Sharing of Digital (and Physical) Twins within a Global Research Network

International Approaches, Innovations, Methods and Standards in Industrial Engineering and Management

AIM Conference in Berlin, Germany
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RESEARCH AREAS

Collaborative Prototyping Environment

Develop an advanced technical capability and safe environment for prototyping and testing cobotic solutions

Robot Awareness of Humans

Improve the safety & efficiency of co-locating humans and robotic systems in operational environments

Human-Robot Jobs of the Future

Impact of collaborative robotics on workforce integration, skills development and business adoption and design for human factors in manufacturing industry

Human-Robot Collaboration

Solutions for robots and humans to collaborate on shared work processes or production outputs that are intuitive, effective and safe

Human Awareness of Robots

Develop the tasks, indicators, information and processes humans need to work alongside robots

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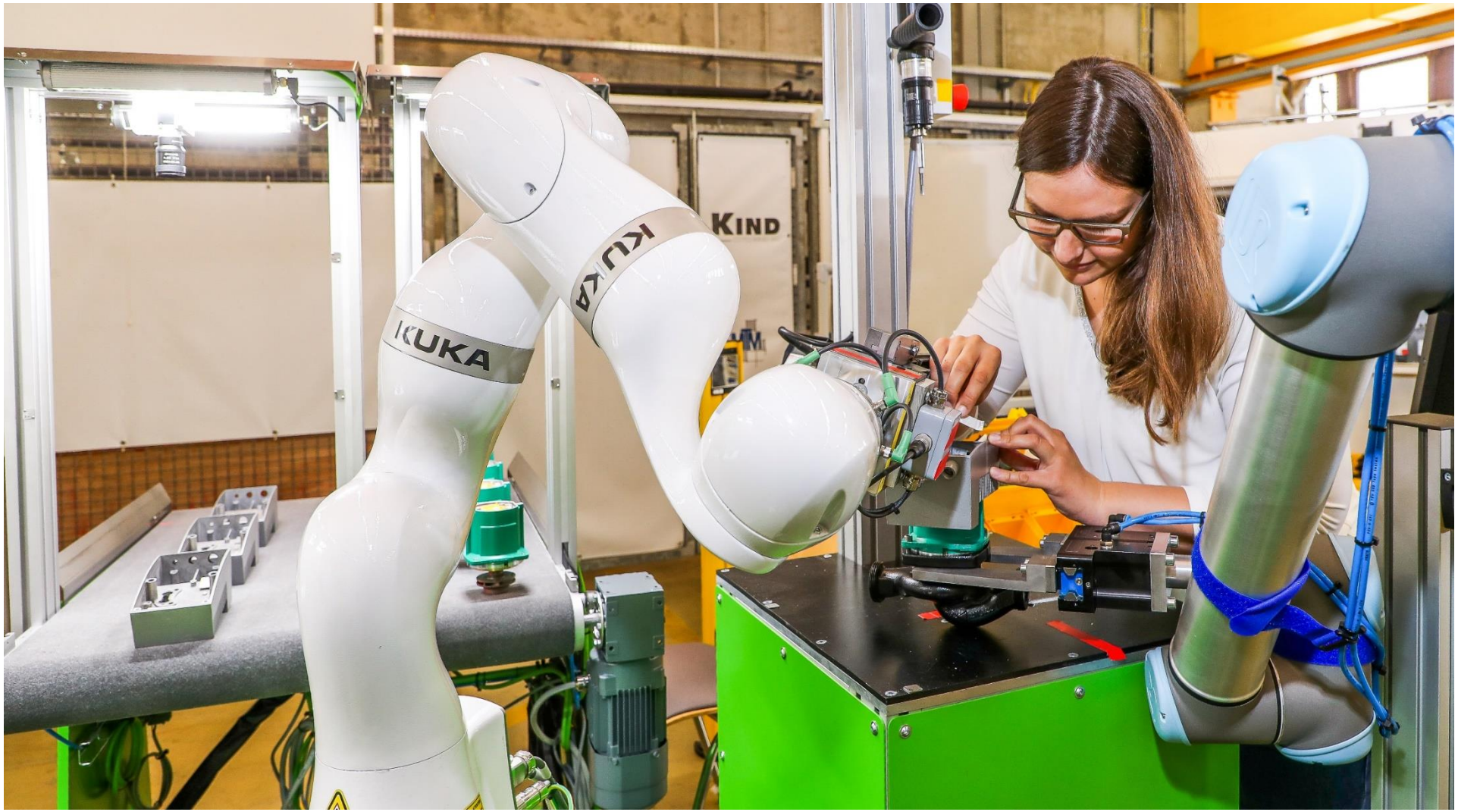
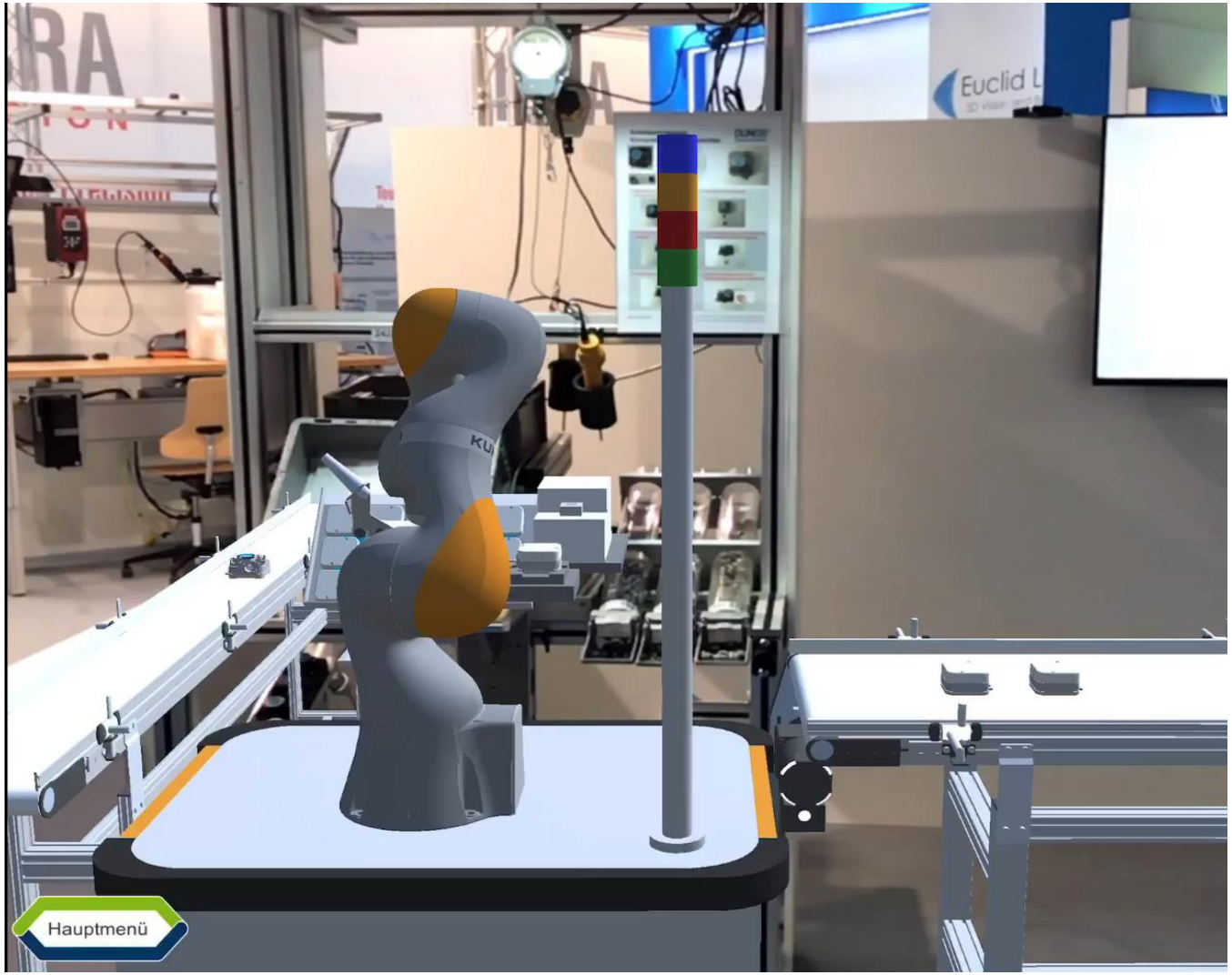
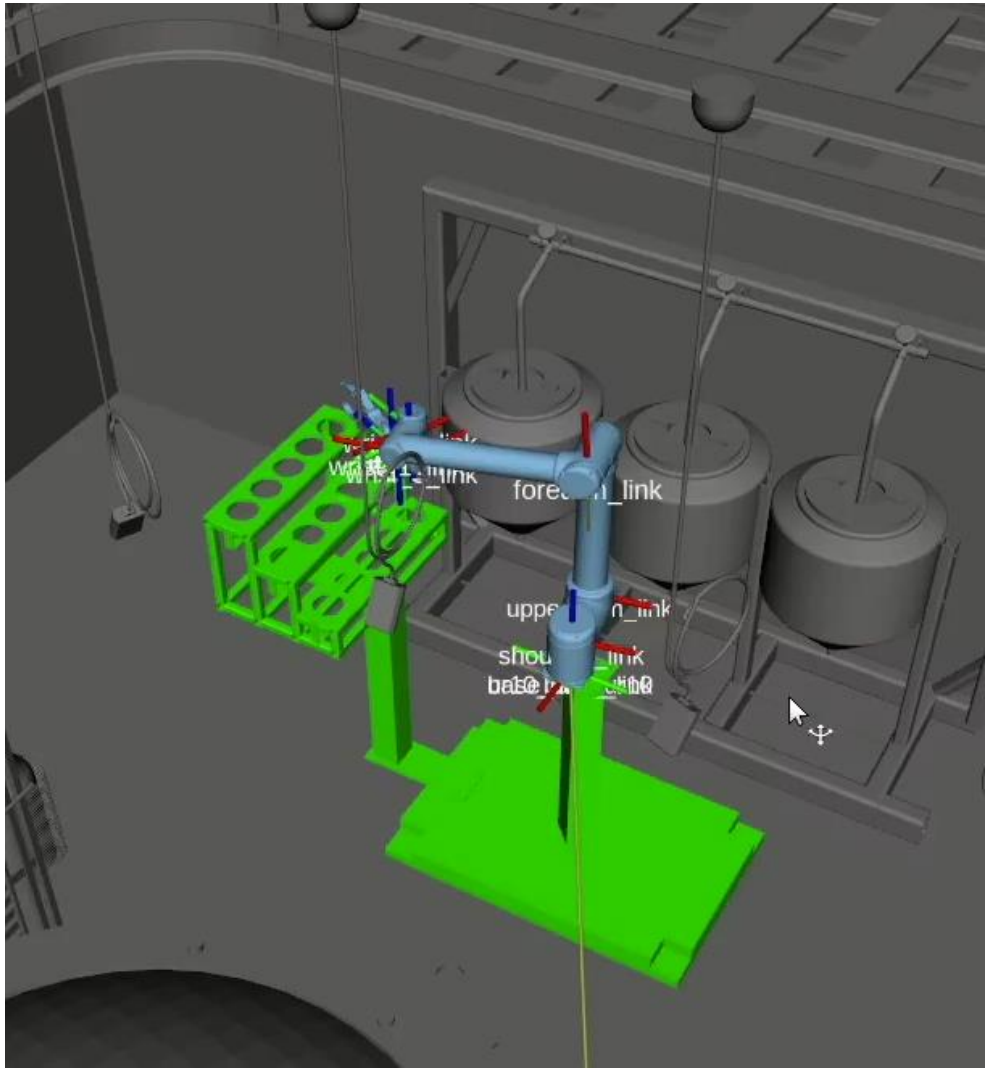
Human-Robot Collaboration for Assembly of Pumps



