

PDL/S

Towards an alternate serialisation of
PDL

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Motivation

- ✦ PDL is a language for describing parameters of general web services
 - ✦ good for workflow orchestration etc.
- ✦ The PDL standard uses XML as the serialisation of the language
 - ✦ common practice within IVOA
 - ✦ XML has good validation/editing tools
 - ✦ but...
 - ✦ rather verbose for humans to write/parse
 - ✦ For PDL (rather like ADQL 1.0 *cf* SQL) the XML structure is like the parse tree of a more natural “human-parsable” language
- ✦ So...
 - ✦ create “domain specific language” (DSL) that has a more concise representation.

Domain Specific Language

- ✦ concise
- ✦ reasonable defaults
- ✦ similar overall structure to XML

```
service testing
{
  parameters {
    p1 : real ;
    p2 : integer;
    p3 : string;
    p4 : boolean;
    p5[10] : real;
    pout : string;
  }
  input {
    params=p1,p2;
    constraints
    << if ($p2^2 + 1) * 5 > 10
      then $p1 in range [ cos(4.25) >| 4 ] or $p1 > 1 >>
    << assert $p3 != "stop" >>
    group gin {
      params = p5;
      active when $p3 in { "production", "deployment"};
    }
  }
  output {
    params = pout;
  }
}
```


Implementation

- Using Eclipse Xtext - a language development package
 - easy to create a domain specific language (DSL) with full Eclipse editor functionality
 - syntax highlighting/formatting
 - auto-completion
 - validation
 - quick fixes
 - Just write the grammar and the above comes for free! (it can be further customised if the default behaviour is not quite what is desired).
 - compiles to the PDL XML form for compatibility with existing infrastructure

The Grammar

- ✦ follows PDL concepts and naming
- ✦ Medium complexity
 - ✦ easy to change syntax
 - ✦ more difficult to add new concepts

```

grammar net.ivoa.pdl.pdls.Pdls with org.eclipse.xtext.common.Terminals

import "http://www.eclipse.org/emf/2002/Ecore" as ecore

generate pdls "http://www.ivoa.net/pdl/pdls/Pdls"

/*
 * domain specific language for PDL
 *
 * Paul Harrison Apr. 2014.
 */
PDL:
  Service;

Service:
  'service' name=ID '{'
    'parameters' '{'
      (parameters += Parameter)+
    '}'
    'input' '{'
      (inputs += ParameterGroup)*
    '}'
    'output' '{'
      (outputs += ParameterGroup)*
    '}'
  '}'
  ;

/* */
ParameterID:
  ID
;
/* include restriction of always conditional statement as convenience to
Parameter:
  name = ParameterID ':' type=ParameterType ';'
;

enum ParameterType :
  INPUT OUTPUT

```


A Work in Progress

- ✦ Turns out to be more difficult than VODSL for VODML (last year!)
 - ✦ Grammar design is a “black art” - can be difficult to expunge ambiguities
- ✦ PDL/S Incomplete
 - ✦ current implementation not as expressive as XML PDL - e.g. multiple boolean conditions, parameter metadata.
 - ✦ Syntax unimaginative
- ✦ Eclipse integration incomplete
 - ✦ requires more customized syntax highlighting, formatting, intelli-sense etc.
 - ✦ compilation back to PDL not finished

Demonstration

The screenshot displays the Eclipse Platform IDE with the following components:

- Project Explorer:** Shows a project named 'models' containing several VDSL files, including 'SourceDM.vdsl' which is currently selected.
- Outline:** Shows the structure of the 'SourceDM' package, including the 'source' package and its contents: 'LuminosityMeasurement', 'Source', 'AstroObject', 'SkyCoordinateFrame', 'SkyError', 'CircleError', 'AlignedEllipse', 'GenericEllipse', 'SkyCoordinate', 'SourceClassification', and 'LuminosityType'.
- Editor:** Displays the VDSL code for 'SourceDM.vdsl'. The code includes package declarations, includes for other VDSL files, and class definitions for 'LuminosityMeasurement' and 'Source'.
- Problems:** Lists 35 errors, all of which are 'Vodsl Problem' types. The errors are related to unresolved references to various data types and definition types from other VDSL files.

```

model src ( 1.0 ) "This is a sample data model. It contains the IVOA UML Profile and imports the IVOA_Profile data model with p
It has some sample relationships etc to be used in documentation etc."

include "IVOA.vdsl"

include "PhotDM-alt.vdsl"

package source "this is main package"
{

otype LuminosityMeasurement ""
{

value : quantity.RealQuantity /* utype=ivoa:quantity.RealQuantity*/ "" ;
error : quantity.RealQuantity /* utype=ivoa:quantity.RealQuantity*/ @? "" ;
description : string /* utype=ivoa:string*/ @? "" ;
type : source.LuminosityType /* utype=src:source.LuminosityType*/ "" ;

}

otype Source extends source.AstroObject /* utype=src:source.AstroObject*/ ""
{

name : string /* utype=ivoa:string*/ "" ;
description : string /* utype=ivoa:string*/ @? "" ;
position : source.SkyCoordinate /* utype=src:source.SkyCoordinate*/ "" ;
positionError : source.SkyError /* utype=src:source.SkyError*/ @? "" ;
classification : source.SourceClassification /* utype=src:source.SourceClassification*/ "" ;
luminosity : source.LuminosityMeasurement /* utype=src:source.LuminosityMeasurement*/ @* as composition ""

}

```

Description	Resource	Path	Location	Type
Couldn't resolve reference to DataType 'topl.p1.multiplicities'.	test.vdsl	/models	line: 43 /models...	Vodsl Problem
Couldn't resolve reference to DefinitionType 'Characterisation'.	Cube2.4.1.vdsl	/models	line: 144 /mode...	Vodsl Problem
Couldn't resolve reference to DefinitionType 'ChAxis'.	Characterization....	/models	line: 94 /models...	Vodsl Problem
Couldn't resolve reference to DefinitionType 'CoordSys'.	Cube2.4.1.vdsl	/models	line: 146 /mode...	Vodsl Problem
Couldn't resolve reference to DefinitionType 'daft'.	test.vdsl	/models	line: 19 /models...	Vodsl Problem
Couldn't resolve reference to DefinitionType 'Derived'.	Cube2.4.1.vdsl	/models	line: 145 /mode...	Vodsl Problem
Couldn't resolve reference to DefinitionType 'ImageData'.	Cube2.4.1.vdsl	/models	line: 219 /mode...	Vodsl Problem
Couldn't resolve reference to DefinitionType 'NDPoint'.	Cube2.4.1.vdsl	/models	line: 199 /mode...	Vodsl Problem
Couldn't resolve reference to DefinitionType 'Obs'.	ObsCore.vdsl	/models	line: 67 /models...	Vodsl Problem
Couldn't resolve reference to DefinitionType 'Obs'.	ObsCore.vdsl	/models	line: 75 /models...	Vodsl Problem

Still only an alpha level implementation

Conclusions

- ✦ I think that it is worth pursuing a PDL/S DSL definition
 - ✦ easier for humans to read
 - ✦ Informs PDL 2.0
- ✦ XText provides a good framework to develop PDL/S
 - ✦ forces compliance with a grammar
 - ✦ is RAD with discipline
- ✦ However, XText/Eclipse does not have to be used to create PDL/S instances
- ✦ Current implementation <https://github.com/pahjbo/PDL-S>
 - ✦ full code, examples and XSLT to transform from PDL to PDL/S