

NIST 15926 Conformance Testing Project Status

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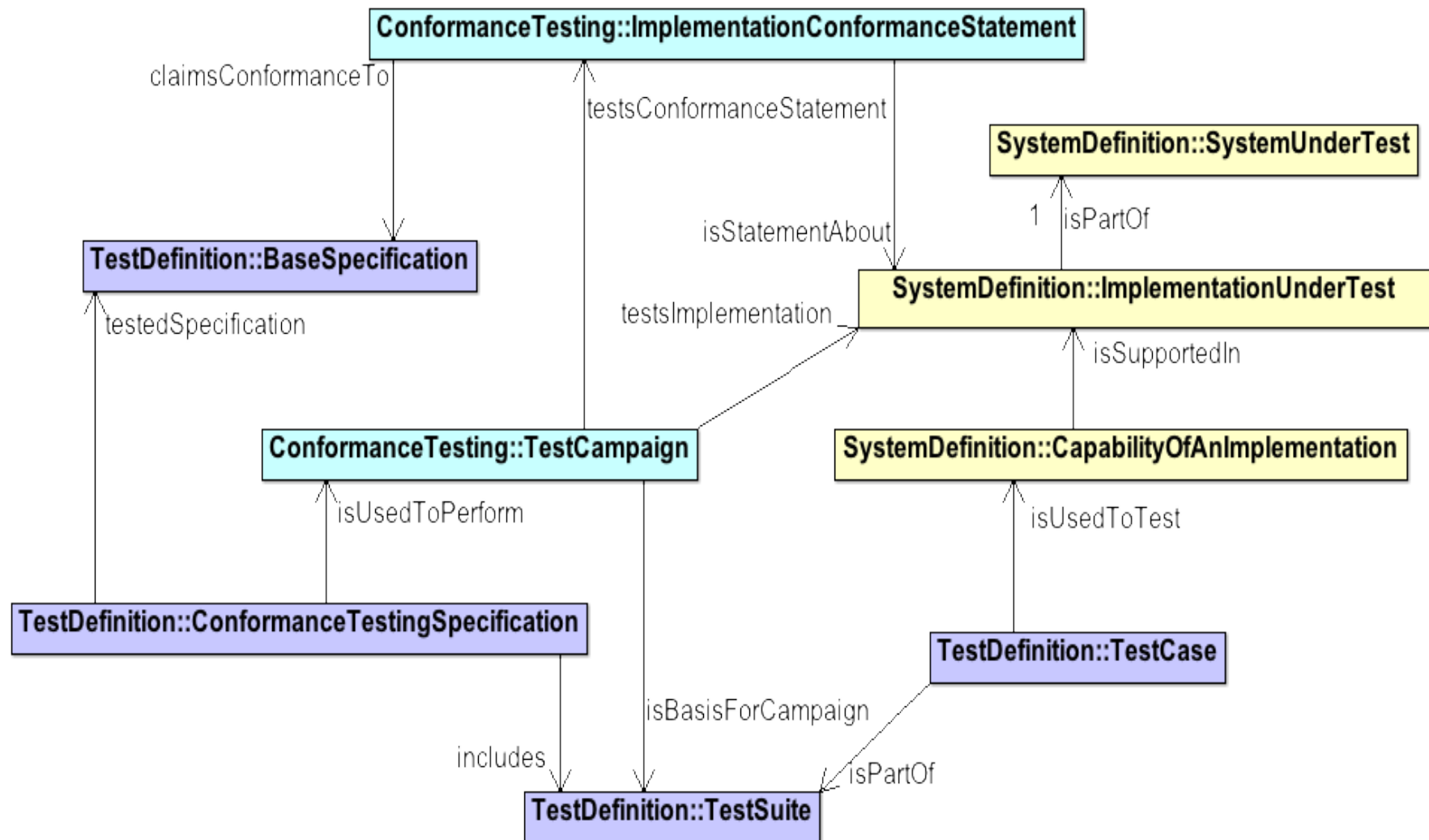
EDRC Technical Team Call

Agenda

- Vocabulary for conformance testing reminder
- Test case release 1.0
- Technical testing approaches
- Conclusion

Vocabulary for conformance testing

1. A **base specification** is created, often by a standards-developing organization, against which conformance can be claimed.
2. A **testing specification** is created to test implementations of that standard.
3. The testing specification is composed of **test suites** that are composed of **test cases**.
4. A **system** is composed of **implementations** that are composed of **capabilities**, some or all of which are claimed to conform to the standard.
5. A set of **test campaigns** are performed to test those claims.



