Data Integration for ArcGIS Users

Data Interoperability

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Product overview

- Extension to ArcGIS (optional)
- Jointly developed with Safe Software
  - Based on Feature Manipulation Engine (FME) technology
  - Includes FME Workbench
Agenda

• Desktop Product Overview
  – Format Support
  – Data Translation
  – Spatial ETL (Extract, Transform and Load)
    • Workbench

• ArcGIS Engine and ArcGIS Server Overview

• Questions
Format Support
Added format support

• Directly read vector data formats
  – Support for 100+ data formats
    • GIS, CAD, database
  – Read-only
Added format support

• Directly read vector data formats
  – Support for 100+ data formats
    • GIS, CAD, database
  – Read-only

• Use in ArcGIS Desktop applications
  (ArcMap, ArcCatalog, ArcScene, etc.)
ArcCatalog format support

• Manage your data
  – Browse tree
ArcCatalog format support

- Manage your data
  - Browse tree
  - Interoperability Connections
ArcCatalog format support

• Manage your data
  – Browse tree
  – Interoperability Connections

– View your data
  ▪ Geography
  ▪ Feature attributes
  ▪ Metadata
ArcMap format support

- Display data in native format
  - No data conversion
- Support for all standard map functions

Symbolization

Labels

Selections

Identify
Format Support - New at 9.3

• Upgrade to FME 2008

• New formats
  – Industry Foundation Class STEP Files (IFC)
  – CityGML
  – LandXML
  – GeoRSS
  – Trible JobXML
  – Autodesk 2007 (DWG/DXF)
  – Aeronautical Information Exchange Model (AIXM)

Updated Formats

• KML 2.1

• Autodesk AutoCAD Reader/Writer now supports Release 2007 files.
Data Translation
Data translation tools

- Data Interoperability Tools
  - Geoprocessing Toolbox
  - Quickly convert data to new format

Format Support

- GML XML WFS
- MapInfo GeoMedia
- Shapefile Geodatabase
- Oracle PostGreSQL DB2
Data translation tools

- **Data Interoperability Tools**
  - Geoprocessing Toolbox
  - Quickly convert data to new format
- **Quick Import**
  - New file or personal geodatabase

Format Support:
- CAD
- GML XML WFS
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- CAD
- GML XML WFS
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Data translation tools

- **Data Interoperability Tools**
  - Geoprocessing Toolbox
  - Quickly convert data to new format

- **Quick Import**
  - New file or personal geodatabase

- **Quick Export (75+ formats)**
  - Publish data to many formats
Geoprocessing integration

- Use data (formats) as input to core geoprocessing tools
  - Buffer, Clip, Union, Frequency, etc.
  - Outputs to ESRI format
Build interoperability into models

- Combine tools in geoprocessing models
  - Use interoperability data sources as input to the model
  - Export and distribute results in desired format

An ESRI shapefile is generated from the buffer operation, which is then output to three different formats: GML, file geodatabase, and GeoMedia.

This model uses a MapInfo MIF file as input to a buffer operation.
New at 9.3

Help / Documentation

• Help Topics updated
  – Reorganized
  – New content

- ArcGIS Data Interoperability extension
  - About the Data Interoperability help system
  - An overview of Data Interoperability
  - Key concepts of the Data Interoperability extension
  - Using the Data Interoperability tools
  - Common tasks using Data Interoperability

- Common tasks using Data Interoperability
  - Enabling the Data Interoperability extension
  - Creating an Interoperability Connection
  - Using external data sources in ArcMap and ArcGIS Desktop
  - Using Data Interoperability in Geoprocessing
  - Using the Quick Import tool
  - Using the Quick Export tool
  - Creating a custom format
  - Creating Spatial ETL tools using the Workbench
  - Using Data Interoperability with ArcGIS Server

- Using the Data Interopability tools
  - Direct read
  - Quick conversion
  - Data transformation
Format Support
Data Translation
Geoprocessing

Demonstration
Spatial ETL
(extract, transform, load)
Spatial ETL

• ETL: Extract, transform, load
  – Extract data from a source system
  – Transform the data to match the schema of the destination system
  – Load the data into the destination system
Spatial ETL

• **ETL: Extract, transform, load**
  – Extract data from a source system
  – Transform the data to match the schema of the destination system
  – Load the data into the destination system

