

# Data Systematics: The Metamodel of PSOA RuleML Illustrated by Grailog Visualization

(PDF version: [ruleml.org/talks/PSOAMetamodelGrailogWedding.pdf](http://ruleml.org/talks/PSOAMetamodelGrailogWedding.pdf))

Harold Boley

University of New Brunswick  
Faculty of Computer Science  
Fredericton, NB, Canada

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# Introduction

- [PSOA RuleML](#) builds on a novel data systematics
- Slicing and dicing the [PSOA metamodel cube](#)
- Exemplify with 18 oidless/oidful, tupled/slotted, perspeneutral/perspectival wedding atoms
- Illustrate all kinds of atoms by [Grailog](#) visualization
- Provide template syntax and informal semantics
- Data facts complemented by interoperation rules:

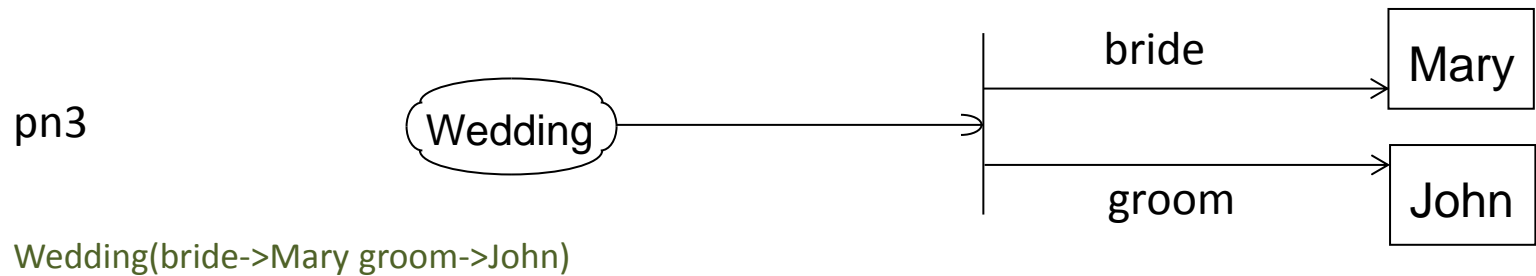
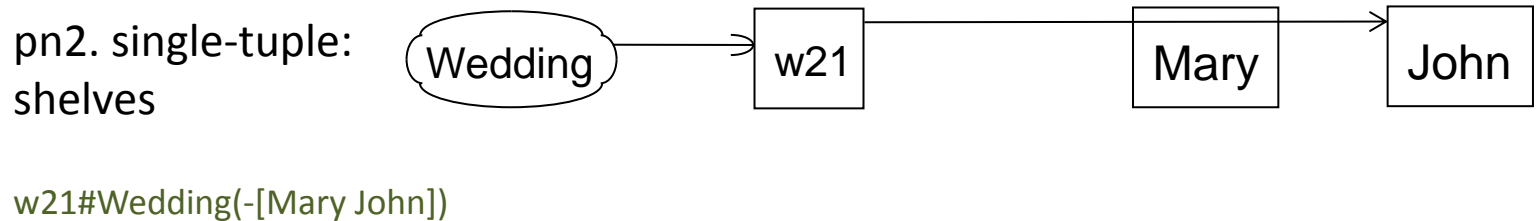
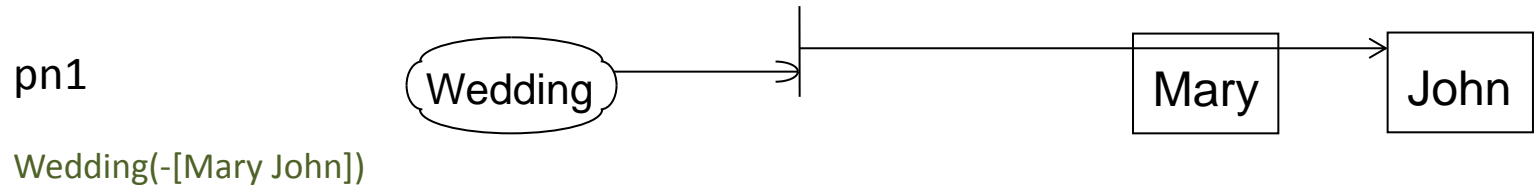
[http://wiki.ruleml.org/index.php/PSOA\\_RuleML\\_Bridges\\_Graph\\_and\\_Relational\\_Databases](http://wiki.ruleml.org/index.php/PSOA_RuleML_Bridges_Graph_and_Relational_Databases)  
(*syntactic realization* for core interoperation path pv1-pv3-pv4-pn4, abridged by PSOA rule)

