Summary of Database Systems Course Analysis: *BottleNecks in Production at Acutec*

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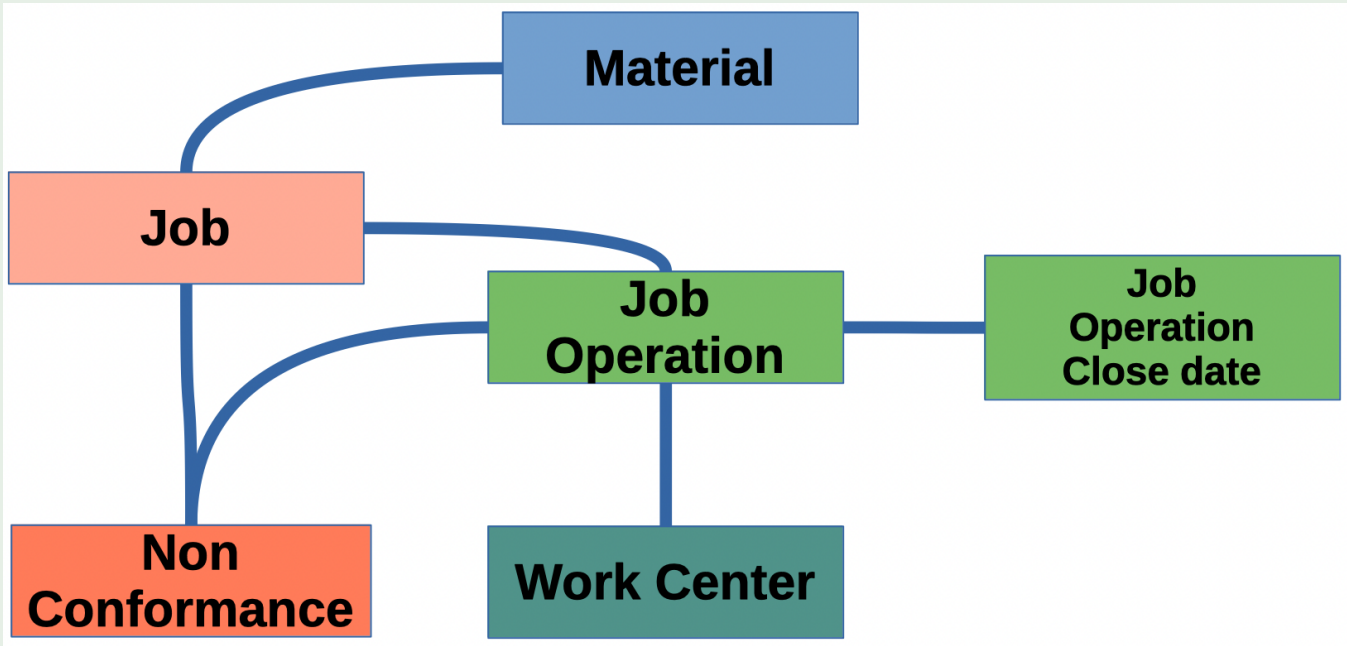
Schema

Schema from Acutec Data



Data

Acutec data set as a `SQLite3` database

Data from Acutec

Link: `https://drive.google.com/drive/folders/1A2rw5fk-xLNoEfMWpfYtPtoRG5OAd07o?usp=sharing`

Schemas

Job

```
CREATE TABLE IF NOT EXISTS "job" (
  "JobID" TEXT,
  "Status" TEXT,
  "Unit_Price" REAL,
  "Sched_Start" TEXT,
  "Sched_End" TEXT,
  "Make_Quantity" INTEGER,
  "Order_Quantity" INTEGER,
  "Pick_Quantity" INTEGER,
  "Shipped_Quantity" INTEGER,
  "Returned_Quantity" INTEGER );
```

Schemas

joboperation

```
CREATE TABLE IF NOT EXISTS "joboperation" (
  "JobOpID" TEXT,
  "JobID" TEXT,
  "Status" TEXT,
  "Inside_Oper" INTEGER,
  "Sequence" INTEGER,
  "Sched_Start" TEXT,
  "Sched_End" TEXT,
  "Est_Setup_Hrs" REAL,
  "Est_Run_Hrs" REAL,
  "Est_Total_Hrs" REAL,
  "Act_Run_Qty" INTEGER,
  "WcID" TEXT );
```

