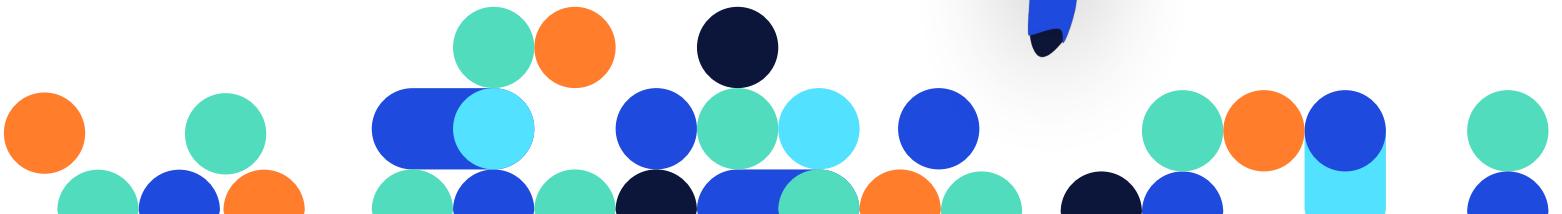


DataStax Developer Day



DSE Graph



DSE Graph - Agenda

- DSE Graph and its applications
- Retrieving graph elements
- Walking paths in a graph
- Graph training on DataStax Academy



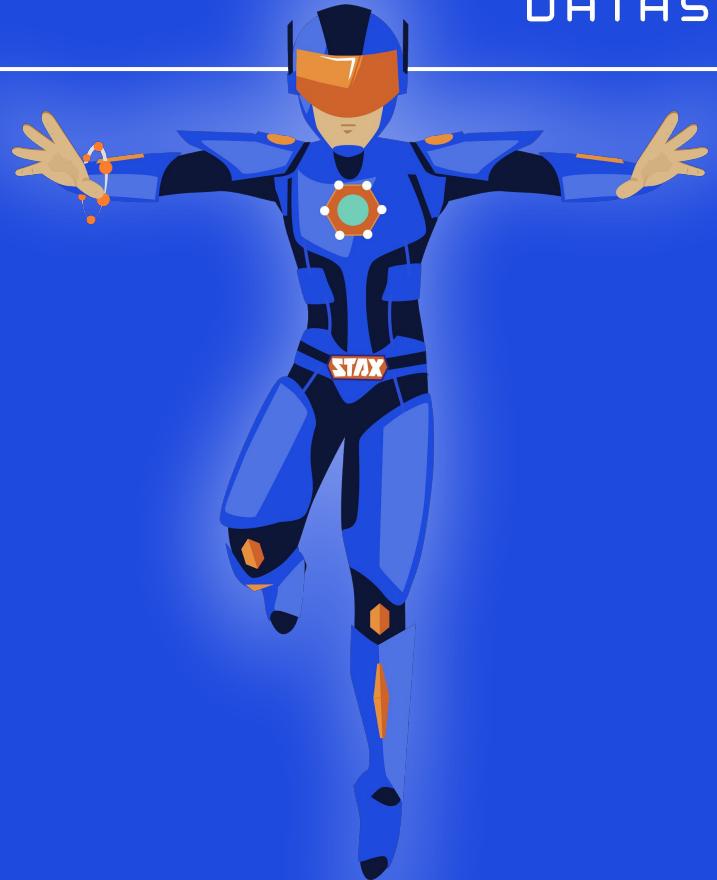
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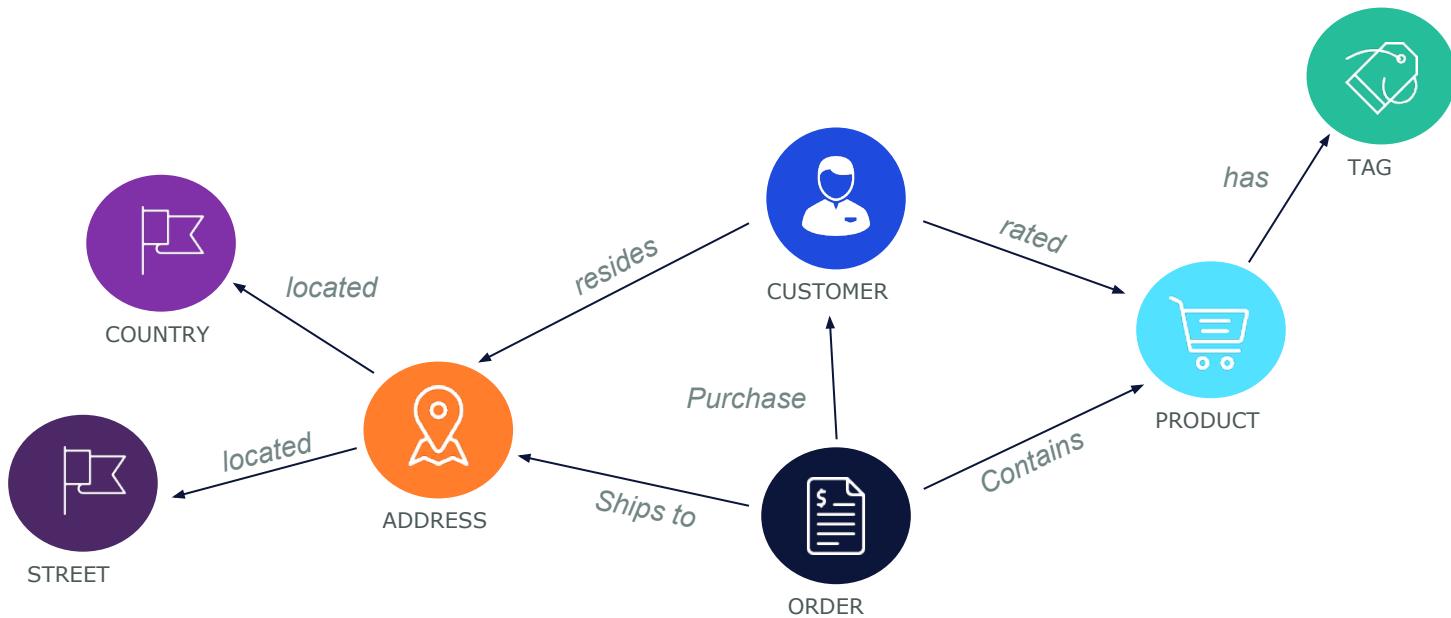
DSE Graph

Introduction to Graph



Getting Started

- **Graph databases** are useful for discovering simple and complex relationships between objects. Relationships are fundamental to how objects interact with one another and their environment. Graph databases are the perfect representation of the relationships between objects



- Who are our most influential customers?
- What are all the ways a customer is interacting with our company?
- How much better could we achieve our company goals if we understood the complete view of our customers.



Customer 360

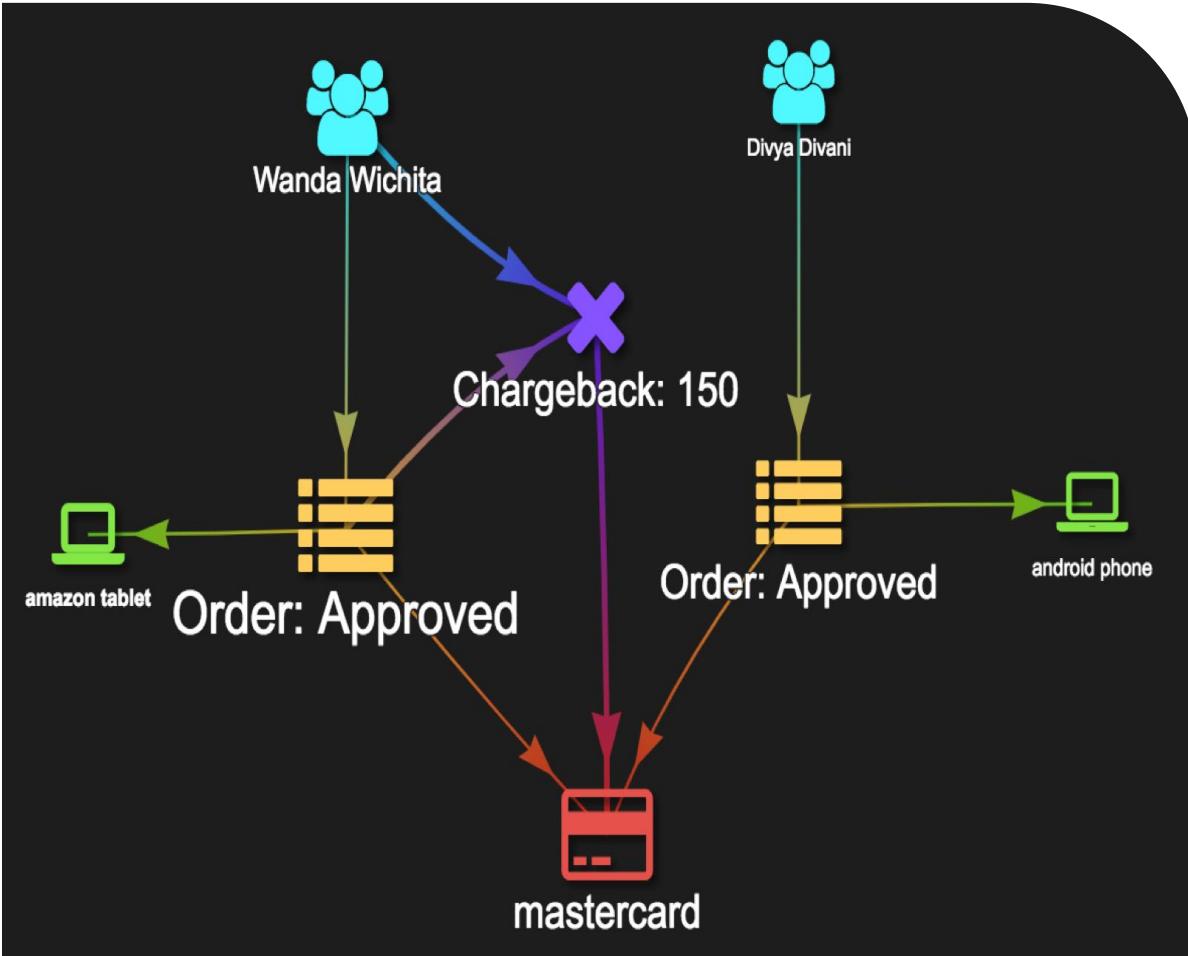


Gain a singular, contextual view of the customer in real time for a seamless, personalized customer experience across all touchpoints.

