HTL Leoben **Higher Federal Technical College of Industrial Engineering – Information technology and smart production**	**Diploma Exam**

DIPLOMA THESIS

Documentation

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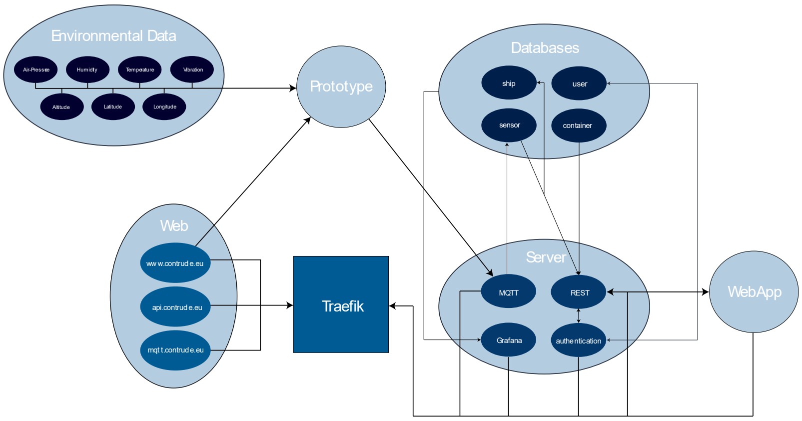
Topic	Container-Tracking & Umweltdatenerfassung (CONTRUDE)
Co-operation partners	HTL Leoben

Assignment of tasks	Containers on a cargo ship are exposed to various environmental influences. Within a container ship, forwarding and storing environmental data from individual containers is beneficial for quality assurance, but it is often difficult to implement due to the challenging radio frequency propagation conditions.

Realisation	**Kampl:** Collection of environmental data (e.g., temperature, air pressure, etc.) using microcontrollers, as well as forwarding the information under challenging radio frequency propagation conditions. **Schrempf:** Analysis and evaluation of various frameworks for persisting environmental data, as well as the architectural structure of the overall application. **Gekle:** Development of a frontend for displaying environmental data on container ships.

Results	**Kampl:** Development of three prototypes based on an ESP32 microcontroller board. Implementation of a mesh network to send the collected sensor data to a central server, with the chosen data transmission protocol ensuring efficient data transfer and processing. **Schrempf:** Design and implementation of the server-side software architecture, considering modular approaches using software containers. Design of interfaces for persisting and providing the generated data—distinguishing between time series data and master data. **Gekle:** Development of a simulator to reduce the number of required hardware prototypes while still allowing testing of the concept on a ship-sized scale. Additionally, the development of a web application is included, allowing users to view the position and neighboring or nearby containers and their environmental data.

Illustrative graph, photo (incl. explanation)	

Participation in competitions Awards	No

Accessibility of the Diploma Thesis	https://github.com/bitsneak/Contrude hardback diploma thesis

Approval (Date / Signature)	Examiner	Head of College