The following was presented at DMT'12
(May 20-23, 2012).

The contents are provisional and will be
superseded by a paper in the
DMT'12 Proceedings.

See also earlier Proceedings (1997-2011)
http://ngmdb.usgs.gov/info/dmt/

Managing Complex Schema Upgrades with FME and ArcGIS

Richard Nairn
Geological Survey of Canada(Calgary)

Natural Resources Canada
Ressources naturelles Canada

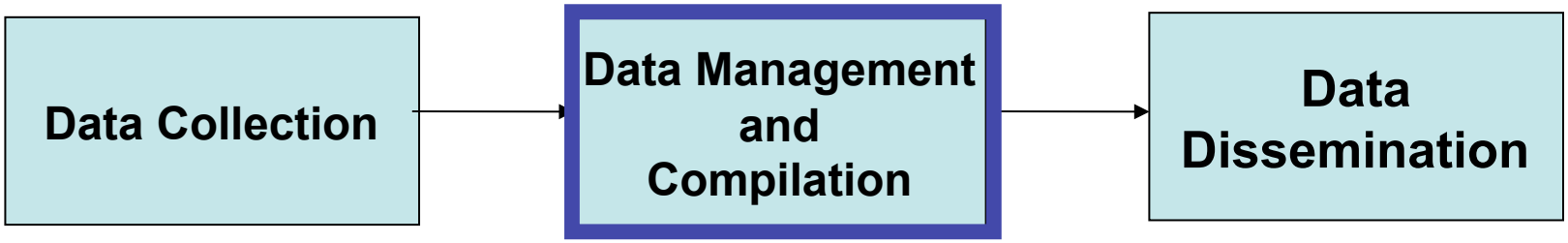
Canada

Outline

- Overview of Surficial Data Model
- Describe Workflow of Schema Upgrade
- Using ArcCatalog to Setup Geodatabase
- Using FME to Translate Data
  - Workbench basics
  - Readers and writers
  - Transformer Introduction
- Using Custom Transformers
- Future Steps

Context

- Geo-mapping for Energy and Minerals Program (GEM)
- Geological Map Flow project (GMF)



- Designed to reflect the steps involved in creating a standardized surficial geology map.
- Streamline the process of compiling, editing, publishing.
- Workflow has multiple components
  1. Geodatabase
  2. Style File
  3. Font File.

Brief history

The science language was first developed following an extensive review of existing data models and maps.

It was then refined by a small working group through iterative consultations with GSC surficial geology mappers.

Today, the working group is known as the Surficial Legend Review Committee and involves surficial geology mappers, science editors, and GIS experts.

How is it described?

- Science language
- Legend
- Symbolology

Group: Ice-contact features
Feature type: Esker ridge
Location confidence: Defined
Sense: Known
True ground length: Accurate
Geological event name: e.g. X Glaciation

