Using CSV Files Importing to Build Graph DB in Neo4j

Introduction on the Approach

Database is in Neo4j 1.6.3, target to create graph database from scratch, with following content and data model:

Database purpose: Geographical Region / Country and their Climate Zone Mapping

Node:

- Region: e.g. North America, Africa, Asia etc.
- Country: e.g. Italy, China, Canada etc.
- Climate Zone: 3-char code base on [Koppen Climate Classification]

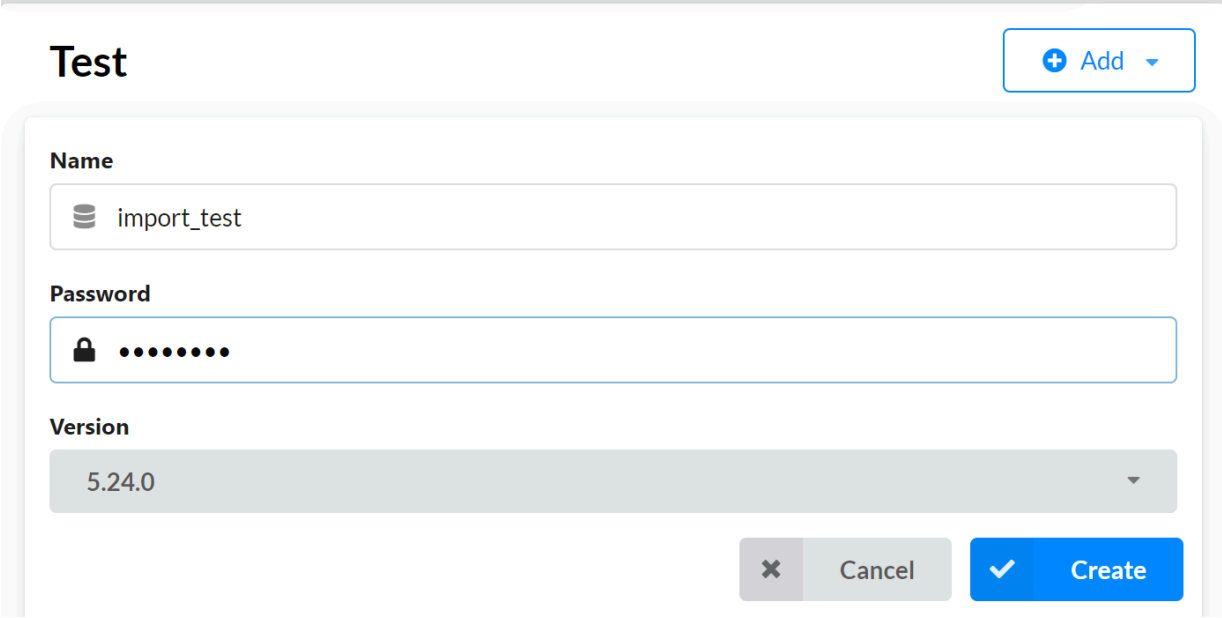
Testing Scenarios

1. Load CSV to create new Node with some instances
2. Load CSV to create both two Nodes and mapping relationships together
3. Load CSV to merge more instances to existing Node
4. Load CSV to merge more instances and more relationships to existing Node

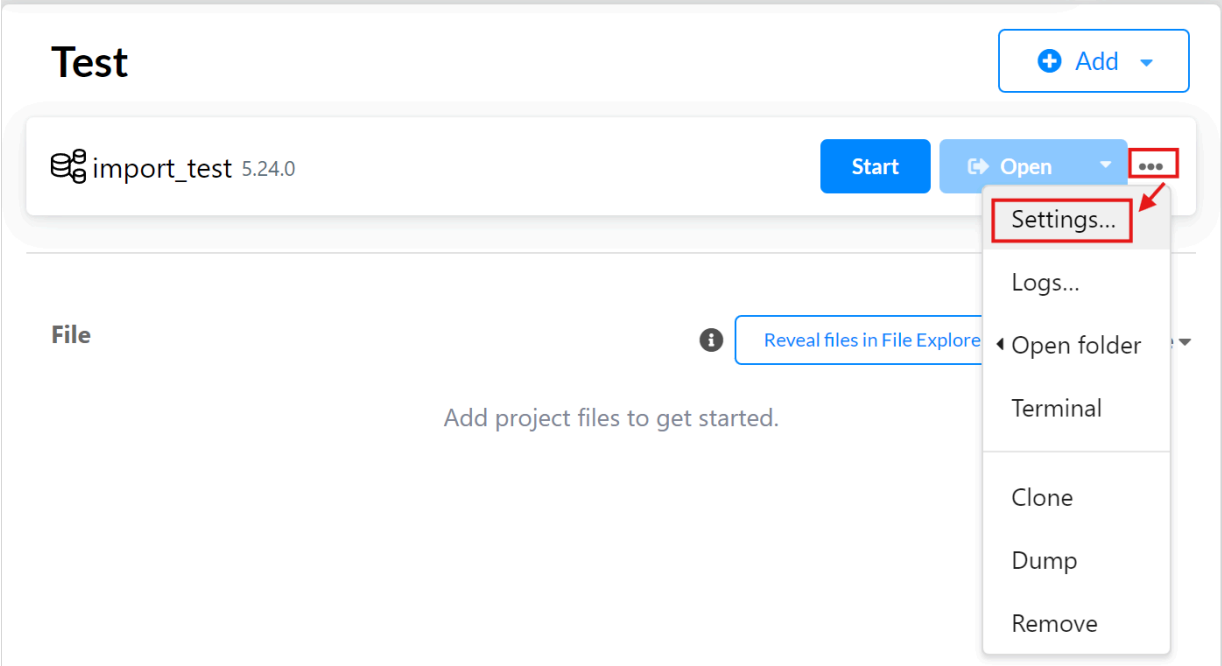
Primarily comparing the effect of `CREATE` and `MERGE` in Neo4j Cypher syntax.