Schemas

nonconformance

```
CREATE TABLE IF NOT EXISTS "nonconformance" (
  "CreatedDt" TEXT,
  "latestCount" INTEGER,
  "ColorCurrent" TEXT,
  "CreatedBy" TEXT,
  "DiscardedQtyToKeep" INTEGER,
  "DiscardedQtyToKeepDestructiveTest" INTEGER,
  "Assignee" TEXT,
  "DefectCodeDisplayText" TEXT,
  "SetupPart" INTEGER,
  "InitialCount" REAL,
  "TagID" INTEGER,
  "JobOpID" TEXT );
```

Schemas

jobmaterialguess

```
CREATE TABLE IF NOT EXISTS "jobmaterialguess" (
  "JobID" TEXT,
  "Material" TEXT );
```

joboperationclosedate

```
CREATE TABLE IF NOT EXISTS "workcenter" (
  "WcID" TEXT,
  "Department" TEXT );
```

joboperationclosedate

```
CREATE TABLE IF NOT EXISTS "joboperationclosedate" (
  "JobOpID" TEXT,
  "LastChangeHistoryClosedDate" TEXT );
```

- Students were given a created SQLlite3 database.

Where to Start

"Trace the Red Tags back to some cause."

- Start with the **RED FLAGs**
- Where do these flags originate?
- What tables and variables are impacted?
- Which variables may be reached by queries involving Red Flags which may suggest points of failure in production?

Query

```
select distinct(ColorCurrent) from nonconformance;
```

Output

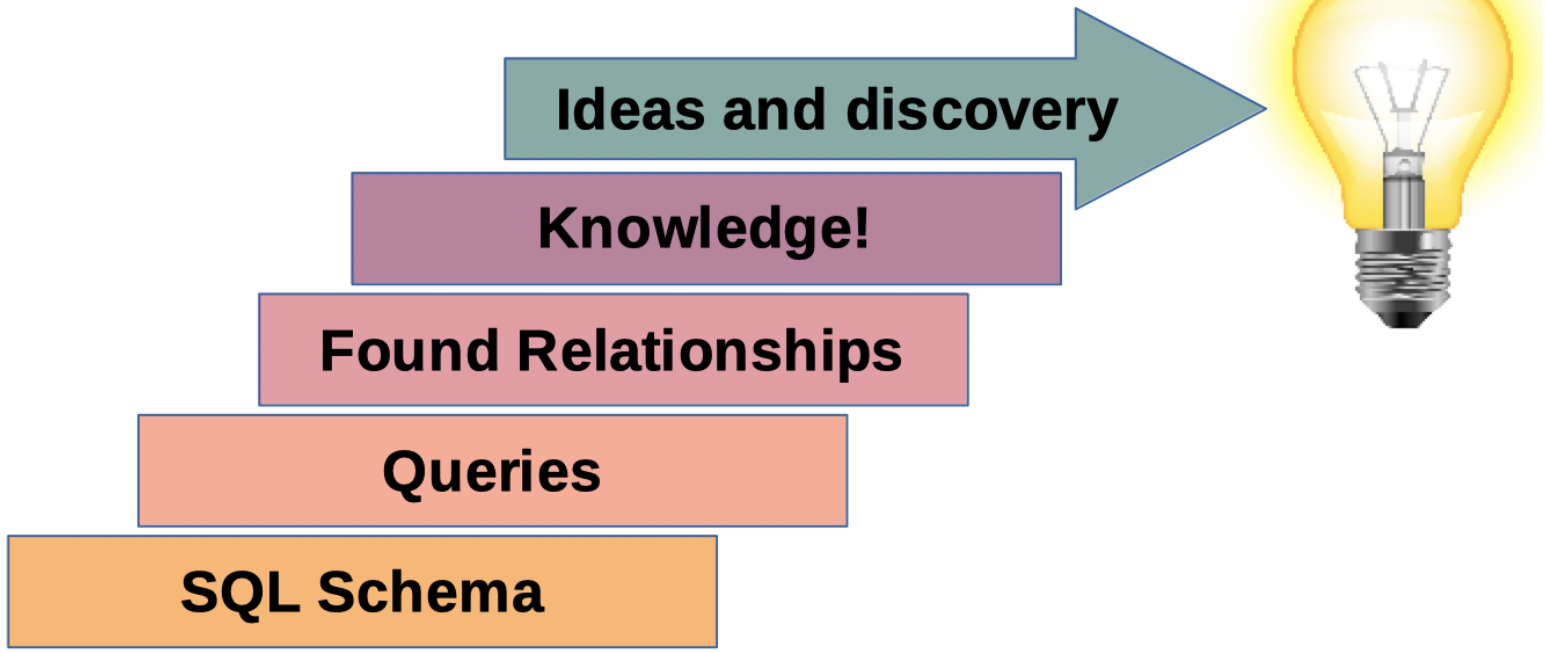
```
 RED,
 BLACK,
 ORANGE,
... RESOLVED: WAS ORANGE
```

Looking Forward

How Could Acutec Spot Bottlenecks With Data?

