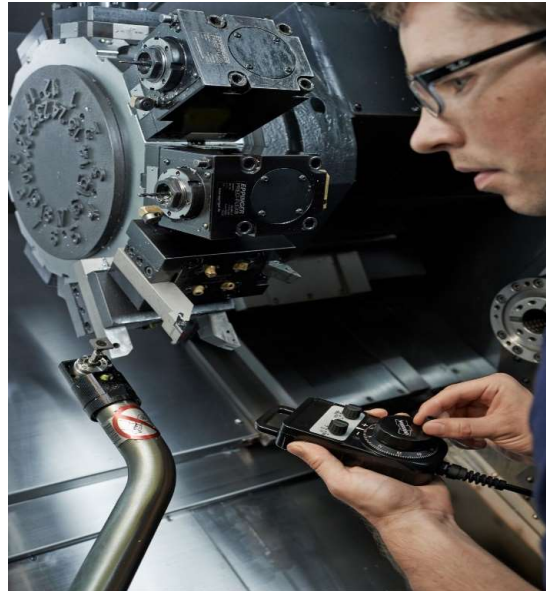# Run MyVirtual Machine

From virtual commissioning to job preparation

SIEMENS

How to improve production processes?

Extended Delivery time for machine and components

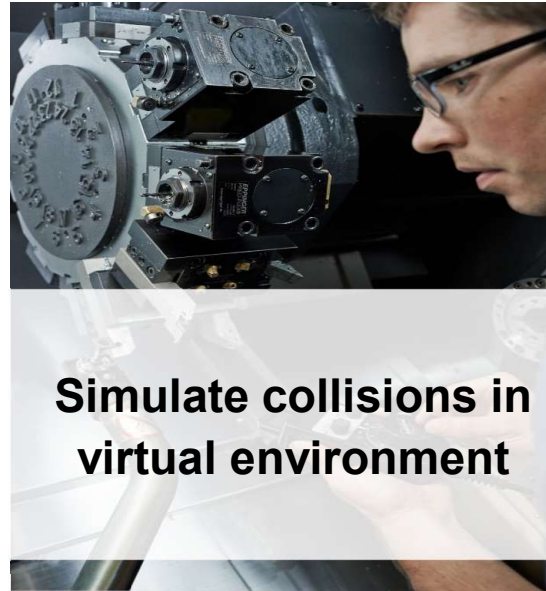Machine collisions cause additional costs and time delay for spare parts delivery

High effort and cost to setup and to maintain a training and showroom facility

SIEMENS

How to improve production processes?

Do not waste the time – start with a digital twin

Simulate collisions in virtual environment

Offer virtual trainings with same behavior and look&feel as the real machine

Extended Delivery time for machine and components

Machine collisions cause additional costs and time delay for spare parts delivery

High effort and cost to setup and to maintain a training and showroom facility

SIEMENS

Where a digital twin is created and how can I get it for my job preparation?

Scalable and virtual machine engineering at **machine manufacturer…**

Create MyVirtual Machine

…can be reused at **machine user** for scalable and virtual job preparation

Run MyVirtual Machine

SIEMENS

The digital twin unites all relevant technical departments and enables end-to-end collaboration
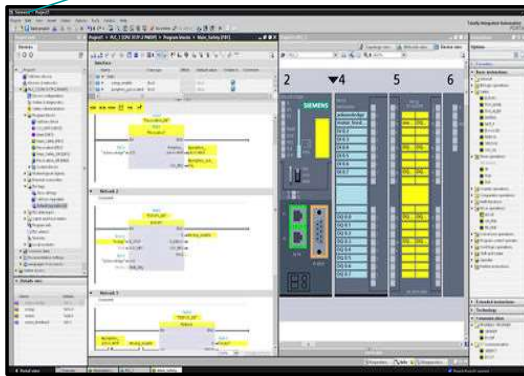

Scalable and virtual machine engineering at machine manufacturer…

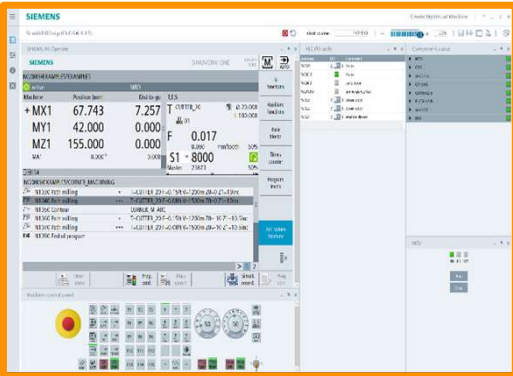**Logic creation & configuration** (PLC)

