

SPARQL 1.1

Requête simple

```
SELECT ?a
WHERE
{
    dbr:Les_Misérables dbo:author ?a
}
```

Requête simple

```
SELECT ?a
WHERE
{
    dbr:Les_Misérables dbo:author ?a
}
```

On recherche l'auteur d'un livre

Requête simple

```
SELECT ?a
WHERE
{
  dbr:Les_Misérables dbo:author ?a
}
```

auteur

http://dbpedia.org/resource/Victor_Hugo

Réponses multiples

```
SELECT ?livre ?auteur
WHERE
{
    ?livre dbo:author ?auteur .
    ?auteur dbo:birthPlace dbr:Caen .
}
```

Réponses multiples

```
SELECT ?livre ?auteur
WHERE
{
    ?livre dbo:author ?auteur .
    ?auteur dbo:birthPlace dbr:Caen .
}
```

On recherche les livres écrits par un auteur né à Caen

Réponses multiples

```
SELECT ?livre ?auteur
WHERE
{
  ?livre dbo:author ?auteur .
  ?auteur dbo:birthPlace dbr:Caen .
}
```

livre	auteur
http://dbpedia.org/resource/Le Tiroir secret	http://dbpedia.org/resource/Roger Grenier
http://dbpedia.org/resource/Letters from an American Farmer	http://dbpedia.org/resource/J. Hector St. John de Crèveceur

Littéraux

```
SELECT ?b
WHERE
{
  [] rdfs:label "Barack Obama";
    dbo:birthPlace ?b .
}
```


Littéraux

```
SELECT ?b
WHERE
{
  [] rdfs:label "Barack Obama";
    dbo:birthPlace ?b .
}
```

On veut savoir où est né Barack Obama (on ne connaît pas son URI)

Littéraux

```
SELECT ?b
WHERE
{
  [] rdfs:label "Barack Obama";
  bo:birthPlace ?b .
}
```



Littéraux

```
SELECT ?b
WHERE
{
  [] rdfs:label "Barack Obama"@en;
    dbo:birthPlace ?b .
}
```

Le littéral a une étiquette de langue, qu'il faut spécifier dans la requête

Littéraux

```
SELECT ?b
WHERE
{
  [] rdfs:label "Barack Obama";
    dbo:birthPlace ?b .
}
```

b
http://dbpedia.org/resource/Honolulu
http://dbpedia.org/resource/Hawaii

Fusion des résultats

```
SELECT CONCAT("[", ?p, " ET ", ?s, "]")
WHERE {
    ?p dbo:spouse ?s .
    ?p dbo:birthPlace dbr:Montreal .
    ?s dbo:birthPlace dbr:Montreal .
}
```

Fusion des résultats

```
SELECT CONCAT( "[", ?p, " ET ", ?s, "]" )
WHERE {
    ?p dbo:spouse ?s .
    ?p dbo:birthPlace dbr:Montreal .
    ?s dbo:birthPlace dbr:Montreal .
}
```

callret-0
[http://dbpedia.org/resource/Audrey_Capel_Doray ET http://dbpedia.org/resource/Audrey_Capel_Doray]
[http://dbpedia.org/resource/Len_Blum ET http://dbpedia.org/resource/Heather_Munroe-Blum]
[http://dbpedia.org/resource/Heather_Munroe-Blum ET http://dbpedia.org/resource/Len_Blum]
[http://dbpedia.org/resource/Jacques_Parizeau ET http://dbpedia.org/resource/Lisette_Lapointe]
[http://dbpedia.org/resource/Arthur_Holden ET http://dbpedia.org/resource/Claire_Holden_Rothman]
[http://dbpedia.org/resource/Geneviève_Bujold ET http://dbpedia.org/resource/Paul_Almond]
[http://dbpedia.org/resource/Lisette_Lapointe ET http://dbpedia.org/resource/Jacques_Parizeau]
[http://dbpedia.org/resource/Claire_Holden_Rothman ET http://dbpedia.org/resource/Arthur_Holden]
[http://dbpedia.org/resource/Georges_Vanier ET http://dbpedia.org/resource/Pauline_Vanier]