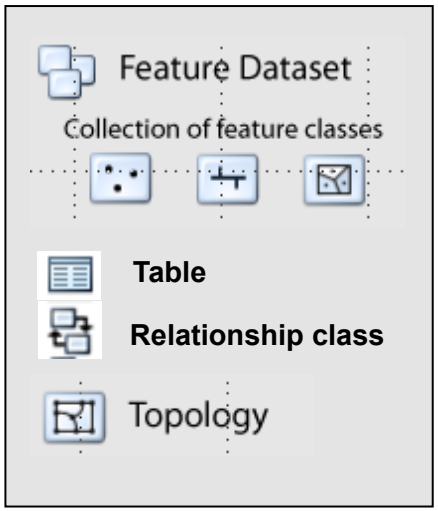
Legend

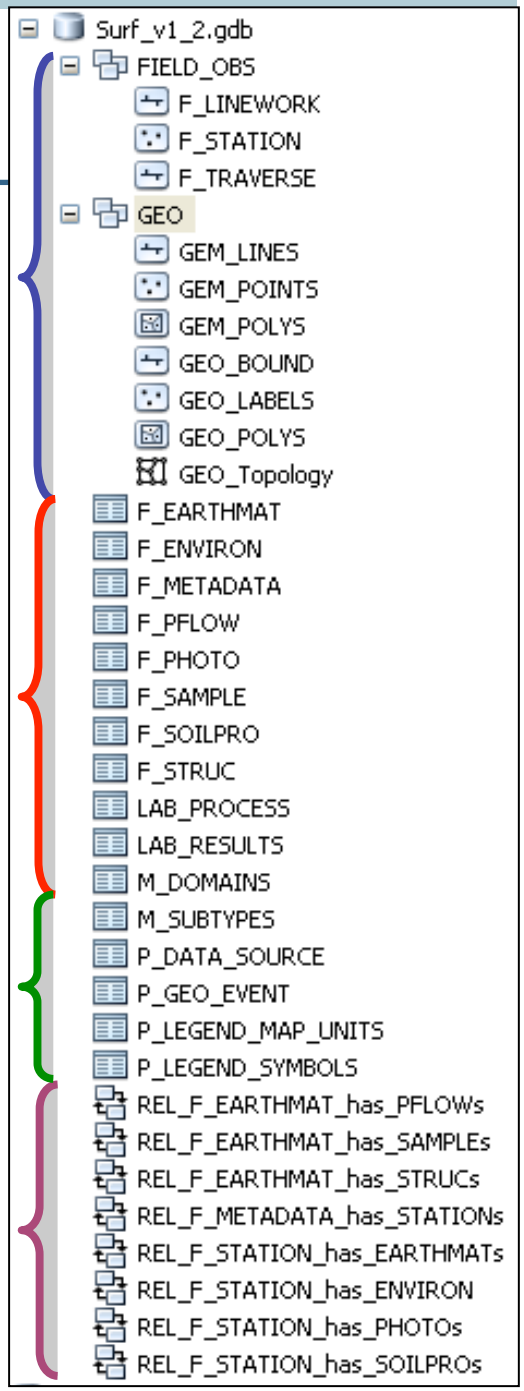
Esker ridge (sense known)……

Geodatabase

Geodatabase elements

- Feature classes
- Data tables
- Metadata tables
- Relationship classes





Naming convention

F_: Field data
GEM_: GEoMorphological features
GEO_: GEOlogical map units
LAB_: sample analysis LAB results
P_: Project specific information

Geodatabase

- Science Language is managed using coded domains
- Each Feature Class is controlled by Subtypes:
  - 218 Subtypes in total
- Coded Domains control allowed attributes
  - 635 Domains

	181	GEM_POINTS	20201001	To be defined (All)
360	FTYPE_DID	102	Buried drumlin ridge	
361	FTYPE_DID	106	Alluvial bar or levee ridge	
362	FTYPE_DID	110	Ice-pushed ridge	
363	FTYPE_DID	119	Crag-and-tail	
364	FTYPE_DID	120	Drumlin	
365	FTYPE_DID	121	Drumlinoid or fluting	
366	FTYPE_DID	122	Fluted bedrock	
367	FTYPE_DID	123	Buried drumlin	
368	FTYPE_DID	124	Buried drumlinoid or fluting	
369	FTYPE_DID	126	Gelifluction-lobe or solifluction-lobe	
370	FTYPE_DID	150	Eolian lag deposit	
371	FTYPE_DID	163	Recently deglaciated area	
372	FTYPE_DID	168	Nivation hollows	or un
373	FTYPE_DID	172	Ice-flow direction	›gen,
374	FTYPE_DID	179	Avalanche track	
	UTYPE_DID	GFv	GFv: Glaciofluvial sediments - Veneer	
	118	GEM_LINES	30701005	Esker ridge (Sense known or inferred)

Why upgrade – Why FME

- Surficial Data Model is not a mature product yet.
- Science Language is refined in response to feedback.
- Changes in Symbology.
- Targeting yearly schema release
- Each release can bring <u>many</u> modifications

GEO_LABELS and GEO_POLYS			V1.00		v1.1	
New symbol colour chart	CONTROL_SID	field_name	domain_code	domain_value_en	domain_code	domain_value_en
new colour codes; same labels	**722**	SYMBOL_DID	3.01.04.006	Ab: Alluvial sediments - Blanket	3.01.04.005	Ab: Alluvial sediments - Blanket
	745	SYMBOL_DID	3.01.07.029	GFh: Glaciofluvial sediments - Hummocky sediments	3.01.07.038	GFh: Glaciofluvial sediments - Hummocky sediments
	750	SYMBOL_DID	3.01.08.120	GLr: Glaciolacustrine sediments - Beach sediments	3.01.08.151	GLr: Glaciolacustrine sediments - Beach sediments
For Control_SID = 700 (Cs)		field_name	domain_code	domain_value_en	domain_code	domain_value_en
CONTROL no longer exists - is replaced by "to be defined"		**CONTROL_SID**	**700**	**Cs: Colluvial and mass-wasting deposits - Stratifie**	**793**	**x: To be defined - To be defined**
UTYPE no longer exists - is replaced by "to be defined"		UTYPE_DID	Cs	Cs: Colluvial and mass-wasting deposits - Stratified scree	x	x: To be defined - To be defined
SYMBOL no longer exist - is replaeced by "to be defined"		SYMBOL_DID	3.01.01.166	Cs: Colluvial and mass-wasting deposits - Stratified scree	3.01.99.990	x: To be defined - To be defined
Append comment		EDIT_REMARKS				Was coded as Cs
For Control_SID = 765 (Tx)		field_name	domain_code	domain_value_en	domain_code	domain_value_en
Control no longer exists - is replaced by "to be defined"		**CONTROL_SID**	**765**	**Tx: Glacial sediments - Reworked till**	**793**	**x: To be defined - To be defined**
UTYPE no longer exists - is replaced by "to be defined"		UTYPE_DID	Tx	Tx: Glacial sediments - Reworked till	x	x: To be defined - To be defined
SYMBOL no longer exist - is replaeced by "to be defined"		SYMBOL_DID	3.01.10.204	Tx: Glacial sediments - Reworked till	3.01.99.990	x: To be defined - To be defined
Append comment		EDIT_REMARKS				Was coded as Tx
For UTYPE2 = Cs		field_name	domain_code	domain_value_en	domain_code	domain_value_en
Cs is replaced by X		UTYPE2_DID	Cs	Cs: Colluvial and mass-wasting deposits - Stratified scree	x	x: To be defined - To be defined
For UTYPE2 = Tx		field_name	domain_code	domain_value_en	domain_code	domain_value_en
Tx is replaced by X		UTYPE2_DID	Tx	Tx: Glacial sediments - Reworked till	x	x: To be defined - To be defined
For UTYPE = Tst		field_name	domain_code	domain_value_en	domain_code	domain_value_en
Tst is replaced by Ts		UTYPE_DID	Tst	Tst: Glacial sediments - Streamlined till	Ts	Ts: Glacial sediments - Streamlined till
For UTYPE2 = Tst		field_name	domain_code	domain_value_en	domain_code	domain_value_en
Tst is replaced by Ts		UTYPE2_DID	Tst	Tst: Glacial sediments - Streamlined till	Ts	Ts: Glacial sediments - Streamlined till

