



# NebulaGraph

## NebulaGraph Database

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v3.3.0

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# 1. NebulaGraph 3.3.0

---

## Note

2023-1-13 GitHub commit [c8ce6ea2](#) " " #C65467

## Compatibility

NebulaGraph 3.2 Tag NebulaGraph 3.3.0 Tag

NebulaGraph

## 1.1

---

- 
- [NebulaGraph](#)
- 
- 
- [nGQL](#)
- [FAQ](#)
- 

## 1.2

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- [NebulaGraph 3.3.0](#)
- [NebulaGraph Studio](#)
- [NebulaGraph Dashboard](#)
- [NebulaGraph Dashboard](#)
- [NebulaGraph Explorer](#)

## 1.3

---

- [Nebula Graph](#)
- 
- 
- 
- 

## 1.4

---

## Note

 **Caution**

caution

 **Danger**

danger

 **Performance** **Faq** **Compatibility**

nGQL   openCypher      nGQL

 **Enterpriseonly**

## 1.5

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NebulaGraph    Markdown

---

:January 13, 2023

## 2.

---

- 03 45



- 02 24



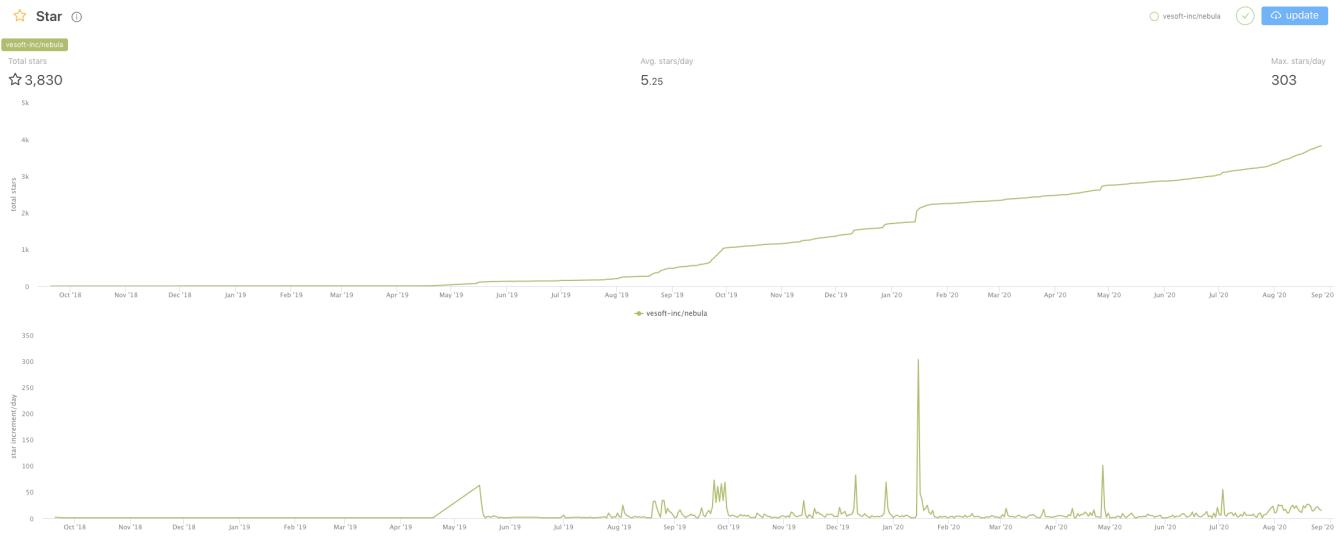
### 2.1

---

Amazon Facebook

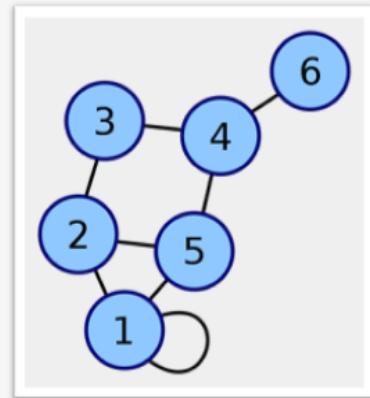
#### 2.1.1

NebulaGraph GitHub

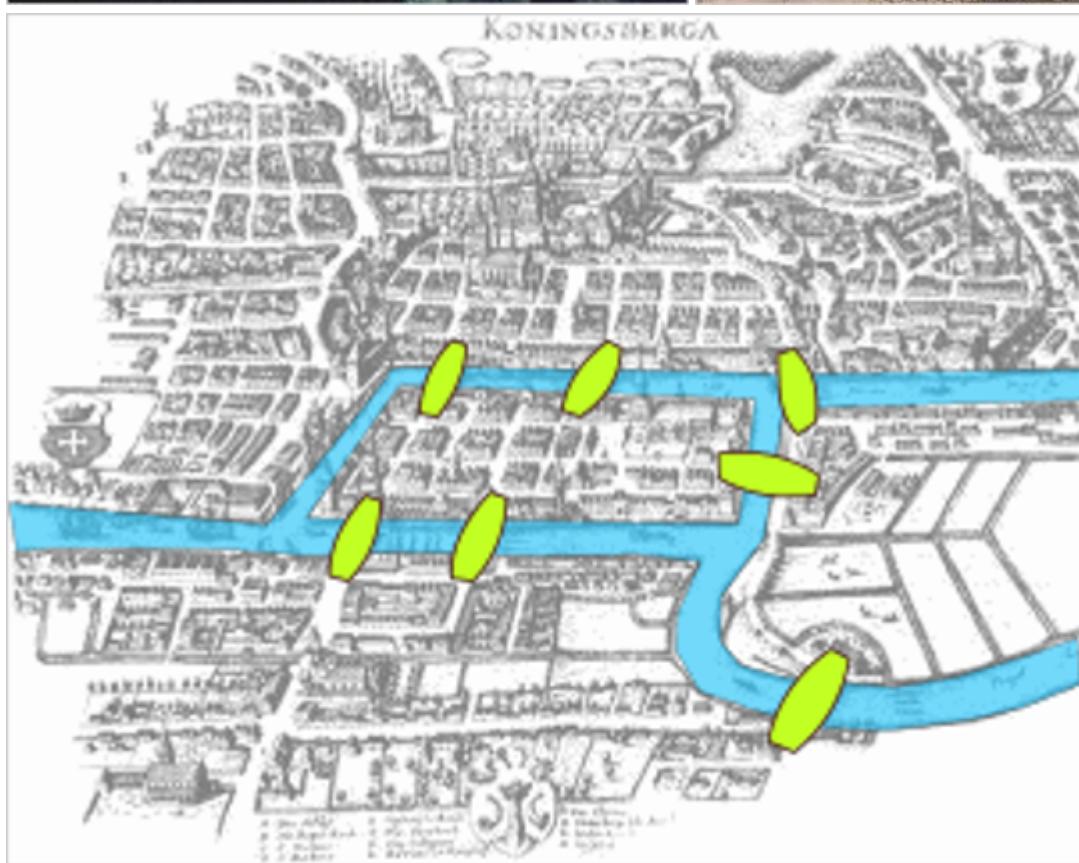




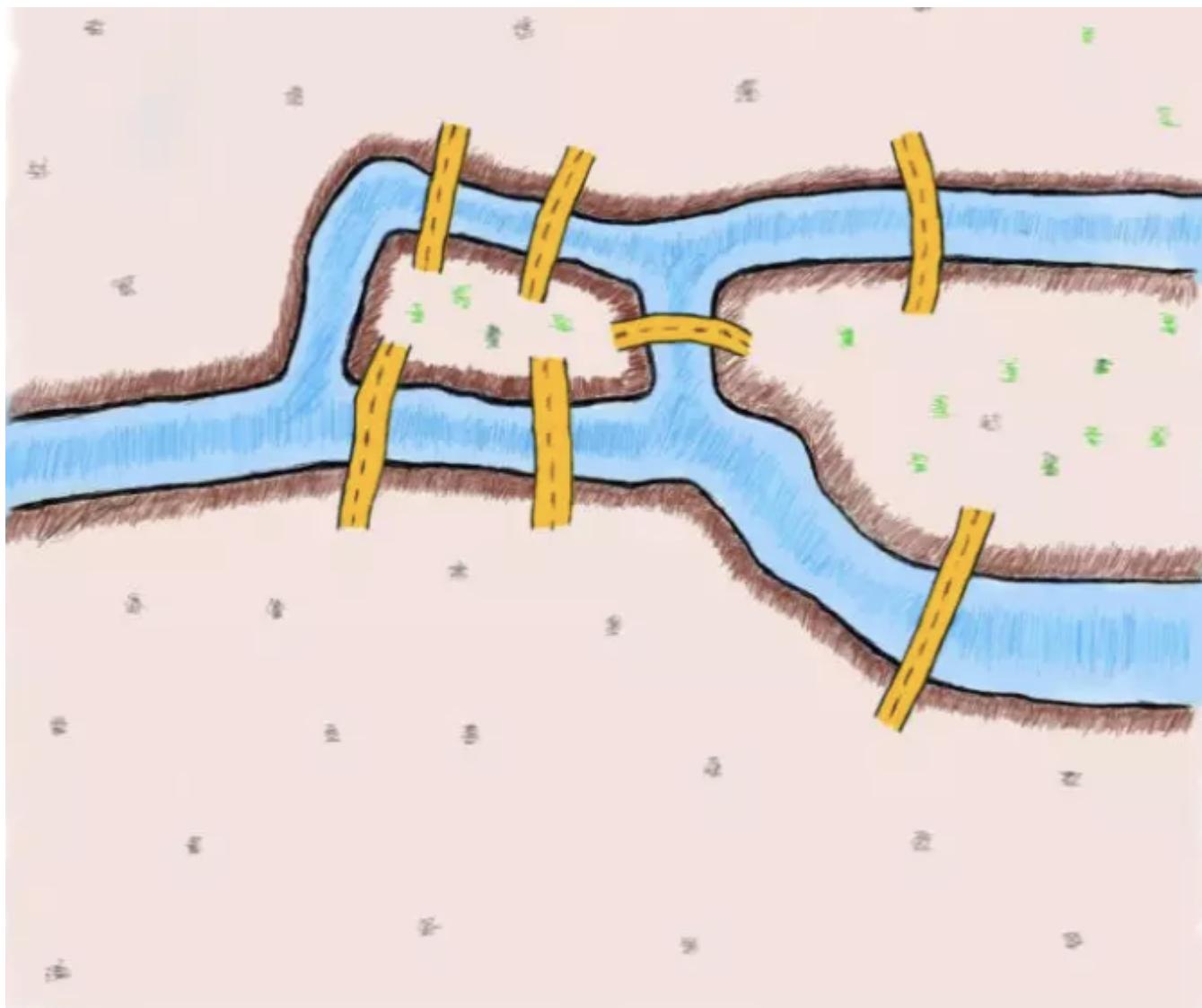
Graph: Image, Visual



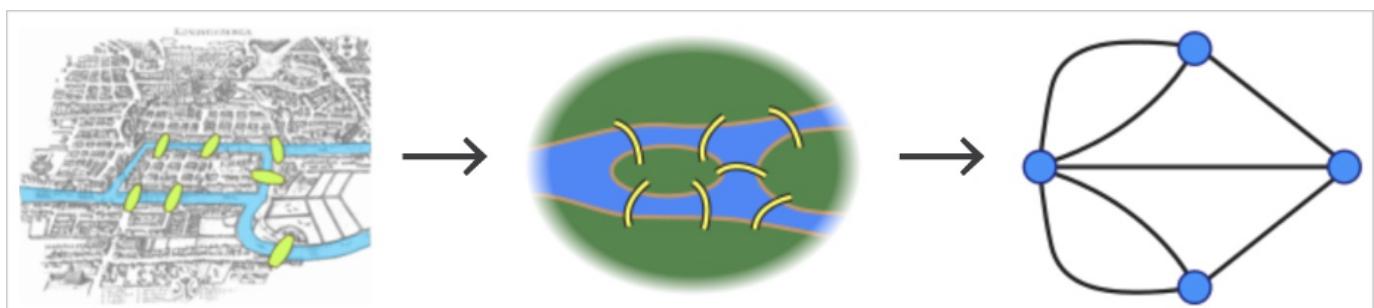
Graph: Network, Connection, Linked Data



1



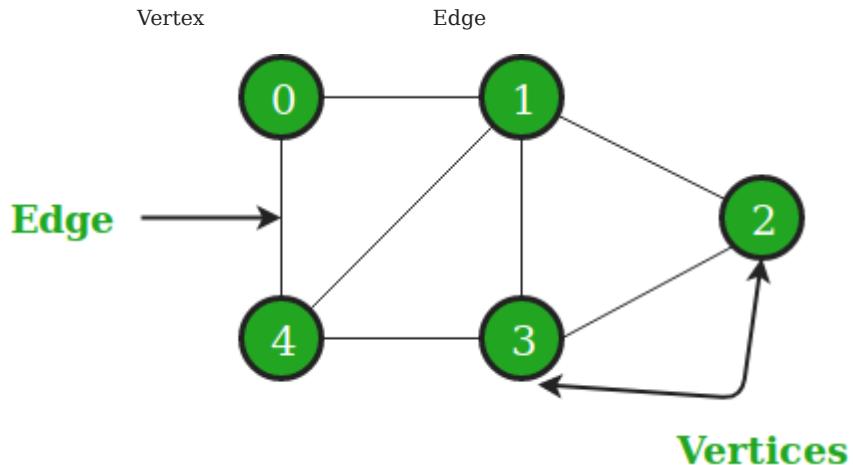
1735



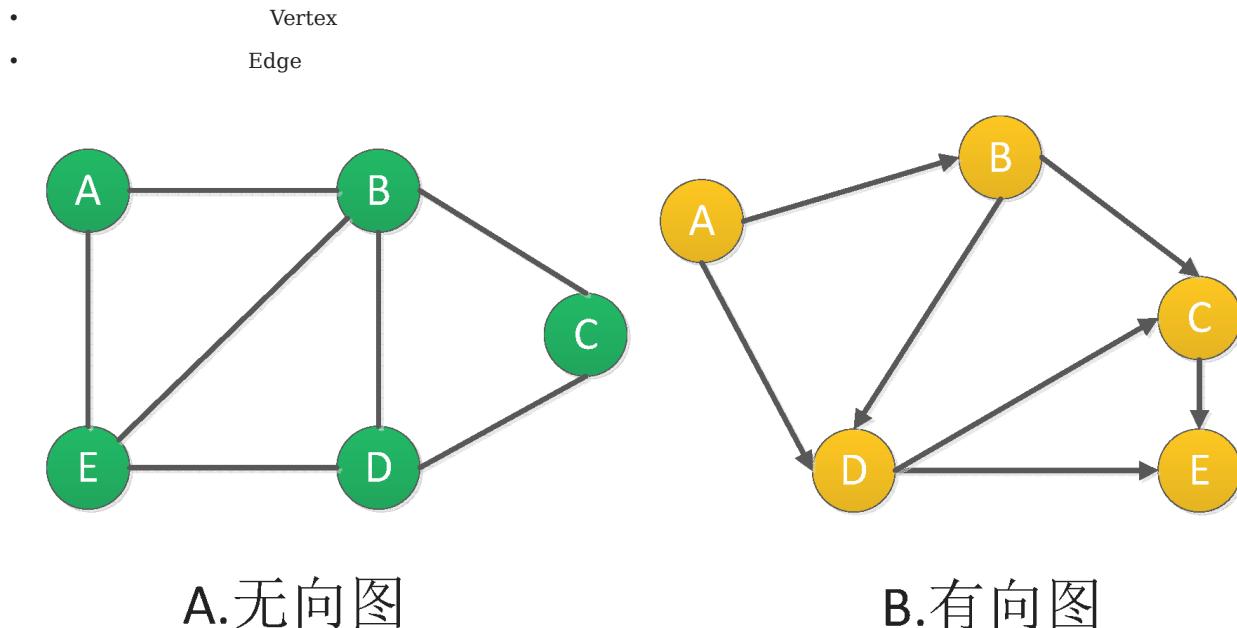
Graph

“ ” “ ”

1878

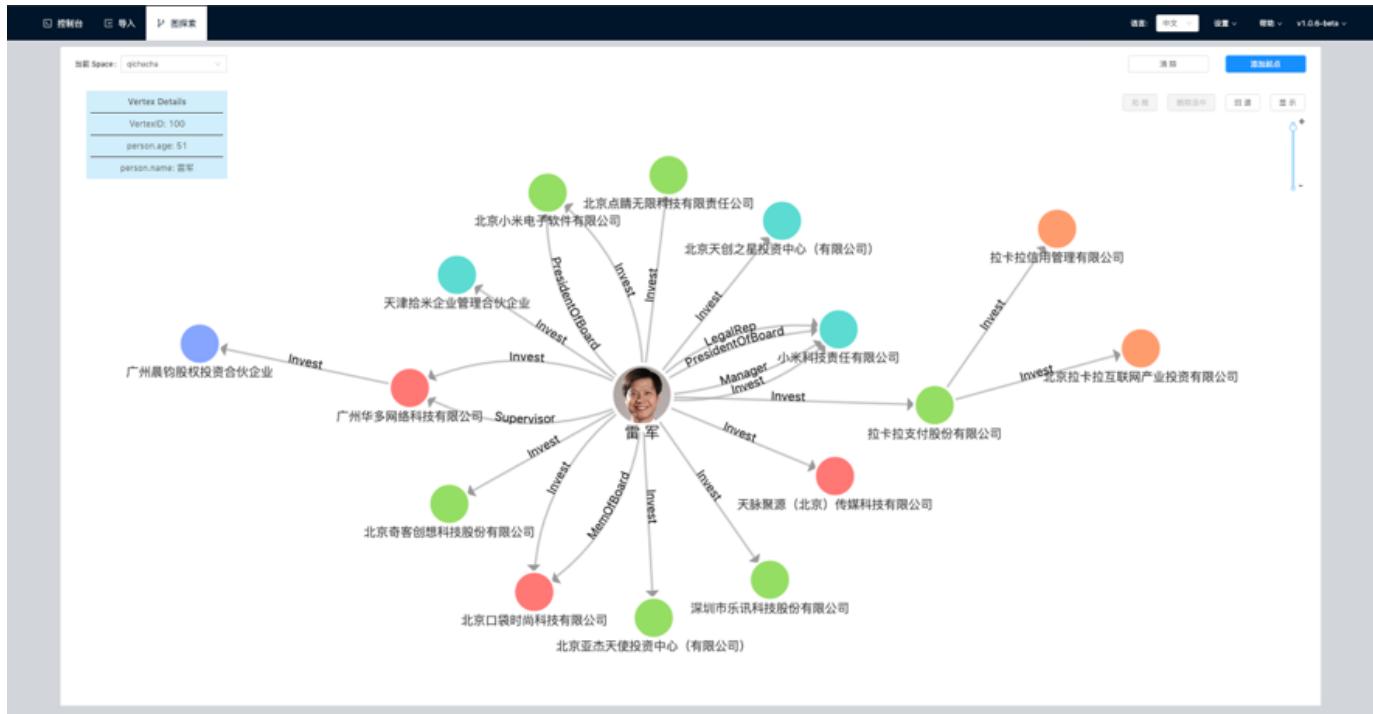


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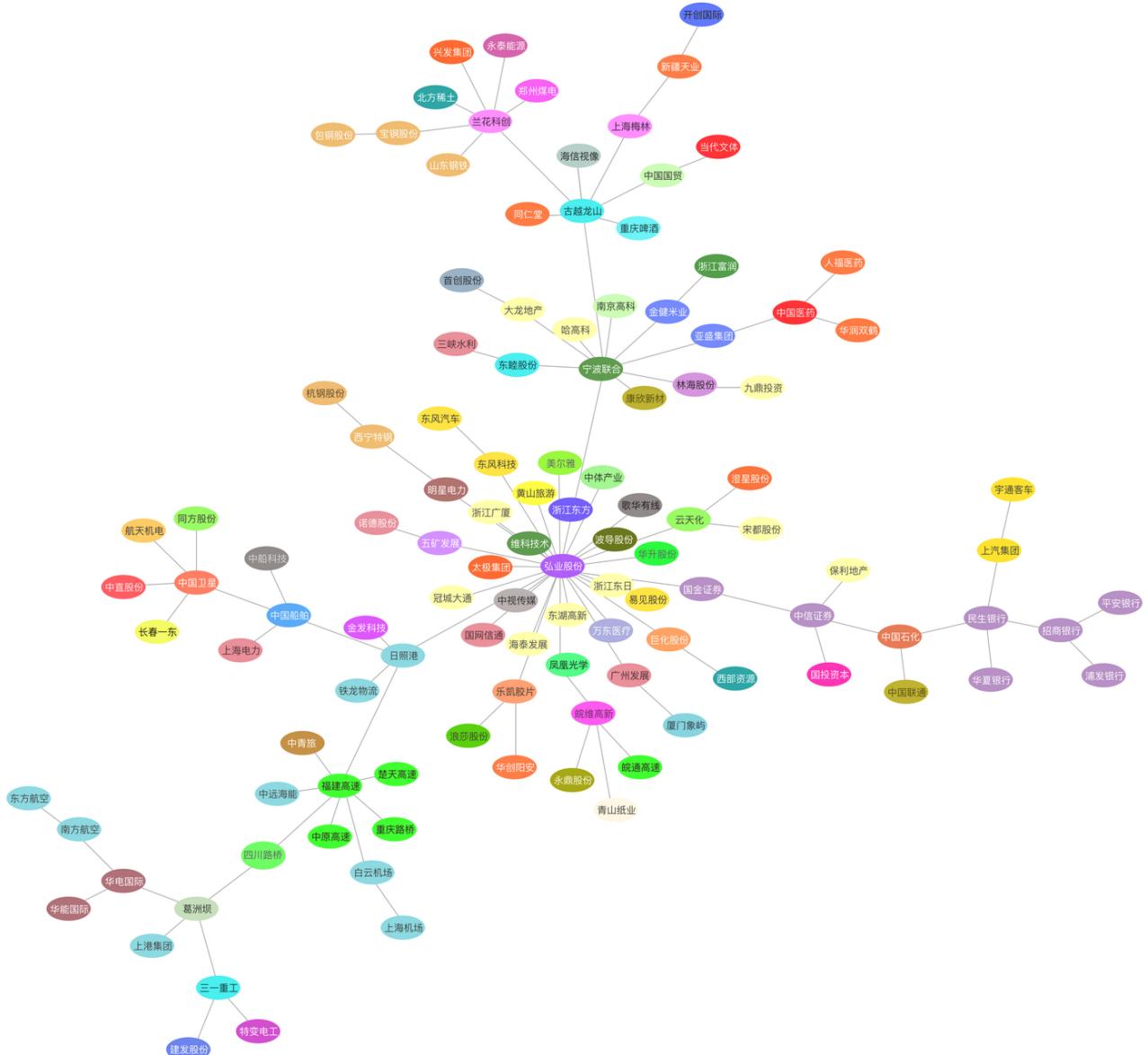


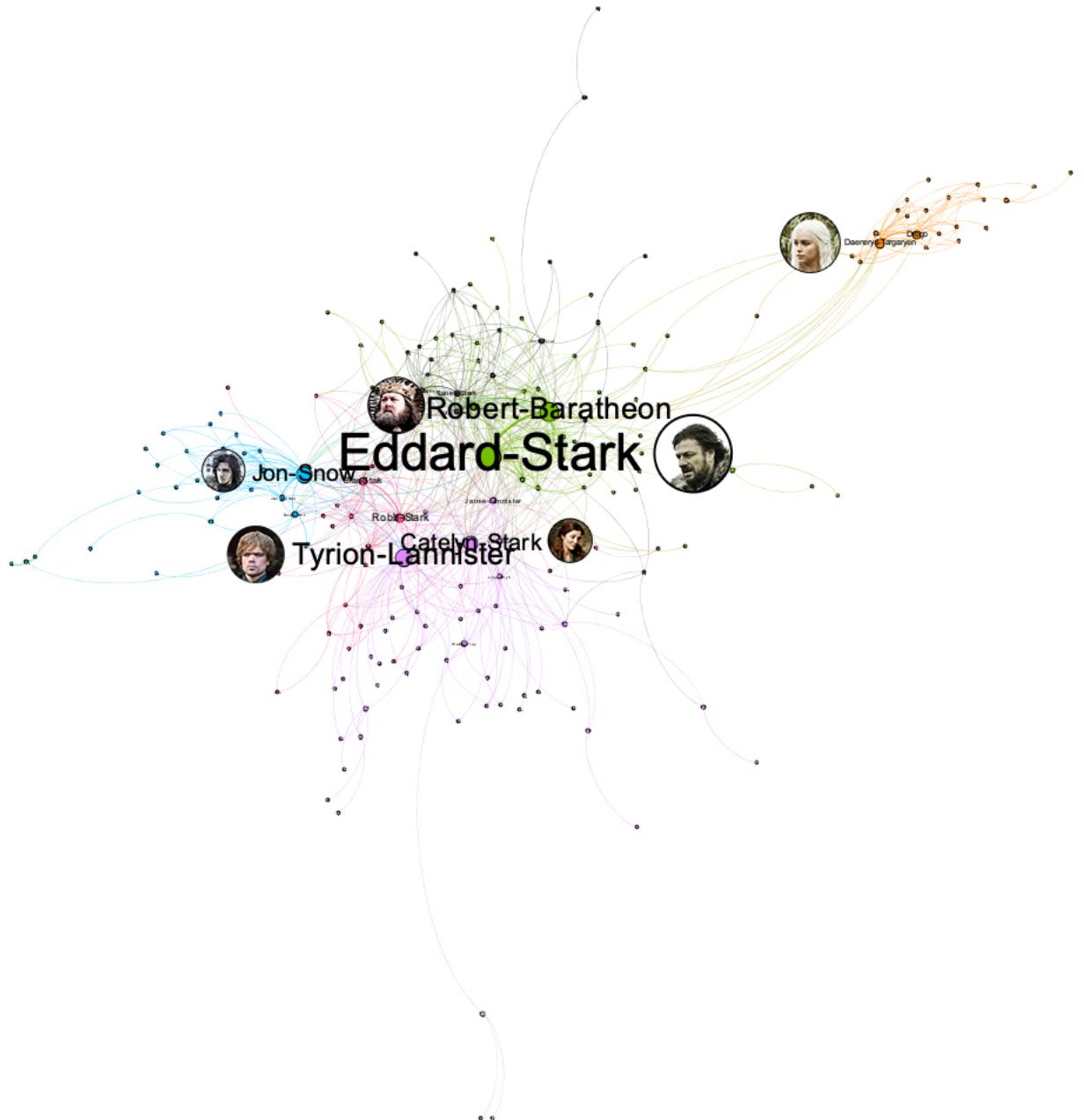
properties

BOSS



2





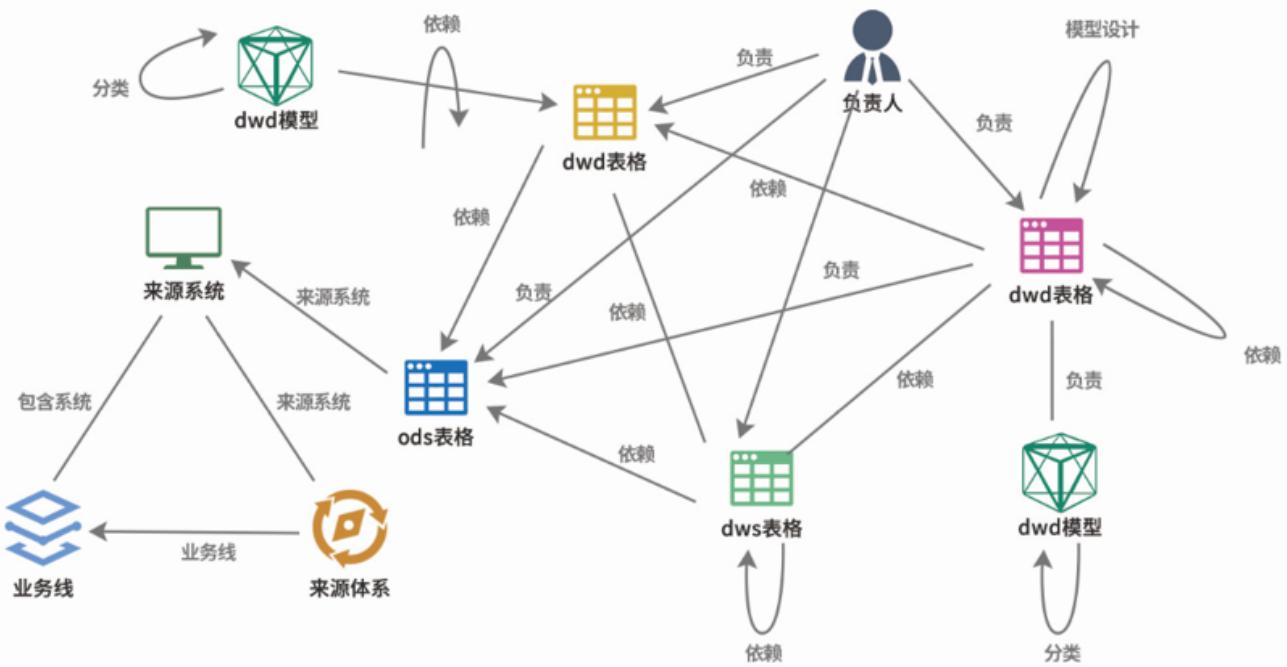
IT

Hive

Job

ETL <sup>4</sup>

ETL



IT

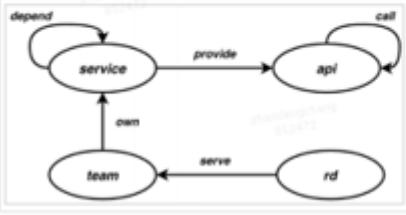
5

(99.99%)

### 服务治理

- 图谱数据
  - 将RPC服务调用关系写入图谱
  - 包含service、api、team等4类实体及5类关系
  - 点边数量在百万级别，实时写入
  - 用于服务链路治理和告警优化

```
//查找API com.sankuai.ia.search.api:SearchControllerV2.search过去七天可用率低于99.99%的链路的thrift调用，最大图遍历深度为10
GO 1 TO 10 STEPS FROM hash("com.sankuai.ia.search.api:SearchControllerV2.search") OVER call WHERE call.availability>0 AND call.availability<1000000 AND $$.api.type=="mthrift" YIELD call._src,call._dst
```



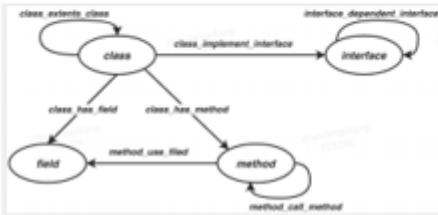
```
//查找所有java类型服务提供的API，并统计其会影响的上游API的数量，从高到低排序看影响次数大小（调用的可用率小于4个9）
LOOKUP ON service WHERE service.type=="java"
| GO FROM $-.VertexID OVER provider YIELD
provider._dst AS java_api_id
| GO FROM $-.java_api_id OVER call REVERSELY WHERE
call.availability>0 AND call.availability<1000000
YIELD call_src AS api_src, call_dst AS api_dst
| GROUP BY $-.api_src YIELD $-.api_src AS api_id,
count(1) AS call_cnt
| ORDER BY call_cnt DESC
| FETCH PROP ON api $-.api_id YIELD
api.appkey,api.method,$-.call_cnt
```

5

### 代码依赖分析

- 图谱数据
  - 将公司代码库中代码的依赖关系写入图谱
  - 包含method, field, class, interface等4类顶点，7类关系
  - 点边数量在千万级别，实时写入
  - 用于QA精准测试
    - PR向代码仓库提交PR后，能查询出所修改代码能影响到的外部接口，并展示调用路径

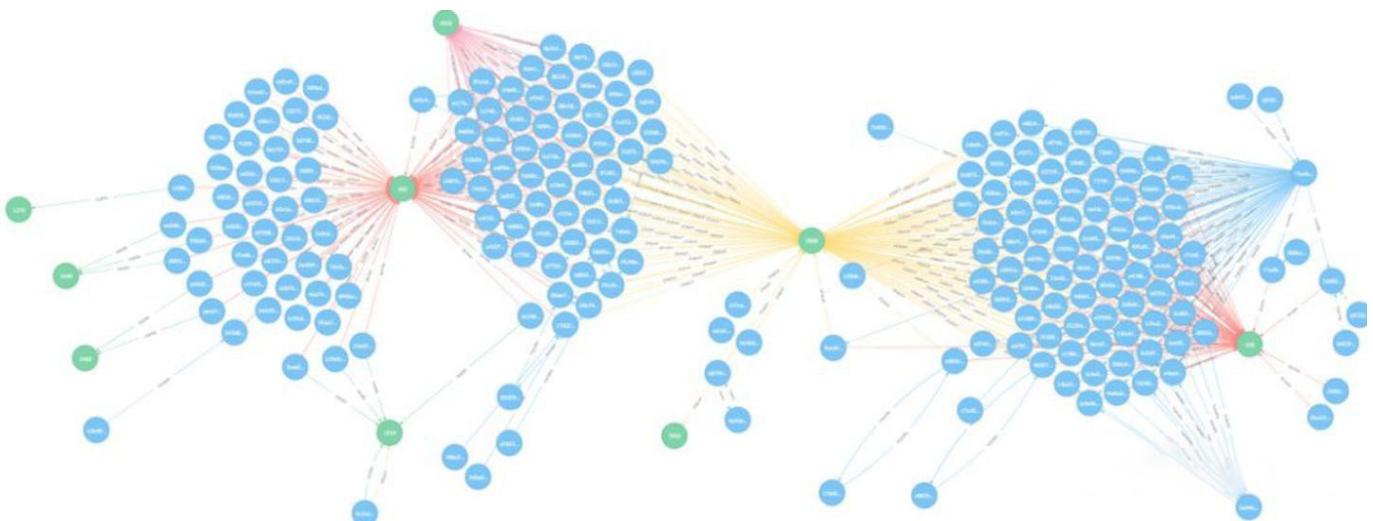
```
//查找最外层method到某个method的所有无环路径
(GO 1 to 30 STEPS FROM 2946345526231222882 OVER
method_call_method REVERSELY YIELD DISTINCT
method_call_method._dst AS id
MINUS
GO 1 to 30 STEPS FROM 2946345526231222882 OVER
method_call_method REVERSELY YIELD DISTINCT
method_call_method._src as id )
| FIND NOLOOP path FROM $-.id TO
2946345526231222882 OVER method_call_method UPTO
30 STEPS
```

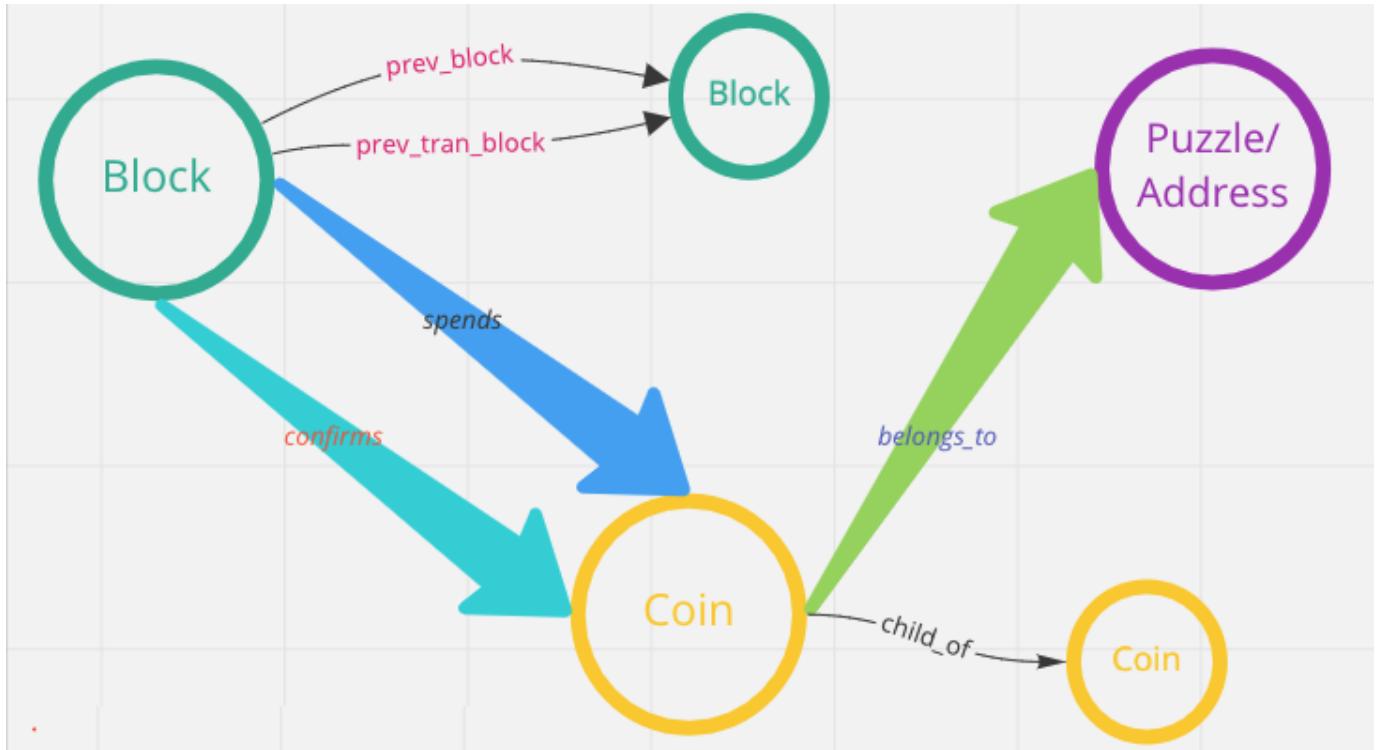


```
//确认两个method间是否有路径
FIND SINGLE SHORTEST PATH FROM hash("method1")
TO hash("method2") OVER method_call_method UPTO
30 STEPS
```

6

“ “ “ ”

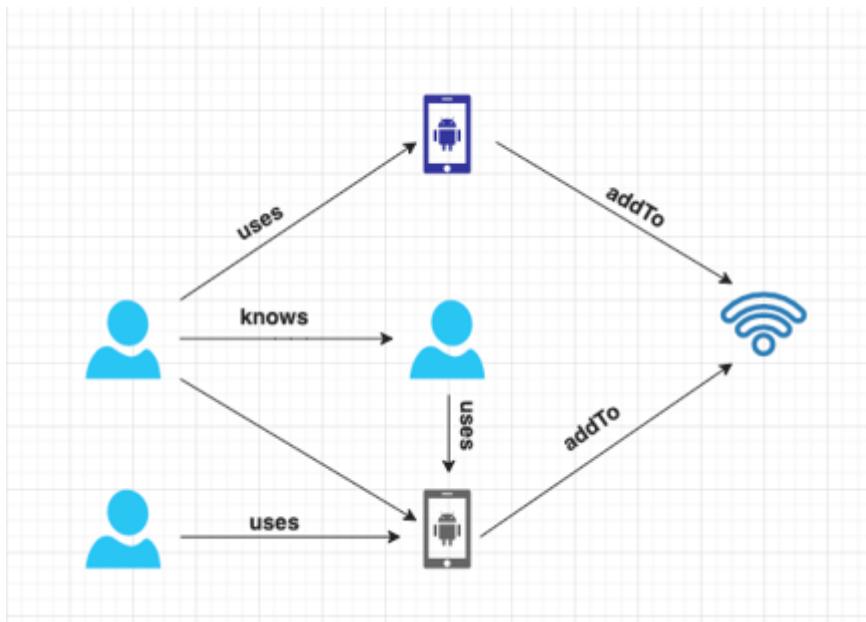




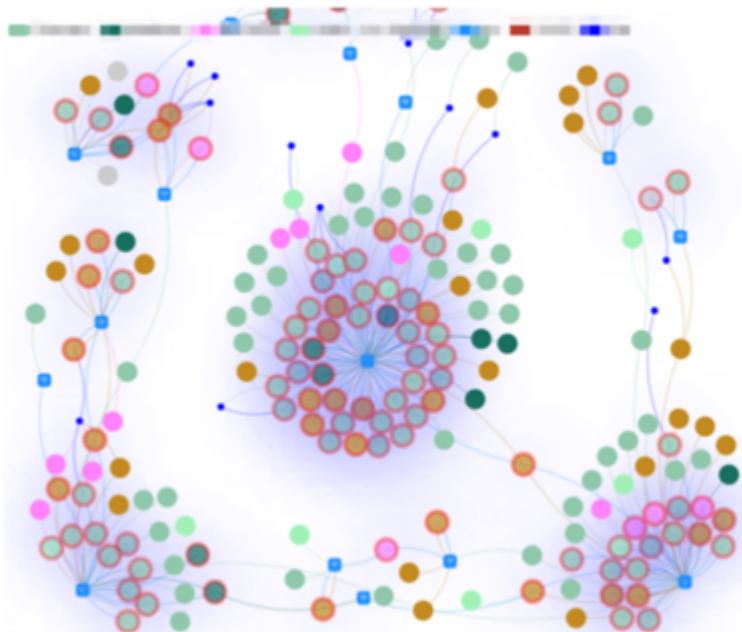
7

WIFI

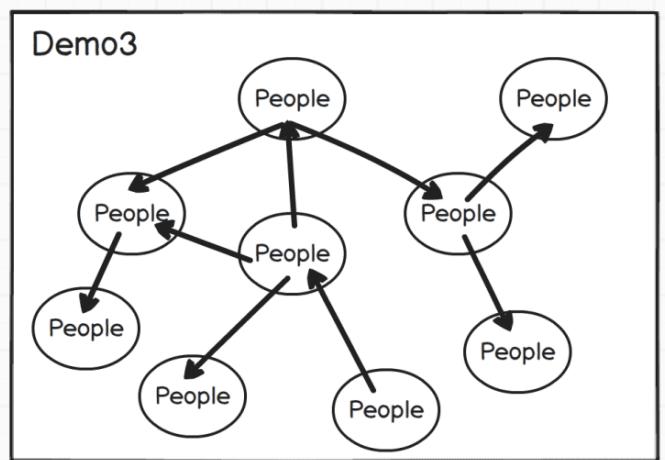
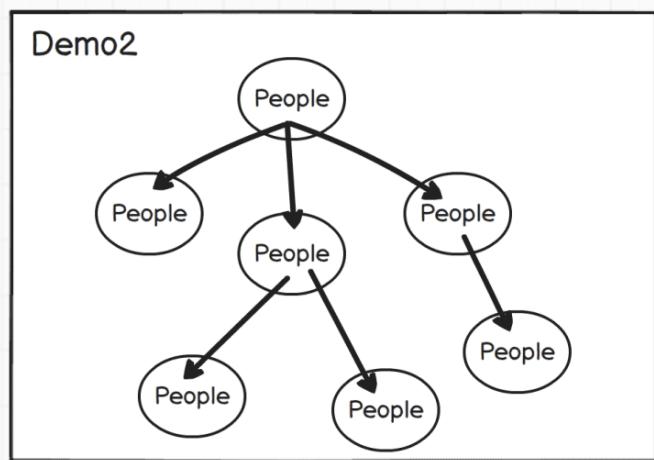
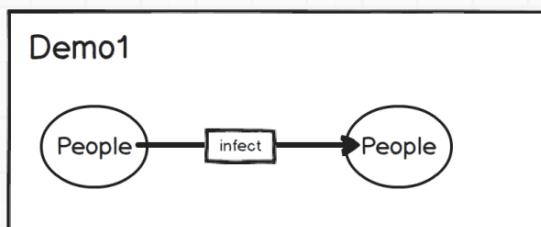
WIFI



360 7 8 9 10



11

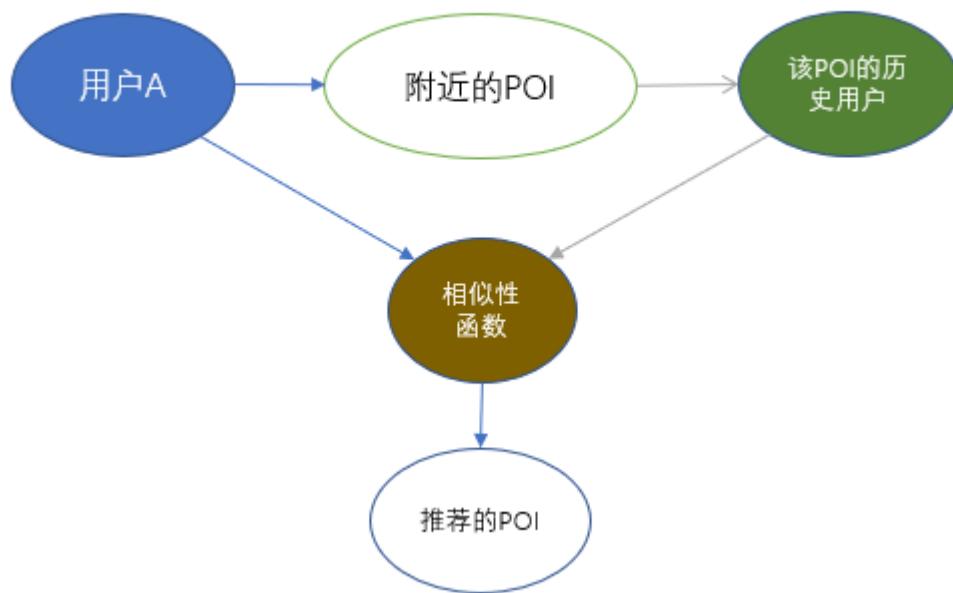


O2O

POI Point-of-Interest

12

APP



**Screenshot 1: 搜索结果 - 望京 新荟城**

- 目的地: 望京 新荟城
- 新荟城: 48美食 16购物 8休闲娱乐 7丽人 6亲子 648m  
包含「东方饺子王」等人气美食店
- 附近商户: 海底捞火锅 (望京新荟城店)
- 附近餐厅: 得尚闻烤鱼 (新荟城购物中心)

**Screenshot 2: 搜索结果 - 望京soho**

- 目的地: 望京soho
- 望京SOHO: 望京 商务楼 1.4km  
评分: 4.9/5, 2414条评价, ¥87  
描述: “北京最适合拍豪华夜景的地方”
- 附近餐厅: 香港汇, 望京一号, 七号八号·小酒小菜

**Screenshot 3: 搜索结果 - 望京SOHO**

- 目的地: 望京SOHO
- 望京SOHO: 望京 商务楼 1.4km  
评分: 4.9/5, 2414条评价, ¥87  
描述: “北京最适合拍豪华夜景的地方”
- 附近餐厅: 香港汇, 望京一号, 七号八号·小酒小菜

vivo OPPO

### 2.1.3

XML/JSON

• “ ” “ ”

数据表格

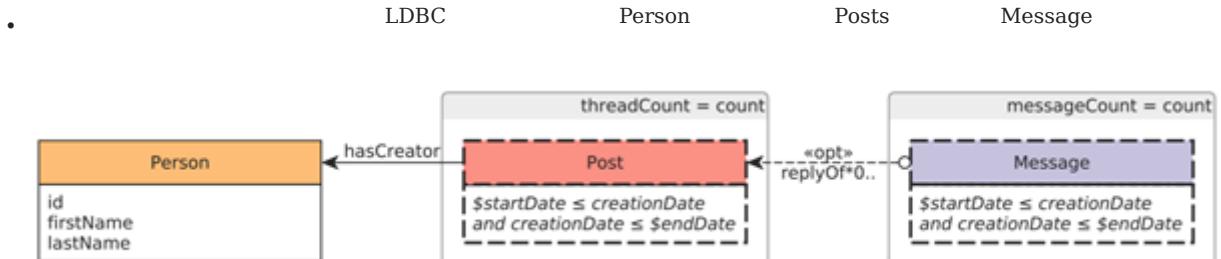
节点 边 配置 添加节点 添加边 搜索/替换 输入电子表格 输出表格 更多功能 过滤: Id

Id	Label	Interval	Modularity Class	betweenness	community	
-4364237027732478972	Arya-Stark		4	0.017495	0	
-4973959390558533367	Gendry		0	0.0	0	
-7025436182975816947	Hallis-Mollen		5	0.0	0	
8249703968876499989	Raymun-Darry		0	0.0	0	
-9085767779232784107	Hobb		3	0.0	1	
7505218728385384214	Randyll-Tarly		3	0.0	1	
5114251854412197144	Viserys-Targaryen		7	0.002858	2	
-2958304360028784612	Jonos-Bracken		2	0.0	3	
-4359919586974142177	Lancel-Lannister		0	0.0	0	
7195357273749773604	Robb-Stark		5	0.072984	0	
1075531505424338989	Marq-Piper		4	0.006237	0	
-3670573862518875597	Addam-Marbrand		2	0.0	0	
3931316780000927284	Robert-Arryn		2	0.0	0	
4826030504180653879	Irri		7	0.000096	2	
7181995877190281794	Jommo		7	0.0	2	
1787258805162148944	Eddard-Stark		0	0.269604	0	
-558158798715221422	Danwell-Frey		1	0.021389	4	
-2434779847791595692	Mordane		4	0.001056	0	
8409318129262644314	Clydas		3	0.0	1	
-1738391870688186527	Karyl-Vance		2	0.010753	5	
6902668443292429674	Haggo		7	0.000068	2	
95861621849685359	Mya-Stone		2	0.0	0	
2025059960255100299	Porther		0	0.0	0	
-1967336888960310122	Colemon		2	0.0	0	
5894253429758865049	Ilyn-Payne		4	0.00032	0	
-1356662602606843742	Pycelle		0	0.000321	0	
382702656484230079	Gared		6	0.004328	1	
1306559795724859089	Jorah-Mormont		7	0.012611	2	
-96410199981447977	Cayn		0	0.000022	0	
7160113306884551800	Chella		2	0.0	0	

添加列 和并列 删除列 清除列 复制数据到其它列 填写数值到列 复制列数据 从正则表达式中新建一个布尔列 新建一列 (列表或者正则表达式匹配组合) 布尔值求反 列转换为动态







## PostgreSQL

```
--PostgreSQL
WITH RECURSIVE post_all(psa_threadid
    , psa_thread_creatorid, psa_messageid
    , psa_creationdate, psa_messagestype
) AS (
    SELECT m_messageid AS psa_threadid
    , m_creatorid AS psa_thread_creatorid
    , m_messageid AS psa_messageid
    , m_creationdate, 'Post'
    FROM message
    WHERE 1=1 AND m_c_replyof IS NULL -- post, not comment
    AND m_creationdate BETWEEN :startDate AND :endDate
UNION ALL
    SELECT psa.psa_threadid AS psa_threadid
    , psa.psa_thread_creatorid AS psa_thread_creatorid
    , m_messageid, m_creationdate, 'Comment'
    FROM message p, post_all psa
    WHERE 1=1 AND p.m_c_replyof = psa.psa_messageid
    AND m_creationdate BETWEEN :startDate AND :endDate
)
SELECT p.p_personid AS "person.id"
    , p.p_firstname AS "person.firstName"
    , p.p_lastname AS "person.lastName"
    , count(DISTINCT psa.psa_threadid) AS threadCount
END) AS messageCount
    , count(DISTINCT psa.psa_messageid) AS messageCount
FROM person p left join post_all psa on (
    1=1 AND p.p_personid = psa.psa_thread_creatorid
    AND psa_creationdate BETWEEN :startDate AND :endDate
)
GROUP BY p.p_personid, p.p_firstname, p.p_lastname
ORDER BY messageCount DESC, p.p_personid
LIMIT 100;
```

## Cypher

```
--Cypher
MATCH (person:Person)-[:HAS_CREATOR]-(post:Post)-[:REPLY_OF*0..]->(reply:Message)
WHERE post.creationDate >= $startDate AND post.creationDate <= $endDate
    AND reply.creationDate >= $startDate AND reply.creationDate <= $endDate
RETURN
    person.id, person.firstName, person.lastName, count(DISTINCT post) AS threadCount,
    count(DISTINCT reply) AS messageCount
ORDER BY
    messageCount DESC, person.id ASC
LIMIT 100
```

	SQL	join	Neo4j	12
--	-----	------	-------	----

深度	关系型数据库的执行时间(s)	Neo4j的执行时间(s)	返回的记录条数
2	0.016	0.01	~2500
3	30.267	0.168	~110000
4	1543.505	1.359	~600000
5	未完成	2.132	~800000

## 关系数据库 vs 图数据库(多跳查询)

- IT
- 13 (IT)
- 2019 Gartner 27% 500 20%

#### 2.1.4 RDF

---

##### RDF

---

1. <https://medium.freecodecamp.org/i-dont-understand-graph-theory-1c96572a1401>. ↪
  2. <https://nebula-graph.com.cn/posts/stock-interrelation-analysis-jgraphnt-nebula-graph/> ↪
  3. <https://nebula-graph.com.cn/posts/game-of-thrones-relationship-networkx-gephi-nebula-graph/> ↪
  4. <https://nebula-graph.com.cn/posts/practicing-nebula-graph-webank/> ↪
  5. <https://nebula-graph.com.cn/posts/meituan-graph-database-platform-practice/> ↪ ↪
  6. <https://zhuanlan.zhihu.com/p/90635957> ↪
  7. <https://nebula-graph.com.cn/posts/graph-database-data-connections-insight/> ↪ ↪
  8. <https://nebula-graph.com.cn/posts/kuaishou-security-intelligence-platform-with-nebula-graph/> ↪
  9. <https://nebula-graph.com.cn/posts/nebula-graph-for-social-networking/> ↪
  10. <https://mp.weixin.qq.com/s/K2QinpR5Rplw1teHpHtf4w> ↪
  11. <https://nebula-graph.com.cn/posts/detect-corona-virus-spreading-with-graph-database/> ↪
  12. <https://nebula-graph.com.cn/posts/meituan-graph-database-platform-practice/> ↪ ↪
  13. <https://arxiv.org/abs/1709.03188> ↪
- 

