Blog Post 2: Fueling the Digital Twin – Data Aggregation in PANTHEON

A Digital Twin is only as accurate as the data it consumes. PANTHEON's architecture incorporates sophisticated data connectors and aggregators to create a real-time mirror of urban environments tailored for disaster management.

Core Data Sources

The platform aggregates diverse datasets to build a comprehensive operational picture:

- **Satellite Data:** Utilizes Copernicus services (e.g., Atmosphere Monitoring Service, Emergency Management Service) to provide macro-level environmental data, processed via tools like SNAP and QGIS.
- **IoT Weather Data:** In-situ monitoring of local conditions—temperature (-40 to 125°C range), wind speed (0-80 m/sec), and solar radiation—transmitted via NB-IoT or IEEE 802.15.4 protocols.
- **Traffic Data:** Aggregates real-time traffic flow from various vendors (e.g., regional municipalities, tollway operators) to model evacuation routes and infrastructure blockages.
- **UAV Data:** Collects payload data (EO/IR images, LiDAR) and navigation states from drones operating in the field.
- **Community Data:** Integrates sociological data, such as population density correlated with mobility capability (e.g., age classes, access to vehicles), crucial for planning evacuations of vulnerable populations.

Pre-processing and Curation

Before data reaches the simulation engines, it undergoes rigorous pre-processing. Raw data from these disparate sources is normalized into standard formats (JSON/CSV) via REST APIs. This ensures that the subsequent ML and simulation models receive clean, structured inputs for accurate analysis.