

Query plans of RDF-based-approach-2 for GraphDB

Query 1

```
SELECT ?id ?lbl
{
  { # ----- Begin optimization group 1 -----

    ?n1 ns1:name "XU JIE" . #   Collection size: 6.0   Predicate collection size: 466139.0   Unique subjects: 466139.0   Unique
objects: 335677.0   Current complexity: 6.0
    ?n1 node:label ?lbl . #       Collection size: 559600.0   Predicate collection size: 559600.0   Unique subjects: 559600.0
        Unique objects: 4.0   Current complexity: 6.0

  } # ----- End optimization group 1 -----
  # ESTIMATED NUMBER OF ITERATIONS: 6.0

  OPTIONAL
  {

    { # ----- Begin optimization group 2 -----

      ?n1 ns1:node\_id ?id . #   Collection size: 559600.0   Predicate collection size: 559600.0   Unique subjects: 559600.0
          Unique objects: 559600.0   Current complexity: 1.0

    } # ----- End optimization group 2 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0

  }
}
```

Query 2

```
SELECT ?lbl ?country
{
  { # ----- Begin optimization group 1 -----

    ?n ns1:name "EL PORTADOR" . #   Collection size: 9325.0   Predicate collection size: 466139.0   Unique subjects:
466139.0   Unique objects: 335677.0   Current complexity: 9325.0
    ?n node:label ?lbl . #       Collection size: 559600.0   Predicate collection size: 559600.0   Unique subjects: 559600.0
        Unique objects: 4.0   Current complexity: 9325.0
    ?n ns1:countries ?country . #   Collection size: 462798.0   Predicate collection size: 462798.0   Unique subjects:
462798.0   Unique objects: 311.0   Current complexity: 9325.0
    FILTER (?country != "")

  } # ----- End optimization group 1 -----
  # ESTIMATED NUMBER OF ITERATIONS: 9325.0

}
```

NOTE: Optimization groups are evaluated one after another exactly in the given order.
If there are too many optimization groups consisting of a single statement pattern,
then one should try to relocate the following clauses by hand:
VALUES, BIND, OPTIONAL, property paths with '*' and/or '+' (the latter can be also
surrounded with brackets).
Sub-SELECTs will always be evaluated first."

Query 3

SELECT DISTINCT ?lbl

```
{
  { # ----- Begin optimization group 1 -----
    ?n node:label ?lbl . #      Collection size: 559600.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
    Unique objects: 4.0  Current complexity: 559600.0

  } # ----- End optimization group 1 -----
  # ESTIMATED NUMBER OF ITERATIONS: 559600.0
}
```

Query 4

SELECT DISTINCT ?lbl

```
{
  { # ----- Begin optimization group 1 -----
    ?r1 edge:label ?lbl . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
    Unique objects: 3.0  Current complexity: 674102.0

  } # ----- End optimization group 1 -----
  # ESTIMATED NUMBER OF ITERATIONS: 674102.0
}
```

Query 5

SELECT ?name ?lbl

```
{
  { # ----- Begin optimization group 1 -----
    ?n1 ns1:name "ORION HOUSE SERVICES (HK) LIMITED" . #      Collection size: 2.0      Predicate collection size: 466139.0
    Unique subjects: 466139.0      Unique objects: 335677.0      Current complexity: 2.0
    ?n1 ns1:InRelationTo ?r1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
    257667.0      Unique objects: 674102.0      Current complexity: 5.232350281564965
    ?r1 edge:label "intermediary_of" . #      Collection size: 213634.0      Predicate collection size: 674102.0      Unique subjects:
    674102.0      Unique objects: 3.0      Current complexity: 5.232350281564965
    ?r1 ns1:PointsTo ?n2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
    Unique objects: 307082.0      Current complexity: 5.232350281564965
    ?n2 node:label ?lbl . #      Collection size: 559600.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
    Unique objects: 4.0      Current complexity: 5.232350281564965

  } # ----- End optimization group 1 -----
  # ESTIMATED NUMBER OF ITERATIONS: 5.232350281564965

  OPTIONAL
  {
    { # ----- Begin optimization group 2 -----
      ?n2 ns1:name ?name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects: 466139.0
      Unique objects: 335677.0      Current complexity: 1.0

    } # ----- End optimization group 2 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0
  }
}
```

