# OGC Project Document 18-092: Activity Plan for an OGC Interoperability Experiment

Title: OGC CDB Vector Data in GeoPackage Interoperability Experiment
(CDB-VECTOR-GPKG-IE) Activity Plan

Abbreviation:CDB-VECTOR-GPKG-IE

# Summary

This OGC Interoperability Experiment (IE) (CDB-VECTOR-GPKG-IE) will test encoding of vector data via GeoPackage in the OGC CDB 1.1 Standard and Best Practices. A primary objective of this IE will be to inform decision making for possible enhancements in the OGC CDB Standards Working Group (SWG). Some or all of the proposed IE outcomes may result in recommendations for changes to, alternatives to, or replacement of, the OGC CDB 1.1 Volume 1: Core Standard (15-113r5) and OGC CDB 1.1 Volume 4: OGC CDB Best Practice use of Shapefiles for Vector Data Storage (16-070r3). The proposed IE outcomes may result in recommendations for future work in the next major revision to the OGC CDB Standard and Best Practices (CDB 2.0)

This IE is based on preliminary work conducted under funding by the U.S. Army Geospatial Center (AGC), the results of which have been publicly released as OGC Document Number 18-077: OGC CDB and GeoPackage Discussion Paper (https://portal.opengeospatial.org/files/?artifact\_id=80537&version=1)

The current approved OGC CDB 1.1 Standard provides a Best Practices document describing the encoding of vector data using Esri Shapefiles. All previous versions of CDB (including OGC CDB Standard 1.0 and the Industry-maintained CDB Specification 3.2 and prior) have only described vector data encoding in Shapefiles. All known CDB content and repositories that include vector data are encoded using Shapefiles. While the Esri Shapefile Specification is freely available for anyone to implement, the Specification is proprietary (the IP is owned by one company). Another issue is that every use of Shapefiles creates four physical files on storage which has performance implications.

The goal of this IE will be achieved by replicating the experimentation conducted in the Discussion Paper by IE participants who are CDB content creators, maintainers of CDB repositories, implementers of CDB datasets in run-time and non-run-time CDB use cases, or new CDB 1.1 users who are evaluating CDB implementations.

These IE participants will produce an OGC Engineering Report that discusses whether the recommended alternate encoding of CDB vector data as a GeoPackage is fit for use and submission to the OGC for consideration as an approved change to the OGC CDB 1.1 Standard and/or Best Practices.

The authors of the Discussion Paper explored four alternative technical approaches to replacing Esri Shapefiles with OGC GeoPackage as an encoding method for vector data, and suggested that one or more of these technical approaches should be evaluated as a revision to CDB 1.1.

A minor, backwards compatible revision to OGC CDB 1.1 is desired to be transparent and to not interfere with implementations that support OGC CDB 1.1 but an alternate vector data encoding may not provide backwards compatibility depending on the alternative selected. This experiment will verify which, if any, of the alternative technical approaches best supports the CDB community of use.

# INITIATOR ORGANIZATIONS

The OGC members who are initiators of this Interoperability Experiment are:

* CAE
* Presagis
* VATC
* Leidos
* FlightSafety
* Cognitics
* U.S. Special Operations Command
* The University of Calgary
* Carl Reed (OGC Individual Member)

Contact information for these organizations is at the end of this activity plan.

# Participant and observer ORGANIZATIONS

This IE will be open to the general public. Participants will be required to make a resource commitment. Non OGC organizations are allowed in the IE as Observers. OGC members who are not willing to make a resource commitment may also register as Observers.

## Observer caveats

Official IE Observers will be granted access to the IE project on the OGC Portal. Observer status allows the member or non-member to monitor progress of the given IE, have access to the IE E-Mail reflector, access documents as they are posted to the IE folder on the portal, contribute software and/or data to the effort, and so forth. Observers are welcome to attend the IE Kickoff meeting, however, they cannot comment on documents, or otherwise disrupt the execution of the IE. OGC Engineering Reports from the IE will be made available to all OGC members at the end of the IE for review and comment. The Members may then elect to make the report publicly available.

## Participants

The following organizations will participate in the CDB-VECTOR-GPKG-IE. Participants are welcome to join up to the kickoff meeting.

* The Initiators listed above;
* TBD

## Observers

The following organizations are identified as observers of the CDB-VECTOR-GPKG-IE. Observers are welcome anytime throughout the process.

* TBD

# DESCRIPTION

## Objectives

The objectives of the CDB-VECTOR-GPKG-IE include:

* Evaluate options for encoding vector data in OGC CDB 1.1 using OGC GeoPackage. The evaluations will explore content creation, run-time performance, and backwards-compatibility issues.
* Prepare an OGC Engineering Report that presents the results along with a plan for submission of Change Request Proposals to existing OGC CDB 1.1 Standard and Best Practices documents.

