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A Cloud-Based DataFabric for Multi-Hazard Nowcasting and Near-Real-Time Disaster Risk Management: The Emilia-Romagna Case Study within the DIRECTED Project

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The increasing frequency and intensity of compound hydro-meteorological and wildfire events require advanced, operational, integrated tools capable of supporting early warning and near-real-time Disaster Risk Management (DRM). Within the framework of the EU-funded **DIRECTED** project, we present the development and operational implementation of a **Data Fabric** designed for a **Real-World Lab** in the Emilia-Romagna region (Italy).

The proposed Data Fabric is a **cloud-native, serverless web application** specifically designed to support **nowcasting and short-term forecasting** of **pluvial and coastal flood hazards** as well as **wildfire propagation**. The system has been **co-designed in close collaboration with civil protection authorities (**ARPAE**) and first emergency responders (firefighters)** to ensure operational relevance, usability, and direct integration into emergency workflows.

The platform integrates **interoperable real-time observations** provided by the ARPAE monitoring network, including weather radar, rainfall intensity, sea level, waves, tides, and wind measurements, together with meteorological and marine forecast models. These heterogeneous data streams are ingested into a scalable processing pipeline that feeds **multi-hazard impact models**, including high-resolution flood hazard models developed by SaferPlaces and wildfire spread models. The system produces **near-real-time hazard maps at building-level resolution**, enabling rapid identification of exposed and vulnerable receptors such as population, critical infrastructure, and strategic assets.

Beyond hazard mapping, the Data Fabric supports **impact-based decision-making**, facilitating the rapid assessment of potential consequences and the design of mitigation, such as flood barriers, and Disaster Risk Reduction (DRR) measures during evolving events. This contribution

demonstrates how **cloud technologies, interoperable data infrastructures, and stakeholder-driven co-design** can be effectively combined to enhance preparedness, response, and resilience in complex multi-hazard contexts. Lessons learned highlight both the opportunities and challenges of deploying advanced digital solutions for operational DRM at regional scale.