General Introduction to the use of X3ML toolkit

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ICS-FORTH

Workshop Content

1. X3ML Design Principles
2. Basic Interface Operation
3. Setting up a New Mapping
4. Matching Table Operation
5. Mapping Patterns
6. Instance Generators

1. X3ML DESIGN PRINCIPLES

X3ML: A Mapping Language

•**X3ML** is a declarative, XML based language which describes schema mappings in such a way that they can be collaboratively created and discussed by experts.

•Mappings have been done in very many custom ways in the past.

•In practice mappings are produced manually by Domain/IT experts:

- labor-intensive
- error prone
- time consuming

•Emphasis is on establishing a standardized mapping description which lends itself to collaboration and the building of a mapping memory to accumulate knowledge and experience.

X3ML toolkit

- the **X3ML Toolkit** is a set of small, open source, microservices that follow the SYNERGY Reference Model. They are designed with open interfaces and they can be easily customized and adapted to complex environments. The key components of the toolkit are:
  - Mapping Memory Manager
  - 3M Editor
  - X3ML Engine

- FORTH's open access service is found at: https://www.ics.forth.gr/isl/3M

3M : Mapping Memory Manager

- **3M** is a tool for managing mapping definition files. It’s based on FIMS management system for the administration of the files and also on the 3MEditor for editing and viewing the files. It provides a number of administrative actions that assist the experts to manage their mapping definition files.

- The source code is open source available on github http://github.com/isl/Mapping-Memory-Manager

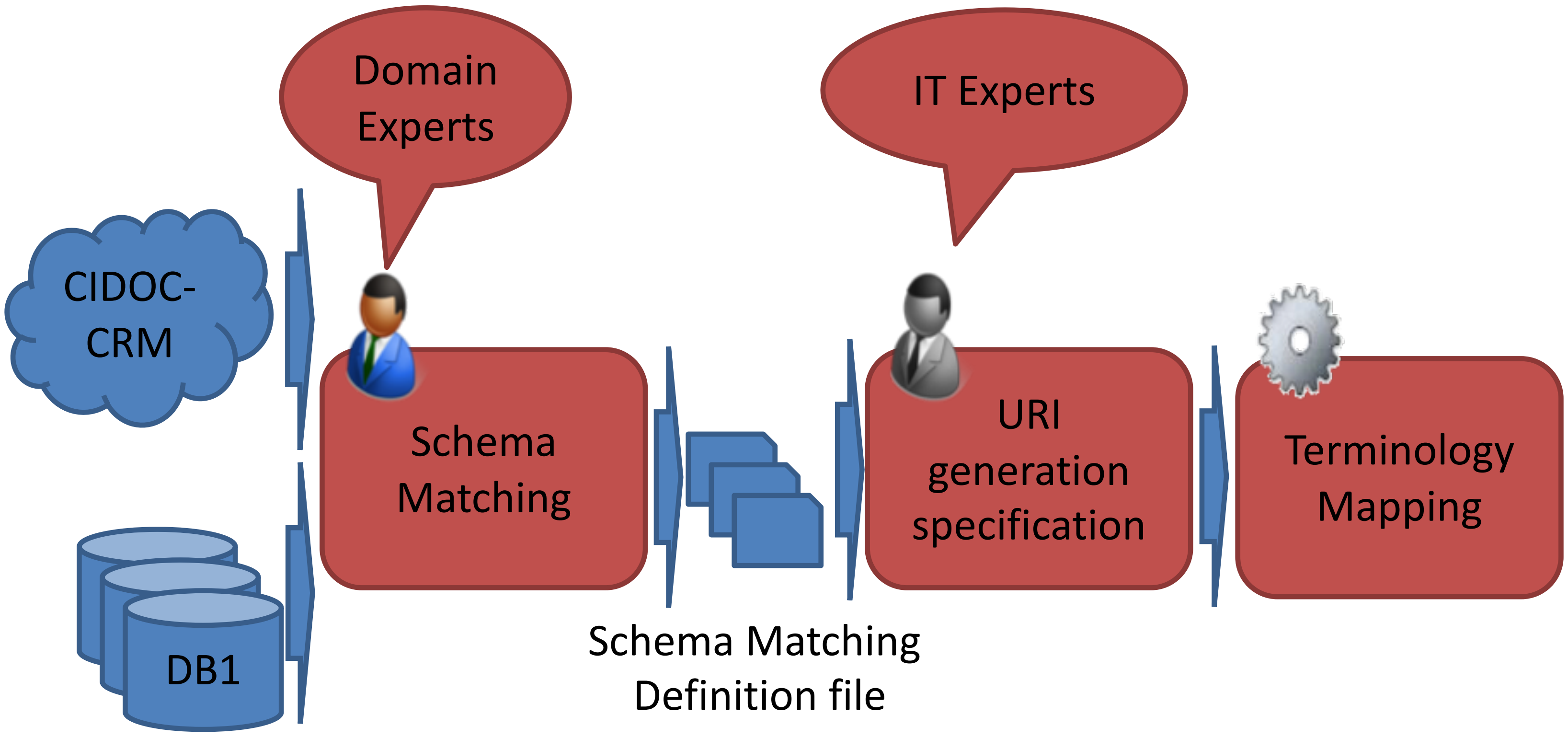
3M Editor: A Mapping Editor

- **3MEditor** is a software that allows domain experts to build and discuss mappings with little resource to any particular software skills. It is the interface tool envisioned to allow domain experts to build mappings.
- It provides:
    - Source and target agnostic mapping facility
    - Guided mapping according to deployed ontology’s logic
    - Comment and justification facility
    - Mapping storage
    - Separated instance generation practice for IT professionals
- The source code is open source available on github https://github.com/isl/3MEditor

X3ML engine: A Transformation Tool

- The X3ML Engine realizes the transformation of the source records to the target format. The engine takes as input the source data (currently in the form of an XML document), the description of the mappings in the X3ML mapping definition file and the URI generation policy file and is responsible for transforming the source document into a valid RDF document which corresponds to the input XML file, with respect to the given mappings and policy.
- The source code is open source available on github https://github.com/isl/x3ml

X3ML Workflow

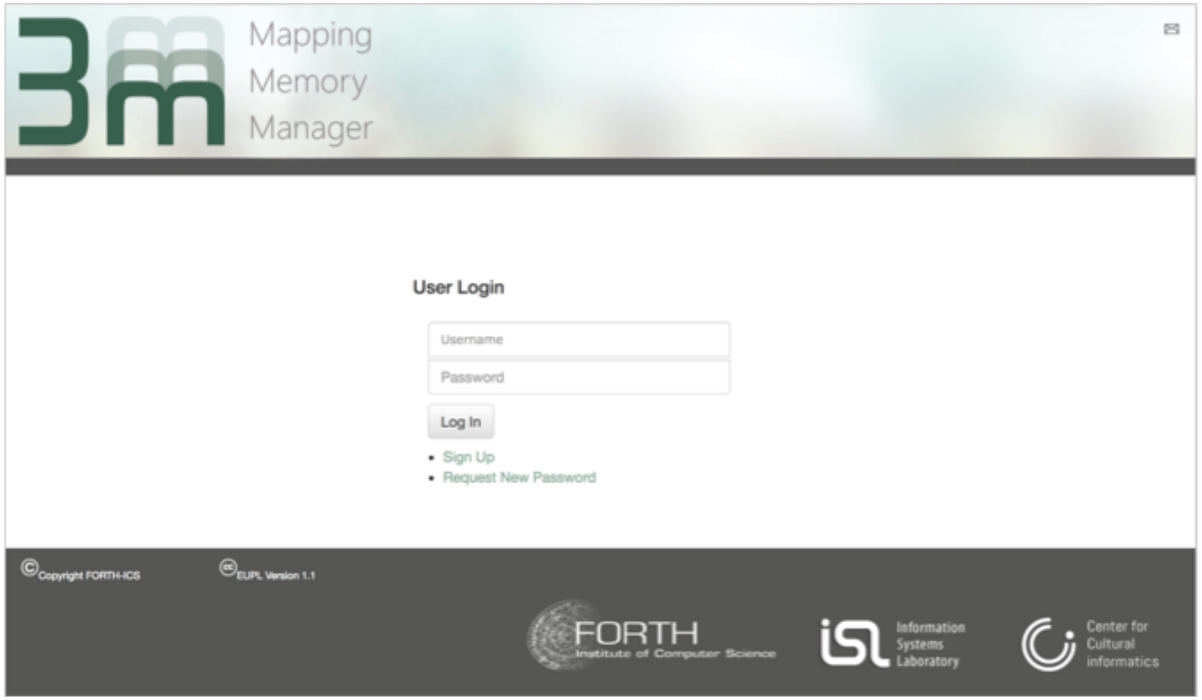


2. BASIC INTERFACE OPERATION

Basic Interface Operation Section Content

1. Logging In / New User
2. Control Tools and List
3. ‘More’ Feature in Control Tools
   (e.g. Copy / Give Rights)
4. Search / Filter options
5. Manual

1. Login


Mapping
Memory
Manager
Log In
Sign Up
Request New Password
FORTH Institute of Computer Science
Information Systems Laboratory
Center for Cultural informatics

User Login

Username

Password

Copyright FORTH-ICS

EUPL Version 1.1

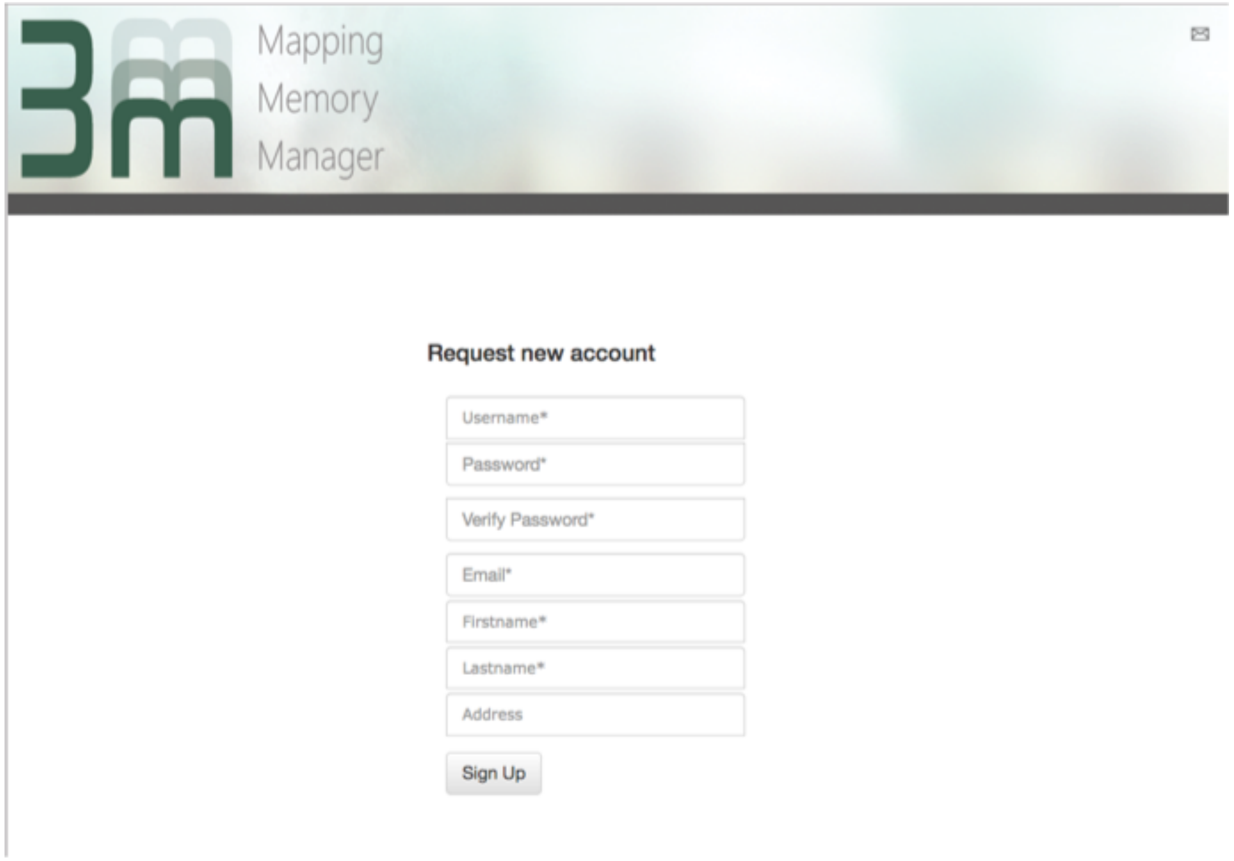
- Create New User
- Reset Password

OR

- Login

Login at:
https://www.ics.forth.gr/isl/3M

1. New User



Request new account

Username*

Password*

Verify Password*

Email*

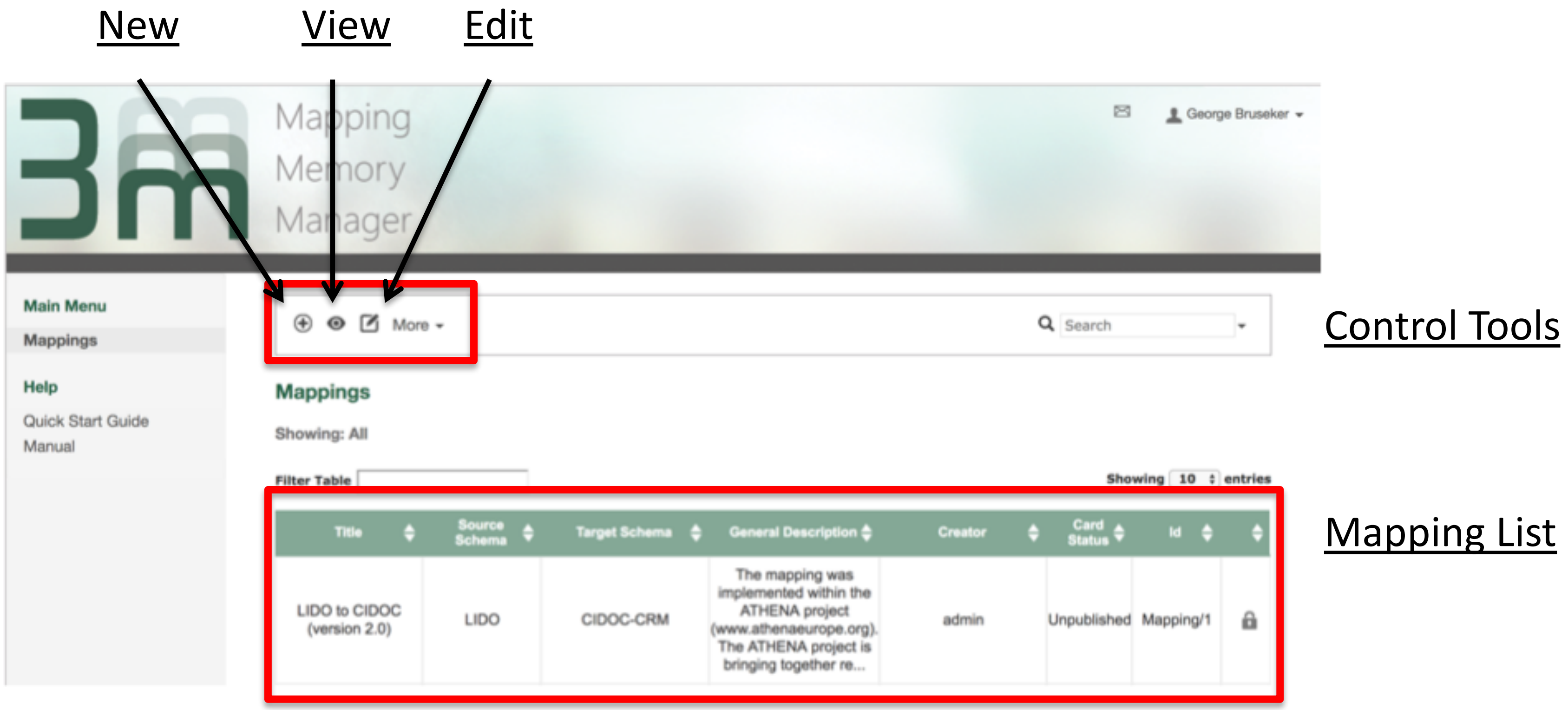
Firstname*

Lastname*

Address

- Only need a valid email to sign up!
- System will send a verification email and you can begin

2. Control Tools and List



Mappings

Showing: All

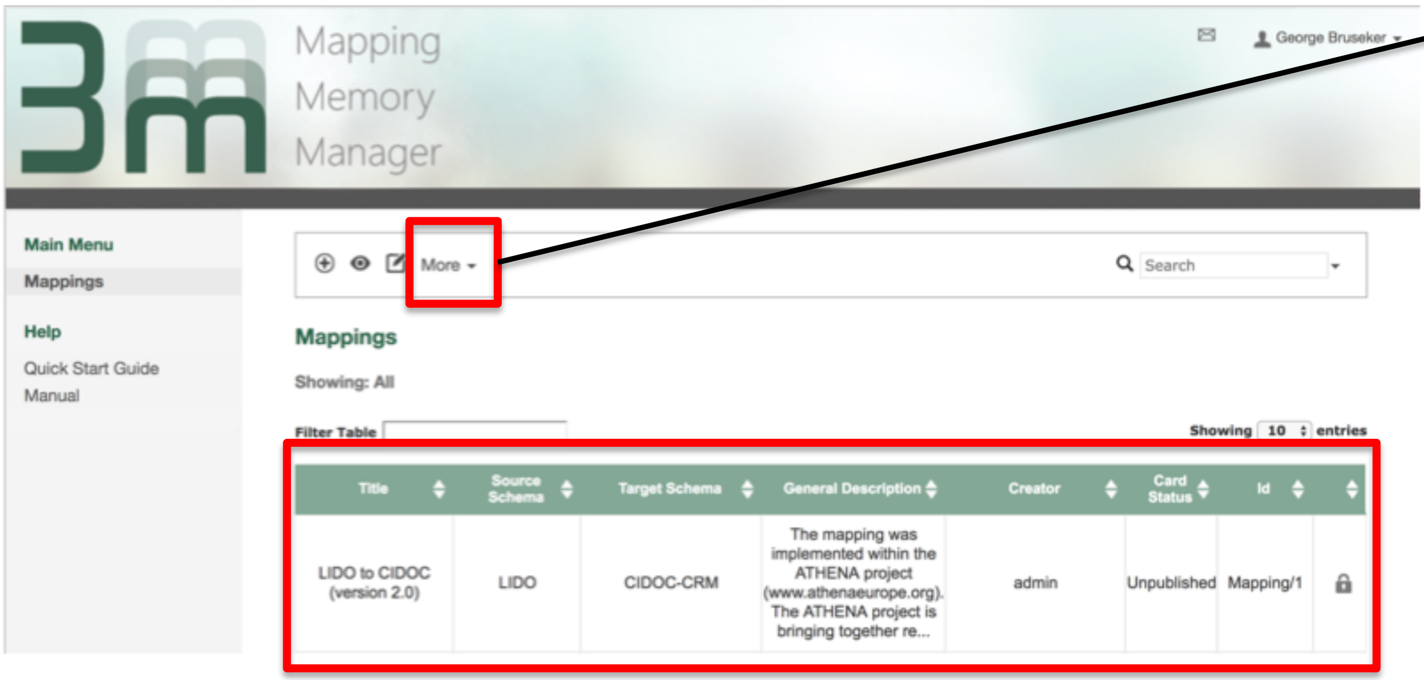
Filter Table

Showing 10 entries

Title	Source Schema	Target Schema	General Description	Creator	Card Status	Id	
LIDO to CIDOC (version 2.0)	LIDO	CIDOC-CRM	The mapping was implemented within the ATHENA project (www.athenaeurope.org). The ATHENA project is bringing together re...	admin	Unpublished	Mapping/1	🔒

- Tools for working with maps located in top Control Tools bar
- to view or edit a map, first select it in Mapping List, then click the appropriate icon

3. Control Tools 'More'



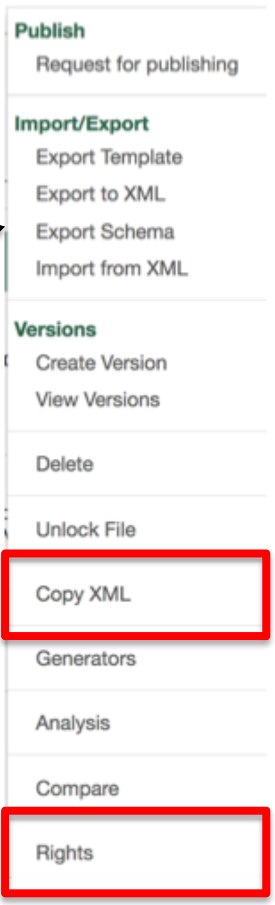
Mappings

Showing: All

Filter Table

Showing 10 entries

Title	Source Schema	Target Schema	General Description	Creator	Card Status	Id	
LIDO to CIDOC (version 2.0)	LIDO	CIDOC-CRM	The mapping was implemented within the ATHENA project (www.athenaeurope.org). The ATHENA project is bringing together re...	admin	Unpublished	Mapping/1	🔒

