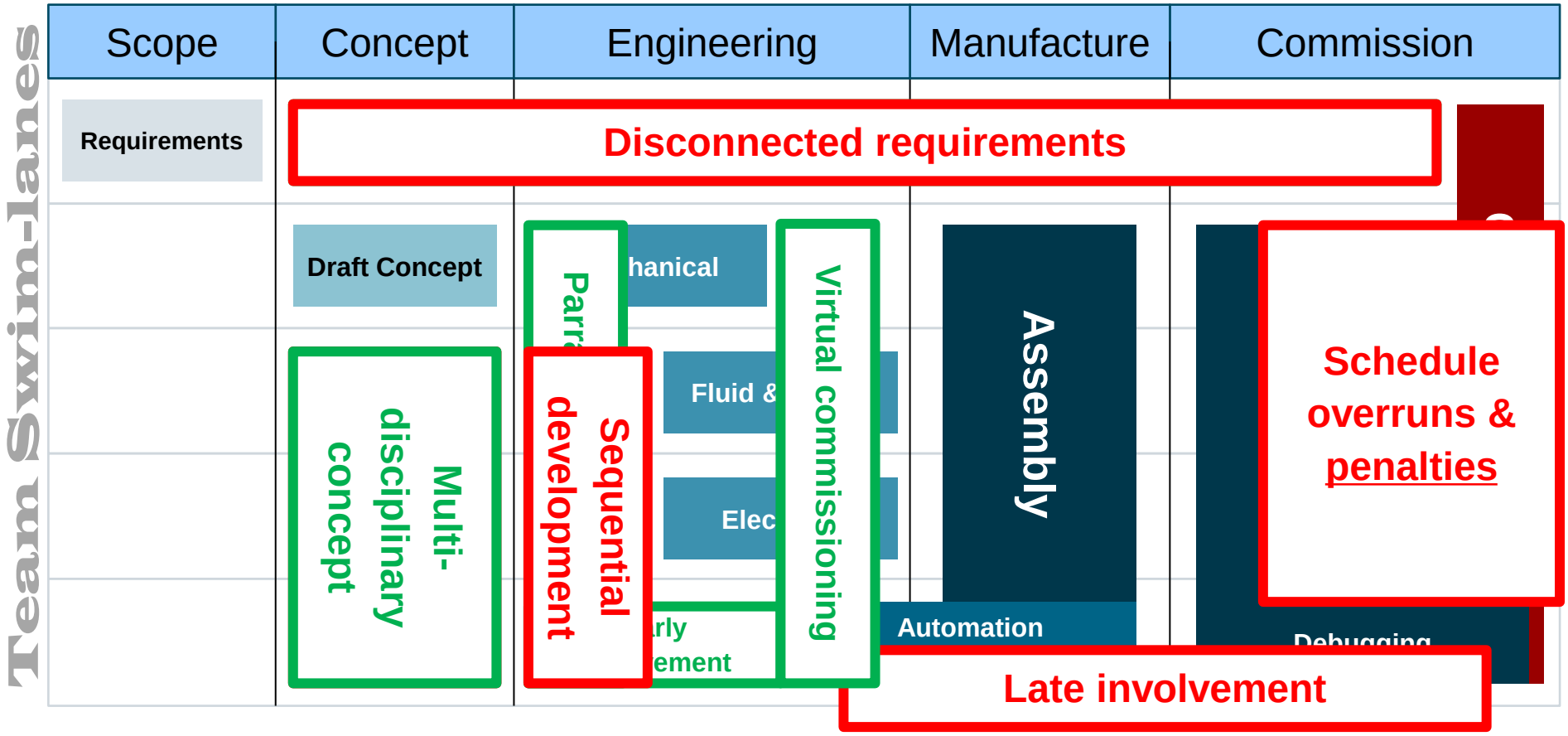
Integration with Automation under the TIA Portal umbrella