Companies want to have a complete view of their users or products. Understanding every interaction and touchpoint across multiple business units is key to a great customer experience. A graph model is the best way to **consolidate** and make sense of data from disparate sources such as **customer facing apps** and **business backend systems**.



Fraud Detection



A graph database helps connect the dots to identify trends while at the same time spot outliers as potential threats.



Personalization & Recommendation

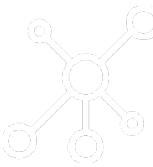
The screenshot shows a video platform interface with a dark theme. At the top, there's a navigation bar with a 'KillrVideo' logo, a search bar, and user information ('Tour: Off', 'What is this?', 'cedrick lunven'). Below the navigation is a section titled 'RECENT VIDEOS' which displays five video thumbnails. The first video is a 'DISTRIBUTED DATA SHOW EPISODE 40: FEATURE FLAGS WITH CEDRICK' by cedrick lunven. The second is 'MODERN DATA PROTECTION FOR NEXT-GEN APPS AND DATABASES' by Chadd Boehm. The third is 'THE FIRST PURGE TRAILER #1 (2018) | MOVIECLIPS TRAILERS' by Crystal Schaden. The fourth is 'LEARN DINOSAURS NAMES AND SOUNDS WITH FUNNY CAT - BEST TOY' by Otha Hane. The fifth is 'MOTHER CAT AND CUTE KITTEN BEST FAMILY CATS COMILATION' by Bill Turner. Below this is a section titled 'RECOMMENDED FOR YOU' which also displays five video thumbnails. The first is 'C* SUMMIT EU 2013: MIXING BATCH AND REAL-TIME: CASSANDRA WITH' by Nakia Kuhlman. The second is 'DUYHAI DOAN - APACHE CASSANDRA 3 NEW COOL FEATURES' by Matteo Roob. The third is 'FUNNIEST CATS AND KITTENS COMPILATION 2017 | BEST CUTE CAT' by Anahi Hessel. The fourth is 'ARE YOU HERE OFFICIAL TRAILER #1 (2014) - ZACH GALIFIANAKIS, AMY' by Isaiah Porous. The fifth is 'IOT IN ACTION WITH MICROSOFT BOSTON EVENT HIGHLIGHTS' by Phoebe Bauch. A green oval highlights the 'RECOMMENDED FOR YOU' section.

- What are the videos people, with same interests (tags) as me, have liked the most ?
- A graph database is the most efficient tool for understanding users and creating insightful, data-driven, real-time experiences.
- These actions must be based on the most recent actions and operate in real time to deliver a highly relevant customer experience.



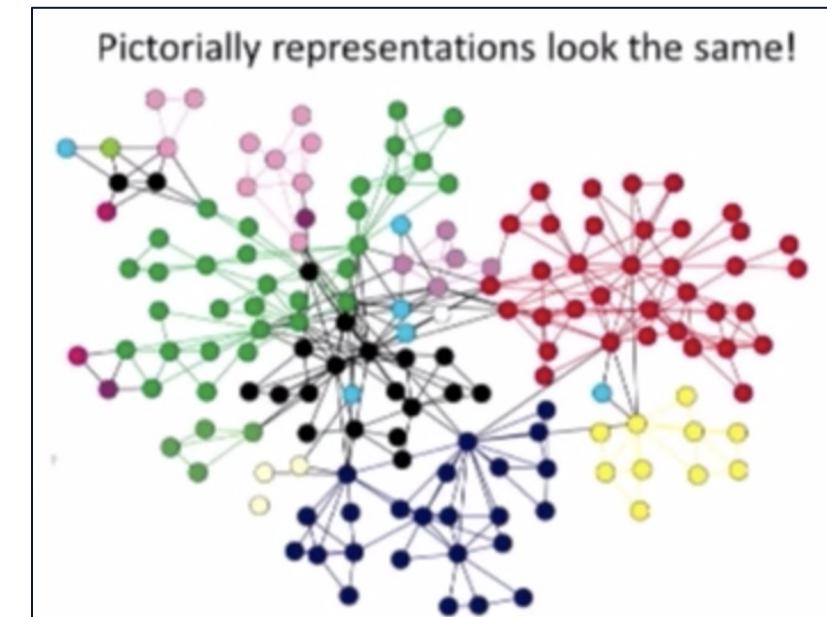
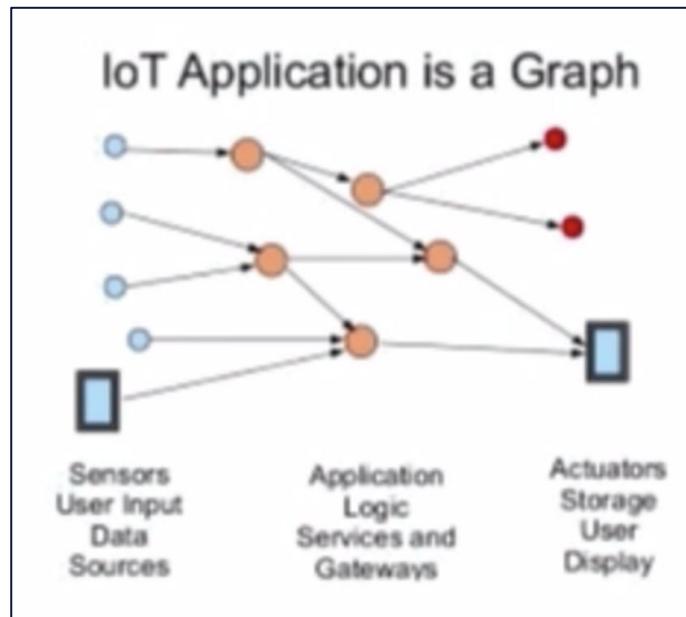
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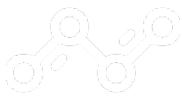
<https://community.datastax.com>



IoT, Asset management & Networking

How easily can you perform **analysis** on numerous **relationships** that form among data elements and tend to be of much greater interest when examined collectively than reviewed in isolation? A graph is also a good model for managing network assets (with their properties or configurations) and how they relate to each other over time.

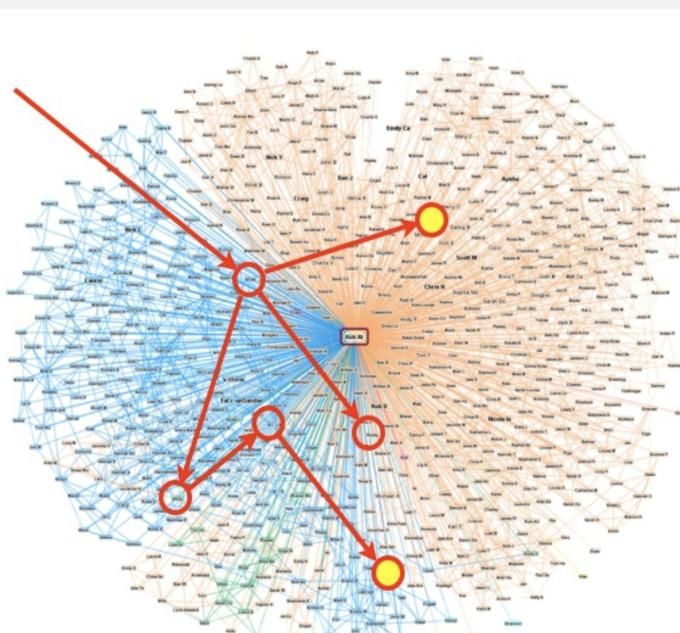




Others use cases...

