Understanding and Working with the OGC Geopackage

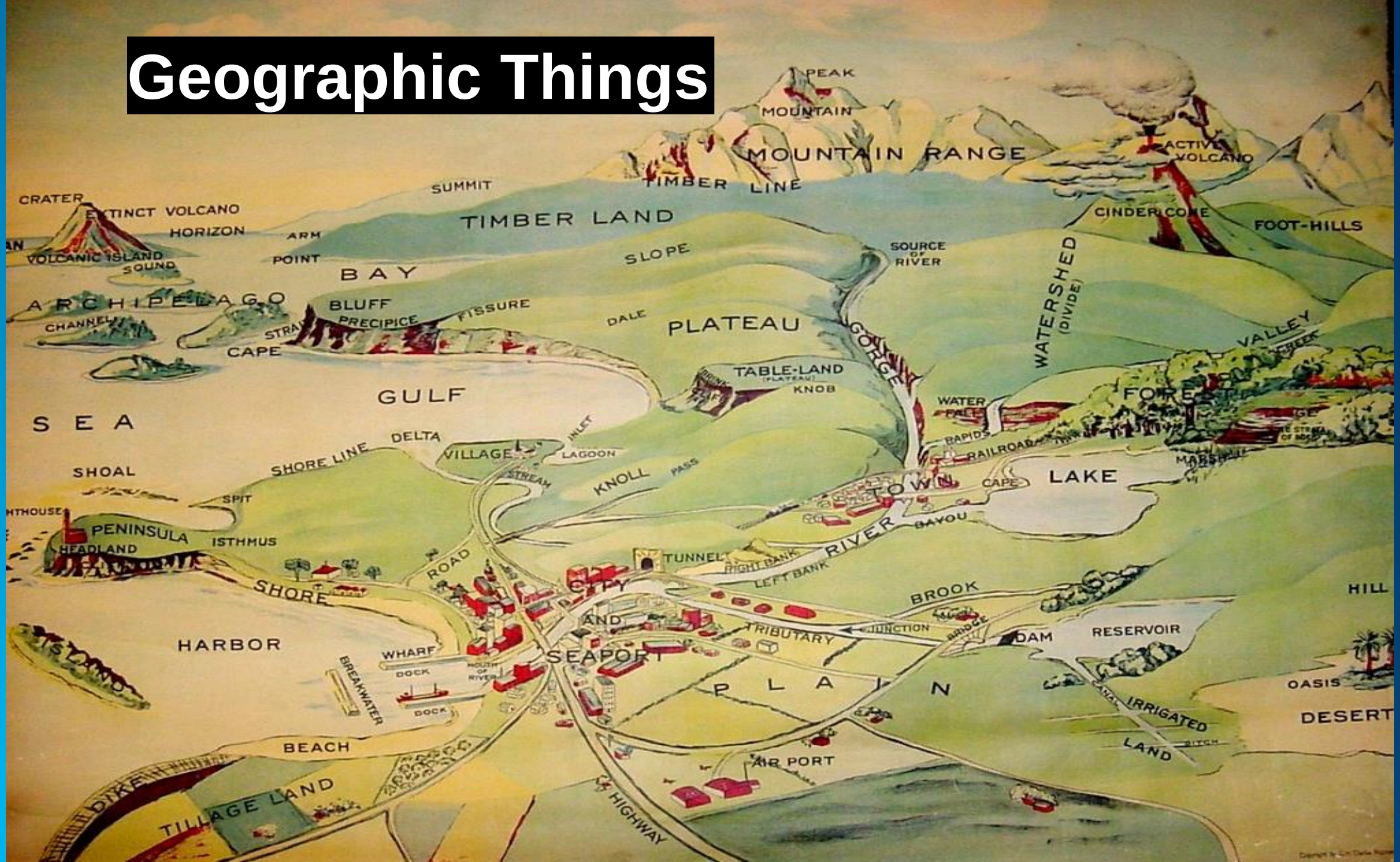
Keith Ryden

Lance Shipman

Introduction

- Introduction to Simple Features
- What is the GeoPackage?
- Esri Support
- Looking ahead…

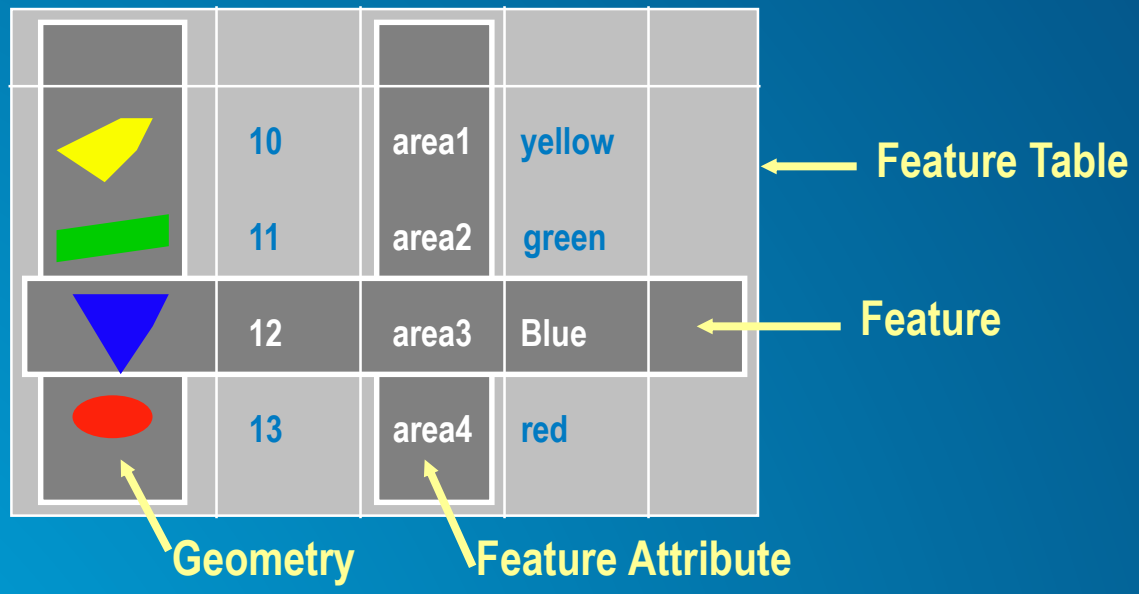
Geographic Things



Why add spatial data to a database?

