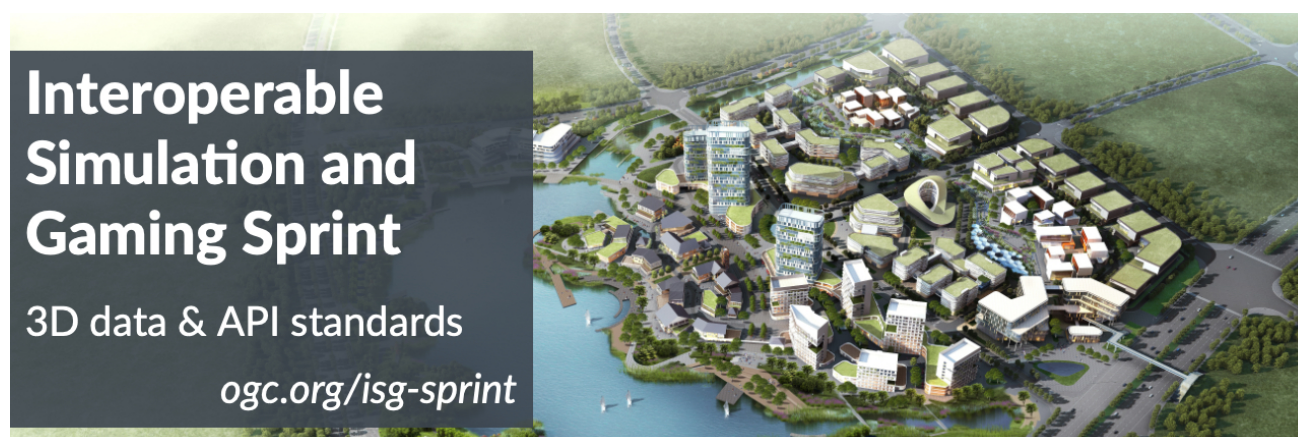


ISG Sprint: Call for Participation

Revised 10 September 2020



Corrigenda and Clarifications

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

Corrigenda List

Section	Description
Links	Add links to various document sections.
(no change to visible output)	Add deep link to Deliverables section.
Items to Be Provided	Link to sample San Diego CDB data.
Intro, Master Schedule, Sprint Activities	Settle Kickoff for 09:30-12:30 EDT on September 1, 2020.
Intro, Architecture Components and Requirements.	Remove comments that final specs will become available in late July (since they are now available).
Intro, Deliverables, Sprint Activities, Appendix C: Signed Release (removed).	Commit to full virtual Sprint Week.
Intro, Master Schedule, Sprint Activities	Postpone Sprint Week dates to September 21-25.

Table 1: The list of changes to this CFP after publication date

The following table identifies all clarifications that have been provided in response to questions received from organizations interested in this CFP.

Questions and Clarifications

Question	Clarification
No questions at this time	

Table 2: The list of questions and clarifications that have been issued after publication date

Links to Various Document Sections

- [Master Schedule](#).
- [Technical Architecture](#).
- [Architecture Components and Requirements](#).
- [Table 4 Pilot ERs](#).
- [Sprint Scenario](#).
- [Sprint Deliverables](#).
- [Items to be Provided](#).
- [Sprint Activities](#).
- [Previous Work](#).

Introduction

The Open Geospatial Consortium (OGC®) is releasing this Call for Participation (CFP) to solicit proposals for the OGC Interoperable Simulation and Gaming (ISG) Sprint initiative ("Sprint").

CFP responses are due **August 21, 2020**.

The Sprint Week will be a **full virtual event** (no physical meeting). The event is scheduled to take place **September 21-25, 2020**.

The Kickoff (mandatory for participants) is scheduled to take place **09:30-12:30 EDT on September 1, 2020**.

The goal of the Sprint is to advance the use of relevant OGC and Khronos standards in the modeling and simulation community through practical exercise and testing of the *OGC API - GeoVolumes* draft specification ("draft spec") produced by the [3D Data Container and Tiles API Pilot](#) ("Pilot").

Of particular interest is the handling and integration of glTF models coming from multiple sources (see [Sprint Scenario](#)). There is secondary interest in the spec's implementability,

consistency, completeness, and maturity. Implementation experiences obtained from the Sprint will advance the interests and work of the [OGC Interoperable Simulation and Gaming Domain Working Group \(ISG DWG\)](#) and of the [OGC Standards Baseline](#) in general.