For EDRC

- Base specification : PCA RDL data model, Part 8 template model, specific templates and RD for Data Sheets
- Test Case, Test Suite
 - EDRC Use Case 1 – granular complete coverage in 20 test cases
 - EDRC Use Case 2 Annex E example as one file as a start
- Test Specification
 - Test suite plus testing means : recommend use of RDF query language called SPARQL as test means
- Test Campaign
 - Export to file, run SPARQL over file
 - Import from file 1) human review in tool and 2) export and test

Atomic test case breakdown

- Driven from Use Case 1 table of contents

General Information Section

Project Information, Tag Number and Document Data

Job Number

Item Number

Revision Number

Date

Operating Conditions Section

Properties

Normal Capacity

Other Capacity

Property Templates

Capacity Normal

Capacity Other

Capacity Rated

Suction Pressure Max

Suction Pressure Rated

Discharge Pressure

Differential Pressure

Differential Head

NPSHA

Process Variations

Starting Conditions

Service Continuous

Service Intermittent

Starts Per Day

Parallel Operations Required

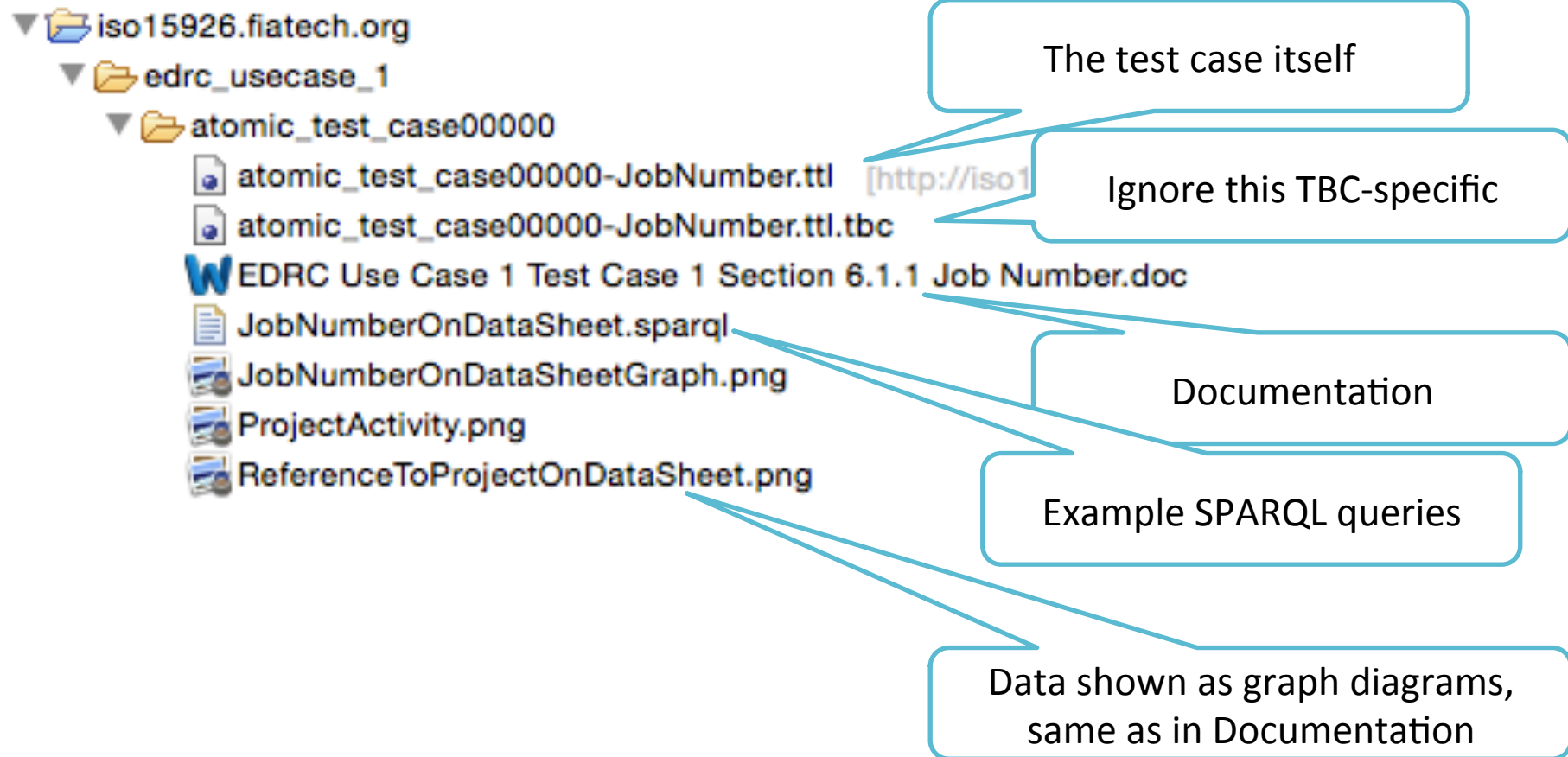
Test Case Format

- An OWL Turtle file containing the test case data
 - A test case may owl:import another test case
 - Is Turtle RDF encoding ok, or is RDF/XML always needed by EDRC team vendors?
- Some OWL Turtle files containing new RD
- A word document with explanation, comment and any questions
- SPARQL query file(s)
- Instance diagram graph figure(s)