: January 13, 2023

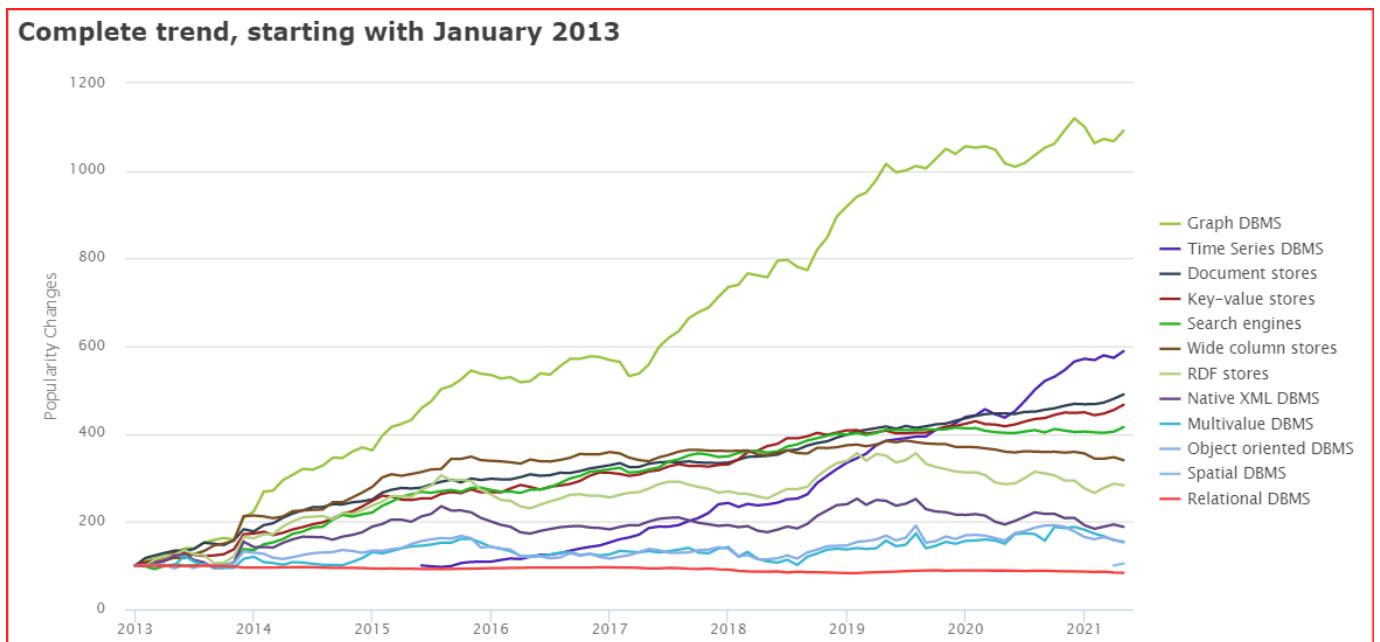
## 2.2

TTL              UDF

### 2.2.1

#### DB-Engines

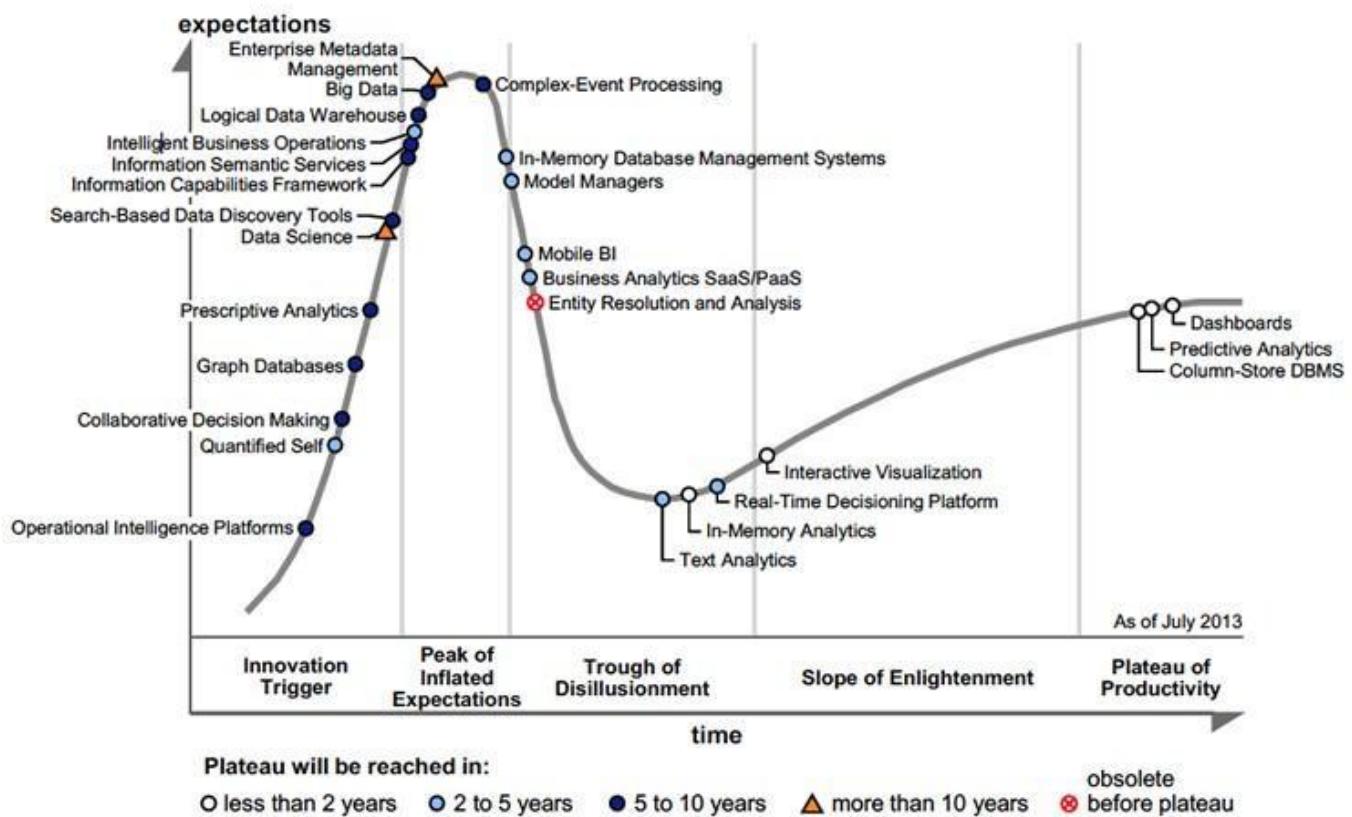
DB-Engines.com	2013	"	"	1			
		Google		IT		371	12
							12



#### Gartner

Gartner 2013 2 " " Big Data

Figure 1. Hype Cycle for Business Intelligence and Analytics, 2013



BI = business intelligence; DBMS = database management system; SaaS = software as a service; PaaS = platform as a service

"2021

④

# Gartner Top 10 Data and Analytics Trends, 2021



## Accelerating Change

- 1** Smarter, Responsible, Scalable AI
- 2** Composable Data and Analytics
- 3** Data Fabric Is the Foundation
- 4** From Big to Small and Wide Data



## Operationalizing Business Value

- 5** XOps
- 6** Engineering Decision Intelligence
- 7** D&A as a Core Business Function



## Distributed Everything

- 8** Graph Relates Everything
- 9** The Rise of the Augmented Consumer
- 10** D&A at the Edge

[gartner.com/SmarterWithGartner](http://gartner.com/SmarterWithGartner)

Source: Gartner  
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**Gartner**

"

Graph Relates Everything

Gartner 2025

2021 10% 80%

Gartner

DB-Engines

verifiedmarketresearch<sup>4</sup>, fnfresearch<sup>5</sup>, marketsandmarkets<sup>6</sup>, gartner<sup>7</sup>  
 (CAGR) 30-40 5-10%

2019 8 6 25%



## Global Graph Database Market, 2019-2026

\$4.13

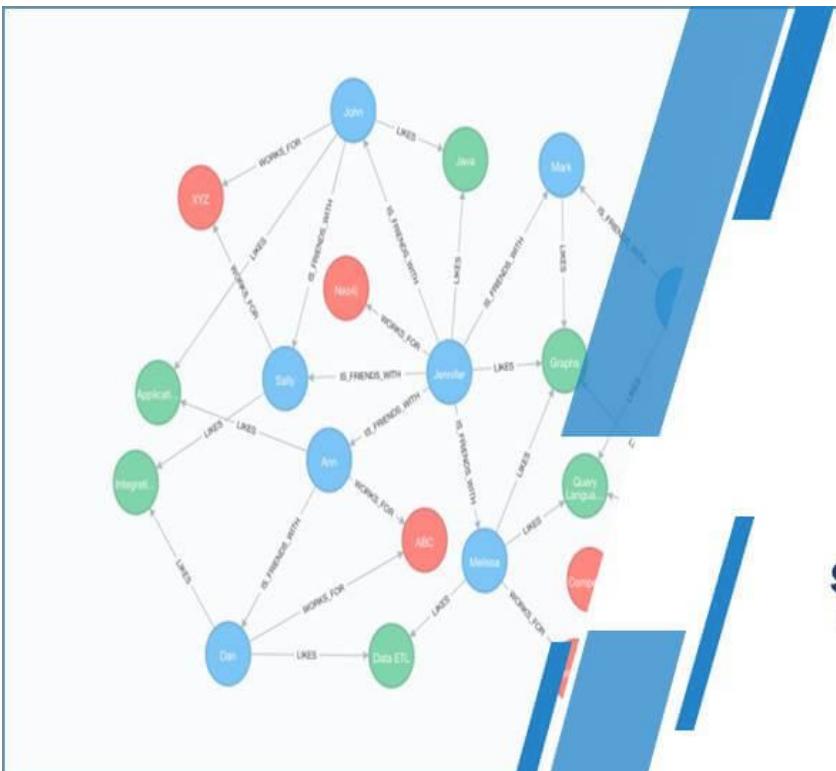
Billion by 2026

\$780.71

Million in 2018

2019 (E)

2026 (P)



### 2.2.2

#### Neo4j

1970

" "

CODASYL<sup>8</sup>

G/G+<sup>9</sup>

" "

Neo4j ( )

Neo4j Languages<sup>10 9</sup>

Cypher

ISO WG3

"An overview of the recent history of Graph Query



(Graph Query Language GQL)

SQL SQL

SQL

1989 SQL-89

—

SQL-89

(GQL) SQL

SQL-89 GQL

Neo4j Cypher ( — ISO GQL-standard ) Apache TinkerPop Gremlin (Declarative query language) —  
 " " " " (Imperative query language)

GQL

- 2000 Neo4j network
- 2001 Neo4j
- 2007 Neo4j

- 2009 Neo4j XPath Gremlin<sup>11</sup>
- 2010 Neo4j Marko Rodriguez Property Graph Neo4j Tinkerpop / Gremlin
- 2011 Neo4j 1.4; Cypher
- 2012 Neo4j 1.8 Cypher Neo4j 2.0 Cypher
- 2015 Neo4j Cypher openCypher
- 2017 ISO WG3 SQL
- 2018 12 Neo4j 3.5
- 2019 , ISO (ISO/IEC JTC 1 N 14279 ISO/IEC JTC 1/SC 32 N 3228
- 2021 Neo4j F 3.25

**NEO4J**

Neo4j	2000	Neo4j	schema	Neo4j	Peter Neubauer
Informix Cocoon			Neo4j	Emil Eifrem	Peter
key-value		Java API			
Neo4j	2011	Johan Svensson		Neo4j	Neo4j
structure	Neo4j 1.4		key-value	Neo4j	search
	Neo4j 2.0	2013.12	---	label	Neo4j
" " " " "	" "	"	Neo4j	Cypher	Neo4j
		search structure			

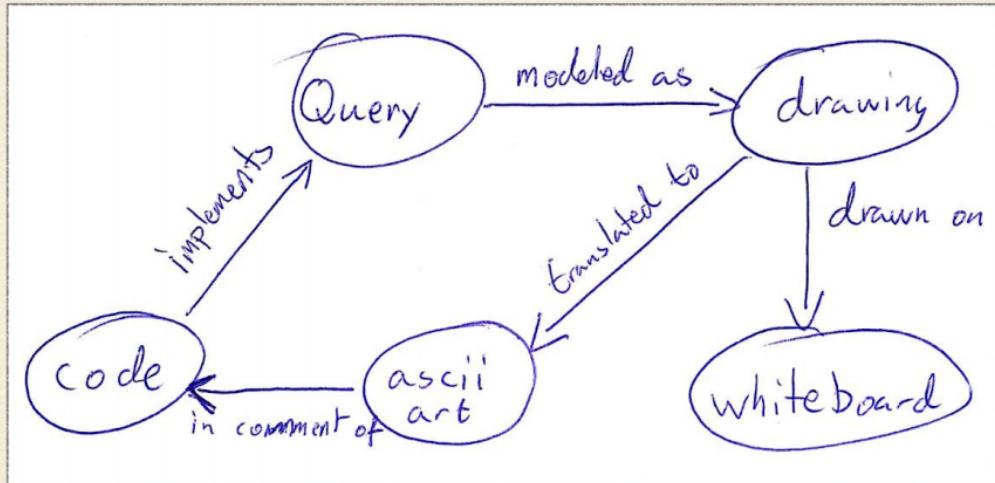
**GREMLIN**

Gremlin	Apache TinkerPop		Neo4j	Java API	(library)	API
NOSQL	NOSQL	REST	HTTP	Neo4j	Tobias Lindaaker	Ivarsson
Rodriguez	XPath	Groovy		Gremlin	2009	11
Marko	XPath	Groovy	Gremlin	Groovy		DSL

**CYPHER**

Gremlin	Neo4j	Java API	Procedural	Gremlin
	30	SQL	SQL	Neo4j
2010	Andrés Taylor	Neo4j	SQL	2011 Neo4j 1.4
Cypher	"ASCII	(ASCII art)"	Neo4j	---Cypher

# The Origin of Cypher



# The Origin of Cypher

(query) -- [MODELED\_AS] --> (drawing)  
 ^  
 |  
 [ IMPLEMENTS ]  
 |  
 |  
 (code) <- [ IN\_COMMENT\_OF ] - (ascii art)

drawing  
 |  
 [ TRANSLATED\_TO ]  
 |  
 v

---

## Cypher

2012 10 Neo4j 1.8 Cypher

2013 12 Neo4j 2.0 label label

Neo4j Cypher

2015 9 Neo4j openCypher Implementors Group oCIG Cypher openCypher

Cypher

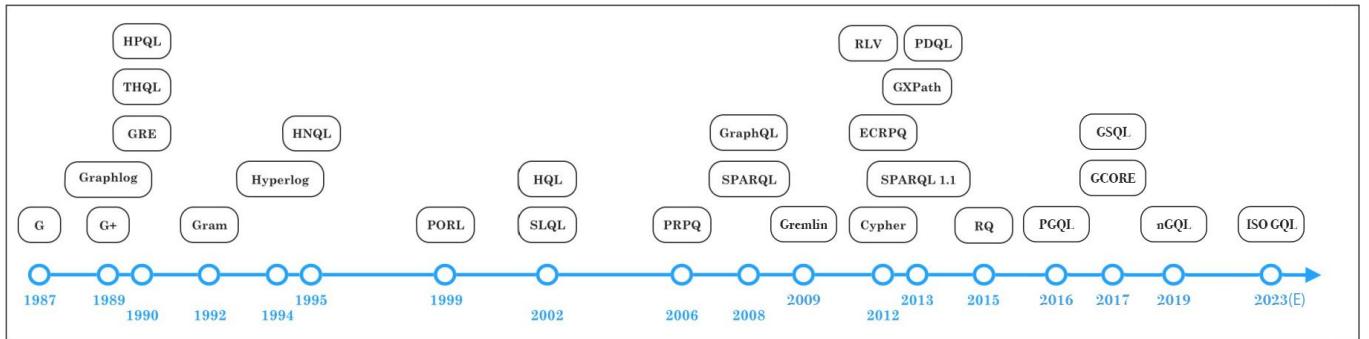
2015 Oracle PGX PGQL

2016 Linked Data Benchmarking Council, LDBC LDBC G-CORE

2018 Redis (library) RedisGraph Cypher

2019 ISO openCypher, PGQL, GSQ<sup>12</sup>L, and G-CORE

2019 NebulaGraph openCypher NebulaGraph Query Language, nGQL



2005-2010 Google " " Hadoop Cassandra

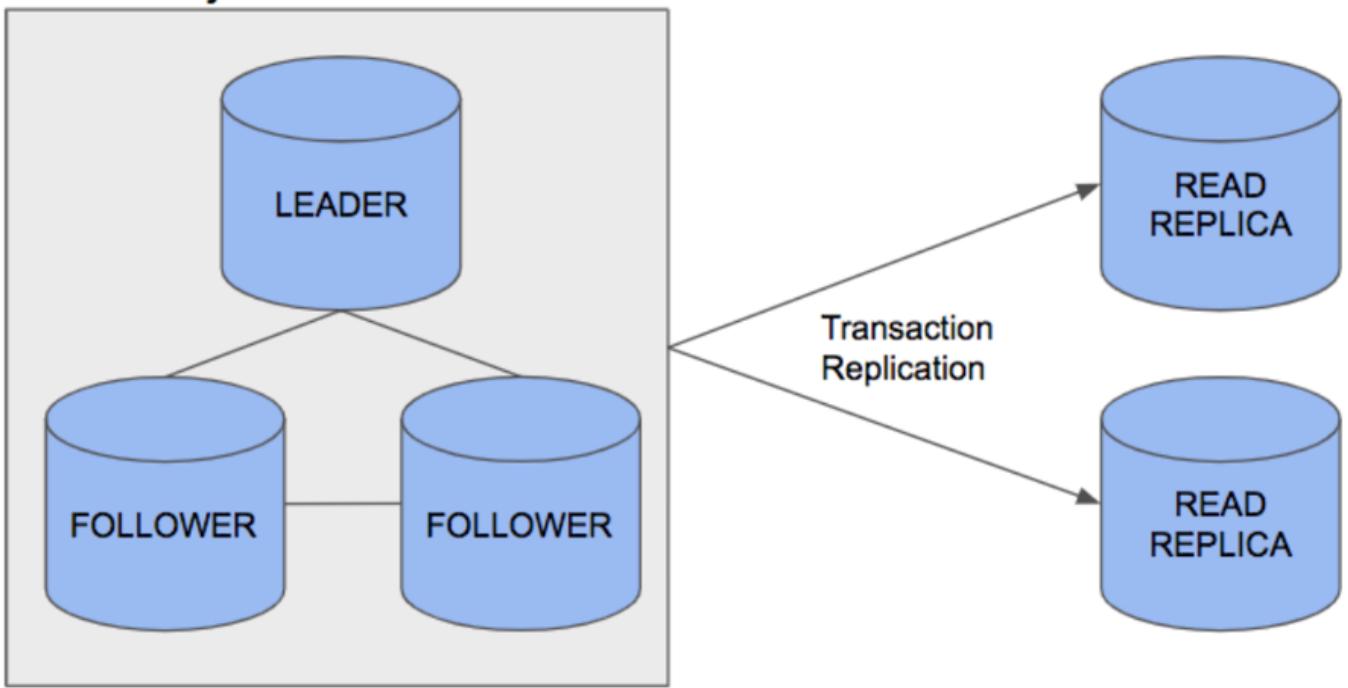
1. ( Neo4j)

2.

Neo4j

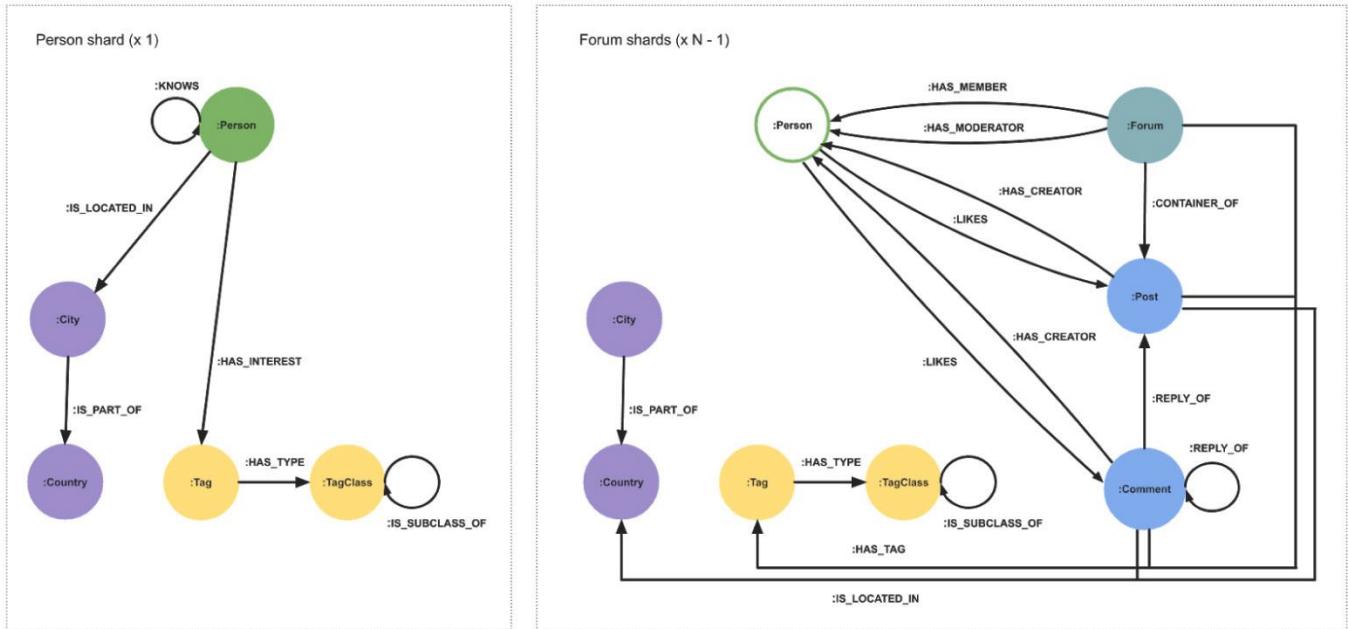
• Neo4j 3.X (Master-slave/slave)

## Neo4j Causal Cluster

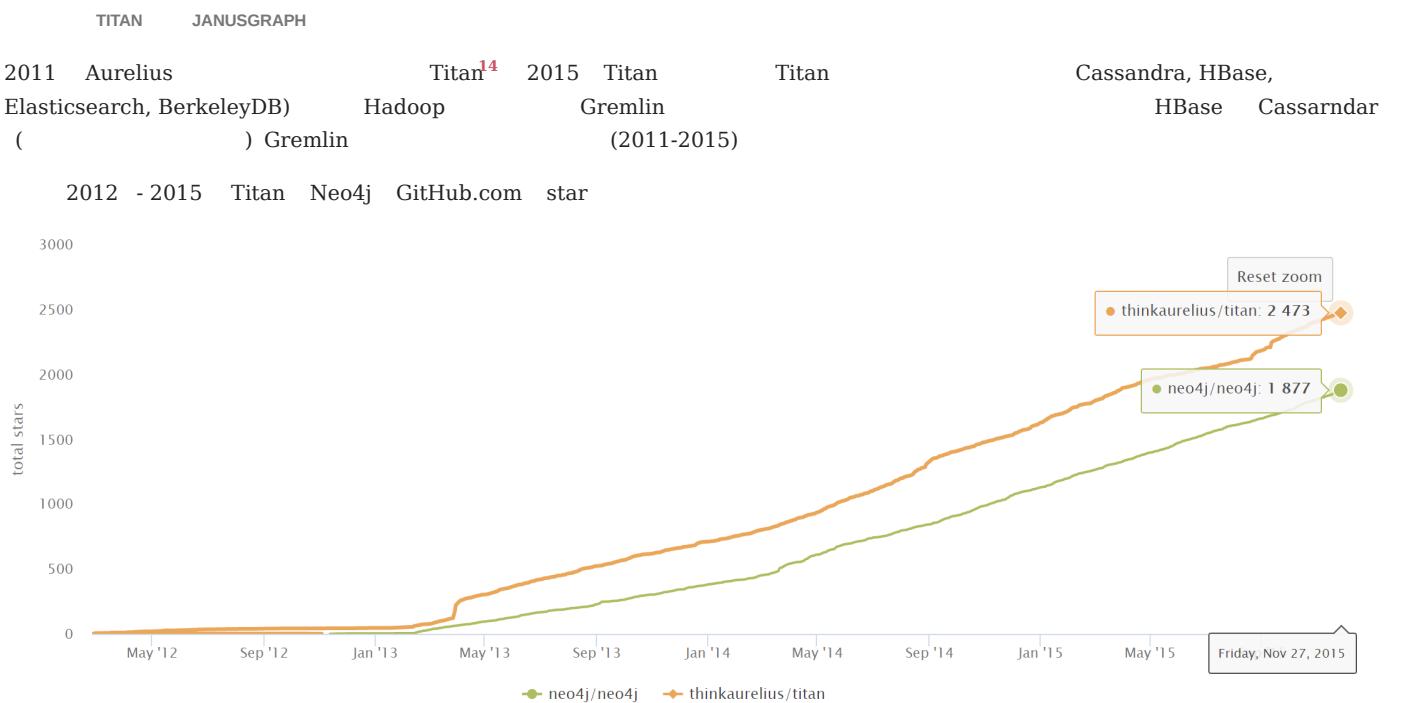
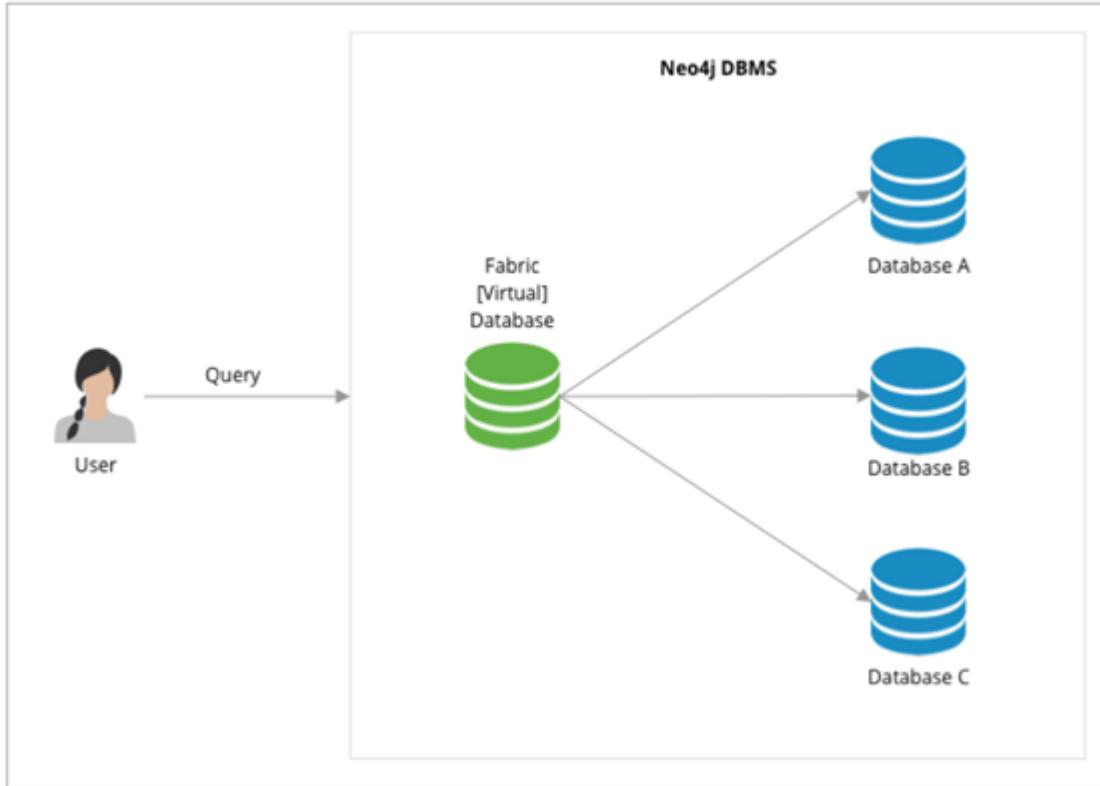


Cluster architecture

- Neo4j 4.X
- ( Fabric<sup>13</sup>



```
USE graphA # S1.1  Shard A
MATCH (movie:Movie)
Return movie.title AS title
UNION  # S2.      Join
USE graphB # S1.2  Shard B
MATCH move:Movie)
RETURN movie.title AS title
```



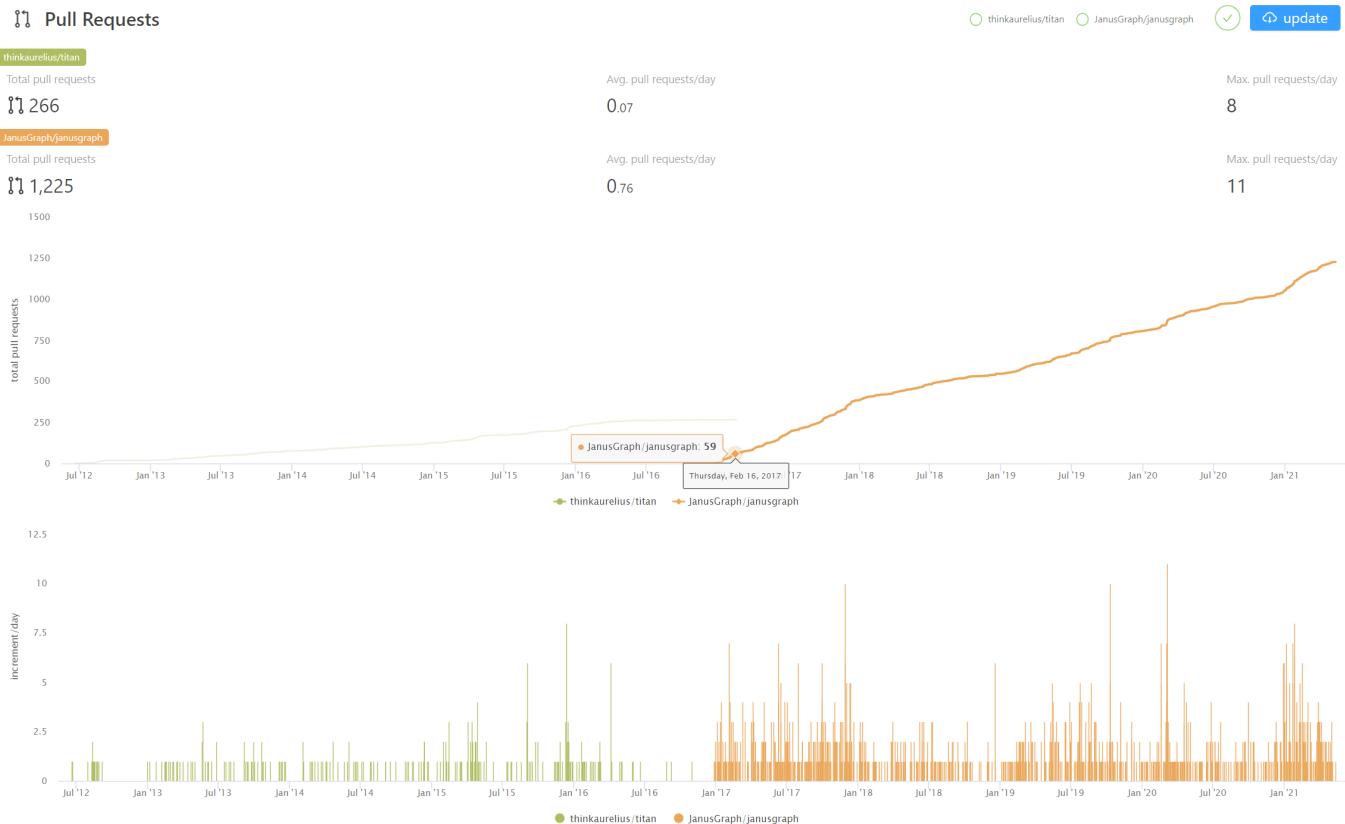
2015   Aurelius(Titan)   DataStax      Titan      (DataStax Enterprise Graph)

Aurelius(Titan)  
Google, GRAKN.AI, Hortonworks, IBM and Amazon)   2017  
JanusGraph

Linux  
(Expero,  
JanusGraph<sup>15</sup>)

2012-2021 (pull request)

1. Aurelius(Titan) 2015	( )
2. JanusGraph 2017 1	Titan 5 pull request



ORIENTDB, TIGERGRAPH, ARANGODB, DGRAPH

Linux JanusGraph

OrientDB LTD (2017 SAP )	2011	OrientDB	+ KV +	OrientDB SQL (SQL )
GraphQL (TigerGraph)	2012	TigerGraph	( )	GraphQL (SQL )
ArangoDB GmbH	2014	ArangoDB	Apache License 2.0	AQL ( , KV )
DGraph Labs	2016	DGraph	Apache Public License 2.0 + Dgraph Community License	RDF GraphQL

Microsoft Azure Cosmos DB<sup>16</sup>  
RDF Oracle graph<sup>18</sup>

SQL key-value

Amazon AWS Neptune<sup>17</sup>

AWS

Oracle

NEBULAGRAPH

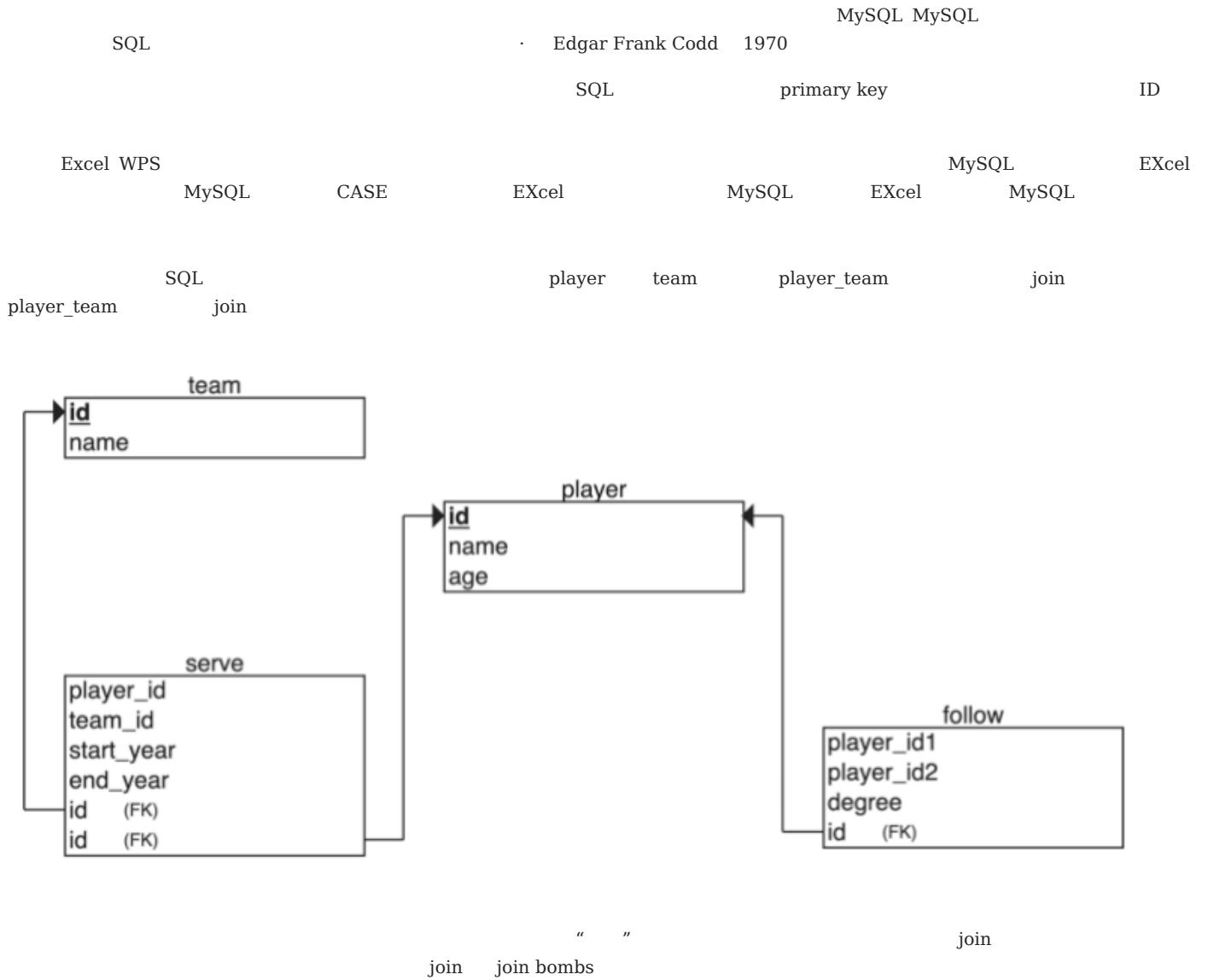
NebulaGraph

- 
1. [https://db-engines.com/en/ranking\\_categories](https://db-engines.com/en/ranking_categories) ↵
  2. <https://www.yellowfinbi.com/blog/2014/06/yfcommunitynews-big-data-analytics-the-need-for-pragmatism-tangible-benefits-and-real-world-case-165305> ↵
  3. <https://www.gartner.com/smarterwithgartner/gartner-top-10-data-and-analytics-trends-for-2021/> ↵
  4. <https://www.verifiedmarketresearch.com/product/graph-database-market/> ↵
  5. <https://www.globenewswire.com/news-release/2021/01/28/2165742/0/en/Global-Graph-Database-Market-Size-Share-to-Exceed-USD-4-500-Million-By-2026-Facts-Factors.html> ↵
  6. <https://www.marketsandmarkets.com/Market-Reports/graph-database-market-126230231.html> ↵
  7. <https://www.gartner.com/en/newsroom/press-releases/2019-07-01-gartner-says-the-future-of-the-database-market-is-the> ↵
  8. <https://www.amazon.com/Designing-Data-Intensive-Applications-Reliable-Maintainable/dp/1449373321> ↵
  9. I. F. Cruz, A. O. Mendelzon, and P. T. Wood. A Graphical Query Language Supporting Recursion. In Proceedings of the Association for Computing Machinery Special Interest Group on Management of Data, pages 323-330. ACM Press, May 1987. ↵ ↵
  10. "An overview of the recent history of Graph Query Languages". Authors: Tobias Lindaaker, U.S. National Expert. Date: 2018-05-14 ↵
  11. Gremlin    Apache TinkerPop        (<https://tinkerpop.apache.org/>) ↵
  12. <https://docs.tigergraph.com/dev/gsql-ref> ↵
  13. <https://neo4j.com/fosdem20/> ↵
  14. <https://github.com/thinkaurelius/titan> ↵
  15. <https://github.com/JanusGraph/janusgraph> ↵
  16. <https://azure.microsoft.com/en-us/free/cosmos-db/> ↵
  17. <https://aws.amazon.com/cn/neptune/> ↵
  18. <https://www.oracle.com/database/graph/> ↵
- 

:January 13, 2023

2.3

### 2.3.1



IBM . Edgar Frank Codd 1970  
tuple calculus

SQL IBM R IBM . IBM Oracle

12 Codd's 12 rules

**NoSQL**

NoSQL	" "	NoSQL	NoSQL	90	" SQL" " SQL"
-------	-----	-------	-------	----	---------------

- key-value stores
- column-family stores
- document stores
- graph databases

SQL	web	
IT		DBA
Redis	Voldemort	Oracle BDB

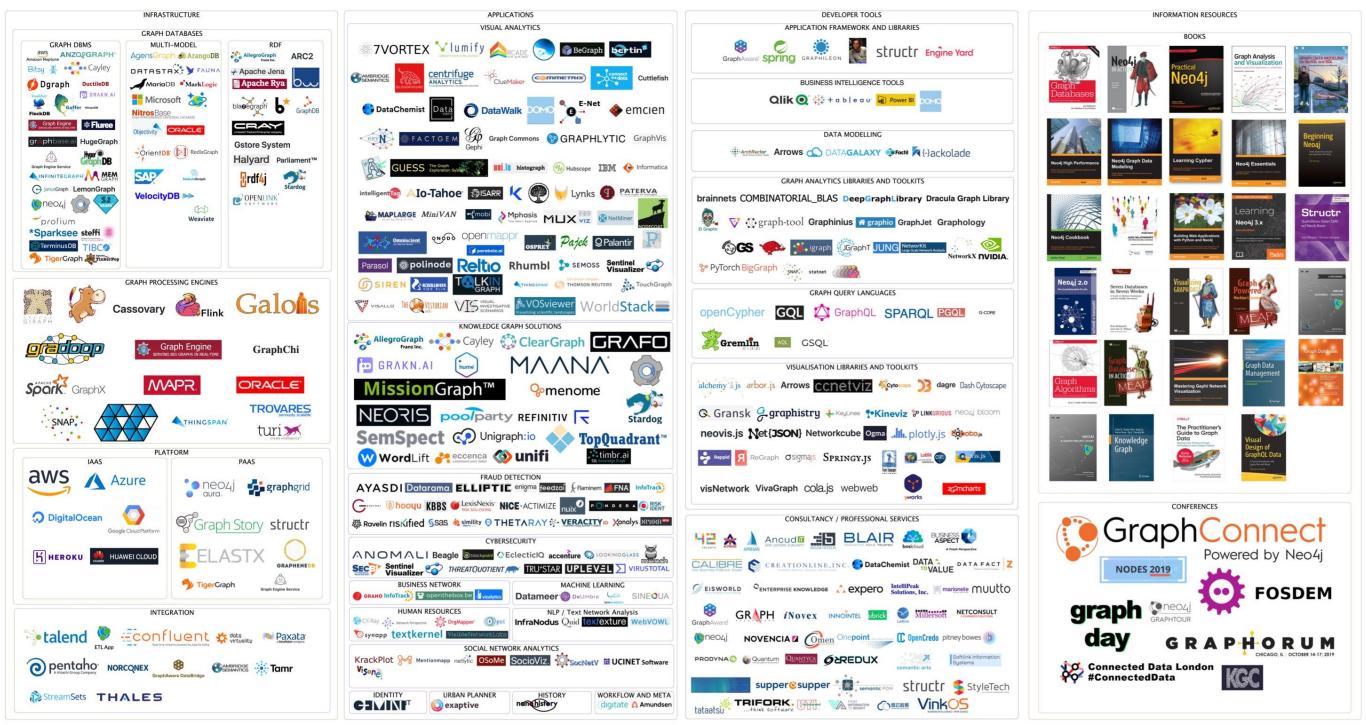
NoSQL	NoSQL	
		HBase Cassandra HadoopDB

NoSQL	XML JOSN YAML	JSON	JSON
JSON	MongoDB CouchDB Terrastore		
NoSQL	NebulaGraph	NoSQL	NoSQL
		NoSQL	NebulaGraph Neo4j OrientDB

**2.3.2**

2020 1

## GRAPH TECHNOLOGY LANDSCAPE 2020



2020 v2

• ( )

•

• K

- (Pattern matching) /

" (subgraph isomorphism)" —

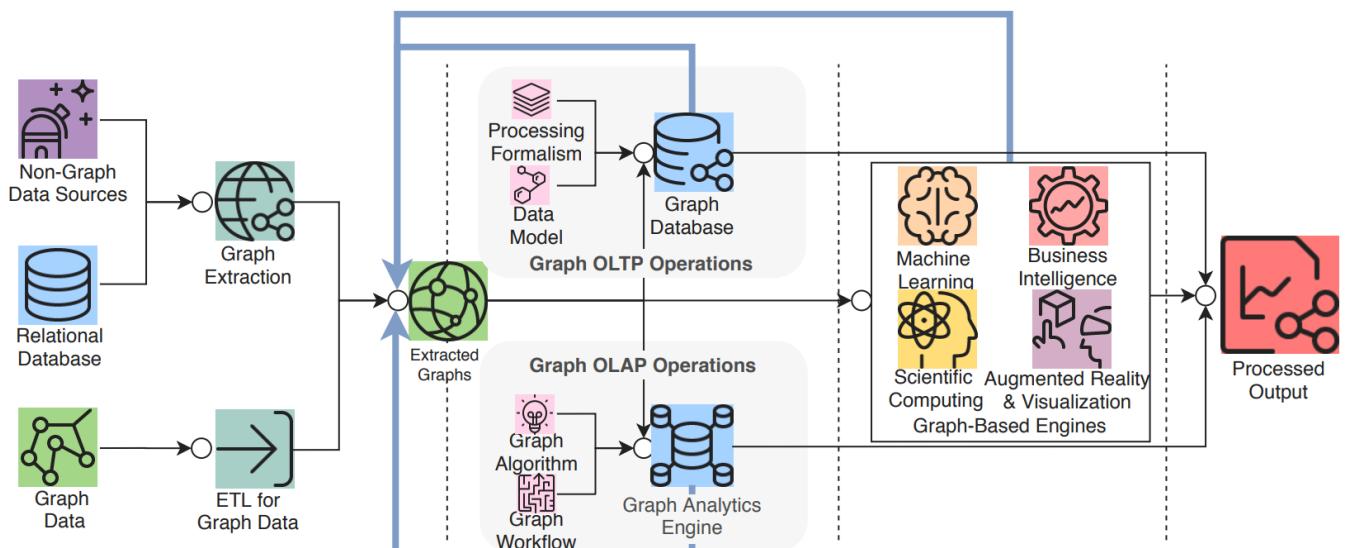
3

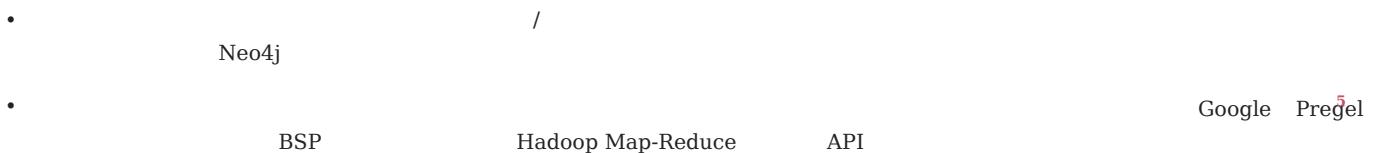
Graph G	Graph H	An isomorphism between G and H
		$f(a) = 1$ $f(b) = 6$ $f(c) = 8$ $f(d) = 3$ $f(g) = 5$ $f(h) = 2$ $f(i) = 4$ $f(j) = 7$

- (Regular Path Query) ——
- count

(Graph Database) (Graph processing)

4 ( ) ( ) ETL (Graph OLTP) (Graph OLAP) BI





### Query (e.g. Cypher/Python)

Real-time, local decisioning  
and pattern matching

**Local patterns**

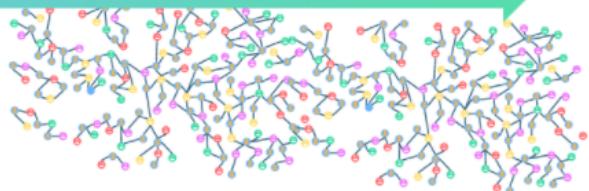


You know what you're looking  
for and making a decision

### Graph Algorithms libraries

Global analysis  
and iterations

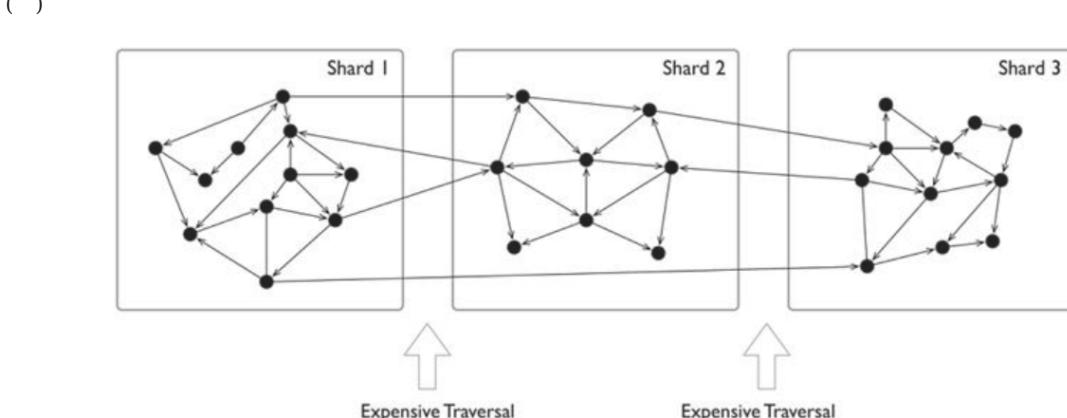
**Global computation**



You're learning the overall structure of a  
network, updating data, and predicting

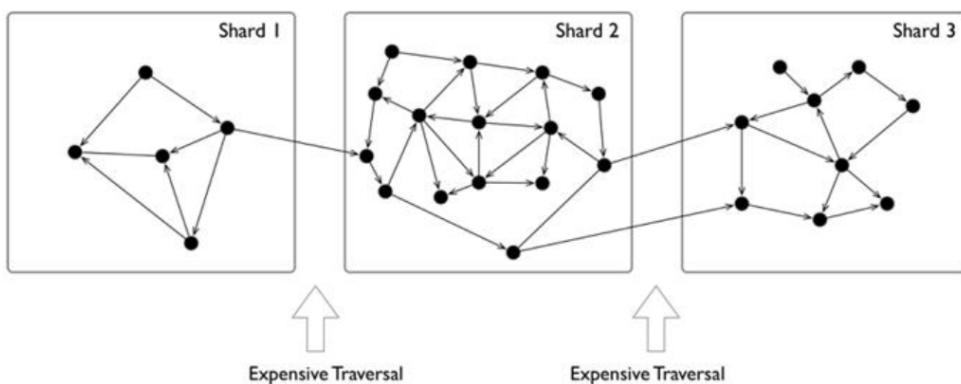
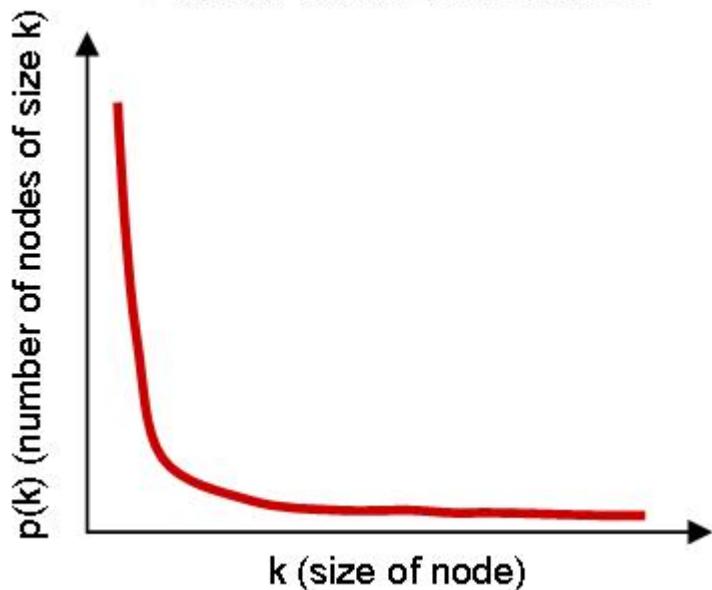
6

key	docID	(key-value, doc)	NoSQL	key-value
	" "	6	NP	10



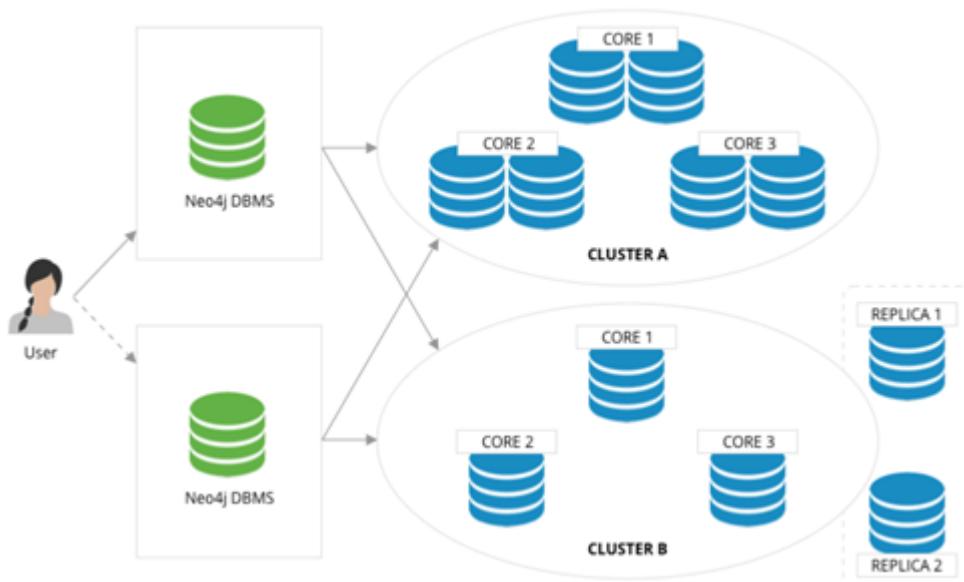
7

## Power Law Distribution

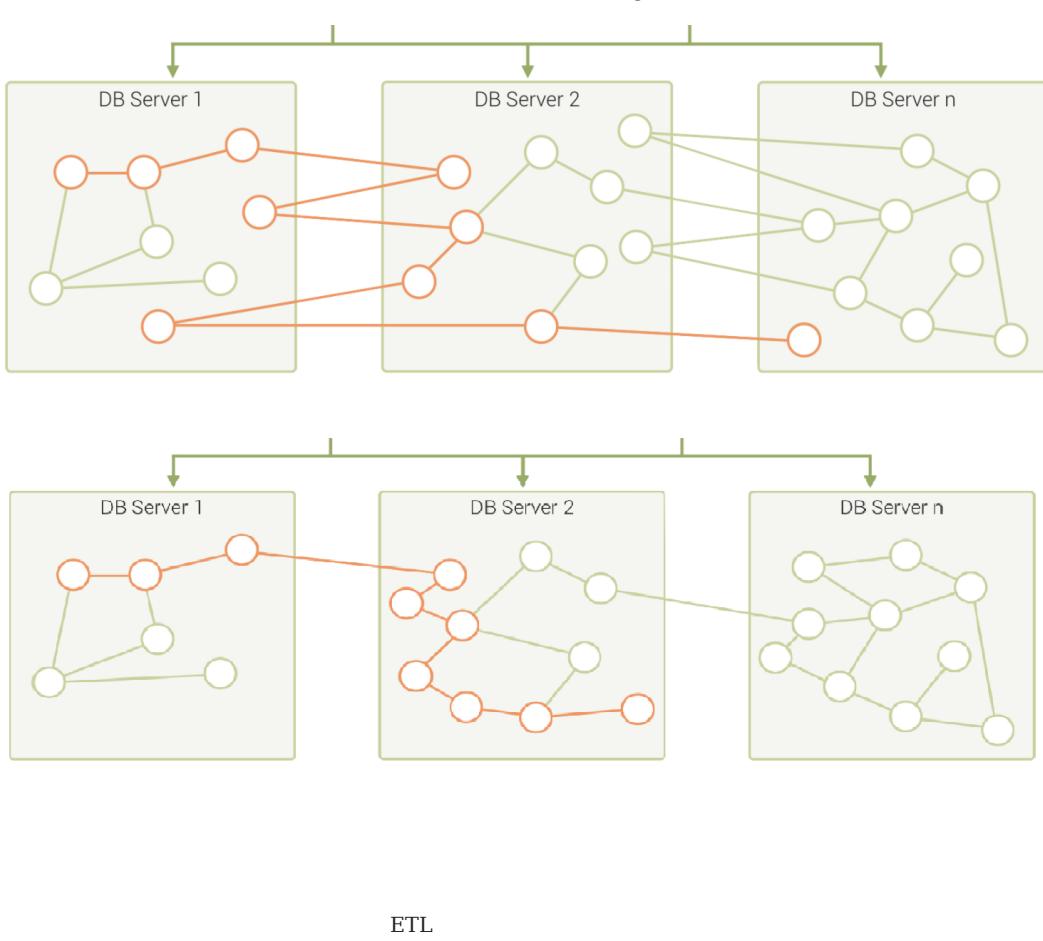


(Sharding)

Neo4j 4.x Fabric



- (View)
  - Partition Sharding) Partition



**9**

- ( ):
- 
- API
- 
- 
- 
- ETL
- Debug

SQLite      Oracle

### Note

- JGraphT<sup>10</sup>: Java (library)
- JUNG<sup>11</sup> BSD Java
- igraph<sup>12</sup>: Library, R python C
- NetworkX<sup>13</sup>: python
- Cytoscape<sup>14</sup>:
- Gephi<sup>15</sup>:
- arrows.app<sup>16</sup> Cypher .