Construction d'un graphe

```
PREFIX local: <http://www.exemple.com/>
```

```
CONSTRUCT { dbr:Montreal local:couple  
            [ rdf:member ?p; rdf:member ?s ] . }
```

```
WHERE
```

```
{  
    ?p dbo:spouse ?s ;  
        dbo:birthPlace dbr:Montreal .  
    ?s dbo:birthPlace dbr:Montreal .  
}
```

Construction d'un graphe

```
PREFIX local: <http://www.exemple.com/>

CONSTRUCT { dbr:Montreal local:couple
             [ rdf:member ?p; rdf:member ?s ] .}

WHERE
{
  ?p dbo:spouse ?s ;
     dbo:birthPlace dbr:Montreal .
  ?s dbo:birthPlace dbr:Montreal .
}
```

@prefix ns0: <http://www.exemple.com/> .

@prefix dbr: <http://dbpedia.org/resource/> .

dbr:Montreal ns0:couple _:b29689172 , _:b29689170 , _:b29689171 ,
_:b29689168 , _:b29689169 , _:b29689166 ,
_:b29689167 , _:b29689164 , _:b29689165 .

@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .

_:b29689165 rdf:member dbr:Len_Blum , dbr:Heather_Munroe-Blum .
_:b29689166 rdf:member dbr:Heather_Munroe-Blum , dbr:Len_Blum .
_:b29689167 rdf:member dbr:Jacques_Parizeau , dbr:Lisette_Lapointe .
_:b29689168 rdf:member dbr:Claire_Holden_Rothman , dbr:Arthur_Holden .
_:b29689169 rdf:member dbr:Paul_Almond , dbr:Geneviève_Bujold .
_:b29689170 rdf:member dbr:Jacques_Parizeau , dbr:Lisette_Lapointe .
_:b29689171 rdf:member dbr:Arthur_Holden , dbr:Claire_Holden_Rothman .
_:b29689172 rdf:member dbr:Pauline_Vanier , dbr:Georges_Vanier .

Filtrage des résultats

```
SELECT  ?b ?title
WHERE
{
  ?b a dbo:Book ;
      dbp:name ?title .
  FILTER contains(str(?title), "Darth Vader")
}
```

Filtrage des résultats

```
SELECT  ?b ?title
WHERE
{
  ?b a dbo:Book ;
      dbp:name ?title .
  FILTER contains(str(?title), "Darth Vader")
}
```

b	title
http://dbpedia.org/resource/Dark Lord: The Rise of Darth Vader	"Dark Lord The Rise of Darth Vader"@en
http://dbpedia.org/resource/The Glove of Darth Vader	"The Glove of a Darth Vader"@en

Filtrage des résultats

```
PREFIX dc: <http://purl.org/dc/elements/1.1/>
PREFIX ns: <http://example.org/ns#>
SELECT ?title ?price
WHERE
{
    ?x ns:price ?price .
    FILTER (?price < 30.5)
    ?x dc:title ?title .
}
```

Sous-graphes optionnels

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name ?mbox
WHERE
{
    ?x foaf:name ?name .
    OPTIONAL { ?x foaf:mbox ?mbox }
}
```

Sous-graphes optionnels avec contraintes

```
PREFIX dc: <http://purl.org/dc/elements/1.1/>
PREFIX ns: <http://example.org/ns#>
SELECT ?title ?price
WHERE
{
  ?x dc:title ?title .
  OPTIONAL { ?x ns:price ?price . FILTER (?price < 30) }
}
```

Sous-graphes optionnels multiples

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name ?mbox ?hpage
WHERE
{
    ?x foaf:name ?name .
    OPTIONAL { ?x foaf:mbox ?mbox } .
    OPTIONAL { ?x foaf:homepage ?hpage }
}
```