Query 6

SELECT ?lbl1 ?name ?link ?lbl2

```
{
{
  { # ----- Begin optimization group 1 -----
    ?n1 ns1:name "BEARER" . #      Collection size: 497.0 Predicate collection size: 466139.0    Unique subjects: 466139.0
      Unique objects: 335677.0      Current complexity: 497.0
    ?n1 node:label ?lbl1 . #      Collection size: 559600.0    Predicate collection size: 559600.0    Unique subjects: 559600.0
      Unique objects: 4.0    Current complexity: 497.0
    ?n1 ns1:InRelationTo ?r1 . #      Collection size: 674102.0    Predicate collection size: 674102.0    Unique subjects:
257667.0    Unique objects: 674102.0    Current complexity: 1300.239044968894
    ?r1 edge:label "officer_of" . #      Collection size: 309363.0    Predicate collection size: 674102.0    Unique subjects:
674102.0    Unique objects: 3.0    Current complexity: 1300.239044968894
    ?r1 ns1:PointsTo ?n2 . #      Collection size: 674102.0    Predicate collection size: 674102.0    Unique subjects: 674102.0
      Unique objects: 307082.0    Current complexity: 1300.239044968894
    ?n2 node:label ?lbl2 . #      Collection size: 559600.0    Predicate collection size: 559600.0    Unique subjects: 559600.0
      Unique objects: 4.0    Current complexity: 1300.239044968894

  } # ----- End optimization group 1 -----
  # ESTIMATED NUMBER OF ITERATIONS: 1300.239044968894

  OPTIONAL
  {
    { # ----- Begin optimization group 2 -----

      ?n2 ns1:name ?name . #      Collection size: 466139.0    Predicate collection size: 466139.0    Unique subjects: 466139.0
        Unique objects: 335677.0    Current complexity: 1.0

    } # ----- End optimization group 2 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0

  }
  OPTIONAL
  {
    { # ----- Begin optimization group 3 -----

      ?r1 ns1:link ?link . #      Collection size: 674102.0    Predicate collection size: 674102.0    Unique subjects: 674102.0
        Unique objects: 33.0    Current complexity: 1.0

    } # ----- End optimization group 3 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0

  }
}
UNION
{
  { # ----- Begin optimization group 4 -----

    ?n1 ns1:name "The Bearer" . #      Collection size: 434.0 Predicate collection size: 466139.0    Unique subjects: 466139.0
      Unique objects: 335677.0      Current complexity: 434.0
    ?n1 node:label ?lbl1 . #      Collection size: 559600.0    Predicate collection size: 559600.0    Unique subjects: 559600.0
      Unique objects: 4.0    Current complexity: 434.0
    ?n1 ns1:InRelationTo ?r1 . #      Collection size: 674102.0    Predicate collection size: 674102.0    Unique subjects:
257667.0    Unique objects: 674102.0    Current complexity: 1135.4200110995976
    ?r1 edge:label "officer_of" . #      Collection size: 309363.0    Predicate collection size: 674102.0    Unique subjects:
674102.0    Unique objects: 3.0    Current complexity: 1135.4200110995976
    ?r1 ns1:PointsTo ?n2 . #      Collection size: 674102.0    Predicate collection size: 674102.0    Unique subjects: 674102.0
      Unique objects: 307082.0    Current complexity: 1135.4200110995976
```

```

?n2 node:label ?lbl2 . #      Collection size: 559600.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
    Unique objects: 4.0      Current complexity: 1135.4200110995976

} # ----- End optimization group 4 -----
# ESTIMATED NUMBER OF ITERATIONS: 1135.4200110995976

OPTIONAL
{

    { # ----- Begin optimization group 5 -----

        ?n2 ns1:name ?name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects: 466139.0
            Unique objects: 335677.0      Current complexity: 1.0

    } # ----- End optimization group 5 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL
{

    { # ----- Begin optimization group 6 -----

        ?r1 ns1:link ?link . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
            Unique objects: 33.0      Current complexity: 1.0

    } # ----- End optimization group 6 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0

}
}
}
}