Initialize Project and Database in Neo4j

Create a project in Neo4j 1.6.3 called `Test`, then create one new local_dbms called `import_test`, leave version as 4.24.0, as below:



After database is created, click the three dots and choose Settings..., as below:



In order to be able to load CSV from local directory, you need to find this setting line and comment it:

Edit settings

```
#server.directories.data=data
#server.directories.plugins=plugins
#server.directories.logs=logs
#server.directories.lib=lib
#server.directories.run=run
#server.directories.licenses=licenses
#server.directories.metrics=metrics
#server.directories.dumps.root=data/dumps
#server.directories.transaction.logs.root=data/transactions

# This setting constrains all `LOAD CSV` import files to be under the `import` directory. Remove or comment it out to
# allow files to be loaded from anywhere in the filesystem; this introduces possible security problems. See the
# `LOAD CSV` section of the manual for details.
server.directories.import=import
```

```
# This setting constrains all `LOAD CSV` import files to be under the `import` directory. Remove or comment it out to
# allow files to be loaded from anywhere in the filesystem; this introduces possible security problems. See the
# `LOAD CSV` section of the manual for details.
# server.directories.import=import  # comment at 20925/09/25 for load local CSV
```

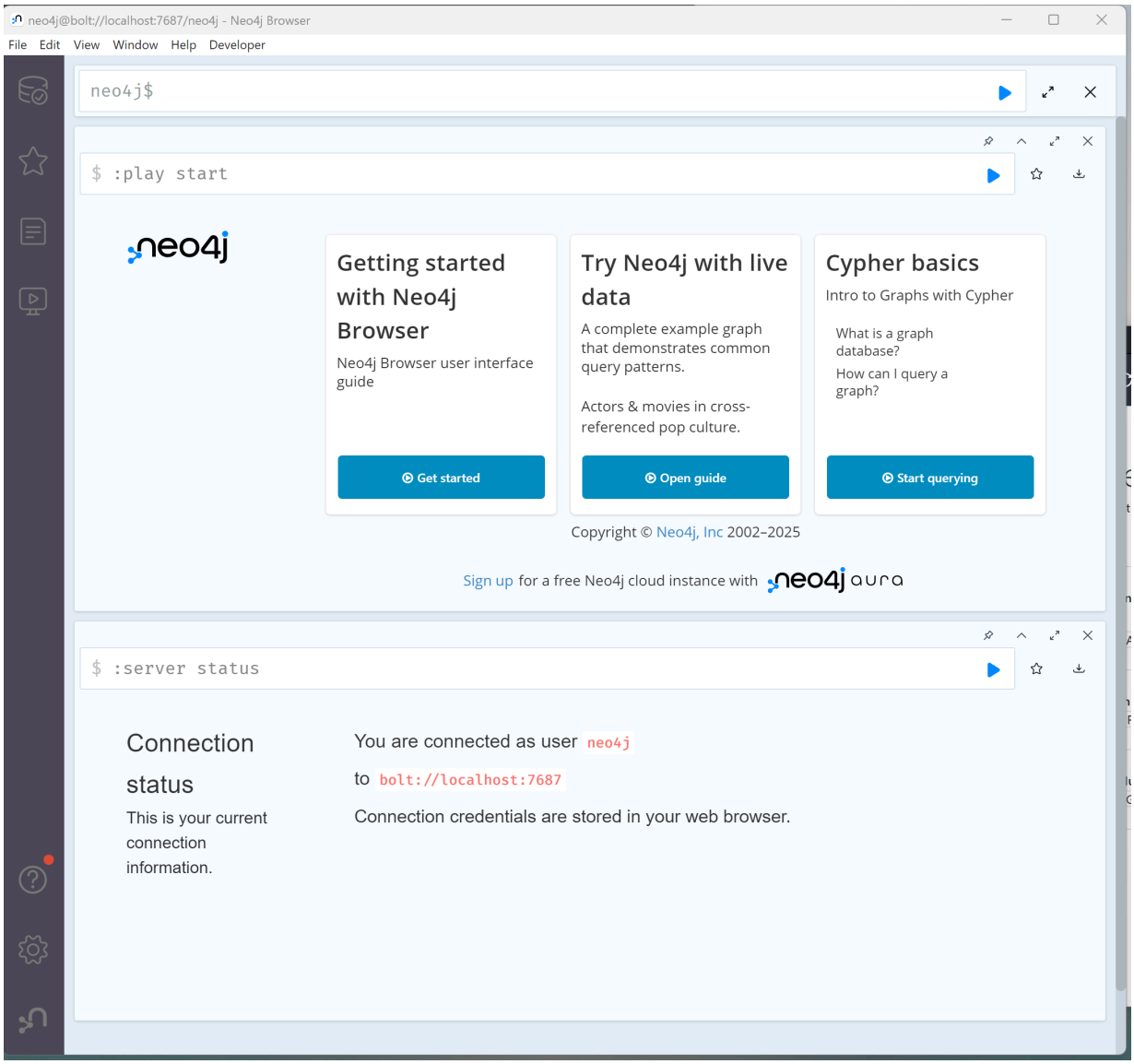
Then `Apply` and `Close`.

Load CSV to create new Node with some instances

Prepare initial [Region1.csv](), with 2 regions under Region header:

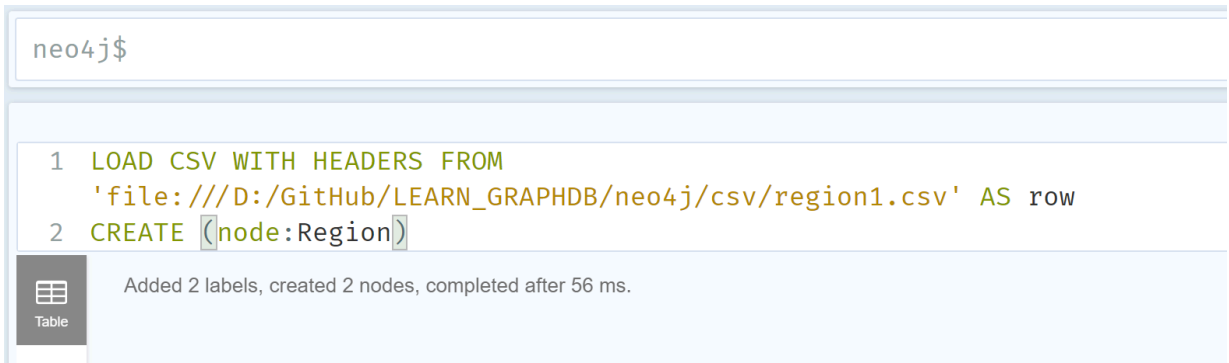
```
Region
Europe
Asia
```

Start the local dbsm `import_test`, once it's loaded, click `Open` with Neo4j Browser, you should see below home screen:



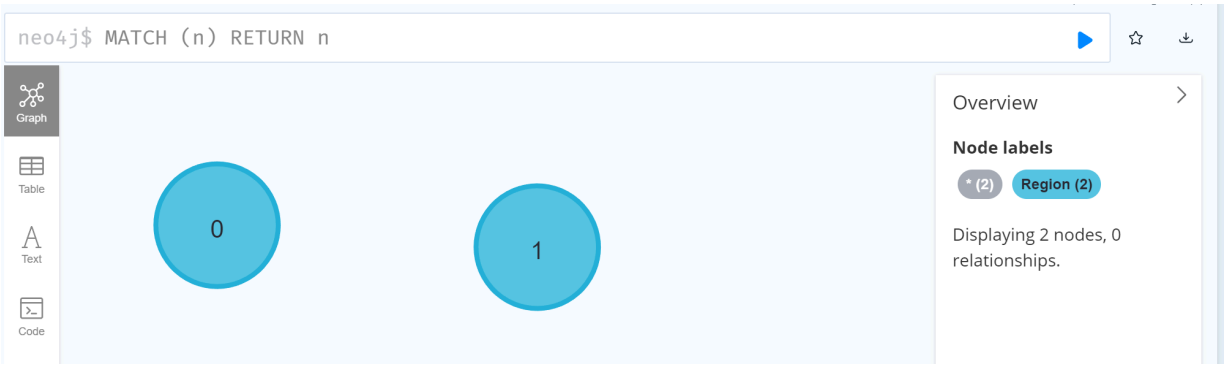
Use below `CREATE` query:

```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/
CREATE (node:Region)
```