Schema Upgrade Workflow

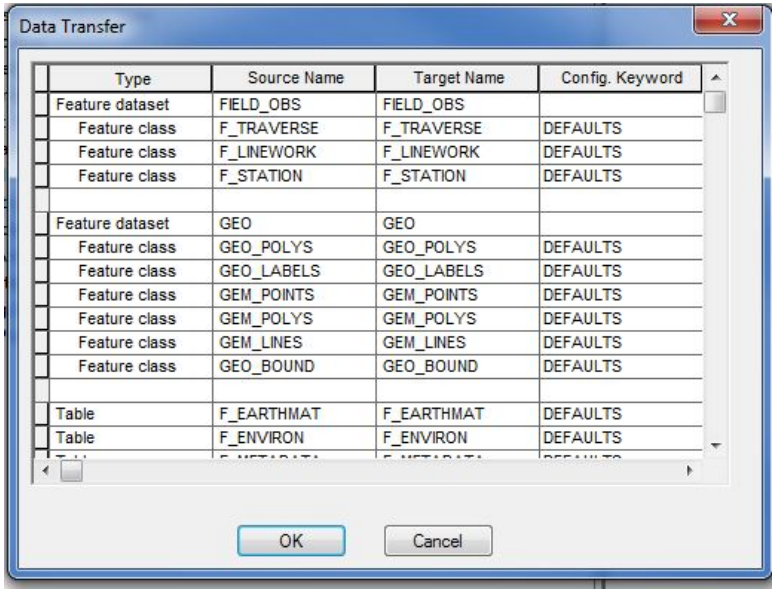
1. Create Target Geodatabase
2. Import Current Surficial Data Model Schema
3. Import Existing Projection Definition
4. Transfer Required Project-Specific Domain Information
5. Apply Schema Transformation with FME
6. Transfer and Merge XML Metadata for GeoDatabase