Using Databases

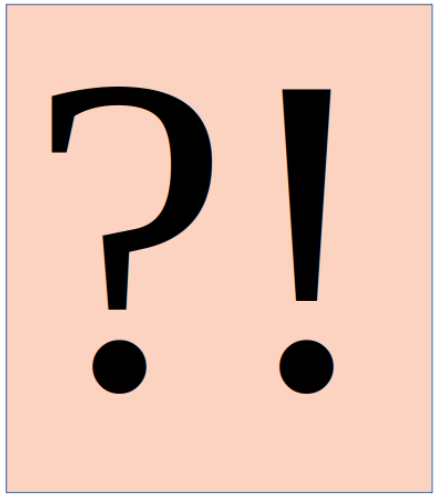
Data to Discovery



humanGene	EnsNum	x00511204	x7d9d7119	x93904035
RMND5A	ENSG00000153561.11	16.0546348885	15.0430361402	151243.109382
RAD23A	ENSG00000179262.5	38.9356481105	21.5142980486	775745.036464
RAD17	ENSG00000152942.17	6.71326600079	5.55100617028	151541.361155
TTDN1 (C7orf11)	ENSG00000168303.5	1.85918994126	3.36634373043	49283.8903263
RAD54L	ENSG00000085999.10	0.009701507[illegible]	4.41325732573	15129.8861733
UBE2N	ENSG00000177889.8	10.5477997015	8.83952862957	359788.007883
TMEM30A	ENSG00000112697.14	24.071963429	65.9105478056	702950.166486
POLG	ENSG00000140521.10	11.0086481904	14.6093304994	264502.854355
TIPIN	ENSG00000075131.5	1.0519040137	3.47877339239	46372.2363066
RECQL	ENSG00000004700.14	7.3107903322[illegible]	13.8899062988	156082.413536
BRCA2 (FANCD1)	ENSG00000139618.13	0.0304680934309	2.00230876714	8123.47419519
RPA3	ENSG00000106399.10	2.73917849196	11.9965343474	98[illegible]73.7266513
RNASEH2B	ENSG00000136104.17	2.25140900487	2.16690519349	51635.1402182
RAD18	ENSG00000070950.5	1.03082443513	5.06228468473	48787.2494237
CAVIK1	ENSG00000004660.13	0.715850842656	1.95868467159	87931.7903047

Missing Discoveries?

Where did my idea go?



What stumped my discovery?

- Discoveries in data are first imagined, then verified
- The patterns that we can find are limited by our imaginations to find a *testable* cases to query
- Is there a way to find relationships without first knowing that they could exist?!