## Background

Four design alternatives were identified in the initial evaluation for the incorporation of GeoPackage into a CDB data store, as described in OGC Discussion Paper 18-077:

1. Replace each Shapefile with a GeoPackage (Alternative #1)
	* Replace three Shapefiles with one GeoPackage consolidating geometry types.
2. Make each CDB tile a layer in a single GeoPackage (Alternative #2)
	* Make each vector tile within CDB a table within a GeoPackage for a CDB dataset.
3. Store each CDB LOD as a layer in GeoPackage (Alternative #3)
	* Each CDB GeoPackage contains up to 24 layers for each of the LODs.
4. Store all the Vector Data of a Geocell in one GeoPackage (Alternative #4)
	* Store both CDB layers and LODs in a single GeoPackage per CDB Geocell.

Alternative two proved to be impractical, and is eliminated from the follow-on experiments. Only alternative 1, 3 and 4 will be explored in this Interoperability Experiment.

## Experiments

Participants in the CDB-VECTOR-GPKG-IE will analyze and/or perform one or more of the following experiments, and contribute to the IE Engineering Report. Two ‘sample’ CDB datasets are in the process of being approved for release as resources to participants in this IE.

## Experiment #1

The methodology involves:

* Acquisition of sample dataset(s) provided for the IE.
* Use of provided open-source software to modify each sample dataset according to the three technical alternatives.
* Consensus and provision of baseline (unmodified) and three alternative encoding datasets.
* Evaluate process and provide feedback on conversions resulting from Experiment #1.

## Experiment #2

The methodology involves:

* Modifying implementation software according to Alternative #1.
	+ Replace each Shapefile, consolidating the three geometry files with a single GeoPackage.
* Evaluate and compare performance using the baseline CDB datasets and the Alternative #1 datasets.
* Evaluate analysis and results from Experiment #2 for performance, backwards-compatibility and risks to interoperability.

## Experiment #3

The methodology involves:

* Modifying implementation software according to Alternative #2.
	+ Store each CDB LOD as a layer in GeoPackage
* Evaluate and compare performance using the baseline CDB datasets and the Alternative #2 datasets.
* Evaluate analysis and results from Experiment #3 for performance, backwards-compatibility and risks to interoperability.

## Experiment #4

The methodology involves:

* Modifying implementation software according to Alternative #3.
	+ Store each Geocell of Vector Data as a layer in GeoPackage (extends Alternative #3 to have a single GeoPackage per Geocell of CDB, with all LODs and all CDB feature layers).
* Evaluate and compare performance using the baseline CDB datasets and the Alternative #3 datasets.
* Evaluate analysis and results from Experiment #4 for performance, backwards-compatibility and risks to interoperability.

# DELIVERABLES

The documentation listed below will be considered the deliverables for the project.

## Documentation

* The results of the four experiments will be documented. The results of the experiments will not identify specific participants (will be anonymous). All project documentation will be posted to the OGC Portal. The OGC Wiki will be used as needed.

## Demonstration

* The developed documents will be made available on the OGC portal.
* Demonstration of visual results via captured video, as appropriate.
* SCHEDULE (Tentative).

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| **Startup**OGC Architecture Board approval of Activity Plan: November 2018Press Release / Call for Participants: Nov/Dec 2018 |
| **Execution**Planned kickoff date (execution start date): December 13, 2018CDB-VECTOR-GPKG-IE Execution: Dec 2018 – Apr 2019Planned end date: April 2019 |
| **Wrap-up and Reporting**Demonstration by Webinar: May/Jun 2019Final document submission: June 2019 |

# RESOURCE PLAN

The Initiative Manager will be David Graham (CAE) and the Initiative Technical Lead will be Carl Reed.

The following resources will be available.

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| *Web Resources* | OGC will provide a project workspace on the OGC Portal. |
| *Staffing* | Each initiating and participating organization will provide adequate staff resources to support their defined responsibilities for the duration of the CDB-VECTOR-GPKG-IE.  |
| *Hardware* | Participants will provide hardware as needed to support the CDB-VECTOR-GPKG-IE. |
| *Software* | Participants will provide software as needed to support the CDB-VECTOR-GPKG-IE. |
| *Other Resources* | Participants in the IE are self-funded. All expenses incurred in carrying out the CDB-VECTOR-GPKG-IE will be assumed by the participating agencies within their regular line-of-business.  |

# INITIATOR ORGANIZATIONS – Contact Information

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