Star-Wars Hands-On Workshop Lab Exercises

Mark Quinsland
Senior Field Engineer
22-September 2022

Notes on Hands-On Exercises:

The full text of the exercises and the data files are all available from the Github repo:
https://github.com/mquinz/star_wars_demo

The exercises use the pre-release Data Importer tool that is currently available only on Neo4j Aura.
It is assumed that you have a login & password for Neo4j Aura.

If you are unable to create an Aura account, please let me know and I will set you up with 'Plan B'

We will also be using the browser-based Neo4j modeling tool called Arrows and is available at
https://arrows.app/

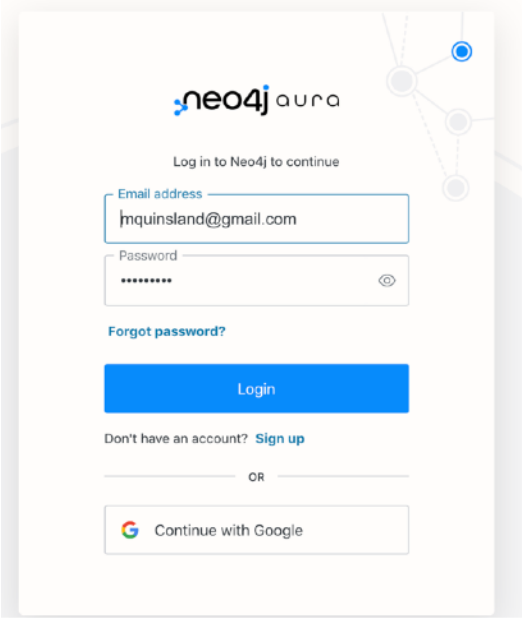
The Arrows app is a simple tool takes only a few minutes to learn but is invaluable for designing Neo4j data models.

Lab 0 - Connecting to Aura

Lab 0 - Creating a New Database in Aura

Login - or create a free account

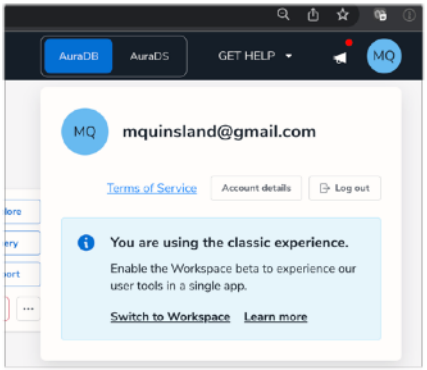
- Proceed to https://login.neo4j.com
- Enter username and password
- Create a new account if necessary



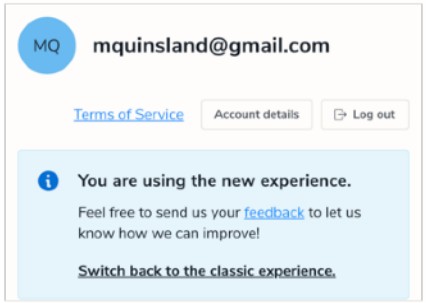
Lab 0 - Creating a New Database in Aura

Switch to New Workspace Experience

- After logging in, click on your initials in the menu bar
- You will see one of these messages to indicate whether you are in the classic version, or the new Workspace version.
- We will be using the new Workspace version. (it's in beta testing so things may get rough!)



Or

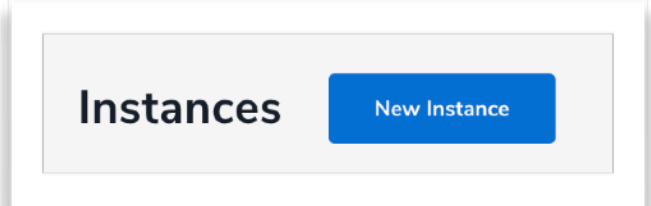


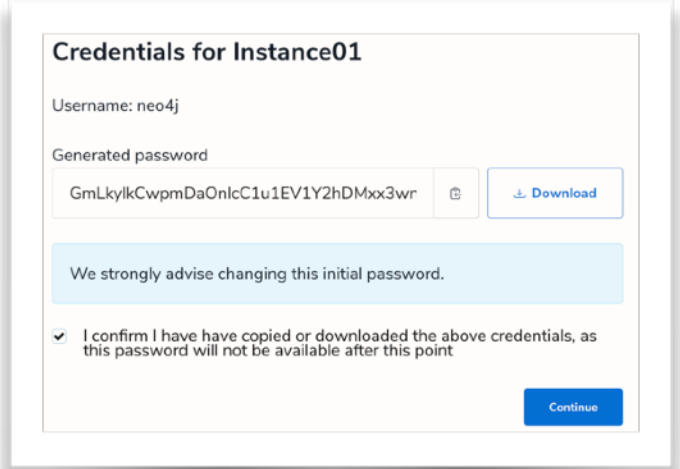
Lab 0 - Creating a New Database in Aura

Create a new Instance

- Click on the New Instance Button
- Select the Movies instance

- Your new instance will be named Instance01 and a password will be generated. Copy the password to the clipboard and download the password file
- Please remember where you downloaded the password file!