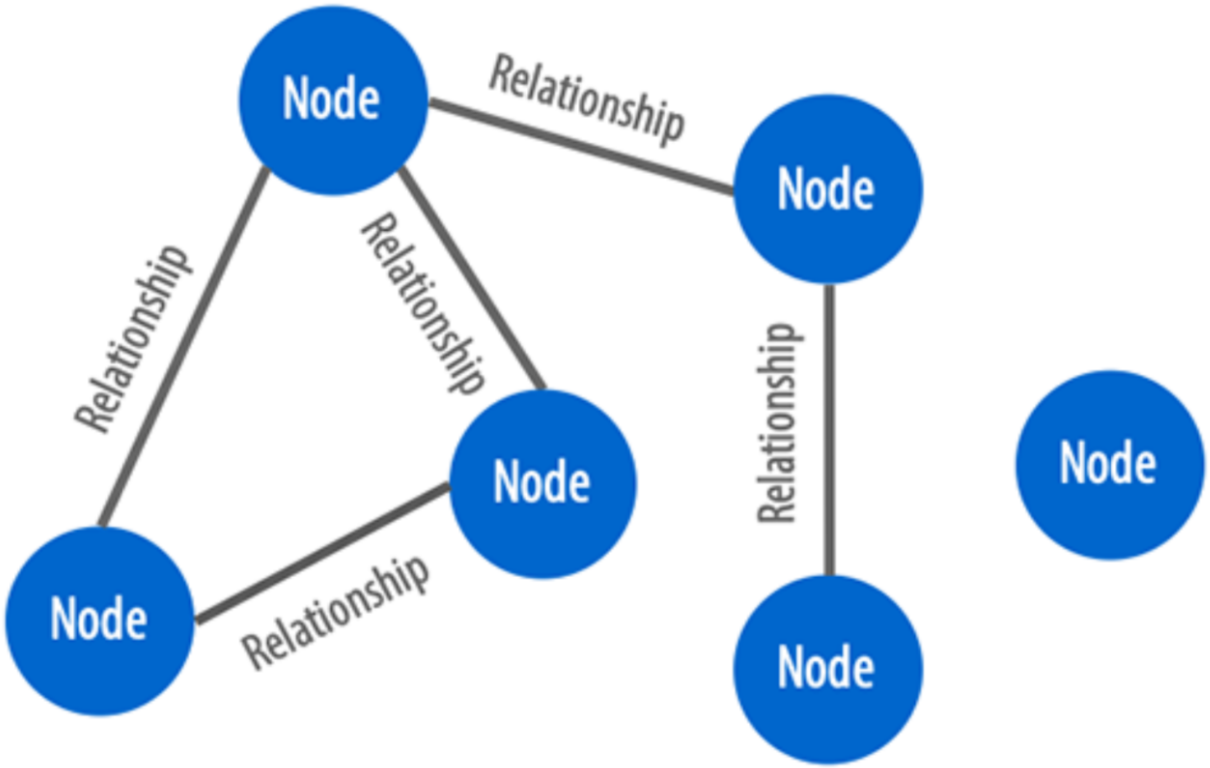
Databases, Visually

- A visual database system using methods from graph theory to use networks to determine relationships (edges) and discover meaning from connected data-points (nodes). Users are able to interact with the data in a network.