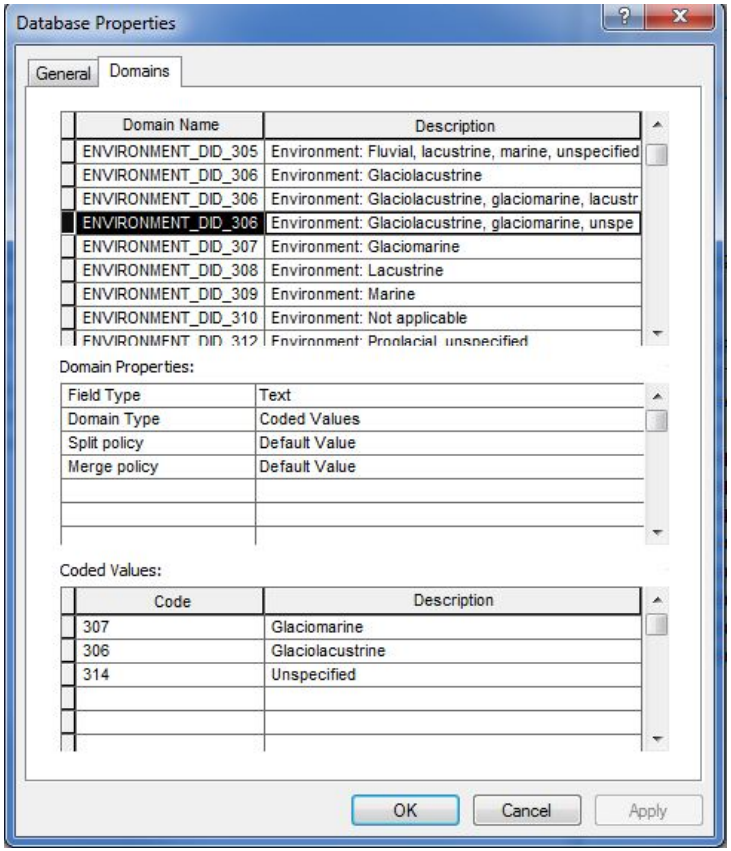
ArcGIS

ArcGIS

Geodatabase Setup using ArcCatalog

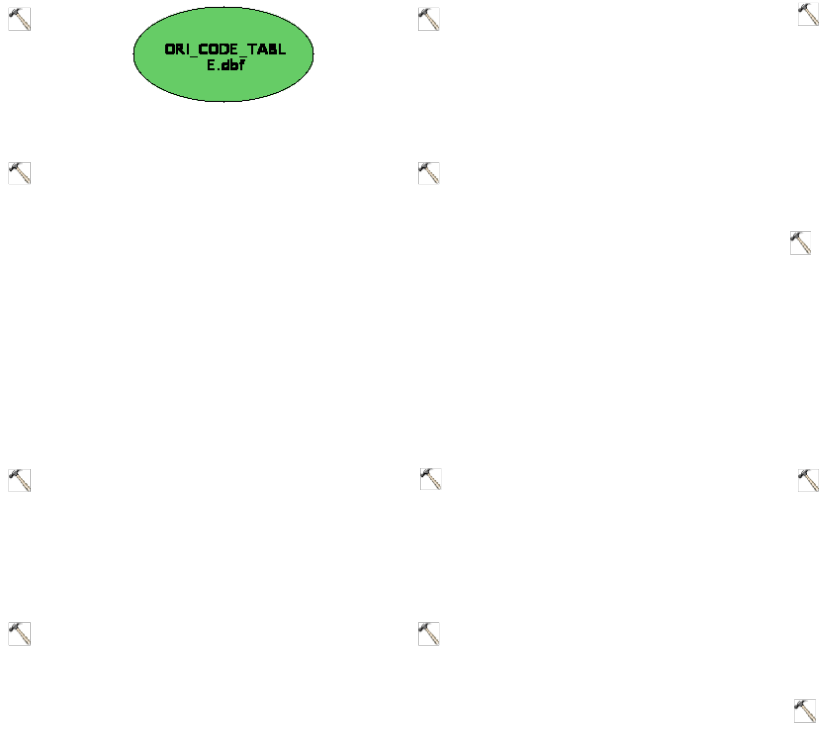
- Geodatabase is not upgraded in place.
- New geodatabase created – New Schema imported
- Contains all updated feature classes and domains.
- Import Projection information.