Human-Robot-Collaboration in Industrial Algae Production

Sharing of Digital Twins between Sydney and Dortmund





Industrielle Demonstrator-Zelle (Bj. 2006, SIM GmbH)

Einsatzzweck:

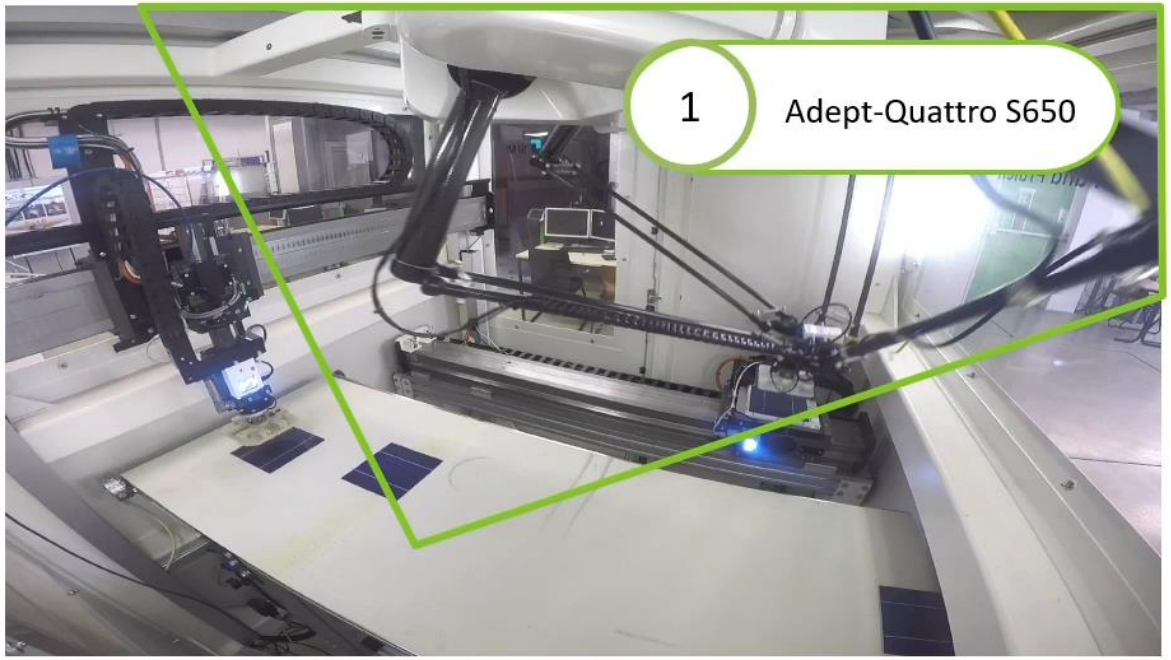
- Pick & Place-Kreislauf von Wafern
- Randomisierte Platzierung der Wafer auf dem Förderband mit Hilfe eines
- Erkennung der Wafer durch ein Kamerasystem

