Federated Query Optimization Method based on SPARQL Endpoint Features for Efficient Retrieval

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Background : Timeouts in SPARQL query execution

LOD facilitates publishing and sharing metadata in machine-readable formats, enabling data interlinking and integration.

Accessing LOD datasets via the SPARQL query language often leads to timeouts.

Primary causes of query timeouts:

A. Volume of stored data
B. Performance of the SPARQL query engine
C. Composition of the SPARQL query

Objective : Retrieving SPARQL results without timeouts

While factors A and B are beyond the user's direct control, this study focuses on understanding and addressing factor C.

Decompose SPARQL queries and rewrite them into queries of executable granularity to mitigate timeouts.

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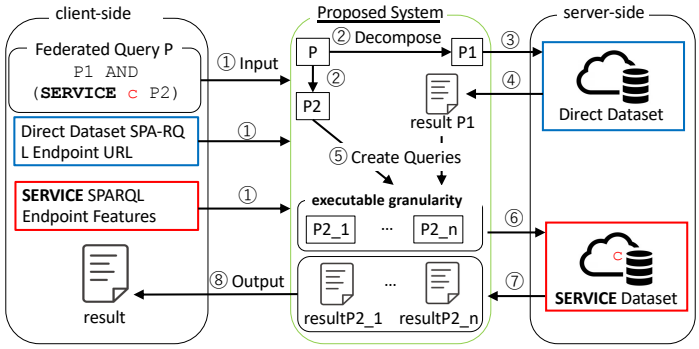
1. **Iteratively query to gather features for each SPARQL endpoint, specifically:**
   - Supported HTTP request methods (GET or POST)
   - Size constraints for executable SPARQL queries (i.e., HTTP Request Header/Body Size)
2. **Dissect the input Federated Query to align with the previously acquired features:**
   - Utilizing the VALUES clause



Evaluation

- Prepared two federated query patterns (mechanically or manually) for evaluation.
- Performed comparative evaluation using the three methods below:

1. EXISTING METHOD
Execute the federated query as provided.

2. VALUES METHOD
Rewrite the federated query using the VALUES clause.

3. PROPOSED METHOD

Conclusion

- PROPOSED method demonstrated the highest success rate among the three methods.
- No notable difference was observed between the VALUES and PROPOSED methods regarding execution time.
- For future work, additional evaluation queries will be prepared to assess accuracy further.

Evaluation Results

Mechanical Query	number of successes / number of trials, average time(s)		
	EXISTING	VALUES	PROPOSED
assaultlily-rdf	0/10,	0/10,	10/10, 3.60
Cultural Japan	0/10,	0/10,	10/10, 0.21
DBpedia	0/10,	10/10, 2.49	10/10, 3.13
DBpedia Japanese	10/10, 18.01	0/10,	0/10,
Earthquake LOD	10/10, 39.91	0/10,	10/10, 0.92
Japan Search	0/10,	0/10,	10/10, 1.65
jrslod	10/10, 9.80	0/10,	10/10, 0.43
Linked Open Vocabularies	0/10,	0/10,	10/10, 4.23
Media Art Database	0/10,	0/10,	0/10,
Web NDL Authorities	10/10, 9.50	0/10,	10/10, 0.40
Onsen LOD	0/10,	0/10,	10/10, 0.19
OWL de ramen ontology	0/10,	10/10, 5.09	10/10, 5.18
☆pikopiko planet☆space	0/10,	0/10,	0/10,
PrismDB	0/10,	0/10,	10/10, 1.49
Wikidata	0/10,	0/10,	10/10, 44.73

Manual Query	number of successes / number of trials, average time(s)		
	EXISTING	VALUES	PROPOSED
Query1	0/10,	5/10, 63.44	5/10, 72.35
Query2	10/10, 7.36	0/10,	0/10,
Query3	0/10,	0/10,	0/10,
Query4	1/10, 335.41	0/10,	10/10, 61.24
Query5	0/10,	0/10,	10/10, 9.80
Query6	9/10, 437.28	0/10,	10/10, 170.16

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