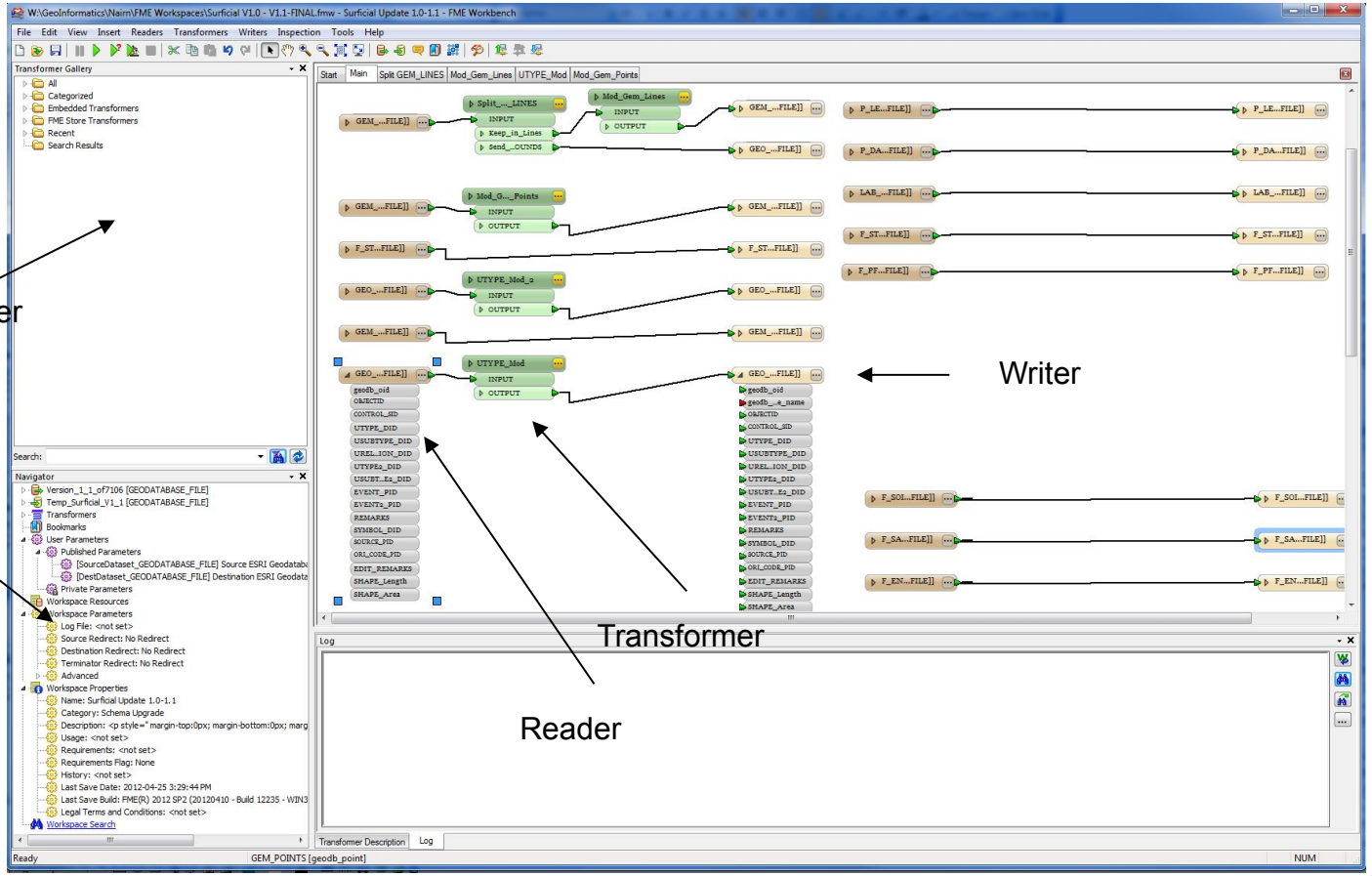
Transferring Project Domains

- Goal is to reduce manual steps
- Used existing workflow to create ModelBuilder Tool



Using FME to Transform Schema

- Gives a visual representation of transformations.
- Repeatable transformations once a model is built

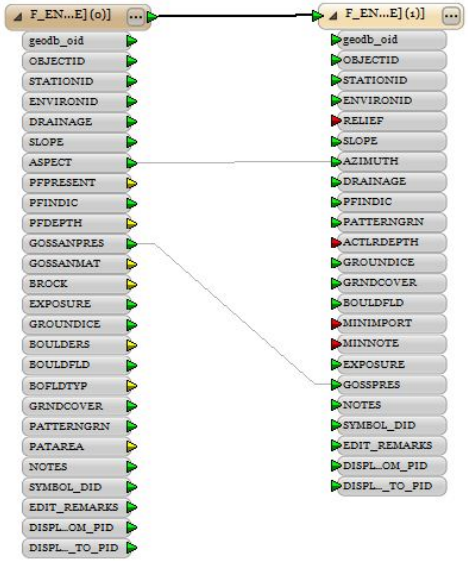


Using FME to Transform Schema

- Simple schema changes (eg. field length) require no action
- Renaming field requires a simple feature class remapping

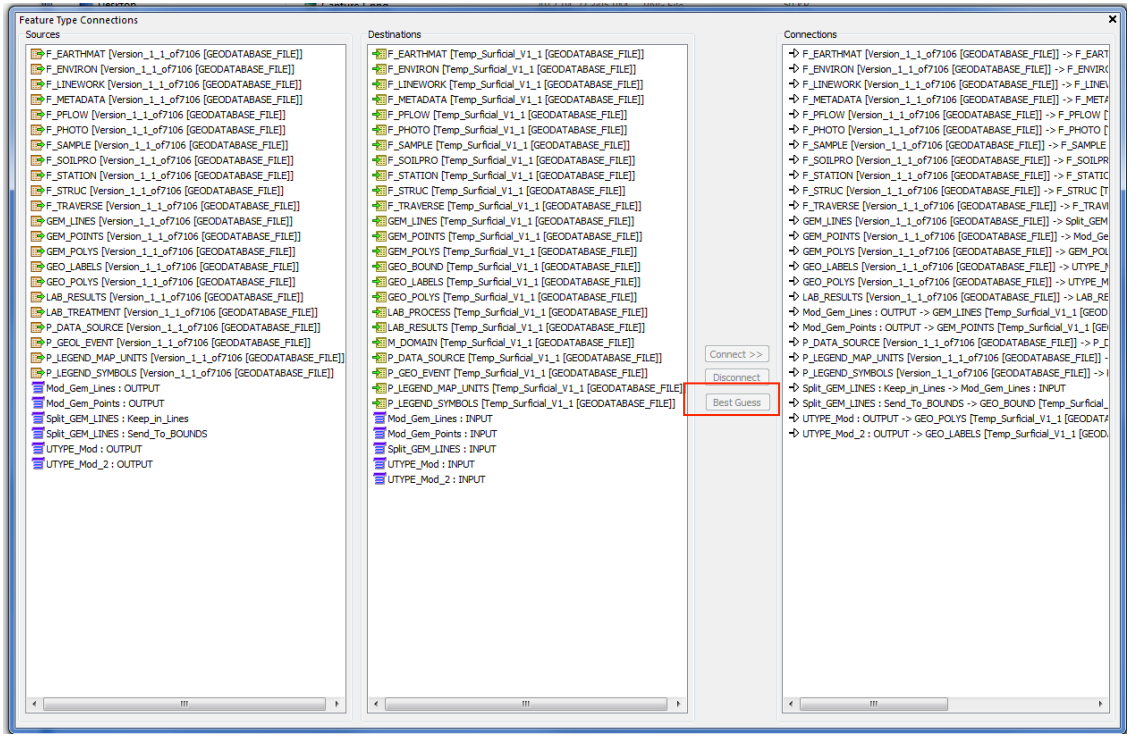
Simple Schema Change

- Add Reader and Writer
- Connect Reader and Writer
- Remap any renamed attributes