Steuerung:

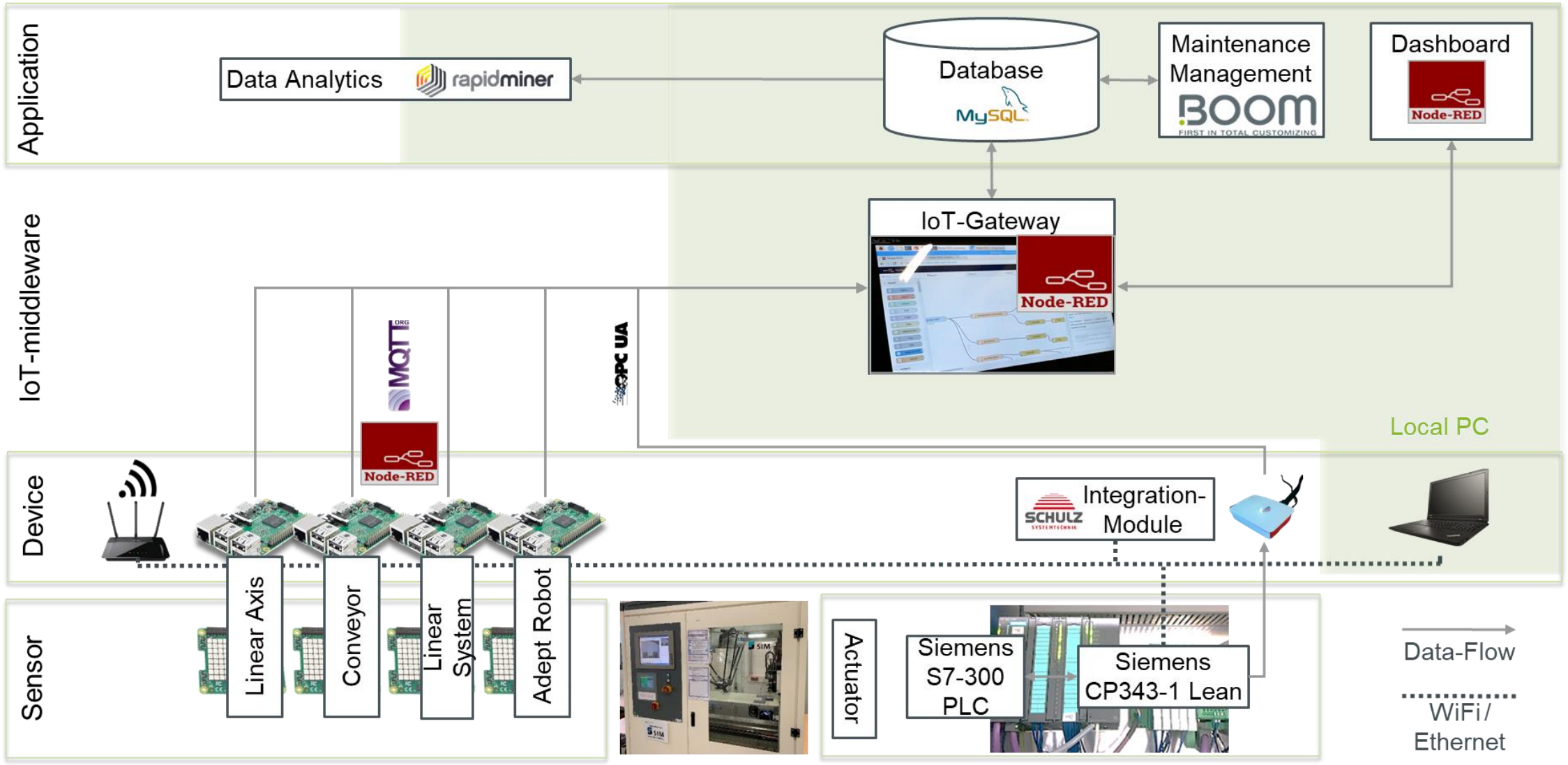
- Siemens Simatic S7-300
- Autarke Adept-Steuerung

Komponenten:

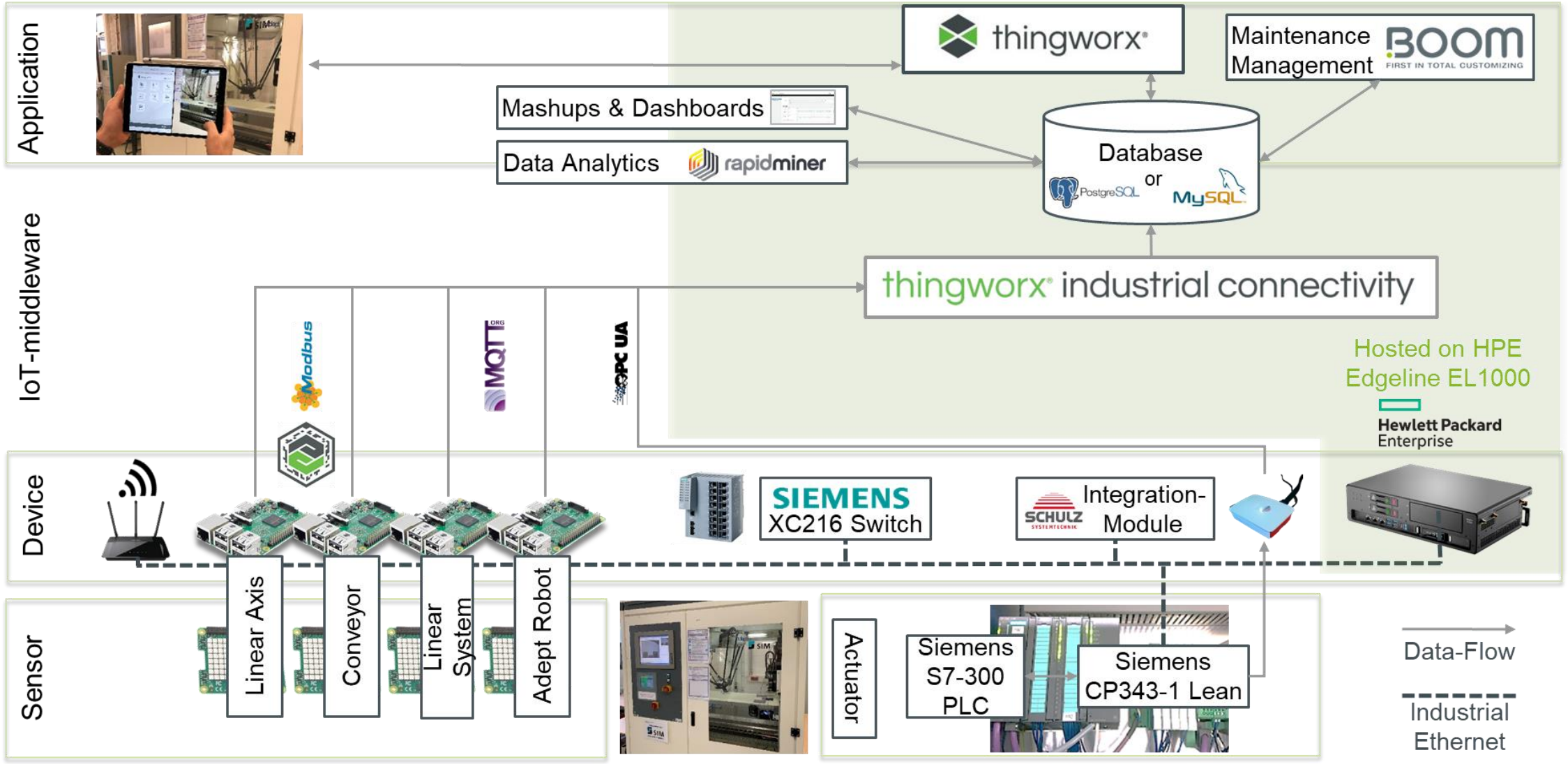
1. Adept Quattro s650 & pneumatische Greifer mit Adept Sight Vision-System
2. Laterales Lineartransportsystem mit pneumatischen Schunk-Greifer-Modulen
3. SEW-AC-Elektromotor-betriebenes Förderband



