

# Growing your graph with OTTR

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A method for graph enrichment

By Veronika Heimsbakk



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## Growing your graph with OTTR

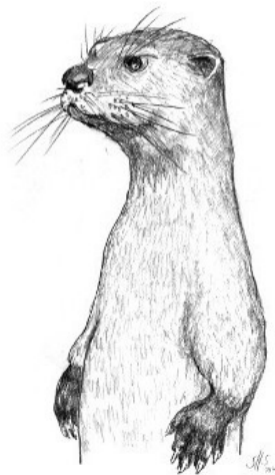
**Veronika Heimsbakk**

Managing AI Engineer | Insights & Data | Capgemini Norway

- > Logic & semantics, University of Oslo
- > 7+ yrs in various KG related projects

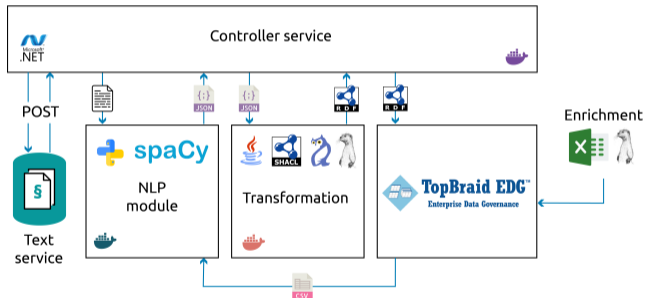
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## Reasonable Ontology Templates

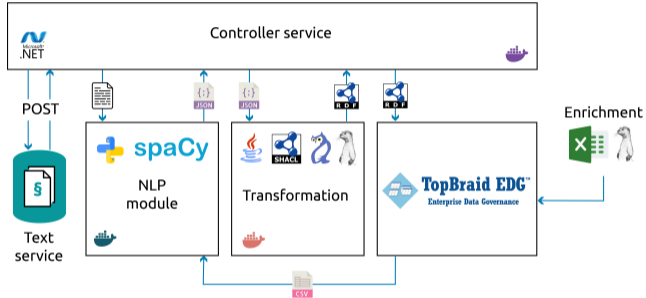


## OTTR at the Norwegian Maritime Authority

The Norwegian Maritime Authority (NMA) use OTTR for *graph enrichment*.



## OTTR at the Norwegian Maritime Authority



- › Translating *code systems* into RDF.
- › A tool for domain experts.
- › Collaborative spreadsheets.

## Code systems at the NMA

3851	<b>Meldingstype</b>		
3852	<b>Code</b>	<b>Norwegian</b>	<b>English</b>
3853	ALT	Altinn	Altinn
3854			
3855	<b>Meldingsvarslingsyper</b>		
3856	<b>Code</b>	<b>Norwegian</b>	<b>English</b>
3857	EMAIL	e-post	E-mail
3858	SMS	SMS	SMS
3859			
3860	<b>Meldingsvedleggstype</b>		
3861	<b>Code</b>	<b>Norwegian</b>	<b>English</b>
3862	ALR	Svar brev refusjonssøknad	Answer letter reimbursement application
3863	CRA	CRA meldingstype	CRA message type
3864	VARSEL	Varsling for utgående sertifikater	Notification for expiring certificates
3865			
3866	<b>MerverdiavgiftSats</b>		
3867	<b>Code</b>	<b>Norwegian</b>	<b>English</b>
3868	MVA	25	25
3869			
3870	<b>Miljøskadetype</b>		
3871	<b>Code</b>	<b>Norwegian</b>	<b>English</b>
3872	1	Bunkersolje	Bunker oil
3873	1.1	Tungolje	Heavy fuel oil
3874	1.2	Diesel	Diesel fuel oil

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## Specifications

**mOTTR** Concepts and Abstract Model for Reasonable Ontology Templates

**rOTTR** Adapting Reasonable Ontology Templates to RDF

**wOTTR** Web Reasonable Ontology Templates

**stOTTR** Terse Syntax for Reasonable Ontology Templates

**tabOTTR** Tabular Reasonable Ontology Template Instances

**bOTTR** Batch Instantiation of OTTR templates

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## Terse Syntax for Reasonable Ontology Templates

This specification defines the Terse Syntax for Reasonable Ontology Templates (stOTTR) for serialising OTTR templates and instances of OTTR templates, as defined by rOTTR.



## stOTTR Terms

A term is, syntactically, either a variable, a constant or a list of terms.

```
?chocolateCake
```

```
?CAKE
```

```
<http://example.com/carrotcake>
```

```
ex:bananabread
```

```
:bløtkake
```

```
[]
```

```
_:blankcake
```

## stOTTR Terms

A term is, syntactically, either a variable, a constant or a list of terms.

```
"coffee"  
"tea"^^xsd:normalisedString  
42  
true  
3.14  
  
("coffee", ex:bananabread, 42)  
(("coffee", 42), ex:bananabread, (3.14) )
```

## stOTTR Types

A type, i.e., the type of a term, is either a basic type, a list type or a LUB-type (least upper bound).

```
xsd:double
owl:Class
rdfs:Resource
ottr:Bot

List<xsd:string>
List<NEList<xsd:int>>

LUB<xsd:string>
LUB<owl:Class>
```

LUB-types cannot be nested.