NC/PLC/HMI Simulation & Test

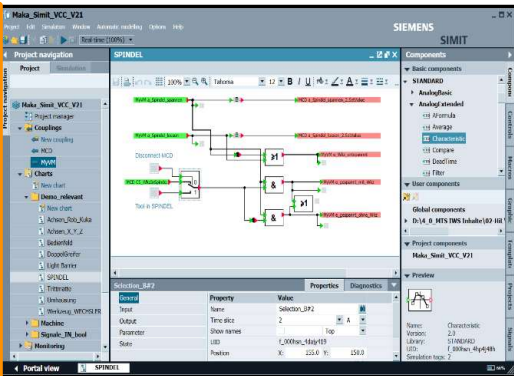**Periphery simulation** (Inputs / Outputs)
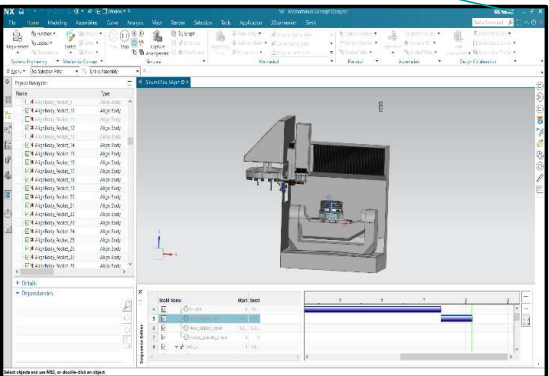
3D Mechatronics simulation
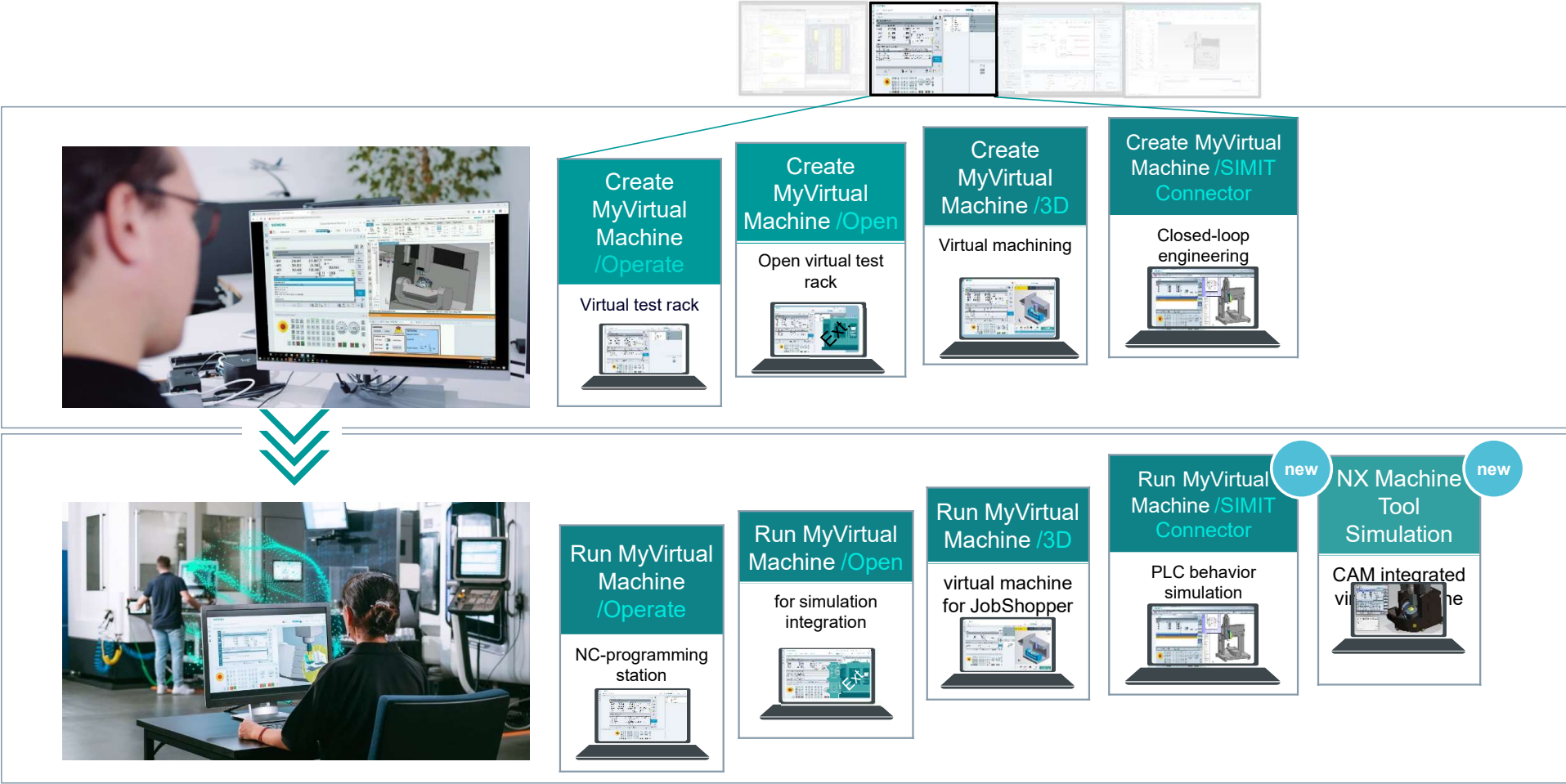
TIA Portal

Create MyVirtual Machine

SIMIT Simulation Framework

Mechatronics Concept Designer

Create MyVirtual Machine is the central CNC virtual element on which most operations can be tested

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Where a digital twin is created and how can I get it for my job preparation?