Prototyping IIoT-Architecture for Digital Twinning

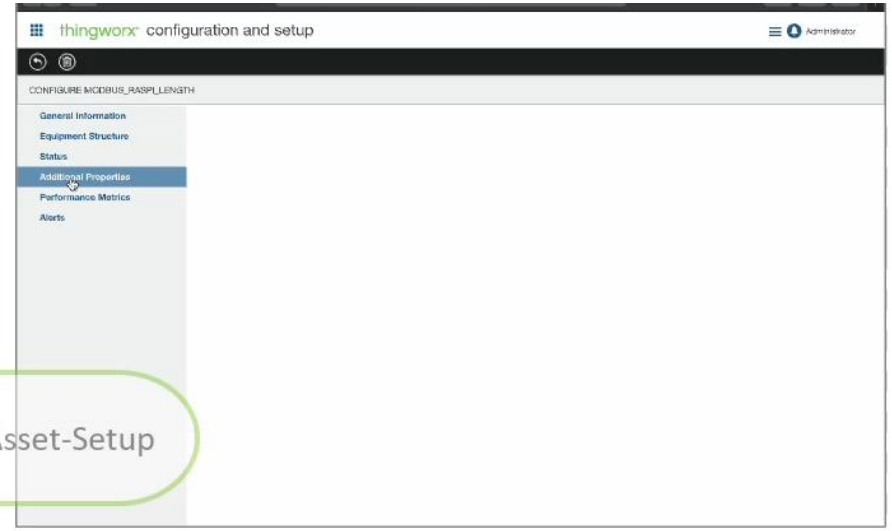


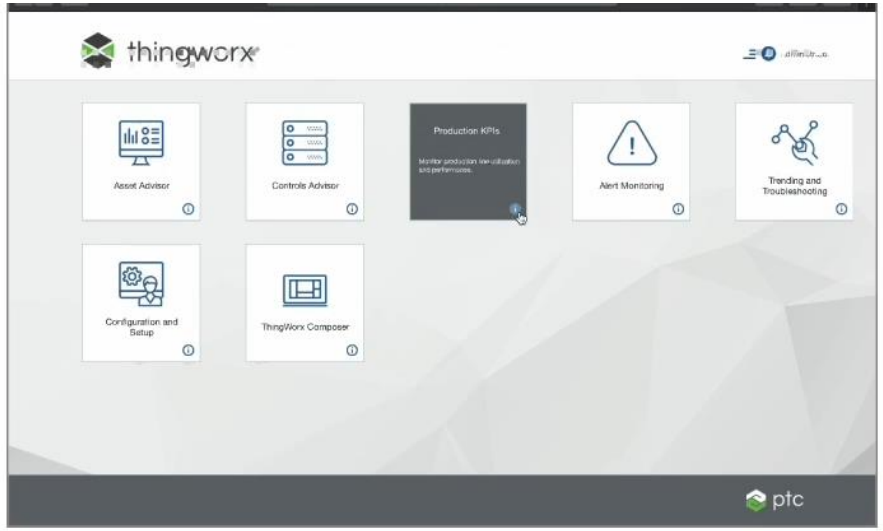
High Performance IIoT-Architecture for Digital Twinning