```

Query 7

```

SELECT ?lbl1 ?link ?lbl2 ?entity_name
{
    {
        { # ----- Begin optimization group 1 -----

            ?r1 ns1:end_date "11-APR-2014" . #      Collection size: 64.0      Predicate collection size: 79522.0      Unique subjects: 79522.0
                Unique objects: 6367.0      Current complexity: 64.0

            ?n1 ns1:InRelationTo ?r1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 257667.0
                Unique objects: 674102.0      Current complexity: 64.0

            ?n1 node:label ?lbl1 . #      Collection size: 559600.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
                Unique objects: 4.0      Current complexity: 64.0

            ?r1 ns1:PointsTo ?n2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
                Unique objects: 307082.0      Current complexity: 64.0

            ?n2 node:label ?lbl2 . #      Collection size: 559600.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
                Unique objects: 4.0      Current complexity: 64.0

            ?n2 ns1:status "Active" . #      Collection size: 55728.0      Predicate collection size: 226252.0      Unique subjects: 226252.0
                Unique objects: 26.0      Current complexity: 64.0

            ?n1 ns1:name "THE BEARER" . #      Collection size: 70871.0      Predicate collection size: 466139.0      Unique subjects: 466139.0
                Unique objects: 335677.0      Current complexity: 64.0

        } # ----- End optimization group 1 -----
        # ESTIMATED NUMBER OF ITERATIONS: 64.0

    OPTIONAL
    {

        { # ----- Begin optimization group 2 -----

            ?r1 ns1:link ?link . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
                Unique objects: 33.0      Current complexity: 1.0

```

```

} # ----- End optimization group 2 -----
# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL
{

{ # ----- Begin optimization group 3 -----

    ?n2 ns1:name ?entity_name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects:
466139.0 Unique objects: 335677.0      Current complexity: 1.0

    } # ----- End optimization group 3 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0
}
}
UNION
{
{ # ----- Begin optimization group 4 -----

    ?r1 ns1:end_date "29-DEC-2009" . # Collection size: 828.0 Predicate collection size: 79522.0      Unique subjects: 79522.0
        Unique objects: 6367.0      Current complexity: 828.0
    ?n1 ns1:InRelationTo ?r1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
257667.0 Unique objects: 674102.0      Current complexity: 828.0
    ?n1 node:label ?lbl1 . #      Collection size: 559600.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
        Unique objects: 4.0      Current complexity: 828.0
    ?r1 ns1:PointsTo ?n2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 307082.0      Current complexity: 828.0
    ?n2 node:label ?lbl2 . #      Collection size: 559600.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
        Unique objects: 4.0      Current complexity: 828.0
    ?n2 ns1:status "Defaulted" . #      Collection size: 100090.0      Predicate collection size: 226252.0      Unique subjects:
226252.0 Unique objects: 26.0 Current complexity: 828.0
    ?n1 ns1:name "THE BEARER" . #      Collection size: 70871.0      Predicate collection size: 466139.0      Unique subjects:
466139.0 Unique objects: 335677.0      Current complexity: 828.0

    } # ----- End optimization group 4 -----
    # ESTIMATED NUMBER OF ITERATIONS: 828.0

    OPTIONAL
    {

    { # ----- Begin optimization group 5 -----

        ?r1 ns1:link ?link . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
            Unique objects: 33.0 Current complexity: 1.0

        } # ----- End optimization group 5 -----
        # ESTIMATED NUMBER OF ITERATIONS: 1.0

    }
    OPTIONAL
    {

    { # ----- Begin optimization group 6 -----

        ?n2 ns1:name ?entity_name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects:
466139.0 Unique objects: 335677.0      Current complexity: 1.0

        } # ----- End optimization group 6 -----
        # ESTIMATED NUMBER OF ITERATIONS: 1.0

    }
    }
}