# Slicing and Dicing the PSOA Metamodel Cube

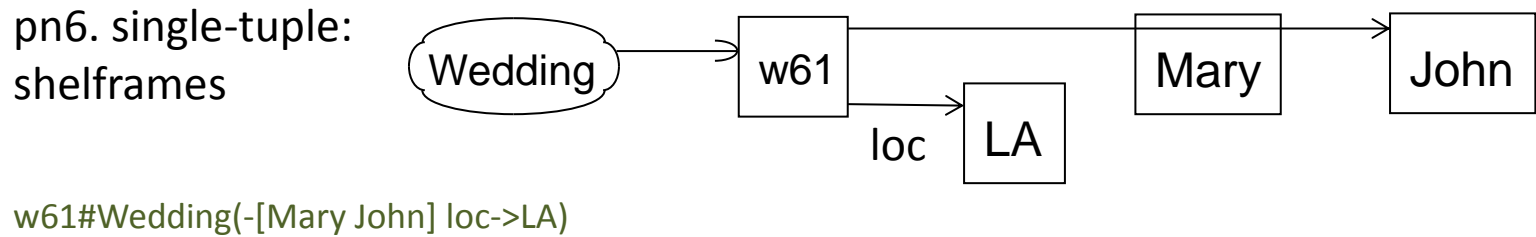
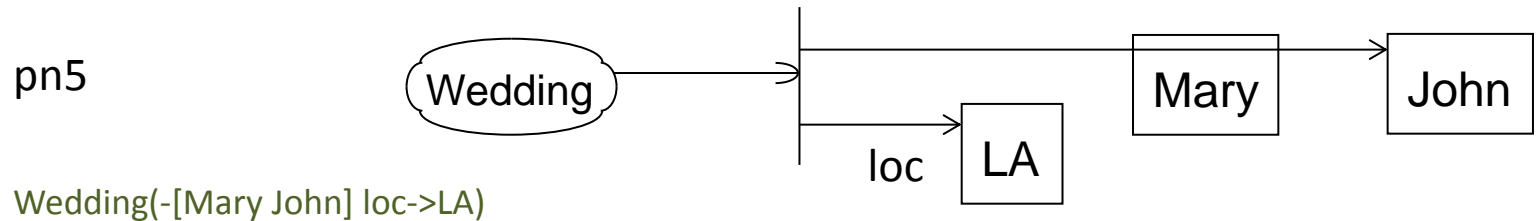
- Via 3 (orthogonal) dimensions, the **full metamodel** cube systematizes 18 kinds of atoms that are contained in ( $3*3*2 =$ ) 18 unit cubes (units) named  $pxi$  ( $x=n,v,p; i=1,...,6$ )
- By choosing one of the reductions PDO, DPO, or ODP, users can variously slice and dice the cube, in a kind of (meta)[OLAP](#), initially reducing its 3 dimensions to slices of 2 dimensions:
- **PDO** reduction, via **Perspectivity** dimension, to 3 slices, each with 6 units structured by **Descriptor**-row and **OID**-column dimensions:
  - 6 perspeneutral units ( $x=n; i=1,...,6$ ) vs. 6 perspectival units ( $x=v; i=1,...,6$ ) vs. 6 perspeneutral+perspectival units ( $x=p; i=1,...,6$ )
- The **core metamodel** is an 8-unit subcube of the full metamodel cube, which can be reduced, PDO-style, to 2 **Perspectivity** slices: pn1-pn4 and pv1-pv4
  - Each includes a prominent unit: **frame** atoms (pn4) and **relationship** atoms (pv1)
- **DPO** reduction (e.g., for full metamodel), via **Descriptor** dimension, to 3 slices, each with 6 units structured by **Perspectivity**-row and **OID**-column dimensions:
  - 6 tupled units ( $x=n,v,p; i=1,2$ ) vs. 6 slotted units ( $x=n,v,p; i=3,4$ ) vs. 6 tupled+slotted units ( $x=n,v,p; i=5,6$ )
- **ODP** reduction (e.g., for full metamodel), via **OID** dimension, to 2 slices, each with 9 units structured by **Descriptor**-row and **Perspectivity**-column dimensions:
  - 9 oidless units ( $x=n,v,p; i=1,3,5$ ) vs. 9 oidful units ( $x=n,v,p; i=2,4,6$ )