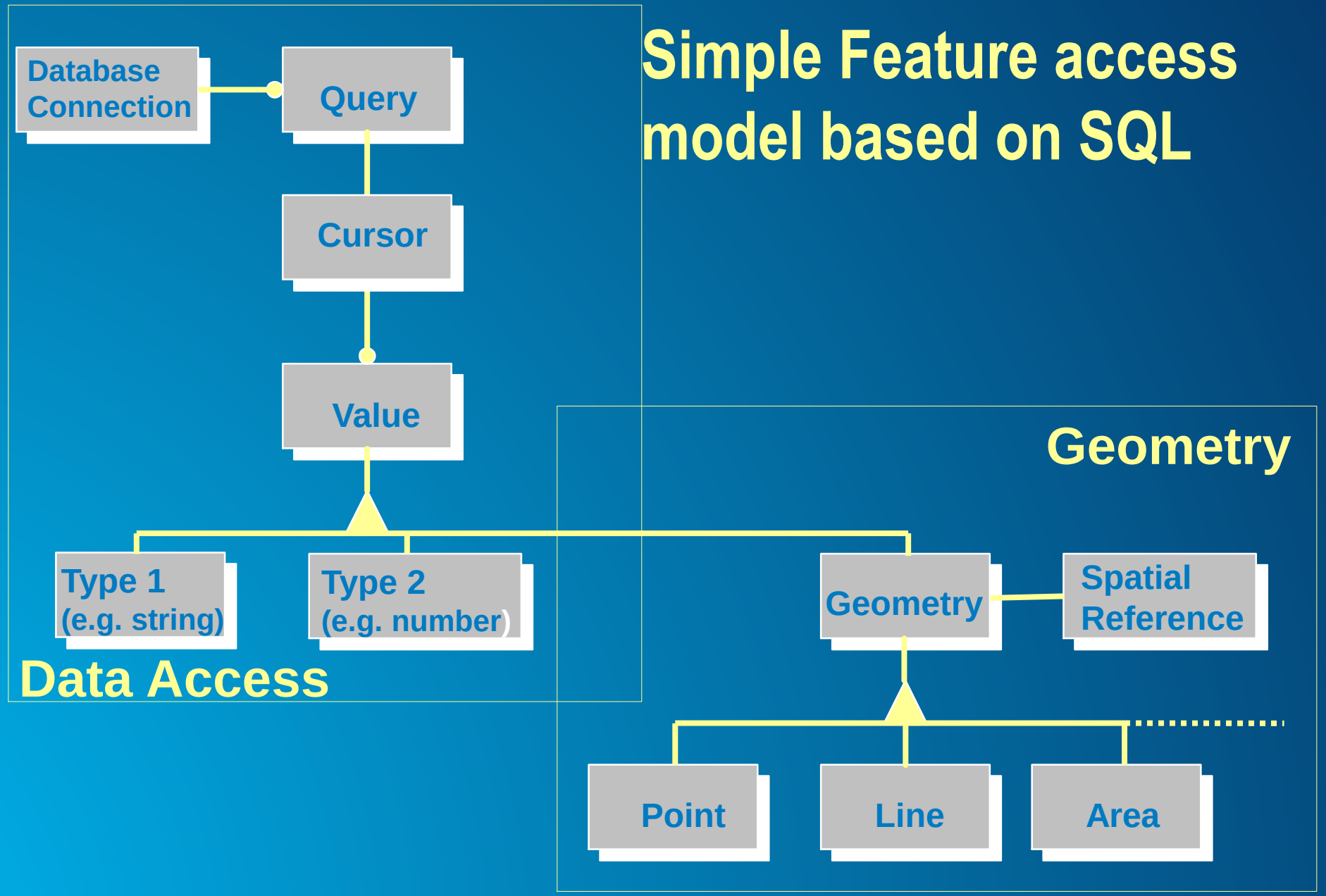
- The premise:
  - People want to manage spatial data in association with their standard business data.
  - Spatial data is simply another “property” of a business object.
- The approach:
  - Utilize the existing SQL data access model.
  - Define a simple geometry object.
  - Define well known representations for passing structured data between systems.
  - Define a simple metadata schema so applications can find the spatial data.
  - Integrate support for spatial data types with commercial RDBMS software.