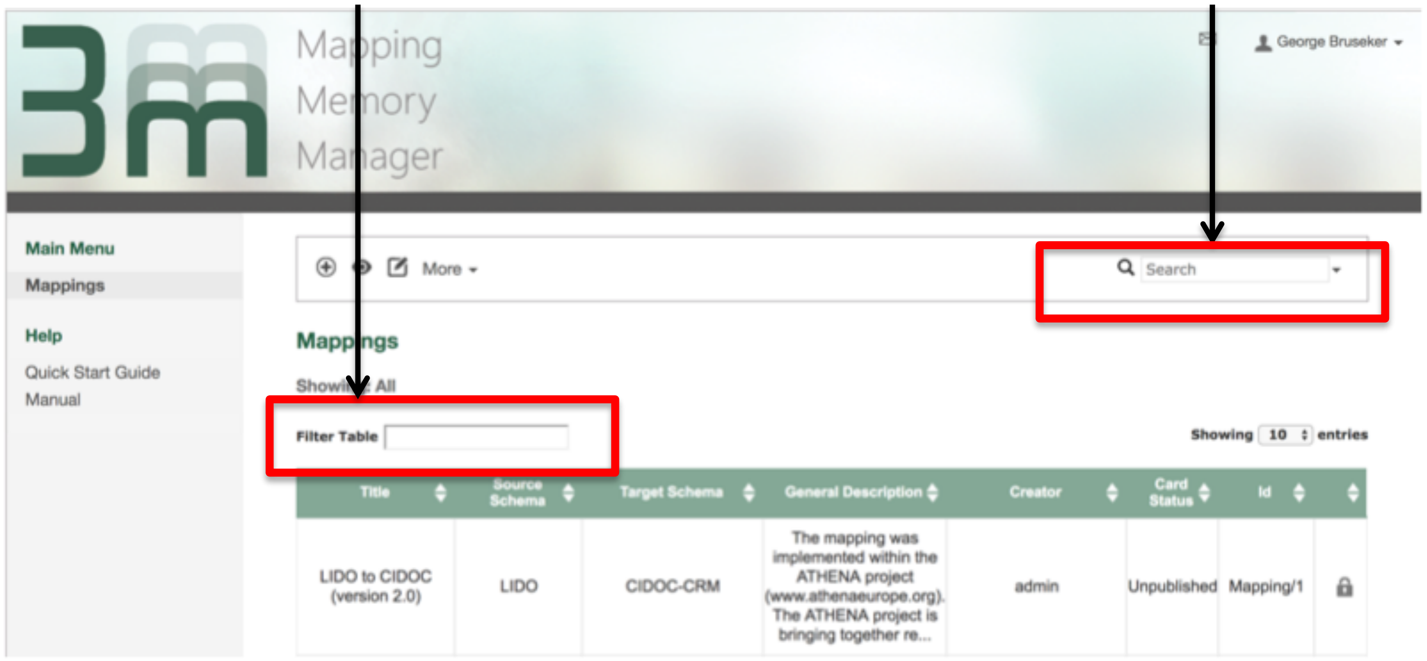


- 'More' dropdown menu gives many options for working on a mapping.
- 'Copy XML' allows you to take a full copy of the selected mapping (useful when not sure of changes)
- 'Rights' allows you to share edit rights to other users.

4. Search and Filter

Filter

Search



Title	Source Schema	Target Schema	General Description	Creator	Card Status	Id	
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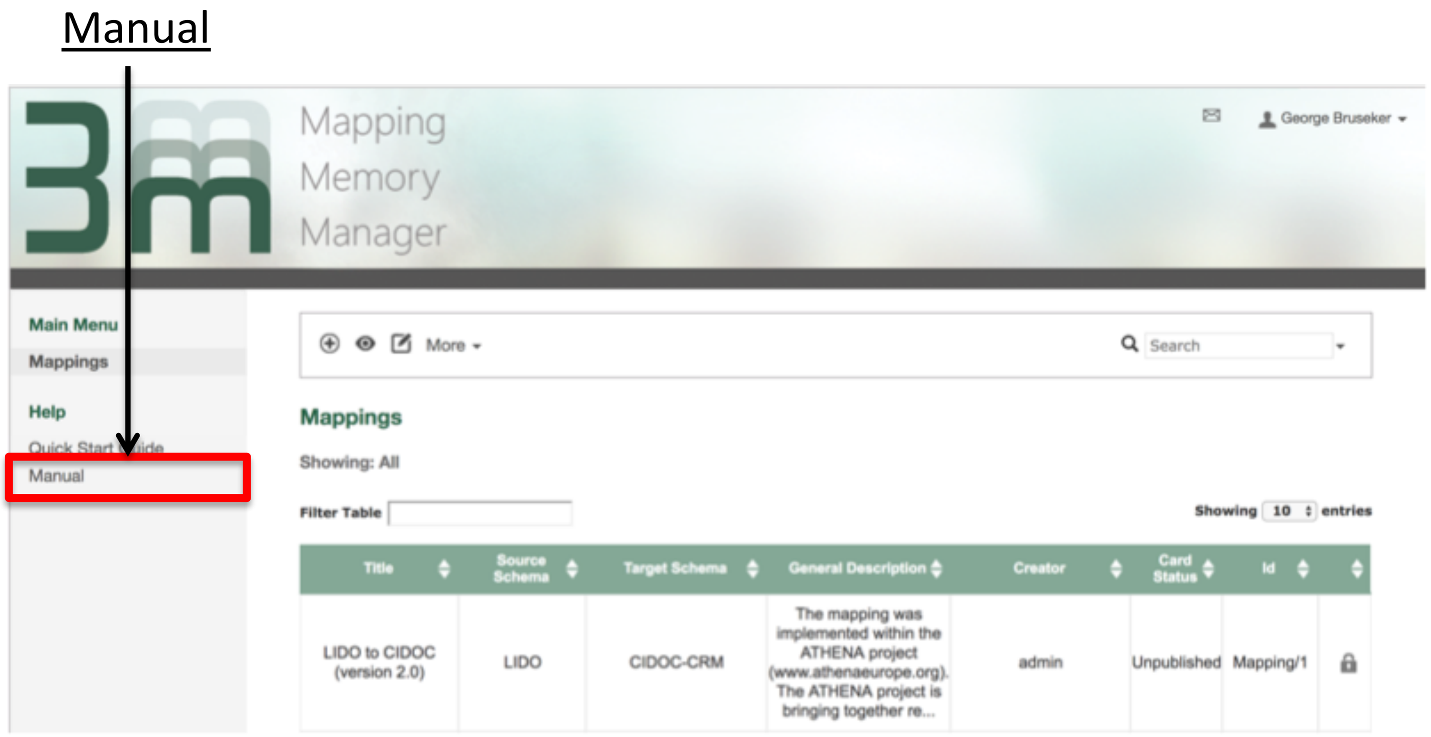
- There is a search feature allowing you to find maps
- There is a filter feature to narrow down within a viewed search set

5. Manual



Title	Source Schema	Target Schema	General Description	Creator	Card Status	Id	
LIDO to CIDOC (version 2.0)	LIDO	CIDOC-CRM	The mapping was implemented within the ATHENA project (www.athenaeurope.org). The ATHENA project is bringing together re...	admin	Unpublished	Mapping/1	🔒

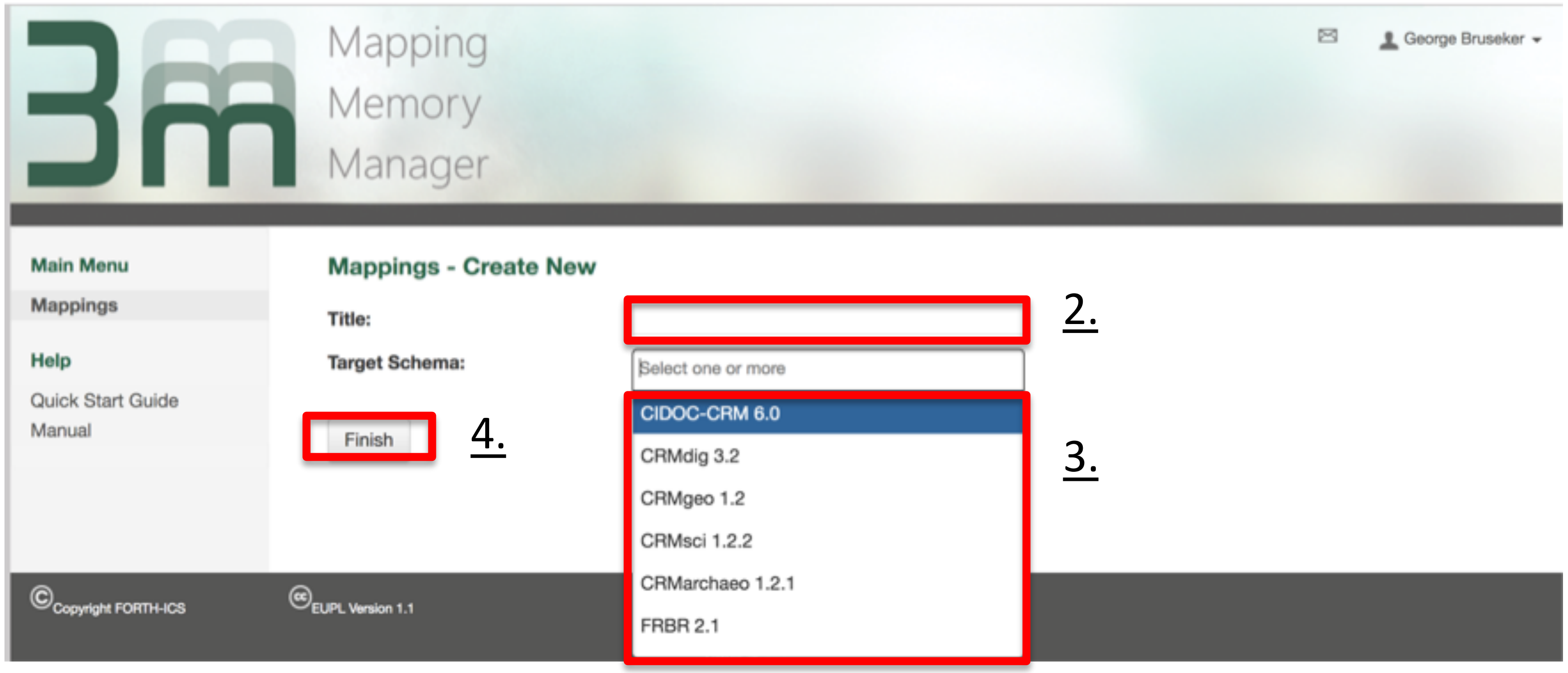
- The complete documentation for 3M including general mapping instructions and advice is always accessible directly from the sidebar.

3. SETTING UP A NEW MAPPING

Setting up New Mapping Section Content

1. Give Title and choose Target Schemas
2. Edit/View Info Tab
3. Add Generic Mapping Metadata
4. Adding Source Schema
5. Adding Sample Data
6. Adding Target Schemas

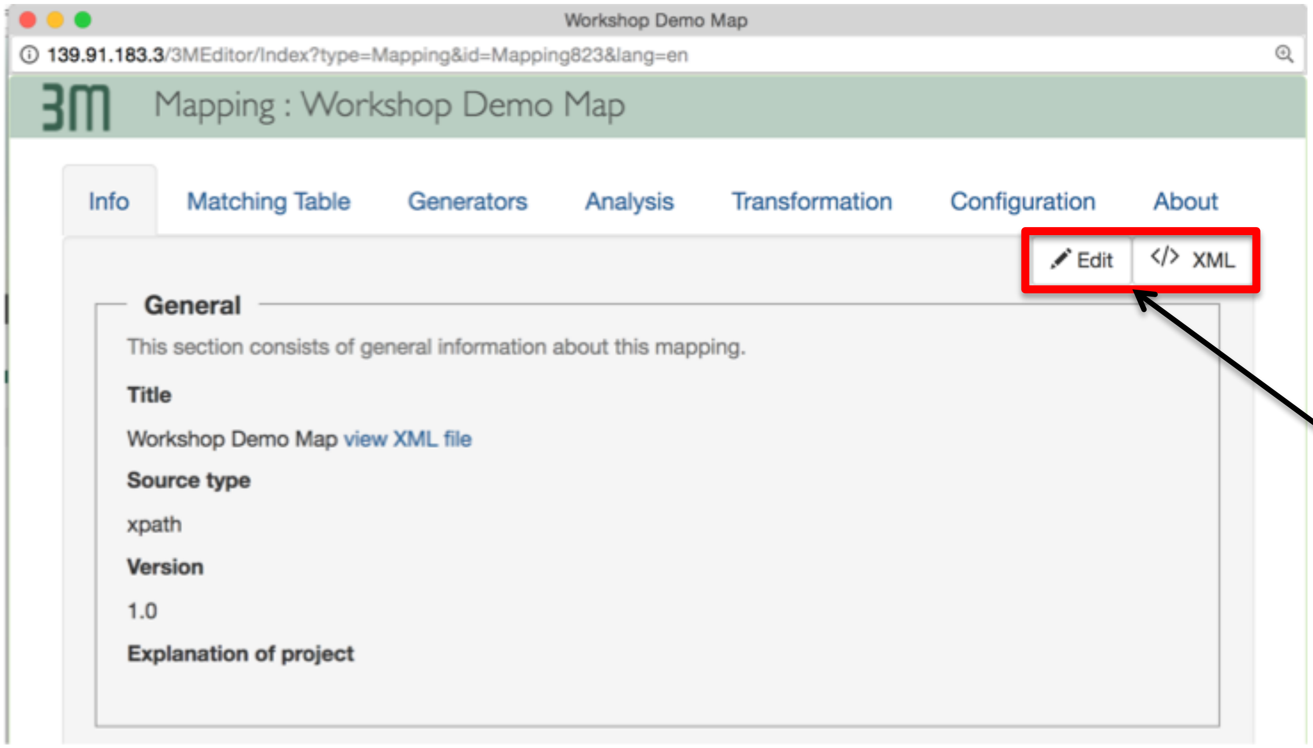
1. Creating a New Map: Title & Targets



Creating a new mapping involves:

1. Click the '+' button (Create New) in 3M to open a create new map dialogue
2. Assign a title so it can be found again
3. Choose target schema(s) you wish to use
4. Finish the creation of the new map
5. Once map saved, find it again from list and open using 'edit function' (see above)

2. Filling the Info Tab: Edit/View/XML Modes



General

This section consists of general information about this mapping.

Title

Workshop Demo Map view XML file

Source type

xpath

Version

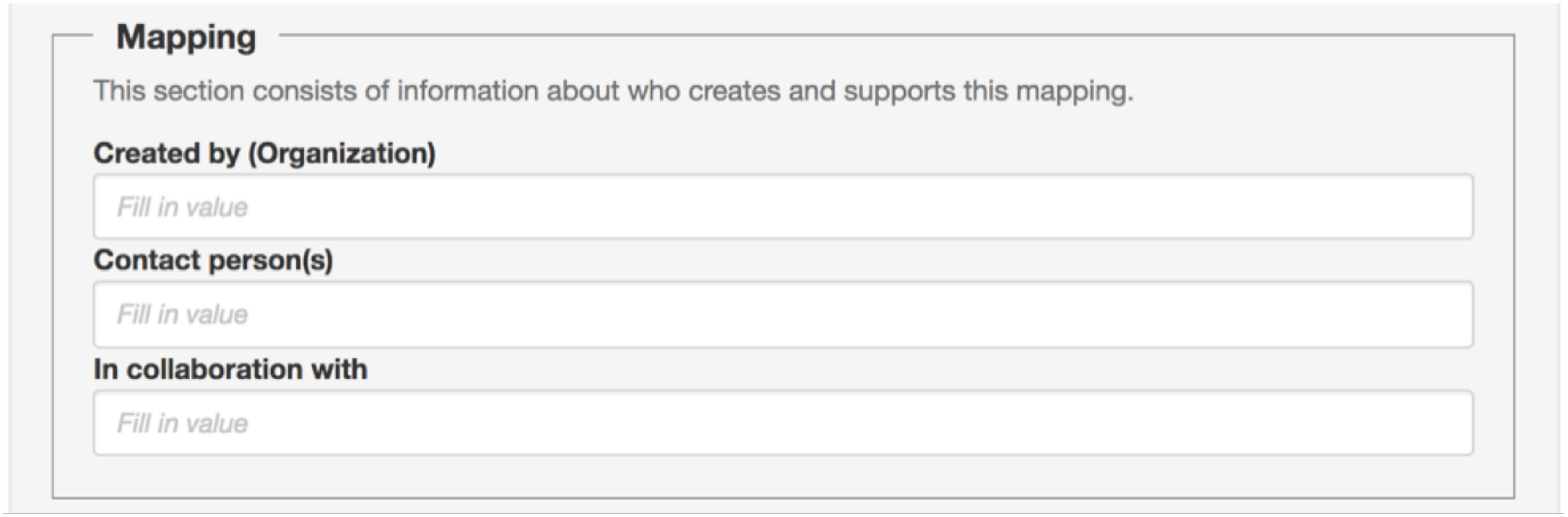
1.0

Explanation of project

<u>Edit</u>
<u>View</u>
<u>XML</u>

- To edit the mapping, you will need to enter edit mode. This can be done by choosing the 'Edit' button.
- To leave edit mode, you can choose the opposite 'View' button. Experts can also edit the XML directly by clicking the 'XML' button.

3. Adding Generic Mapping Metadata


Mapping

This section consists of information about who creates and supports this mapping.

Created by (Organization)

Fill in value

Contact person(s)

Fill in value

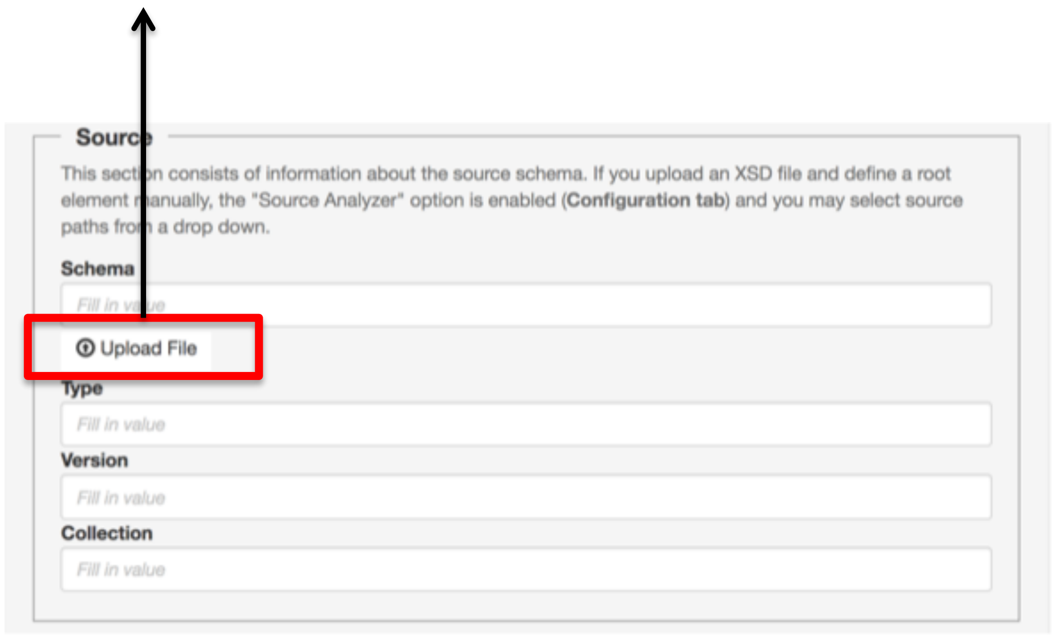
In collaboration with

Fill in value

Mapping Metadata provides crucial provenance information to the mapping so that it can be re-used in the future.

Who did this mapping? How can they be contacted?

4. Adding Source Schema



Source

This section consists of information about the source schema. If you upload an XSD file and define a root element manually, the "Source Analyzer" option is enabled (**Configuration tab**) and you may select source paths from a drop down.

