Open Geospatial Consortium — Request for Information on Testbed 13 Data and Services

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Chapter 1. RFI Purpose and Scope

The Open Geospatial Consortium (OGC®) Innovation Program ("IP") provides global, hands-on, collaborative prototyping for rapid development and delivery of proven candidate specifications to the OGC Standards Program, where these candidates can then be considered for further action. In IP initiatives, Participants collaborate to examine specific geo-processing interoperability questions posed by the initiative's Sponsors. These initiatives include concept development studies, testbeds, experiments, pilots, and plugfests – all designed to foster the rapid development and adoption of open, consensus-based standards.

RFI activities themselves are being conducted as an OGC Concept Development Study, governed by the *OGC Interoperability Program Policies and Procedures* [https://portal.opengeospatial.org/files/64320].

This Request for Information (RFI) is being issued to help establish a data and services infrastructure for upcoming *Testbed 13* [http://www.opengeospatial.org/projects/initiatives/testbed13] ("T13") activities. The following figure illustrates key testbed elements.
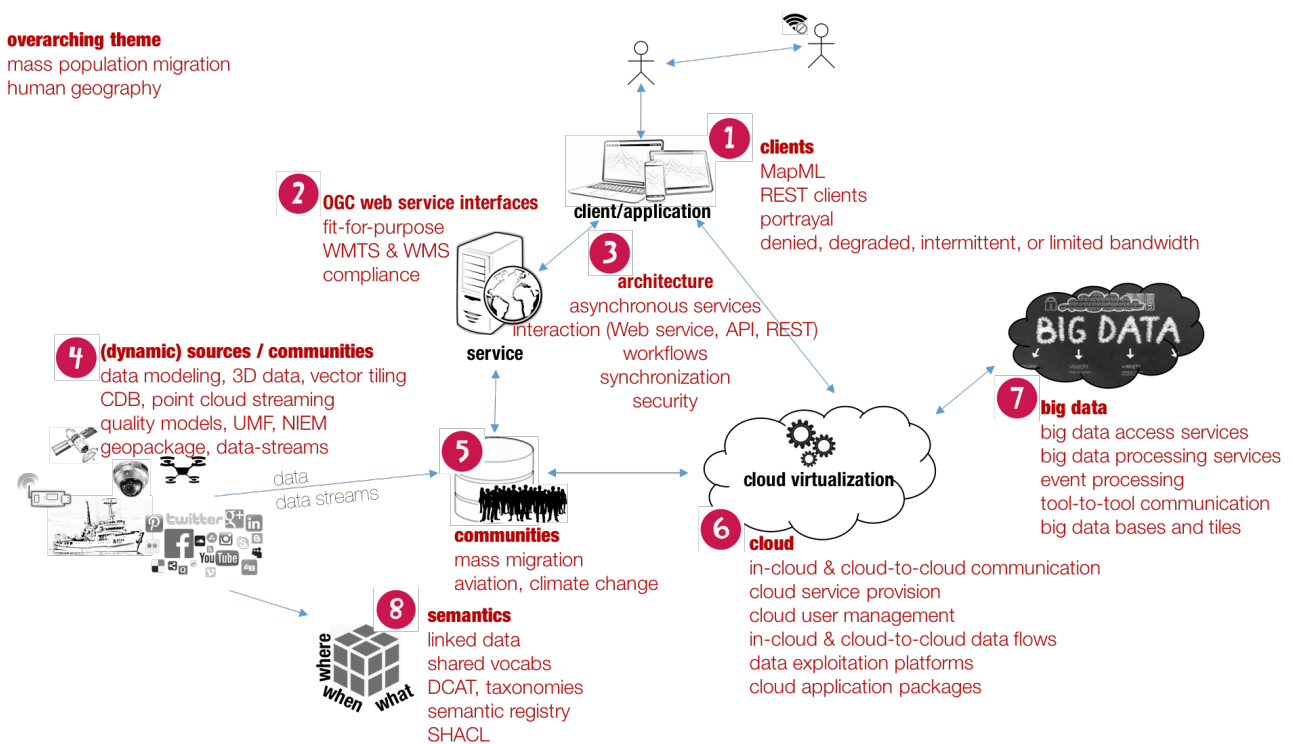
Figure 1. Testbed 13 Overview

As described in the *Testbed 13 Call for Participation (CFP)* [http://www.opengeospatial.org/standards/requests/154], the testbed is organized into the following six threads.