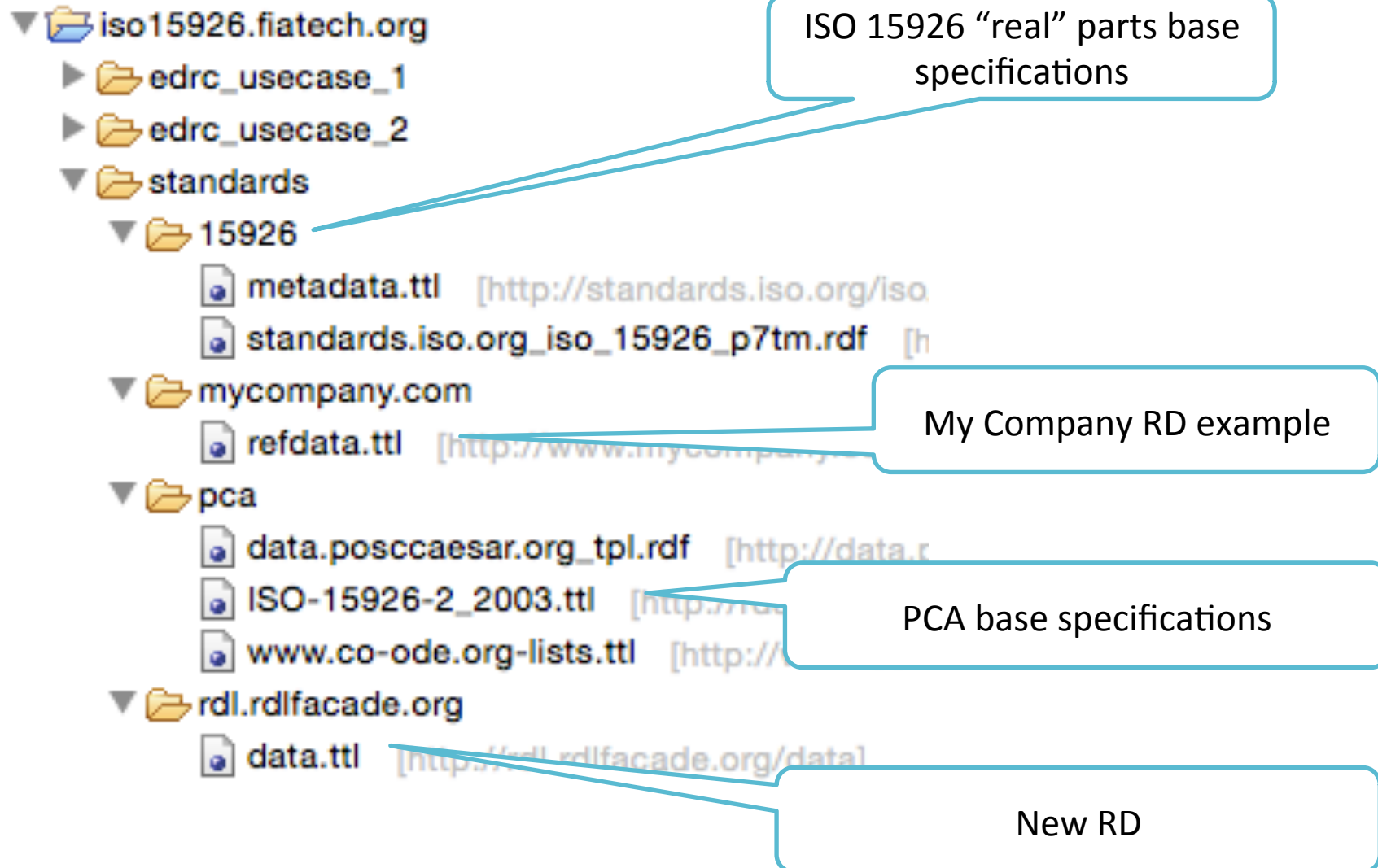
Reference Data for Test Cases

- Published PCA RDL as found at
 - <http://data.posccaesar.org/rdl/>
- “New” RD required for the test cases that should eventually be in PCA (I think), base URI for now is
 - <http://rdl.rdlfacade.org/data>
- “New” RD company-specific example, base URI is
 - <http://www.mycompany.com/iso15926/edrc/refdata>
- Atomic test case 00004 data is enumerated class, unclear if this is considered RD.

