B4M36DS2, BE4M36DS2: **Database Systems 2**

https://cw.fel.cvut.cz/b221/courses/b4m36ds2/

Practical Class 11

Neo4j

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11. 12. 2023

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Data Model

Database system structure

Instance → single **graph**

Property graph = directed labeled multigraph

- Collection of vertices (nodes) and edges (relationships)

Node

- Internal identifier
- Set of labels, set of properties

Relationship

- Internal identifier
- **Direction**, start and end node
- Exactly one type, set of properties

First Steps

Connect to our NoSQL server

- SSH / PuTTY and SFTP / WinSCP
- **nosql.felk.cvut.cz**

Start Cypher shell

- `cypher-shell`

Get familiar with basic commands

- `help`
- `exit`

Sample data (common database)

- See `/home/DS2/neo4j/data.cypher`

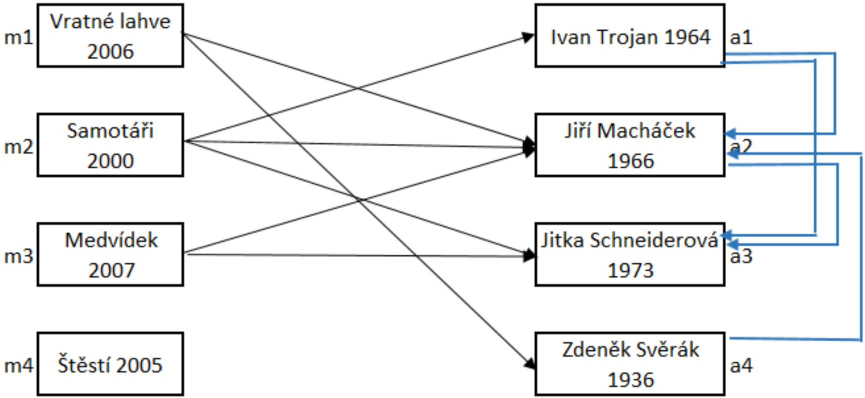
Source file

```
CREATE
  (m1:MOVIE { id: "vratnelahve", title: "Vratne lahve", year: 2006 }),
  (m2:MOVIE { id: "samotari", title: "Samotari", year: 2000 }),
  (m3:MOVIE { id: "medvidek", title: "Medvidek", year: 2007 }),
  (m4:MOVIE { id: "stesti", title: "Stesti", year: 2005 }),

  (a1:ACTOR { id: "trojan", name: "Ivan Trojan", year: 1964 }),
  (a2:ACTOR { id: "machacek", name: "Jiri Machacek", year: 1966 }),
  (a3:ACTOR { id: "schneiderova", name: "Jitka Schneiderova", year: 1973 }),
  (a4:ACTOR { id: "sverak", name: "Zdenek Sverak", year: 1936 }),
  (a5:ACTOR { id: "novak", name: "Jan Novak", year: 1970 }),
  (a6:ACTOR { id: "svoboda", name: "Petr Svoboda", year: 1965 }),
  (a7:ACTOR { id: "kral", name: "Lukas Kral", year: 1980 }),
  (a8:ACTOR { id: "novotny", name: "Martin Novotny", year: 1975 }),
```

