

What Finance can learn from Dating Sites

Max De Marzi
GOTO Chicago



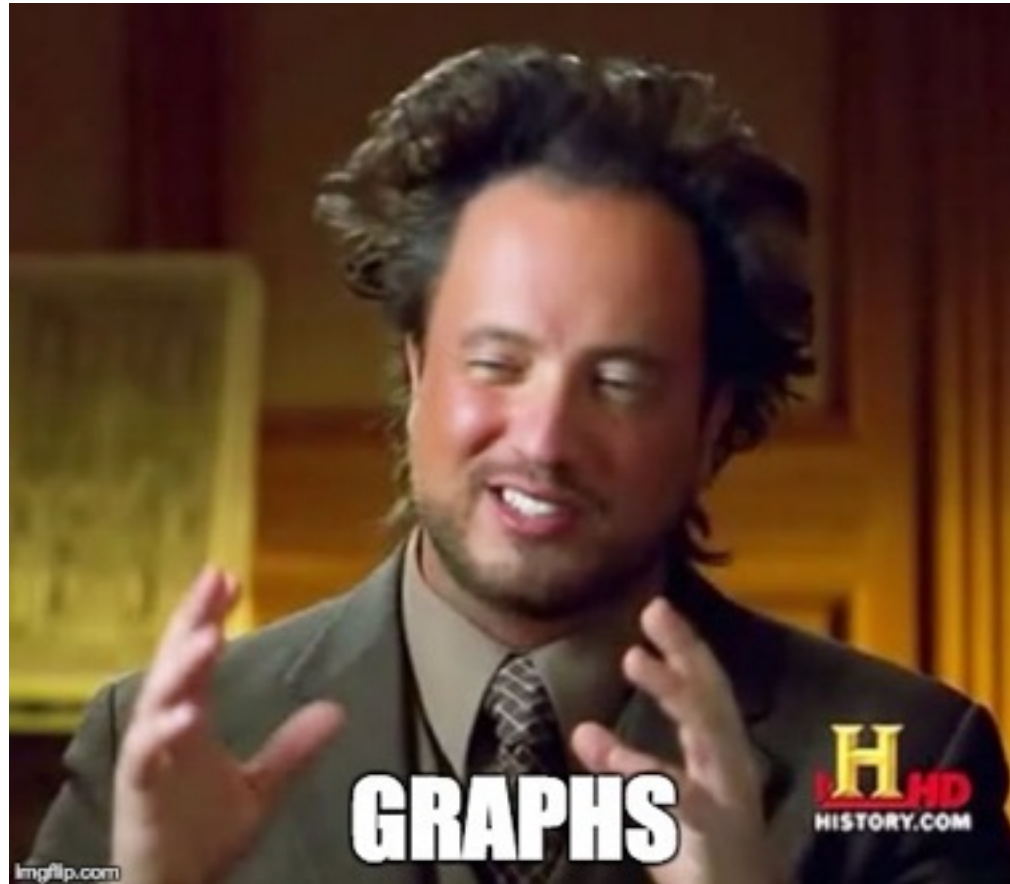
About Me



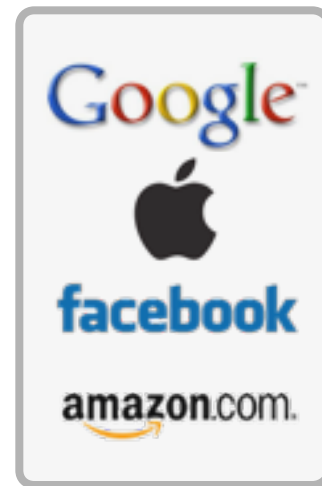
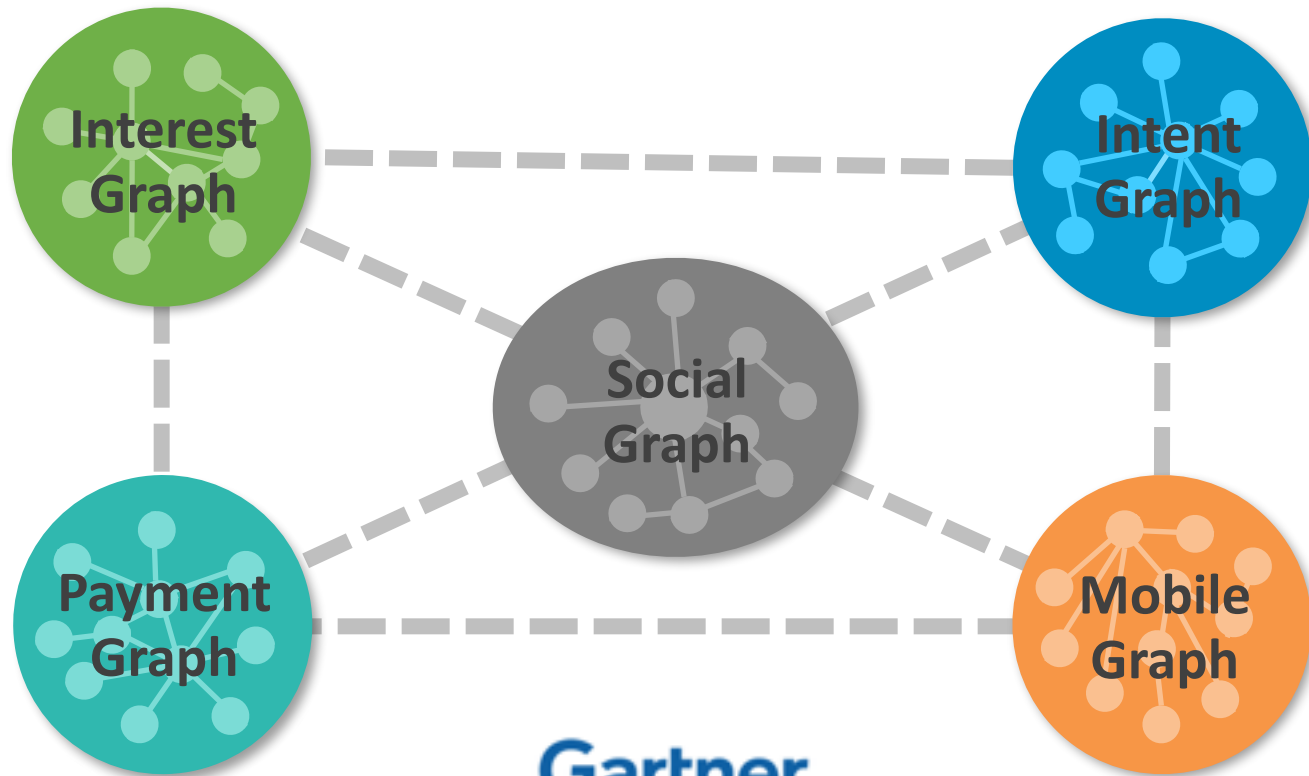
- **Max De Marzi** - Neo4j Field Engineer
- My Blog: <http://maxdemarzi.com>
- Find me on Twitter: @maxdemarzi
- Email me: maxdemarzi@gmail.com
- GitHub: <http://github.com/maxdemarzi>



TLDR:



Consumer Web Giants Depend on Five Graphs



Gartner.

The Five Graphs of Love



Friends of Friends Graph

- Real World Basis
- Its Weighted (BFF vs Family)
- Awesome or Awkward

Passion Graph

- Shared Interests
- Desired Traits
- Long vs Short Term

Location Graph

- Long Distance Sucks
- Where are the single people
- Where should we meet

Safety Graph

- True Identity
- Liers and Cheaters
- Balancing Privacy

SPAM Graph

- Click Bait
- Wanna Cam?
- Professionals



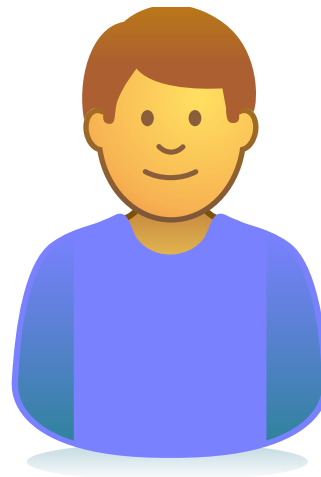
The Five Graphs of Love



Meet Jeremy



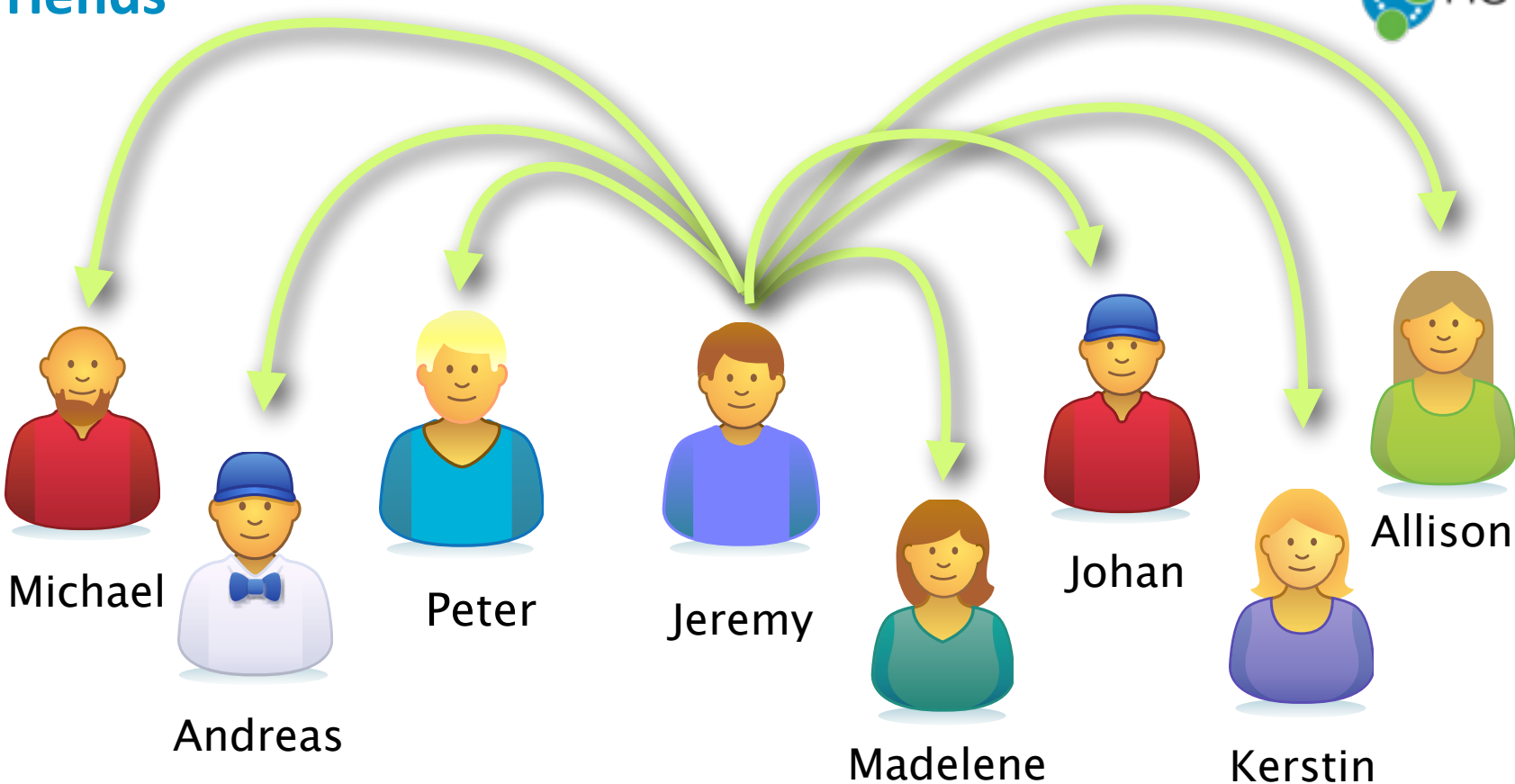
- Single
- Handsome
- Friendly
- etc



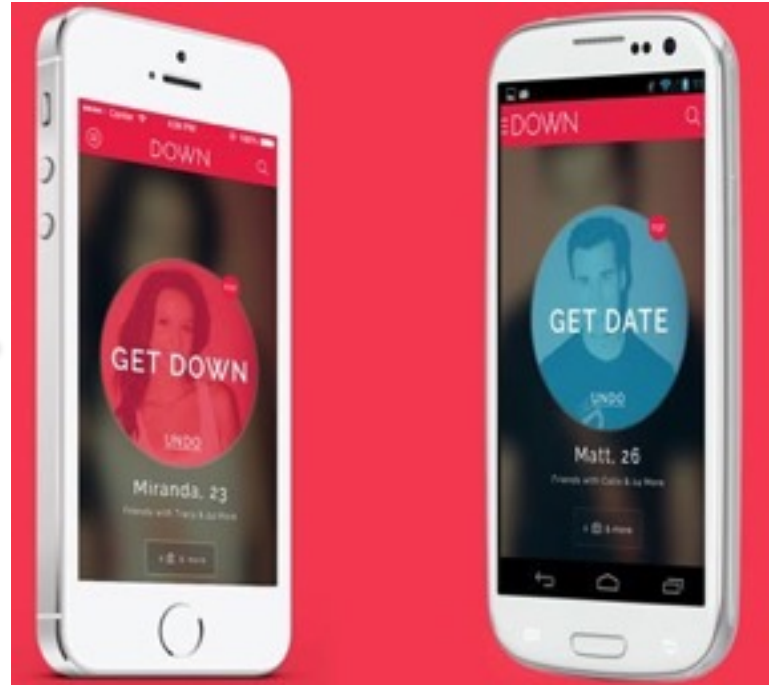
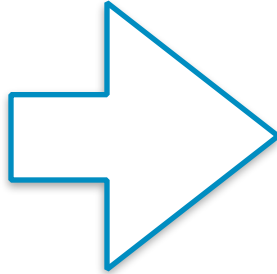
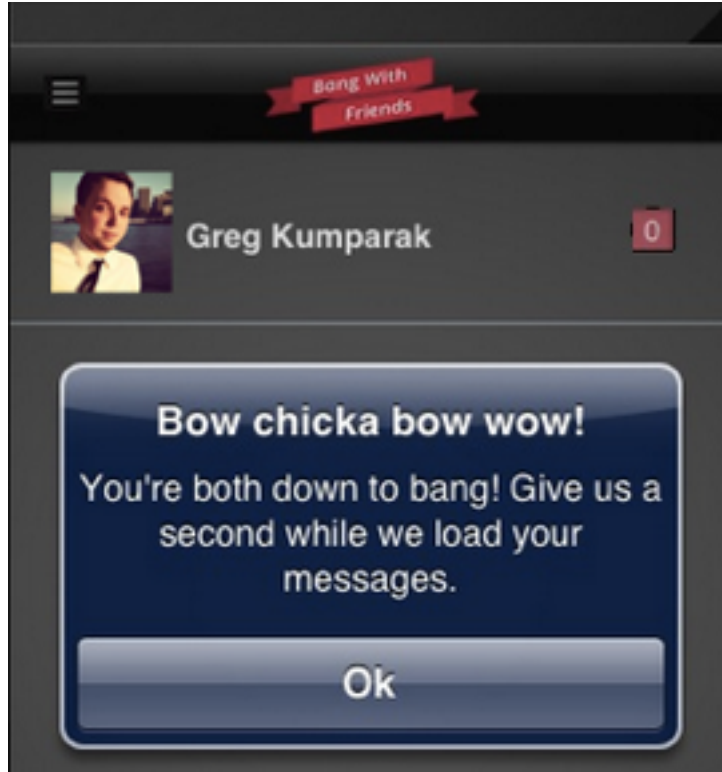
Jeremy