- Dynamic Source Integration (DSI)

- Earth Observation Clouds (EOC)

- Cross Community Interoperability (CCI)

- Field Operations (FO)

- Streaming & 3D Data (S3D)

- Compliance Testing (COT)

These threads integrate both an architectural and a thematic view, which allows a keeping related work items closely together and removing dependencies across threads. The following figure illustrates the allocation of work packages to threads:

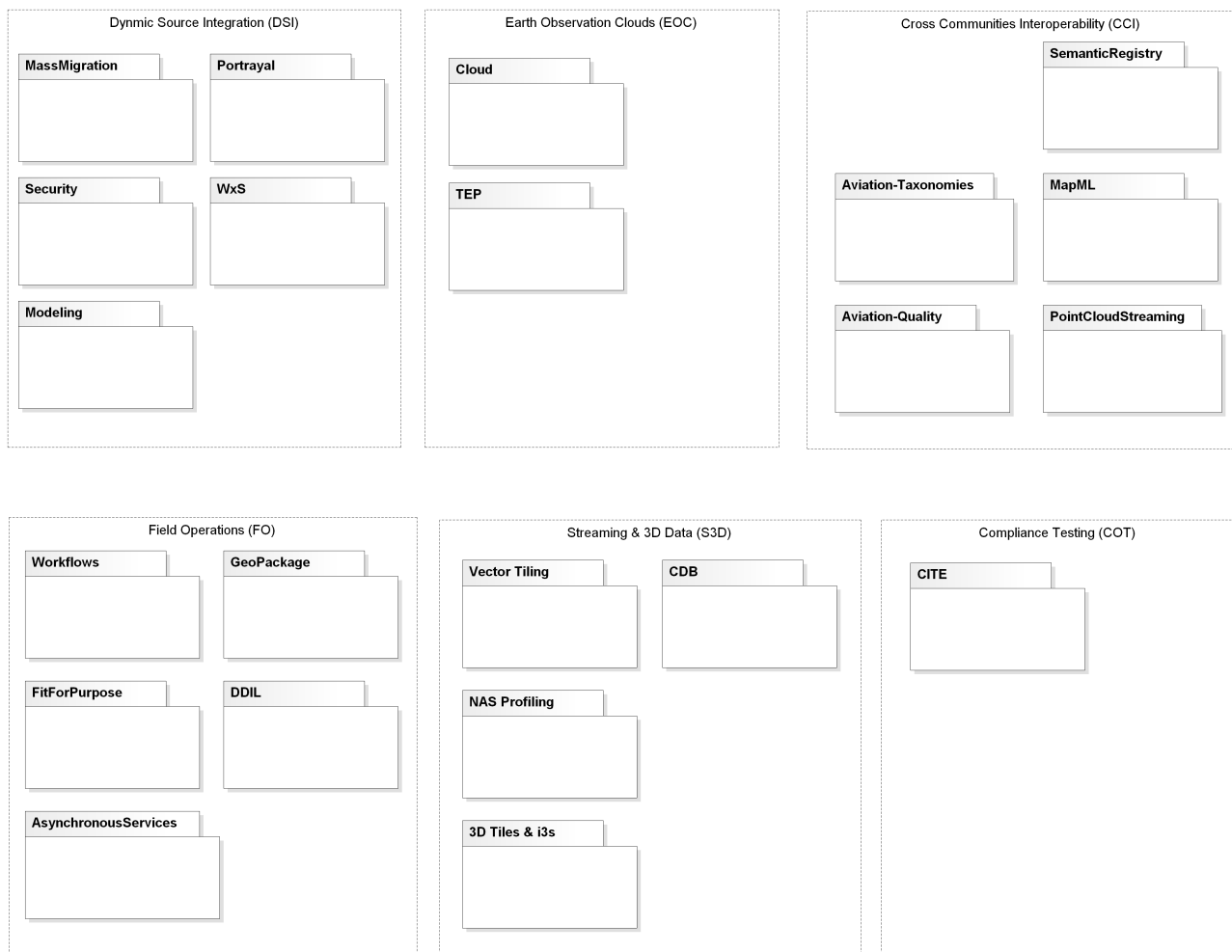*Figure 2. Overview of work package allocation to threads*

RFI responses will be utilized to help identify, assess, and gather the current state and available source data and services in the European and Middle East regions. These will be used to support the development, test and demonstration of OGC standards and technologies in support of the initiative's overarching mass population migration theme.