IMPORTANT

This CFP describes the overall Pilot setup and goals, along with **DRAFT** versions of spec artifacts such as architecture and data structure diagrams. The updated draft spec to be tested in the Sprint ~~will be made available later in July 2020~~ has been made available. Please monitor [Corrigenda and Clarifications](#) for all the latest changes.

The Pilot developed and prototyped a draft specification for organizing 2D and 3D geospatial resources such as 3D tiles datasets and glTF models. The example implementations enabled 3D geospatial volumes to support multiple data containers and allowed applications working with 2D tiled resources to retrieve 3D geospatial resources. The Pilot also assessed prototype spatial data structures for hierarchical geospatial volumes.

To help achieve Pilot goals, the spec defined access to attributed 3D geospatial resources and a corresponding data container format for (streamed) data delivery compatible with [GL Transmission Format \(glTF\)](#) from [The Khronos Group](#).

The sprint will examine the feasibility of implementing the spec by running a week-long code development activity to prototype selected aspects of the draft specification. It is recognized that a single prototype of the entire spec will likely not be possible within given resource and time constraints.

Once the original CFP has been published, interested bidders may submit questions via timely submission of email(s) to the OGC Technology Desk (techdesk@opengeospatial.org). Question submitters will remain anonymous and answers will be regularly compiled and published in the **Corrigenda & Clarifications** section.

Background

The Pilot project was built upon work from Testbeds 13 through 15, Vector Tiles Pilots, 3D Tiles, and I3S; combined with the introduction of resource-oriented APIs built on the OpenAPI framework. These provide the foundation for the draft specification that is the test subject for this Sprint.

Multiple OGC members participated in the Pilot along with the OGC, The Khronos Group, and an initiative sponsor to develop the draft spec. This spec allows 2D assets (maps, vector graphics), building data, and 3D assets (glTF models, OGC building models, digital elevations) to be used together to produce a synoptic view of the region in question.

Benefits of Participation

The Sprint will provide an opportunity for solution providers to collaborate and suggest revisions to the draft spec in the context of a hands-on engineering experience. Participation will raise the visibility of all participants, who will come together in an agile way to contribute to the maturity of the growing set of OGC APIs.

Up to six organizations will be selected for funded participation, with each selected participant receiving a stipend of \$15,000 to use as they see fit.

Master Schedule

Milestone	Date	Activity
M01	07 Jul 2020	Release Call for Participation (CFP)
M02	21 Aug 2020	Response deadline - Bidder proposals due
M03	28 Aug 2020	Notification of selection
M04	01 Sep 2020	Kickoff 09:30-12:30 EDT
M05	21 Sep 2020	Start of Sprint week
M06	25 Sep 2020	End of Sprint week
M07	05 Oct 2020	Sprint Reports due

Table 3: This is a listing of significant Sprint milestone dates. Bidders must be mindful of the date for M02 - Response deadline.

Technical Architecture

Architecture Components and Requirements

This section provides the **DRAFT** technical architecture and identifies all requirements and corresponding work items. It references the **OGC Standards Baseline**, i.e., the complete set of member approved **Abstract Specifications**, **Standards**, and **Community Standards**.

The goal of the Pilot was to explore an integrated suite of draft specifications for 3D tiled geospatial resources and compatibility with existing OGC 3D delivery standards such as the **3D Portrayal Service** OGC Implementation Standard as well as the **3D Tiles** and **I3S** Community Standards. Related OGC 3D standards were also referenced, including **CDB** and **CityGML**.

NOTE

Figures 1 and 2 below do not show a CDB data store since CDB was not heavily used in the Pilot. But CDB will be a key element of the Sprint.

This suite supports smooth transitions between 2D and 3D environments; allows

applications working with 2D tiled resources to retrieve 3D tiled resources; and enables 3D tile bounding volumes to support multiple data containers. Pilot work products, as well as the implementation and community standards described above, will serve as baselines that may be adopted with or without changes for use in the Sprint.

