

Finding my desired service @ run time

Productive 4.0 Eisenstadt Workshop online
Tuesday, March 24, 2020

Alternative titles:

- Interoperability with a digital twin
- Indexed assembly line with PLC having an OPC-UA server

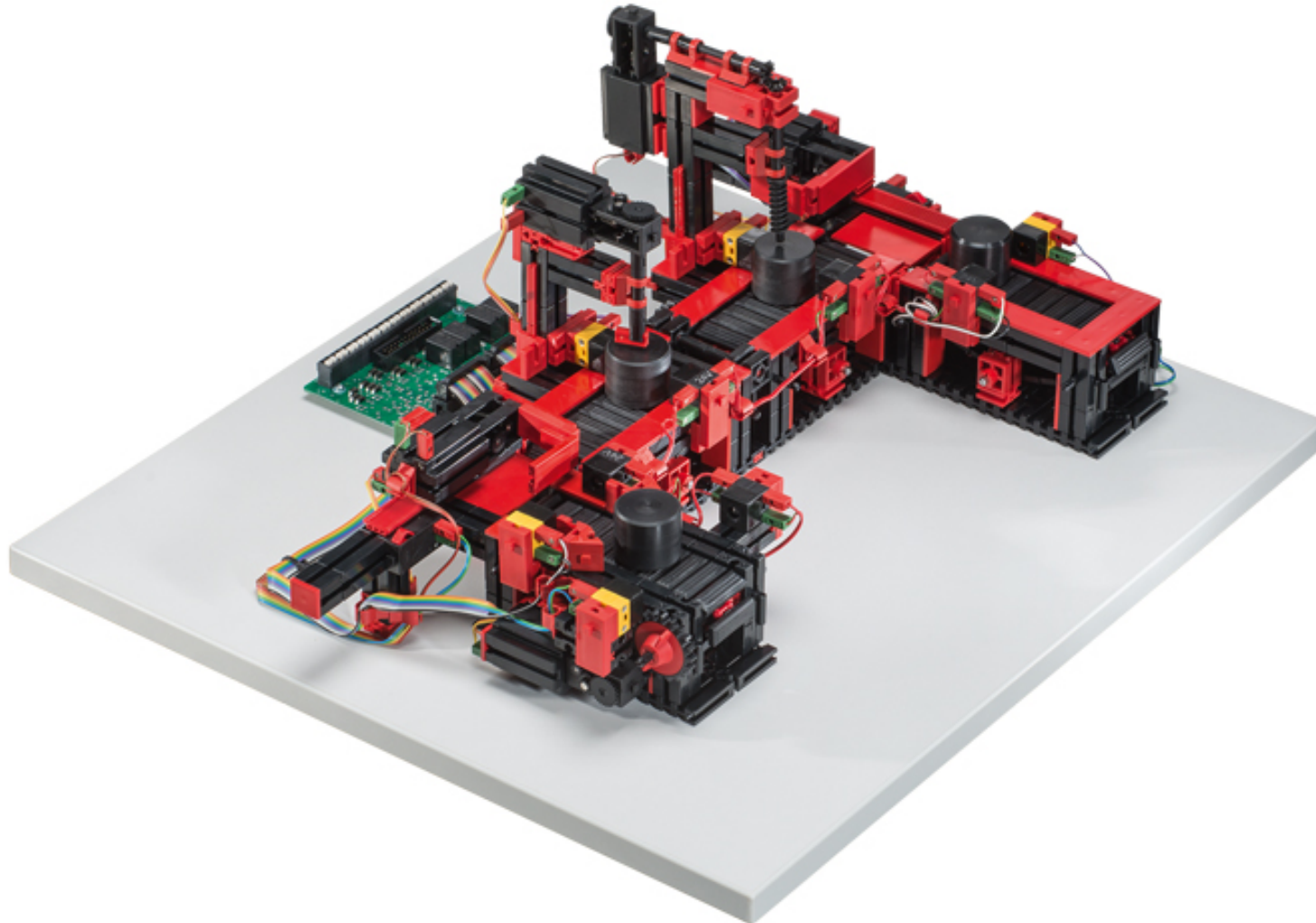


The project receives grants from the European H2020 research and innovation programme, ECSEL Joint Undertaking, and National Funding Authorities from 19 involved countries under grant agreement no. GAP-737459 - 999978918.