Chapter 2. Areas and Layers of Interest

T13 Participants will implement services, access data, and demonstrate capabilities potentially using services and data identified by RFI responses. The T13 demonstration scenario will address challenges related to the coordination of multi-regional / national operations surrounding the current exodus of people from the Middle East to Europe. The testbed aims to understand and document how standards-based tools and practices help enable structured information exchange for humanitarian aid and law enforcement.

The general region of interest is shown by by the following diagram, which also illustrates the scale of the current crisis.
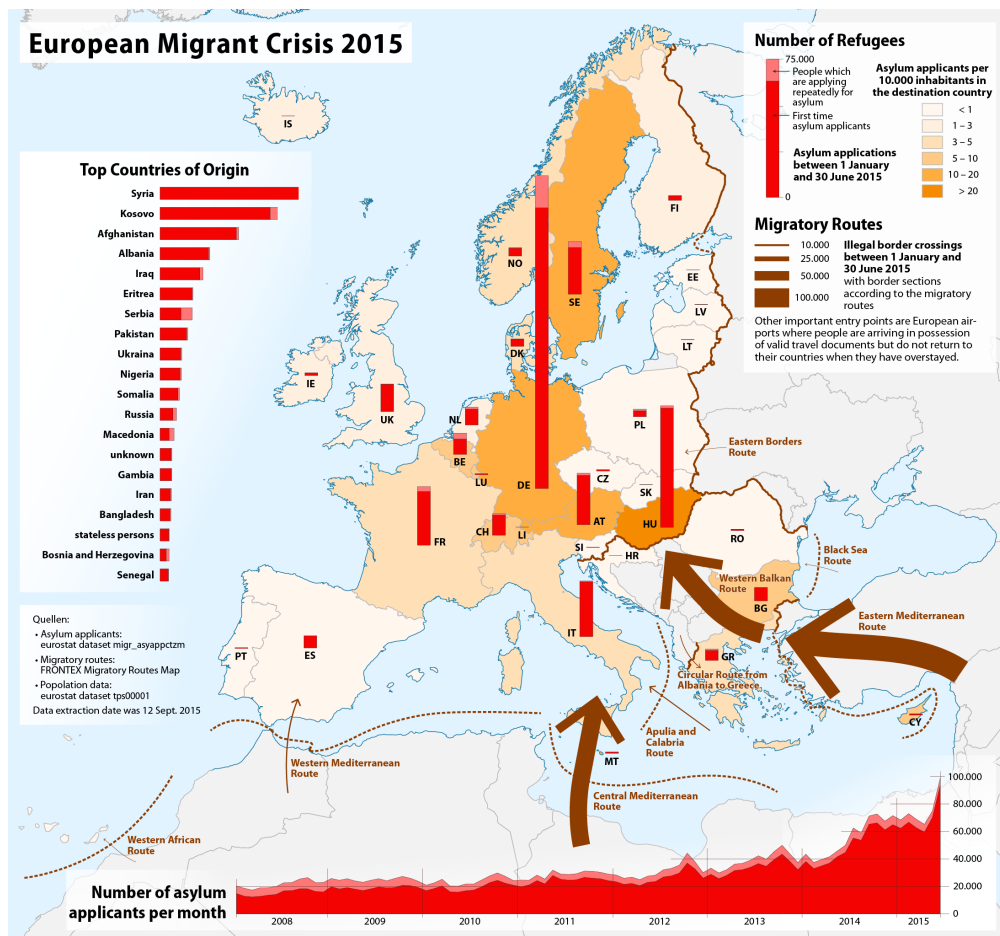

Figure 3. European Migrant Crises 2015 (source: wikimedia by Dörrbecker, CC BY-SA 2.0)

Typical migration routes are shown in the figure below.

Figure 4. Mass migration routes map. source: edmaps.com
[https://www.edmaps.com/html/syrian_refugee_crisis_in_maps.html]

RFI responses recommending data or services having any overlap with this region will be considered. A more focused area of interest (AOI) for the T13 theme will be established once the RFI responses have been received and analyzed.

Keeping in mind the concerns identified by these references, the physical-geography layers of interest to the RFI include (but aren't limited to) roads, harbors, borders and border-crossings, surveillance areas, agriculture, drought, and humanitarian response resources. The human-geography layers of interest are primarily the human populations at risk or on escape due to the various threats.

2.1. Sample Scenario

Data and services pertaining to any of the T13 requirements will be considered. The full set of use cases are described in *Appendix B Technical Architecture* of the *T13 CFP* [http://www.opengeospatial.org/standards/requests/154]. As a representative example, a mass population migration scenario derived from the "Fit for Purpose" work package had been paraphrased below to illustrate the role data and services can play.

