Blog Post 3: How It Works: PANTHEON's Open-Source Geospatial Architecture

Connecting diverse data sources like satellites, drones, and sensors requires a flexible and powerful architectural framework. In the PANTHEON project, we have chosen an open-source stack to build our GeoPlatform, offering cost-effectiveness, robust community support, and rapid deployment capabilities .

Our system is organized into a typical **three-tier architecture**:

1. **Data Acquisition Layer:** This includes the sources themselves—EO satellites, UxVs, and in-situ IoT sensor networks.
2. **Data Processing and Storage Layer:** This middle tier is responsible for cleaning, transforming, indexing, and storing the spatial data. This is where the magic of harmonization happens.
3. **Application and Visualization Layer:** This is the front-end that presents the data to users through interactive dashboards and web-based GIS platforms.

To power this architecture, we rely on a set of proven open-source tools, as shown in our architecture overview.

- **GeoServer:** This is a leading open-source server for sharing geospatial data. It acts as the critical backend component, publishing data using open standards from the Open Geospatial Consortium (OGC), including **WMS** (Web Map Service), **WFS** (Web Feature Service), and **WCS** (Web Coverage Service) . This adherence to open standards is what ensures interoperability and makes it a cornerstone of our system.
- **PostGIS:** This is a spatial database extender for PostgreSQL. It serves as the primary "Geographical database" for storing and managing our vector and raster datasets, working directly with GeoServer.
- **OpenLayers:** This is a powerful JavaScript library used to build rich, interactive web-based maps. It is a key visualization tool that consumes the WMS and WFS layers (or "services") provided by GeoServer to create the user-facing map.

By using this open-source stack, we create an interoperable and extensible system tailored to the needs of disaster response. This "hybrid model" allows us to deploy as much of the GIS infrastructure on-premise as possible, while still communicating with external cloud providers for data.

In our next blog post, we'll look at how this platform is applied in real-world case studies.