SPARQL Template Transformation Language
-
Un langage de transformation de graphe RDF

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Wimmics, UCA, Inria, I3S, UNS, CNRS

http://wimmics.inria.fr

Agenda

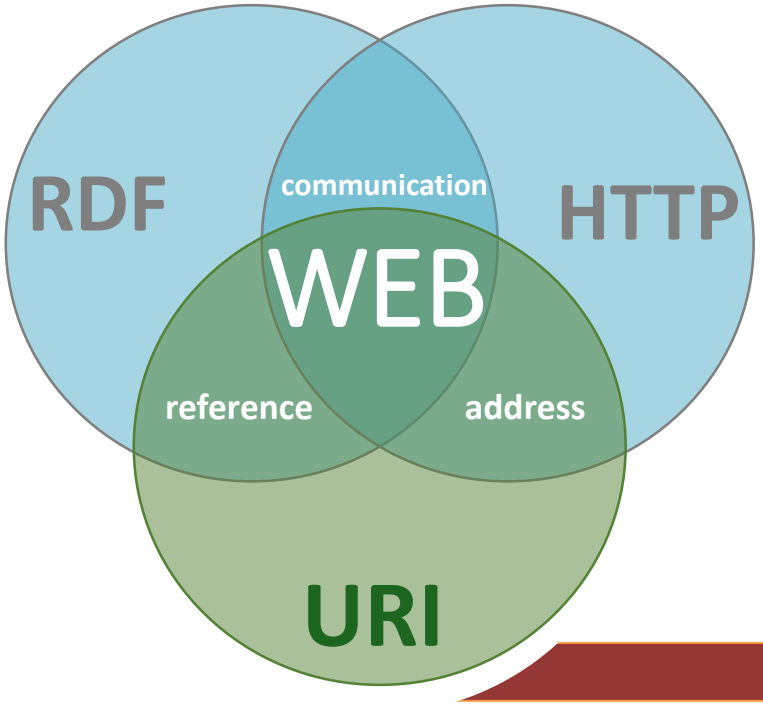
1. Introduction
2. STTL: SPARQL Template Transformation Language
3. LDScript: Linked Data Script Language
4. STTL Server
5. TD

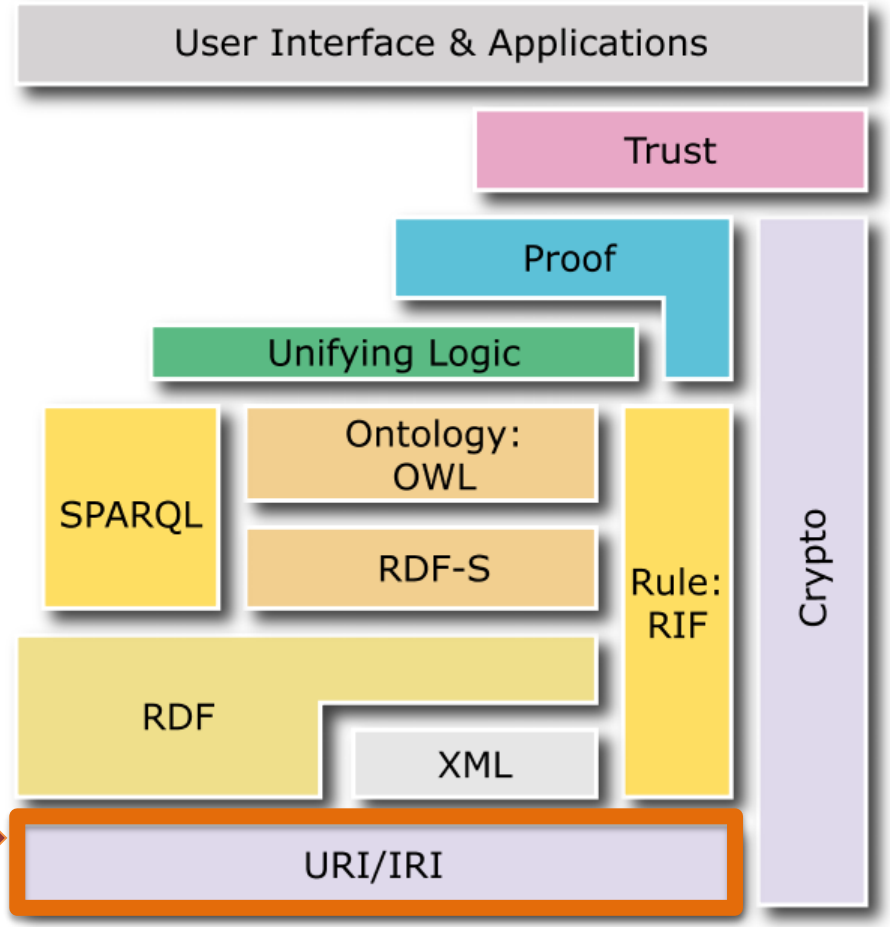
Slides: http://wimmics.inria.fr/lectures