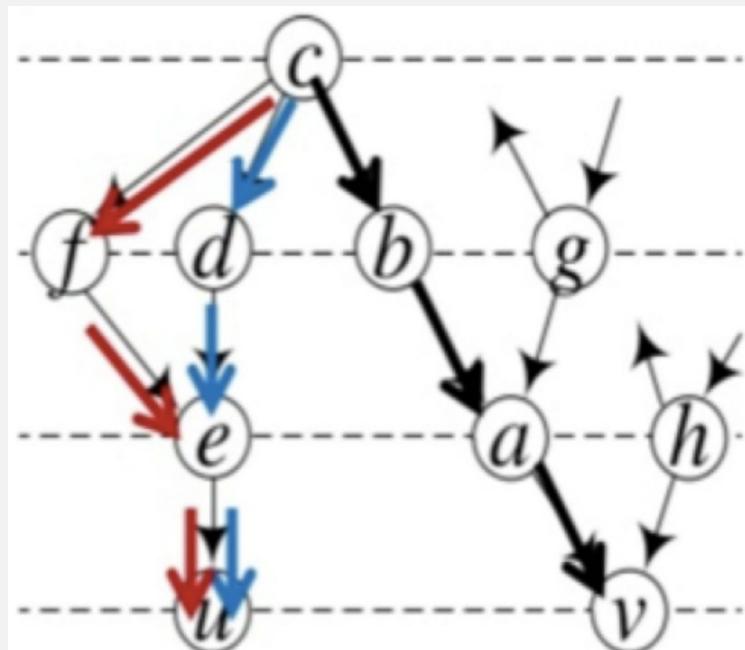
Healthcare

What drugs bill bind to proteinX and interact with drug Y



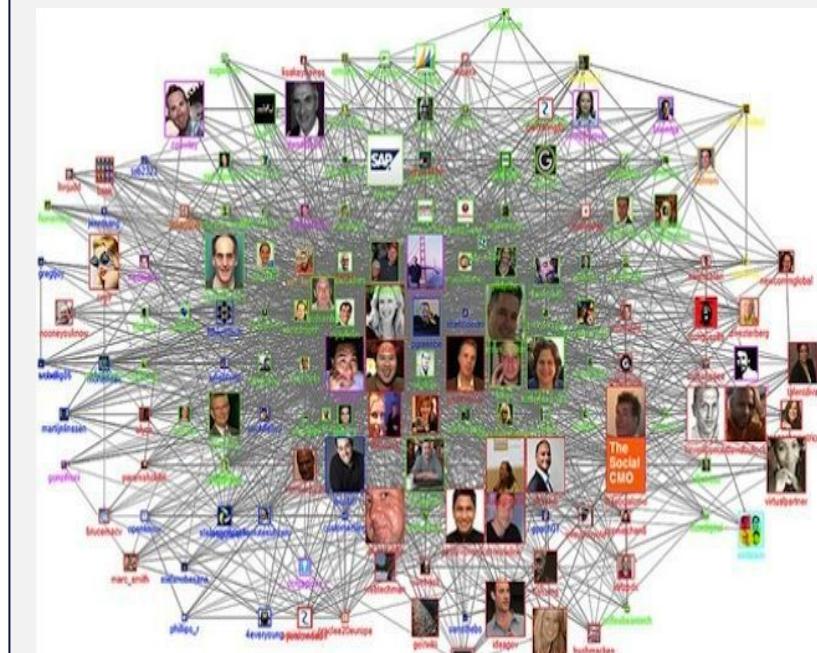
Path Finding

What manufacturing lines lead to the most defects.



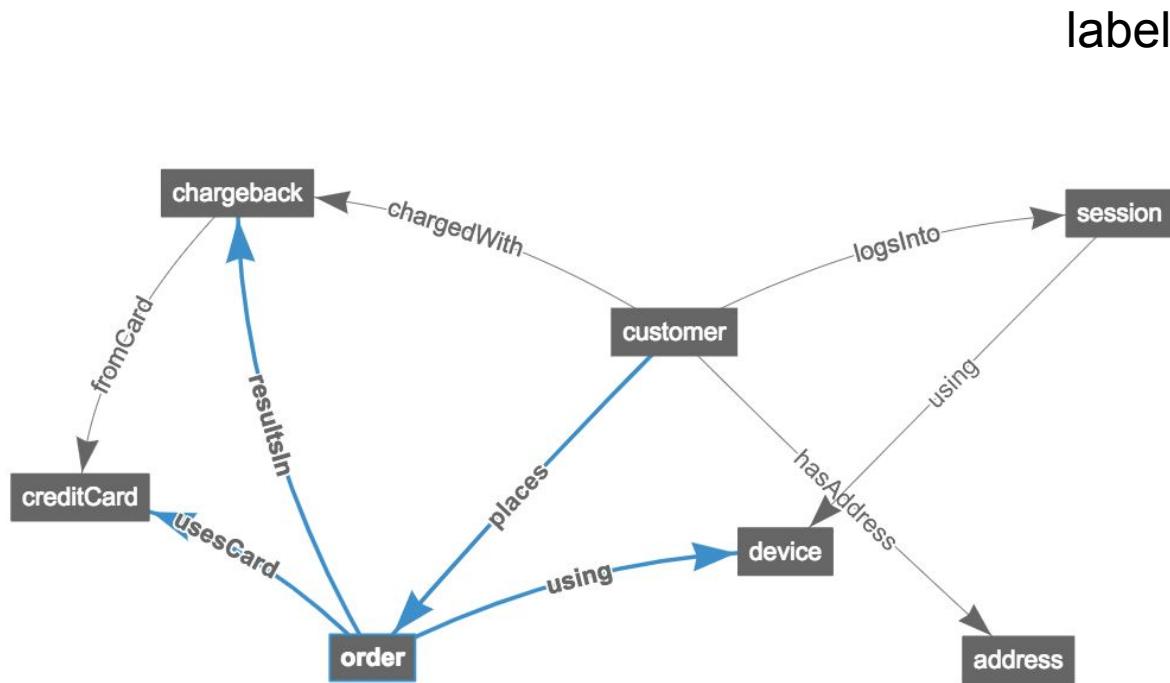
Social

How people are connected.
Who is more influential.



Vertex

A **vertex** is an **noun**, such as a person, location, customer, order or anything else you can think of as nouns.



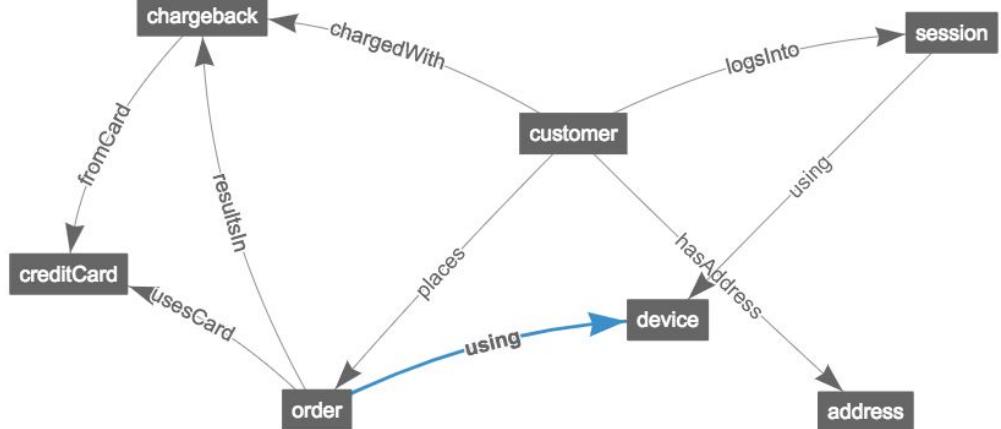
label

order			
ID Properties			
Name	Type		
orderid	Uuid		
Properties			
Name	Type	Cardinality	TTL
amount	Decimal	Single	
createdtime	Timestamp	Single	
creditcardhashed	Text	Single	
deviceid	Uuid	Single	
ipaddress	Text	Single	
outcome	Text	Single	



Edge

An **edge** defines the relationship between two vertices, it is a **verb**. A person can create software, or an author can write a book. Think verbs when you are defining edges.



using

Cardinality: Multiple

Properties
(none)



Property

- A **property** stores information for a vertex, edge or another property. Properties have unique name, a type and a cardinality.
- Information in a graph database can be retrieved using **graph traversals**. Graph traversals “walk” a graph with a single or series of *traversal steps* that can define a starting point for a traversal and **filter** the results **to find the answers** to queries about the graph data.

```
schema.propertyKey('customerid').Uuid()  
    .ifNotExists().create()  
schema.propertyKey('firstname').Text()  
    .ifNotExists().create()  
schema.propertyKey('amount').Decimal()  
    .ifNotExists().create()
```

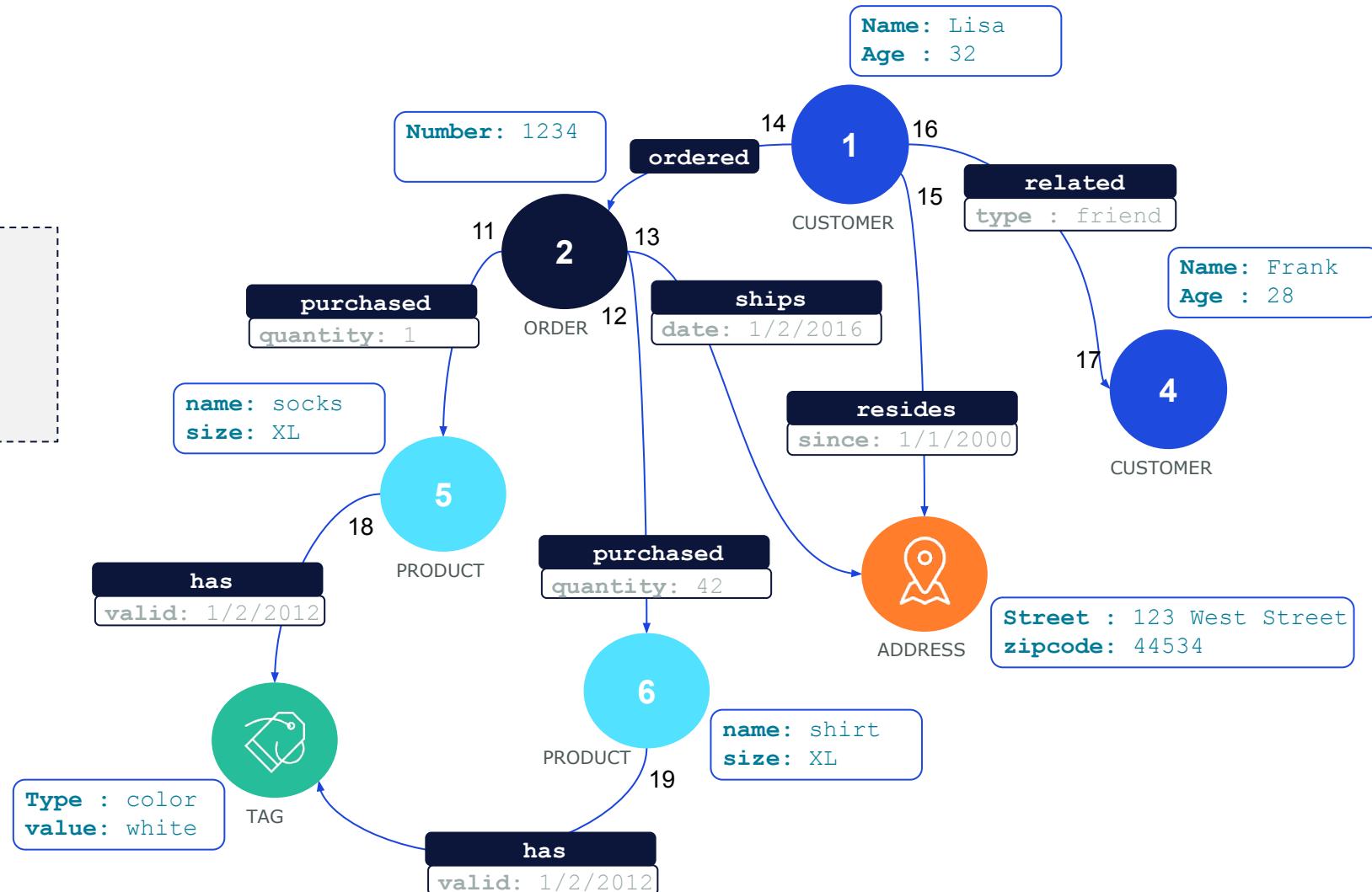
```
g.v().hasLabel("product")  
    .has("title", textContains("Fan"))  
    .inE("reviewed")  
    .has("score", 5)  
    .values("summary")
```



Playground

Find Lisa's order numbers.

