Property Graph Querying roadmap and initial scope

Title Property Graph Querying roadmap and initial scope
Authors Neo4j SQL working group
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1. References

[sq-pg-2017-0047r1] Peter Furniss, Alastair Green, Petra Selmer, “SQL Graph Query Procedures” (with corrigenda), August/October 2017

1 Current members of the Neo4j SQL working group are: Alastair Green, Peter Furniss, Petra Selmer, Stefan Plantikow, Tobias Lindaaker
2. Roadmap and Initial Scope of extensions to SQL for Property Graphs

Taking into account verbal comments by Fred Zemke (Oracle) at the Ad Hoc meeting on 2 May 2018, and the proposals made by Neo4j in [sql-pg-2017-0047r1], and the state of progress in the Ad Hoc to date, we’d like to suggest the following roadmap and initial scope.

This is a working proposal: there are edge cases and different ways of describing the potential progression.

Text in **Bold** is In Scope for the Initial Working Draft to be discussed at WG3 meeting in Ilmenau, early October, with the assumption that the IWD will not change scope as it transmutes into a CD for inclusion as a new part of a presumed SQL:2020.

Text in *Italic* is Potentially In Scope for the Initial Working Draft, but only if the In Scope work has been successfully drafted into an IWD.

Text in *Roman* is Out of Scope for the Initial Working Draft, but indicates useful progressions in functionality supporting graph data processing.

3. SQL Property Graph Data Model and DDL

1. Define the SQL version of the PGDM
2. Define how DDL will enable Graph objects to be created and dropped in the Information Schema, which conform to the PGDM
3. Define how DDL will enable named Graph objects to be optionally mapped to Tables in the Information Schema, including the lifecycle of that mapping (initial state, additions, amendments, partial deletions)
4. Definition of Graph metadata and of Graph (reference) type to support graph existence searches and graph projections (construction).
5. Definition of Node, Edge and Path data types.
### 4. Graph functions and operations

<table>
<thead>
<tr>
<th>Function</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAPH_TABLE</td>
<td><strong>MATCH verb</strong></td>
</tr>
<tr>
<td></td>
<td>Path pattern match with simple node and edge type and property value predicates for fixed length paths, with presence, alternation and conjunction tests on node and edge types, and an entity identity function</td>
</tr>
<tr>
<td></td>
<td>Same for variable length paths, with constraints on min and max length of paths</td>
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<tr>
<td></td>
<td>Same for shortest and top $k$ paths, including distinction and limitation</td>
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<td></td>
<td>Control over degrees of isomorphism, including homomorphism, edge isomorphism, isomorphism, and extending to control for specified edge and node variables</td>
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<tr>
<td></td>
<td>Ability to express path pattern matches using regular expressions, including patterns of sub patterns</td>
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<tr>
<td></td>
<td>Ability to name a path pattern, for use as the operand of another pattern (pattern &quot;macros&quot;)</td>
</tr>
<tr>
<td></td>
<td>Support for property projection into a SQL table</td>
</tr>
<tr>
<td></td>
<td>Support for entity projection into a SQL table</td>
</tr>
<tr>
<td></td>
<td>Support for “foreign languages”: ability to insert a table-projecting Cypher query, or a PGQL query, into the function to act as a SQL sub-query</td>
</tr>
<tr>
<td>GRAPH_VALUE</td>
<td>As for GRAPH_TABLE but for any scalar projection of MATCH results</td>
</tr>
<tr>
<td>GRAPH_EXISTS</td>
<td>Return a boolean given graph metadata inputs which allow a Graph in the...</td>
</tr>
</tbody>
</table>

ANSI INCITS sql-pg-2018-0010
| GRAPH_QUERY | GRAPH ENTITY INSERT  
|            | GRAPH ENTITY UPDATE  
|            | GRAPH ENTITY DELETE  
|            | GRAPH PROJECT into the Information Schema as named object (CREATE GRAPH <foo> FROM GRAPH_QUERY), but without support for GRAPH reference datatype (no projection into outer query)  
|            | Use of GRAPH PROJECT to project graphs into outer query, implying GRAPH reference type and graph metadata  
|            | Support for “foreign languages”: ability to insert a graph-projecting Cypher query into the function to act as a SQL sub-query  

Information Schema to be uniquely identified.

Return a table of graph references given partial matches on input graph metadata.
5. An ITI and openCypher contribution from Neo4j Inc.

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It is also a contribution to the openCypher community² and like all such contributions is:

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² https://www.opencypher.org/