W3C Semantic Web

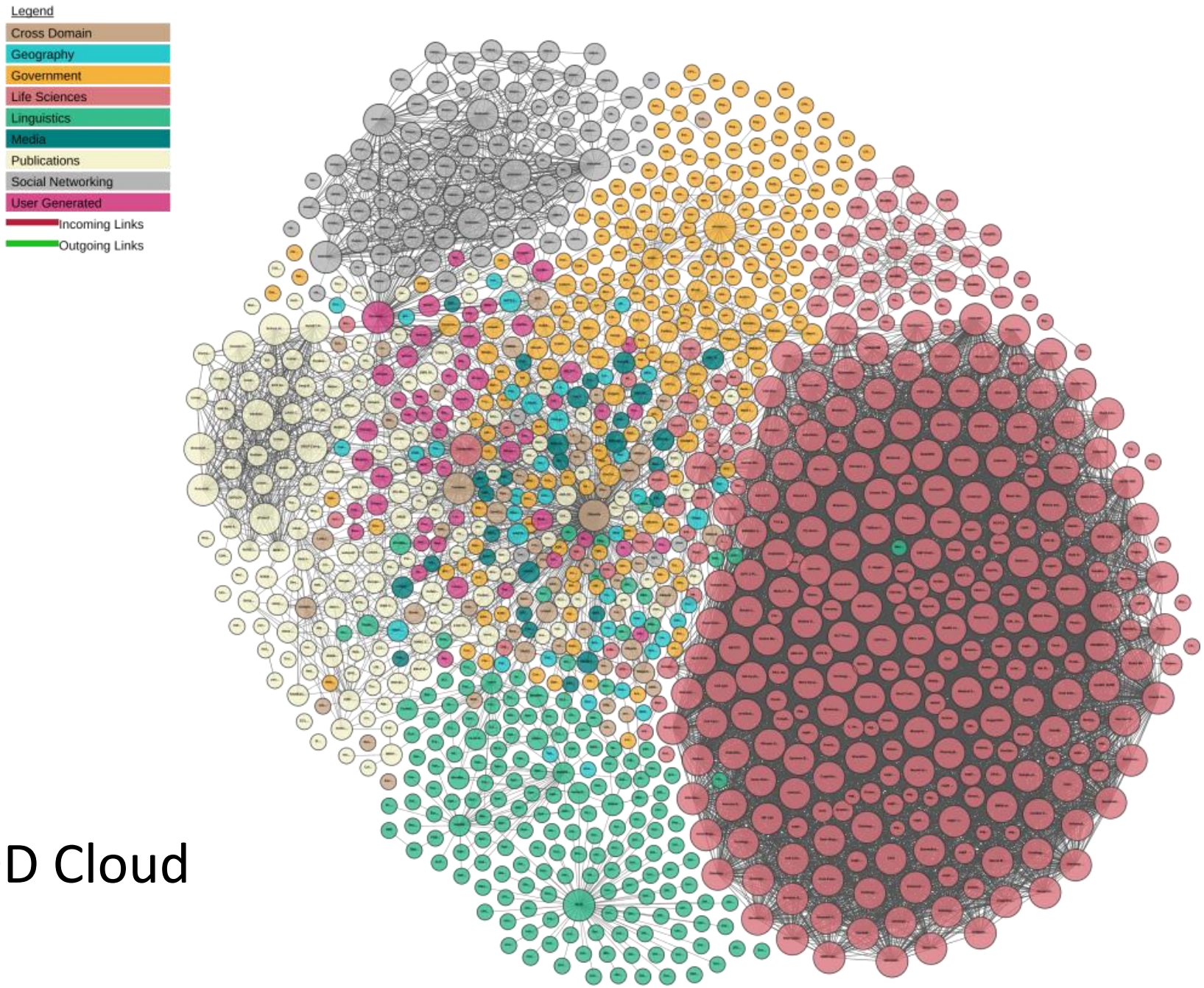
1. Semantic Web : connaissances
2. Web of Data : données
3. Linked (Open) Data : données liées

Semantic Web





universal nodes and types identification



LOD Cloud

"Linking Open Data cloud diagram 2017, by Andrejs Abele, John P. McCrae, Paul Buitelaar, Anja Jentzsch and Richard Cyganiak. http://lod-cloud.net/"