Alternatives

```
PREFIX dc10: <http://purl.org/dc/elements/1.0/>
PREFIX dc11: <http://purl.org/dc/elements/1.1/>
SELECT ?title
WHERE
{
  {?book dc10:title ?title} UNION {?book dc11:title ?title}
}
```

Alternatives

```
PREFIX dc10: <http://purl.org/dc/elements/1.0/>
PREFIX dc11: <http://purl.org/dc/elements/1.1/>
SELECT ?title ?author WHERE
{
    {?book dc10:title ?title . ?book dc10:creator ?author}
    UNION
    {?book dc11:title ?title . ?book dc11:creator ?author}
}
```


Négation

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?person WHERE
{
  ?person rdf:type foaf:Person .
  FILTER NOT EXISTS {?person foaf:name ?name }
}
```

Remarque: on peut aussi utiliser le filtre EXISTS (qui a bien sûr l'effet contraire)

Retrait de solutions

```
PREFIX : <http://example/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT DISTINCT ?s WHERE
{
    ?s ?p ?o .
    MINUS { ?s foaf:givenName "Bob" . }
}
```

Difficile de voir la différence avec NOT EXISTS

Chemin de propriétés

- ^ Inverse
- / Séquence
- | Alternative
- * Zéro ou plusieurs propriétés dans le chemin
- + Une ou plusieurs propriétés dans le chemin
- ? Zéro ou une propriété dans le chemin
- ! Négation

Exemples de chemins de propriétés

```
{ :book1 dc:title|rdfs:label ?displayString }
```

```
{ ?x foaf:name "Alice" ;  
  foaf:knows/foaf:knows/foaf:name ?name . }
```

```
{ <mailto:alice@example> ^foaf:mbox ?x }
```

```
{ ?x foaf:knows/^foaf:knows ?y . FILTER(?x != ?y) }
```

```
{ ?x rdf:type/rdfs:subClassOf* ?type }
```

Assignations

```
PREFIX dc: <http://purl.org/dc/elements/1.1/>
PREFIX ns: <http://example.org/ns#>
SELECT ?title ?price WHERE
{
  ?x ns:price ?p;
  ?p ns:discount ?discount
  BIND (?p*(1-?discount) AS ?price)
  FILTER(?price < 20)
  ?x dc:title ?title .
}
```

Assignations

```
PREFIX dc: <http://purl.org/dc/elements/1.1/>
PREFIX ns: <http://example.org/ns#>
SELECT ?title ?price WHERE
{
  ?x ns:price ;
  ?p ns:discount ?discount
  BIND (?p*(1-?discount) AS ?price)
  FILTER(?price < 20)
  ?x dc:title ?title .
}
```

```
PREFIX dc: <http://purl.org/dc/elements/1.1/>
PREFIX ns: <http://example.org/ns#>
SELECT ?title ?price WHERE
{
  { ?x ns:price ;
    ?p ns:discount ?discount
    BIND (?p*(1-?discount) AS ?price) }
  ?x dc:title ?title .
  FILTER(?price < 20)
}
```

Agrégations

- Opérateurs d'agrégation:
 - COUNT
 - SUM, MIN
 - MAX
 - AVG
 - GROUP_CONCAT
 - SAMPLE
- Opérateur de regroupement: GROUP BY
- Opérateur de filtrage de groupes: HAVING

Exemple d'agrégation

```
PREFIX : <http://books.example/>
SELECT ?org (SUM(?lprice) AS ?totalPrice)
WHERE
{
    ?org :affiliates ?auth .
    ?auth :writesBook ?book .
    ?book :price ?lprice .
}
GROUP BY ?org
HAVING (SUM(?lprice) > 10)
```

```
@prefix : <http://books.example/> .
:org1 :affiliates :auth1, :auth2 .
:auth1 :writesBook :book1, :book2 .
:book1 :price 9 .
:book2 :price 5 .
:auth2 :writesBook :book3 .
:book3 :price 7 .
:org2 :affiliates :auth3 .
:auth3 :writesBook :book4 .
:book4 :price 7 .
```


Exemple d'agrégation