Create MyVirtual Machine /Operate
Virtual test rack

Create MyVirtual Machine /Open
Open virtual test rack

Create MyVirtual Machine /3D
Virtual machining

Create MyVirtual Machine /SIMIT Connector
Closed-loop engineering

Run MyVirtual Machine /Operate
NC-programming station

Run MyVirtual Machine /Open
for simulation integration

Run MyVirtual Machine /3D
virtual machine for JobShopper

Run MyVirtual Machine /SIMIT Connector (new)
PLC behavior simulation

NX Machine Tool Simulation (new)
CAM integrated virtual machine

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Run MyVirtual Machine /Operate
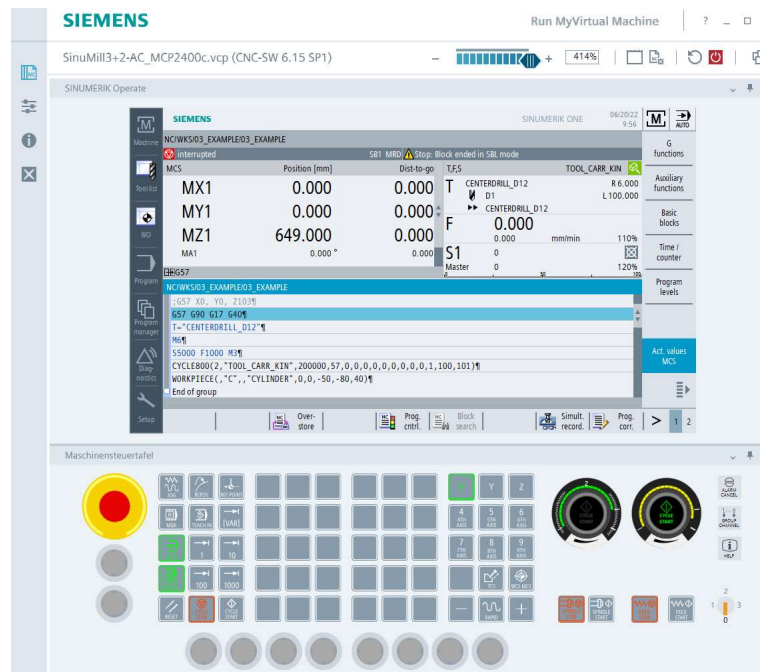# Original CNC architecture and identical operation of the machine

NC program check and machining time estimation **+**

Original Operate HMI with OEM applications **+**

Verification of the postprocessor **+**

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Run MyVirtual Machine /Open
API interface for connection to other simulation systems
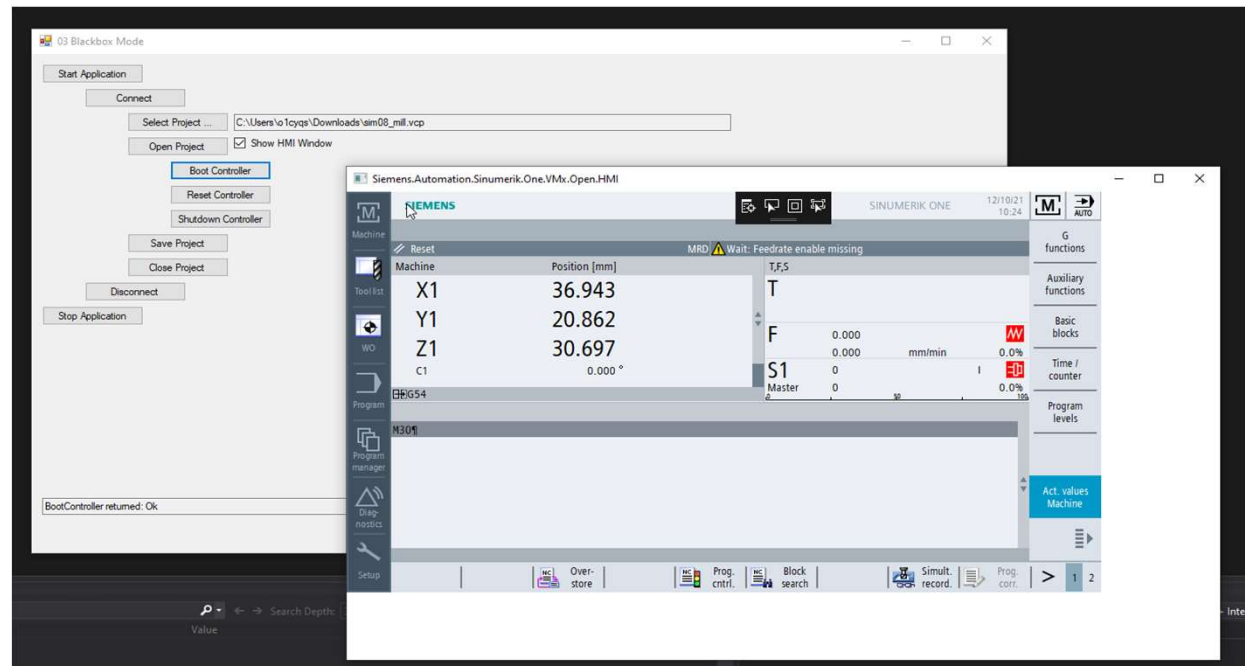

.NET/ C++ programming interface

＋

Realization of test automation

＋

Flexible integration into existing 3D simulations

＋

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Run MyVirtual Machine /3D
Integrated 3D simulation without CAD-CAM environment