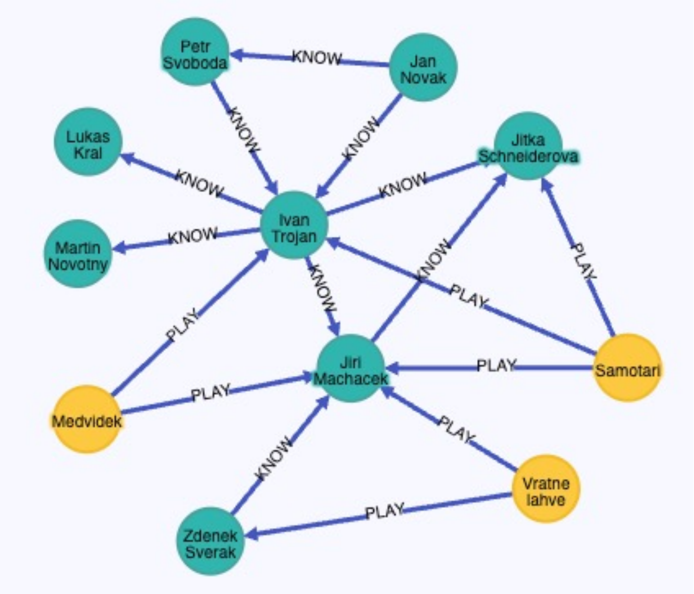
Source file

```
(m1)-[c1:PLAY { role: "Robert Landa" }]->(a2),
(m1)-[c2:PLAY { role: "Josef Tkaloun" }]->(a4),
(m2)-[c3:PLAY { role: "Ondrej" }]->(a1),
(m2)-[c4:PLAY { role: "Jakub" }]->(a2),
(m2)-[c5:PLAY { role: "Hanka" }]->(a3),
(m3)-[c6:PLAY { role: "Ivan" }]->(a1),
(m3)-[c7:PLAY { role: "Jirka", award: "Czech Lion" }]->(a2),

(a1)-[f1:KNOW]->(a2),
(a1)-[f2:KNOW]->(a3),
(a2)-[f3:KNOW]->(a3),
(a4)-[f4:KNOW]->(a2),
(a5)-[f5:KNOW]->(a6),
(a6)-[f6:KNOW]->(a1),
(a5)-[f7:KNOW]->(a1),
(a1)-[f8:KNOW]->(a7),
(a1)-[f9:KNOW]->(a8);
```

Source file


m1
Vratné lahve 2006
m2
Samotáři 2000
m3
Medvídek 2007
m4
Štěstí 2005
Ivan Trojan 1964
a1
Jiří Macháček 1966
a2
Jitka Schneiderová 1973
a3
Zdeněk Svěrák 1936
a4

Source file


Petr Svoboda
KNOW
Jan Novak
KNOW
KNOW
Lukas Kral
KNOW
Jitka Schneiderova
KNOW
Martin Novotny
KNOW
Ivan Trojan
KNOW
PLAY
KNOW
PLAY
PLAY
Jiri Machacek
PLAY
Samotari
Medvidek
PLAY
KNOW
PLAY
Vratne lahve
PLAY
Zdenek Sverak

Exercise 1

Express the following Cypher query

- **Find movies with identifier *medvidek***
- Return movie nodes together with title properties

Exercise 2

Express the following Cypher query

- **Find actors born in *1965* or later**
- Return actor names and years they were born
- Sort the result using years (in descending order) and then names (in ascending order)

Exercise 3

Express the following Cypher query

- **Find titles of movies in which *Jiri Machacek* played**

Exercise 4

Express the following Cypher query

- **Find all actors whom Jiří Macháček knows**

Exercise 5

Express the following Cypher query

- **Find movies where at least one actor played**

Exercise 6

Express the following Cypher query

- **Find actors who played with *Ivan Trojan***

Exercise 7

Express the following Cypher query

- **Find all friends of actor *Ivan Trojan***
- Include friends of friends etc.
- Return actor names

Exercise 8

Express the following Cypher query

- **Find pairs of movies and their actors**
- Include movies without actors as well

Exercise 9

Express the following Cypher query

- **Find actors who played in movies having above average number of actors**
- Return actor names

Exercise 10

Express the following Cypher query

- **Find all actors who have played in the same movie as Jiří Macháček**
- **Output distinct actor names and concatenate movie titles if necessary.**

References

Embedded database and traversal framework

- https://neo4j.com/docs/java-reference/current/

JavaDoc

- https://neo4j.com/docs/java-reference/current/javadocs/

Cypher query language

- https://neo4j.com/docs/developer-manual/current/cypher/

Cypher reference card

- https://neo4j.com/docs/cypher-refcard/current/