Open Geospatial Consortium

Seeking Additional Sponsors for an AI-augmented Discrete Global Grid Systems Interoperability Initiative

Streamlining the interoperation of different DGGS systems and assessing the power of Retrieval-Augmented Generation AI technologies in Disaster Management.

OGC is seeking visionary organizations that are interested in supporting an upcoming interoperability initiative aimed at testing, enabling, and improving AI-augmented Discrete Global Grid Systems (DGGS). DGGS represent locations as cells, moving beyond traditional geographic reference systems. As a result, DGGS can provide a foundation for a global localization system in which every object in the real world has a unique location identifier. DGGS are well-suited for data integration and efficient querying and analysis. Therefore, they are ideally positioned to serve as authoritative 'content stores' for AI-powered natural language queries. **Applications for sponsorship will close on January 31, 2025**.

This Call for Sponsors is based on the requirements of two OGC Strategic Member organizations that have expressed interest in sponsoring this pilot: [Natural Resources Canada](#) and the [United States Geological Survey (USGS)](#). Of course, new sponsors can expand the requirements and define the initiative goals according to their ideas.

The interoperability initiative, known as the "AI-DGGS Pilot," seeks to explore and demonstrate how systems using different DGGS grid designs can use OGC Standards to automatically exchange data and information, with a particular view on supporting disaster mapping. Further, the Pilot will investigate how DGGS systems can be enhanced with Standards-based AI/ML tools—such as AI chatbots for natural language queries and AI-driven insights for automated analysis and pattern detection—using a Retrieval-Augmented Generation (RAG) approach that provides accurate, authoritative, hallucination-free responses.

On the data integration side, DGGS can serve as a localization identifier system for any real-world object. DGGS organizes space using nested cells. A list of cell IDs describes the exact geometries of real-world objects, where the accuracy depends only on the cell size. Since DGGS can map an index of all cell sizes, data described at different "zoom levels" can be efficiently integrated and linked. This makes DGGS an ideal localization & identification system for many domains, such as finance, disaster management, and environmental analysis. It can serve as a replacement or enhancement for postal addresses, as it eliminates the need for descriptive addresses or physical landmarks. Even areas without traditional infrastructure, such as roads, can be precisely identified. Similarly, a DGGS never struggles to adapt to dynamic urban growth.

OGC is looking for visionary organizations eager to embrace the future of geographical information systems. By sponsoring this initiative, you will contribute to a project that has the potential to significantly advance how geospatial data is processed and utilized while positioning your organization at the forefront of geospatial innovation.

DGGS: A natively digital reference system

For historical reasons, Geographic Information Systems (GIS) use a projected (and thus distorted), scale-dependent representation of Earth originally designed for navigation using paper maps. In contrast, Discrete Global Grid Systems (DGGS) offer a natively digital cell-based system that accurately represents Earth as a spheroid. DGGS partitions the planet into hierarchically tessellated cells that span all scales. This creates a "spreadsheet for Earth" that enables incredibly efficient analysis and integration of large datasets.
Using cells of fixed area, information recorded about phenomena at a location can be easily referenced to the explicit area of its associated cell(s), quickly integrated with other cell values from different datasets, and efficiently analyzed to provide valid summaries for any chosen selection of cells. DGGS offer a much simpler method to ingest statistical and other gridded information into broader geospatial systems, unlocking tremendous potential for improved contextual analysis and insight.

DGGS can be constructed in multiple ways to meet diverse goals. Achieving interoperability between different DGGS will be necessary to ensure individuals and software using differing DGGS approaches can work together seamlessly. The DGGS Pilot seeks to understand and demonstrate such interoperability.

Integration Across DGGS Systems

The OGC DGGS Pilot will explore and demonstrate how geospatial data standards can enable DGGS interoperability in disaster management or other domains of interest to Pilot Sponsors. This will be achieved by prototyping different DGGS solutions that use geospatial data standards to work together to deliver geospatial integration, analysis, and visualization functionality to support disaster management and other Sponsor scenarios. Outcomes will provide insight into the ability of current and emerging OGC Standards to meet these interoperability requirements. This will lead to future improvements in the design of OGC Standards, including the potential to create new Standards where needed.