Pilot Engineering Reports (ERs) are available at the links in Table 4. ~~Note that these ERs will not become final until later in July 2020. Pre-release versions are being provided for convenience.~~

Document (Engineering Reports - ER)	Link
D001 3D Data Container ER (aka <i>Pilot Implementation Experiences</i>)	https://portal.ogc.org/files/?artifact_id=94028
D002 OGC API - GeoVolumes ER (aka <i>Draft Specification</i>)	https://portal.ogc.org/files/?artifact_id=94029
D003: Pilot Summary ER (aka <i>Extended Executive Summary</i>)	https://portal.ogc.org/files/?artifact_id=94030

Table 4: Pilot Engineering Reports

The Pilot architecture is illustrated in the following two figures (and accompanying descriptions). ~~Note that these artifacts will not become final until later in July 2020. Pre-release versions of these documents are being provided for convenience.~~

Service Architecture

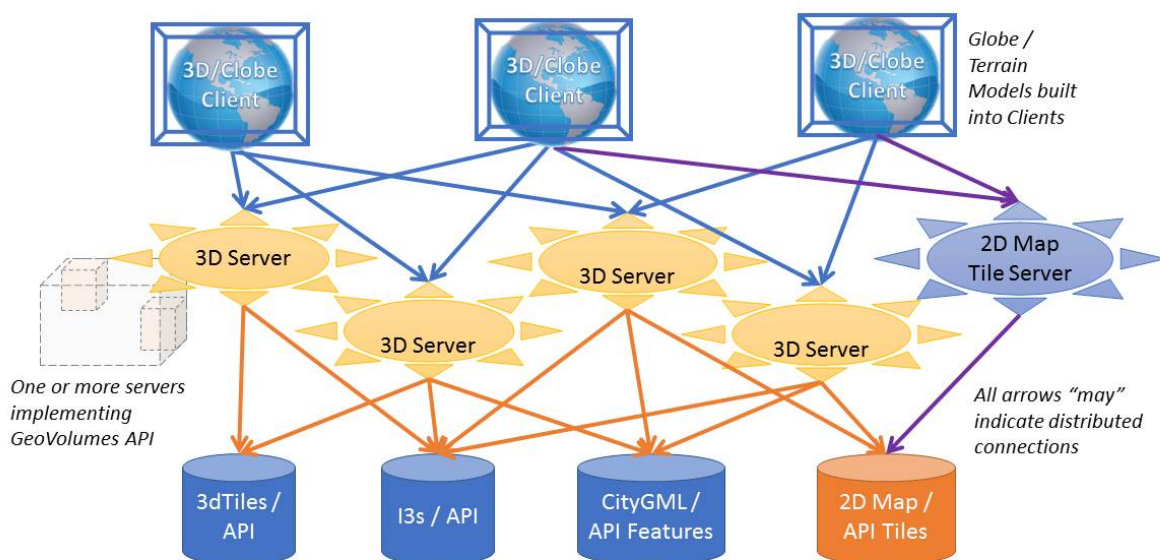


Figure 1: The architecture of the various Pilot capabilities is shown with connecting arrows indicating request flow. Each client has a built-in Globe model that provides a base coordinate system for all additional data.

Arrows show the potential paths of requests from the clients; data flow is in the reverse direction. The connecting lines indicate conceptual requests and data flows. The actual connections may be distributed across several physical devices. More-detailed component descriptions are provided after *Figure 2*.