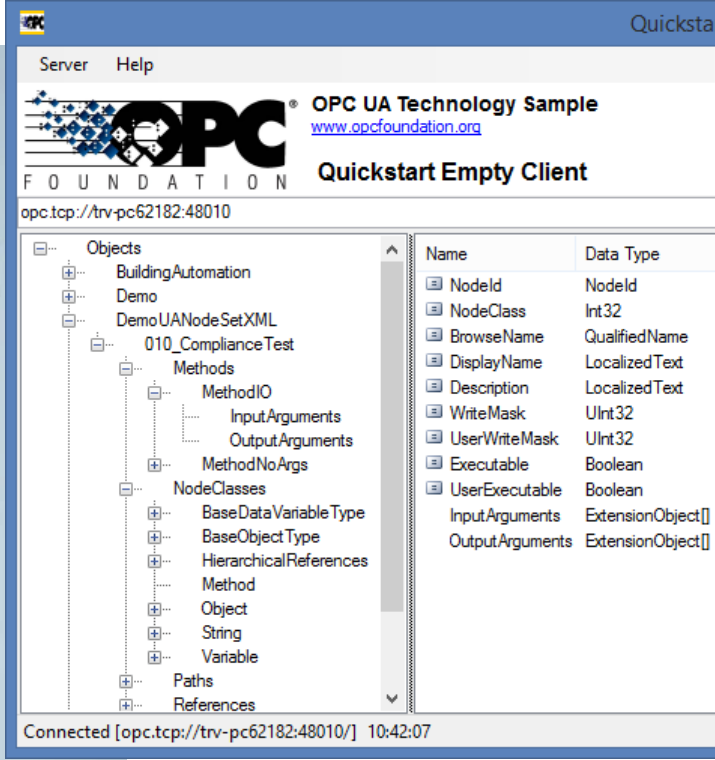
Indexed line with 2 machining stations

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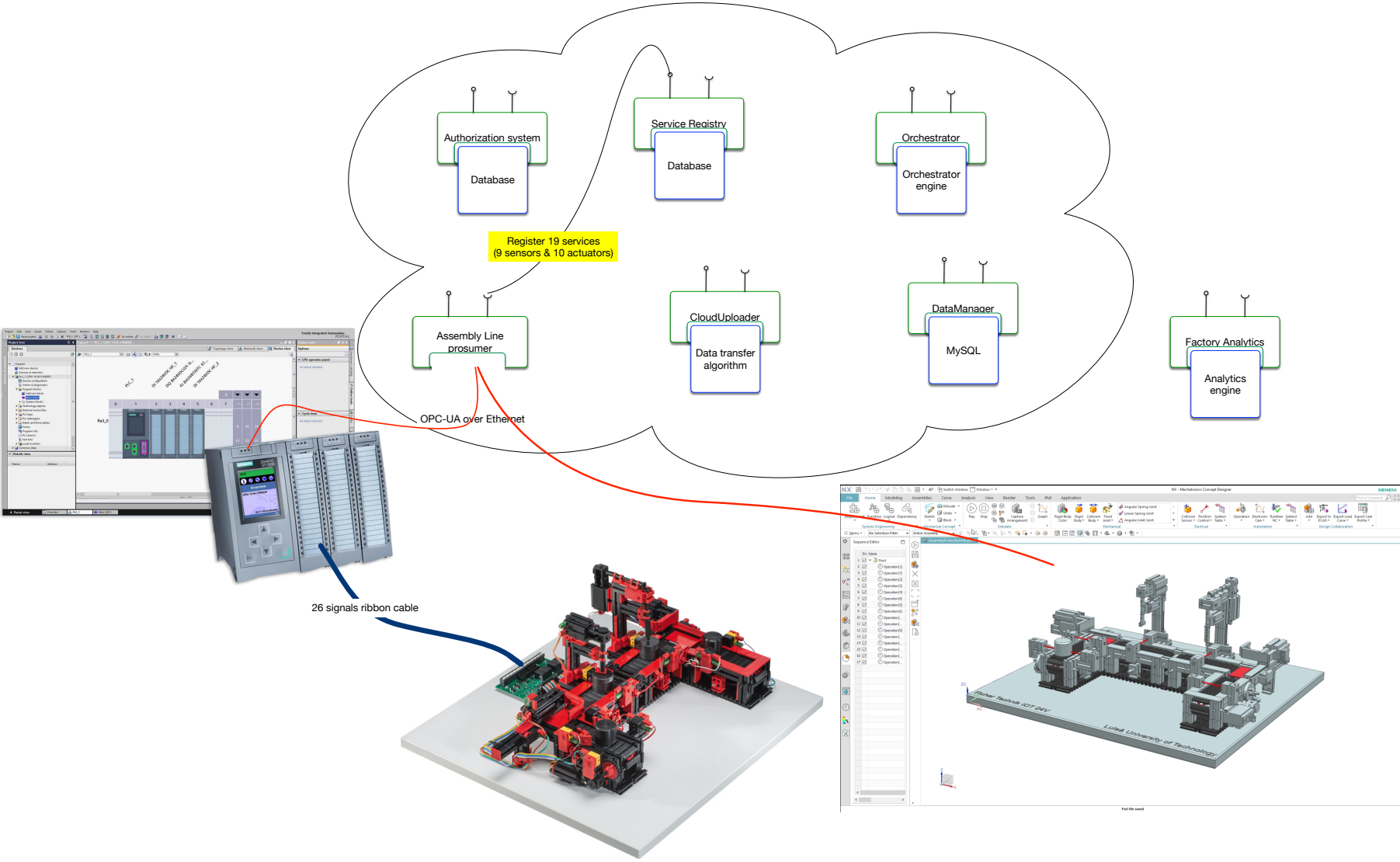
- Two machining Stations
 - Milling
 - Drilling
- Four Conveyor Belts
- Two Sliders
- Nine Sensors
- Ten Actuators

