OGC Disaster Resilience Pilot (DRP-2019) & GEOSS Architecture Implementation Pilot (AIP-10): Call for Participation (CFP)

Version 1.0 - 29 March 2019

Table of Contents

Corrigenda

The following table identifies all corrections that have been applied to this CFP compared to the original release. Minor editorial changes (spelling, grammar, etc.) are not included.

Section	Description
no entries	

Clarifications

Clarifications to the CFP will be presented on the main project web page:

http://www.opengeospatial.org/projects/initiatives/dp

In addition, the following table will be updated periodically with all clarifications that have been provided in response to questions received from organizations interested in this CFP.

Question	Clarification
no entries	

Abbreviations

The following table lists all abbreviations used in this CFP.

CFP	Call for Participation
CR	Change Request
DER	Draft Engineering Report
DWG	Domain Working Group
ER	Engineering Report
IP	Innovation Program
NAS	NSG Application Schema
NEO	NSG Enterprise Ontology
NSG	(US) National System for Geospatial Intelligence
OCL	Object Constraint Language
OGC	Open Geospatial Consortium
ORM	OGC Reference Model
OWS	OGC Web Services
PA	Participation Agreement
PMT	Profile Management Tool
POC	Point of Contact
Q&A	Questions and Answers
RM-ODP	Reference Model for Open Distributed Processing
SHACL	Shapes Constraint Language
SCXML	ShapeChange XML (model-exchange format)
SOW	Statement of Work
SWG	Standards Working Group
SWRL	Semantic Web Rule Language
TBD	To Be Determined

TC	OGC Technical Committee
TEM	Technical Evaluation Meeting
TIE	Technical Interoperability Experiment
UML	Unified Modeling Language
URL	Uniform Resource Locator
WFS	Web Feature Service
WPS	Web Processing Service
WG	Working Group (SWG or DWG)

Chapter 1. Introduction

The Open Geospatial Consortium (OGC®) is releasing this Call for Participation ("CFP") to solicit proposals for the OGC Disaster Resilience Pilot (DRP-2019) & GEOSS Architecture Implementation Pilot (AIP-10) Initiative ("Pilot" or "Initiative"). This initiative brings two formerly separate initiatives together: The Disaster Resilience Pilot and the GEOSS Applications Implementation Pilot (GEOSS AIP) have been merged to form the new OGC Disaster Resilience Pilot (DRP-2019) & GEOSS Architecture Implementation Pilot (AIP-10). Both initiatives have been merged because they share the same ambitions, technical principles, interoperability challenges, and goals: To develop best practices in sharing and accessing data through Spatial Data Infrastructures in specific contexts: Disaster Resilience on the one side, and general Earth Observation data driven contexts such as ecology, energy, or public health on the other.

The goal of the Disaster Resilience pilot is to develop and demonstrate user guides to build reliable and powerful data infrastructures that make all data required for decision making, analysis, and response in a flooding, hurricane, or wildfire situation available in a cost-effective way. The goal of all other contexts is on similar interoperability challenges, but different thematic contexts.

The initiative primarily builds on the results of a recent OGC Disasters Interoperability Concept Development Study. The work has been published in the form of the OGC Development of Disaster Spatial Data Infrastructures for Disaster Resilience report. The study, sponsored by US Geological Survey (USGS) and Federal Geographic Data Committee (FGDC), and Department of Homeland Security (DHS) focused on how to best support the development of, or combination of SDI(s) for the use in disasters, to advance the understanding of stakeholder issues, and serve stakeholders' needs. The members of the study defined priority challenges to be addressed in dedicated pilot programs. This initiative is the first pilot in this context. It tackles several fields that require better guidance on how Spatial Data Infrastructures can be used in an optimal way in the context of disasters.

The initiative is further supporting GEOSS, the Global Earth Observation System of Systems. GEOSS provides comprehensive, coordinated and sustained observations of the Earth system in order to improve monitoring of the state of the Earth. It increases understanding of Earth processes and enhances prediction of the behavior of the Earth system. The GEOSS Architecture Implementation Pilot (AIP) develops and deploys new process and infrastructure components for the broader GEOSS architecture. OGC leads the AIP using the OGC Innovation Program for over a decade.

The initiative will bring data and infrastructure experts together to exercise specific scenarios. Focus is on disaster resilience, but exercised together with additional scenarios that have similar interoperability challenges. Examples are energy assessments, ecological, or public health scenarios. Within four months, specific aspects such as the integration of remotely sensed data, derived products such as e.g. shorelines, survey data and derived products such as digital elevation models (DEMs), model and forecasting data, and in-situ data shall be demonstrated for selected use cases. The goal is to develop best practices that help domain members to enhance current systems and system setups, to better understand how data can be shared and integrated more efficiently, and to provide a platform to exchange know-how around Spatial Data Infrastructures (SDIs). All scenarios will be

demonstrated at a final event at USGS headquarters, Reston, VA in September 2019. All activities shall results in two main outcomes:

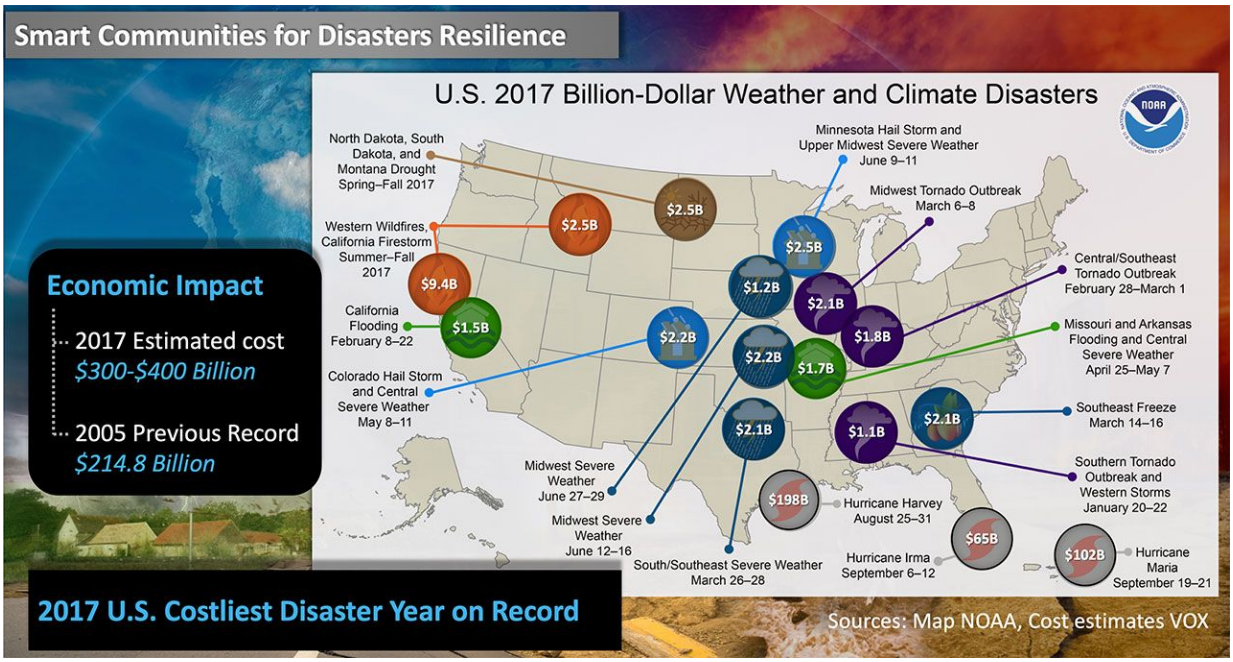
1. User guides that help enhancing existing data infrastructures and components, to better understand interoperability challenges, and solutions that increase the value of data and data infrastructures in the context of disaster resilience
2. Demonstrations of implemented scenarios that serve as blueprints for future activities and demonstrate the potential of modern Spatial Data Infrastructures

This is a practical implementation and user guide development driven initiative. Cost-share funding has been made available to offset participants' costs **for all disaster related scenarios**. Everyone is invited to respond to this Call for Participation (CfP) with ideas on scenarios, work items, demonstration scenarios, and corresponding user guides. This CfP provides a rather high level definition of scenarios that shall serve as a starting point for bidders. They need to be developed into implementable use cases during the first phase of the initiative, based on initial ideas expressed in bidders' proposals. Bidders for this CfP are invited to provide their ideas in a holistic manner, which can include even additional requirements for data, infrastructure, processing capacities, client technologies, etc. The OGC team together with sponsoring organizations will bring all ideas together, try to find matching data and service requests and offerings, and select participants for cost-share based on quality of submitted proposals.

1.1. Background

Multiple jurisdictions across expansive regions are spending increasing time and resources to assist communities and citizens to prepare, respond and recover from major disaster events including hurricanes, earthquakes, landslides, flooding, disease outbreaks, extended drought, and wildfires to name a few. Globally, in the last ten years, there have been an average of 370 natural disasters and over 70,000 fatalities a year. In the U.S. alone, the cumulative cost of 16 separate

billion-dollar weather events was $306.2 billion.



This chart by NOAA reflects the top 16 events that affected the US in 2017 with cost from Vox associated with each event. The cumulative damage of these 16 U.S. events identified in 2017 is $306.2 billion, which shatters the previous U.S. annual record cost of $214.8 billion (CPI-adjusted), established in 2005 due to the impacts of Hurricanes Dennis, Katrina, Rita and Wilma.

Over the past years, agencies such as FGDC have worked extensively with partners and stakeholders to utilized geospatial data and technologies to respond to large-scale natural disasters including wildland fires, floods as well as hurricanes Harvey, Irma and Maria. Examples range from U.S Census providing geographically enriched social and economic data to assist National, State, and Local recovery efforts to NOAA and USGS providing data, forecasts, models, imagery to assist emergency response efforts to aid responders, damage assessors, and displaced citizens.

To avoid or minimize disaster impacts, effective coordination policies and practices as well as the efficient gathering of current and often near real-time data of known quality from a range of sources. Many local, national, and regional jurisdictions

have adopted common Spatial Data Infrastructure (SDI) policies and best practices to support the sharing and exploitation of important location and condition information, and to support rapid adoption of new geoinformation sources and technologies. However, in many cases, as described in responses submitted to a Request for Information, these policies and practices may be inconsistently implemented and coordinated which has limited the ability of valuable information and tools to be shared and used to address disaster management.

The ability to effectively share, use, and re-use geospatial information and applications across and between public and private sector organizations in support of disaster preparation, response and resilience is dependent upon having a SDI already in-place when disaster strikes. Nevertheless, there are several recurring challenges in disaster events:

- Lack of an integrated policy and operational framework to facilitate rapid acceptance, qualification, gestation and use of relevant geospatial information from a range of government, commercial providers and citizens.
- Inability with existing metadata approaches to quickly discover and understand which information sources are most useful in the context of a user's need.
- Inability to properly fuse and synthesize multiple data sources locally to derive knowledge necessary for rapid disaster response decisions.
- The need for a persistent platform to organize and manage disaster related geospatial information and tools necessary for collaborating organizations to address the full disaster lifecycle – preparedness, response and recovery.

This initiative will address these and a range of further complex issues where geospatial data are necessary but still not optimally integrated and available for the various phases of responsible disaster planning, response and recovery, and security.

1.2. OGC Innovation Program Initiative

This Initiative is being conducted under the OGC Innovation Program. The OGC Innovation Program provides a collaborative agile process for solving geospatial challenges. Organizations (sponsors and technology implementers) come together to solve problems, produce prototypes, develop demonstrations, provide best practices, and advance the future of standards. Since 1999 more than 100 initiatives have been taking place. Innovation Program initiatives include testbeds, interoperability experiments, pilots, concept development studies, hackathons, engineering services, and plugfests.

1.3. Benefits of Participation

This Initiative provides a unique opportunity to help shaping best practices and guidelines for reliable and powerful Spatial Data Infrastructures for disaster resilience. It allows to experiment with new ideas and test workflows and processing chains.

The outcomes of this initiative help other organizations to establish enhanced data infrastructure elements and to address known issues in a guided way. The demonstration scenarios and outreach communication activities allow efficient sharing of ideas and capabilities. The initiative itself provides a platform for collaborative experimentation and development. The sponsorship supports this vision with cost-sharing funds to largely offset the costs associated with development, engineering, and demonstration of these outcomes. This offers selected Participants a unique opportunity to recoup a high portion of their initiative expenses.

Chapter 2. Initiative Organization and Execution

2.1. Initiative Policies and Procedures

This initiative will be conducted under the following OGC Policies and Procedures:

- This Initiative will be conducted in accordance with OGC Innovation Program

Policies and Procedures.