```
PREFIX : <http://books.example/>
```

```
SELECT ?org (SUM(?lprice) AS ?totalPrice)
```

```
WHERE
```

```
{  
  ?org :affiliates ?auth .  
  ?auth :writesBook ?book .  
  ?book :price ?lprice .  
}
```

1

```
GROUP BY ?org
```

```
HAVING (SUM(?lprice) > 10)
```

```
@prefix : <http://books.example/> .
```

```
:org1 :affiliates :auth1, :auth2 .
```

```
:auth1 :writesBook :book1, :book2 .
```

```
:book1 :price 9 .
```

```
:book2 :price 5 .
```

```
:auth2 :writesBook :book3 .
```

```
:book3 :price 7 .
```

```
:org2 :affiliates :auth3 .
```

```
:auth3 :writesBook :book4 .
```

```
:book4 :price 7 .
```

?org	?auth	?book	?lprice
-------------	--------------	--------------	----------------

:org1	:auth1	:book1	9
-------	--------	--------	---

:org1	:auth1	:book2	5
-------	--------	--------	---

:org1	:auth2	:book3	7
-------	--------	--------	---

:org2	:auth3	:book4	7
-------	--------	--------	---

Exemple d'agrégation

```
PREFIX : <http://books.example/>
SELECT ?org (SUM(?lprice) AS ?totalPrice)
WHERE
{
    ?org :affiliates ?auth .
    ?auth :writesBook ?book .
    ?book :price ?lprice .
}
```

```
GROUP BY ?org
HAVING (SUM(?lprice) > 10)
```

```
@prefix : <http://books.example/> .
:org1 :affiliates :auth1, :auth2 .
:auth1 :writesBook :book1, :book2 .
:book1 :price 9 .
:book2 :price 5 .
:auth2 :writesBook :book3 .
:book3 :price 7 .
:org2 :affiliates :auth3 .
:auth3 :writesBook :book4 .
:book4 :price 7 .
```

?org	?auth	?book	?lprice
:org1	:auth1	:book1	9
:org1	:auth1	:book2	5
:org1	:auth2	:book3	7

:org2	:auth3	:book4	7
------------------	-------------------	-------------------	--------------

Exemple d'agrégation

```
PREFIX : <http://books.example/>
SELECT (SUM(?lprice) AS ?totalPrice)
WHERE
{
    ?org :affiliates ?auth .
    ?auth :writesBook ?book .
    ?book :price ?lprice .
}
GROUP BY ?org
HAVING (SUM(?lprice) > 10)
```

3

```
@prefix : <http://books.example/> .
:org1 :affiliates :auth1, :auth2 .
:auth1 :writesBook :book1, :book2 .
:book1 :price 9 .
:book2 :price 5 .
:auth2 :writesBook :book3 .
:book3 :price 7 .
:org2 :affiliates :auth3 .
:auth3 :writesBook :book4 .
:book4 :price 7 .
```

?org	?totalPrice
:org1	21

Exemple d'agrégation (sans HAVING)

```
PREFIX : <http://books.example/>
```

```
SELECT ?org (SUM(?lprice) AS ?totalPrice)
```

```
WHERE
```

```
{  
    ?org :affiliates ?auth .  
    ?auth :writesBook ?book .  
    ?book :price ?lprice .  
}
```

```
GROUP BY ?org
```

```
@prefix : <http://books.example/> .  
:org1 :affiliates :auth1, :auth2 .  
:auth1 :writesBook :book1, :book2 .  
:book1 :price 9 .  
:book2 :price 5 .  
:auth2 :writesBook :book3 .  
:book3 :price 7 .  
:org2 :affiliates :auth3 .  
:auth3 :writesBook :book4 .  
:book4 :price 7 .
```

Exemple d'agrégation (sans HAVING)