```

Query 8

```
SELECT ?lbl1 ?name ?link ?address
{
```

```
  { # ----- Begin optimization group 1 -----
```

```
    ?r1 edge:label "registered_address" . # Collection size: 151105.0      Predicate collection size: 674102.0      Unique subjects:
674102.0 Unique objects: 3.0 Current complexity: 151105.0
    ?n1 ns1:InRelationTo ?r1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
257667.0 Unique objects: 674102.0      Current complexity: 151105.0
    ?n1 node:label ?lbl1 . #      Collection size: 559600.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
      Unique objects: 4.0 Current complexity: 151105.0
    ?r1 ns1:PointsTo ?n3 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
      Unique objects: 307082.0      Current complexity: 151105.0
```

```
  } # ----- End optimization group 1 -----
```

```
  # ESTIMATED NUMBER OF ITERATIONS: 151105.0
```

```
OPTIONAL
```

```
{
```

```
  { # ----- Begin optimization group 2 -----
```

```
    ?n1 ns1:name ?name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects: 466139.0
      Unique objects: 335677.0      Current complexity: 1.0
```

```
  } # ----- End optimization group 2 -----
```

```
  # ESTIMATED NUMBER OF ITERATIONS: 1.0
```

```
}
```

```
OPTIONAL
```

```
{
```

```
  { # ----- Begin optimization group 3 -----
```

```
    ?r1 ns1:link ?link . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
      Unique objects: 33.0 Current complexity: 1.0
```

```
  } # ----- End optimization group 3 -----
```

```
  # ESTIMATED NUMBER OF ITERATIONS: 1.0
```

```
}
```

```
OPTIONAL
```

```
{
```

```
  { # ----- Begin optimization group 4 -----
```

```
    ?n3 ns1:address ?address . #      Collection size: 93453.0      Predicate collection size: 93453.0      Unique subjects:
93453.0 Unique objects: 93445.0      Current complexity: 1.0
```

```
  } # ----- End optimization group 4 -----
```

```
  # ESTIMATED NUMBER OF ITERATIONS: 1.0
```

```
}
```

```
}
```

Query 9

SELECT ?lbl ?name ?link1 ?first_address ?link2 ?second_address

```
{
  { # ----- Begin optimization group 1 -----
    ?r1 edge:label "registered_address" . # Collection size: 151105.0      Predicate collection size: 674102.0      Unique subjects:
674102.0 Unique objects: 3.0 Current complexity: 151105.0
    ?n1 ns1:InRelationTo ?r1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
257667.0 Unique objects: 674102.0      Current complexity: 151105.0
    ?n1 node:label ?lbl . #      Collection size: 559600.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
      Unique objects: 4.0 Current complexity: 151105.0
    ?r1 ns1:PointsTo ?n2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
      Unique objects: 307082.0      Current complexity: 151105.0
    ?n1 ns1:InRelationTo ?r2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
257667.0 Unique objects: 674102.0      Current complexity: 395317.14464793704
    ?r2 edge:label "registered_address" . # Collection size: 151105.0      Predicate collection size: 674102.0      Unique subjects:
674102.0 Unique objects: 3.0 Current complexity: 395317.14464793704
    ?r2 ns1:PointsTo ?n3 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
      Unique objects: 307082.0      Current complexity: 395317.14464793704
    FILTER (?n2 != ?n3)
  } # ----- End optimization group 1 -----
  # ESTIMATED NUMBER OF ITERATIONS: 395317.14464793704

  OPTIONAL
  {
    { # ----- Begin optimization group 2 -----
      ?n1 ns1:name ?name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects: 466139.0
        Unique objects: 335677.0      Current complexity: 1.0
    } # ----- End optimization group 2 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0

  }
  OPTIONAL
  {
    { # ----- Begin optimization group 3 -----
      ?r1 ns1:link ?link1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 33.0 Current complexity: 1.0
    } # ----- End optimization group 3 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0

  }
  OPTIONAL
  {
    { # ----- Begin optimization group 4 -----
      ?n2 ns1:address ?first_address . #      Collection size: 93453.0      Predicate collection size: 93453.0      Unique subjects:
93453.0 Unique objects: 93445.0      Current complexity: 1.0
    } # ----- End optimization group 4 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0

  }
  OPTIONAL
  {
```

```

{ # ----- Begin optimization group 5 -----

    ?r2 ns1:link ?link2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
    Unique objects: 33.0 Current complexity: 1.0

} # ----- End optimization group 5 -----
# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL
{

    { # ----- Begin optimization group 6 -----

        ?n3 ns1:address ?second_address . #      Collection size: 93453.0      Predicate collection size: 93453.0      Unique subjects:
        93453.0      Unique objects: 93445.0      Current complexity: 1.0

    } # ----- End optimization group 6 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0

}
}