# Exemplifying the Perspectivity Slices

Core oidless/oidful, tupled/slotted atoms that are **perspeneutral**:

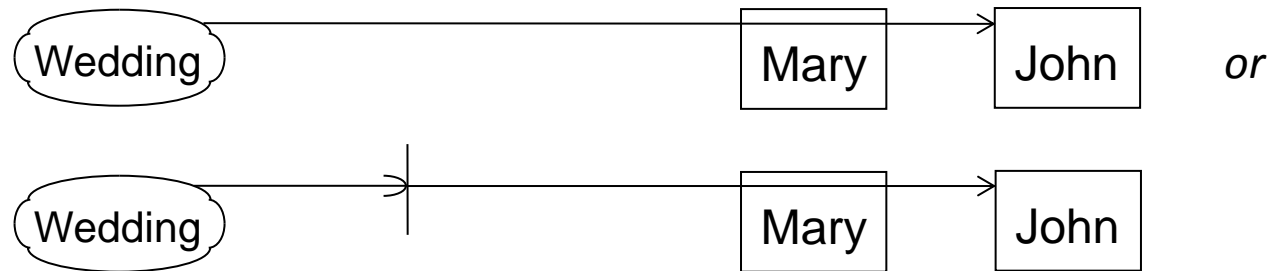


Extra oidless/oidful, combined tupled+slotted atoms that are **perspeneutral**:



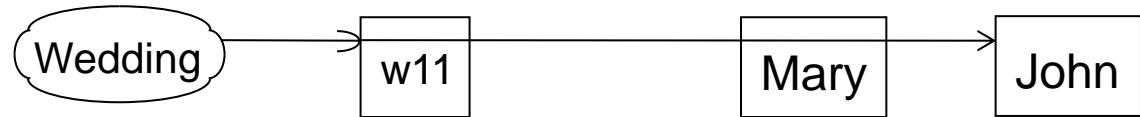
Core oidless/oidful, tupled/slotted atoms that are **perspectival**:

pv1. single-tuple:  
**relationships**



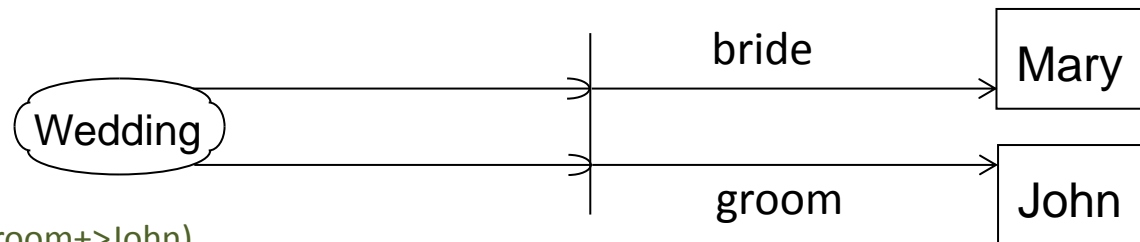
Wedding(Mary John) *or* Wedding(+[Mary John])

