

Benefits and Efficiencies of Model Driven Implementation of Small Scale Content Specifications in GenIE



Debbie Wilson

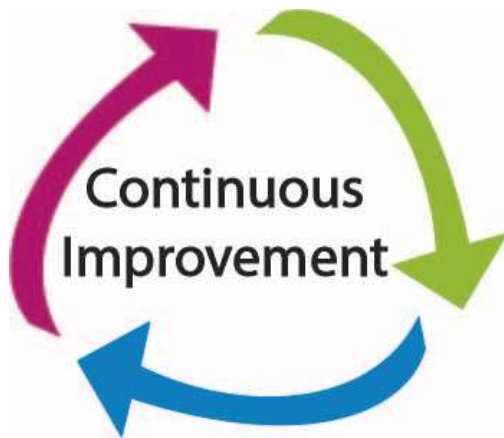
Senior Geographic Information Architect

29th January 2015

**EUROSDR/AGILE/OGC/JRC/ELF WORKSHOP 'DATA MODELLING
AND MODEL DRIVEN IMPLEMENTATION OF DATA DISTRIBUTION'**



Overview



CONSISTENCY
IS 

The word "CONSISTENCY" is written in large, bold, black capital letters. Below it, the word "IS" is written in the same style. To the right of "IS" is a blue icon of a key.

Capacity Building



A 3D illustration of a person in an orange suit walking up a set of grey stairs. The stairs are curved and lead upwards. The text "Capacity Building" is written in bold black letters to the left of the person.

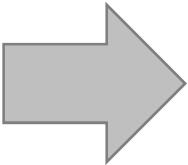
History of modelling and implementation in the OS