Simple Feature Model

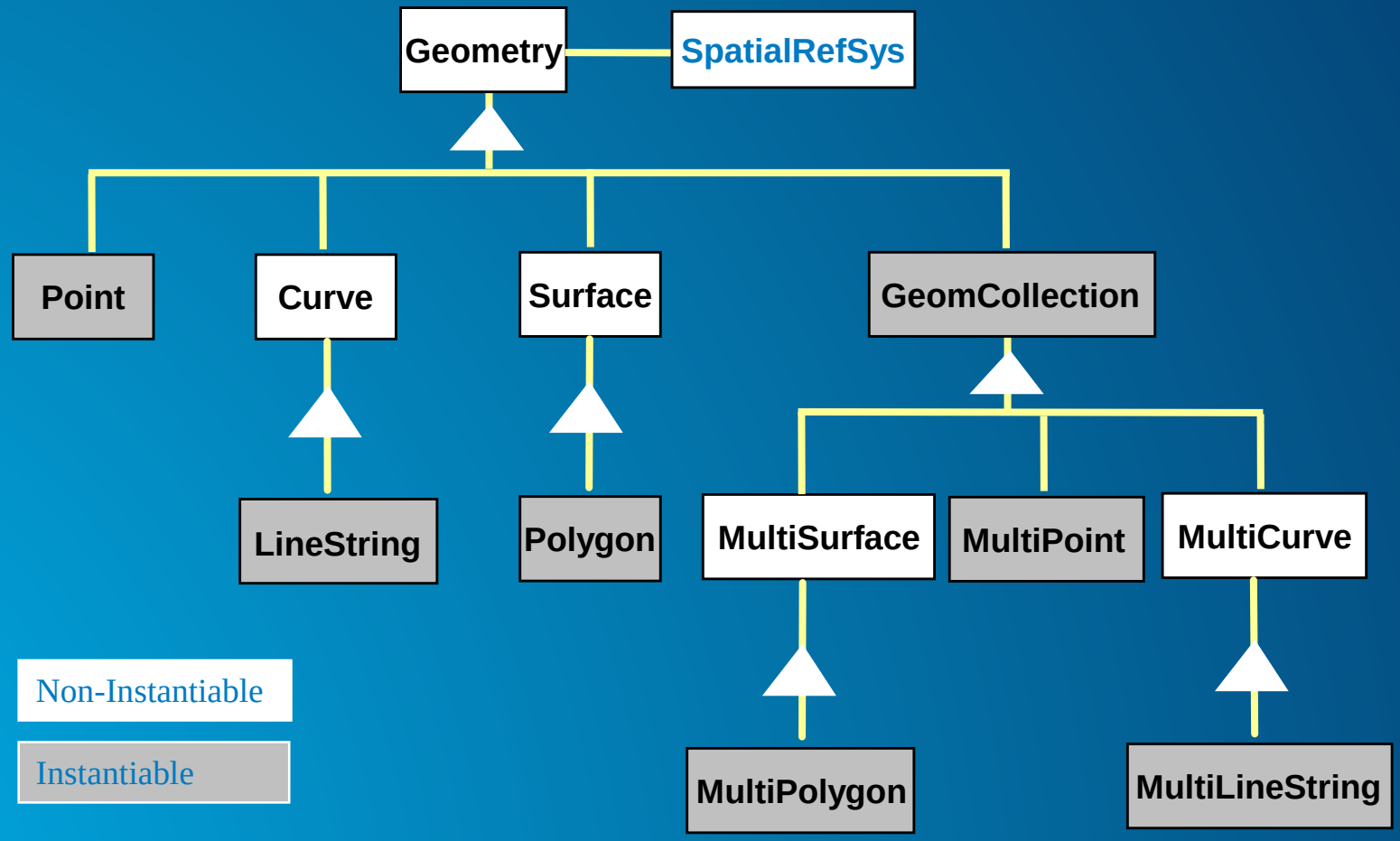


- Feature Tables contain rows (features) sharing common properties (Feature Attributes).
- Geometry is a Feature Attribute.

Simple Feature access model based on SQL



Simple Feature Geometry



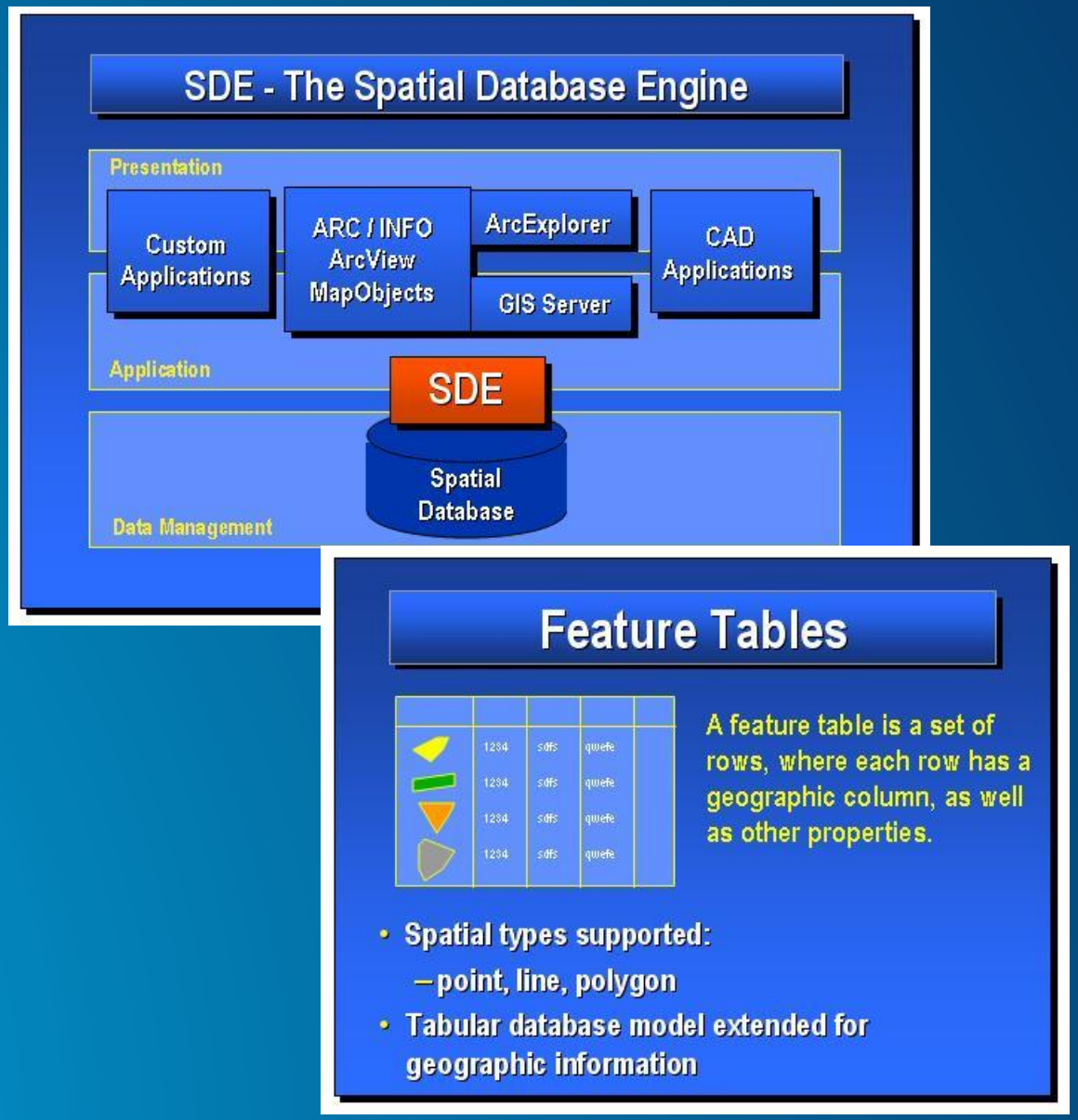
Some of the Major Standards Involved

- ISO 19125, Geographic Information - Simple feature access
  - Part 1: common architecture
  - Part 2: SQL Option
- ISO 13249-3, Information technology — Database languages — SQL Multimedia and Application Packages — Part 3: Spatial
- ISO 19107, Geographic information — Spatial schema
- ISO 19111, Geographic information — Spatial referencing by coordinates — Part 1: Fundamentals
- ISO 19162, Geographic information — Well known text for coordinate reference systems
- OpenGIS Simple Features Specification for SQL, Revision 1.1
- OpenGIS Topic 2 — Spatial Referencing by Coordinates
- OGC 12-063r5, Geographic information — Well known text for coordinate reference systems