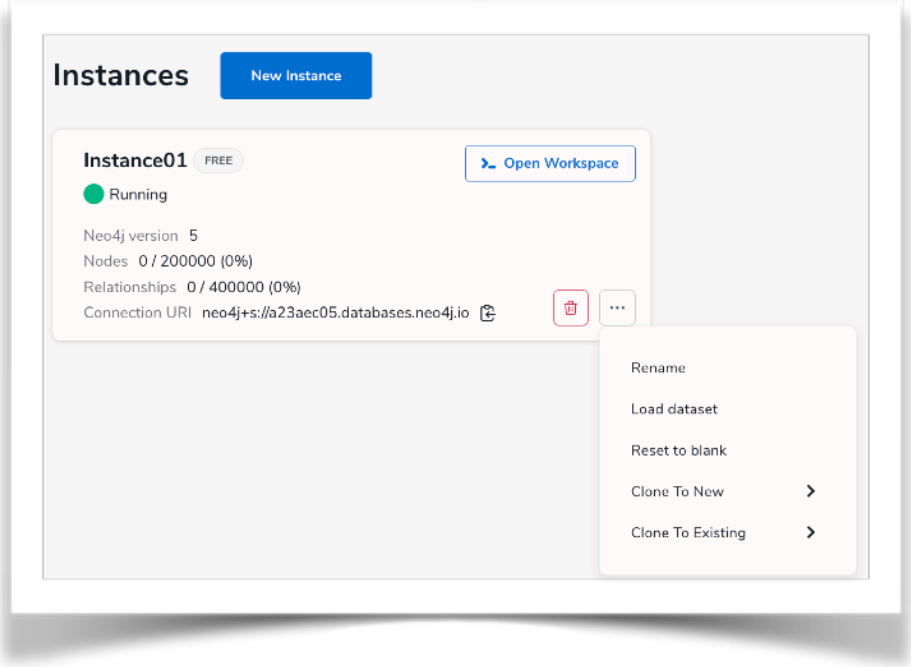




Lab 0 - Creating a New Database in Aura

Rename the new Instance

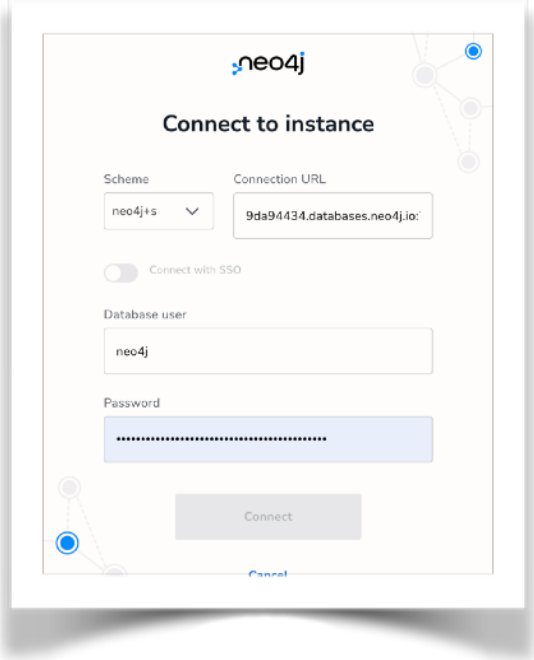
- In a moment or two, the instance will be created and the status will change to ‘Running’
- Change the name to something useful by clicking on the … button next to the trash can.
- Some basic statistics will be shown
- The instance will be free to use for its lifetime. After periods of inactivity it will be suspended, but resuming it requires only a simple click.



Lab 0 - Creating a New Database in Aura

Testing the Connection

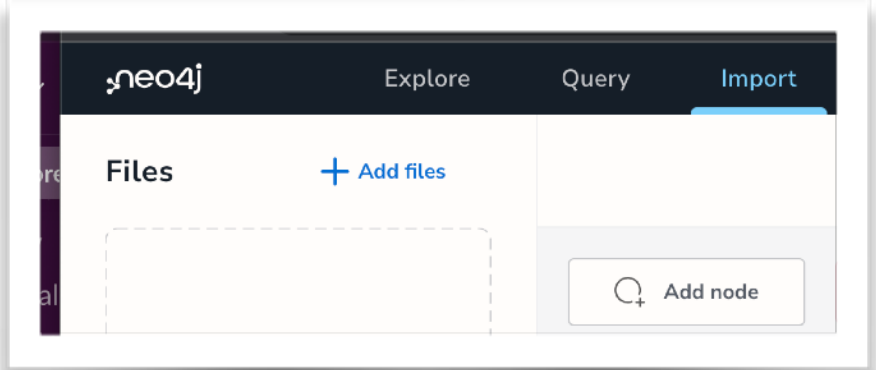
- Click on the Open Workspace button to display the Connect to Instance dialog.
- Paste your password into the appropriate field.
- If you forgot your password and failed to download it, you must delete the instance and start over.



Lab 0 - Creating a New Database in Aura

Viewing the Workspace

- The Aura Developer Workspace has 3 main tabs.
- Explore: Uses Neo4j Bloom to analyze and visualize the graph without writing code
- Query: Write and execute Cypher queries to create, read, update, and delete data.
- Import: Use the Neo4j Import tool to load CSV files without writing code
- We will start on the Query tab

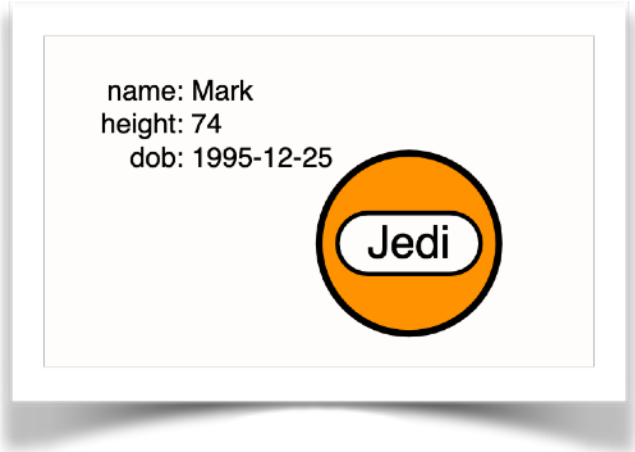


Lab 1 - Data Modeling with Arrows

Lab 1 - Data Modeling using Arrows

Creating A New Node

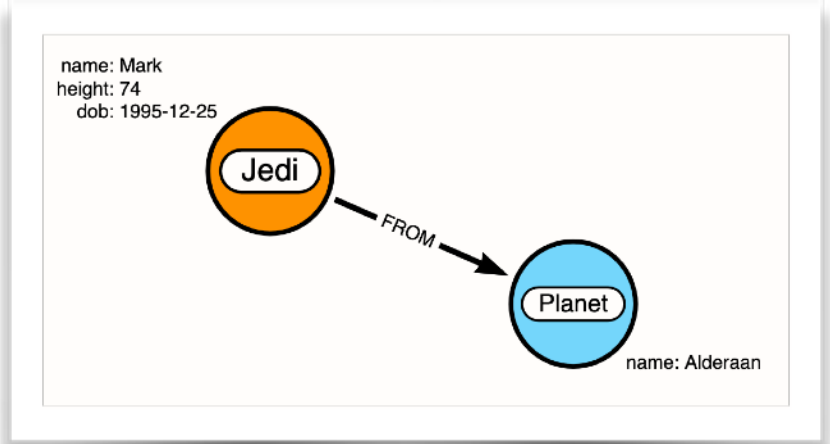
- Bring up https://arrows.app on a browser
- Tap on the empty node to highlight it
- On the properties tab, give the new node a label (not a caption)
- Give the node a property:value pair (name: your name)
- Give the node 2-3 additional properties
- Give the node a color