• **Spatial ETL**
  – Extract, transform, and load *spatial* data
  – Data transformation, semantic data translation
Spatial ETL

• ETL: Extract, transform, load
  – Extract data from a source system
  – Transform the data to match the schema of the destination system
  – Load the data into the destination system

• Spatial ETL
  – Extract, transform, and load spatial data
  – Data transformation, semantic data translation

• Data transformations may include changes to
  – Format
  – Coordinate system
  – Feature types
  – Attribute schema
Data Migration Example

*Migrate data to a common data model*

- **Regional / County**
- **State**
- **Federal**

Spatial ETL

Nation GIS
Workbench application

- Graphically create spatial ETL data flow from source to destination

Extract your source dataset onto the workspace.

Transform or adjust the way your data flows from its source to the destination.

Load your data into the destination dataset.
Workbench transformers

- Workbench transformers
  - 225 + available transformers
  - Use transformers to manipulate source data
    - Attributes
    - Geometry

Source data  ➔  Transformer(s)  ➔  Destination data
Workbench transformers

- **Attribute operations**
  - Join attributes to features
  - Map new attribute values
  - Create new attribute values

- **Geometric operations**
  - Alter/build geometry
  - Filter by geometry
  - Spatial relationships
Workbench transformers

Create, manipulate, and convert geometry and attributes

• Select a subset of data to load
  – RoadType = “Paved”
  – GeometryType = Polygon

  AttributeFilter transformer
  GeometryFilter transformer
Workbench transformers

Create, manipulate, and convert geometry and attributes

- Select a subset of data to load
  - RoadType = “Paved”
  - GeometryType = Polygon

- Translate coded values

<table>
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<td>Residential</td>
</tr>
</tbody>
</table>

ValueMapper transformer
Workbench transformers

Create, manipulate, and convert geometry and attributes

• Select a subset of data to load
  – RoadType = “Paved”
  – GeometryType = Polygon

• Translate coded values

• Derive new attribute values or construct geometry
  – Points geometries to linear features
Workbench transformers

Create, manipulate, and convert geometry and attributes

- *Join* together data from multiple sources

<table>
<thead>
<tr>
<th></th>
<th>Jeff</th>
<th>1</th>
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</thead>
<tbody>
<tr>
<td>Phil</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Sales</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Products</td>
<td></td>
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Joiner transformer

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Join together data from multiple sources

Summarize/concatenate multiple rows of data

<table>
<thead>
<tr>
<th></th>
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<th>Concatenator transformer</th>
<th></th>
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</thead>
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<tr>
<td>2</td>
<td>AC</td>
<td></td>
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</tr>
</tbody>
</table>
Workbench transformers

Create, manipulate, and convert geometry and attributes

• *Join* together data from multiple sources

• *Summarize/concatenate* multiple rows of data

• *Split* a single attribute into multiple attributes
ArcGIS integration of spatial ETL

- Spatial ETL tool
  - Data is converted
  - Custom geoprocessing tool
  - Define your output schema once and use many times
ArcGIS integration of spatial ETL

- Spatial ETL tool
  - Data is converted
  - Custom geoprocessing tool
  - Define your output schema once and use many times

- Custom formats
  - Dynamic data transformation
    - No data conversion
    - Custom view of the data
  - Define once and use many times
Workbench and ModelBuilder

- Graphical authoring environments
- Workbench processes data at the feature level
- ModelBuilder processes data at the dataset or layer level
ModelBuilder and Workbench

- Graphical authoring environments
- Workbench processes data at the feature level
- ModelBuilder processes data at the dataset or layer level

- Complementary technologies
  - Workbench creates processes that can run in ModelBuilder
    - Use Spatial ETL tools in models, scripting, and command line
Spatial ETL tasks

- **Data migration**
  - Process of moving data between systems

- **Data cleanup/data manipulation**
  - Clean up errors in the data and streamline data preparation