Spatial Database

Shape files in a database

- Multi-user, seamless, scalable
- Leverage SQL
  - Geometry Types
  - Spatial indexing
  - Query processing
  - Storage
- Implications for data modeling
  - Simple feature information model with related tables
  - Search and scan, not traversal
- The “master database” concept
  - Entity-relationship modeling
  - Database architects (gods)

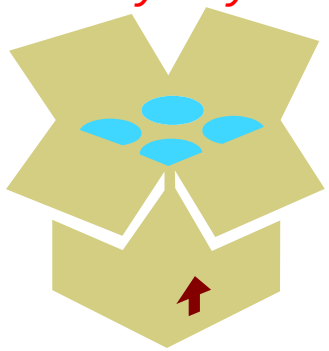


What is a GeoPackage?

What is GeoPackage?

- A single container for the storage and use of vector, raster, and tiled caches.
- Available for use on ~~a variety of mobile platforms.~~

Virtually any modern platform – mobile, laptop, workstation, server



- Described by a manifest.
- Defined by an open standard, ~~free of license.~~

Permissive OGC License

OGC®

What is the GeoPackage?

Introduction

- **OGC standard for the exchange and direct use of vector geospatial features and tiled raster data.**
- **Interoperable across enterprise and personal computing environments, and is specially designed for use on Mobile devices where connectivity is limited.**
- **Implemented on top of SQLite.**
- **May contain vector data, tiled raster data or both.**

What is the GeoPackage

Specifications

- Max size: Approximately 140TB.
  - Lower size limits may be imposed by the file system and is noted in the specification.

- Geometries
  - Similar to Esri ST_Geometry
  - Based on OGC 99-049 OpenGIS® Simple Features Specification for SQL Revision 1.1 5, 1999, Clause 2.3. Point, Line and Polygon data supported.

What is the GeoPackage

Specifications

- Tiled Raster Data
  - OGC 07-057r7 OpenGIS® Web Map Tile Service Implementation Standard version 1.0.0 2010-04-06 (WMTS)
- Data Types
  - SHORT INTEGER, LONG INTEGER
  - FLOAT, DOUBLE,
  - TEXT, BLOB
  - DATETIME.

See the GeoPackage standard (http://www.geopackage.org/spec/) for details.

What is the GeoPackage?

Esri History

- In 2014 Esri announced the support of the new Open Geospatial Consortium(OGC) GeoPackage Encoding Standard.
- Esri actively participated in the development of this standard.
- One of the very early adopters of the specification – supporting it even before it was approved by OGC membership as a final standard.

What is the GeoPackage?

Versions

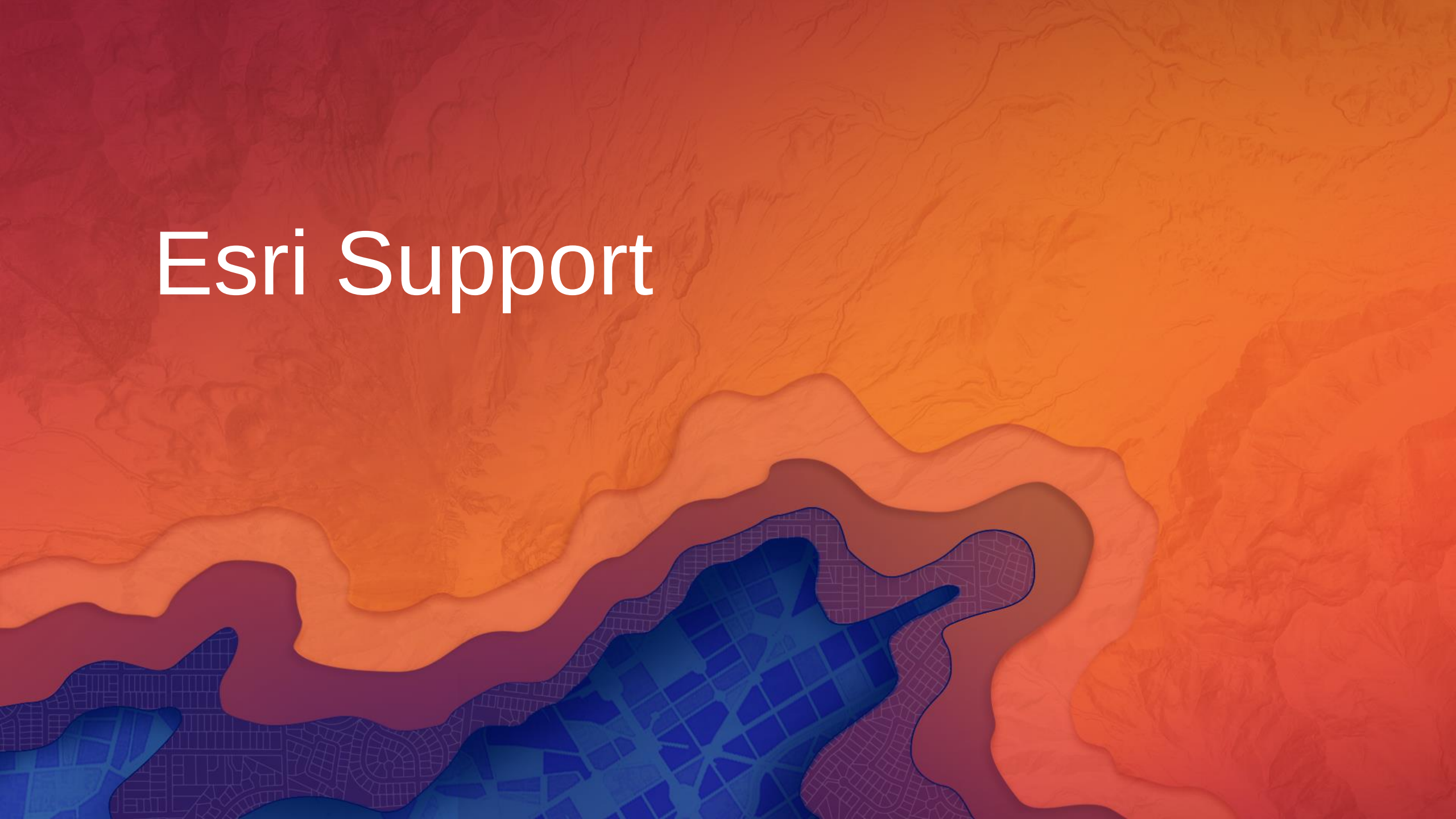
ArcGIS Version	GeoPackage Version
10.2.2	Beta
10.3.1	1.0(1.0.1)
10.5	1.1
10.5.1	1.2 (beta)