### Benchmark

LDBC

LDBC<sup>17</sup> Linked Data Benchmark Council   Oracle   Intel   Neo4j   TigerGraphSNB Social Network Benchmark  
TPC-C, TPC-H   SQL

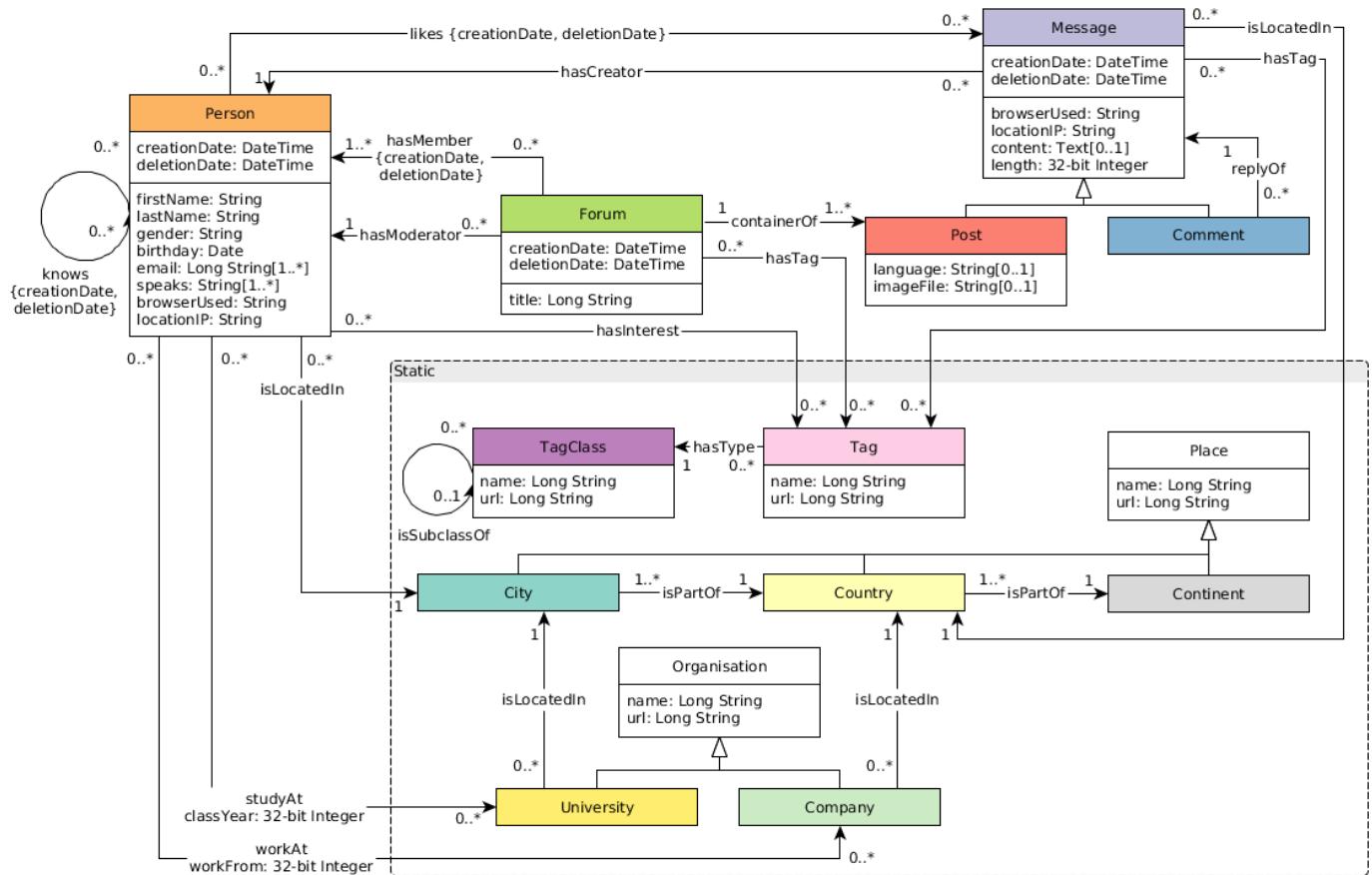
LDBC

Benchmark

Interactive

BI

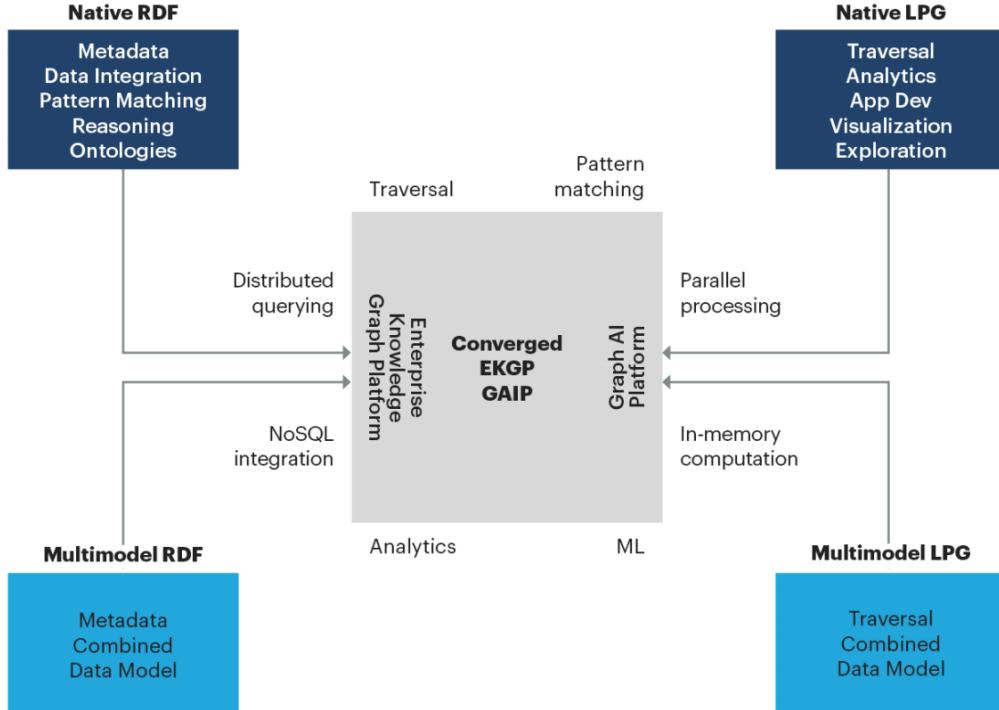
SNB



0.1 GB (scale factor 0.1) 1000 GB (sf1000) 10 TB 100 TB

Scale Factor	0.1	0.3	1	3	10	30	100	300	1000
# of Persons	1.5K	3.5K	11K	27K	73K	182K	499K	1.25M	3.6M
# of nodes	327.6K	908K	3.2M	9.3M	30M	88.8M	282.6M	817.3M	2.7B
# of edges	1.5M	4.6M	17.3M	52.7M	176.6M	540.9M	1.8B	5.3B	17B

## 2.3.3

**Convergence of Capabilities in the Graph DBMS Landscape**

Source: Gartner  
737853\_C

**Gartner**

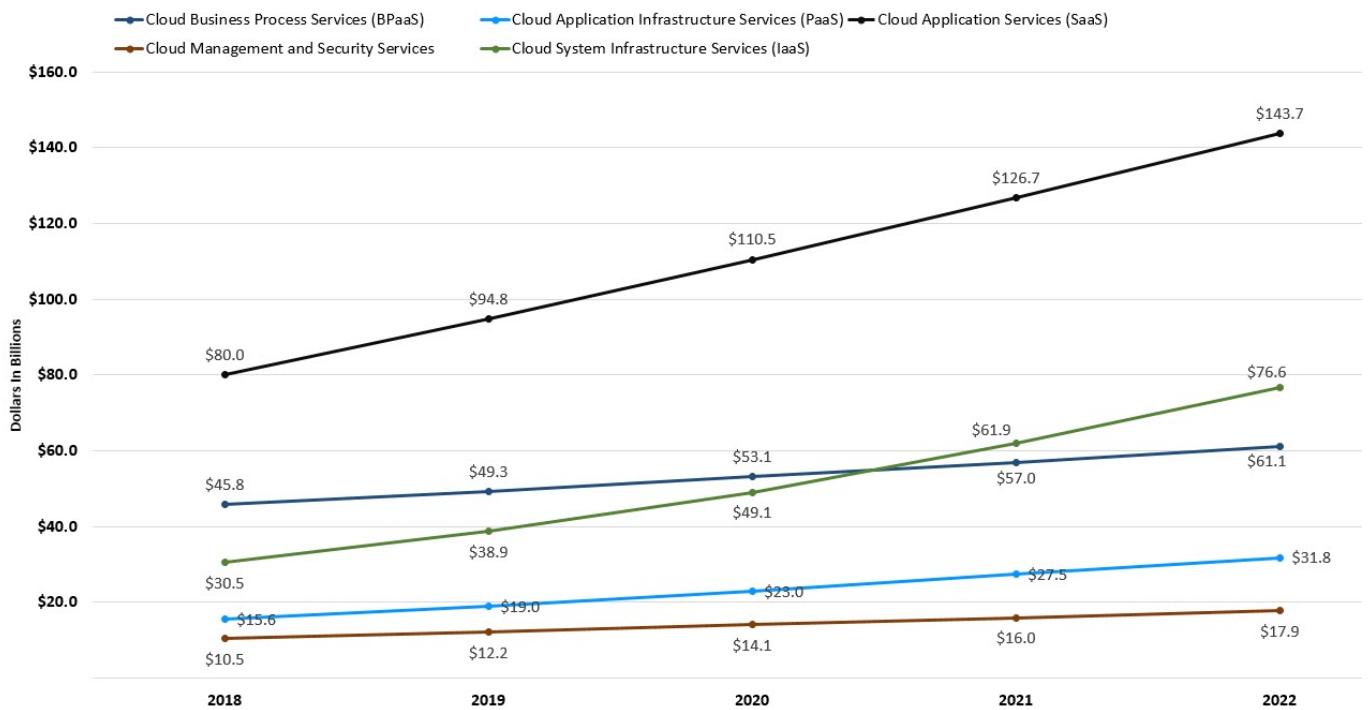
Gartner

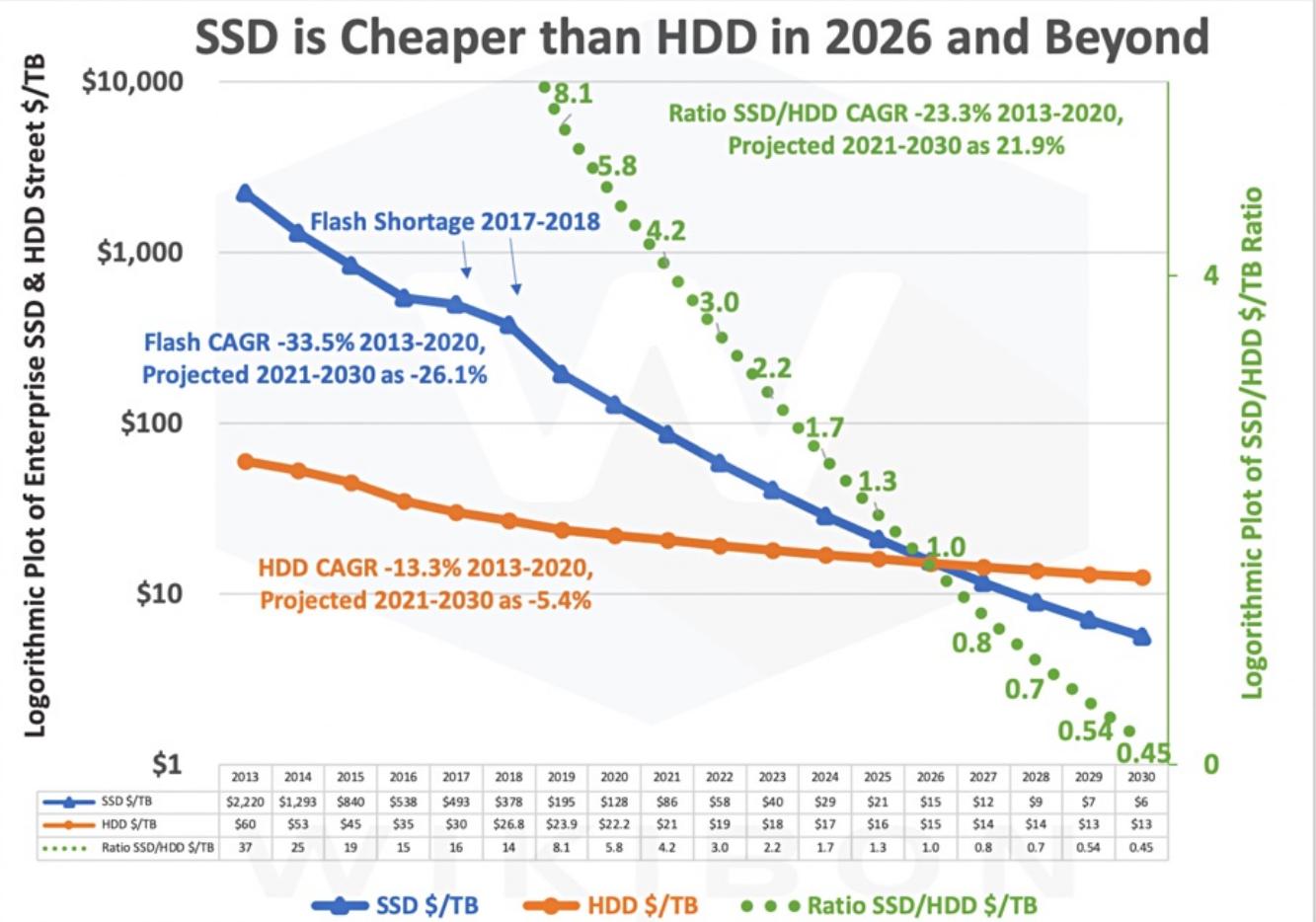
18

10

### Worldwide Public Cloud Service Revenue Forecast, 2018 - 2022

(Billions of U.S. Dollars) Source: Gartner April 2, 2019





**Figure 4 - SSD/HDD Pricing Ratio 2013 - 2030**

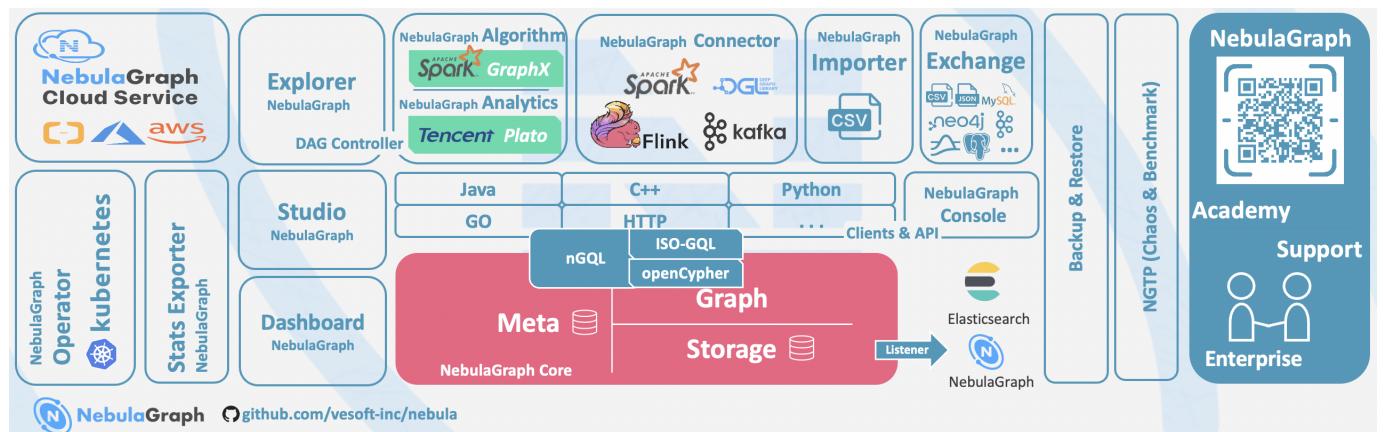
Source: © Wikibon, 2021.

- 
1. <https://graphaware.com/graphaware/2020/02/17/graph-technology-landscape-2020.html> ↵
  2. ( ) [ ]((mailto:min.wu@vesoft.com)) ↵
  3. [https://en.wikipedia.org/wiki/Graph\\_isomorphism](https://en.wikipedia.org/wiki/Graph_isomorphism) ↵
  4. The Future is Big Graphs! A Community View on Graph Processing Systems. <https://arxiv.org/abs/2012.06171> ↵
  5. G. Malewicz, M. H. Austern, A. J. Bik, J. C. Dehnert, I. Horn, N. Leiser, and G. Czajkowski. Pregel: a system for large-scale graph processing. In Proceedings of the International Conference on Management of data (SIGMOD), pages 135–146, New York, NY, USA, 2010. ACM ↵
  6. <https://neo4j.com/graphacademy/training-iga-40/02-iga-40-overview-of-graph-algorithms/> ↵
  7. <https://livebook.manning.com/book/graph-powered-machine-learning/welcome/v-8/> ↵
  8. <https://www.arangodb.com/learn/graphs/using-smartgraphs-arangodb/> ↵
  9. <https://arxiv.org/abs/1709.03188> ↵
  10. <https://jgrapht.org/> ↵
  11. <https://github.com/jrtom/jung> ↵
  12. <https://igraph.org/> ↵
  13. <https://networkx.org/> ↵
  14. <https://cytoscape.org/> ↵
  15. <https://gephi.org/> ↵
  16. <https://arrows.app/> ↵
  17. [https://github.com/ldbc/ldbc\\_snb\\_docs](https://github.com/ldbc/ldbc_snb_docs) ↵
  18. <https://cloudcomputing-news.net/news/2019/apr/15/public-cloud-soaring-to-331b-by-2022-according-to-gartner/> ↵
  19. <https://blocksandfiles.com/2021/01/25/wikibon-ssds-vs-hard-drives-wrights-law/> ↵
- 

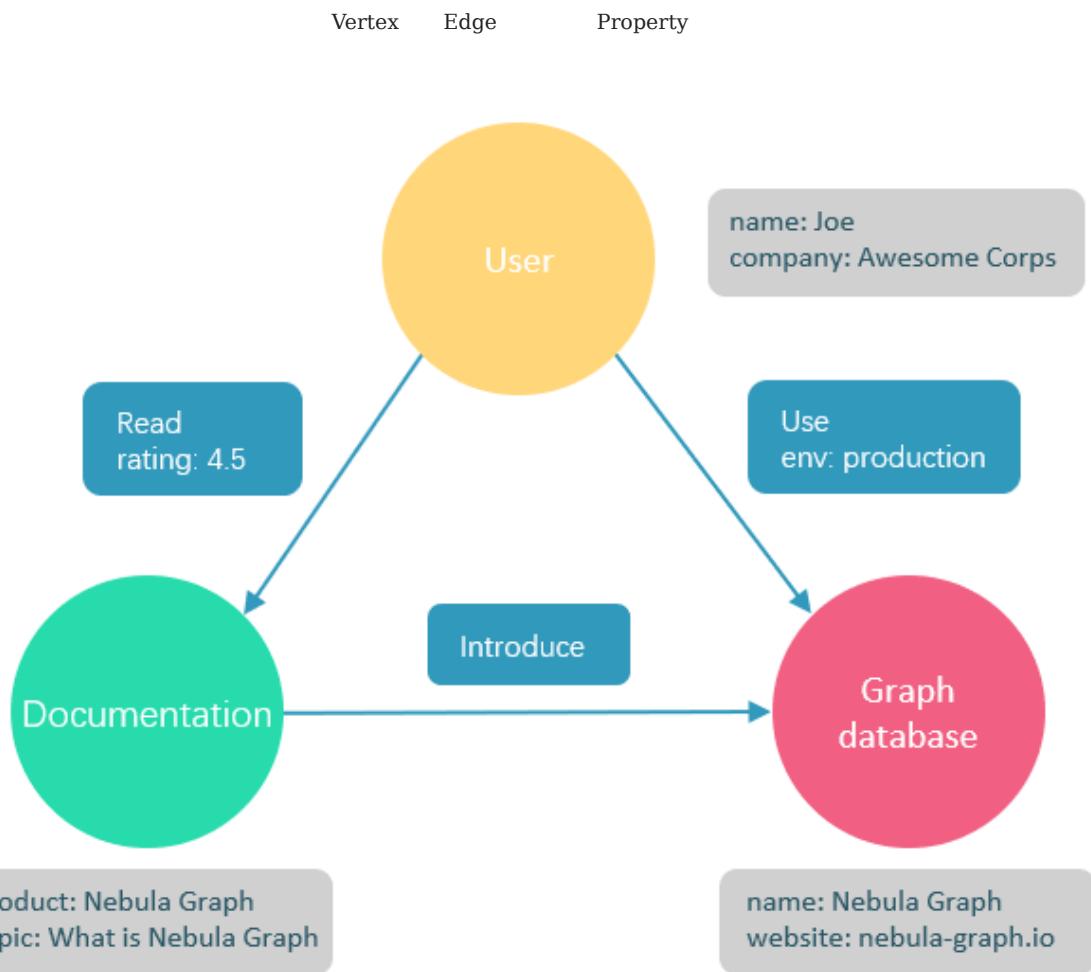
: January 13, 2023

## 2.4 NebulaGraph

NebulaGraph



### 2.4.1



NebulaGraph

## 2.4.2 NebulaGraph

---

NebulaGraph Apache 2.0

NebulaGraph

[NebulaGraph GitHub](#)

C++ NebulaGraph

[NebulaGraph benchmarking](#)

NebulaGraph

NebulaGraph

NebulaGraph shared-nothing

NebulaGraph Java Python C++ Go

[NebulaGraph clients](#)

NebulaGraph

LDAP Lightweight Directory Access Protocol

NebulaGraph

[NebulaGraph Studio](#) [NebulaGraph Console](#) [NebulaGraph Exchange](#)

NebulaGraph

Spark Flink HBase

### openCypher

NebulaGraph

nGQL

openCypher

[nGQL](#)

NebulaGraph

SSD

HDD +

NebulaGraph

360

NebulaGraph

[NebulaGraph](#)

## 2.4.3

---

NebulaGraph

NebulaGraph

NebulaGraph

NebulaGraph

NebulaGraph

NebulaGraph

#### 2.4.4

---

- NebulaGraph 01 39



#### 2.4.5

---

#### 2.4.6

---

- - 
  - 
  - 
  - GitHub
- 

:January 13, 2023

## 2.5

---

NebulaGraph

### 2.5.1

NebulaGraph 6

- Space
- Vertex
- VID VID VID int64 fixed\_string(N)
- 0 Tag

#### Compatibility

NebulaGraph 2.x Tag

- Edge
- 
- 
- < VID Edge type (rank) VID > EID
- Edge type
- Rank int64 0



Rank Edge type  
Rank  
next(), pre(), head(), tail(), max(), min(), lessThan(), moreThan()

- Tag
- Tag
- Edge type
- Edge type
- Property
- Key-value pair

#### Note

Tag Edge type " " " "

## 2.5.2

NebulaGraph

**player team**      **serve follow**

Tag	<b>player</b>	name (string) age int
Tag	<b>team</b>	name (string)
Edge type	<b>serve</b>	start_year (int) end_year (int)
Edge type	<b>follow</b>	degree (int)

### Note

NebulaGraph

### Incompatibility

NebulaGraph 3.3.0      "      "      "      "      **INSERT VERTEX** **DELETE VERTEX** **INSERT EDGE**  
**DELETE EDGE**

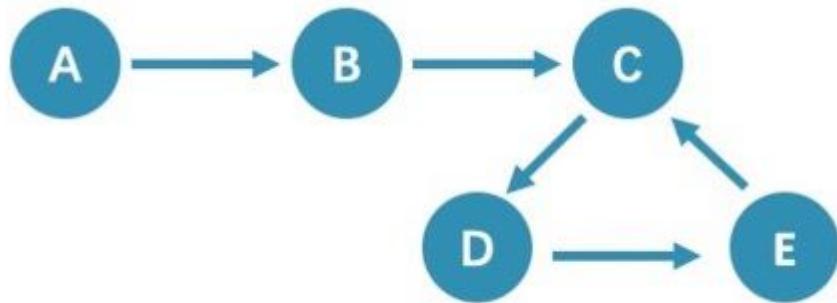
openCypher    MERGE

:January 13, 2023

## 2.6

---

walk trail path



### 2.6.1 walk

walk

C D E

A->B->C->D->E    A->B->C->D->E->C    A->B->C->D->E->C->D

**Note**

GO      walk

### 2.6.2 trail

trail

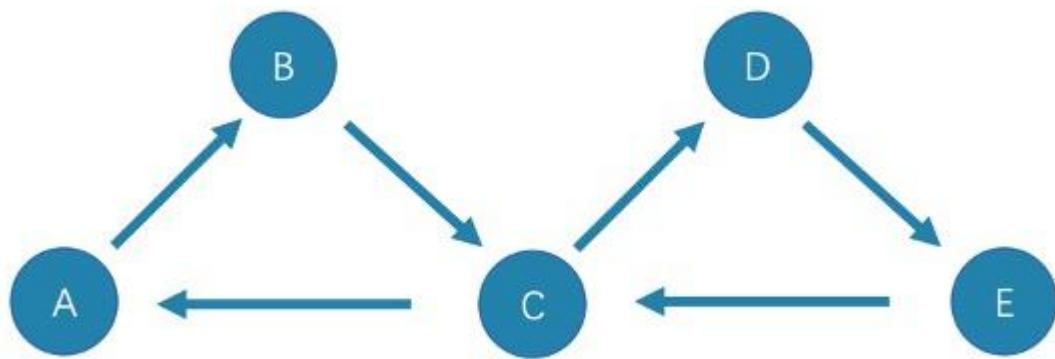
trail

5      A->B->C->D->E->C

**Note**

MATCH FIND PATH GET SUBGRAPH      trail

trail      cycle    circuit



- cycle

**cycle**      **trail**

A->B->C->A    C->D->E->C .

- circuit

**circuit**      **trail**

A->B->C->D->E->C->A

## 2.6.3 path

**path**

4      A->B->C->D->E

## 2.6.4

Path 03 09

:January 13, 2023

## 2.7 VID

---

NebulaGraph ID VID Vertex ID

### 2.7.1 VID

- VID FIXED\_STRING(<N>) INT64 VID
- VID + VID
- VID ID UUID
- VID
- VID Tag " " " " Tag " " "
- VID Tag INSERT IF NOT EXISTS INSERT
- VID TAG A TAG B INSERT TAG A TAG B
- VID LSM-tree VID

### 2.7.2 VID

- NebulaGraph 1.x VID INT64 2.x INT64 FIXED\_STRING(<N>) CREATE SPACE vid\_type VID
- id() VID
- LOOKUP MATCH VID
- VID DELETE xxx WHERE id(xxx) == "player100" GO FROM "player100" VID  
LOOKUP | GO FROM \$-.ids LOOKUP |

### 2.7.3 VID

- VID
- VID VID;
  - VID
  - snowflake VID
  - FIXED\_STRING(<N>) N BASE64 MD5 hash
  - hash int64 VID 10 hash 1/10

### 2.7.4 VID

VID

VID

### 2.7.5 "(start vid)"

NebulaGraph MATCH GO LOOKUP VID start vid

```
start vid

1. GO FROM "player100" OVER      start vid  "player100"
2. LOOKUP ON player WHERE player.name == "Tony Parker"      MATCH (v:player {name:"Tony Parker"})      player.name      start
vid
```

 Caution

```
match (n) return n;      Scan vertices or edges need to specify a limit number, or limit number can not push down.
LIMIT
```

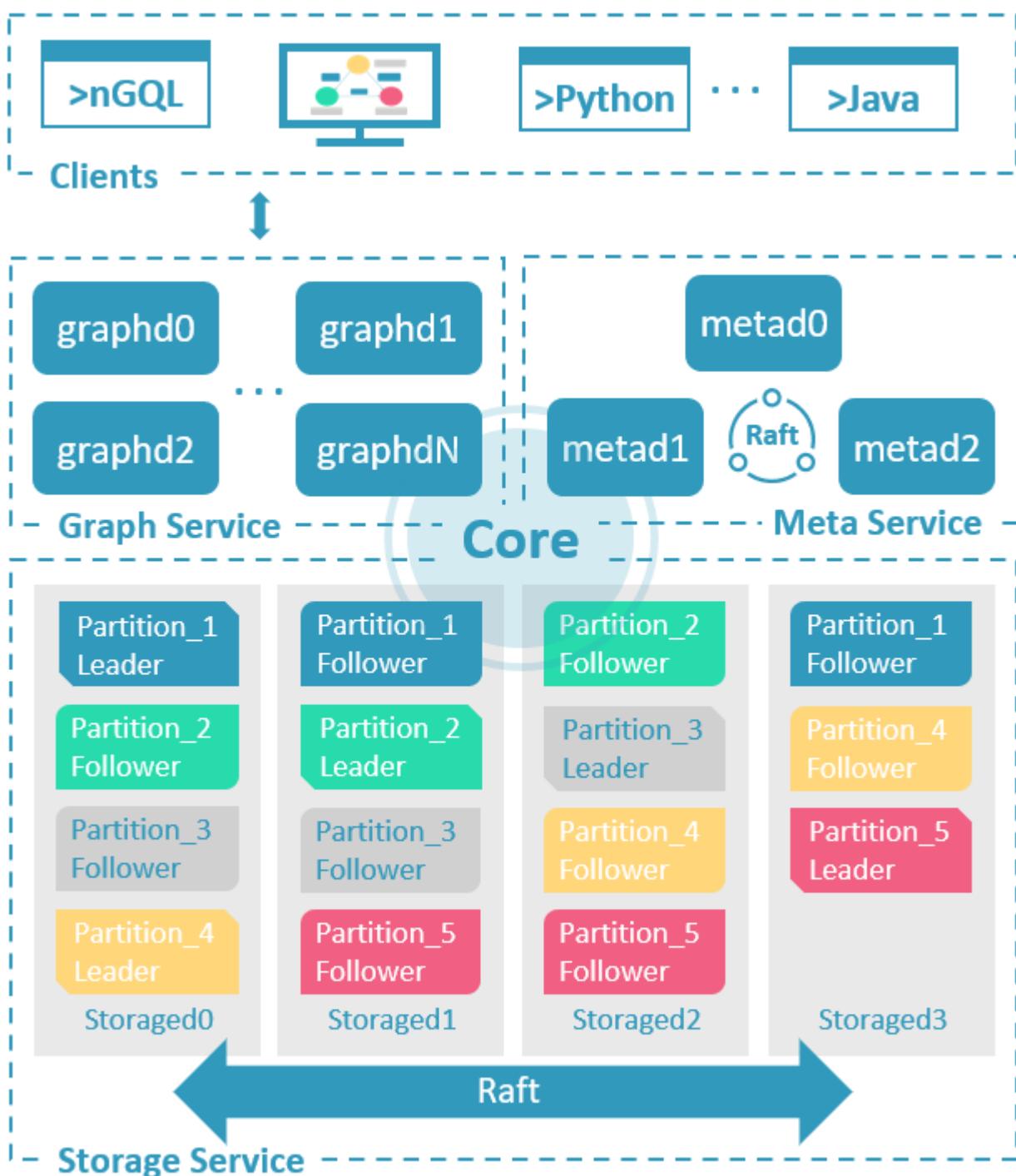
---

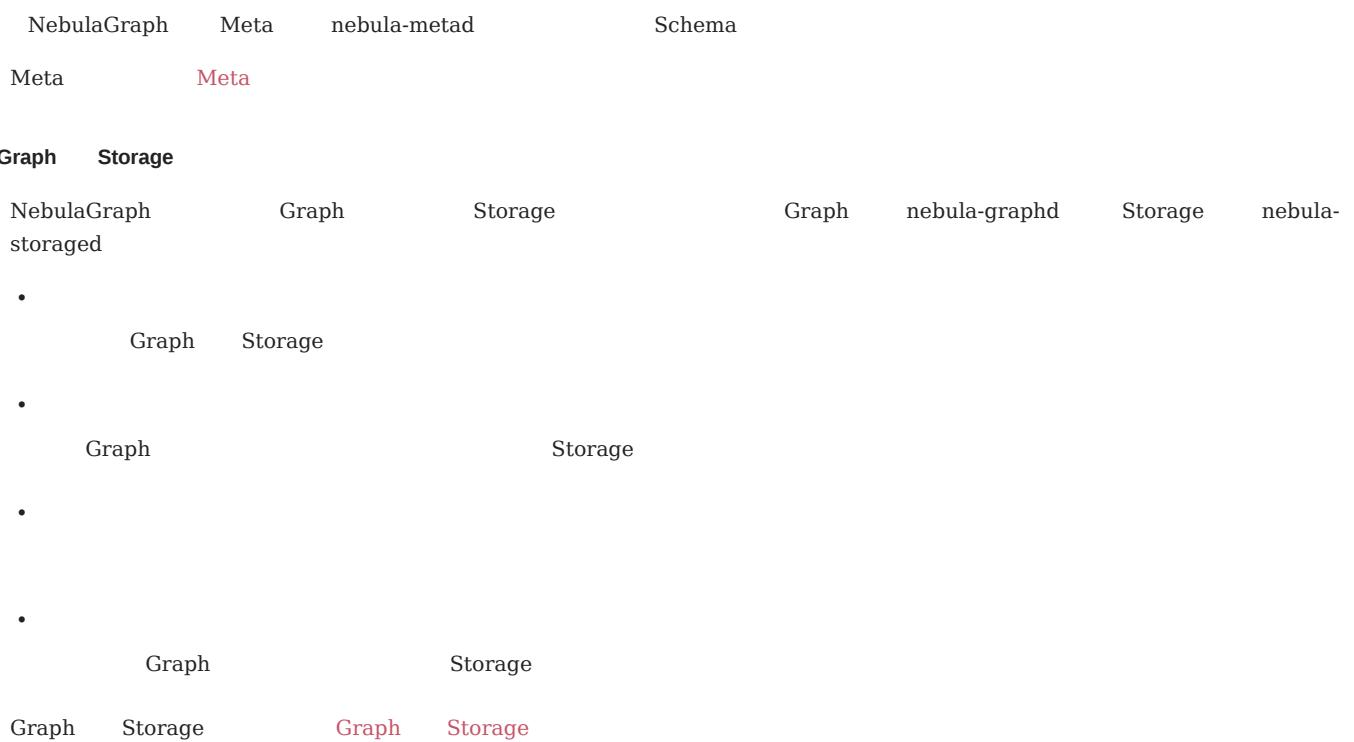
:January 13, 2023

## 2.8

### 2.8.1 NebulaGraph

NebulaGraph      Graph    Meta    Storage  
 NebulaGraph  
 NebulaGraph



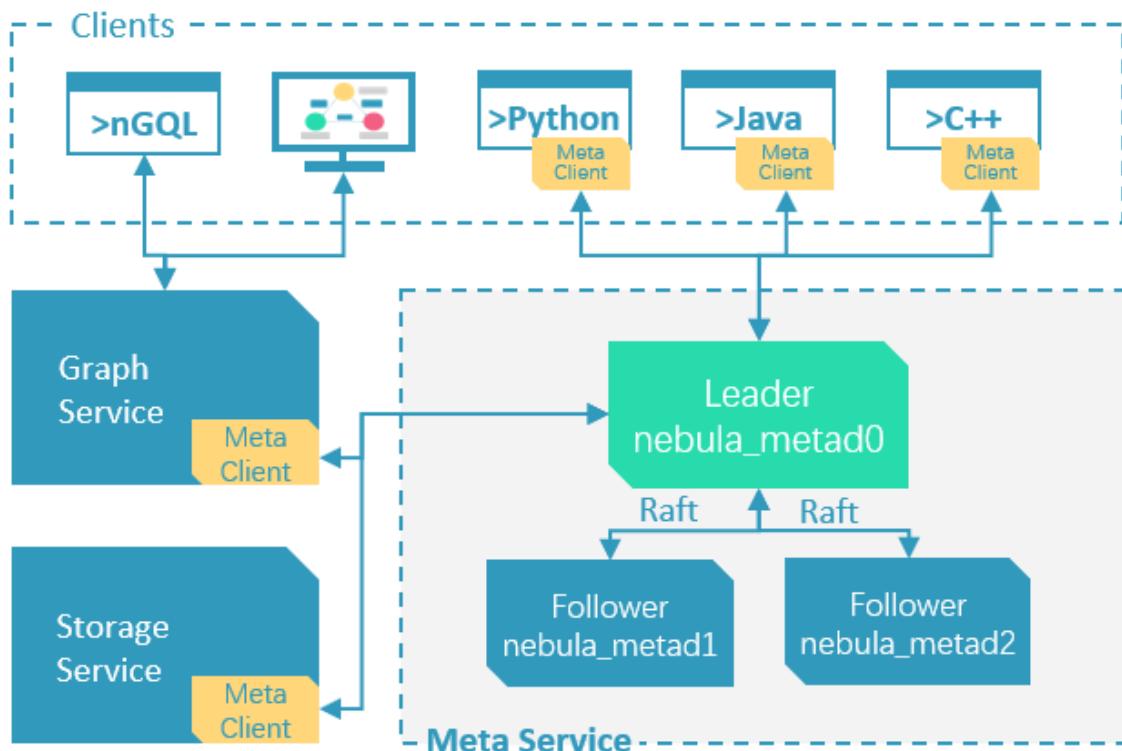
**Meta**

: January 13, 2023

## 2.8.2 Meta

Meta

Meta



Meta	nebula-metad		nebula-metad			
•	NebulaGraph	1	3	nebula-metad	3	1
•	NebulaGraph	3		nebula-metad		
nebula-metad	Raft		leader	follower		
leader	leader		follower	leader	follower	leader

### Note

leader follower Raft leader leader Raft Storage

Meta

Meta		Meta	Meta
NebulaGraph			

Meta

NebulaGraph Meta

## SCHEMA

NebulaGraph Schema Tag Edge type Tag Edge type

## Meta Schema      Schema

NebulaGraph Schema

TTL

Meta

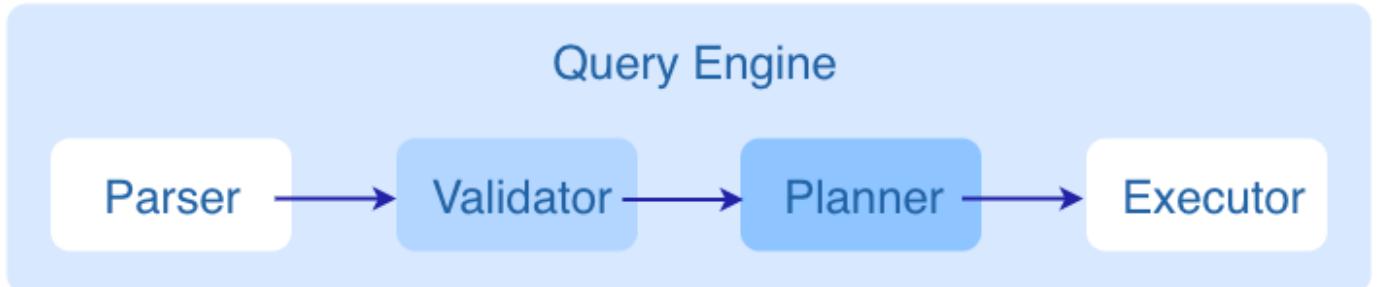
: January 13, 2023

### 2.8.3 Graph

Graph

Graph

Graph



Graph

1. **Parser**
2. **Validator**
3. **Planner**
4. **Executor**

#### Parser

Parser

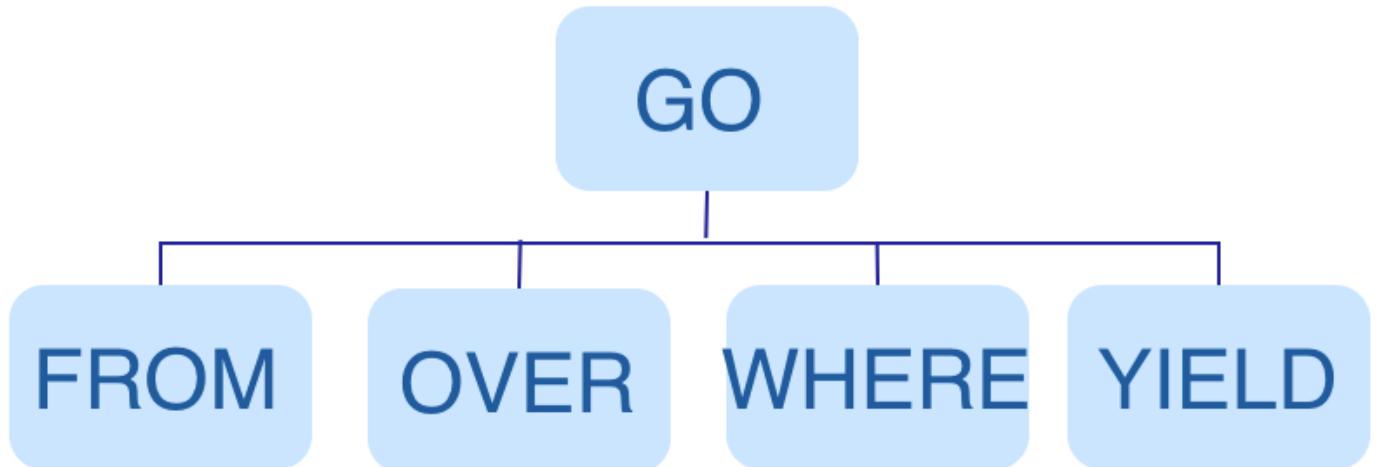
Flex

Bison

AST

```
GO FROM "Tim" OVER like WHERE properties(edge).likeness > 8.0 YIELD dst(edge)
```

AST



**Validator**

Validator AST

•

OVER WHERE YIELD

Schema Edge type Tag

Schema

•

```
$var = GO FROM "Tim" OVER like YIELD dst(edge) AS ID; GO FROM $var.ID OVER serve YIELD dst(edge) Validator
      ID           var
```

•

WHERE bool null empty

•

\* \* Schema

```
GO FROM "Tim" OVER * YIELD dst(edge), properties(edge).likeness, dst(edge) OVER Edge type Edge type
like serve          GO FROM "Tim" OVER like,serve YIELD dst(edge), properties(edge).likeness, dst(edge)
```

•

|

```
GO FROM "Tim" OVER like YIELD dst(edge) AS ID | GO FROM $-.ID OVER serve YIELD dst(edge) Validator      $-.ID
```

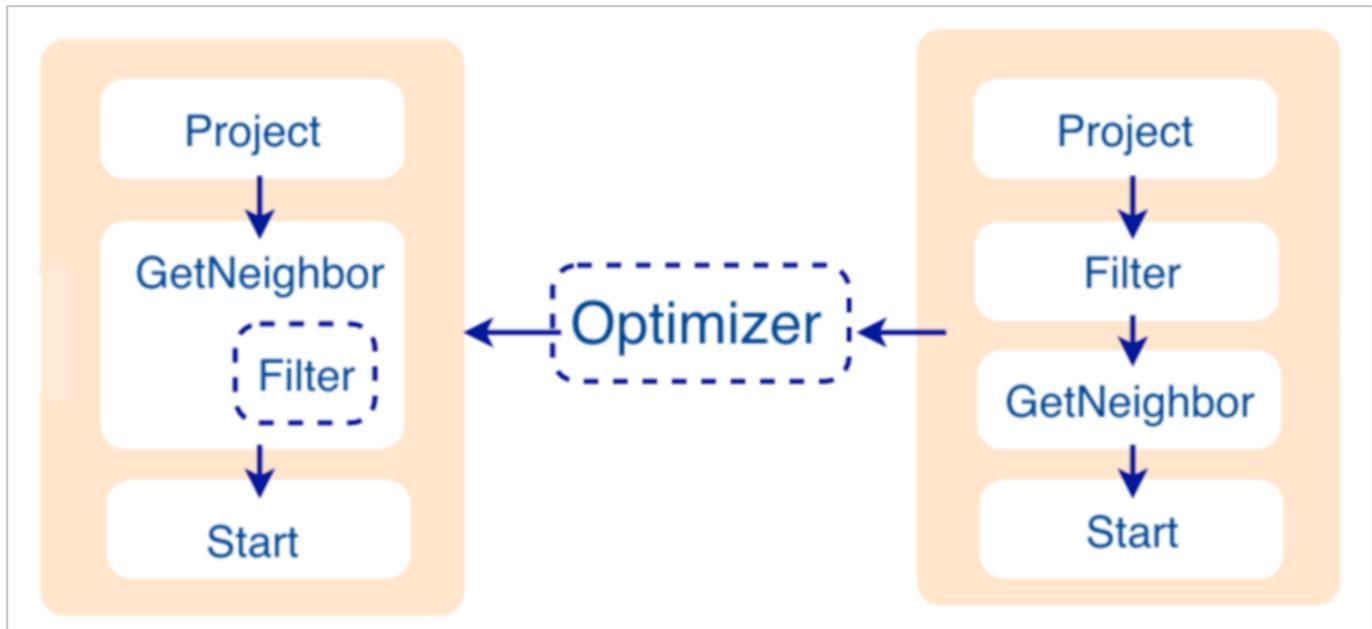
Validator

src/planner

**Planner**

nebula-graphd.conf enable\_optimizer false Planner Validator Executor

nebula-graphd.conf enable\_optimizer true Planner Validator



- ```

Project      Filter   Filter      GetNeighbor      Start
key         value           Start

nebula-graph    src/context/ExecutionContext.cpp
ResultMap     Filter          ResultMap["GN1"]       ResultMap["Filter2"]

```
- ```

Planner      RBO rule-based optimization      Validator      CBO cost-based optimization
nebula-graph    src/optimizer/
Project

RBO
Filter      GetNeighbor      Filter      GetNeighbor      Filter
GetNeighbor  Storage        Storage

```
- Executor**

```

Executor      Scheduler      Executor

```



## NebulaGraph

```

|--src
  |--graph
    |--context   //
    |--executor  //
    |--gc         //
    |--optimizer //
    |--planner   //
    |--scheduler //
    |--service   //
    |--session   //
    |--stats     //
    |--util      //
    |--validator //
    |--visitor   //visitor
  
```

## NebulaGraph

- nMeetup      Query Engine 33 30

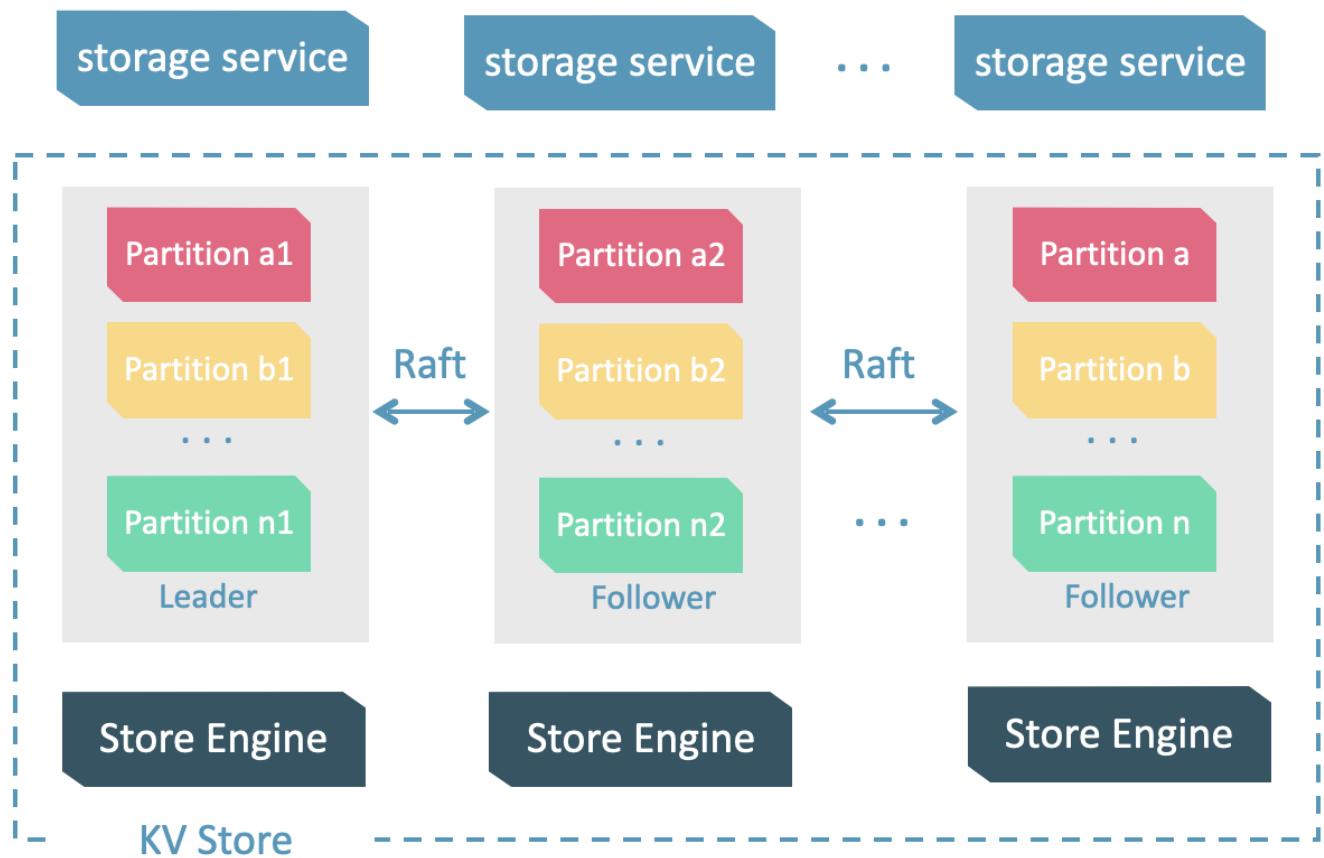
:January 13, 2023

## 2.8.4 Storage

NebulaGraph              Meta              Meta  
 Storage              nebula-storaged              Storage

- KVStore
- Shared-nothing        NAS
- Raft
- Raft
- 

Storage



Storage      nebula-storaged      nebula-storaged      1      3

nebula-storaged      Raft

- Storage interface

Storage                    API API                    KV

- `getNeighbors`

- `insert vertex/edge`

- `getProps`

Storage                    Storage                    KV

- Consensus

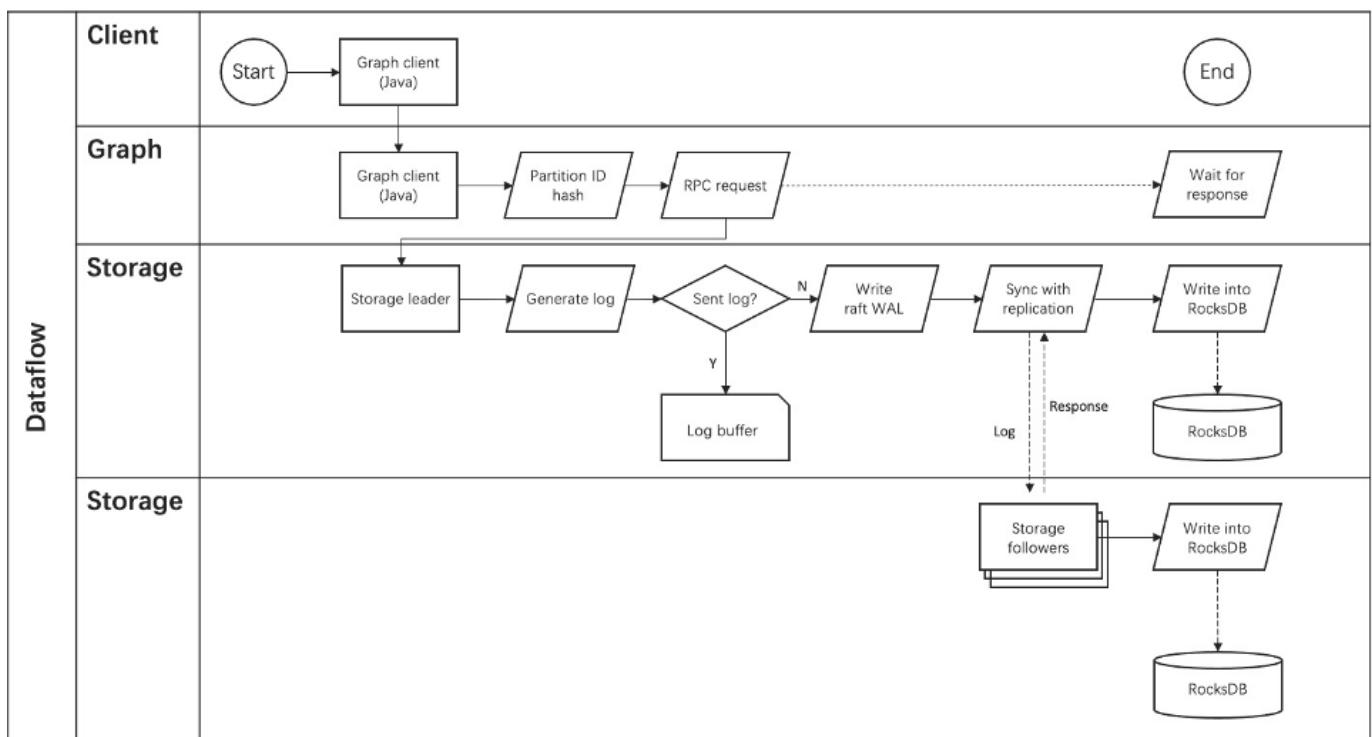
Storage                    Multi Group Raft

- Store Engine

Storage                    `get put scan`                    `KVStore.h KVEngine.h`

Storage

### Storage



### KVStore

NebulaGraph      KVStore      KVStore

- KVStore
- Schema   NebulaGraph      Schema
-

NebulaGraph    RocksDB                      KVStore

- NebulaGraph
- Meta                 Storage

 Note

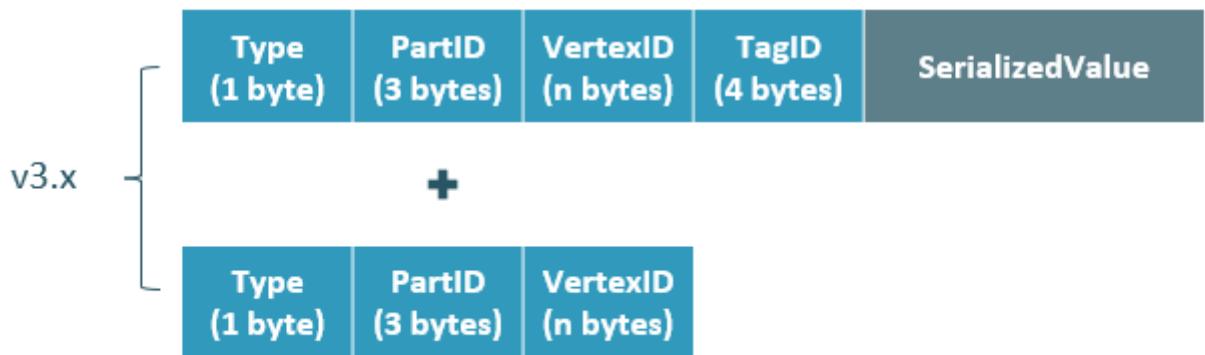
- WAL                 WAL
-

NebulaGraph

key

value

NebulaGraph 2.x 3.x Tag TagID value key



Type	key	1				
PartID		3	Storage	balance		
VertexID	ID	ID	int	8	ID	string
TagID		Tag ID	4			
SerializedValue		value				

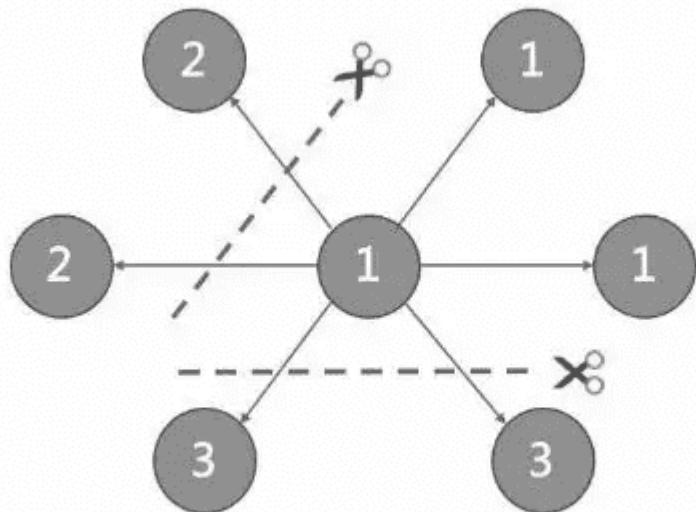
Type (1 byte)	PartID (3 bytes)	VertexID (n bytes)	EdgeType (4 bytes)	Rank (8 bytes)	VertexID (n bytes)	PlaceHolder (1 byte)	SerializedValue
------------------	---------------------	-----------------------	-----------------------	-------------------	-----------------------	-------------------------	-----------------