- OGC Principles of Conduct will govern all personal and public Initiative interactions.
- Participants drafting documents for the Initiative are required to allow OGC to copyright and publish documents following the OGC Intellectual Property Rights Policy.

2.2. Initiative Roles

The roles generally played in any OGC Innovation Program initiative include Sponsors, Bidders, Participants, Observers, and the Innovation Program Team ("IP Team"). Additional explanations of the roles are provided in Annex: Tips for New Bidders.

The IP Team for this Initiative will include an Initiative Director and an Initiative Architect. Unless otherwise stated, the Initiative Director will serve as the primary point of contact (POC) for the OGC.

The Initiative Architect will work with Participants and Sponsors to ensure that Initiative activities and deliverables are properly assigned and performed. They are responsible for scope and schedule control, and will provide timely escalation to the Initiative Director regarding any severe issues or risks that happen to arise.

2.3. Types of Deliverables

All activities in this initiative will result in a Deliverable. These Deliverables can take the form of Documents or Demonstrations. Implementation components are considered to be provided by participants on a per-need basis, but are not considered as deliverables in this initiative. Focus is clearly on guides and demonstrations.

2.3.1. Documents

This initiatives will provide documents in the form of user guides. Templates for these user guides will be discussed at the kick-off meeting. The initiative results will be summarized in an OGC Disaster Resilience Pilot Summary Engineering Report.

2.3.2. Implementations

This initiative will not fund any implementations, but demonstrations and user guide development exclusively. All participants are required to provide necessary software components required to implement intended scenarios. No participant is required to make any service or data available without agreement.

2.4. Proposals & Proposal Evaluation

Proposals are expected to be short and precisely addressing the work items a bidder is interested in. A proposal template will be made available. The proposal, including technical and financial details, has a page limit as defined in Appendix A. Details on the proposal submission process are provided in Appendix A: Proposal Submission Guidelines. The proposal evaluation process and criteria are described below. **Proposals that are fully in-kind are excluded from the proposal evaluation process, but automatically accepted**.

2.4.1. Evaluation Process

Proposals will be evaluated according to criteria that can be divided into three areas: Technical, management, and cost. Each review will commence by analyzing the proposed deliverables in the context of the Sponsor priorities, examining viability in light of the requirements and assessing feasibility against the use cases.

At the Technical Evaluation Meeting (TEM), the IP Team will present Sponsors with recommendations regarding which parts of which proposals should be offered cost-sharing funding (and at what level). Sponsors will decide whether and how draft recommendations in all these areas should be modified.

Immediately following TEM, the IP Team will begin to notify Bidders of their selection to enter negotiations for potentially becoming initiative Participants. The

IP Team will will also develop the Statement of Work (SOW) being part of the initiative Participant Agreement for each selected Bidder.

2.4.2. Management Criteria

- Adequateness and quality of concise descriptions of all proposed activities, including how each activity contributes to achievement of particular requirements and deliverables
- Willingness to share information and work in a collaborative environment
- Contribution toward Sponsor goals of enhancing availability of standards-based offerings in the marketplace

2.4.3. Technical Criteria

- How well applicable requirements in this CFP are addressed by the proposed solution
- Proposed solutions could be executed within available resources
- Proposed solutions support and promote the initiative system architecture and demonstration concept
- Where applicable, proposed solutions are OGC-compliant

2.4.4. Cost Criteria

- Cost-share compensation request is reasonable for proposed effort
- All Participants are required to provide at least some level of in-kind contribution (i.e., activities requesting no cost-share compensation).

2.5. Reporting

Initiative participant business/contract representatives are required (per a term in the Participation Agreement contract) to report the progress and status of the

participant's work. Detailed requirements for this reporting will be provided during contract negotiation. Initiative accounting requirements (e.g., invoicing) will also be described in the contract.

The IP Team will provide monthly progress reports to Sponsors that require input by all participants. Ad hoc notifications may also occasionally be provided for urgent matters. To support this reporting, each Initiative participant must submit (1) a monthly Technical Progress Report and (2) a monthly Business Progress Report by the first working day on or after the 5th of each month. Templates for both of these report types will be provided and must be followed. Both reports require minimum effort.

The purpose of the Monthly Business Progress Report is to provide initiative management with a quick indicator of project health from the perspective of each Initiative participant. The IP Team will review action item status on a weekly basis with the Initiative participants assigned to complete those actions. Initiative participants must be available for these contacts to be made.

Chapter 3. Master Schedule

The following table details the major Initiative milestones and events. Dates are subject to change.

Table 1. Master schedule

Milestone	Date	Event
M01	02 April 2019	Release of Call for Participation (CFP)
M02	07 May 2019	Proposals due
M03	07 June 2019	Participant selection and agreements
M04	14 June 2019	Virtual Kick-off meeting (Go-To-Meeting)
M05	06 September 2019	Demonstrations and Engineering Reports due
M06	17 September 2019	Demonstration event at USGS, Reston, VA

M07	30 September 2019	All final Engineering Reports due, official end of project
M08	15 October 2019	Participants' summary reports due

3.1. Miscellaneous

Corrections and Clarifications

Once the original CFP has been published, ongoing authoritative updates and answers to questions can be tracked by monitoring the CFP Corrigenda Table and the CFP Clarifications Table.

Participant Selection and Agreements:

Bidders may submit questions via timely submission of email(s) to the OGC Technology Desk. Question submitters will remain anonymous, and answers will be regularly compiled and published in the CFP Clarifications page.

OGC may also choose to conduct a Bidder's question-and-answer webinar to review the clarifications and invite follow-on questions.

Following the closing date for submission of proposals, OGC will evaluate received proposals, review recommendations with the Sponsor, and negotiate Participation Agreement (PA) contracts, including statements of work (SOWs), with selected Bidders. Participant selection will be complete once PA contracts have been signed with all Participants.

Kick-off: The Kickoff is a virtual meeting where Participants, guided by the Initiative Architect, will refine the Initiative architecture and settle upon specific use cases and demonstration scenarios together with Sponsors. Participants will be required to attend the Kickoff.

Regular Teleconference and Interim Meetings After the Kickoff, participants will meet virtually in a frequent basis remotely via web meetings and teleconferences. Typical frequency of teleconferences is one meeting per week.