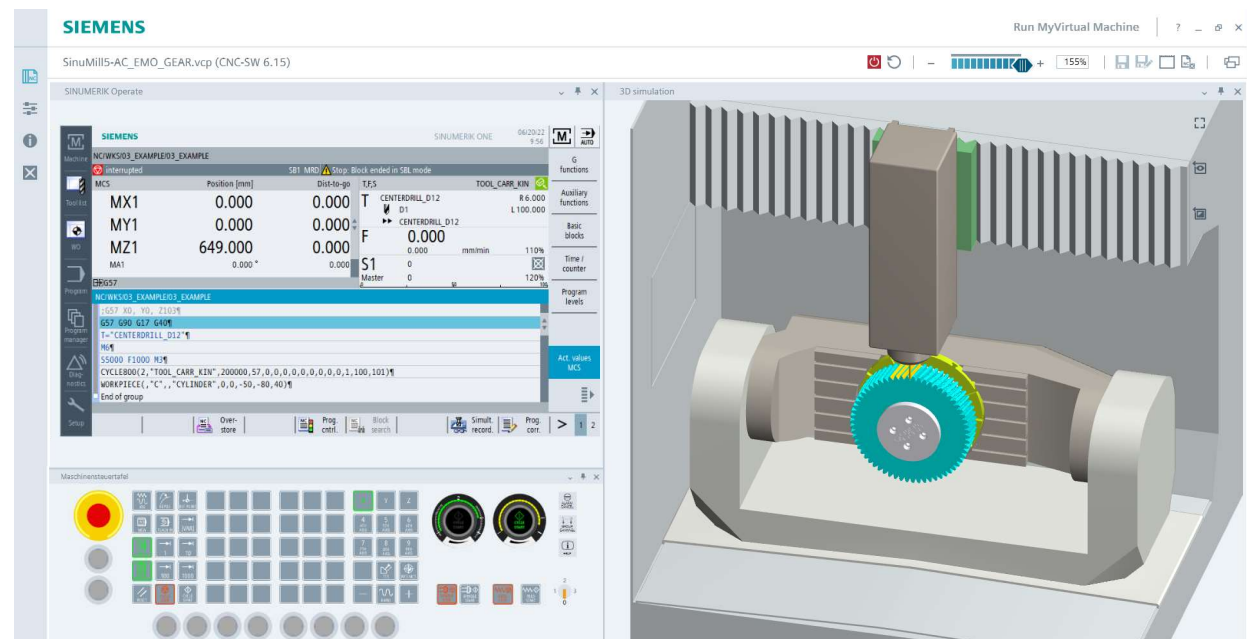NC program verification
with kinematics simulation
+

Collision detection
and analysis
+

Library with tools, clamping,
blanks
+

Ideal for trainings
+

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Run MyVirtual Machine /SIMIT Connector
Runtime environment of virtual commissioning for machine user
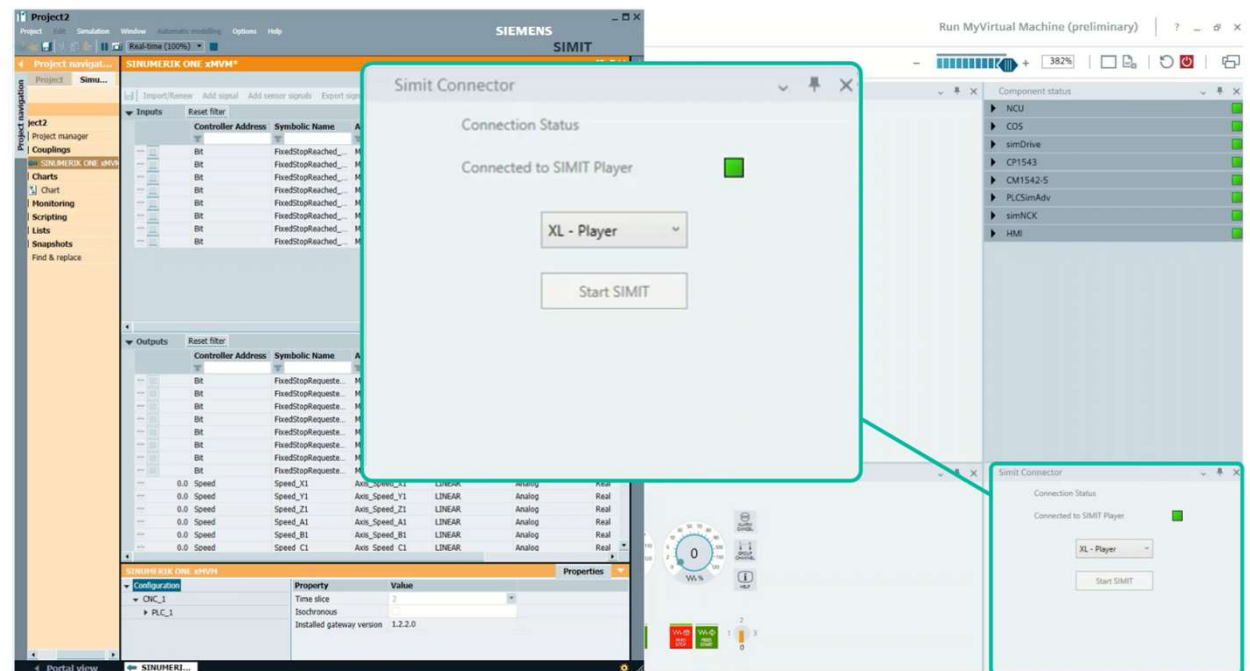
Behavior simulation of the complete machine including auxiliary units, specific control panels, etc.

Archiving of the SIMIT project into the Run MyVirtual Machine project (.vcp)

Operation but no modifications to the behavior models

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Material removal and comprehensive collision detection with NX Machine Tool Simulation

NX Machine Tool Simulation

Integrated CAD-CAM-CNC chain with full scope of SINUMERIK "language" ➕

Interaction with integrated virtual PLC (gripper, handler, tool change, etc.) ➕

Build-in NC code editor and program management (cycles, and subprograms, etc.) ➕

Machining time and machine status analysis (e.g. cutting and secondary times optimization) ➕

