

FACTORY IN A BOX

The design of the flexible, lab-scale production cell

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Website: <https://github.com/jku-isse/factory-in-a-box>

Objectives

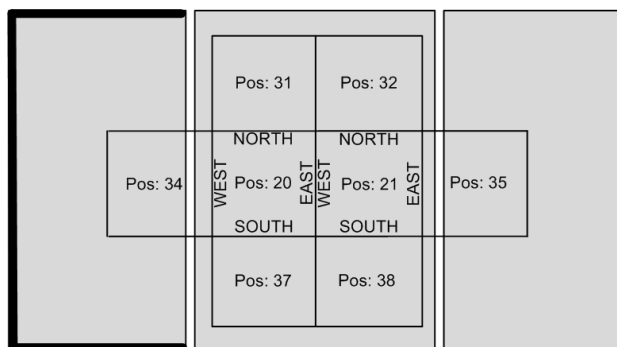
The purpose of Factory in a Box is to demonstrate adaptability on the shop floor:

- Adapt the shop floor layout: machines and turntables can be flexibly arranged
- Adapt the production process: users can select which drawings (from a selection) should be plotted (thus making every product different from the previous one)
- Adapt the production schedule: production jobs are allocated to machines dynamically depending on machine availability (independent of current shop floor layout).



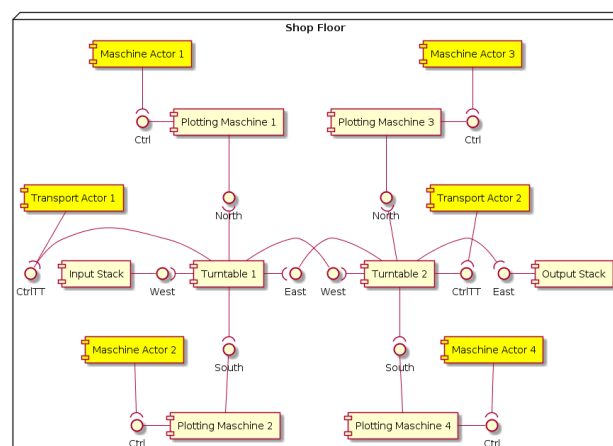
Physical Layout

Factory in a Box consists of a grid layout where each grid cell is assigned a position number based on IP address.



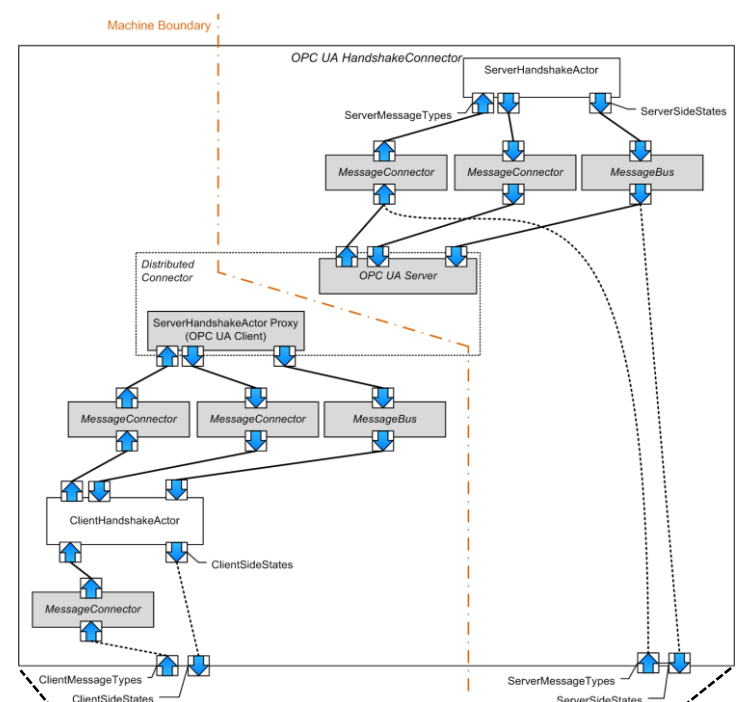
Logical M2M Layout

Machines communicate directly across grid cell boundaries to handover pallets. Turntables in the middle connect to Input-, Output-, and Plotter-Stations as well as other Turntables.



Software Architecture

Factory in a Box follows an architectural style that allow for easy replacement of components and connectors, thus facilitating testability, adaptability, evolution, and maintenance.



Technical Details

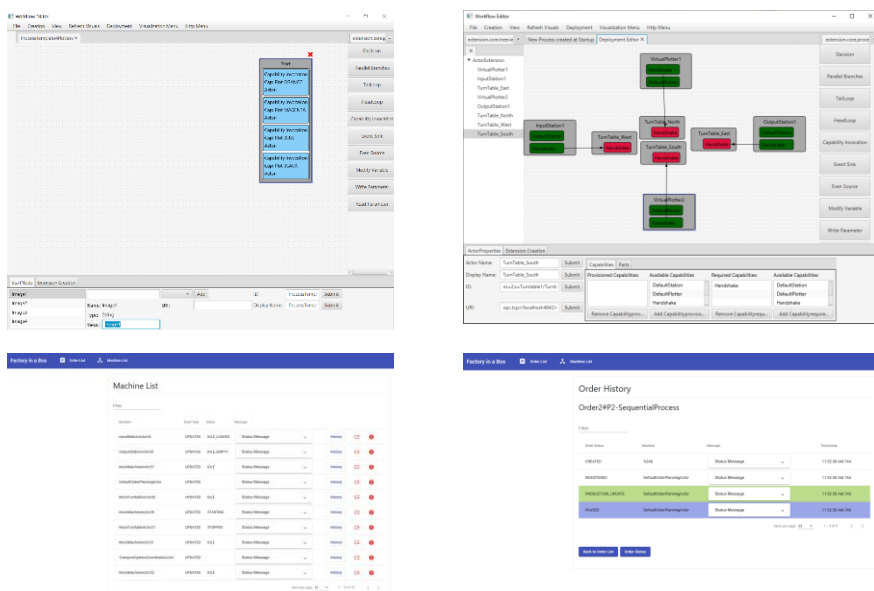
Factory in a Box consist of:

- Lego EV3 Mindstorm set for input/output stations and plotters running control logic implemented in 4DIAC/Forte Function Blocks, communicating via OPC UA provided by Open62514
- BrickPi (Raspberry Pi 3 based) Turntables running Java and Akka communicating via OPC UA provided by Eclipse Milo
- Raspberry Pi 4 running Java and Akka for controlling production processes and transport, communicating via OPC UA provided by Eclipse Milo

Control and Configuration

Factory in a Box provides multiple control interfaces:

- Process Editor for specifying production orders
- Wiring Editor for specifying machine-to-machine communication.
- Web Interface for inspecting order status/control, machine status/control.



Hall of Fame:

Christoph Mayr-Dorn, Mario Krizic, Stefan Bichler, Michael Mayrhofer (Pro²Future), Jan Holzweber (Pro²Future), Alois Zötl, Georg Weichhart (Profactor), Alexander Egyed, Michael Bishara, Max Spatenegger

In collaboration with:



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