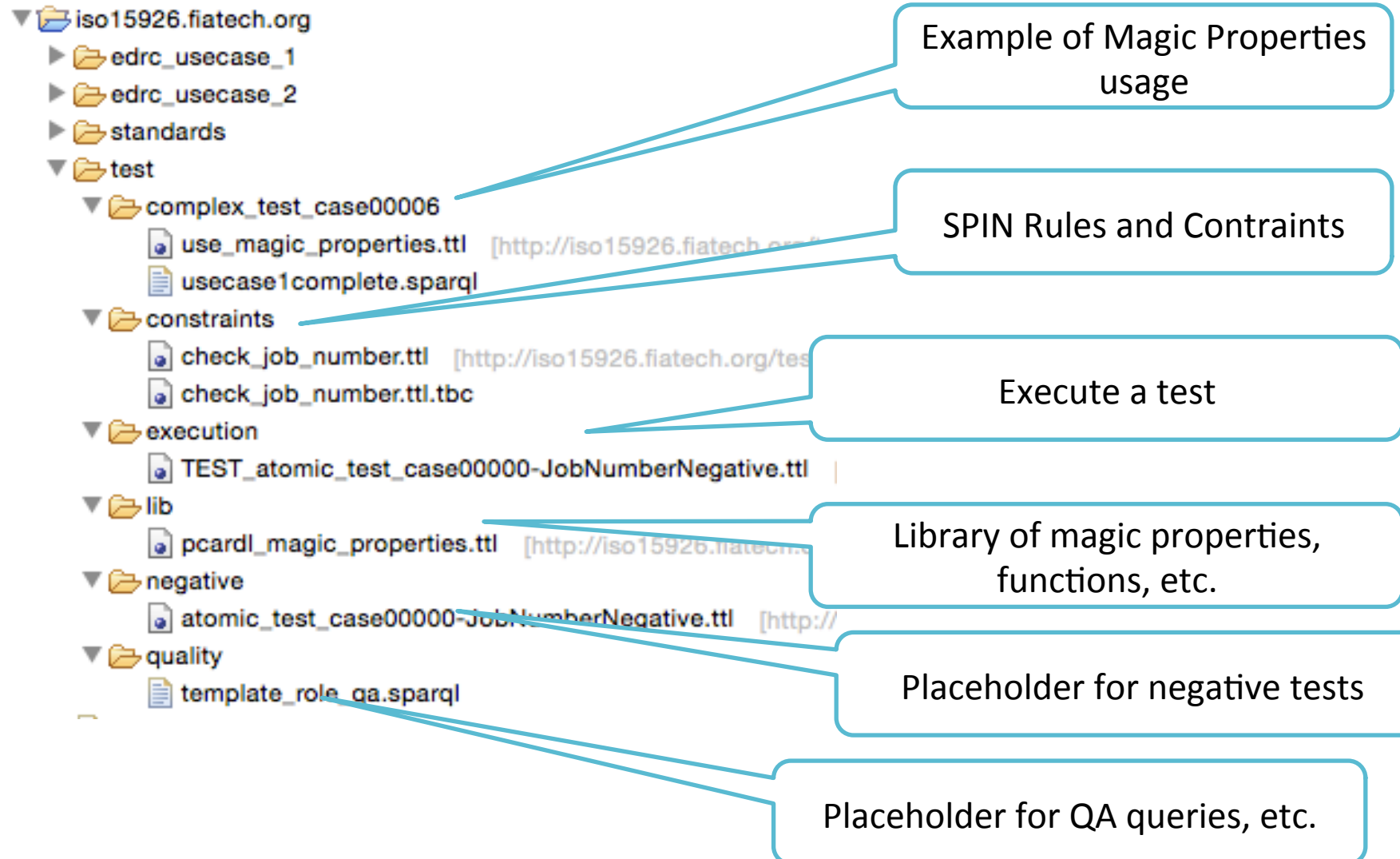
Use Case 1 Test Case(s) Folder Contents : Atomic and Complex



