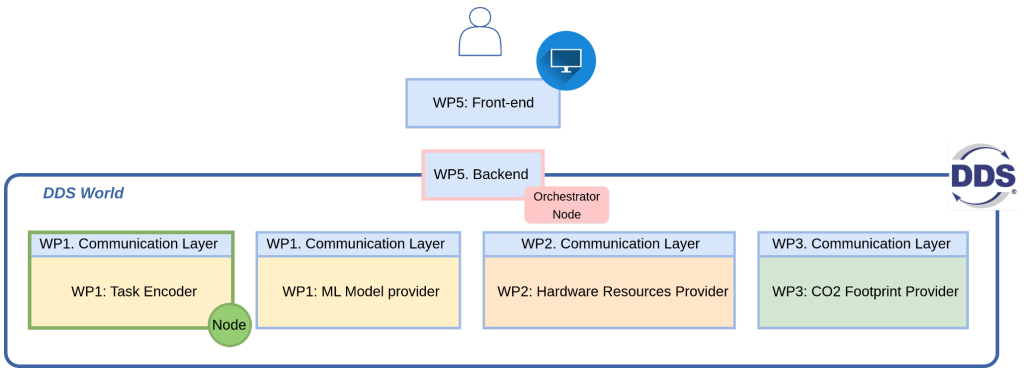
D5.1 - Framework architecture, back-end, front-end design and release

The *SustainML* project aims to develop a design framework and associated toolkit to improve energy efficiency throughout the entire life cycle of machine learning applications: from the design and exploration phase to initial iterations of training, testing and optimizing various system versions until final training in the production systems (often requiring large amounts of data, computations, and epochs) and (where appropriate) continuous online retraining of the inference process during deployment.

The resulting product *SustainML Design Framework,* aimed to be developed in this project, will provide an energy optimized hardware solution with the corresponding *Machine Learning* model for solving a desired machine learning problem formulated by the user.

Given the distributed nature of the SustainML ecosystem, the use of DDS (*Data Distribution Service*) is proposed to enable real-time communication between the different SustainML software modules (*nodes*). The *Data Distribution Service* is a data-centric communication protocol used for distributed software application communications. It describes the communications Application Programming Interfaces (APIs) and Communication Semantics that enable communication between data providers and data consumers.



The proposed software design will remain essential to ensure that the final *SustainML Design Framework* meets user needs, is adaptable to future changes, and exhibits high performance by carefully considering factors such as modularity, scalability, security, and user experience. UML diagrams and SOLID design principles will be used to assure the code quality.

Deliverable *D5.1 Framework architecture, back-end, front-end design and release* establishes the software requirements and covers the detailed architecture and design for the different components within the SustainML Design Framework, as well as the release

procedure. This document will be updated every year to reflect the most recent state of the framework as the project progresses.