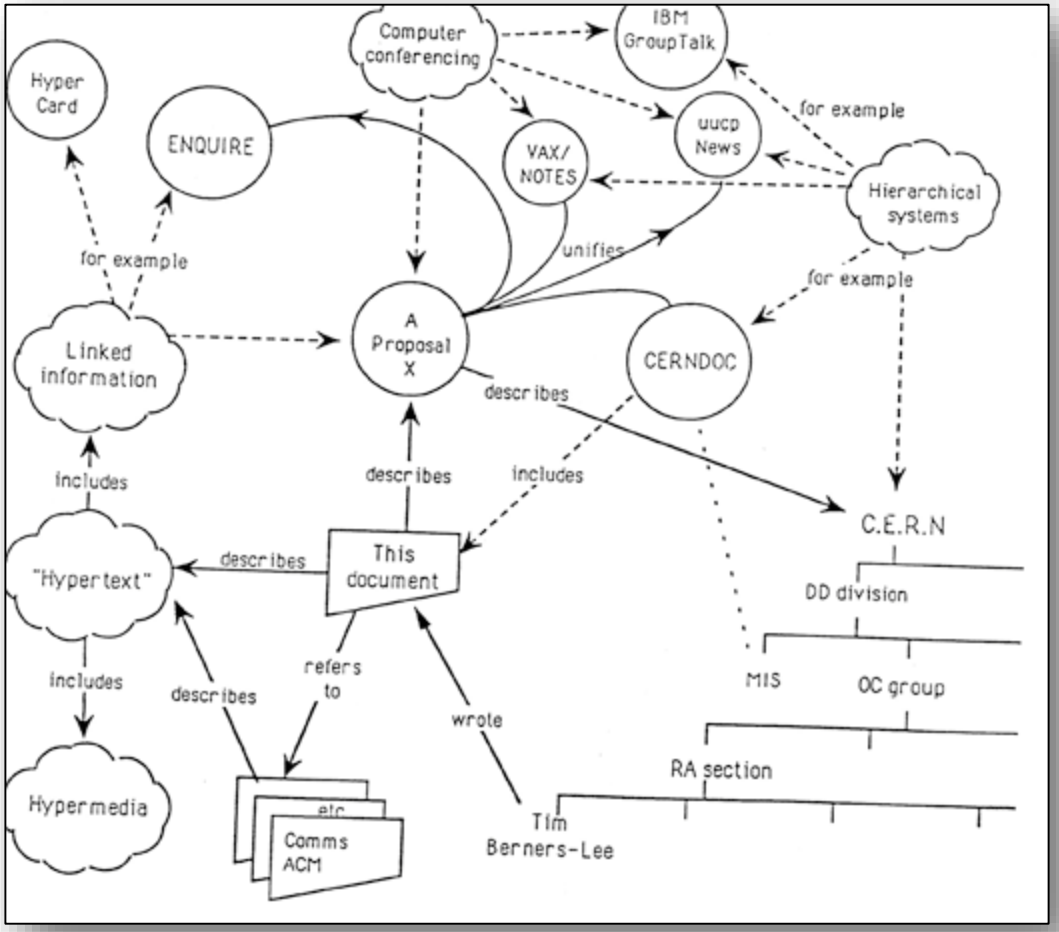
W3C Web of Data

1. RDF: Resource Description Framework
2. RDFS: RDF Schema
3. SPARQL: RDF Query Language

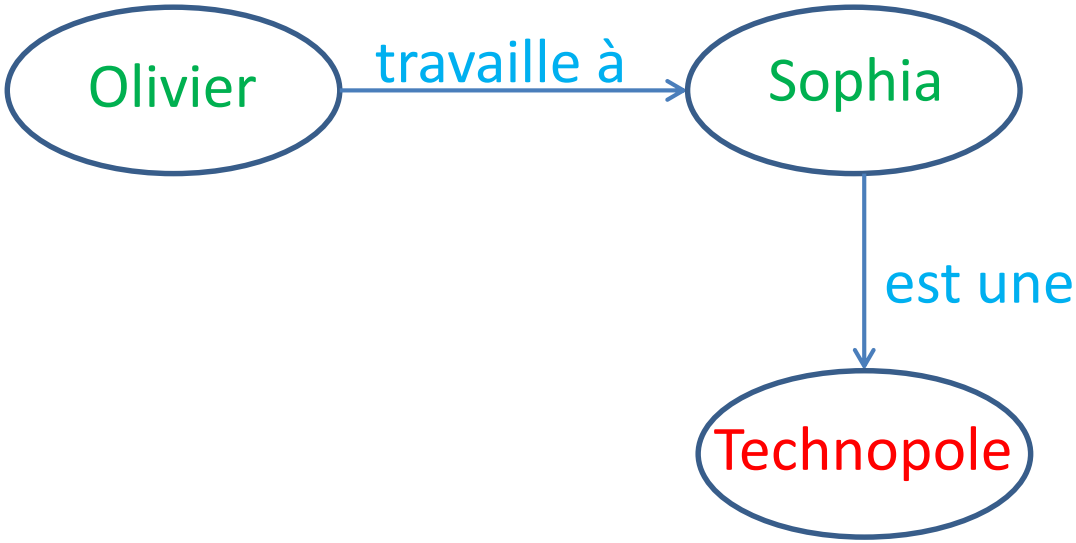
Wimmics Web of Data

1. RDF: Resource Description Framework
2. RDFS: RDF Schema
3. SPARQL: RDF Query Language
4. SPARQL Rule: Inference Rules
5. SPARQL Template: RDF Graph Transformation
6. LDScript : SPARQL based Script Language

RDF: Graphe orienté étiqueté



Graphe étiqueté orienté



Syntaxe Turtle

```
@prefix foaf: <http://xmlns.com/foaf/0.1/>
@prefix ex:   <http://example.org/>

<http://www.inria.fr/olivier.corby>
  foaf:name "Olivier Corby " ;
  ex:workAt <http://example.org/SophiaAntipolis> .
```

Typer les ressources

ex:Olivier rdf:type foaf:Person, ex:Hiker .

ex:SophiaAntipolis rdf:type ex:Technopole .

Graphes nommés

```
graph ex:g1 {
    ex:James a ex:Lecturer ;
        foaf:name "James" .
}

graph ex:g2 {
    ex:James a ex:Musician ;
        foaf:name "Jimmy" .
}
```

RDF Schema

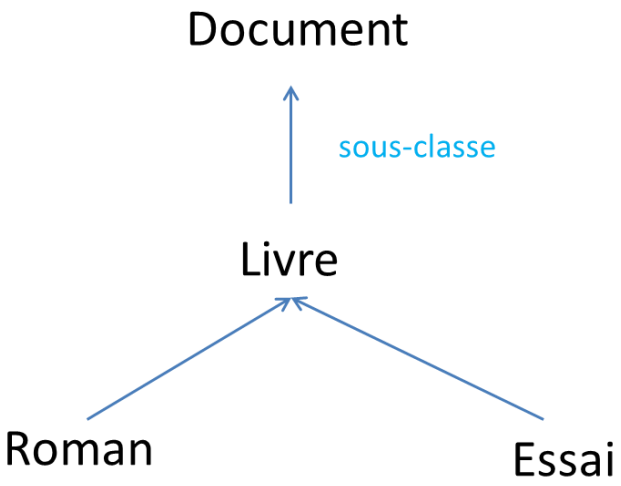
RDFS Class

ex:Document a rdfs:Class .

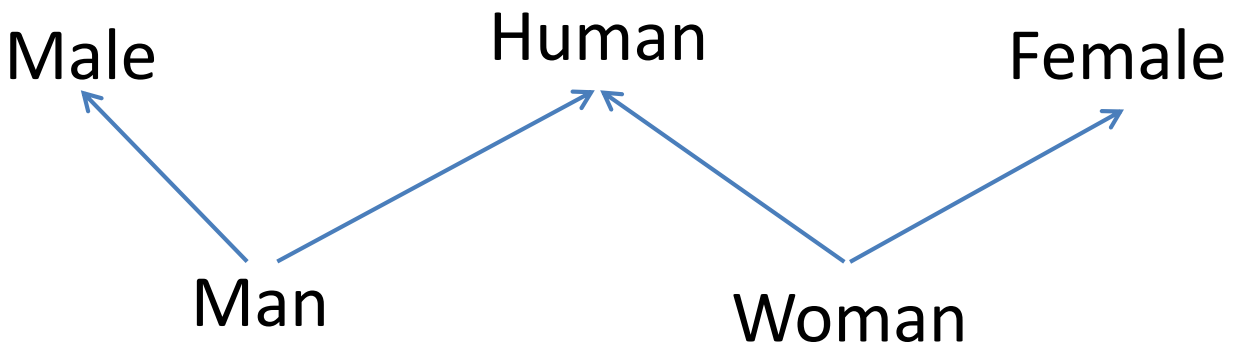
ex:Livre a rdfs:Class ;
 rdfs:subClassOf ex:Document .

ex:Roman a rdfs:Class ;
 rdfs:subClassof ex:Livre .

ex:Essai a rdfs:Class ;
 rdfs:subClassof ex:Livre .



Héritage multiple



ex:Man rdfs:subClassOf ex:Male, ex:Human .

ex:Woman rdfs:subClassOf ex:Female, ex:Human .

RDF Property

```
foaf:knows a rdf:Property ;
        rdfs:domain foaf:Person ; # type du sujet
        rdfs:range foaf:Person .     # type de la valeur
```

SPARQL

SPARQL

```
select *
where {
  ?x a foaf:Person ;
        foaf:name "Olivier"
}
```

SPARQL Property Path

```
select *
where {
  us:Olivier  foaf:knows+  ?y
}
```

SPARQL Construct

```
construct {
        ?x us:subPartOf ?z
}
where {
        ?x us:subPartOf ?y
        ?y us:subPartOf ?z
}
```

SPARQL Service

```
select *
where {
  service <http://fr.dbpedia.org/sparql> {
        ?r rdfs:label "Antibes" @fr ;
                ?p ?y
 }
}
```

SPARQL Update

```
delete { ?x foaf:name ?n }
insert  { ?x rdfs:label ?n }
where { ?x foaf:name ?n }
```

SPARQL Template Transformation Language

STTL

STTL : transformation language for RDF

XSLT : transformation language for XML

- Input RDF graph
- Output Text format
- SPARQL based
- Declarative transformation rules

XSLT - STTL

```
<xsl:template  match="person">
        <xsl:apply-templates select="knows"/>
</xsl:template>
```

```
template { st:apply-templates(?y) }
where { ?in a foaf:Person ; foaf:knows ?y }
```