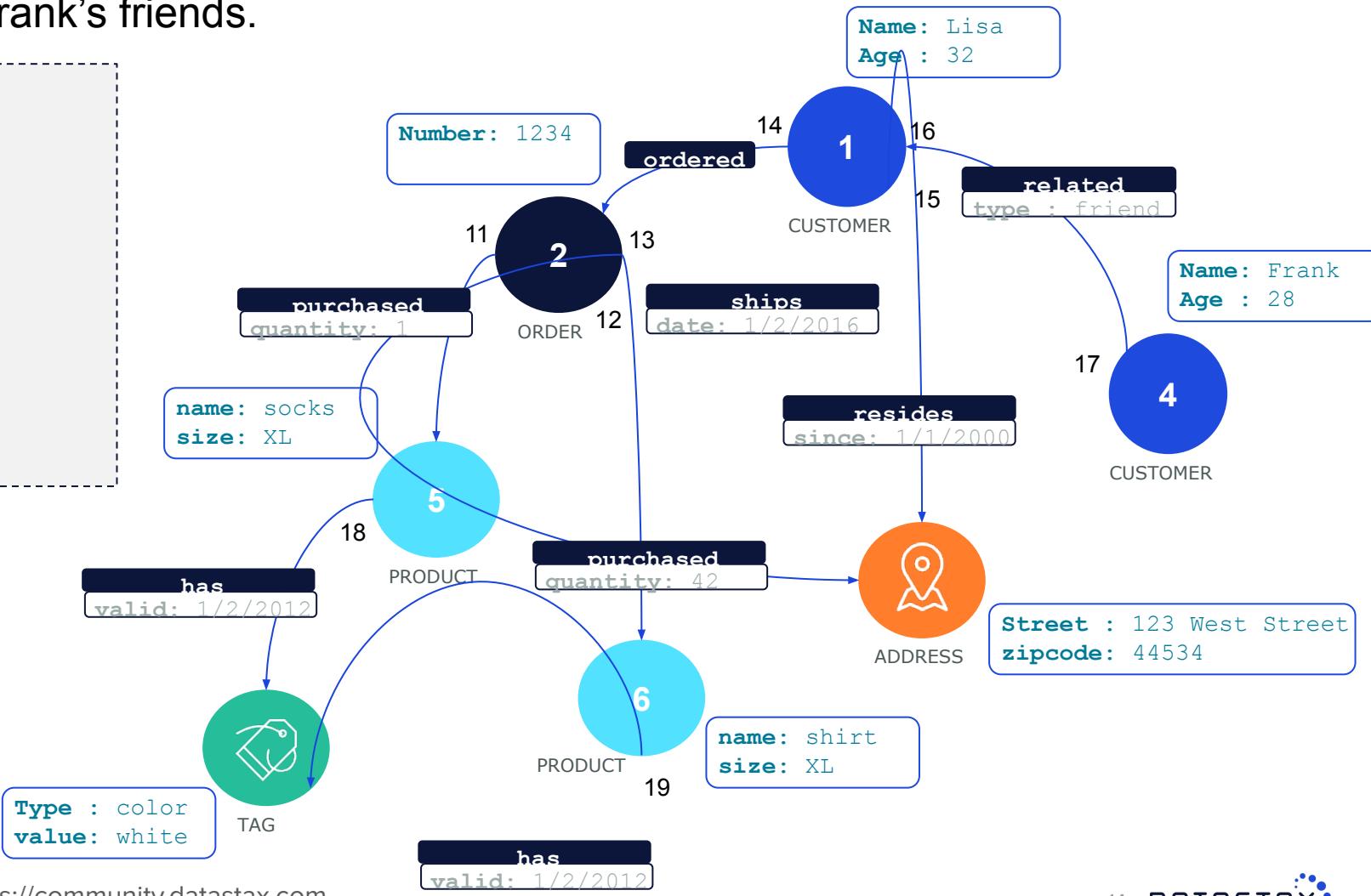
```
g.V().has('customer', 'name',  
          .out('ordered') 'Lisa')  
  
.values('number')
```



Playground

Find all product names purchased by Frank's friends.

```
g.V().has('customer', 'name',  
          'Frank')  
.outE('related').has('type',  
                     'friend')  
.inv()  
.out('ordered')  
.out('purchased')  
)  
.values('name')
```



DataStax Enterprise Graph

Real-time graph database management system

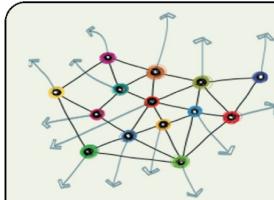
- Adopts Apache TinkerPop™ standards for data and traversal
- Uses Apache Cassandra™ for scalable storage and retrieval
- Leverages Apache Solr™ for full-text search and indexing
- Integrates Apache Spark™ for fast analytic traversal
- Supports comprehensive data security for the enterprise



DSE Graph Technologies

Applications

 DataStax
DSE Graph



Graph Applications



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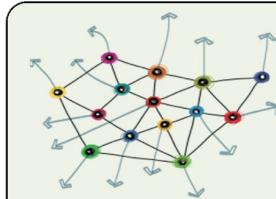
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DSE Graph Technologies

Interfaces

 DSE Graph



Graph Applications



Property graph and Gremlin API
DSE graph schema API



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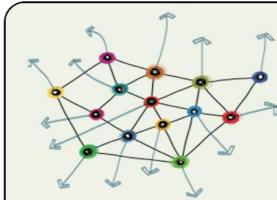


DSE Graph Technologies

Technologies

DATASTAX

DSE Graph



Graph Applications



Property graph and Gremlin API
DSE graph schema API



Fully integrated
backend technologies



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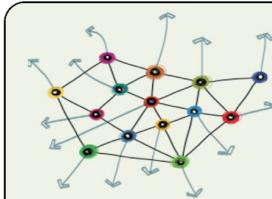
<https://community.datastax.com>

DATASTAX®

DSE Graph Technologies

Middleware

DATASTAX
DSE Graph



Graph Applications



Property graph and Gremlin API
DSE graph schema API



Schema, data, and query mappings
OLTP and OLAP engines



Fully integrated
backend technologies

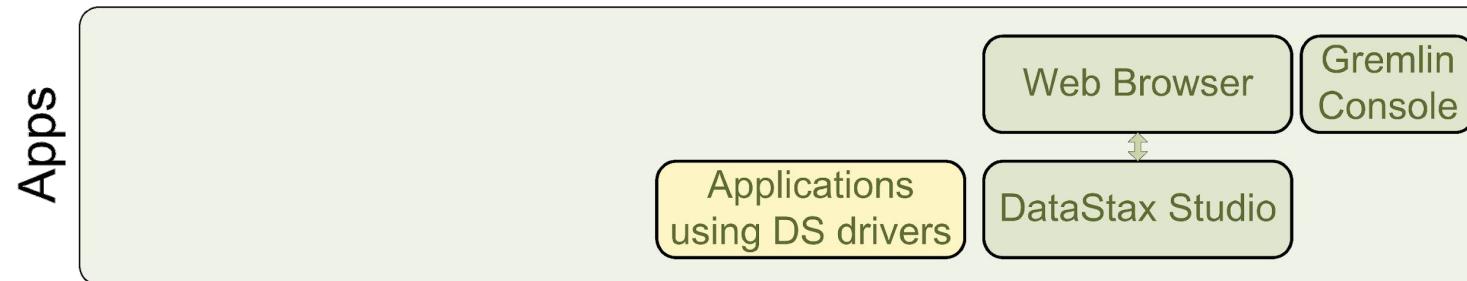


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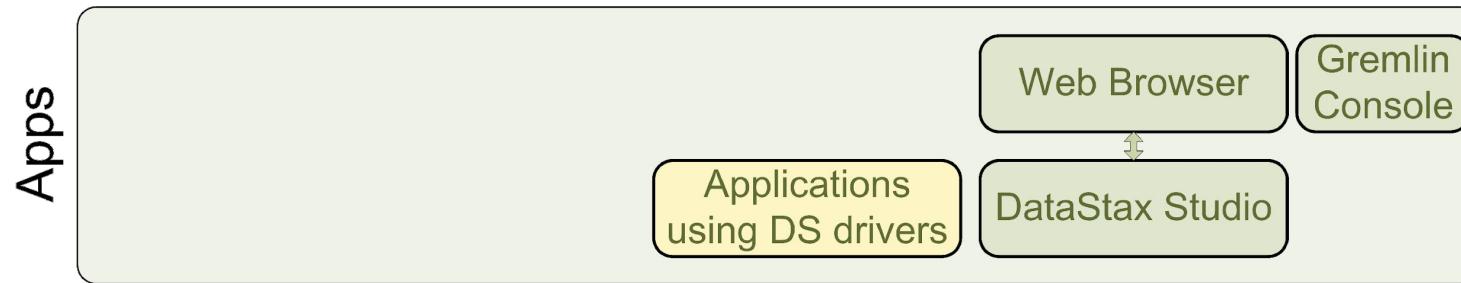
DATASTAX®