- `https://neo4j.com/`
- Graphgists Projects: `https://neo4j.com/graphgists/`

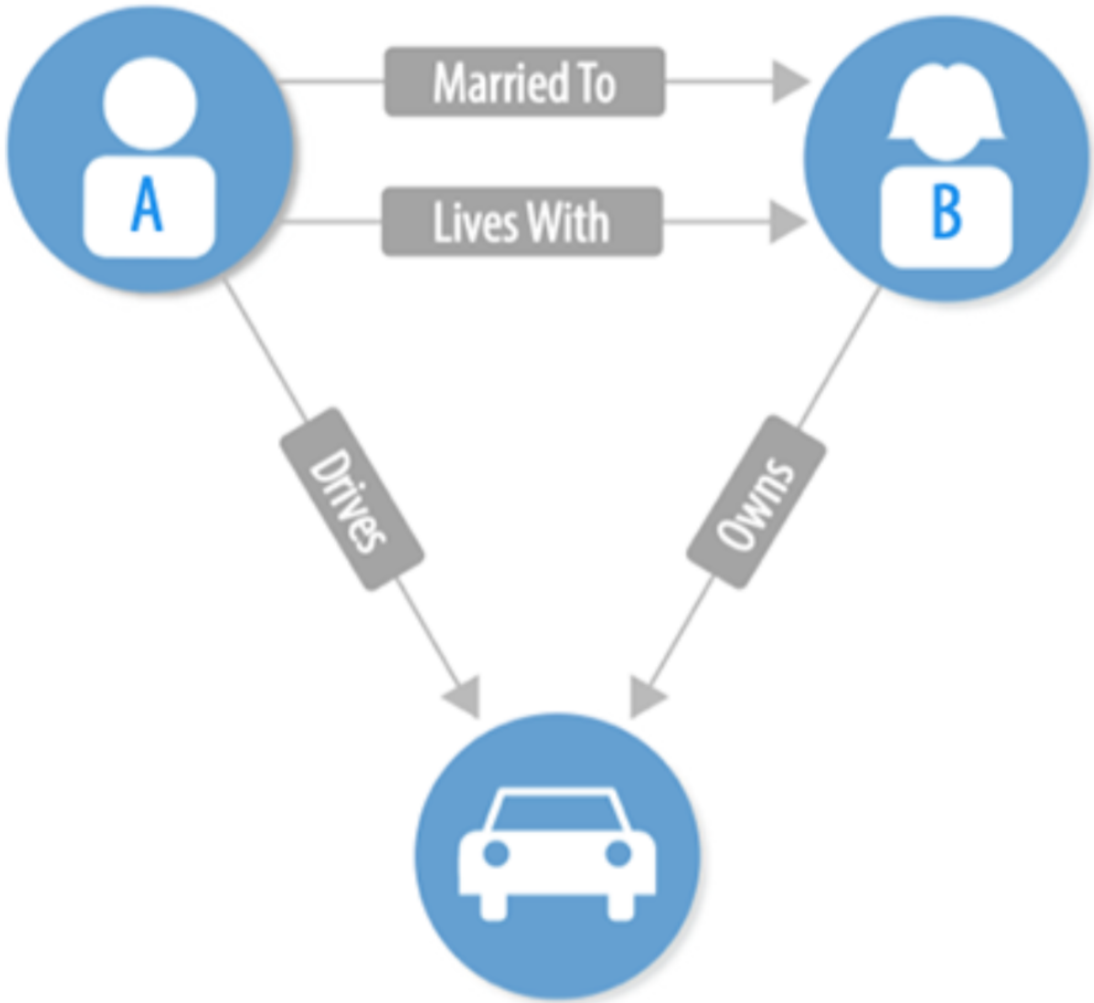
Networks Of Data

Relationships exist by connectivity



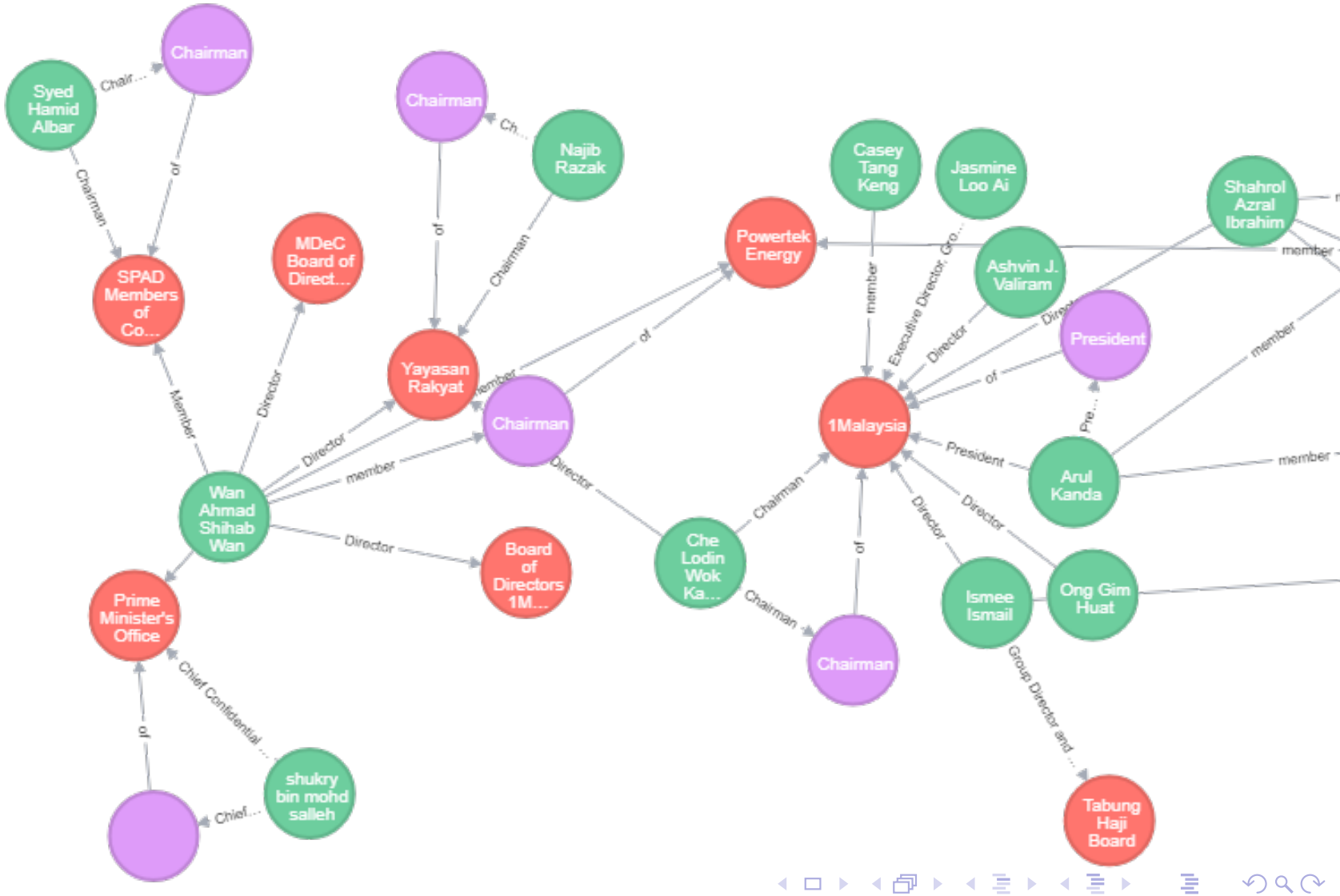
- All fields of a database are represented as a network
  - *Rows* $\rightarrow$ *nodes*
  - *Table names* $\rightarrow$ *label names*
  - *Joins* or *foreign keys* $\rightarrow$ *relationships* between nodes