3DContainer API Resource Architecture

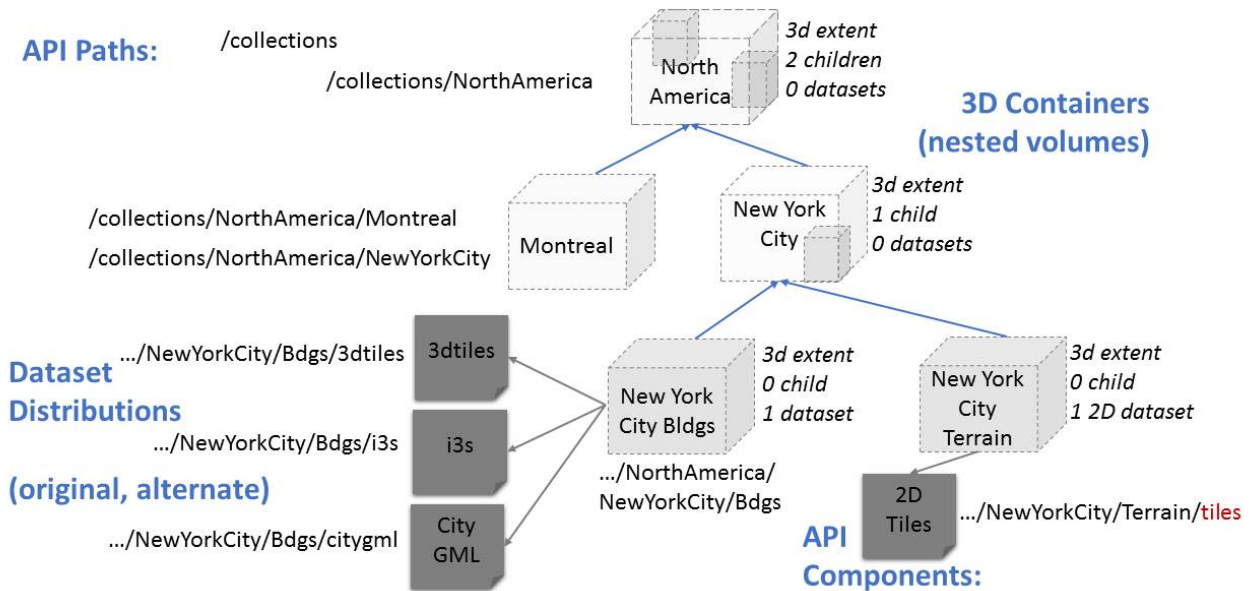


Figure 2: Pilot data architecture illustrating access to datasets for two North American cities (Montreal and New York). The architecture supporting New York City is shown in detail.

The Pilot API resource architecture is shown in *Figure 2*. It illustrates access to datasets for two North American cities, New York and Montreal with the detailed structure only shown for New York City. The illustration is not meant to be a complete collection of all possible or existing data sets.

Here are more-detailed component descriptions to accompany *Figure 1*.

1. **3D/Globe Clients** (top layer of *Figure 1*) - Client application running in a Web browser or desktop application that can query, render, and potentially analyze the tiled 3D resources served by 3D Servers via an *OGC API - GeoVolumes API*. Ideally, clients access and visualize 2D tiled geospatial resources as well. Client applications include their own built-in *Globe* model that is used as the base coordinate system for all data layers, including terrain models, surface images, features, and buildings.
2. **One or more 3D Servers implementing an OGC API - GeoVolumes API** - These are *OGC API - GeoVolumes API* implementations used throughout the architecture to support requests for 3D data. The draft spec uses the **OpenAPI framework** to specify API building blocks. See the Pilot **D002 OGC API - GeoVolumes ER** for examples.
3. **2D Map Tile Server** - A server for providing access to various 2D resources, including

maps.

4. **Data stores** - Persistent data structured as *3D Tiles*, *I3S*, *CityGML*, *CDB*, or 2D, or any other data type that is needed in this environment. Each data store is exposed by an API appropriate for the data.

Summary of Previous Work

The Pilot built on previous work from other OGC initiatives and Standards Program efforts. These documents also serve as foundational references for this Sprint. The document titles and links are listed here, along with links to the OpenAPI and glTF specs. Full descriptions are provided in [Previous Work](#).

- **Pilot Engineering Reports** (listed above in [Table 4](#))
- **3D Tiles Community Standard**
- **Indexed 3D Scene Layer (I3S) Community Standard**
- **CDB Standard**
- **Testbed-13 3D Tiles and I3S Interoperability and Performance ER**
- **3D Portrayal Service 1.0 Standard**
- **OGC API - Features**
- **OGC Testbed-15 Maps and Tiles API ER**
- **OGC Testbed-15 Styles API ER**
- **OGC Routing Pilot ER**
- **OpenAPI Specification**
- **glTF Specification**

Sprint Scenario

As discussed above, OGC wishes to determine the implementability of the *OGC API - GeoVolumes* draft spec. Exploring the integration with other OGC APIs is considered key to OGC's adoption of this spec. While it is not necessary, participants are encouraged to use one or more of the scenarios described below as a starting point for their proposal for the Sprint. The architecture of the scenarios is based on the diagrams and descriptions above and the existing infrastructure developed during the Pilot. The servers used in the Pilot should be available for the Sprint. It is the participant's responsibility to confirm the operation of the server with the providing organization. The available servers and organizations are identified in the Pilot ERs.