Development of Engineering Reports, Change Requests, and Other Document Deliverables: Development of Engineering Reports (ERs), Change Requests (CRs) and other document deliverables will commence during or immediately after Kickoff.

Under the Participation Agreement (PA) contracts to be formed with selected Bidders, ALL Participants will be responsible for contributing content to the ERs. But the ER Editor role will assume the duty of being the primary ER author.

Final Summary Reports, Demonstration Event and Other Stakeholder Meetings: Participant Final Summary Reports will constitute the close of funded activity. Further development work might take place to prepare and refine assets to be shown at stakeholder meetings.

Chapter 4. Deliverables

Each participant shall support the development of user guides, the final demonstration, and screen recordings with voice over to be used to communicate results of the pilots. Cost-share funding is available and will be made assigned depending on the evaluation results. Fully-in-kind proposals are appreciated! For full in-kind proposals, requirements on deliverables can be relaxed.

Important	The list of deliverables contains a single work item only. Various copies of this work item will be funded! The number of copies depends on the final budget and cost-share requests. All cost-share requests shall reference deliverable D001!

The following table summarizes the full set of Initiative deliverables. Technical details can be found in the Appendix B: Technical Architecture.

Table 2. CFP Deliverables and Funding Status

ID	Document / Component	Funding Status
D001	Scenario Package: User guide & Demonstration	funded

Appendix A: Proposal Submission Guidelines

A.1. General Requirements

The following requirements apply to the proposal development process and activities.

- Proposals must be submitted before the appropriate response due date indicated in the Master Schedule.
- If cost-share funding is requested, then proposing organizations must be an OGC member and familiar with the OGC Mission, Vision, and Goals. Proposals from non-members will be considered, if a completed application for OGC membership or a letter of intent to become a member if selected for funding is submitted prior to or along with the proposal. If you are in doubt about membership, please contact OGC at techdesk@opengeospatial.org.
- Proposals may address selected portions of the initiative requirements as long as the solution ultimately fits into the overall initiative architecture. A single proposal may address multiple requirements and deliverables. To ensure that Sponsor priorities are met, the OGC may negotiate with individual Bidders to drop, add, or change some of the proposed work.
- Participants selected as Editors will also be expected to participate in the full course of activities throughout the Initiative, documenting implementation findings and recommendations and ensuring document delivery.
- All Selected Participants (both cost-share and pure in-kind) must attend with at least one technical representative to the Kickoff. Participants are also encouraged to attend at least with one technical representative the Demonstration Event.
- No work facilities will be provided by OGC. Each Participant will be required to

perform its PA obligations at its own provided facilities and to interact remotely with other Initiative stakeholders.

- Information submitted in response to this CFP will be accessible to OGC staff members and to Sponsor representatives. This information will remain in the control of these stakeholders and will not be used for other purposes without prior written consent of the Bidder. Once a Bidder has agreed to become an Initiative Participant, it will be required to release proposal content (excluding financial information) to all Initiative stakeholders. Commercial confidential information should not be submitted in any proposal (and, in general, should not be disclosed during Initiative execution).

- Bidders will be selected to receive cost sharing funds on the basis of adherence to the requirements (as stated in in the CFP Appendix B Technical Architecture) and the overall quality of their proposal.

- Bidders not selected for cost sharing funds may still be able to participate by addressing the stated CFP requirements on a purely in-kind basis.

- Each Participant (including pure in-kind Participants) that is assigned to make a deliverable will be required to enter into a Participation Agreement contract ("PA") with the OGC. The reason this requirement applies to pure in-kind Participants is that other Participants will be relying upon their delivery to show component interoperability. Each PA will include a statement of work ("SOW") identifying Participant roles and responsibilities.

A.2. What to Submit

The two documents that shall be submitted, with their respective templates are as follows:

1. Technical Proposal: https://portal.opengeospatial.org/files/?artifact_id=82493
2. Cost Proposal: https://portal.opengeospatial.org/files/?artifact_id=82494

Proposals that are fully in-kind are invited to provide the cost-share proposal on a voluntary basis. It allows us to better understand the overall volume of the initiative.

A **Technical Proposal** should be based on the Response Template and must include the following:

- Cover page
- Overview (Not to exceed one page)
- Proposed contribution (Basis for Technical Evaluation; not to exceed 1 page per work item), including:
    - Understanding of interoperability issues, understanding of technical requirements and architecture, and potential enhancements to OGC and related industry architectures and standards
    - Description of data to be used, processed, or transferred
    - Brief description of the involved stakeholders

The Cost Proposal should be based on the two worksheets contained in the Cost Proposal Template and must include the following:

- Completed Initiative Cost-Sharing Funds Request Form
- Completed Initiative In-Kind Contribution Declaration Form

Additional instructions are contained in the templates themselves.

A.3. How to Transmit the Response

Guidelines:

- Proposals shall be submitted to the OGC Technology Desk (techdesk@opengeospatial.org).
- The format of the technical proposal shall be Microsoft Word or Portable Document Format (PDF).

- The format of the cost proposal is a Microsoft Excel Spreadsheet.
- Proposals must be submitted before the appropriate response due date indicated in the Master Schedule.

A.4. Questions and Clarifications

Once the original CFP has been published, ongoing authoritative updates and answers to questions can be tracked by monitoring this CFP.

Bidders may submit questions via timely submission of email(s) to the OGC Technology Desk. Question submitters will remain anonymous, and answers will be regularly compiled and published in the CFP clarifications table.