Networks In Neo4J



- An acting schema: The relationships between nodes are built into the network

Networks In Neo4J



Networks Of Data

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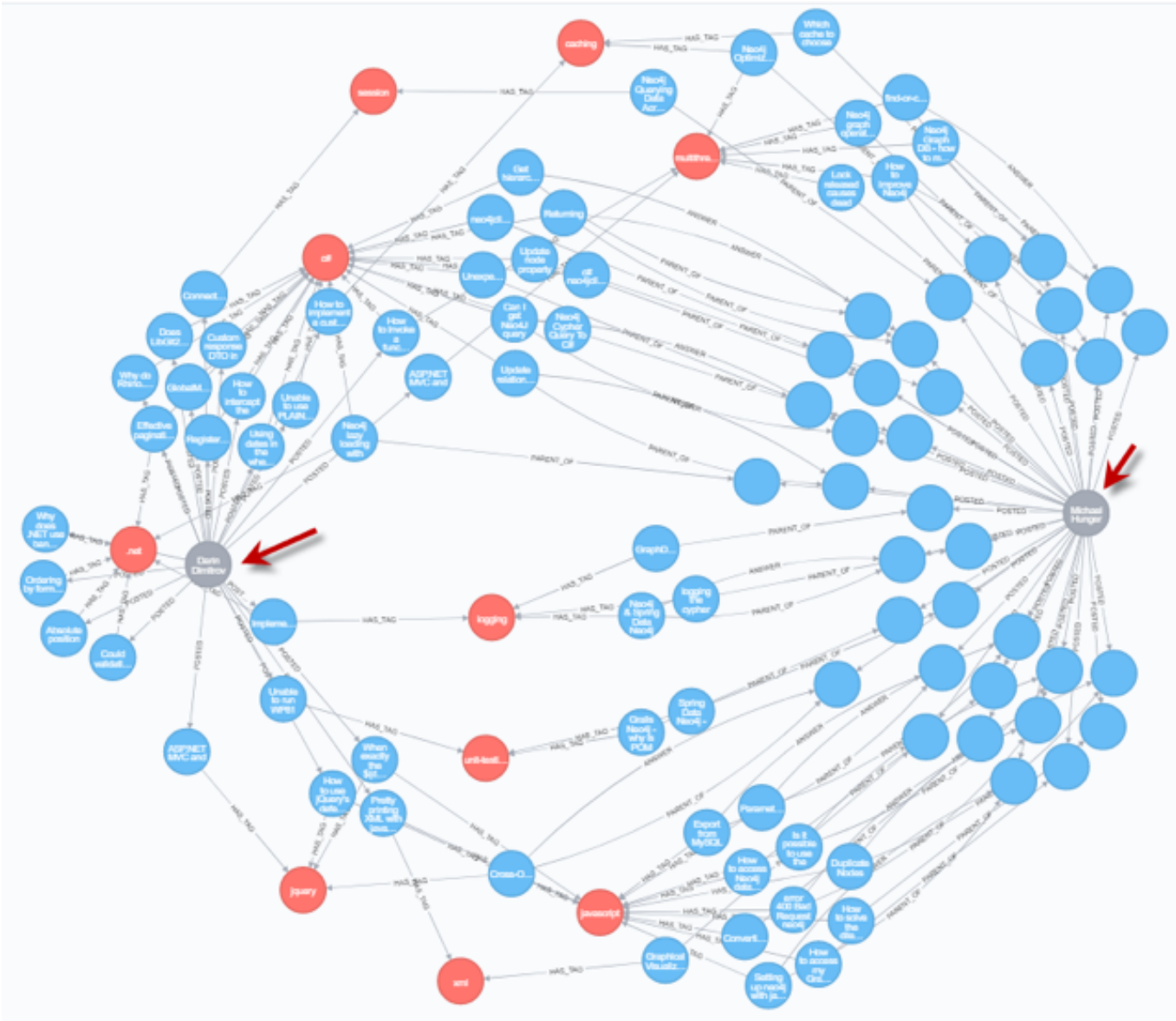
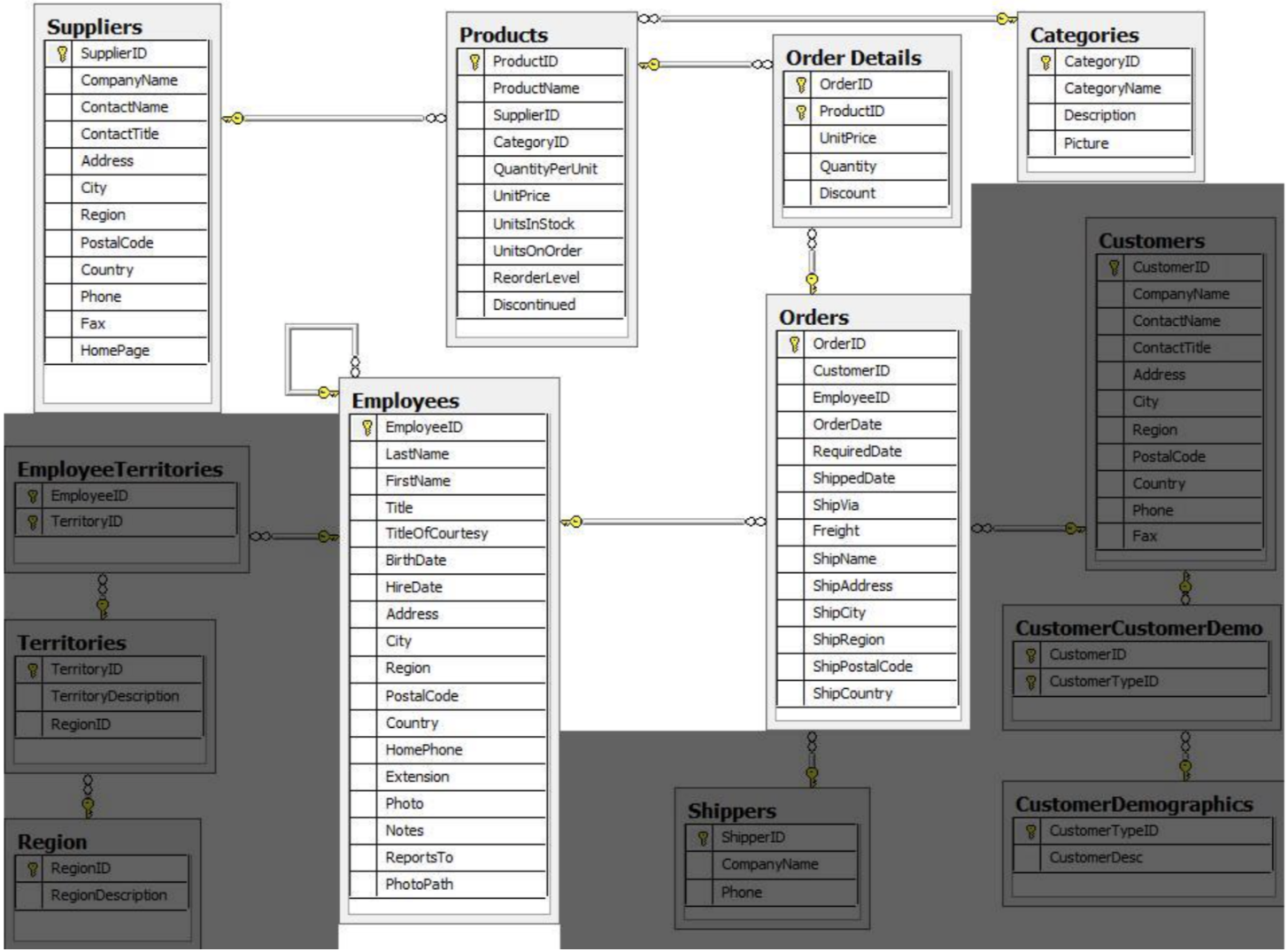