Friends



Bang With Friends => Down



Better Idea



Martin lacampo from Facebook

So useless, whereas Bang with Friends of Friends, that would be something.



Oh, it's Friday!

toomaspai

@Martin lacampo Interesting idea this is.

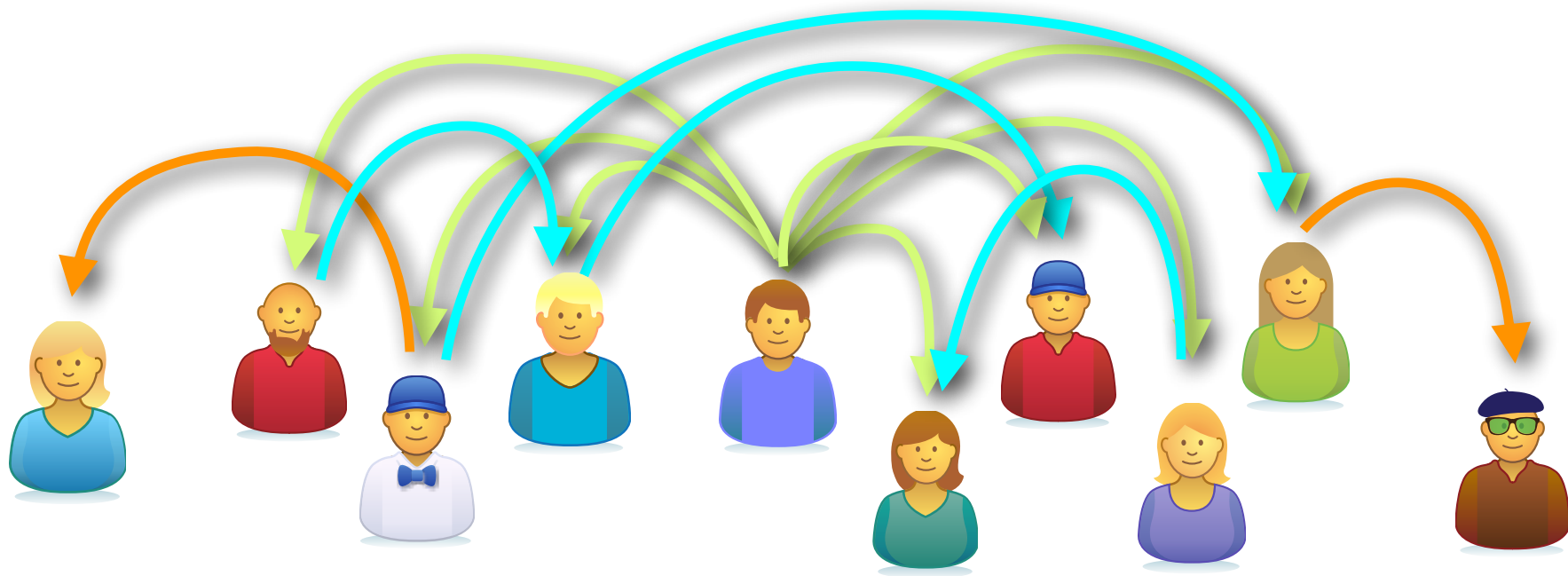


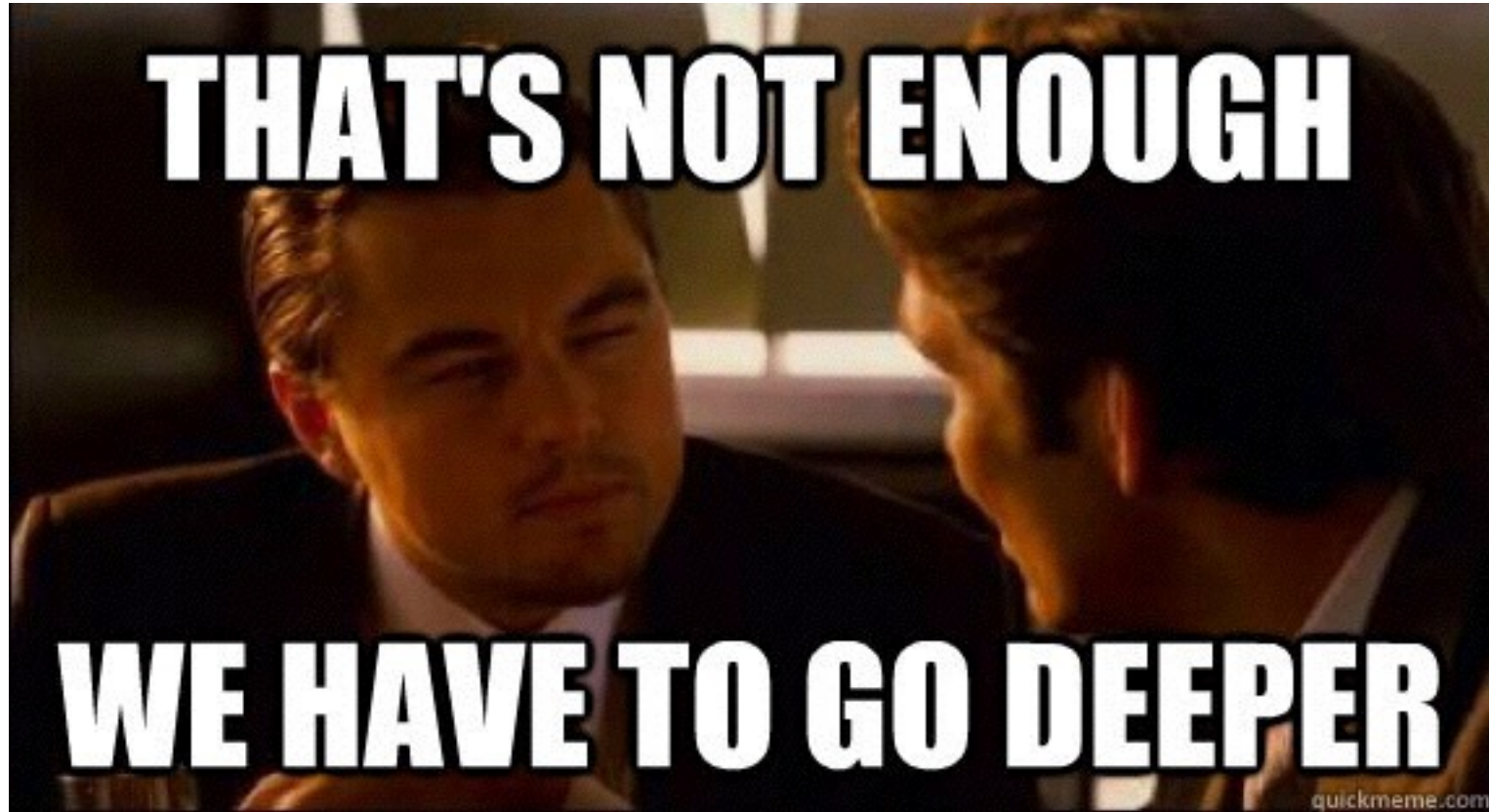
Flag



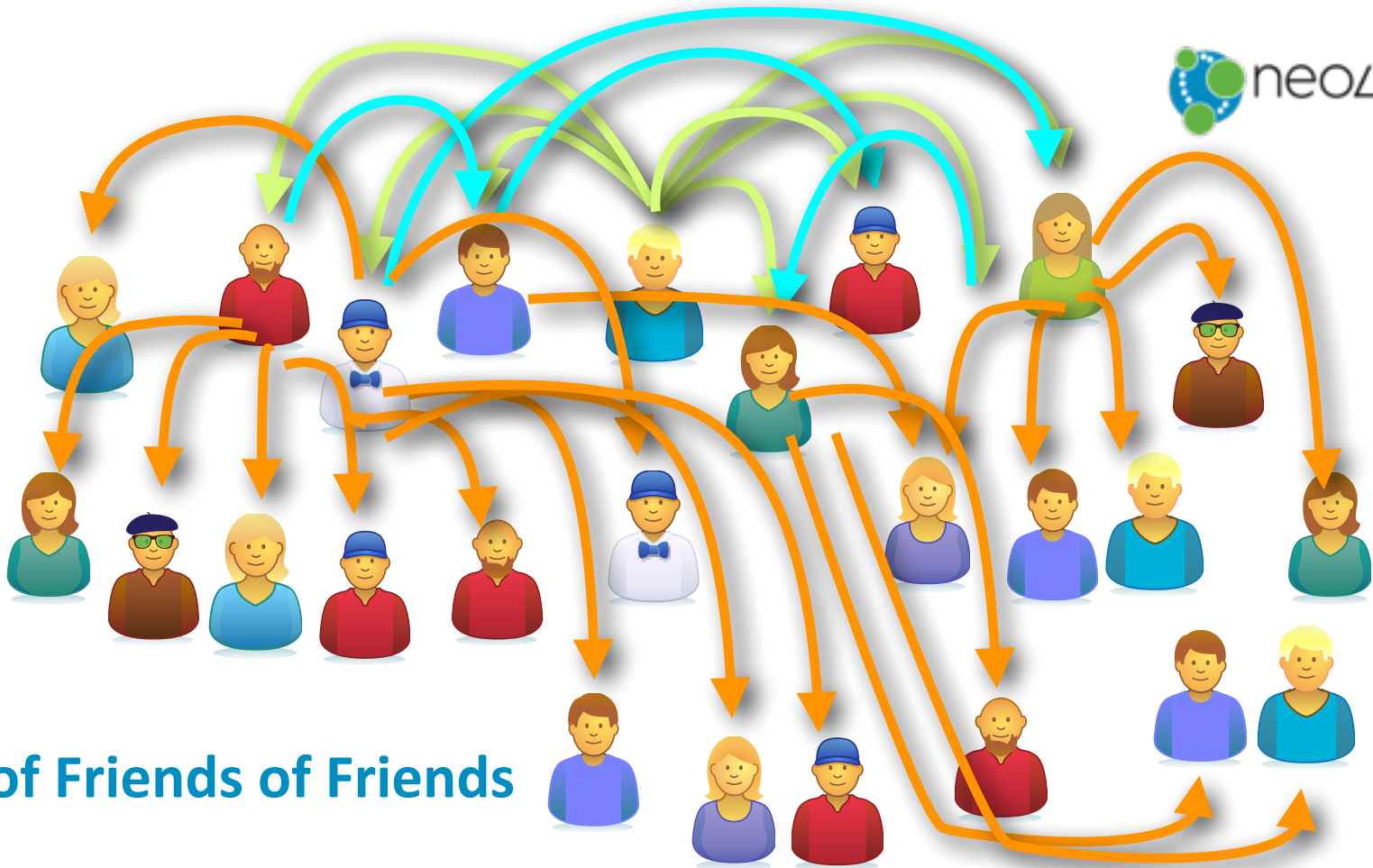
Share

Friends of Friends



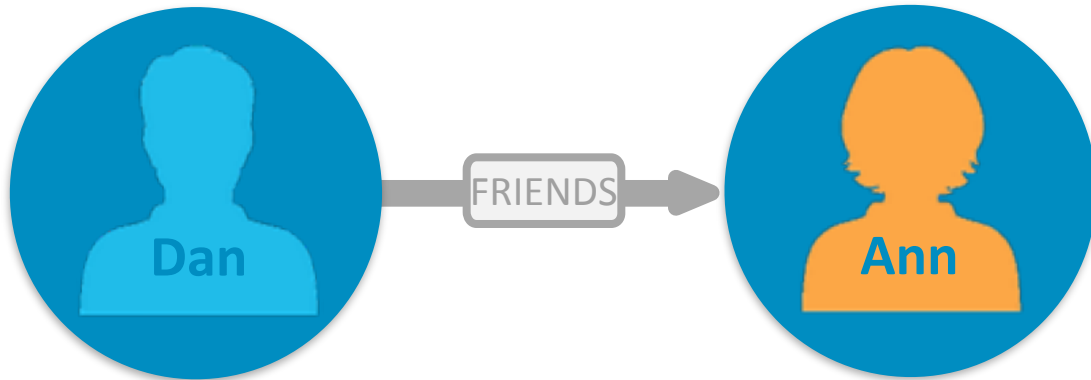


FOFOFs



Friends of Friends of Friends

Cypher Query Language



Node

Node

```
MATCH ( :Person { name:"Dan" } ) -[:FRIENDS]-> ( :Person { name:"Ann" } )
```