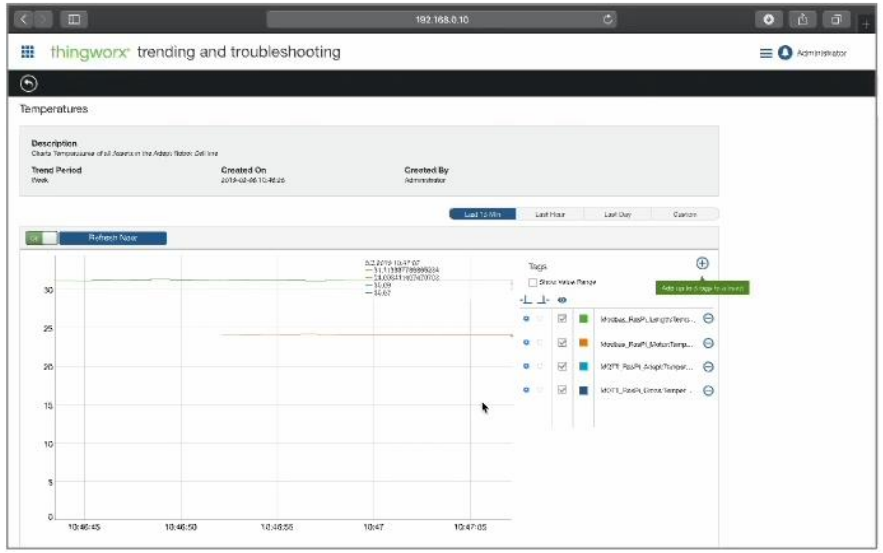


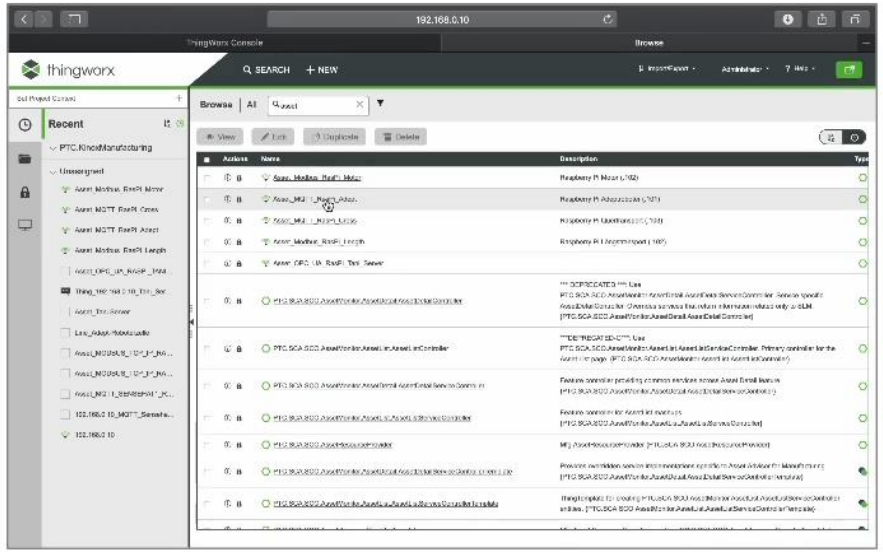
Digital Twinning of an Automated Handling System

1 Line & Asset-Setup







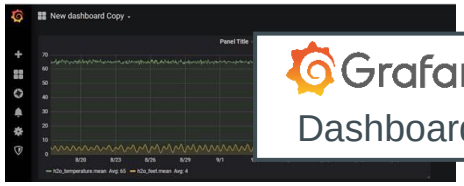


Morphology for IIoT-Architecture Design

Architecture Levels	Implementation Options (examples only)						
Integration into Business Processes, eg. ERP	Grafana	Tableau	Siemens Mindsphere	Integration in MES	Splunk	Manufacturing Apps	PTC ThingWorx (*Manufacturing Apps)*
Data Analytics	RapidMiner	Python, R		MatLAB Statistics.		Microsoft Azure	PTC ThingWorx *(Industrial IoT Platform)*
Data Aggregation				Node-RED			
Data Storage	Relational DB (e.g. InfluxDB)	Hadoop-Cluster		Bosch IoT Cloud	Edge Server		PTC ThingWorx *(KEPServerEX)*
Interface Embedded System-Data Storage (Protocol)	MQTT	AMQP	OPC-UA	TCP/IP	LoRaWAN	HTTP	Modbus
Interface Embedded System-Data Storage (Network)	WLAN	LAN	BLE (Bluetooth)	5G	NFC	6LoWPAN	ZigBee
Local Data ETL and Pre-processing (Software)	Node-RED	RapidMiner	R & Python	Siemens Simatic Software	Bosch XDK, Bosch Connected Industrial Sensor Solution (CISS)	Microsoft Azure IoT-Edge	PTC ThingWorx
Local Data ETL and Pre-processing (Hardware)	Raspberry Pi Banana Pi	Harting Mica	Balluf IO Link	MindConnect 2040		PLC (e.g. Simatic S7-1500)	…
Interface Embedded System-Sensors	RS-485	I²C	CAN-Bus	SPI-Bus			RS-232
Sensors	Raspberry Sense Hat	External Sensors	Internal Sensors	Bosch Phantom		…	…