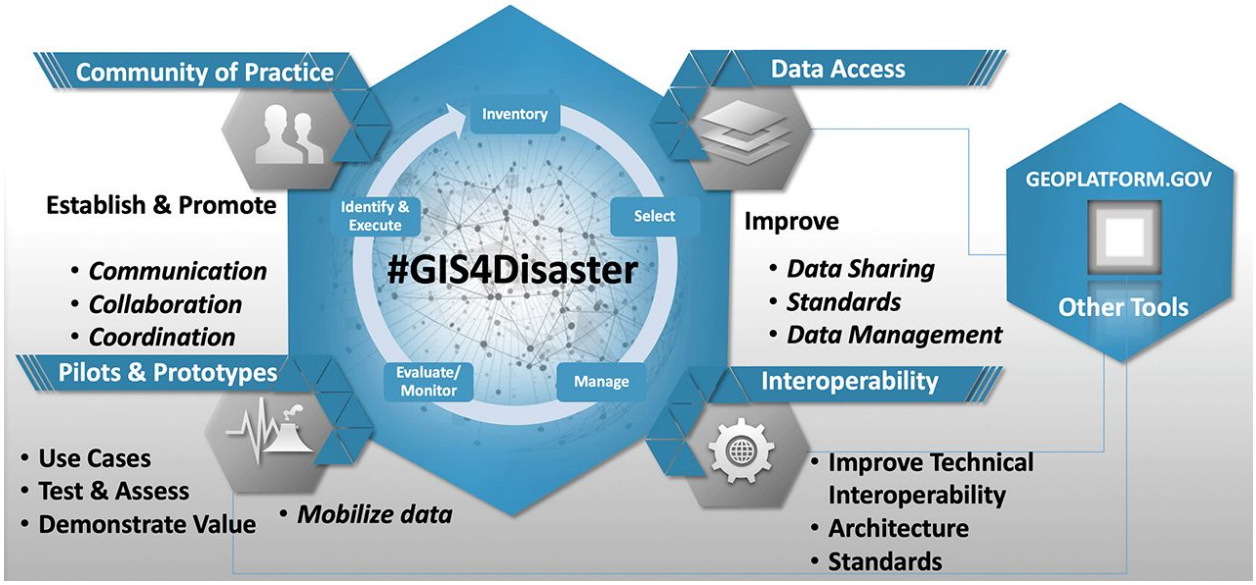
OGC may also choose to conduct a Bidder's question-and-answer webinar to review the clarifications and invite follow-on questions.

Update to this CFP including questions and clarifications will be posted to the original URL of this CFP.

Appendix B: Technical Architecture

Note	This appendix provides the technical architecture, which includes descriptions of the OGC baseline and identifies scenarios, requirements and corresponding work items.

This initiative faces the challenge to make appropriate data available in an efficient way for further use, which requires standards for data discovery, access, and exchange. Data sharing conventions can further support these processes. Exchanged data then needs to be integrated with other data, and the integration processes often take place in other software environments. In this context, interoperability is essential, i.e. the capability of two (software) components to work together and understand each other thanks to standardized interfaces, data exchange formats, data access security models, exchange policies etc. Interoperability is not only a technical challenge, but applies to all levels from binary data to political willingness to share and collaborate.



As illustrated in the figure above, these initiative supports the whole Geoinformation System for Disaster cycle (GIS4Disaster), that starts communities identifying their needs, inventories that list available data and processing capabilities, data access and management standards and conventions to work with the data, experiments such as this initiative to explore status quo and to provide guides on how to best build and execute the full cycle. Eventually, we end with our communities of practice again, that use what is available and revise requirements and needs.

The initiative further supports thematic contexts that are not directly affecting disasters, such as energy, ecology, or public health. For details on the various thematic contexts, please see section Introduction above.

B.1. Baseline Architecture

B.1.1. OGC Standards Baseline

The OCG Standards Baseline is the complete set of member approved Abstract Specifications, Standards including Profiles and Extensions, and Community Standards.

OGC standards are technical documents that detail interfaces or encodings. Software developers use these documents to build open interfaces and encodings into their products and services. These standards are the main "products" of the Open Geospatial Consortium. The membership developed these to address specific interoperability challenges. Ideally, when OGC standards are implemented in products or online services by two different software engineers working independently, the resulting components plug and play, that is, they work together without further debugging. OGC standards and supporting documents are available to the public at no cost. A growing number of eLearning modules becomes is emerging that provides further details.

Any Schemas (xsd, xslt, etc.) that support an approved OGC standard can be found in the official OGC Schema Repository.

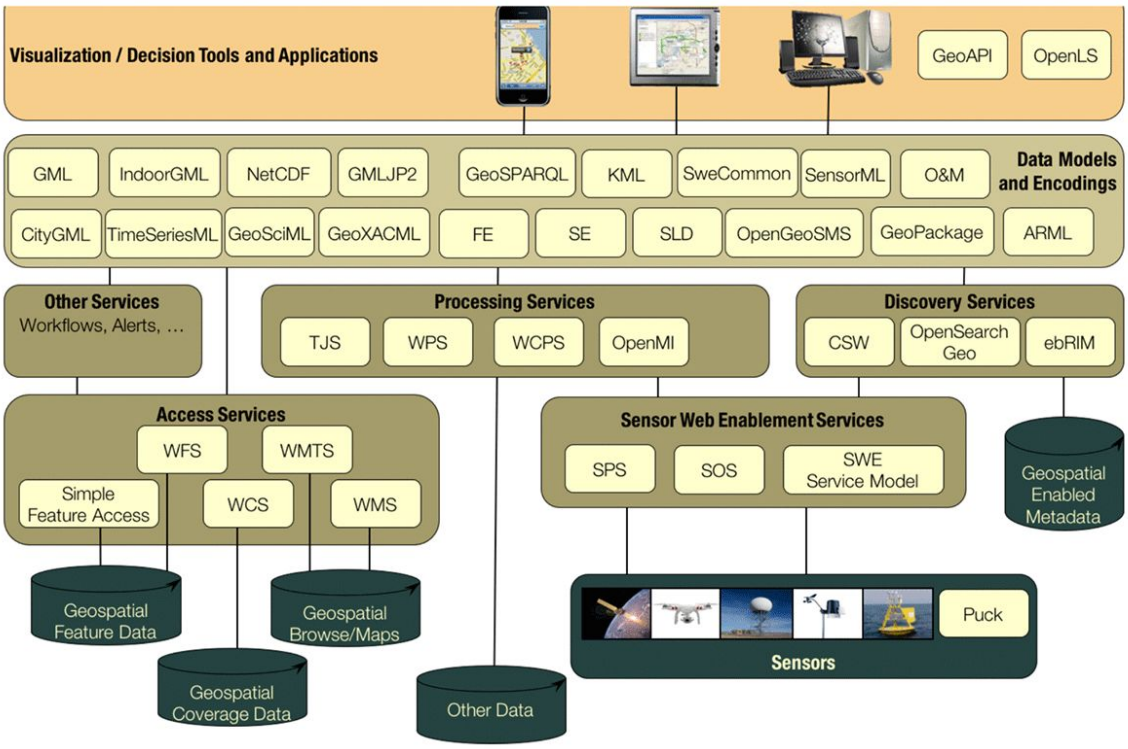
The OGC Testing Facility Web page provides online executable tests for some OGC standards. The facility helps organizations to better implement service interfaces, encodings and clients that adhere to OGC standards.