Label Property Label Property

Express Complex Queries Easily with Cypher



SQL Query

```
SELECT T.directreports AS directReports, sum(T.count) AS count
FROM :
SELECT manager.pid AS directReports, AS count
FROM person_reportes manager
WHERE manager pid = (SELECT id FROM person WHERE name = "Name Name")
GROUP BY directReports
UNION
SELECT manager.pid AS directReports, count(reports.directly_manages) AS count
FROM person_reportes manager
JOIN person_reportes reports
ON manager.directly_manages = reports.pid
WHERE manager pid = (SELECT id FROM person WHERE name = "Name Name")
GROUP BY directReports
UNION
SELECT manager.pid AS directReports, count(L2Reportees.directly_manages) AS count
FROM person_reportes manager
JOIN person_reportes L2Reportees
ON L2Reportees.directly_manages = L2Reportees.pid
WHERE manager pid = (SELECT id FROM person WHERE name = "Name Name")
GROUP BY directReports
UNION
SELECT L2Reportees pid AS directReports, count(L2Reportees.directly_manages)
AS count
FROM person_reportes manager
JOIN person_reportes L2Reportees
ON L2Reportees.directly_manages = L2Reportees.pid
WHERE manager pid = (SELECT id FROM person WHERE name = "Name Name")
GROUP BY directReports
UNION
SELECT T.directreports AS directReports, sum(T.count) AS count
FROM :
SELECT manager.directly_manages AS directReports, AS count
FROM person_reportes manager
WHERE manager pid = (SELECT id FROM person WHERE name = "Name Name")
GROUP BY directReports
UNION
SELECT reportees.pid AS directReports, count(reports.directly_managed) AS count
FROM person_reportes manager
JOIN person_reportes reports
ON manager.directly_managed = reports.pid
WHERE manager pid = (SELECT id FROM person WHERE name = "Name Name")
GROUP BY directReports
UNION
```

Cypher Query

```
MATCH (boss)-[:MANAGES*0..3]->(sub),
      (sub)-[:MANAGES*1..3]->(report)
WHERE boss.name = "John Doe"
RETURN sub.name AS Subordinate,
      count(report) AS Total
```

Find all direct reports and
how many people they manage,
up to 3 levels down

The Five Graphs of Love



Interests



Jonathan



:REPORTED_INTEREST

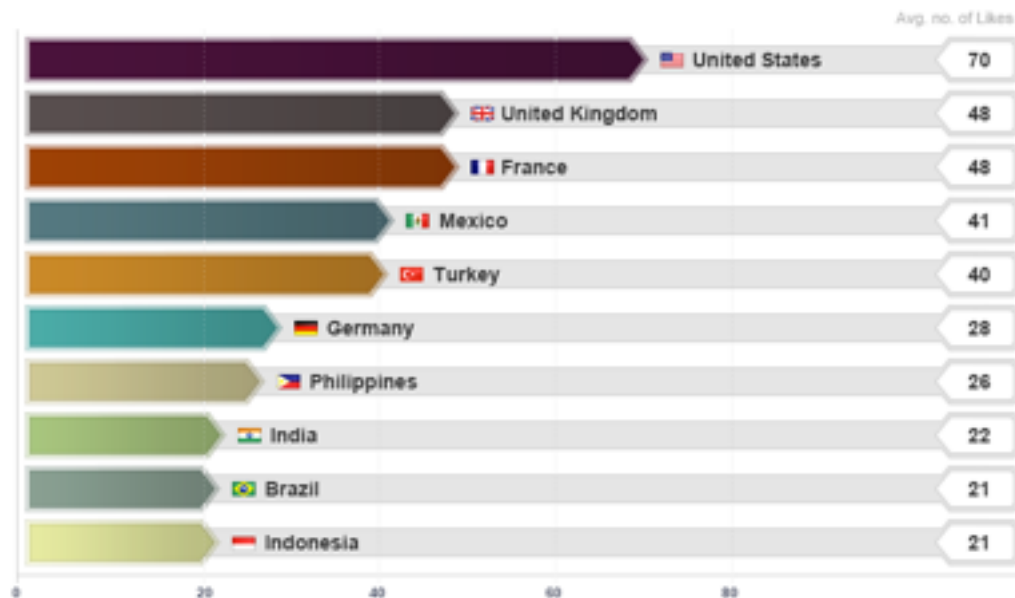


```
1 MATCH (date)-[:REPORTED_INTEREST]->(interest)
2 WHERE interest.name = "Foodie" AND date.gender = 'F'
3 RETURN date
```



Likes

How Many Pages Does an Average Facebook User Like per Country?



Note: These are the 10 countries with the biggest number of Facebook users as of April 4th, 2013



Traits

The image displays two sequential screenshots of the eHarmony mobile application. The left screenshot shows a registration or profile setup screen where a user named 'Jared' is filling out information. It includes options for gender ('I'm a') and the gender of the person they are interested in ('I'm interested in meeting a'). The right screenshot shows a personality quiz question asking the user to select four traits from a list of eight options: Good Listener, Modest, Respectful, Affectionate, Caring, Spontaneous, Physically Fit, and Warm. The app's interface is clean with a dark header and light gray body. The status bar at the top of both screens shows AT&T service, signal strength, time (12:12 PM and 12:19 PM), and battery levels (92% and 89%).



Dear eHarmony,

My name is

I'm a

 
man woman

I'm interested in meeting a

 
man woman

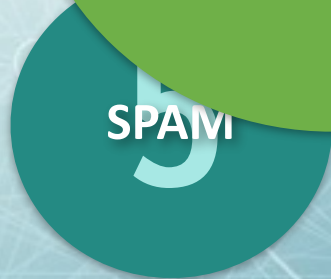
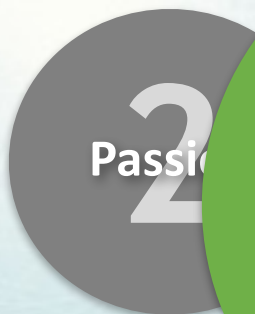
[Continue](#)

If your best friends had to pick four words to describe you, which four from this list would they pick?

Please choose 4 items

- Good Listener
- Modest
- Respectful
- Affectionate
- Caring
- Spontaneous
- Physically Fit
- Warm

The Five Graphs of Love



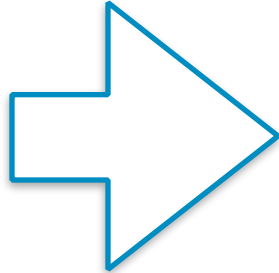
Location



```
1 START date = node('withinDistance:[51.99,-0.19, 100.0]')
2 WHERE date.gender = 'F'
3 RETURN date
```



Three Dots and a Dash



Recommend Love



Find your soulmate in the graph

- Are they energetic?
- Do they like dogs?
- Have a good sense of humor?
- Neat and tidy, but not crazy about it?

What are the Top 10 Potential Mates for me

- that are in the same location
- are sexually compatible
- have traits I want
- want traits I have



Cypher Query: Love Recommendation



```
MATCH (me:Person {name:"maxdemarzi"})-[:LIVES_IN]->city<-[:LIVES_IN]-person
WHERE me.orientation = person.orientation
      AND (me.orientation = "straight" XOR (me.gender = person.gender))
      AND me-[:WANTS]->()-<-[:HAS]-person
      AND me-[:HAS]->()-<-[:WANTS]-person
WITH DISTINCT city.name AS city_name, person, me
MATCH me-[:WANTS]->attributes<-[:HAS]-person-[:WANTS]->requirements<-[:HAS]-me
RETURN city_name, person.name AS person_name,
        COLLECT(DISTINCT attributes.name) AS my_interests,
        COLLECT(DISTINCT requirements.name) AS their_interests,
        COUNT(DISTINCT attributes) AS matching_wants,
        COUNT(DISTINCT requirements) AS matching_has
ORDER BY matching_wants / (1.0 / matching_has) DESC
LIMIT 10
```

Love Recommendation Results



Neo Love Matching Match Another User

Matching Loves for Luvenia

Reload the page or click [Match Another User](#)

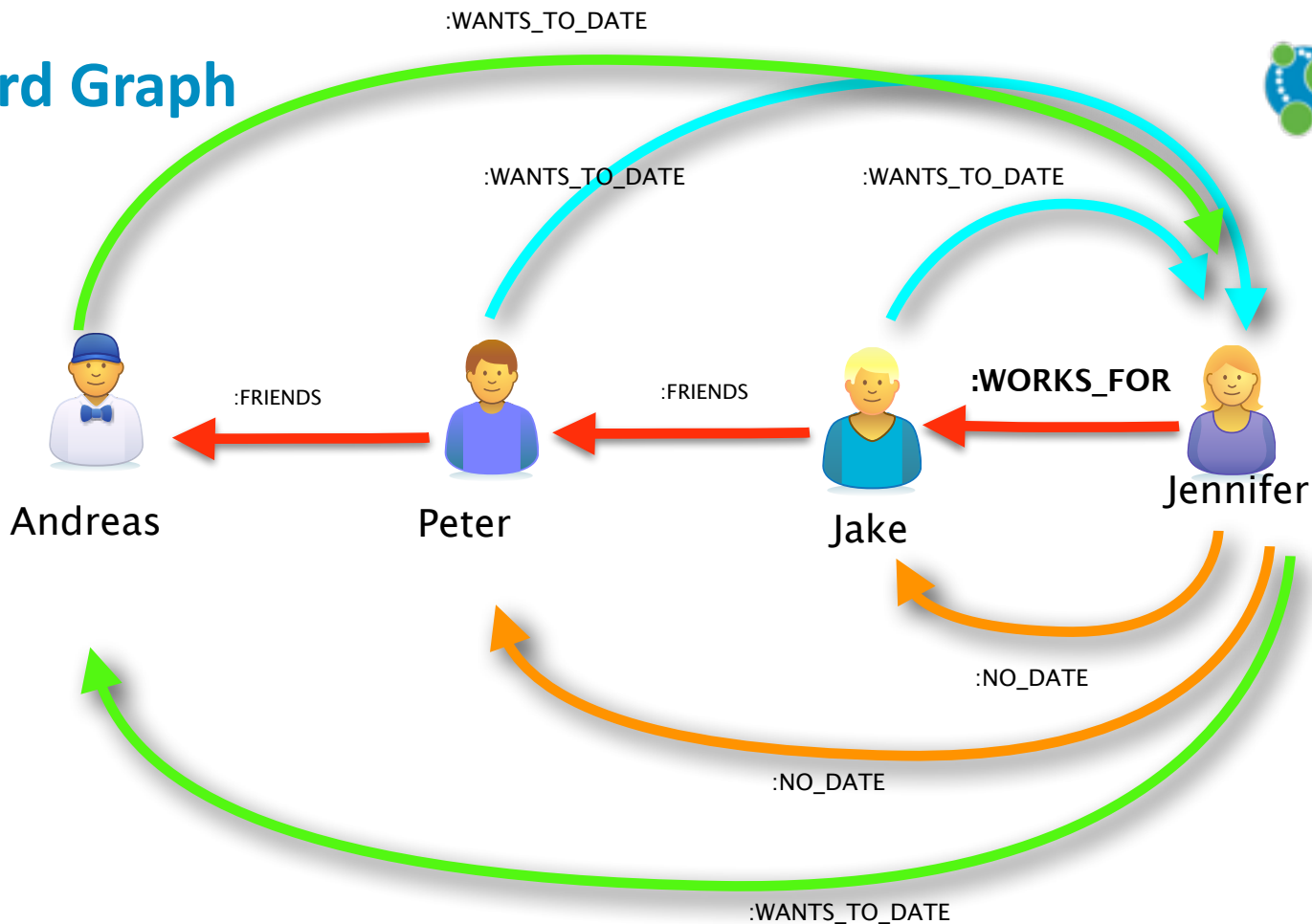
Love	Compatibility	Your Matches	Their Matches
Chet in Philadelphia	2.0	<div>✓ Humorous</div> <div>✓ Thoughtful</div>	<div>✓ Likeable</div>
Mckinley in Philadelphia	1.0	<div>✓ Serious</div>	<div>✓ Creative</div>
Gene in Philadelphia	1.0	<div>✓ Serious</div>	<div>✓ Likeable</div>
Keith in Philadelphia	1.0	<div>✓ Quiet</div>	<div>✓ Inventive</div>



The Five Graphs of Love



Awkward Graph



Liars

As a work of science fiction, your
resume is only surpassed
by your eHarmony profile.