Signal definition
Automation-centric collaboration

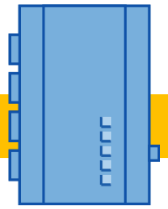


Sequence Function Chart

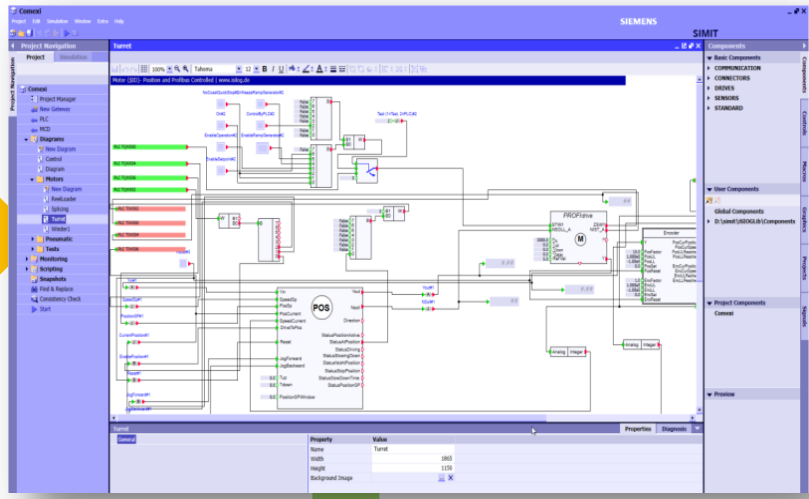
Impact on the traditional development process