## stOTTR Instances

```
ex:Template(ex:Coffee , ex:Tea) .
```

```
ex:Template( , ) .
```

```
ex:Template(?cake , "coffee") .
```

```
cross | ex:Template( ++(ex:Coffee , ex:Tea) ) .
```

```
zipMin | ex:Template(1, 2, ++(ex:Coffee , ex:Tea) ) .
```

## stOTTR Template signatures

```
ex:Template1 [ ?a , ?b ] .
```

```
ex:Template2 [ ! owl:Class ?a , ? xsd:double ?b = 3.14 ] .
```

```
ex:Template3 [ !??a ] .
```

```
ex:Template4 [ ]  
@@ex:Template1(ex:Template4, "arg"),  
@@ex:Template1(ex:Template4, "another arg")  
.
```

## stOTTR Example

```
o-sdir:Drawing[
  ! ?drawing,
  ?subject,
  ?projectCode,
  ! ?labelNo,
  ?description,
  ? ?labelEn
] :: {
  o-rdfs:SubClassOf(?drawing, sdir:Document),
  o-rdf:Type(?drawing, owl:Class),
  ottr:Triple(?drawing, sdir:subject, ?subject),
  o-rdf:Type(?subject, owl:Class),
  ottr:Triple(?drawing, sdir:projectCode, ?projectCode),
  o-rdf:Type(?projectCode, sdir:ProjectCode),
  o-rdfs:Label(?drawing, ?labelNo),
  o-rdfs:Label(?drawing, ?labelEn),
  ottr:Triple(?drawing, rdfs:comment, ?description)
} .
```

---

## tabOTTR

tabOTTR is designed to be simple to use and simple to parse. The development is driven by use cases. There are therefore constructs or types of values that may not be possible to represent in tabOTTR.

## tabOTTR Prefix

#OTTR	prefix
ex	<a href="http://example.org/">http://example.org/</a>
unit	<a href="http://qudt.org/vocab/unit/">http://qudt.org/vocab/unit/</a>
#OTTR	end

The following are implicitly declared for all files:

```
rdf      http://www.w3.org/1999/02/22-rdf-syntax-ns\#
rdfs     http://www.w3.org/2000/01/rdf-schema\#
owl      http://www.w3.org/2002/07/owl\#
xsd      http://www.w3.org/2001/XMLSchema\#
dc       http://purl.org/dc/elements/1.1/
ottr     http://ns.ottr.xyz/templates\#
```



## stOTTR Example

	A	B	C	E	F	G	H
1	#OTTR	prefix					
2	ottr	<a href="http://ns.ottr.xyz/0.4/">http://ns.ottr.xyz/0.4/</a>					
3	sdir	<a href="https://www.sdir.no/SDIR_Simulator#">https://www.sdir.no/SDIR_Simulator#</a>					
4	o-sdir	<a href="https://www.sdir.no/SDIR_Simulator/ottr#">https://www.sdir.no/SDIR_Simulator/ottr#</a>					
5	scope	<a href="https://www.sdir.no/SDIR_Simulator/shapes/scope#">https://www.sdir.no/SDIR_Simulator/shapes/scope#</a>					
6	sh	<a href="http://www.w3.org/ns/shacl#">http://www.w3.org/ns/shacl#</a>					
7	#OTTR	end					
8							
9	#OTTR	template	o-sdir:Drawing				
10		1	2	3	4	5	6
11	iri	iri	iri	text	text	text	
12	<b>Dokumenteres i følgende dokument</b>	<b>Fagområde</b>		Norsk label	beskrivelse av tegningen	Engelsk label	
13	sdir:AccommodationFireExtinguishingSystem	sdir:FireExinction	sdir:ProjectCodeB11	Slokkesystem innredning@@no	For behandling av fast installerte slokkesystem i innredning skal følgende dokumentasjon innsendes: <ul style="list-style-type: none"> <li>Typegodkjenningssertifikat</li> <li>Dokumentasjon krevd av typegodkjenningssertifikat</li> <li>Kapasitetsberegninger</li> </ul>		
14	sdir:FireControlPlan	sdir:FireExinction	sdir:ProjectCodeB11	Brannkontrollplan@@no	All dokumentasjon skal være merket med versjon eller dato, i tillegg til vanlig nummerering. Planen skal være i tilstrekkelig stor målestokk til å gi et klart bilde av installasjonene, og symbolene skal være i henhold til IMO resolution A.952(23). Mangler noe av dette vil dokumentasjonen bli returnert <ul style="list-style-type: none"> <li>Generalløst med inntegnet plassering av brannpumper, brannledning, isolasjonsventil og hydranter</li> <li>Symboliste som forklarer rør og ventilinndelinger, samt pumpekapasitet@@no</li> </ul>	Fixed fire – extinguishing system accomodat	
15	sdir:FireMainDrawing	sdir:FireExinction	sdir:ProjectCodeB11	Brannledning@@no		Accommodations for crew (MLC)@@en	

---

## tabOTTR Data types

`iri` IRI

`blank` RDF blank node

`text` untyped RDF literal

`IRI, e.g. XSD` typed RDF literal

`auto` individually determined by value

`X+` an RDF list where the type of items are determined by X

Each value is individually typed according to following rules.