To be used in other domains, such as finance, the Pilot would need to standardize the association mechanisms between real-world objects and DGGS cell identifiers, standardize possible DGGS operations to conflate data using different Discrete Global Grid Systems, and standardize the vocabulary used for all DGGS aspects. The result would be a geo-enabled thematic domain that leaves behind traditional localization mechanisms such as postal addresses or geographic reference systems such as parallels and meridians or geodetic datums.

Retrieval-Augmented Generation (RAG)

Retrieval-Augmented Generation (RAG) is an approach to large language model (LLM) (aka natural language) powered AI 'chatbots' that adds an additional, authoritative content store to which the LLM can refer for its responses. Using this approach, LLM AI models become an interface for queries of authoritative sources rather than the sources themselves. The approach gives the benefits of natural language queries without the risk of hallucinations occurring from the extrapolation of the model's training data.

The AI-DGGS Pilot seeks to investigate how DGGS can be used as content stores in RAG-based LLM 'AI Chatbots', enabling natural language queries such as "How many people live in this street that needs to be evacuated?" or "Identify which neighborhoods are likely to be impacted by flooding."

Pilot Objectives

Through this project, we will understand the ability of OGC data discovery, access, and processing standards to enable independent DGGS to integrate or interface in various contexts. The project will explore AI technologies' role in querying and visualization of DGGS in support of knowledge generation. This will help you as a Sponsor to understand the current state of DGGS interoperability in the context of rapid data integration, determine the suitability of DGGS technology to meet disaster management or other sponsor requirements (e.g., data integration, analysis, and visualization as well as real-world object localization), and identify additional work that will be required to fully realize DGGS interoperability for disaster management, financial services, insurance services, and other applications.

Detailed objectives are described through the following points. New sponsors are invited to add to this list:

1. Suitability and Interoperability:

   ● Understand the suitability of geospatial data standards for supporting interoperability between multiple DGGS grid designs for various disaster management (or other) requirements.
   ● Demonstrate the interoperability of independent DGGS using the draft [OGC API – DGGS Standard](#).

2. Data Integration and Management:

   ● Demonstrate the ability of different geospatial data standards to integrate diverse forms of geospatial and statistical data using DGGS.
   ● Evaluate the ability of geospatial data standards to manage and connect actual weather and climate data with DGGS.

3. AI-powered Interaction with DGGS:
   • Enabling an AI Chatbot interface to ask questions about DGGS-enabled data.
   • Execution of geospatial analysis within DGGS using AI Chatbot prompts with results output to the chatbot and mapping user interface.

4. Analysis and Visualization:

- Prototype the use of OGC standards for enabling interoperable analysis and visualization within DGGS in a disaster management context.
- Explore the use of OGC standards to enable AI approaches with DGGS.

5. Development and Dissemination:

- Develop general and technical materials to facilitate various stakeholders' understanding and use of project outcomes.
- Identify additional standards development activities required to meet disaster management interoperability requirements for DGGS.
- Create and maintain the availability of prototypes and demonstrations beyond the project end date.

The pilot is expected to start in early 2025 and ends in Q1/Q2-2026.

Organizations interested in Sponsoring the OGC DGGS Pilot, learning more about the benefits of Sponsorship, or tailoring the Pilot to meet their interoperability needs should email DGGSPilot@ogc.org.

About OGC
The Open Geospatial Consortium (OGC) is a membership organization dedicated to using the power of geography and technology to solve problems faced by people and the planet. OGC unlocks value and opportunity for its members through Standards, Innovation, and Collaboration. Our membership represents a diverse and active global community drawn from government, industry, academia, international development agencies, research & scientific organizations, civil society, and advocates.
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