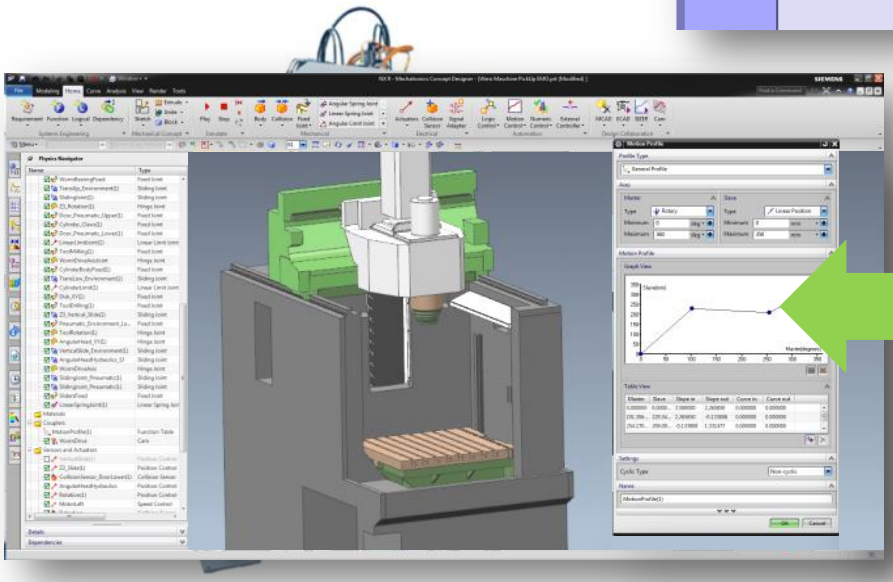


What does “simulating a machine” mean?
Validating automation



Bus Simulation Box





Continuous Automation validation
Multi-disciplinary maturation

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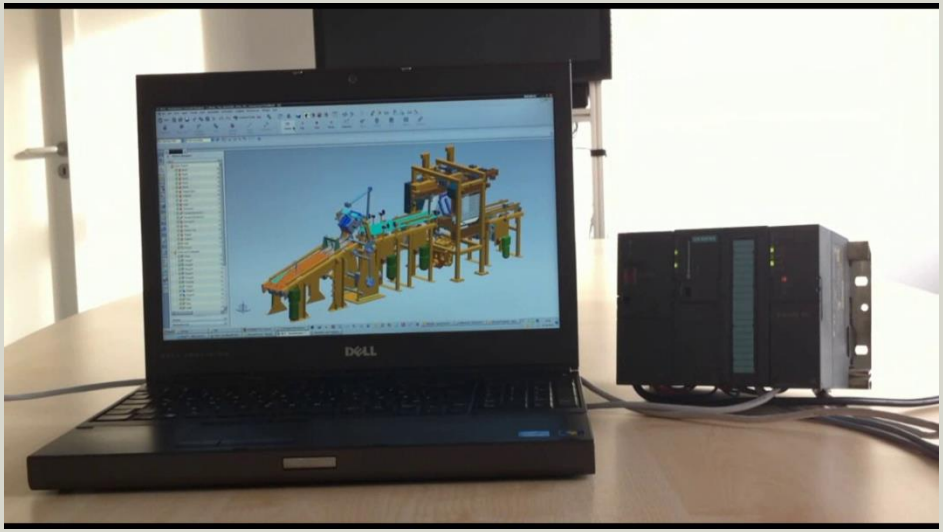
Validate automation software during development

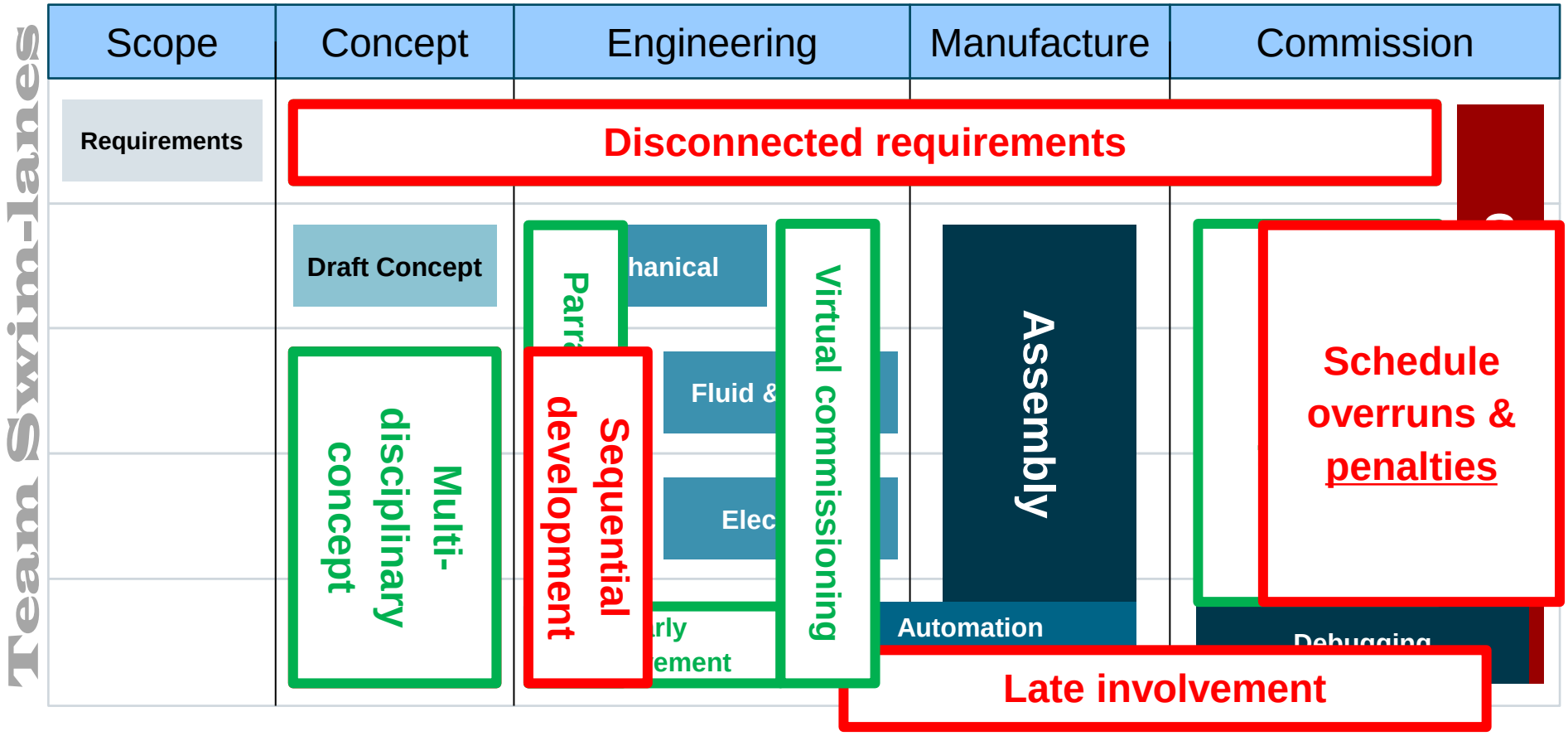
- Reuse the Design for the HIL testing.
- Physics engine and user interaction
- PLC Connect is totally integrated into MCD
- Interfaces: Modbus, Profibus, Profinet, PLCSim and individual interfaces to non Siemens PLC (SHM)
- Automation-Data is stored in PRT-file