What is the GeoPackage?

Supported Data Types

- Simple vector (Points, Lines, Polygons)
- Standalone Tables
- Tiled Raster

Esri Support



Esri Support

Software

- ArcMap, ArcCatalog (10.2.2)
- ArcGIS Pro (1.2)
- Runtime (**10.2.4 java, 10.2.8 Android)**

Esri Support

General

- Create
  - CreateSQLiteDatabase Geoprocessing Tool

Esri Support

Vector

- Draw
- Import/Export
  - Copy/Paste, FeatureClass2FeatureClass, Table2Table
- Query
- Edit only through code. No edit session.
- ST_Geometry functions

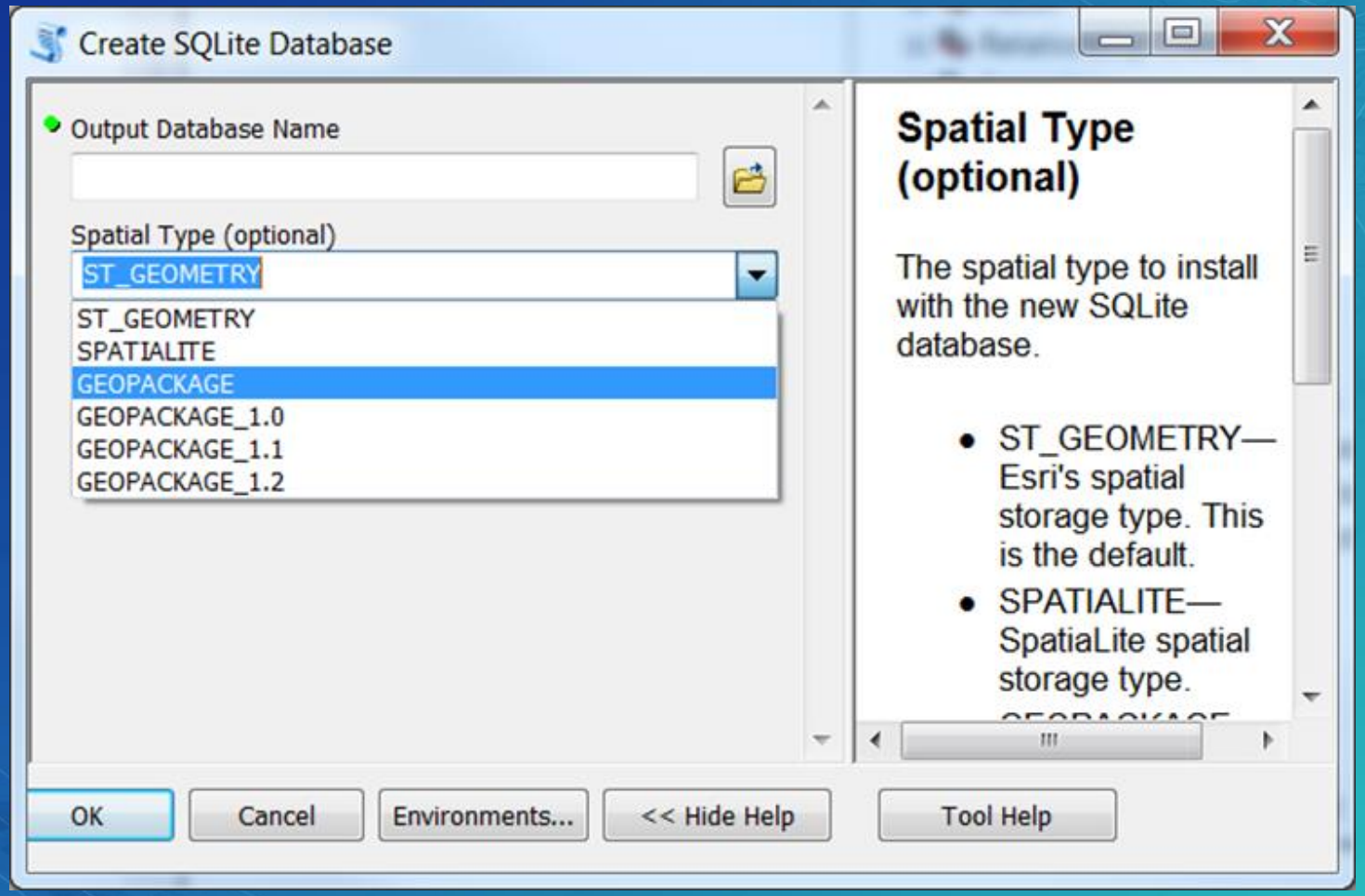
Esri Support

Raster

- Draw
  - 10.5, 1.5 and before: Use Add Raster Layer.
  - 10.5.1, 2.0: Add like any other supported raster.
- Import
  - 10.4.1 and before: Raster2GPKG
    - https://github.com/Esri/raster2gpkg
  - 10.5, 2.0: AddRasterToGeoPackage Geoprocessing Tool.

