IBM Graph – Graph Database-as-a-Service
Managing Data and Its Relationships in a Cloud

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March 2, 2017 – GraphHPC-2017
From the “Moscow thaw: 1953-1968” exhibition at the Museum of Moscow
Why graph databases?

- Graphs are the natural way to store and query data
- Allow you to focus on the problem rather than the data model

Inspired by Alaa Mahmoud, “Building a Graph Database in the Cloud – Challenges and Advantages”, https://www.youtube.com/watch?v=NalS4q4n6sQ
Graph databases vs. Relational databases

```
SELECT Orders.OrderID, Customers.CustomerName, Orders.OrderDate
FROM Orders
INNER JOIN Customers
ON Orders.CustomerID = Customers.CustomerID
```

No more JOINs to find relationships!

g.V().hasLabel("Customer").out("Orders").values("CustomerName", "OrderDate")

Inspired by Alaa Mahmoud, "Building a Graph Database in the Cloud – Challenges and Advantages", https://www.youtube.com/watch?v=NaIS4q4n6sQ
Starting with a graph database

- Lots of pieces
- Hurdles of
  - Installing
  - Configuring
  - Maintaining
  - Administering

Inspired by Alaa Mahmoud, “Building a Graph Database in the Cloud – Challenges and Advantages”, https://www.youtube.com/watch?v=NalS4q4n6sQ
Cloud to the rescue

- Focus on the problem
- High availability
- Scalability
- Cost effective for startups and enterprises
- Security

Inspired by Alaa Mahmoud, "Building a Graph Database in the Cloud – Challenges and Advantages", https://www.youtube.com/watch?v=Na1s4q4n6sQ
Cloud is effective

- Sharing
- Automation

Inspired by Alaa Mahmoud, "Building a Graph Database in the Cloud – Challenges and Advantages", [https://www.youtube.com/watch?v=NaIS4q4n6sQ](https://www.youtube.com/watch?v=NaIS4q4n6sQ)
Sharing

Inspired by Alaa Mahmoud, "Building a Graph Database in the Cloud – Challenges and Advantages", [https://www.youtube.com/watch?v=NaIS4q4n6sQ](https://www.youtube.com/watch?v=NaIS4q4n6sQ)
What to host?

- No proprietary software
- Open Source
- Open Standards
- Apache Tinkerpop
- No vendor lock-in

Inspired by Alaa Mahmoud, "Building a Graph Database in the Cloud – Challenges and Advantages", https://www.youtube.com/watch?v=NaIS4q4n6sQ
IBM Graph

- IBM Graph – graph database-as-a-service

Advantages
- High availability
- Scalability
- 24x7 management

Features
- Based on the Apache TinkerPop.
- Apache TinkerPop v3 compatible API
- Full Apache TinkerPop v3 query language
- Simplified HTTP APIs
- Bluemix dashboard

- Offered on IBM Bluemix cloud platform-as-a-service
IBM Graph HTTP API

- /vertices to manage vertices
- /edges to manage edges
- /gremlin to query with gremlin queries
- /index to manage indexes
- /schema to create and view all existing indexes
Example: Music Festival
HTTP API: Add vertex ("attendee")

```python
def v1 = graph.addVertex("name", "Aaron Saul", label, "attendee", "age", 28, "gender", "male");
```

GDS_TOKEN="NTZmNTA5YTITC...mA91Ky93dFFpcTNTYVkvST0="
API_URL="https://ibmgraph-alpha.eu-gb.bluemix.net/9cf...fa2"
curl \
  -X POST \
  -H "Authorization: gds-token $GDS_TOKEN" \
  -H 'Content-Type: application/json' \
  $API_URL/g/vertices \
  -d '{"label": "attendee", "properties": {"name": "Aaron Saul", "age": 28, "gender": "male"}}'

```
{"requestId":"cf...e0","status":{"message":","code":200,"attributes":{}},'result':{"data":[{"id":4104,"label":"attendee","type":"vertex ","properties":{"gender":{"id":"16p-360-1ll","value":"male"}},"name":{"id":"1kx-360-s1","value":"Aaron Saul"},"age":{"id":"1z5-360-2dh","value":28}]}],"meta":{}}
```
HTTP API: Add vertex ("band")

```python
def v2 = graph.addVertex("name", "Declan McKenna", label, "band", "genre", "Folk", "monthly_listeners", "192302");
```