pv2



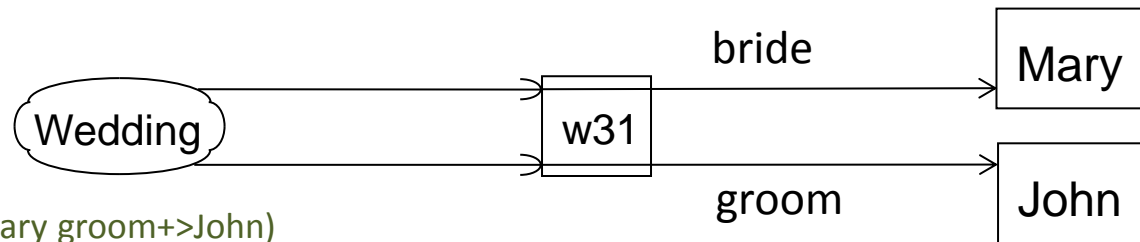
w11#Wedding(+[Mary John])

pv3: pairships



Wedding(bride+>Mary groom+>John)

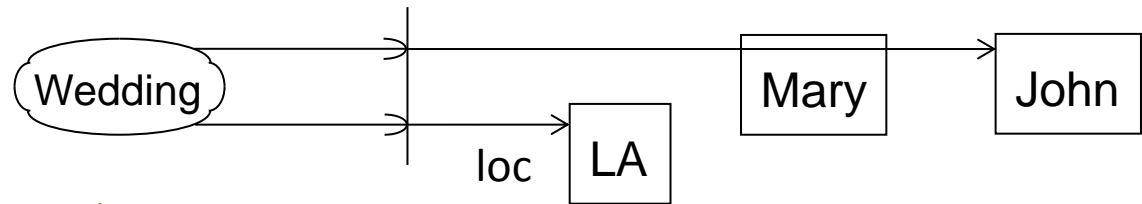
pv4



w31#Wedding(bride+>Mary groom+>John)

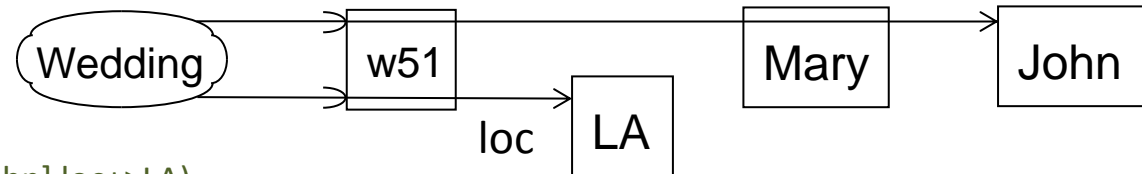
Extra oidless/oidful, combined tupled+slotted atoms that are **perspectival**:

pv5. single-tuple:  
relpairships



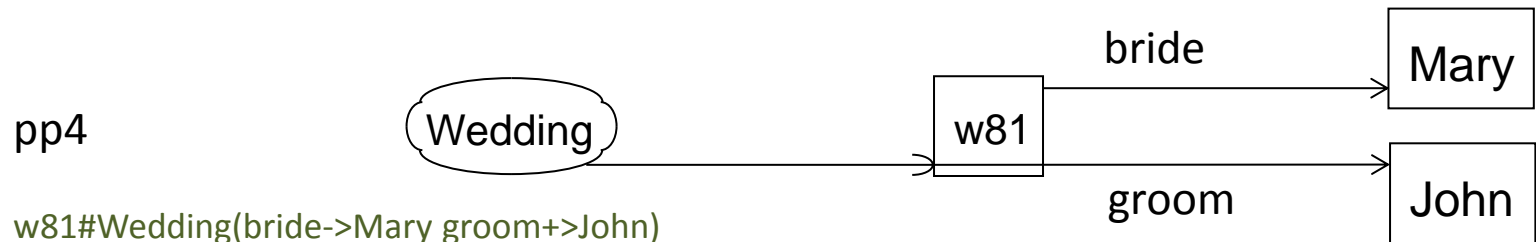
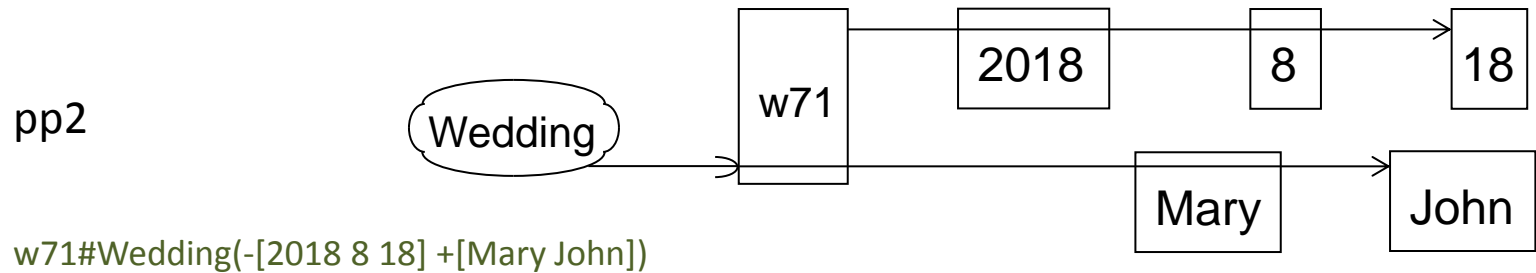
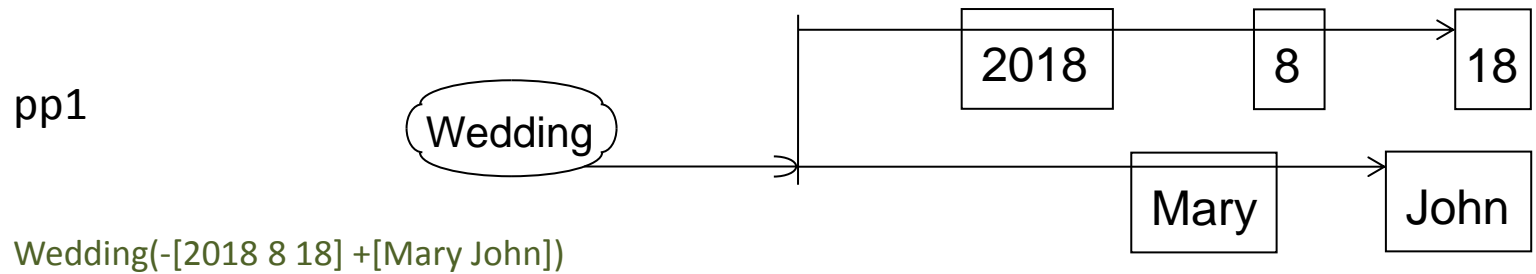
Wedding(+[Mary John] loc+>LA)