Supporting numerous technologies (mill-turn, swiss-lathe, robotics, additive, etc.) ➕
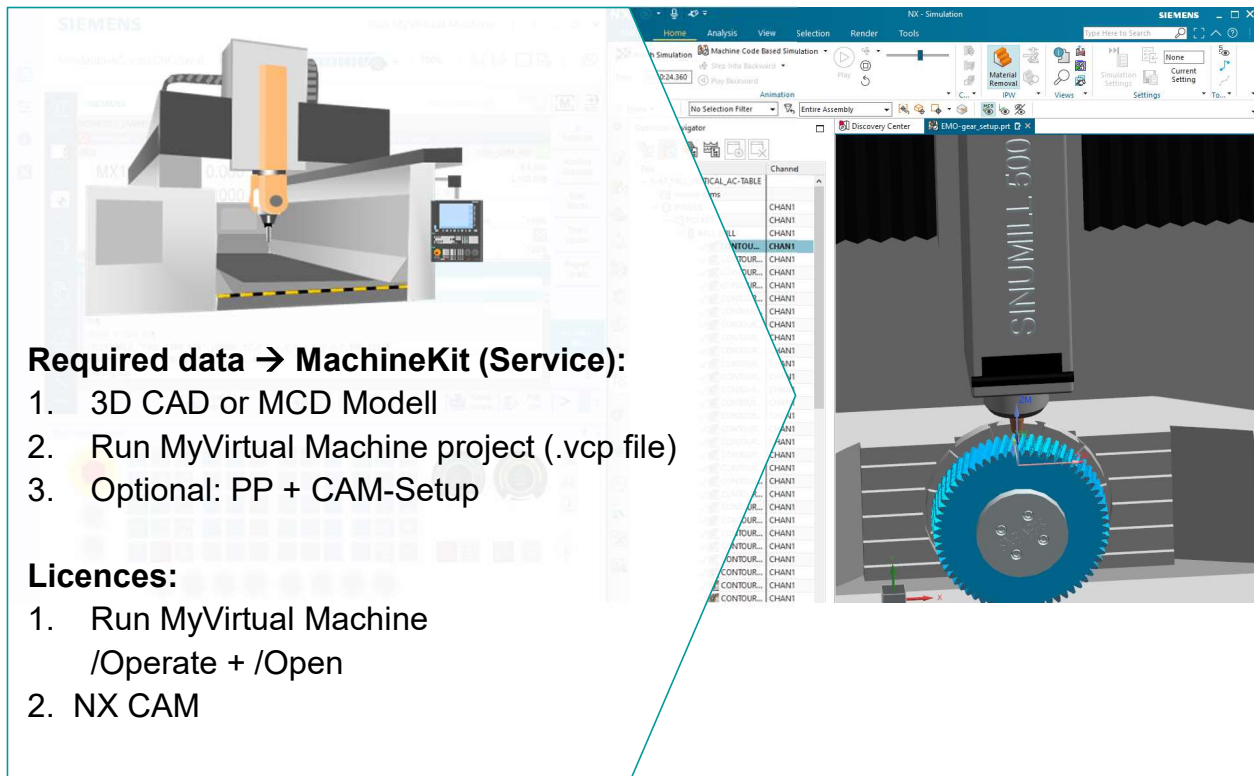
Required data → MachineKit (Service):
1. 3D CAD or MCD Modell
2. Run MyVirtual Machine project (.vcp file)
3. Optional: PP + CAM-Setup

Licences:
1. Run MyVirtual Machine /Operate + /Open
2. NX CAM

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What is the Digital Twin and what is the software?

Machine Manufacturer

OEM A   **Create MyVirtual Machine V1.1**
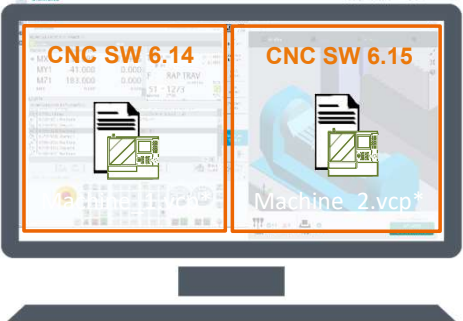
OEM B   **Create MyVirtual Machine V1.2**

Machine User

Run MyVirtual Machine V1.x

* virtual commissioning project –
intellectual propery of OEM
Create & Run MyVirtual Machine –
software to create /execute vcp file

+ One application for all projects and CNC software versions

+ Common database (vcp) for OEM, service and user

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Create MyVirtual Machine (CMVM) vs. Run MyVirtual Machine (RMVM)
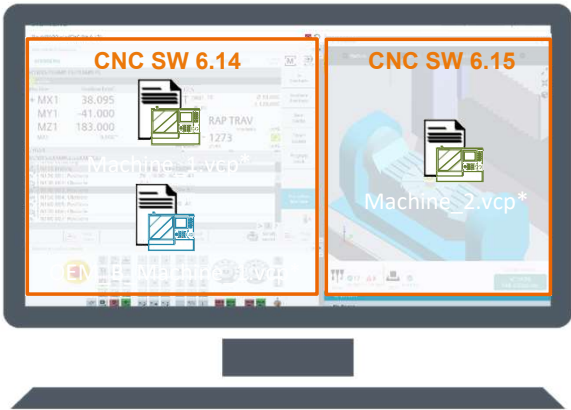# Function differences