SOA offered by OPC-UA on a Siemens PLC



Loose coupling?
Binding at run time?

Making use of the Arrowhead Framework



“Googling” for a service at runtime with the Orchestrator

The screenshot displays an IDE window with the following components:

- Project Explorer:** Shows a multi-module project structure including `OPC_UA_Interface`, `client-skeleton-consumer`, and `client-skeleton-provider`.
- Code Editor:** Displays the `ProviderController` class with two REST endpoints:
 - `readVariableNode`: A GET endpoint that reads a variable from the OPC-UA service. It includes a comment: `// FIXME Double-check that the token security prevents tampering with variables in the OPC-UA it is not supposed to access (I.e. only allows access to the variables in the Service Registry)`. The code uses `OPCUAInteractions.readNode` and replaces a placeholder in the response body.
 - `writeVariableNode`: A POST endpoint that writes a value to the OPC-UA service. It uses `OPCUAInteractions.writeNode` and checks for security conditions.
- Run Console:** Shows the application's startup logs and user input. Key messages include:
 - Application initialization for `OPCUAInterface` and `OPCUAConsumer`.
 - Log messages: `main] e.a.c.l.c.ApplicationInitListener : Security mode: SECURE`, `Client CN: consumer_skeleton.testcloud2.aitia.arrowhead.eu`, `'SERVICE_REGISTRY' core system is reachable.`, and `'ORCHESTRATOR' core system is reachable.`
 - User input: `Enter the device Name: Sensor/Actuator/All`, `Enter the device Type Name: Phototransistor/Pushbutton/Motor/Conveyorbelt/slider/All`, `Enter the Location : Loading/Milling/Drilling/OffLoading/All`, `Enter the instance number: One/Two/All`.
 - Service responses: A series of status checks for various devices, e.g., `Service response: Status of 'I1 Push-button slider 1 front' is {false}`.
 - Final output: `Do you want to start the Factory: Yes/No` (No), `Exiting code!!!`, and `Process finished with exit code 0`.

Videos of the models

- fischertechnik indexed line: http://staff.www.ltu.se/~deventer/afdemo/IMG_1236-1.mov
- Siemens NX with MCD twin: <http://staff.www.ltu.se/~deventer/afdemo/fischertechnikP4.mp4>