Type	key	1					
PartID		3	Storage	balance			
VertexID	ID	VertexID	ID	ID	VertexID	ID	ID
Edge type	0	0	4				
Rank				8			
PlaceHolder		1					
SerializedValue		value					

NebulaGraph Schema

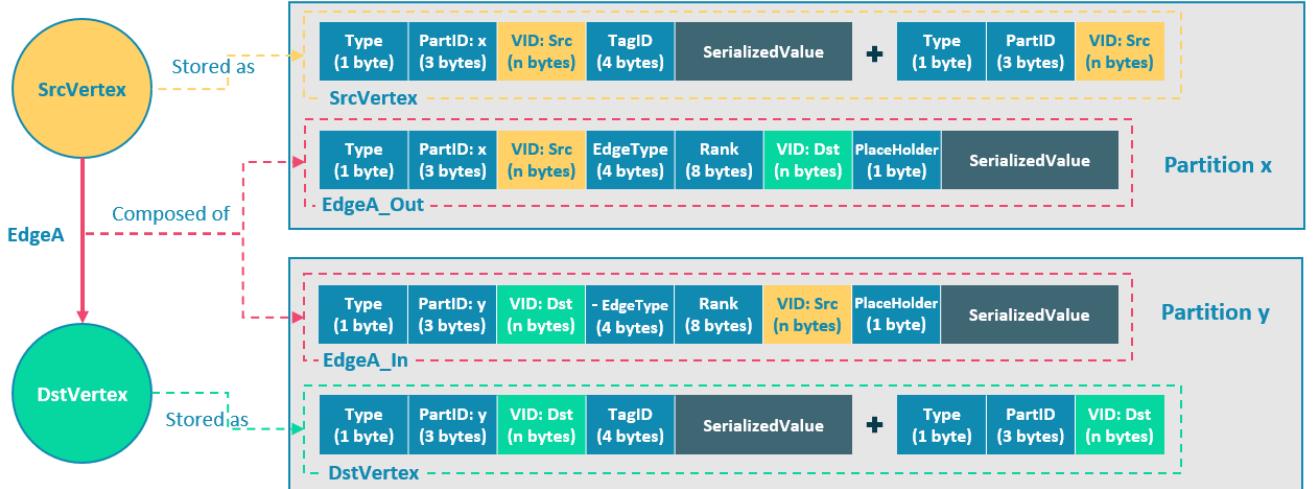
Schema NebulaGraph Schema Meta Schema

Partition NebulaGraph



NebulaGraph

key-value pair



SrcVertex	EdgeA	DstVertex	$(\text{SrcVertex}) - [\text{EdgeA}] \rightarrow (\text{DstVertex})$		6
Partition x	Partition x				
• SrcVertex	Partition x				
• EdgeA	EdgeA_Out	SrcVertex	Partition x	key	Type PartID x VID Src SrcVertex ID
EdgeType	Rank 0	VID Dst	DstVertex	ID	PlaceHolder SerializedValue Value
• DstVertex	Partition y				
• EdgeA	EdgeA_In	DstVertex	Partition y	key	Type PartID y VID Dst DstVertex ID EdgeType
Rank 0	VID Src	SrcVertex	ID	PlaceHolder SerializedValue Value	EdgeA_Out
EdgeA_Out	EdgeA_In		EdgeA	EdgeA_Out	(a) - [] -> (a) EdgeA_In
EdgeA_Out	EdgeA_In	NebulaGraph		key	value

TOSS

**Hash****VID****Tag****Note**

CREATE SPACE

**VID**

```
// ID     8      1.0      int64
uint64_t vid = 0;
if (id.size() == 8) {
    memcpy(static_cast<void*>(&vid), id.data(), 8);
} else {
    MurmurHash2 hash;
    vid = hash(id.data());
}
PartitionID pId = vid % numParts + 1;
```

int64      int64      1

```
pId = vid % numParts + 1;

%
numParts            VID            CREATE SPACE      partition_num
pId                VID            ID

100     VID 1 101 1001            ID
```

**Raft**

RAFT

Raft	Raft	" "	Leader	Leader	Follower	Leader
Follower		Leader Leader	Follower		Raft-wal	

**Note**

Raft-wal	Raft	IO	Leader				
	Leader	Raft-wal	Follower	" "	Raft-wal		
Leader Follower							
1		Leader		2	3	3	Leader
2 Follower	Leader	Leader	Follower		2		

**Note**

Raft      HDFS      Raft    " "

**MULTI GROUP RAFT**

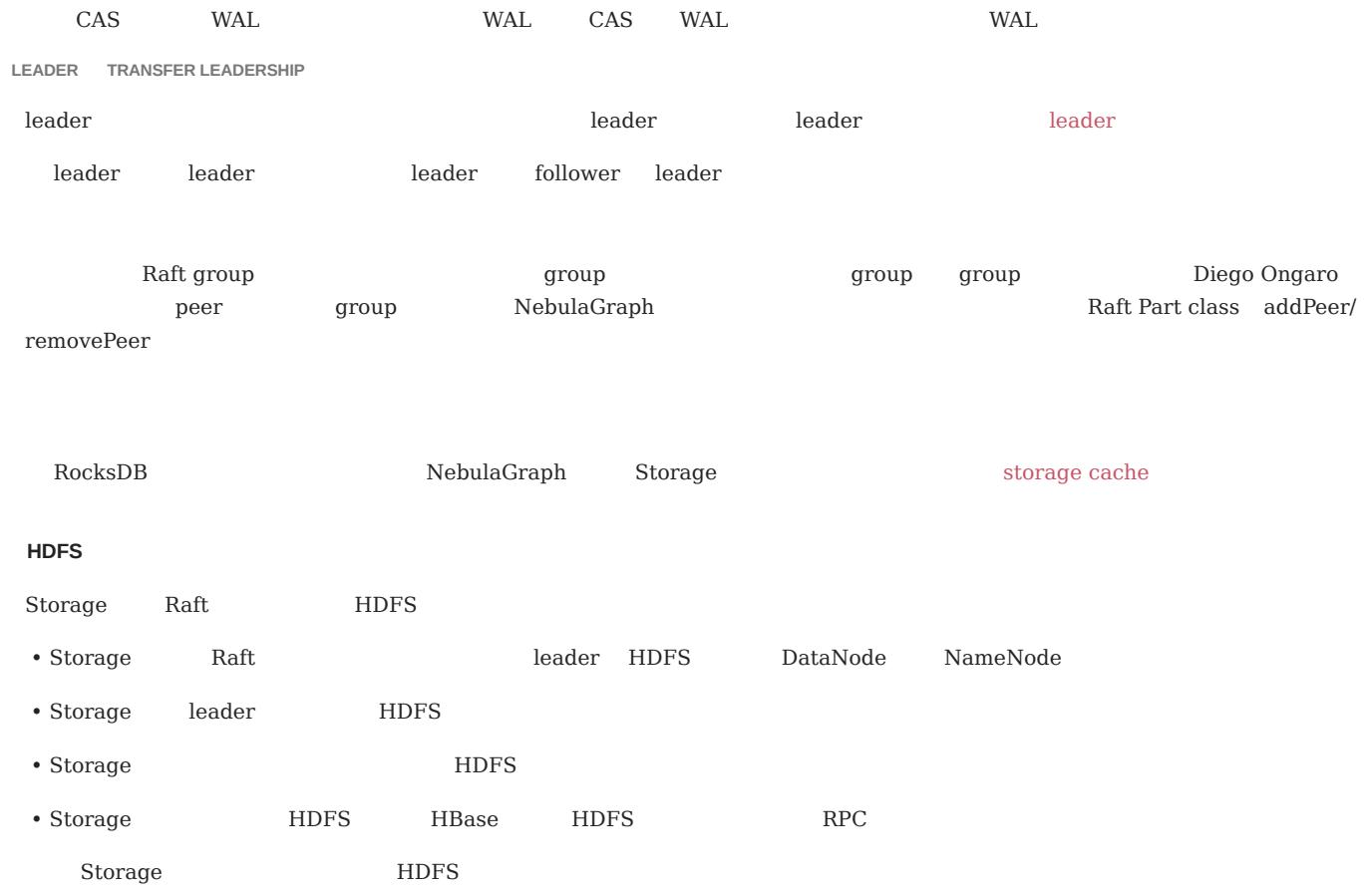
Storage	Raft	Multi Group Raft	Raft group	leader	follower
Raft					
Raft WAL	NebulaGraph	Multi Group Raft	NebulaGraph	Raft group	
Multi Group Raft 2					

- Transport
 

Raft group	peer	Transport
------------	------	-----------
- 

**BATCH**

NebulaGraph      NebulaGraph WAL      NebulaGraph




---

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### 3.

---

#### 3.1

---

NebulaGraph

NebulaGraph

NebulaGraph

##### 3.1.1



NebulaGraph

1.

2. NebulaGraph
3. NebulaGraph

NebulaGraph Cloud

NebulaGraph Cloud

##### 3.1.2



NebulaGraph

1. NebulaGraph
2. NebulaGraph
3. NebulaGraph
4. Storage
5. nGQL CURD

RPM DEB

NebulaGraph

NebulaGraph

### 3.1.3

NebulaGraph

#### NebulaGraph Academy

- 03 45



- 02 24



Bilibili

- Foesa ——NebulaGraph 04 20



- Foesa —— path 03 09



- Foesa —— 02 27



- Foesa —— 02 53



- Nebula Explore Demo Show 02 53



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## 3.2

---

### 3.2.1

NebulaGraph

NebulaGraph

NebulaGraph  
Cloud

NebulaGraph

NebulaGraph Cloud

NebulaGraph

**NebulaGraph**



NebulaGraph Cloud

3.1.3

NebulaGraph

NebulaGraph Cloud



NebulaGraph Cloud

NebulaGraph

Nebula Graph Nebula Dashboard

Nebula Explorer

14

- 
- RAM
- AliyunECSFullAccess
- AliyunVPCFullAccess
- AliyunROSFullAccess
- AliyunCloudMonitorFullAccess
- AliyunComputeNestUserFullAccess

NebulaGraph Cloud

NebulaGraph

NebulaGraph

30



NebulaGraph

ECS

1. **NebulaGraph**

2. **NebulaGraph**

3. **NebulaGraph Enterprise**

NebulaGraph

**Caution**

- 4.
5.           ECS
- 
- 
- 6.
7. **NebulaGraph**           ECS
- 8.
- a.       **VPC**     **ID**
- b.
- c.       **ID**
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
15.           10



1. **NebulaGraph**

2. **NebulaGraph**

3. NebulaGraph \*

4.

5.

6.

7. **NebulaGraph**

8.

9.

10.

11.

12.

13.

14.

10

Q

1. RAM

2.

3. NebulaGraph

NebulaGraph

---

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### 3.2.2 NebulaGraph

NebulaGraph

NebulaGraph Explorer

NebulaGraph

NebulaGraph Explorer      NebulaGraph

- 1.
- 2.
- 
- 
3.      **ID**
4.      **nebula\_private\_ip explorer\_portal**
5.    **explorer\_portal**      NebulaGraph Explorer
- 6.
- **Host** nebula\_private\_ip :9669      192.168.98.160:9669
- **root**
- 



NebulaGraph

NebulaGraph

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### 3.2.3 NebulaGraph

nGQL NebulaGraph  
Nebula Graph

nGQL NebulaGraph

NebulaGraph Cloud Explorer



Explorer

NebulaGraph

nGQL

NebulaGraph

Explorer

NebulaGraph

创建图空间

创建 Tag /  
Edge Type

插入数据

查询数据

其他操作

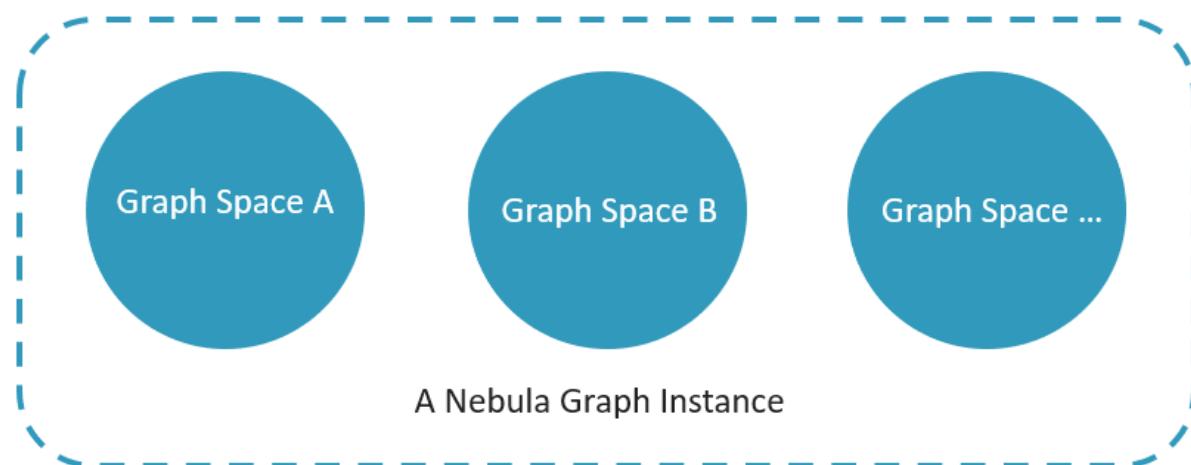
Explorer



nGQL

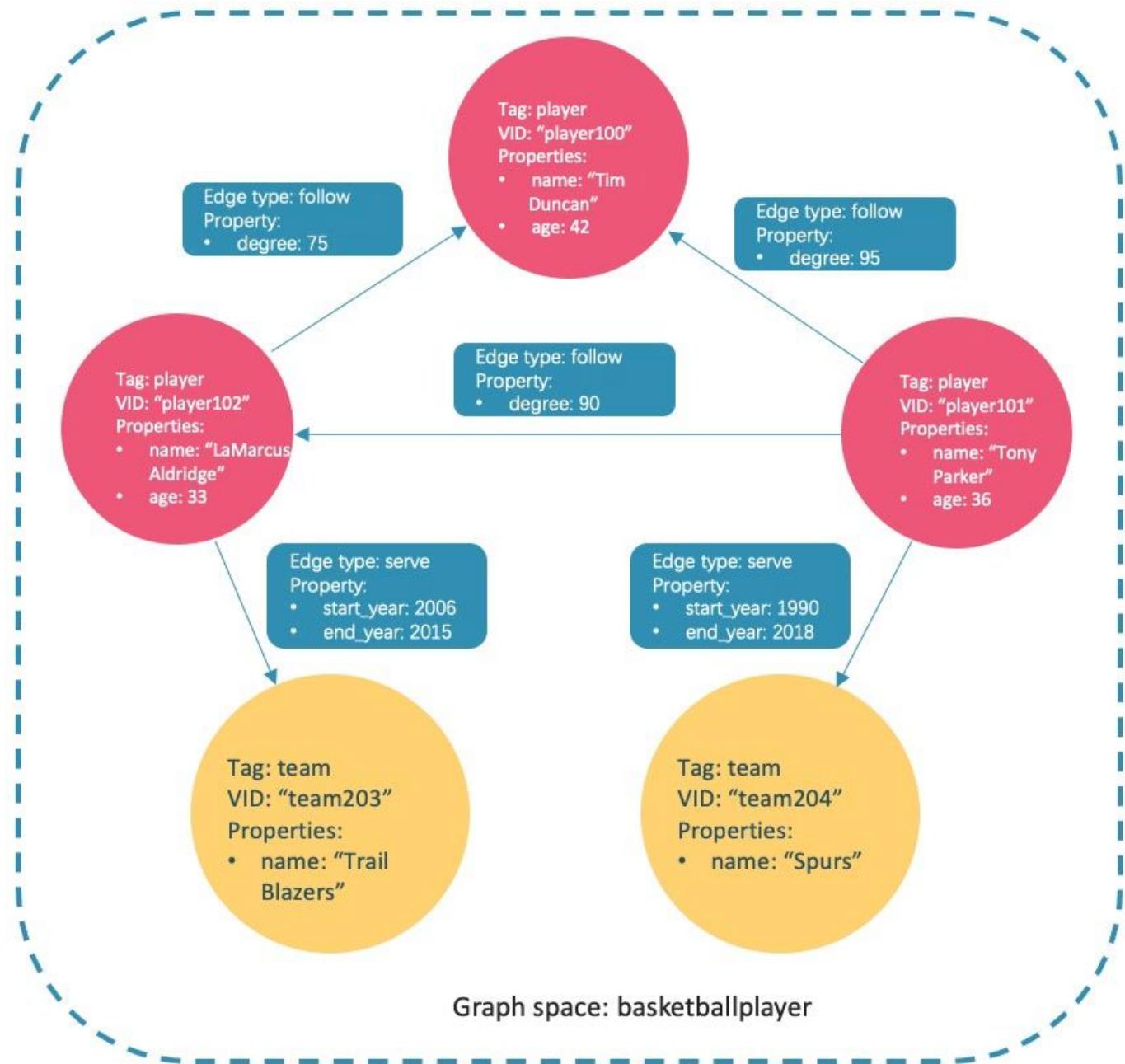
SCHEMA

NebulaGraph



## Schema NebulaGraph Schema

Vertex	0
Tag	
Edge	
Edge type	



**Caution**

NebulaGraph

2 20

- CREATE SPACE
- CREATE TAG
- CREATE EDGE
- ALTER TAG
- ALTER EDGE
- CREATE TAG INDEX
- CREATE EDGE INDEX

**Note**

10 heartbeat\_interval\_secs

NGQL

- 

```
CREATE SPACE [IF NOT EXISTS] <graph_space_name> (
[partition_num = <partition_number>,]
[replica_factor = <replica_number>,]
vid_type = {FIXED_STRING(<N>) | INT64}
)
[COMMENT = '<comment>'];
```

**CREATE SPACE**

- 

```
nebula> SHOW SPACES;
```

- 

```
USE <graph_space_name>;
```

1.

basketballplayer

```
nebula> CREATE SPACE basketballplayer(partition_num=15, replica_factor=1, vid_type=fixed_string(30));
```

**Note**

[ERROR (-1005)]: Host not enough!

**Storage**

2. SHOW HOSTS

```
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+
| Host | Port | HTTP port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "storaged0" | 9779 | 19669 | "ONLINE" | 5 | "basketballplayer:5" | "basketballplayer:5" | "3.1.0" |
```

```
| "storaged1" | 9779      | 19669      | "ONLINE" | 5           | "basketballplayer:5"          | "basketballplayer:5" | "3.1.0" |
| "storaged2" | 9779      | 19669      | "ONLINE" | 5           | "basketballplayer:5"          | "basketballplayer:5" | "3.1.0" |
+-----+-----+-----+-----+-----+-----+-----+-----+
```

**Leader distribution**

BALANCE LEADER

**Storage**

3. basketballplayer

nebula[(none)]&gt; USE basketballplayer;

**SHOW SPACES**

```
nebula> SHOW SPACES;
+-----+
| Name      |
+-----+
| "basketballplayer" |
+-----+
```

**Tag Edge type**

NGQL

```
CREATE {TAG | EDGE} [IF NOT EXISTS] {<tag_name> | <edge_type_name>}
(
    <prop_name> <data_type> [NULL | NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>']
    [{, <prop_name> <data_type> [NULL | NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>']} ...]
)
[TTL_DURATION = <ttl_duration>]
[TTL_COL = <prop_name>]
[COMMENT = '<comment>'];
```

**CREATE TAG CREATE EDGE**

Tag: player team Edge type: follow serve

player	Tag	name (string), age (int)
team	Tag	name (string)
follow	Edge type	degree (int)
serve	Edge type	start_year (int), end_year (int)

```
nebula> CREATE TAG player(name string, age int);
nebula> CREATE TAG team(name string);
nebula> CREATE EDGE follow(degree int);
nebula> CREATE EDGE serve(start_year int, end_year int);
```

**INSERT Tag****Edge type**

NGQL

```
•
INSERT VERTEX [IF NOT EXISTS] [tag_props, [tag_props] ...]
VALUES <vid>: ([prop_value_list])

tag_props:
tag_name ([prop_name_list])

prop_name_list:
[prop_name [, prop_name] ...]
```

```
prop_value_list:
  [prop_value [, prop_value] ...]
```

vid Vertex ID vid

**INSERT VERTEX**

•

```
INSERT EDGE [IF NOT EXISTS] <edge_type> ( <prop_name_list> ) VALUES
<src_vid> -> <dst_vid>[@<rank>] : ( <prop_value_list>
[, <src_vid> -> <dst_vid>[@<rank>] : ( <prop_value_list> ), ...];

<prop_name_list> ::= 
[ <prop_name> [, <prop_name> ] ...]

<prop_value_list> ::= 
[ <prop_value> [, <prop_value> ] ...]
```

**INSERT EDGE**

•

```
nebula> INSERT VERTEX player(name, age) VALUES "player100":("Tim Duncan", 42);
nebula> INSERT VERTEX player(name, age) VALUES "player101":("Tony Parker", 36);
nebula> INSERT VERTEX player(name, age) VALUES "player102":("LaMarcus Aldridge", 33);
nebula> INSERT VERTEX team(name) VALUES "team203":("Trail Blazers"), "team204":("Spurs");
```

•

```
nebula> INSERT EDGE follow(degree) VALUES "player101" -> "player100":(95);
nebula> INSERT EDGE follow(degree) VALUES "player101" -> "player102":(90);
nebula> INSERT EDGE follow(degree) VALUES "player102" -> "player100":(75);
nebula> INSERT EDGE serve(start_year, end_year) VALUES "player101" -> "team204":(1999, 2018), "player102" -> "team203":(2006, 2015);
```

• **GO**

GO

YIELD

• **FETCH**

• **LOOKUP**

WHERE

• **MATCH**

NebulaGraph

NGQL

• **GO**

```
GO [[<M> TO] <N> STEPS ] FROM <vertex_list>
OVER <edge_type_list> [{REVERSELY | BIDIRECT}]
[ WHERE <conditions> ]
YIELD [DISTINCT] <return_list>
[ { SAMPLE <sample_list> | <limit_by_list_clause> } ]
[ | GROUP BY {<col_name> | expression> | <position>} YIELD <col_name>]
```

```
[| ORDER BY <expression> [{ASC | DESC}]]  
[| LIMIT [<offset>,<number_rows>];
```

- **FETCH**

- **Tag**

```
FETCH PROP ON {<tag_name>[, tag_name ...] | *}  
<vid> [, vid ...]  
YIELD <return_list> [AS <alias>];
```

- 

```
FETCH PROP ON <edge_type> <src_vid> -> <dst_vid>[@<rank>] [, <src_vid> -> <dst_vid> ...]  
YIELD <output>;
```

- **LOOKUP**

```
LOOKUP ON {<vertex_tag> | <edge_type>}  
[WHERE <expression> [AND <expression> ...]]  
YIELD <return_list> [AS <alias>];  
  
<return_list>  
  <prop_name> [AS <col_alias>] [, <prop_name> [AS <prop_alias>] ...];
```

- **MATCH**

```
MATCH <pattern> [<clause_1>] RETURN <output> [<clause_2>];
```

**GO**

- **VID** `player101` `follow`

```
nebula> GO FROM "player101" OVER follow YIELD id($$);  
+-----+  
| id($) |  
+-----+  
| "player100" |
```

```
| "player102" |
+-----+
```

- VID player101 follow 35

```
nebula> GO FROM "player101" OVER follow WHERE properties($$).age >= 35 \
    YIELD properties($$).name AS Teammate, properties($$).age AS Age;
+-----+-----+
| Teammate | Age |
+-----+-----+
| "Tim Duncan" | 42 |
+-----+-----+
```

/

YIELD

\$\$

\

- VID player101 follow

\*

```
nebula> GO FROM "player101" OVER follow YIELD dst(edge) AS id | \
    GO FROM $.id OVER serve YIELD properties($$).name AS Team, \
    properties($^).name AS Player;
+-----+-----+
| Team | Player |
+-----+-----+
| "Trail Blazers" | "LaMarcus Aldridge" |
+-----+-----+
```

/

\$^

|

\$-

\*

### Note

```
nebula> $var = GO FROM "player101" OVER follow YIELD dst(edge) AS id; \
    GO FROM $var.id OVER serve YIELD properties($$).name AS Team, \
    properties($^).name AS Player;
+-----+-----+
| Team | Player |
+-----+-----+
| "Trail Blazers" | "LaMarcus Aldridge" |
+-----+-----+
```

**FETCH**

VID player100

```
nebula> FETCH PROP ON player "player100" YIELD properties(vertex);
+-----+
| properties(VERTEX) |
+-----+
| {age: 42, name: "Tim Duncan"} |
+-----+
```

### Note

LOOKUP MATCH

UPDATE UPSERT

UPSERT UPDATE INSERT UPSERT

### Note

partition UPSERT INSERT UPDATE partition

nGQL

- UPDATE

```
UPDATE VERTEX <vid> SET <properties to be updated>
[WHEN <condition>] [YIELD <columns>];
```

- UPDATE

```
UPDATE EDGE ON <edge_type> <source vid> -> <destination vid> [@rank]
SET <properties to be updated> [WHEN <condition>] [YIELD <columns to be output>];
```

- UPSERT

```
UPSERT {VERTEX <vid> | EDGE <edge_type>} SET <update_columns>
[WHEN <condition>] [YIELD <columns>];
```

- UPDATE VID player100 name FETCH

```
nebula> UPDATE VERTEX "player100" SET player.name = "Tim";
nebula> FETCH PROP ON player "player100" YIELD properties(vertex);
+-----+
| properties(VERTEX) |
+-----+
```

```
| {age: 42, name: "Tim"} |  
+-----+  
|
```

- UPDATE degree FETCH

```
nebula> UPDATE EDGE ON follow "player101" -> "player100" SET degree = 96;  
nebula> FETCH PROP ON follow "player101" -> "player100" YIELD properties(edge);  
+-----+  
| properties(EDGE) |  
+-----+  
| {degree: 96} |  
+-----+
```

- INSERT VID player111 UPSERT

```
nebula> INSERT VERTEX player(name,age) VALUES "player111":("David West", 38);  
nebula> UPSERT VERTEX "player111" SET player.name = "David", player.age = $^.player.age + 11 \  
WHEN $.player.name == "David West" AND $.player.age > 20 \  
YIELD $.player.name AS Name, $.player.age AS Age;  
+-----+-----+  
| Name | Age |  
+-----+-----+  
| "David" | 49 |  
+-----+
```

## nGQL

- 

```
DELETE VERTEX <vid1>[, <vid2>...]
```

- 

```
DELETE EDGE <edge_type> <src_vid> -> <dst_vid>[@<rank>]  
[, <src_vid> -> <dst_vid>...]
```

- 

```
nebula> DELETE VERTEX "player111", "team203";
```

- 

```
nebula> DELETE EDGE follow "player101" -> "team204";
```

## CREATE INDEX Tag Edge type



```
MATCH LOOKUP
```

```
" " MATCH LOOKUP
```

## nGQL

-

```
CREATE {TAG | EDGE} INDEX [IF NOT EXISTS] <index_name>
ON {<tag_name> | <edge_name>} ([<prop_name_list>]) [COMMENT = '<comment>'];
```

- REBUILD {TAG | EDGE} INDEX <index\_name>;

### Note

utf-8

3

10

30

LOOKUP MATCH

LOOKUP MATCH

Tag player name Tony Parker

```
//      name      player_index_1
nebula> CREATE TAG INDEX IF NOT EXISTS player_index_1 ON player(name(20));
//
//      REBUILD TAG INDEX player_index_1
+-----+
| New Job Id |
+-----+
| 31          |
+-----+

//      LOOKUP
nebula> LOOKUP ON player WHERE player.name == "Tony Parker" \
      YIELD properties(vertex).name AS name, properties(vertex).age AS age;
+-----+-----+
| name      | age   |
+-----+-----+
| "Tony Parker" | 36   |
+-----+-----+

//      MATCH
nebula> MATCH (v:player{name:"Tony Parker"}) RETURN v;
+-----+
| v           |
+-----+
| ("player101" :player{age: 36, name: "Tony Parker"}) |
```

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## 3.3 nGQL

---

### 3.3.1

---

double abs(double x)	x
double floor(double x)	x
double ceil(double x)	x
double round(double x)	x x 0
double sqrt(double x)	x
double cbrt(double x)	x
double hypot(double x, double y)	x y
double pow(double x, double y)	$x^y$
double exp(double x)	$e^x$
double exp2(double x)	$2^x$
double log(double x)	$e^x$
double log2(double x)	$2^x$
double log10(double x)	$10^x$
double sin(double x)	x
double asin(double x)	x
double cos(double x)	x
double acos(double x)	x
double tan(double x)	x
double atan(double x)	x
double rand()	[0,1)
int rand32(int min, int max)	[min, max] 32 int max min 0 32
int rand64(int min, int max)	[min, max] 64 int max min 0 64
bit_and()	AND
bit_or()	OR
bit_xor()	XOR
int size()	
int range(int start, int end, int step)	[start, end] step 1
int sign(double x)	x x 0 0 x -1 x 1
double e()	e 2.718281828459045
double pi()	$\pi$ 3.141592653589793
double radians()	radians(180) 3.141592653589793

avg()
count() count({expr   *}) count()     NULL count(expr) count() size()
max()
min()
collect()     collect()
std()
sum()

int strcasecmp(string a, string b)	a=b	0	a>b	0	a<b	0
string lower(string a)						
string toLower(string a)	lower()					
string upper(string a)						
string toUpper(string a)	upper()					
int length(a)						
string trim(string a)						
string ltrim(string a)						
string rtrim(string a)						
string left(string a, int count)	count	count	a	a		
string right(string a, int count)	count	count	a	a		
string lpad(string a, int size, string letters)	a	letters	size			
string rpad(string a, int size, string letters)	a	letters	size			
string substr(string a, int pos, int count)	a	pos	pos	count		
string substring(string a, int pos, int count)	substr()					
string reverse(string)						
string replace(string a, string b, string c)	a	b	c			
list split(string a, string b)	b	a				
concat()	concat()	concat(string1, string2, ...)				
concat_ws()	concat_ws()	separator				
extract()	extract()					
json_extract()	json_extract()	JSON	map			

- 

int now()		
timestamp timestamp()		
date date()	UTC	
time time()	UTC	
datetime datetime()	UTC	

- Schema

- nGQL

id(vertex)	ID	ID	
map properties(vertex)			
map properties(edge)			
string type(edge)	Edge type		
src(edge)	ID	ID	
dst(edge)	ID	ID	
int rank(edge)	rank		
vertex	ID	Tag	
edge	Edge type	ID	ID rank
vertices	GET SUBGRAPH		
edges	GET SUBGRAPH		
path	FIND PATH		

- openCypher

id(<vertex>)	ID	ID	
list tags(<vertex>)	Tag	labels()	
list labels(<vertex>)	Tag	tags()	openCypher
map properties(<vertex_or_edge>)			
string type(<edge>)	Edge type		
src(<edge>)	ID	ID	
dst(<edge>)	ID	ID	
vertex startNode(<path>)		ID	
string endNode(<path>)		ID	
int rank(<edge>)	rank		

keys(expr)

labels(vertex) Tag

nodes(path)

range(start, end [, step]) [start, end] step 1

relationships(path)

reverse(list)

tail(list)

head(list)

last(list)

reduce()

bool toBoolean()

float toFloat()

string toString()

int toInteger()

set toSet()

int hash() hash() NULL

true false WHERE

```
<predicate>(<variable> IN <list> WHERE <condition>)
```

exists() true false

any() true false

all() true false

none() true false

single() true false

CASE nGQL YIELD RETURN

CASE	ELSE	ELSE	NULL
------	------	------	------

coalesce()

### 3.3.2

- MATCH

```
MATCH <pattern> [<clause_1>] RETURN <output> [<clause_2>];
```

	(v)		(v)
Tag	MATCH (v:player) RETURN v	:<tag_name>	Tag
Tag	MATCH (v:player:team) RETURN v LIMIT 10	:	Tag
	MATCH (v:player{name:"Tim Duncan"}) RETURN v	Tag	{<prop_name>: <prop_value>}
	MATCH (v) WITH v, properties(v) as props, keys(properties(v)) as kk LIMIT 10000 WHERE [i in kk where props[i] == "Tim Duncan"] RETURN v	Tag	Tag
ID	MATCH (v) WHERE id(v) == 'player101' RETURN v	ID	id()
ID	MATCH (v:player { name: 'Tim Duncan' })--(v2) WHERE id(v2) IN ["player101", "player102"] RETURN v2	ID	WHERE id(v) IN [vid_list]
	MATCH (v:player{name:"Tim Duncan"})--(v2) RETURN v2.player.name AS Name	--	-- < >
	MATCH p=(v:player{name:"Tim Duncan"})-->(v2) RETURN p	--	--
	MATCH (v:player{name:"Tim Duncan"})-[e]-(v2) RETURN e	--	--> <--
	MATCH ()<-[e]-() RETURN e LIMIT 3	-[e]-	
Edge type	MATCH ()-[e:follow]->() RETURN e LIMIT 5	:<edge_type> [e:follow]-	Edge type -
	MATCH (v:player{name:"Tim Duncan"})- [e:follow{degree:95}]->(v2) RETURN e	{<prop_name>: <prop_value>} [e:follow{likeness:95}]	Edge type Edge type
	MATCH ()-[e]->() WITH e, properties(e) as props, keys(properties(e)) as kk LIMIT 10000 WHERE [i in kk where props[i] == 90] RETURN e		
Edge type	MATCH (v:player{name:"Tim Duncan"})-[e:follow   :serve]->(v2) RETURN e	Edge type Edge type [e:follow   serve]	[e:follow   :serve]
	MATCH (v:player{name:"Tim Duncan"})-[]->(v2)<- [e:serve]-(v3) RETURN v2, v3		
	MATCH p=(v:player{name:"Tim Duncan"})-[e:follow*2]->(v2) >(v2) RETURN DISTINCT v2 AS Friends	:<edge_type>*<hop> e	hop
	MATCH p=(v:player{name:"Tim Duncan"})- [e:follow*1..3]->(v2) RETURN v2 AS Friends	minHop maxHop	minHop maxHop
Edge type	MATCH p=(v:player{name:"Tim Duncan"})-[e:follow   serve*2]->(v2) RETURN DISTINCT v2	Edge type Edge type	hop minHop maxHop e
	MATCH (v:player{name:"Tim Duncan"}) RETURN v MATCH (v:player{name:"Tim Duncan"})-[e]->(v2) RETURN e	RETURN {<vertex_name>   <edge_name>}	
ID	MATCH (v:player{name:"Tim Duncan"}) RETURN id(v)	id()	ID
Tag	MATCH (v:player{name:"Tim Duncan"}) RETURN labels(v)	labels() labels(v)	Tag N labels(v)[n-1]

	MATCH (v:player{name:"Tim Duncan"}) RETURN v.player.age	RETURN {<vertex_name>   <edge_name>}.<property> AS
	MATCH p=(v:player{name:"Tim Duncan"})-[]-(v2) RETURN properties(v2)	properties()
Edge type	MATCH p=(v:player{name:"Tim Duncan"})-[e]->() RETURN DISTINCT type(e)	type() Edge type
	MATCH p=(v:player{name:"Tim Duncan"})-[*3]->()	RETURN <path_name>
	RETURN nodes(p)	nodes()
	MATCH p=(v:player{name:"Tim Duncan"})-[]-(v2) RETURN relationships(p)	relationships()
	MATCH p=(v:player{name:"Tim Duncan"})-[*..2]->(v2) RETURN p AS Paths, length(p) AS Length	length()

- OPTIONAL MATCH

```
MATCH (m)-[]-(n) WHERE id(m)=="player100" OPTIONAL MATCH (n)-[]-(l) WHERE id(n)=="player125" RETURN id(m),id(n),id(l) NULL
```

- LOOKUP

```
LOOKUP ON {<vertex_tag> | <edge_type>} [WHERE <expression> [AND <expression> ...]] YIELD <return_list> [AS <alias>]
```

	LOOKUP ON player WHERE player.name == "Tony Parker" YIELD player.name AS name, player.age AS age	Tag player name Tony Parker
	LOOKUP ON follow WHERE follow.degree == 90 YIELD follow.degree	Edge type follow degree 90
Tag	LOOKUP ON player YIELD properties(vertex),id(vertex)	Tag player VID
Edge type	LOOKUP ON like YIELD edge AS e	Edge type like
	LOOKUP ON player YIELD id(vertex)  YIELD COUNT(*) AS Player_Count	Tag player
	LOOKUP ON like YIELD id(vertex)  YIELD COUNT(*) AS Like_Count	Edge type like

- GO

```
GO [[<M> TO] <N> STEPS ] FROM <vertex_list>
OVER <edge_type_list> [{REVERSELY | BIDIRECT}]
[ WHERE <conditions> ]
YIELD [DISTINCT] <return_list>
[ {SAMPLE <sample_list> | LIMIT <limit_list>} ]
[| GROUP BY {col_name | expr | position} YIELD <col_name>]
[| ORDER BY <expression> [{ASC | DESC}]]
[| LIMIT [<offset_value>,] <number_rows>]
```

GO FROM "player102" OVER serve YIELD dst(edge)	player102
GO 2 STEPS FROM "player102" OVER follow YIELD dst(edge)	player102
GO FROM "player100", "player102" OVER serve WHERE properties(edge).start_year > 1995 YIELD DISTINCT properties(\$\$).name AS team_name, properties(edge).start_year AS start_year, properties(\$^).name AS player_name	
GO FROM "player100" OVER follow, serve YIELD properties(edge).degree, properties(edge).start_year	Edge type UNKNOWN_PROP
GO FROM "player100" OVER follow REVERSELY YIELD src(edge) AS destination	player100
GO FROM "player100" OVER follow REVERSELY YIELD src(edge) AS id   GO FROM \$-.id OVER serve WHERE properties(\$^).age > 20 YIELD properties(\$^).name AS FriendOf, properties(\$\$).name AS Team	player100
GO FROM "player102" OVER follow YIELD dst(edge) AS both	player102
GO 2 STEPS FROM "player100" OVER follow YIELD src(edge) AS src, dst(edge) AS dst, properties(\$ \$).age AS age   GROUP BY \$-.dst YIELD \$-.dst AS dst, collect_set(\$-.src) AS src, collect(\$-.age) AS age	

- **FETCH**

```
FETCH PROP ON {<tag_name>[, tag_name ...] | *}
<vid> [, vid ...]
YIELD <return_list> [AS <alias>]
```

FETCH PROP ON player "player100" YIELD properties(vertex)	FETCH	Tag	
FETCH PROP ON player "player100" YIELD player.name AS name	YIELD		
FETCH PROP ON player "player101", "player102", "player103" YIELD properties(vertex)	ID	,	
FETCH PROP ON player, t1 "player100", "player103" YIELD properties(vertex)	FETCH	Tag	Tag
FETCH PROP ON * "player100", "player106", "team200" YIELD properties(vertex)	FETCH	*	

```
FETCH PROP ON <edge_type> <src_vid> -> <dst_vid>[@<rank>] [, <src_vid> -> <dst_vid> ...]
YIELD <output>;
```

FETCH PROP ON serve "player100" -> "team204" YIELD properties(edge)	player100	team204	serve
FETCH PROP ON serve "player100" -> "team204" YIELD serve.start_year	YIELD		
FETCH PROP ON serve "player100" -> "team204", "player133" -> "team202" YIELD properties(edge)	(<src_vid> -> <dst_vid>[@<rank>] )	,	
FETCH PROP ON serve "player100" -> "team204"@1 YIELD properties(edge)	rank	0	FETCH
GO FROM "player101" OVER follow YIELD follow._src AS s, follow._dst AS d	player101	follow	degree
FETCH PROP ON follow \$-.s -> \$-.d YIELD follow.degree			
\$var = GO FROM "player101" OVER follow YIELD follow._src AS s, follow._dst AS d; FETCH PROP ON follow \$var.s -> \$var.d YIELD follow.degree			

- SHOW

SHOW CHARSET	SHOW CHARSET	SHOW CHARSET	
SHOW COLLATION	SHOW COLLATION	SHOW COLLATION	
SHOW CREATE SPACE	SHOW CREATE SPACE <space_name>	SHOW CREATE SPACE basketballplayer	
SHOW CREATE TAG/EDGE	SHOW CREATE {TAG <tag_name>   EDGE <edge_name>}	SHOW CREATE TAG player	Tag/Edge type
SHOW HOSTS	SHOW HOSTS [GRAPH   STORAGE   META]	SHOW HOSTS SHOW HOSTS GRAPH	Graph Storage Meta
SHOW INDEX STATUS	SHOW {TAG   EDGE} INDEX STATUS	SHOW TAG INDEX STATUS	
SHOW INDEXES	SHOW {TAG   EDGE} INDEXES	SHOW TAG INDEXES	Tag Edge type
SHOW PARTS	SHOW PARTS [<part_id>]	SHOW PARTS	
SHOW ROLES	SHOW ROLES IN <space_name>	SHOW ROLES in basketballplayer	
SHOW SNAPSHOTS	SHOW SNAPSHOTS	SHOW SNAPSHOTS	
SHOW SPACES	SHOW SPACES	SHOW SPACES	
SHOW STATS	SHOW STATS	SHOW STATS	STATS
SHOW TAGS/EDGES	SHOW TAGS   EDGES	SHOW TAGS   SHOW EDGES	Tag/Edge type
SHOW USERS	SHOW USERS	SHOW USERS	
SHOW SESSIONS	SHOW SESSIONS	SHOW SESSIONS	
SHOW SESSIONS	SHOW SESSION <Session_Id>	SHOW SESSION 1623304491050858	ID
SHOW QUERIES	SHOW [ALL] QUERIES	SHOW QUERIES	Session
SHOW META LEADER	SHOW META LEADER	SHOW META LEADER	Meta leader

## 3.3.3

GROUP BY	GROUP BY <var> YIELD <var>, <aggregation_function(var)>	GO FROM "player100" OVER follow BIDIRECT YIELD \$\$.player.name as Name   GROUP BY \$-.Name YIELD \$-.Name as Player, count(*) AS Name_Count	player100
LIMIT	YIELD <var> [  LIMIT [<offset_value>, <number_rows>]	GO FROM "player100" OVER follow REVERSELY YIELD \$\$.player.name AS Friend, \$\$.player.age AS Age   ORDER BY \$-.Age, \$-.Friend   LIMIT 1, 3	2 3
SKIP	RETURN <var> [SKIP <offset>] [LIMIT <number_rows>]	MATCH (v:player{name:"Tim Duncan"}) --> (v2) RETURN v2.player.name AS Name, v2.player.age AS Age ORDER BY Age DESC SKIP 1	SKIP <offset> LIMIT <number_rows>
SAMPLE	<go_statement> SAMPLE <sample_list>;	GO 3 STEPS FROM "player100" OVER * YIELD properties(\$\$).name AS NAME, properties(\$\$).age AS Age SAMPLE [1,2,3];	
ORDER BY	<YIELD clause> ORDER BY <expression> [ASC   DESC] [, <expression> [ASC   DESC] ...]	FETCH PROP ON player "player100", "player101", "player102", "player103" YIELD player.age AS age, player.name AS name   ORDER BY \$-.age ASC, \$-.name DESC	ORDER BY
RETURN	RETURN {<vertex_name> <edge_name>  <vertex_name>.<property>  <edge_name>.<property> ...}	MATCH (v:player) RETURN v.player.name, v.player.age LIMIT 3	name age
TTL	CREATE TAG <tag_name>(<property_name_1> <property_value_1>, <property_name_2> <property_value_2>, ...) ttl_duration= <value_int>, ttl_col = <property_name>	CREATE TAG t2(a int, b int, c string) ttl_duration= 100, ttl_col = "a"	Tag TTL
WHERE	WHERE {<vertex> edge_alias>.<property_name> {> = < ...} <value>...}	MATCH (v:player) WHERE v.player.name == "Tim Duncan" XOR (v.player.age < 30 AND v.player.name == "Yao Ming") OR NOT (v.player.name == "Yao Ming" OR v.player.name == "Tim Duncan") RETURN v.player.name, v.player.age	WHERE GO LOOKUP MATCH WITH
YIELD	YIELD [DISTINCT] <col> [AS <alias>] [, <col> [AS <alias>] ...] [WHERE <conditions>];	GO FROM "player100" OVER follow YIELD dst(edge) AS ID   FETCH PROP ON player \$-.ID YIELD player.age AS Age   YIELD AVG(\$-.Age) as Avg_age, count(*)as Num_friends	player100 player
WITH	MATCH \$expressions WITH {nodes()  labels() ...}	MATCH p=(v:player{name:"Tim Duncan"})--() WITH nodes(p) AS n UNWIND n AS n1 RETURN DISTINCT n1	WITH
UNWIND	UNWIND <list> AS <alias> <RETURN clause>	UNWIND [1,2,3] AS n RETURN n	

## 3.3.4

CREATE SPACE	CREATE SPACE [IF NOT EXISTS] <graph_space_name> ( [partition_num = <partition_number>, ] [replica_factor = <replica_number>, ] vid_type = {FIXED_STRING(<N>)   INT[64]} ) [COMMENT = '<comment>']	CREATE SPACE my_space_1 (vid_type=FIXED_STRING(30))	
CREATE SPACE	CREATE SPACE <new_graph_space_name> AS <old_graph_space_name>	CREATE SPACE my_space_4 as my_space_3	Schema
USE	USE <graph_space_name>	USE space1	
SHOW SPACES	SHOW SPACES	SHOW SPACES	NebulaGraph
DESCRIBE SPACE	DESC[RIBE] SPACE <graph_space_name>	DESCRIBE SPACE basketballplayer	
CLEAR SPACE	CLEAR SPACE [IF EXISTS] <graph_space_name>		Schema
DROP SPACE	DROP SPACE [IF EXISTS] <graph_space_name>	DROP SPACE basketballplayer	

## 3.3.5 TAG

CREATE TAG	CREATE TAG [IF NOT EXISTS] <tag_name> ( <prop_name> <data_type> [NULL   NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>'] [{, <prop_name> <data_type> [NULL   NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>'] } ... ] [TTL_DURATION = <ttl_duration>] [TTL_COL = <prop_name>] [COMMENT = '<comment>']	CREATE TAG woman(name string, age int, married bool, salary double, create_time timestamp) TTL_DURATION = 100, TTL_COL = "create_time"	Tag
DROP TAG	DROP TAG [IF EXISTS] <tag_name>	DROP TAG test;	Tag
ALTER TAG	ALTER TAG <tag_name> <alter_definition> [, alter_definition] ... ] [ttl_definition [, ttl_definition] ... ] [COMMENT = '<comment>']	ALTER TAG t1 ADD (p3 int, p4 string)	Tag
			TTL Time-To- Live)
SHOW TAGS	SHOW TAGS	SHOW TAGS	Tag
DESCRIBE TAG	DESC[RIBE] TAG <tag_name>	DESCRIBE TAG player	Tag
DELETE TAG	DELETE TAG <tag_name_list> FROM <VID>	DELETE TAG test1 FROM "test"	Tag

### 3.3.6 Edge type

<b>CREATE EDGE</b>	<code>CREATE EDGE [IF NOT EXISTS] &lt;edge_type_name&gt; ( &lt;prop_name&gt; &lt;data_type&gt; [NULL   NOT NULL] [DEFAULT &lt;default_value&gt;] [COMMENT '&lt;comment&gt;'] [{, &lt;prop_name&gt; &lt;data_type&gt; [NULL   NOT NULL] [DEFAULT &lt;default_value&gt;] [COMMENT '&lt;comment&gt;']}] ... ) [TTL_DURATION = &lt;ttx_duration&gt;] [TTL_COL = &lt;prop_name&gt;] [COMMENT = '&lt;comment&gt;']</code>	<code>CREATE EDGE e1(p1 string, p2 int, p3 timestamp) TTL_DURATION = 100, TTL_COL = "p2"</code>	Edge type
<b>DROP EDGE</b>	<code>DROP EDGE [IF EXISTS] &lt;edge_type_name&gt;</code>	<code>DROP EDGE e1</code>	Edge type
<b>ALTER EDGE</b>	<code>ALTER EDGE &lt;edge_type_name&gt; &lt;alter_definition&gt; [, alter_definition] ... [ttl_definition [, ttl_definition] ... ] [COMMENT = '&lt;comment&gt;']</code>	<code>ALTER EDGE e1 ADD (p3 int, p4 string)</code>	Edge type
<b>SHOW EDGES</b>	<code>SHOW EDGES</code>	<code>SHOW EDGES</code>	Edge type
<b>DESCRIBE EDGE</b>	<code>DESC[RIBE] EDGE &lt;edge_type_name&gt;</code>	<code>DESCRIBE EDGE follow</code>	Edge type

### 3.3.7

<b>INSERT VERTEX</b>	<code>INSERT VERTEX [IF NOT EXISTS] [tag_props, [tag_props] ...] VALUES &lt;vid&gt;: ([prop_value_list])</code>	<code>INSERT VERTEX t2 (name, age) VALUES "13":("n3", 12), "14":("n4", 8)</code>	NebulaGraph
<b>DELETE VERTEX</b>	<code>DELETE VERTEX &lt;vid&gt; [, &lt;vid&gt; ...]</code>	<code>DELETE VERTEX "team1"</code>	
<b>UPDATE VERTEX</b>	<code>UPDATE VERTEX ON &lt;tag_name&gt; &lt;vid&gt; SET &lt;update_prop&gt; [WHEN &lt;condition&gt;] [YIELD &lt;output&gt;]</code>	<code>UPDATE VERTEX ON player "player101" SET age = age + 2</code>	Tag
<b>UPSERT VERTEX</b>	<code>UPSERT VERTEX ON &lt;tag&gt; &lt;vid&gt; SET &lt;update_prop&gt; [WHEN &lt;condition&gt;] [YIELD &lt;output&gt;]</code>	<code>UPSERT VERTEX ON player "player667" SET age = 31</code>	UPDATE INSERT

### 3.3.8

<b>INSERT EDGE</b>	<code>INSERT EDGE [IF NOT EXISTS] &lt;edge_type&gt; ( &lt;prop_name_list&gt; ) VALUES &lt;src_vid&gt; -&gt; &lt;dst_vid&gt;[@&lt;rank&gt;] : ( &lt;prop_value_list&gt; ) [, &lt;src_vid&gt; -&gt; &lt;dst_vid&gt;[@&lt;rank&gt;] : ( &lt;prop_value_list&gt; ), ...]</code>	<code>INSERT EDGE e2 (name, age) VALUES "11"- &gt;"13":("n1", 1)</code>	NebulaGraph
<b>DELETE EDGE</b>	<code>DELETE EDGE &lt;edge_type&gt; &lt;src_vid&gt; -&gt; &lt;dst_vid&gt;[@&lt;rank&gt;] [, &lt;src_vid&gt; -&gt; &lt;dst_vid&gt;[@&lt;rank&gt;] ...]</code>	<code>DELETE EDGE serve "player100" -&gt; "team204"@0</code>	
<b>UPDATE EDGE</b>	<code>UPDATE EDGE ON &lt;edge_type&gt; &lt;src_vid&gt; -&gt; &lt;dst_vid&gt; [@&lt;rank&gt;] SET &lt;update_prop&gt; [WHEN &lt;condition&gt;] [YIELD &lt;output&gt;]</code>	<code>UPDATE EDGE ON serve "player100" -&gt; "team204"@0 SET start_year = start_year + 1</code>	Edge type
<b>UPsert EDGE</b>	<code>UPSERT EDGE ON &lt;edge_type&gt; &lt;src_vid&gt; -&gt; &lt;dst_vid&gt; [@rank] SET &lt;update_prop&gt; [WHEN &lt;condition&gt;] [YIELD &lt;properties&gt;]</code>	<code>UPSERT EDGE on serve "player666" -&gt; "team200"@0 SET end_year = 2021</code>	UPDATE INSERT

### 3.3.9

• LOOKUP MATCH

CREATE INDEX	CREATE {TAG   EDGE} INDEX [IF NOT EXISTS] <index_name> ON {<tag_name>   <edge_name>} ([<prop_name_list>]) [COMMENT = '<comment>']	CREATE TAG INDEX player_index on player()	Tag EdgeType
SHOW CREATE INDEX	SHOW CREATE {TAG   EDGE} INDEX <index_name>	show create tag index index_2	Tag Edge type nGQL
SHOW INDEXES	SHOW {TAG   EDGE} INDEXES	SHOW TAG INDEXES	Tag Edge type
DESCRIBE INDEX	DESCRIBE {TAG   EDGE} INDEX <index_name>	DESCRIBE TAG INDEX player_index_0	Field Type
REBUILD INDEX	REBUILD {TAG   EDGE} INDEX [<index_name_list>]	REBUILD TAG INDEX single_person_index	
SHOW INDEX STATUS	SHOW {TAG   EDGE} INDEX STATUS	SHOW TAG INDEX STATUS	
DROP INDEX	DROP {TAG   EDGE} INDEX [IF EXISTS] <index_name>	DROP TAG INDEX player_index_0	

•

SIGN IN TEXT SERVICE [(<elastic_ip:port> [,<username>, <password>]), (<elastic_ip:port>), ...]	SIGN IN TEXT SERVICE (127.0.0.1:9200)	NebulaGraph Elasticsearch SIGN IN Elasticsearch
SHOW TEXT SEARCH CLIENTS	SHOW TEXT SEARCH CLIENTS	
SIGN OUT TEXT SERVICE	SIGN OUT TEXT SERVICE	
CREATE FULLTEXT {TAG   EDGE} INDEX <index_name> ON {<tag_name>   <edge_name>} ([<prop_name_list>])	CREATE FULLTEXT TAG INDEX nebula_index_1 ON player(name)	
SHOW FULLTEXT INDEXES	SHOW FULLTEXT INDEXES	
REBUILD FULLTEXT INDEX	REBUILD FULLTEXT INDEX	
DROP FULLTEXT INDEX <index_name>	DROP FULLTEXT INDEX nebula_index_1	
LOOKUP ON {<tag>   <edge_type>} WHERE <expression> [YIELD <return_list>]	LOOKUP ON player WHERE FUZZY(player.name, "Tim Dunncan", AUTO, OR) YIELD player.name	

### 3.3.10

GET SUBGRAPH [WITH PROP] [<step_count> STEPS]	GET SUBGRAPH 1 STEPS	Edge type
FROM {<vid>, <vid>...} [{IN   OUT   BOTH}]	FROM "player100" YIELD	
<edge_type>, <edge_type>... YIELD [VERTICES AS <vertex_alias> [, EDGES AS <edge_alias>]]	VERTICES AS nodes,	
FIND { SHORTEST   ALL   NOLOOP } PATH [WITH PROP] FROM <vertex_id_list> TO <vertex_id_list> OVER <edge_type_list> [REVERSELY   BIDIRECT] [<WHERE clause>] [UPTO <N> STEPS] YIELD path as <alias> [ ORDER BY \$-.path] [  LIMIT <M>]	FIND SHORTEST PATH FROM "player102" TO "team204" OVER * YIELD path as p	(<vertex_id>) ->(<vertex_id>)