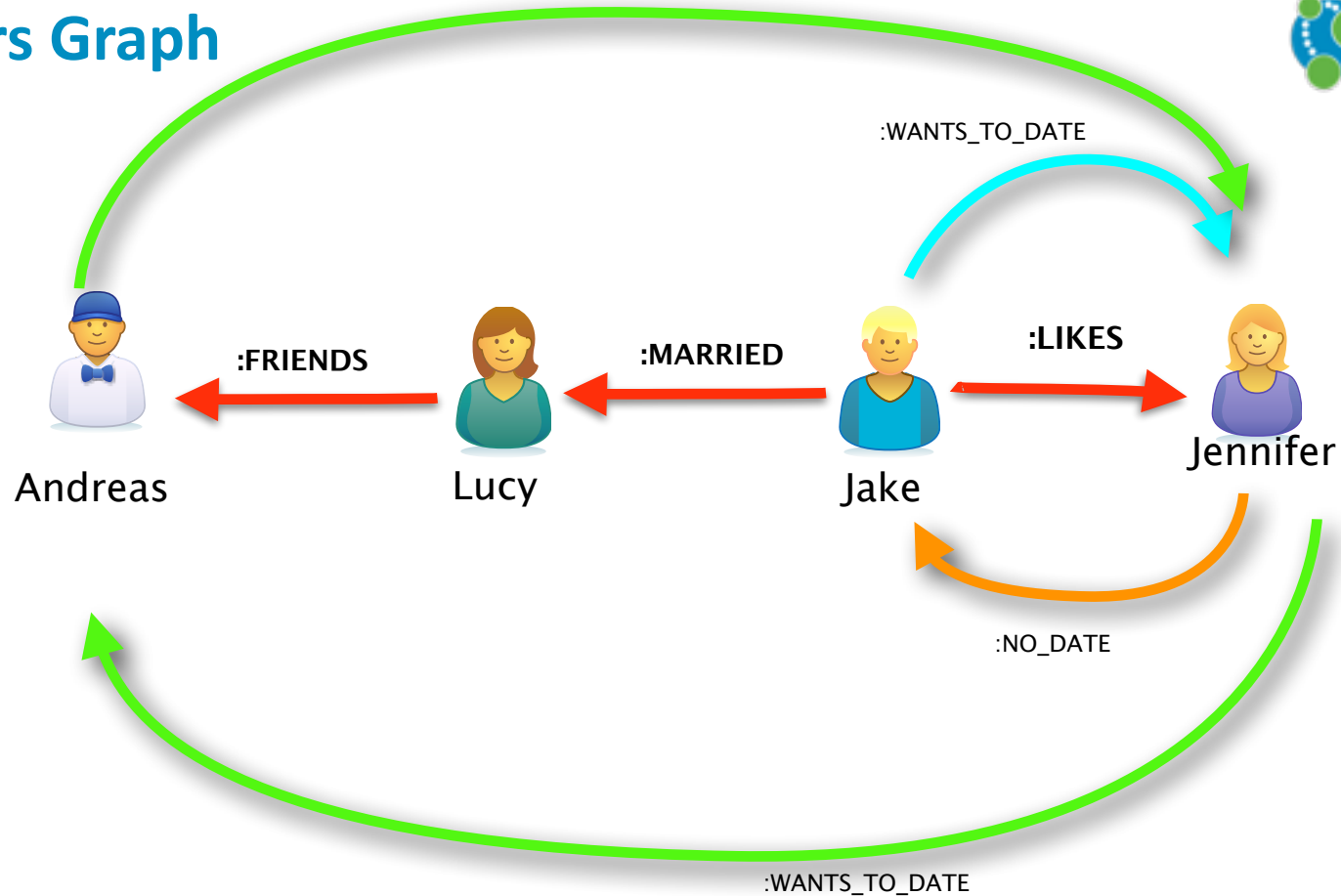


your  cards
someecards.com

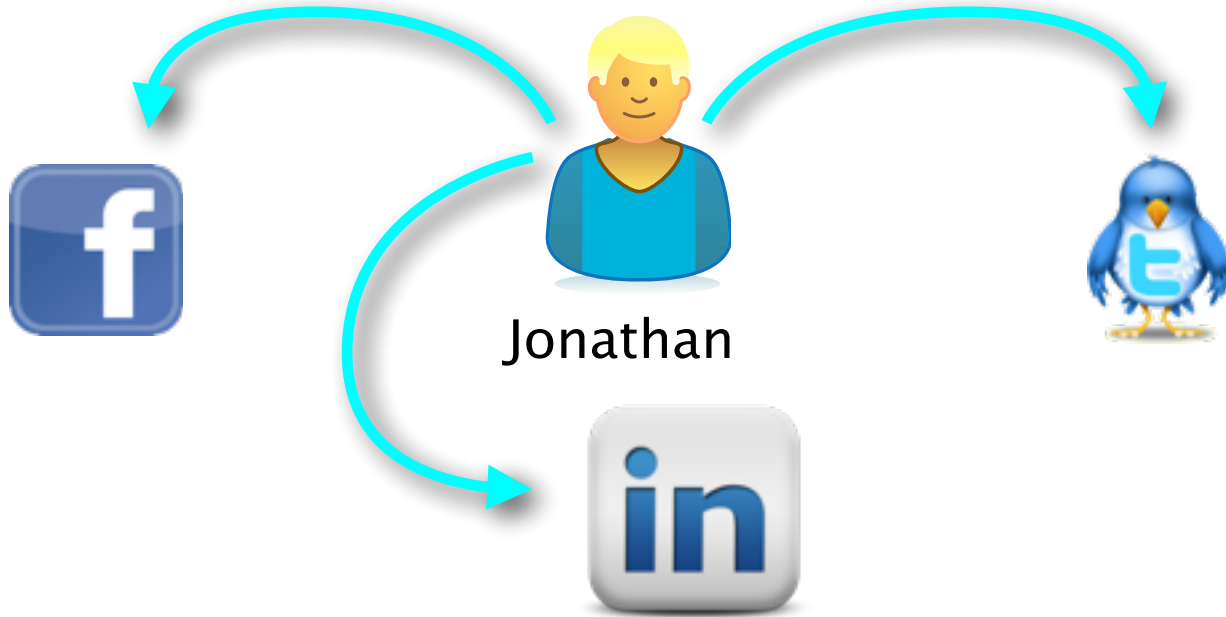
:WANTS_TO_DATE



Cheaters Graph



Let's take a closer look at Jonathan



Follows



- 

BooBooLoon @YodasMethDealer
Doritos logo enthusiast.

⚙️ ▾ Following
- 

Fernando @ParisDrugLord
19 • Rap Shuffle • First Professionally Made Rap Shuffle Magazine (80+Pages) Coming Soon • Ugly But Wealthy By 30 • DON'T STEAL SHIT FROM MY WEBSITE

⚙️ ▾ Following
- 

DrugLord Records @DrugLordRecords
NYC-based boutique record label with the philosophy: CRIME IS LORD Artists: @TheLaBiancas @JJBrine

⚙️ ▾ Following
- 

Drug Lord @the_high_life
This is not about weed. Butt connoisseur, Quote RT me and you'll get blocked

⚙️ ▾ Following
- 

Drug Lord 🍷 @BakedPrincess__
Beyoncé is a virgo & I am too, so basically I AM Beyoncé. Flawless ✨

⚙️ ▾ Following
- 

Cocaine So White... @CocaineSoWhite
Original Cocaine So White Account

⚙️ ▾ Following
- 

Meth Tweets @DontMethWithMe
Meth 24/7 Email: methtweets@yahoo.com

⚙️ ▾ Following

Tweets



Jonathan Dreamyman @JonathanDreamym · now
Chemistry sucks in general but illegal drugs are fabulous.

Expand

↩ Reply 🗑 Delete ★ Favorite ... More



Jonathan Dreamyman @JonathanDreamym · 14m
Walter could add my secret ingredient, vanilla extract! I get lots of sales in the hood.

Expand

↩ Reply 🗑 Delete ★ Favorite ... More



Jonathan Dreamyman @JonathanDreamym · 17m
Walter White is my hero!

Expand

↩ Reply 🗑 Delete ★ Favorite ... More



Jonathan Dreamyman @JonathanDreamym · 17m
I am a huge fan of making drugs!

Expand

↩ Reply 🗑 Delete ★ Favorite ... More



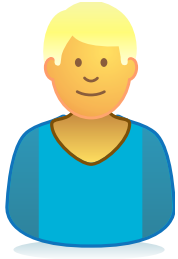
Jonathan Dreamyman @JonathanDreamym · 18m
I met a drug dealer last weekend. He was awesome! His gf was quite a nice lady as well.

Expand

↩ Reply 🗑 Delete ★ Favorite ... More



Real Interests



Jonathan

:DEMONSTRATED_INTEREST



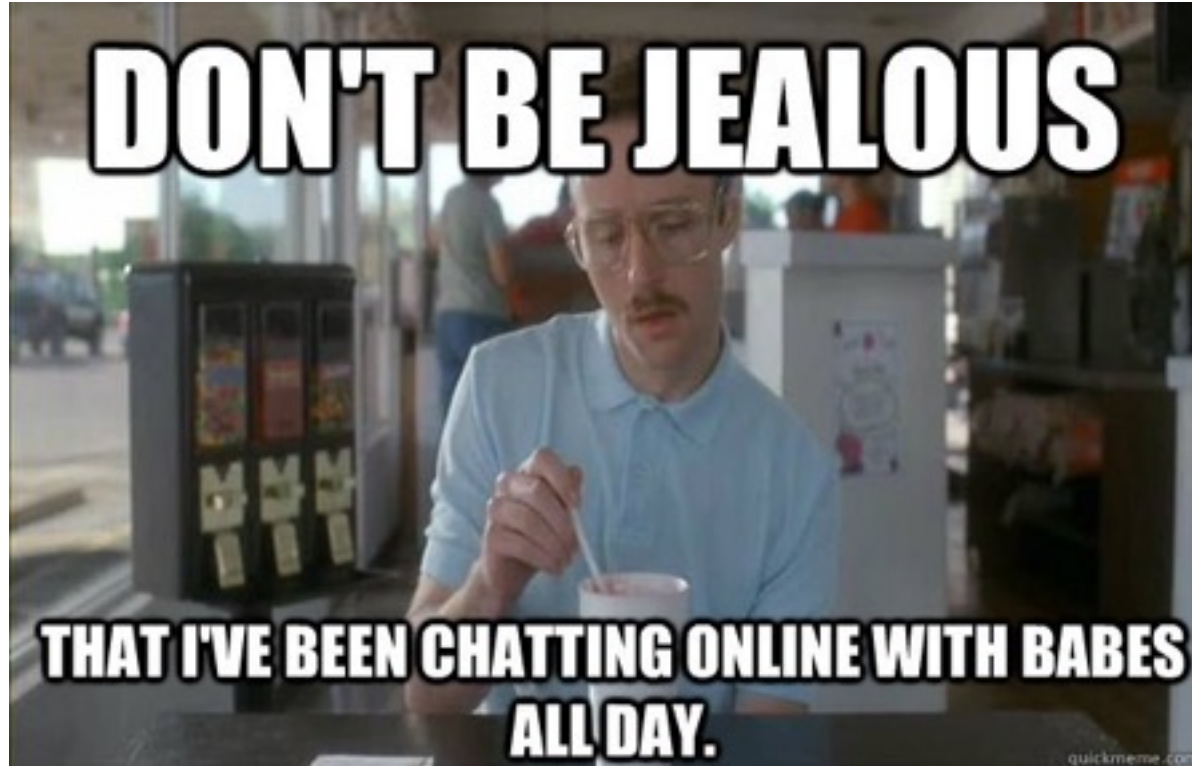
```
1 CREATE (Jonathan:Person{name:"Jonathan Dreamyman"})
2 -[:DEMONSTRATED_INTEREST]->
3 (drugs:Interest{name:"Drugs"})
```

The Five Graphs of Love



Click Bait





SHIP OUT 02.11.15 5:55 AM ET



Silicon Valley's Sex Workers Are Being Priced Out of the City By Their Own Clients

An FBI crackdown and skyrocketing rents in San Francisco are forcing them to take side jobs—like driving for Uber—or leave.



Financial Giants Depend on Five Graphs As Well



Payment Graph

- Fraud detection
- Credit risk analysis
- Chargebacks

Customer Graph

- Org drill-through
- Product recommendations
- Mobile payments

Asset Graph

- Portfolio analytics
- Risk management
- Market/sentiment analysis
- Compliance

Entitlement Graph

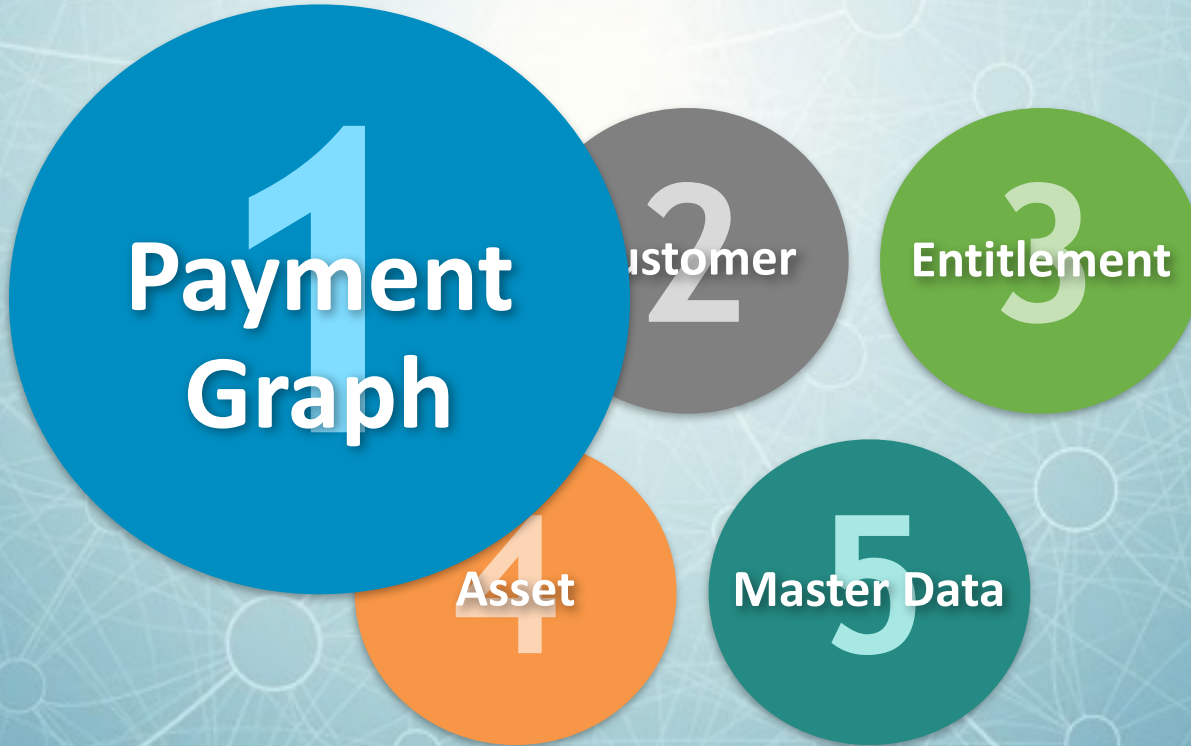
- Identity management
- Access management
- Authorization