1. Investigate how model and terrain updates, originating (preferred) from a **CDB** data store and delivered as glTF, are integrated with 3D Tiles into the client environment. The questions to be examined should include:
 - a. How are terrain changes handled with existing structures?
 - b. How are new models integrated with existing elevation terrain?
 - c. How are existing models handled when CDB updates indicate change (additions/deletions/configurations)?
2. Containers may specify 0 or 1 datasets. A dataset indicates a primary and potentially one or more alternate distributions. Investigate whether there are implementation issues with accessing multiple distributions.
3. What should be the organization of the underlying 3D data? It is unlikely that there is a single best solution to these problems, so identifying use cases for particular choices will be important.
 - a. Is there one bounding volume hierarchy per county, region, city, or some other geo-political boundaries?
 - b. How are features (buildings, vegetation, transportation networks, etc.) structured in the data store? Are they layers in geo-political sets, or are geo-political data layers in feature sets?

Deliverables

Deliverables can take the form of documentation, source code, or videos.

A **Sprint Report** (SR) is documentation that each participant will deliver by uploading content to an initiative repository. Each SR should include:

1. Which portions of the draft spec where an implementation was attempted.
2. The results of that implementation, including comments about inconsistencies or incompleteness in the draft spec.
3. General lessons-learned from the participant's perspective.

Source code: participants are **permitted** but not **required** to deliver open-source code with appropriate licensing. This code may be delivered to an initiative repository (to be provided as needed) or to a public repository. Alternatively, open-source code could also be submitted to a non-OGC repository.

Short videos (<90 seconds) should show participant work products. These will be used by OGC in outreach activities and must be made available on a royalty-free basis, free and clear to be placed on the **OGC YouTube Channel** and **initiative page** without restriction.

Videos may be created by screen-recording a client demonstration. Voice-overs are optional. Video examples can be found for previous initiatives in the OGC YouTube Channel, particularly the [OGC Vector Tiles Pilot](#) and the [OGC Routing API Pilot](#).

Items to Be Provided

Here's a summary of items to be provided in support of Sprint activities (grouped by providing organization):

1. To be provided by OGC:
 - a. *(clicking this link will start a download of a 17GB file)* [San Diego CDB sample data](#).
 - i. This is public data being made available with no restrictions.
 - b. Other datasets TBD... bidders may propose additional datasets for use in the Sprint.
2. To be provided by Participants:
 - a. Computers, displays, and other electronic devices.
 - b. Any data beyond the sample datasets provided by OGC.
 - c. Any software needed for work during the Sprint.
 - d. Backup of participant data and software is optional, but highly recommended. If a participant chooses to back up their work, it is the responsibility of the participant to provide the necessary software and hardware to carry out the operation.

Sprint Organization and Execution

Sprint Activities

Kickoff: The Kickoff is a virtual meeting (using GoToMeeting) and is **mandatory** for at least one technical point of contact for each participant. The Initiative Architect will lead a review of the final version of the draft spec. Detailed instructions for sprint-week activities will also be provided. The Kickoff is scheduled to take place **09:30-12:30 EDT on September 1, 2020**.

Sprint Week: All participants are required to attend and participate for the entirety of the Sprint Week. The Sprint Week will be a **full virtual event** (no physical meeting). The event is scheduled to take place **September 21-25, 2020**.

All participants will be required to be available for teleconferences for communication with other team members. These are tentatively scheduled for 10:00-16:00 EDT during each day

of Sprint Week.

Development of Document Deliverables: Development of Sprint Reports (SRs) and other document deliverables will commence immediately following Kickoff. SRs should be authored in AsciiDoc format (see the [AsciiDoc User Guide](#) and the [AsciiDoc Cheat Sheet](#)). Exceptions such as Google Docs or Microsoft Word might be permitted on a case-by-case basis.

Policies and Procedures

This initiative will be conducted within the [policy framework](#) of OGC's Bylaws and Intellectual Property Rights Policy ("IPR Policy"), as agreed to in the OGC Membership Agreement, and in accordance with the OGC Innovation Program Policies and Procedures and the OGC Principles of Conduct, the latter governing all related personal and public interactions.

Several key requirements are summarized below for ready reference:

- Each selected Participant will agree to notify OGC staff if it is aware of any claims under any issued patents (or patent applications) which would likely impact an implementation of the specification or other work product which is the subject of the initiative. Participant need not be the inventor of such patent (or patent application) in order to provide notice, nor will Participant be held responsible for expressing a belief which turns out to be inaccurate. Specific requirements are described under the "Necessary Claims" clause of the IPR Policy.
- Each selected Participant will agree to refrain from making any public representations that draft document content has been endorsed by OGC before such a document has been approved in an OGC Technical Committee (TC) vote.
- Each selected Participant will agree to describe its contributions, and to coordinate with other initiative team members, at the Kickoff.

