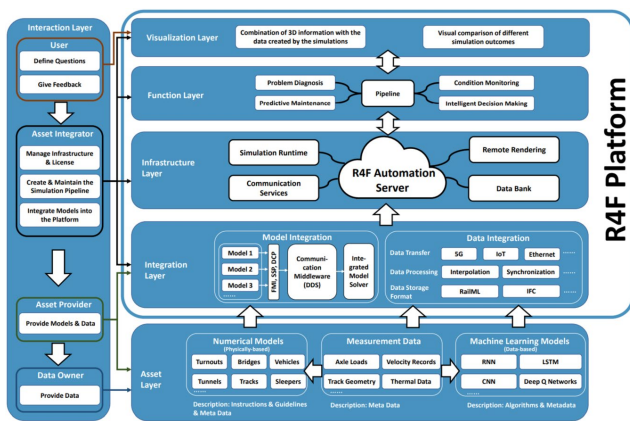




Rail4Future

Projekttitlel:	Resilient Digital Railway Systems to enhance performance
Projektnummer:	882504
Deliverable:	D1.1.2 Blueprint architecture with simulation workflow

In this report, a conceptual model-based digital twin platform that aims to integrate measurement data, numerical models, and machine learning models from different railway subsystems into a holistic large-scale railway infrastructure platform is proposed for the first time. The R4F Platform may ensure that reliable and valuable data can continuously flow throughout the whole life span of the holistic system and its subsystems, which may help build a fully connected and digitized railway infrastructure system. The R4F Platform will be exploited for problem diagnosis, predictive maintenance, condition monitoring, and some other cases based on user demand. The proposed R4F Platform framework can be summarized into six layers: asset layer, integration layer, infrastructure layer, function layer, visualization layer, and interaction layer. The Interaction Layer represents the user



The R4F Platform landscape

interaction with the Platform. For now, we identified four roles: User, which is the end-user of the system, running the simulations; Asset Integrator, an expert within the company that runs an instance of the Platform and is responsible for integrating the assets (e.g. simulation and data) into the Platform; Asset Provider, who creates assets from data and makes them available; Data Owner, which are the legal owner of Assets. The Asset Layer provides the blueprints for Assets that are able to be used in the Platform. It defines three categories of assets (Numerical Models, Measurement Data, Machine Learning Models) and the requirements to be

integrated (e.g. Meta Data). All the data and models are integrated within the integration layer into the Platform via their respective interfaces. The integration layer manages the import and integration of different data and models to the R4F Platform. The infrastructure layer is responsible for running simulations on the underlying hardware and controlling the simulation pipelines defined by the model and data integrators and providers. Together with the integration layer, it instantiates and executes simulations that are defined at the function layer. In the function layer, the simulation paths are either called up from previous simulations or, based on graphs, are newly compiled and processed in pipelines. In the end, the simulation results will be delivered to the visualization layer via defined interfaces. There these are processed and displayed according to the user's request.