

Query:

```
SELECT ?pname ?uni WHERE {  
  ?prof ub:name ?pname .  
  ?prof ub:doctoralDegreeFrom ?uni .  
}
```

Shape: FullProfessor

```
"name": "FullProfessor"  
"class": "ub:FullProfessor"  
{ "path": "ub:doctoralDegreeFrom", "min": 1, "shape": "University" },  
{ "path": "ub:emailAddress", "min": 1 },  
{ "path": "ub:name", "min": 1 },  
{ "path": "ub:name", "max": 1 },  
{ "path": "ub:teacherOf", "min": 1, "shape": "Course" },  
{ "path": "ub:teacherOf", "max": 2, "shape": "Course" },  
{ "path": "ub:telephone", "min": 1 },  
{ "path": "ub:worksFor", "min": 1, "shape": "Department" }
```

Shape: University

```
"name": "University"  
"class": "ub:University"  
{ "path": "ub:name", "min": 1 },  
{ "path": "ub:name", "max": 1 }
```

	Current	Simplified	Improvement (abs./rel.)	
	t_c [ms]	t_s [ms]	$t_s - t_c$ [ms]	$(t_s - t_c)/t_c$ [%]
Const1	550.33	719.36	169.03	30.72
Const2	8.49	22.64	14.15	166.67
Exec1	3.97	4.98	1.01	25.55
Exec2	86.31	4.94	-81.37	-94.28
Exec3	49.20	73.79	24.58	49.96
Exec4	12198.02	191.32	-12,006.70	-98.43
Total	12,896.31	1,017.02	-11,879.29	-92.11

Current Subquery:	Simplified Subquery:
Construction 1 (Execute input query):	
<pre> CONSTRUCT { ?x a ub:FullProfessor . ?x ub:doctoralDegreeFrom ?s_0 . ?x ub:name ?c_1x . } WHERE { ?x a ub:FullProfessor . ?x ub:doctoralDegreeFrom ?s_0 . ?x ub:name ?c_1x . } </pre>	<pre> CONSTRUCT { ?x a ub:FullProfessor . ?x ub:name ?c_1x . ?x ub:doctoralDegreeFrom ?s_0 . } WHERE { ?x a ub:FullProfessor . ?x ub:name ?c_1x . ?x ub:doctoralDegreeFrom ?s_0 . } </pre>
550.33 ms (3801 triples)	719.36 ms (3801 triples)
Construction 2 (Add shape constraints):	
<pre> CONSTRUCT { ?s_0 a ub:University . ?s_0 ub:name ?c_0s_0 . } WHERE { ?x a ub:FullProfessor . ?x ub:doctoralDegreeFrom ?s_0 . ?s_0 a ub:University . ?s_0 ub:name ?c_0s_0 . ?x ub:name ?c_1x . } </pre>	<pre> CONSTRUCT { ?s_0 ub:name ?c_0s_0 . ?s_0 a ub:University . } WHERE { ?s_0 ub:name ?c_0s_0 . ?x ub:doctoralDegreeFrom ?s_0 . ?x ub:name ?c_1x . ?s_0 a ub:University . ?x a ub:FullProfessor . } </pre>
8.49 ms (10 triples)	22.64 ms (10 triples)
Execution 1 (Validation: University):	
<pre> SELECT ?x WHERE { ?x a ub:University } </pre>	<pre> SELECT DISTINCT ?x WHERE { ?x a ub:University . } ORDER BY ?x </pre>
3.97 ms (5 triples)	4.98 ms (5 triples)
Execution 2 (Validation: University):	
<pre> SELECT DISTINCT ?x WHERE { ?x a ub:University . { SELECT DISTINCT ?x WHERE { ?x ub:name ?p_6 . } }} ORDER BY ?x </pre>	<pre> SELECT DISTINCT ?x WHERE { ?x a ub:University . ?x ub:name ?p_6 . } ORDER BY ?x </pre>
ub:name (1272 triples) a ub:University (5 triples) 86.31 ms (5 triples)	4.94 ms (5 triples)

Execution 3 (Validation: FullProfessor):

```
SELECT ?x WHERE {  
  ?x a ub:FullProfessor  
}
```

```
SELECT DISTINCT ?x WHERE {  
  ?x a ub:FullProfessor.  
} ORDER BY ?x
```

49.20 ms (1267 triples)

73.79 ms (1267 triples)

Execution 4 (Validation: FullProfessor):

```
SELECT DISTINCT ?p_12 ?x WHERE {  
  ?x a ub:FullProfessor. {  
    SELECT DISTINCT ?p_12 ?x WHERE {  
      ?x ub:doctoralDegreeFrom ?p_12.  
      ?x ub:name ?p_13.  
    } ORDER BY ?x  
  }  
  SELECT DISTINCT ?x WHERE {  
    ?x ub:name ?p_13.  
  }  
} ORDER BY ?x
```

ub:name (1272 triples)

ub:doctoralDegreeFrom (1267 triples)

a ub:FullProfessor (1267 triples)

12198.02 ms (1267 triples)

191.32 ms (1267 triples)

All CONSTRUCT queries end with: ORDER BY ASC(?x) LIMIT 10000 OFFSET