XSLT -STTL

	XSLT	STTL
Input	XML	RDF
Output	XML	Text
Syntax	XML	SPARQL extension
Template	xsl:template	template {} where {}
Named Template	xsl:template name="test"	template ex:test
Apply templates	xsl:apply-templates	st:apply-templates()
Apply named template	xsl:call-template	st:call-template()
Parameters	xsl:with-param	(?x, ?y)
Numbering	xsl:number	st:number()
Sorting	xsl:sort	order by
Grouping	xsl:for-each-group	group by
Condition	xsl:if	if (exp, then, else)

STTL motivating use cases

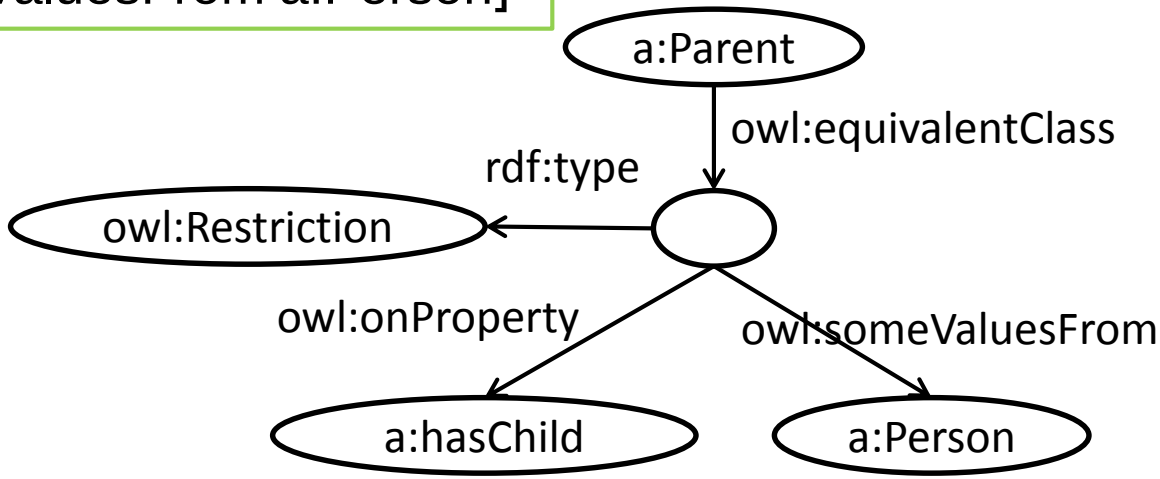
1. Transformation of RDF data from one RDF syntax to another:
   - Turtle
   - RDF/XML
   - JSON LD
2. Presentation of RDF data:
   - RDF to HTML
   - RDF to Latex
   - RDF to Natural Language
   - RDF to graphic format (GML)
3. Transformation of statements in a given language from RDF to another syntax:
   - OWL/RDF to OWL functional syntax
   - SPARQL/RDF (SPIN) to SPARQL syntax
   - AST of *L* in RDF to concrete syntax of *L*
4. Constraint checking
   - OWL Profile: OWL RL
   - SHACL

Example use case: OWL/RDF to OWL/FS

```
a:Parent owl:equivalentClass [ a owl:Restriction ;
                               owl:onProperty a:hasChild;
                               owl:someValuesFrom a:Person]
```

OWL/RDF (Turtle)

STTL transformation




```
EquivalentClasses (a:Parent ObjectSomeValuesFrom(a:hasChild, a:Person) )
```

OWL/Functional Syntax

SPARQL

Query forms

```
SELECT WHERE { GP }
CONSTRUCT { GP } WHERE { GP }
ASK { GP }
DESCRIBE  WHERE { GP }
```

SPARQL Template

Query forms

```
SELECT WHERE { GP }
CONSTRUCT { GP } WHERE { GP }
ASK { GP }
DESCRIBE  WHERE { GP }
```

```
TEMPLATE { Text Pattern } WHERE { GP }
```

SPARQL Template

An additional SPARQL query form:

```
TEMPLATE { Text Pattern } WHERE { GP }
```

with Text Pattern = (VARIABLE | EXP | TEXT)*

RDF to HTML transformation

```
TEMPLATE { format {"<a href=‘%s’>%s</a>"  str(?x) str(?name) } }
WHERE { ?x a foaf:Person ; foaf:name ?name }
```

```
ns:olivier a foaf:Person ; foaf:name "Olivier".
ns:catherine a foaf:Person ; foaf:name "Catherine".
```

```
<a href=‘http://ns.inria.fr/olivier’>Olivier</a>
<a href=‘http://ns.inria.fr/catherine’>Catherine</a>
```

RDF to Turtle transformation

```
TEMPLATE { ?x  " "  rdfs:label  " "  ?name  "." }
WHERE { ?x a foaf:Person ; foaf:name ?name }
```

```
ns:olivier a foaf:Person ; foaf:name "Olivier".
ns:catherine a foaf:Person ; foaf:name "Catherine".
```

```
ns:olivier rdfs:label "Olivier".
ns:catherine rdfs:label "Catherine".
```

STTL: Transformation

A set of templates

```
TEMPLATE { "EquivalentClasses (" ?in " " ?c ")" }
WHERE { ?in owl:equivalentClass ?c }

TEMPLATE { "SubClassOf (" ?in " " ?c ")" }
WHERE { ?in rdfs:subClassOf ?c }

TEMPLATE { "ObjectSomeValuesFrom (" ?p " " ?c ")" }
WHERE { ?in a owl:Restriction ;
        owl:onProperty ?p ;
        owl:someValuesFrom ?c }
```

Template recursive call

```
TEMPLATE { "EquivalentClasses ("
    ?in " " ?c ")" }
WHERE { ?in owl:equivalentClass ?c . }
```

Template recursive call

```
TEMPLATE { "EquivalentClasses ("
    st:apply-templates(?in) " " ?c ")" }
WHERE { ?in owl:equivalentClass ?c . }
```

Template recursive call

```
TEMPLATE { "EquivalentClasses ("
    st:apply-templates(?in) " " st:apply-templates(?c) ")" }
WHERE { ?in owl:equivalentClass ?c . }
```

STTL

1. SPARQL Template Query form
2. Transformation: a set of Templates
3. Extension functions: st:apply-templates, st:call-template

Focus Node ?in

```
template {
        st:apply-templates(?y)
}
where { ?in foaf:knows ?y }
```

Focus Node ?in

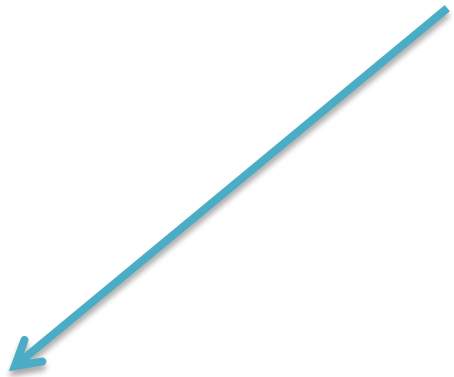
```
template {
        st:apply-templates(?y)
}
where { ?in foaf:knows ?y }

template {}
where {
        ?in a foaf:Person
}
```

