# Digital Miniature Factory

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## Motivation

The Digital Miniature Factory serves as a demonstration model for the use of Industrial Internet of Things (IIoT) in a production process by the means of decentralized control system. Several stations like a packaging plant, part sorting station, conveyor belts as well as a mobile robot handling the transport between the stations are manufactured as a small-scale model (2m by 3m). The aim of this project is a comprehensible presentation of IIoT concepts and benefits.

## Methods

The stations are operated via industrial hardware (e.g. PLCs from WAGO, SIEMENS, B&R, SICK). By using ThingWorx, the production process can be controlled from the cloud and machine and production data can be retrieved. This allows the production process to be flexibly adapted without the necessity of reprogramming local PLCs. All stations communicate locally with the KEPServerEX connectivity platform via OPC UA and data is transferred to ThingWorx via a WebSocket connection. Figure 1 shows the network topology of the developed system. By using augmented reality (AR) with Vuforia Studio, it is possible to display a digital twin of the plant. In addition, this allows the plant to be controlled manually and helps with maintenance or troubleshooting. In Figure 2 the digital twins of the storage station and a conveyor belt are shown.

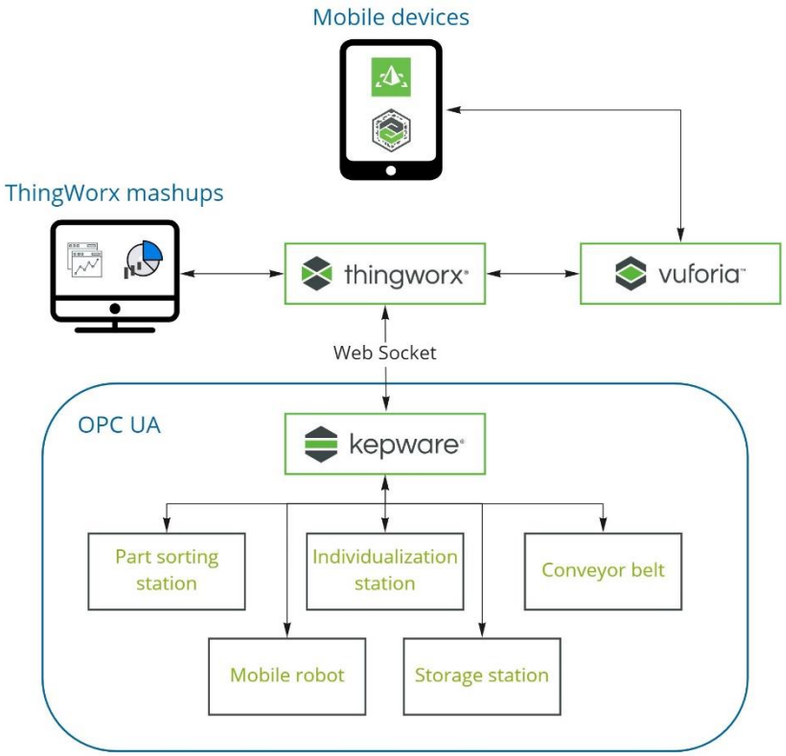


Figure 1: Network topology

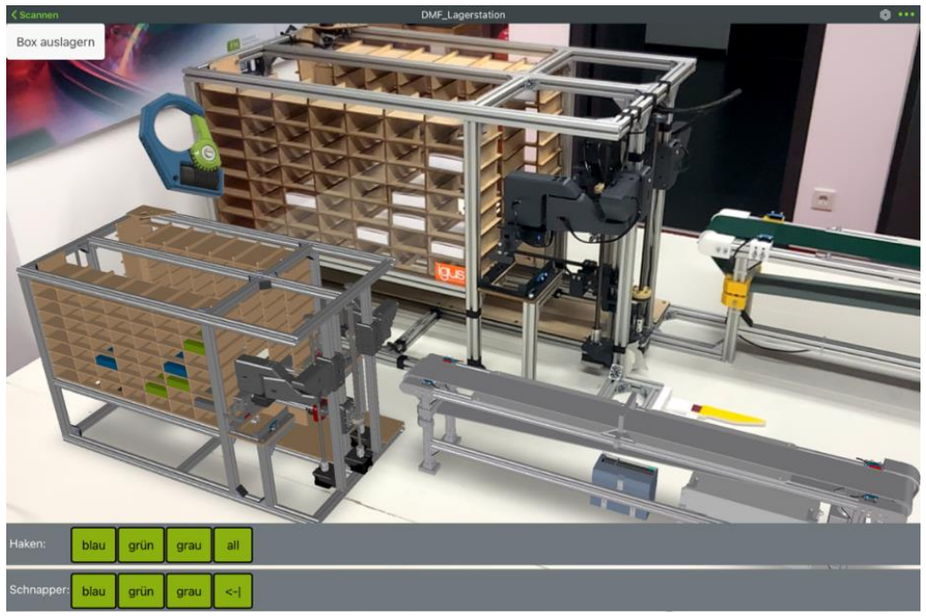


Figure 2: Digital twin

## Results and Outlook

The network infrastructure and physical stations were developed and connected, digital twins of stations were created. Individual stations and the overall process still needs to be further developed to enable a comprehensive demonstration of IIoT benefits.