Roles

The Innovation Program Team (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 to ensure that initiative activities and deliverables are properly assigned and performed.

Proposal Procedure and Participant Selection

Proposals must be submitted by the deadline indicated in the [Master Schedule](#). Following

this deadline, OGC will evaluate received proposals and notify bidders of selection results. Selected bidders will enter into a Participant Agreement (PA) contract with OGC.

Bidders not selected for funding may seek approval to participate at their own expense.

IMPORTANT

Proposals from both OGC members and non-members will be considered.

However, for a non-member to qualify for stipend funds, it must also submit a completed application for OGC membership (or a letter of intent to become a member if selected).

Proposals should include the following information:

- Contact information: name, telephone, email, organization, complete address, OGC membership status.
- Deliverable type(s): API implementation and/or client and/or data.
- How proposed deliverable(s) will fit with and support the **Technical Architecture**.
- How proposed activities will contribute to achieving the Sprint goal.
- Willingness to share information and work in a collaborative environment.

Proposal file format should be Microsoft Word or Portable Document Format (PDF). Anybody should be able to freely read, copy, or print a PDF submission (no locking or encryption).

The file should be submitted as an email attachment to the OGC Technology Desk (techdesk@opengeospatial.org).

Information submitted in response to this CFP will be accessible to OGC and sponsor staff members. This information will remain in the control of these individuals and will not be used for other purposes without prior written consent from the bidder. Once a bidder has agreed to become a Sprint participant, they will be encouraged to reproduce any relevant proposal content for use by other team members (and as input to their SRs).

Questions and Clarifications

Ongoing CFP updates and answers to questions can be tracked by monitoring this CFP. Bidders may submit questions by email to the OGC Technology Desk (techdesk@opengeospatial.org). Question submitters will remain anonymous, and answers will be regularly compiled and published in the **Corrigenda and Clarifications**.

Any updates to this CFP (including questions and clarifications) will be posted to the original URL of this CFP.

Appendix A: Abbreviations

The following table lists abbreviations used in this CFP.

Abbreviation	Meaning
API	Application Programming Interface
CFP	Call for Participation
CR	Change Request
DWG	Domain Working Group
ER	Engineering Report
IP	Innovation Program
OGC	Open Geospatial Consortium
PA	Participation Agreement
POC	Point of Contact
SOW	Statement of Work
SR	Sprint Report
SWG	Standards Working Group
TC	OGC Technical Committee
URL	Uniform Resource Locator
WFS	Web Feature Service
WG	Working Group (SWG or DWG)

Table A.1: A list of commonly used abbreviations in the OGC community.

Appendix B: Previous Work

The Pilot built on previous work from other OGC Innovation Program initiatives and OGC Standards Program efforts. These documents also serve as foundational references for this Sprint.

- **OGC 3D Pilot Engineering Reports** - The reports from the Pilot that describe and document the results. The documents are discussed in [Architecture Components and Requirements](#) and in [Table 4](#), and reproduced here for convenience. The D002 Engineering Report contains the Draft Specification.

Document (Engineering Reports - ER)	Link
D001 3D Data Container ER (aka <i>Pilot Implementation Experiences</i>)	https://portal.ogc.org/files/?artifact_id=94028
D002 OGC API - GeoVolumes ER (aka <i>Draft Specification</i>)	https://portal.ogc.org/files/?artifact_id=94029
D003: Pilot Summary ER (aka <i>Extended Executive Summary</i>)	https://portal.ogc.org/files/?artifact_id=94030

Table B.1: Pilot Engineering Reports (copy of [Table 4](#)).