Esri Support

GeoPackage Creation

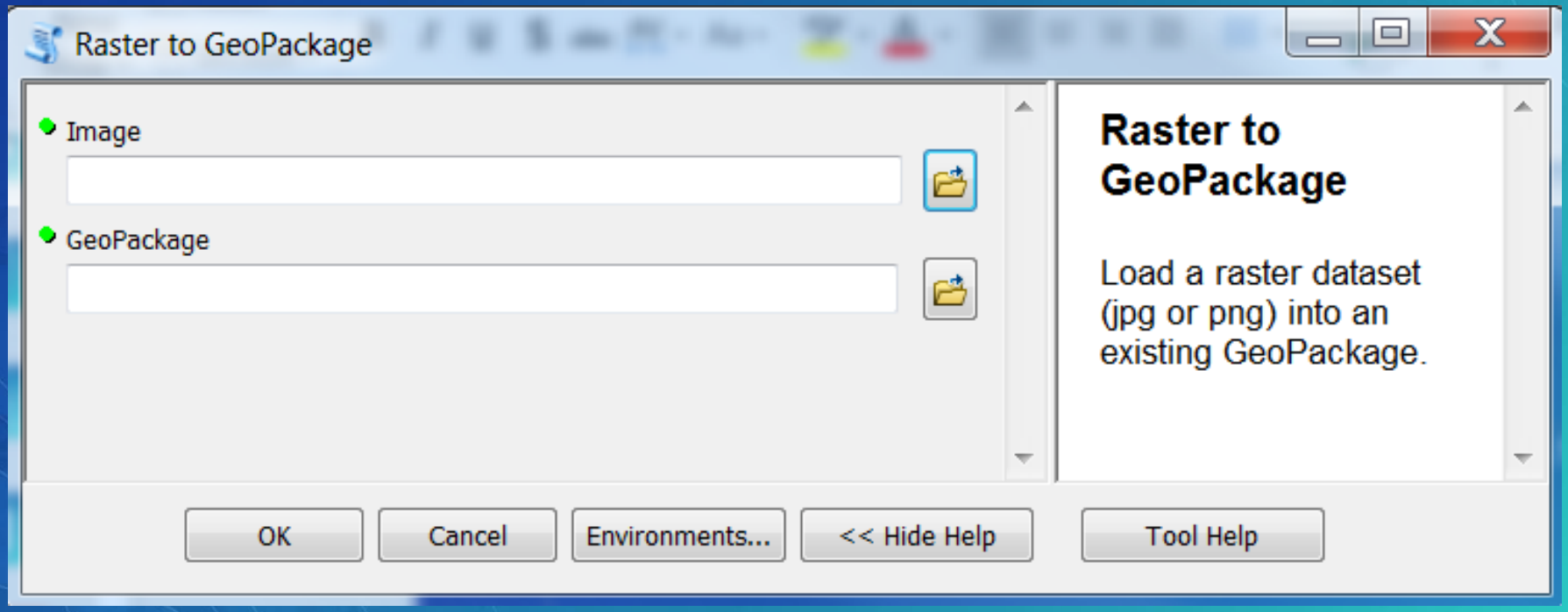


Esri Support

Loading a Image (pre10.5)

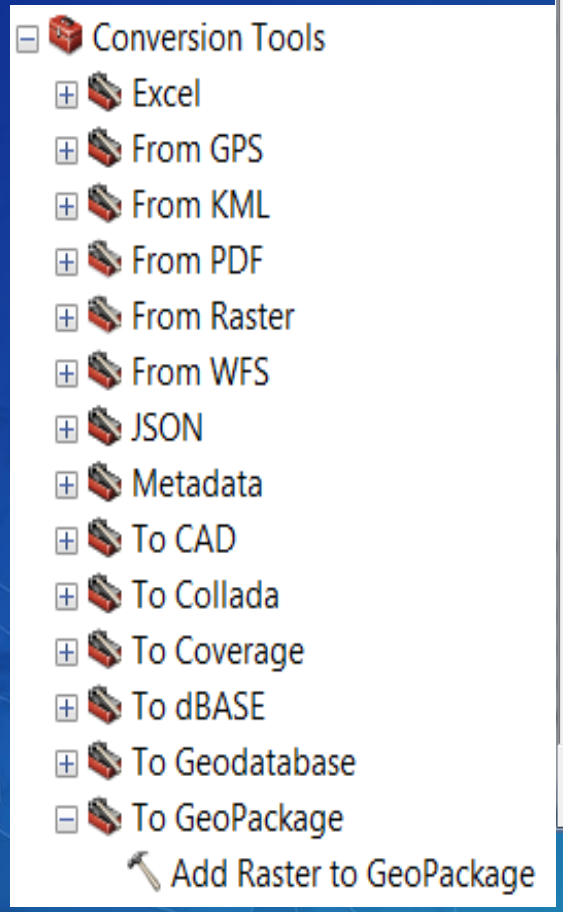
- Download and install raster2gpkg tool from Git Hub (10,3,1, 10.4, 10.4.1).