Named Template

```
template {
        st:call-template(st:title)
}
where {}
```

Named Template

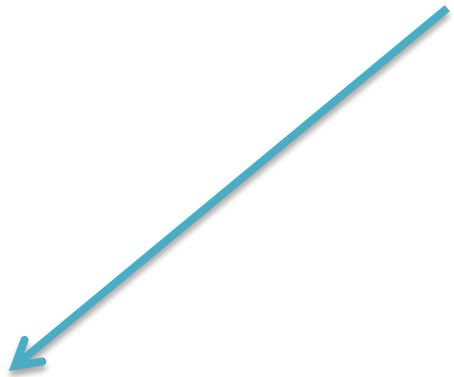
```
template {
        st:call-template(st:title)
}
where {}
```



```
template st:title {}
where {}
```

Named Template

```
template {
        st:call-template(st:title, ?y)
}
where {}
```



```
template st:title (?x) {}
where {}
```

STTL Features

STTL Extension Functions

prefix st: <http://ns.inria.fr/sparql-template/>

st:apply-templates(term)
st:apply-templates-with(transform-uri, term)
st:call-template(template-uri, term)
st:call-template-with(transform-uri, template-uri, term)

st:turtle(term)
st:set(term, term)
st:get(term)

Start template

```
template st:start {
        st:apply-templates(?x)
}
where {
        ?x a foaf:Person
}
```

Priority

template { }

where { }

pragma { st:template st:priority 200 }

Profile template: Declare Functions

```
template st:profile {}
where {}

function st:display(?x) {
  if (isBlank(?x),
        concat("bnode: " , ?x),
        st:turtle(?x))
}
```

Variable Processing

Function st:process processes variables

```
template { ?y }
where { ?in ?p ?y }
```

Compiled into:

```
template { st:process(?y) }
where { ?in ?p ?y }
```

Overloading Variable Processing

```
function st:process(?x) {
  if (isBlank(?x),
        st:apply-templates(?x),
        st:turtle(?x))
}
```

Overloading Template Aggregate

Function st:aggregate aggregates template results

```
function st:aggregate(?x) {
        aggregate(?x, us:merge)
}

function us:merge(?list) {
        apply(rq:and, ?list)
}
```

Template Statements

- Separator
- Format
- Group
- Box
- Loop
- Numbering
- Values Unnest

Separator

```
template {
        ?y
        ;  separator = ", "
}
where {
        ?in foaf:knows ?y
}
```

Format

```
template {
  format  {
        "<h2>%1$s</h2><p>%2$s</p>"

        st:apply-templates(?x)
        st:apply-templates(?y)
  }
}
where {
}
```

External Format

```
template {
  format  {
        <http://example.org/format/test.html>

        st:apply-templates(?x)
        st:apply-templates(?y)
  }
}
where {
}
```

Format Function

st:format(format, exp+)

Group

group { E1 .. En }

::=

group_concat(concat(E1, .. En))

Group

```
template {
        ?in " : " group { ?y }
}
where {
        ?in foaf:knows ?y
}
```

Group

group { E1 .. En ; separator = "--" }

Box

box { E1 .. En }

::=

concat(E1, .. En)

st:nl()

box | sbox | ibox

Box

box: nl(+1) exp nl(-1)

sbox: nl(+1) exp indent(-1)

ibox: indent(+1) exp indent(-1)

Numbering

```
template {
        st:number() " " st:apply-templates(?x)
}
where {
        ?in foaf:knows ?y
}
order by ?x
```

Values Unnest

- Extend SPARQL values with expressions

```
template { }
where {
        values  ?val  {  unnest (exp)  }
}
```

Constraint Checking with STTL

- OWL Profile checking
  - OWL ontology conforms to OWL RL ?
- SHACL Validation
  - RDF Graph conforms to SHAPE ?

Constraint Checking with STTL

- Template returns a boolean true/false whether a constraint is verified/not verified
- Aggregate operator is boolean AND

SHACL Validation

```
template { ?suc }
where {
        graph sh:shape {
                ?sh sh:property [
                        sh:path ?p ; sh:class ?c ]
        }
        values ?val { unnest(sh:path(?in, ?p)) }
        bind (exists { ?val rdf:type/rdfs:subClassOf* ?c }
        as ?suc)
}
```

Compiling STTL

template { E1 .. En }
where {}

compiled as :

select (concat(cp(E1), .. cp(En)) as ?out)
where {}
+
aggregate(Ω, group_concat, ?out)

STTL Compilation

cp(Var(x)) = st:process(x)

Default:

st:process(?x) = st:turtle(?x)

Overloaded:

```
function st:process(?x) {
  st:apply-templates(?x)
}
```

LDScript: Linked Data Script Language

LDScript: Linked Data Script Language

- Simple language to define extension functions
- For SPARQL and STTL
- On top of SPARQL Filter language

Function Definition

```
function us:fac(?n) {
  if (?n = 0, 1, ?n * us:fac(?n – 1))
}
```

Locable Variable

```
let (?x = us:foo(?y)) {
        us:bar(?x)
}
```

List datatype

```
xt:list(1, 2, 3)

let (?l = @(1 2 3)) {
}

xt:iota(5) = xt:list(1, 2, 3, 4, 5)
```

Iterator

```
for (?x in ?list) {
}

map(us:fun, ?list)
maplist(us:fun, ?list)
mapfind(us:test, ?list)
mapfindlist(us:test, ?list)
```

LDScript & SPARQL Query

```
let (?sol = select * where { ?x foaf:knows ?y}){



}
```

LDScript & SPARQL Query

```
let (?sol = select * where { ?x foaf:knows ?y}){
        for ((?x, ?y) in ?sol) {
                xt:display(?x, ?y)
        }
}
```

LDScript & SPARQL Query

```
let (?g = construct where { ?x foaf:knows ?y}){



}
```

LDScript & SPARQL Query

```
let (?g = construct where { ?x foaf:knows ?y}){
        for ((?s, ?p, ?o) in ?g) {
                xt:display(?s, ?o)
        }
}
```

STTL Transformations

1.	RDF to Turtle	st:turtle
2.	RDF to RDF/XML	st:rdfxml
3.	RDF to JSON-LD	st:jsonld
4.	OWL to Functional Syntax	st:owl
5.	SPIN to SPARQL	st:spin
6.	SPARQL Query Result	st:sparql
7.	SPARQL Tutorial	st:web
8.	DBpedia Navigator	st:navlab
9.	Wikipedia Edit History Navigator	st:dbedit
10.	Calendar	st:calendar
11.	History Timeline	
12.	Sudoku (1 template)	
13.	OWL Profile check	st:owlrl
14.	SHACL Validation	st:dsmain

Usage

Create a directory e.g. sttl

Write one template per file in sttl, with extension .rq

Use:

st:apply-templates-with("/home/myself/sttl/")

Use in Java:

```
Transformer t = Transformer.create(g, "/home/myself/sttl/");
String str = t.transform();
```

STTL development environment

Corese/KGRAM 3.1 – Wimmics INRIA I3S – 2015-05-01

File Edit Engine Debug Query Template Explain ?