### 3.3.11

EXPLAIN	EXPLAIN [format="row"   "dot"] <your_nGQL_statement>	EXPLAIN format="row" SHOW TAGS	nGQL
PROFILE	PROFILE [format="row"   "dot"] <your_nGQL_statement>	PROFILE format="row" SHOW TAGS	nGQL

### 3.3.12

- BALANCE

BALANCE LEADER	leader	ID	
•			
SUBMIT JOB COMPACT	RocksDB	compact	
SUBMIT JOB FLUSH	RocksDB	memfile	
SUBMIT JOB STATS		SHOW STATS	
SHOW JOB <job_id>	Meta	SUBMIT JOB	nebula-storaged
SHOW JOBS			
STOP JOB			
RECOVER JOB			
•			
KILL QUERY (session=<session_id>, plan=<plan_id>)	KILL	QUERY(SESSION=1625553545984255, PLAN=163)	

: January 13, 2023

## 4. nGQL

---

### 4.1 nGQL

#### 4.1.1 nGQL

nGQL NebulaGraph Query Language NebulaGraph

nGQL

SQL

nGQL

issue

NebulaGraph

NebulaGraph 3.0

openCypher

9

#### nGQL

- 
- 
- 
- 
- 
- 
- 
- 
- openCypher 9

#### Basketballplayer

NebulaGraph

basketballplayer

NebulaGraph Console

- f

#### Note

ADD HOSTS

Storage

Storage

NebulaGraph nGQL

- (Draft) ISO/IEC JTC1 N14279 SC 32 - Database\_Languages - GQL
- (Draft) ISO/IEC JTC1 SC32 N3228 - SQL\_Property\_Graph\_Queries - SQLPGQ
- OpenCypher 9

nGQL

< >

:

[ ]

{ }

|

...

nGQL

```
INSERT VERTEX [IF NOT EXISTS] [tag_props, [tag_props] ...]
VALUES <vid>: ([prop_value_list])

tag_props:
  tag_name ([prop_name_list])

prop_name_list:
  [prop_name [, prop_name] ...]

prop_value_list:
  [prop_value [, prop_value] ...]
```

```
nebula> CREATE TAG IF NOT EXISTS player(name string, age int);
```

## openCypher

NGQL OPENCYPHER

nGQL NebulaGraph	openCypher	openCypher Implementers Group	openCypher 9
nGQL openCypher	openCypher		



nGQL = nGQL + openCypher

NGQL OPENCYPHER 9



nGQL DQL (match, optional match, with )

DDL DML DCL

Bolt

APOC GDS

"compatibility" " "

NebulaGraph Issues

incompatible

NGQL OPENCYPHER 9

openCypher 9		nGQL
Schema	Schema	Schema
=	==	
^	pow(x, y)	^
Rank	@rank	
-	openCypher 9 OPTIONAL MATCH	DML CREATE MERGE DCL MATCH , \ +
Label Tag	Label	Tag

## ↑ Compatibility

### openCypher 9 Cypher

1. Cypher Cypher " " openCypher nGQL
2. Cypher constraints Unique node property constraints Node property existence constraints Relationship property existence constraints Node key constraints OpenCypher nGQL Schema Schema NOT NULL  
" " UNIQUE constraint
3. Cypher APoC openCypher 9 APoC Cypher Bolt openCypher 9

### NGQL

NebulaGraph GitHub [features](#) 2500 nGQL

features features nGQL

```
Feature: Basic match

Background:
Given a graph with space named "basketballplayer"

Scenario: Single node
When executing query:
"""
MATCH (v:player {name: "Yao Ming"}) RETURN v;
"""

Then the result should be, in any order, with relax comparison:
| v
| ("player133" :player{age: 38, name: "Yao Ming"}) |
```

```
Scenario: One step
When executing query:
"""
MATCH (v1:player{name: "LeBron James"}) -[r]-> (v2)
RETURN type(r) AS Type, v2.player.name AS Name
"""

Then the result should be, in any order:
```

Type	Name
"follow"	"Ray Allen"
"serve"	"Lakers"
"serve"	"Heat"
"serve"	"Cavaliers"

Feature: Comparison of where clause

```
Background:
Given a graph with space named "basketballplayer"
```

```
Scenario: push edge props filter down
When profiling query:
"""
GO FROM "player100" OVER follow
```

```

WHERE properties(edge).degree IN [v IN [95,99] WHERE v > 0]
YIELD dst(edge), properties(edge).degree
"""

Then the result should be, in any order:
| follow_dst | follow.degree |
| "player101" | 95           |
| "player125" | 95           |

And the execution plan should be:
| id | name      | dependencies | operator info |
| 0  | Project    | 1            |                   |
| 1  | GetNeighbors| 2            | {"filter": "(properties(edge).degree IN [v IN [95,99] WHERE (v>0)])"} |
| 2  | Start      |              |                   |

```

**Feature****Background****Given****Scenario** @skip**When** nGQL executing query profiling query**Then** when issue NebulaGraph**And** when

@skip

**tck case** CI/CD

TINKERPOP GREMLIN

W3C RDF SPARQL GRAPHQL

NebulaGraph	Schema	RDF
nGQL	SPARQL	GraphQL

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## 4.1.2

pattern

NebulaGraph

(a)

a

(a)-[]->(b)

a b

a b

(a)-[]->(b)<-[]-(c)

 path

### Tag

 Note

nGQL Tag openCypher Label

Tag Tag

Tag

(a:User)-[]->(b)

Tag

(a:User :Admin)-[] ->(b)

nGQL

(a {name: 'Andres', sport: 'Brazilian Ju-Jitsu'})

(a)-[{blocked: false}]->(b)

(a)-[]-(b)

(a)-[r]-&gt;(b)

Tag

(a)-[r:REL\_TYPE]-&gt;(b)

Tag

Edge type

Edge type

|

(a)-[r:TYPE1|TYPE2]-&gt;(b)

(a)-[:REL\_TYPE]-&gt;(b)

3 2

2

(a)-[]-&gt;()-[]-&gt;(b)

variable-length edges

(a)-[\*3..5]-&gt;(b)

\*3..5 3 5

4 3 5 4 6 5

(a)-[\*..5]-&gt;(b)

## Note

(a)-[\*3..]-&gt;(b) (a)-[\*]-&gt;(b)

nGQL

p = (a)-[\*3..5]-&gt;(b)

MATCH

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### 4.1.3

nGQL



- NebulaGraph 1.x      `#`   `--`   `//`   `/* */`
- NebulaGraph 2.x      `--`

#### Examples

```
nebula> #  
nebula> RETURN 1+1;      #  
nebula> RETURN 1+1;      //  
nebula> RETURN 1 /*      */ + 1 == 2;  
nebula> RETURN 11 +  
/*           \  
   \           \  
*/ 12;
```

nGQL      `\`

#### OpenCypher

- nGQL      `\`      `/* */`
- openCypher

```
/* openCypher  
  
 */  
MATCH (n:label)  
RETURN n;
```

```
/*  nGQL  \  
   \  \  
 */  \  
MATCH (n:tag) \  
RETURN n;
```

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#### 4.1.4

```
my_space MY_SPACE
```

```
nebula> CREATE SPACE IF NOT EXISTS my_space (vid_type=FIXED_STRING(30));
nebula> use MY_SPACE;
[ERROR (-1005)]: SpaceNotFound:
```

```
show spaces
```

```
nebula> show spaces;
nebula> SHOW SPACES;
nebula> SHOW spaces;
nebula> show SPACES;
```

```
count() COUNT() couNT()
```

```
nebula> WITH [NULL, 1, 1, 2, 2] As a \
    UNWIND a AS b \
    RETURN count(b), COUNT(*), couNT(DISTINCT b);
+-----+-----+-----+
| count(b) | COUNT(*) | couNT(DISTINCT b) |
+-----+-----+-----+
| 4       | 5       | 2       |
+-----+-----+-----+
```

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## 4.1.5

nGQL Schema

- 
- `AND`



```
nebula> CREATE TAG TAG(name string);
[ERROR (-1004)]: SyntaxError: syntax error near 'TAG'

nebula> CREATE TAG `TAG` (name string);
Execution succeeded

nebula> CREATE TAG SPACE(name string);
Execution succeeded

nebula> CREATE TAG  (  string);
Execution succeeded

nebula> CREATE TAG ` %      &*+-*/` (`q-      =  wer` string);
Execution succeeded
```

```
ACROSS
ADD
ALTER
AND
AS
ASC
ASCENDING
BALANCE
BOOL
BY
CASE
CHANGE
COMPACT
CREATE
DATE
DATETIME
DELETE
DESC
DESCENDING
DESCRIBE
DISTINCT
DOUBLE
DOWNLOAD
DROP
EDGE
EDGES
EXISTS
EXPLAIN
FETCH
FIND
FIXED_STRING
FLOAT
FLUSH
FORMAT
FROM
GET
GO
GRANT
IF
IGNORE_EXISTED_INDEX
IN
INDEX
INDEXES
INGEST
INSERT
INT
INT16
INT32
INT64
```

```

INT8
INTERSECT
IS
LIMIT
LIST
LOOKUP
MAP
MATCH
MINUS
NO
NOT
NOT_IN
NULL
OF
OFFSET
ON
OR
ORDER
OVER
OVERWRITE
PROFILE
PROP
REBUILD
RECOVER
REMOVE
RESTART
RETURN
REVERSELY
REVOKE
SET
SHOW
STEP
STEPS
STOP
STRING
SUBMIT
TAG
TAGS
TIME
TIMESTAMP
TO
UNION
UPDATE
UPSERT
UPTO
USE
VERTEX
VERTICES
WHEN
WHERE
WITH
XOR
YIELD

```

```

ACCOUNT
ADMIN
ALL
ANY
ATOMIC_EDGE
AUTO
BIDIRECT
BOTH
CHARSET
CLIENTS
COLLATE
COLLATION
COMMENT
CONFIGS
CONTAINS
DATA
DBA
DEFAULT
ELASTICSEARCH
ELSE
END
ENDS
ENDS_WITH
FORCE
FULLTEXT
FUZZY
GOD
GRAPH
GROUP
GROUPS
GUEST
HDFS
HOST
HOSTS
INTO

```

```
IS_EMPTY
IS_NOT_EMPTY
IS_NOT_NULL
IS_NULL
JOB
JOBS
KILL
LEADER
LISTENER
META
NOLOOP
NONE
NOT_CONTAINS
NOT_ENDS_WITH
NOT_STARTS_WITH
OPTIONAL
OUT
PART
PARTITION_NUM
PARTS
PASSWORD
PATH
PLAN
PREFIX
QUERIES
QUERY
REDUCE
REGEXP
REPLICA_FACTOR
RESET
ROLE
ROLES
SAMPLE
SEARCH
SERVICE
SESSION
SESSIONS
SHORTEST
SIGN
SINGLE
SKIP
SNAPSHOT
SNAPSHOTS
SPACE
SPACES
STARTS
STARTS_WITH
STATS
STATUS
STORAGE
SUBGRAPH
TEXT
TEXT_SEARCH
THEN
TOP
TTL_COL
TTL_DURATION
UNWIND
USER
USERS
UUID
VALUE
VALUES
VID_TYPE
WILDCARD
ZONE
ZONES
FALSE
TRUE
```

---

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## 4.1.6 nGQL

nGQL

nGQL

nGQL

nGQL

### Compatibility

nGQL Cypher Style Guide

1.

```
GO FROM "player100" OVER follow REVERSELY YIELD src(edge) AS id;
```

```
GO FROM "player100" \
OVER follow REVERSELY \
YIELD src(edge) AS id;
```

2.

```
GO FROM "player100" OVER follow REVERSELY YIELD src(edge) AS id | GO FROM $-.id \
OVER serve WHERE properties($^).age > 20 YIELD properties($^).name AS FriendOf, properties($$).name AS Team;
```

```
GO FROM "player100" \
OVER follow REVERSELY \
YIELD src(edge) AS id | \
GO FROM $-.id OVER serve \
WHERE properties($^).age > 20 \
YIELD properties($^).name AS FriendOf, properties($$).name AS Team;
```

3. 80

```
MATCH (v:player{name:"Tim Duncan"})-[e]->(v2) \
WHERE (v2.player.name STARTS WITH "Y" AND v2.player.age > 35 AND v2.player.age < v.player.age) OR (v2.player.name STARTS WITH "T" AND v2.player.age < 45 AND \
v2.player.age > v.player.age) \
RETURN v2;
```

```
MATCH (v:player{name:"Tim Duncan"})-[e]->(v2) \
WHERE (v2.player.name STARTS WITH "Y" AND v2.player.age > 35 AND v2.player.age < v.player.age) \
OR (v2.player.name STARTS WITH "T" AND v2.player.age < 45 AND v2.player.age > v.player.age) \
RETURN v2;
```

### Note

80

## nGQL

1. Tag Edge type

```
MATCH p=(v:players)-[e:are_following]-(v2) \
RETURN nodes(p);
```

```
MATCH p=(v:player)-[e:follow]-(v2) \
RETURN nodes(p);
```

2. -

```
MATCH (v:basketballTeam) \
RETURN v;
```

```
MATCH (v:basketball_team) \
RETURN v;
```

3.

```
match (v:player) return v limit 5;
```

```
MATCH (v:player) RETURN v LIMIT 5;
```

**Pattern**

1. Pattern

```
MATCH (v:player{name: "Tim Duncan", age: 42}) \
-[e:follow]->()-[e2:serve]->()<--(v2) \
RETURN v, e, v2;
```

```
MATCH (v:player{name: "Tim Duncan", age: 42})-[e:follow]-> \
()-[e2:serve]->()<--(v2) \
RETURN v, e, v2;
```

2.

```
MATCH (v:player)-[e:follow]->(v2) \
RETURN v;
```

```
MATCH (v:player)-[:follow]->() \
RETURN v;
```

3.

```
MATCH ()-[:follow]->(v) \
RETURN v;
```

```
MATCH (v)<-[ :follow ] -() \
RETURN v;
```

```
RETURN 'Hello Nebula!';
```

```
RETURN "Hello Nebula!"\\'123\\'"
```

## Note

\

```
RETURN "\\\"NebulaGraph is amazing,\\\" the user says.";
```

1. ; nGQL

```
FETCH PROP ON player "player100" YIELD properties(vertex);
```

```
FETCH PROP ON player "player100" YIELD properties(vertex);
```

2. |

```
GO FROM "player100" \
OVER follow \
YIELD dst(edge) AS id; | \
GO FROM $-.id \
OVER serve \
YIELD properties($$).name AS Team, properties($^).name AS Player;
```

```
GO FROM "player100" \
OVER follow \
YIELD dst(edge) AS id | \
GO FROM $-.id \
OVER serve \
YIELD properties($$).name AS Team, properties($^).name AS Player;
```

3.

```
$var = GO FROM "player100" \
OVER follow \
YIELD dst(edge) AS id \
GO FROM $var.id \
OVER serve \
YIELD properties($$).name AS Team, properties($^).name AS Player;
```

```
$var = GO FROM "player100" \
OVER follow \
YIELD dst(edge) AS id | \
GO FROM $var.id \
OVER serve \
YIELD properties($$).name AS Team, properties($^).name AS Player;
```

```
$var = GO FROM "player100" \
OVER follow \
YIELD dst(edge) AS id; \
GO FROM $var.id \
OVER serve \
YIELD properties($$).name AS Team, properties($^).name AS Player;
```

---

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## 4.2

---

### 4.2.1

nGQL

nGQL	64	INT64	32	INT32	16	INT16	8	INT8
------	----	-------	----	-------	----	-------	---	------

INT64	INT64	INT	-9,223,372,036,854,775,808 ~ 9,223,372,036,854,775,807
INT32	INT32		-2,147,483,648 ~ 2,147,483,647
INT16	INT16		-32,768 ~ 32,767
INT8	INT8		-128 ~ 127

nGQL	FLOAT	DOUBLE
------	-------	--------

FLOAT	FLOAT	3.4E +/- 38	6~7
DOUBLE	DOUBLE	1.7E +/- 308	15~16

nGQL	1e2	1.1e2	.3e4	1.e4	-1234E-10
------	-----	-------	------	------	-----------

**Note**

MySQL DECIMAL

nGQL

**VID**

INT64	INT64
INT32	INT64
INT16	INT64
INT8	INT64
FLOAT	DOUBLE
DOUBLE	DOUBLE

nGQL	INT8	VID	TAG	Edge type	INT8	nGQL	INT8	INT64
------	------	-----	-----	-----------	------	------	------	-------

- NebulaGraph

- 123456

- 0x1e240

- 0361100

NebulaGraph

score	INT	INSERT	0xb	FETCH	11	0xb
-------	-----	--------	-----	-------	----	-----

- FLOAT/DDOUBLE INT
- 

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## 4.2.2

NebulaGraph      BOOL      true    false

nGQL

- 
- WHERE

---

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### 4.2.3

#### NebulaGraph

##### nGQL

- STRING
- FIXED\_STRING(<length>) <length> FIXED\_STRING(32)  
"Hello, Cooper" 'Hello, Cooper'

##### nGQL

- VID
- Schema Tag Edge type
- 

•

```
nebula> CREATE TAG IF NOT EXISTS t1 (p1 FIXED_STRING(10));
```

•

```
nebula> CREATE TAG IF NOT EXISTS t2 (p2 STRING);
```

- NebulaGraph
- VID NebulaGraph

• "\n\t\r\b\f"

• "\110ello world"

#### OpenCypher

##### openCypher Cypher nGQL openCypher

```
# File: Literals.feature
Feature: Literals

Background:
  Given any graph
Scenario: Return a single-quoted string
  When executing query:
    """
      RETURN '' AS literal
    """
  Then the result should be, in any order:
    | literal |
    | '' | # Note: it should return single-quotes as openCypher required.
And no side effects
```

Cypher

nGQL

Cypher

```
nebula > YIELD '' AS quote1, "" AS quote2, """ AS quote3, """' AS quote4
+-----+-----+-----+
| quote1 | quote2 | quote3 | quote4 |
+-----+-----+-----+
| ""     | ""     | """   | """'  |
+-----+-----+-----+
```

---

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## 4.2.4

DATE TIME DATETIME TIMESTAMP DURATION

- NebulaGraph timezone\_name DATE TIME DATETIME UTC

### Note

timezone\_name

- date() time() datetime() datetime("2017-03-04 22:30:40.003000+08:00")  
datetime("2017-03-04T22:30:40.003000[Asia/Shanghai]")
- date() time() datetime() timestamp()
- date() time() datetime() duration() date().month time("02:59:40").minute

### Note

Map

## openCypher

- localdatetime()
- YYYY-MM-DDThh:mm:ss YYYY-MM-DD hh:mm:ss
- time("1:1:1")

## DATE

DATE	NebulaGraph	DATE	YYYY-MM-DD	-32768-01-01	32767-12-31
date()	year month day date()	YYYY	YYYY-MM	YYYY-MM-DD	01

```
nebula> RETURN DATE({year:-123, month:12, day:3});
+-----+
| date({year:-(123),month:12,day:3}) |
+-----+
| -123-12-03 |
+-----+
nebula> RETURN DATE("23333");
+-----+
| date("23333") |
+-----+
| 23333-01-01 |
+-----+
```

## TIME

TIME	NebulaGraph	TIME	hh:mm:ss.msmsmsususus	00:00:00.000000	23:59:59.999999
time()	hour minute second				

**DATETIME**

```
DATETIME      NebulaGraph      DATETIME      YYYY-MM-DDThh:mm:ss.msmsmsususus      -32768-01-01T00:00:00.000000
32767-12-31T23:59:59.999999
```

- `datetime()`      `year month day hour minute second`
- `datetime()`    `TIMESTAMP`      `DATETIME`      `TIMESTAMP`      `0~9223372036`
- `datetime()`    `int`      `int`

```
#
nebula> RETURN datetime();
+-----+
| datetime() |
+-----+
| 2022-08-29T06:37:08.933000 |
+-----+

#
nebula> RETURN datetime().hour;
+-----+
| datetime().hour |
+-----+
| 6 |
+-----+

#      DATETIME
nebula> RETURN datetime(timestamp(1625469277));
+-----+
| datetime(timestamp(1625469277)) |
+-----+
| 2021-07-05T07:14:37.000000 |
+-----+

nebula> RETURN datetime(1625469277);
+-----+
| datetime(1625469277) |
+-----+
| 2021-07-05T07:14:37.000000 |
+-----+
```

**TIMESTAMP**

```
TIMESTAMP      UTC      1970-01-01T00:00:01  2262-04-11T23:47:16
```

```
TIMESTAMP
```

- `1615974839`      `2021-03-17T17:53:59`
- `TIMESTAMP`      `timestamp()`
- `TIMESTAMP`      `timestamp()`    `now()`
- `timestamp()`      `0~9223372036`
- `timestamp()`    `DATETIME`      `TIMESTAMP`      `DATETIME`      `string`
- **64 int**

```
#
nebula> RETURN timestamp();
+-----+
| timestamp() |
+-----+
| 1625469277 |
+-----+

#
nebula> RETURN timestamp("2022-01-05T06:18:43");
+-----+
| timestamp("2022-01-05T06:18:43") |
+-----+
| 1641363523 |
+-----+

#      datetime()
nebula> RETURN timestamp(datetime("2022-08-29T07:53:10.939000"));
+-----+
| timestamp(datetime("2022-08-29T07:53:10.939000")) |
+-----+
```

```
+-----+
| 1661759590
+-----+
```

## Note

`timestamp()`      `timestamp(datetime())`

## DURATION

`DURATION`      `years months days hours minutes seconds`      `Key`      `Map`      `duration({years: 12, months: 5, days: 14, hours: 16, minutes: 12, seconds: 70})`

`DURATION`

- `DURATION`
- 

## 1. Tag date1 DATE TIME DATETIME

```
nebula> CREATE TAG IF NOT EXISTS date1(p1 date, p2 time, p3 datetime);
```

## 2. test1

```
nebula> INSERT VERTEX date1(p1, p2, p3) VALUES "test1":(date("2021-03-17"), time("17:53:59"), datetime("2017-03-04T22:30:40.003000[Asia/Shanghai]"));
```

## 3. test1 p1

```
nebula> CREATE TAG INDEX IF NOT EXISTS date1_index ON date1(p1);
nebula> REBUILD TAG INDEX date1_index;
nebula> MATCH (v:date1) RETURN v.date1.p1.month;
+-----+
| v.date1.p1.month |
+-----+
| 3 |
+-----+
```

## 4. Tag school TIMESTAMP

```
nebula> CREATE TAG IF NOT EXISTS school(name string, found_time timestamp);
```

## 5. DUT "1988-03-01T08:00:00"

```
# 1988-03-01T08:00:00      573177600      UTC      573206400
nebula> INSERT VERTEX school(name, found_time) VALUES "DUT":("DUT", 573206400);

#
nebula> INSERT VERTEX school(name, found_time) VALUES "DUT":("DUT", timestamp("1988-03-01T08:00:00"));
```

## 6. dut now() timestamp()

```
# now()
nebula> INSERT VERTEX school(name, found_time) VALUES "dut":("dut", now());

# timestamp()
nebula> INSERT VERTEX school(name, found_time) VALUES "dut":("dut", timestamp());
```

## WITH

```
nebula> WITH time({hour: 12, minute: 31, second: 14, millisecond:111, microsecond: 222}) AS d RETURN d;
+-----+
| d |
+-----+
| 12:31:14.111222 |
+-----+

nebula> WITH date({year: 1984, month: 10, day: 11}) AS x RETURN x + 1;
```

```
+-----+
| (x+1)      |
+-----+
| 1984-10-12 |
+-----+  
nebula> WITH date('1984-10-11') as x, duration({years: 12, days: 14, hours: 99, minutes: 12}) as d \
    RETURN x + d AS sum, x - d AS diff;
+-----+-----+
| sum      | diff      |
+-----+-----+
| 1996-10-29 | 1972-09-23 |
+-----+-----+
```

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## 4.2.5 NULL

NULL NOT NULL

### NULL

AND OR XOR NOT

a	b	a AND b	a OR b	a XOR b	NOT a
false	false	false	false	false	true
false	null	false	null	null	true
false	true	false	true	true	true
true	false	false	true	true	false
true	null	null	true	null	false
true	true	true	true	false	false
null	false	false	null	null	null
null	null	null	null	null	null
null	true	null	true	null	null

### OpenCypher

NebulaGraph NULL openCypher

NULL

NebulaGraph NULL openCypher

NULL

NebulaGraph NULL openCypher

### NOT NULL

Tag player name NOT NULL

```
nebula> CREATE TAG IF NOT EXISTS player(name string NOT NULL, age int);
```

SHOW Tag name NOT NULL age NULL

```
nebula> SHOW CREATE TAG player;
+-----+-----+
| Tag | Create Tag |
+-----+-----+
| "student" | "CREATE TAG `player` (
| | `name` string NOT NULL,
| | `age` int64 NULL
| | ) ttl_duration = 0, ttl_col = """
+-----+-----+
```

Kobe age NULL

```
nebula> INSERT VERTEX player(name, age) VALUES "Kobe":("Kobe",null);
```

### NOT NULL

Tag player age NOT NULL

```
nebula> CREATE TAG IF NOT EXISTS player(name string, age int NOT NULL DEFAULT 18);
```

```
Kobe      name
```

```
nebula> INSERT VERTEX player(name) VALUES "Kobe":("Kobe");
```

```
Kobe      age      18
```

```
nebula> FETCH PROP ON player "Kobe" YIELD properties(vertex);
+-----+
| properties(VERTEX) |
+-----+
| {age: 18, name: "Kobe"} |
+-----+
```

---

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## 4.2.6

List

[ ] ,

### OpenCypher

List Set Map

[M]  
[M..N]  
[M..]  
[..N]

nGQL	0	0	1	-1	-1	-2
• [M]	M					
• [M..N]	M ≤	N	N 0			
• [M..]	M ≤					
• [..N]		N	N 0			

### Note

- 
- M ≥ N
- M null BAD\_TYPE M N null null

```
#      [1,2,3]
nebula> RETURN list[1, 2, 3] AS a;
+-----+
| a      |
+-----+
| [1, 2, 3] |
+-----+

#      [1,2,3,4,5]      3          0          4
nebula> RETURN range(1,5)[3];
+-----+
| range(1,5)[3] |
+-----+
| 4           |
+-----+

#      [1,2,3,4,5]      -2         -1      -2          4
nebula> RETURN range(1,5)[-2];
+-----+
| range(1,5)[-2] |
+-----+
| 4           |
+-----+

#      [1,2,3,4,5]      0   3   3
nebula> RETURN range(1,5)[0..3];
+-----+
| range(1,5)[0..3] |
+-----+
| [1, 2, 3] |
+-----+

#      [1,2,3,4,5]      2

```

```

nebula> RETURN range(1,5)[3..] AS a;
+-----+
| a      |
+-----+
| [4, 5] |
+-----+

#      3
nebula> WITH list[1, 2, 3, 4, 5] AS a \
    RETURN a[..3] AS r;
+-----+
| r      |
+-----+
| [1, 2, 3] |
+-----+

#      [1,2,3,4,5]      2
nebula> RETURN [n IN range(1,5) WHERE n > 2 | n + 10] AS a;
+-----+
| a      |
+-----+
| [13, 14, 15] |
+-----+

#
nebula> YIELD list[1, 2, 3][0..-1] AS a;
+-----+
| a      |
+-----+
| [1, 2] |
+-----+

#
nebula> YIELD list[1, 2, 3, 4, 5][-3..-1] AS a;
+-----+
| a      |
+-----+
| [3, 4] |
+-----+

#
      1 2
nebula> $var = YIELD 1 AS f, 3 AS t; \
    YIELD list[1, 2, 3][$var.f..$var.t] AS a;
+-----+
| a      |
+-----+
| [2, 3] |
+-----+

#
nebula> RETURN list[1, 2, 3, 4, 5] [0..10] AS a;
+-----+
| a      |
+-----+
| [1, 2, 3, 4, 5] |
+-----+

nebula> RETURN list[1, 2, 3] [-5..5] AS a;
+-----+
| a      |
+-----+
| [1, 2, 3] |
+-----+

# [0..0]
nebula> RETURN list[1, 2, 3, 4, 5] [0..0] AS a;
+-----+
| a      |
+-----+
| []   |
+-----+

# M ≥ N
nebula> RETURN list[1, 2, 3, 4, 5] [3..1] AS a;
+-----+
| a      |
+-----+
| []   |
+-----+

#
      null      null
nebula> WITH list[1,2,3] AS a \
    RETURN a[0..null] as r;
+-----+
| r      |
+-----+
| __NULL__ |
+-----+

#      [1,2,3,4,5]
nebula> RETURN tail([n IN range(1, 5) | 2 * n - 10]) AS a;
+-----+
| a      |
+-----+

```

```

| [-6, -4, -2, 0] |
+-----+
#      [1,2,3]
nebula> RETURN [n IN range(1, 3) WHERE true | n] AS r;
+-----+
| r      |
+-----+
| [1, 2, 3] |
+-----+

#      [1,2,3]
nebula> RETURN size(list[1,2,3]);
+-----+
| size([1,2,3]) |
+-----+
| 3            |
+-----+

#      [92,90]      where
nebula> GO FROM "player100" OVER follow WHERE properties(edge).degree NOT IN [x IN [92, 90] | x + $$.player.age] \
    YIELD dst(edge) AS id, properties(edge).degree AS degree;
+-----+-----+
| id      | degree |
+-----+-----+
| "player101" | 95   |
| "player102" | 90   |
+-----+-----+

#  MATCH
nebula> MATCH p = (n:player{name:"Tim Duncan"})-[:follow]->(m) \
    RETURN [n IN nodes(p) | n.age + 100] AS r;
+-----+
| r      |
+-----+
| [142, 136] |
| [142, 133] |
+-----+

```

## OpenCypher

- openCypher              null        nGQL              OUT\_OF\_RANGE

```

nebula> RETURN range(0,5)[-12];
+-----+
| range(0,5)[-12] |
+-----+
| OUT_OF_RANGE     |
+-----+

```

- set map list
- Rank
- List        pattern    [(src)-[]->(m) | m.name]

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## 4.2.7

Set

List

{ } ,

### OpenCypher

- List Set Map
- OpenCypher nGQL

```
#      {1,2,3}
nebula> RETURN set{1, 2, 3} AS a;
+-----+
| a   |
+-----+
| {3, 2, 1} |
+-----+

#      {1,2,1}          {1,2}
nebula> RETURN set{1, 2, 1} AS a;
+-----+
| a   |
+-----+
| {2, 1} |
+-----+

#           1
nebula> RETURN 1 IN set{1, 2} AS a;
+-----+
| a   |
+-----+
| true |
+-----+

#
nebula> YIELD size(set{1, 2, 1}) AS a;
+---+
| a |
+---+
| 2 |
+---+

#
nebula> GO FROM "player100" OVER follow \
    YIELD set{properties($$).name, properties($$).age} as a;
+-----+
| a   |
+-----+
| {36, "Tony Parker"} |
| {41, "Manu Ginobili"} |
+-----+
```

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## 4.2.8

Map	Key-Value	Key	Value	map['<key>']
{ }	,			

### OpenCypher

- List Set Map
- map projection

```

#
nebula> YIELD map{key1: 'Value1', Key2: 'Value2'} as a;
+-----+
| a |
+-----+
| {Key2: "Value2", key1: "Value1"} |
+-----+

#
nebula> YIELD map{listKey: [{inner: 'Map1'}, {inner: 'Map2'}]} as a;
+-----+
| a |
+-----+
| {listKey: [{inner: "Map1"}, {inner: "Map2"}]} |
+-----+

#
nebula> RETURN map{a: LIST[1,2], b: SET{1,2,1}, c: "hee"} as a;
+-----+
| a |
+-----+
| {a: [1, 2], b: {2, 1}, c: "hee"} |
+-----+

#
nebula> RETURN map{a: LIST[1,2], b: SET{1,2,1}, c: "hee"}["b"] AS b;
+-----+
| b |
+-----+
| {2, 1} |
+-----+

#      key      value
nebula> RETURN "a" IN MAP{a:1, b:2} AS a;
+-----+
| a |
+-----+
| true |
+-----+

```

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## 4.2.9

### NebulaGraph

```
nebula> UNWIND [true, false, 'true', 'false', NULL] AS b \
    RETURN toBoolean(b) AS b;
+-----+
| b      |
+-----+
| true   |
+-----+
| false  |
+-----+
| true   |
+-----+
| false  |
+-----+
| __NULL__ |
+-----+  
  
nebula> RETURNtoFloat(1), toFloat('1.3'), toFloat('1e3'), toFloat('not a number');
+-----+-----+-----+-----+
| toFloat(1) | toFloat("1.3") | toFloat("1e3") | toFloat("not a number") |
+-----+-----+-----+-----+
| 1.0       | 1.3        | 1000.0     | __NULL__      |
+-----+-----+-----+-----+
```

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## 4.2.10

GEOGRAPHY

NebulaGraph

Point LineString Polygon

SQL-MM 3

geo

**GEOGRAPHY**

GEOGRAPHY

"POINT(3 8)"      3°      8°

Point      "POINT(3 8)"

LineString      "LINESTRING(3 8, 4.7 73.23)"

Polygon      "POLYGON((0 1, 1 2, 2 3, 0 1))"

geo      geo

```
// Tag
nebula> CREATE TAG IF NOT EXISTS any_shape(geo geography);

// Tag
nebula> CREATE TAG IF NOT EXISTS only_point(geo geography(point));

// Tag
nebula> CREATE TAG IF NOT EXISTS only_linestring(geo geography(linestring));

// Tag
nebula> CREATE TAG IF NOT EXISTS only_polygon(geo geography(polygon));

// Edge type
nebula> CREATE EDGE IF NOT EXISTS any_shape_edge(geo geography);

//
nebula> INSERT VERTEX any_shape(geo) VALUES "103":(ST_GeogFromText("POLYGON((0 1, 1 2, 2 3, 0 1))"));

//
nebula> INSERT EDGE any_shape_edge(geo) VALUES "201"->"302":(ST_GeogFromText("POLYGON((0 1, 1 2, 2 3, 0 1))"));

// 103 geo
nebula> FETCH PROP ON any_shape "103" YIELD ST_ASText(any_shape.geo);
+-----+
| ST_ASText(any_shape.geo) |
+-----+
| "POLYGON((0 1, 1 2, 2 3, 0 1))" |
+-----+

// 201->302 geo
nebula> FETCH PROP ON any_shape_edge "201"->"302" YIELD ST_ASText(any_shape_edge.geo);
+-----+
| ST_ASText(any_shape_edge.geo) |
+-----+
| "POLYGON((0 1, 1 2, 2 3, 0 1))" |
+-----+

// geo LOOKUP
nebula> CREATE TAG INDEX IF NOT EXISTS any_shape_geo_index ON any_shape(geo);
nebula> REBUILD TAG INDEX any_shape_geo_index;
nebula> LOOKUP ON any_shape YIELD ST_ASText(any_shape.geo);
+-----+
| ST_ASText(any_shape.geo) |
+-----+
| "POLYGON((0 1, 1 2, 2 3, 0 1))" |
+-----+
```

geo      geo

s2_max_level	30	S2 cell	1 ~ 30
s2_max_cells	8	S2 cell	1 ~ 30

**Note**

Point      Point      s2\_max\_level      30

```
nebula> CREATE TAG INDEX IF NOT EXISTS any_shape_geo_index ON any_shape(geo) with (s2_max_level=30, s2_max_cells=8);
```

---

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## 4.3

---

### 4.3.1

#### NebulaGraph

- opencypher
- nGQL ;
- nGQL |

#### OpenCypher

- ```
opencypher      nGQL      MATCH ... | GO ... | YIELD ...
•   openCypher      MATCH  RETURN  WITH
•       nGQL    FETCH  GO  LOOKUP
```

A B C     A        B        C

#### Note

#### openCypher

- opencypher

```
#  
nebula> MATCH p=(v:player{name:"Tim Duncan"})--() \  
WITH nodes(p) AS n \  
UNWIND n AS n1 \  
RETURN DISTINCT n1;
```

- nGQL

```
#  
nebula> SHOW TAGS; SHOW EDGES;  
  
#  
nebula> INSERT VERTEX player(name, age) VALUES "player100":("Tim Duncan", 42); \  
INSERT VERTEX player(name, age) VALUES "player101":("Tony Parker", 36); \  
INSERT VERTEX player(name, age) VALUES "player102":("LaMarcus Aldridge", 33);
```

- nGQL

```
#  
nebula> GO FROM "player100" OVER follow YIELD dst(edge) AS id | \  
GO FROM $.id OVER serve YIELD properties($$).name AS Team, \  
properties($^).name AS Player;  
+-----+-----+  
| Team | Player |  
+-----+-----+  
"Spurs"	"Tony Parker"
"Hornets"	"Tony Parker"
"Spurs"	"Manu Ginobili"
+-----+-----+
```

---

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### 4.3.2

NebulaGraph

#### OpenCypher

```
nebula> MATCH (v:player{name:"Tim Duncan"}) RETURN v;
+-----+
| v
+-----+
| ("player100" :player{name: "Tim Duncan", age: 42}) |
+-----+
```

v

#### nGQL

|      |                       |         |
|------|-----------------------|---------|
| nGQL | \$var_name   var_name | —       |
|      |                       | session |

#### Note

```
nebula> $var = GO FROM "player100" OVER follow YIELD dst(edge) AS id; \
    GO FROM $var.id OVER serve YIELD properties($$).name AS Team, \
    properties($^).name AS Player;
+-----+-----+
| Team      | Player        |
+-----+-----+
"Spurs"	"Tony Parker"
"Hornets"	"Tony Parker"
"Spurs"	"Manu Ginobili"
+-----+-----+
```

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### 4.3.3

WHERE | YIELD

#### Note

nGQL GO

\$^.<tag\_name>.<prop\_name>

\$^

tag\_name Tag

prop\_name Tag

\$.<tag\_name>.<prop\_name>

\$\$

tag\_name Tag

prop\_name Tag

<edge\_type>.<prop\_name>

edge\_type Edge type

prop\_name Edge type

\_src

\_dst

\_type

\_rank rank

```
#      Tag player    name      Tag player    age
nebula> GO FROM "player100" OVER follow YIELD $^.player.name AS startName, $$.player.age AS endAge;
+-----+-----+
| startName | endAge |
+-----+-----+
| "Tim Duncan" | 36      |
| "Tim Duncan" | 41      |
+-----+-----+

#   Edge type follow  degree
nebula> GO FROM "player100" OVER follow YIELD follow.degree;
+-----+
| follow.degree |
+-----+
| 95          |
+-----+


#   EdgeType   follow     VID     VID EdgeType           rank
nebula> GO FROM "player100" OVER follow YIELD follow._src, follow._dst, follow._type, follow._rank;
+-----+-----+-----+-----+
| follow._src | follow._dst | follow._type | follow._rank |
+-----+-----+-----+
| "player100" | "player101" | 17        | 0          |
| "player100" | "player125" | 17        | 0          |
+-----+-----+-----+-----+
```



NebulaGraph 2.6.0

[Schema](#)

NebulaGraph 3.3.0

```
GO FROM "player100" OVER follow YIELD properties($^).name AS startName, properties($$).age AS endAge;
GO FROM "player100" OVER follow YIELD properties(edge).degree;
GO FROM "player100" OVER follow YIELD src(edge), dst(edge), type(edge), rank(edge);
```

NebulaGraph 3.3.0

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## 4.4

---

### 4.4.1

NebulaGraph

```
=
+
-
*
/
==

!=, <>

>

>=

<

<=

%

-
IS NULL      NULL
IS NOT NULL   NULL
IS EMPTY
IS NOT EMPTY

true  false
```

 Note

- NULL
- EMPTY GROUP BY count() sum() max() hash() collect() + \*

### OpenCypher

openCypher EMPTY MATCH EMPTY

==

## Note

nGQL      == openCypher      =

```
nebula> RETURN 'A' == 'a', toUpper('A') == toUpper('a'), toLower('A') == toLower('a');
+-----+
| ("A"=="a") | (toUpper("A")==toUpper("a")) | (toLower("A")==toLower("a")) |
+-----+-----+-----+
| false      | true           | true           |
+-----+-----+-----+
```

```
nebula> RETURN '2' == 2, toInteger('2') == 2;
+-----+
| ("2"==2) | (toInteger("2")==2) |
+-----+-----+
| false    | true          |
+-----+-----+
```

&gt;

```
nebula> RETURN 3 > 2;
+-----+
| (3>2) |
+-----+
| true  |
+-----+
```

```
nebula> WITH 4 AS one, 3 AS two \
           RETURN one > two AS result;
+-----+
| result |
+-----+
| true   |
+-----+
```

&gt;=

```
nebula> RETURN 2 >= "2", 2 >= 2;
+-----+
| (2>="2") | (2>=2) |
+-----+-----+
| __NULL__ | true   |
+-----+-----+
```

&lt;

```
nebula> YIELD 2.0 < 1.9;
+-----+
| (2<1.9) |
+-----+
| false   |
+-----+
```

&lt;=

```
nebula> YIELD 0.11 <= 0.11;
+-----+
| (0.11<=0.11) |
+-----+
| true    |
+-----+
```

!=

```
nebula> YIELD 1 != '1';
+-----+
| (1!="1") |
+-----+
| true   |
+-----+
```

IS [NOT] NULL

```
nebula> RETURN null IS NULL AS value1, null == null AS value2, null != null AS value3;
+-----+-----+
| value1 | value2  | value3  |
+-----+-----+-----+
| true   | __NULL__ | __NULL__ |
+-----+-----+-----+
```

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#### 4.4.2

NebulaGraph

AND

OR

NOT

XOR

NULL

NULL



0

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#### 4.4.3

nGQL |

##### openCypher

nGQL

nGQL SQL

- SQL
- nGQL shell |

```
nebula> GO FROM "player100" OVER follow \
    YIELD dst(edge) AS dstid, properties($$).name AS Name | \
    GO FROM $-.dstid OVER follow YIELD dst(edge);

+-----+
| dst(EDGE) |
+-----+
| "player100" |
| "player102" |
| "player125" |
| "player100" |
+-----+
```

| YIELD | YIELD | ID        |
|-------|-------|-----------|
|       | \$-   | \$-.dstid |

NebulaGraph A | B

1. A
  - 2.
  3. A |
- a. A
- b.
- c. graphhd
- d. graphhd B
- graphhd A | B

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#### 4.4.4

---

nGQL      WHERE    YIELD

##### openCypher

nGQL

\$^

\$\$

\$-

```
# nebula> GO FROM "player100" OVER follow YIELD properties($^).age AS SrcAge, properties($$).age AS DestAge;
+-----+-----+
| SrcAge | DestAge |
+-----+-----+
| 42     | 36     |
| 42     | 41     |
+-----+-----+

#   player100      player
nebula> GO FROM "player100" OVER follow \
          YIELD dst(edge) AS id | \
          GO FROM $-.id OVER serve \
          YIELD properties($^).name AS Player, properties($$).name AS Team;
+-----+-----+
| Player        | Team      |
+-----+-----+
"Tony Parker"	"Spurs"
"Tony Parker"	"Hornets"
"Manu Ginobili"	"Spurs"
+-----+-----+
```

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#### 4.4.5

UNION UNION ALL INTERSECT MINUS

nGQL

NebulaGraph

##### openCypher

nGQL

##### UNION UNION DISTINCT UNION ALL

```
<left> UNION [DISTINCT | ALL] <right> [ UNION [DISTINCT | ALL] <right> ...]
```

- UNION DISTINCT      UNION      A    B
- UNION ALL      A    B
- left right

```
#  
nebula> GO FROM "player102" OVER follow YIELD dst(edge) \  
UNION \  
GO FROM "player100" OVER follow YIELD dst(edge);  
+-----+  
| dst(EDGE) |  
+-----+  
| "player100" |  
| "player101" |  
| "player125" |  
+-----+  
  
#  
nebula> GO FROM "player102" OVER follow YIELD dst(edge) \  
UNION ALL \  
GO FROM "player100" OVER follow YIELD dst(edge);  
+-----+  
| dst(EDGE) |  
+-----+  
| "player100" |  
| "player101" |  
| "player101" |  
| "player125" |  
+-----+  
  
# UNION YIELD  
nebula> GO FROM "player102" OVER follow \  
YIELD dst(edge) AS id, properties(edge).degree AS Degree, properties($$).age AS Age \  
UNION /* DISTINCT */ \  
GO FROM "player100" OVER follow \  
YIELD dst(edge) AS id, properties(edge).degree AS Degree, properties($$).age AS Age;  
+-----+-----+-----+  
| id | Degree | Age |  
+-----+-----+-----+  
"player100"	75	42
"player101"	75	36
"player101"	95	36
"player125"	95	41
+-----+-----+-----+
```

##### INTERSECT

```
<left> INTERSECT <right>
```

- INTERSECT      A    B
- left right

```
nebula> GO FROM "player102" OVER follow \  
YIELD dst(edge) AS id, properties(edge).degree AS Degree, properties($$).age AS Age \  
INTERSECT \  
+-----+-----+-----+  
| id | Degree | Age |  
+-----+-----+-----+  
"player100"	75	42
"player101"	75	36
"player101"	95	36
"player125"	95	41
+-----+-----+-----+
```

```
GO FROM "player100" OVER follow \
YIELD dst(edge) AS id, properties(edge).degree AS Degree, properties($$).age AS Age;
+-----+
| id | Degree | Age |
+-----+
+-----+
```

**MINUS**

|        |              |         |            |     |   |   |
|--------|--------------|---------|------------|-----|---|---|
| <left> | <b>MINUS</b> | <right> |            |     |   |   |
| MINUS  | A B          | A-B     | left right | A-B | A | B |

```
nebula> GO FROM "player100" OVER follow YIELD dst(edge) \
MINUS \
GO FROM "player102" OVER follow YIELD dst(edge);
+-----+
| dst(EDGE)   |
+-----+
| "player125" |
+-----+
```

```
nebula> GO FROM "player102" OVER follow YIELD dst(edge) \
MINUS \
GO FROM "player100" OVER follow YIELD dst(edge);
+-----+
| dst(EDGE)   |
+-----+
| "player100" |
+-----+
```

| GO FROM 1 UNION GO FROM 2 | GO FROM 3 | GO FROM 1 UNION (GO FROM 2 | GO FROM 3)

```
nebula> GO FROM "player102" OVER follow \
YIELD dst(edge) AS play_dst \
UNION \
GO FROM "team200" OVER serve REVERSELY \
YIELD src(edge) AS play_src \
| GO FROM $-.play_src OVER follow YIELD dst(edge) AS play_dst;

+-----+
| play_dst   |
+-----+
| "player100" |
| "player101" |
| "player117" |
| "player105" |
+-----+
```

```
nebula> GO FROM "player102" OVER follow YIELD follow._dst AS play_dst \
UNION \
GO FROM "team200" OVER serve REVERSELY YIELD serve._dst AS play_dst \
| GO FROM $-.play_dst OVER follow YIELD follow._dst AS play_dst;
```

UNION

```
nebula> (GO FROM "player102" OVER follow \
YIELD dst(edge) AS play_dst \
UNION \
GO FROM "team200" OVER serve REVERSELY \
YIELD src(edge) AS play_dst) \
| GO FROM $-.play_dst OVER follow YIELD dst(edge) AS play_dst;
```

UNION

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#### 4.4.6

##### NebulaGraph

+

CONTAINS

(NOT) IN

(NOT) STARTS WITH

(NOT) ENDS WITH



+

```
nebula> RETURN 'a' + 'b';
+-----+
| ("a"+ "b") |
+-----+
| "ab"      |
+-----+
nebula> UNWIND 'a' AS a UNWIND 'b' AS b RETURN a + b;
+-----+
| (a+b) |
+-----+
| "ab"   |
+-----+
```

CONTAINS

CONTAINS

```
nebula> MATCH (s:player)-[e:serve]->(t:team) WHERE id(s) == "player101" \
    AND t.team.name CONTAINS "ets" RETURN s.player.name, e.start_year, e.end_year, t.team.name;
+-----+-----+-----+
| s.player.name | e.start_year | e.end_year | t.team.name |
+-----+-----+-----+
| "Tony Parker" | 2018       | 2019       | "Hornets"  |

nebula> GO FROM "player101" OVER serve WHERE (STRING)properties(edge).start_year CONTAINS "19" AND \
    properties($^).name CONTAINS "ny" \
    YIELD properties($^).name, properties(edge).start_year, properties(edge).end_year, properties($$).name;
+-----+-----+-----+
| properties($^).name | properties(EDGE).start_year | properties(EDGE).end_year | properties($$).name |
+-----+-----+-----+
| "Tony Parker"     | 1999       | 2018       | "Spurs"    |

nebula> GO FROM "player101" OVER serve WHERE !(properties($$).name CONTAINS "ets") \
    YIELD properties($^).name, properties(edge).start_year, properties(edge).end_year, properties($$).name;
+-----+-----+-----+
| properties($^).name | properties(EDGE).start_year | properties(EDGE).end_year | properties($$).name |
+-----+-----+-----+
| "Tony Parker"     | 1999       | 2018       | "Spurs"    |
```

(NOT) IN

```
nebula> RETURN 1 IN [1,2,3], "Yao" NOT IN ["Yi", "Tim", "Kobe"], NULL IN ["Yi", "Tim", "Kobe"];
+-----+-----+
| (1 IN [1,2,3]) | ("Yao" NOT IN ["Yi", "Tim", "Kobe"]) | (NULL IN ["Yi", "Tim", "Kobe"]) |
+-----+-----+-----+
```

```
| true      | true      | __NULL__      |
+-----+-----+-----+
|
```

## (NOT) STARTS WITH

```
nebula> RETURN 'apple' STARTS WITH 'app', 'apple' STARTS WITH 'a', 'apple' STARTS WITH toUpper('a');
+-----+-----+-----+
| ("apple" STARTS WITH "app") | ("apple" STARTS WITH "a") | ("apple" STARTS WITH toUpper("a")) |
+-----+-----+-----+
| true      | true      | false      |
+-----+-----+-----+
```

```
nebula> RETURN 'apple' STARTS WITH 'b','apple' NOT STARTS WITH 'app';
+-----+-----+
| ("apple" STARTS WITH "b") | ("apple" NOT STARTS WITH "app") |
+-----+-----+
| false     | false     |
+-----+-----+
```

## (NOT) ENDS WITH

```
nebula> RETURN 'apple' ENDS WITH 'app', 'apple' ENDS WITH 'e', 'apple' ENDS WITH 'E', 'apple' ENDS WITH 'b';
+-----+-----+-----+
| ("apple" ENDS WITH "app") | ("apple" ENDS WITH "e") | ("apple" ENDS WITH "E") | ("apple" ENDS WITH "b") |
+-----+-----+-----+
| false     | true      | false      | false      |
+-----+-----+-----+
```

## Note

openCypher      MATCH    WITH      nGQL      FETCH    GO    LOOKUP

NebulaGraph

std::regex

`=~ '<regexp>'`

```
nebula> RETURN "384748.39" =~ "\d+(\.\d{2})?";
+-----+
| ("384748.39"=~"\d+(\.\d{2})?") |
+-----+
| true      |
+-----+
```

```
nebula> MATCH (v:player) WHERE v.player.name =~ 'Tony.*' RETURN v.player.name;
+-----+
| v.player.name |
+-----+
| "Tony Parker" |
+-----+
```

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## 4.4.7

NebulaGraph List

+

IN

[]

```

nebula> YIELD [1,2,3,4,5]+[6,7] AS myList;
+-----+
| myList          |
+-----+
| [1, 2, 3, 4, 5, 6, 7] |
+-----+

nebula> RETURN size([NULL, 1, 2]);
+-----+
| size([NULL,1,2]) |
+-----+
| 3               |
+-----+

nebula> RETURN NULL IN [NULL, 1];
+-----+
| (NULL IN [NULL,1]) |
+-----+
| __NULL__          |
+-----+

nebula> WITH [2, 3, 4, 5] AS numberlist \
    UNWIND numberlist AS number \
    WITH number \
    WHERE number IN [2, 3, 8] \
    RETURN number;
+-----+
| number |
+-----+
| 2      |
| 3      |
+-----+

nebula> WITH ['Anne', 'John', 'Bill', 'Diane', 'Eve'] AS names RETURN names[1] AS result;
+-----+
| result |
+-----+
| "John" |
+-----+

```

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#### 4.4.8

##### nGQL

- -
- ! NOT
- \* / %
- - +
- == >= > <= < <> !=
- AND
- OR XOR
- =

```
nebula> RETURN 2+3*5;
+-----+
| (2+(3*5)) |
+-----+
| 17          |
+-----+

nebula> RETURN (2+3)*5;
+-----+
| ((2+3)*5) |
+-----+
| 25          |
+-----+
```

##### openCypher

|            |                |                               |
|------------|----------------|-------------------------------|
| openCypher | $x < y \leq z$ | $x < y \text{ AND } y \leq z$ |
| nGQL       | $x < y \leq z$ | $(x < y) \leq z$              |

---

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## 4.5

---

### 4.5.1

NebulaGraph

#### **abs()**

abs()

abs(<expression>)

- expression      double
- double

```
nebula> RETURN abs(-10);
+-----+
| abs(-(10)) |
+-----+
| 10          |
+-----+
nebula> RETURN abs(5-6);
+-----+
| abs((5-6)) |
+-----+
| 1           |
+-----+
```

#### **floor()**

floor()

floor(<expression>)

- expression      double
- double

```
nebula> RETURN floor(9.9);
+-----+
| floor(9.9) |
+-----+
| 9.0         |
+-----+
```

#### **ceil()**

ceil()

ceil(<expression>)

- expression      double
- double

```
nebula> RETURN ceil(9.1);
+-----+
| ceil(9.1) |
+-----+
```

```
+-----+
| 10.0 |
+-----+
```

**round()****round()****round(<expression>, <digit>)**

- **expression**      **double**
- **digit**            **0**                  **int**
- **double**

```
+-----+
| round(314.15926, 2) |
+-----+
| 314.16 |
+-----+

+-----+
| round(314.15926, -1) |
+-----+
| 310.0 |
+-----+
```

**sqrt()****sqrt()****sqrt(<expression>)**

- **expression**      **double**
- **double**

```
+-----+
| sqrt(9) |
+-----+
| 3.0 |
+-----+
```

**cbrt()****cbrt()****cbrt(<expression>)**

- **expression**      **double**
- **double**

```
+-----+
| cbrt(8) |
+-----+
| 2.0 |
+-----+
```

**hypot()**

hypot()

hypot(&lt;expression\_x&gt;, &lt;expression\_y&gt;)

- expression\_x    expression\_y              double                        x    y
- double

```
nebula> RETURN hypot(3,2*2);
+-----+
| hypot(3,(2*2)) |
+-----+
| 5.0             |
+-----+
```

**pow()**pow()              x<sup>y</sup>

pow(&lt;expression\_x&gt;, &lt;expression\_y&gt;, )

- expression\_x              double              x
- expression\_y              double              y
- double

```
nebula> RETURN pow(3,3);
+-----+
| pow(3,3)  |
+-----+
| 27         |
+-----+
```

**exp()**exp()              e      e<sup>x</sup>

exp(&lt;expression&gt;)

- expression              double              x
- double

```
nebula> RETURN exp(2);
+-----+
| exp(2)      |
+-----+
| 7.38905609893065 |
+-----+
```

**exp2()**exp2()    2      2<sup>x</sup>

exp2(&lt;expression&gt;)

- expression              double              x
- double

```
nebula> RETURN exp2(3);
+-----+
| exp2(3) |
+-----+
| 8.0      |
+-----+
```

**log()**

```
log()      e      \(\log_e\{N\}\)

log(<expression>)

• expression      double      N
```

- double

```
nebula> RETURN log(8);
+-----+
| log(8)        |
+-----+
| 2.0794415416798357 |
+-----+
```