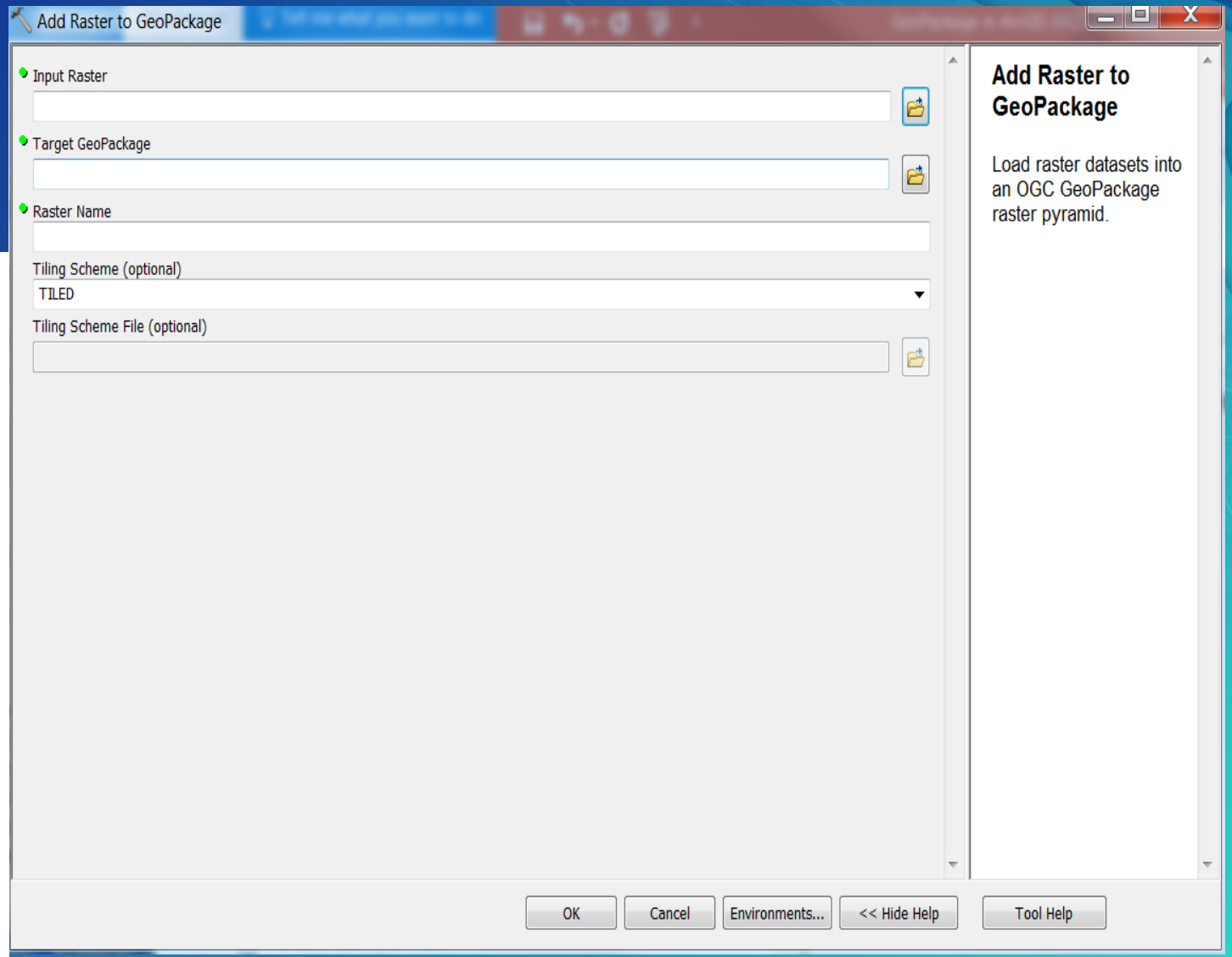
(https://github.com/Esri/raster2gpkg)



Esri Support

Loading an Image (10.5)





Esri Support

Vector – ST_Geometry

- The OGC standard that defines ST_Geometry includes a set of functions that allow you to create, insert, update and query the ST_Geometries via SQL.
- Using the SQLite3.exe command line tool you can open a ST_Geometry database, import the ST_Geometry dll and then execute the ST_Geometry functions.
- Select the buildings that are not completely contained within one lot.:

```
SELECT DISTINCT (building_id) FROM bfp, lots WHERE st_intersects (lot, footprint) = 1 AND
st_contains (lot, footprint) = 0;
```

Esri Support

Vector – ST_Geometry: Loading the extension

- In ArcGIS Desktop the ST_Geometry libraries can be found in Desktop10.5\DatabaseSupport\SQLite\Windows32 or from my.esri.com

- To load bring up SQLite3.exe.

  SQLite3 MyData.sqlite

  > SELECT load_extension(‘c:\Program Files\ESRI\Desktop10.5\DatabaseSupport\SQLite\Windows32\stgeometry_sqlite.dll','SDE_SQL_funcs_init’);