Product Management Team

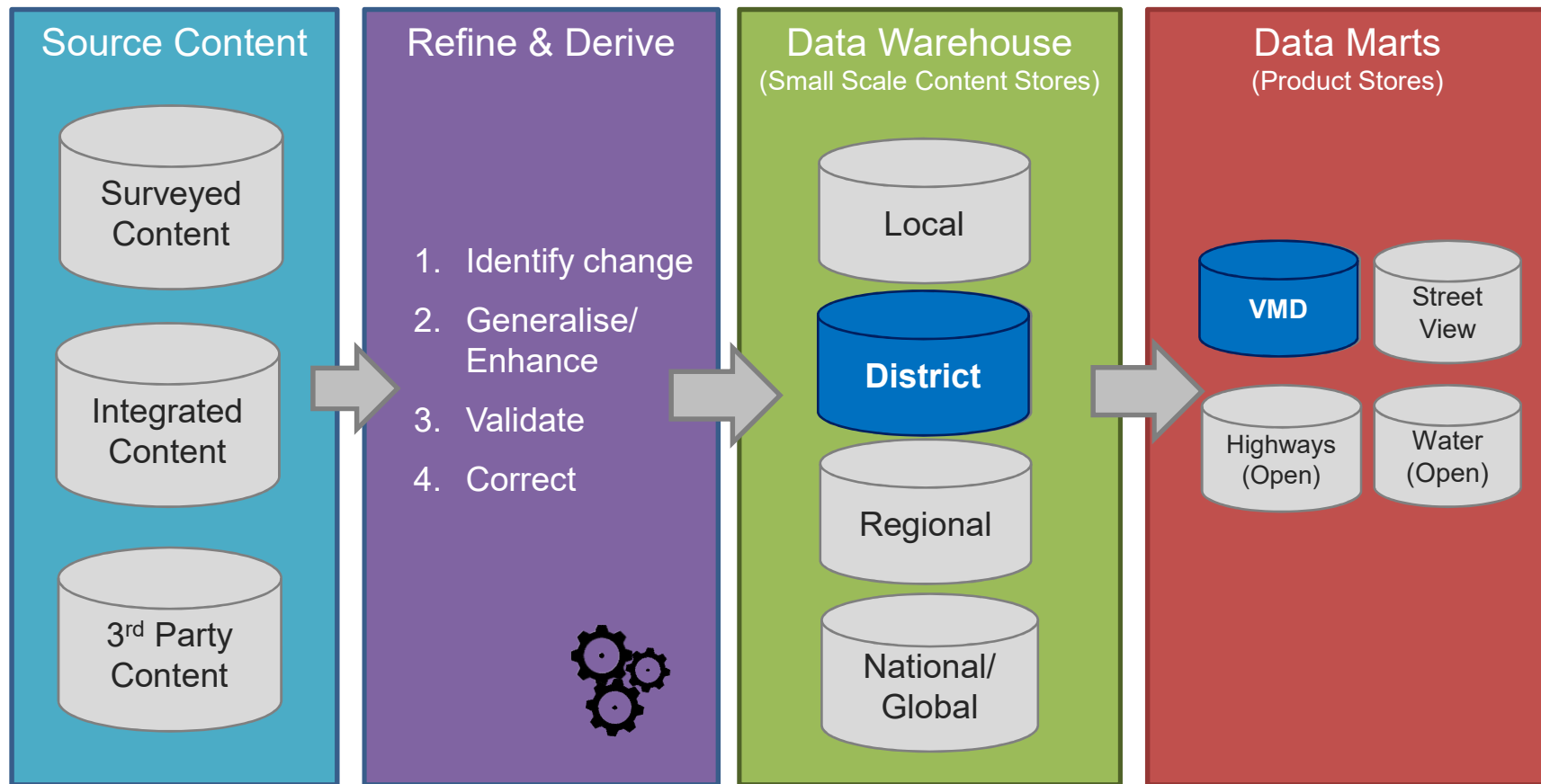


Logical model



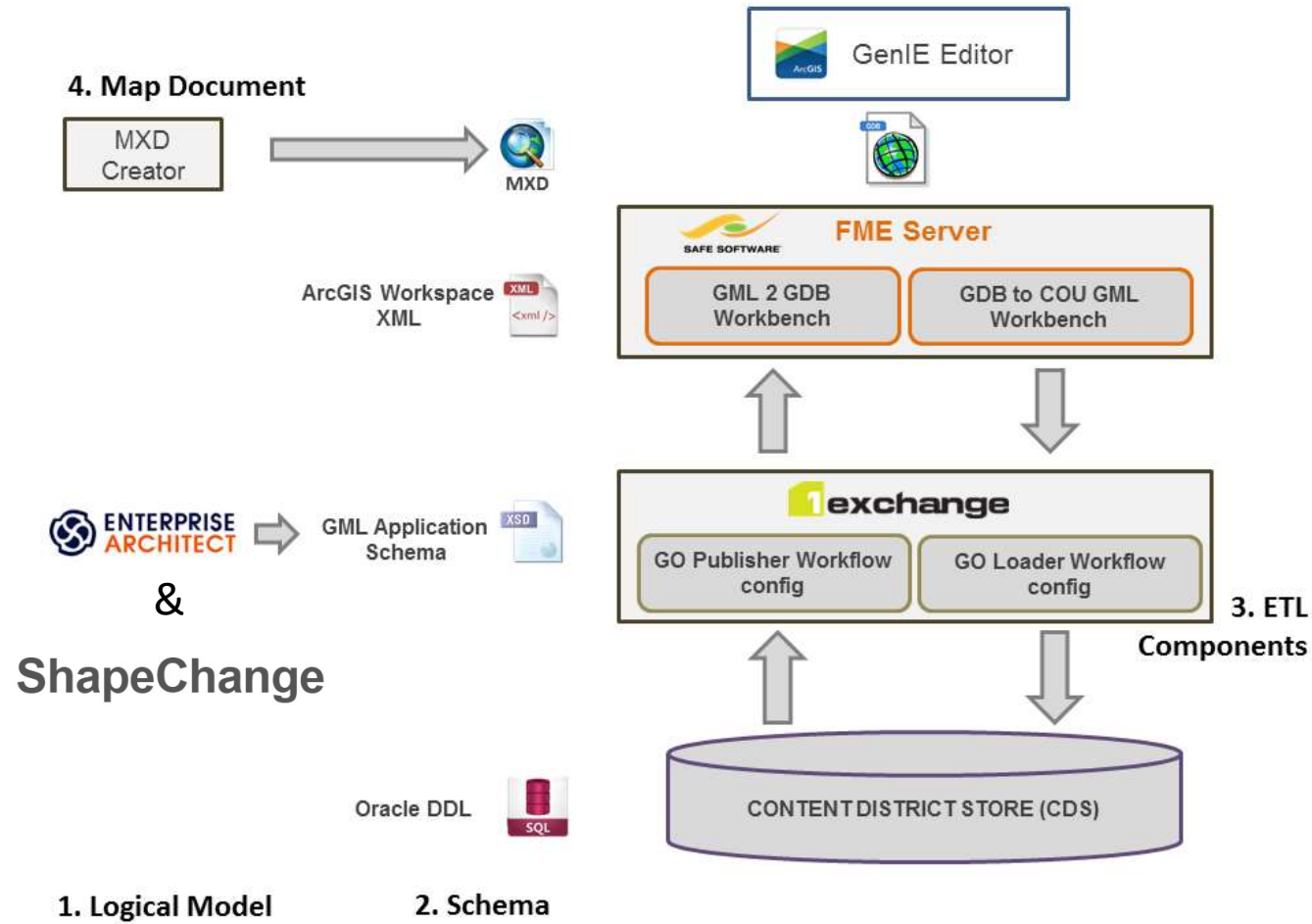
Manually generate implementation schema

GenIE Data Architecture

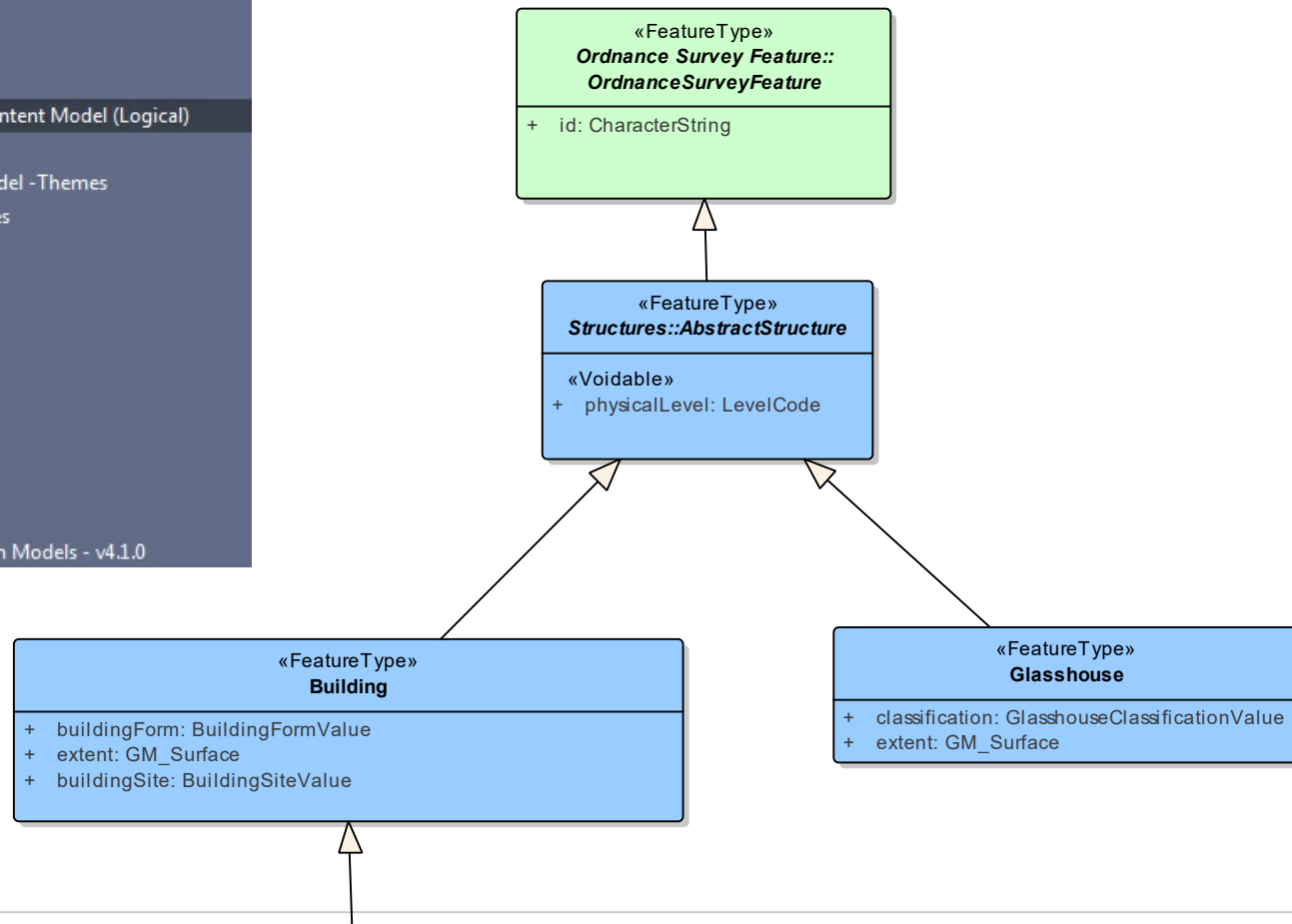
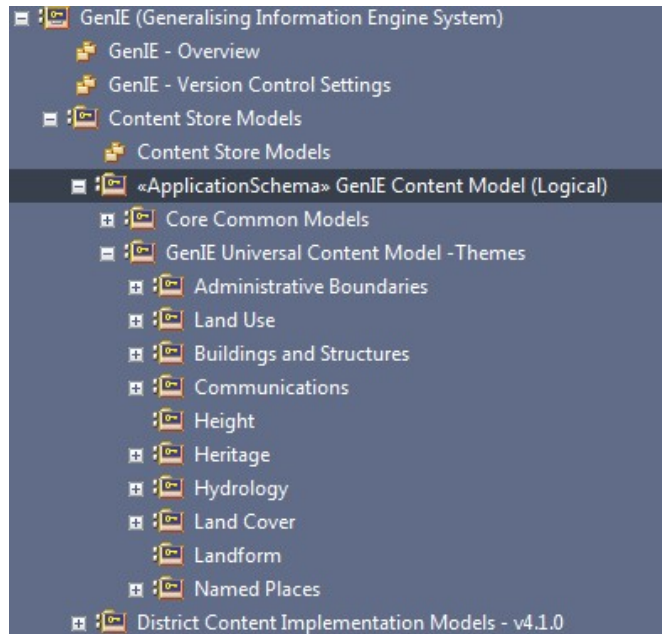


GenIE Editor Architecture

Testing and Continuous Integration



Ensuring consistency between content stores: Profiling



Ensuring consistency between content stores: Profiling

The screenshot shows a software window titled "Building : Features". On the left, there are tabs for "Attributes" and "Operations". The main area contains a table of features and a detailed view of an attribute.

Name	Type	Scope	Stereotype	Alias	Initial Value
extent	GM_Surface	Public		geometry	
buildingSite	BuildingSiteValue	Public			
buildingForm	BuildingFormVal...	Public			

Attribute (buildingSite)	
Containment	Not Specified
Static	False
Property	
Is Literal	False
Transient	False
Derived	False
Is ID	False
Multiplicity	[1]
Is Collection	False
Container Type	

Attribute (buildingSite)	
from BuildingSiteValue	
profiles	local

The interface also includes tabs for "Notes", "Constraints", "Redefines", and "Tagged Values". A red box highlights the "Attribute (buildingSite)" and "from BuildingSiteValue" sections in the "Tagged Values" tab. At the bottom right, there are "Close" and "Help" buttons.