```

Query 10

```

SELECT ?link1 ?link2 ?address
{

    { # ----- Begin optimization group 1 -----

        ?r1 edge:label "registered_address" . #      Collection size: 151105.0      Predicate collection size: 674102.0      Unique subjects:
        674102.0      Unique objects: 3.0      Current complexity: 151105.0

        ?n1 ns1:InRelationTo ?r1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
        257667.0      Unique objects: 674102.0      Current complexity: 151105.0

        ?n1 node:label "officer" . #      Collection size: 238402.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
        Unique objects: 4.0      Current complexity: 151105.0

        ?r1 ns1:PointsTo ?n3 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 307082.0      Current complexity: 151105.0

        ?r2 ns1:PointsTo ?n3 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 307082.0      Current complexity: 331703.5277548016

        ?n2 ns1:InRelationTo ?r2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
        257667.0      Unique objects: 674102.0      Current complexity: 331703.5277548016

        ?n2 node:label "entity" . #      Collection size: 213634.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
        Unique objects: 4.0      Current complexity: 331703.5277548016

        ?r2 edge:label "registered_address" . #      Collection size: 151105.0      Predicate collection size: 674102.0      Unique subjects:
        674102.0      Unique objects: 3.0      Current complexity: 331703.5277548016

    } # ----- End optimization group 1 -----
    # ESTIMATED NUMBER OF ITERATIONS: 331703.5277548016

    OPTIONAL
    {

        { # ----- Begin optimization group 2 -----

            ?r1 ns1:link ?link1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
            Unique objects: 33.0 Current complexity: 1.0

        } # ----- End optimization group 2 -----
        # ESTIMATED NUMBER OF ITERATIONS: 1.0

    }
    OPTIONAL
    {

```



```

{ # ----- Begin optimization group 3 -----

    ?r2 ns1:link ?link2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
    Unique objects: 33.0 Current complexity: 1.0

} # ----- End optimization group 3 -----
# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL
{

    { # ----- Begin optimization group 4 -----

        ?n3 ns1:address ?address . #      Collection size: 93453.0      Predicate collection size: 93453.0      Unique subjects:
        93453.0 Unique objects: 93445.0      Current complexity: 1.0

    } # ----- End optimization group 4 -----
    # ESTIMATED NUMBER OF ITERATIONS: 1.0

}
}

