RollResearch

# Mechatronics Circus & Demo Day

April 7th, 2022

Thomas Widmaier

RollResearch

# Grinding Machine OPC UA
# Data flow to the Smart Factory

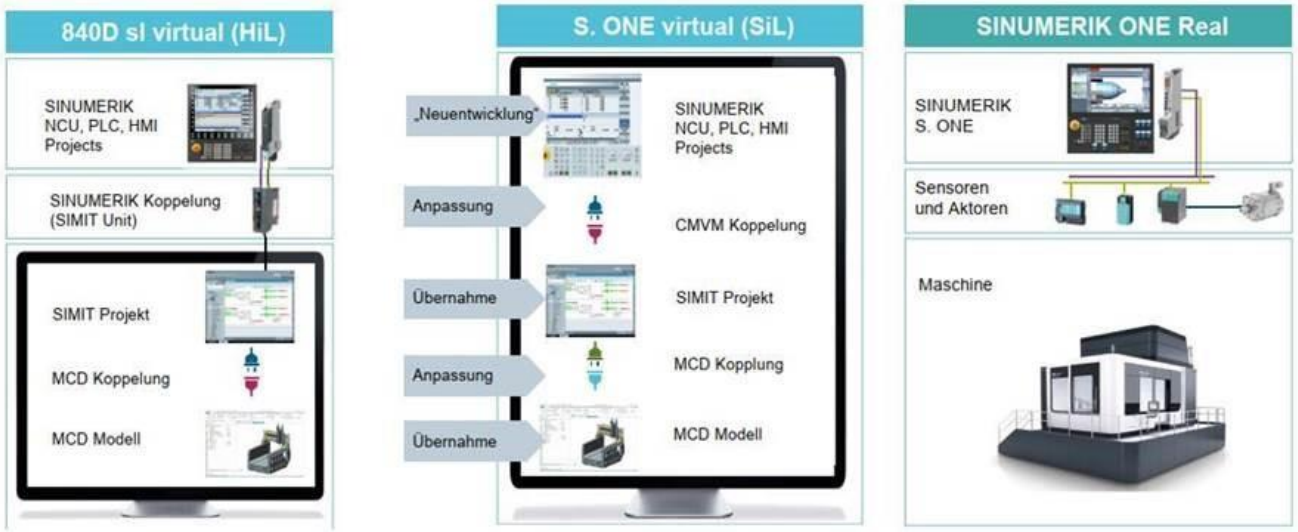
D.Sc. (Tech.) Thomas Widmaier
RollResearch International Oy

RollResearch

# Grinding machine

# Virtual grinding machine

- At least two possibilities to create a virtual grinding machine
  - Real NC hardware operating in simulation mode with a simulation module to simulate attached hardware, e.g., Siemens Sinumerik 840D and Simit
  - Complete simulation software to simulate the NC and attached hardware, e.g., Siemens Sinumerik One Virtual
  - Both possibilities allow the usage of the UPC UA interface



RollResearch

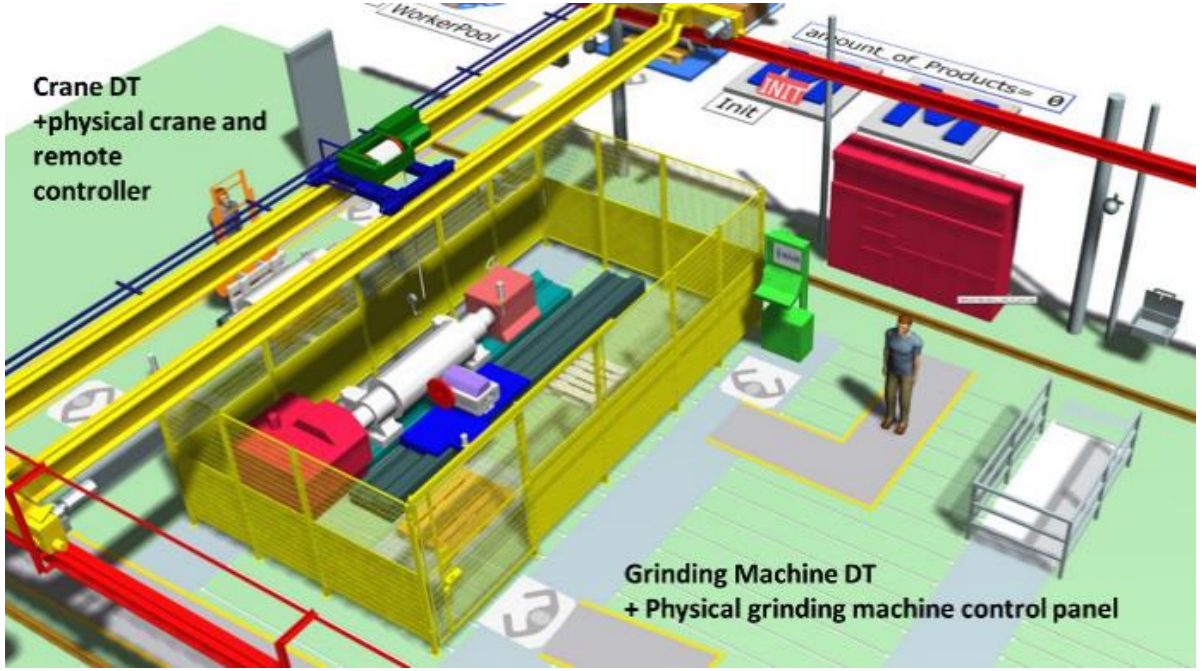
# OPC UA Data flow to the Smart Factory

Virtual grinding machine

RollResearch

# Smart factory

- Has digital twins of real machines
- Kinematic models (requires 3D modelling, e.g, NX, Tecnomatix, etc.)
- Communication over the OPC UA interface
- Connection to factory's ERP or MES systems