B.1.2. OGC Best Practices and Discussion Papers

OGC also maintains other documents relevant to Innovation Program initiatives, including Engineering Reports, Best Practice Documents, Discussion Papers, and White Papers.

B.2. Initiative Architecture

The goal of the initiative is to develop and demonstrate user guides to build reliable and powerful data infrastructures that make all data required for decision making, analysis, and response in various contexts with focus on flooding, hurricane, or wildfire situations. Following the OGC standards baseline and best practices and applying results from the OGC Disasters Interoperability Concept Development Study, the targeted architecture is based on the loose confederation approach as illustrated in the figure below. The approach uses a set of standardized service interfaces that allow well-defined access to data. Appropriate interfaces are available for any type of data, e.g. satellite imagery, maps, survey data, road networks, shorelines, digital elevation models, model and simulation data, sensor data, or other in-situ data, including human observations and citizen science data.



Loose confederation approach

Often, these loosely connected services are bundled in specific portal solutions. The portal, usually implemented as a Website with discovery, data access, and visualization capabilities then forms a closely architected approach. As long as all services remain open for public access, this is a meaningful approach to provide a seamless user experience for a dedicated community. Nevertheless, keeping all service interfaces available allows cross-community integration and usage of data, which is often essential in multi-event disaster scenarios or cross-border situations.

B.2.1. Previous Work

The following reports serve as input for this initiative:

- OGC Development of Disaster Spatial Data Infrastructures for Disaster Resilience
- Strengthening Disaster Risk Reduction Across the Americas Summit - Simulated Exercise Engineering Report

- OGC Testbed-13: NA001 Climate Data Accessibility for Adaptation Planning
- Arctic Spatial Data Pilot Concept Study
- Arctic Spatial Data Pilot: Phase 2 Report

B.2.2. Scenarios

It has been agreed that Disaster SDIs can be enhanced best by the implementation and description of a number of scenarios. These scenarios shall make use of a number of data sets discovered and served by the disasters SDI and visualized by disasters SDI client components. *Disasters SDI* stands here for general SDIs that serve data and processing capabilities in the context of disasters, not any specific SDI. The scenarios can be located anywhere.

A similar approach will be applied to non-disaster scenarios.

The scenarios targeted in this initiative may not only include disaster response situations, but also exercise the current state of data and product exchange practices and technologies throughout the disaster life cycle, including disaster planning, response, and recovery.

In exercising these scenarios there should be involvement of both public and

private sector entities sharing disaster impact, response, and recovery data to support more effective and timely coordination during the response and recovery phases.

It will be the job of the participant to determine what data may be necessary for a particular scenario and then to present how to best discover, retrieve and utilize the data and services deemed necessary.

There are a number of aspects that are independent on the specific scenario. Instead, they are applicable to almost all scenarios. These include for example rapid discovery of data on various types of clients, online/offline situations and low bandwidth, need to avoid information overload in crisis situations, but need for extensive data sets in analysis and planning phases.

It is emphasized that locations identified in the scenarios below are meant exemplarily. Participants are free to suggest different locations and spatial scales if data and services are available for these.

B.2.2.1 Scenario 1: Flood

Floods are far and away the most common natural disaster worldwide and account for the most deaths.

Number of disasters per type 1998-2017, source: UNISDR

The deadliest disaster of the 20th century was the China floods of 1931, which by many accounts resulted in more than a million deaths.

According to the NASA Earth Science Disasters Program, in the United States, floods account for more deaths than any other natural disaster; resulting in more loss of life and property than other types of hazards and severe weather events. This is possibly due to the multifaceted nature of flood events. For instance, the US Eastern and Gulf coasts are particularly vulnerable to storm surges from hurricanes, while the Northeast and North Central U.S., and some areas of the Western U.S. are more susceptible to excessive rainfall, snow/ice melt, and dam failures. In Alaska the Upper Midwest and other areas, river ice jams can also cause severe flooding.

In this scenario, heavy rains over the past several days have saturated the ground, leaving waterways in the area at dangerously high levels. The rains are the result of a Category 2 hurricane that came ashore between Corpus Christi and Houston, Texas and headed NNW towards Austin, Texas. There was minimal wind damage but the hurricane carried significant moisture. As the hurricane progresses, the National Weather Service issues a Flood Watch for Austin, Texas and the surrounding areas. The forecast calls for additional heavy rainfall, perhaps as much as 10–12 inches during the next 72 hours as projected by several weather forecast models. Many of the primary roads in the area are beginning to flood and detours are required.

As the rain continues to fall, the National Weather Service issues a Flood Warning for Austin and estimates that major flooding will occur within 12 hours. Areas around the city are experiencing minor flooding. The Mayor has issued a voluntary evacuation for Austin and, as a result, roads are becoming clogged with the increased traffic.

As it continues to rain large portions of Austin are without power. In some areas, residents had to be rescued from flooded homes and vehicles. Roadways remain flooded and impassable.

B.2.2.2 Scenario 2: In-situ for Floods forecasting system

In this scenario, a *Flood Forecasting System* has already been developed by the GEO Global Water Sustainability (GEOGLOWS) community and needs to access in-situ water information via an API to provide verification on the quality of the forecast to forecasters and decision makers.

By themselves, in-situ measurements of hydrologic processes are critical for any hydrologic analysis. The challenge for most developing parts of the world are resources both for collecting data as well as managing it and making it available. GEOSS and the World Meteorological Organization (WMO) have already done much to improve the ability for data sharing. The WMO has encouraged and trained National Hydrological Service (NHS) around the world in better practices, but it remains a big challenge. New standards, such as OGC WaterML and cloud storage make it possible to establish services for better access and use of these data. WaterML Part 1 and Part 2 have been adopted as WMO Standards by the 15th session of the WMO Commission of Hydrology.

The user of this data will be the GEO's hydrologic information and forecasting capabilities built by GEOGLOWS which will produce data for the Disaster crisis manager.

The expected outcome of this pilot will be documented experiences and best practice APIs to access the hydro related data needed by GEOGLOWS to validate, calibrate, improve modeling through assimilation (updating initial streamflow between forecasts), quantify forecast skill, allow observed historical data to be compared to the simulated historical data so that a proper understanding of model performance can be achieved to help end users develop greater confidence when using results to make decisions. This data could eventually be used to run ensemble forecasts to express uncertainties. Past data could allow the simulation of historical hydrology as a mean of putting current forecasts in context relative to possible extreme events. GEO's hydrologic information and forecasting capabilities built by GEOGLOWS will build flood forecasts products based on the data made available.