Lab 1 - Data Modeling using Arrows

Creating A Related Node

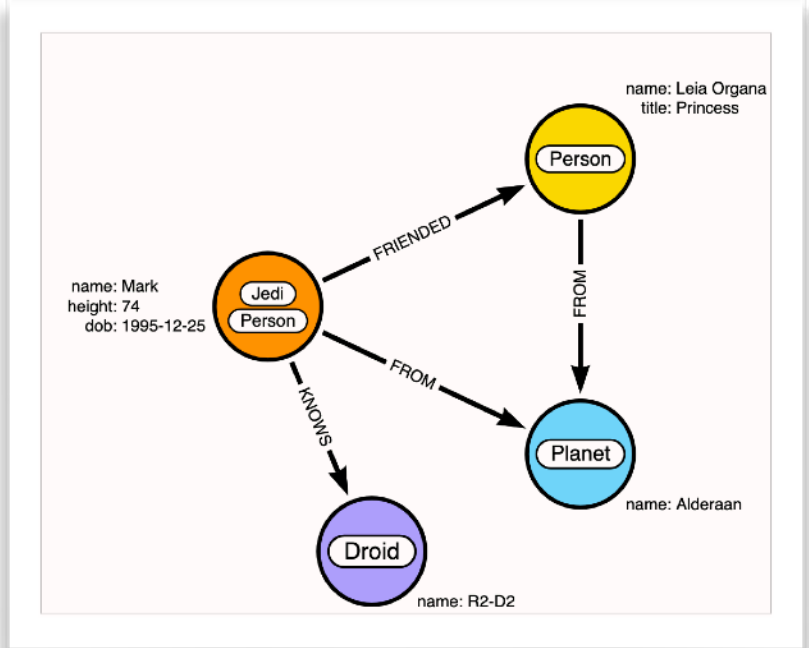
1. Hover over the border of the source node until the border shows that it is selected
2. Click on the selection border and drag it away from the node. You will see a new node appear.
3. Drop the new node away from other nodes
4. On the properties tab, give the new node a label (not a caption)
5. Give the node a property:value pair (name: your name)
6. Select the relationship and give it a type.



Lab 1 - Data Modeling using Arrows

Creating Related Nodes

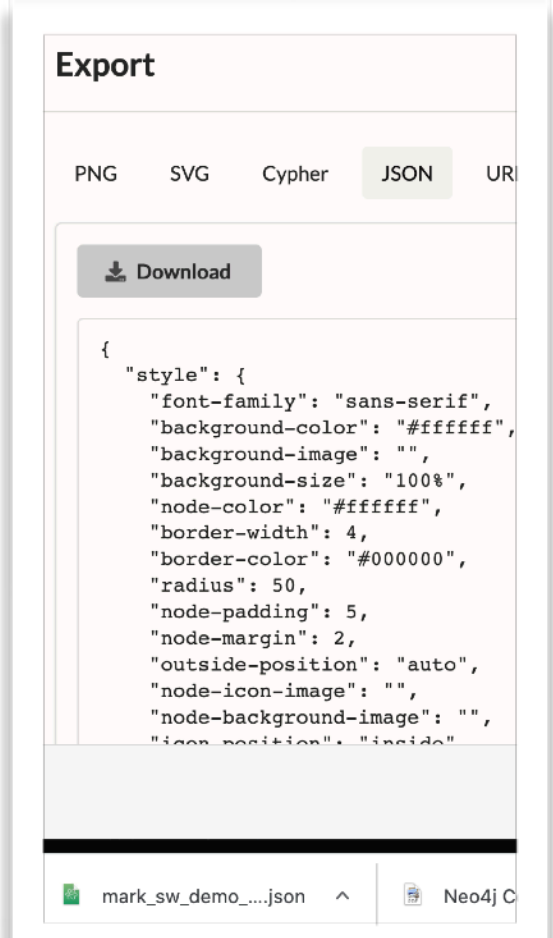
1. Hover over the border of the source node until the border shows that it is selected
2. Click on the selection border and drag it away from the node. You will see a new node appear.
3. Drop the new node away from other nodes
4. On the properties tab, give the new node a label (not a caption)
5. Give the node a property:value pair (name: your name)
6. Select the relationship and give it a type.
7. Repeat for 2-3 more nodes



Lab 1 - Data Modeling using Arrows

Exporting a Model

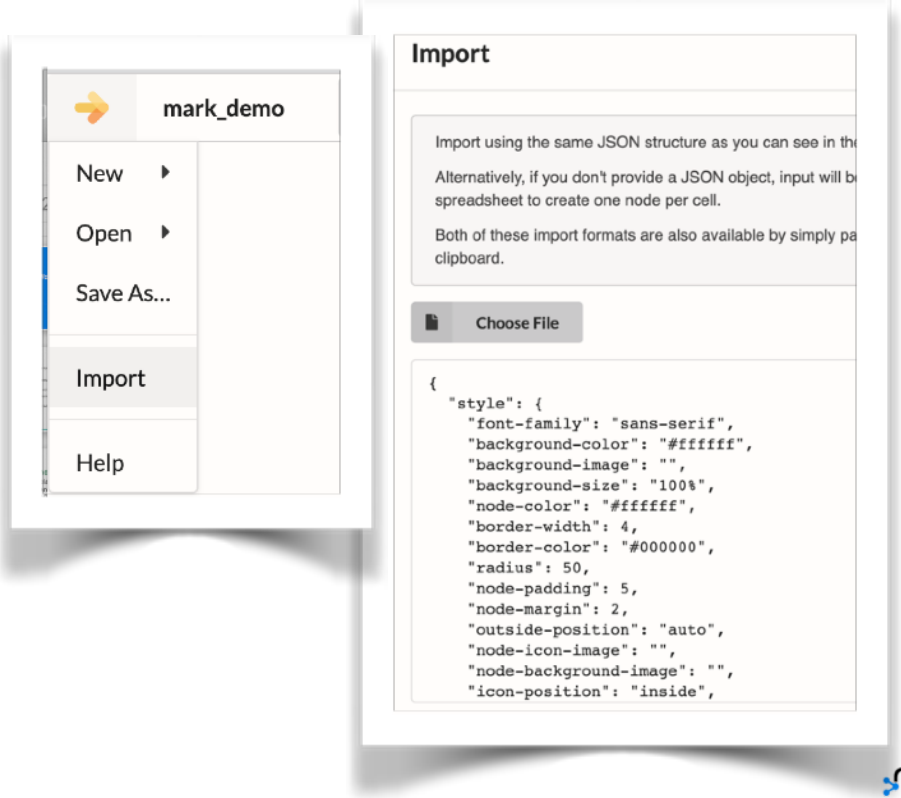
1. Give the model a name
2. Click on the Download/Export button
3. Select the JSON tab
4. Click on the Download button
5. Select a safe place to store the JSON file.