DSE Graph Components

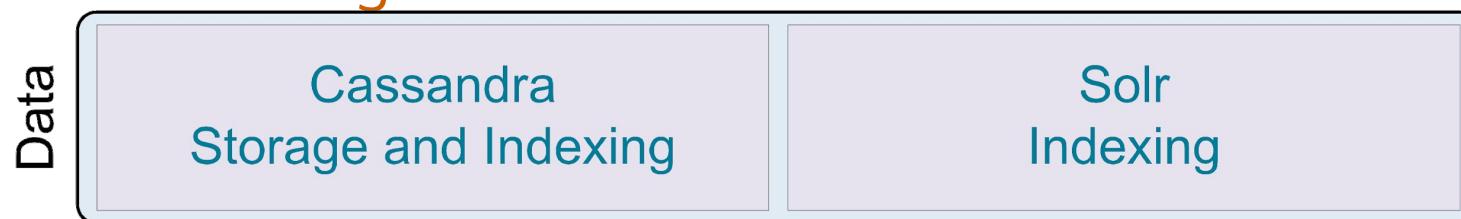


Apps and Tools

DSE Graph Components



Data Storage and Indexing

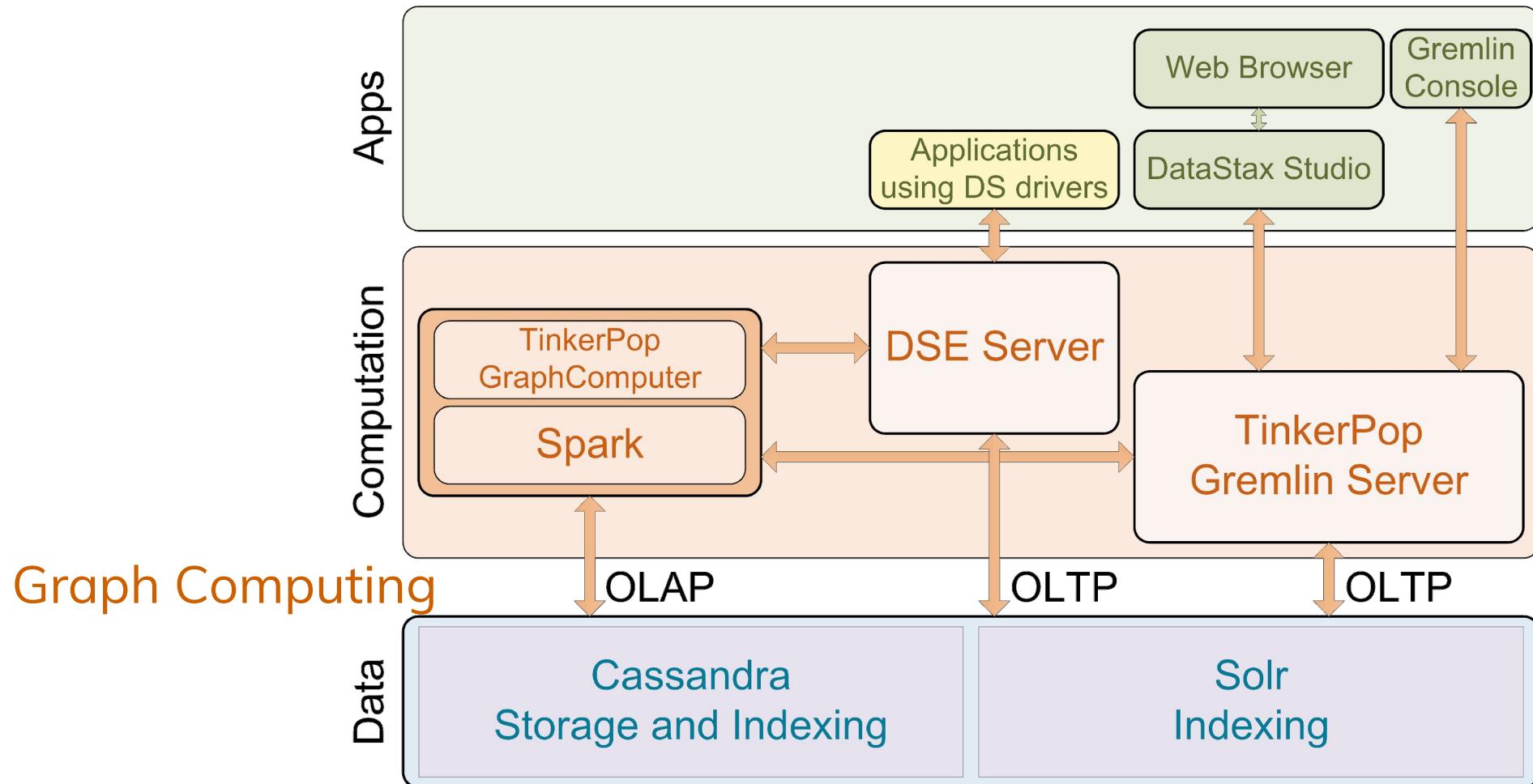


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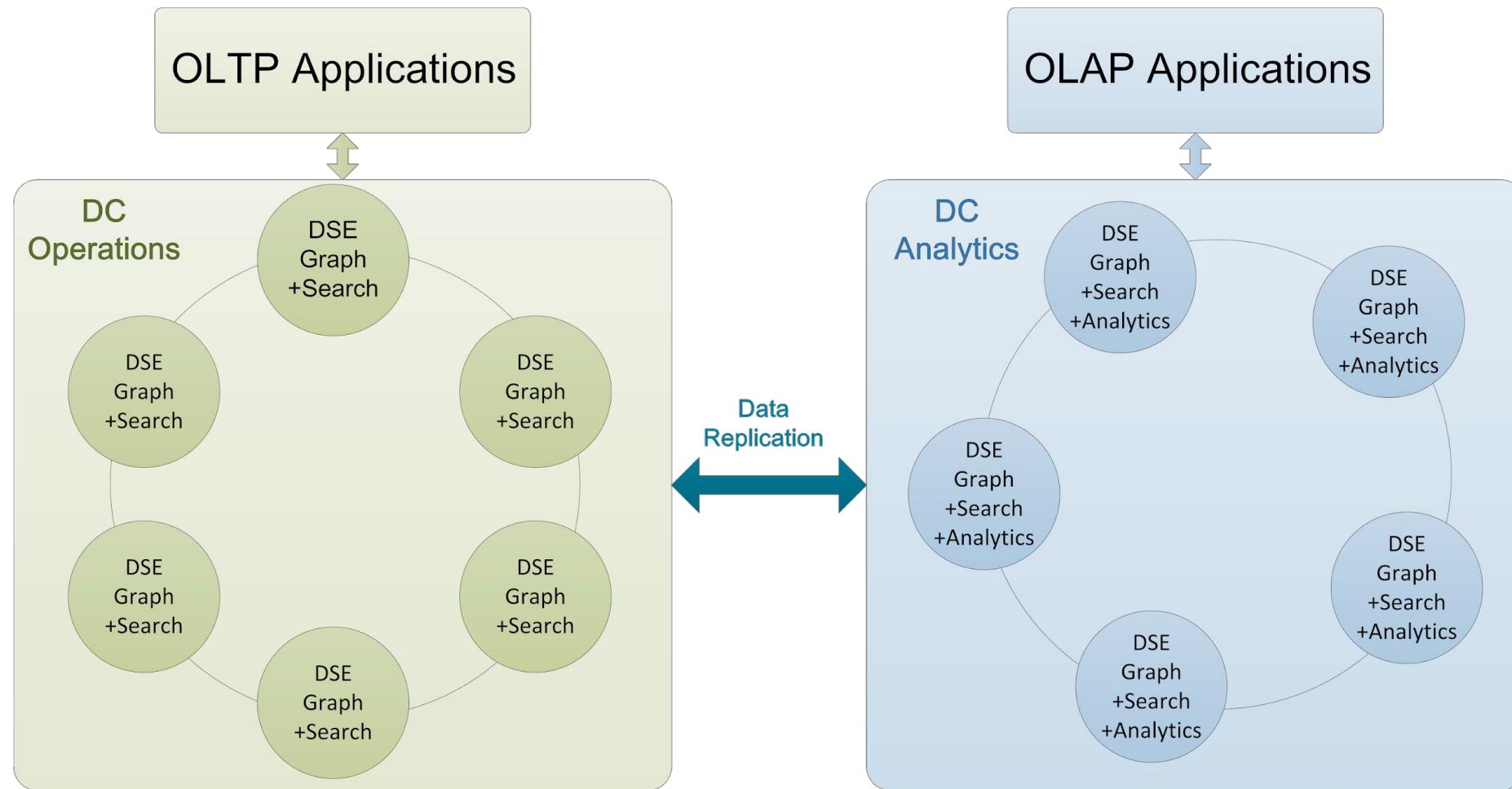