Under this scenario, a user is trying to understand and monitor refugee migration across several countries following a civil war in a neighboring country. The user is trying to determine the following:

A. Where is the migration taking place (to and from)?

B. At what rate are the refugee camps growing?

C. What are the estimated populations in these camps?

D. What are the road logistics around these camps?

E. Are sources of usable water available?

F. Where are residences being abandoned?

G. What are the preferred migration paths?

The user knows that recent satellite imagery and other geospatial data could provide some of this information. What's needed in the case of a non-expert user is for the discovery and analysis tools to provide inromation access based on the desired outcome. The steps of a potential use case for the first question in the scenario might read as follows:

1. The user opens a browser-based discovery tool and locates the general area on a map.

2. The tool provides a link to access all the predefined use-case based discovery options (i.e., profiles) that the vendor supports; assume, in this case, that the tool lists the following discovery profiles: Road Mapping, Agricultural Land Use, Change Detection, and Urban Mapping.

3. Assume that the user wishes to first look at road infrastructure near the current refugee camps and selects the "Road Mapping" profile.

4. On the backend, the profile is translated into a set of "Fit for Purpose" attributes, in this case the ground sample distance, accuracy, the currency, and other factors the provider knows will result in a good road mapping product. These attribute filter options are sent to the catalog system.

5. The results are displayed to the user (as browse samples), who is given the option to produce a mapping product for downloading.

6. The user selects the option to produce and download the map product, at which point the client system passes the request (with the selected imagery references) to a WPS service with the same Road Mapping profile selected.

7. The backend system translates the profile into a set of "Fit for Purpose" attributes again, this time representing processing attributes such as product type (1:5,000 scale mosaic, bands to use, requested GSD, bit depth of product, projection, etc.); the WPS process creates the imagery and places it in a cloud-hosted store on the user's behalf.

8. The user is presented an option to view the full resolution product within the client tool or to download it for offline processing.

Chapter 3. Types of Source Data and Services

T13 clients will be implemented to use software applications to access data via standardized interfaces and communication protocols that include standardized data information models and encodings. A variety of source data and services could be useful to support the associated scenarios and use cases.

The following RFI response elements have been identified as potentially relevant. However, these are not intended to be an exclusive set, and additional candidate elements will also be welcomed:

Climate Data and modeling. Climate Data and modeling including data such as inland drought or flooding. OGC seeks to identify a number of data sets, portals, data centers, simulation models, and other Web services that can be used during implementation testing of services in scenarios built around use of NASA ESDS data. The data and services will be used for testing and development of services and client interfaces serving to broaden distribution access and formats of climate reanalysis, climate model data, and climate based observational data for ease of system-to-system ingest, access (e.g., API, WCS, other), and data delivery formats such as HDF, NetCDF, Shapefile, GeoTIFF for ingest by the scientist and non-climate scientist. OGC will collaborate with the Federation of Earth Science Information Partners (ESIP). ESIP is an open, networked community that brings together science, data and information technology practitioners with the mission to support the networking and data dissemination needs of ESIP members and the global Earth science data community by linking the functional sectors of observation, research, application, education and use of Earth science.

OGC is seeking data to be used for development and testing of enhanced standards implemented in systems that aim to broaden understanding of impacts of climate change by inland "drought and flooding" via climate prediction models (single model, ensemble, reanalysis, other) against global population centers.

Climate-induced environmental stresses are likely to contribute to migrations that exacerbate social and political tensions, some of which could overwhelm host governments and populations. The National Intelligence Council describes the situation in the Implications for US National Security of Anticipated Climate Change report "NIC WP 2016-01" [https://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/Implications_for_US_National_Security_of_Anticipated_Climate_Change.pdf] from September 2016 as follows: "Long-term changes in climate will produce more extreme weather events and put greater stress on critical Earth systems like oceans, freshwater, and biodiversity. These in turn will almost certainly have significant effects, both direct and indirect, across social, economic, political, and security realms during the next 20 years. These effects will be all the more pronounced

as people continue to concentrate in climate-vulnerable locations, such as coastal areas, water-stressed regions, and ever-growing cities."