Lab 1 - Data Modeling using Arrows

Importing a Model that was previously exported

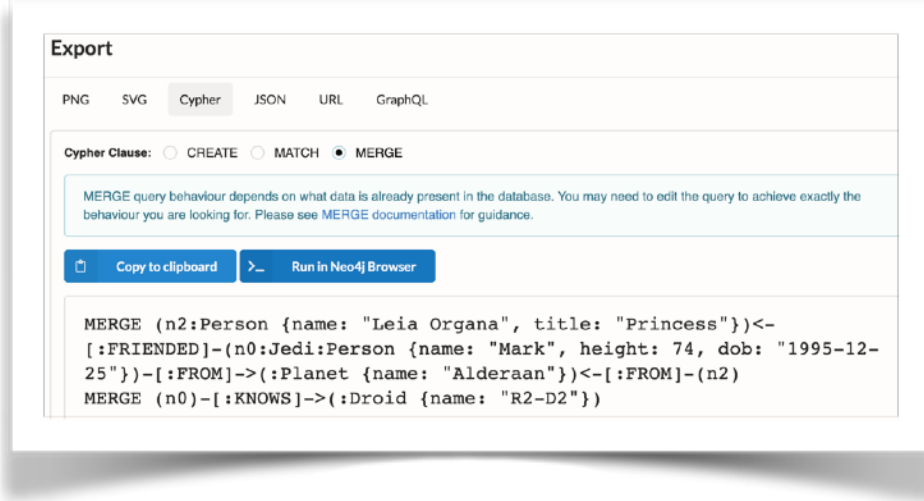
1. Click on the yellow arrow at the top left corner
2. Select the Import item
3. Choose the JSON file to be uploaded.
4. View the new nodes / relationships.



Lab 1 - Data Modeling using Arrows

Testing the Model

1. Click on the Download/Export button
2. Select the Cypher tab
3. Select the Create option
4. Review the Cypher code
5. Copy the code to clipboard
6. Paste it into a browser
7. Execute the Cypher to create the nodes
8. View the newly created data in the browser



Lab 1 - Data Modeling using Arrows

Viewing the Data in Neo4j Browser

1. Copy the Cypher text that was generated by the Export window
2. Switch to your browser and bring up the Aura Developer Workbench tab
3. Paste the code into the execution window
4. Click on the small blue arrow to execute the command

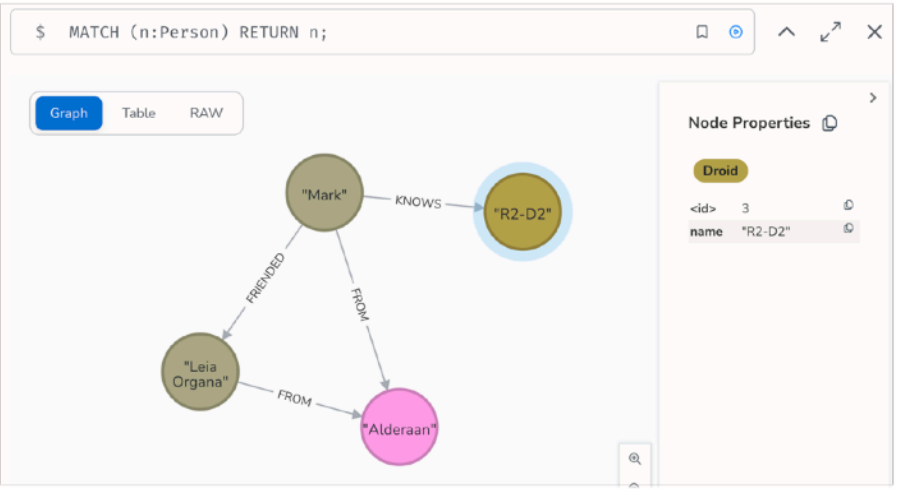
```
CREATE (n6:Person {name: "Leia Organa", title:
"Princess"})<-[:FRIENDED]-(n4:Jedi:Person {name:
"Mark", height: 74, dob: "1995-12-25"})-[:FROM]->
(:Planet {name: "Alderaan"})<-[:FROM]-(n6),
(n4)-[:KNOWS]->(:Droid {name: "R2-D2"})
```

Lab 1 - Data Modeling using Arrows

Viewing the Data in Neo4j Browser

1. Run a simple Cypher command to view your data
2. Double-click on the nodes to see related nodes appear.

```
MATCH (n:Person) RETURN n;
```