Creating Test Scenarios for TDD of implementation schema

Test-driven development (TDD) is a software **development** process that relies on the repetition of a very short **development** cycle: first the developer writes an (initially failing) automated **test** case that defines a desired improvement or new function, then produces the minimum amount of code to pass that **test**, and ...

[Test-driven development - Wikipedia, the free encyclopedia](https://en.wikipedia.org/wiki/Test-driven_development)
en.wikipedia.org/wiki/Test-driven_development

- TDD of implementation schema requires two inputs:
 1. Logical Model describing data structure
 2. Encoding Rules for implementation schema
 - Logical → DDL
 - Logical → GML
 - Logical → GDB

Creating Test Scenarios for TDD of implementation

Created EA Document Template to allow test analyst to automatically generate Background

Aspiration: to automatically generate test scenarios from model

NCrunch
Version 2.12.0.2 of NCrunch is now available!
[Go to www.ncrunch.net](http://www.ncrunch.net)
[Close this message](#)

```
Feature: InsertAdministrativeBoundaryIntoSchema
  To confirm the AdministrativeBoundary table is correct
  Insert valid and invalid data
  And confirm expected number of fields
  And check default values are create on insert

  Background: Test Domain Values for AdministrativeBoundary
  Given the following domain values are defined for "AdministrativeLevel"
  | value |
  |-----|
  | International |
  | Country |
  | Region |
  | County |
  | District |
  | Civil Parish |

  Scenario: Count fields in database and confirm the expected number
  Given I have a CDS database connection using the connection file located under "DATABASECONNECTIONCDS"
  When I count the number of fields in the table "ADMINISTRATIVEBOUNDARY_LN"
  Then I confirm that number of fields is "3"

  Scenario: Confirm the field types and length
  Given I have a CDS database connection using the connection file located under "DATABASECONNECTIONCDS"
  Then the table "ADMINISTRATIVEBOUNDARY_LN" should have the fields
  | Field | type | length | Nullable |
  |-----|-----|-----|-----|
  | ID | VARCHAR2 | 38 | N |
  | CLASSIFICATION | VARCHAR2 | 15 | N |
  And the table "ADMINISTRATIVEBOUNDARY_LN_LT" should have the fields
  | Field | Type | Length | Nullable |
  |-----|-----|-----|-----|
  | GEOMETRY | SDO_GEOMETRY | - | N |

  Scenario: Confirm Geometry and Srid have the correct types - Geometry of specific type and Spatial Reference
  Given I have a CDS database connection using the connection file located under "DATABASECONNECTIONCDS"
  Then the "VERSIONED" table "ADMINISTRATIVEBOUNDARY_LN" should have a Geometry Type of "LINE" and a Spatial Reference of "..."

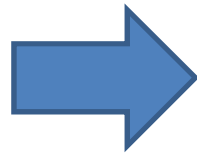
  Scenario: Confirm Table is Versioned
  Given I have a CDS database connection using the connection file located under "DATABASECONNECTIONCDS"
  Then the table "ADMINISTRATIVEBOUNDARY_LN" is versioned

  Scenario: Insert Valid Record into Table (ADMINISTRATIVEBOUNDARY_LN)
  Given I have a CDS database connection using the connection file located under "DATABASECONNECTIONCDS"
  And if the feature identified in table "ADMINISTRATIVEBOUNDARY_LN" and field "ID" with value "{B699A005-78D9-2682-E040-A40A282C5563}"
  When I create a feature to insert into the target table "ADMINISTRATIVEBOUNDARY_LN"
  And the feature has the following fields
  | FieldName | FieldValue | SimpleFieldTypeDescriptor |
  |-----|-----|-----|
  | ID | {B699A005-78D9-2682-E040-A40A282C5563} | String |
  | GEOMETRY | geometry | Geometry |
  | CLASSIFICATION | Country | String |
  And the feature has "LINE" geometry
```