Result is `Added 2 labels, created 2 nodes`

Using `MATCH (n) RETURN n` , can see there're automatic `0` adn `1` as the label of the node `Region` :



This is not shown the value of regions, so we need to add property during CSV load, let's try to use `MERGE` first:

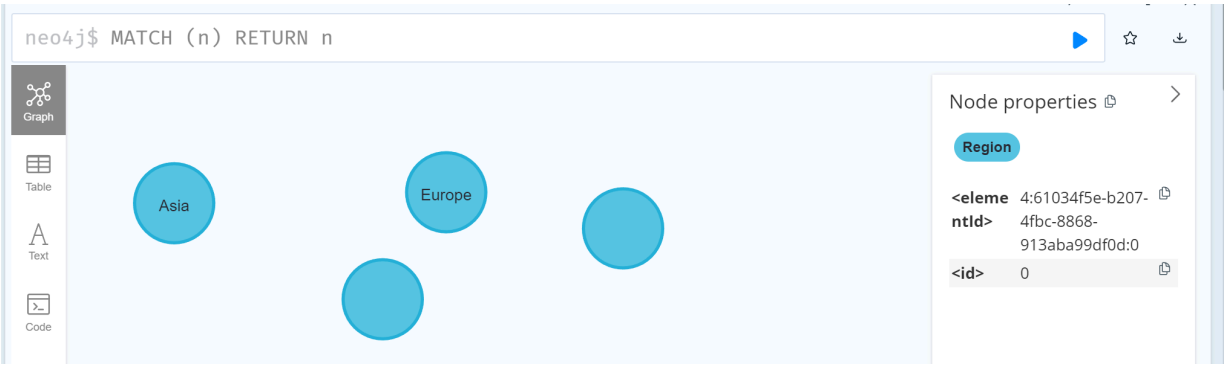
```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/
MERGE (node:Region {Region: row.Region})
```

```
1 LOAD CSV WITH HEADERS FROM
  'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/csv/region1.csv' AS row
2 MERGE (node:Region {Region: row.Region})
```

Table

Added 2 labels, created 2 nodes, set 2 properties, completed after 34 ms.

However, the two additional instances have been created so now you've 4 instance of `Region` :



From this comparison, we know that we should add every column as row property while first load, and the `merge` will create additional instances if not using certain match mechanism.

Using below query to clear database:

```
MATCH (n) DETACH DELETE n
```

```
neo4j$ MATCH (n) DETACH DELETE n
```

Table

Deleted 4 nodes, completed after 5 ms.

So, now the database is cleaned:

```
neo4j$ MATCH (n) RETURN n
```

Table

(no changes, no records)

We can run the `CREATE` query with Property now, as below:

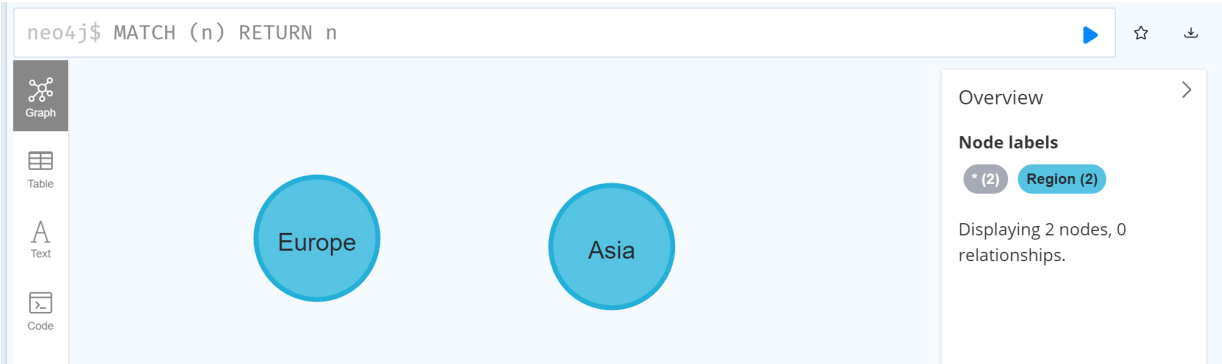
```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/
CREATE (node:Region {Region: row.Region})
```

```
1 LOAD CSV WITH HEADERS FROM
  'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/csv/region1.csv' AS row
2 CREATE (node:Region {Region: row.Region})
```

Table

Added 2 labels, created 2 nodes, set 2 properties, completed after 3 ms.

Result is now just 2 instances:



Load CSV to create both two Nodes and mapping relationships together

Create two column CSV [region-country1.csv] which include all new regions (and countries) that not in [region1.csv], as below:

```
Region,Country
North_America,USA
South_America,Brazil
South_America,Peru
```

The relation is `(Region)-[:INCLUDES]->(Country)`

Execute below `CREATE` query:

```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/
MERGE (source:Region {Region: row.Region})
CREATE (target:Country {Country: row.Country})
CREATE (source)-[:INCLUDES]->(target)
```

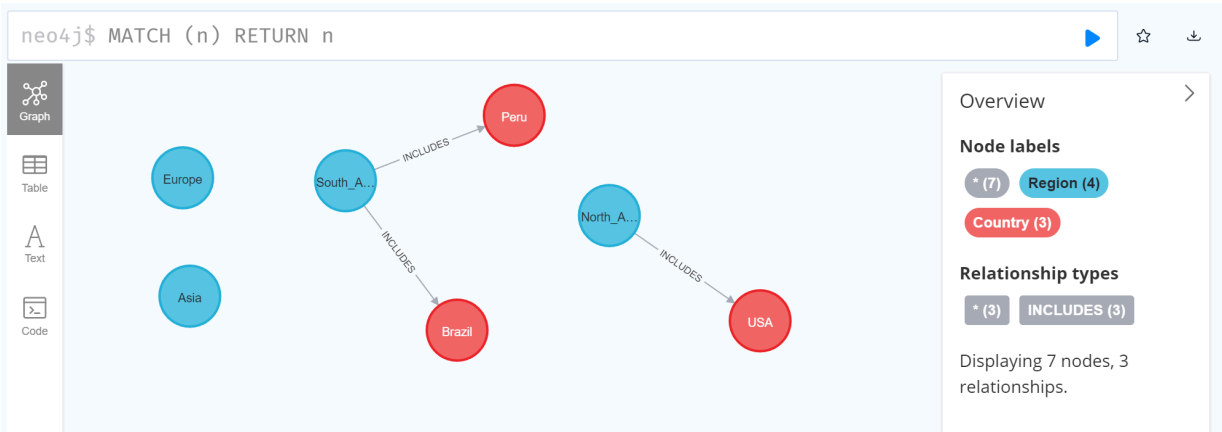
Note: since we already have `Region` as Node which had been created in previous step's query, here we use `MERGE` on that node instead of `CREATE` .

```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/csv/region-country1.csv' AS row
MERGE (source:Region {Region: row.Region})
CREATE (target:Country {Country: row.Country})
CREATE (source)-[:INCLUDES]->(target)
```

Table

Added 5 labels, created 5 nodes, set 5 properties, created 3 relationships, completed after 41 ms.