Data providers are encouraged to describe the available data and services they can provide, and all metadata useful on semantics and methodology of measurement. Participants can be data providers or API developers based on the data that will be made available. WMO will support this pilot by facilitating contacts with relevant data providers. GEOGLOWS will support this pilot by providing the GEO's hydrologic information and forecasting capabilities and resources to evolve it based on the APIs or data access that will be developed.

B.2.2.3 Scenario 3: Wildfire

Wildfire itself, is an integral natural process that acts to maintain ecosystem biodiversity and structure. This includes any non-structure fire that occurs in vegetation or natural fuels, is an essential process that connects terrestrial systems to the atmosphere and climate. However, the effects of these fires can be disastrous, both immediately (e.g., poor air quality, loss of life and property) and through post-fire impacts (floods, debris flows/landslides, poor water quality).

In this scenario, temperatures have been soaring over the past week—plus a rise in winds and a significant drop in humidity levels—outdoor burning bans are in place for campsites, forest land, and mountainous areas throughout southern California. Local media outlets report that fire departments and the U.S. Forest Service have responded to and contained several small brush fires in remote areas just east of Yucaipa, a city located 10 miles east of San Bernardino, in San Bernardino County, California. According to the National Weather Service, the combination of dry fuels and weather conditions has drastically increases the risk of extreme fire danger, and it issues a Fire Weather Warning or Red Flag Warning. The threat for wildfire has been extended to more densely populated areas, including communities built within any proximity to wildfire-prone lands.

The U.S. Forest Service spots a fire 4 miles outside of Yucaipa. The fire is spreading rapidly, threatening numerous acres of forest and moving in the direction of Oak Glen. Several buildings have already burned; heavy smoke is reducing visibility and air quality, and a major electrical transformer is destroyed, causing widespread power outages. The local fire chief warns that at the fire's current rate of spread, it

will reach residential and business areas within 24 hours if not contained. A mandatory evacuation is issued. Schools are closed and roads throughout the area are jammed with people trying to leave.

B.2.2.4 Scenario 4: Hurricane

Hurricanes are intense tropical weather systems consisting of dangerous winds and torrential rains. Hurricanes often spawn tornadoes and can produce a storm surge of ocean water that can be up to 24 feet at its peak and 50 to 100 miles wide. In many cases the most destructive component of hurricanes is the storm surge.

A typical hurricane is 400 miles in diameter with an average lifespan of 9 days in a range of less than 1 day to more than 12 days. A hurricanes' highest wind speeds occur 20 to 30 miles from the center.

The National Hurricane Center (NHC) categorizes a hurricane by its sustained wind intensity on a Saffir-Simpson Hurricane Scale that is used to estimate the potential for property damage and flooding. "Major" hurricanes are placed in Categories 3, 4, or 5 with sustained wind intensities between 111 mph to greater than 155 mph. The most dangerous potential storm would be a slow-moving Category 5 hurricane, making landfall in a highly populated area.

In this scenario, a tropical storm develops in the Atlantic and is upgraded to a hurricane after 5 days in the open waters. After 4 days, the hurricane has steadied at dangerous Category 4 level and models indicate a track that includes a possible landfall along the coast adjacent to the Wilmington, North Carolina, Major Metropolitan Area (MMA) within 2 more days. As the storm moves closer to land, massive evacuations are required.

The hurricane reaches its peak as predicted, a Category 5 hurricane, and makes landfall with a direct hit on Wilmington, NC, and coastal resort towns. Sustained winds are at 160 mph with a storm surge greater than 20 feet above normal. Certain low-lying escape routes are inundated by water anywhere from 5 hours before the eye of the hurricane reaches land. The rain associated with the storm

has caused rivers to overflow their banks, and several rivers systems are experiencing record flood levels.

The hurricane track is predicted to continue to track North heading towards the MMA of Richmond and Washington, D.C.

B.2.2.5 Scenario 5: Landslides

The Landslides scenario aims to provide an enhanced landslide risk assessment framework based on the statistical analysis of long time series of satellite and geospatial data. Focus is given on landslide susceptibility mapping, based on existing models (Copernicus Emergency Management Service models) that incorporate ground velocities estimated from EO SAR data (ERS, ENVISAT, Sentinel-1), registered landslides events based on the inventory provided by IGME (Institute of Geology & Mineral Exploration), other non EO data such as DEM, slope, aspect, geology, soil properties, lithology, LU/LC, faults, precipitation, soil moisture, seismicity, or drainage density. The scenario targets robust and transferable solutions for dynamic mapping and monitoring of landslide hazard zones in complex geo-environmental settings.

B.2.2.6 Scenario 6: Energy Pilot

Satellite images are routinely processed to yield information on clouds properties. The Copernicus Atmosphere Monitoring Service (CAMS) offer access to properties of the cloudless atmosphere every 3h. These sets of information are combined together with site-specific properties, e.g. elevation and shadowing by local relief, to produce estimates of the solar radiation at a given site. Thus, the computation is made on an ad hoc basis on-the-fly. To better account for changes in solar position and possible shadowing effects, computations of the solar radiation are made every 1min and the results are then aggregated e.g. every 15min or 1h, chosen by the user. The operations that are currently working satisfactorily though improvements are necessary to simplify data access by end users.

A new use case has arisen recently due to the large penetration of photovoltaic (PV)

plants in Europe. Grid operators need a better knowledge of the very local production of electricity by PV plants that are connected to the grid in order to ensure the stability and quality of the electricity delivered to customers. Accordingly, their requests are for time-series of solar radiation over a regular grid of points covering their area of interest which may be nation-wide. Though the time-series may be short, e.g. two days of estimates every 15min, the number of grid nodes may be high. An area of say 1000kmx1000 km with a grid cell of 10 km in size means running the model for 10,000 nodes at the same time. The concept of cloud computing may help in solving this issue in both computational aspects and dissemination aspects.