Functions	Create MyVirtual Machine	Run MyVirtual Machine	Explanation and applications
Project management			
• **Creating new projects (VCP)**	✓		Project for using in RMVM/CMVM
• **Opening a project (VCP)**	✓	✓	
• **Using template machines**	✓	✓	Siemens example machine projects included
• **Save / Save as**	✓	✓	Saves all project changes in the configuration
SINUMERIK access levels			
• **Service and manufacturer access**	✓		Changes to the machine data for commissioning
• **Key-operated switches 1-3 + user access**	✓	✓	3 access levels, e.g. editing programs and cycles
Settings and functions			
• **NCU control board**	✓		Displaying PLC status (Run, Stop, Error)
• **Mechanical properties**	✓		E.g. brake states and spindle pitch
• **PLC input / output table**	✓	✓	Input: toggle switches; output: LEDs for the PLC
• **Projects settings**	✓	✓	Information on the VCP project, e.g. GIV version, path
• **Machine control panel**	✓	✓	Machine operation (edit function only in CMVM)
Commissioning / diagnostics			
• **PLC project upload from virtual control**	✓		Loading the PLC project from CMVM to TIA project
• **PLC project download from virtual control**	✓		Downloading a created TIA project into CMVM
• **Generating archives (.dsf)**	✓		Exporting a NC archive for a real machine
• **Reading in archives (.dsf)**	✓		Reading in an NC archive of the real machine
• **TIA Portal online connection and diagnostics**	✓	✓	Online connection of virtual controller and TIA portal, e.g. for diagnostic of PLC blocks

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Use-Cases

Use of the digital twin in everyday business

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Machine in delivery
Faster start of production
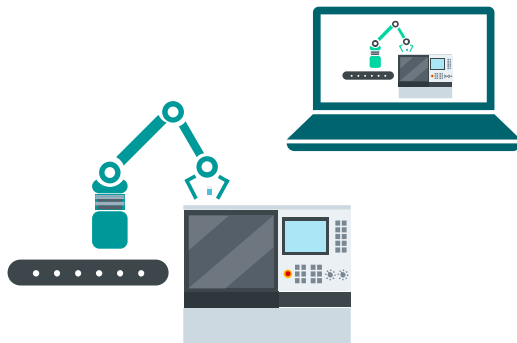
Machine Manufacturer	**Delivery**	**Machine User**

Virtual preparation

Ramp-up time

2 Weeks compared to 5 w/o digital twin
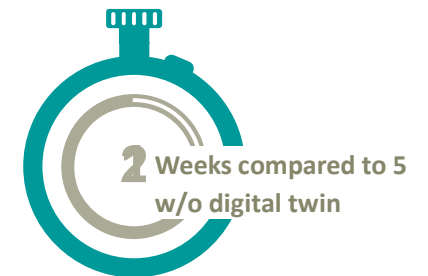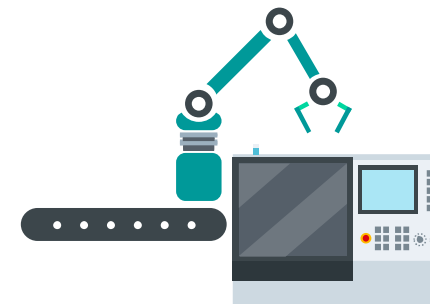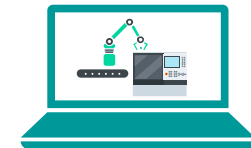
✓ Regular interaction with machine buyer and pre-acceptance tests using the digital twin

✓ Significant reduction of ramp-up time for machine user based on preparation on a virtual model

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Machine in operation
The digital twin as a training environment

Machine Manufacturer

Machine User

✓ Time and location-independent training via Teams, Skype & Co.
✓ Safe training environment also for self-learning
✓ Learning without interrupting the machine or even production

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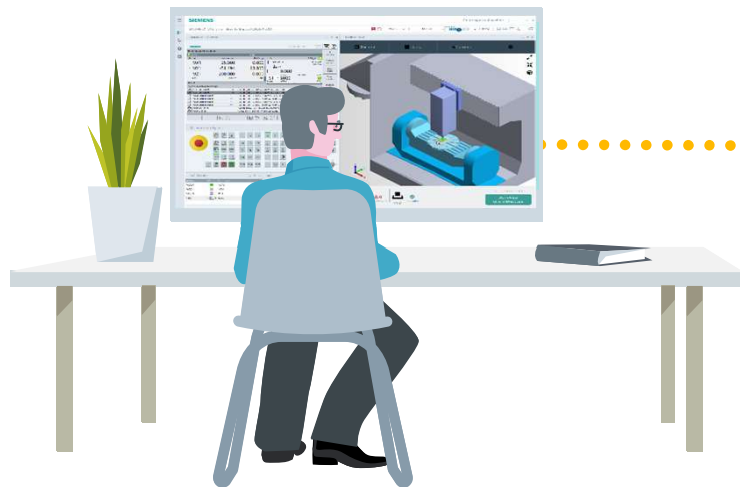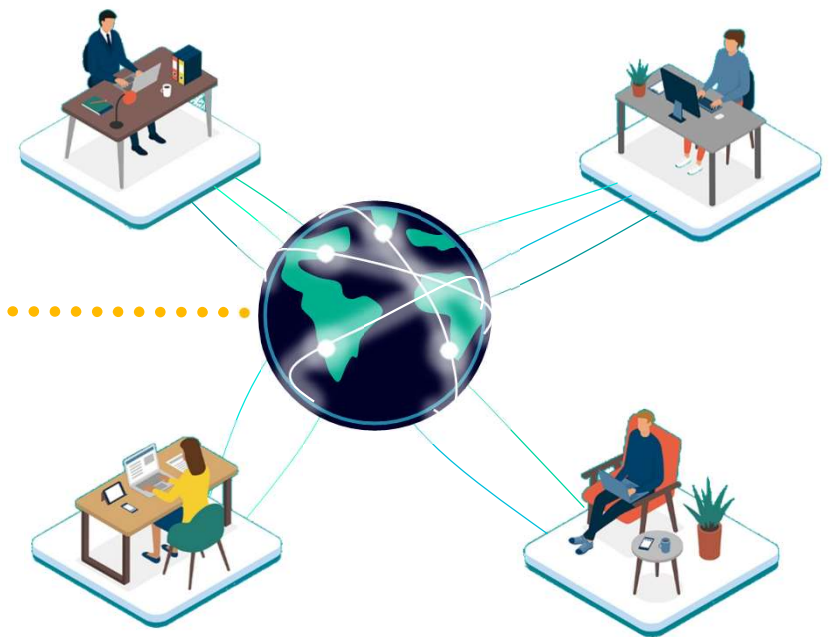
Machine operation
Export of a digital twin for work preparation