Result is as below:



This step shows that you can use `MERGE` to add new instances to existing Node, and with combining using `CREATE` and `MERGE`, we can load the larger CSV dataset now, first, let's make one Climate Zone dictionary node

Load Larger CSV with Multiple Columns (Sample: Climate_Group)

In above steps, our Node csv files only have one single column, the real dataset may have more columns, let below:

```
Group_Code,Group_Name,Group_Description
A,Tropical climates,Tropical climates have an average
temperature of 18 °C (64.4 °F) or higher every month of the
year, with significant precipitation.
B,Desert and semi-arid climates,Desert and semi-arid climates
are defined by low precipitation in a region that does not fit
the polar (EF or ET) criteria of no month with an average
temperature greater than 10 °C (50 °F).
C,Temperate climates,Temperate climates have the coldest month
averaging between 0 °C (32 °F) (or −3 °C (26.6 °F)) and 18 °C
(64.4 °F) and at least one month averaging above 10 °C (50 °F).
D,Continental climates,Continental climates have at least one
month averaging below 0 °C (32 °F) (or −3 °C (26.6 °F)) and at
least one month averaging above 10 °C (50 °F).
E,Polar and alpine climates,Polar and alpine climates has every
month of the year with an average temperature below 10 °C
(50 °F).
```

Shown as below:

neo4j > csv > climategroup.csv

1	Group_Code	Group_Name	Group_Description
2	A	Tropical climates	Tropical climates have an averag
3	B	Desert and semi-arid climates	Desert and semi-arid climates ar
4	C	Temperate climates	Temperate climates have the colc
5	D	Continental climates	Continental climates have at lea
6	E	Polar and alpine climates	Polar and alpine climates has ev
7			

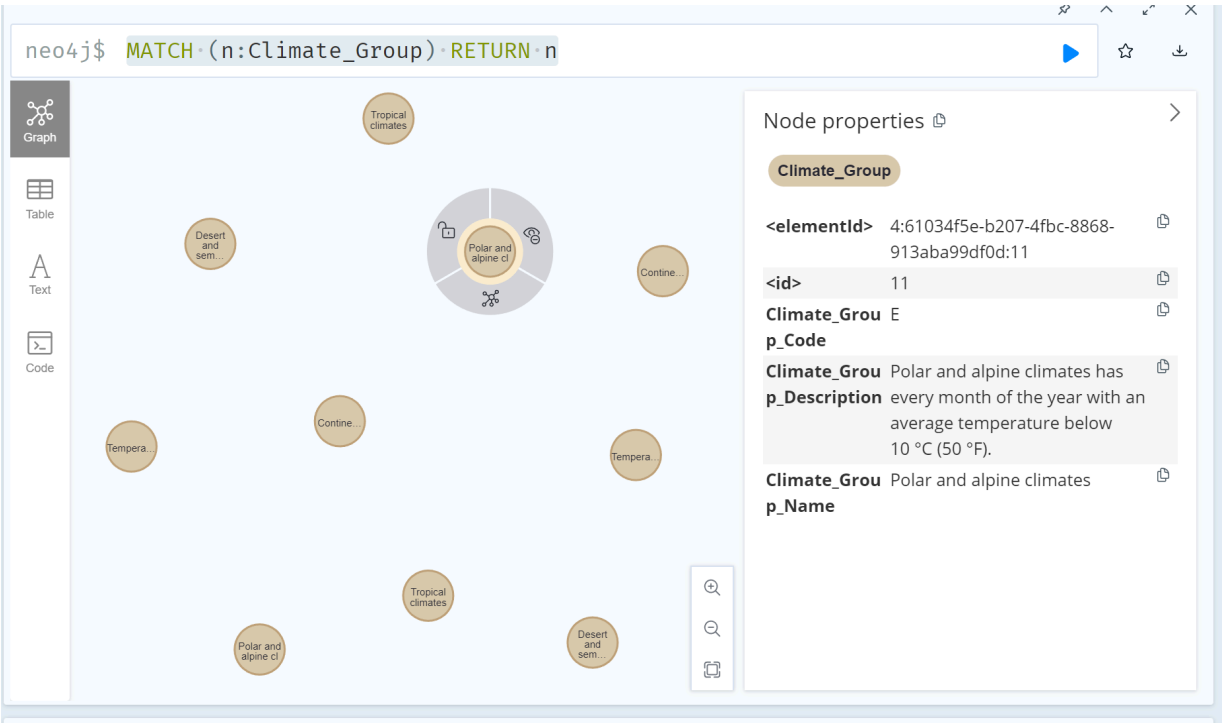
Use below Cypher to load CSV:

```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/
CREATE (node:Climate_Group {
    Climate_Group_Code: row.Group_Code,
    Climate_Group_Name: row.Group_Name,
    Climate_Group_Description: row.Group_Description
})
```

```
1 LOAD CSV WITH HEADERS FROM
  'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/csv/climategroup.csv' AS row
2 CREATE (node:Climate_Group {
3     Climate_Group_Code: row.Group_Code,
4     Climate_Group_Name: row.Group_Name,
5     Climate_Group_Description: row.Group_Description
6 })
```

Added 5 labels, created 5 nodes, set 15 properties, completed after 11 ms.

Using `MATCH (n:Climate_Group) RETURN n` to return first 10 instances of `Climate_Group`, as below and you may see properties in the right part when clicking one instance:



Load Multi-Columns CSV with "Foreign Key" to Other Node

Refer to [ClimateZone.csv](), which have below structure:

neo4j > csv > climatezone.csv

	Zone_Code	Zone_Name	Group
2	AF	Tropical rainforest climate	A
3	AM	Tropical monsoon climate	A
4	AW	Tropical web climate	A
5	AS	Tropical savanna climate	A
6	AD	Tropical dry climate	A
7	BWH	Hot desert climate	B
8	BWK	Cold desert climate	B
9	BSH	Hot semi-arid climate	B
10	BSK	Code semi-arid climate	B
11	CFA	Humid subtropical climate	C

First 2 columns create dictionary for Climate_Zone, the 3rd column refers to Climate_Group, we need to add one new relation:

```
(Climate_Zone)-[:INGROUP]->(Climate_Group)
```

Using below query to create Node `Climate_Zone` :