Regular SQL View

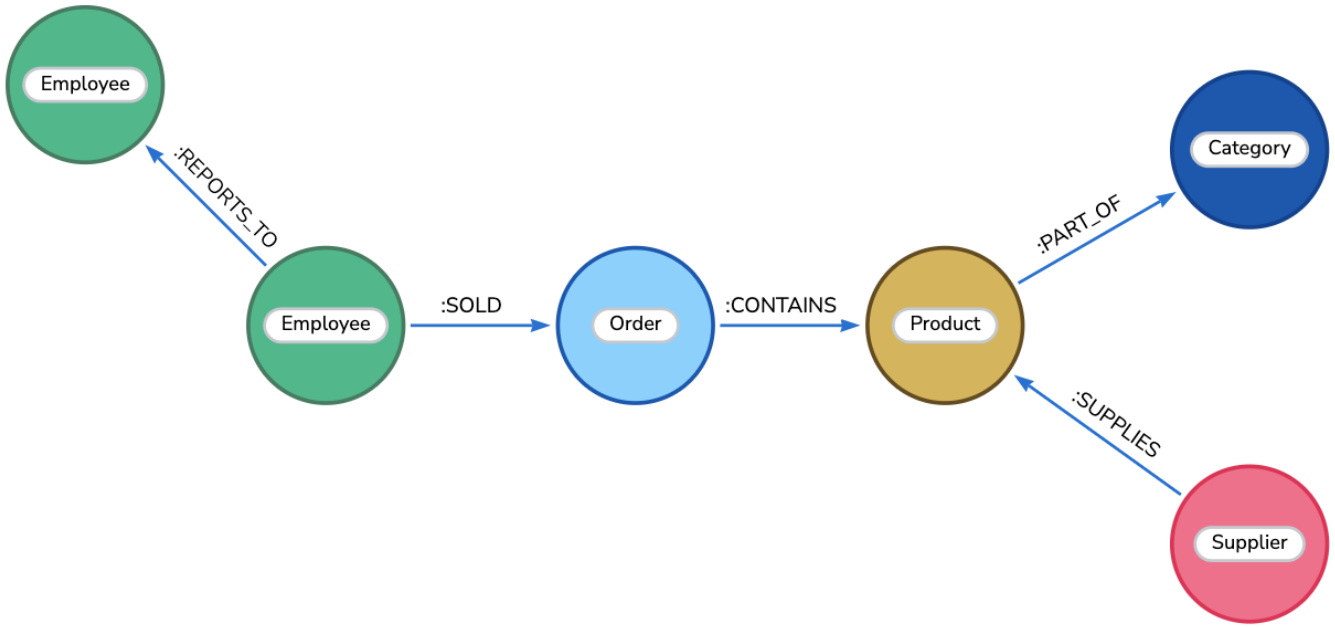
SQL to Neo4J Conversion



Reference:
`https://neo4j.com/docs/getting-started/appendix/tutorials/guide-import-relational-and-etl/`

Regular Visual View

SQL to Neo4J Conversion



From SQL Tables ...

- *Suppliers*, *Employees*, *Products*, *Orders*, *Categories*, and *Order Details*

Reference:
`https://neo4j.com/docs/getting-started/appendix/tutorials/guide-import-relational-and-etl/`

Internship Course at Allegheny College

CMPSC 529 - Internship: Computer Science

Credits: 1-4

Academic study completed in support of an internship experience with a partner institution. An Allegheny faculty member assigns and evaluates the academic work done by the student. May be repeated for credit. Students are invited to use their own departmentally approved laptop in this course; a limited number of laptops are available for use during class and lab sessions.

Prerequisite: Permission of instructor.

Distribution Requirements: none.

Internship Course at Allegheny College

Let's keep this project going!

- An internship course in the Department of Computer Science and Information
- Potentially: Two or Three students enrolled
- Goal of the internship: convert the SQL data into visual databases to discover bottlenecks
- Acutec will have to meet with students and me two or three times during the semester (Progress reports, Questions and Answers)
- (That's it!!)