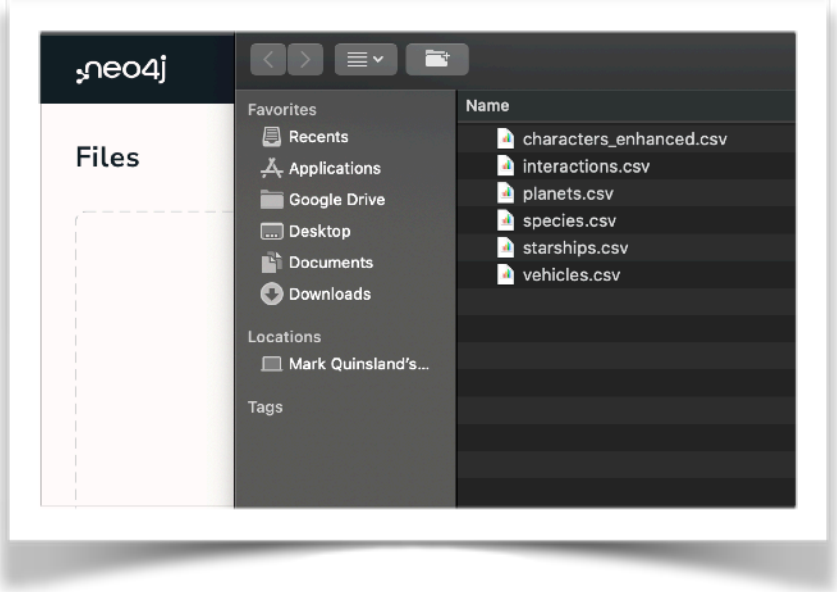


Lab 2 - Using Workspace Importer

Lab 2 - Using Workspace Importer

Selecting CSV files to Import

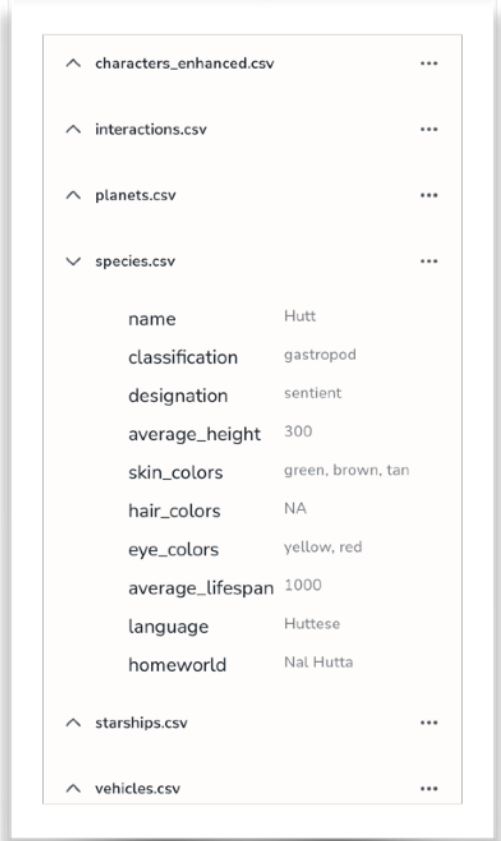
- Download the data files from
- https://github.com/mquinz/star_wars_demo/blob/master/data/star_wars_data.zip
- Unzip the files
- Click on the + Add files link on the Workspace Import tab or drag-and-drop the files onto the files tab.



Lab 2 - Using Workspace Importer

Previewing Data From CSV files

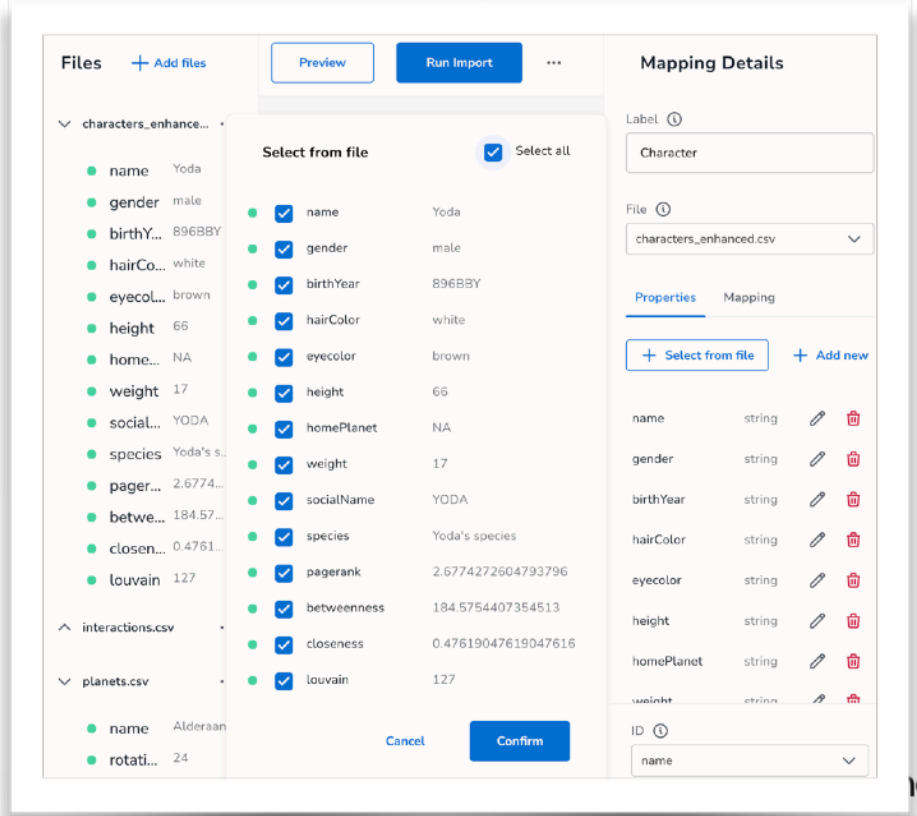
- After adding the 6 CSV files, expand/ collapse the file names to preview the data in the files
- The importer will attempt to determine data types for the values, but you can override/correct this in the next step.



Lab 2 - Using Workspace Importer

Adding Nodes

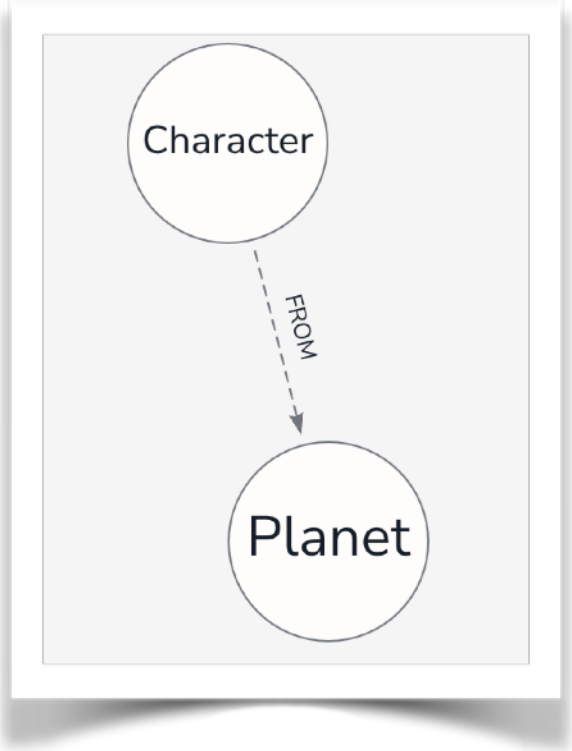
- Click on the Add Node Button and an empty node type will appear.
- In the Mapping Details tab, enter the name of a Label e.g. Character
- Select a CSV file that contains the data to be loaded for that Label
- Click on the ‘Select from file’ link and choose the property names to be loaded.
- Edit data types or field names
- In the ID field, choose which property value should be used as the primary key of each node



