Graph Analytics

Modeling Chat Data using a Graph Data Model

The graph model is a network based on chat interactions between users.

A chat session can be initiated by a user, other users on the same team are able to join and leave the session.

Interactions between users begins when a user create a post.

it's possible for a user, mention another user.

All relationship between entities are logged with timestamp.

Creation of the Graph Database for Chats

The schema of the 6 CSV files:

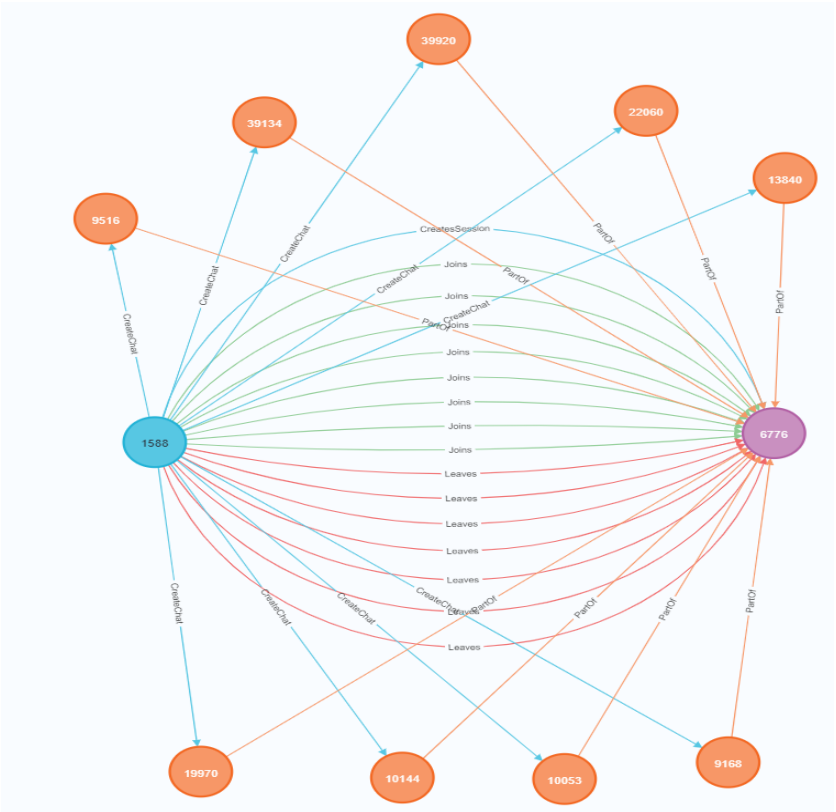
Files	Fields
chat_create_team_chat	-userid -teamid -teamChatSessionID -timestamp
chat_item_team_chat	-userid -teamchatsessionid -chatitemid -timestamp
chat_join_team_chat	-userid -teamChatSessionID -teamstamp
chat_leave_team_chat	-userid -teamchatsessionid -timestamp
chat_mention_team_chat	-chatItem -userid -timeStamp
chat_respond_team_chat	-chatid1 -chatid2 -timestamp

Explain the loading process and include a sample LOAD command:

```
LOAD CSV FROM "file:///chat_create_team_chat.csv" AS row
MERGE (u:User {id: toInteger(row[0])}) MERGE (t:Team {id: toInteger(row[1])})
MERGE (c:TeamChatSession {id: toInteger(row[2])})
MERGE (u)-[:CreatesSession{timeStamp: row[3]}]->(c)
MERGE (c)-[:OwnedBy{timeStamp: row[3]}]->(t)
```

The first line imports the csv file from specific path. second, third and fourth lines creates nodes with different labels (User, Team, TeamChatSession) and have id properties. fifth and sixth lines create a relatiosship under lables specified like this:
Between User nodes and TeamChatSessionnodes called CreateSession
Between TeamChatSession nodes and Team nodes called OwnedBy.

Present a screenshot of some part of the graph you have generated. The graphs must include clearly visible examples of most node and edge types. Below are two acceptable examples. The first example is rendered in the default Neo4j distribution, the second has had some nodes moved to expose the edges more clearly. Both include examples of most node and edge types:

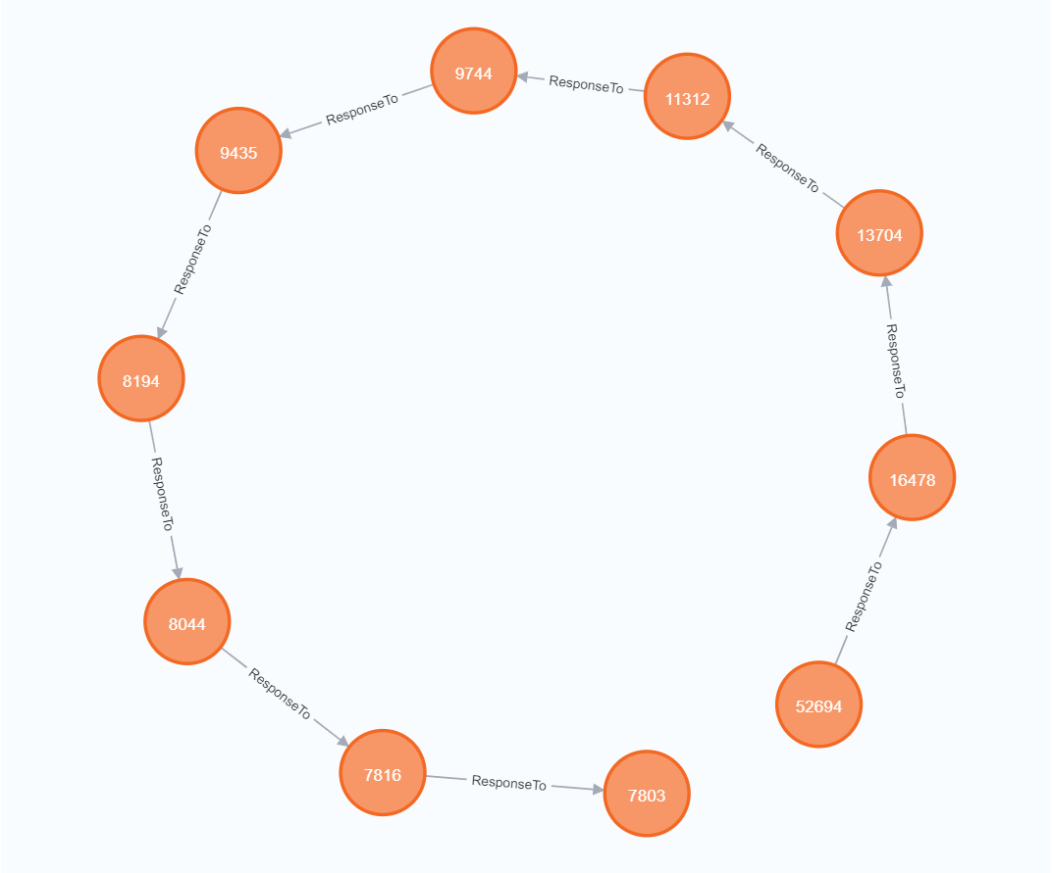


Finding the longest conversation chain and its participants

Report the results including the length of the conversation (path length) and how many unique users were part of the conversation chain. Describe your steps. Write the query that produces the correct answer:

How many chats are involved between tow nodes?

```
match p=(a)-[:ResponseTo*]->(b)
return p,length(p)
order by length(p) desc limit 1
```



The longest conversation chain in the chat data has path length (9) and there is (10) chats are involved on it.

How many Users are participated in this chain?

```
match p=(c:ChatItem)-[:ResponseTo*]->(j:ChatItem)
where length(p) = 9
with p
match q=(u:User)-[:CreateChat]-(c:ChatItem)
where (c in NODES(p))
return count(DISTINCT u)
```

With (9) as longest path, count the number of distinct Users who create a ChatItem in the longest path and the query result is (5) Users.

Analyzing the relationship between top 10 chattiest users and top 10 chattiest teams

Describe your steps from Question 2. In the process, create the following two tables. You only need to include the top 3 for each table. Identify and report whether any of the chattiest users were part of any of the chattiest teams.

Chattiest Users:

```
match (u:User)-[:CreateChat]-(i:ChatItem)
return u.id as Users , count(u.id) as Num_Chats
order by count(u.id) desc limit 10
```

Users	Number of Chats
394	115
2067	111
1087	109
209	109
554	107
1627	105
999	105
516	105
668	104
461	104

Chattiest Teams:

```
match (:ChatItem)-[:PartOf]-(:TeamChatSession)-[:OwnedBy]-(t:Team)
return t.id as Teams , count(t.id) as Num_Chats
order by count(t.id) desc limit 10
```

Teams	Number of Chats
82	1324
185	1036
112	957
18	844
194	836
129	814
52	788
136	783
146	746
81	736

Finally, present your answer, i.e. whether or not any of the chattiest users are part of any of the chattiest teams.

```
match (u:User)-[:CreateChat]-(:ChatItem)-[:PartOf]-(:TeamChatSession)-[:OwnedBy]-(t:Team)
where u.id in [394,2067,1087,209,554,1627,999,516,668,461]
and t.id in [82,185,112,18,194,129,52,136,146,81]
return distinct u.id as User , t.id as Team
```

The result be like:

	User	Team
1	999	52

How Active Are Groups of Users?

Describe your steps for performing this analysis. Be as clear, concise, and as brief as possible. Finally, report the top 3 most active users in the table below.

connect mention Users:

```
match (u1:User)-[:CreateChat]->(:ChatItem)-[:Mentioned]->(u2:User)
merge (u1)-[:InteractsWith]->(u2)
```

connect Users response with the chat creator:

```
match (u1:User)-[:CreateChat]->(:ChatItem)-[:ResponseTo]-(:ChatItem)<-[:CreateChat]-(u2:User)
merge (u1)-[:InteractsWith]->(u2)
```

Eliminate all self-interactions:

```
match (u1)-[r:InteractsWith]->(u2) where u1.id=u2.id detach delete r
```

Most Active Users (based on Cluster Coefficients)

```
match (u1:User{id:394})-[:InteractsWith]->(u2:User)
with collect(u2.id) as neighbours, count(u2) as k
match (u3:User)-[iw:InteractsWith]->(u4:User)
where (u3.id in (neighbours)) and (u4.id in (neighbours))
return count(iw)/(k * (k - 1) * 1.0) as ClusterCoefficient
```

User ID	Coefficient
394	0.9167
2067	0.7679
209	0.9524