System | Query1 × | +

Query | Validate | to SPIN | to SPARQL | Prove | Trace | Search | Refresh stylesheet | Default stylesheet

```
template {
  st:apply-templates-with(st:owl)
}
where {
}
```

Graph | XML | Validate

```
Ontology(<http://example.com/owl/families>

Import(<http://example.org/otherOntologies/families.owl>)

SubClassOf(Annotation(rdfs:comment "States that every man is a person."@en)
<http://example.com/owl/families/Man> <http://example.com/owl/families/Person>)

SubClassOf(
  ObjectIntersectionOf(
    ObjectOneOf(<http://example.com/owl/families/Mary> <http://example.com/owl/families/Bill> <http://example.com/owl/families/Meg>) <
  ObjectIntersectionOf(<http://example.com/owl/families/Parent>
    ObjectMaxCardinality(1 <http://example.com/owl/families/hasChild>)
    ObjectAllValuesFrom(<http://example.com/owl/families/hasChild> <http://example.com/owl/families/Female>))
)

DisjointClasses(<http://example.com/owl/families/Woman> <http://example.com/owl/families/Man>)

DisjointClasses(<http://example.com/owl/families/Mother> <http://example.com/owl/families/Father> <http://example.com/owl/families/Your

NegativeObjectPropertyAssertion(<http://example.com/owl/families/hasWife> <http://example.com/owl/families/Bill> <http://example.com/ov

NegativeDataPropertyAssertion(<http://example.com/owl/families/hasAge> <http://example.com/owl/families/Jack> "53"^^xsd:integer)

NegativeObjectPropertyAssertion(<http://example.com/owl/families/hasDaughter> <http://example.com/owl/families/Bill> <http://example.co

Declaration(Class(<http://example.com/owl/families/Adult>))
```

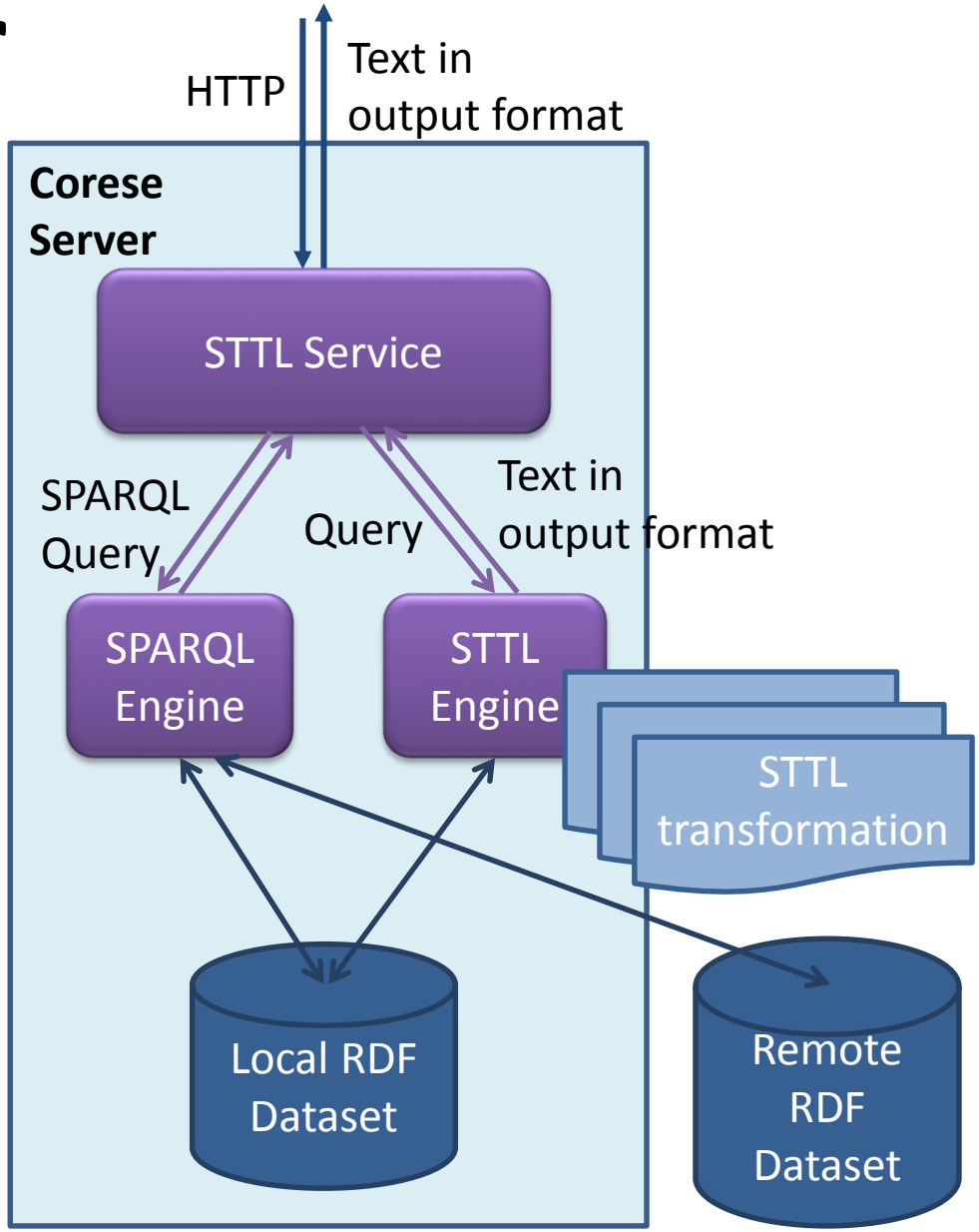
Application

STTL engine

available in the Corese Semantic Web Factory

- Free download: http://wimmics.inria.fr/corese
  - SPARQL engine
  - STTL engine
  - Standalone environment to develop transformation
  - SPARQL endpoint
  - STTL server
- Web Server

STTL Server


HTTP
Text in
output format
Corese
Server
STTL Service
SPARQL
Query
Query
Text in
output format
SPARQL
Engine
STTL
Engine
STTL
transformation
Local RDF
Dataset
Remote
RDF
Dataset