GDS_TOKEN="NTZmNTA5YTITC...mA91Ky93dFFpcTNYVkvST0="
API_URL="https://ibmgraph-alpha.eu-gb.bluemix.net/9cf...fa2"
curl \
-X POST \ 
-H "Authorization: gds-token $GDS_TOKEN" \ 
-H 'Content-Type: application/json' \ 
$API_URL/g/vertices \ 
-d '{"label": "band", "properties": {"name": "Declan McKenna", "genre": "Folk", "monthly_listeners": "192302"}}'```

```json
{"requestId":"f0...50","status":{"message":"","code":200,"attributes":{}},"result":{"data": [{"id":40964264,"label":"band","type":"vertex","properties":{"monthly_listeners": [{"id":ody51-oe088-3yd","value":"192302"}],"name": [{"id":odyj9-oe088-sl","value":"Declan McKenna"}],"genre": [{"id":odyxh-oe088-35x","value":"Folk"}]}}],"meta":{}}}
```
HTTP API: Add edge ("bought_ticket")

v1.addEdge("bought_ticket", v2);

GDS_TOKEN="NTZmNTA5YTITC...mA91Ky93dFFpcTNTYVkvST0="
API_URL="https://ibmgraph-alpha.eu-gb.bluemix.net/9cf...fa2"
curl \
   -X POST \
   -H "Authorization: gds-token $GDS_TOKEN" \
   -H 'Content-Type: application/json' \n   $API_URL/g/edges \
   -d '{"label": "bought_ticket", "outV": 4104, "inV": 40964264, "properties": {"date": "Feb 28, 2017", "time": "21:00"}}'

{"requestId": "cf...e7", "status": {"message": ", "code": 200, "attributes": {}}, "result": {"data": [{"id": "odxc1-360-8phoe088", "label": "bought_ticket", "type": "edge", "inVLabel": "band", "outVLabel": "attendee", "inV": 40964264, "outV": 4104, "properties": {"date": "Feb 28, 2017", "time": "21:00"}}]}, "meta": {}}
Getting “IBM Graph Essentials” badge

- IBM Open Badge
IBM Bluemix and IBM Graph: Getting started
Resources

- IBM Graph – https://ibm.biz/ibm-graph

- Alaa Mahmoud, "Building a Graph Database in the Cloud – Challenges and Advantages", Graph Day / DataDayTexas 2017, Jan 14 – https://www.youtube.com/watch?v=NaIS4q4n6sQ

- IBM Graph public Slack channel – http://ibm-graph-slackinvite.mybluemix.net

- Apache Tinkerpop – https://tinkerpop.apache.org
More resources

- Docs: https://ibm-graph-docs.ng.bluemix.net/
- Twitter: https://twitter.com/IBMGraph
- Stack Overflow: http://stackoverflow.com/questions/tagged/ibm-graph
- Experts
  - Alaa Mahmoud: https://twitter.com/alaa_mahmoud
  - Michael Elsmore: https://twitter.com/ukmadlz
  - Kamal Shannak: https://twitter.com/shannakam
- Tutorials
  - https://developer.ibm.com/clouddataservices/2016/11/15/7-databases-7-days-ibm-graph/
- Examples
  - http://bacon.mybluemix.net/
Conclusion

- Graphs are the natural way to store and query data
- No more JOINs!
- Cloud to the rescue
- IBM Graph – graph database-as-a-service
- Interface:
  - Bluemix GUI
  - HTTP API
- IBM Graph Essentials – earn an Open Badge for your knowledge
- Sign in for a Bluemix trial
Backup slides
What to offer: A shared multi-tenant instance

Inspired by Alaa Mahmoud, "Building a Graph Database in the Cloud – Challenges and Advantages", https://www.youtube.com/watch?v=NalS4q4n6sQ
What to offer: A shared multi-tenant + partition keys

Inspired by Alaa Mahmoud, “Building a Graph Database in the Cloud – Challenges and Advantages”, https://www.youtube.com/watch?v=NaIS4q4n6sQ
What to offer: An instance for each user

Inspired by Alaa Mahmoud, “Building a Graph Database in the Cloud – Challenges and Advantages”, https://www.youtube.com/watch?v=NaI54q4n6sQ
Continuous monitoring

Inspired by Alaa Mahmoud, “Building a Graph Database in the Cloud – Challenges and Advantages”, [https://www.youtube.com/watch?v=NaIS4q4n6sQ](https://www.youtube.com/watch?v=NaIS4q4n6sQ)
Continuous delivery

Inspired by Alaa Mahmoud, "Building a Graph Database in the Cloud – Challenges and Advantages", [https://www.youtube.com/watch?v=Nal4q4n6sQ](https://www.youtube.com/watch?v=Nal4q4n6sQ)
Cloud platform as a Service (IaaS – PaaS – SaaS)
- create,
- deploy, and
- manage applications on the cloud

Based on Cloud Foundry, an open source PaaS

Runs on IBM SoftLayer infrastructure

Bluemix Essentials badge
https://www.youracclaim.com/org/ibm/badge/bluemix-essentials
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    - Blockchain
  - System z
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