CYPHER

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Introduction

- **Problem Statement**: Linked Open Data connects diverse data sources but presents complex querying challenges.
- **Challenge**: Traditional databases (SQL) struggle with LOD's interconnected structure.
- **Goal**: We need a flexible, graph-based query language designed to handle these complexities.

What is Cypher?

- **Cypher** is Neo4j's declarative graph query language
- Allows users to focus on *what* to retrieve from the graph, rather than *how* to retrieve it.
- Optimized for querying complex data relationships, helps users realize the full potential of property graph databases.
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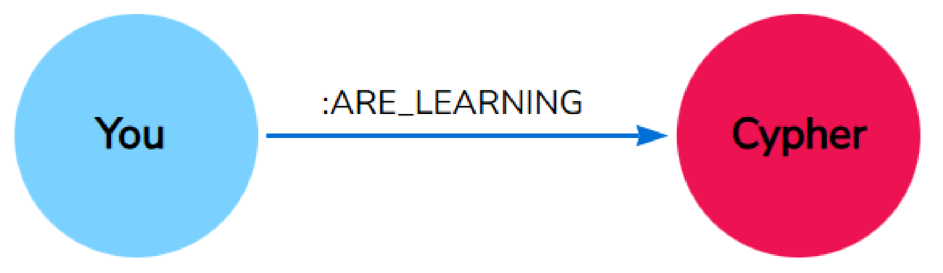
Cypher's Visual Syntax

- Uses ASCII-art-like syntax for representing nodes and relationships:
  - **Example**: `(nodes)-[:CONNECT_TO]->(otherNodes)`
  - **Notation**: Rounded brackets for circular nodes, `-[:ARROWS]->` for relationships.
  - 

  - (You)-[:ARE_LEARNING]->(Cypher)
- Writing a Cypher query resembles drawing patterns in data, which makes Cypher highly intuitive and easy to read.

Cypher and SQL: Key Differences [1]

Cypher and **SQL** share some similarities but have important differences:

1. **Schema Flexibility**:
   - Cypher and Neo4j offer greater schema flexibility than SQL, allowing nodes and relationships to exist without enforcing a fixed schema.
   - Example: Cypher enables users to add new attributes and relationships as graphs evolve, without requiring all nodes or relationships to have the same properties.

Cypher and SQL: Key Differences [2]

2. **Query Order**:
    - SQL queries start with the data to return, while Cypher queries end with the return clause.
    - **SQL Example**:

      ```
      SELECT movie.name
      FROM movie
      WHERE movie.rating > 7
      ```

    - **Cypher Example**:

      ```
      MATCH (movie:Movie)
      WHERE movie.rating > 7
      RETURN movie.title
      ```

Cypher and SQL: Key Differences [3]

3. **Conciseness**:
    - Cypher queries are often more concise, representing complex data relationships without needing JOINs.
    - **SQL Example**:

      ```
      SELECT actors.name
      FROM actors
        LEFT JOIN acted_in ON acted_in.actor_id = actors.id
        LEFT JOIN movies ON movies.id = acted_in.movie_id
      WHERE movies.title = "The Matrix"
      ```
    - **Cypher Example**:

      ```
      MATCH (actor:Actor)-[:ACTED_IN]->(movie:Movie {title: 'The Matrix'})
      RETURN actor.name
      ```

How Cypher Solves LOD and Knowledge Graph Challenges

Cypher provides key features that make querying LOD and Knowledge Graphs effective:

1. **Interoperability**: Integrates data from diverse sources.
2. **Schema flexibility**: Pattern matching adapts to varied LOD data structures.
3. **In-depth querying**: Enables knowledge discovery through multi-hop graph traversals.

Key Features of Cypher for LOD

Core features that make Cypher valuable for Knowledge Graphs:

- **Pattern Matching**: Enables finding specific structures in the graph.
- **Aggregation & Filtering**: Summarizes and refines large datasets.
- **Graph Traversals**: Discovers multi-hop relationships effortlessly.

Real-World Example of Cypher in a Knowledge Graph

Query:

```
MATCH (a:Author)-[:WROTE]->(p:Publication) RETURN a.name, p.title
```

Output?

Future Potential of Cypher in Linked Open Data

- Part of the openCypher project for widespread use.
- Growing adoption in graph databases, enabling better LOD interoperability.
- A powerful tool for future data integration and Knowledge Graph applications.

Thank You!

References: - Neo4j Cypher Query Language.

- Query a Neo4j database using Cypher
- Comparing Cypher with SQL
- openCypher