IIoT-Training Infrastructure at UTS

Application



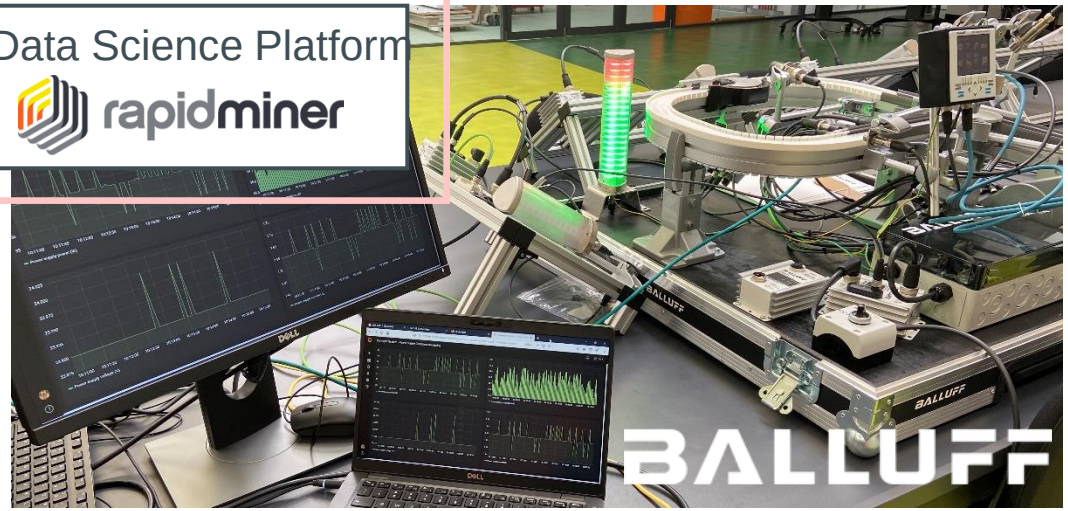
Grafana
Dashboards

Data Science Platform
rapidminer

Database
InfluxDB

IoT Middleware

Node-RED



Edge Device

Industrial PC
Modbus

Control Units

S7-1200
SIEMENS

IO-Master
Link

Display

Camera

Light

Read/Write
head