Schema

Fill in value

Upload File

Type

Fill in value

Version

Fill in value

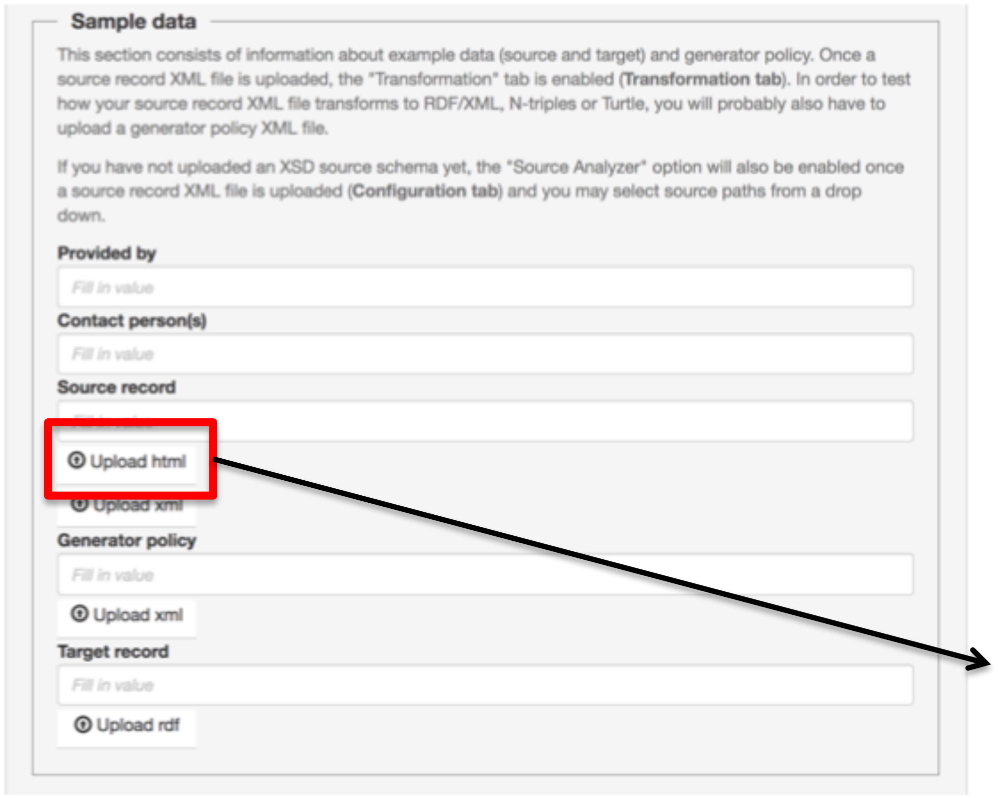
Collection

Fill in value

- Upload a source schema using 'upload button'
- Source can be in XML or XSD.
- Additional metadata can be added for
  - the type of schema
  - the version of the schema
  - what collection schema used for

Adding source schema allows 3M to help guide mapping by only allowing valid paths to be selected from source.

5. Adding Source Schema Sample Data



Sample data

This section consists of information about example data (source and target) and generator policy. Once a source record XML file is uploaded, the "Transformation" tab is enabled (**Transformation tab**). In order to test how your source record XML file transforms to RDF/XML, N-triples or Turtle, you will probably also have to upload a generator policy XML file.

If you have not uploaded an XSD source schema yet, the "Source Analyzer" option will also be enabled once a source record XML file is uploaded (**Configuration tab**) and you may select source paths from a drop down.

Provided by

Fill in value

Contact person(s)

Fill in value

Source record

Upload html

Upload xml

Generator policy

Fill in value

Upload xml

Target record

Fill in value

Upload rdf

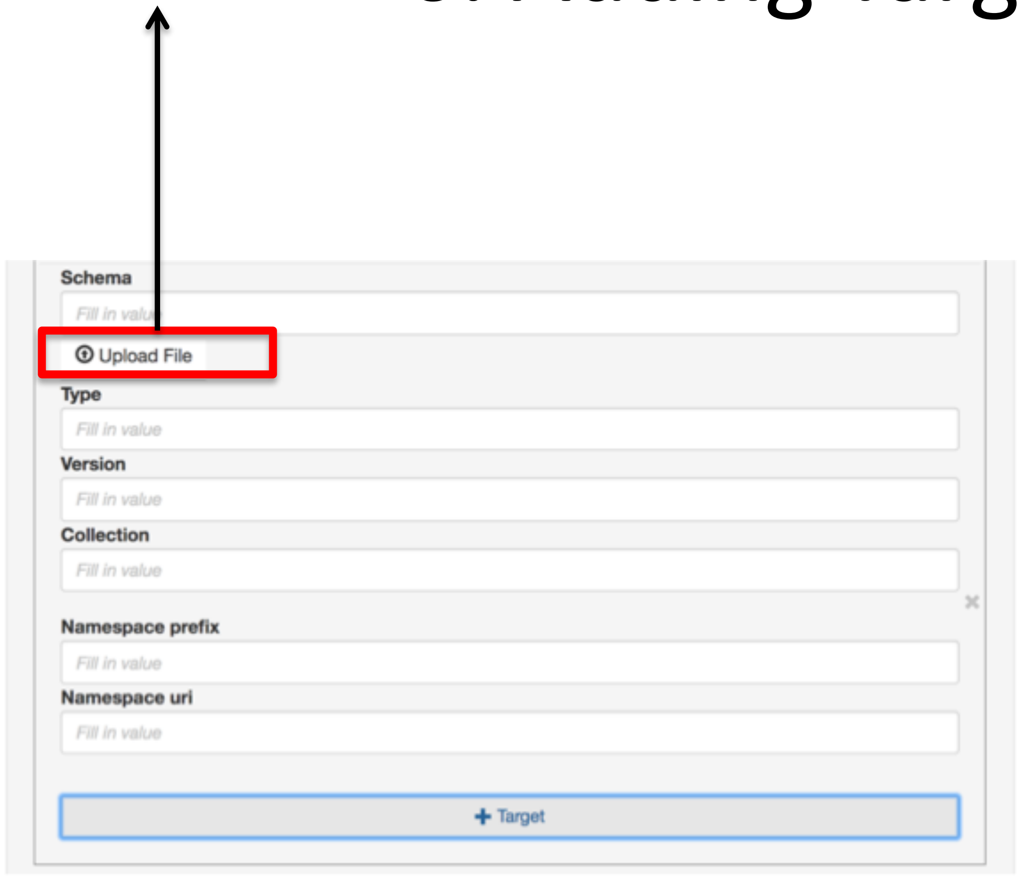
- Upload Source Data by choosing ‘Upload xml’ button
- Add provenance information of who gave data and how they can be contacted.

<u>Upload Sample Source Data</u>

Adding source sample data allows testing of the mapping with real data using the 3M transformation tool.

6. Adding Target Schema

Upload Target Schema



- Click '+Target' to add new target
- Upload target schema using 'upload' button
- For each target schema specify
  - it's namespace prefix e.g.: 'crm'
  - It's full namespace URI
- Additional metadata can be added for
  - the name of the schema
  - the type of schema
  - the version of the schema
  - what collection schema used for

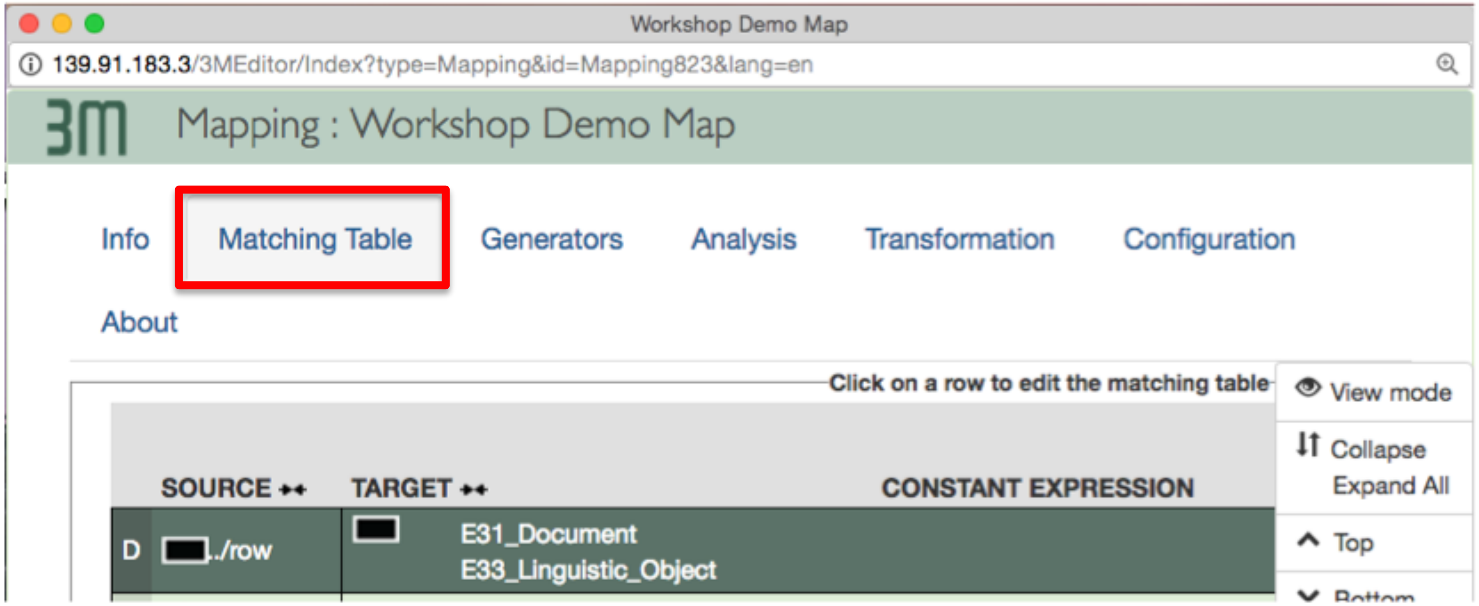
Adding target schema allows 3M to help guide mapping by only allowing valid paths to be selected from target.

4. MATCHING TABLE OPERATION

Matching Table Operation Section Content

1. Accessing Matching Table
2. Adding a Map
3. Adding a Link
4. Copy / Delete Maps and Links
5. How to comment
6. View Controls

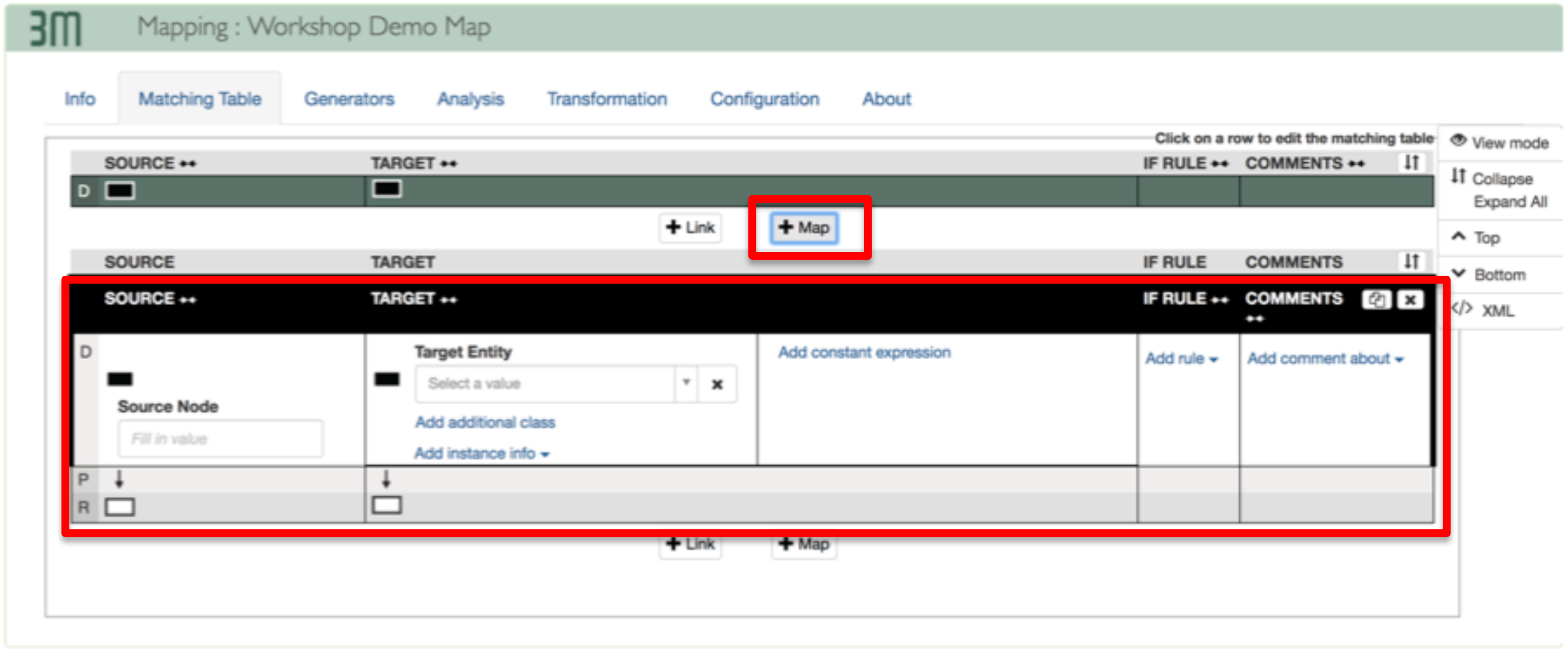
1. Accessing the Matching Table


Workshop Demo Map
139.91.183.3/3MEditor/Index?type=Mapping&id=Mapping823&lang=en
3M
Mapping : Workshop Demo Map
Info
Matching Table
Generators
Analysis
Transformation
Configuration
About
Click on a row to edit the matching table
View mode
Collapse
Expand All
Top
Bottom

SOURCE	TARGET	CONSTANT EXPRESSION
D ../row	E31_Document E33_Linguistic_Object	

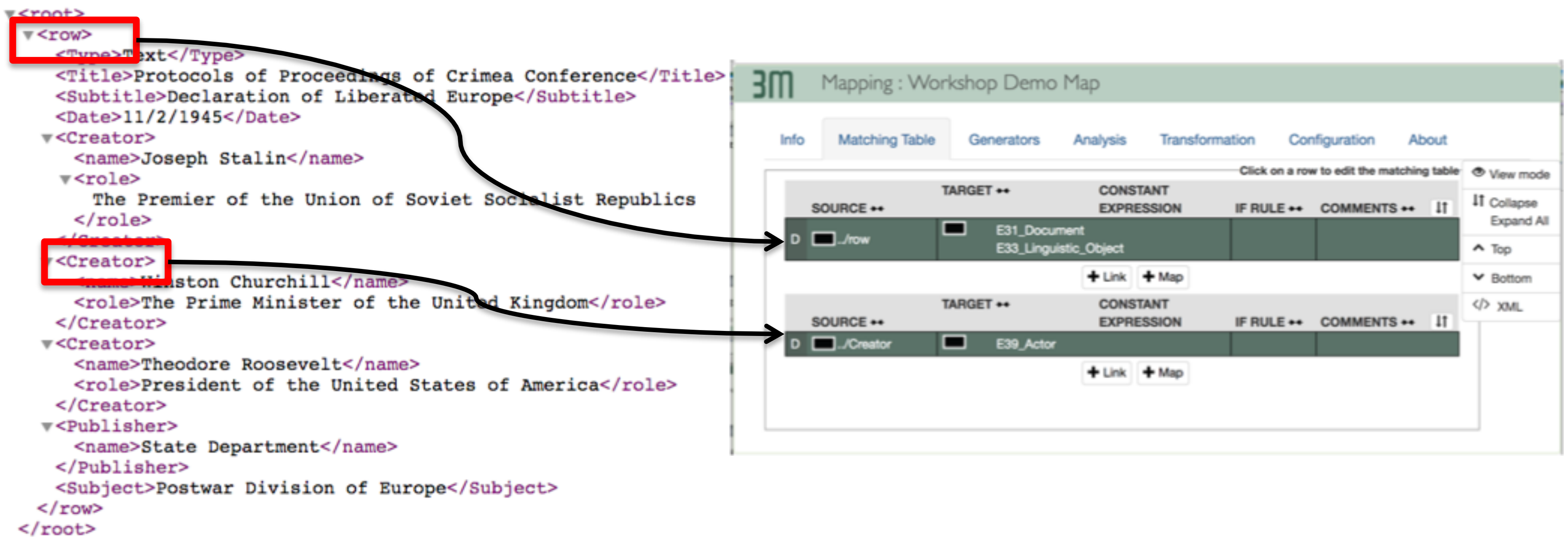
- From within your mapping, click on ‘matching table’ tab

2. Adding a New Map



- Maps are used for mapping a domain (root node) from the source to a specific class in the target ontology
- If your data structure is complex (not flat) you can use multiple maps to map multiple domains (root nodes) in the source data structure
- Use '+ Map' button to add additional maps

1. Adding Map Examples



```
<root>
  <row>
    <Type>Text</Type>
    <Title>Protocols of Proceedings of Crimea Conference</Title>
    <Subtitle>Declaration of Liberated Europe</Subtitle>
    <Date>11/2/1945</Date>
    <Creator>
      <name>Joseph Stalin</name>
      <role>
        The Premier of the Union of Soviet Socialist Republics
      </role>
    </Creator>
    <Creator>
      <name>Winston Churchill</name>
      <role>The Prime Minister of the United Kingdom</role>
    </Creator>
    <Creator>
      <name>Theodore Roosevelt</name>
      <role>President of the United States of America</role>
    </Creator>
    <Publisher>
      <name>State Department</name>
    </Publisher>
    <Subject>Postwar Division of Europe</Subject>
  </row>
</root>
```

Mapping : Workshop Demo Map

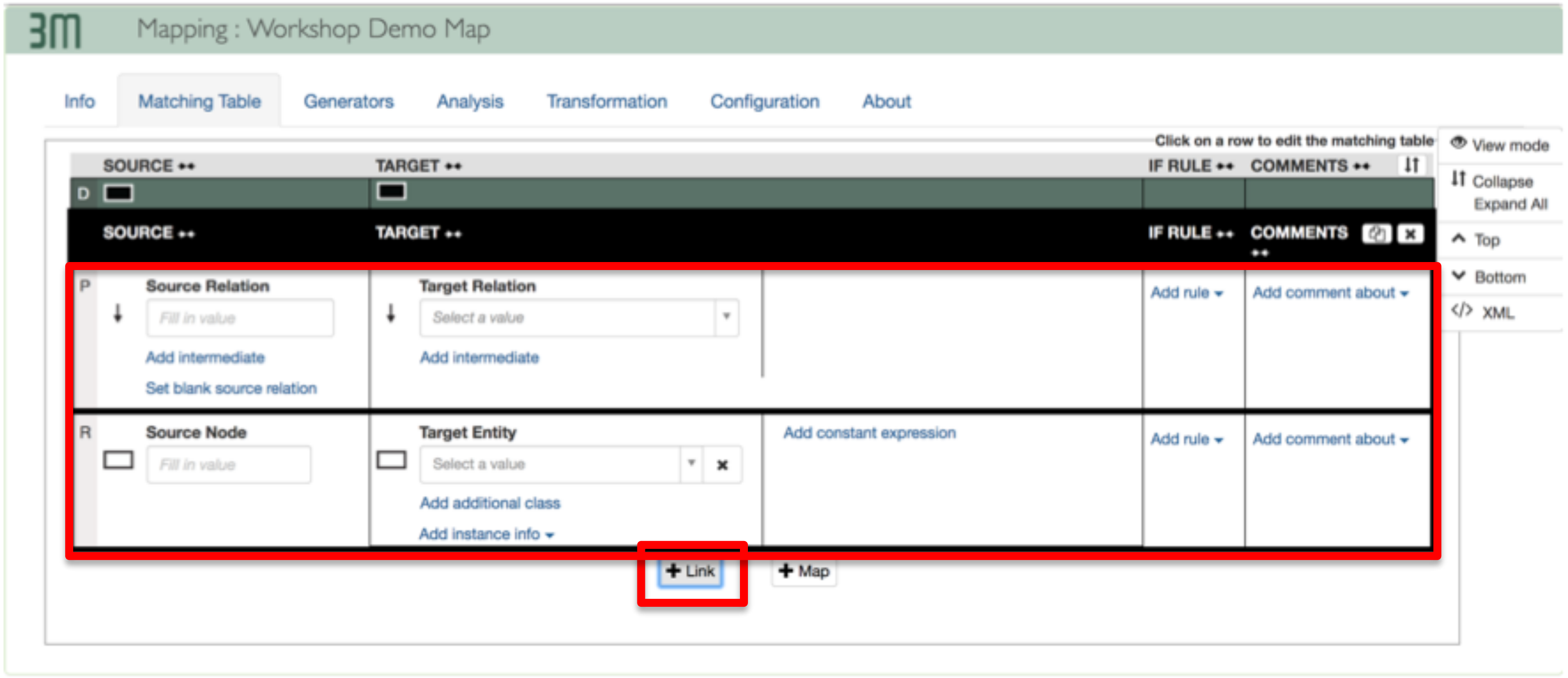
Click on a row to edit the matching table