Hardware in the Loop validation

Mechatronics Maturation

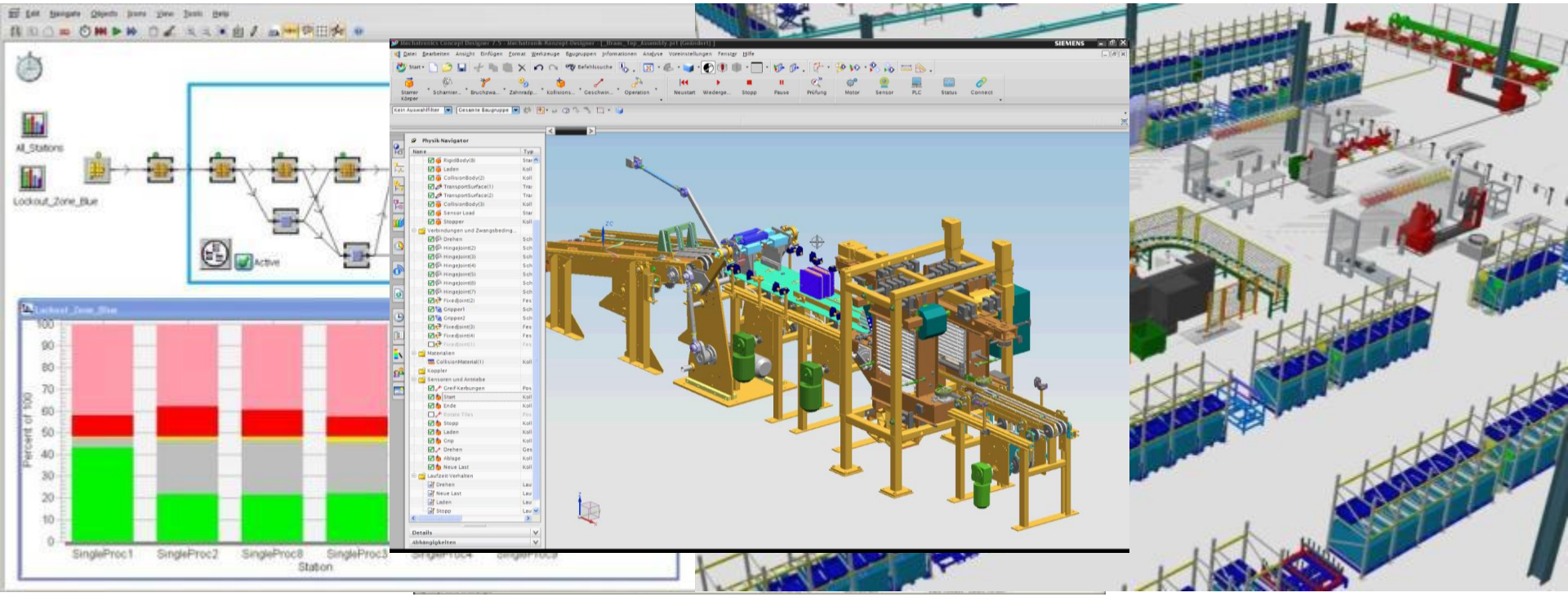
Impact on the traditional development process