Master Data Graph

- Enterprise collaboration
- Corporate hierarchy
- Data governance



The Five Graphs of Finance



Intuit Payment Graph

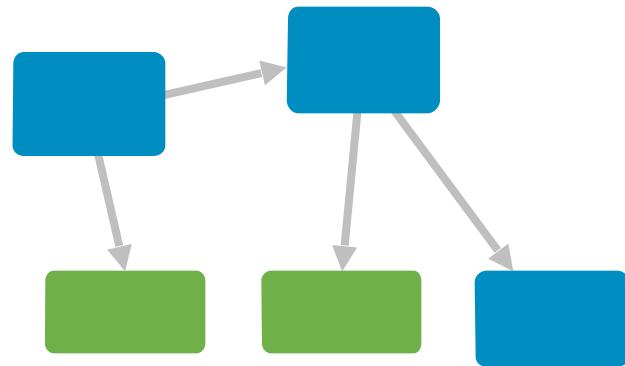


Discover latent network from multiple product data stores

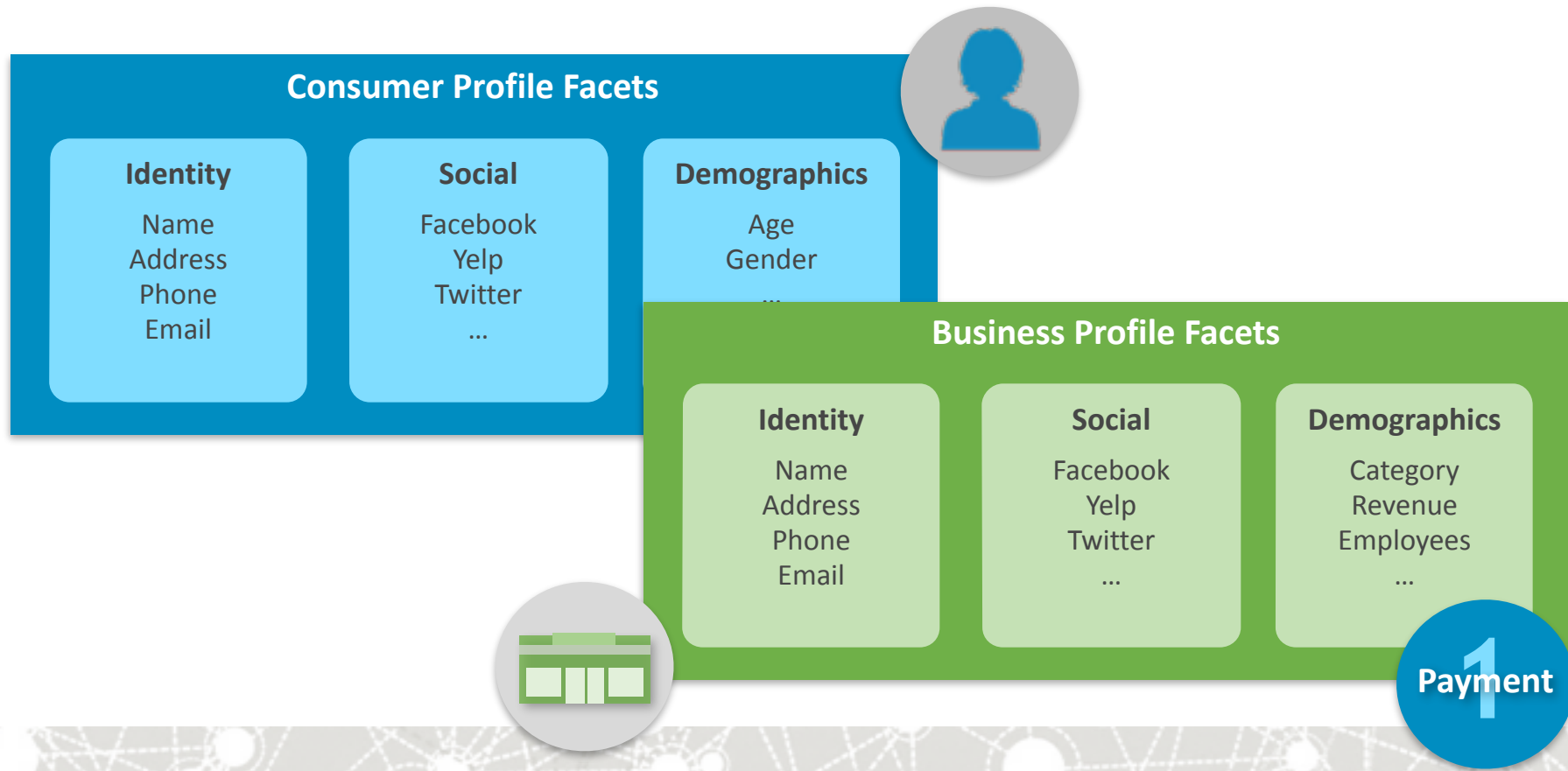
- Uniquely identify entities and their connections
- Connections scored by volume of trade

Empower business-unit teams to leverage the Intuit Payment Graph to build applications

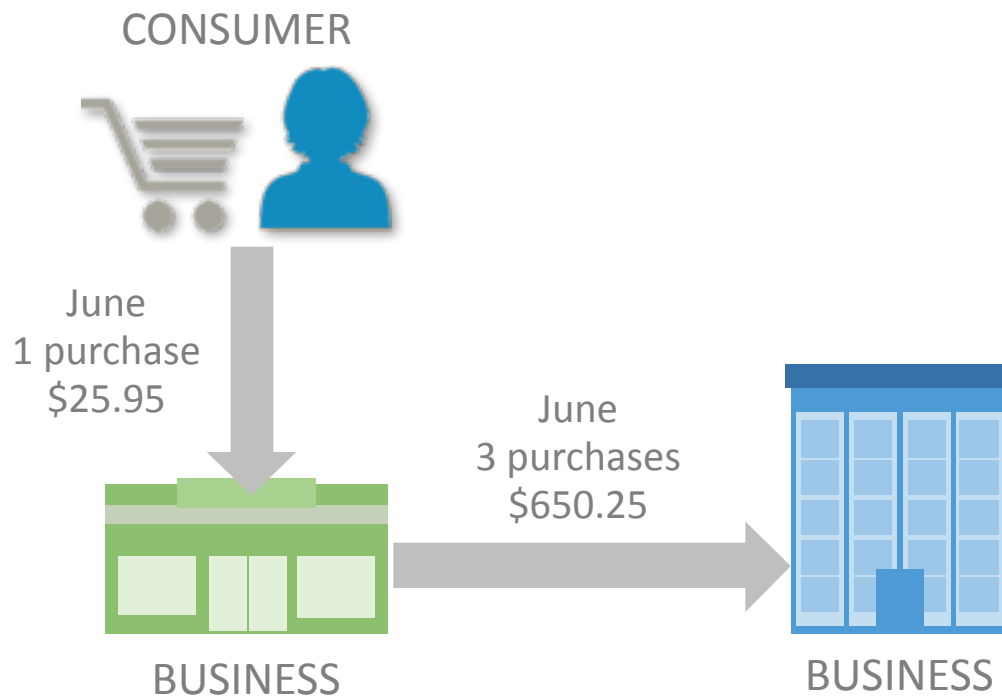
- Graph to be available for real-time queries



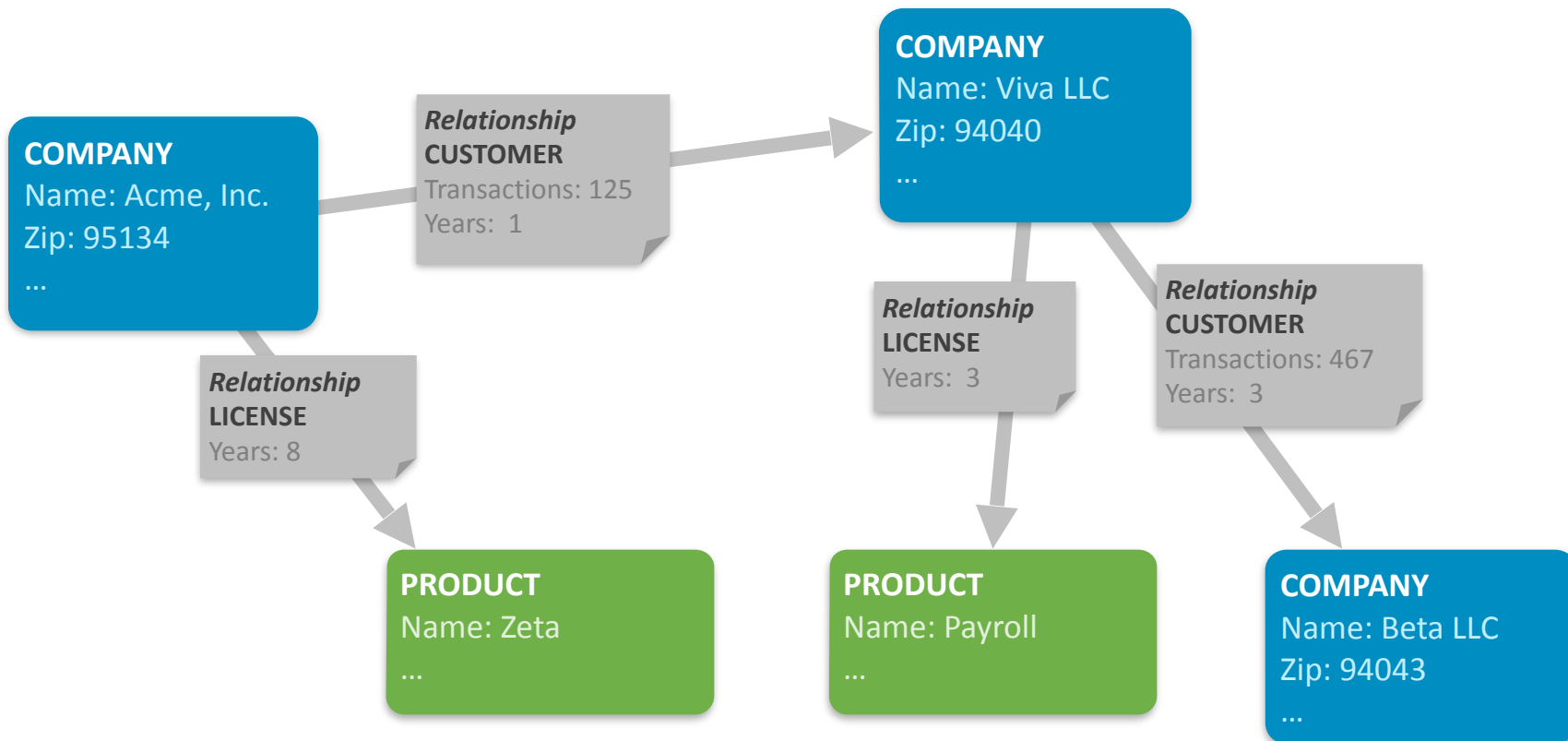
Payment Graph Depends on the Customer Graph