	SOURCE	TARGET	CONSTANT EXPRESSION	IF RULE	COMMENTS
D	../row	E31_Document E33_Linguistic_Object			

	SOURCE	TARGET	CONSTANT EXPRESSION	IF RULE	COMMENTS
D	../Creator	E39_Actor			

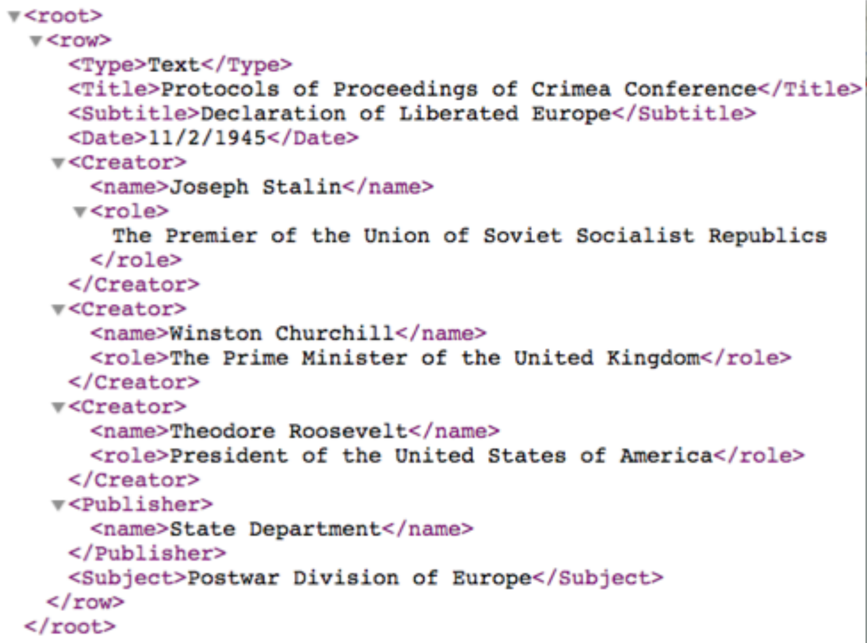
- We add maps for significant nodes in the source XML that have many relations to re-express in the target ontology. These are primary foci of interest.
- In this example ‘row’ is the root node under which individual source records in this schema are documented, attributing title, subtitle etc. This is our focus of interest and becomes the source domain in a map.
- In this example there is a subnode of ‘row’ called ‘creator’ which has its own list of properties. We can create a new map for this more complex node and later link the two maps. This simplifies mapping and makes the mapping definition easier to read.

3. Adding a New Link

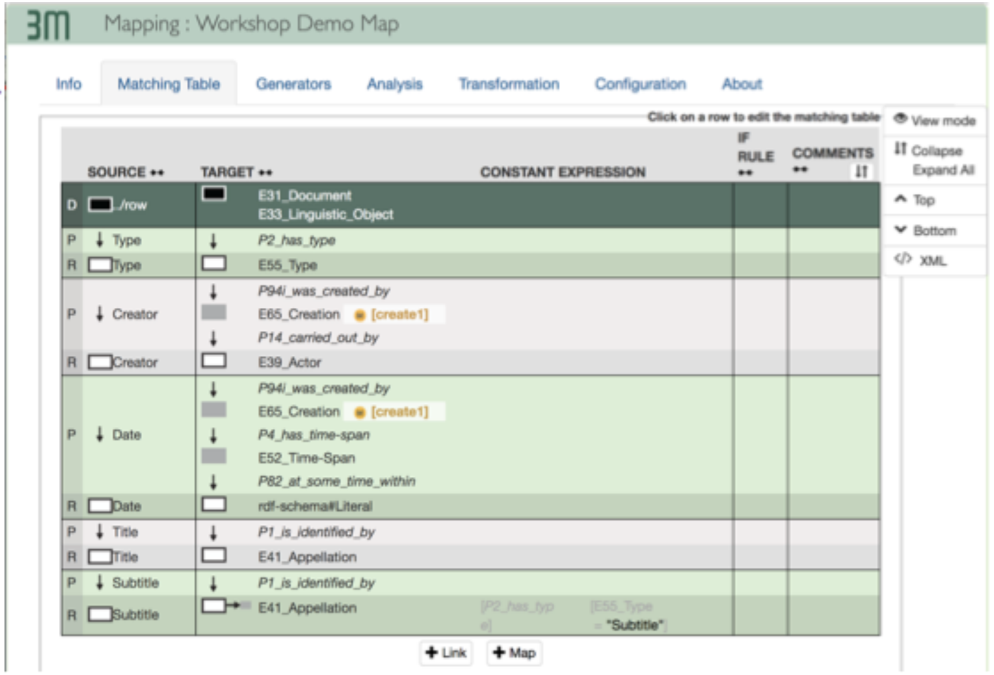


- A link is used for mapping one field/node under a domain (root node) from the source to a semantic path in the target ontology
- For each field/node in the source that should be mapped, there should be at least one link in the map
- Use '+ Link' button to add additional links

3. Adding Link Examples



```
▼<root>
  ▼<row>
     <Type>Text</Type>
     <Title>Protocols of Proceedings of Crimea Conference</Title>
     <Subtitle>Declaration of Liberated Europe</Subtitle>
     <Date>11/2/1945</Date>
    ▼<Creator>
       <name>Joseph Stalin</name>
      ▼<role>
         The Premier of the Union of Soviet Socialist Republics
       </role>
     </Creator>
    ▼<Creator>
       <name>Winston Churchill</name>
       <role>The Prime Minister of the United Kingdom</role>
     </Creator>
    ▼<Creator>
       <name>Theodore Roosevelt</name>
       <role>President of the United States of America</role>
     </Creator>
    ▼<Publisher>
       <name>State Department</name>
     </Publisher>
     <Subject>Postwar Division of Europe</Subject>
   </row>
 </root>
```

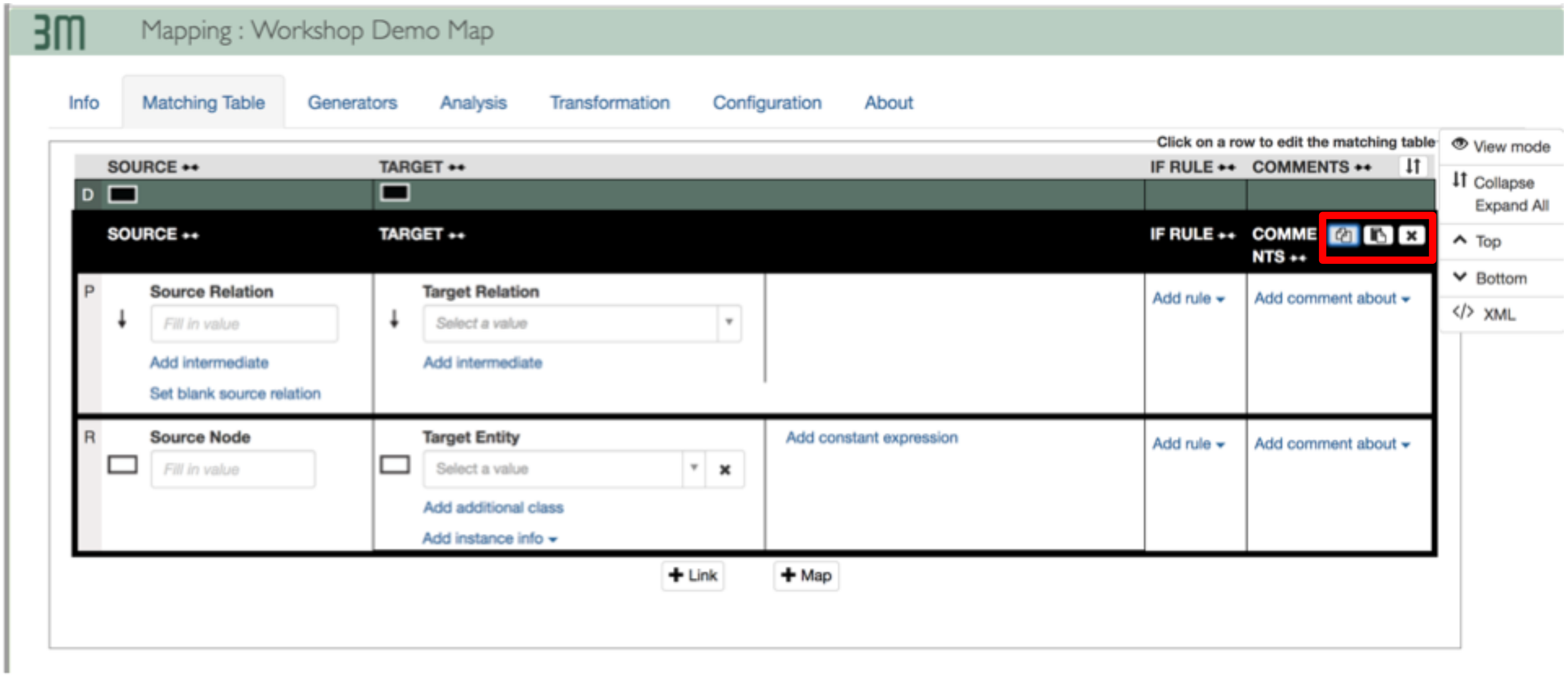


	SOURCE	TARGET	CONSTANT EXPRESSION	IF RULE	COMMENTS
D	./row	E31_Document E33_Linguistic_Object			
P	Type	*P2_has_type*			
R	Type	E55_Type			
P	Creator	*P94i_was_created_by* E65_Creation [create1] *P14_carried_out_by*			
R	Creator	E39_Actor			
P	Date	*P94i_was_created_by* E65_Creation [create1] *P4_has_time-span* E52_Time-Span *P82_at_some_time_within*			
R	Date	rdf-schema#Literal			
P	Title	*P1_is_identified_by*			
R	Title	E41_Appellation			
P	Subtitle	*P1_is_identified_by*			
R	Subtitle	E41_Appellation	[P2_has_type] [E55_Type = "Subtitle"]		

EXAMPLE:

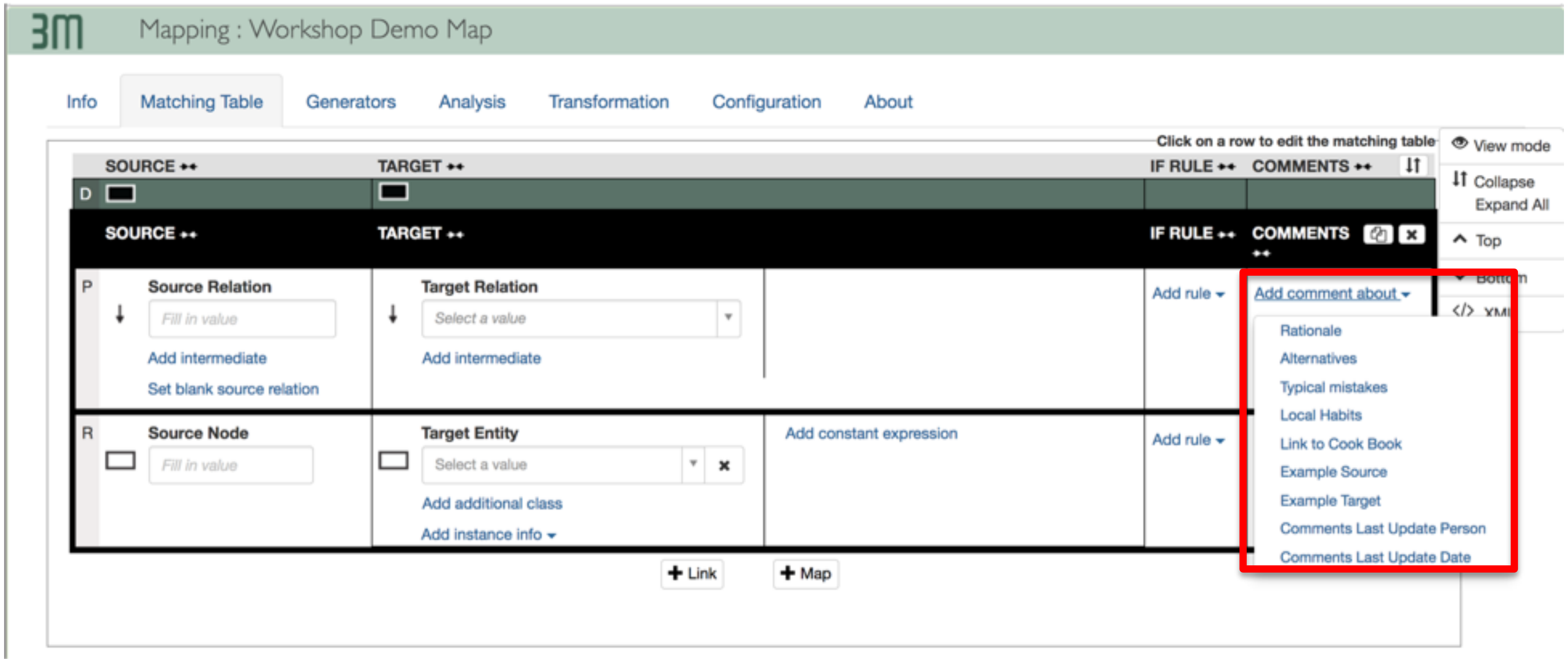
- The domain (root node) ‘row’ contains all information about our base record in the source
- ‘row’ has five properties ‘Title’, ‘Subtitle’, ‘Date’, ‘Creator’, ‘Publisher’ and ‘Subject’
- For each property we want to map, we need one link in the map

4. Copying and Deleting Maps/Links



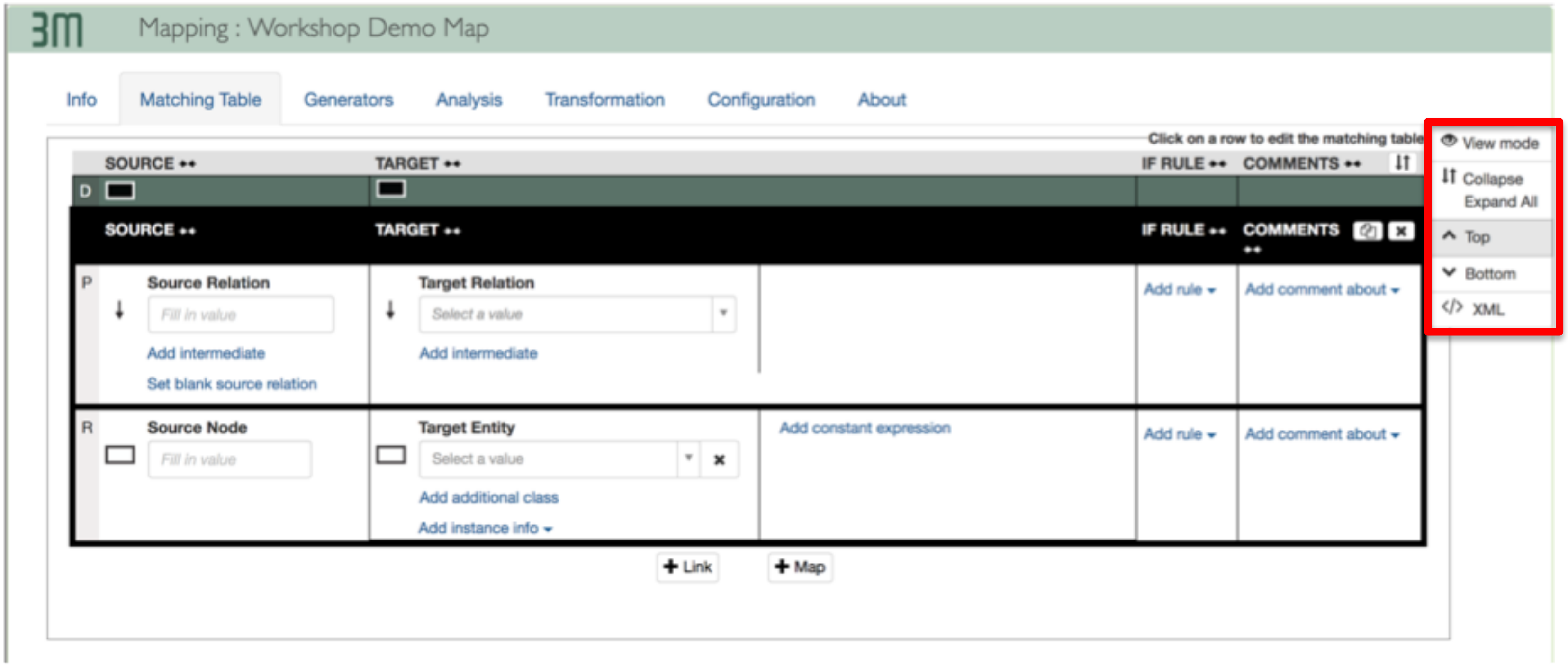
- Longer maps/links can take time to generate. The copying feature allows one to quickly duplicate existing maps/links.
- To copy a map or link click the 'duplicate' icon, followed by the 'clipboard icon'
- To delete a map/link, select the appropriate map/link and then click the 'x'

5. Commenting



- 3MEditor allows you to make comments on the mapping of individual fields/nodes in links. This is a useful feature to explain/remember mapping decisions
- To add comment click 'Add comment about'

6. View Controls



3MEditor also offers a series of control tools to help navigate and work with your mapping

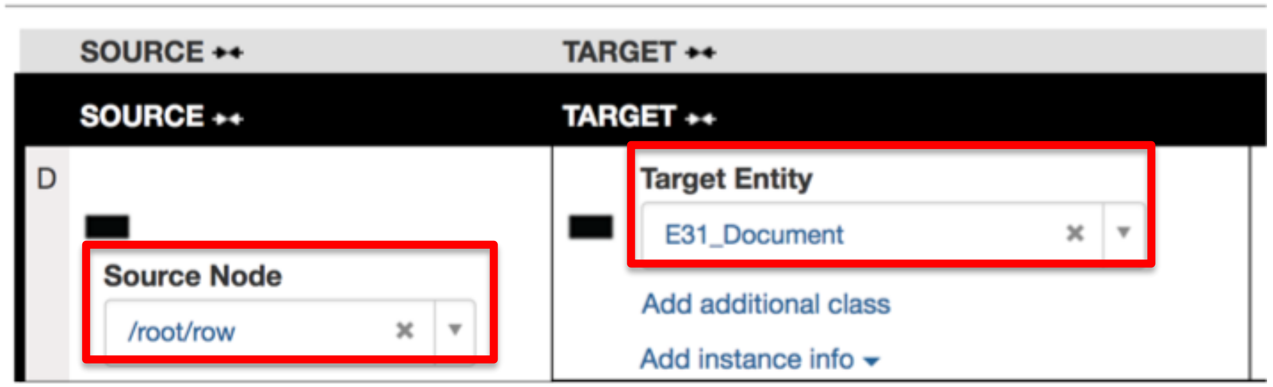
- **View Mode:** toggles map to read only
- **Collapse/Expand All:** Opens or Closes all Links in Maps
- **Top/Bottom:** Provides scrolling over long maps
- **</>XML:** Allows direct editing of the underlying X3ML definition of the mapping

5. MAPPING PATTERNS

Mapping Patterns Section Content

1. Mapping Source Root to Target Domain
2. Simple Field Mapping (One to One)
3. Introducing Intermediate Nodes
4. Adding constants
5. Using variables
6. Joining Maps
7. Multiple instantiation

1. Mapping Source to Target Domain


SOURCE ↔ TARGET ↔

Source Node: /root/row

Target Entity: E31_Document

- Click top row in a map
- On Source Side, choose appropriate domain (root node) from source
- On Target Side, choose appropriate class in target ontology