```
PREFIX : <http://books.example/>
```

```
SELECT ?org (SUM(?lprice) AS ?totalPrice)
```

```
WHERE
```

```
{  
  ?org :affiliates ?auth .  
  ?auth :writesBook ?book .  
  ?book :price ?lprice .  
}
```

```
GROUP BY ?org
```

```
@prefix : <http://books.example/> .  
:org1 :affiliates :auth1, :auth2 .  
:auth1 :writesBook :book1, :book2 .  
:book1 :price 9 .  
:book2 :price 5 .  
:auth2 :writesBook :book3 .  
:book3 :price 7 .  
:org2 :affiliates :auth3 .  
:auth3 :writesBook :book4 .  
:book4 :price 7 .
```

?org	?totalPrice
:org1	21
:org2	7

Autre exemple d'agrégation

```
PREFIX : <http://data.example/>
SELECT (AVG(?size) AS ?asize) WHERE
{
    ?x :size ?size
}
GROUP BY ?x
HAVING (AVG(?size) > 10)
```

Sous-requêtes

```
PREFIX : <http://people.example/>
PREFIX : <http://people.example/>
SELECT ?y ?minName WHERE {
  :alice :knows ?y .
  {
    SELECT ?y (MIN(?name) AS ?minName) WHERE {
      ?y :name ?name .
    } GROUP BY ?y
  }
}
```

```
@prefix : <http://people.example/> .
:alice :name "Alice", "Alice Foo", "A. Foo" .
:alice :knows :bob, :carol .
:bob :name "Bob", "Bob Bar", "B. Bar" .
:carol :name "Carol", "Carol Baz", "C. Baz" .
```

Sous-requêtes

```
PREFIX : <http://people.example/>
PREFIX : <http://people.example/>
SELECT ?y ?minName WHERE {
  :alice :knows ?y .
  {
    SELECT ?y (MIN(?name) AS ?minName) WHERE {
      ?y :name ?name .
    } GROUP BY ?y
  }
}
```

```
@prefix : <http://people.example/> .
:alice :name "Alice", "Alice Foo", "A. Foo" .
:alice :knows :bob, :carol .
:bob :name "Bob", "Bob Bar", "B. Bar" .
:carol :name "Carol", "Carol Baz", "C. Baz" .
```

y	minName
:bob	"B. Bar"
:carol	"C. Baz"

Spécification du graphe

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX dc: <http://purl.org/dc/elements/1.1/>
SELECT ?who ?g ?mbox
FROM <http://example.org/dft.ttl> (graphe par défaut)
FROM NAMED <http://example.org/alice>
FROM NAMED <http://example.org/bob>
WHERE {
    ?g dc:publisher ?who .
    GRAPH ?g { ?x foaf:mbox ?mbox }
}
```

Fédération de requêtes: SERVICE

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name
FROM <http://example.org/myfoaf.rdf>
WHERE
{
    <http://example.org/myfoaf/I> foaf:knows ?person .
    SERVICE <http://people.example.org/sparql>
    {
        ?person foaf:name ?name .
    }
}
```

Fédération de requêtes: SERVICE

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name
FROM <http://example.org/myfoaf.rdf>
WHERE
{
    <http://example.org/myfoaf/I> foaf:knows ?person .
    SERVICE <http://people.example.org/sparql>
    {
        ?person foaf:name ?name .
    }
}
```

Myfoaf.rdf:

:michel foaf:knows <http://example.org/people15> .

http://people.example.org/sparql:

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix : <http://example.org/> .
:people15 foaf:name "Alice" .
:people16 foaf:name "Bob" .
:people17 foaf:name "Charles" .
:people18 foaf:name "Daisy" .
```

name
"Alice"

Modificateurs de requêtes

- ORDER BY
- DISTINCT
- LIMIT et OFFSET

Formes de requêtes

- SELECT
- CONSTRUCT
- ASK
- DESCRIBE