pv6



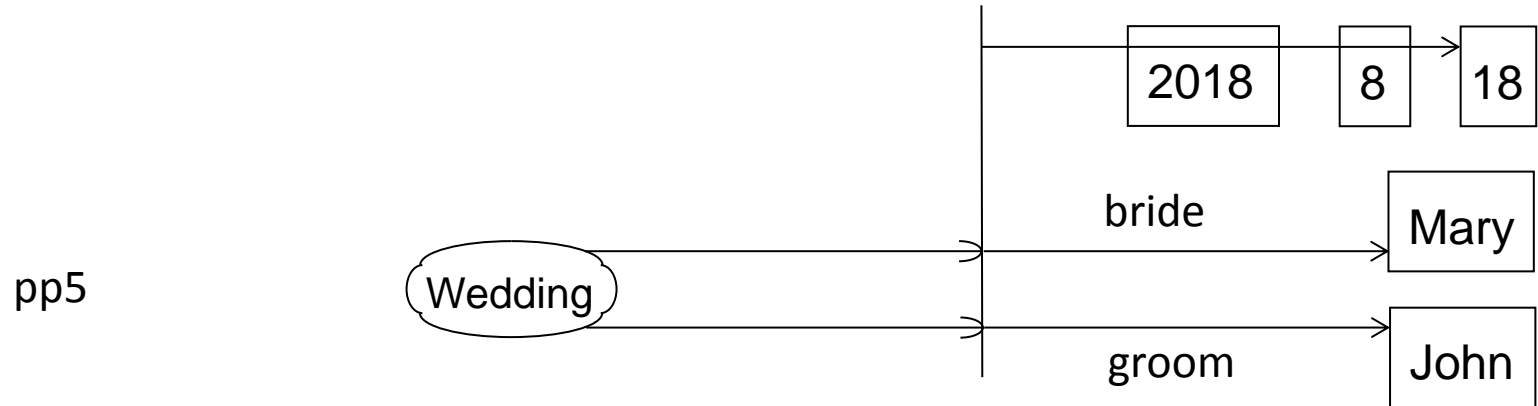
w51#Wedding(+[Mary John] loc+>LA)

Adding oidless/oidful, tupled/slotted, combined **perspeneutral**+**perspectival** atoms:

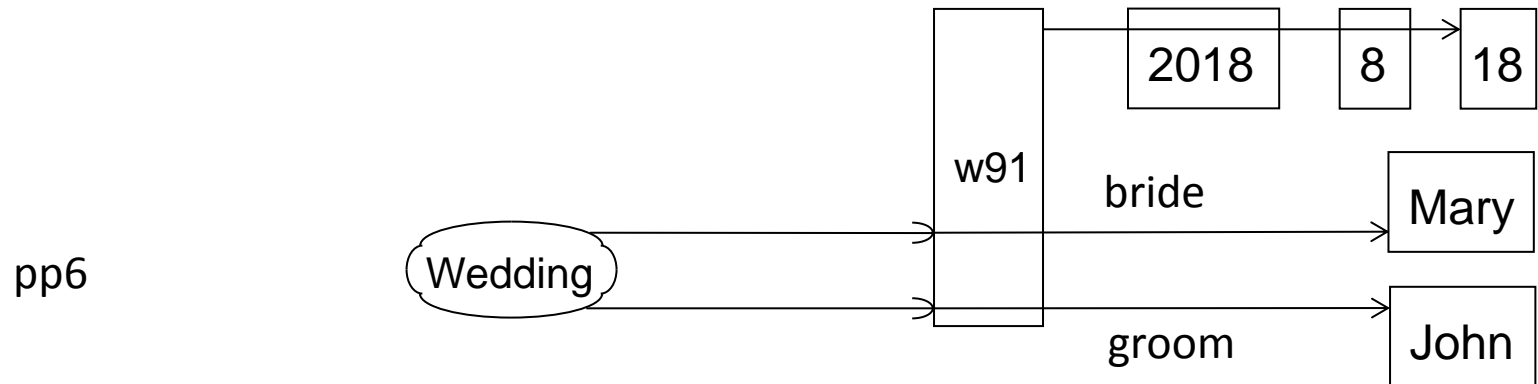




Also oidless/oidful, combined tupled+slotted, combined **perspeneutral**+**perspectival**:



Wedding(-[2018 8 18] bride+>Mary groom+>John)



w91#Wedding(-[2018 8 18] bride+>Mary groom+>John)