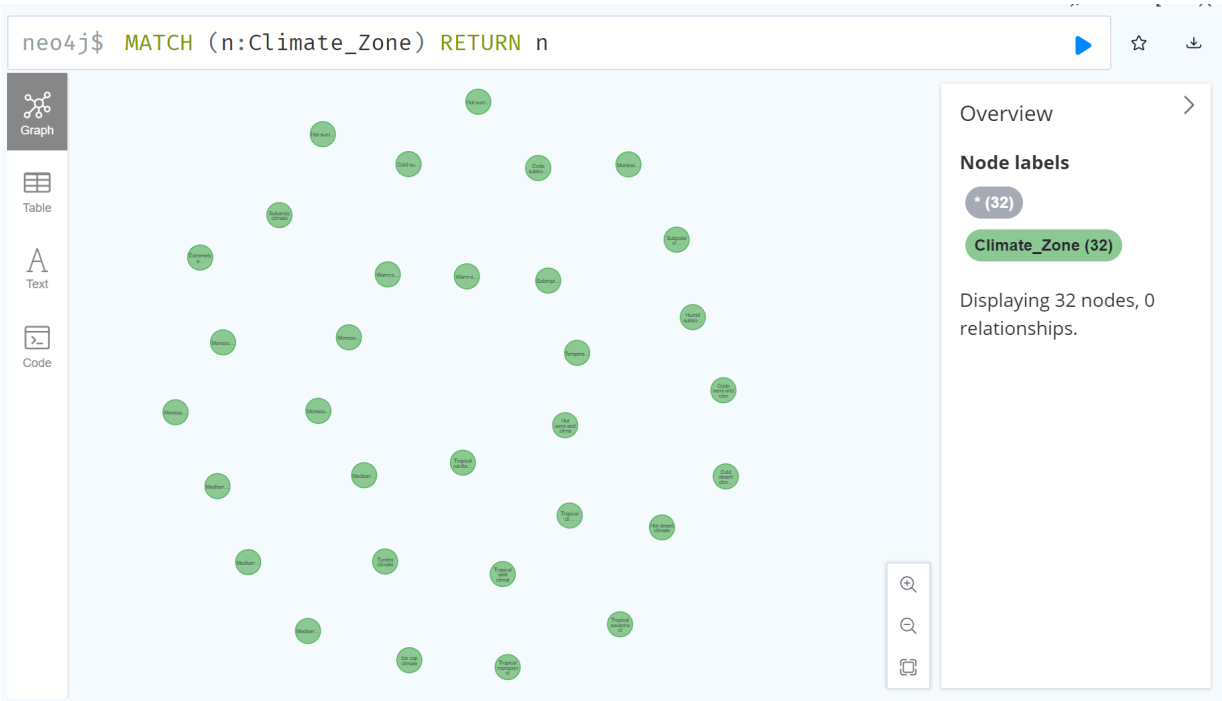
```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/
CREATE (node: Climate_Zone {
    Climate_Zone_Code: row.Zone_Code,
    Climate_Zone_Name: row.Zone_Name,
    Climate_Group_code: row.Group
})
```

```
LOAD CSV WITH HEADERS FROM
'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/csv/climatezone.csv' AS row
CREATE (node: Climate_Zone {
    Climate_Zone_Code: row.Zone_Code,
    Climate_Zone_Name: row.Zone_Name,
    Climate_Group_code: row.Group
})
```

Table

Added 32 labels, created 32 nodes, set 96 properties, completed after 40 ms.

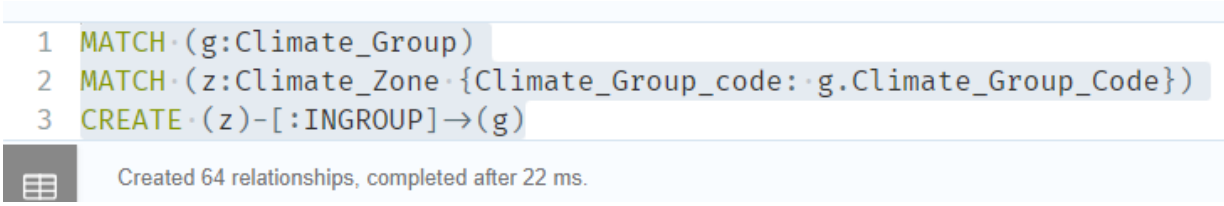
Result as below:



Create Relationship via `MATCH`

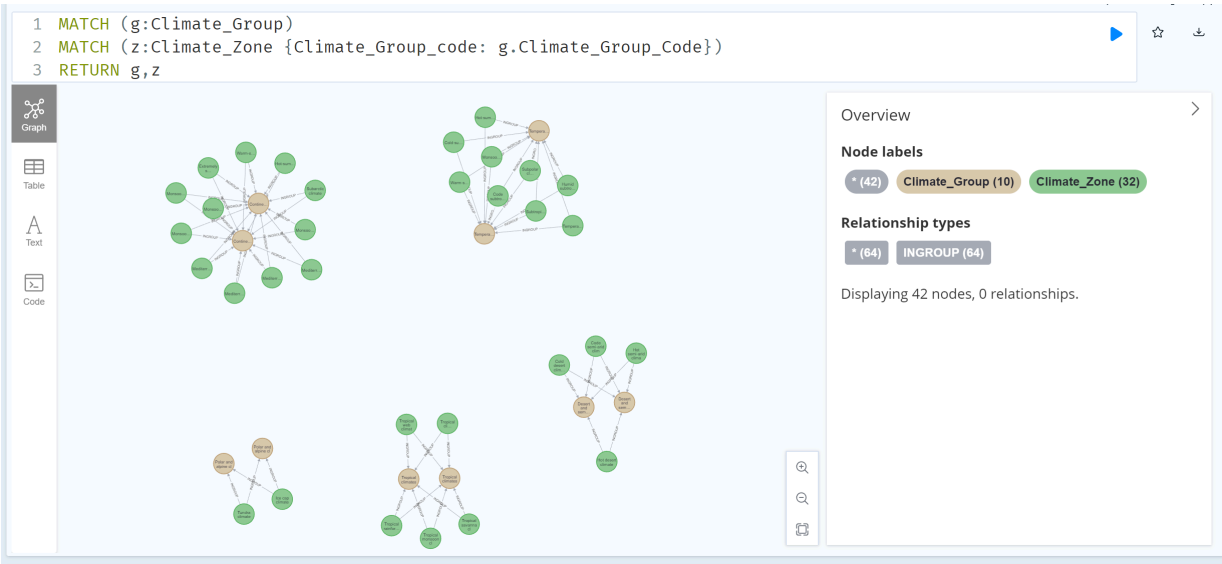
Using below query to create the `:INGROUP` relation:

```
MATCH (g:Climate_Group)
MATCH (z:Climate_Zone {Climate_Group_code: g.Climate_Group_Code})
CREATE (z)-[:INGROUP]->(g)
```



Note: in early step when creating `Climate_Zone` node, I've typo mistake to have `Climate_Group_code` with lower case `c` in `code`, have to align that since Cypher query is case sensitive.