```

Query 11

```

SELECT ?name ?valid ?sourceID
{

    { # ----- Begin optimization group 1 -----

        ?n1 node:label "intermediary" . #      Collection size: 14110.0      Predicate collection size: 559600.0      Unique subjects:
        559600.0 Unique objects: 4.0 Current complexity: 14110.0

        ?n1 ns1:InRelationTo ?r1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
        257667.0 Unique objects: 674102.0      Current complexity: 36914.23123644083

        ?r1 ns1:PointsTo ?n2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 307082.0      Current complexity: 36914.23123644083

        ?n2 node:label "entity" . #      Collection size: 213634.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
        Unique objects: 4.0 Current complexity: 36914.23123644083

        ?n2 ns1:InRelationTo ?r2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
        257667.0 Unique objects: 674102.0      Current complexity: 96574.0941018727

        ?r2 ns1:PointsTo ?n3 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 307082.0      Current complexity: 96574.0941018727

        ?n3 node:label "address" . #      Collection size: 93454.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
        Unique objects: 4.0 Current complexity: 96574.0941018727

        ?r3 ns1:PointsTo ?n3 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 307082.0      Current complexity: 211998.0656054754

        ?n4 ns1:InRelationTo ?r3 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
        257667.0 Unique objects: 674102.0      Current complexity: 211998.0656054754

        ?n4 node:label "officer" . #      Collection size: 238402.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
        Unique objects: 4.0 Current complexity: 211998.0656054754

    } # ----- End optimization group 1 -----
    # ESTIMATED NUMBER OF ITERATIONS: 211998.0656054754

    OPTIONAL
    {

        { # ----- Begin optimization group 2 -----

            ?r1 ns1:valid\_until ?valid . #      Collection size: 1228392.0      Predicate collection size: 1228392.0      Unique subjects:
            1228392.0 Unique objects: 2.0 Current complexity: 1.0

        } # ----- End optimization group 2 -----
    }
}

```

```

# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL
{

{ # ----- Begin optimization group 3 -----

?r1 ns1:sourceID ?sourceID . #      Collection size: 1233702.0      Predicate collection size: 1233702.0      Unique subjects:
1233702.0 Unique objects: 1.0      Current complexity: 1.0

} # ----- End optimization group 3 -----
# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL
{

{ # ----- Begin optimization group 4 -----

?n1 ns1:name ?name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects: 466139.0
Unique objects: 335677.0      Current complexity: 1.0

} # ----- End optimization group 4 -----
# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
}

```

Query 12.

```

SELECT ?officer_name ?link1 ?officer2_name ?link2 ?entity_name ?intermediary_name ?valid_until ?e_name
{

{ # ----- Begin optimization group 1 -----

?n5 node:label "intermediary" . #      Collection size: 14110.0      Predicate collection size: 559600.0      Unique subjects:
559600.0 Unique objects: 4.0      Current complexity: 14110.0

?n5 ns1:InRelationTo ?r4 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
257667.0 Unique objects: 674102.0      Current complexity: 36914.23123644083

?r4 edge:label "intermediary_of" . #      Collection size: 213634.0      Predicate collection size: 674102.0      Unique subjects:
674102.0 Unique objects: 3.0      Current complexity: 36914.23123644083

?r4 ns1:PointsTo ?n4 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
Unique objects: 307082.0      Current complexity: 36914.23123644083

?n4 node:label "entity" . #      Collection size: 213634.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
Unique objects: 4.0      Current complexity: 36914.23123644083

?r3 ns1:PointsTo ?n4 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
Unique objects: 307082.0      Current complexity: 81033.5907182682

?n2 ns1:InRelationTo ?r3 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
257667.0 Unique objects: 674102.0      Current complexity: 81033.5907182682

?n2 node:label "officer" . #      Collection size: 238402.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
Unique objects: 4.0      Current complexity: 81033.5907182682

?r3 edge:label "officer_of" . #      Collection size: 309363.0      Predicate collection size: 674102.0      Unique subjects:
674102.0 Unique objects: 3.0      Current complexity: 81033.5907182682

?r1 ns1:PointsTo ?n2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
Unique objects: 307082.0      Current complexity: 177883.7755725377

?n1 ns1:InRelationTo ?r1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
257667.0 Unique objects: 674102.0      Current complexity: 177883.7755725377

?n1 node:label "officer" . #      Collection size: 238402.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
Unique objects: 4.0      Current complexity: 177883.7755725377

?r1 edge:label "officer_of" . #      Collection size: 309363.0      Predicate collection size: 674102.0      Unique subjects:
674102.0 Unique objects: 3.0      Current complexity: 177883.7755725377