Lab 2 - Using Workspace Importer

Creating Relationships Between Nodes

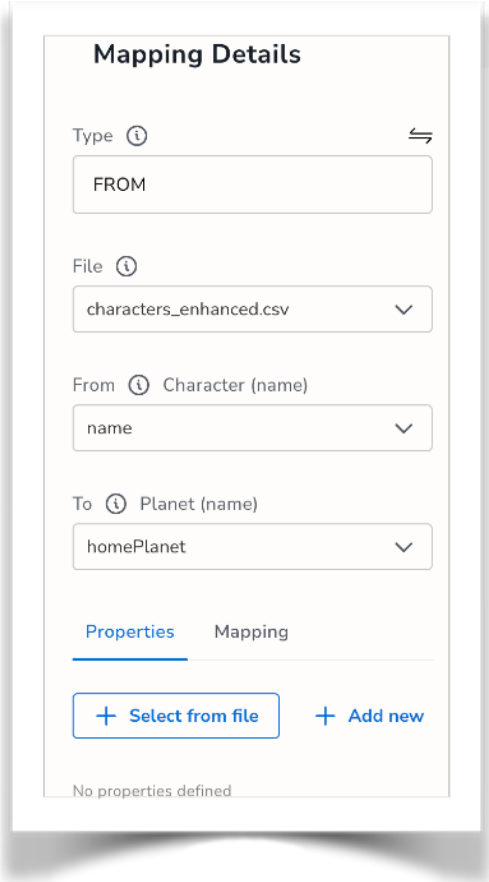
- Select a Node type that will serve as the ‘From’ node
- Hover over its border until the border color changes and a + indicator appears.
- Drag the + indicator to the node that will be the ‘To node.
- Double-Click on the relationship line to select it and type in the relationship type
- The line will appear broken until the relationship info is completed



Lab 2 - Using Workspace Importer

Creating Relationships Between Nodes

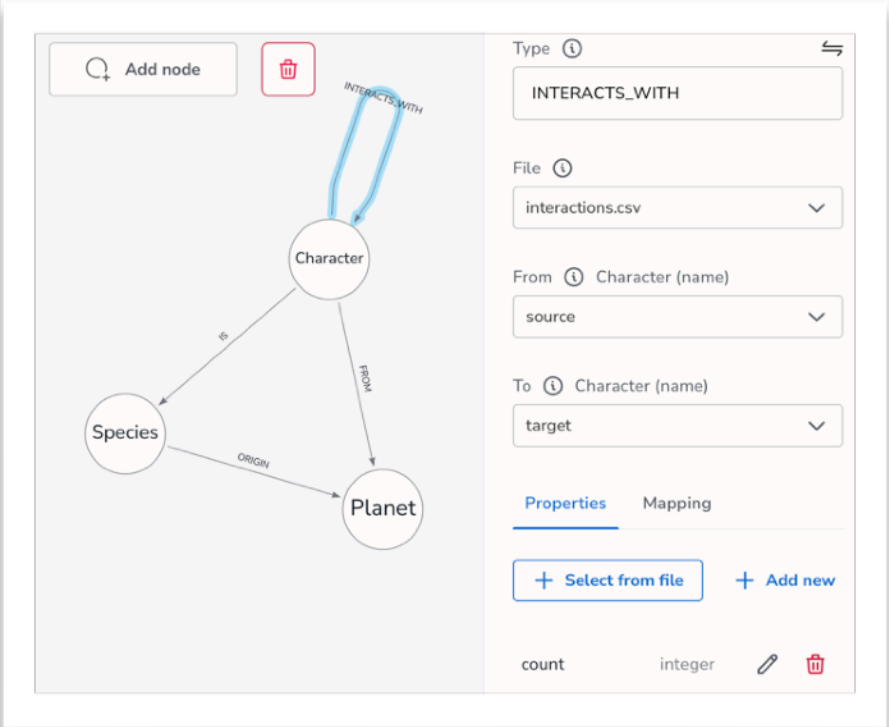
- Complete the remaining fields on the Mapping Details tab.
- Type: The name of the relationship
- File: Which file has the source/target information for the relationship
- From: Which field contains the ID of the From node
- To: Which field contains the ID of the To node
- Properties: Any fields that should be used as relationship properties.



Lab 2 - Using Workspace Importer

Creating Self-Join Relationship

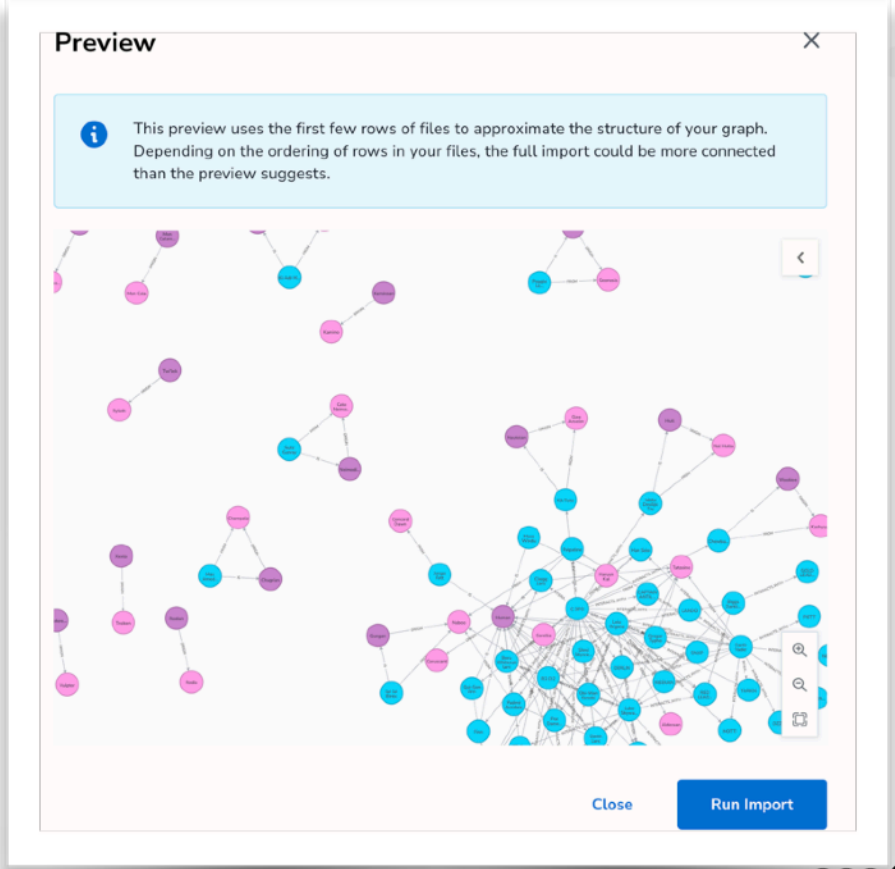
- Select the Character node and hover over its border until the + indicator appears
- Drag the selection + indicator away from the Character node, and then drag it back and drop it on the Character node.
- Fill out the mapping details.
- Type: INTERACTS_WITH
- File: interactions.csv
- From: source
- To: target
- Properties: count