“standards” Folder Contents



“test” Folder Contents



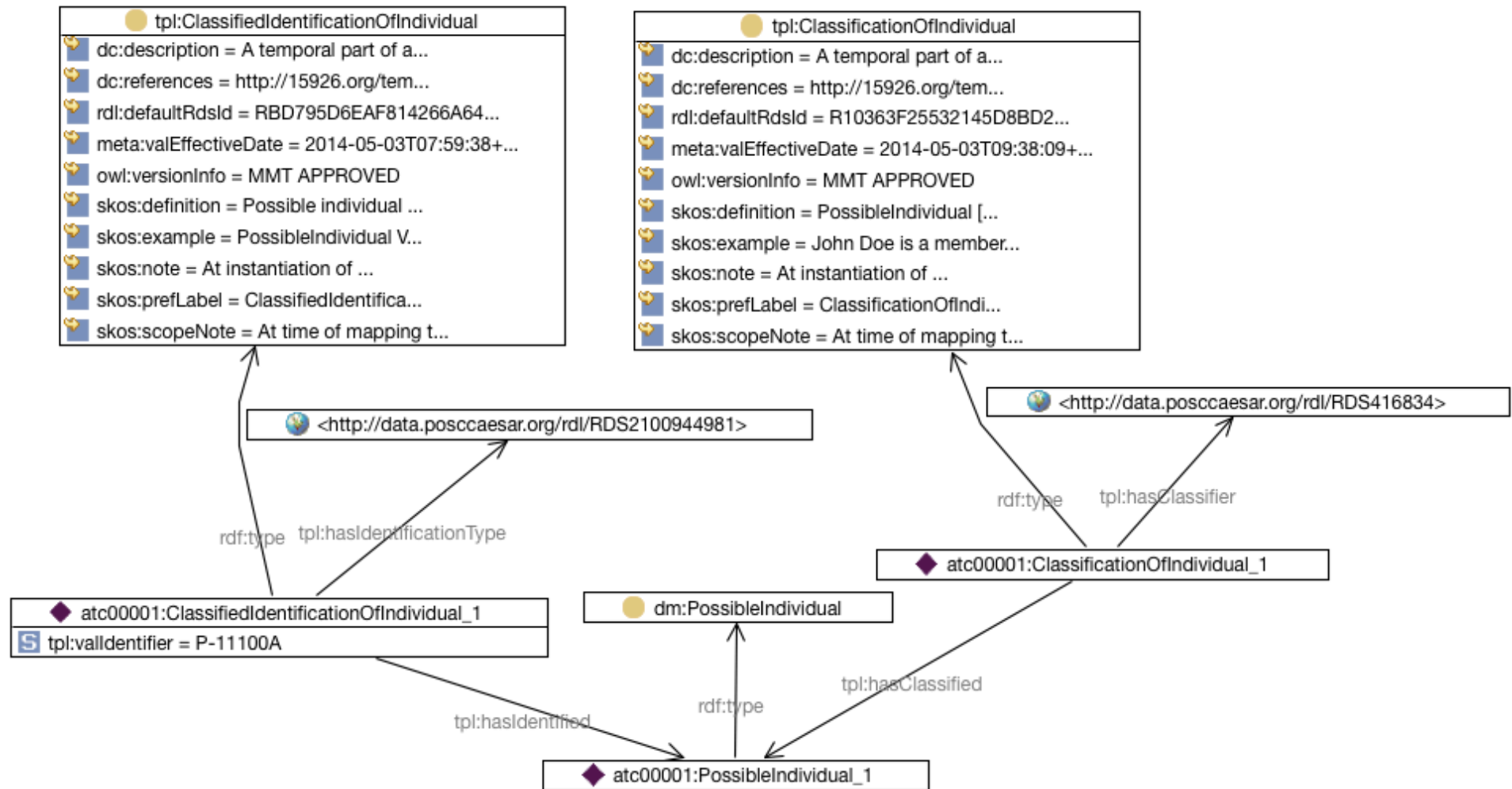
Atomic test case example ttl – Item Number

```
# baseURI: http://iso15926.fiatech.org/edrc_usecase_1/atomic_test_case00001-ItemNumber
# imports: http://data.posccaesar.org/tpl/

@prefix atc00001: <http://iso15926.fiatech.org/edrc_usecase_1/atomic_test_case00001-ItemNumber#> .
@prefix dm: <http://rds.posccaesar.org/2008/02/OWL/ISO-15926-2_2003#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix tpl: <http://data.posccaesar.org/tpl/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

<http://iso15926.fiatech.org/edrc_usecase_1/atomic_test_case00001-ItemNumber>
  rdf:type owl:Ontology ;
  owl:imports tpl: ;
  owl:versionInfo "Created with TopBraid Composer"^^xsd:string ;
  rdfs:comment "EDRC Use Case 1 Section 6.1.2 Item Number"^^xsd:string ;
.
atc00001:ClassificationOfIndividual_1
  rdf:type tpl:ClassificationOfIndividual ;
  tpl:hasClassified atc00001:PossibleIndividual_1 ;
  rdfs:label "Pump is CENTRIFUGAL PUMP"^^xsd:string ;
  rdfs:comment "EDRC Use Case 1 Section 6.1.2 Item Number"^^xsd:string ;
  tpl:hasClassifier <http://data.posccaesar.org/rdl/RDS416834> ;
.
atc00001:ClassifiedIdentificationOfIndividual_1
  rdf:type tpl:ClassifiedIdentificationOfIndividual ;
  tpl:hasIdentificationType <http://data.posccaesar.org/rdl/RDS2100944981> ;
  tpl:hasIdentified atc00001:PossibleIndividual_1 ;
  rdfs:label "Pump P-11100A"^^xsd:string ;
  tpl:valIdentifier "P-11100A"^^xsd:string ;
  rdfs:comment "EDRC Use Case 1 Section 6.1.2 Item Number"^^xsd:string ;
.
atc00001:PossibleIndividual_1
  rdf:type dm:PossibleIndividual ;
  rdfs:comment "EDRC Use Case 1 Section 6.1.2 Item Number"^^xsd:string ;
  rdfs:label "Pump"^^xsd:string ;
.
```