Semi-automated generation of implementation schema

GO Loader to automatically generate DDL from GML

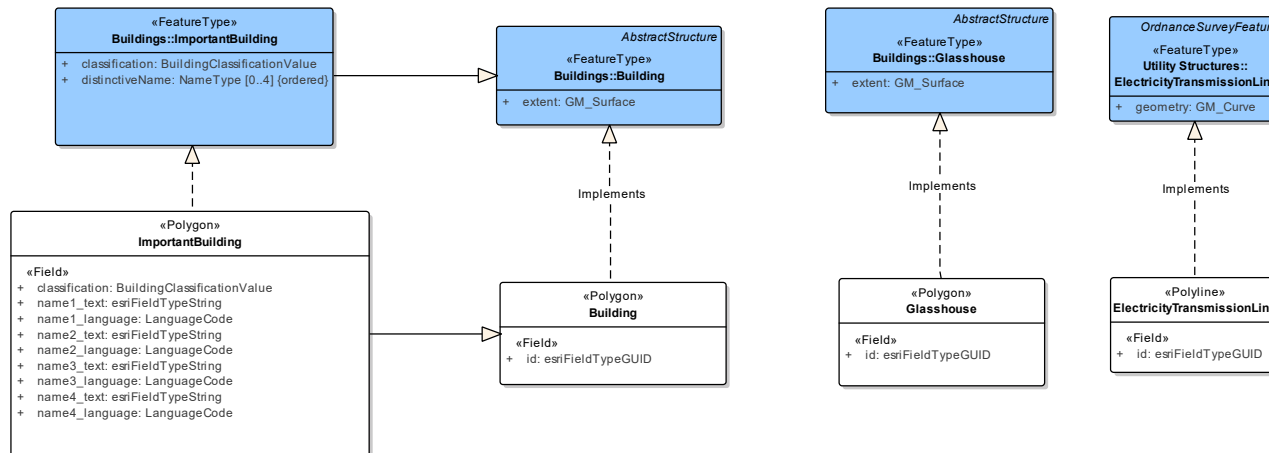
ShapeChange



Flattening & Profiling Transformer

GO Loader 1.7.4

GML Elements	GML Type	Translation Method	Substit...	Table	Column	Column Type
AdministrativeBoundary	district:AdministrativeBoundaryType	Load		ADMINISTRATIVEBOUNDARY_LN		
Building	district:BuildingType	Load		BUILDINGS_AR		
ElectricityTransmissionLine	district:ElectricityTransmissionLineType	Load		ELECTRICITYTRANSLINE_LN		
Foreshore	district:ForeshoreType	Load		FORESHORE_AR		
FunctionalSite	district:FunctionalSiteType	Load		FUNCTIONALSITE_PT		
FunctionalSiteExtent	district:FunctionalSiteExtentType	Load		FUNCTIONALSITE_D_AR		
Glasshouse	district:GlasshouseType	Load		GLASSHOUSE_AR		
HeritageSite	district:HeritageSiteType	Load		HERITAGESITE_PT		
HeritageSiteExtent	district:HeritageSiteExtentType	Load		HERITAGESITE_D_AR		
ImportantBuilding	district:ImportantBuildingType	Load		IMPORTANTBUILDING_AR		
district:classification	district:BuildingClassificationValueType	Insert		IMPORTANTBUILDING_AR	CLASSIFICATION	VARCHAR
district:geometry	gml:SurfacePropertyType	Insert		IMPORTANTBUILDING_AR	GEOMETRY	GEOMETRY
district:id	xs:string	Insert		IMPORTANTBUILDING_AR	ID	VARCHAR
district:name1_language	district:LanguageCodeType	Insert		IMPORTANTBUILDING_AR	NAME1_LANGUAGE	VARCHAR
district:name1_text	xs:string	Insert		IMPORTANTBUILDING_AR	NAME1_TEXT	VARCHAR
district:name2_language	district:LanguageCodeType	Insert		IMPORTANTBUILDING_AR	NAME2_LANGUAGE	VARCHAR
district:name2_text	xs:string	Insert		IMPORTANTBUILDING_AR	NAME2_TEXT	VARCHAR
district:name3_language	district:LanguageCodeType	Insert		IMPORTANTBUILDING_AR	NAME3_LANGUAGE	VARCHAR
district:name3_text	xs:string	Insert		IMPORTANTBUILDING_AR	NAME3_TEXT	VARCHAR
district:name4_language	district:LanguageCodeType	Insert		IMPORTANTBUILDING_AR	NAME4_LANGUAGE	VARCHAR
district:name4_text	xs:string	Insert		IMPORTANTBUILDING_AR	NAME4_TEXT	VARCHAR
MarineWater	district:MarineWaterType	Load		MARINEWATER_AR		
MotorwayJunction	district:MotorwayJunctionType	Load		MOTORWAYJUNCTION_PT		
NamedPlace	district:NamedPlaceType	Load		NAMEDPLACE_PT		
NamedPlaceExtent	district:NamedPlaceExtentType	Load		NAMEDPLACE_D_AR		



Manually generate ArcGIS model in EA

Semi-automated generation of implementation schema

GO Loader to automatically generate DDL from GML

