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Utilizing multifunctional display computer as a local gateway in industrial IoT use cases

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Extended abstract. The Industry 4.0 paradigm emphasizes the increased level of automation and data exchange in manufacturing technologies. Hence, industrial companies have to deal with vast amounts of data gathered from the production. Usually it is not practical to send all the measured data outside the local premises for further processing. Onboard processing, temporary storing, and appropriate forwarding of the data are key operations to be handled by an industrial gateway.

CrossControl produces computers for industrial use, with integrated displays. These display computers run individually tailored Linux distributions optimized by the image footprint and runtime performance. Most common use case for such display computers are in heavy industrial vehicles, with connectivity to the onboard vehicle control bus. By utilizing a dedicated connectivity module, the onboard display can have a wireless connection as well, for on-site device and backoffice connectivity.

This conference paper for Automaatiopäivät23 introduces key parts of the Productive4.0 project which addresses the general theme of Industry 4.0. The paper discusses the use cases of machine and fleet management offered as an industrial Software as a Service (SaaS). The pilot implementation of CrossControl's gateway device is presented with the focus on the software stack, information flow architecture and the graphical user interface. Moreover, applying Service Oriented Architecture (SOA) by means of Arrowhead framework on gateway and edge level is also discussed.

The data flow and the software components deployed for the display computer in both Productive4.0 use cases is outlined in Figure 1. The display computer runs Node.js based runtime and has its own local database up and running. In addition, it is capable of converting HTTP messages to MQTT protocol and distribute those messages to interested MQTT clients, as dispatched by the Mosquitto broker running on the display. Storing data to the database and the message conversion are both offered as a service. The Arrowhead framework gives a standardized way to apply SOA in industrial domain. The implementation allows the full set of Arrowhead services, meaning any kind of devices, to consume the offered services. The display computer is also itself an Arrowhead service consumer as it connects to a bigger database located in the cloud.

The finalization of Arrowhead services at the gateway is in progress, for full implementation of the functionality depicted in Figure 1. This pilot implementation provides a proof-of-concept for deploying a multifunctional device both as an industrial gateway and as a human machine interface, in an Arrowhead-compliant IoT environment.

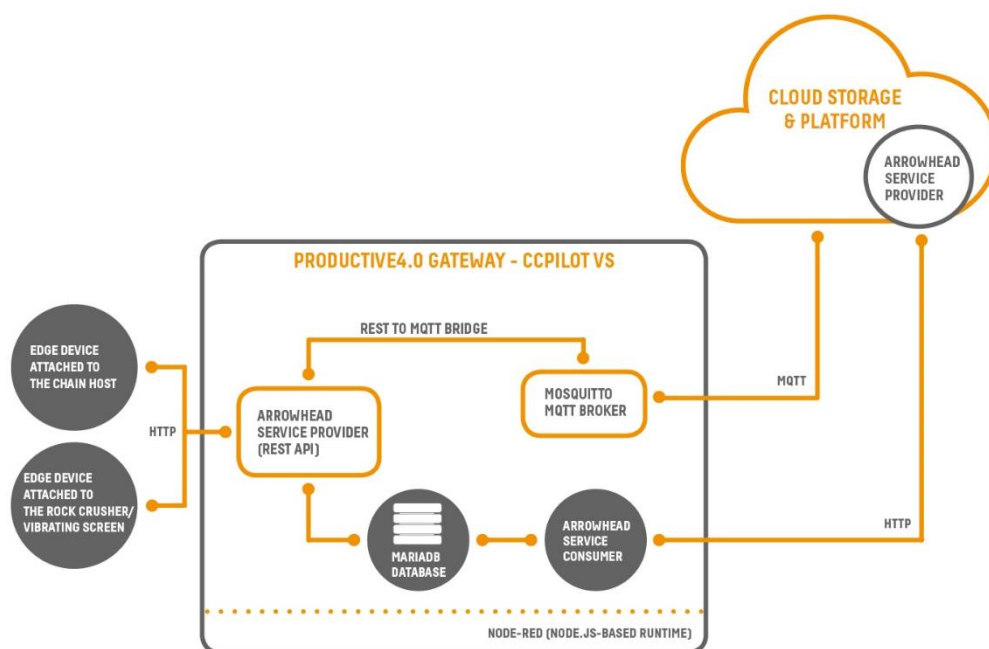


Figure 1. Data flow in Productive4.0 use cases and gateway device's software and technology stack.