DSE Graph Components



DSE Graph Multi-DC Deployment

Workload Type Separation



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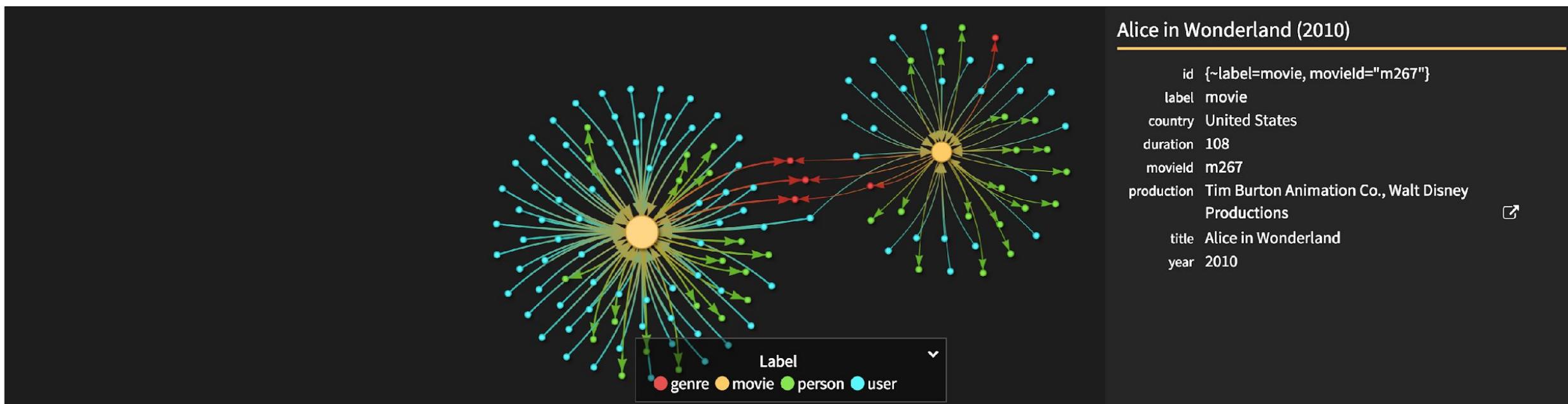


DSE Graph Tools

Gremlin ▾

Real-time ▶ 🔍 ⚙️ ⌛ ⌂

```
g.V().has("movie", "title", "Alice in Wonderland").bothE()
```



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DSE Graph Tools

```
..[$] <O> bin/dse gremlin-console  
      \,,,/ (o o)  
----o00o-(3)-o00o----  
plugin activated: tinkerpop.tinkergraph  
plugin activated: tinkerpop.server  
plugin activated: tinkerpop.utilities  
gremlin> :remote config alias g KillrVideo.g  
==>g=KillrVideo.g  
gremlin> g.V().has("person", "name", "Johnny Depp").in("actor").values("title")  
==>Pirates of the Caribbean: On Stranger Tides  
==>Edward Scissorhands  
==>Ed Wood  
==>Into the Woods  
==>Pirates of the Caribbean: Dead Man's Chest  
==>Pirates of the Caribbean: At World's End (Pirates of the Caribbean 3)  
==>Alice in Wonderland  
==>Chocolat  
==>Finding Neverland  
==>Sweeney Todd: The Demon Barber of Fleet Street  
==>Charlie and the Chocolate Factory  
==>Dead Man  
==>Pirates of the Caribbean: The Curse of the Black Pearl  
==>Cry Baby  
gremlin> █
```



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DSE Graph Tools

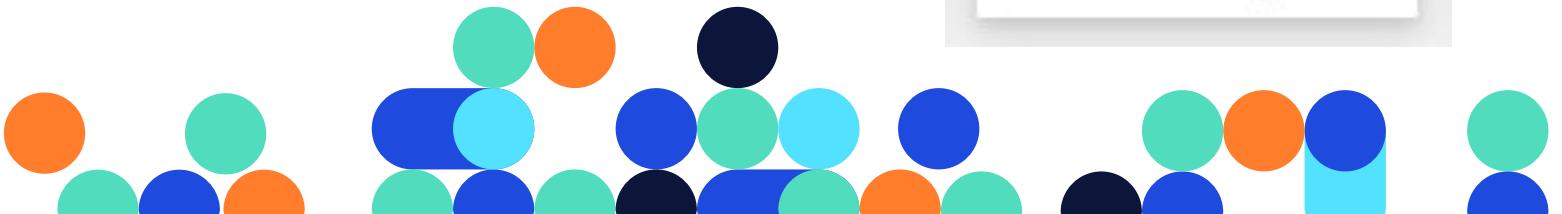
```
..[$] <()> dse-graph-loader-6.0.0/graphloader /var/lib/graph/loading-script.groovy -graph KillrVideo
2018-04-18 17:16:24 INFO DataLoaderImpl:213 - Scheduling [directors] for reading
2018-04-18 17:16:24 INFO DataLoaderImpl:213 - Scheduling [composers] for reading
2018-04-18 17:16:24 INFO DataLoaderImpl:213 - Scheduling [screenwriters] for reading
2018-04-18 17:16:24 INFO DataLoaderImpl:213 - Scheduling [cinematographers] for reading
2018-04-18 17:16:24 INFO DataLoaderImpl:213 - Scheduling [knows] for reading
2018-04-18 17:16:24 INFO Reporter:92 - ADD Request for 0 vertices 12515 edges 0 properties 0 anonymous
2018-04-18 17:16:24 INFO Reporter:97 - Current total additions: 12596 vertices 18560 edges 16456 properties 0 anonymous
2018-04-18 17:16:24 INFO Reporter:99 - 47612 total elements written
2018-04-18 17:16:24 INFO DataLoaderImpl:213 - Scheduling [rated] for reading
2018-04-18 17:16:25 INFO Reporter:92 - ADD Request for 0 vertices 10700 edges 0 properties 0 anonymous
2018-04-18 17:16:25 INFO Reporter:97 - Current total additions: 12596 vertices 29260 edges 16456 properties 0 anonymous
2018-04-18 17:16:25 INFO Reporter:99 - 58312 total elements written
2018-04-18 17:16:26 INFO Reporter:92 - ADD Request for 0 vertices 10600 edges 0 properties 0 anonymous
2018-04-18 17:16:26 INFO Reporter:97 - Current total additions: 12596 vertices 39860 edges 16456 properties 0 anonymous
2018-04-18 17:16:26 INFO Reporter:99 - 68912 total elements written
2018-04-18 17:16:27 INFO Reporter:92 - ADD Request for 0 vertices 10600 edges 0 properties 0 anonymous
2018-04-18 17:16:27 INFO Reporter:97 - Current total additions: 12596 vertices 50460 edges 16456 properties 0 anonymous
2018-04-18 17:16:27 INFO Reporter:99 - 79512 total elements written
```



Time for an exercise!



“DSE Graph: Introduction” Notebook



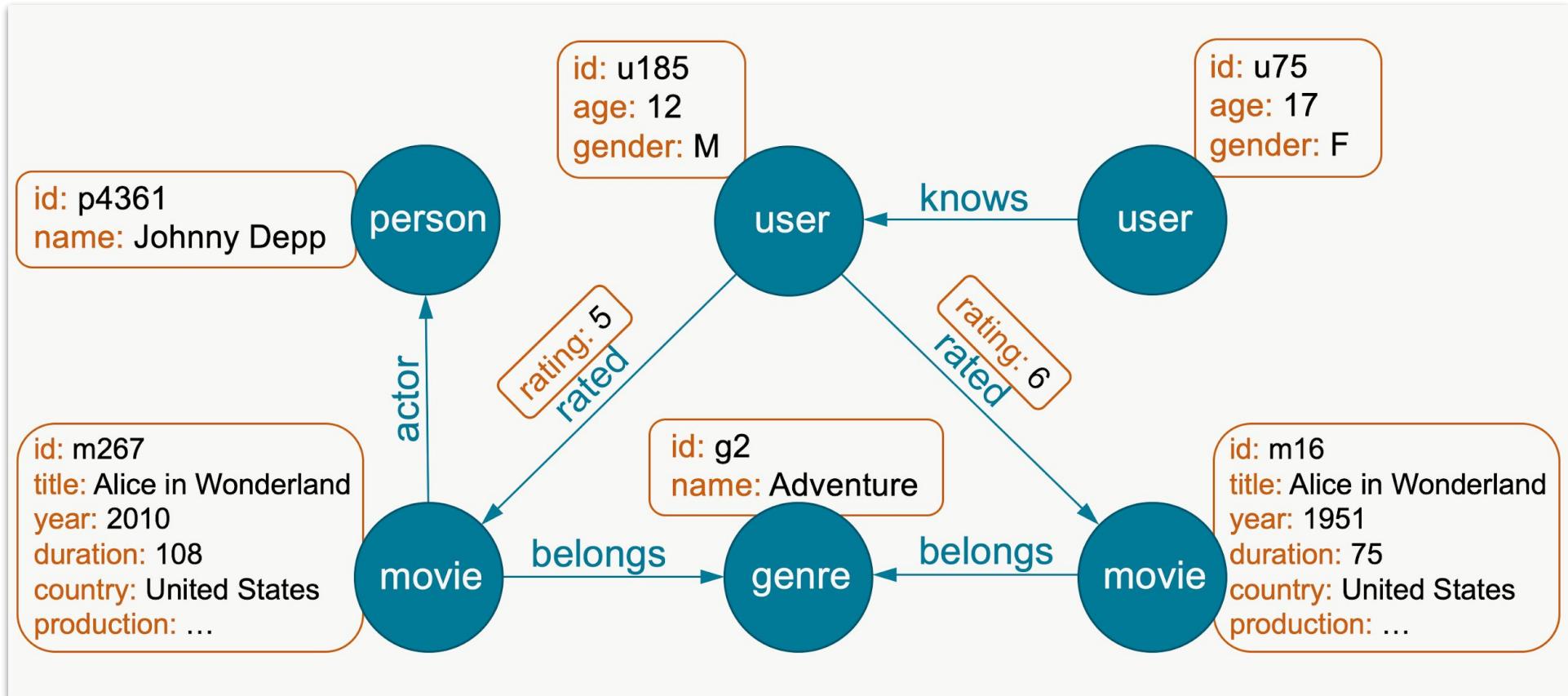
DSE Graph

Retrieving Graph Elements



The KillrVideo graph

- Property graph – vertex-labeled, edge-labeled, directed, binary, attributed multi-graph:
 - Vertices
 - Edges
 - Properties