Esri Support

Not Supported at this time

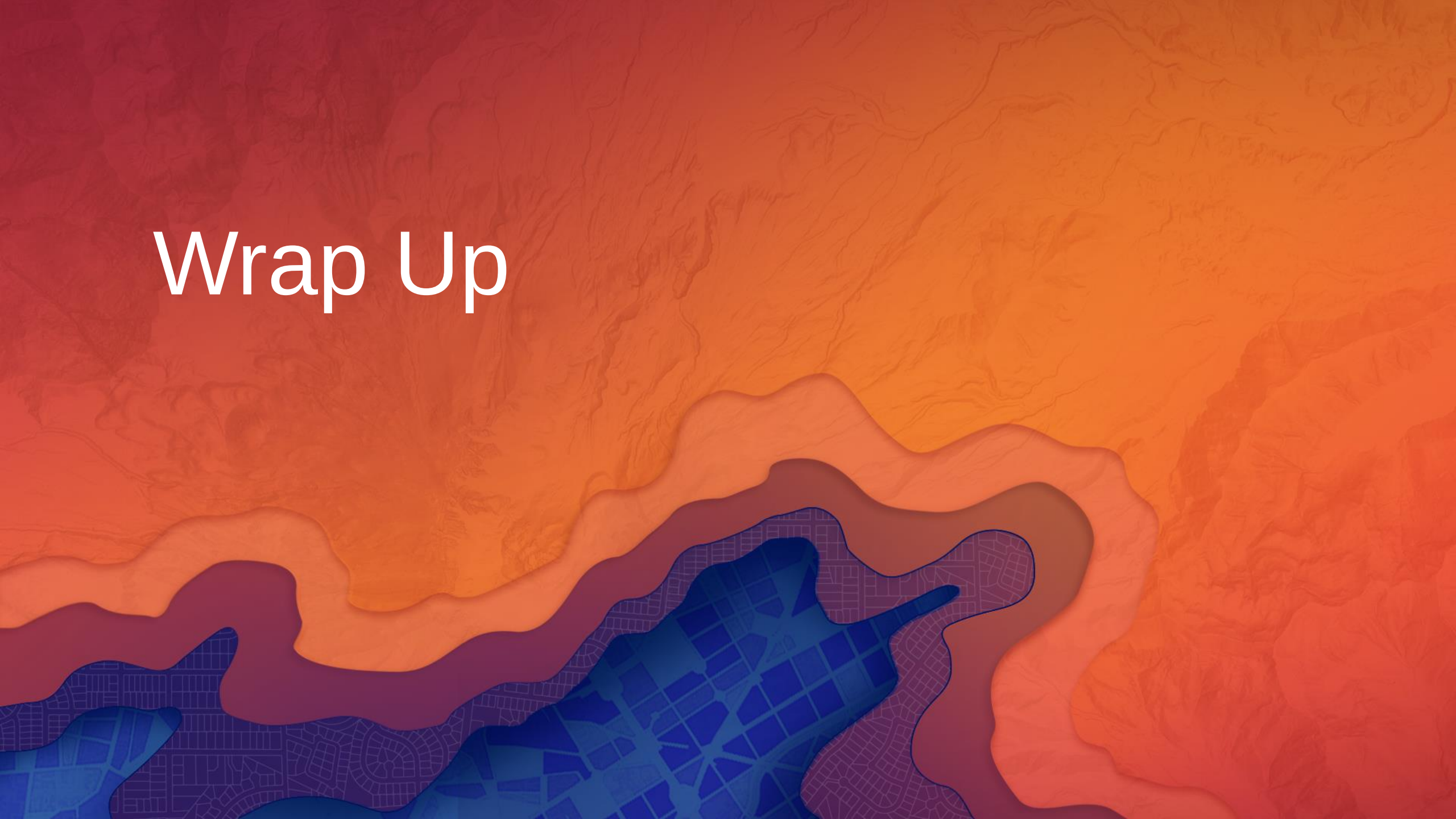
- Editing
- Metadata

Looking Ahead

Looking Ahead

- Loading Tile Caches directly into GeoPackage Tiled Raster.
- Loading an Area Of Interest into a GeoPackage Tiled Raster.
- GeoPackage support was not included in Runtime Update 1. It is scheduled for Update 2, late November 2017.

Wrap Up



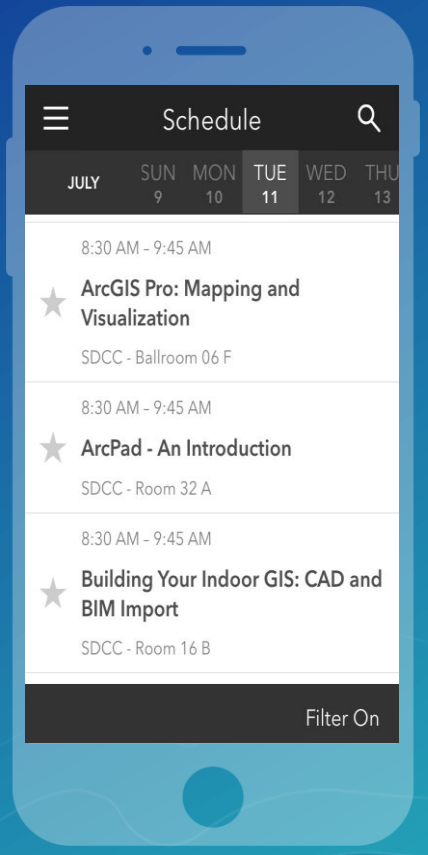
Wrap Up

- What is the GeoPackage?
- Esri Support
- Looking ahead…

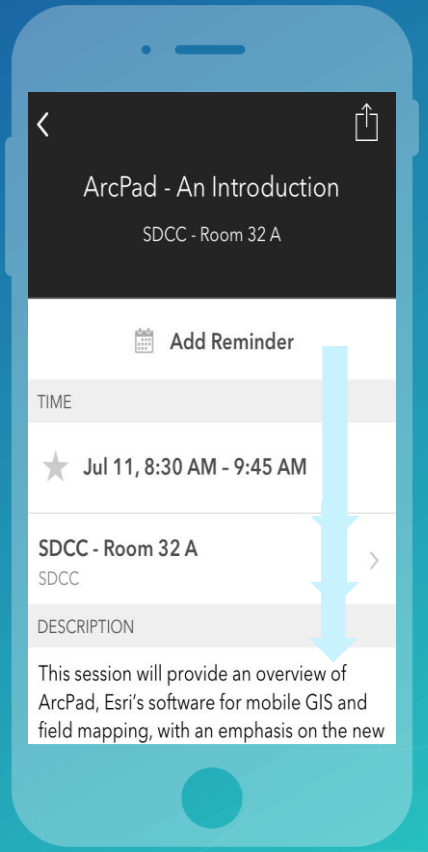
Please Take Our Survey on the **Esri Events App!**

Download the Esri Events app and find your event

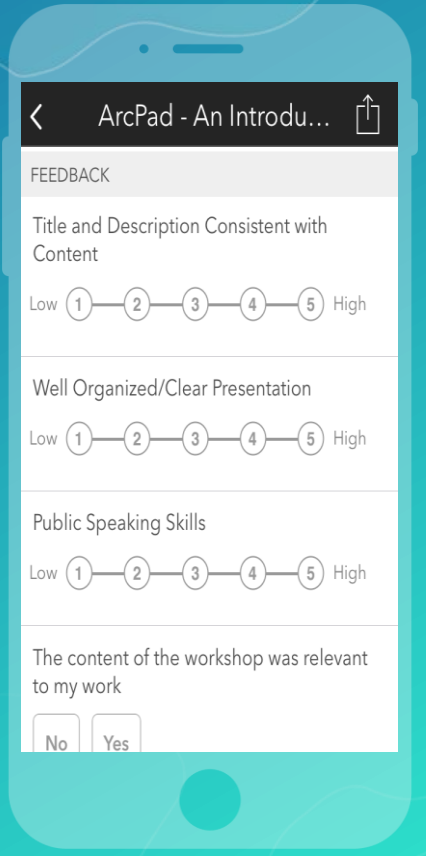
Select the session you attended



Scroll down to find the survey



Complete Answers and Select "Submit"



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