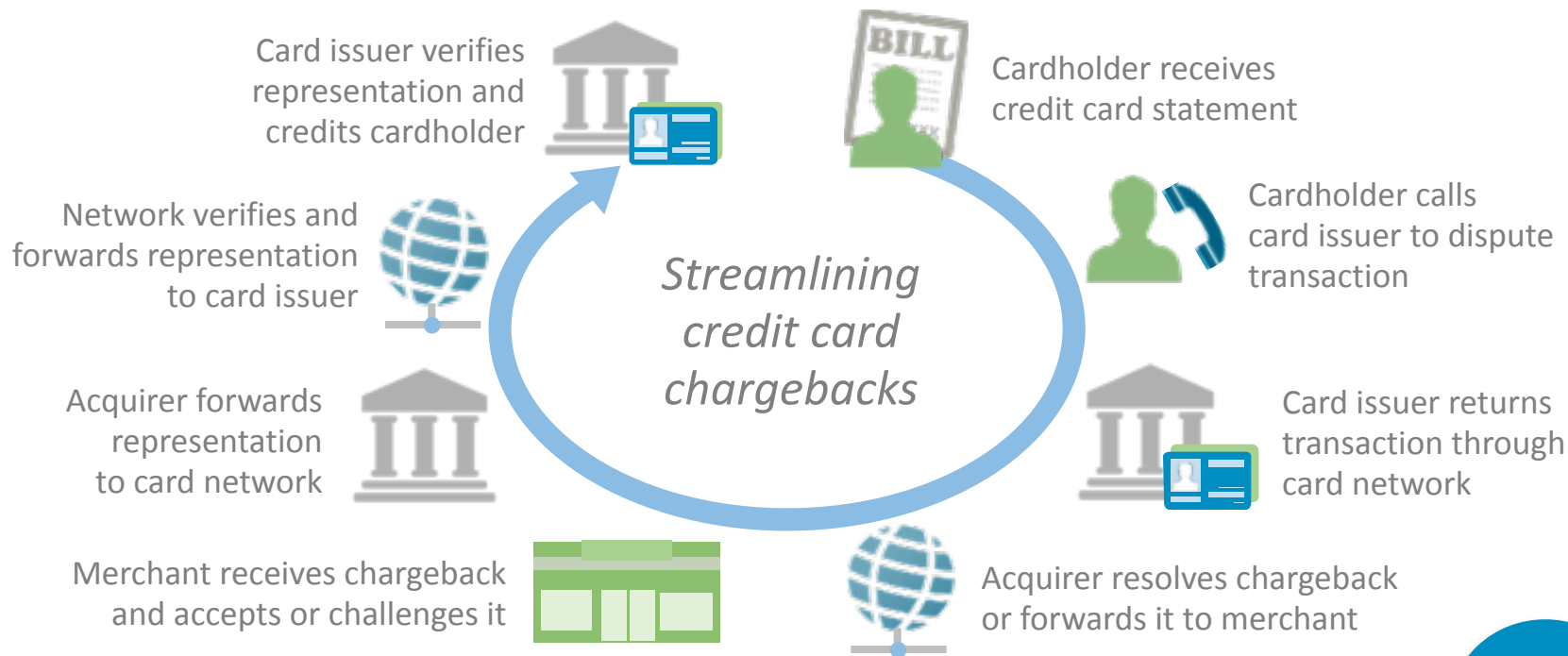
Capturing C2B and B2B Transactions



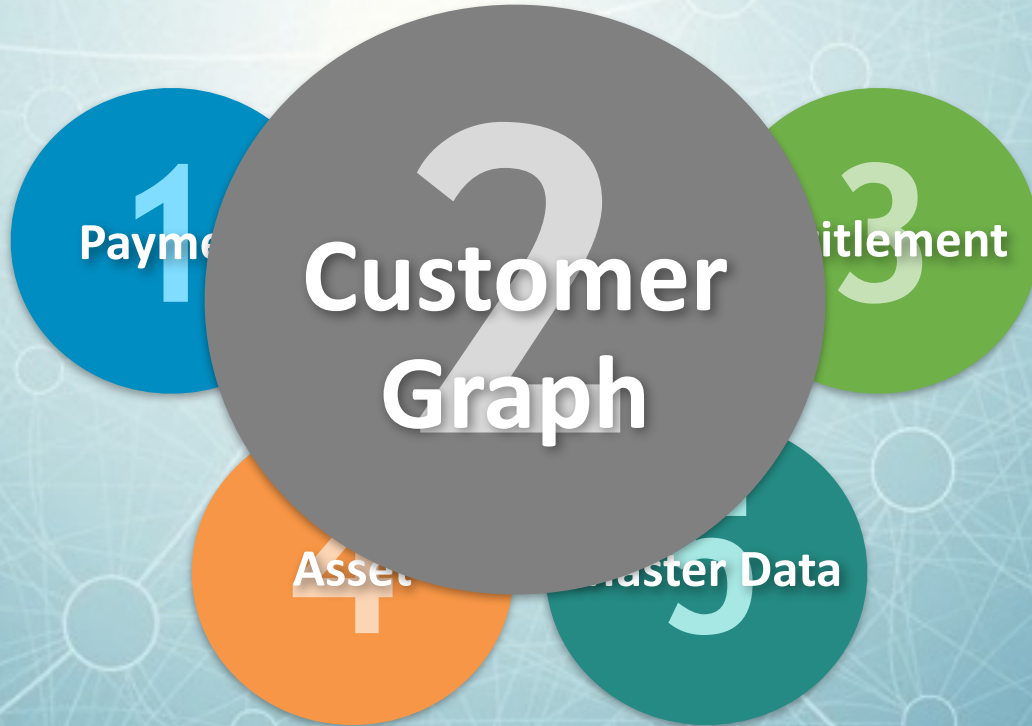
#1: Payment Graph Example



#1: Payment Graph Example



The Five Graphs of Finance



All Companies and Customers Are Related



opencorporates
The Open Database Of
The Corporate World

Company name
☒ Companies ☐ Directors

Search

Share this page    

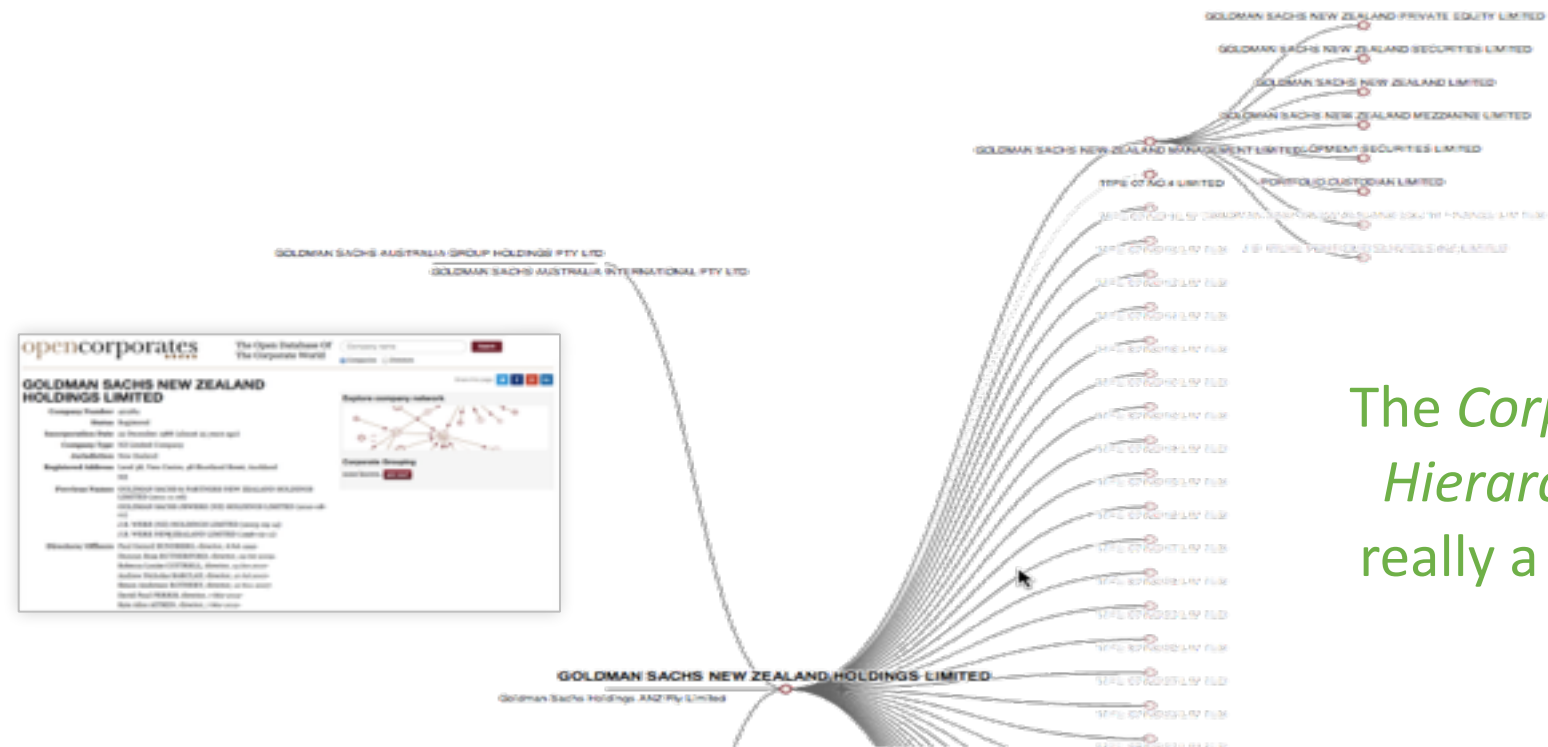
GOLDMAN SACHS NEW ZEALAND HOLDINGS LIMITED

Company Number 421284
Status Registered
Incorporation Date 22 December 1988 (almost 25 years ago)
Company Type NZ Limited Company
Jurisdiction New Zealand
Registered Address Level 38, Vero Centre, 48 Shortland Street, Auckland NZ
Previous Names GOLDMAN SACHS & PARTNERS NEW ZEALAND HOLDINGS LIMITED (2011-11-06)
GOLDMAN SACHS JBWERE (NZ) HOLDINGS LIMITED (2010-08-01)
J.B. WERE (NZ) HOLDINGS LIMITED (2003-09-14)
J.B. WERE NEW ZEALAND LIMITED (1996-02-11)
Directors/ Officers Paul Gerard SUNDBERG, director, 8 Feb 1995-
Duncan Ross RUTHERFORD, director, 29 Oct 2009-
Rebecca Louise COTTRELL, director, 14 Jan 2010-
Andrew Nicholas BARCLAY, director, 27 Jul 2007-
Simon Anderson ROTHERY, director, 12 Nov 2007-
David Paul FERRIS, director, 7 Mar 2012-
Kate Alice AITKEN, director, 7 Mar 2012-

Explore company network

Corporate Grouping
none known. [add now!](#)

Corporate Hierarchy is Really a Graph



The Corporate Hierarchy is really a graph

Cleaning and Matching for 360-Degree Master View



Name	Windsor Press, Inc.
Address	6 North Third St
City	Hamburg
State	PA
Zip	19526
Phone	610-562-2267

Name	The Windsor Press
Address	6 North 3 rd Street
City	Hamburg
State	PA
Zip	19526-0465
Phone	610-562-2267

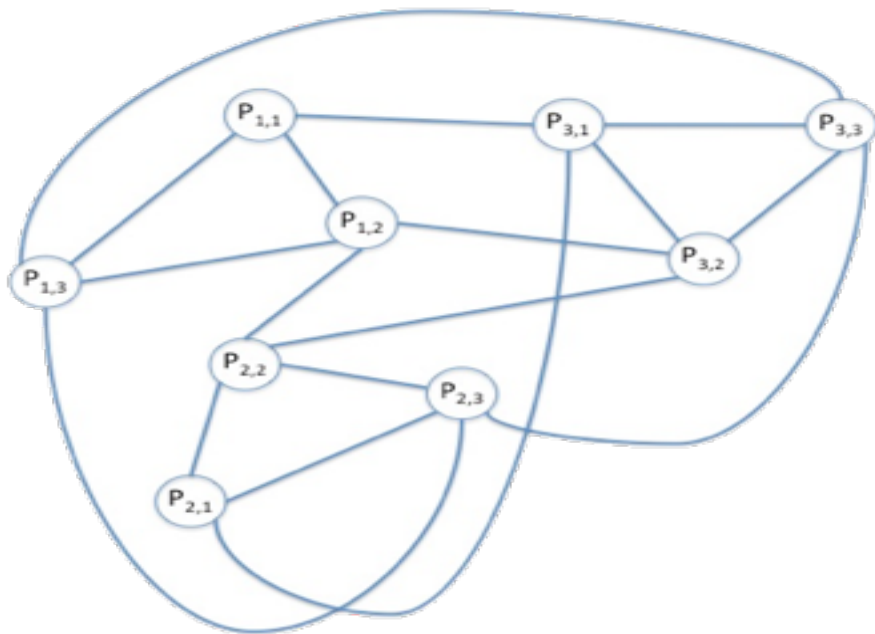
*Both of the records
above map to the
same record*

ID	002114902
Name	Windsor Press, Inc.
Address	6 N 3rd St
City	Hamburg
State	PA
Zip	19526-1502
Phone	610-562-2267