**log2()**

```
log2()      2      \(\log_2\{N\}\)

log2(<expression>)

• expression      double      N
```

- double

```
nebula> RETURN log2(8);
+-----+
| log2(8) |
+-----+
| 3.0      |
+-----+
```

**log10()**

```
log10()     10     \(\log_{10}\{N\}\)

log10(<expression>)

• expression      double      N
```

- double

```
nebula> RETURN log10(100);
+-----+
| log10(100) |
+-----+
| 2.0        |
+-----+
```

**sin()**

```
sin()      radians()
```

`sin(<expression>)`

- `expression`      `double`
- `double`

```
nebula> RETURN sin(3);
+-----+
| sin(3)      |
+-----+
| 0.1411200080598672 |
+-----+
```

### `asin()`

`asin()`      `radians()`

`asin(<expression>)`

- `expression`      `double`
- `double`

```
nebula> RETURN asin(0.5);
+-----+
| asin(0.5)      |
+-----+
| 0.5235987755982989 |
+-----+
```

### `cos()`

`cos()`      `radians()`

`cos(<expression>)`

- `expression`      `double`
- `double`

```
nebula> RETURN cos(0.5);
+-----+
| cos(0.5)      |
+-----+
| 0.8775825618903728 |
+-----+
```

### `acos()`

`acos()`      `radians()`

`acos(<expression>)`

- `expression`      `double`
- `double`

```
nebula> RETURN acos(0.5);
+-----+
| acos(0.5)      |
+-----+
```

```
| 1.0471975511965979 |
+-----+
```

**tan()**

**tan()** radians()

tan(<expression>)

- expression double
- double

```
nebula> RETURN tan(0.5);
+-----+
| tan(0.5)      |
+-----+
| 0.5463024898437905 |
+-----+
```

**atan()**

**atan()** radians()

atan(<expression>)

- expression double
- double

```
nebula> RETURN atan(0.5);
+-----+
| atan(0.5)      |
+-----+
| 0.4636476090008061 |
+-----+
```

**rand()**

**rand()** [0,1)

rand()

- double

```
nebula> RETURN rand();
+-----+
| rand()      |
+-----+
| 0.6545837172298736 |
+-----+
```

**rand32()**

**rand32()** [min, max] 32

```
rand32(<expression_min>,<expression_max>)
```

- expression\_min int min
- expression\_max int max
- int
- max min 0 32 int

```
nebula> RETURN rand32(1,100);
+-----+
| rand32(1,100) |
+-----+
| 63           |
+-----+
```

### rand64()

```
rand64() [min, max] 64
```

```
rand64(<expression_min>,<expression_max>)
```

- expression\_min int min
- expression\_max int max
- int
- max min 0 64 int

```
nebula> RETURN rand64(1,100);
+-----+
| rand64(1,100) |
+-----+
| 34           |
+-----+
```

### bit\_and()

```
bit_and() AND
```

```
bit_and(<expression_1>,<expression_2>)
```

- expression\_1 expression\_2 int
- int

```
nebula> RETURN bit_and(5,6);
+-----+
| bit_and(5,6) |
+-----+
| 4           |
+-----+
```

### bit\_or()

```
bit_or() OR
```

```
bit_or(<expression_1>,<expression_2>)
```

- expression\_1 expression\_2 int
- int

```
nebula> RETURN bit_or(5,6);
+-----+
| bit_or(5,6) |
+-----+
| 7           |
+-----+
```

### **bit\_xor()**

```
bit_xor() XOR
```

```
bit_xor(<expression_1>,<expression_2>)
```

- expression\_1 expression\_2 int
- int

```
nebula> RETURN bit_xor(5,6);
+-----+
| bit_xor(5,6) |
+-----+
| 3           |
+-----+
```

### **size()**

```
size()
```

```
size({<expression>|<string>})
```

- expression
- string
- int

```
nebula> RETURN size([1,2,3,4]);
+-----+
| size([1,2,3,4]) |
+-----+
| 4           |
+-----+
```

```
nebula> RETURN size("basketballplayer") as size;
+----+
| size |
+----+
| 16   |
+----+
```

### **range()**

```
range() [start,end]
```

```
range(<expression_start>,<expression_end>[,<expression_step>])
```

- expression\_start      int      start
- expression\_end      int      end
- expression\_step      int      step      1
- list

```
nebula> RETURN range(1,(3*3),2);
+-----+
| range(1,(3*3),2) |
+-----+
| [1, 3, 5, 7, 9] |
+-----+
```

### sign()

- ```
sign()      0      0      -1      1
```
- ```
sign(<expression>)
```
- expression      double
  - int

```
nebula> RETURN sign(10);
+-----+
| sign(10) |
+-----+
| 1 |
+-----+
```

### e()

- ```
e()      e 2.718281828459045
```
- ```
e()
```
- double

```
nebula> RETURN e();
+-----+
| e() |
+-----+
| 2.718281828459045 |
+-----+
```

### pi()

- ```
pi()      π 3.141592653589793
```
- ```
pi()
```
- double

```
nebula> RETURN pi();
+-----+
| pi() |
+-----+
```

```
| 3.141592653589793 |  
+-----+
```

## radians()

```
radians()  
  
radians(<angle>)  
  
• double
```

```
nebula> RETURN radians(180);  
+-----+  
| radians(180) |  
+-----+  
| 3.141592653589793 |  
+-----+
```

---

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## 4.5.2

### NebulaGraph

#### avg()

avg()

```
avg(<expression>)
```

- double

```
nebula> MATCH (v:player) RETURN avg(v.player.age);
+-----+
| avg(v.player.age) |
+-----+
| 33.294117647058826 |
+-----+
```

#### count()

count()

- nGQL            count()    GROUP BY            YIELD
- openCypher        count()        RETURN        GROUP BY  
count({<expression> | \*})
- count(\*)        NULL
- int

```
nebula> WITH [NULL, 1, 1, 2, 2] As a UNWIND a AS b \
    RETURN count(b), count(*), count(DISTINCT b);
+-----+-----+-----+
| count(b) | count(*) | count(distinct b) |
+-----+-----+-----+
| 4       | 5       | 2       |
+-----+-----+-----+
```

```
#   player101 follow      follow player101
#   `count()` ``GROUP BY``

nebula> GO FROM "player101" OVER follow BIDIRECT \
    YIELD properties($$).name AS Name \
    | GROUP BY $-.Name YIELD $-.Name, count(*);
+-----+-----+
| $-.Name | count(*) |
+-----+-----+
"LaMarcus Aldridge"	2
"Tim Duncan"	2
"Marco Belinelli"	1
"Manu Ginobili"	1
"Boris Diaw"	1
"Dejounte Murray"	1
+-----+-----+


#   `count()` ``

nebula> MATCH (v1:player)-[:follow]-(v2:player) \
    WHERE id(v1) == "player101" \
    RETURN v2.player.name AS Name, count(*) as cnt ORDER BY cnt DESC;
+-----+-----+
| Name | cnt |
+-----+-----+
"LaMarcus Aldridge"	2
"Tim Duncan"	2
"Boris Diaw"	1
"Manu Ginobili"	1
"Dejounte Murray"	1
"Marco Belinelli"	1
+-----+-----+
```

- `$-.Name`

- `count(*)`

```
basketballplayer      count(*)      2      player101      follow
```

```
#  
nebula> LOOKUP ON player \  
    YIELD player.age AS playerage \  
    | GROUP BY $-.playerage \  
    YIELD $-.playerage AS age, count(*) AS number \  
    | ORDER BY $-.number DESC, $-.age DESC;
```

| age | number |
|-----|--------|
| 34  | 4      |
| 33  | 4      |
| 30  | 4      |
| 29  | 4      |
| 38  | 3      |

...

```
#  
nebula> MATCH (n:player) \  
    RETURN n.player.age AS age, count(*) AS number \  
    ORDER BY number DESC, age DESC;
```

| age | number |
|-----|--------|
| 34  | 4      |
| 33  | 4      |
| 30  | 4      |
| 29  | 4      |
| 38  | 3      |

...

```
#      Tim Duncan  
nebula> MATCH (v:player{name:"Tim Duncan"}) -[e]- (v2) \  
    RETURN count(e);
```

| count(e) |
|----------|
| 13       |

```
#      Tim Duncan  
nebula> MATCH (n:player {name : "Tim Duncan"})-[]->(friend:player)-[]->(fof:player) \  
    RETURN count(fof), count(DISTINCT fof);
```

| count(fof) | count(distinct fof) |
|------------|---------------------|
| 4          | 3                   |

## max()

### max()

```
max(<expression>)
```

- 

```
nebula> MATCH (v:player) RETURN max(v.player.age);  
+-----+  
| max(v.player.age) |  
+-----+  
| 47 |  
+-----+
```

## min()

### min()

`min(<expression>)`

```
nebula> MATCH (v:player) RETURN min(v.player.age);  
+-----+  
| min(v.player.age) |  
+-----+  
| 20 |  
+-----+
```

## collect()

`collect()`

```
collect(<expression>)
```

- ## • list

```
nebula> UNWIND [1, 2, 1] AS a \
    RETURN a;
+---+
| a |
+---+
| 1 |
| 2 |
| 1 |
+---+  
  
nebula> UNWIND [1, 2, 1] AS a \
    RETURN collect(a);
+-----+
| collect(a) |
+-----+
| [1, 2, 1] |
+-----+  
  
nebula> UNWIND [1, 2, 1] AS a \
    RETURN a, collect(a), size(collect(a));
+-----+-----+
| a | collect(a) | size(collect(a)) |
+-----+-----+
| 2 | [2]       | 1           |
| 1 | [1, 1]     | 2           |
+-----+-----+  
  
#          3
nebula> UNWIND ["c", "b", "a", "d"] AS p \
    WITH p AS q \
    ORDER BY q DESC LIMIT 3 \
    RETURN collect(q);
+-----+
| collect(q) |
+-----+
| ["d", "c", "b"] |
+-----+  
  
nebula> WITH [1, 1, 2, 2] AS coll \
    UNWIND coll AS x \
    WITH DISTINCT x \
    RETURN collect(x) AS ss;
+-----+
| ss   |
+-----+
| [1, 2] |
+-----+  
  
nebula> MATCH (n:player) \
    RETURN collect(n.player.age);
+-----+
| collect(n.player.age) |
+-----+
| [32, 32, 34, 29, 41, 40, 33, 25, 40, 37, ...  
...  
  
#  
nebula> MATCH (n:player) \
    RETURN n.player.age AS age, collect(n.p...
```

```
| 20 | ["Luka Doncic"] |
| 25 | ["Joel Embiid", "Kyle Anderson"] |
+-----+
...
nebula> GO FROM "player100" OVER serve \
    YIELD properties($$).name AS name \
    | GROUP BY $-.name \
    YIELD collect($-.name) AS name;
+-----+
| name      |
+-----+
| ["Spurs"] |
+-----+
nebula> LOOKUP ON player \
    YIELD player.age AS playerage \
    | GROUP BY $-.playerage \
    YIELD collect($-.playerage) AS playerage;
+-----+
| playerage   |
+-----+
| [22]        |
| [47]        |
| [43]        |
| [25, 25]    |
+-----+
...

```

**std()**

std()

std(&lt;expression&gt;)

- double

```
nebula> MATCH (v:player) RETURN std(v.player.age);
+-----+
| std(v.player.age) |
+-----+
| 6.423895701687502 |
+-----+
```

**sum()**

sum()

sum(&lt;expression&gt;)

- 

```
nebula> MATCH (v:player) RETURN sum(v.player.age);
+-----+
| sum(v.player.age) |
+-----+
| 1698           |
+-----+
```

```
nebula> GO FROM "player100" OVER follow YIELD dst(edge) AS dst, properties($$).age AS age \
    | GROUP BY $-.dst \
    YIELD \
    $-.dst AS dst, \
    toInteger((sum($-.age)/count($-.age)))+avg(distinct $-.age+1)+1 AS statistics;
+-----+
| dst      | statistics |
+-----+
| "player125" | 84.0     |
| "player101"  | 74.0     |
+-----+
```

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### 4.5.3

NebulaGraph

- SQL nGQL 1 C 0

#### **strcasecmp()**

strcasecmp()

```
strcasecmp(<string_a>,<string_b>)

• string_a string_b
•      int
• string_a = string_b      0      string_a > string_b      0      string_a < string_b      0
```

```
nebula> RETURN strcasecmp("a","aa");
+-----+
| strcasecmp("a","aa") |
+-----+
| -97
+-----+
```

#### **lower() toLower()**

lower() toLower()

```
lower(<string>) | toLower(<string>)

• string
•      string
```

```
nebula> RETURN lower("Basketball_Player");
+-----+
| lower("Basketball_Player") |
+-----+
| "basketball_player"       |
+-----+
```

#### **upper() toUpper()**

upper() toUpper()

```
upper(<string>) | toUpper(<string>)

• string
•      string
```

```
nebula> RETURN upper("Basketball_Player");
+-----+
| upper("Basketball_Player") |
+-----+
```

```
| "BASKETBALL_PLAYER"      |
+-----+
|
```

**length()**

```
length() -
```

```
length({<string>}|<path>)
```

- string
- path
- int

```
nebula> RETURN length("basketball");
+-----+
| length("basketball") |
+-----+
| 10
+-----+
```

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-->(v2) return length(p);
+-----+
| length(p) |
+-----+
| 1
| 1
| 1
+-----+
```

**trim()**

```
trim()
```

```
trim(<string>)
```

- string
- string

```
nebula> RETURN trim(" basketball player ");
+-----+
| trim(" basketball player ") |
+-----+
| "basketball player" |
+-----+
```

**ltrim()**

```
ltrim()
```

```
ltrim(<string>)
```

- string
- string

```
nebula> RETURN ltrim(" basketball player ");
+-----+
| ltrim(" basketball player ") |
+-----+
| "basketball player" |
+-----+
```

**rtrim()**

rtrim()

`rtrim(<string>)`

- `string`
- `string`

```
nebula> RETURN rtrim(" basketball player ");
+-----+
| rtrim(" basketball player " ) |
+-----+
| " basketball player" |
+-----+
```

**left()**

left()

`left(<string>,<count>)`

- `string`
- `count` `count`
- `string`

```
nebula> RETURN left("basketball_player",6);
+-----+
| left("basketball_player",6) |
+-----+
| "basket" |
+-----+
```

**right()**

right()

`right(<string>,<count>)`

- `string`
- `count` `count`
- `string`

```
nebula> RETURN right("basketball_player",6);
+-----+
| right("basketball_player",6) |
+-----+
| "player" |
+-----+
```

**lpad()**

lpad()

`lpad(<string>,<count>,<letters>)`

- `string`
- `count`                    `count`    `string`                    `string`                    `count`
- `letters`
- `string`

```
nebula> RETURN lpad("abcd",10,"b");
+-----+
| lpad("abcd",10,"b") |
+-----+
| "bbbbbbabcd" |
+-----+

nebula> RETURN lpad("abcd",3,"b");
+-----+
| lpad("abcd",3,"b") |
+-----+
| "abc" |
+-----+
```

## rpad()

`rpad()`

`rpad(<string>,<count>,<letters>)`

- `string`
- `count`                    `count`    `string`                    `string`                    `count`
- `letters`
- `string`

```
nebula> RETURN rpad("abcd",10,"b");
+-----+
| rpad("abcd",10,"b") |
+-----+
| "abcd#####" |
+-----+

nebula> RETURN rpad("abcd",3,"b");
+-----+
| rpad("abcd",3,"b") |
+-----+
| "abc" |
+-----+
```

## substr()  substring()

`substr()`  `substring()`

`substr(<string>,<pos>,<count>)`  `substring(<string>,<pos>,<count>)`

- `string`
- `pos`                    `int`
- `count`
- `string`

**SUBSTR() | SUBSTRING()**

- pos 0
- pos
- pos BAD\_DATA
- count pos
- count 0
- NULL

 **enCypher**

openCypher a null null

```
nebula> RETURN substr("abcdefg",2,4);
+-----+
| substr("abcdefg",2,4) |
+-----+
| "cdef"               |
+-----+

nebula> RETURN substr("abcdefg",0,4);
+-----+
| substr("abcdefg",0,4) |
+-----+
| "abcd"               |
+-----+

nebula> RETURN substr("abcdefg",2);
+-----+
| substr("abcdefg",2) |
+-----+
| "cdefg"              |
+-----+
```

**reverse()**

reverse()

reverse(<string>)

- string
- string

```
nebula> RETURN reverse("abcdefg");
+-----+
| reverse("abcdefg") |
+-----+
| "gfedcba"          |
+-----+
```

**replace()**

replace() a b

```
replace(<string>,<substr_a>,<string_b>)
```

- string
- substr\_a a
- string\_b b
- string

```
nebula> RETURN replace("abcdefg","cd","AAAAAA");
+-----+
| replace("abcdefg","cd","AAAAAA") |
+-----+
| "abAAAAAefg" |
+-----+
```

## split()

```
split() b

split(<string>,<substr>)

• string

• substr b

• list
```

```
nebula> RETURN split("basketballplayer","a");
+-----+
| split("basketballplayer","a") |
+-----+
| ["b", "sketb", "llp1", "yer"] |
+-----+
```

## concat()

```
concat()

concat(<string1>,<string2>,...)

•

• NULL concat() NULL

• string
```

```
// 1 2 3
nebula> RETURN concat("1","2","3") AS r;
+-----+
| r   |
+-----+
| "123" |
+-----+

//      NULL
nebula> RETURN concat("1","2",NULL) AS r;
+-----+
| r   |
+-----+
| __NULL__ |
+-----+

nebula> GO FROM "player100" over follow \
          YIELD concat(src(edge), properties($^).age, properties($$).name, properties(edge).degree) AS A;
+-----+
| A   |
+-----+
```

```
+-----+
| "player10042Tony Parker95" |
| "player10042Manu Ginobili95" |
+-----+
```

**concat\_ws()**

```
concat_ws()      separator

concat_ws(<separator>, <string1>, <string2>, ... )
```

- 
- NULL    concat\_ws()       NULL
- NULL
- NULL    NULL

```
//      +  a b c
nebula> RETURN concat_ws("+", "a", "b", "c") AS r;
+-----+
| r      |
+-----+
| "a+b+c" |
+-----+

//      NULL
nebula> RETURN concat_ws(NULL, "a", "b", "c") AS r;
+-----+
| r      |
+-----+
| __NULL__ |
+-----+

//      +      NULL
nebula> RETURN concat_ws("+", "a", NULL, "b", "c") AS r;
+-----+
| r      |
+-----+
| "a+b+c" |
+-----+

//      +
nebula> RETURN concat_ws("+", "a") AS r;
+-----+
| r      |
+-----+
| "a"   |
+-----+

nebula> GO FROM "player100" over follow \
    YIELD concat_ws(" ", src(edge), properties($^).age, properties($$).name, properties(edge).degree) AS A;
+-----+
| A      |
+-----+
| "player100 42 Tony Parker 95" |
| "player100 42 Manu Ginobili 95" |
+-----+
```

**extract()**

```
extract()

extract(<string>, "<regular_expression>")

• string
• regular_expression
• list
```

```
nebula> MATCH (a:player)-[b:serve]-(c:team{name: "Lakers"}) \
    WHERE a.player.age > 45 \
    RETURN extract(a.player.name, "\w+") AS result;
+-----+
```

```
| result |
+-----+
| ["Shaquille", "O", "Neal"] |
+-----+

nebula> MATCH (a:player)-[b:serve]-(c:team{name: "Lakers"}) \
    WHERE a.player.age > 45 \
    RETURN extract(a.player.name, "hello") AS result;
+-----+
| result |
+-----+
| []   |
+-----+
```

**json\_extract()**

json\_extract()    JSON        map

extract(<string>)

- string            JSON
- map

**Caution**

- Bool Double Int String NULL
- 1 Map            2

```
nebula> YIELD json_extract('{"a": 1, "b": {}, "c": {"d": true}}') AS result;
+-----+
| result |
+-----+
| {a: 1, b: {}, c: {d: true}} |
+-----+
```

---

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#### 4.5.4

##### NebulaGraph

```
int now()  
timestamp timestamp()  
date date() UTC  
time time() UTC  
datetime datetime() UTC  
map duration()
```

```
nebula> RETURN now(), timestamp(), date(), time(), datetime();  
+-----+-----+-----+-----+-----+  
| now() | timestamp() | date() | time() | datetime() |  
+-----+-----+-----+-----+-----+  
| 1640057560 | 1640057560 | 2021-12-21 | 03:32:40.351000 | 2021-12-21T03:32:40.351000 |  
+-----+-----+-----+-----+-----+
```

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#### 4.5.5 Schema

NebulaGraph Schema

## Schema

- nGQL
  - openCypher

nGQL

nGQL YIELD WHERE



```
vertex edge vertices edges path AS <alias> GO FROM "player100" OVER follow YIELD edge AS e;
```

### ID(VERTEX)

**id(vertex)** ID

`id(vertex)`

- ID

```
nebula> LOOKUP ON player WHERE player.age > 45 YIELD id(vertex);
+-----+
| id(VERTEX) |
+-----+
| "player144" |
| "player140" |
+-----+
```

## PROPERTIES(VERTEX)

properties(vertex)

`properties(vertex)`

- map

```
nebula> LOOKUP ON player WHERE player.age > 45 \
          YIELD properties(vertex);
+-----+
| properties(VERTEX) |
+-----+
| {age: 47, name: "Shaquille O'Neal"} |
| {age: 46, name: "Grant Hill"} |
+-----+
```

#### PROPERTIES(EDGE)

`properties(edge)`

`properties(edge)`

- map

```
nebula> GO FROM "player100" OVER follow \
           YIELD properties(edge);
+-----+
| properties(EDGE) |

```

```
+-----+
| {degree: 95}      |
| {degree: 95}      |
+-----+
```

## TYPE(EDGE)

type(edge) Edge type

type(edge)

- string

```
nebula> GO FROM "player100" OVER follow \
    YIELD src(edge), dst(edge), type(edge), rank(edge);
+-----+-----+-----+-----+
| src(EDGE) | dst(EDGE) | type(EDGE) | rank(EDGE) |
+-----+-----+-----+-----+
| "player100" | "player101" | "follow" | 0       |
| "player100" | "player125" | "follow" | 0       |
+-----+-----+-----+-----+
```

## SRC(EDGE)

src(edge) ID

src(edge)

- ID

```
nebula> GO FROM "player100" OVER follow \
    YIELD src(edge), dst(edge);
+-----+-----+
| src(EDGE) | dst(EDGE) |
+-----+-----+
| "player100" | "player101" |
| "player100" | "player125" |
+-----+-----+
```

## Note

src(edge) properties(\$^)

src(edge)

ID properties(\$^)

GO FROM "player100" player100

## DST(EDGE)

dst(edge) ID

dst(edge)

- ID

```
nebula> GO FROM "player100" OVER follow \
    YIELD src(edge), dst(edge);
+-----+-----+
| src(EDGE) | dst(EDGE) |
+-----+-----+
| "player100" | "player101" |
| "player100" | "player125" |
+-----+-----+
```

## Note

dst(edge) ID

**RANK(EDGE)**

rank(edge) rank

rank(edge)

- int

```
nebula> GO FROM "player100" OVER follow \
    YIELD src(edge), dst(edge), rank(edge);
+-----+-----+-----+
| src(EDGE) | dst(EDGE) | rank(EDGE) |
+-----+-----+-----+
| "player100" | "player101" | 0
| "player100" | "player125" | 0
+-----+-----+
```

**VERTEX**

vertex ID Tag AS <alias>

vertex

```
nebula> LOOKUP ON player WHERE player.age > 45 YIELD vertex AS v;
+-----+
| v |
+-----+
| ("player144" :player{age: 47, name: "Shaquille O'Neal"}) |
| ("player140" :player{age: 46, name: "Grant Hill"}) |
+-----+
```

**EDGE**

edge Edge type ID ID rank AS <alias>

edge

```
nebula> GO FROM "player100" OVER follow YIELD edge AS e;
+-----+
| e |
+-----+
| [:follow "player100"->"player101" @0 {degree: 95}] |
| [:follow "player100"->"player125" @0 {degree: 95}] |
+-----+
```

**VERTICES**

vertices GET SUBGRAPH

**EDGES**

edges GET SUBGRAPH

**PATH**

path FIND PATH

**openCypher**

openCypher RETURN WHERE

ID()

id() ID

id(<vertex>)

- ID

```
nebula> MATCH (v:player) RETURN id(v);
+-----+
| id(v) |
+-----+
| "player129" |
| "player115" |
| "player106" |
| "player102" |
...
```

## TAGS()

tags() labels() Tag

```
tags(<vertex>) labels(<vertex>)
```

- list

```
nebula> MATCH (v) WHERE id(v) == "player100" \
    RETURN tags(v);
+-----+
| tags(v) |
+-----+
| ["player"] |
+-----+
```

## PROPERTIES()

properties()

```
properties(<vertex_or_edge>)
```

- map

```
nebula> MATCH (v:player)-[e:follow]-() RETURN properties(v),properties(e);
+-----+-----+
| properties(v) | properties(e) |
+-----+-----+
{age: 31, name: "Stephen Curry"}	{degree: 90}
{age: 47, name: "Shaquille O'Neal"}	{degree: 100}
{age: 34, name: "LeBron James"}	{degree: 13}
...
```

## TYPE()

type() Edge type

```
type(<edge>)
```

- string

```
nebula> MATCH (v:player{name:"Tim Duncan"})-[e]->() \
    RETURN type(e);
+-----+
| type(e) |
+-----+
| "serve" |
| "follow" |
| "follow" |
+-----+
```

## SRC()

src() ID

```
src(<edge>)
```

- ID

```
nebula> MATCH ()-[e]->(v:player{name:"Tim Duncan"}) \
    RETURN src(e);
+-----+
| src(e) |
+-----+
| "player125" |
| "player113" |
| "player102" |
...
```

## DST()

|       |             |
|-------|-------------|
| dst() | ID          |
|       | dst(<edge>) |

- ID

```
nebula> MATCH (v:player{name:"Tim Duncan"})-[e]->() \
    RETURN dst(e);
+-----+
| dst(e) |
+-----+
| "team204" |
| "player101" |
| "player125" |
+-----+
```

## STARTNODE()

|             |                   |
|-------------|-------------------|
| startNode() | ID Tag            |
|             | startNode(<path>) |

```
nebula> MATCH p = (a :player {name : "Tim Duncan"})-[r:serve]-(t) \
    RETURN startNode(p);
+-----+
| startNode(p) |
+-----+
| ("player100" :player{age: 42, name: "Tim Duncan"}) |
+-----+
```

## ENDNODE()

|           |                 |
|-----------|-----------------|
| endNode() | ID Tag          |
|           | endNode(<path>) |

```
nebula> MATCH p = (a :player {name : "Tim Duncan"})-[r:serve]-(t) \
    RETURN endNode(p);
+-----+
| endNode(p) |
+-----+
| ("team204" :team{name: "Spurs"}) |
+-----+
```

## RANK()

|        |              |
|--------|--------------|
| rank() | rank         |
|        | rank(<edge>) |

- int

```
nebula> MATCH (v:player{name:"Tim Duncan"})-[e]->() \
    RETURN rank(e);
+-----+
```

```
| rank(e) |
+-----+
| 0      |
| 0      |
| 0      |
+-----+
```

---

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## 4.5.6

NebulaGraph      List      nGQL      openCypher

• SQL    nGQL      1      C      0

### RANGE()

```
range() [start, end]
range(start, end [, step])

• step 1
• list
```

```
nebula> RETURN range(1,9,2);
+-----+
| range(1,9,2) |
+-----+
| [1, 3, 5, 7, 9] |
+-----+
```

### REVERSE()

```
reverse()
reverse(<list>)

• list
```

```
nebula> WITH [NULL, 4923, 'abc', 521, 487] AS ids \
    RETURN reverse(ids);
+-----+
| reverse(ids) |
+-----+
| [487, 521, "abc", 4923, __NULL__] |
+-----+
```

### TAIL()

```
tail()
tail(<list>)

• list
```

```
nebula> WITH [NULL, 4923, 'abc', 521, 487] AS ids \
    RETURN tail(ids);
+-----+
| tail(ids) |
+-----+
| [4923, "abc", 521, 487] |
+-----+
```

### HEAD()

```
head()
```

```
head(<list>)
```

- 

```
nebula> WITH [NULL, 4923, 'abc', 521, 487] AS ids \
    RETURN head(ids);
+-----+
| head(ids) |
+-----+
| __NULL__ |
+-----+
```

LAST()

last()

```
last(<list>)
```

- 

```
nebula> WITH [NULL, 4923, 'abc', 521, 487] AS ids \
    RETURN last(ids);
+-----+
| last(ids) |
+-----+
| 487       |
+-----+
```

REDUCE()

reduce()

e e

Lisp

Scala fold reduce



openCypher reduce() nGQL Cypher reduce()

reduce(<accumulator> = <initial>, <variable> IN <list> | <expression>)

- accumulator
- initial accumulator
- variable
- list
- expression accumulator
- 

```
nebula> RETURN reduce(totalNum = -4 * 5, n IN [1, 2] | totalNum + n * 2) AS r;
```

```
+-----+
| r   |
+-----+
| -14 |
+-----+
```

```
nebula> MATCH p = (n:player{name:"LeBron James"})->[:follow]-(m) \
    RETURN nodes(p)[0].age AS src1, nodes(p)[1].age AS dst2, \
    reduce(totalAge = 100, n IN nodes(p) | totalAge + n.age) AS sum;
```

```
+-----+-----+
| src1 | dst2 | sum |
+-----+-----+
34	31	165
34	29	163
34	33	167
34	26	160
```

```
| 34 | 34 | 168 |
| 34 | 37 | 171 |
+-----+-----+-----+
nebula> LOOKUP ON player WHERE player.name == "Tony Parker" YIELD id(vertex) AS VertexID \
    | GO FROM $-.VertexID over follow \
    WHERE properties(edge).degree != reduce(totalNum = 5, n IN range(1, 3) | properties($$).age + totalNum + n) \
    YIELD properties($$).name AS id, properties($$).age AS age, properties(edge).degree AS degree;
+-----+-----+-----+
| id | age | degree |
+-----+-----+-----+
"Tim Duncan"	42	95
"LaMarcus Aldridge"	33	90
"Manu Ginobili"	41	95
+-----+-----+-----+
```

## nGQL

KEYS()

keys()

```
keys({vertex | edge})
```

- list

```
+-----+
nebula> LOOKUP ON player \
    WHERE player.age > 45 \
    YIELD keys(vertex);
+-----+
| keys(VERTEX) |
+-----+
| ["age", "name"] |
| ["age", "name"] |
+-----+
```

LABELS()

labels() Tag

```
labels(vertex)
```

- list

```
+-----+
nebula> FETCH PROP ON * "player101", "player102", "team204" \
    YIELD labels(vertex);
+-----+
| labels(VERTEX) |
+-----+
| ["player"] |
| ["player"] |
| ["team"] |
+-----+
```

## openCypher

KEYS()

keys()

```
keys(<vertex_or_edge>)
```

- list

```
+-----+
nebula> MATCH (v:player{name:"Tim Duncan"})-[e]->() \
    RETURN keys(e);
+-----+
| keys(e) |
+-----+
| ["end_year", "start_year"] |
| ["degree"] |
+-----+
```

```
| ["degree"] |  
+-----+  
|
```

**LABELS()**

**labels()** Tag

```
labels(<vertex>)
```

- list

```
nebula> MATCH (v)-[e:serve]->() \  
 WHERE id(v)=="player100" \  
 RETURN labels(v);  
+-----+  
| labels(v) |  
+-----+  
| ["player"] |  
+-----+
```

**NODES()**

**nodes()** ID Tag

```
nodes(<path>)
```

- list

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-->(v2) \  
 RETURN nodes(p);  
+-----+  
| nodes(p) |  
+-----+  
| [{"player100":player{age: 42, name: "Tim Duncan"}, "team204":team{name: "Spurs"}}, {"player101":player{age: 36, name: "Tony Parker"}}, {"player125":player{age: 41, name: "Manu Ginobili"}}] |  
+-----+
```

**RELATIONSHIPS()**

**relationships()**

```
relationships(<path>)
```

- list

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-->(v2) \  
 RETURN relationships(p);  
+-----+  
| relationships(p) |  
+-----+  
| [{"serve": "player100->team204", "end_year": 2016, "start_year": 1997}, {"follow": "player100->player101", "degree": 95}, {"follow": "player100->player125", "degree": 95}] |  
+-----+
```

---

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## 4.5.7

NebulaGraph

### **toBoolean()**

toBoolean()

```
toBoolean(<value>)
```

- bool

```
nebula> UNWIND [true, false, 'true', 'false', NULL] AS b \
    RETURN toBoolean(b) AS b;
+-----+
| b   |
+-----+
| true |
| false|
| true |
| false|
| __NULL__ |
+-----+
```

### **toFloat()**

toFloat()

```
toFloat(<value>)
```

- float

```
nebula> RETURN toFloat(1), toFloat('1.3'), toFloat('1e3'), toFloat('not a number');
+-----+-----+-----+-----+
| toFloat(1) | toFloat("1.3") | toFloat("1e3") | toFloat("not a number") |
+-----+-----+-----+-----+
| 1.0       | 1.3          | 1000.0      | __NULL__      |
+-----+-----+-----+-----+
```

### **toString()**

toString()

```
toString(<value>)
```

- string

```
nebula> RETURN toString(9669) AS int2str, toString(null) AS null2str;
+-----+-----+
| int2str | null2str |
+-----+-----+
| "9669"  | __NULL__ |
+-----+-----+
```

### **toInteger()**

toInteger()

```
toInteger(<value>)
```

- int

```
nebula> RETURN toInteger(1), toInteger('1'), toInteger('1e3'), toInteger('not a number');
+-----+-----+-----+-----+
| toInteger(1) | toInteger("1") | toInteger("1e3") | toInteger("not a number") |
+-----+-----+-----+-----+
| 1           | 1           | 1000        | __NULL__      |
+-----+-----+-----+-----+
```

**toSet()****toSet()****toSet(<value>)**

- **set**

```
nebula> RETURN toSet(list[1,2,3,1,2]) AS list2set;
+-----+
| list2set |
+-----+
| {3, 1, 2} |
+-----+
```

**hash()****hash()** NULL**hash()** MurmurHash2 seed 0xc70f6907UL [MurmurHash2.h](#)**Java**

```
MurmurHash2.hash64("to_be_hashed".getBytes(),"to_be_hashed".getBytes().length, 0xc70f6907)
```

**hash(<string>)**

- **int**

```
nebula> RETURN hash("abcde");
+-----+
| hash("abcde")   |
+-----+
| 811036730794841393 |
+-----+

nebula> YIELD hash([1,2,3]);
+-----+
| hash([1,2,3])   |
+-----+
| 11093822460243 |
+-----+

nebula> YIELD hash(NULL);
+-----+
| hash(NULL)   |
+-----+
| -1          |
+-----+

nebula> YIELD hash(toLower("HELLO NEBULA"));
+-----+
| hash(toLower("HELLO NEBULA"))   |
+-----+
| -8481157362655072082         |
+-----+
```

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## 4.5.8

NebulaGraph

### CASE

|      |            |      |      |      |
|------|------------|------|------|------|
| CASE | openCypher | nGQL | CASE |      |
| CASE |            |      | ELSE | ELSE |
|      |            |      |      | NULL |

•

```
CASE <comparer>
WHEN <value> THEN <result>
[WHEN ...]
[ELSE <default>]
END
```



CASE      END

| comparer | value                       |
|----------|-----------------------------|
| value    | comparer                    |
| result   | value    comparer    result |
| default  | default                     |

•

```
nebula> RETURN \
CASE 2+3 \
WHEN 4 THEN 0 \
WHEN 5 THEN 1 \
ELSE -1 \
END \
AS result;
```

```
+-----+
| result |
+-----+
| 1      |
+-----+
```

```
nebula> GO FROM "player100" OVER follow \
YIELD properties($$).name AS Name, \
CASE properties($$).age > 35 \
WHEN true THEN "Yes" \
WHEN false THEN "No" \
ELSE "Nah" \
END \
AS Age_above_35;
```

```
+-----+
| Name       | Age_above_35 |
+-----+
| "Tony Parker" | "Yes"      |
| "Manu Ginobili" | "Yes"      |
+-----+
```

•

```
CASE
WHEN <condition> THEN <result>
[WHEN ...]
```

```
[ELSE <default>]
END
```

|           |           |        |
|-----------|-----------|--------|
| condition | condition | true   |
| result    | condition | true   |
| default   |           | result |

- 

```
nebula> YIELD \
CASE WHEN 4 > 5 THEN 0 \
WHEN 3+4==7 THEN 1 \
ELSE 2 \
END \
AS result;
+-----+
| result |
+-----+
| 1      |
+-----+
```

```
nebula> MATCH (v:player) WHERE v.player.age > 30 \
RETURN v.player.name AS Name, \
CASE \
WHEN v.player.name STARTS WITH "T" THEN "Yes" \
ELSE "No" \
END \
AS Starts_with_T;
+-----+-----+
| Name        | Starts_with_T |
+-----+-----+
"Tim Duncan"	"Yes"
"LaMarcus Aldridge"	"No"
"Tony Parker"	"Yes"
+-----+-----+
```

```
nebula> GO FROM "player100" OVER follow \
YIELD properties($$).name AS Name, properties($$).age AS Age, \
CASE properties($$).age \
WHEN properties($$).age > 35 THEN "Yes" \
ELSE "No" \
END \
AS Age_above_35;
+-----+-----+-----+
| Name        | Age   | Age_above_35 |
+-----+-----+-----+
| "Tony Parker" | 36    | "No"          |
| "Manu Ginobili" | 41    | "No"          |
+-----+-----+-----+
```

|      |                  |                       |    |
|------|------------------|-----------------------|----|
| 35   | Yes              | 36                    | No |
| CASE | \$\$ .player.age | \$\$ .player.age > 35 | 36 |

- $\$\$.player.age$     36    int
- $\$\$.player.age > 35$     true    boolean

No

## coalesce()

coalesce()

coalesce(<expression\_1>[,<expression\_2>...])

-

```
nebula> RETURN coalesce(null,[1,2,3]) as result;
+-----+
| result      |
+-----+
| [1, 2, 3]   |
+-----+

nebula> RETURN coalesce(null) as result;
+-----+
| result      |
+-----+
| __NULL__    |
+-----+
```

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## 4.5.9

true false WHERE

NebulaGraph

|          | true | false |
|----------|------|-------|
| exists() | true | false |
| any()    | true | false |
| all()    | true | false |
| none()   | true | false |
| single() | true | false |

### Note

NULL

### Incompatibility

openCypher exists()

<predicate>(<variable> IN <list> WHERE <condition>)

```
nebula> RETURN any(n IN [1, 2, 3, 4, 5, NULL] \
    WHERE n > 2) AS r;
+-----+
| r   |
+-----+
| true |
+-----+

nebula> RETURN single(n IN range(1, 5) \
    WHERE n == 3) AS r;
+-----+
| r   |
+-----+
| true |
+-----+

nebula> RETURN none(n IN range(1, 3) \
    WHERE n == 0) AS r;
+-----+
| r   |
+-----+
| true |
+-----+

nebula> WITH [1, 2, 3, 4, 5, NULL] AS a \
    RETURN any(n IN a WHERE n > 2);
+-----+
| any(n IN a WHERE (n>2)) |
+-----+
| true                         |
+-----+

nebula> MATCH p = (n:player{name:"LeBron James"})->[:follow]-(m) \
    RETURN nodes(p)[0].name AS n1, nodes(p)[1].name AS n2, \
    all(n IN nodes(p) WHERE n.name NOT STARTS WITH "D") AS b;
+-----+-----+-----+
| n1      | n2      | b      |
+-----+-----+-----+
| "LeBron James" | "Danny Green" | false |
```

```

"LeBron James"	"Dejounte Murray"	false
"LeBron James"	"Chris Paul"	true
"LeBron James"	"Kyrie Irving"	true
"LeBron James"	"Carmelo Anthony"	true
"LeBron James"	"Dwyane Wade"	false
+-----+-----+-----+
nebula> MATCH p = (n:player{name:"LeBron James"})-[:follow]->(m) \
    RETURN single(n IN nodes(p) WHERE n.age > 40) AS b;
+----+
| b |
+----+
| true |
+----+
nebula> MATCH (n:player) \
    RETURN exists(n.player.id), n IS NOT NULL;
+-----+-----+
| exists(n.player.id) | n IS NOT NULL |
+-----+-----+
| false | true |
...
nebula> MATCH (n:player) \
    WHERE exists(n['name']) \
    RETURN n;
+-----+
| n |
+-----+
| ("player105" :player{age: 31, name: "Danny Green"}) |
| ("player109" :player{age: 34, name: "Tiago Splitter"}) |
| ("player111" :player{age: 38, name: "David West"}) |
...

```

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## 4.5.10 geo

geo                    GEOGRAPHY

|                                                   |              |                            |                     |             |           |
|---------------------------------------------------|--------------|----------------------------|---------------------|-------------|-----------|
| ST_Point(longitude, latitude)                     | GEOGRAPHY    |                            |                     |             |           |
| ST_GeogFromText(wkt_string)                       | GEOGRAPHY    | WKT                        | GEOGRAPHY           |             |           |
| ST_ASText(geography)                              | STRING       |                            | GEOGRAPHY           | WKT         |           |
| ST_Centroid(geography)                            | GEOGRAPHY    |                            | GEOGRAPHY           |             | GEOGRAPHY |
| ST_ISValid(geography)                             | BOOL         |                            | GEOGRAPHY           |             |           |
| ST_Intersects(geography_1, geography_2)           | BOOL         |                            | GEOGRAPHY           |             |           |
| ST_Covers(geography_1, geography_2)               | BOOL         | geography_1<br>geography_1 | geography_2<br>True | geography_2 |           |
| ST_CoveredBy(geography_1, geography_2)            | BOOL         | geography_2<br>geography_2 | geography_1<br>True | geography_1 |           |
| ST_DWithin(geography_1, geography_2,<br>distance) | BOOL         | geography_1<br>distance    | geography_2<br>True | geography_2 |           |
| ST_Distance(geography_1, geography_2)             | FLOAT        |                            | GEOGRAPHY           |             |           |
| S2_CellIdFromPoint(point_geography)               | INT          |                            | GEOGRAPHY           | S2          | ID        |
| S2_CoveringCellIds(geography)                     | ARRAY<INT64> |                            | GEOGRAPHY           | S2          | ID        |

```

nebula> RETURN ST_ASText(ST_Point(1,1));
+-----+
| ST_ASText(ST_Point(1,1)) |
+-----+
| "POINT(1 1)"           |
+-----+

nebula> RETURN ST_ASText(ST_GeogFromText("POINT(3 8)"));
+-----+
| ST_ASText(ST_GeogFromText("POINT(3 8)")) |
+-----+
| "POINT(3 8)"           |
+-----+

nebula> RETURN ST_ASTEXT(ST_Centroid(ST_GeogFromText("LineString(0 1,1 0)")));
+-----+
| ST_ASTEXT(ST_Centroid(ST_GeogFromText("LineString(0 1,1 0)")) ) |
+-----+
| "POINT(0.5000380800773782 0.5000190382261059)"           |
+-----+

nebula> RETURN ST_ISValid(ST_GeogFromText("POINT(3 8)"));
+-----+
| ST_ISValid(ST_GeogFromText("POINT(3 8)")) |
+-----+
| true                         |
+-----+

nebula> RETURN ST_Intersects(ST_GeogFromText("LineString(0 1,1 0)'),ST_GeogFromText("LineString(0 0,1 1)' ));
+-----+
| ST_Intersects(ST_GeogFromText("LineString(0 1,1 0)'),ST_GeogFromText("LineString(0 0,1 1)' )) |
+-----+
| true                         |
+-----+

nebula> RETURN ST_Covers(ST_GeogFromText("POLYGON((0 0,10 0,10 10,0 10,0 0))"),ST_Point(1,2));
+-----+

```

```

| ST_Covers(ST_GeogFromText("POLYGON((0 0,10 0,10 10,0 10,0 0))"),ST_Point(1,2)) |
+-----+
| true
+-----+
nebula> RETURN ST_CoveredBy(ST_Point(1,2),ST_GeogFromText("POLYGON((0 0,10 0,10 10,0 10,0 0))"));
+-----+
| ST_CoveredBy(ST_Point(1,2),ST_GeogFromText("POLYGON((0 0,10 0,10 10,0 10,0 0))")) |
+-----+
| true
+-----+
nebula> RETURN ST_dwithin(ST_GeogFromText("Point(0 0)"),ST_GeogFromText("Point(10 10)'),2000000000.0);
+-----+
| ST_dwithin(ST_GeogFromText("Point(0 0)"),ST_GeogFromText("Point(10 10)'),2000000000) |
+-----+
| true
+-----+
nebula> RETURN ST_Distance(ST_GeogFromText("Point(0 0)'),ST_GeogFromText("Point(10 10)')));
+-----+
| ST_Distance(ST_GeogFromText("Point(0 0)'),ST_GeogFromText("Point(10 10)')) |
+-----+
| 1.5685230187677438e+06
+-----+
nebula> RETURN S2_CellIdFromPoint(ST_GeogFromText("Point(1 1)'));
+-----+
| S2_CellIdFromPoint(ST_GeogFromText("Point(1 1)')) |
+-----+
| 1153277837650709461
+-----+
nebula> RETURN S2_CoveringCellIds(ST_GeogFromText("POLYGON((0 1, 1 2, 2 3, 0 1))"));
+-----+
| S2_CoveringCellIds(ST_GeogFromText("POLYGON((0 1, 1 2, 2 3, 0
1))"))
+-----+
| [1152391494368201343, 1153466862374223872, 1153554823304445952, 1153836298281156608, 1153959443583467520, 1154240918560178176, 1160503736791990272,
116059169772212352] |
+-----+

```

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## 4.5.11

### **openCypher**

NebulaGraph 3.3.0

UDF

---

: January 13, 2023

## 4.6

### 4.6.1 MATCH

```

MATCH      pattern
          MATCH      NebulaGraph      RETURN
          basketballplayer

GO      LOOKUP      MATCH      MATCH      trail
MATCH

MATCH <pattern> [<clause_1>] RETURN <output> [<clause_2>];

• pattern      pattern      MATCH      ,      (a)-[]->(b),(c)-[]->(d)
• clause_1      WHERE      WITH      UNWIND      OPTIONAL MATCH      MATCH
• output      AS
• clause_2      ORDER BY      LIMIT

      MATCH      MATCH
• MATCH      WHERE      id()      VID
•           MATCH (v) RETURN v LIMIT N      MATCH ()-[e]->() RETURN e LIMIT N
•      Tag      MATCH (v:player) RETURN v LIMIT N
•      Edge Type      MATCH ()-[e:follow]->() RETURN e LIMIT N

```

#### Note

- MATCH
- Tag Edge Type MATCH (v:player)-[e:follow]->() RETURN e LIMIT N



3.0.0 Tag Tag RETURN < >.< > RETURN < >.<Tag >.< >

```

#   Tag player      name      Edge type follow
nebula> CREATE TAG INDEX IF NOT EXISTS player_index_1 ON player(name(20));
nebula> CREATE EDGE INDEX IF NOT EXISTS follow_index on follow();

#
nebula> REBUILD TAG INDEX player_index_1;
+-----+
| New Job Id |
+-----+

```

```
| 121      |
+-----+
nebula> REBUILD EDGE INDEX follow_index;
+-----+
| New Job Id |
+-----+
| 122      |
+-----+
#
nebula> SHOW JOB 121;
+-----+-----+-----+-----+-----+
| Job Id(TaskId) | Command(Dest) | Status | Start Time | Stop Time | Error Code |
+-----+-----+-----+-----+-----+
121	"REBUILD_TAG_INDEX"	"FINISHED"	2021-05-27T02:18:02.000000	2021-05-27T02:18:02.000000	"SUCCEEDED"
0	"storaged1"	"FINISHED"	2021-05-27T02:18:02.000000	2021-05-27T02:18:02.000000	"SUCCEEDED"
1	"storaged0"	"FINISHED"	2021-05-27T02:18:02.000000	2021-05-27T02:18:02.000000	"SUCCEEDED"
2	"storaged2"	"FINISHED"	2021-05-27T02:18:02.000000	2021-05-27T02:18:02.000000	"SUCCEEDED"
"Total:3"	"Succeeded:3"	"Failed:0"	"In Progress:0"	""	""
+-----+-----+-----+-----+-----+					
nebula> SHOW JOB 122;					
+-----+-----+-----+-----+-----+					
Job Id(TaskId)	Command(Dest)	Status	Start Time	Stop Time	Error Code
+-----+-----+-----+-----+-----+					
122	"REBUILD_EDGE_INDEX"	"FINISHED"	2021-05-27T02:18:11.000000	2021-05-27T02:18:11.000000	"SUCCEEDED"
0	"storaged1"	"FINISHED"	2021-05-27T02:18:11.000000	2021-05-27T02:18:21.000000	"SUCCEEDED"
1	"storaged0"	"FINISHED"	2021-05-27T02:18:11.000000	2021-05-27T02:18:21.000000	"SUCCEEDED"
2	"storaged2"	"FINISHED"	2021-05-27T02:18:11.000000	2021-05-27T02:18:21.000000	"SUCCEEDED"
"Total:3"	"Succeeded:3"	"Failed:0"	"In Progress:0"	""	""
+-----+-----+-----+-----+-----+
```



NebulaGraph 3.0.0

MATCH (v) RETURN v LIMIT n ; LIMIT

MATCH (v) RETURN v

(v)

```
nebula> MATCH (v) \
    RETURN v \
    LIMIT 3;
+-----+
| v      |
+-----+
| ("player102" :player{age: 33, name: "LaMarcus Aldridge"}) |
| ("player106" :player{age: 25, name: "Kyle Anderson"})   |
| ("player115" :player{age: 40, name: "Kobe Bryant"})    |
+-----+
```

TAG



NebulaGraph 3.0.0

Tag Tag Tag

Tag MATCH NebulaGraph 3.0.0 Tag

LIMIT

:&lt;tag\_name&gt; Tag

```
nebula> MATCH (v:player) \
    RETURN v \
    LIMIT 3;
+-----+
| v      |
+-----+
| ("player102" :player{age: 33, name: "LaMarcus Aldridge"}) |
| ("player106" :player{age: 25, name: "Kyle Anderson"})   |
| ("player115" :player{age: 40, name: "Kobe Bryant"})    |
+-----+
...
```

Tag :

## Note

Tag

```
match (v1:player:team) where v1.player.name=="Tim Duncan" return v1 limit 10;
```

```
nebula> CREATE TAG actor (name string, age int);
nebula> INSERT VERTEX actor(name, age) VALUES "player100":("Tim Duncan", 42);
nebula> MATCH (v:player:actor) \
    RETURN v \
    LIMIT 10;
+-----+
| v |
+-----+
| {"player100" :actor{age: 42, name: "Tim Duncan"} :player{age: 42, name: "Tim Duncan"}) |
+-----+
```

Tag {<prop\_name>: <prop\_value>}

```
#      name
nebula> MATCH (v:player{name:"Tim Duncan"}) \
    RETURN v;
+-----+
| v |
+-----+
| {"player100" :player{age: 42, name: "Tim Duncan"}) |
+-----+
```

WHERE

```
nebula> MATCH (v:player) \
    WHERE v.player.name == "Tim Duncan" \
    RETURN v;
+-----+
| v |
+-----+
| {"player100" :player{age: 42, name: "Tim Duncan"}) |
+-----+
```

## ↑enCypher

openCypher 9 = nGQL == =

Tag

```
nebula> MATCH (v) \
    WITH v, properties(v) as props, keys(properties(v)) as kk \
    LIMIT 10000 WHERE [i in kk where props[i] == "Tim Duncan"] \
    RETURN v;
+-----+
| v |
+-----+
| {"player100" :player{age: 42, name: "Tim Duncan"}) |
+-----+
```

ID

ID id() ID

```
nebula> MATCH (v) \
    WHERE id(v) == 'player101' \
    RETURN v;
+-----+
| v |
+-----+
| {"player101" :player{age: 36, name: "Tony Parker"}) |
+-----+
```

ID WHERE id(v) IN [vid\_list]

```
nebula> MATCH (v:player { name: 'Tim Duncan' })--(v2) \
    WHERE id(v2) IN ["player101", "player102"] \
```

```
RETURN v2;
+-----+
| v2
+-----+
| ("player101" :player{age: 36, name: "Tony Parker"}) |
| ("player101" :player{age: 36, name: "Tony Parker"}) |
| ("player102" :player{age: 33, name: "LaMarcus Aldridge"}) |
+-----+
```



nGQL 1.x

nGQL 2.x

```
nebula> MATCH (v:player{name:"Tim Duncan"})--(v2:player) \
    RETURN v2.player.name AS Name;
+-----+
| Name
+-----+
| "Manu Ginobili"
| "Manu Ginobili"
| "Dejounte Murray"
...
```



```
# -->      v      v2      v      v2
nebula> MATCH (v:player{name:"Tim Duncan"})-->(v2:player) \
    RETURN v2.player.name AS Name;
+-----+
| Name
+-----+
| "Tony Parker"
| "Manu Ginobili"
...
```

## CASE

```
nebula> MATCH (v:player{name:"Tim Duncan"})--(v2) \
    RETURN \
    CASE WHEN v2.team.name IS NOT NULL \
    THEN v2.team.name \
    WHEN v2.player.name IS NOT NULL \
    THEN v2.player.name END AS Name;
+-----+
| Name
+-----+
| "Manu Ginobili"
| "Manu Ginobili"
| "Spurs"
| "Dejounte Murray"
...
```

```
nebula> MATCH (v:player{name:"Tim Duncan"})-->(v2)<--(v3) \
    RETURN v3.player.name AS Name;
+-----+
| Name
+-----+
| "Dejounte Murray"
| "LaMarcus Aldridge"
| "Marco Belinelli"
...
```

```
nebula> MATCH (v:player{name:"Tim Duncan"})-->()<--(v3) \
    RETURN v3.player.name AS Name;
+-----+
| Name
+-----+
| "Dejounte Murray"
| "LaMarcus Aldridge"
...
```

```
| "Marco Belinelli" |  
...
```

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-->(v2) \  
      RETURN p;  
+-----+  
| p |  
+-----+  
| <"player100" :player{age: 42, name: "Tim Duncan"}->("team204" :team{name: "Spurs"})> |  
| <"player100" :player{age: 42, name: "Tim Duncan"}->("player101" :player{age: 36, name: "Tony Parker"})> |  
| <"player100" :player{age: 42, name: "Tim Duncan"}->("player125" :player{age: 41, name: "Manu Ginobili"})> |  
+-----+
```



nGQL @ rank openCypher rank



NebulaGraph 3.0.0

MATCH

NebulaGraph 3.0.0

LIMIT

```
nebula> MATCH ()<-[e]-() \  
      RETURN e \  
      LIMIT 3;  
+-----+  
| e |  
+-----+  
| [:follow "player101"->"player102" @0 {degree: 90}] |  
| [:follow "player103"->"player102" @0 {degree: 70}] |  
| [:follow "player135"->"player102" @0 {degree: 80}] |  
+-----+
```

EDGE TYPE

:<edge\_type> Edge type -[e:follow]-



NebulaGraph 3.0.0 Edge Type

Edge type

Edge Type

MATCH

NebulaGraph 3.0.0

Edge

Type

LIMIT

```
nebula> MATCH ()-[e:follow]->() \  
      RETURN e \  
      limit 3;  
+-----+  
| e |  
+-----+  
| [:follow "player102"->"player100" @0 {degree: 75}] |  
| [:follow "player102"->"player101" @0 {degree: 75}] |  
| [:follow "player129"->"player116" @0 {degree: 90}] |  
+-----+
```