Using FME to Transform Schema

- If you have many feature classes: Feature Connection Wizard
  - Manual or Best Guess
    - Any feature class that has the same name
    - Any attribute that has the same name

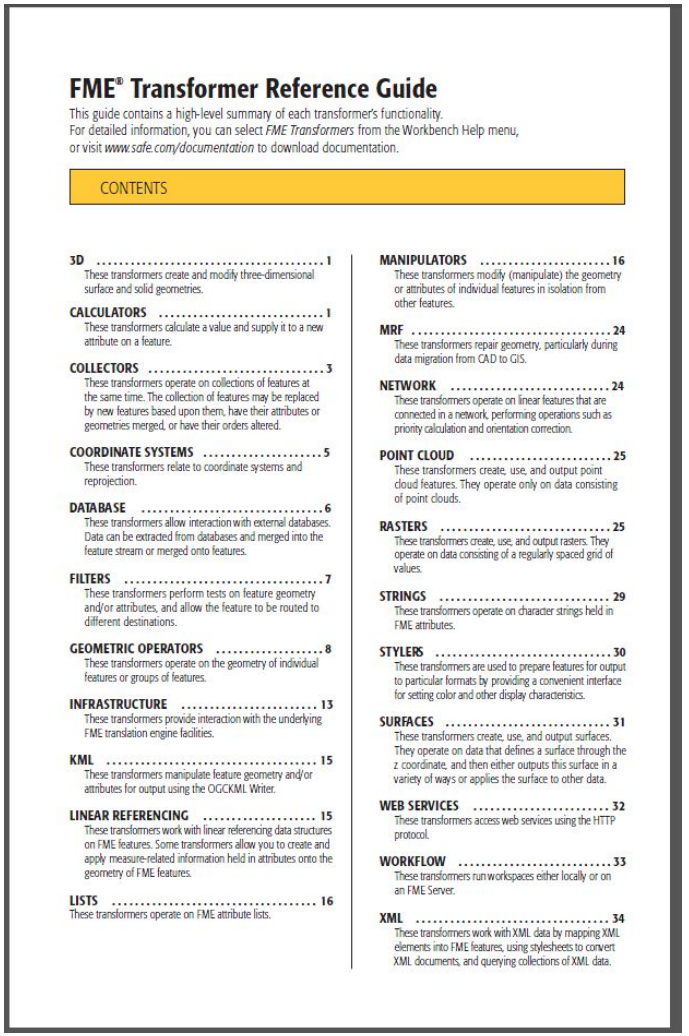


FME Transformers

- What is a transformer?

A transformer is an FME Workbench object that carries out the restructuring of features from the source data to the destination data. FME contains over 400 different transformers that perform different types of restructuring.

- FME Transformer Reference Guide



FME® Transformer Reference Guide

This guide contains a high-level summary of each transformer's functionality.
For detailed information, you can select *FME Transformers* from the Workbench Help menu, or visit *www.safe.com/documentation* to download documentation.