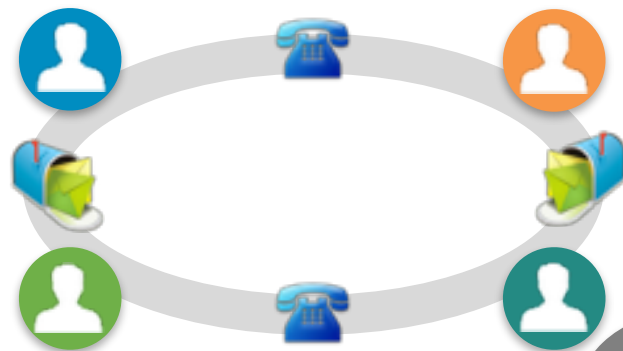
Synthetic Identities and Fraud Rings



Bank Fraud Using False Personas



3 fake addresses and
3 fake phone addresses
can create 9 fake customers



2
Customer

High Speed Fraud - 1000 R/S



FEB 12 2014

6 COMMENTS

JAVA, PROBLEMS, RANDOM

EDIT

ONLINE PAYMENT RISK MANAGEMENT WITH NEO4J



High Speed Fraud - 8000 R/S



FEB 27 2014

4 COMMENTS

DEPLOYMENT, JAVA,
PROBLEMS

EDIT

NEO4J AT LUDICROUS SPEED



<http://maxdemarzi.com/2014/02/27/neo4j-at-ludicrous-speed/>

High Speed Fraud - 28000 R/S



MAR 10 2014

3 COMMENTS

DEPLOYMENT, JAVA,
PROBLEMS

EDIT

IT'S OVER 9000! NEO4J ON WEBSOCKETS

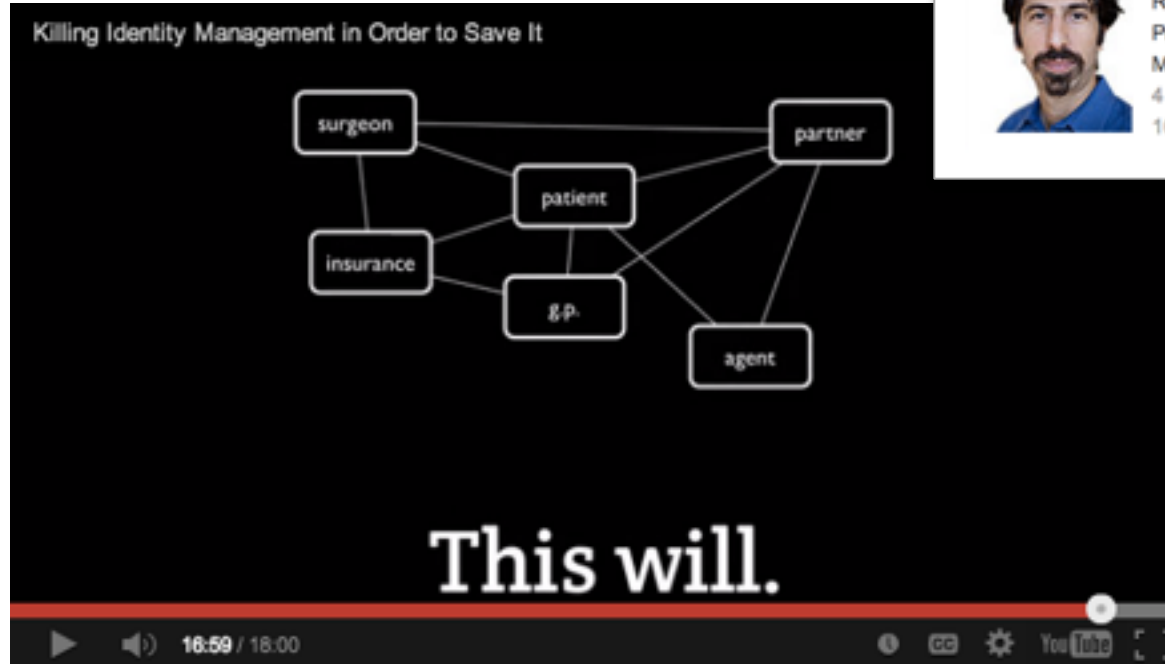


<http://maxdemarzi.com/2014/03/10/its-over-9000-neo4j-on-websockets/>

The Five Graphs of Finance



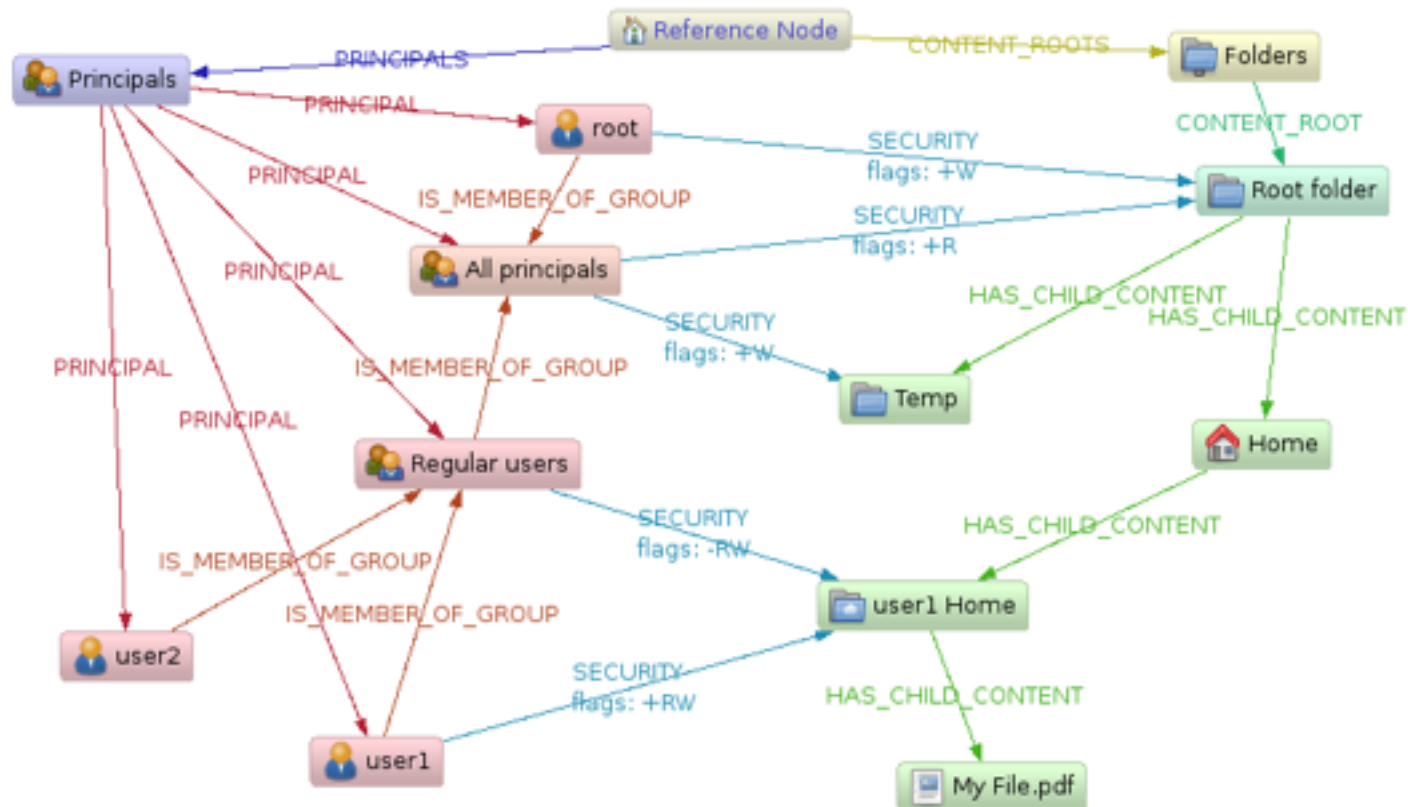
Killing IAM in Order to Save It



Ian Glazer
Research Vice
President and Agenda
Manager
4 years at Gartner
16 years IT industry



Access Control



Permission Resolution



MAR 18 2013

8 COMMENTS

JAVA, PROBLEMS

EDIT

PERMISSION RESOLUTION WITH NEO4J - PART 1



The Five Graphs of Finance



Asset Graph Examples



Portfolio Analytics



IT Asset Management



Risk Analysis



Express Complex Relationship Queries Easily



For a given fund, return all assets that are made up of other assets, ordered by the total number of included assets

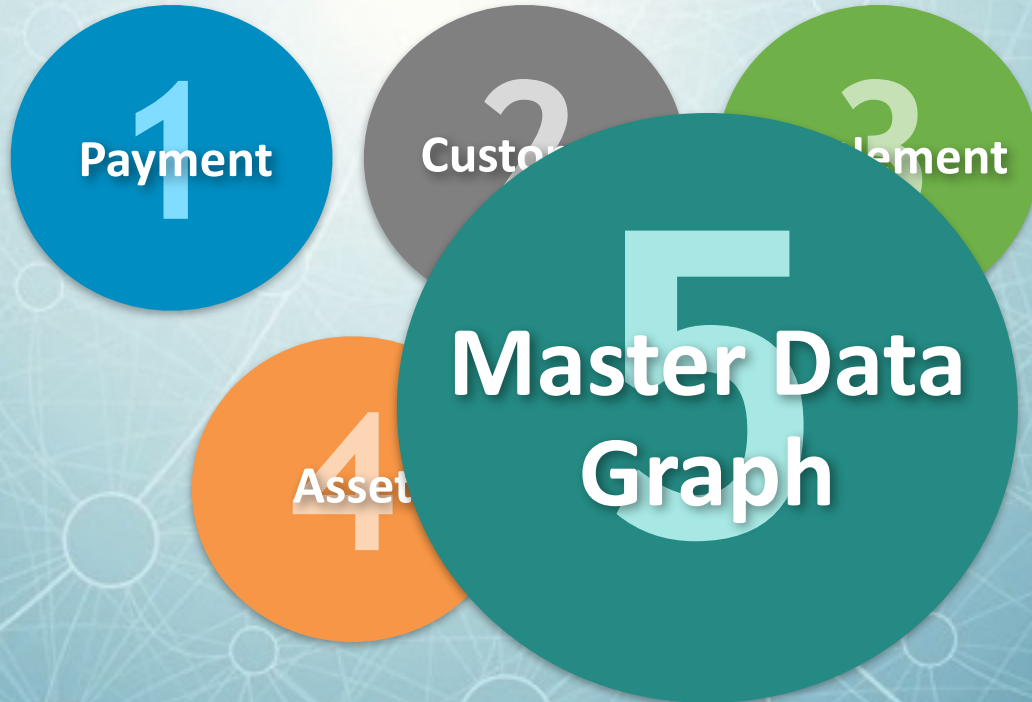
Cypher Query

```
MATCH (fund)-[:INCLUDES*0..n]->(sub),
      (sub)-[:INCLUDES*1..n]->(asset)
WHERE fund.ticker = "TRLGX"
RETURN sub.ticker AS Asset_Group,
       count(asset) AS Total
ORDER BY Total DESC
```

SQL Query

```
(SELECT T.directReportees AS directReportees, sum(T.count) AS count
FROM (
  SELECT manager.pid AS directReportees, 0 AS count
  FROM person_reportes manager
  WHERE manager.pid = (SELECT id FROM person WHERE name = "Name Name")
) UNION
  SELECT manager.pid AS directReportees, count(manager.directly_managed) AS count
  FROM person_reportes manager
  WHERE manager.pid = (SELECT id FROM person WHERE name = "Name Name")
) GROUP BY directReportees
) UNION
  SELECT manager.pid AS directReportees, count(reportes.directly_managed) AS count
  FROM person_reportes manager
  JOIN person_reportes reportes
  ON manager.directly_managed = reportes.pid
  WHERE manager.pid = (SELECT id FROM person WHERE name = "Name Name")
) GROUP BY directReportees
) UNION
  SELECT manager.pid AS directReportees, count(L2Reportees.directly_managed) AS count
  FROM person_reportes manager
  JOIN person_reportes L2Reportees
  ON manager.directly_managed = L2Reportees.pid
  ON L2Reportees.directly_managed = L2Reportees.pid
  WHERE manager.pid = (SELECT id FROM person WHERE name = "Name Name")
) GROUP BY directReportees
) AS T
GROUP BY directReportees
) UNION
  (SELECT T.directReportees AS directReportees, sum(T.count) AS count
  FROM (
    SELECT manager.directly_managed AS directReportees, 0 AS count
    FROM person_reportes manager
    WHERE manager.pid = (SELECT id FROM person WHERE name = "Name Name")
  ) UNION
    SELECT reportes.pid AS directReportees, count(reportes.directly_managed) AS count
    FROM person_reportes manager
    JOIN person_reportes L2Reportees
    ON manager.directly_managed = L2Reportees.pid
    ON L2Reportees.directly_managed = L2Reportees.pid
    WHERE manager.pid = (SELECT id FROM person WHERE name = "Name Name")
  ) GROUP BY directReportees
  ) AS T
  GROUP BY directReportees
) UNION
  (SELECT L2Reportees.pid AS directReportees, count(L2Reportees.directly_managed)
  AS count
  FROM person_reportes manager
  JOIN person_reportes L2Reportees
  ON manager.directly_managed = L2Reportees.pid
  ON L2Reportees.directly_managed = L2Reportees.pid
  WHERE manager.pid = (SELECT id FROM person WHERE name = "Name Name")
  ) GROUP BY directReportees
  ) AS T
  GROUP BY directReportees
) UNION
  (SELECT L2Reportees.directly_managed AS directReportees, 0 AS count
  FROM person_reportes manager
  JOIN person_reportes L2Reportees
  ON manager.directly_managed = L2Reportees.pid
  ON L2Reportees.directly_managed = L2Reportees.pid
  WHERE manager.pid = (SELECT id FROM person WHERE name = "Name Name")
  ) GROUP BY directReportees
  )
)
```

The Five Graphs of Finance



Research Management



StockTwits®



HFR
Hedge Fund Research, Inc.



Bloomberg

WALL STREET & MARKETS

How Does One Fake Tweet Cause a Stock Market Crash?

By Christopher Matthews @crobmatthews | April 24, 2013 | 6 Comments



At 1:07 p.m. on Tuesday, the Twitter feed of the Associated Press [told](#) us that [Barack Obama](#) had been injured in an explosion at the White House. The tweet was fake — the product of a hack — but given the events in [Boston](#) last week, the news spread like [wildfire](#), garnering more than 4,000 retweets.

RELATED

Money Talking: How High-Frequency Trading is Impacting Your Investments

Musk's April 1 tweet touts a 'Model W'

0 Comments | Print | Reprints | Respond |     Recommend 5



The blog post gives details about a watch that can "tell the time no matter where you are on Earth."

Kathleen Burke
Automotive News

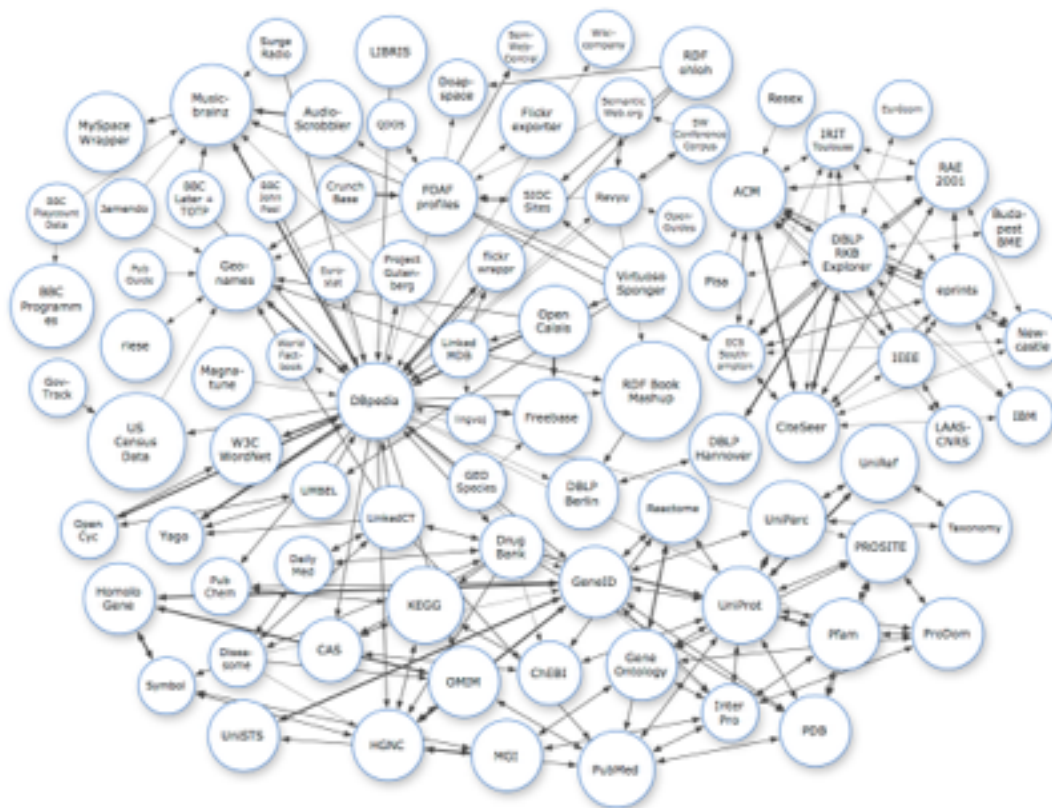
April 1, 2015 - 5:45 pm ET

Tesla Motors is coming out with a new product, and it's not a car. Or so Tesla CEO Elon Musk **told his Twitter followers** on April 1.