Examples of use and analysis of this type of data includes:

- Predicting drought and migration

- Connecting Models to Social Systems

- Agriculture Land use and registry

- Forestry data and locations

- Urban Land use and registry

- Earth Observation, Radar, Synthetic Radar or Optical

Cloud Computing Environment for Earth Observation Data. OGC is seeking data and services to support work package investigations to develop a Cloud Computing Environment for Earth Observation Data. The goal is to develop an integrated cloud computing solution using OGC web services that works to support the ESA Exploitation Platforms (see separate but related solicitation as referenced in the Testbed 13 CFP) as well as for the Canadian Forestry Service (see Testbed 13 CFP for more details). Among the data that OGC is seeking includes forest features or biophysical parameters from space-borne Synthetic Aperture Radar (SAR) and optical data products while using the synergistic combination of Earth Observation (EO) missions to estimate forest biomass in Canada.

The actual cloud environment to be further developed into an operation model that would support (pre-)processing of high volumes of Earth observation data. This (pre-)processing is envisioned to be handled in the Cloud where processing power and storage can be elastic.

Agriculture data. Agriculture data and locations (soils, crops, usage, etc.) is needed during development and testing of enhanced standards in systems and system-to-system interfaces. Testbed 13 will test the data in systems and services to facilitate analysis of effects of climate on crop production via improved access to climate prediction/data for ingest into crop forecasting models, potentially requiring temporal and spatial subsetting of climate model variables relevant to rain and soil conditions. The data, made available through effective services and system-to-system interfaces, GIS based data formats (e.g., Shape, GeoTIFF) in addition to options to ingest subset HDF, NetCDF formats further improves the understanding and use of the data.

Topographic and Orthoimagery. OGC is seeking data for testing in GeoPackages that would contain both features and instructions for styling of features as well as orthoimagery, shaded relief raster tile sets, national wetlands raster tile sets and elevation data.

Common Database (CDB) standard data for Modeling and Simulation. OGC is seeking CDB data and CityGML/3D data with interest to also support integration with CityGML/3D data and data models. CDB data is needed also to evaluate support for and interoperability issues related to the use of multiple Feature Data Dictionaries and schemas in CDB standard model format. Specifically, the OGC is seeking model, feature and coverage data for use to evaluate the current CDB data model as compared to the National System for Geospatial Intelligence (NSG) and DGIWG data models and investigate interoperability between the current CDB data contents and NGA Application Schema (NAS) based content.

Aviation data for Data Quality Assessment. OGC is seeking data to be used in work item tasks that will investigate data quality characteristics and methods that can be applied in development of new or enhanced standards for all aviation information domains: weather, flight, and aeronautical. Data is requested in formats from among the following models:

- Flight Information Exchange Model (FIXM)

- Aeronautical Information Exchange Model (AIXM)

- Weather Information Exchange Model (WXXM)

- Aerodrome Mapping Exchange Model (AMXM)

Maritime Data and Context for Mass Migration. OGC is seeking representative source thematic geospatial data; and existing or sample US National Information Exchange Model (NIEM) formatted messages associated with the Maritime Information Sharing Environment (MISE). These data and messages will be used for investigation, test and demonstration in Testbed 13. The emphasis will be to advance the understanding and use of the CVISR IEPD messages.

- **Consolidated Vessel Information and Security Reporting (CVISR).** An Exchange Model Description that has defined and standardized levels characterizing how much is known about a vessel (and associated people, cargo, and infrastructure) at a given time. CVISR is generally an assembled product consisting of essential elements from the following four IEPDs.

- **Position (POS).** An Exchange Model Description that defines a geospatial position, course, heading, speed, and status of a vessel at a given time. A series of position reports can be combined to produce track information.

- **Indicators and Notifications (IAN).** An Exchange Model Description that defines Indicators that are provide information used to inform or contribute to an analytical process. Notifications include warnings of a possible event and alerts about the execution of an event.

- **Notice of Arrival (NOA).** An Exchange Model Description that defines a 96-hour advance notice that all vessels inbound to US ports are required to submit, which lists

vessel, crew, passenger, and cargo information.

- **Vessel Information (VINFO).** An Exchange Model Description that defines Static vessel characteristics information, such as vessel tombstone data.

A variety of information sources are expected to be used to test and demonstrate Mass Migration Source integration. These types of information include:

Ship Transponder (AIS) information and analytics. AIS data is a maritime technical standard developed by the International Maritime Organization (IMO) which combines GPS, VHF and data processing technologies to enable the exchange of relevant information in a strictly defined format between different marine entities. Data may be a simple exchange of position, course, speed and identity information between individual vessels or more sophisticated data exchanges between specialist shore and buoy located devices.