Item Number data as graph diagram



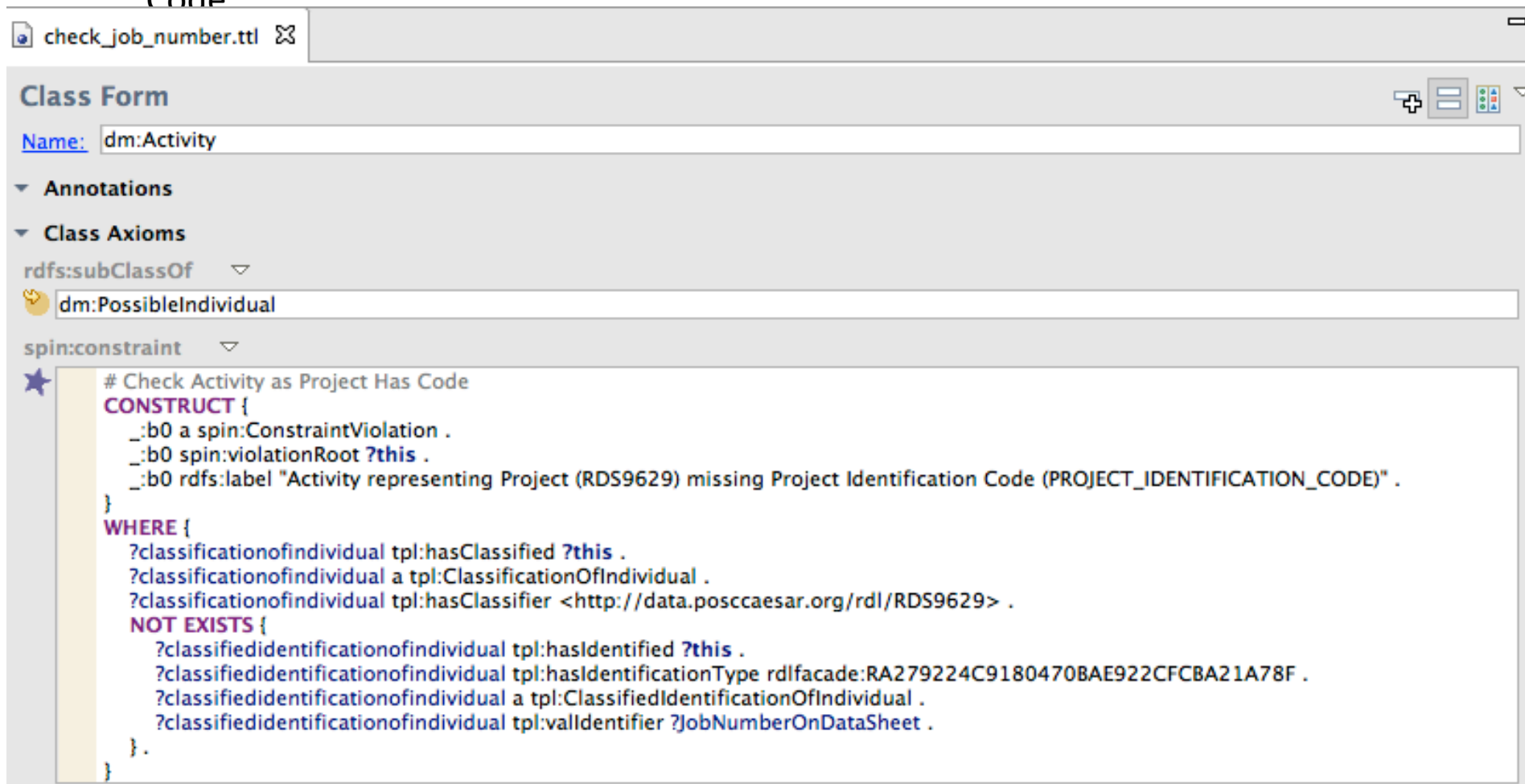
Technical testing

- A few possibilities for performing tests
 - Use pure SPARQL query producing a SPARQL result set
 - Use SPIN Constraint and/or SPIN Rule
 - Write software that performs testing (e.g. Ruby using RDF.rb)

Example SPIN constraint :

Check Activity as Project has Id Code

- Report error if Activity that is a Project BUT does not have a Project Identification Code



The screenshot shows a web-based editor for a SPIN constraint. The browser tab is titled 'check_job_number.ttl'. The main window has a title bar 'Class Form' and a toolbar with icons for adding, deleting, and saving. The 'Name' field is set to 'dm:Activity'. Under the 'Annotations' section, there are no annotations. Under the 'Class Axioms' section, the 'rdfs:subClassOf' property is set to 'dm:PossibleIndividual'. The 'spin:constraint' section is expanded, showing a constraint with a star icon on the left. The constraint text is as follows:

```
# Check Activity as Project Has Code
CONSTRUCT {
  _b0 a spin:ConstraintViolation .
  _b0 spin:violationRoot ?this .
  _b0 rdfs:label "Activity representing Project (RDS9629) missing Project Identification Code (PROJECT_IDENTIFICATION_CODE)" .
}
WHERE {
  ?classificationofindividual tpl:hasClassified ?this .
  ?classificationofindividual a tpl:ClassificationOfIndividual .
  ?classificationofindividual tpl:hasClassifier <http://data.posccaesar.org/rdl/RDS9629> .
  NOT EXISTS {
    ?classifiedidentificationofindividual tpl:hasIdentified ?this .
    ?classifiedidentificationofindividual tpl:hasIdentificationType rdf:uri:RA279224C9180470BAE922CFCBA21A78F .
    ?classifiedidentificationofindividual a tpl:ClassifiedIdentificationOfIndividual .
    ?classifiedidentificationofindividual tpl:valIdentifier ?JobNumberOnDataSheet .
  } .
}
```


Example SPIN constraint :