# Syntax and Semantics of Atoms

Core oidless/oidful, tupled/slotted atoms that are **perspeneutral**:

pn1

$f(-[t \dots t] \dots -[t \dots t])$

Implicit existential OID; tuples  $-[t \dots t]$  independent from predicate  $f$

pn2. single-tuple:  
shelves

$o\#f(-[t \dots t] \dots -[t \dots t])$

Explicit OID  $o$ ; tuples  $-[t \dots t]$  independent from predicate  $f$

pn3

$f(p \rightarrow v \dots p \rightarrow v)$

Implicit existential OID; slots  $p \rightarrow v$  independent from predicate  $f$

pn4: **frames**

$o\#f(p \rightarrow v \dots p \rightarrow v)$

Explicit OID  $o$ ; slots  $p \rightarrow v$  independent from predicate  $f$

Extra oidless/oidful, combined tupled+slotted atoms that are **perspeneutral**:

pn5

$f(-[t \dots t] \dots -[t \dots t] p \rightarrow v \dots p \rightarrow v)$       Implicit existential OID; descriptors independent from predicate  $f$

pn6. single-tuple:  
shelframes

$o\#f(-[t \dots t] \dots -[t \dots t] p \rightarrow v \dots p \rightarrow v)$       Explicit OID  $o$ ; descriptors independent from predicate  $f$

Core oidless/oidful, tupled/slotted atoms that are **perspectival**:

pv1. single-tuple:  
**relationships**

$f(t \dots t)$  or  $f(+[t \dots t])$

$f(+[t \dots t] \dots +[t \dots t])$

Implicit existential OID; tuples  $+[t \dots t]$  dependent on predicate  $f$

pv2

$o\#f(t \dots t)$  or  $o\#f(+[t \dots t])$

$o\#f(+[t \dots t] \dots +[t \dots t])$

Explicit OID  $o$ ; tuples  $+[t \dots t]$  dependent on predicate  $f$

pv3: pairships

$f(p+>v \dots p+>v)$

Implicit existential OID; slots  $p+>v$  dependent on predicate  $f$

pv4

$o\#f(p+>v \dots p+>v)$

Explicit OID  $o$ ; slots  $p+>v$  dependent on predicate  $f$

Extra oidless/oidful, combined tupled+slotted atoms that are **perspectival**:

pv5. single-tuple:  
relpairships

$f(+[t \dots t] \dots +[t \dots t] p+>v \dots p+>v)$     Implicit existential OID; descriptors dependent on predicate  $f$

pv6

$o\#f(+[t \dots t] \dots +[t \dots t] p+>v \dots p+>v)$     Explicit OID  $o$ ; descriptors dependent on predicate  $f$

Adding oidless/oidful, tupled/slotted, combined **p**erspeneutral+**p**erspectival atoms:

pp1

$f(+[t \dots t] \dots +[t \dots t]$   
 $-[t \dots t] \dots -[t \dots t])$

Implicit existential OID; both in/dependent tuples w.r.t. predicate  $f$

pp2

$o\#f(+[t \dots t] \dots +[t \dots t]$   
 $-[t \dots t] \dots -[t \dots t])$

Explicit OID  $o$ ; both in/dependent tuples w.r.t. predicate  $f$

pp3

$f(p \rightarrow v \dots p \rightarrow v$   
 $p \rightarrow v \dots p \rightarrow v)$

Implicit existential OID; both in/dependent slots w.r.t. predicate  $f$

pp4

$o\#f(p \rightarrow v \dots p \rightarrow v$   
 $p \rightarrow v \dots p \rightarrow v)$

Explicit OID  $o$ ; both in/dependent slots w.r.t. predicate  $f$

Also oidless/oidful, combined tupled+slotted, combined **perspeneutral**+**perspectival**:

pp5

$f(+[t \dots t] \dots +[t \dots t]$   
 $-[t \dots t] \dots -[t \dots t]$   
 $p+>v \dots p+>v$   
 $p->v \dots p->v)$

Implicit existential OID; both in/dependent descriptors w.r.t. predicate  $f$

pp6

$o\#f(+[t \dots t] \dots +[t \dots t]$   
 $-[t \dots t] \dots -[t \dots t]$   
 $p+>v \dots p+>v$   
 $p->v \dots p->v)$

Explicit OID  $o$ ; both in/dependent descriptors w.r.t. predicate  $f$