A Galaxy Interactive Environment for exploring the Neo4j Graph Database

Thoba Lose, Peter van Heusden, Alan Christoffels

thoba@sanbi.ac.za, pvh@sanbi.ac.za, alan@sanbi.ac.za
South African National Bioinformatics Institute
University of the Western Cape
South Africa

Introduction

• Storing biological data involves modeling and storing thousands of entities that are interrelated in complex ways.

• Relational databases meet very specific needs and are not designed to fit all scenarios.

• Graph databases, which focus on connections between entities, are seen as a natural fit to these complex relationships.

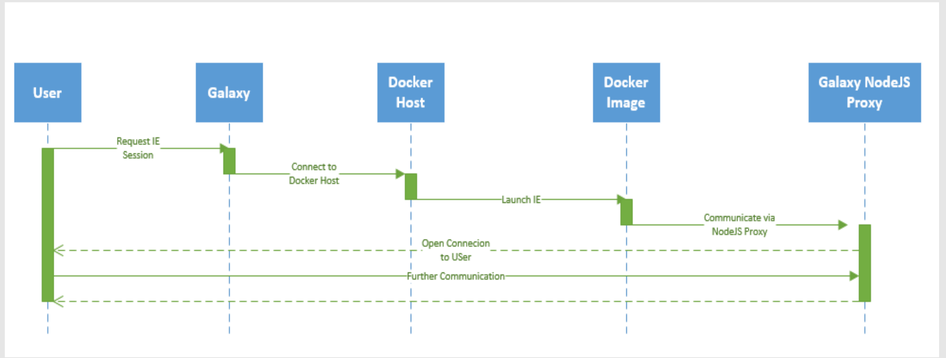
• Neo4j is a highly scalable graph database with a declarative query language called Cypher.

Implementation

• We implemented a Galaxy Interactive Environment (GIE) to explore a Neo4J database that is stored as a Galaxy dataset.

•The GIE was built by linking a Galaxy plugin to a Docker container based on a modified version of the Neo4J:2.3 Docker image.

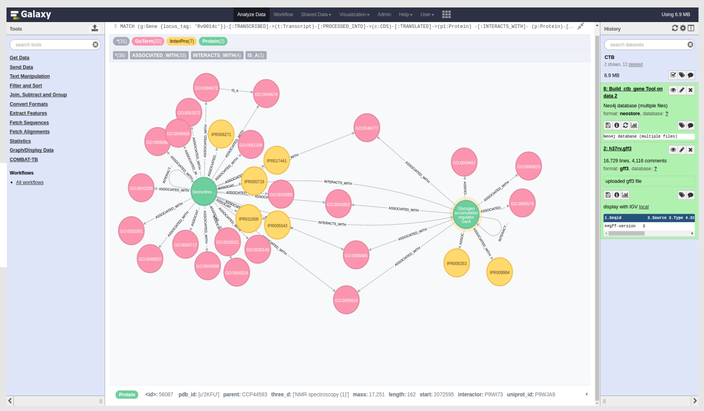
• The Interactive Environment is launched from the visualisation menu and is only available for Neo4J database (neostore) datatypes.



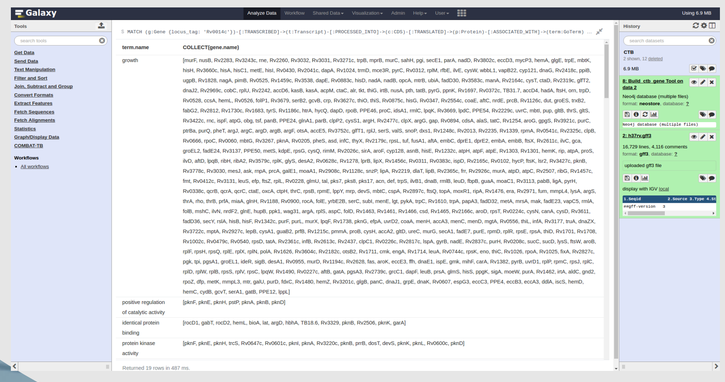
Results

A Neo4j GIE to explore the graph database using Cypher, a declarative query language desgined for expressing graph queries. Thus, allowing logical querying across entities.


```
$ MATCH (g:Gene {locus_tag: 'Rv0014c'})-[:TRANSCRIBED]->(t:Transcript)-[:PROCESSED_INTO]->
(c:CDS)-[:TRANSLATED]->(p1:Protein) -[:INTERACTS_WITH]- (p:Protein)-[:ASSOCIATED_WITH]->
(term) RETURN p, term
```




```
1 MATCH (g:Gene {locus_tag: 'Rv0014c'})-[:TRANSCRIBED]->(t:Transcript)-[:PROCESSED_INTO]->
(c:CDS)-[:TRANSLATED]->(p:Protein)-[:ASSOCIATED_WITH]->(term:GoTerm) WITH COLLECT(term) AS
terms UNWIND terms AS term
2 MATCH (gene:Gene) -[]->(:Transcript)-[]->(:CDS)-[]->(:Protein)-[]->(term:GoTerm) RETURN
term.name, COLLECT(gene.name)
```



Conclusion

The development of the Neo4J GIE bridges the gap between Galaxy and graph databases by allowing users to interrogate, using the Cypher declarative language, data without leaving Galaxy.

References

SANBI
South African National Bioinformatics Institute

saMRC advancinglife

UNIVERSITY of the WESTERN CAPE