The screenshot displays the ShapeChange application window. At the top, a navigation bar includes links for Home, About, Get Started, Examples, Application schemas, Transformations, and Output Targets. The 'Output Targets' menu is open, listing options: XML Schema, Feature Catalogue, Ontology, ArcGIS Workspace (highlighted in yellow), SQL DDL (highlighted in yellow), JSON Schema, and UML model. Below the menu, a diagram shows a central blue box with arrows pointing to 'UML model' and 'Configuration file'. The main content area features the 'ShapeChange' logo and the text 'Processing application schemas for geographic information'. Below this, it states 'Generate GML application schemas, HTML feature catalogues and other representations' and includes a prominent blue 'Get Started' button.

«Field»
+ classifica
+ name1_t
+ name1_l
+ name2_text: esiFieldTypeString
+ name2_language: LanguageCode
+ name3_text: esiFieldTypeString
+ name3_language: LanguageCode
+ name4_text: esiFieldTypeString
+ name4_language: LanguageCode

«Field»
+ id: esiFieldTypeGUID

«Field»
+ id: esiFieldTypeGUID

«Field»
+ id: esiFieldTypeGUID

Benefits of Model Driven Approach

- Implementation schema can be automatically derived from the logical model using consistent encoding rules (i.e. flattening rules)
 - Removes need for expensive resources to perform basic schema development—use their skill for tuning, software development etc.
 - Removes manual interpretation of logical model – resulting in inconsistencies
 - Significantly reduces development time
- Automation results in:
 - Consistency
 - Repeatability
 - Re-usable toolset
- Was able to train non-modeller staff to use the tools to develop the implementation schema
- Automated Test framework essential for ensuring that implementation schema reflected logical model

Benefits of Model Driven Approach

- Product Development – Open Data Mandate to develop 3 new products by March 2015!
 - Two product development teams responsible for creating alpha products reusing GenIE architecture
 - No requirement to use scarce IS resources – as product development consultants able to re-use tools to automatically generate schemas from logical models

Quote: Lucy Diamond (Product Development Consultant)

Wow – its only taken me a couple of hours to create the product schema (GML) and database schema (DDL).

We thought this would take several days!!

.....Damn - I've now got to concentrate on the generalisation rules as thought this would be much harder

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