Work preparation

Work execution

✓ Virtual run-in NC program
✓ Collision check
✓ Machining time estimation
✓ Post processor test

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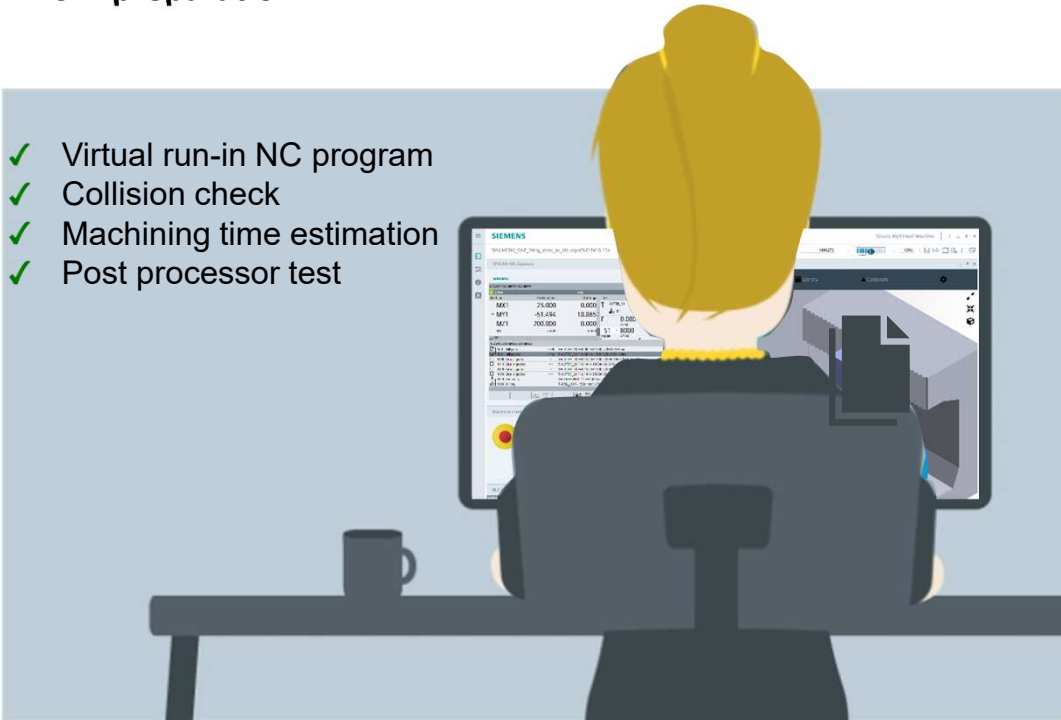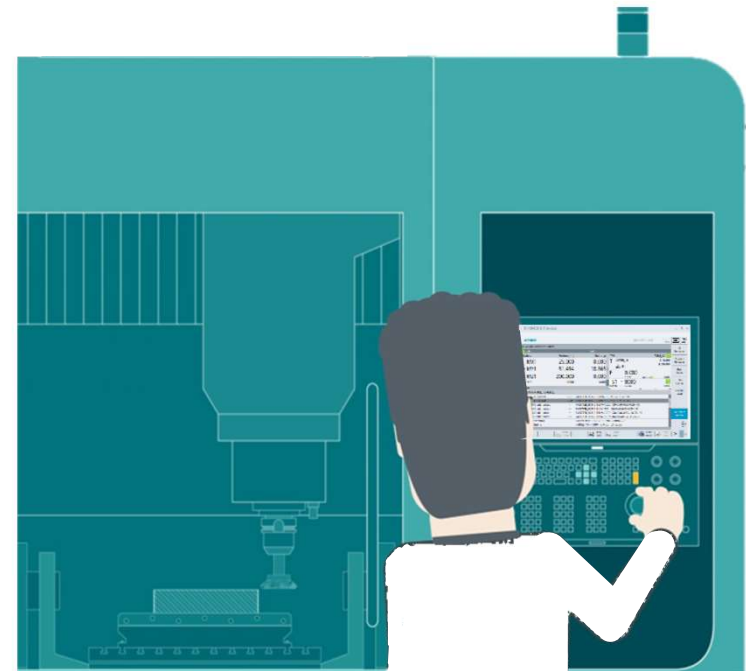
Machine in service
Reuse of digital twin for service and after sales

Machine Manufacturer

Machine User

✓ Reuse existing machine model to reproduce customer's problem
✓ Aftersales: Evaluation of the implementation of subsequent customer requests with the help of the digital twin