Change `CREATE` line to `RETURN`, you can view the relationship creation result:

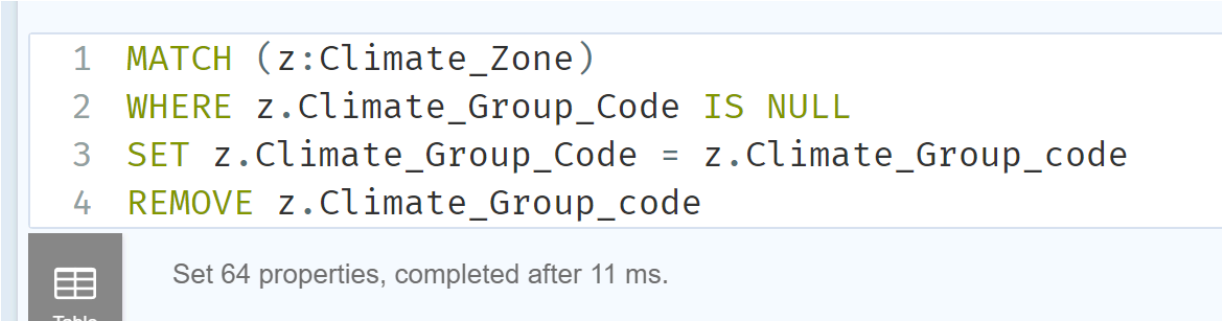


Change Property Key in an Object

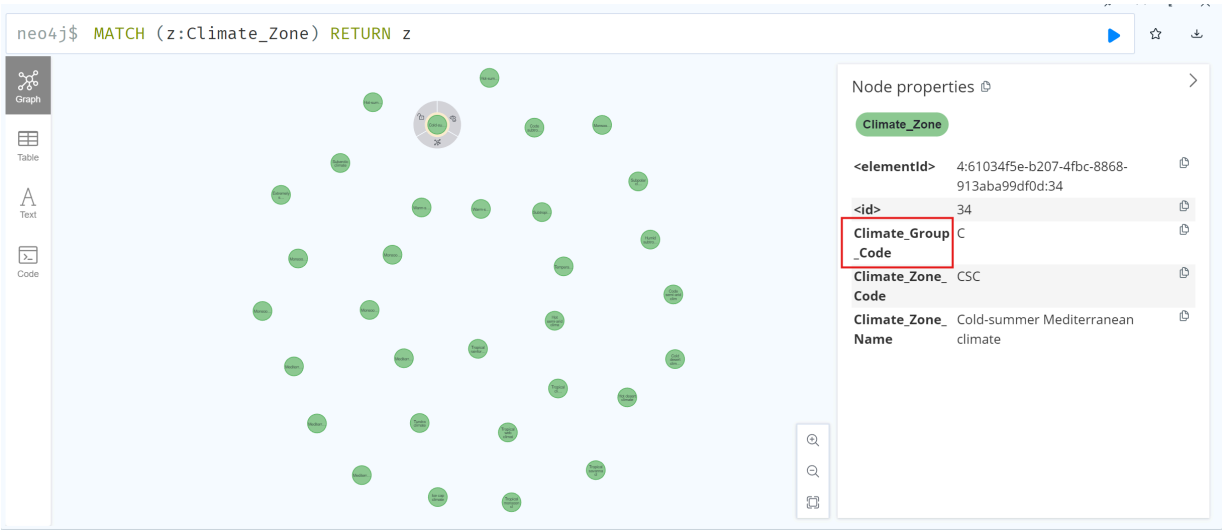
For node `Climate_Zone` , let's practice `SET` to rename the property key `Climate_Group_code` , using below query:

```
MATCH (z:Climate_Zone)
WHERE z.Climate_Group_Code IS NULL
SET z.Climate_Group_Code = z.Climate_Group_code
REMOVE z.Climate_Group_code
```

Execute nad set 64 properties:



Result `MATCH (z:Climate_Zone) RETURN z` is now with corrected Property Key:



Load Country x Climate_Zone Relationship into Group

Get Weather and Climate information from https://weatherandclimate.com/countries, save as CSV file - [country-climatezone.csv](), with following 4 columns:

neo4j > csv > country-climatezone.csv

	Country	Climate_Zone	Avg_F	Avg_C
1	Afghanistan	DSB	60.26	15.7
2	Albania	CSB	59.31	15.17
3	Algeria	BWH	68	20
4	American Samoa	AW	82.4	28
5	Andorra	CFB	44.91	7.17

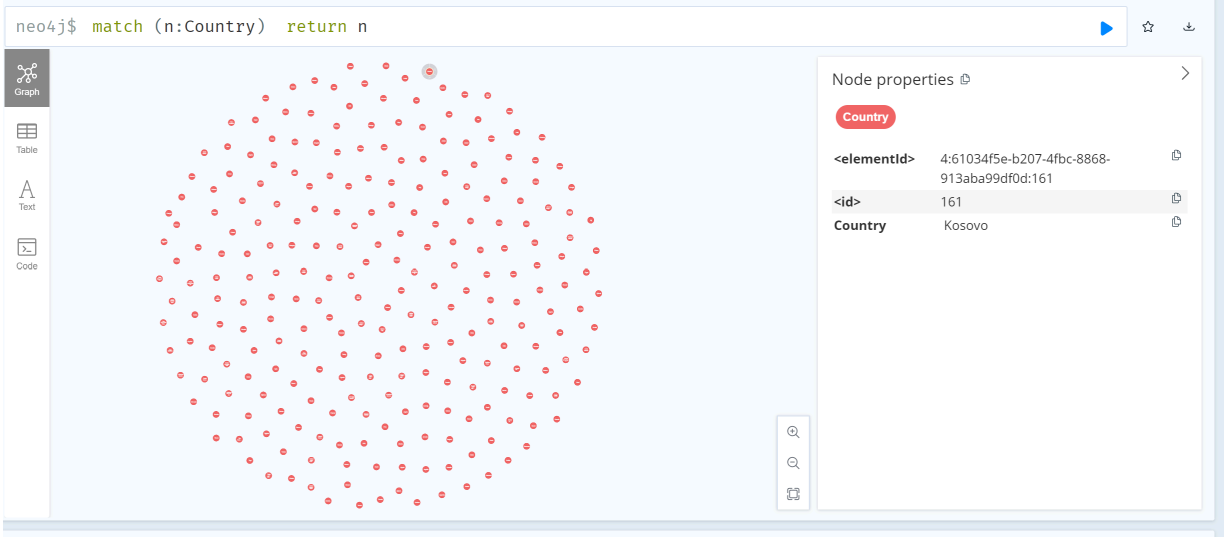
Use below query to load this CSV file, merging to `Country` node:

```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/
MERGE (c:Country {
    Country: row.Country
})
```

```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/csv/country-climatezone.csv' AS row
MERGE (c:Countryc {
    Country: row.Country
})
```

Added 246 labels, created 246 nodes, set 246 properties, completed after 37 ms.