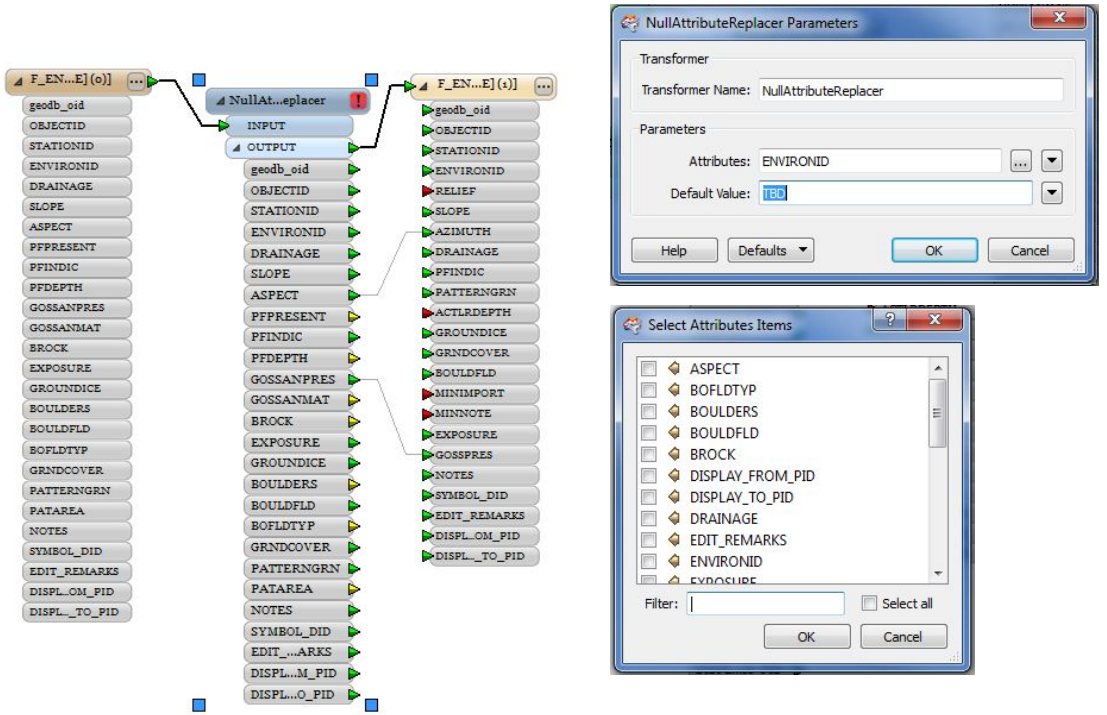
CONTENTS

FME Transformers - Sampler

- Calculators – Calculates a value into a new attribute
  - AreaCalculator – Calculates the area of an object and stores in attribute.
  - BoundsExtractor – Extracts minimum and max coordinates into new attribute
  - DateFormatter – Reformats and replaces date or time strings into a new format
  - DecimalDegreesCalculator – Calculates decimal degree from separate DMS values.
- Collectors – Operates on collections of features at the same time
  - BoundingBoxAccumulator – Takes a set of features and creates 2d bounding box
  - HullAccumulator – Creates convex of concave hulls for a group of features.
- Filters – Performs tests on features and routes accordingly
  - ChangeDetector – Detects changes between two sets of input features
  - Sampler – Preserves a number of features or sampling of features
  - SpatialFilter – Filters based on spatial releationship (overlap,contained
- Geometric – Operates on the geometry of individual features
  - Clipper
  - Dissolver
  - PolygonBuilder