Lab 2 - Using Workspace Importer

Preview the Import

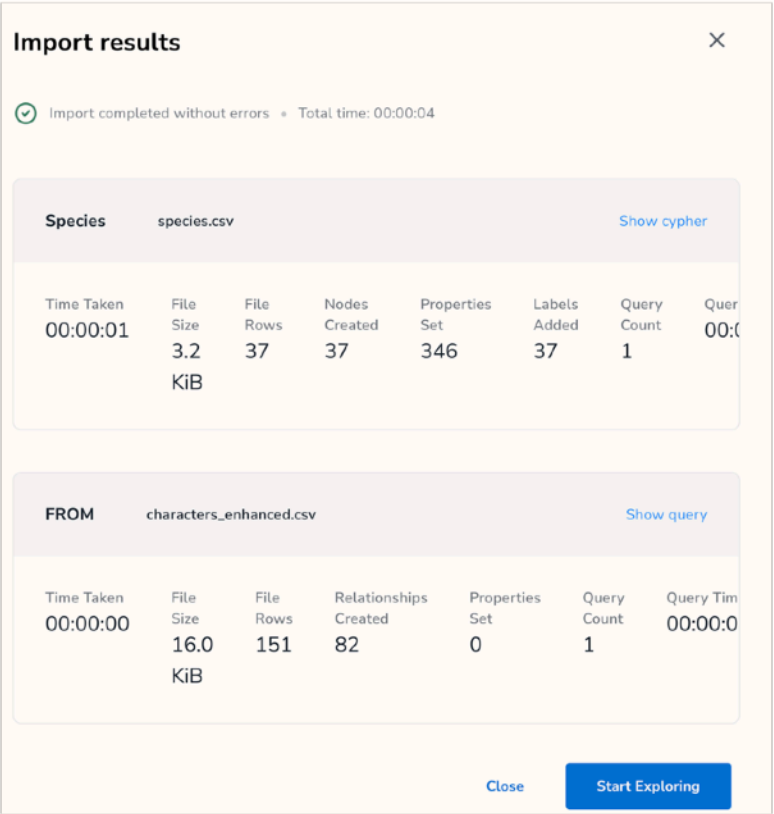
- Click on the Preview button
- A sampling of records from each of the files will used to give an idea of how the nodes and relationships will look.
- If everything looks okay, click on the Run Import button.



Lab 2 - Using Workspace Importer

Run the Import

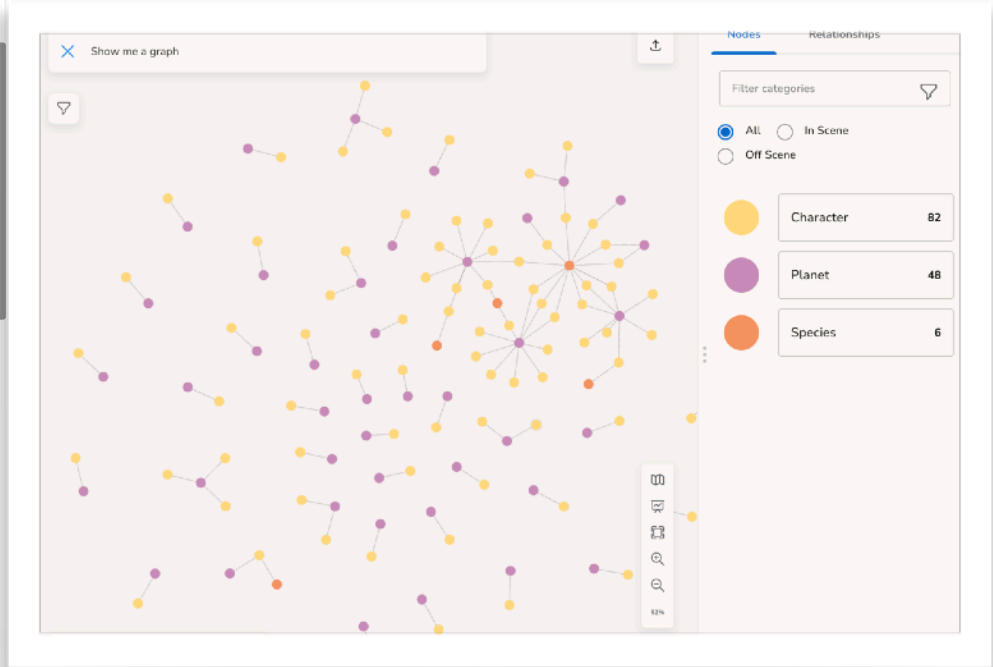
- Click on the Run Import button
- A summary of the import will be shown.
- Each Node Label and each Relationship Type will be summarized.
- If all looks good, click on the Start Exploring button.