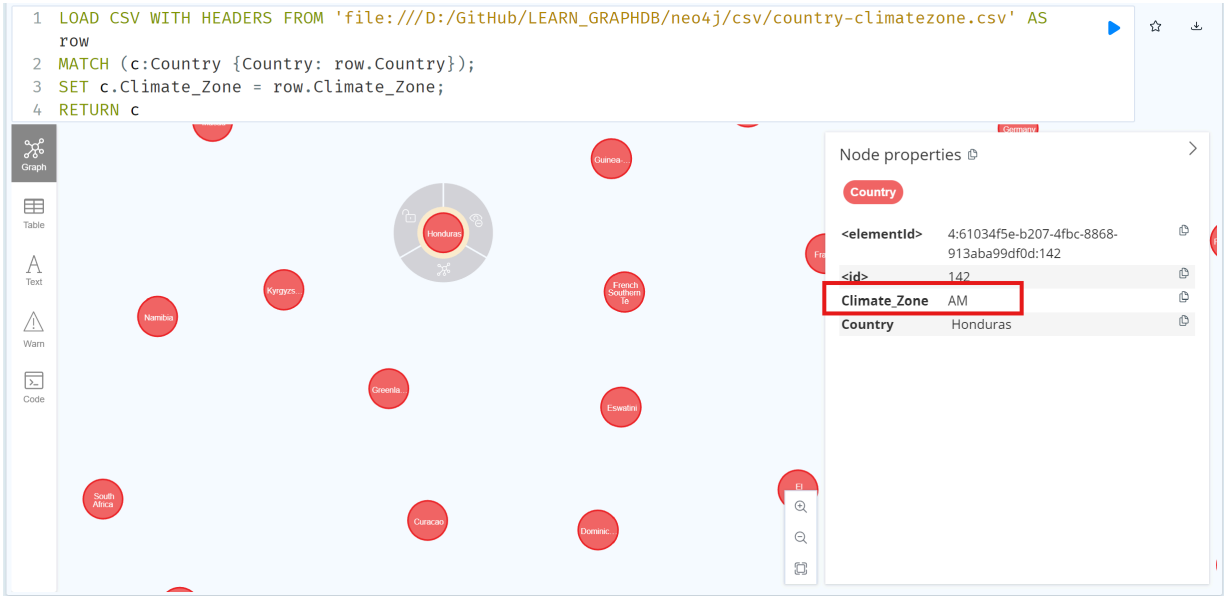
Result as below for `Country` node now:



Load `Climate_Zone` columns in `Country` node:

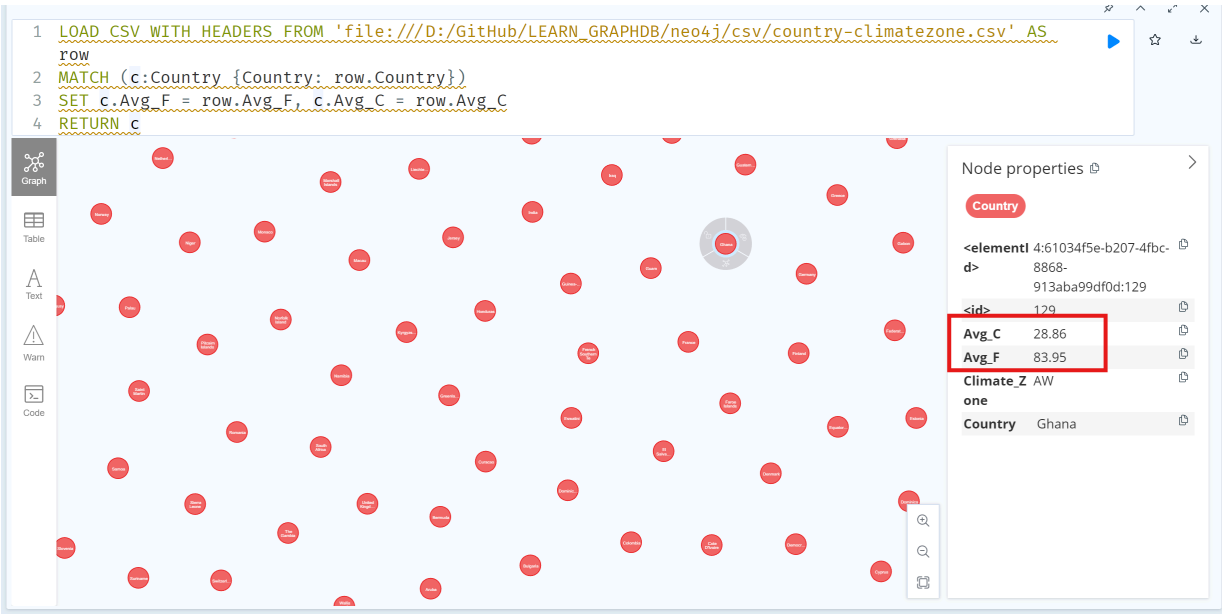
```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/
MATCH (c:Country {Country: row.Country})
SET c.Climate_Zone = row.Climate_Zone
RETURN c
```

After executing, new column added as one property:



Now, add two new columns together (separated by `,` in `SET` clause):

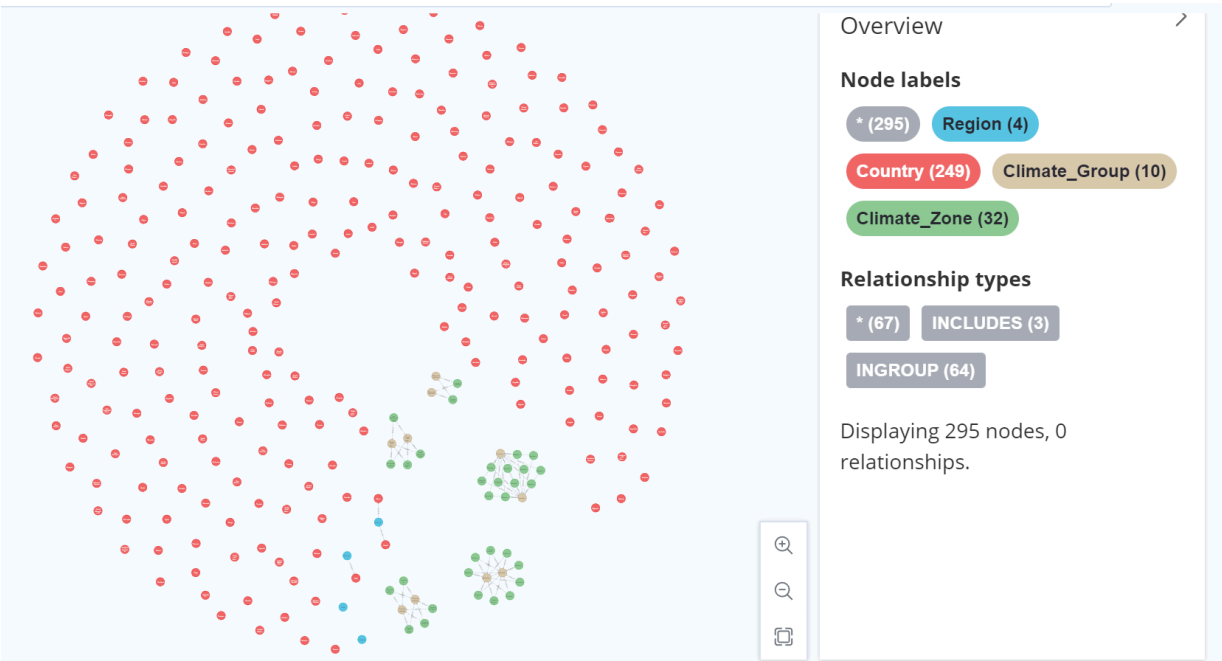
```
LOAD CSV WITH HEADERS FROM 'file:///D:/GitHub/LEARN_GRAPHDB/neo4j/
MATCH (c:Country {Country: row.Country})
SET c.Avg_F = row.Avg_F, c.Avg_C = row.Avg_C
RETURN c
```