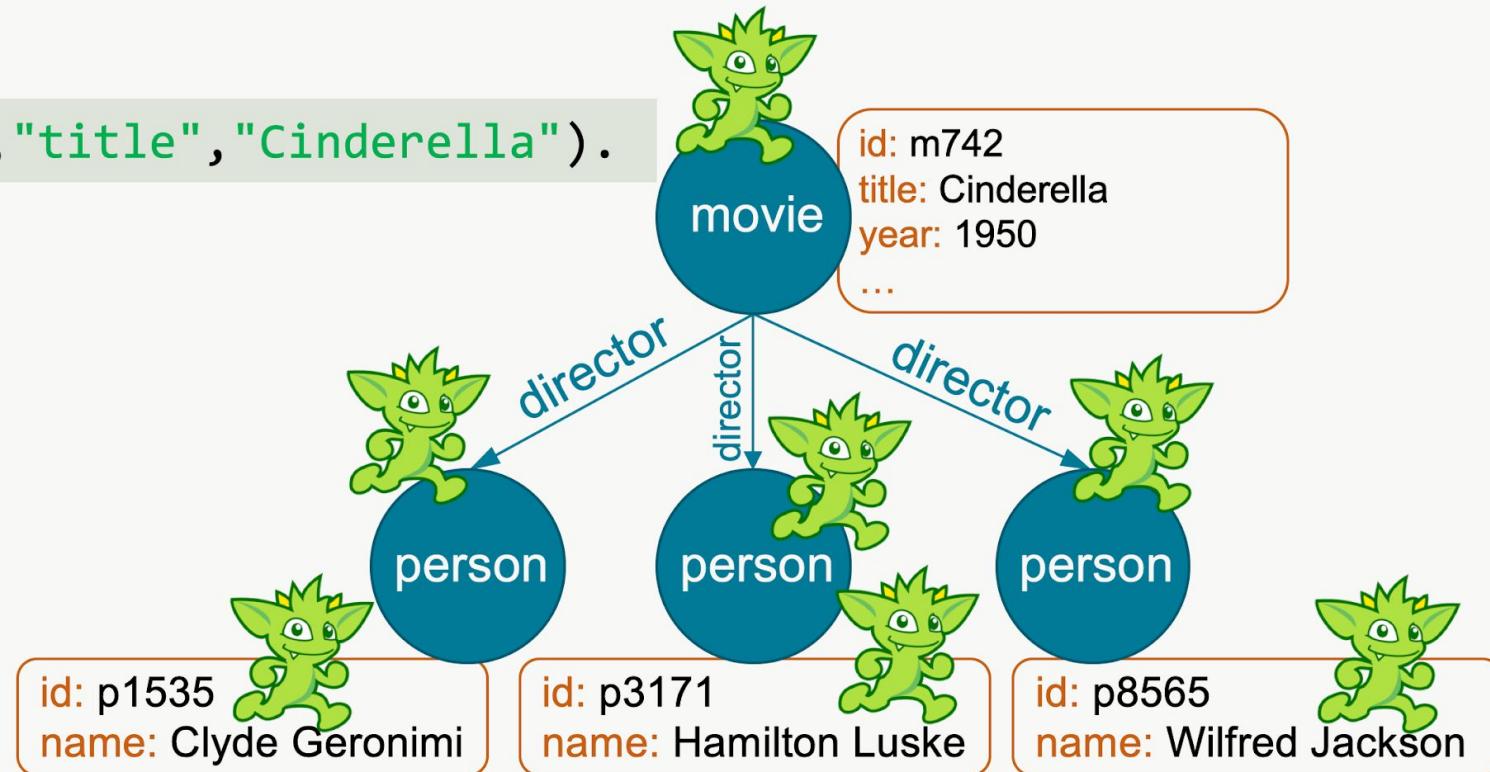


Follow the gremlin

```
g.V().has("movie","title","Cinderella").
```

```
out("director").
```

```
values("name")
```



And another Exercise!

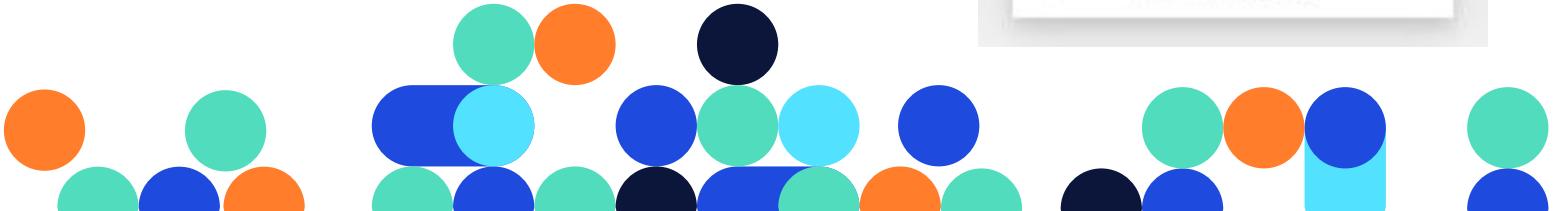


“DSE Graph: Retrieving Graph Elements” Notebook

06-02 - DSE Graph:
Retrieving Graph
Elements

Developer Day Cluster

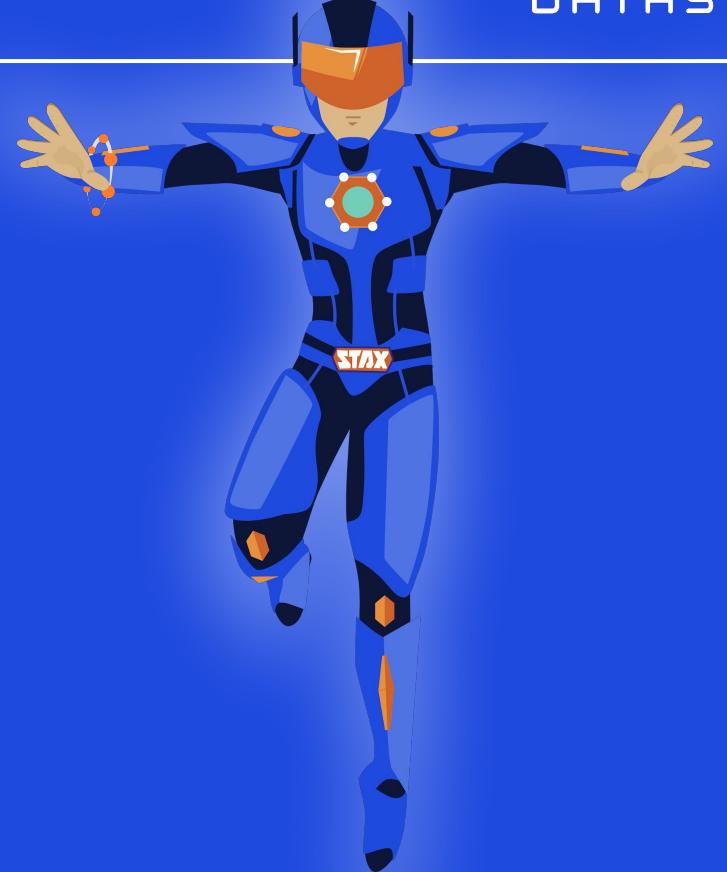
a minute ago ...