- **Data distribution**
  - Distribute data to different systems

- **Change detection**
  - Determine changes between two different files

- **Data validation**
  - Verify and validate spatial data
New at 9.3

Transformers

• 35+ additional transformers

- ArcMeasureExtractor
- ArcMeasureSetter
- ArcPropertyExtractor
- ArcPropertySetter
- ArcSDEGridSnapper
- AttributeExploder
- CoordinateSystem
- DescriptionConverter
- Creator
- EllipsePropertyExtractor
- EllipsePropertySetter
- FeatureHolder
- FMEFunctionCaller
- GeometryRefiner
- GeometryReplacer
- GeometryValidator
- GeoRSSFeatureExtractor
- GeoRSSFeatureReplacer
- LineMeasureExtractor
- LineMeasureSetter
- MinimumSpanning
- CircleReplacer
- NeighborColorSetter
- OrientationExtractor
- ParameterFetcher
- PartCounter
- PathSplitter
- PointMeasureExtractor
- PointMeasureSetter
- PythonCreator
- SummaryReporter
- TextAdder
- TextLocationExtractor
- TextPropertyExtractor
- TextPropertySetter
- URLFetcher
- VariableSetter
- VariableRetriever

NEW
New at 9.3

Workbench Updates

- Overview Window

- Floating Windows

- Customizable Transformer Gallery
  - (i.e. My Favorites GP toolbox)
New at 9.3
Feature Types and Geometry

• Select Feature Types Dialog
  – choose layers to process

• Rich Geometry Model – complex geometry
  – Advanced Geometries
    • paths (measures)
    • bulged polylines
New at 9.3
Transformer and Stream Interaction

• Incomplete Transformers

• Disconnecting Streams / Isolating Transformers
  – testing
Feature Type Manipulation

- Updating Feature Types for Source and Destination datasets when schema has changed.
New at 9.3
Schema Mapping Transformers

- Replace manual field maps with AttributeCopier
  - Persist throughout workspace
Workbench
Spatial ETL
Demonstration
ArcGIS Engine and ArcGIS Server
Overview
ArcGIS Engine and ArcGIS Server Support

Extensions

• Data Interoperability ArcGIS Engine extension
  – Data
  – Geoprocessing tools

• Data Interoperability ArcGIS Server extension
  – Map Services
  – Geoprocessing Services

Enables extension’s data handling and support capabilities to be embedded in custom desktop or server-based applications.
ArcGIS Engine extension

Provides custom desktop applications…

• Access to Data Interoperability data sources

• Ability to run Data Interoperability’s geoprocessing tools in custom applications
  – Quick Import, Quick Export
  – Spatial ETL
ArcGIS Server Workflow Basics

Share geographic content:

1. **Author** the GIS resource using ArcGIS Desktop

2. **Publish** the resource as a service using ArcGIS Server

3. **Use** the service from a client application
   - (Desktop, ArcGIS Explorer, Custom Web App)
Data Interoperability ArcGIS Server

The power of Desktop Data Interoperability on the Server

• Map Services
  – Publish maps that contain non-ESRI formats to ArcGIS Server

  ![Map Services Diagram]

• Geoprocessing Services
  – Publish models that contain Data Interoperability’s Data Integration tools to ArcGIS Server

  ![Geoprocessing Services Diagram]

** All resources authored using ArcGIS Desktop
Publishing Data Interoperability resources to ArcGIS Server

Demonstration
Quick Export Geoprocessing Model

- Bird Nests - File Geodatabase
- Quick Export
- Output Dataset GML
Future Development Plans

• Upgrade released software to latest FME platform (FME2009)

• New Vector Formats:
  – ADAC XML Reader
  – Adobe PDF 2D Writer
  – AutoDesk 3DS Writer
  – CityGML Writer
  – IBM Informix Reader & Writer
  – IBM Informix Spatial Reader & Writer
  – MS SQL Server Spatial Reader & Writer
  – OpenStreetMap Reader
  – Wavefront OBJ Reader & Writer

• Vector Format Updates:
  – Improved Geodatabase annotation support.
Resources

- **ArcGIS Data Interoperability**
  - Including web demos

- **GIS Standards and Interoperability**

- **FME Workbench Introductory Training**
  [www.safe.com/esri](http://www.safe.com/esri)

- **ArcGIS Data Interoperability Tutorial**
Data Interoperability Summary

1. Incorporates multiple data formats from open or proprietary sources directly into your GIS

2. Maintains data quality (spatial and attribute information) as you convert between different data models.

3. Migrates data from other systems/data models or maintain multiple systems.

4. Integrates into the ArcGIS geoprocessing framework
Session Evaluations Reminder

Please turn in your session evaluations.

Questions??

... Thank you