Check full path Activity to Datasheet

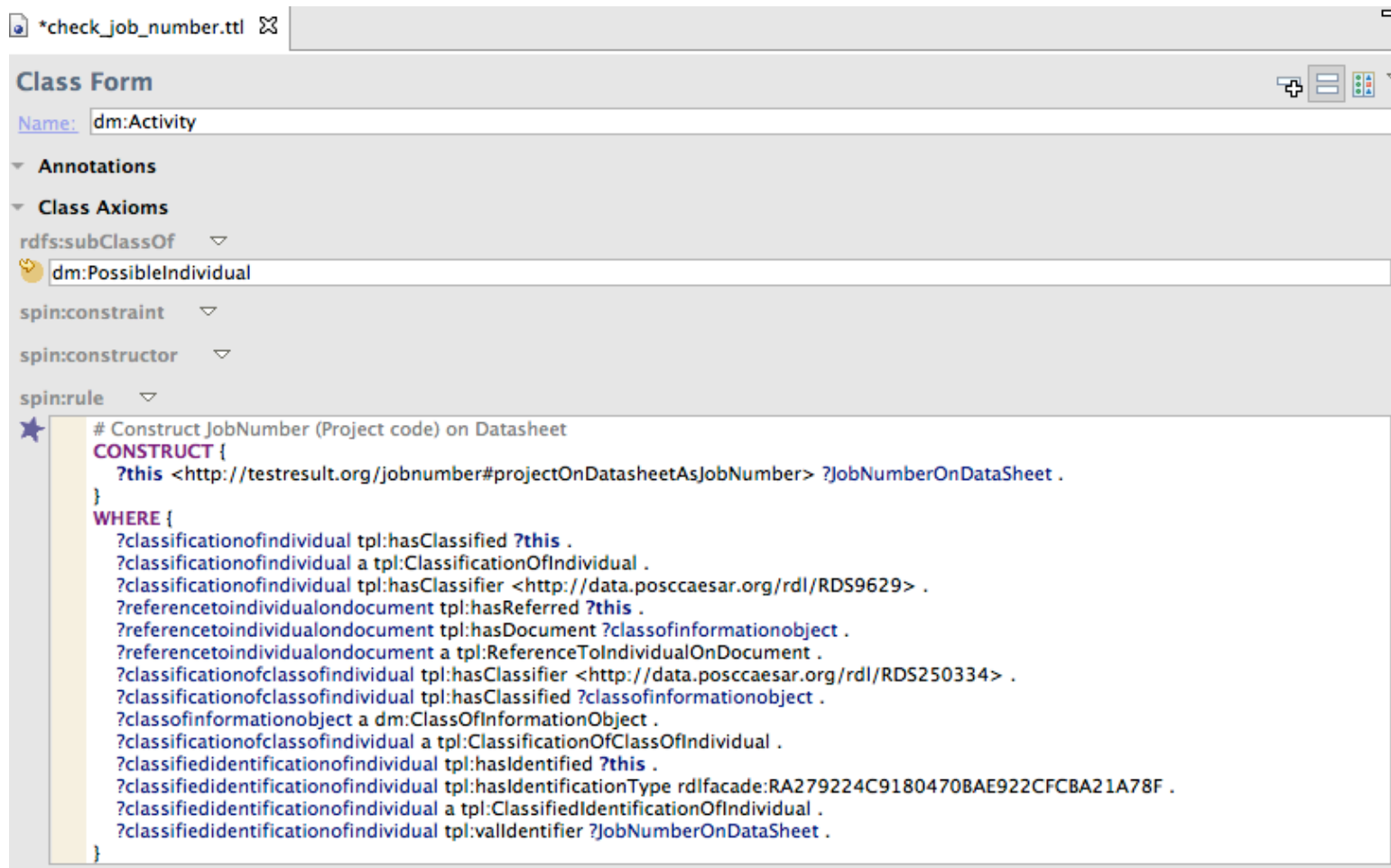
- Report error if Activity that is a Project and has a Project Identification Code BUT is not referenced on a ClassOfInformationObject that is a Datasheet

```
# Check full path Activity to Datasheet
CONSTRUCT {
  _:b0 a spin:ConstraintViolation .
  _:b0 spin:violationRoot ?this .
  _:b0 rdfs:label "Activity representing Project (RDS9629) with Project Identification Code (PROJECT_IDENTIFICATION_CODE) not on a Data Sheet (RDS250334)" .
}
WHERE {
  ?classificationofindividual tpl:hasClassified ?this .
  ?classificationofindividual a tpl:ClassificationOfIndividual .
  ?classificationofindividual tpl:hasClassifier <http://data.posccaesar.org/rdl/RDS9629> .
  ?classifiedidentificationofindividual tpl:hasIdentified ?this .
  ?classifiedidentificationofindividual tpl:hasIdentificationType rdl:facade:RA279224C9180470BAE922CFCBA21A78F .
  ?classifiedidentificationofindividual a tpl:ClassifiedIdentificationOfIndividual .
  ?classifiedidentificationofindividual tpl:valIdentifier ?JobNumberOnDataSheet .
NOT EXISTS {
  ?referencetoindividualondocument tpl:hasReferred ?this .
  ?referencetoindividualondocument tpl:hasDocument ?classofinformationobject .
  ?referencetoindividualondocument a tpl:ReferenceToIndividualOnDocument .
  ?classificationofclassofindividual tpl:hasClassifier <http://data.posccaesar.org/rdl/RDS250334> .
  ?classificationofclassofindividual tpl:hasClassified ?classofinformationobject .
  ?classofinformationobject a dm:ClassOfInformationObject .
  ?classificationofclassofindividual a tpl:ClassificationOfClassOfIndividual .
}
}.
```


Example SPIN rule :

Construct Job Number (Project code) on Datasheet

- Construct JobNumberOnDataSheet value from Activity that is a Project and has a Project Identification Code and is referenced on a ClassOfInformationObject that is a Datasheet