- **3D Tiles Community Standard** - An OGC standard for streaming and rendering massive 3D geospatial content such as Photogrammetry, 3D Buildings, BIM/CAD, Instanced Features, and Point Clouds. The standard defines a hierarchical data structure and a set of tile formats which deliver renderable content. Of specific interest to this initiative is glTF. The standard document also describes 3D Tile Styles, a declarative styling specification which may be applied to tile sets.
- **Indexed 3D Scene Layer (I3S) Community Standard** - An OGC Community standard which provides the delivery format and persistence model for Scene Layers. A Scene Layer is a container for arbitrarily large amounts of heterogeneously distributed 3D geographic content, supporting coordinate reference systems and height models in conjunction with a rich set of layer types.
- **CDB Standard** - This specification defines a standardized model and structure for a single, “versionable”, virtual representation of the earth by creating an open format for the storage, access and modification of a synthetic environment database. The current version of CDB is V1.1. The **3D Geospatial Series Tech Sprint II** is addressing the requirements and capabilities for CDB V2.0. A draft Engineering Report will be available by the time of the Sprint Kickoff.
- **Testbed-13 3D Tiles and I3S Interoperability and Performance ER** - This report captures the lessons learned from prototyping interoperability of 3D Tiles and I3S using: a 3D Portrayal Service, performance studies of 3D tiling algorithms, and a proof-of-concept of the use of 3D Tiles and I3S as data delivery formats for the OGC 3D Portrayal Service interface standard.
- **3D Portrayal Service 1.0 Standard** - This OGC standard specifies how geospatial 3D content is described, selected, and delivered. The standard provides a framework to determine whether 3D content is interoperable at the content representation level.
- **OGC API - Features** - The OGC API - Features - Part 1: Core provides API building blocks to create, modify and query features on the Web. This standard specifies the fundamental API building blocks for interacting with features. The spatial data community uses the term ‘feature’ for things in the real world that are of interest. The standard is part of the OGC API family of standards. OGC API standards define modular API building blocks to spatially enable Web APIs in a consistent way.

Most recently, the OGC Web Feature Service (WFS) and Filter Encoding Service (FES) Standards Working Group rebuilt the WFS standard to the new OGC API - Features standard with an integrated OpenAPI definition as core to describe how to build against the standard. The results are being taken by others working to advance other OGC standards as OpenAPI definitions. This work can be reviewed on the OGC API - Features standard webpage.

- **OGC Testbed-15 Maps and Tiles API ER** - This ER was developed as part of OGC Testbed-15. It is not a standard, but it reflects the latest work on Web APIs to access and manage maps and 2D tiled data.
- **OGC Testbed-15 Styles API ER** - This ER was developed as part of OGC Testbed-15. It is not a standard, but it reflects the latest work done in OGC on styles for 2D data. The Styles API is a Web API that enables map servers and clients as well as visual style editors to manage and fetch styles. The API is consistent with the emerging OGC API family of standards. The API complements the Features, Maps and Tiles APIs and builds on the conceptual model for styles developed in OGC Testbed-15. This report specifies the API using OpenAPI, specifies how the same styles should be represented in a GeoPackage and documents the lessons learned during the implementation.
- **OGC Routing Pilot ER** - This ER was developed as part of the OGC Routing Pilot. This Pilot assessed an abstract baseline suite of functions, capabilities, and encodings to address a common standard interface for network routing functionality. This includes guidance for extending the Routing API to account for various routing data models and support for network routing engine configuration via the Routing API. The OGC API - Routing is not an OGC standard, but it was delivered to the OGC Standards Program for further consideration.
- **OpenAPI Specification** - OpenAPI is a freely-available API description framework that provides a developer with programmatic access to a software application or service. These APIs use sets of technologies that enable websites and/or client applications to interact with each other by using REST, SOAP, JavaScript, and other web technologies. These APIs have allowed web communities to create an open architecture for sharing content and data between communities and applications. A very typical application for an Open API is to access data: Tweets, geolocation(s), maps, stock quotes, weather sensors, and so forth.

OGC members and staff have actively been investigating OpenAPI (and its commercial equivalent, Swagger) since 2016. It was recognized that the existing web service standards were in effect web APIs, but that modernizing their means of providing content to the web required a fundamental change in underlying design. Two documents advanced further the idea: 1) the OGC Open Geospatial APIs White Paper and the Spatial Data on the Web Best Practices, jointly developed by OGC and W3C. These documents highlighted how geospatial data should be more native to the web. Further, OGC staff were working on "implementer-friendly" views of our standards and experimented with an OpenAPI definition for the Web Map Tile Service (WMTS) and became aware of work by the United Kingdom Hydrographic Office (UKHO) to publish OpenAPI definitions for OGC Web Map Service (WMS) of Electronic Navigational Charts.

- **glTF Specification** - The GL Transmission Format (glTF) is designed to be an API-neutral asset delivery format optimized for the efficient delivery of 3D assets into a

computer's graphical processing unit (GPU). It is supported by the major content creation and displays tools and is developed and maintained by [The Khronos Group](#).

Appendix C: Signed Release was removed since there will no longer be any physical meetings.