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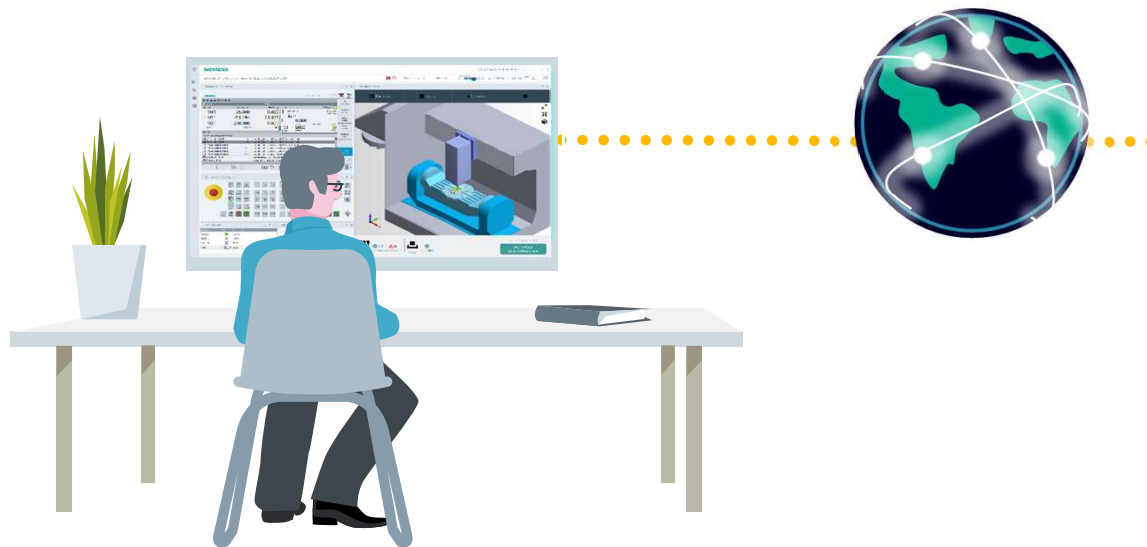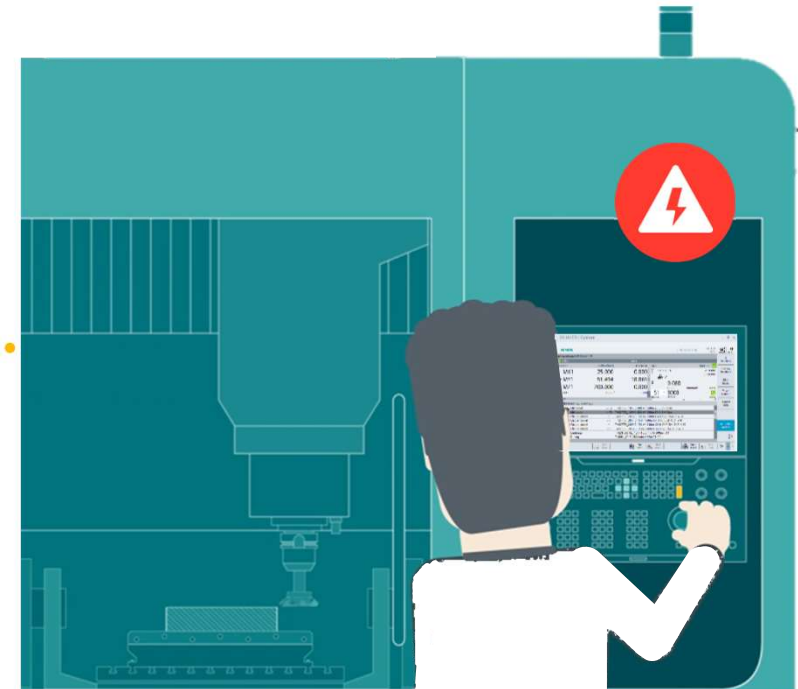
Value creation with the digital twins in machine engineering and operation

CAD design of the machine	Kinematization, mech. concept, phys. behavior model	Dig. control cabinet as behavior model of the I/O devices	Virtual CNC with NC, PLC, HMI

Commissioning

NX CAD	NX MCD	SIMIT	Create MyVirtual Machine /Operate + /SIMIT Connector

Teamcenter

Exchange kinematization and virtual control projecting

Work preparation

NX CAD	NX CAM	Post processor	NX Machine Tool Simula... Run MyVirtual Machine /Operate +/Open...

CAD design of the workpiece	Generation of tool path and production strategy	Compilation of tool path into specific G code	Integr. simulation in NX CAM based on org. control behavior

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Ordering data and logistics

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Run MyVirtual Machine
Ordering data

Product	License-type	Product-ID
Run MyVirtual Machine /Operate	Floating Academics[1]	MCS4220 MCS4220a
Run MyVirtual Machine /Open	Floating Academics[1]	MCS4230 MCS4230a
Run MyVirtual Machine /3D	Floating Academics[1]	MCS4240 MCS4230a
Run MyVirtual Machine /SIMIT Connector	Floating Academics[1]	MCS4075f MCS4075a

Floating: server based licenses, can be used with several working stations (not simultaneously). Recommend to order

[1]**Academics:** for non commercial use. Available as floating only

- Fore more information request detailed license description

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NX Machine Tool Simulation
Products, Services and Licenses – Virtual Controller

DISW Product Portfolio	Motion Control Product Portfolio	Customer Services
NX CAM bundled simulation NX CAM high value bundle (e. g. Total Machining) with **NX Machine Tool Simulation Addon - NX30434 included** CAM Base Package + **NX Machine Tool Simulation Addon NX30434** **NX Machine Tool Simulation Advanced - NX11431** **NX Machine Tool Simulation - NX11435**	**SINUMERIK ONE** **MCS4220 Run MyVirtual Machine / Operate** **MCS4230 Run MyVirtual Machine / Open**	**Customer Services** Implementation Package by OEM, MC or local DISW partner Alternatively: **MC4R26VM31 NX Machine Tool Simulation Tool Engineering** Controller Copy Machine Tool Model End-customer support

Sale and implementation services requires involvement of Siemens DI SW + Siemens MC + OEM

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