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mes Training Curriculums

INDI4.0 Project Stuttgart | 06/2021 Workshop documents Intellectual Output “O2”

Manufacturing Execution System

with Siemens TIA Portal
OPC-UA Client Server

Learning situation:	Establishing and testing an OPC-UA communication between PLC (server) and a software application (client)

Competence area / subject:	Professional competence
School type / occupational field / occupation:	Vocational / technical school / electrical engineering / mechatronics

- Requirement area:	Compare and select communication interfaces of an MES. Configure the selected interface
Time range:	2 units
Learning factory:	Festo CP-Factory and CP-Labs, module turning
Technical settings:	Beamer, PC with Windows, tablet (WLAN), S7 1500 CPU
Software:	OPC UA clients with .NET from SIEMENS / TIA V14

Brief description and learning objectives this lesson sequence:

- Configuration of the OPC UA client
- Testing the "data exchange" OPC UA Client / TIA Portal

Information about the learning factory

The i4.0 project Offenburg comprises three pillars:

1. **Expansion of the basic laboratory** Drive technology
   The basic laboratory was additionally equipped with a servo machine test bench for examining the various electrical machines from Lukas-Nülle. Part of the acquisition is also the Interactive Lab Assistant from Lukas Nülle, with whose help the pupils can work on the interactive experiment setups.

2. **Basic control technology laboratory** with 4 CP Labs from Festo Didactic.
   The CP Labs are equipped with the application modules "turning", "stacking magazine", "measuring analog", "workpiece output". A CPU 1512 from Siemens is located in each CP Lab. Another module is additionally equipped with an industrial camera from Sick and a module with a Keyence SR-2000 industrial camera for the recognition and evaluation of QR codes by the PLC

3. **CP Factory Industry 4.0** from Festo Didactic with the modules “high-bay warehouse”, “basic module switch”, “robot assembly cell with Kuka KR6”, “robot loading cell with Kuka KR6”, “CNC Con-

cept Mill 55”, “basic module with application turning”, “basic module with Analog measurement application "," Basic module with drilling application "," Basic module with pressing application "," Basic module with heating application "," Basic manual workstation module "," Docking AGV "module and self-propelled AGV system" Robotino ".

Further information can be found under the following links:

Festo company:
https://www.festo-didactic.com/de-de/lernsysteme/lernsysteme-fuer-industrie-4.0

Lucas Nülle company
https://www.lucas-nuelle.de/191/apg/2/Produkte/Maschinen-Antriebstechnik.htm

Goal analysis for the binding classification in the learning area lessons / for the course planning:

competency-based goals (1: 1 from BP)	Contents (1: 1 from BP)	Action result	interdisciplinary skills
There is not any	There is not any		

Progress planning

Methodical and didactic information

dura-tion	phase	What is learned Desired competencies	How do you learn? Action of the teacher	 Action of the pupils	media	material	Cooperation, notices, Explanations
10	E.	Recognize topic or task / problem.	-> How can the communication between the OPC UA client and server be tested? Discussion and issue AB.		PC, B	CPU S7-1500, TIA V14, OPC UA Client, AB	AB -> 2. UE Doc 02 Works-heet.docx
15	ERA	Start the client	Brief instruction regarding: Possibility Number 1 Discussion of step-by-step in-structions. Possibility 2 Meeting downloaded docu-mentation.	Work independently on the task at hand according to one of the two options. Look for the following .exe - "UA Client.exe" in the file directory of the previously downloaded file and start it.	PC, TT, AB	CPU S7-1500, TIA V14, OPC UA Client,	AB -> 2. UE Doc 02 Works-heet.docx
15	ERA	Establishing a connection to the server.		Adjust the IP address. Can all "endpoints" be dis-played. Select connection type "No-ne". "Establish" connection with	PC, TT, AB	CPU S7-1500, TIA V14, OPC UA Client,	AB -> 2. UE Doc 02 Works-heet.docx

				the server.			
10	ERA	Creation of variables for OPC UA communication on the server (PLC).		Create data block. Create "test variables". Load program into PLC.	PC, TT, AB	CPU S7-1500, TIA V14, OPC UA Client,	AB -> 2. UE Doc 02 Works-heet.docx
15	ERA	Browse in the address space of the OPC UA server.		Establish a connection to the OPC UA server. "Browsing" through the individual nodes in the address space of the OPC UA server. Find the right node.	PC, TT, AB	CPU S7-1500, TIA V14, OPC UA Client,	AB -> 2. UE Doc 02 Works-heet.docx
10	ERA	Reading and writing of variables via the OPC UA communication.		Read and write individual variables.	PC, TT, AB	CPU S7-1500, TIA V14, OPC UA Client,	AB -> 2. UE Doc 02 Works-heet.docx
15	K	Knowledge building		Hold knowledge / s on the AB. Present the result (s), describe the procedure, point out any problem (s) that have occurred and point out possible solutions.	PC, TT, AB, B, D		AB -> 2. UE Doc 02 Works-heet.docx

Abbreviations:

Phase:	BA = processing, E = opening of lessons, ERA = development, FM = support measure, K = consolidation, KO = confrontation, PD = pedagogical diagnosis, Z = summary; R = reflection, T = review
Media:	AP = audio player, B = projector, D = document camera, LB = textbook, O = overhead projector, PC = computer, PW = pin board, T = blackboard, TT = tablet, WB = whiteboard; SPH = smartphone; ATB = Apple TV box
Further Abbreviations:	AA = work order, AB = worksheet, AO = advance organizer, D = file, DK = documentation, EA = individual work, FK = professional competence, FOL = slide, GA = group work, HA = homework, HuL = action and learning situation, I = Information, IKL = I can list, KR = competence grid, L = teacher, LAA = work order solution, LF = learning area, LNF = learning factory, O = folder, P = plenum PA = partner work, PPT = PowerPoint presentation, PR = Presentation, SuS = pupils, TA = blackboard, ÜFK = transferable skills, V = video
Learning phase:	k = collective, cooperative = cooperative, i = individual