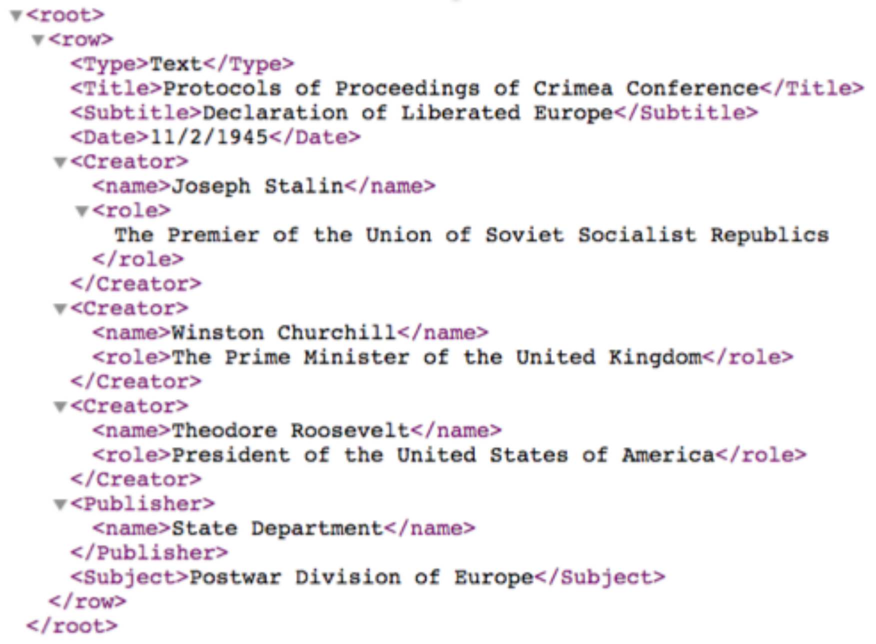
This now says:

“for each instance of source domain (root node) generate one instance of target class”

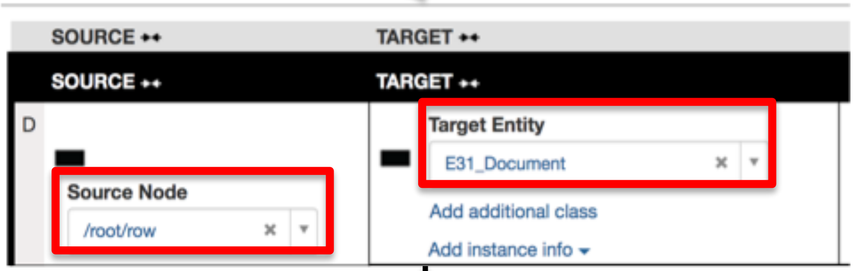
1. Mapping Source to Target Domain Example

Source

Mapping Instruction



```
▼<root>
  ▼<row>
     <Type>Text</Type>
     <Title>Protocols of Proceedings of Crimea Conference</Title>
     <Subtitle>Declaration of Liberated Europe</Subtitle>
     <Date>11/2/1945</Date>
    ▼<Creator>
       <name>Joseph Stalin</name>
      ▼<role>
         The Premier of the Union of Soviet Socialist Republics
       </role>
     </Creator>
    ▼<Creator>
       <name>Winston Churchill</name>
       <role>The Prime Minister of the United Kingdom</role>
     </Creator>
    ▼<Creator>
       <name>Theodore Roosevelt</name>
       <role>President of the United States of America</role>
     </Creator>
    ▼<Publisher>
       <name>State Department</name>
     </Publisher>
     <Subject>Postwar Division of Europe</Subject>
   </row>
</root>
```



Source Node: /root/row

Target Entity: E31_Document

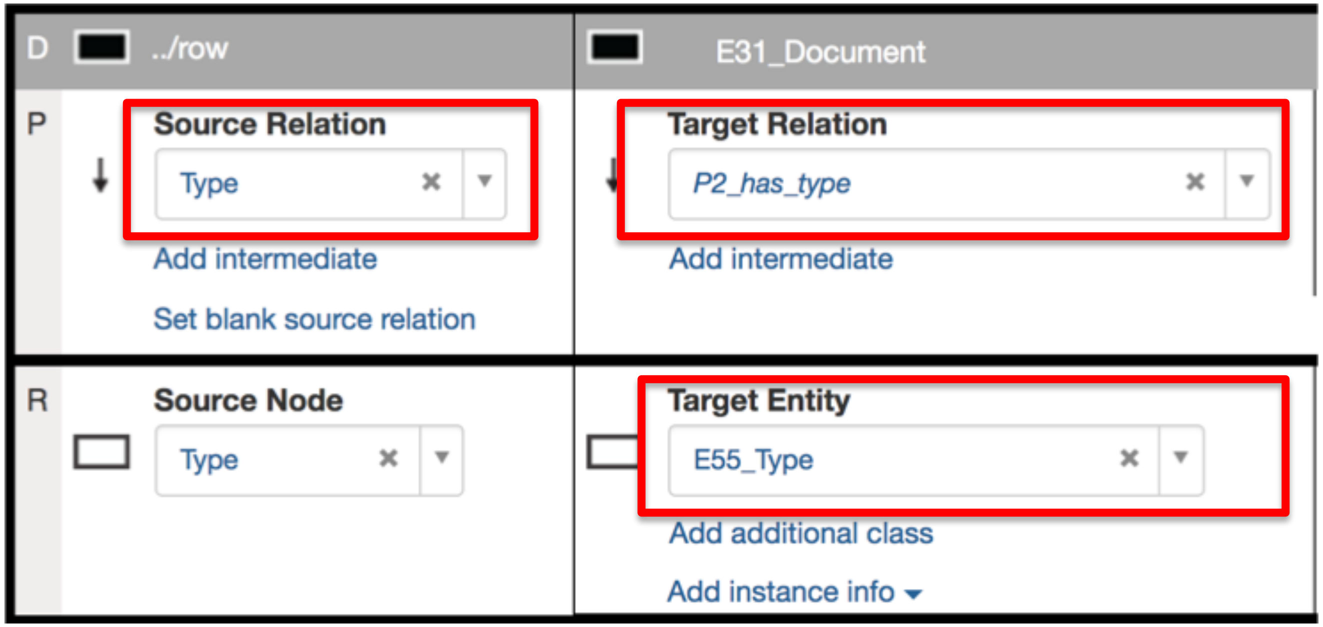
Generates Output

E31 Document
Row/1

So this mapping instruction says,

"for each instance of 'row' in source, create an RDF instance of type 'E31 Document'"

2. Simple Field Mapping: One to One



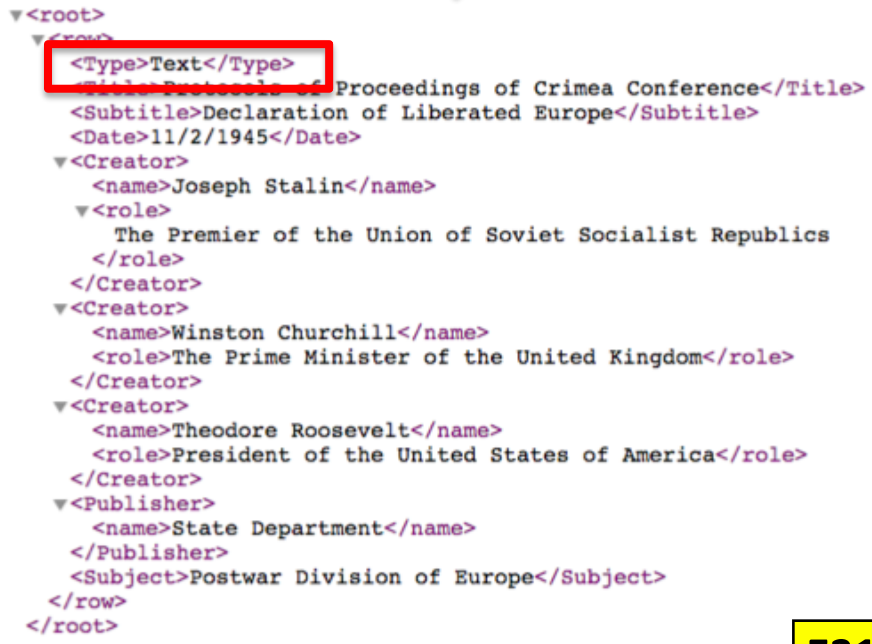
- Choose field for mapping from Source
- Add one relation and one target class in target

This creates a simple triple statement in RDF of form S-V-O

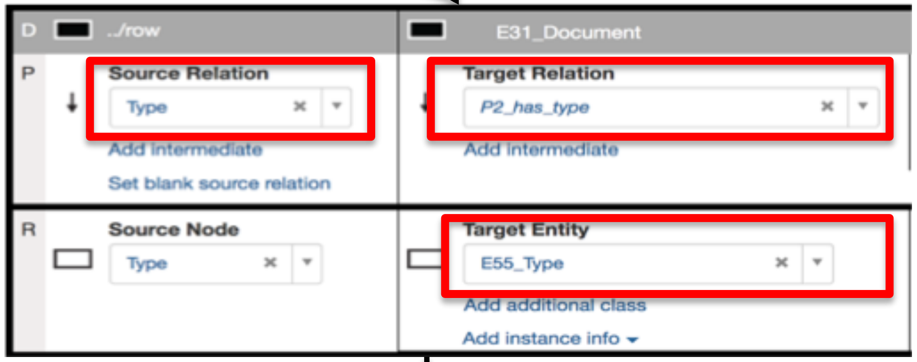
2. Simple Mapping One to One Example

Mapping Instruction

Source

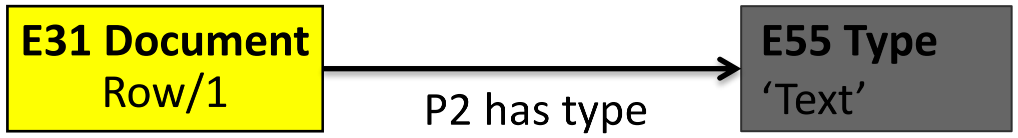


```
▼<root>
  ▼<row>
    <Type>Text</Type>
    <Title>Protocols of Proceedings of Crimea Conference</Title>
    <Subtitle>Declaration of Liberated Europe</Subtitle>
    <Date>11/2/1945</Date>
   ▼<Creator>
      <name>Joseph Stalin</name>
     ▼<role>
        The Premier of the Union of Soviet Socialist Republics
      </role>
    </Creator>
   ▼<Creator>
      <name>Winston Churchill</name>
      <role>The Prime Minister of the United Kingdom</role>
    </Creator>
   ▼<Creator>
      <name>Theodore Roosevelt</name>
      <role>President of the United States of America</role>
    </Creator>
   ▼<Publisher>
      <name>State Department</name>
    </Publisher>
    <Subject>Postwar Division of Europe</Subject>
  </row>
</root>
```



D	../row	E31_Document
P	Source Relation: Type Add intermediate Set blank source relation	Target Relation: P2_has_type Add intermediate
R	Source Node: Type	Target Entity: E55_Type Add additional class Add instance info

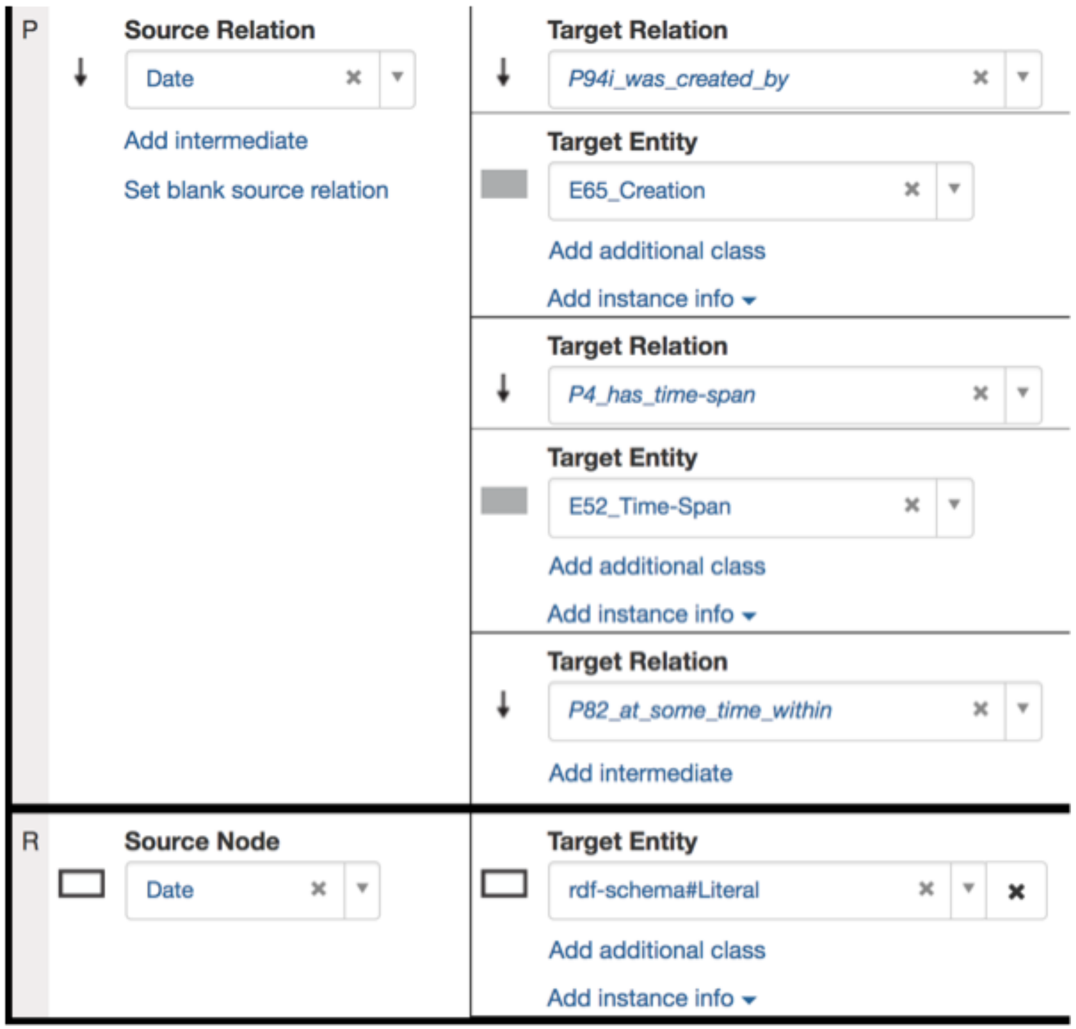
Generates Output



So this mapping instruction says,

“for each instance of ‘type’ in ‘row’, create an RDF triple stating that this instance of ‘E31 Document’” has type ‘E55 Type’

3. Introducing Intermediate Nodes



P

Source Relation

Date

Add intermediate

Set blank source relation

Target Relation

P94i_was_created_by

Target Entity

E65_Creation

Add additional class

Add instance info

Target Relation

P4_has_time-span

Target Entity

E52_Time-Span

Add additional class

Add instance info

Target Relation

P82_at_some_time_within

Add intermediate

R

Source Node

Date

Target Entity

rdf-schema#Literal

Add additional class

Add instance info

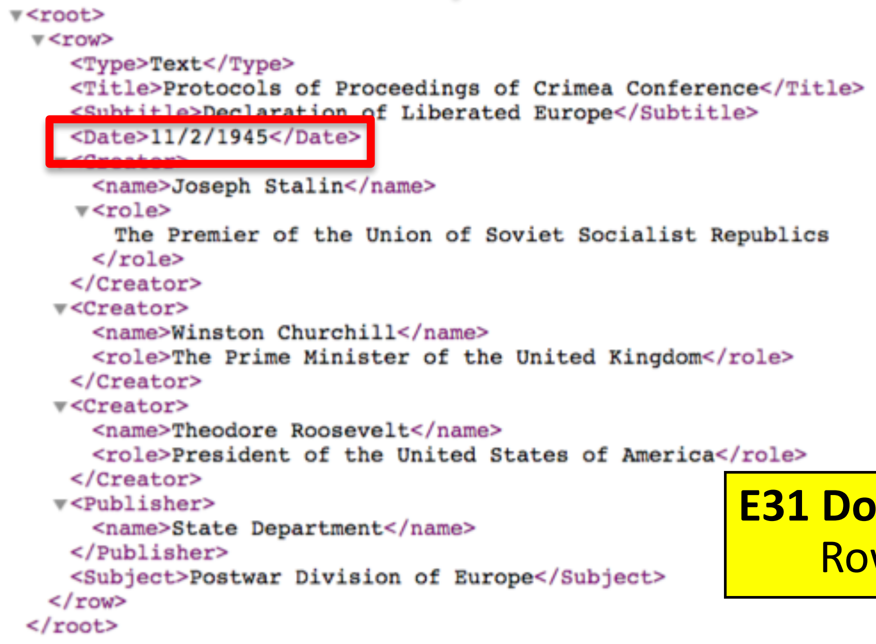
For more complex paths, intermediate nodes are necessary.

- 'Click 'Add Intermediate Node' for as many intermediate relations as you may need to build

In this example, the date of the creation of the Crimea document is expressed.

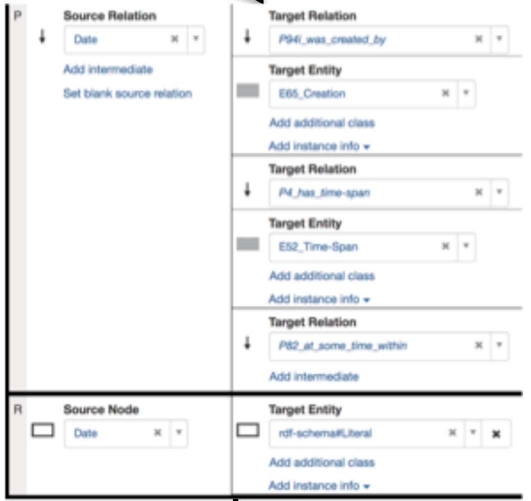
3. Introducing Intermediate Nodes Example

Source



```
▼<root>
  ▼<row>
     <Type>Text</Type>
     <Title>Protocols of Proceedings of Crimea Conference</Title>
     <Subtitle>Declaration of Liberated Europe</Subtitle>
     <Date>11/2/1945</Date>
    ▼<Creator>
       <name>Joseph Stalin</name>
      ▼<role>
         The Premier of the Union of Soviet Socialist Republics
       </role>
     </Creator>
    ▼<Creator>
       <name>Winston Churchill</name>
       <role>The Prime Minister of the United Kingdom</role>
     </Creator>
    ▼<Creator>
       <name>Theodore Roosevelt</name>
       <role>President of the United States of America</role>
     </Creator>
    ▼<Publisher>
       <name>State Department</name>
     </Publisher>
     <Subject>Postwar Division of Europe</Subject>
  </row>
</root>
```