B.2.2.7 Other Scenarios

Other scenarios can be added to the pilot depending on interest of the geospatial community. Of particular interest are scenarios that are connected to Disaster Situations, for example:

- Agriculture and food security: Food Security, global vegetation monitoring and many other areas need consistent time series of high-quality Earth Observation data and in-situ data.A dedicated service that allows users to explore and view the time series without having to download the data, can support many services as demonstrated in Crop Monitoring Supporting Food Security
- Space and security: Earth Observation data are currently showing an unprecedented scenario in terms of variety, volume, velocity, veracity and value; moreover, datasets to be used for security applications can be composed also by geospatial data coming from other sources. Thus, the key challenge in the Space and Security domain is to improve the capacity to access, process and analyse this huge amount of heterogeneous data to provide decision-makers with timely, clear and useful information. An important value provided by EO datasets is the possibility to identify certain features or changes on the Earth's surface at various spatial and temporal scales. Change Detection is a transversal technique supporting the monitoring of urban, built-up and natural environments by identifying

relevant changes within areas of interest. The provided information constitutes a valid support to address environmental, scientific, humanitarian, security or political issues. Within this context, the space and security scenario objectives are tools for detecting and characterizing changes occurring on the Earth's surface, and exploration of methods for extracting information on changes at different scales.

- Air pollution: Megacities are global hotspots of air pollution and associated health risks. Their unlimited growth in area and population, new arising technologies, the implementation of mitigation policies and the possible impacts of climate change require a continuous monitoring of air pollution levels. Therefore the scenario "Air Pollution in Megacities" could offer a global multi-sensor approach combining atmosphere and land data to analyze air pollution variability in megacities and urban agglomerations. Users can explore air quality and urban growth of megacities derived from multiple EO sensors including Sentinel-3 and -5P and the Copernicus Atmosphere Monitoring Service.

For sure, other scenarios could be taken onboard if the objectives of this initiative are met. The list of possible further scenarios includes but is not limited to Biodiversity, Cold regions, Territorial planning, Food security, or Oceanic drift models.

B.2.3. Work Items & Deliverables

The following figure illustrates the work items and deliverables of this initiative.

The following list identifies all deliverables that are part of this initiative. Detailed requirements are stated above. It is emphasized that even though the current list shows four items, the final number of scenario packages depends on the number of selected proposals.

- **Scenario Package 1** - Package contains a user guide and demonstration. The demonstration itself can consist of multiple components. The demonstration is considered delivered by screen recording with voice over and ideally by live demonstration at the final demonstration meeting. The user guide shall contain sufficient detail to support others interested in enhancing their Disaster SDIs with similar components.
- **Scenario Package 2** - same as Scenario Package 1
- **Scenario Package 3** - same as Scenario Package 1
- **Scenario Package N** - same as Scenario Package 1

Appendix C: Tips for new bidders

Bidders who are new to OGC initiatives are encouraged to review the following tips:

- In general, the term "activity" is used as a verb describing work to be performed in an initiative, and the term "deliverable" is used as a noun describing artifacts to be developed and delivered for inspection and use.
- The roles generally played in any OGC Innovation Program initiative are defined in the OGC Innovation Program Policies and Procedures, from which the following definitions are derived and extended:
    - Sponsors are OGC member organizations that contribute financial resources to steer Initiative requirements toward rapid development and delivery of proven candidate specifications to the OGC Standards Program. These requirements take the form of the deliverables described herein. Sponsors representatives help serve as "customers" during Initiative execution, helping ensure that requirements are being addressed and broader OGC interests are being served.
    - Bidders are organizations who submit proposals in response to this CFP. A Bidder selected to participate will become a Participant through the execution of a Participation Agreement contract with OGC. Most Bidders are expected to propose a combination of cost-sharing request and in-kind contribution (though solely in-kind contributions are also welcomed).
    - Participants are selected OGC member organizations that generate empirical information through the definition of interfaces, implementation of prototype components, and documentation of all related findings and recommendations in Engineering Reports, Change Requests and other artifacts. They might be receiving cost-share funding, but they can also make purely in-kind contributions. Participants assign business and technical representatives to represent

their interests throughout Initiative execution.

    - Observers are individuals from OGC member organizations that have agreed to OGC intellectual property requirements in exchange for the privilege to access Initiative communications and intermediate work products. They may contribute recommendations and comments, but the IP Team has the authority to table any of these contributions if there's a risk of interfering with any primary Initiative activities.

    - The Innovation Program Team (IP Team) is the management team that will oversee and coordinate the Initiative. This team is comprised of OGC staff, representatives from member organizations, and OGC consultants. The IP Team communicates with Participants and other stakeholders during Initiative execution, provides Initiative scope and schedule control, and assists stakeholders in understanding OGC policies and procedures.

    - The term Stakeholders is a generic label that encompasses all Initiative actors, including representatives of Sponsors, Participants, and Observers, as well as the IP Team. Initiative-wide email broadcasts will often be addressed to "Stakeholders".

    - Suppliers are organizations (not necessarily OGC members) who have offered to supply specialized resources such as capital or cloud credits. OGCs role is to assist in identifying an initial alignment of interests and performing introductions of potential consumers to these suppliers. Subsequent discussions would then take place directly between the parties.

- Non-OGC member organizations must become members in order to be selected as Participants receiving cost-share funds. Non-members are welcomed to submit proposals as long as the proposal is complemented by a letter of intent to become a member if selected for.

- Any individual wishing to gain access to the Initiative's intermediate work products in the restricted area of the Portal (or attend private working

meetings / telecons) must be a member-approved user of the OGC Portal system. Intermediate work products that are intended to be shared publicly will be made available as draft ER content in a public GitHub repository.

- Individuals from any OGC member organization that does not become an Initiative Sponsor or Participant may still (as a benefit of membership) quietly observe all Initiative activities by registering as a Observer.
- All else being equal, preference will be given to proposals that include a larger proportion of in-kind contribution.
- All else being equal, preference will be given to proposed components that are certified OGC-compliant.
- A Bidder may propose against any or all deliverables.
- In general, the Participant Agreements will not require delivery of any component source code to OGC.
    - What is delivered instead is the behavior of the component installed on the Participant's machine, and the corresponding documentation of findings, recommendations, and technical artifacts as contributions to the initiative's Engineering Report(s).
    - In some instances, a Sponsor might expressly require a component to be developed under open-source licensing, in which case the source code would become publicly accessible outside the Initiative as a by-product of implementation.
- Results of other recent OGC initiatives can be found in the OGC Public Engineering Report Repository.

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