{<prop\_name>: <prop\_value>} Edge type [e:follow{likeness:95}]

```
nebula> MATCH (v:player{name:"Tim Duncan"})-[e:follow{degree:95}]->(v2) \  
      RETURN e;  
+-----+  
| e |  
+-----+  
| [:follow "player100"->"player101" @0 {degree: 95}] |  
| [:follow "player100"->"player125" @0 {degree: 95}] |  
+-----+
```

## Edge type

```
nebula> MATCH ()-[e]->() \
    WITH e, properties(e) as props, keys(properties(e)) as kk \
    LIMIT 10000 WHERE [i in kk where props[i] == 90] \
    RETURN e;
+-----+
| e |
+-----+
| [:follow "player125"->"player100" @0 {degree: 90}] |
| [:follow "player140"->"player114" @0 {degree: 90}] |
| [:follow "player133"->"player144" @0 {degree: 90}] |
| [:follow "player133"->"player114" @0 {degree: 90}] |
...
+-----+
```

## EDGE TYPE

|  |           |                   |           |   |           |                  |
|--|-----------|-------------------|-----------|---|-----------|------------------|
|  | Edge type | [e:follow :serve] | Edge type | : | Edge type | [e:follow serve] |
|--|-----------|-------------------|-----------|---|-----------|------------------|



Tag Edge type

```
MATCH (v)-[e:follow|serve]->(v2) where v.player.name=="Tim Duncan" RETURN e limit 10; (v) Tag
```

```
nebula> MATCH (v:player{name:"Tim Duncan"})-[e:follow|:serve]->(v2) \
    RETURN e;
+-----+
| e |
+-----+
| [:follow "player100"->"player101" @0 {degree: 95}] |
| [:follow "player100"->"player125" @0 {degree: 95}] |
| [:serve "player100"->"team204" @0 {end_year: 2016, start_year: 1997}] |
+-----+
```

```
nebula> MATCH (v:player{name:"Tim Duncan"})-[]->(v2)<-[:serve]->(v3) \
    RETURN v2, v3;
+-----+-----+
| v2 | v3 |
+-----+-----+
("team204" :team{name: "Spurs"})	("player104" :player{age: 32, name: "Marco Belinelli"})
("team204" :team{name: "Spurs"})	("player101" :player{age: 36, name: "Tony Parker"})
("team204" :team{name: "Spurs"})	("player102" :player{age: 33, name: "LaMarcus Aldridge"})
...
+-----+-----+
```

:&lt;edge\_type&gt;\*&lt;hop&gt; hop

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e:follow*2]->(v2) \
    RETURN DISTINCT v2 AS Friends;
+-----+
| Friends |
+-----+
| ("player100" :player{age: 42, name: "Tim Duncan"}) |
| ("player125" :player{age: 41, name: "Manu Ginobili"}) |
| ("player102" :player{age: 33, name: "LaMarcus Aldridge"}) |
+-----+
```

hop 0

```
nebula> MATCH (v:player{name:"Tim Duncan"}) -[*0]-> (v2) \
    RETURN v2;
+-----+
| v2 |
+-----+
| ("player100" :player{age: 42, name: "Tim Duncan"}) |
+-----+
```

## Note

```
-[e:follow*2]-> e .degree
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e:follow*2]->(v2) \
  WHERE e.degree > 1 \
  RETURN DISTINCT v2 AS Friends;
```

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e:follow*2]->(v2) \
  WHERE ALL(e_ in e WHERE e_.degree > 0) \
  RETURN DISTINCT v2 AS Friends;
```

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e:follow*2]->(v2) \
  WHERE e[0].degree > 98 \
  RETURN DISTINCT v2 AS Friends;
```

:<edge\_type>\*[minHop..maxHop]

## Caution

maxHop graph OOM

| minHop | minHop | 1 |
|--------|--------|---|
|--------|--------|---|

| maxHop | maxHop |
|--------|--------|
|--------|--------|

minHop maxHop :<edge\_type>\*

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e:follow*]->(v2) \
  RETURN v2 AS Friends;
+-----+
| Friends |
+-----+
| {"player125" :player{age: 41, name: "Manu Ginobili"}) |
| {"player101" :player{age: 36, name: "Tony Parker"}) |
...
```

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e:follow*1..3]->(v2) \
  RETURN v2 AS Friends;
+-----+
| Friends |
+-----+
| {"player101" :player{age: 36, name: "Tony Parker"}) |
| {"player125" :player{age: 41, name: "Manu Ginobili"}) |
| {"player100" :player{age: 42, name: "Tim Duncan"}) |
...
```

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e:follow*1..]->(v2) \
  RETURN v2 AS Friends;
+-----+
| Friends |
+-----+
| {"player125" :player{age: 41, name: "Manu Ginobili"}) |
| {"player101" :player{age: 36, name: "Tony Parker"}) |
| {"player100" :player{age: 42, name: "Tim Duncan"}) |
...
```

DISTINCT

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e:follow*1..3]->(v2:player) \
  RETURN DISTINCT v2 AS Friends, count(v2);
+-----+-----+
| Friends | count(v2) |
+-----+-----+
{"player102" :player{age: 33, name: "LaMarcus Aldridge"})	1
{"player100" :player{age: 42, name: "Tim Duncan"})	4
{"player101" :player{age: 36, name: "Tony Parker"})	3

```

```
| ("player125" :player{age: 41, name: "Manu Ginobili"}) | 3 |
```

| minHop | 0 | minHop | 0 | "Tim Duncan" | 5 |
|--------|---|--------|---|--------------|---|
|--------|---|--------|---|--------------|---|

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e:follow*0..3]->(v2:player) \
    RETURN DISTINCT v2 AS Friends, count(v2);
```

| Friends                                                   | count(v2) |
|-----------------------------------------------------------|-----------|
| ("player102" :player{age: 33, name: "LaMarcus Aldridge"}) | 1         |
| ("player100" :player{age: 42, name: "Tim Duncan"})        | 5         |
| ("player125" :player{age: 41, name: "Manu Ginobili"})     | 3         |
| ("player101" :player{age: 36, name: "Tony Parker"})       | 3         |

**EDGE TYPE**

| Edge type | hop | minHop | maxHop | Edge type |
|-----------|-----|--------|--------|-----------|
|-----------|-----|--------|--------|-----------|

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e:follow|serve*2]->(v2) \
    RETURN DISTINCT v2;
```

| v2                                                        |
|-----------------------------------------------------------|
| ("team204" :team{name: "Spurs"})                          |
| ("player100" :player{age: 42, name: "Tim Duncan"})        |
| ("team215" :team{name: "Hornets"})                        |
| ("player125" :player{age: 41, name: "Manu Ginobili"})     |
| ("player102" :player{age: 33, name: "LaMarcus Aldridge"}) |

```
nebula> CREATE TAG INDEX IF NOT EXISTS team_index ON team(name(20));
nebula> REBUILD TAG INDEX team_index;
nebula> MATCH (v1:player{name:"Tim Duncan"}), (v2:team{name:"Spurs"}) \
    RETURN v1,v2;
```

| v1                                                 | v2                               |
|----------------------------------------------------|----------------------------------|
| ("player100" :player{age: 42, name: "Tim Duncan"}) | ("team204" :team{name: "Spurs"}) |

**shortestPath**

```
nebula> MATCH p = shortestPath((a:player)-[e:follow*..2]-(b:player))\
    WHERE a.player.age > 45 AND b.player.age < 30 \
    RETURN p;
```

| p                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <"player144" :player{age: 47, name: "Shaquille O'Neal"}->[:follow@0 {degree: 80}]->("player100" :player{age: 42, name: "Tim Duncan"})<-[:follow@0 {degree: 99}]-("player113" :player{age: 29, name: "Dejounte Murray"})> |

**MATCH****MATCH**

```
nebula> MATCH (m)-[]->(n) WHERE id(m)=="player100" \
    MATCH (n)-[]->(l) WHERE id(n)=="player125" \
    RETURN id(m),id(n),id(l);
```

| id(m)       | id(n)       | id(l)       |
|-------------|-------------|-------------|
| "player100" | "player125" | "team204"   |
| "player100" | "player125" | "player100" |

## OPTIONAL MATCH

OPTIONAL MATCH



NebulaGraph 3.3.0 MATCH . GO , LOOKUP , | FETCH MATCH

---

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## 4.6.2 OPTIONAL MATCH



OPTIONAL MATCH Beta

|                |       |       |      |
|----------------|-------|-------|------|
| OPTIONAL MATCH | MATCH | MATCH | NULL |
|----------------|-------|-------|------|

### openCypher

nGQL openCypher

|       |                |
|-------|----------------|
| MATCH | OPTIONAL MATCH |
|-------|----------------|

```
nebula> MATCH (m)-[]->(n) WHERE id(m)=="player100" \
    OPTIONAL MATCH (n)-[]->(l) WHERE id(n)=="player125" \
    RETURN id(m),id(n),id(l);
+-----+-----+-----+
| id(m) | id(n) | id(l) |
+-----+-----+-----+
"player100"	"team204"	____NULL____
"player100"	"player101"	____NULL____
"player100"	"player125"	"team204"
"player100"	"player125"	"player100"
+-----+-----+-----+
```

|       |                |
|-------|----------------|
| MATCH | OPTIONAL MATCH |
|-------|----------------|

```
nebula> MATCH (m)-[]->(n) WHERE id(m)=="player100" \
    MATCH (n)-[]->(l) WHERE id(n)=="player125" \
    RETURN id(m),id(n),id(l);
+-----+-----+-----+
| id(m) | id(n) | id(l) |
+-----+-----+-----+
| "player100" | "player125" | "team204" |
| "player100" | "player125" | "player100" |
+-----+-----+-----+
```

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### 4.6.3 LOOKUP

- `LOOKUP`
- `LOOKUP`
- `WHERE`
- `Tag`      `Tag`      `ID`
- `Edge type`      `Edge type`      `rank`
- `Tag`      `Edge type`

#### OpenCypher

nGQL

- 
- `Explain`



2.5.0

`LOOKUP`

`LOOKUP`

```
LOOKUP ON {<vertex_tag> | <edge_type>}
[WHERE <expression> [AND <expression> ...]]
YIELD <return_list> [AS <alias>]
[<clause>];

<return_list>
  <prop_name> [AS <col_alias>] [, <prop_name> [AS <prop_alias>] ...];
```

- `WHERE <expression>`      `AND`    `OR`      `WHERE`
- `YIELD`      `YIELD`
- `AS`
- `clause`      `ORDER BY`      `LIMIT`

**WHERE**

LOOKUP WHERE

- \$- \$^
- tagName.prop1 > tagName.prop2
- AliasProp
- XOR
- STARTS WITH
- rank()
- .

Tag player name Tony Parker

```
nebula> CREATE TAG INDEX IF NOT EXISTS index_player ON player(name(30), age);

nebula> REBUILD TAG INDEX index_player;
+-----+
| New Job Id |
+-----+
| 15          |
+-----+

nebula> LOOKUP ON player \
    WHERE player.name == "Tony Parker" \
    YIELD id(vertex);
+-----+
| id(VERTEX)   |
+-----+
| "player101"  |
+-----+

nebula> LOOKUP ON player \
    WHERE player.name == "Tony Parker" \
    YIELD properties(vertex).name AS name, properties(vertex).age AS age;
+-----+-----+
| name      | age   |
+-----+-----+
| "Tony Parker" | 36   |
+-----+-----+

nebula> LOOKUP ON player \
    WHERE player.age > 45 \
    YIELD id(vertex);
+-----+
| id(VERTEX)   |
+-----+
| "player144"  |
| "player140"  |
+-----+

nebula> LOOKUP ON player \
    WHERE player.name STARTS WITH "B" \
    AND player.age IN [22,30] \
    YIELD properties(vertex).name, properties(vertex).age;
+-----+-----+
| properties(VERTEX).name | properties(VERTEX).age |
+-----+-----+
| "Ben Simmons"        | 22            |
| "Blake Griffin"      | 30            |
+-----+-----+

nebula> LOOKUP ON player \
    WHERE player.name == "Kobe Bryant" \
    YIELD id(vertex) AS VertexID, properties(vertex).name AS name | \
    GO FROM $-.VertexID OVER serve \
    YIELD $-.name, properties(edge).start_year, properties(edge).end_year, properties($$).name;
+-----+-----+-----+-----+
| $-.name      | properties(EDGE).start_year | properties(EDGE).end_year | properties($$).name |
+-----+-----+-----+-----+
| "Kobe Bryant" | 1996           | 2016           | "Lakers"          |
+-----+-----+-----+-----+
```

Edge type follow degree 90

```

nebula> CREATE EDGE INDEX IF NOT EXISTS index_follow ON follow(degree);

nebula> REBUILD EDGE INDEX index_follow;
+-----+
| New Job Id |
+-----+
| 62          |
+-----+

nebula> LOOKUP ON follow \
    WHERE follow.degree == 90 YIELD edge AS e;
+-----+
| e           |
+-----+
| [:follow "player109"->"player125" @ {degree: 90}] |
| [:follow "player118"->"player120" @ {degree: 90}] |
| [:follow "player118"->"player131" @ {degree: 90}] |
...
| ...

nebula> LOOKUP ON follow \
    WHERE follow.degree == 90 \
    YIELD properties(edge).degree;
+-----+
| properties(EDGE).degree |
+-----+
| 90                      |
| 90                      |
...
| ...

nebula> LOOKUP ON follow \
    YIELD properties(edge).degree as degree \
    | ORDER BY $-.degree \
    | LIMIT 10;
+-----+
| degree |
+-----+
| -1      |
| -1      |
| 9       |
| 10      |
| 13      |
| 50      |
| 55      |
| 60      |
| 70      |
| 70      |
+-----+


nebula> LOOKUP ON follow \
    WHERE follow.degree == 60 \
    YIELD dst(edge) AS DstVID, properties(edge).degree AS Degree \
    GO FROM $.DstVID OVER serve \
    YIELD $.DstVID, properties(edge).start_year, properties(edge).end_year, properties($$).name;
+-----+-----+-----+-----+
| $.DstVID | properties(EDGE).start_year | properties(EDGE).end_year | properties($$).name |
+-----+-----+-----+-----+
"player105"	2010	2018	"Spurs"
"player105"	2009	2010	"Cavaliers"
"player105"	2018	2019	"Raptors"
+-----+-----+-----+-----+

```

## Tag / Edge type

Tag                      Edge type              Tag    Edge type

Tag player name age

Tag player ID Tag player name age

- Tag player VID

```
nebula> CREATE TAG IF NOT EXISTS player(name string,age int);
nebula> CREATE TAG INDEX IF NOT EXISTS player_index on player();

nebula> REBUILD TAG INDEX player_index;
+-----+
| New Job Id |
+-----+
| 66          |
+-----+

nebula> INSERT VERTEX player(name,age) \
VALUES "player100":("Tim Duncan", 42), "player101":("Tony Parker", 36);

#      player      MATCH (n:player) RETURN id(n) /*, n */

nebula> LOOKUP ON player YIELD id(vertex);
+-----+
| id(VERTEX)   |
+-----+
| "player100"  |
| "player101"  |
| ...          |
+-----+

#      4
nebula> LOOKUP ON player YIELD id(vertex) | LIMIT 4;
+-----+
| id(VERTEX)   |
+-----+
| "player105"  |
| "player109"  |
| "player111"  |
| "player118"  |
+-----+
```

- Edge type follow

```
nebula> CREATE EDGE IF NOT EXISTS follow(degree int);
nebula> CREATE EDGE INDEX IF NOT EXISTS follow_index on follow();

nebula> REBUILD EDGE INDEX follow_index;
+-----+
| New Job Id |
+-----+
| 88          |
+-----+

nebula> INSERT EDGE follow(degree) \
VALUES "player100"->"player101":(95);

#      follow      MATCH (s)-[e:follow]->(d) RETURN id(s), rank(e), id(d) /*, type(e) */

nebula> LOOKUP ON follow YIELD edge AS e;
+-----+
| e           |
+-----+
| [:follow "player105"->"player100" @0 {degree: 70}] |
| [:follow "player105"->"player116" @0 {degree: 80}] |
| [:follow "player109"->"player100" @0 {degree: 80}] |
| ...          |
+-----+
```

Tag player Edge type follow

```
nebula> LOOKUP ON player YIELD id(vertex)|\
YIELD COUNT(*) AS Player_Number;
+-----+
| Player_Number |
+-----+
| 51           |
+-----+

nebula> LOOKUP ON follow YIELD edge AS e| \
YIELD COUNT(*) AS Follow_Number;
+-----+
| Follow_Number |
+-----+
| 81           |
+-----+
```

 Note[SHOW STATS](#)

---

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#### 4.6.4 GO

GO                  GO                  walk

##### openCypher

nGQL

```
GO [[<M> TO] <N> STEPS ] FROM <vertex_list>
OVER <edge_type_list> [{REVERSELY | BIDIRECT}]
[ WHERE <conditions> ]
YIELD [DISTINCT] <return_list>
[ { SAMPLE <sample_list> | <limit_by_list_clause> }]
[ | GROUP BY {<col_name> | expression} | <position> } YIELD <col_name>]
[ | ORDER BY <expression> [{ASC | DESC}]]
[ | LIMIT [<offset>,] <number_rows>];

<vertex_list> ::=
<vid> [, <vid> ...]

<edge_type_list> ::=
<edge_type> [, <edge_type> ...]
| *
```

- ```
<return_list> ::= 
  <col_name> [AS <col_alias>] [, <col_name> [AS <col_alias>] ...]
```
- <N> STEPS N 1 N 0 NebulaGraph
  - M TO N STEPS M-N M 0 M 1 GO 0 TO 2 GO 1 TO 2
  - <vertex\_list> ID \$-.id
  - <edge\_type\_list> Edge type
  - REVERSELY | BIDIRECT <vertex\_list> REVERSELY BIDIRECT <edge\_type>.\_type
  - WHERE <conditions> WHERE AND OR NOT XOR WHERE

 Note

- Edge type WHERE WHERE edge1.prop1 > edge2.prop2
- GO
- YIELD [DISTINCT] <return\_list> <return\_list> Schema src(edge) dst(edge) type(edge)
- SAMPLE <sample\_list> SAMPLE
- <limit\_by\_list\_clause> LIMIT
- GROUP BY GROUP BY YIELD
- ORDER BY ORDER BY

 Note

- LIMIT [<offset>,] <number\_rows> LIMIT

```
#     player102
nebula> GO FROM "player102" OVER serve YIELD dst(edge);
+-----+
| dst(EDGE) |
+-----+
| "team203" |
| "team204" |
+-----+
```

```
#     player102
nebula> GO 2 STEPS FROM "player102" OVER follow YIELD dst(edge);
+-----+
| dst(EDGE) |
+-----+
| "player101" |
| "player125" |
| "player100" |
| "player102" |
| "player125" |
+-----+
```

```
# 
nebula> GO FROM "player100", "player102" OVER serve \
      WHERE properties(edge).start_year > 1995 \
      YIELD DISTINCT properties($$).name AS team_name, properties(edge).start_year AS start_year, properties($^).name AS player_name;
```

```

| team_name      | start_year | player_name      |
+-----+-----+-----+
| "Spurs"       | 1997      | "Tim Duncan"    |
| "Trail Blazers" | 2006      | "LaMarcus Aldridge" |
| "Spurs"       | 2015      | "LaMarcus Aldridge" |
+-----+-----+-----+


#     Edge type      UNKNOWN_PROP
nebula> GO FROM "player100" OVER follow, serve \
          YIELD properties(edge).degree, properties(edge).start_year;
+-----+-----+
| properties(EDGE).degree | properties(EDGE).start_year |
+-----+-----+
| 95           | UNKNOWN_PROP        |
| 95           | UNKNOWN_PROP        |
| UNKNOWN_PROP  | 1997              |
+-----+-----+


#     player100
nebula> GO FROM "player100" OVER follow REVERSELY \
          YIELD src(edge) AS destination;
+-----+
| destination |
+-----+
| "player101" |
| "player102" |
...
#     MATCH      GO
nebula> MATCH (v)-[e:follow]->(v2) WHERE id(v) == 'player100' \
          RETURN id(v2) AS destination;
+-----+
| destination |
+-----+
| "player101" |
| "player102" |
...
...


#     player100
nebula> GO FROM "player100" OVER follow REVERSELY \
          YIELD src(edge) AS id | \
          GO FROM $-.id OVER serve \
          WHERE properties($^).age > 20 \
          YIELD properties($^).name AS FriendOf, properties($$).name AS Team;
+-----+-----+
| FriendOf   | Team      |
+-----+-----+
| "Boris Diaw" | "Spurs"   |
| "Boris Diaw" | "Jazz"    |
| "Boris Diaw" | "Suns"    |
...
#     MATCH      GO
nebula> MATCH (v)-[e:follow]->(v2)-[e2:serve]->(v3) \
          WHERE id(v) == 'player100' \
          RETURN v2.player.name AS FriendOf, v3.team.name AS Team;
+-----+-----+
| FriendOf   | Team      |
+-----+-----+
| "Boris Diaw" | "Spurs"   |
| "Boris Diaw" | "Jazz"    |
| "Boris Diaw" | "Suns"    |
...
...


#     player100 1~2
nebula> GO 1 TO 2 STEPS FROM "player100" OVER follow \
          YIELD dst(edge) AS destination;
+-----+
| destination |
+-----+
| "player101" |
| "player125" |
...
#     MATCH      GO
nebula> MATCH (v) -[e:follow*1..2]->(v2) \
          WHERE id(v) == "player100" \
          RETURN id(v2) AS destination;
+-----+
| destination |
+-----+
| "player100" |
| "player102" |
...
...


#
nebula> GO 2 STEPS FROM "player100" OVER follow \
          YIELD src(edge) AS src, dst(edge) AS dst, properties($$).age AS age \
          | GROUP BY $-.dst \
          YIELD $-.dst AS dst, collect_set($-.src) AS src, collect($-.age) AS age;

```

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## 4.6.5 FETCH

**FETCH**

**openCypher**

nGQL

```
FETCH PROP ON {<tag_name>[, tag_name ...] | *}
<vid> [, vid ...]
YIELD <return_list> [AS <alias>];
```

tag_name	Tag
*	Tag
vid	ID
YIELD	YIELD
AS	

**TAG**

FETCH Tag

```
nebula> FETCH PROP ON player "player100" YIELD properties(vertex);
+-----+
| properties(VERTEX) |
+-----+
| {age: 42, name: "Tim Duncan"} |
+-----+
```

**YIELD**

```
nebula> FETCH PROP ON player "player100" \
          YIELD properties(vertex).name AS name;
+-----+
| name      |
+-----+
| "Tim Duncan" |
+-----+
```

**ID**

,

```
nebula> FETCH PROP ON player "player101", "player102", "player103" YIELD properties(vertex);
+-----+
| properties(VERTEX) |
+-----+
| {age: 33, name: "LaMarcus Aldridge"} |
| {age: 36, name: "Tony Parker"} |
| {age: 32, name: "Rudy Gay"} |
+-----+
```

**TAG**

FETCH Tag Tag ,

```
#   Tag t1
nebula> CREATE TAG IF NOT EXISTS t1(a string, b int);
```

```
#    player100  Tag t1
nebula> INSERT VERTEX t1(a, b) VALUES "player100":("Hello", 100);

#    Tag player  t1    player100
nebula> FETCH PROP ON player, t1 "player100" YIELD vertex AS v;
+-----+
| v
+-----+
| {"player100" :player{age: 42, name: "Tim Duncan"} :t1{a: "Hello", b: 100}} |
+-----+
```

## FETCH Tag

```
nebula> FETCH PROP ON player, t1 "player100", "player103" YIELD vertex AS v;
+-----+
| v
+-----+
| {"player100" :player{age: 42, name: "Tim Duncan"} :t1{a: "Hello", b: 100}} |
| {"player103" :player{age: 32, name: "Rudy Gay"}) |
+-----+
```

## FETCH \*

```
nebula> FETCH PROP ON * "player100", "player106", "team200" YIELD vertex AS v;
+-----+
| v
+-----+
| {"player100" :player{age: 42, name: "Tim Duncan"} :t1{a: "Hello", b: 100}} |
| {"player106" :player{age: 25, name: "Kyle Anderson"} |
| {"team200" :team{name: "Warriors"}) |
+-----+
```

```
FETCH PROP ON <edge_type> <src_vid> -> <dst_vid>[@<rank>] [, <src_vid> -> <dst_vid> ...]
YIELD <output>;
```

edge_type	Edge type
src_vid	ID
dst_vid	ID
rank	rank
	0
	Edge type
	rank
YIELD	YIELD

```
#    player100  team204  serve
nebula> FETCH PROP ON serve "player100" -> "team204" YIELD properties(edge);
+-----+
| properties(EDGE)           |
+-----+
| {end_year: 2016, start_year: 1997} |
+-----+
```

## YIELD

```
nebula> FETCH PROP ON serve "player100" -> "team204" \
      YIELD properties(edge).start_year;
+-----+
| properties(EDGE).start_year |
+-----+
| 1997                         |
+-----+
```

```
(<src_vid> -> <dst_vid>[@<rank>]) ,
```

```
nebula> FETCH PROP ON serve "player100" -> "team204", "player133" -> "team202" YIELD edge AS e;
+-----+
| e
+-----+
| [:serve "player100"->"team204" @0 {end_year: 2016, start_year: 1997}] |
| [:serve "player133"->"team202" @0 {end_year: 2011, start_year: 2002}] |
+-----+
```

**RANK**

Edge type	rank
-----------	------

```
#      rank
nebula> insert edge serve(start_year,end_year) \
values "player100"->"team204"@1:(1998, 2017);

nebula> insert edge serve(start_year,end_year) \
values "player100"->"team204"@2:(1990, 2018);

#      rank 0      FETCH      rank
#      rank 0      FETCH      rank
nebula> FETCH PROP ON serve "player100" -> "team204" YIELD edge AS e;
+-----+
| e
+-----+
| [:serve "player100"->"team204" @0 {end_year: 2016, start_year: 1997}] |
+-----+
```

# rank 0 FETCH rank
nebula> FETCH PROP ON serve "player100" -> "team204"@1 YIELD edge AS e;
+-----+
| e
+-----+
| [:serve "player100"->"team204" @1 {end\_year: 2017, start\_year: 1998}] |
+-----+

**FETCH**

FETCH	nGQL	GO
-------	------	----

```
#      player101      follow      degree
nebula> GO FROM "player101" OVER follow \
YIELD src(edge) AS s, dst(edge) AS d \
| FETCH PROP ON follow $-.s -> $-.d \
YIELD properties(edge).degree;
+-----+
| properties(EDGE).degree |
+-----+
| 95
| 90
| 95
+-----+
```

```
nebula> $var = GO FROM "player101" OVER follow \
YIELD src(edge) AS s, dst(edge) AS d; \
FETCH PROP ON follow $var.s -> $var.d \
YIELD properties(edge).degree;
+-----+
| properties(EDGE).degree |
+-----+
| 95
| 90
| 95
+-----+
```

---

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## 4.6.6 SHOW

### SHOW CHARSET

```
SHOW CHARSET
```

```
utf8  utf8mb4      utf8  NebulaGraph  uft8      utf8  utf8mb4
```

```
SHOW CHARSET;
```

```
nebula> SHOW CHARSET;
+-----+-----+-----+
| Charset | Description      | Default collation | Maxlen |
+-----+-----+-----+
| "utf8"  | "UTF-8 Unicode"  | "utf8_bin"        | 4       |
+-----+-----+-----+
```

Charset

Description

Default collation

Maxlen

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**SHOW COLLATION**

SHOW COLLATION

```
    utf8_bin  utf8mb4_bin
•      utf8      utf8_bin
•      utf8mb4   utf8mb4_bin
```

SHOW COLLATION;

```
nebula> SHOW COLLATION;
+-----+-----+
| Collation | Charset |
+-----+-----+
| "utf8_bin" | "utf8"  |
+-----+-----+
```

---

Collation

---

Charset

---

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**SHOW CREATE SPACE**

SHOW CREATE SPACE

**CREATE SPACE**

SHOW CREATE SPACE &lt;space\_name&gt;;

```
nebula> SHOW CREATE SPACE basketballplayer;
+-----+
+-----+
| Space          | Create
Space           |
+-----+
+-----+
| "basketballplayer" | "CREATE SPACE `basketballplayer` (partition_num = 10, replica_factor = 1, charset = utf8, collate = utf8_bin, vid_type =
FIXED_STRING(32), atomic_edge = false)" |
+-----+
+-----+
```

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**SHOW CREATE TAG/EDGE**

SHOW CREATE TAG	Tag	Tag	CREATE TAG
SHOW CREATE EDGE	Edge type	Edge type	CREATE EDGE

```
SHOW CREATE {TAG <tag_name> | EDGE <edge_name>};
```

```
nebula> SHOW CREATE TAG player;
+-----+-----+
| Tag   | Create Tag
+-----+-----+
| "player" | "CREATE TAG `player` (
|           |   `name` string NULL,
|           |   `age` int64 NULL
|           | ) ttl_duration = 0, ttl_col = """
+-----+-----+

nebula> SHOW CREATE EDGE follow;
+-----+-----+
| Edge  | Create Edge
+-----+-----+
| "follow" | "CREATE EDGE `follow` (
|           |   `degree` int64 NULL
|           | ) ttl_duration = 0, ttl_col = """
+-----+-----+
```

---

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## SHOW HOSTS

SHOW HOSTS leader Graph Storage Meta

## Note

NebulaGraph

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## SHOW INDEX STATUS

```
SHOW INDEX STATUS
```

```
SHOW {TAG | EDGE} INDEX STATUS;
```

```
nebula> SHOW TAG INDEX STATUS;
+-----+-----+
| Name      | Index Status |
+-----+-----+
| "date1_index"    | "FINISHED"   |
| "basketballplayer_all_tag_indexes" | "FINISHED"   |
| "any_shape_geo_index"  | "FINISHED"   |
+-----+-----+

nebula> SHOW EDGE INDEX STATUS;
+-----+-----+
| Name      | Index Status |
+-----+-----+
| "follow_index" | "FINISHED"   |
+-----+-----+
```

- REBUILD NATIVE INDEX

---

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**SHOW INDEXES**

SHOW INDEXES Tag Edge type

SHOW {TAG | EDGE} INDEXES;

```
nebula> SHOW TAG INDEXES;
+-----+-----+-----+
| Index Name | By Tag | Columns |
+-----+-----+-----+
| "player_index_0" | "player" | []      |
| "player_index_1" | "player" | ["name"] |
+-----+-----+-----+

nebula> SHOW EDGE INDEXES;
+-----+-----+-----+
| Index Name | By Edge | Columns |
+-----+-----+-----+
| "follow_index" | "follow" | []      |
+-----+-----+-----+
```



NebulaGraph 2.0.1 SHOW TAG/EDGE INDEXES Names

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**SHOW PARTS**

SHOW PARTS

SHOW PARTS [&lt;part\_id&gt;];

```
nebula> SHOW PARTS;
+-----+-----+-----+
| Partition ID | Leader | Peers | Losts |
+-----+-----+-----+
| 1 | "192.168.2.1:9779" | "192.168.2.1:9779" | "" |
| 2 | "192.168.2.2:9779" | "192.168.2.2:9779" | "" |
| 3 | "192.168.2.3:9779" | "192.168.2.3:9779" | "" |
| 4 | "192.168.2.1:9779" | "192.168.2.1:9779" | "" |
| 5 | "192.168.2.2:9779" | "192.168.2.2:9779" | "" |
| 6 | "192.168.2.3:9779" | "192.168.2.3:9779" | "" |
| 7 | "192.168.2.1:9779" | "192.168.2.1:9779" | "" |
| 8 | "192.168.2.2:9779" | "192.168.2.2:9779" | "" |
| 9 | "192.168.2.3:9779" | "192.168.2.3:9779" | "" |
| 10 | "192.168.2.1:9779" | "192.168.2.1:9779" | "" |
+-----+-----+-----+
```

```
nebula> SHOW PARTS 1;
+-----+-----+-----+
| Partition ID | Leader | Peers | Losts |
+-----+-----+-----+
| 1 | "192.168.2.1:9779" | "192.168.2.1:9779" | "" |
+-----+-----+-----+
```

Partition ID		ID		
Leader	Raft leader	IP		
Peers	leader	follower	IP	
Losts			IP	

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**SHOW ROLES**

SHOW ROLES

- GOD ADMIN GOD
- DBA USER GUEST
- 

SHOW ROLES IN &lt;space\_name&gt;;

```
nebula> SHOW ROLES in basketballplayer;
+-----+-----+
| Account | Role Type |
+-----+-----+
| "user1" | "ADMIN"   |
+-----+-----+
```

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**SHOW SNAPSHOTS**

SHOW SNAPSHOTS

GOD root SHOW SNAPSHOTS

SHOW SNAPSHOTS;

```
nebula> SHOW SNAPSHOTS;
+-----+-----+-----+
| Name      | Status | Hosts
+-----+-----+-----+
| "SNAPSHOT_2020_12_16_11_13_55" | "VALID" | "storaged0:9779, storaged1:9779, storaged2:9779" |
| "SNAPSHOT_2020_12_16_11_14_10" | "VALID" | "storaged0:9779, storaged1:9779, storaged2:9779" |
+-----+-----+-----+
```

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**SHOW SPACES**

SHOW SPACES

CREATE SPACE

SHOW SPACES;

```
nebula> SHOW SPACES;
+-----+
| Name      |
+-----+
| "docs"    |
| "basketballplayer" |
+-----+
```

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**SHOW STATS**

[SHOW STATS](#)      [SUBMIT JOB STATS](#)

- 
- 
- Tag
- Edge type



[SHOW STATS](#)      [SUBMIT JOB STATS](#)      [TTL](#)      [Compaction](#)

[SUBMIT JOB STATS](#)

[SUBMIT JOB STATS](#)



[SHOW STATS](#)      [SUBMIT JOB STATS](#)      [SUBMIT JOB STATS](#)

SHOW STATS;

```
#  
nebula> USE basketballplayer;  
  
#     SUBMIT JOB STATS  
nebula> SUBMIT JOB STATS;  
+-----+  
| New Job Id |  
+-----+  
| 98          |  
+-----+  
  
#  
nebula> SHOW JOB 98;  
+-----+-----+-----+-----+-----+-----+  
| Job Id( taskId ) | Command(Dest) | Status      | Start Time           | Stop Time            | Error Code |  
+-----+-----+-----+-----+-----+-----+  
| 98          | "STATS"    | "FINISHED"  | 2021-11-01T09:33:21.000000 | 2021-11-01T09:33:21.000000 | "SUCCEEDED" |  
| 0          | "storaged2" | "FINISHED"  | 2021-11-01T09:33:21.000000 | 2021-11-01T09:33:21.000000 | "SUCCEEDED" |  
| 1          | "storaged0" | "FINISHED"  | 2021-11-01T09:33:21.000000 | 2021-11-01T09:33:21.000000 | "SUCCEEDED" |  
| 2          | "storaged1" | "FINISHED"  | 2021-11-01T09:33:21.000000 | 2021-11-01T09:33:21.000000 | "SUCCEEDED" |  
| "Total:3"   | "Succeeded:3" | "Failed:0"  | "In Progress:0"        | ""                  | ""          |  
+-----+-----+-----+-----+-----+-----+  
  
#  
nebula> SHOW STATS;  
+-----+-----+-----+  
| Type      | Name      | Count |  
+-----+-----+-----+  
| "Tag"     | "player"  | 51   |  
| "Tag"     | "team"    | 30   |  
| "Edge"    | "follow"  | 81   |  
| "Edge"    | "serve"   | 152  |  
| "Space"   | "vertices" | 81   |  
| "Space"   | "edges"   | 233  |  
+-----+-----+-----+
```

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**SHOW TAGS/EDGES**

SHOW TAGS	Tag
SHOW EDGES	Edge type

```
SHOW {TAGS | EDGES};
```

```
nebula> SHOW TAGS;
+-----+
| Name   |
+-----+
| "player" |
| "star"   |
| "team"   |
+-----+

nebula> SHOW EDGES;
+-----+
| Name   |
+-----+
| "follow" |
| "serve"  |
+-----+
```

---

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**SHOW USERS**

SHOW USERS

GOD root SHOW USERS

SHOW USERS;

```
nebula> SHOW USERS;
+-----+-----+
| Account | IP Whitelist |
+-----+-----+
| "root" | ""           |
| "user1" | ""           |
| "user2" | "192.168.10.10" |
+-----+-----+
```

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**SHOW SESSIONS**

NebulaGraph

- `exit` API release `nebula-graphd.conf` `session_idle_timeout_secs`  
(TODO: coding)
- `SHOW SESSIONS` Graph
- `SHOW LOCAL SESSIONS` Graph Graph
- `SHOW SESSION <Session_Id>` Session ID

```
SHOW [LOCAL] SESSIONS;
SHOW SESSION <Session_Id>;
```

```
nebula> SHOW SESSIONS;
+-----+-----+-----+-----+-----+-----+
| SessionId | UserName | SpaceName | CreateTime | UpdateTime | GraphAddr | Timezone |
| ClientIp  |           |           |           |           |           |           |
+-----+-----+-----+-----+-----+-----+
| 1651220858102296 | "root" | "basketballplayer" | 2022-04-29T08:27:38.102296 | 2022-04-29T08:50:46.282921 | "127.0.0.1:9669" | 0 | "::ffff:
127.0.0.1" |
| 165119930300991 | "root" | "basketballplayer" | 2022-04-29T02:28:50.300991 | 2022-04-29T08:16:28.339038 | "127.0.0.1:9669" | 0 | "::ffff:
127.0.0.1" |
| 1651112899847744 | "root" | "basketballplayer" | 2022-04-28T02:28:19.847744 | 2022-04-28T08:17:44.470210 | "127.0.0.1:9669" | 0 | "::ffff:
127.0.0.1" |
| 1651041092662100 | "root" | "basketballplayer" | 2022-04-27T06:31:32.662100 | 2022-04-27T07:01:25.200978 | "127.0.0.1:9669" | 0 | "::ffff:
127.0.0.1" |
| 1650959429593975 | "root" | "basketballplayer" | 2022-04-26T07:50:29.593975 | 2022-04-26T07:51:47.184810 | "127.0.0.1:9669" | 0 | "::ffff:
127.0.0.1" |
| 1650958897679595 | "root" | "" | 2022-04-26T07:41:37.679595 | 2022-04-26T07:41:37.683802 | "127.0.0.1:9669" | 0 | "::ffff:
127.0.0.1" |
+-----+-----+-----+-----+-----+-----+
nebula> SHOW SESSION 1635254859271703;
+-----+-----+-----+-----+-----+
| SessionId | UserName | SpaceName | CreateTime | UpdateTime | GraphAddr | Timezone |
| ClientIp  |           |           |           |           |           |           |
+-----+-----+-----+-----+-----+
| 1651220858102296 | "root" | "basketballplayer" | 2022-04-29T08:27:38.102296 | 2022-04-29T08:50:54.254384 | "127.0.0.1:9669" | 0 | "::ffff:
127.0.0.1" |
+-----+-----+-----+-----+-----+
```

SessionId	ID
UserName	
SpaceName	" "
CreateTime	timezone_name
UpdateTime	timezone_name
GraphAddr	Graph
Timezone	
ClientIp	IP

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## SHOW QUERIES

SHOW QUERIES

## Session



- SHOW LOCAL QUERIES Session
  - SHOW QUERIES Meta Session session\_reclaim\_interval\_secs Meta

SHOW [LOCAL] QUERIES;

SessionID	ID
ExecutionPlanID	ID
User	
Host	
StartTime	
DurationInUSec	
Status	
Query	

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**SHOW META LEADER**

```
SHOW META LEADER      Meta    leader  
Meta      Meta
```

```
SHOW META LEADER;
```

```
nebula> SHOW META LEADER;  
+-----+-----+  
| Meta Leader | secs from last heart beat |  
+-----+-----+  
| "127.0.0.1:9559" | 3 |  
+-----+-----+
```

Meta Leader	Meta	leader	leader	IP
secs from last heart beat				

---

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## 4.7

---

### 4.7.1 GROUP BY

GROUP BY

**openCypher**

nGQL

openCypher    count()

```
nebula> MATCH (v:player)<-[:follow]-(:player) RETURN v.player.name AS Name, count(*) as cnt ORDER BY cnt DESC;
+-----+-----+
| Name | cnt |
+-----+-----+
| "Tim Duncan" | 10 |
| "LeBron James" | 6 |
| "Tony Parker" | 5 |
| "Chris Paul" | 4 |
| "Manu Ginobili" | 4 |
+-----+-----+
...
```

GROUP BY

GROUP BY | YIELD

```
| GROUP BY <var> YIELD <var>, <aggregation_function(var)>
```

aggregation\_function()    avg() sum() max() min() count() collect() std()

```
#      player100
nebula> GO FROM "player100" OVER follow BIDIRECT \
    YIELD properties($$).name as Name \
    | GROUP BY $-.Name \
    YIELD $-.Name as Player, count(*) AS Name_Count;
+-----+-----+
| Player | Name_Count |
+-----+-----+
| "Shaquille O'Neal" | 1 |
| "Tiago Splitter" | 1 |
| "Manu Ginobili" | 2 |
| "Boris Diaw" | 1 |
| "LaMarcus Aldridge" | 1 |
| "Tony Parker" | 2 |
| "Marco Belinelli" | 1 |
| "Dejounte Murray" | 1 |
| "Danny Green" | 1 |
| "Aron Baynes" | 1 |
+-----+-----+
```

```
#      degree
nebula> GO FROM "player100" OVER follow \
    YIELD src(edge) AS player, properties(edge).degree AS degree \
    | GROUP BY $-.player \
    YIELD sum($-.degree);
+-----+
| sum($-.degree) |
+-----+
| 190 |
+-----+
```

sum()

nGQL      GROUP BY      GROUP BY      openCypher      GROUP BY      GROUP BY      nGQL  
 GROUP BY      openCypher      GROUP BY      nGQL      openCypher      GROUP BY      GROUP BY      how-to-  
**make-group-by-in-a-cypher-query**

34

```
nebula> LOOKUP ON player WHERE player.age > 34 YIELD id(vertex) AS v | \
GO FROM $-v OVER serve YIELD serve.start_year AS start_year, serve.end_year AS end_year | \
YIELD $-.start_year, $-.end_year, count(*) AS count | \
ORDER BY $-.count DESC | LIMIT 5;
+-----+-----+-----+
| $-.start_year | $-.end_year | count |
+-----+-----+-----+
| 2018         | 2019         | 3      |
| 1998         | 2004         | 2      |
| 2012         | 2013         | 2      |
| 2007         | 2012         | 2      |
| 2010         | 2011         | 2      |
+-----+-----+-----+
```

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## 4.7.2 LIMIT

LIMIT                    LIMIT        nGQL        openCypher

- nGQL                    LIMIT                    LIMIT
- openCypher              LIMIT                    SKIP



nGQL    openCypher        LIMIT        ORDER BY

nGQL        LIMIT

nGQL    LIMIT        GO

NGQL        LIMIT

nGQL        LIMIT        SQL        LIMIT        LIMIT

```
... | LIMIT [<offset>,] <number_rows>;
```

offset	0	0
--------	---	---

number_rows
-------------

```
#              3
nebula> LOOKUP ON player YIELD id(vertex)|\
          LIMIT 3;
+-----+
| id(VERTEX)  |
+-----+
| "player100"  |
| "player101"  |
| "player102"  |
+-----+
#              2      3
nebula> GO FROM "player100" OVER follow REVERSELY \
          YIELD properties($$).name AS Friend, properties($$).age AS Age \
          | ORDER BY $-.Age, $-.Friend \
          | LIMIT 1, 3;
+-----+
| Friend      | Age |
+-----+-----+
| "Danny Green"  | 31  |
| "Aron Baynes"  | 32  |
| "Marco Belinelli"  | 32  |
+-----+-----+
```

GO        LIMIT

GO        LIMIT        nGQL

```
<go_statement> LIMIT <limit_list>;
```

limit\_list

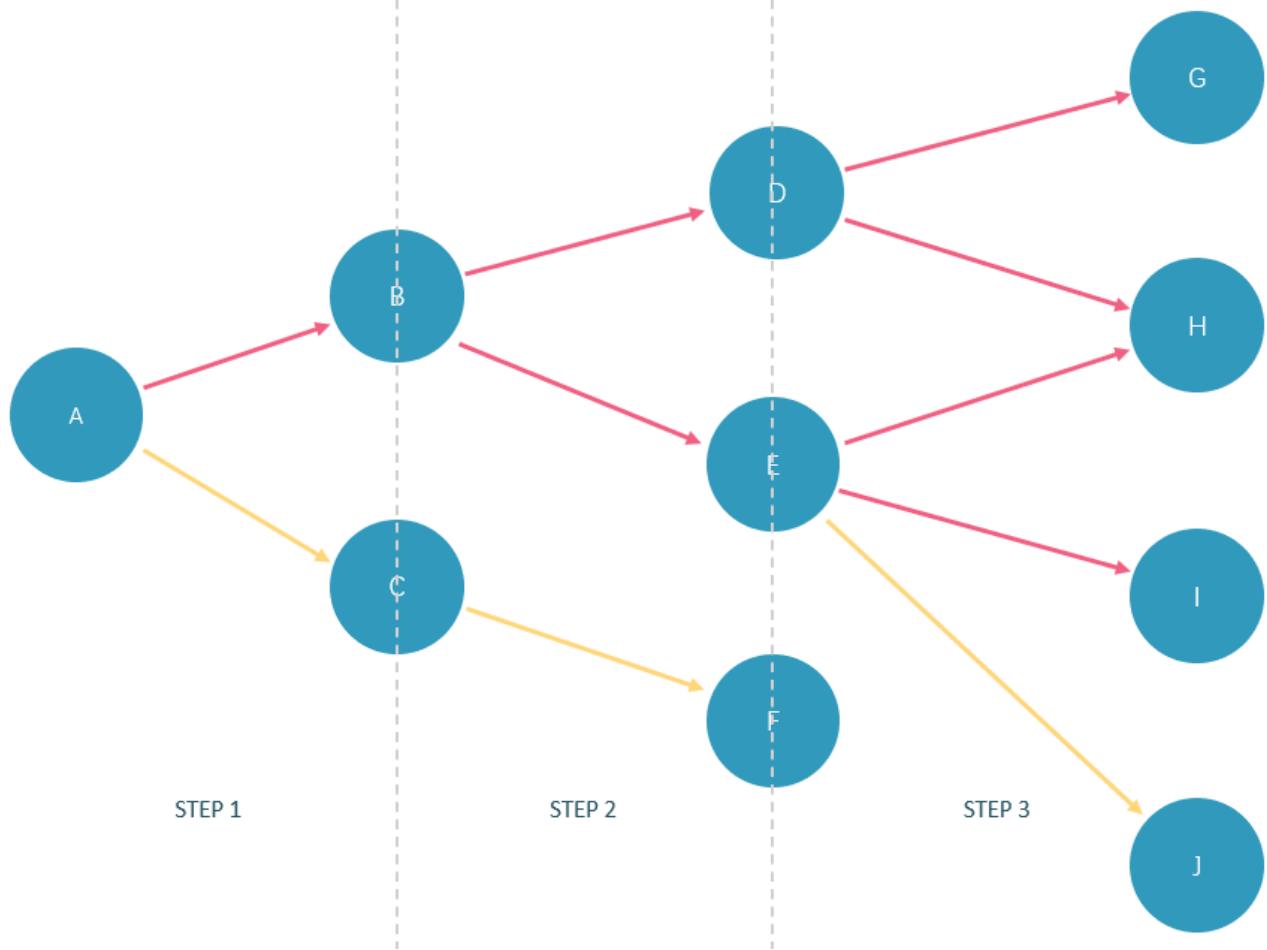
GO STEPS

GO 1 TO 3 STEPS FROM "A" OVER \* LIMIT &lt;limit\_list&gt;

LIMIT

- limit\_list 3 GO 1 TO 3 STEPS FROM "A" OVER \* LIMIT [1,2,4]
- LIMIT [1,2,4] 1 1 2 2 4 4
- GO 1 TO 3 STEPS GO

STEPS



basketballplayer

```
nebula> GO 3 STEPS FROM "player100" \
OVER * \
YIELD properties($$).name AS NAME, properties($$).age AS Age \
LIMIT [3,3,3];
+-----+-----+
| NAME | Age |
+-----+-----+
| "Spurs" | UNKNOWN_PROP |
| "Tony Parker" | 36 |
| "Manu Ginobili" | 41 |
+-----+-----+

nebula> GO 3 STEPS FROM "player102" OVER * BIDIRECT \
YIELD dst(edge) \
LIMIT [rand32(5),rand32(5),rand32(5)];
+-----+
| dst(EDGE) |
+-----+
| "player100" |
| "player100" |
+-----+
```

**openCypher**      **LIMIT**

```
MATCH openCypher      LIMIT
```

```
... [SKIP <offset>] [LIMIT <number_rows>];
```

offset	0	0
--------	---	---

number_rows
-------------

offset number\_rows



8/6      1

**LIMIT**

**LIMIT**

```
nebula> MATCH (v:player) RETURN v.player.name AS Name, v.player.age AS Age \
    ORDER BY Age LIMIT 5;
+-----+-----+
| Name | Age |
+-----+-----+
| "Luka Doncic" | 20 |
| "Ben Simmons" | 22 |
| "Kristaps Porzingis" | 23 |
| "Giannis Antetokounmpo" | 24 |
| "Kyle Anderson" | 25 |
+-----+-----+
```

**SKIP**

**SKIP**

```
nebula> MATCH (:player{name:"Tim Duncan"}) --> (v2) \
    RETURN v2.player.name AS Name, v2.player.age AS Age \
    ORDER BY Age DESC SKIP 1;
+-----+-----+
| Name | Age |
+-----+-----+
| "Manu Ginobili" | 41 |
| "Tony Parker" | 36 |
+-----+-----+
```

```
nebula> MATCH (:player{name:"Tim Duncan"}) --> (v2) \
    RETURN v2.player.name AS Name, v2.player.age AS Age \
    ORDER BY Age DESC SKIP 1+1;
+-----+-----+
| Name | Age |
+-----+-----+
| "Tony Parker" | 36 |
+-----+-----+
```

**SKIP LIMIT**

**SKIP LIMIT**

```
nebula> MATCH (:player{name:"Tim Duncan"}) --> (v2) \
    RETURN v2.player.name AS Name, v2.player.age AS Age \
    ORDER BY Age DESC SKIP 1 LIMIT 1;
+-----+-----+
| Name | Age |
+-----+-----+
| "Manu Ginobili" | 41 |
+-----+-----+
```

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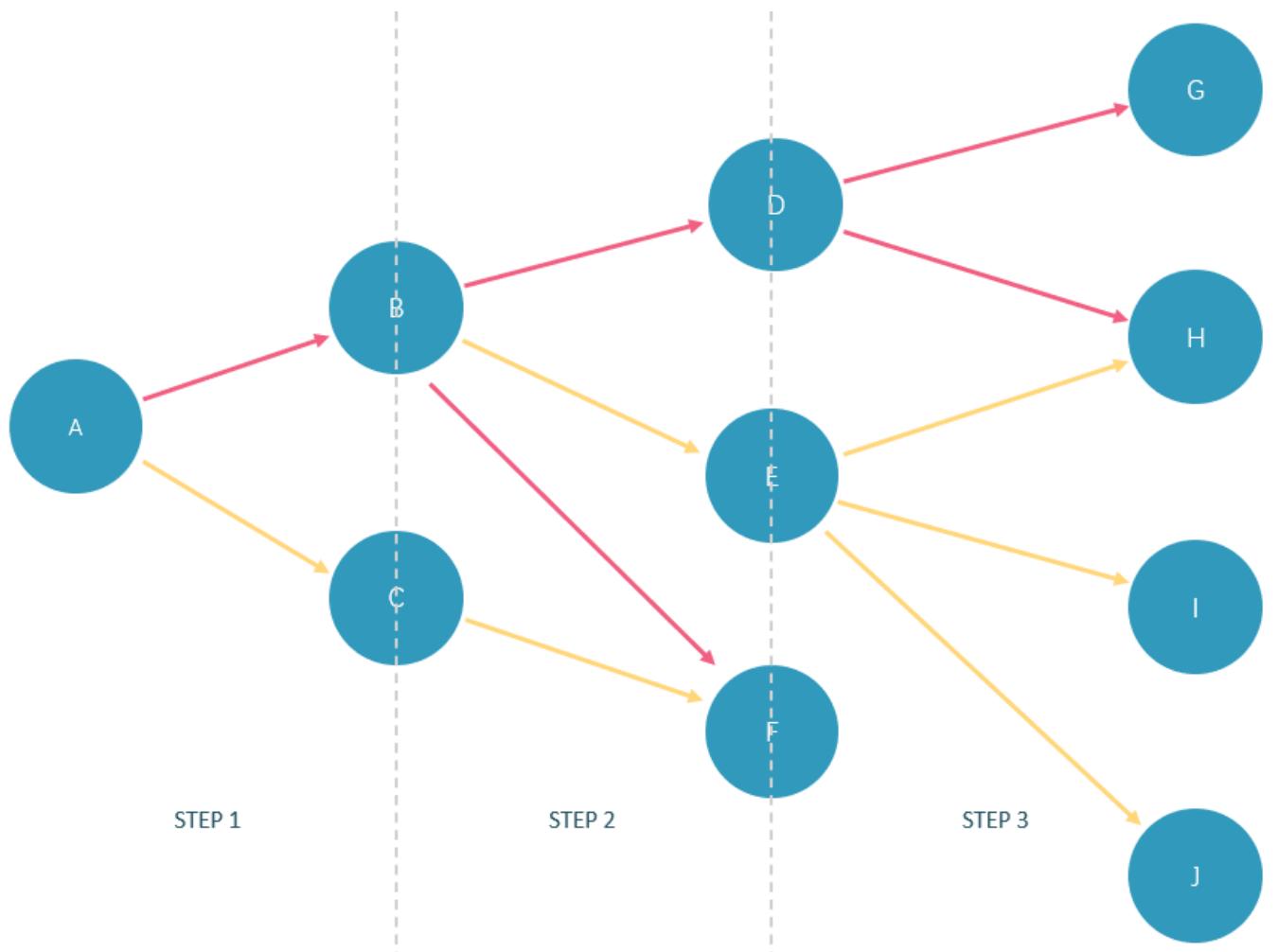
### 4.7.3 SAMPLE

SAMPLE

SAMPLE GO

```
<go_statement> SAMPLE <sample_list>;
```

sample_list	GO	STEPS	GO 1 TO 3 STEPS FROM "A" OVER * SAMPLE <sample_list>	SAMPLE
• sample_list 3			GO 1 TO 3 STEPS FROM "A" OVER * SAMPLE [1,2,4]	
• SAMPLE [1,2,4] 1	1	2	2	4
• GO 1 TO 3 STEPS			GO	GO
STEPS				GO 1 TO 3 STEPS GO 3



basketballplayer

```
nebula> GO 3 STEPS FROM "player100" \
OVER * \
YIELD properties($$).name AS NAME, properties($$).age AS Age \
SAMPLE [1,2,3];
+-----+
| NAME      | Age      |
+-----+-----+
| "Spurs"   | UNKNOWN_PROP |
| "Tony Parker" | 36    |
| "Manu Ginobili" | 41    |
+-----+
```

```
nebula> GO 1 TO 3 STEPS FROM "player100" \
OVER * \
YIELD properties($$).name AS NAME, properties($$).age AS Age \
SAMPLE [2,2,2];
+-----+-----+
| NAME | Age |
+-----+-----+
| "Manu Ginobili" | 41 |
| "Tony Parker" | 36 |
| "Tim Duncan" | 42 |
| "LaMarcus Aldridge" | 33 |
| "Tony Parker" | 36 |
| "Tim Duncan" | 42 |
+-----+-----+
```

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## 4.7.4 ORDER BY

### ORDER BY

- nGQL      YIELD      | ORDER BY
- openCypher      RETURN      ORDER BY
- ASC :  
• DESC :

### nGQL