Workflow

1. SPARQL Query → Result → Transformation → HTML
2. Service SPARQL Query → Result → Transformation → HTML
3. Transformation(Graph) → HTML
4. Transformation(Graph, URI) → HTML
5. Transformation avec clause service e.g. à DBpedia (long, lat)

Example

http://corese.inria.fr/srv/template?
uri=http://fr.dbpedia.org/resource/Auguste&
profile=st:dbpedia

```
profile st:dbpedia :
    query = construct where {
        bind (st:get(st:uri) as ?uri)
        service <http://fr.dbpedia.org/sparql> {
        ?uri rdfs:label ?l ; … }}
    transform = st:navlab
```

Corese Web Server Demo

localhost:8080

Corese | SPARQL Tutorial | SPARQL-SPIN Converter | OWL | Others | Sudoku Solver

CORESE Web Server

Corese is a Semantic Web Factory implementing RDF, RDFS, SPARQL and Inference Rules. This site presents demos of Semantic Web servers and Linked Data Navigators designed with SPARQL Template Transformation Language.

Linked data browsers

Louis XIV de France
(1638 - 1715)

Auguste (dbpeida fr)

Auguste (dbpedia)

Emmanuel-Philibert de Savoie
(1528-1580)

Places
(Nice)

History
(XIVe Siècle)

Online services

SPARQL Query

Server

```
select * where {
 ?x ?p ?y
}
```

Query

DBpedia Query

STD

```
select * where {
 service <http://fr.dbpedia.org/sparql> {
  <http://fr.dbpedia.org/resource/Antibes> ?p ?y
 }
}
limit 10
offset 10
```

Query

Self Service

RDF graph URI:

Format:

st:turtle

Transform

Contact: Olivier Corby

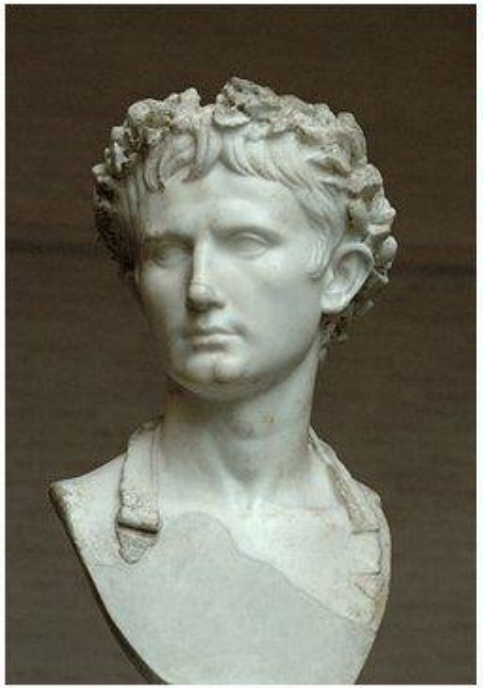
Designed by Fuqi Song using Simplex css style

Corese Web Server

corese.inria.fr/srv/template?uri=http://fr.dbpedia.org/resource/Auguste&profile=st:dbpedia

Corese | SPARQL Tutorial | SPARQL-SPIN Converter | OWL | Others | Sudoku Solver

Auguste



Naissance	-63-09-23+02:00
Décès	14-08-19+02:00
Prédécesseur	Jules César
Successeur	Tibère
Père	Gaius Octavius
Mère	Atia Balba Caesonia
Conjoints	Scribonia (épouse d'Octavien) Clodia Pulchra Livie
Enfants	Julia Caesaris filia
Résumé	Auguste, né sous le nom de Caius Octavius le 23 septembre 63 av. J.-C. à Rome, d'abord appelé Octave puis Octavien, porte le nom de Imperator Caesar Divi Filius Augustus à sa mort le 19 août 14 ap. J.-C. à Nola. Il est le premier empereur romain, du 16 janvier 27 av. J.-C. au 19 août 14 ap. J.-C.Issu d'une ancienne et riche famille de rang équestre appartenant à la gens plébéienne des Octavii, il devient fils adoptif posthume de son grand-oncle maternel Jules César en 44 av.
Wikipedia	http://fr.wikipedia.org/wiki/Auguste
DBpedia	http://fr.dbpedia.org/resource/Auguste

Contact: Olivier Corby

Designed by Fuqi Song using Simplex css style

Corese Web Server Demo – Mozilla Firefox

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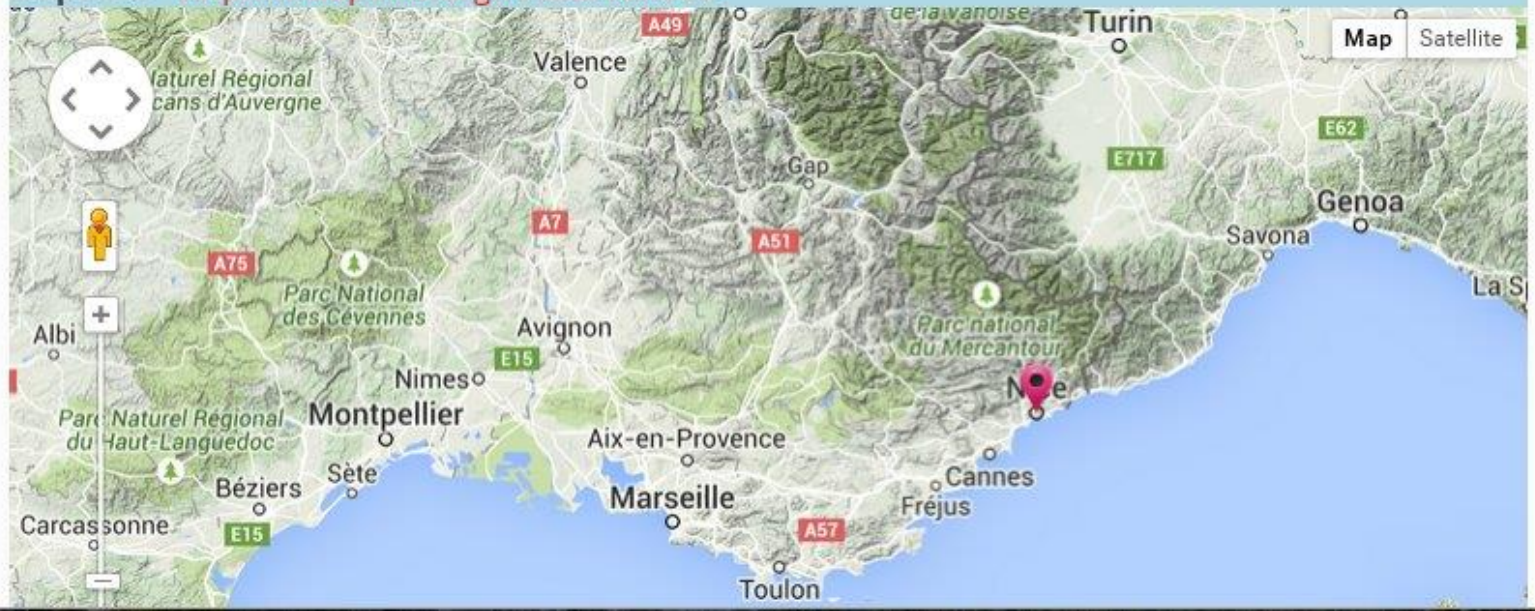
Corese Web Server Demo