DSE Graph

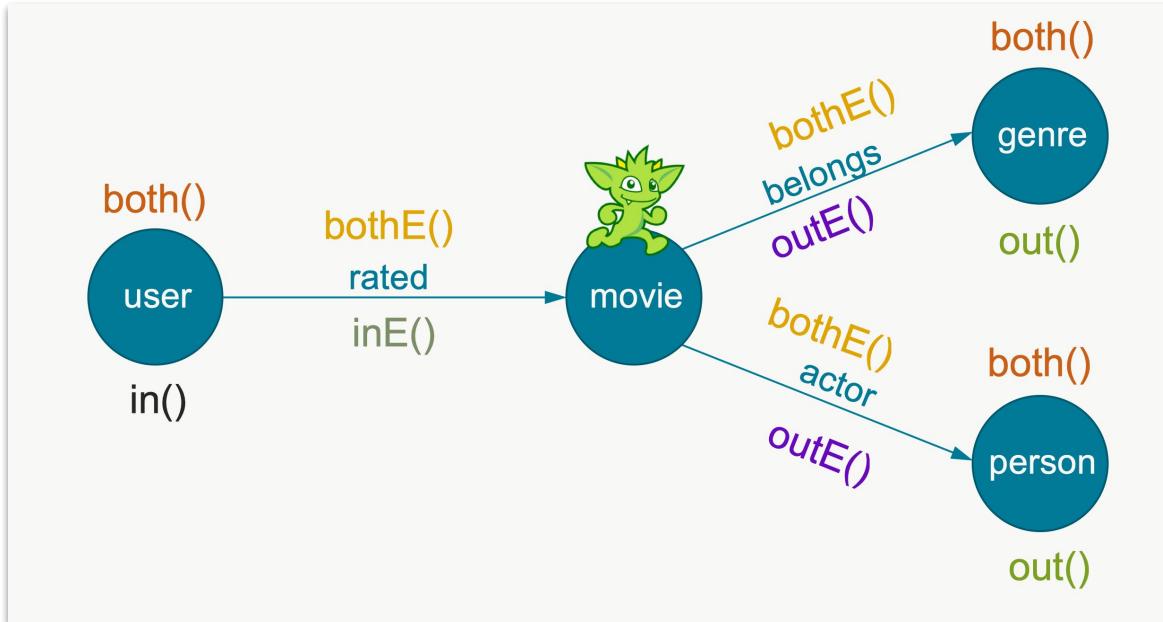


Walking Paths in a Graph

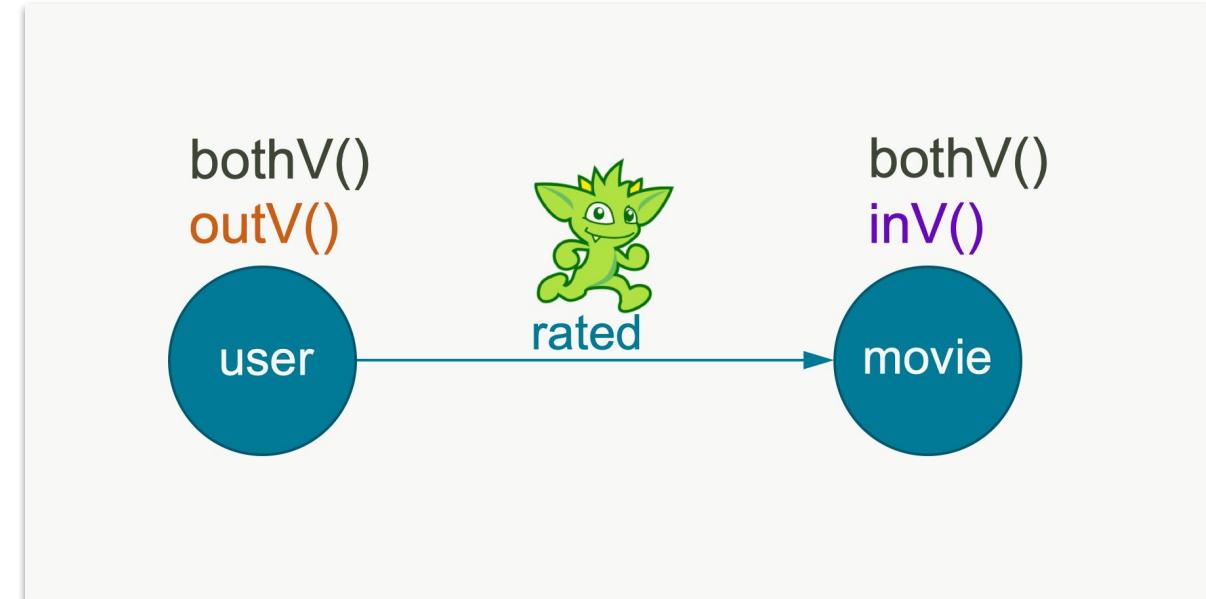


Walking Paths in a Graph

- `in()`, `out()`, `both()`
- `inE()`, `outE()`, `bothE()`



- `inV()`, `outV()`, `bothV()`



Time for an exercise!

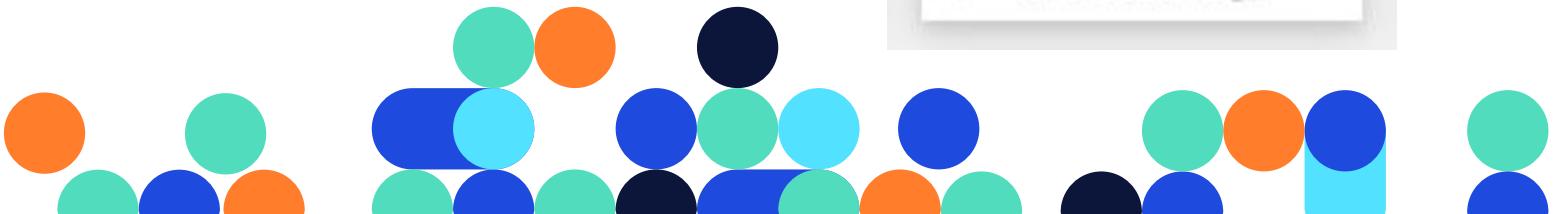


“DSE Graph: Walking Paths in a Graph” Notebook

06-03 - DSE Graph:
Walking Paths

Developer Day Cluster

a few seconds ago ...



DSE Graph

Traversing Neighborhoods and Subgraphs



Time for an exercise!

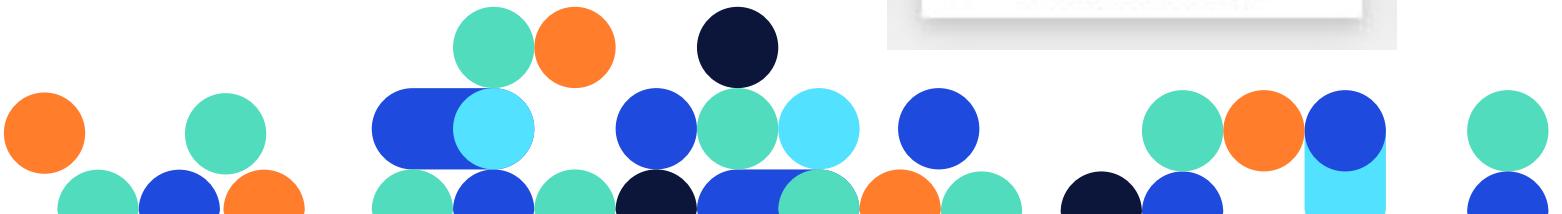


“DSE Graph: Traversing” Notebook

06-04 - DSE Graph:
Traversing

Developer Day Cluster

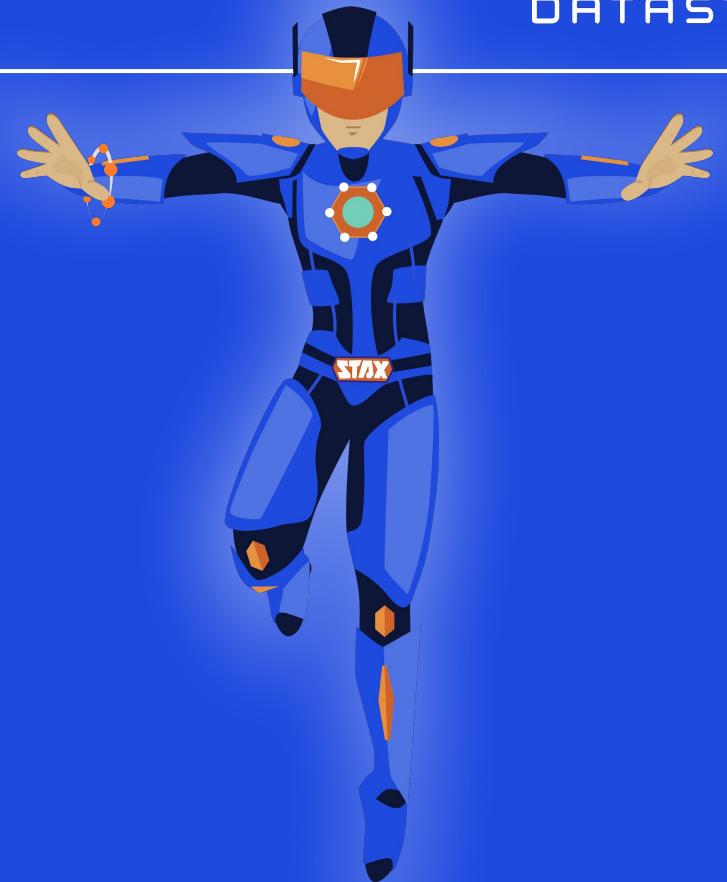
a few seconds ago ...



DSE Graph



Matching Graph Patterns

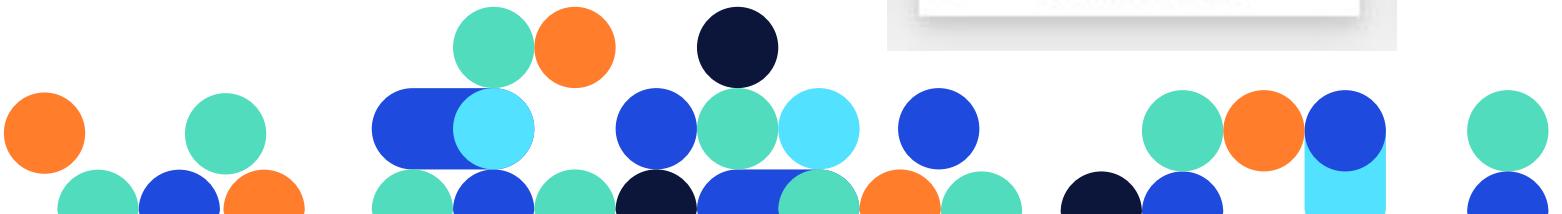
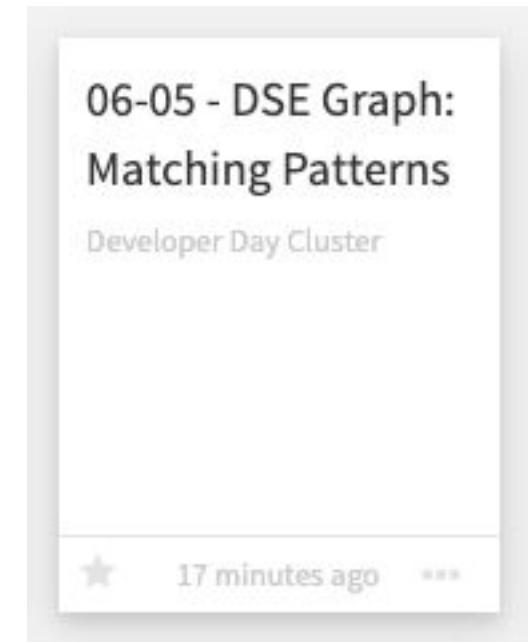


Comparing Imperative and Declarative Traversals

Time for an exercise!



“DSE Graph: Matching Patterns” Notebook



Next Steps

- Continue learning on DataStax Academy:
 - [DS330: DataStax Enterprise 6 Graph](#)
 - [DS332: DataStax Enterprise 6 Graph Analytics](#)

<https://academy.datastax.com>



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Thank You