```

```

    ?n2 ns1:InRelationTo ?r2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
257667.0 Unique objects: 674102.0      Current complexity: 465375.1116014034
    ?r2 edge:label "registered_address" . # Collection size: 151105.0      Predicate collection size: 674102.0      Unique subjects:
674102.0 Unique objects: 3.0      Current complexity: 465375.1116014034
    ?r2 ns1:PointsTo ?n3 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 307082.0      Current complexity: 465375.1116014034
    ?n3 node:label "address" . # Collection size: 93454.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
        Unique objects: 4.0      Current complexity: 465375.1116014034
    ?n5 ns1:InRelationTo ?r5 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects:
257667.0 Unique objects: 674102.0      Current complexity: 1217502.798110465
    ?r5 edge:label "intermediary_of" . # Collection size: 213634.0      Predicate collection size: 674102.0      Unique subjects:
674102.0 Unique objects: 3.0      Current complexity: 1217502.798110465
    ?r5 ns1:PointsTo ?n6 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 307082.0      Current complexity: 1217502.798110465
    FILTER (?n6 != ?n4)
    ?n6 node:label "entity" . #      Collection size: 213634.0      Predicate collection size: 559600.0      Unique subjects: 559600.0
        Unique objects: 4.0      Current complexity: 1217502.798110465

```

} # ----- End optimization group 1 -----

ESTIMATED NUMBER OF ITERATIONS: 1217502.798110465

OPTIONAL

{

{ # ----- Begin optimization group 2 -----

```

    ?n1 ns1:name ?officer_name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects:
466139.0 Unique objects: 335677.0      Current complexity: 1.0

```

} # ----- End optimization group 2 -----

ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL

{

{ # ----- Begin optimization group 3 -----

```

    ?r1 ns1:link ?link1 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 33.0      Current complexity: 1.0

```

} # ----- End optimization group 3 -----

ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL

{

{ # ----- Begin optimization group 4 -----

```

    ?n2 ns1:name ?officer2_name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects:
466139.0 Unique objects: 335677.0      Current complexity: 1.0

```

} # ----- End optimization group 4 -----

ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL

{

{ # ----- Begin optimization group 5 -----

```

    ?r3 ns1:link ?link2 . #      Collection size: 674102.0      Predicate collection size: 674102.0      Unique subjects: 674102.0
        Unique objects: 33.0      Current complexity: 1.0

```

```

} # ----- End optimization group 5 -----
# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL
{

{ # ----- Begin optimization group 6 -----

?n4 ns1:name ?entity_name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects:
466139.0 Unique objects: 335677.0      Current complexity: 1.0

} # ----- End optimization group 6 -----
# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL
{

{ # ----- Begin optimization group 7 -----

?n5 ns1:name ?intermediary_name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique
subjects: 466139.0 Unique objects: 335677.0      Current complexity: 1.0

} # ----- End optimization group 7 -----
# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL
{

{ # ----- Begin optimization group 8 -----

?r4 ns1:valid\_until ?valid\_until . #      Collection size: 1228392.0      Predicate collection size: 1228392.0      Unique subjects:
1228392.0 Unique objects: 2.0      Current complexity: 1.0

} # ----- End optimization group 8 -----
# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
OPTIONAL
{

{ # ----- Begin optimization group 9 -----

?n6 ns1:name ?e_name . #      Collection size: 466139.0      Predicate collection size: 466139.0      Unique subjects: 466139.0
Unique objects: 335677.0      Current complexity: 1.0

} # ----- End optimization group 9 -----
# ESTIMATED NUMBER OF ITERATIONS: 1.0

}
}

```