Imagery from government and commercial providers. Sources of aerial or satellite imagery, available from commercial and government organizations, is requested to support this work package development and testing for a wide variety of uses relating to navigation, environment, land-use, and emergency response.

The following additional RFI response elements have been identified as potentially relevant. These are not intended to be an exclusive set, and additional candidate elements will also be welcomed:

- Existing Data Models and Software for the physical-geography layers of interest
    - Agriculture
    - Drought
    - Humanitarian Response
- Existing Data Models and Software for the human-geography layers of interest (i.e., populations at risk due to water and food shortages)
- Other geospatial data or services that could be used in scenarios involving mass population movement, sheltering, or camps arising from political unrest or natural disasters in the regions
    - Are there any available data or services describing medical and health facilities and locations?
    - Which map data sets or services are available and should become part of the testbed? Which are currently missing and should be developed for the testbed?
    - Which feature data sets or services are available (e.g., road networks, rivers, water bodies or water sources, jurisdictional boundaries), and which are currently missing?

- Which satellite imagery data or services are available, and which are currently missing?

- Relevant standards already in use

- Likely challenges

- Recognition of potential risks, for example by identifying relations between features

- Understanding of current processes, including legal constaints

- Current state of the art in mass migration data standards and interoperability capabilities

- Technology trends that anticipate future interoperability requirements

- Anything else of relevance

Chapter 4. Instructions for Responding to this RFI

Interested respondents are requested to follow the submission instructions below.

4.1. Who May Respond

This RFI is open to the public, especially organizations with data or services covering the European and Middle East regions and which could be made available for public use to support Testbed 13. Of particular interest is geospatial data or services that could be used in scenarios involving mass population movement, sheltering, or camps arising from political unrest or natural disasters in the regions.

4.2. General Terms and Conditions

RFI responses are due by the date listed in the Schedule below. Responses will be held by OGC and shared with Testbed 13 Sponsor organizations listed in the *Testbed 13* [http://www.opengeospatial.org/projects/initiatives/testbed13] page.

Submissions in response to this RFI will remain in OGC control and will be used for the purposes identified in this RFI. A summary of RFI Responses may be made public. Any respondent wishing to submit proprietary information should contact the *OGC Technology Desk* [mailto:techdesk@opengeospatial.org] in advance of sending the response.

Intended Use of Source Data and Services. Source data and services offered in response to this RFI are intended for use in Testbed 13 to support development, test and integration of new or enhanced OGC standards for access, display and analysis of data to demonstrate developed capabilities. Source data or services offered and used in Testbed 13 will be available to testbed Participants, Sponsors, and Observers during testbed execution. Near the testbed conclusion, OGC will conduct a demonstration of developed capabilities. Selected testbed reports and demonstration artifacts will be made publicly available. Any source data or services offered for use in Testbed 13 could potentially appear in or be referenced by these reports and demonstration artifacts.

4.3. How to transmit a response

Send your response in electronic form to the *OGC Technology Desk* [mailto:techdesk@opengeospatial.org] by the submission deadline.

- Any of the following formats is acceptable:
  - Microsoft Office (.DOCX),

- ◦ Open Document Format (.ODT),
- ◦ Portable Document Format (.PDF).

4.4. RFI Response Outline

Each response should address as many aspects as possible as described in the section Types of Source Data and Services section.

Responses are urged to use the following outline:

- Description of responding organization

- Type and for of available assets (data and/or services)

- Relevance to the area of interest (AOI)

- Use cases or scenarios illustrating their use in mass population movement, sheltering, or camps arising from political unrest or natural disasters in the AOI

- Architectures, standards and technologies

- Implementation examples

Respondents are free to add any additional topic as they think appropriate. An organization need not respond to all topics in the outline.

4.5. Questions and Clarifications

Questions and requests for clarification should be sent to the OGC Technology Desk [mailto:techdesk@opengeospatial.org]. Clarifications questions and answers will be posted publicly on or near the Testbed 13 [http://www.opengeospatial.org/projects/initiatives/testbed13] page.

4.6. Reimbursement

The OGC will not reimburse submitters for any costs incurred in connection with preparing responses to this RFI. Cost-sharing opportunities are available under the associated Testbed 13 CFP [http://www.opengeospatial.org/standards/requests/154].

4.7. Schedule

Responses to this RFI are requested on or before 15 March, 2017. At the discretion of the organizations supporting the RFI, responses may be accepted after that date, but those responses could potentially have less effect on subsequent testbed activities.

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