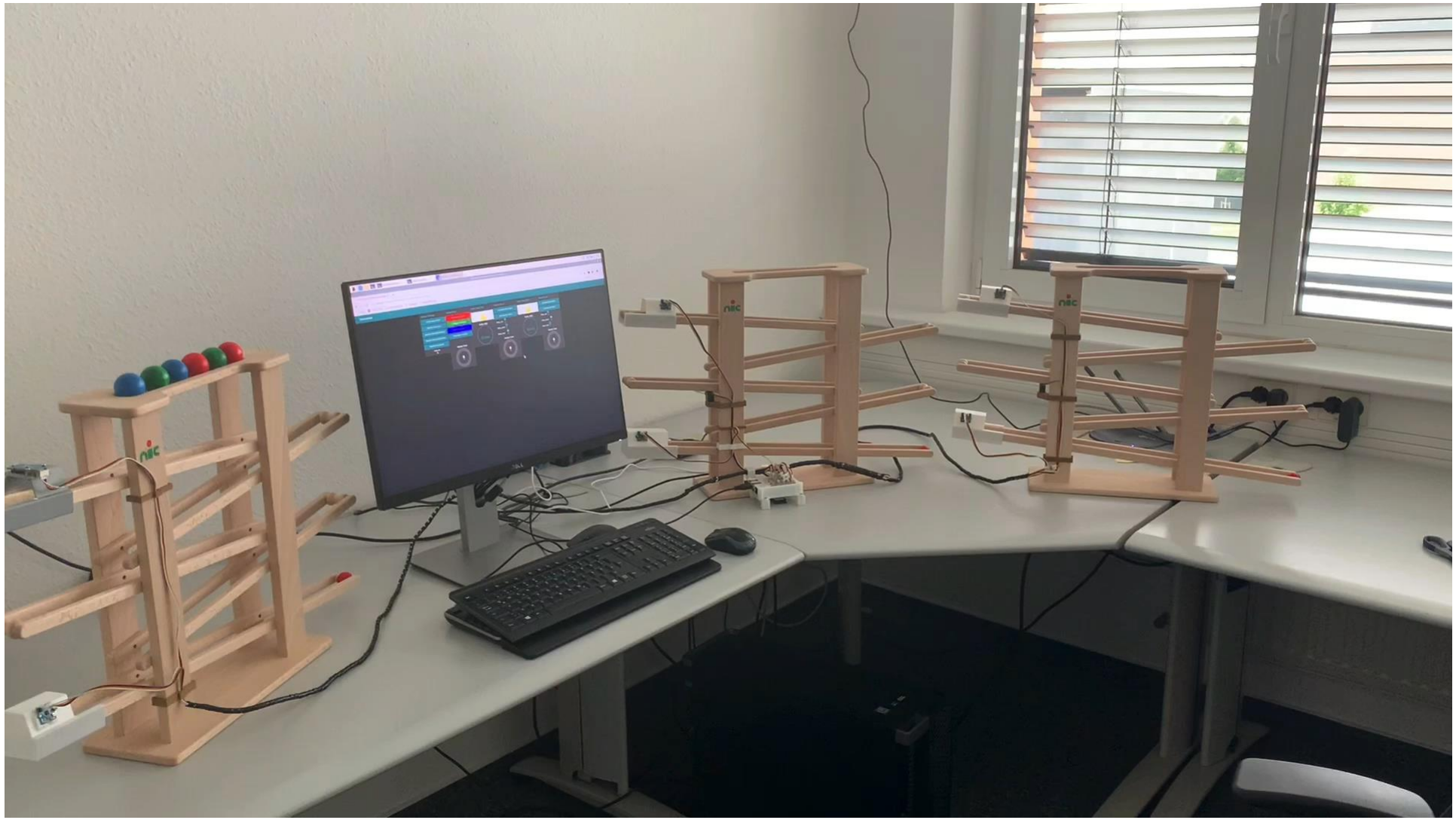
Magnetic
Sensor

Optic
sensor

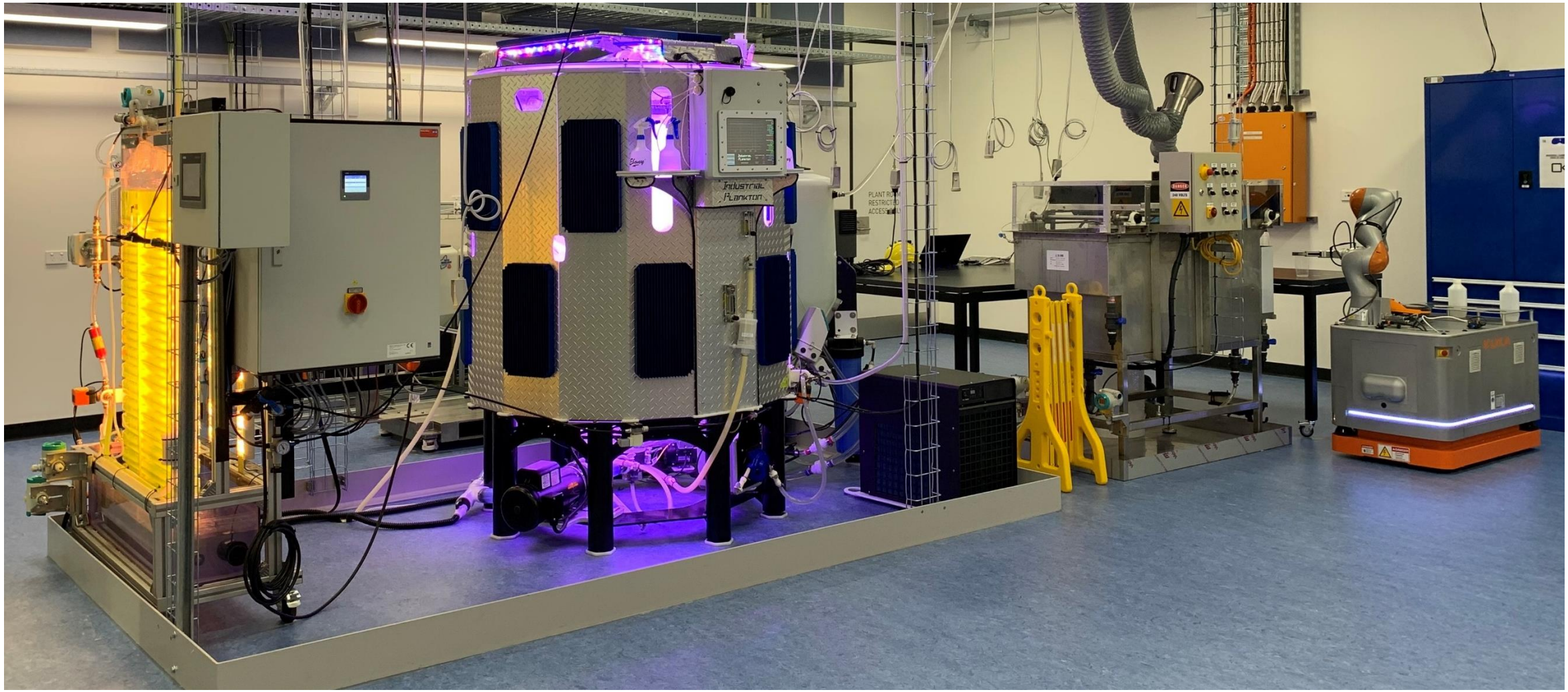
Smart
light

Sensors / Actuators

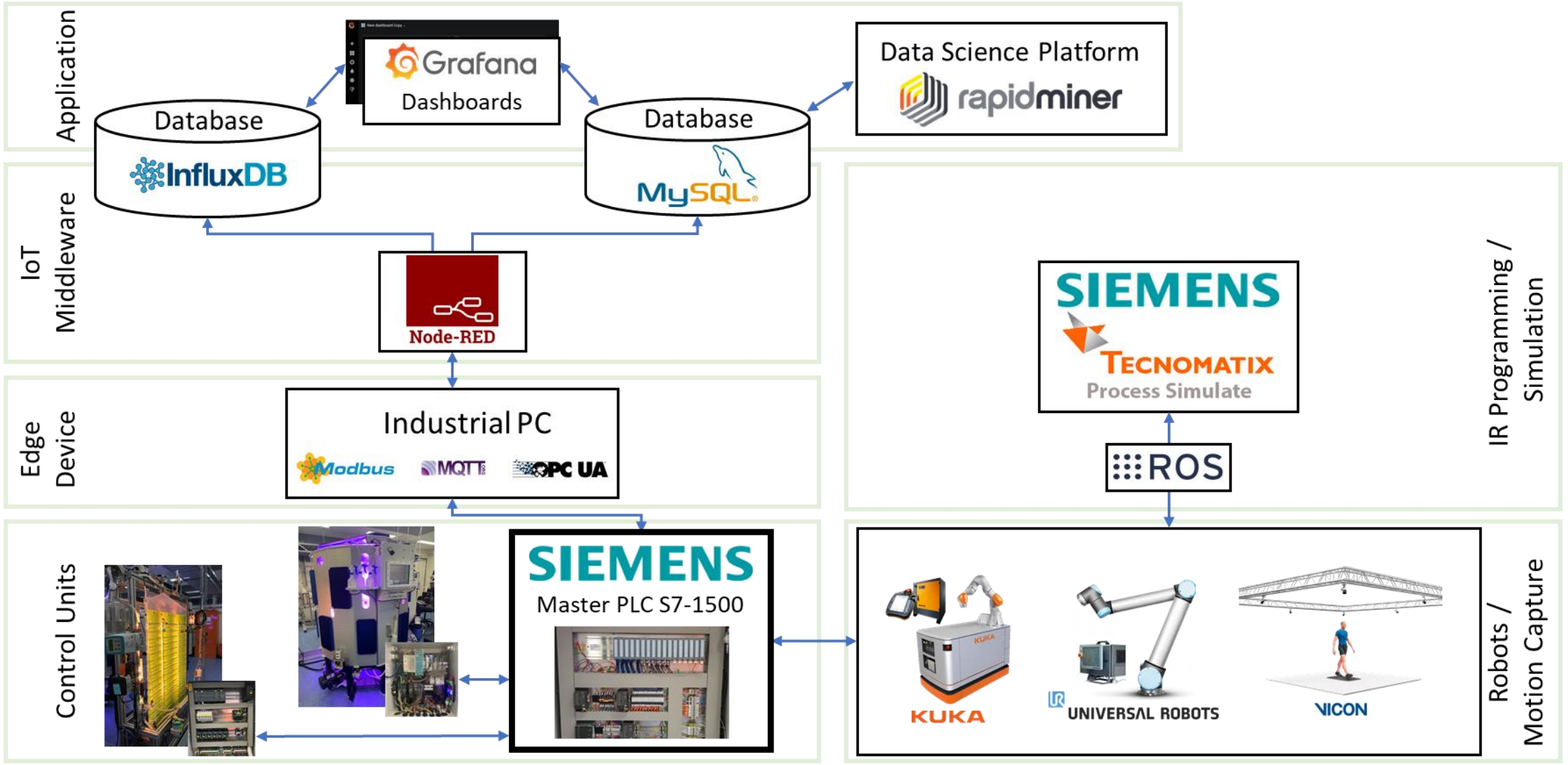
Digital Twinning enabling Dynamic Value Stream Analysis



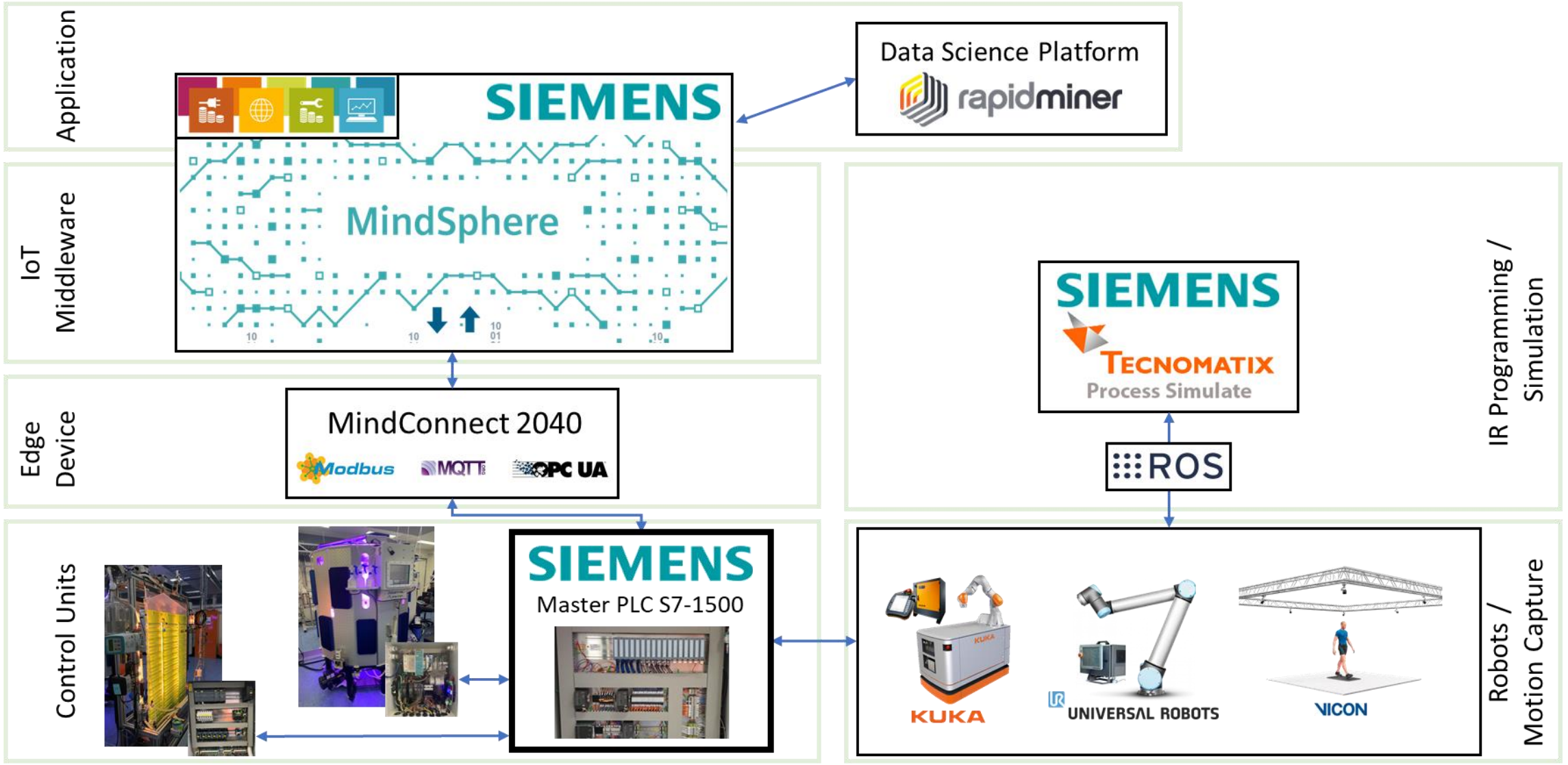
Australian National Industry 4.0 Test Bed at UTS