Mapping Instruction



P

Source Relation: Date

Add intermediate

Set blank source relation

Target Relation: P94i_was_created_by

Target Entity: E65_Creation

Add additional class

Add instance info ▾

Target Relation: P4_has_time-span

Target Entity: E52_Time-Span

Add additional class

Add instance info ▾

Target Relation: P82_at_some_time_within

Add intermediate

R

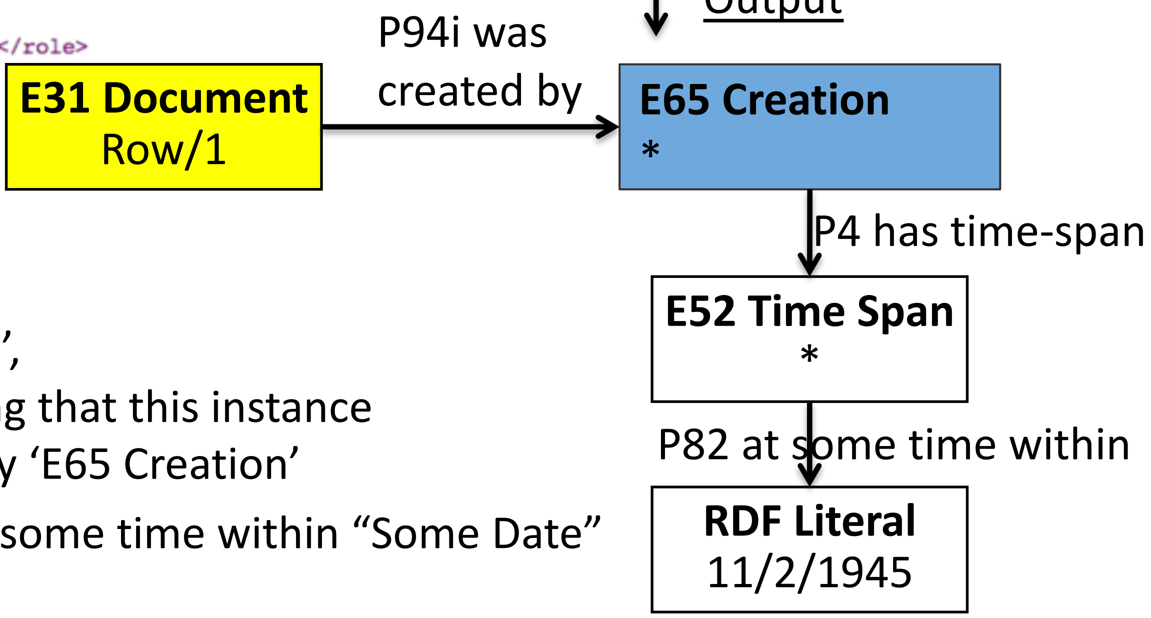
Source Node: Date

Target Entity: rdf-schema#Literal

Add additional class

Add instance info ▾

Output



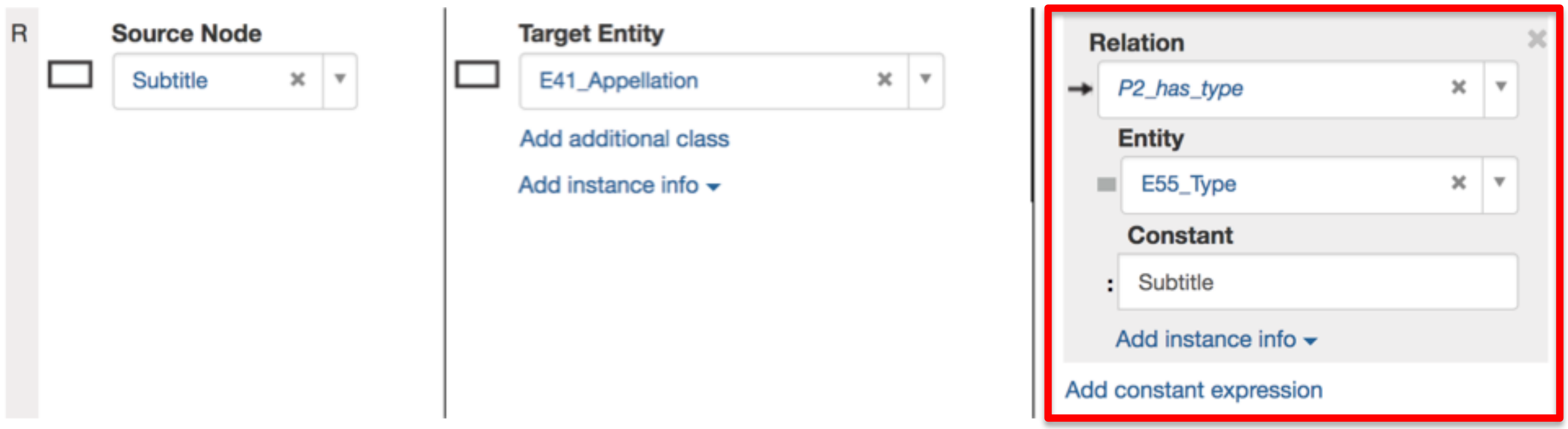
So this mapping instruction says,

“for each instance of ‘date’ in ‘row’,

create a series of RDF triples stating that this instance of ‘E31 Document’” was created by ‘E65 Creation’

has time span “E52 Time Span” at some time within “Some Date”

4. Adding Constant Data


Source Node: Subtitle
Target Entity: E41_Appellation
Relation: P2_has_type
Entity: E55_Type
Constant: Subtitle

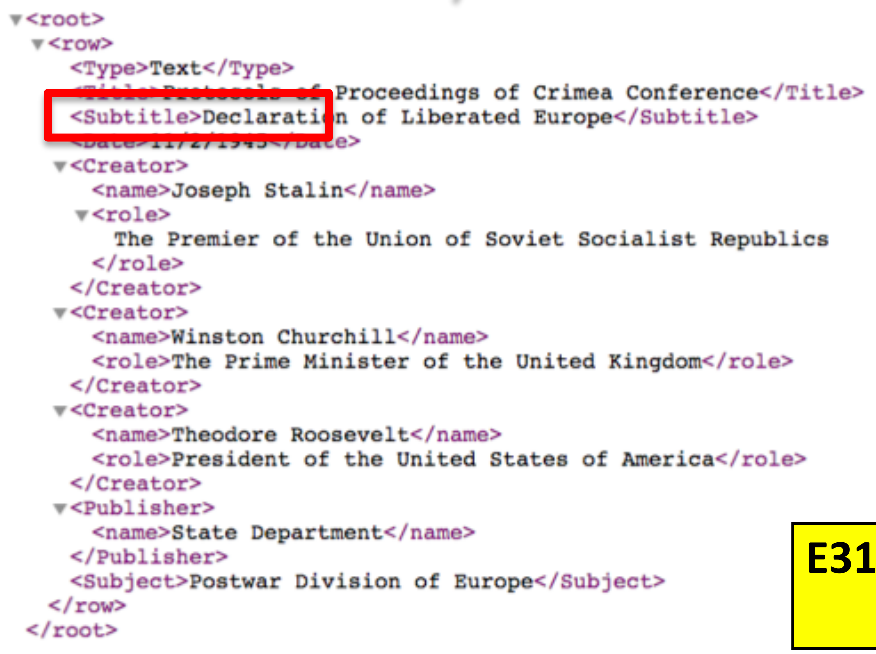
Sometimes, we want to add additional constant information to our mapping.

- Click ‘Add Constant Expression’ (to the right of target)
- Add appropriate links and constant info

In this example, we want to express for each node representing a subtitle in the target graph is of type ‘subtitle’.

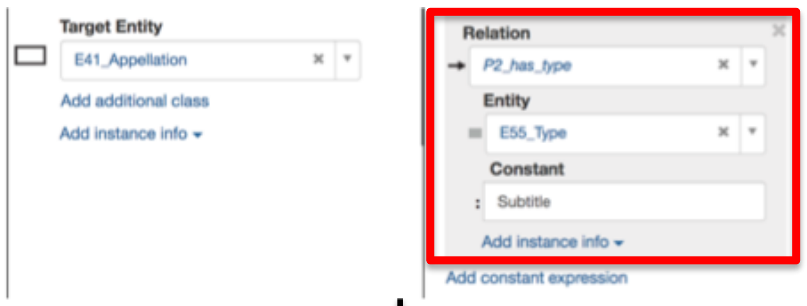
4. Adding Constant Data Example

Source



```
▼<root>
  ▼<row>
     <Type>Text</Type>
     <Title>Protocols of Proceedings of Crimea Conference</Title>
     <Subtitle>Declaration of Liberated Europe</Subtitle>
     <Date>11/2/1945</Date>
   ▼<Creator>
       <name>Joseph Stalin</name>
     ▼<role>
         The Premier of the Union of Soviet Socialist Republics
       </role>
     </Creator>
   ▼<Creator>
       <name>Winston Churchill</name>
       <role>The Prime Minister of the United Kingdom</role>
     </Creator>
   ▼<Creator>
       <name>Theodore Roosevelt</name>
       <role>President of the United States of America</role>
     </Creator>
   ▼<Publisher>
       <name>State Department</name>
     </Publisher>
     <Subject>Postwar Division of Europe</Subject>
   </row>
 </root>
```

Mapping Instruction



Target Entity: E41_Appellation

Add additional class

Add instance info ▾

Relation: P2_has_type

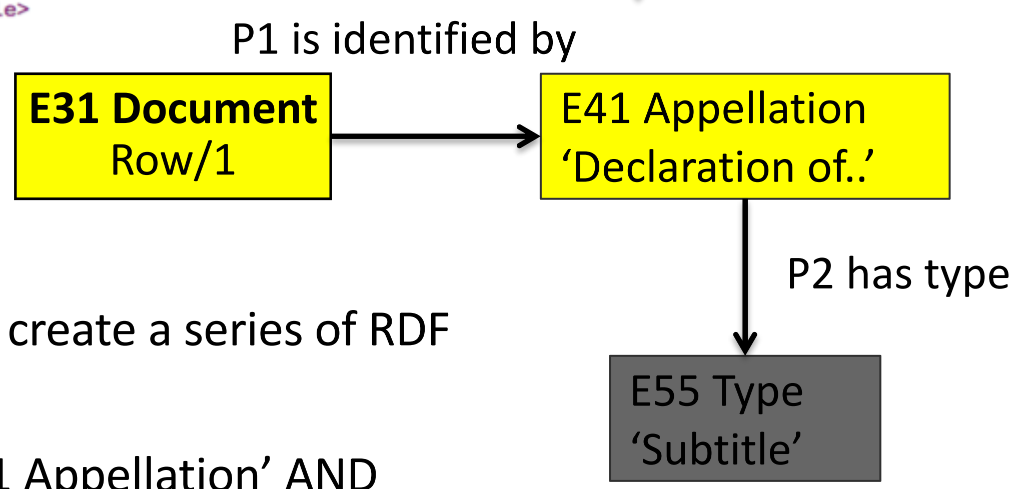
Entity: E55_Type

Constant: Subtitle

Add instance info ▾

Add constant expression

Generates Output



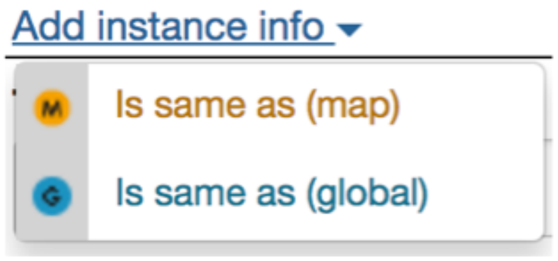
So this mapping instruction says,

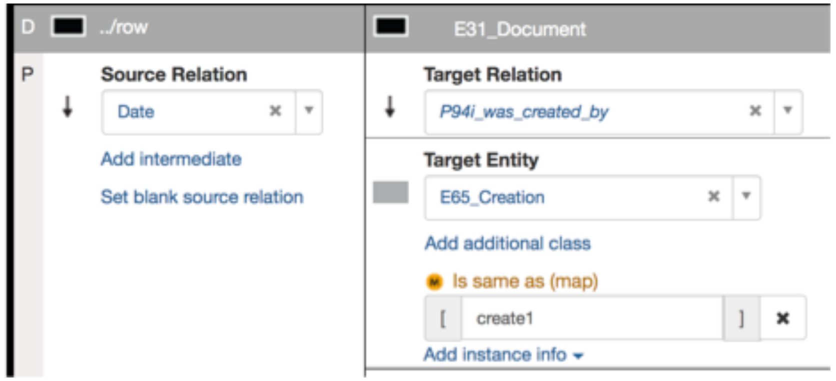
"for each instance of 'subtitle' in 'row', create a series of RDF triples stating that:

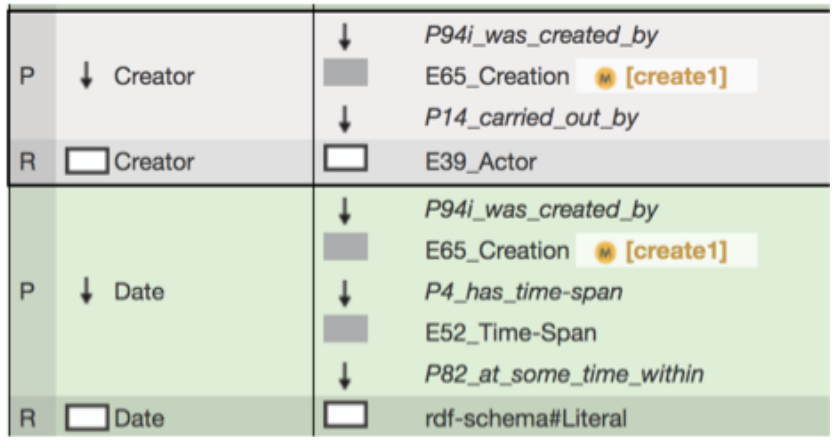
"E31 Document'" is identified by a 'E41 Appellation' AND

'E41 Appellation' has type "E55 Type" (Subtitle)

5. Using Variables







P	Creator	*P94i_was_created_by*
		E65_Creation [create1]
		P14_carried_out_by
R	Creator	E39_Actor
P	Date	*P94i_was_created_by*
		E65_Creation [create1]
		P4_has_time-span
		E52_Time-Span
		P82_at_some_time_within
R	Date	rdf-schema#Literal

When two nodes in a mapping refer to the same real world entity, we can tell the mapping engine to generate only one node for this entity

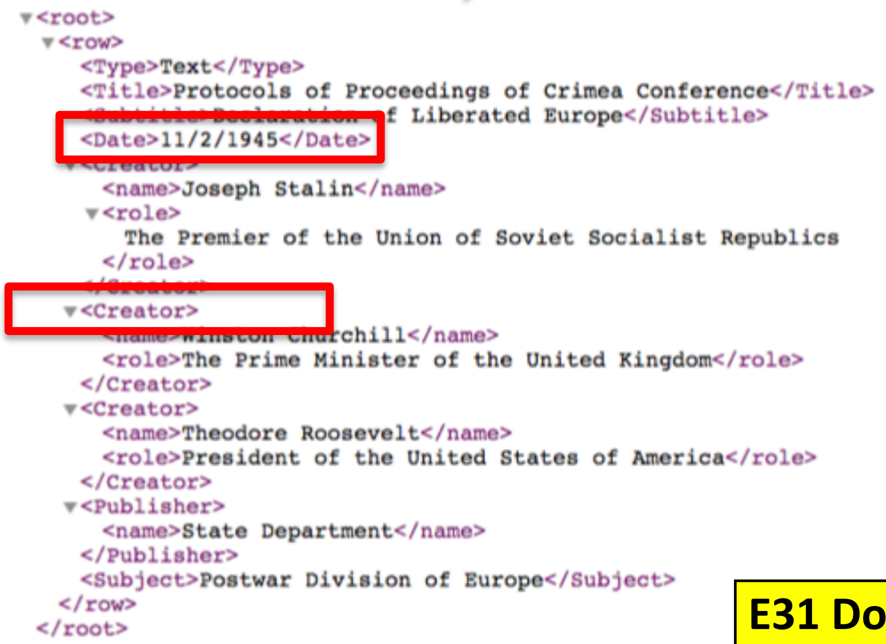
For each node we wish to merge,

- click 'Add instance info'
- Click 'is same as'
- Add variable (random name) to both nodes

In this example there is one creation of the Crimean Protocols

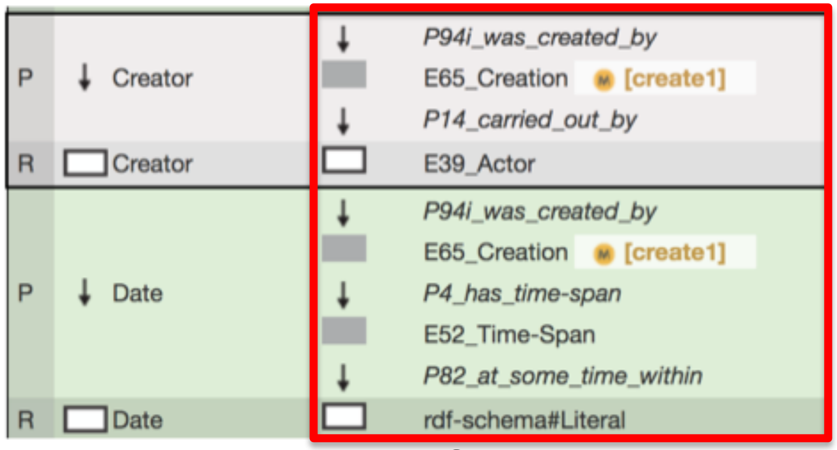
5. Using Variables Example

Source



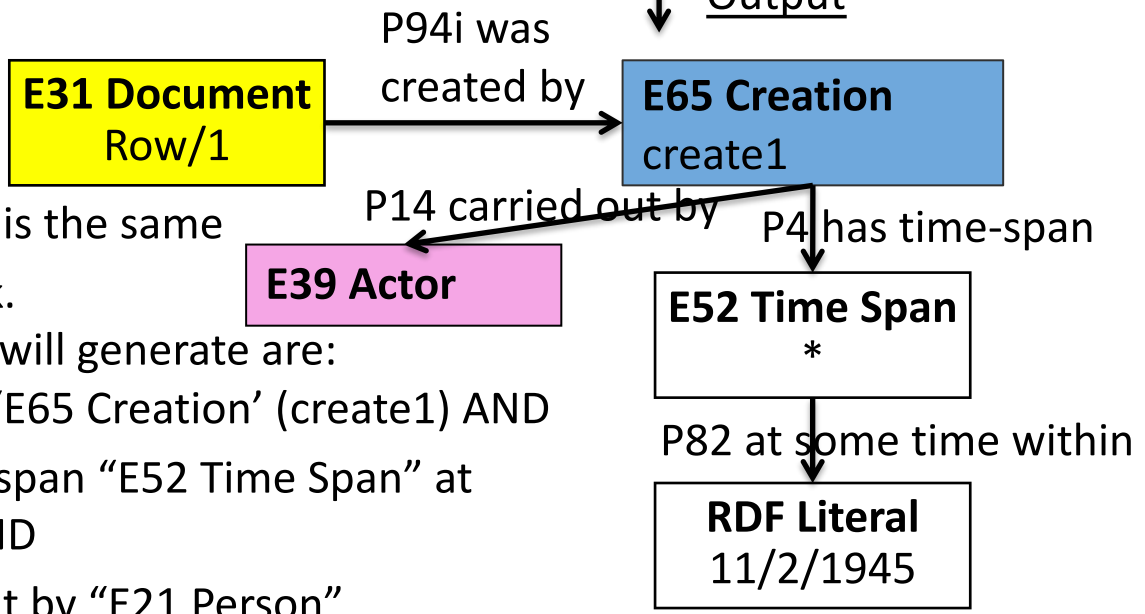
```
▼<root>
  ▼<row>
     <Type>Text</Type>
     <Title>Protocols of Proceedings of Crimea Conference</Title>
     <Subtitle>Declaration of Liberated Europe</Subtitle>
     <Date>11/2/1945</Date>
    ▼<Creator>
       <name>Joseph Stalin</name>
      ▼<role>
         The Premier of the Union of Soviet Socialist Republics
       </role>
     </Creator>
    ▼<Creator>
       <name>Winston Churchill</name>
       <role>The Prime Minister of the United Kingdom</role>
     </Creator>
    ▼<Creator>
       <name>Theodore Roosevelt</name>
       <role>President of the United States of America</role>
     </Creator>
    ▼<Publisher>
       <name>State Department</name>
     </Publisher>
     <Subject>Postwar Division of Europe</Subject>
   </row>
 </root>
```

Mapping Instruction



P	↓ Creator	↓ *P94i_was_created_by*
		E65_Creation [create1]
		↓ *P14_carried_out_by*
R	Creator	E39_Actor
P	↓ Date	↓ *P94i_was_created_by*
		E65_Creation [create1]
		↓ *P4_has_time-span*
		E52_Time-Span
		↓ *P82_at_some_time_within*
R	Date	rdf-schema#Literal

Generates Output



So this mapping instruction says,

The Creation in the 'Creator' link is the same with the Creation in the 'Date' link.