RollResearch

# Data flow from the (virtual) grinding machine

- All machines are connected to the factory's ERP or MES system.
- Information from the grinding machine can be divided to three groups:
  - Short term information concerning actual workload and status of the machine,
  - Long term information, e.g., machine efficiency, and
  - Properties and capabilities of the machine, e.g., max. dimensions of the workpieces
- Short term information and Properties and capabilities are also required to coordinate the cooperation of the different machine in the Smart Factory
- Long term information is required for the long-term planning and operation of the factory

RollResearch

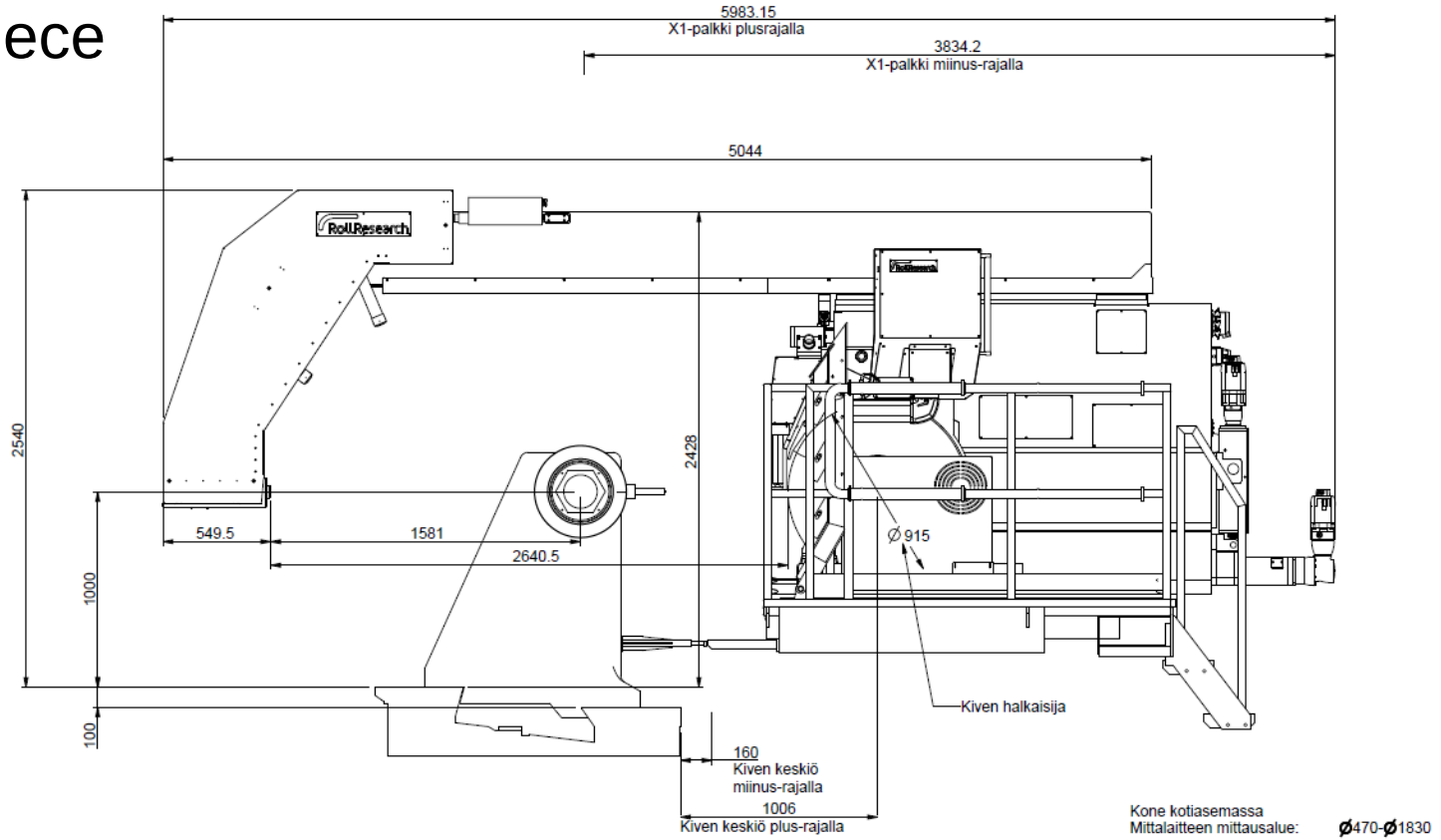
# Short term information

•Short term Information can include:

- Actual workload
- Estimated time when the machine is available for next workpiece
- Short term efficiency, e.g., removed material from the workpiece and wear
  of the grinding wheel => wheel efficiency
- Name or ID of the workpiece
- Name or ID of the grinding wheel
- Name or ID of the operator
- Coordination between the grinding machine and other machines, e.g., crane

# Properties and capabilities

- Workpiece types (rolls) that can be ground with the machine
- Max. dimensions for the workpiece
- Max. weight



RollResearch

# Long term information

- Mainly statistical data:
  - Overall efficiency, including:
    - Grinding wheel efficiency,
    - Ground rolls per time unit,
    - Operator efficiency,
    - Average grinding durations,
    - Etc.
  - Help for planning
    - Out of service time (per time unit),
    - Planned service times
    - Etc.

RollResearch

# Thank you for your attention