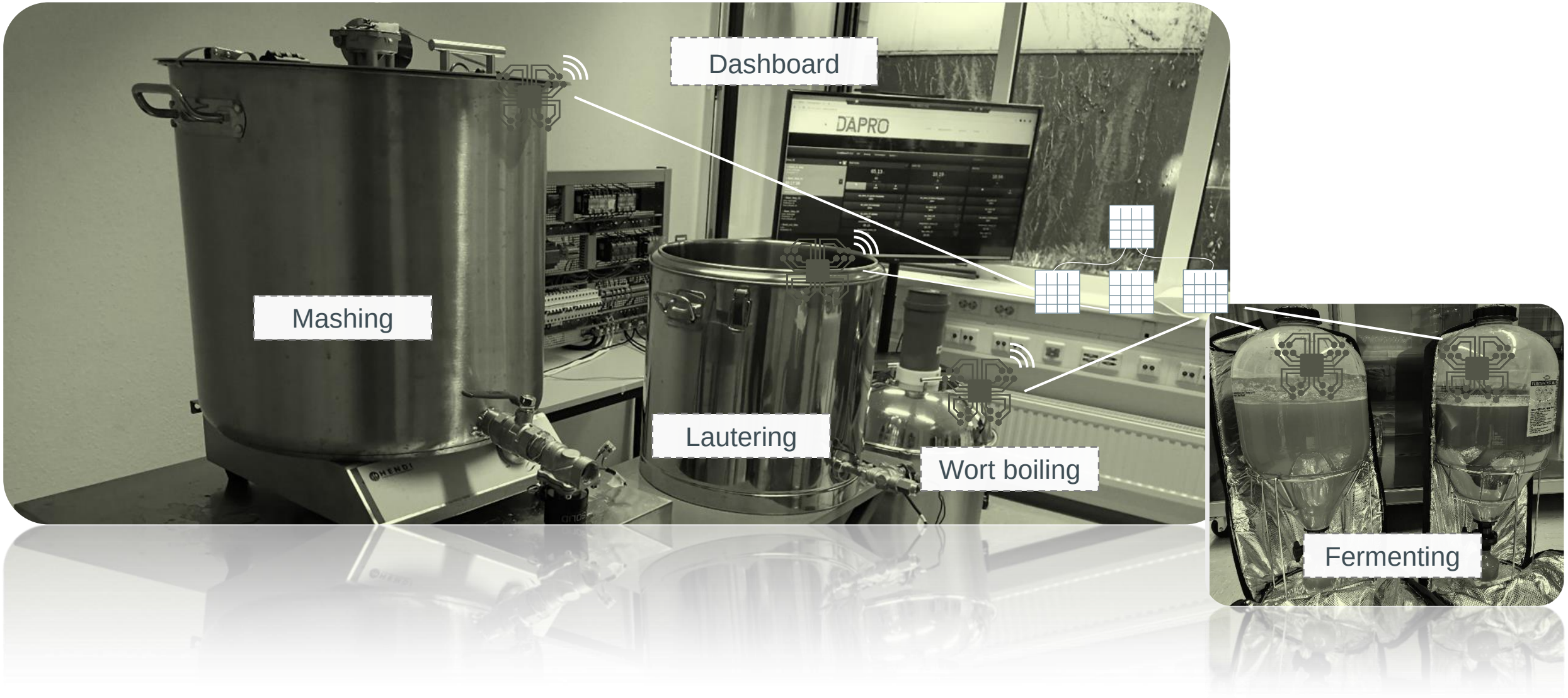
Prototyping IIoT-Architecture for Algae Production



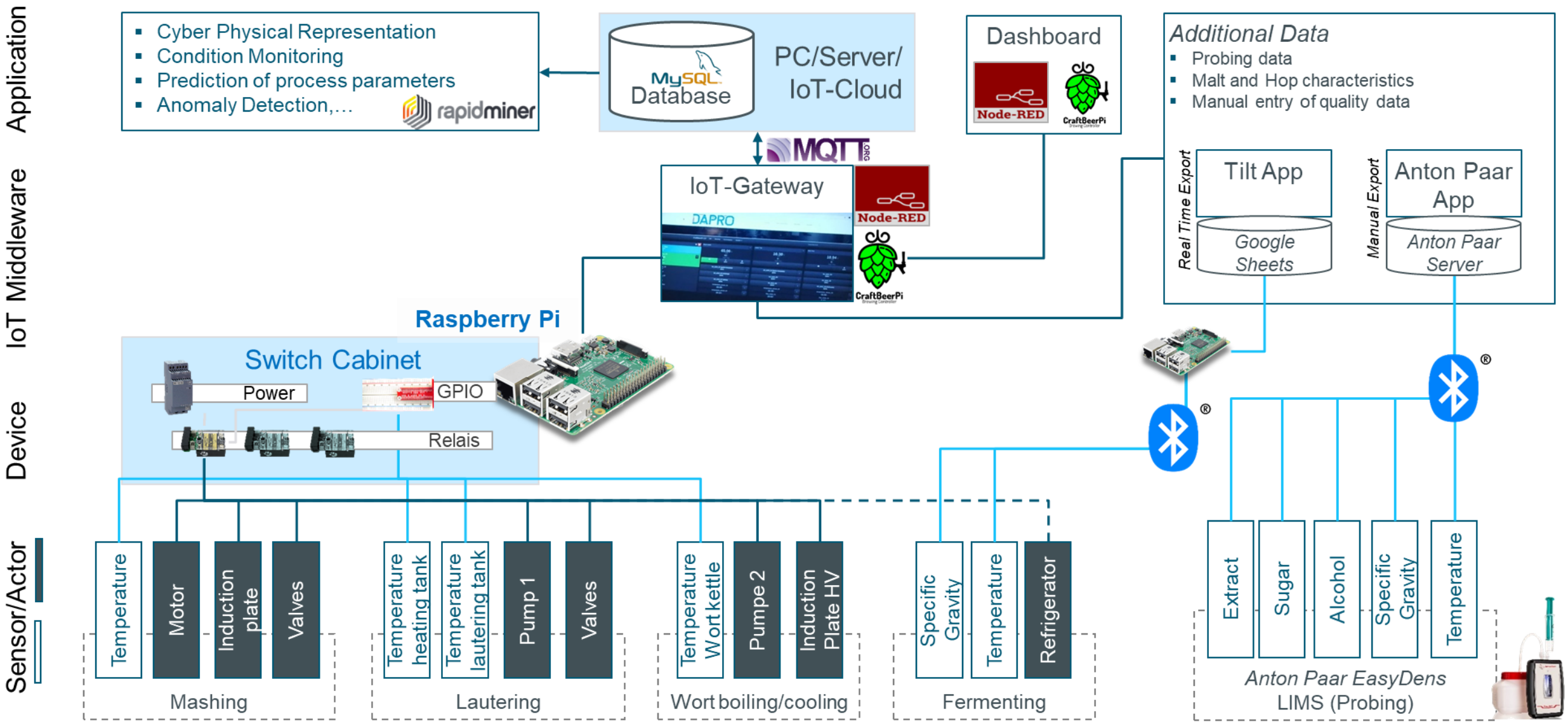
High Performance IIoT-Architecture for Algae Production



Cyber-Physical Brewery at RIF in Dortmund



Cyber-Physical Brewery IIoT-Architecture



Physical and Digital Twinning of Brewing Systems

Cloud-based sharing of Digital Twin

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Cheers and thank you for your kind attention!