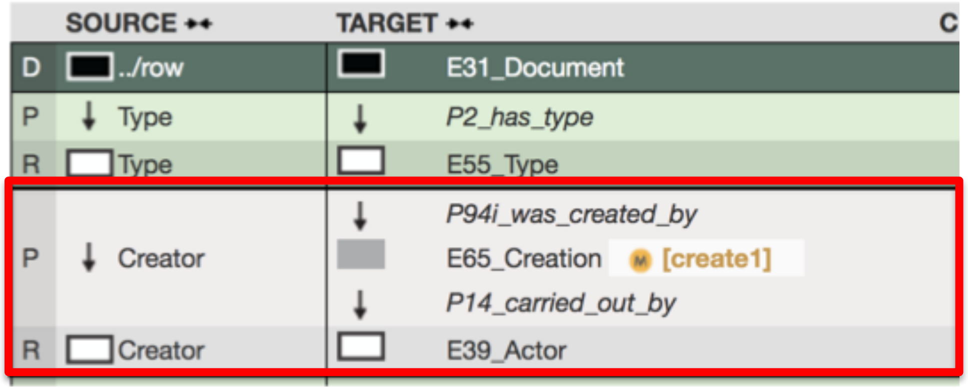
The series of RDF triples that this will generate are:

'E31 Document'" was created by 'E65 Creation' (create1) AND

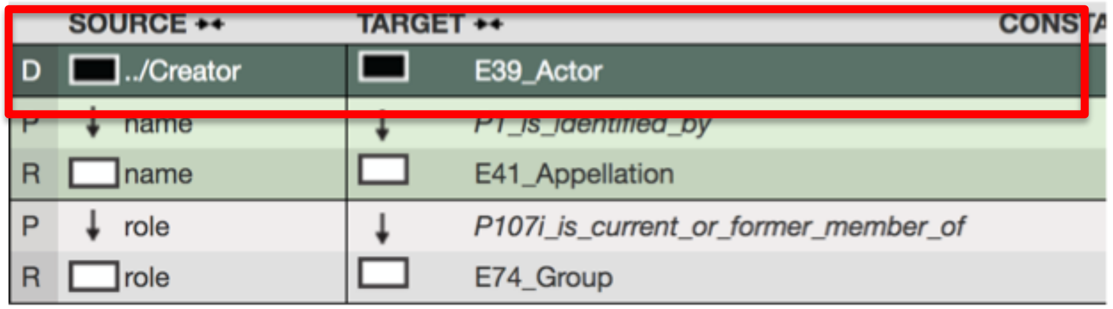
'E65 Creation' (create1) has time span "E52 Time Span" at some time within "Some Date" AND

'E65 Creation' (create1) carried out by "E21 Person"

6. Joining Maps



	SOURCE	TARGET	C
D	../row	E31_Document	
P	Type	*P2_has_type*	
R	Type	E55_Type	
P	Creator	*P94i_was_created_by*	
		E65_Creation [create1]	
		P14_carried_out_by	
R	Creator	E39_Actor	



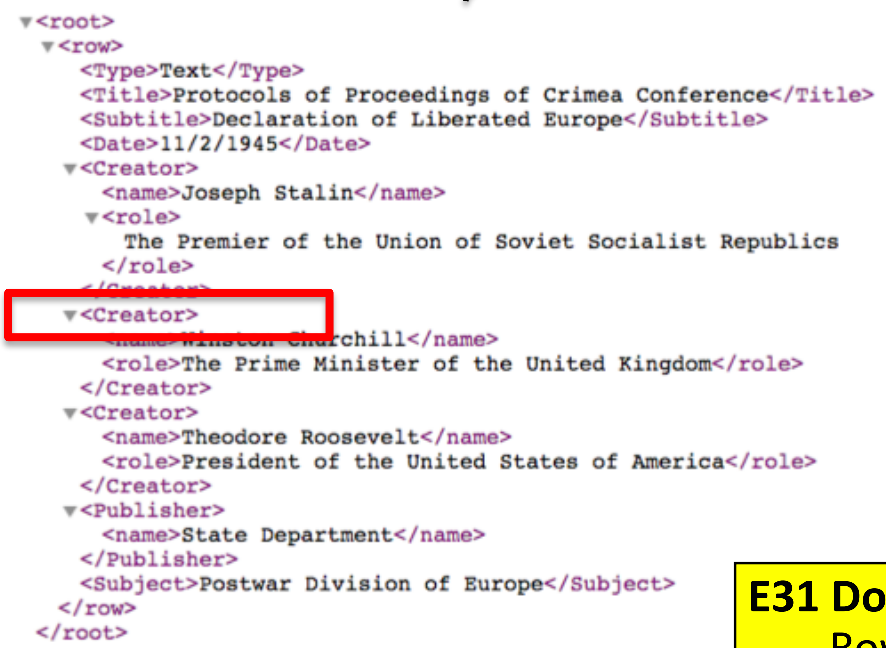
	SOURCE	TARGET	CONSTA
D	../Creator	E39_Actor	
P	name	*P1_is_identified_by*	
R	name	E41_Appellation	
P	role	*P107i_is_current_or_former_member_of*	
R	role	E74_Group	

Two maps can be joined, just in case the first maps a node which is the domain of a second map. This is often done for convenience purposes, to make mapping easier and simple to read.

E.g.: There is a subnode in the XML that has many fields describing an actor. In map 1, reference Actor. In map 2, map all fields for Actor node.

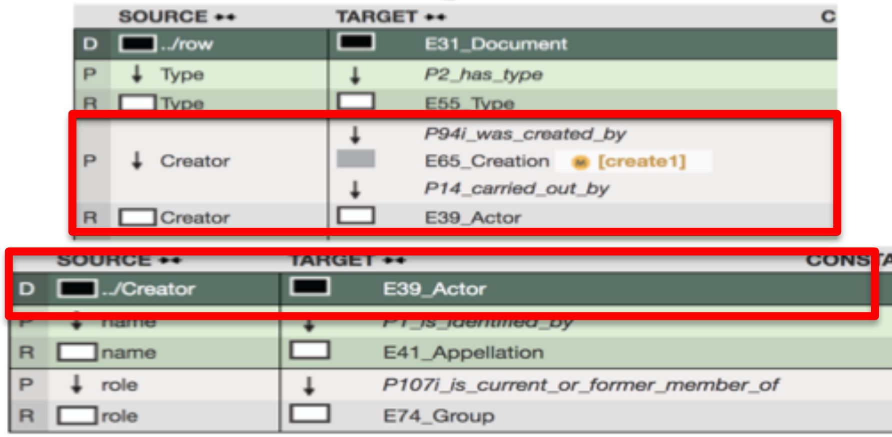
6. Joining Maps Example

Source



```
▼<root>
  ▼<row>
     <Type>Text</Type>
     <Title>Protocols of Proceedings of Crimea Conference</Title>
     <Subtitle>Declaration of Liberated Europe</Subtitle>
     <Date>11/2/1945</Date>
   ▼<Creator>
       <name>Joseph Stalin</name>
     ▼<role>
         The Premier of the Union of Soviet Socialist Republics
       </role>
     </Creator>
   ▼<Creator>
       <name>Winston Churchill</name>
       <role>The Prime Minister of the United Kingdom</role>
     </Creator>
   ▼<Creator>
       <name>Theodore Roosevelt</name>
       <role>President of the United States of America</role>
     </Creator>
   ▼<Publisher>
       <name>State Department</name>
     </Publisher>
     <Subject>Postwar Division of Europe</Subject>
  </row>
</root>
```

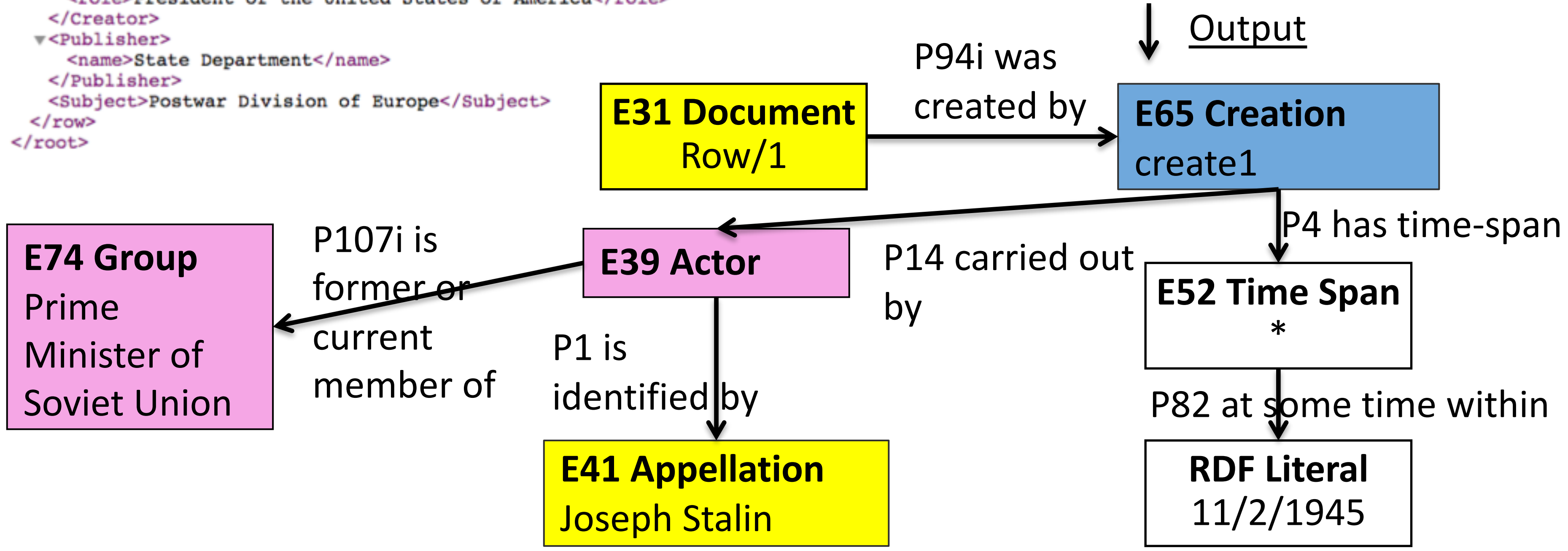
Mapping Instruction



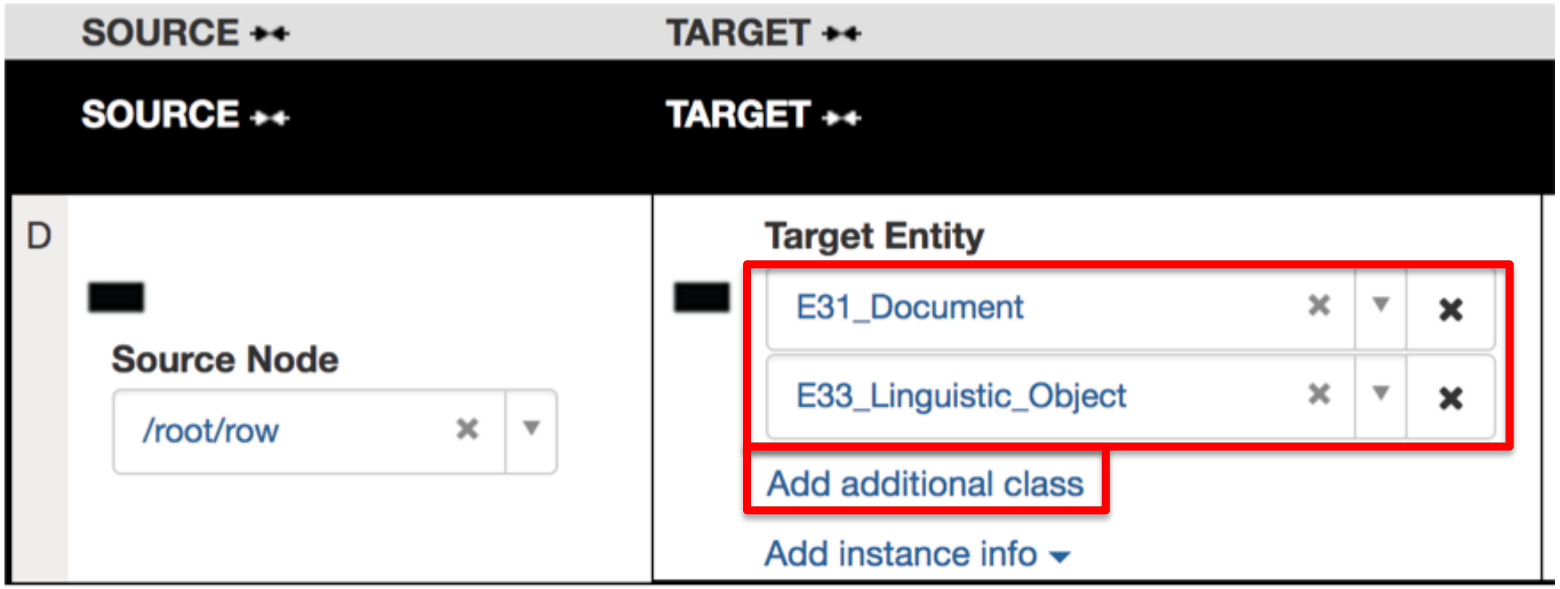
	SOURCE	TARGET	C
D	../row	E31_Document	
P	↓ Type	↓ P2_has_type	
R	Type	E55_Type	
P	↓ Creator	↓ P94i_was_created_by E65_Creation [create1] ↓ P14_carried_out_by	
R	Creator	E39_Actor	

	SOURCE	TARGET	CONS
D	../Creator	E39_Actor	
P	↓ name	↓ P1_is_identified_by	
R	name	E41_Appellation	
P	↓ role	↓ P107i_is_current_or_former_member_of	
R	role	E74_Group	

Generates Output



7. Multiple Instantiation



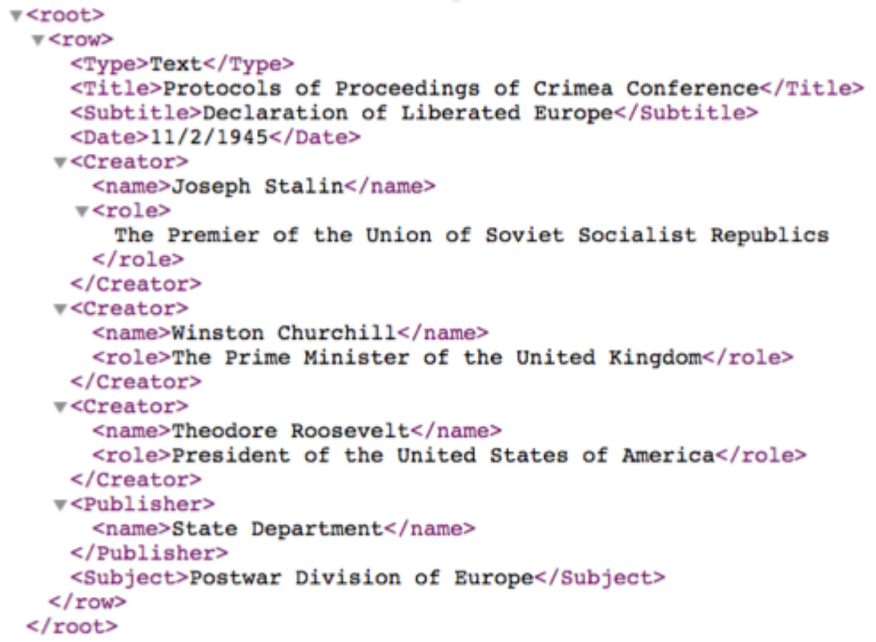
For any node, if it is an instance of two or more classes, we can express this in 3M by using the ‘add additional class’ feature.

In this example, we say each ‘row’ from source both is an E31 Document and an E33 Linguistic Object. This allows the use of relations from both classes.

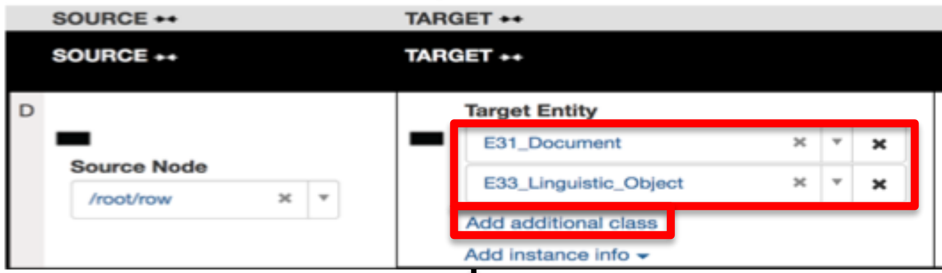
7. Multi Instantiation Example

Mapping Instruction

Source



```
▼<root>
  ▼<row>
     <Type>Text</Type>
     <Title>Protocols of Proceedings of Crimea Conference</Title>
     <Subtitle>Declaration of Liberated Europe</Subtitle>
     <Date>11/2/1945</Date>
    ▼<Creator>
       <name>Joseph Stalin</name>
      ▼<role>
         The Premier of the Union of Soviet Socialist Republics
       </role>
     </Creator>
    ▼<Creator>
       <name>Winston Churchill</name>
       <role>The Prime Minister of the United Kingdom</role>
     </Creator>
    ▼<Creator>
       <name>Theodore Roosevelt</name>
       <role>President of the United States of America</role>
     </Creator>
    ▼<Publisher>
       <name>State Department</name>
     </Publisher>
     <Subject>Postwar Division of Europe</Subject>
   </row>
</root>
```



SOURCE ↔ TARGET ↔

SOURCE ↔ TARGET ↔

D

Source Node: /root/row

Target Entity: E31_Document, E33_Linguistic_Object

Generates Output

E33 Linguistic Object
E31 Document
Row/1

So this mapping instruction says,

“for each instance of ‘row’ in source, create an RDF instance of both type ‘E31 Document’ and ‘E33 Linguistic Object’”

6. INSTANCE GENERATORS

Instance Generator Section Content

1. Why Instance Generators, what do they do?
2. Defining instance generation functions/patterns (offline)
3. Adding generator file
4. Opening up the generator editor
5. Specifying Instance Generators
6. Testing Transform

1. Why instance generators?

The mapping table allows you to make a translation between a source schema and and an RDFS encoded schema like CIDOC CRM.

Each node specified in the target will become a separate data entity in the semantic graph that is created through the X3ML transformation engine.

This separate data entity will need a unique identifier by which it can be found in the system (like a unique key in a relational database)

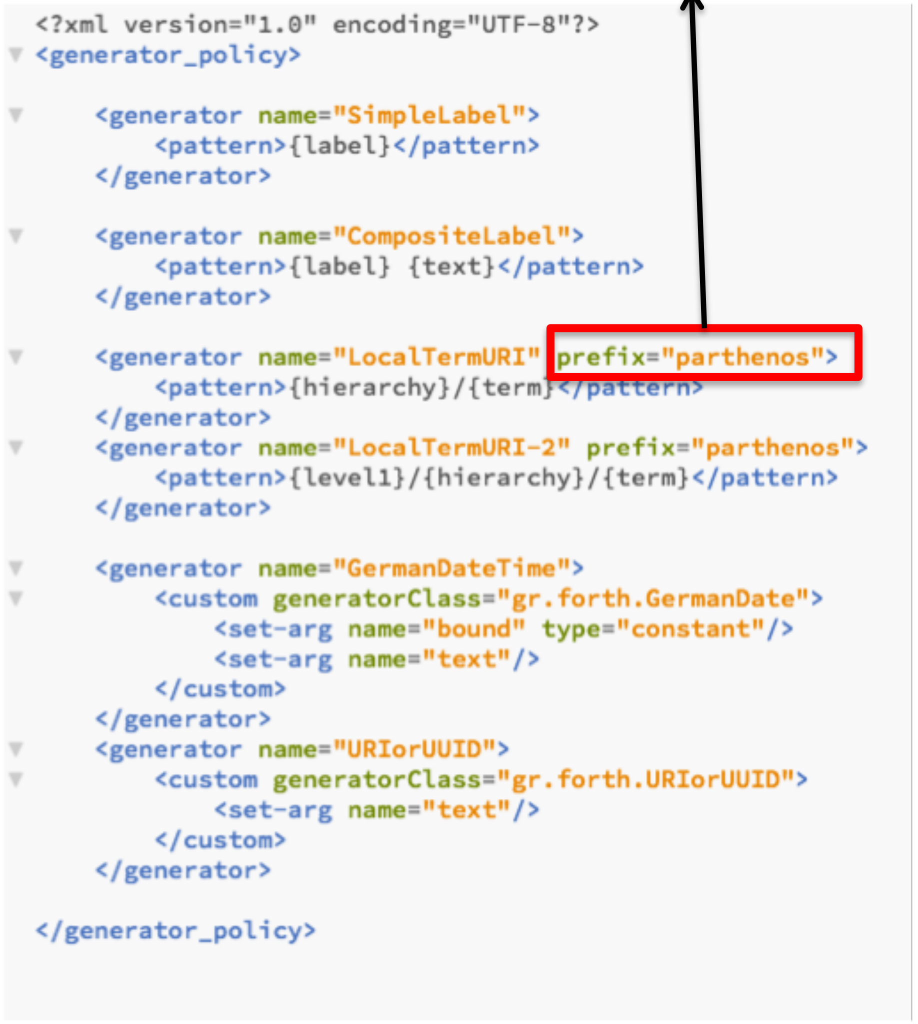
The instance generators allow specifying patterns for building unique identifiers for instances called ‘URIs’.

Because a URI is often unreadable to the uninitiated, it is highly recommended that for each node a label (usually the actual data value from you source schema) be added to each node as well. This is also done through the instance generator.