The screenshot shows a software interface for editing a SPIN rule. The title bar indicates the file is `*check_job_number.ttl`. The main window is titled "Class Form" and displays the class `dm:Activity`. Below the class name, there are sections for "Annotations", "Class Axioms", and "spin:rule". The "spin:rule" section is expanded, showing a rule with a comment: "# Construct JobNumber (Project code) on Datasheet". The rule is defined as follows:

```
CONSTRUCT {  
  ?this <http://testresult.org/jobnumber#projectOnDatasheetAsJobNumber> ?JobNumberOnDataSheet .  
}  
WHERE {  
  ?classificationofindividual tpl:hasClassified ?this .  
  ?classificationofindividual a tpl:ClassificationOfIndividual .  
  ?classificationofindividual tpl:hasClassifier <http://data.posccaesar.org/rdl/RDS9629> .  
  ?referencetoindividualondocument tpl:hasReferred ?this .  
  ?referencetoindividualondocument tpl:hasDocument ?classofinformationobject .  
  ?referencetoindividualondocument a tpl:ReferenceToIndividualOnDocument .  
  ?classificationofclassofindividual tpl:hasClassifier <http://data.posccaesar.org/rdl/RDS250334> .  
  ?classificationofclassofindividual tpl:hasClassified ?classofinformationobject .  
  ?classofinformationobject a dm:ClassOfInformationObject .  
  ?classificationofclassofindividual a tpl:ClassificationOfClassOfIndividual .  
  ?classifiedidentificationofindividual tpl:hasIdentified ?this .  
  ?classifiedidentificationofindividual tpl:hasIdentificationType rdlfacade:RA279224C91804708AE922CFCBA21A78F .  
  ?classifiedidentificationofindividual a tpl:ClassifiedIdentificationOfIndividual .  
  ?classifiedidentificationofindividual tpl:valIdentifier ?JobNumberOnDataSheet .  
}
```

Example SPIN magic property : get PCA RDL hasDesignation

```
OPTIONAL {  
  ?class pcardlprop:designation ?classlabel  
}
```

Use this in a
query

Rather than
this

```
OPTIONAL { SERVICE <http://data.posccaesar.org/rdl/> {  
  ?class <http://data.posccaesar.org/rdl/hasDesignation> ?classlabel .  
}
```

The screenshot shows the 'Magic Property Form' for the property 'pcardlprop:designation'. The form includes the following sections:

- Name:** pcardlprop:designation
- Annotations:** rdfs:label is set to 'designation'.
- Definition:** rdfs:subClassOf is set to 'spin:MagicProperties'.
- spin:constraints (Arguments, left side):** An argument 'sp:arg1' is defined with type 'dm:Thing'.
- spin:body:** Contains a SPARQL query:

```
SELECT ?designation  
WHERE {  
  OPTIONAL {  
    SERVICE <http://data.posccaesar.org/rdl/> {  
      ?arg1 <http://data.posccaesar.org/rdl/hasDesignation> ?designation .  
    }  
  }  
}
```
- spin:returnType:** Set to 'xsd:string'.
- Other Properties:** rdf:type is set to 'spin:MagicProperty'.

Example SPIN magic property : get PCA RDL classifier hasDesignation

?class pcardlprop:classifierDesignation ?classlabel

Use this in a
query

Rather than
this

Magic Property Form

Name: pcardlprop:classifierDesignation

Annotations

rdfs:comment

rdfs:label

Definition

rdfs:subClassOf

spin:constraints (Arguments, left side)

spin:body

spin:returnType

Other Properties

rdf:type

Example pure SPARQL :

Select Job Number (Project code) on Datasheet

- Select JobNumberOnDataSheet value from Activity that is a Project and has a Project Identification Code and is referenced on a ClassOfInformationObject that is a Datasheet

```
SELECT ?JobNumberOnDataSheet
WHERE {
  ?activity rdf:type dm:Activity .
  ?classificationofindividual tpl:hasClassified ?activity .
  ?classificationofindividual rdf:type tpl:ClassificationOfIndividual .
  ?classificationofindividual tpl:hasClassifier <http://data.posccaesar.org/rdl/RDS9629> .

  ?referencetoindividualondocument tpl:hasReferred ?activity .
  ?referencetoindividualondocument tpl:hasDocument ?classofinformationobject .
  ?referencetoindividualondocument rdf:type tpl:ReferenceToIndividualOnDocument .

  ?classificationofclassofindividual tpl:hasClassifier <http://data.posccaesar.org/rdl/RDS250334> .
  ?classificationofclassofindividual tpl:hasClassified ?classofinformationobject .
  ?classofinformationobject rdf:type dm:ClassOfInformationObject .
  ?classificationofclassofindividual rdf:type tpl:ClassificationOfClassOfIndividual .

  ?classifiedidentificationofindividual tpl:hasIdentified ?activity .
  ?classifiedidentificationofindividual tpl:hasIdentificationType <http://rdl.rdlfacade.org/data#RA279224C9180470BAE922CFCBA21A78F> .
  ?classifiedidentificationofindividual rdf:type tpl:ClassifiedIdentificationOfIndividual .
  ?classifiedidentificationofindividual tpl:valIdentifier ?JobNumberOnDataSheet .
}
```