**iri** string is absolute URL or a QName.

**blank** string starts with `_:`, fresh node `*`.

**typed literal** `xsd:boolean`, `xsd:integer`, `xsd:decimal`

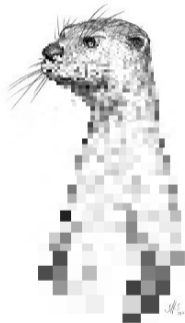
**untyped literal** default

**none value** `ottr:none`

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## Lutra

Lutra is an open source (LGPL) reference implementation of OTTR.



Latest stable .jar downloadable from <https://gitlab.com/ottr/lutra/lutra/-/releases>

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## Running the Lutra CLI

```
java -jar lutra.jar -l ottrlib.ttl -L stottr -I tabottr -f data.xlsx -o outputfile.ttl
```

<code>ottrlib.ttl</code>	Location of stOTTR templates.
<code>data.xlsx</code>	Instance data stored in Excel with tabOTTR flavouring.
<code>outputfile.ttl</code>	Serialized RDF.

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## Running the Lutra CLI

```
java -jar lutra.jar -l ottrlib.ttl -L stottr -I tabottr -f data.xlsx -o outputfile.ttl
```

<code>-l, -library</code>	Location of OTTR library.
<code>-L, -libraryFormat</code>	Input format of library, <code>wottr</code> or <code>stottr</code> .
<code>-I, -inputFormat</code>	Input format of instances, <code>wottr</code> , <code>stottr</code> , <code>tabottr</code> or <code>bottr</code> . Default: <code>wottr</code> .
<code>-f, -fetchMissing</code>	Fetch missing template dependencies.
	Assume that definitions are accessible via IRI. Default: <code>false</code> .
<code>-o, -output</code>	Path for writing output.

## OTTR output

```
sdir:FireControlPlan a owl:Class , sdir:Document ;
  rdfs:comment      "All dokumentasjon skal være ..."@no ;
  rdfs:label        "Brannkontrollplan"@no ,
                  "Fixed fire - extinguishing system accommodation"@en ;
  sdir:projectCode  sdir:ProjectCodeB11 ;
  sdir:subject      sdir:FireExtinction .
```

- > sdir:ProjectCodeB11 and sdir:FireExtinction already exists in our knowledge graph.
- > SPARQL query stored in library to check for resources without description.

## Melt the data!

The screenshot shows the 'Import RDF File' page in the TopBraid EDG application. The interface includes a top navigation bar with the logo 'TopBraid EDG Enterprise Data Governance' and a menu with icons for '+', '≡', '☆', and 'ET'. Below this is a secondary navigation bar with tabs for 'Ontology', 'Dashboard', 'Settings', 'Users', 'Import', 'Transform', 'Export', 'Reports', 'Workflows', 'Tasks', and 'Comments'. The 'Import' tab is active. On the left, a vertical sidebar contains various icons, with the 'Import' icon (a document with a plus sign) highlighted. The main content area is titled 'Import RDF File' and contains the following elements:

- A heading 'Import RDF File'.
- A sub-heading 'Select an RDF file to be added to the current Ontology.'
- A 'Choose File' button followed by the text 'No file chosen'.
- A 'Format' section with four radio button options:
  - Turtle (.ttl) or N-Triple (.nt)
  - Turtle+ (.tulp)
  - JSON-LD (.jsonld)
  - RDF/XML (.rdf)
- A note: 'The compression formats ZIP (.zip), gzip (.ttl.gz etc) and bzip2 (.ttl.bz2 etc) are supported. Only the first file in a ZIP archive will be imported.'
- An 'Options' section with three checkboxes:
  - Record each new triple in change history  
*Not recommended for large files.*
  - Direct streaming import into production copy  
No clean up, change history or side effects will be applied. Cannot be combined with the other options. *For managers only, with care.*
  - Perform constraint validation only  
No changes will be applied. Existing and new triples will be validated together, against any available SHACL shapes.
- A blue 'Finish' button at the bottom.



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## Pros & Cons

- + Easy to serialize chunks of data.
- + Recognizable tools for domain experts.
- + tabOTTR syntax for domain experts.
  
- Difficult to automate.
- Support of few file formats.
- Documentation somewhat hard to read.

<https://ottr.xyz/>



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