2. Defining Instance Generators (Offline)

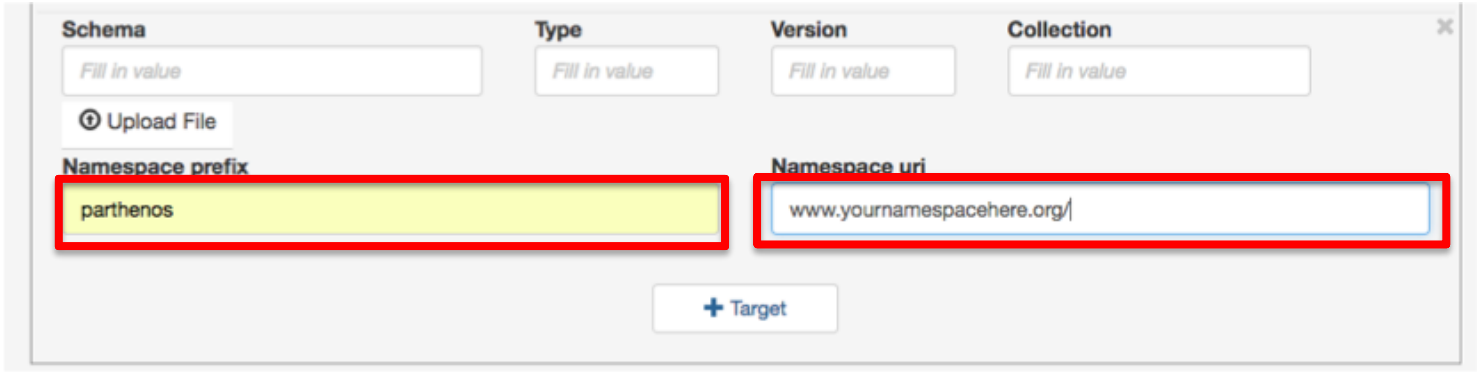
Prefix will be used to define base path of URI

The instance generator is a small piece of simple XML code. This is generated with a simple XML file outside X3ML defining convenient patterns. It can then be uploaded to 3MEditor and used to assign the instance generators.



```
<?xml version="1.0" encoding="UTF-8"?>
<generator_policy>

    <generator name="SimpleLabel">
        <pattern>{label}</pattern>
    </generator>

    <generator name="CompositeLabel">
        <pattern>{label} {text}</pattern>
    </generator>

    <generator name="LocalTermURI" prefix="parthenos">
        <pattern>{hierarchy}/{term}</pattern>
    </generator>
    <generator name="LocalTermURI-2" prefix="parthenos">
        <pattern>{level1}/{hierarchy}/{term}</pattern>
    </generator>

    <generator name="GermanDateTime">
        <custom generatorClass="gr.forth.GermanDate">
            <set-arg name="bound" type="constant"/>
            <set-arg name="text"/>
        </custom>
    </generator>
    <generator name="URIorUUID">
        <custom generatorClass="gr.forth.URIorUUID">
            <set-arg name="text"/>
        </custom>
    </generator>

</generator_policy>
```

3. Adding generator file

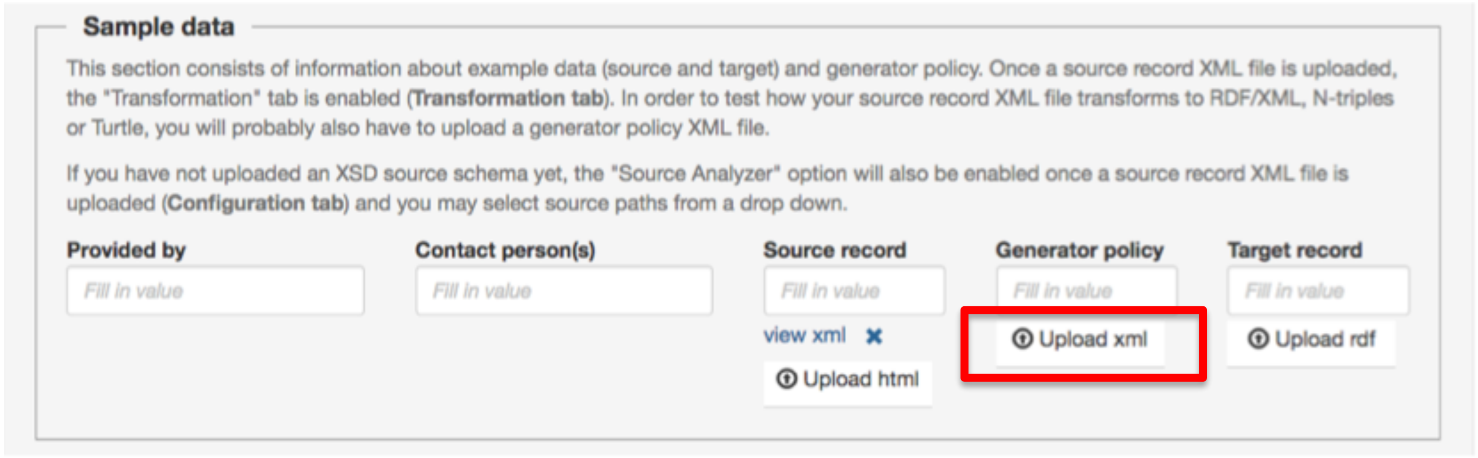


Schema: Fill in value
Type: Fill in value
Version: Fill in value
Collection: Fill in value

Upload File

Namespace prefix: parthenos
Namespace uri: www.yournamespacehere.org/

+ Target



Sample data

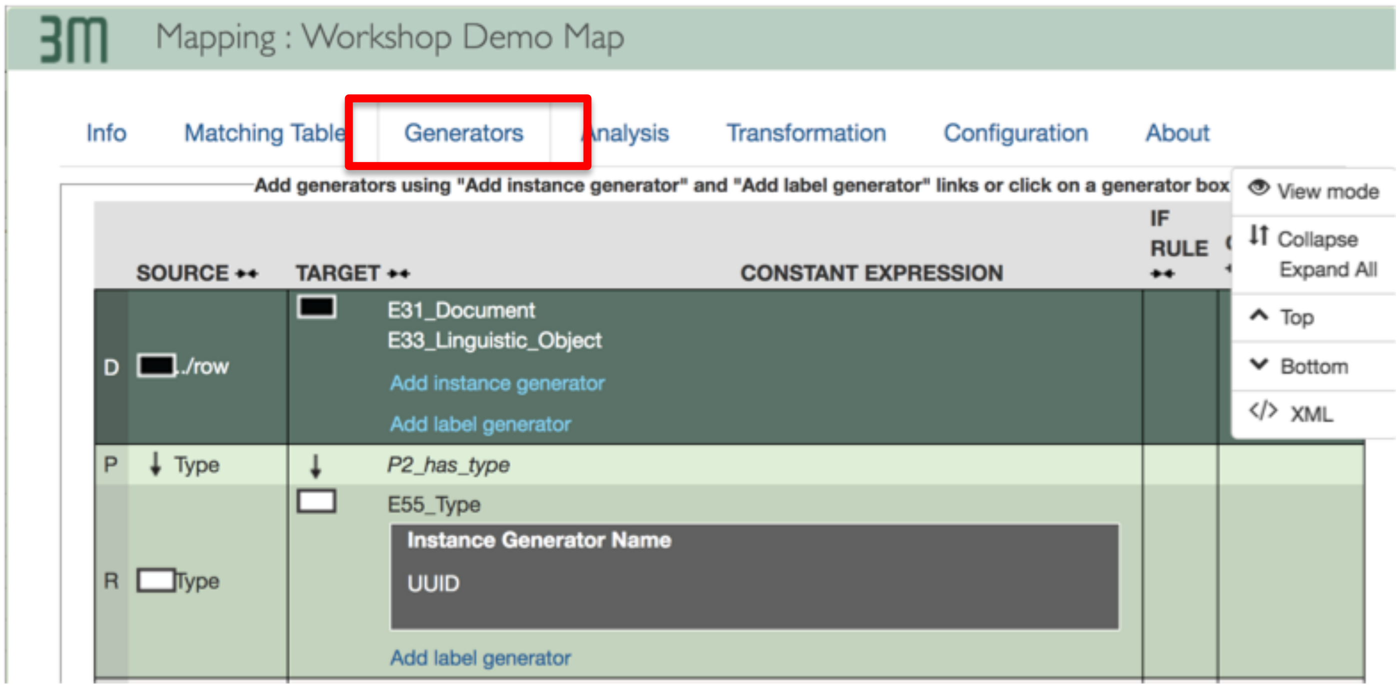
This section consists of information about example data (source and target) and generator policy. Once a source record XML file is uploaded, the "Transformation" tab is enabled (**Transformation tab**). In order to test how your source record XML file transforms to RDF/XML, N-triples or Turtle, you will probably also have to upload a generator policy XML file.

If you have not uploaded an XSD source schema yet, the "Source Analyzer" option will also be enabled once a source record XML file is uploaded (**Configuration tab**) and you may select source paths from a drop down.

Provided by: Fill in value
Contact person(s): Fill in value
Source record: Fill in value — view xml — Upload html
Generator policy: Fill in value — Upload xml
Target record: Fill in value — Upload rdf

1. Add a new 'target' scheme, and specify the same namespace prefix as in your generator file. Use 'namespace uri' field to specify your base namespace
2. Upload the generator file

4. Opening Generator Editor

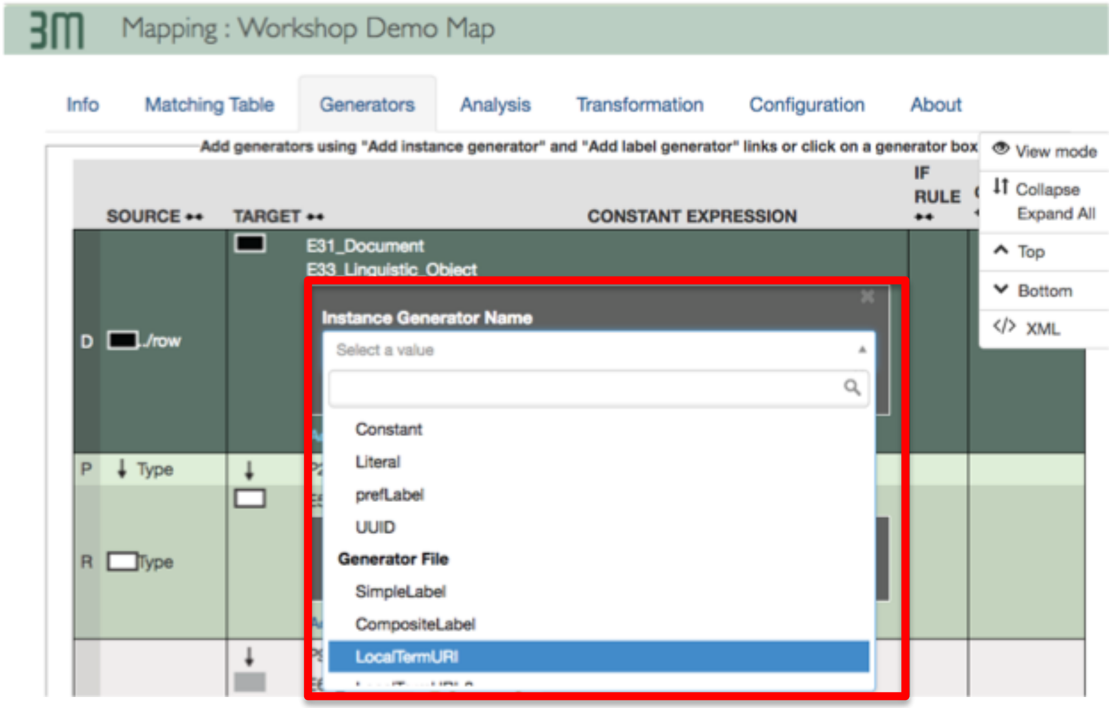


Add generators using "Add instance generator" and "Add label generator" links or click on a generator box

	SOURCE	TARGET	CONSTANT EXPRESSION	IF RULE
D	../row		E31_Document E33_Linguistic_Object Add instance generator Add label generator	
P	Type		P2_has_type	
R	Type		E55_Type Instance Generator Name UUID Add label generator	

Opening generator editor is easy, just click to the generators tab.

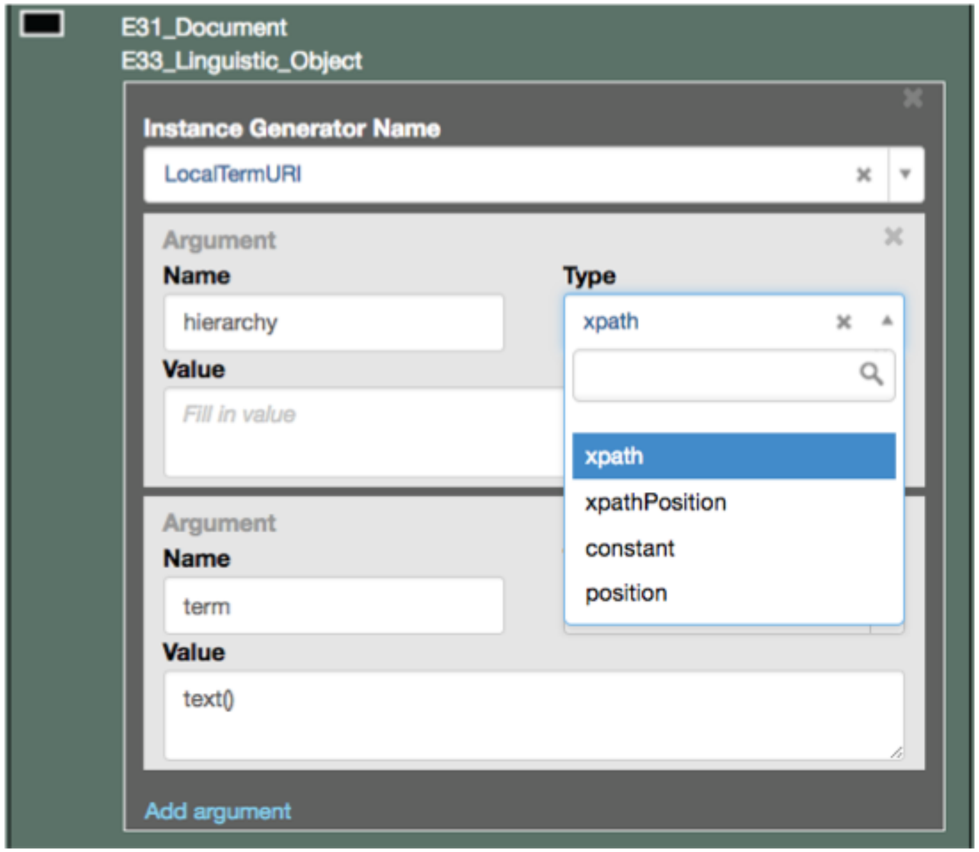
5. Specifying Instance Generators



Add generators using "Add instance generator" and "Add label generator" links or click on a generator box

1. Click Add Instance Generator
2. Select Instance Generator Type

5. Specifying Instance Generators



E31_Document
E33_Linguistic_Object

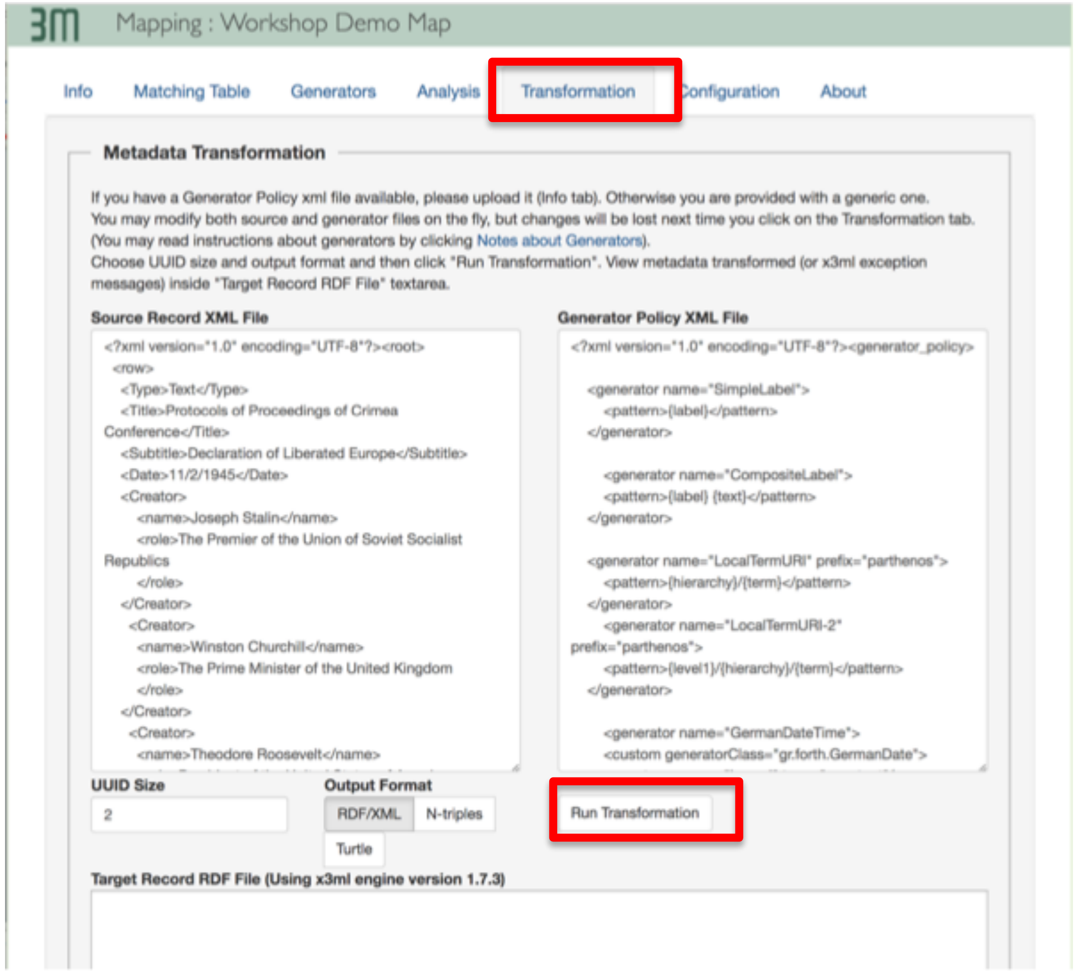
Instance Generator Name: LocalTermURI

Argument
Name: hierarchy
Type: xpath
Value: Fill in value

Argument
Name: term
Value: text()

1. Each argument in a generator specifies a piece of the URI string
2. Each argument in the URI can be of different types, chiefly ‘Constant’ (a value you specify) or ‘xpath’ (a value from the source)
3. The unique portion of the URI should usually be drawn from the source data. It is accessed from a node using the command ‘text()’

6. Testing Transforms



Metadata Transformation

If you have a Generator Policy xml file available, please upload it (Info tab). Otherwise you are provided with a generic one.
You may modify both source and generator files on the fly, but changes will be lost next time you click on the Transformation tab.
(You may read instructions about generators by clicking Notes about Generators).
Choose UUID size and output format and then click "Run Transformation". View metadata transformed (or x3ml exception messages) inside "Target Record RDF File" textarea.

Source Record XML File

```
<?xml version="1.0" encoding="UTF-8"?><root>
 <row>
  <Type>Text</Type>
  <Title>Protocols of Proceedings of Crimea
Conference</Title>
  <Subtitle>Declaration of Liberated Europe</Subtitle>
  <Date>11/2/1945</Date>
  <Creator>
    <name>Joseph Stalin</name>
    <role>The Premier of the Union of Soviet Socialist
Republics
    </role>
  </Creator>
   <Creator>
    <name>Winston Churchill</name>
    <role>The Prime Minister of the United Kingdom
    </role>
  </Creator>
   <Creator>
    <name>Theodore Roosevelt</name>
```

Generator Policy XML File

```
<?xml version="1.0" encoding="UTF-8"?><generator_policy>

   <generator name="SimpleLabel">
     <pattern>{label}</pattern>
   </generator>

     <generator name="CompositeLabel">
     <pattern>{label} {text}</pattern>
   </generator>

   <generator name="LocalTermURI" prefix="parthenos">
     <pattern>{hierarchy}/{term}</pattern>
   </generator>
     <generator name="LocalTermURI-2"
prefix="parthenos">
     <pattern>{level1}/{hierarchy}/{term}</pattern>
   </generator>

     <generator name="GermanDateTime">
     <custom generatorClass="gr.forth.GermanDate">
```

UUID Size: 2

Output Format: [✓ RDF/XML] N-triples Turtle

Run Transformation

Target Record RDF File (Using x3ml engine version 1.7.3)

To test transform all mapped entities must have a instance generator specified.

- Click on 'Transform' tab
- Click 'Run Transformation'
- Analyze resulting RDF and/or error messages

THANK YOU!

Any questions?

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