Siemens solutions for Virtual Commissioning

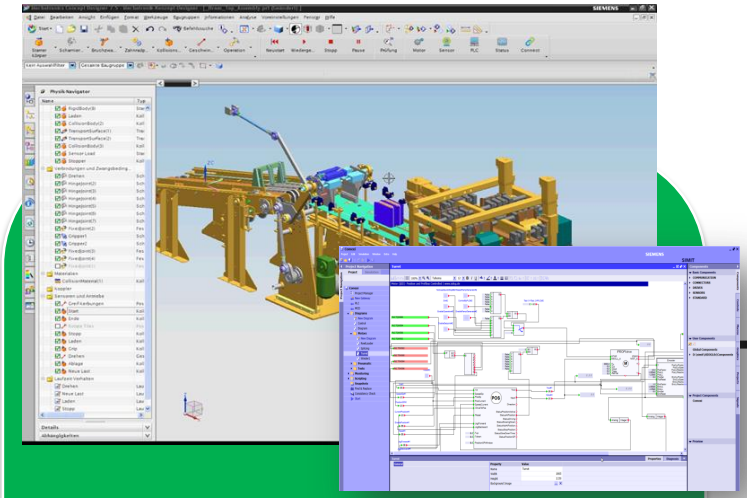
Different scopes, different tools, all supported

Scope	Use Case	Tool
Plant	Logistic, Material Flow	Plant Simulation
Production Cell	Cinematic Equipment, Robots	Process Simulate
Machine & Subsystem	Automation	NX MCD



Virtual Commissionning
From Virtual to Real

Virtual Commissioning setup



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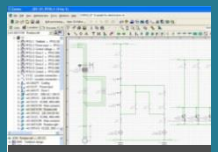
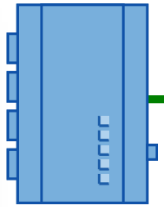
Automation Software





SIMBA
Bus Simulation Box

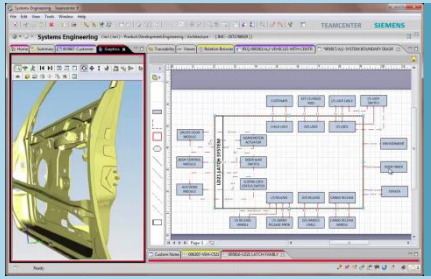
Profibus/Profinet

Machine in Production

PLC

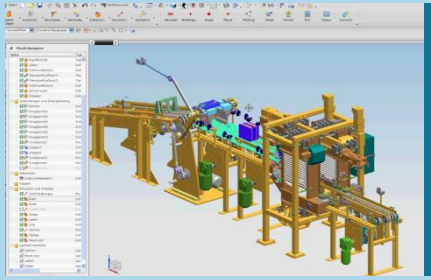
Automation hardware

Take Away
Ensure consistent innovation and safer commissioning



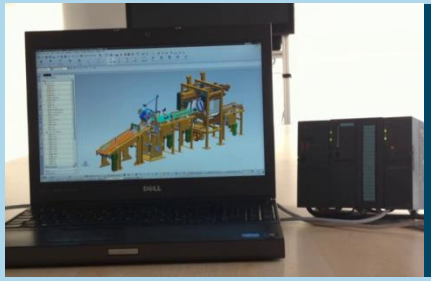
Harness the complexity of the machine

Ensure requirements drive the engineering activities



Reduce innovation risk

Through mechatronics engineering & multidisciplinary collaboration



Regain control over the commissioning phase

By increasing confidence prior to physical commissioning