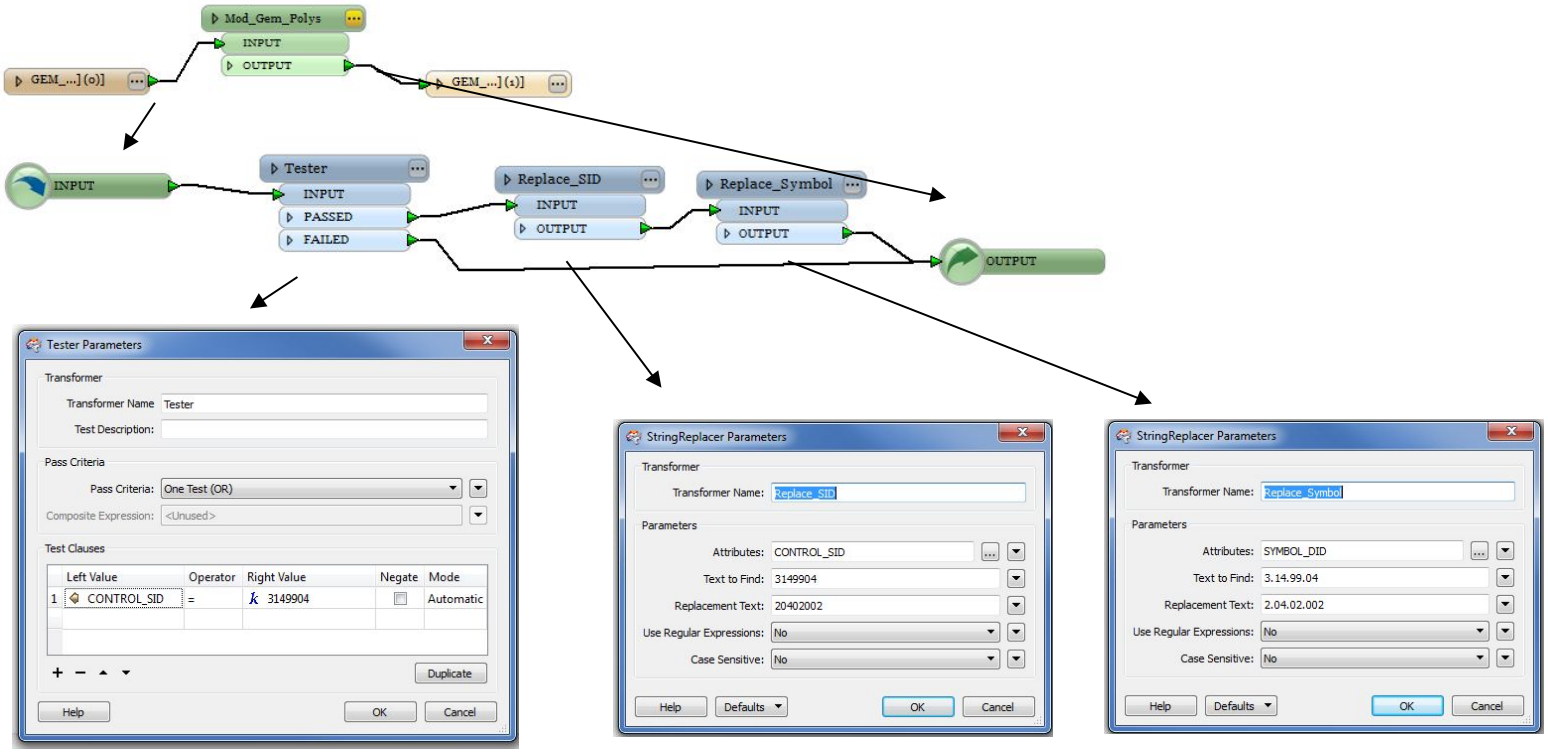
FME Transformers

- Simple transformations can be done in-line with Reader and Writer



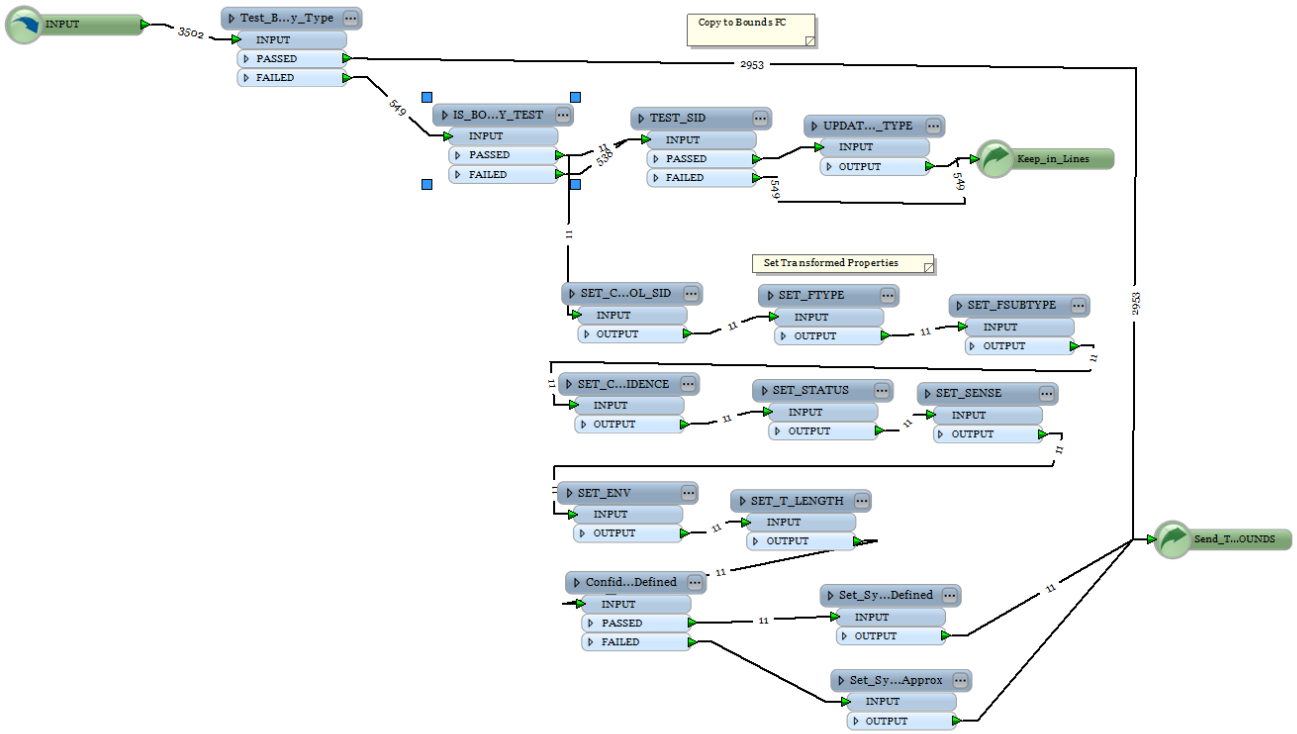
Custom FME Transformers

- Creating a custom transformer generates a separate workspace for the transformer.
- Allows reusability of common tasks.



Custom FME Transformers

- FME annotates the workspace with the number of features processed.
- Can attach data loggers, or inspectors to prototype or debug.



Why Use FME?

- This transformation gets applied to two feature classes…

Future Steps

- Automate Projection transfer with custom ArcCatalog Tool
- Build reference geodatabase and map for validating transformation.

Contact Info & Thanks

- Richard Nairn (Richard.Nairn@NRCan-RNCan.gc.ca)

- Christine Deblonde (Christine.Deblonde@NRCan-RNCan.gc.ca)
  - Surficial Data Model (Open File OF_7003)

- Doug Lemay (Doug.Lemay@NRCan-RNCan.gc.ca)
- Elizabeth Macey (Elizabeth.Macey@NRCan-RNCan.gc.ca)

- David Huntley (David.Huntley@NRCan-RNCan.gc.ca)
- William Chow (William.Chow@NRCan-RNCan.gc.ca)