Add Country to Climate_Zone Relationship

Now we have complete `Country` node, the `Climate_Zone` column in this node plays the foreign-key role to link to the `Climate_Zone_Code` in `Climate_Zone` node.

Full graph is now looks like:

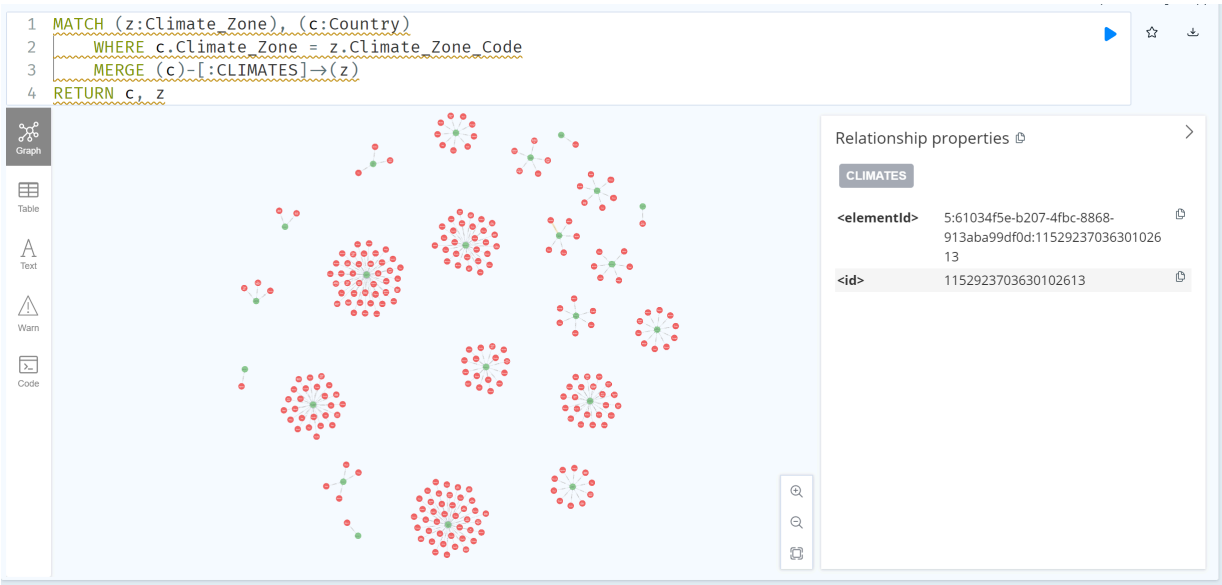


To create relationship `(Country)-[:CLIMATES]->(Climante_Zone)` , using below query:

```
MATCH (z:Climate_Zone), (c:Country)
    WHERE c.Climate_Zone = z.Climate_Zone_Code
```

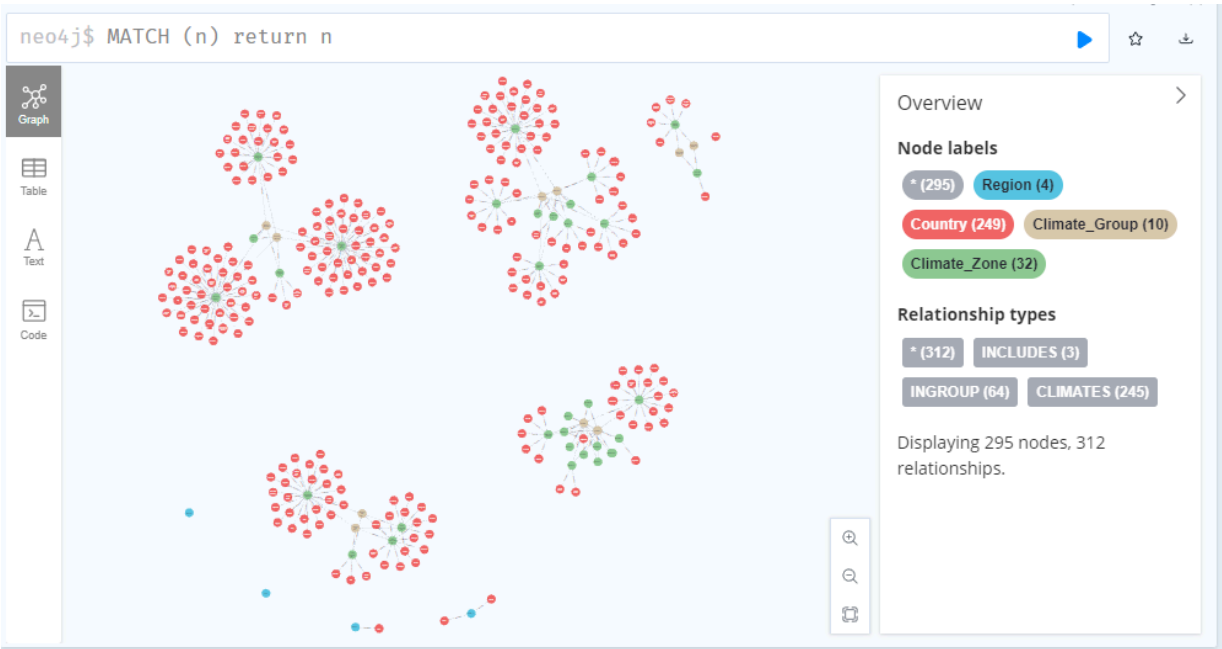
```
    MERGE (c)-[:CLIMATES]->(z)
RETURN c, z
```

Result is like below:



Completion of Country x Climate Mapping Graph

Execute `MATCH (n) RETURN n` , get below full graph now:



We can see some countries with Region relation are not linked to the bigger group, those may due to the node `Region` , and will have further investigation.

After all, through above steps, we can build graph from numbers of CSV files, you can use this dumped database (neo4j_import-test_20250925.dump) for exploring the result.

Date: 2025/09/25