Lab 2 - Using Workspace Importer

Viewing your Handiwork

- Click on the Start Exploring button
- This will show the Explore tab which uses Neo4j Bloom to display the newly imported data



Lab 2 - Using Workspace Importer

Lab 3 - Querying the Graph

Lab 3 - Basic Queries - The Match Statement

- Most queries start with a MATCH statement which is used for pattern matching.
- It is generally the most important part of the query
- All nodes/relationships/paths that meet the filtering criteria are selected.
- Selected items are then passed to the next part of the query

```
// Return all characters
MATCH (c:Character)
RETURN c
```

```
// Return a specific character
MATCH (c:Character)
WHERE c.name = "Han Solo"
RETURN c
```

Lab 3 - Basic Queries - The Match Statement

- Most queries start with a MATCH statement
- Used for pattern matching - similar in some ways to a WHERE clause
- All nodes/relationships/paths that meet the filtering criteria are selected
- Selected items are then passed to the next part of the query
- It is generally the most important part of the query

```
// Return all Characters from Alderaan
MATCH (c:Character)-[FROM]->(p:Planet)
WHERE p.name = "Alderaan"
RETURN c
```

```
// Return a specific Character
MATCH (c:Character)
WHERE c.name = "Han Solo"
RETURN c
```

Lab 3 - Basic Queries - The Match Statement

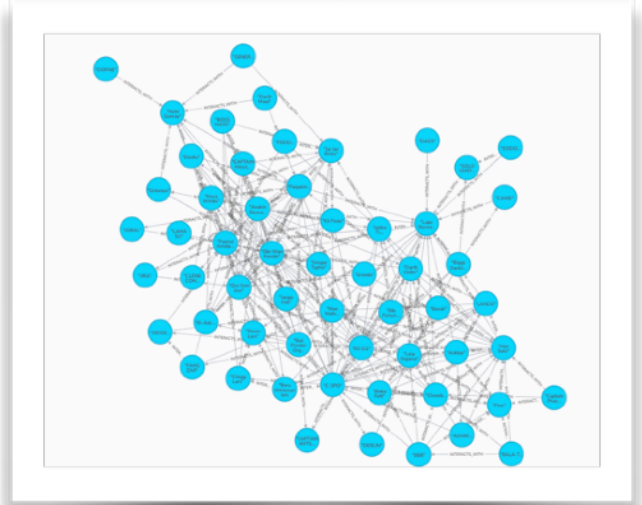
Node Properties Used as a Filter

```
// Return all Characters that interacted with R2-D2
MATCH (c:Character)<-[INTERACTS_WITH]-(other:Character)
WHERE c.name = "R2-D2"
RETURN other
```

Lab 3 - Basic Queries - The Match Statement

Unlike SQL, Variable-Length Queries are simple

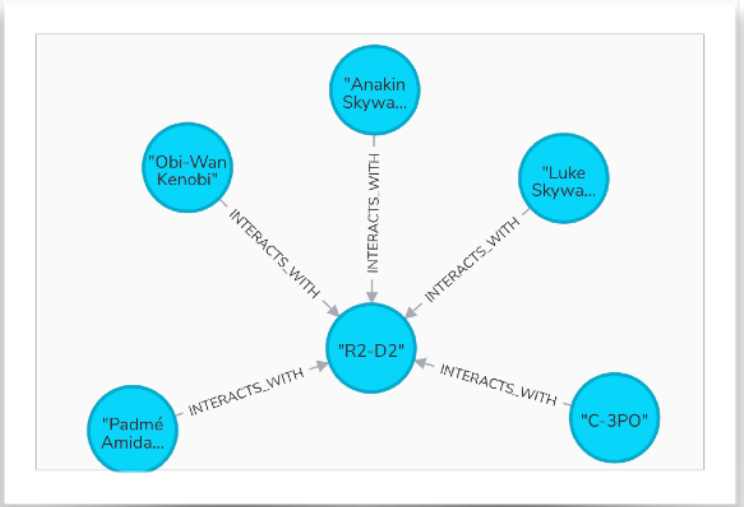
```
// Variable length query - interacts_with 3 levels down
MATCH p=(c:Character)<-[INTERACTS_WITH*..3]-(other:Character)
WHERE c.name = "R2-D2"
RETURN p
```



Lab 3 - Basic Queries - The Match Statement

Relationship Properties Can Also be Used

```
// Who does R2-D2 interact with the most
MATCH p=(c:Character)-[i:INTERACTS_WITH]-(other:Character)
WHERE c.name = "R2-D2"
RETURN p ORDER BY i.count DESC LIMIT 5
```



Lab 3 - Basic Queries - The Match Statement

Aggregation Values Used as a Filter

```
// Which characters interact with the most characters
MATCH (c:Character)-[INTERACTS_WITH]-(other)
WITH c.name as character, count(other) as others
WHERE others > 20
RETURN character, others
ORDER BY others desc LIMIT 5
```

character	others
"Anakin Skywalker"	44
"Obi-Wan Kenobi"	39
"C-3PO"	38
"Padmé Amidala"	36

Showing **1-5** of **5** results

Lab 3 - Basic Queries - The Match Statement

String Comparison Used as a Filter

```
// Which characters have Darth as part of their name
MATCH (c:Character)
WHERE c.name STARTS WITH "Darth"
RETURN c
```

Lab 4 - Updating the Graph

Lab 4 - Update Queries - Creating New Nodes

Using the CREATE Statement

- New nodes can be created using the CREATE statement
- Unless uniqueness constraints are used, duplicates may result

```
// Create a new Character
CREATE (c:Character {name:"Mark Q",
height:74,hair_colors:"Fleshtone"})
RETURN c
```

Lab 4 - Update Queries - Creating New Nodes

Using the MERGE Statement

- New nodes can also be created using the MERGE statement
- Neo will check first to see if any nodes match before creating a new node

```
// Carefully create a new Character using MERGE
MERGE (c:Character {name:"Mark Q"})
ON CREATE SET c +=
{height:74,hair_colors:"Fleshtone"}
RETURN c
```

Lab 4 - Update Queries - Creating New Relationships

Using the MERGE Statement

- New relationships can also be created using the MERGE statement
- Use the MATCH statement to find the “from” and “to” nodes
- Use the MERGE statement to create a new relationship (if necessary)

```
MATCH
(r2:Character),
(me:Character)
WHERE r2.name = 'R2-D2' AND me.name = 'Mark Q'
MERGE (me)-[r:FOLLOWS]->(r2)
RETURN r2,r,me
```