corese.inria.fr/srv/template?uri=http://fr.dbpedia.org/res

Nord	Colomars Falicon Saint-André-de-la-Roche
Nord Est	La Trinité (Alpes-Maritimes)
Est	Villefranche-sur-Mer
Sud Est	
Sud	
Sud Ouest	
Ouest	Saint-Jeannet (Alpes-Maritimes) La Gaude
Nord Ouest	Gattières
Latitude	43.6959
Longitude	7.27141
Wikipedia	http://fr.wikipedia.org/wiki/Nice
DBpedia	http://fr.dbpedia.org/resource/Nice



Corese Web Server

corese.inria.fr/srv/template?uri=http://ns.inria.fr/sparql-template/date/01/2002&profile=st:d

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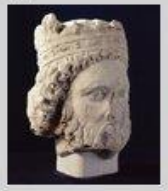
DBpedia History 01/2002

01/2001 << 12/2001 << 01/2002 >> 02/2002 >> 01/2003

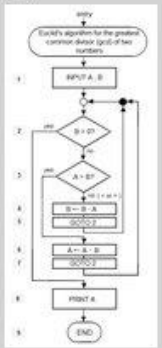
1

Clotaire Ier (2)



John McCarthy (2)

Algorithmique (1)



Carl Sagan (1)

Dagobert Ier (1)

2

Espéranto (1)

GNU (1)

Iron Maiden (1)

Lisp (1)

Linus Torvalds (1)

3

Blanc d'œuf (1)

Modèle standard (physique des particules) (1)

Tourisme (1)

Corese Web Server

corese.inria.fr/srv/template?transform=st:calendar

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2015 - 2016 - 2017

January

Mo	Tu	We	Th	Fr	Sa	Su
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

February

Mo	Tu	We	Th	Fr	Sa	Su
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29						

March

Mo	Tu	We	Th	Fr	Sa	Su
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

April

Mo	Tu	We	Th	Fr	Sa	Su
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

May

Mo	Tu	We	Th	Fr	Sa	Su
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

June

Mo	Tu	We	Th	Fr	Sa	Su
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

July

Mo	Tu	We	Th	Fr	Sa	Su
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

August

Mo	Tu	We	Th	Fr	Sa	Su
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

September

Mo	Tu	We	Th	Fr	Sa	Su
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

October

Mo	Tu	We	Th	Fr	Sa	Su
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

November

Mo	Tu	We	Th	Fr	Sa	Su
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

December

Mo	Tu	We	Th	Fr	Sa	Su
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Calendar generated by a STTL transformation 2016-02-23T14:24:13

Corese Semantic Web Server – Mozilla Firefox

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Corese Semantic Web Server

corese.inria.fr/process/test?uri=/data/primer.owl&tra

Load: /data/primer.owl
Transform: st:owl

Result

```
Ontology(<http://example.com/owl/families>

Import(<http://example.org/otherOntologies/families.owl>)

SubClassOf(Annotation(rdfs:comment "States that every man is a person.")
<http://example.com/owl/families/Man> <http://example.com/owl/families/Person>)

SubClassOf(
  ObjectIntersectionOf(
    ObjectOneOf(<http://example.com/owl/families/Mary> <http://example.com
/owl/families/Bill> <http://example.com/owl/families/Meg>) <http://example.com
/owl/families/Female>)
  ObjectIntersectionOf(<http://example.com/owl/families/Parent>
    ObjectMaxCardinality(1 <http://example.com/owl/families/hasChild>)
    ObjectAllValuesFrom(<http://example.com/owl/families/hasChild>
<http://example.com/owl/families/Female>))
)

DisjointClasses(<http://example.com/owl/families/Woman> <http://example.com
/owl/families/Man>)

DisjointClasses(<http://example.com/owl/families/Mother> <http://example.com
/owl/families/Father> <http://example.com/owl/families/YoungChild>)

NegativeObjectPropertyAssertion(<http://example.com/owl/families/hasWife>
<http://example.com/owl/families/Bill> <http://example.com/owl/families/Mary>)

NegativeDataPropertyAssertion(<http://example.com/owl/families/hasAge>
<http://example.com/owl/families/Jack> "53"^^xsd:integer)

NegativeObjectPropertyAssertion(<http://example.com/owl/families/hasDaughter>
<http://example.com/owl/families/Bill> <http://example.com/owl/families/Susan>)

Declaration(Class(<http://example.com/owl/families/Adult>))

EquivalentClasses(<http://example.com/owl/families/Adult> <http://example.org
/otherOntologies/families/Grownup>)

Declaration(Class(<http://example.com/owl/families/ChildlessPerson>))

EquivalentClasses(<http://example.com/owl/families/ChildlessPerson>
```

Generated by SPARQL Template Transformation using Corese 2015-05-11T10:48:00

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Corese Web Server Demo

corese.inria.fr/srv/tutorial/rdf

Google

Corese SPARQL Tutorial SPARQL-SPIN Converter OWL Others Sudoku Solver

SPARQL Tutorial

Select a query

Previous 13. Count Next

Count

Compter le nombre de solutions avec un opérateur d'aggrégation.
(http://www.w3.org/TR/sparql11-query/#aggregates)

Solution Template submit

```
prefix h: <http://www.inria.fr/2015/humans#>
select (count(*) as ?c) where {
  ?x ?p ?y
}
```

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Corese Web Server Demo

corese.inria.fr/srv/sdk

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SPARQL Sudoku Solver

1	2	3	4	5	6	7	8	9
4	5	6	7	8	9	1	2	3
7	8	9	1	2	3	4	5	6
2	1	4	3	6	5	8	9	7
3	6	5	8	9	7	2	1	4
8	9	7	2	1	4	3	6	5
5	3	1	6	4	2	9	7	8
6	4	2	9	7	8	5	3	1
9	7	8	5	3	1	6	4	2

Submit Reset

Generated by Corese server using SPARQL Template Transformation.
2015-06-30T16:18:58

Conclusion

- STTL Transformation Language for RDF
- Based on SPARQL
- XSLT like

TP

Navigateur hypertexte HTML pour le Web de données