Musk tweeted about a new blog on the company's website today: "Announcing the amazing Tesla Model W."

The blog post gives details about a watch that can "tell the time no matter where you are on Earth."

Connect to the Semantic Web



Technology for Managing the Five Graphs of Finance

1
Payment

2
Customer

3
Entitlement

4
Asset

5
Master Data



Intercontinental Exchange

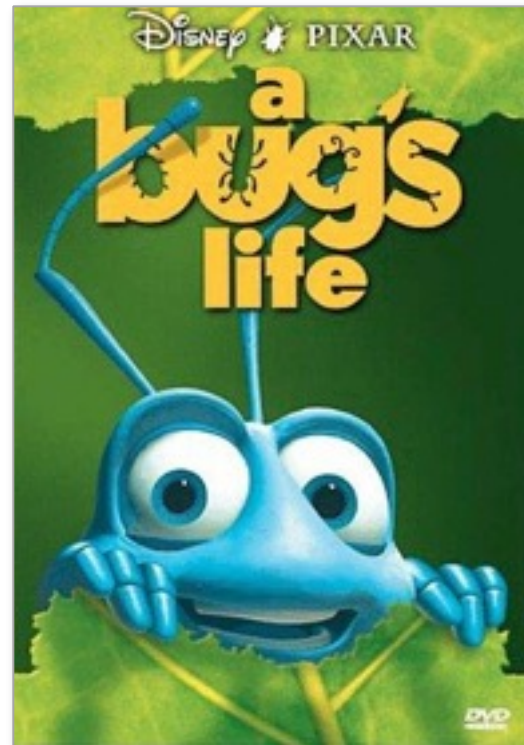
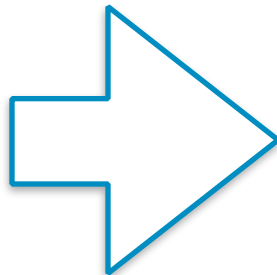


*Social network
for brokers*

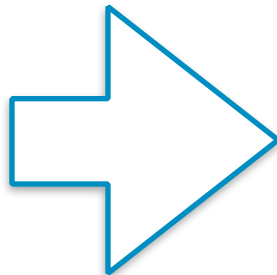
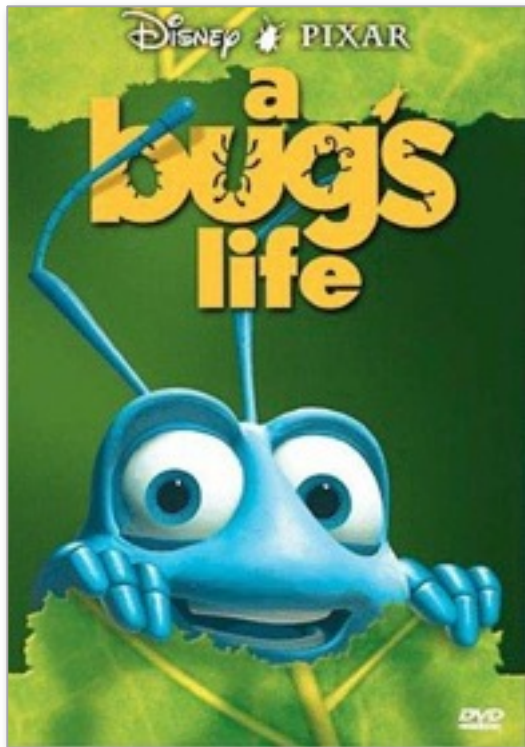


Master
Data

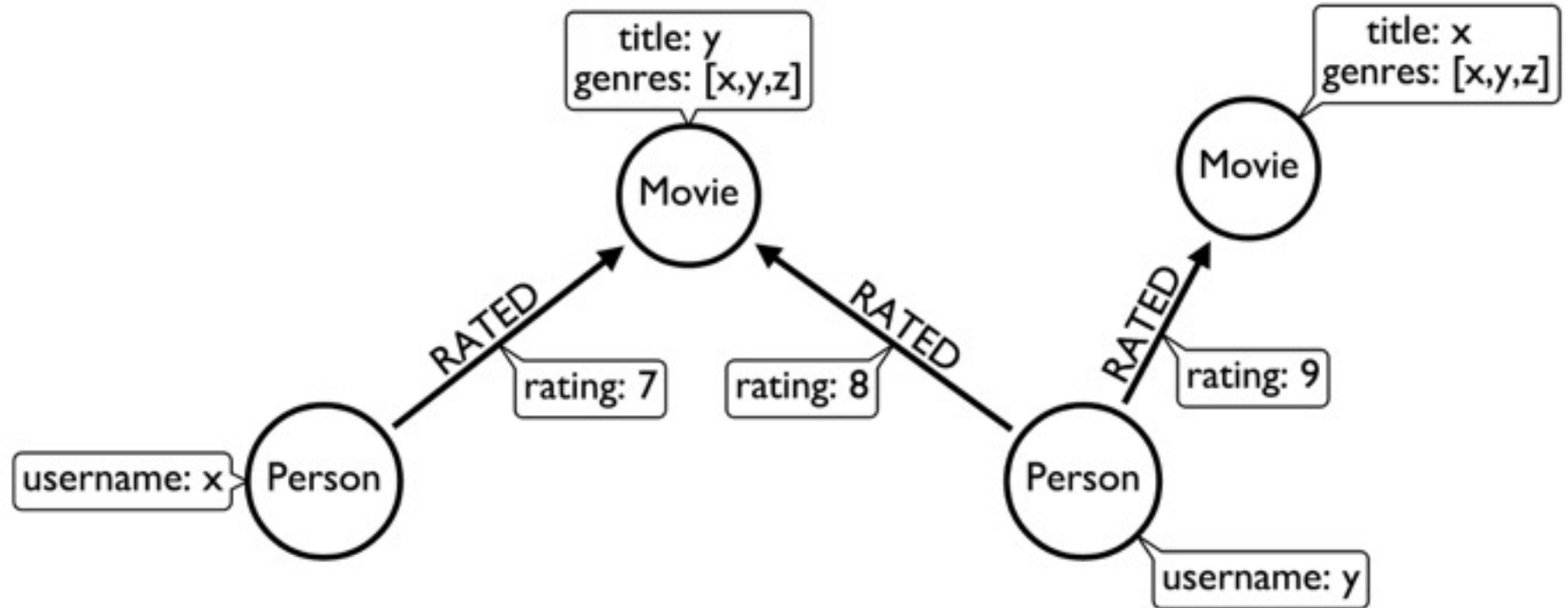
Hello World Recommendation



Hello World Recommendation



Movie Data Model



Cypher Query: Movie Recommendation

What are the Top 25 Movies

- that I haven't seen
- with the same genres as Toy Story
- given high ratings
- by people who liked Toy Story

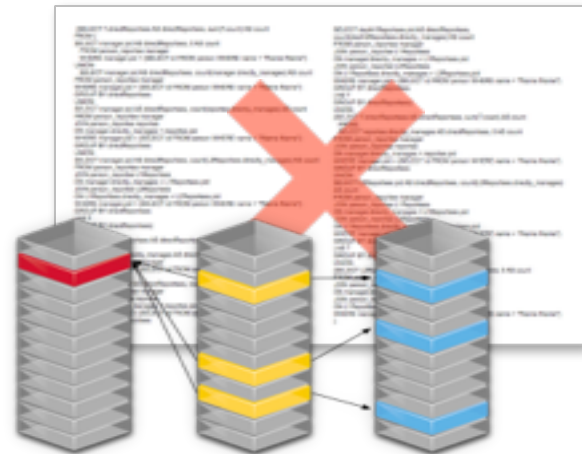
```
MATCH (watched:Movie {title:"Toy Story"}) <-[r1:RATED]- () -[r2:RATED]-> (unseen:Movie)
WHERE r1.rating > 7 AND r2.rating > 7
AND watched.genres = unseen.genres
AND NOT( (:Person {username:"maxdemarzi"}) -[:RATED|WATCHED]-> (unseen) )
RETURN unseen.title, COUNT(*)
ORDER BY COUNT(*) DESC
LIMIT 25
```

Relational Databases Can't Handle Relationships Well



- *Cannot model or store data and relationships* without complexity
- *Performance degrades* with number & levels of relationships, and database size
- *Query complexity grows* with need for JOINS
- *Adding new types of data and relationships* requires schema redesign, increasing time to market

... making traditional databases **inappropriate** when relationships are valuable in **real-time**



Slow development
Poor performance
Low scalability
Hard to maintain

NoSQL Databases *Don't* Handle Relationships



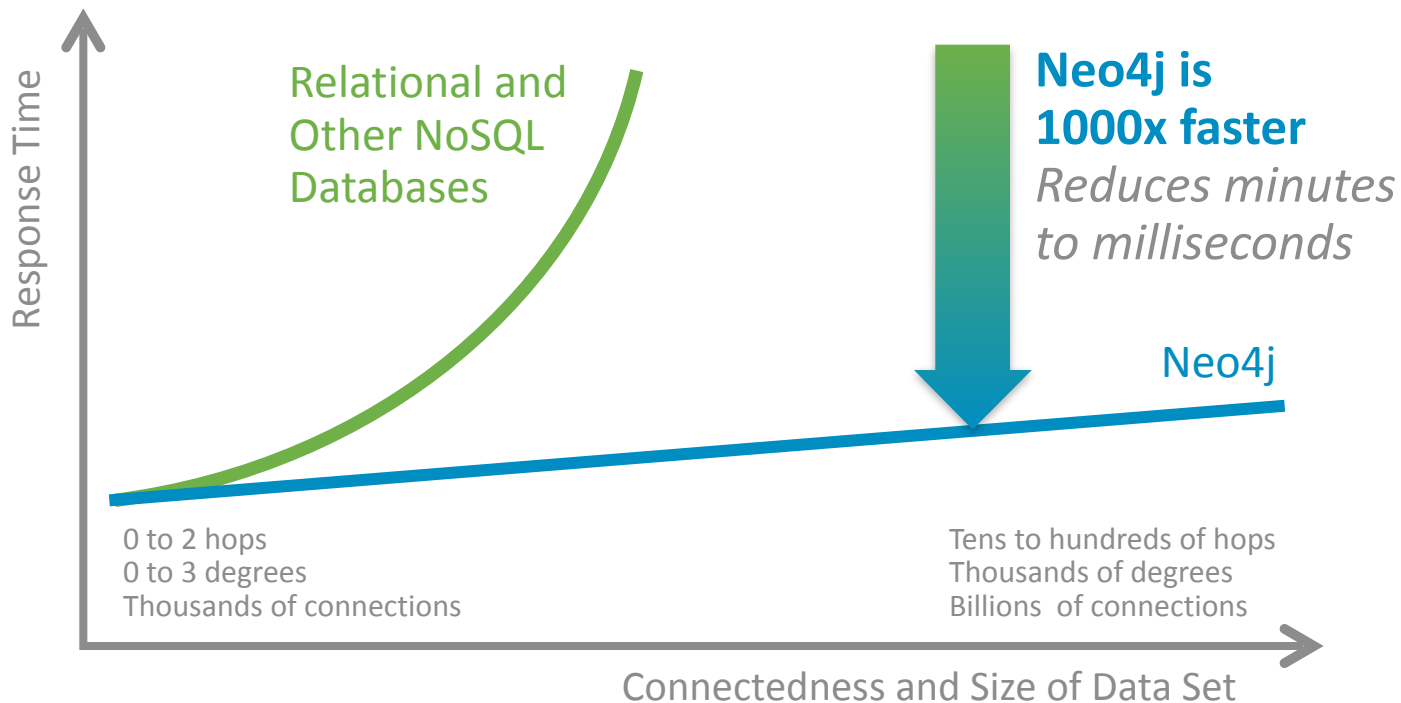
- *No data structures* to model or store relationships
- *No query constructs* to support relationships
- *Relating data requires "JOIN logic"* in the application
- *No ACID support* for transactions

... making NoSQL databases **inappropriate** when relationships are valuable in **real-time**



Real-Time Query Performance

Performance must hold steady with scale



Re-Imagine Your Data as a Graph



Neo4j is an *enterprise-grade graph database* that enables you to:

- **Model and store** your data as a **graph**
- **Query relationships** with ease and in real-time
- **Seamlessly evolve applications** to support new requirements by adding new kinds of data and relationships



Agile development
High performance
Vertical and horizontal scale
Seamless evolution

THANK YOU