```
<YIELD clause>
ORDER BY <expression> [ASC | DESC] [, <expression> [ASC | DESC] ...];
```

### Compatibility

nGQL      ORDER BY      \$-.      2.5.0

```
nebula> FETCH PROP ON player "player100", "player101", "player102", "player103" \
    YIELD properties(vertex).age AS age, properties(vertex).name AS name \
    | ORDER BY $-.age ASC, $-.name DESC;
+-----+
| age | name
+-----+
| 32 | "Rudy Gay"
| 33 | "LaMarcus Aldridge"
| 36 | "Tony Parker"
| 42 | "Tim Duncan"
+-----+
nebula> $var = GO FROM "player100" OVER follow \
    YIELD dst(edge) AS dst; \
    ORDER BY $var.dst DESC;
+-----+
| dst
+-----+
| "player125"
| "player101"
+-----+
```

### OpenCypher

```
<RETURN clause>
ORDER BY <expression> [ASC | DESC] [, <expression> [ASC | DESC] ...];
```

```
nebula> MATCH (v:player) RETURN v.player.name AS Name, v.player.age AS Age \
    ORDER BY Name DESC;
+-----+
| Name      | Age |
+-----+
| "Yao Ming" | 38 |
| "Vince Carter" | 42 |
| "Tracy McGrady" | 39 |
| "Tony Parker" | 36 |
| "Tim Duncan" | 42 |
+-----+
...
#
nebula> MATCH (v:player) RETURN v.player.age AS Age, v.player.name AS Name \
    ORDER BY Age DESC, Name ASC;
+-----+
| Age | Name
+-----+
| 47 | "Shaquille O'Neal"
```

```
| 46 | "Grant Hill"      |
| 45 | "Jason Kidd"      |
| 45 | "Steve Nash"      |
+-----+
...
```

**NULL**

NULL                    NULL

```
nebula> MATCH (v:player{name:"Tim Duncan"}) --> (v2) \
    RETURN v2.player.name AS Name, v2.player.age AS Age \
    ORDER BY Age;
+-----+
| Name      | Age      |
+-----+
| "Tony Parker" | 36      |
| "Manu Ginobili" | 41      |
| __NULL__ | __NULL__ |
+-----+

nebula> MATCH (v:player{name:"Tim Duncan"}) --> (v2) \
    RETURN v2.player.name AS Name, v2.player.age AS Age \
    ORDER BY Age DESC;
+-----+
| Name      | Age      |
+-----+
| __NULL__ | __NULL__ |
| "Manu Ginobili" | 41      |
| "Tony Parker" | 36      |
+-----+
```

---

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## 4.7.5 RETURN

```
RETURN      nGQL      ,  
RETURN  
• RETURN      nGQL      openCypher      MATCH  UNWIND  
• RETURN
```

### openCypher

```
nGQL      openCypher      nGQL      YIELD
```

```
RETURN      openCypher
```

```
•
```

```
MATCH (`_1`:player) \  
RETURN `_1`;
```

```
•
```

```
MATCH (v:player) \  
RETURN (v)-[e]->(v2);
```

- nGQL 1.x RETURN nGQL RETURN <var\_ref> IF <var\_ref> IS NOT NULL
- nGQL 2.0 RETURN nGQL

### Map

```
RETURN      Map      Key
```

```
nebula> RETURN {age: 32, name: "Marco Belinelli"};  
+-----+  
| {age:32,name:"Marco Belinelli"} |  
+-----+  
| {age: 32, name: "Marco Belinelli"} |  
+-----+  
  
nebula> RETURN {zage: 32, name: "Marco Belinelli"};  
+-----+  
| {zage:32,name:"Marco Belinelli"} |  
+-----+  
| {name: "Marco Belinelli", zage: 32} |  
+-----+
```

```
RETURN {<vertex_name> | <edge_name>}
```

```
//  
nebula> MATCH (v:player) \  
RETURN v;  
+-----+  
| v |  
+-----+  
| ("player104" :player{age: 32, name: "Marco Belinelli"}) |  
| ("player107" :player{age: 32, name: "Aron Baynes"}) |  
| ("player116" :player{age: 34, name: "LeBron James"}) |  
| ("player120" :player{age: 29, name: "James Harden"}) |  
| ("player125" :player{age: 41, name: "Manu Ginobili"}) |  
+-----+  
...
```

```
//
nebula> MATCH (v:player)-[e]->() \
    RETURN e;
+-----+
| e |
+-----+
| [:follow "player104"->"player100" @0 {degree: 55}] |
| [:follow "player104"->"player101" @0 {degree: 50}] |
| [:follow "player104"->"player105" @0 {degree: 60}] |
| [:serve "player104"->"team200" @0 {end_year: 2009, start_year: 2007}] |
| [:serve "player104"->"team208" @0 {end_year: 2016, start_year: 2015}] |
+-----+
...
```

**ID**

id() ID

```
nebula> MATCH (v:player{name:"Tim Duncan"}) \
    RETURN id(v);
+-----+
| id(v) |
+-----+
| "player100" |
+-----+
```

**Tag**

labels() Tag

```
nebula> MATCH (v:player{name:"Tim Duncan"}) \
    RETURN labels(v);
+-----+
| labels(v) |
+-----+
| ["player"] |
+-----+
labels(v) N labels(v)[n-1] labels(v)[0]
```

```
nebula> MATCH (v:player{name:"Tim Duncan"}) \
    RETURN labels(v)[0];
+-----+
| labels(v)[0] |
+-----+
| "player" |
+-----+
```

{&lt;vertex\_name&gt;|&lt;edge\_name&gt;}.&lt;property&gt;

```
nebula> MATCH (v:player) \
    RETURN v.player.name, v.player.age \
    LIMIT 3;
+-----+-----+
| v.player.name | v.player.age |
+-----+-----+
| "Danny Green" | 31 |
| "Tiago Splitter" | 34 |
| "David West" | 38 |
+-----+-----+
```

properties()

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[]->(v2) \
    RETURN properties(v2);
+-----+
| properties(v2) |
+-----+
| {name: "Spurs"} |
| {age: 36, name: "Tony Parker"} |
| {age: 41, name: "Manu Ginobili"} |
+-----+
```

**Edge type**

type() Edge type

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[e]->() \
    RETURN DISTINCT type(e);
+-----+
| type(e) |
+-----+
| "serve" |
| "follow" |
+-----+
```

RETURN &lt;path\_name&gt;

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[*3]->() \
    RETURN p;
+-----+
| |
| p |
| +
| +-----+
| | <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player101" :player{age: 36, name: "Tony Parker"})-[:follow@0 {degree: 90}]->("player102" :player{age: 33, name: "LaMarcus Aldridge"})-[:serve@0 {end_year: 2019, start_year: 2015}]->("team204" :team{name: "Spurs"})> |
| | <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player101" :player{age: 36, name: "Tony Parker"})-[:follow@0 {degree: 90}]->("player102" :player{age: 33, name: "LaMarcus Aldridge"})-[:serve@0 {end_year: 2015, start_year: 2006}]->("team203" :team{name: "Trail Blazers"})> |
| | <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player101" :player{age: 36, name: "Tony Parker"})-[:follow@0 {degree: 90}]->("player102" :player{age: 33, name: "LaMarcus Aldridge"})-[:follow@0 {degree: 75}]->("player101" :player{age: 36, name: "Tony Parker"})> |
+-----+
| ...
+-----+
```

nodes()

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[]->(v2) \
    RETURN nodes(p);
+-----+
| nodes(p) |
+-----+
| [{"player100" :player{age: 42, name: "Tim Duncan"}, "team204" :team{name: "Spurs"}}, |
| [{"player100" :player{age: 42, name: "Tim Duncan"}, "player101" :player{age: 36, name: "Tony Parker"}}, |
| [{"player100" :player{age: 42, name: "Tim Duncan"}, "player125" :player{age: 41, name: "Manu Ginobili"}}, |
+-----+
```

relationships()

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[]->(v2) \
    RETURN relationships(p);
+-----+
| relationships(p) |
+-----+
| [[:serve "player100"-->"team204" @0 {end_year: 2016, start_year: 1997}]] |
| [[:follow "player100"-->"player101" @0 {degree: 95}]] |
| [[:follow "player100"-->"player125" @0 {degree: 95}]] |
+-----+
```

length()

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})-[*..2]->(v2) \
    RETURN p AS Paths, length(p) AS Length;
+-----+
| Paths |
| Length |
+-----+
| <("player100" :player{age: 42, name: "Tim Duncan"})-[:serve@0 {end_year: 2016, start_year: 1997}]->("team204" :team{name: "Spurs"})> |
| <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player101" :player{age: 36, name: "Tony Parker"})> |
| <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player125" :player{age: 41, name: "Manu
```

```
Ginobili"})> | 1   |
| <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player101" :player{age: 36, name: "Tony Parker"})-[:serve@0 {end_year: 2018, start_year: 1999}]->("team204" :team{name: "Spurs"})> | 2   |
| <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player101" :player{age: 36, name: "Tony Parker"})-[:serve@0 {end_year: 2019, start_year: 2018}]->("team215" :team{name: "Hornets"})> | 2   |
| <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player101" :player{age: 36, name: "Tony Parker"})-[:follow@0 {degree: 95}]->("player100" :player{age: 42, name: "Tim Duncan"})> | 2   |
| <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player101" :player{age: 36, name: "Tony Parker"})-[:follow@0 {degree: 90}]->("player102" :player{age: 33, name: "LaMarcus Aldridge"})> | 2   |
| <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player101" :player{age: 36, name: "Tony Parker"})-[:follow@0 {degree: 95}]->("player125" :player{age: 41, name: "Manu Ginobili"})> | 2   |
| <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player125" :player{age: 41, name: "Manu Ginobili"})-[:serve@0 {end_year: 2018, start_year: 2002}]->("team204" :team{name: "Spurs"})> | 2   |
| <("player100" :player{age: 42, name: "Tim Duncan"})-[:follow@0 {degree: 95}]->("player125" :player{age: 41, name: "Manu Ginobili"})-[:follow@0 {degree: 90}]->("player100" :player{age: 42, name: "Tim Duncan"})> | 2   |
+-----+
+-----+
```

\*

```
nebula> MATCH (v:player{name:"Tim Duncan"}) \
    RETURN *;
+-----+
| v
+-----+
| ("player100" :player{age: 42, name: "Tim Duncan"}) |
+-----+
```

```
nebula> MATCH (v:player{name:"Tim Duncan"})-[e]->(v2) \
    RETURN *;
+-----+
| v
+-----+
| v2
+-----+
| e
+-----+
| ("player100" :player{age: 42, name: "Tim Duncan"}) | [:follow "player100"-->"player101" @0 {degree: 95}] | ("player101" :player{age: 36, name: "Tony Parker"}) |
| ("player100" :player{age: 42, name: "Tim Duncan"}) | [:follow "player100"-->"player125" @0 {degree: 95}] | ("player125" :player{age: 41, name: "Manu Ginobili"}) |
| ("player100" :player{age: 42, name: "Tim Duncan"}) | [:serve "player100"-->"team204" @0 {end_year: 2016, start_year: 1997}] | ("team204" :team{name: "Spurs"}) |
+-----+
+-----+
```

AS &lt;alias&gt;

```
nebula> MATCH (v:player{name:"Tim Duncan"})-[:serve]->(v2) \
    RETURN v2.team.name AS Team;
+-----+
| Team
+-----+
| "Spurs"
+-----+
```

```
nebula> RETURN "Amber" AS Name;
+-----+
| Name
+-----+
| "Amber"
+-----+
```

NULL

```
nebula> MATCH (v:player{name:"Tim Duncan"})-[e]->(v2) \
    RETURN v2.player.name, type(e), v2.player.age;
+-----+-----+-----+
| v2.player.name | type(e) | v2.player.age |
+-----+-----+-----+
| "Manu Ginobili" | "follow" | 41 |
| __NULL__ | "serve" | __NULL__ |
| "Tony Parker" | "follow" | 36 |
+-----+-----+-----+
```

## RETURN

```

nebula> MATCH (v:player{name:"Tony Parker"})-->(v2:player) \
    RETURN DISTINCT v2.player.name, "Hello"+" graphs!", v2.player.age > 35;
+-----+-----+-----+
| v2.player.name | ("Hello"+" graphs!") | (v2.player.age>35) |
+-----+-----+-----+
| "LaMarcus Aldridge" | "Hello graphs!" | false |
| "Tim Duncan" | "Hello graphs!" | true |
| "Manu Ginobili" | "Hello graphs!" | true |
+-----+-----+-----+

nebula> RETURN 1+1;
+-----+
| (1+1) |
+-----+
| 2 |
+-----+

nebula> RETURN 3 > 1;
+-----+
| (3>1) |
+-----+
| true |
+-----+

nebula> RETURN 1+1, rand32(1, 5);
+-----+
| (1+1) | rand32(1,5) |
+-----+
| 2 | 1 |
+-----+

```

## DISTINCT

```

#      DISTINCT
nebula> MATCH (v:player{name:"Tony Parker"})--(v2:player) \
    RETURN v2.player.name, v2.player.age;
+-----+-----+
| v2.name | v2.age |
+-----+-----+
| "Tim Duncan" | 42 |
| "LaMarcus Aldridge" | 33 |
| "Marco Belinelli" | 32 |
| "Boris Diaw" | 36 |
| "Dejounte Murray" | 29 |
| "Tim Duncan" | 42 |
| "LaMarcus Aldridge" | 33 |
| "Manu Ginobili" | 41 |
+-----+-----+

#      DISTINCT
nebula> MATCH (v:player{name:"Tony Parker"})--(v2:player) \
    RETURN DISTINCT v2.player.name, v2.player.age;
+-----+-----+
| v2.name | v2.age |
+-----+-----+
| "Tim Duncan" | 42 |
| "LaMarcus Aldridge" | 33 |
| "Marco Belinelli" | 32 |
| "Boris Diaw" | 36 |
| "Dejounte Murray" | 29 |
| "Manu Ginobili" | 41 |
+-----+-----+

```

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## 4.7.6 TTL

TTL Time To Live

### openCypher

nGQL

- TTL      Schema
- TTL INDEX
- Tag/Edge type      INDEX      TTL      Tag      TTL
- TTL      INDEX

- Tag
- Tag                  Tag

Edge type

NebulaGraph

Compaction

### Note

TTL      Compaction

## TTL

nGQL    TTL

ttl_col	int timestamp
ttl_duration	64                      ttl_duration 0

### Note

NULL    TTL    TTL

**TTL**

TAG EDGE TYPE

Tag Edge type      ALTER      Tag Edge type

```
#     Tag
nebula> CREATE TAG IF NOT EXISTS t1 (a timestamp);

# ALTER   Tag    TTL
nebula> ALTER TAG t1 TTL_COL = "a", TTL_DURATION = 5;

#           5
nebula> INSERT VERTEX t1(a) VALUES "101":(now());
```

TAG EDGE TYPE

Tag Edge type      TTL      CREATE TAG      CREATE EDGE

```
#     Tag      TTL
nebula> CREATE TAG IF NOT EXISTS t2(a int, b int, c string) TTL_DURATION= 100, TTL_COL = "a";

#           1648197238 1648197138 + 100
nebula> INSERT VERTEX t2(a, b, c) VALUES "102":(1648197138, 30, "Hello");
```

•

nebula&gt; ALTER TAG t1 DROP (a);

• ttl\_col

nebula&gt; ALTER TAG t1 TTL\_COL = "";

• ttl\_duration 0      TTL      Schema

nebula&gt; ALTER TAG t1 TTL\_DURATION = 0;

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## 4.7.7 WHERE

WHERE

WHERE

- nGQL    GO    LOOKUP
- openCypher    MATCH    WITH

### openCypher

Rank	nGQL	openCypher	Rank	rank()	MATCH (:player)-[e:follow]->() RETURN rank(e);
------	------	------------	------	--------	--



\$\$ \$^

WHERE       NOT    AND    OR    XOR

```
nebula> MATCH (v:player) \
  WHERE v.player.name == "Tim Duncan" \
  XOR (v.player.age < 30 AND v.player.name == "Yao Ming") \
  OR NOT (v.player.name == "Yao Ming" OR v.player.name == "Tim Duncan") \
  RETURN v.player.name, v.player.age;
+-----+-----+
| v.player.name | v.player.age |
+-----+-----+
| "Danny Green" | 31      |
| "Tiago Splitter" | 34      |
| "David West" | 38      |
...
...
```

```
nebula> GO FROM "player100" \
  OVER follow \
  WHERE properties(edge).degree > 90 \
  OR properties($$).age != 33 \
  AND properties($$).name != "Tony Parker" \
  YIELD properties($$);
+-----+
| properties($$) |
+-----+
| {age: 41, name: "Manu Ginobili"} |
+-----+
```

## WHERE

- ```
nebula> MATCH (v:player)-[e]-(v2) \
    WHERE v2.player.age < 25 \
    RETURN v2.player.name, v2.player.age;
+-----+-----+
| v2.player.name | v2.player.age |
+-----+-----+
"Ben Simmons"	22
"Luka Doncic"	20
"Kristaps Porzingis"	23
+-----+-----+
```
- ```
nebula> GO FROM "player100" OVER follow \
    WHERE $^.player.age >= 42 \
    YIELD dst(edge);
+-----+
| dst(EDGE) |
+-----+
| "player101" |
| "player125" |
+-----+
```
- ```
nebula> MATCH (v:player)-[e]->() \
    WHERE e.start_year < 2000 \
    RETURN DISTINCT v.player.name, v.player.age;
+-----+-----+
| v.player.name | v.player.age |
+-----+-----+
"Tony Parker"	36
"Tim Duncan"	42
"Grant Hill"	46
...
+-----+
```
- ```
nebula> GO FROM "player100" OVER follow \
    WHERE follow.degree > 90 \
    YIELD dst(edge);
+-----+
| dst(EDGE) |
+-----+
| "player101" |
| "player125" |
+-----+
```
- ```
nebula> MATCH (v:player) \
    WHERE v[tolower("AGE")] < 21 \
    RETURN v.player.name, v.player.age;
+-----+-----+
| v.name | v.age |
+-----+-----+
| "Luka Doncic" | 20 |
+-----+-----+
```
- ```
nebula> MATCH (v:player) \
    WHERE exists(v.player.age) \
    RETURN v.player.name, v.player.age;
+-----+-----+
| v.player.name | v.player.age |
+-----+-----+
| "Danny Green" | 31 |
| "Tiago Splitter" | 34 |
| "David West" | 38 |
...
+-----+
```

## RANK

nGQL	rank	WHERE	rank
------	------	-------	------

```
#  
nebula> CREATE SPACE IF NOT EXISTS test (vid_type=FIXED_STRING(30));  
nebula> USE test;  
nebula> CREATE EDGE IF NOT EXISTS e1(p1 int);
```

```

nebula> CREATE TAG IF NOT EXISTS person(p1 int);
nebula> INSERT VERTEX person(p1) VALUES "1":(1);
nebula> INSERT VERTEX person(p1) VALUES "2":(2);
nebula> INSERT EDGE e1(p1) VALUES "1"->"2">@0:(10);
nebula> INSERT EDGE e1(p1) VALUES "1"->"2"@1:(11);
nebula> INSERT EDGE e1(p1) VALUES "1"->"2">@2:(12);
nebula> INSERT EDGE e1(p1) VALUES "1"->"2">@3:(13);
nebula> INSERT EDGE e1(p1) VALUES "1"->"2">@4:(14);
nebula> INSERT EDGE e1(p1) VALUES "1"->"2">@5:(15);
nebula> INSERT EDGE e1(p1) VALUES "1"->"2">@6:(16);

#      rank      rank      2
nebula> GO FROM "1" \
    OVER e1 \
    WHERE rank(edge) > 2 \
    YIELD src(edge), dst(edge), rank(edge) AS Rank, properties(edge).p1 | \
        ORDER BY $-.Rank DESC;
+-----+-----+-----+-----+
| src(EDGE) | dst(EDGE) | Rank | properties(EDGE).p1 |
+-----+-----+-----+-----+
| "1"      | "2"       | 6   | 16          |
| "1"      | "2"       | 5   | 15          |
| "1"      | "2"       | 4   | 14          |
| "1"      | "2"       | 3   | 13          |
+-----+-----+-----+-----+

```

WHERE            STARTS WITH    ENDS WITH    CONTAINS

## STARTS WITH

## STARTS WITH

```
#          T      player
nebula> MATCH (v:player) \
    WHERE v.player.name STARTS WITH "T" \
    RETURN v.player.name, v.player.age;
+-----+-----+
| v.player.name | v.player.age |
+-----+-----+
| "Tony Parker" | 36   |
| "Tiago Splitter" | 34   |
| "Tim Duncan" | 42   |
| "Tracy McGrady" | 39   |
+-----+-----+
```

t STARTS WITH "t"

```
nebula> MATCH (v:player) \
      WHERE v.player.name STARTS WITH "t" \
      RETURN v.player.name, v.player.age;
+-----+-----+
| v.player.name | v.player.age |
+-----+-----+
+-----+-----+
Empty set (time spent 5080/6474 us)
```

ENDS WITH

## ENDS WITH

```
nebula> MATCH (v:player) \
    WHERE v.player.name ENDS WITH "r" \
    RETURN v.player.name, v.player.age;
```

v.player.name	v.player.age
"Tony Parker"	36
"Tiago Splitter"	34
"Vince Carter"	42

## CONTAINS

## CONTAINS

```
nebula> MATCH (v:player) \
    WHERE v.player.name CONTAINS "Pa" \
    RETURN v.player.name, v.player.age;
```

```
+-----+-----+
| "Paul George" | 28      |
| "Tony Parker" | 36      |
| "Paul Gasol"  | 38      |
| "Chris Paul"  | 33      |
+-----+-----+
```

NOT

NOT

```
nebula> MATCH (v:player) \
    WHERE NOT v.player.name ENDS WITH "R" \
    RETURN v.player.name, v.player.age;
+-----+-----+
| v.player.name | v.player.age |
+-----+-----+
| "Danny Green" | 31      |
| "Tiago Splitter" | 34      |
| "David West" | 38      |
| "Russell Westbrook" | 30      |
...
```

IN

```
nebula> MATCH (v:player) \
    WHERE v.player.age IN range(20,25) \
    RETURN v.player.name, v.player.age;
+-----+-----+
| v.player.name | v.player.age |
+-----+-----+
| "Ben Simmons" | 22      |
| "Giannis Antetokounmpo" | 24      |
| "Kyle Anderson" | 25      |
| "Joel Embiid" | 25      |
| "Kristaps Porzingis" | 23      |
| "Luka Doncic" | 20      |
+-----+-----+

nebula> LOOKUP ON player \
    WHERE player.age IN [25,28] \
    YIELD properties(vertex).name, properties(vertex).age;
+-----+-----+
| properties(VERTEX).name | properties(VERTEX).age |
+-----+-----+
| "Kyle Anderson" | 25      |
| "Damian Lillard" | 28      |
| "Joel Embiid" | 25      |
| "Paul George" | 28      |
| "Ricky Rubio" | 28      |
+-----+-----+
```

NOT

```
nebula> MATCH (v:player) \
    WHERE v.player.age NOT IN range(20,25) \
    RETURN v.player.name AS Name, v.player.age AS Age \
    ORDER BY Age;
+-----+-----+
| Name     | Age   |
+-----+-----+
| "Kyrie Irving" | 26 |
| "Cory Joseph" | 27 |
| "Damian Lillard" | 28 |
| "Paul George" | 28 |
| "Ricky Rubio" | 28 |
...
```

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## 4.7.8 YIELD

`YIELD` nGQL

`YIELD`

- `YIELD` nGQL `GO` `FETCH` `LOOKUP` `YIELD`
- `YIELD`

### openCypher

nGQL openCypher `RETURN`

`YIELD` nGQL openCypher

- `openCypher` `YIELD` `CALL[...YIELD]`

 Note

nGQL `CALL[...YIELD]`

- nGQL `YIELD` openCypher `RETURN`

 Note

`$$` `$-`

### YIELD

`YIELD [DISTINCT] <col> [AS <alias>] [, <col> [AS <alias>] ...];`

`DISTINCT`

<code>col</code>	<code>col</code>
<code>alias</code>	<code>col</code>
	<code>AS</code>

`YIELD`

- `GO` `YIELD`

```
nebula> GO FROM "player100" OVER follow \
    YIELD properties($$).name AS Friend, properties($$).age AS Age;
+-----+---+
| Friend | Age |
+-----+---+
| "Tony Parker" | 36 |
```

```
| "Manu Ginobili" | 41 |
+-----+-----+
```

- **FETCH**      **YIELD**

```
nebula> FETCH PROP ON player "player100" \
          YIELD properties(vertex).name;
+-----+
| properties(VERTEX).name |
+-----+
| "Tim Duncan"           |
+-----+
```

- **LOOKUP**      **YIELD**

```
nebula> LOOKUP ON player WHERE player.name == "Tony Parker" \
          YIELD properties(vertex).name, properties(vertex).age;
+-----+-----+
| properties(VERTEX).name | properties(VERTEX).age |
+-----+-----+
| "Tony Parker"          | 36                  |
+-----+-----+
```

## YIELD

```
YIELD [DISTINCT] <col> [AS <alias>] [, <col> [AS <alias>] ...]
[WHERE <conditions>];
```

### DISTINCT

col	col	
alias	col	AS
conditions	WHERE	WHERE

### YIELD

#### YIELD

```
#   player100      player
nebula> GO FROM "player100" OVER follow \
          YIELD dst(edge) AS ID \
          | FETCH PROP ON player $-.ID \
          YIELD properties(vertex).age AS Age \
          | YIELD AVG($-.Age) as Avg_age, count(*)as Num_friends;
+-----+
| Avg_age | Num_friends |
+-----+-----+
| 38.5    | 2            |
+-----+-----+
```

```
#   player101      player      degree  90  player
nebula> $var1 = GO FROM "player101" OVER follow \
          YIELD properties(edge).degree AS Degree, dst(edge) as ID; \
          YIELD $var1.ID AS ID WHERE $var1.Degree > 90;
+-----+
| ID      |
+-----+
| "player100" |
| "player125" |
+-----+
```

### YIELD

#### YIELD

```
nebula> YIELD rand32(1, 6);
+-----+
| rand32(1,6) |
+-----+
| 3           |
+-----+
```

```
+-----+
nebula> YIELD "Hel" + "\tlo" AS string1, ", World!" AS string2;
+-----+
| string1      | string2      |
+-----+-----+
| "Hel      lo" | ", World!" |
+-----+-----+

nebula> YIELD hash("Tim") % 100;
+-----+
| (hash("Tim")%100) |
+-----+
| 42               |
+-----+

nebula> YIELD \
    CASE 2+3 \
    WHEN 4 THEN 0 \
    WHEN 5 THEN 1 \
    ELSE -1 \
    END \
    AS result;
+-----+
| result |
+-----+
| 1      |
+-----+
```

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## 4.7.9 WITH

WITH

### openCypher

openCypher



openCypher

nGQL WITH

WITH

1

- 1.
2. nodes()
- 3.
- 4.

```
nebula> MATCH p=(v:player{name:"Tim Duncan"})--() \
    WITH nodes(p) AS n \
    UNWIND n AS n1 \
    RETURN DISTINCT n1;
+-----+
| n1 |
+-----+
| {"player100":player{age: 42, name: "Tim Duncan"}}, \
| {"player101":player{age: 36, name: "Tony Parker"}}, \
| {"team204":team{name: "Spurs"}}, \
| {"player102":player{age: 33, name: "LaMarcus Aldridge"}}, \
| {"player125":player{age: 41, name: "Manu Ginobili"}}, \
| {"player104":player{age: 32, name: "Marco Belinelli"}}, \
| {"player144":player{age: 47, name: "Shaquille O'Neal"}}, \
| {"player105":player{age: 31, name: "Danny Green"}}, \
| {"player113":player{age: 29, name: "Dejounte Murray"}}, \
| {"player107":player{age: 32, name: "Aron Baynes"}}, \
| {"player109":player{age: 34, name: "Tiago Splitter"}}, \
| {"player108":player{age: 36, name: "Boris Diaw"}}, \
+-----+
```

2

1. ID player100
2. labels() Tag
- 3.
- 4.

```
nebula> MATCH (v) \
    WHERE id(v)="player100" \
    WITH labels(v) AS tags_unf \
    UNWIND tags_unf AS tags_f \
    RETURN tags_f;
+-----+
| tags_f |
+-----+
| "player" |
+-----+
```

WITH

```
nebula> MATCH (v:player)-->(v2:player) \
    WITH DISTINCT v2 AS v2, v2.player.age AS Age \
    ORDER BY Age \
    WHERE Age<25 \
    RETURN v2.player.name AS Name, Age;
+-----+-----+
| Name | Age |
+-----+-----+
| "Luka Doncic" | 20 |
| "Ben Simmons" | 22 |
| "Kristaps Porzingis" | 23 |
+-----+-----+
```

**collect()**

```
collect()           WITH
```

```
nebula> MATCH (v:player) \
    WITH v.player.name AS Name \
    ORDER BY Name DESC \
    LIMIT 3 \
    RETURN collect(Name);
+-----+
| collect(Name) |
+-----+
| ["Yao Ming", "Vince Carter", "Tracy McGrady"] |
+-----+
```

**RETURN**

```
WITH           RETURN
```

```
nebula> WITH [1, 2, 3] AS `list` RETURN 3 IN `list` AS r;
+-----+
| r   |
+-----+
| true |
+-----+
```

```
nebula> WITH 4 AS one, 3 AS two RETURN one > two AS result;
+-----+
| result |
+-----+
| true   |
+-----+
```

---

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## 4.7.10 UNWIND

UNWIND

UNWIND

### UNWIND

```
UNWIND <list> AS <alias> <RETURN clause>;
```

- 

```
nebula> UNWIND [1,2,3] AS n RETURN n;
+---+
| n |
+---+
| 1 |
| 2 |
| 3 |
+---+
```

### UNWIND

- nGQL UNWIND



**Note**

nGQL UNWIND | \$- UNWIND | \$-

```
<statement> | UNWIND $-.<var> AS <alias> <|> <clause>;
```

- openCypher UNWIND

```
<statement> UNWIND <list> AS <alias> <RETURN clause>
```

- UNWIND WITH DISTINCT



**Note**

nGQL WITH DISTINCT

```
//      `'[1,1,2,2,3,3]`'
nebula> WITH [1,1,2,2,3,3] AS n \
    UNWIND n AS r \
    WITH DISTINCT r AS r \
    ORDER BY r \
    RETURN collect(r);
+-----+
| collect(r) |
+-----+
```

```
| [1, 2, 3] |
```

- MATCH      UNWIND

```
//
nebula> MATCH p=(v:player{name:"Tim Duncan"})--(v2) \
    WITH nodes(p) AS n \
    UNWIND n AS r \
    WITH DISTINCT r AS r \
    RETURN collect(r);
+-----+
| collect(r)
+-----+
| [{"player100": {"player": {"age": 42, "name": "Tim Duncan"}, "player101": {"player": {"age": 36, "name": "Tony Parker"}}, "team204": {"team": {"name": "Spurs"}}, "player102": {"player": {"age": 33, "name": "LaMarcus Aldridge"}}, "player125": {"player": {"age": 41, "name": "Manu Ginobili"}}, "player104": {"player": {"age": 32, "name": "Marco Belinelli"}}, "player144": {"player": {"age": 47, "name": "Shaqoule O'Neal"}}, "player105": {"player": {"age": 31, "name": "Danny Green"}}, "player113": {"player": {"age": 29, "name": "Dejounte Murray"}}, "player107": {"player": {"age": 32, "name": "Aron Baynes"}}, "player109": {"player": {"age": 34, "name": "Tiago Splitter"}}, "player108": {"player": {"age": 36, "name": "Boris Diaw"}}}]
+-----+
```

- GO      UNWIND

```
//
nebula> YIELD ['player101', 'player100'] AS a | UNWIND $-.a AS b | GO FROM $-.b OVER follow YIELD edge AS e;
+-----+
| e
+-----+
| [:follow "player101" -> "player100" @0 {degree: 95}] |
| [:follow "player101" -> "player102" @0 {degree: 90}] |
| [:follow "player101" -> "player125" @0 {degree: 95}] |
| [:follow "player100" -> "player101" @0 {degree: 95}] |
| [:follow "player100" -> "player125" @0 {degree: 95}] |
+-----+
```

- LOOKUP      UNWIND

```
//
nebula> LOOKUP ON player \
    WHERE player.age > 46 \
    YIELD DISTINCT keys(vertex) as p | UNWIND $-.p as a | YIELD $-.a AS a;
+-----+
| a
+-----+
| "age"
| "name"
+-----+
```

- FETCH      UNWIND

```
// player101      Tag
nebula> CREATE TAG hero(like string, height int);
INSERT VERTEX hero(like, height) VALUES "player101":("deep", 182);
FETCH PROP ON * "player101" \
YIELD tags(vertex) as t | UNWIND $-.t as a | YIELD $-.a AS a;
+-----+
| a
+-----+
| "hero"
| "player"
+-----+
```

- GET SUBGRAPH      UNWIND

```
//    player100  0-2  serve
nebula> GET SUBGRAPH 2 STEPS FROM "player100" BOTH serve \
    YIELD edges as e | UNWIND $-.e as a | YIELD $-.a AS a;
+-----+
| a
+-----+
| [:serve "player100"->"team204" @0 {}]
| [:serve "player101"->"team204" @0 {}]
| [:serve "player102"->"team204" @0 {}]
| [:serve "player103"->"team204" @0 {}]
| [:serve "player105"->"team204" @0 {}]
| [:serve "player106"->"team204" @0 {}]
| [:serve "player107"->"team204" @0 {}]
| [:serve "player108"->"team204" @0 {}]
| [:serve "player109"->"team204" @0 {}]
| [:serve "player110"->"team204" @0 {}]
| [:serve "player111"->"team204" @0 {}]
| [:serve "player112"->"team204" @0 {}]
| [:serve "player113"->"team204" @0 {}]
| [:serve "player114"->"team204" @0 {}]
| [:serve "player125"->"team204" @0 {}]
| [:serve "player138"->"team204" @0 {}]
| [:serve "player104"->"team204" @20132015 {}]
| [:serve "player104"->"team204" @20182019 {}]
+-----+
```

- FIND PATH      UNWIND

```
//    player101  team204  serve
nebula> FIND SHORTEST PATH FROM "player101" TO "team204" OVER serve \
    YIELD path as p | YIELD nodes($-.p) AS nodes | UNWIND $-.nodes AS a | YIELD $-.a AS a;
+-----+
| a
+-----+
| ("player101")
| ("team204")
+-----+
```

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## 4.8

### 4.8.1 CREATE SPACE

NebulaGraph      MySQL database      CREATE SPACE      Schema

God      CREATE SPACE

```
CREATE SPACE [IF NOT EXISTS] <graph_space_name> (
    [partition_num = <partition_number>],
    [replica_factor = <replica_number>],
    vid_type = {FIXED_STRING(<N>) | INT[64]}
)
[COMMENT = '<comment>'];
```

IF NOT EXISTS

<graph_space_name>	NebulaGraph	1~4	UTF-8
--------------------	-------------	-----	-------

partition_num	20	HDD	2	3	60	100
---------------	----	-----	---	---	----	-----

replica_factor	3	1		1		
----------------	---	---	--	---	--	--

vid_type	ID FIXED_STRING(<N>)	INT64	INT	INT64 N	UTF-8	N 12	vid_type 4
----------	-------------------------	-------	-----	------------	-------	------	------------

INT64

COMMENT	256
---------	-----

#### Caution

- 1      BALANCE      NebulaGraph

- VID

- NebulaGraph 1.x   VID      INT64      NebulaGraph 2.x   VID      INT64      FIXED\_STRING(<N>)      VID      INSERT  
VID      Wrong vertex id type: 1001

- VID      N      The VID must be a 64-bit integer or a string fitting space vertex id length limit.

- Host not enough!      Storage Host      replica\_factor      SHOW HOSTS

- Storage Host      replica\_factor      Storage Host

- Storage Host      ADD HOSTS      Console      SHOW HOSTS      Storage Host      ADD HOSTS  
Online Storage Host

- Storage Host      Online



2.5.0 2.x vid\_type FIXED\_STRING(8)



graph\_space\_name, partition\_num, replica\_factor, vid\_type, comment      [DROP SPACE](#)      [CREATE SPACE](#)

```
CREATE SPACE <new_graph_space_name> AS <old_graph_space_name>;
```

<new_graph_space_name>	1~4    UTF-8
`	<old_graph_space_name>
Edge type	Schema
<old_graph_space_name>	Tag

```
#      VID
nebula> CREATE SPACE IF NOT EXISTS my_space_1 (vid_type=FIXED_STRING(30));

#      VID
nebula> CREATE SPACE IF NOT EXISTS my_space_2 (partition_num=15, replica_factor=1, vid_type=FIXED_STRING(30));

#      VID
nebula> CREATE SPACE IF NOT EXISTS my_space_3 (partition_num=15, replica_factor=1, vid_type=FIXED_STRING(30)) comment="      ";

#
nebula> CREATE SPACE IF NOT EXISTS my_space_4 as my_space_3;
nebula> SHOW CREATE SPACE my_space_4;
+-----+
+-----+
| Space      | Create
Space
|
+-----+
+-----+
| "my_space_4" | "CREATE SPACE `my_space_4` (partition_num = 15, replica_factor = 1, charset = utf8, collate = utf8_bin, vid_type = FIXED_STRING(30),
atomic_edge = false) ON default_zone_127.0.0.1_9779 comment = '      '" |
+-----+
+-----+
+
```



2      20      heartbeat\_interval\_secs      <5

```
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+-----+
| Host    | Port | HTTP port | Status   | Leader count | Leader distribution          | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+-----+
| "storaged0" | 9779 | 19779    | "ONLINE" | 8           | "basketballplayer:3, test:5" | "basketballplayer:10, test:10" | "3.1.0" |
| "storaged1" | 9779 | 19779    | "ONLINE" | 9           | "basketballplayer:4, test:5"  | "basketballplayer:10, test:10" | "3.1.0" |
| "storaged2" | 9779 | 19779    | "ONLINE" | 3           | "basketballplayer:3"         | "basketballplayer:10, test:10" | "3.1.0" |
+-----+-----+-----+-----+-----+-----+-----+
```

```
nebula> BALANCE LEADER;
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+-----+
| Host | Port | HTTP port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+-----+
| "storaged0" | 9779 | 19779 | "ONLINE" | 7 | "basketballplayer:3, test:4" | "basketballplayer:10, test:10" | "3.1.0" |
| "storaged1" | 9779 | 19779 | "ONLINE" | 7 | "basketballplayer:4, test:3" | "basketballplayer:10, test:10" | "3.1.0" |
| "storaged2" | 9779 | 19779 | "ONLINE" | 6 | "basketballplayer:3, test:3" | "basketballplayer:10, test:10" | "3.1.0" |
+-----+-----+-----+-----+-----+-----+-----+
```

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## 4.8.2 USE

USE

USE

```
USE <graph_space_name>;
```

```
#  
nebula> CREATE SPACE IF NOT EXISTS space1 (vid_type=FIXED_STRING(30));  
nebula> CREATE SPACE IF NOT EXISTS space2 (vid_type=FIXED_STRING(30));  
  
#      space1  
nebula> USE space1;  
  
#      space2      space1  
nebula> USE space2;
```



Fabric Cypher   NebulaGraph

USE

Fabric Cypher

(USE +

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### 4.8.3 SHOW SPACES

SHOW SPACES NebulaGraph

```
SHOW SPACES;
```

```
nebula> SHOW SPACES;
+-----+
| Name      |
+-----+
| "cba"     |
| "basketballplayer" |
+-----+
```

CREATE SPACE

---

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#### 4.8.4 DESCRIBE SPACE

DESCRIBE SPACE

DESC DESCRIPTIVE

```
DESC[RIBE] SPACE <graph_space_name>;
```

```
nebula> DESCRIBE SPACE basketballplayer;
+-----+-----+-----+-----+-----+
| ID | Name          | Partition Number | Replica Factor | Charset | Collate      | Vid Type       | Comment |
+-----+-----+-----+-----+-----+
| 1  | "basketballplayer" | 10            | 1              | "utf8"   | "utf8_bin"    | "FIXED_STRING(32)" |           |
+-----+-----+-----+-----+-----+
```

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## 4.8.5 CLEAR SPACE

CLEAR SPACE

Schema

God

CLEAR SPACE

- 
- CLEAR SPACE
- CLEAR SPACE              CLEAR SPACE              Graph              storage\_client\_timeout\_ms
- CLEAR SPACE                      CLEAR SPACE



- NebulaGraph      CLEAR SPACE

```
CLEAR SPACE [IF EXISTS] <space_name>;
```

/

IF EXISTS

CLEAR SPACE

space\_name

```
CLEAR SPACE basketballplayer;
```

CLEAR SPACE

- Tag
- Edge type
- 

CLEAR SPACE

```
#      basketballplayer
nebula[(none)]> use basketballplayer;
Execution succeeded

#      Tag      Edge type
nebula[basketballplayer]> SHOW TAGS;
+-----+
| Name   |
+-----+
| "player" |
| "team"  |
+-----+
Got 2 rows

nebula[basketballplayer]> SHOW EDGES;
+-----+
```

```

| Name      |
+-----+
| "follow" |
| "serve"  |
+-----+
Got 2 rows

#
nebula[basketballplayer]> SUBMIT JOB STATS;
+-----+
| New Job Id |
+-----+
| 4          |
+-----+
Got 1 rows

#
nebula[basketballplayer]> SHOW STATS;
+-----+-----+-----+
| Type    | Name      | Count   |
+-----+-----+-----+
| "Tag"   | "player"  | 51      |
| "Tag"   | "team"    | 30      |
| "Edge"  | "follow"  | 81      |
| "Edge"  | "serve"   | 152     |
| "Space" | "vertices" | 81      |
| "Space" | "edges"   | 233     |
+-----+-----+-----+
Got 6 rows

# Tag
nebula[basketballplayer]> SHOW TAG INDEXES;
+-----+-----+-----+
| Index Name | By Tag   | Columns |
+-----+-----+-----+
| "player_index_0" | "player" | []       |
| "player_index_1" | "player" | ["name"] |
+-----+-----+-----+
Got 2 rows

# ----- CLEAR SPACE -----
# CLEAR SPACE      basketballplayer
nebula[basketballplayer]> CLEAR SPACE basketballplayer;
Execution succeeded

#
nebula[basketballplayer]> SUBMIT JOB STATS;
+-----+
| New Job Id |
+-----+
| 5          |
+-----+
Got 1 rows

# Tag Edge type
nebula[basketballplayer]> SHOW STATS;
+-----+-----+-----+
| Type    | Name      | Count   |
+-----+-----+-----+
| "Tag"   | "player"  | 0       |
| "Tag"   | "team"    | 0       |
| "Edge"  | "follow"  | 0       |
| "Edge"  | "serve"   | 0       |
| "Space" | "vertices" | 0       |
| "Space" | "edges"   | 0       |
+-----+-----+-----+
Got 6 rows

# Tag
nebula[basketballplayer]> SHOW TAG INDEXES;
+-----+-----+-----+
| Index Name | By Tag   | Columns |
+-----+-----+-----+
| "player_index_0" | "player" | []       |
| "player_index_1" | "player" | ["name"] |
+-----+-----+-----+
Got 2 rows (time spent 523/978 us)

```

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## 4.8.6 DROP SPACE

DROP SPACE



DROP SPACE Storage auto\_remove\_invalid\_space auto\_remove\_invalid\_space true  
auto\_remove\_invalid\_space false Storage

God DROP SPACE

DROP SPACE [IF EXISTS] <graph\_space\_name>;

IF EXISTS



NebulaGraph 3.1.0 DROP SPACE



## FAQ

DROP SPACE

3.1.0 NebulaGraph, DROP SPACE  
<nebula\_graph\_install\_path>/data/storage/nebula/<space\_id> <space\_id> DESCRIBE SPACE {space\_name}

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## 4.9 Tag

### 4.9.1 CREATE TAG

`CREATE TAG`

Tag

#### OpenCypher

nGQL Tag openCypher Label

- openCypher Label `CREATE`
- nGQL Tag `CREATE TAG` Tag MySQL

`CREATE TAG`

Tag

Tag USE

```
CREATE TAG [IF NOT EXISTS] <tag_name>
(
  <prop_name> <data_type> [NULL | NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>']
  [{, <prop_name> <data_type> [NULL | NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>']} ...]
)
[TTL_DURATION = <ttxl_duration>]
[TTL_COL = <prop_name>]
[COMMENT = '<comment>'];
```

IF NOT EXISTS

Tag

Tag Tag

<tag\_name>

1 Tag

2 Tag

3 Tag 1~4 UTF-8

.

<prop\_name>

Tag

Tag

<data\_type>

NULL \| NOT

NULL

NULL

DEFAULT

NebulaGraph

COMMENT

Tag

256

TTL\_DURATION

64

0

TTL\_COL

int timestamp Tag

TTL\_COL TTL

TTL

```
nebula> CREATE TAG IF NOT EXISTS player(name string, age int);
#      Tag
nebula> CREATE TAG IF NOT EXISTS no_property();
#      Tag
nebula> CREATE TAG IF NOT EXISTS player_with_default(name string, age int DEFAULT 20);
#      create_time    TTL 100
nebula> CREATE TAG IF NOT EXISTS woman(name string, age int, \
```

```
married bool, salary double, create_time timestamp) \  
TTL_DURATION = 100, TTL_COL = "create_time";
```

## Tag

Tag	2	20
-----	---	----

```
heartbeat_interval_secs
```

---

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## 4.9.2 DROP TAG

```
DROP TAG           Tag
                  Tag
•      Tag      Tag      Compaction      --
•      Tag      Tag      Tag
Tag      Schema      Compaction

↑↑↑compatibility
```

NebulaGraph 3.3.0 Tag Tag Graph nebula-graphd.conf --graph\_use\_vertex\_key=true  
Storage nebula-storaged.conf --use\_vertex\_key=true

- DROP TAG
- Tag DROP TAG [ERROR (-1005)]: Conflict! drop index

```
DROP TAG [IF EXISTS] <tag_name>;
```

- IF EXISTS Tag Tag
- tag\_name Tag Tag

```
nebula> CREATE TAG IF NOT EXISTS test(p1 string, p2 int);
nebula> DROP TAG test;
```

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### 4.9.3 ALTER TAG

ALTER TAG Tag

**TTL** Time-To-Live

- **ALTER TAG**
- **ALTER TAG** [ERROR (-1005)]: Conflict! drop index

```
ALTER TAG <tag_name>
  <alter_definition> [[, alter_definition] ...]
  [ttl_definition [, ttl_definition] ... ]
  [COMMENT = '<comment>'];

alter_definition:
| ADD   (prop_name data_type [NULL | NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>'])
| DROP  (prop_name)
| CHANGE (prop_name data_type [NULL | NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>'])

ttl_definition:
  TTL_DURATION = ttl_duration, TTL_COL = prop_name
```

- **tag\_name** Tag Tag Tag
- **ALTER TAG** ADD DROP CHANGE ,

```
nebula> CREATE TAG IF NOT EXISTS t1 (p1 string, p2 int);
nebula> ALTER TAG t1 ADD (p3 int, p4 string);
nebula> ALTER TAG t1 TTL_DURATION = 2, TTL_COL = "p2";
nebula> ALTER TAG t1 COMMENT = 'test1';
nebula> ALTER TAG t1 ADD (p5 double NOT NULL DEFAULT 0.4 COMMENT 'p5') COMMENT='test2';
```

#### Tag

Tag 2 20

heartbeat\_interval\_secs

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#### 4.9.4 SHOW TAGS

SHOW TAGS Tag

SHOW TAGS

SHOW TAGS;

```
nebula> SHOW TAGS;
+-----+
| Name      |
+-----+
| "player"  |
| "team"    |
+-----+
```

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## 4.9.5 DESCRIBE TAG

DESCRIBE TAG Tag

DESCRIBE TAG

```
DESC[RIBE] TAG <tag_name>;
```

DESCRIBE DESC

```
nebula> DESCRIBE TAG player;
+-----+-----+-----+-----+
| Field | Type   | Null  | Default | Comment |
+-----+-----+-----+-----+
| "name" | "string" | "YES" |         |          |
| "age"  | "int64"  | "YES" |         |          |
+-----+-----+-----+-----+
```

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## 4.9.6 DELETE TAG

**DELETE TAG**

**Tag**

**DELETE TAG**

```
DELETE TAG <tag_name_list> FROM <VID>;
```

- **tag\_name\_list** Tag Tag , \* Tag
- **VID** Tag ID

```
nebula> CREATE TAG IF NOT EXISTS test1(p1 string, p2 int);
nebula> CREATE TAG IF NOT EXISTS test2(p3 string, p4 int);
nebula> INSERT VERTEX test1(p1, p2),test2(p3, p4) VALUES "test":("123", 1, "456", 2);
nebula> FETCH PROP ON * "test" YIELD vertex AS v;
+-----+
| v |
+-----+
| {"test" :test1{p1: "123", p2: 1} :test2{p3: "456", p4: 2}} |
+-----+
```

```
nebula> DELETE TAG test1 FROM "test";
nebula> FETCH PROP ON * "test" YIELD vertex AS v;
+-----+
| v |
+-----+
| {"test" :test2{p3: "456", p4: 2}} |
+-----+
```

```
nebula> DELETE TAG * FROM "test";
nebula> FETCH PROP ON * "test" YIELD vertex AS v;
+---+
| v |
+---+
+---+
```

### ↑ Compatibility

- openCypher REMOVE v:LABEL v LABEL
- nGQL DELETE TAG

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## 4.9.7

openCypher	SET label	REMOVE label	
NebulaGraph	Tag	Tag	Tag
			DELETE TAG
			Tag
		Tag shareholder	
			DELETE TAG
			Tag

```

//      Tag
nebula> CREATE TAG IF NOT EXISTS shareholder();
nebula> CREATE TAG INDEX IF NOT EXISTS shareholder_tag on shareholder();

//      Tag
nebula> INSERT VERTEX shareholder() VALUES "player100":();
nebula> INSERT VERTEX shareholder() VALUES "player101":();

//
nebula> MATCH (v:shareholder) RETURN v;
+-----+
| v |
+-----+
| ("player100" :player{age: 42, name: "Tim Duncan"} :shareholder{}) |
| ("player101" :player{age: 36, name: "Tony Parker"} :shareholder{}) |
+-----+
nebula> LOOKUP ON shareholder YIELD id(vertex);
+-----+
| id(VERTEX) |
+-----+
| "player100" |
| "player101" |
+-----+

//  player100
nebula> DELETE TAG shareholder FROM "player100";
nebula> LOOKUP ON shareholder YIELD id(vertex);
+-----+
| id(VERTEX) |
+-----+
| "player101" |
+-----+

```



REBUILD TAG INDEX <index\_name\_list>;

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## 4.10 Edge type

### 4.10.1 CREATE EDGE

`CREATE EDGE` Edge type

#### OpenCypher

nGQL Edge type openCypher

- openCypher CREATE
- nGQL Edge type CREATE EDGE Edge type MySQL

`CREATE EDGE` Edge type

Edge type USE

```
CREATE EDGE [IF NOT EXISTS] <edge_type_name>
(
    <prop_name> <data_type> [NULL | NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>']
    [{, <prop_name> <data_type> [NULL | NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>']} ...]
)
[TTL_DURATION = <ttxl_duration>]
[TTL_COL = <prop_name>]
[COMMENT = '<comment>'];
```

IF NOT EXISTS	Edge type	Edge type	Edge type	Edge type	1~4	UTF-8
<code>&lt;edge_type_name&gt;</code>	Edge type	Edge type	Edge type	Edge type		
<code>&lt;prop_name&gt;</code>	Edge type		Edge type			
<code>&lt;data_type&gt;</code>						
<code>NULL \  NOT NULL</code>	NULL	NULL				
<code>DEFAULT</code>		NebulaGraph				
<code>COMMENT</code>	Edge type	256				
<code>TTL_DURATION</code>	64		0			
<code>TTL_COL</code>	int timestamp	Edge type	TTL_COL TTL	TTL		

```
nebula> CREATE EDGE IF NOT EXISTS follow(degree int);
#           Edge type
nebula> CREATE EDGE IF NOT EXISTS no_property();

#           Edge type
nebula> CREATE EDGE IF NOT EXISTS follow_with_default(degree int DEFAULT 20);

#     p2      TTL    100
nebula> CREATE EDGE IF NOT EXISTS e1(p1 string, p2 int, p3 timestamp) \
TTL_DURATION = 100, TTL_COL = "p2";
```

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## 4.10.2 DROP EDGE

DROP EDGE	Edge type	
Edge type	Edge type	Compaction
Edge type	Schema	Compaction

- DROP EDGE
- Edge type      DROP EDGE      [ERROR (-1005)]: Conflict!      drop index

```
DROP EDGE [IF EXISTS] <edge_type_name>
```

- IF EXISTS      Edge type      Edge type
- edge\_type\_name      Edge type      Edge type

```
nebula> CREATE EDGE IF NOT EXISTS e1(p1 string, p2 int);
nebula> DROP EDGE e1;
```

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### 4.10.3 ALTER EDGE

ALTER EDGE      Edge type      TTL Time-To-Live

- ALTER EDGE
- ALTER EDGE      [ERROR (-1005)]: Conflict!      drop index

```
ALTER EDGE <edge_type_name>
  <alter_definition> [, alter_definition] ...
  [ttl_definition [, ttl_definition] ... ]
  [COMMENT = '<comment>'];

alter_definition:
| ADD   (prop_name data_type)
| DROP  (prop_name)
| CHANGE (prop_name data_type)

ttl_definition:
  TTL_DURATION = ttl_duration, TTL_COL = prop_name
```

- edge\_type\_name      Edge type      Edge type      Edge type
- ALTER EDGE      ADD | DROP | CHANGE      ,

```
nebula> CREATE EDGE IF NOT EXISTS e1(p1 string, p2 int);
nebula> ALTER EDGE e1 ADD (p3 int, p4 string);
nebula> ALTER EDGE e1 TTL_DURATION = 2, TTL_COL = "p2";
nebula> ALTER EDGE e1 COMMENT = 'edge1';
```

#### Edge type

Edge type      2      20

heartbeat\_interval\_secs

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#### 4.10.4 SHOW EDGES

SHOW EDGES              Edge type

SHOW EDGES

SHOW EDGES;

```
nebula> SHOW EDGES;
+-----+
| Name      |
+-----+
| "follow"  |
| "serve"   |
+-----+
```

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## 4.10.5 DESCRIBE EDGE

```
DESCRIBE EDGE      Edge type
```

```
DESCRIBE EDGE
```

```
DESC[RIBE] EDGE <edge_type_name>
```

```
DESCRIBE      DESC
```

```
nebula> DESCRIBE EDGE follow;
+-----+-----+-----+-----+
| Field | Type  | Null | Default | Comment |
+-----+-----+-----+-----+
| "degree" | "int64" | "YES" |          |
+-----+-----+-----+-----+
```

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## 4.11

### 4.11.1 INSERT VERTEX

`INSERT VERTEX` NebulaGraph

`INSERT VERTEX`

```
INSERT VERTEX [IF NOT EXISTS] [tag_props, [tag_props] ...]
VALUES VID: ([prop_value_list])

tag_props:
  tag_name ([prop_name_list])

prop_name_list:
  [prop_name [, prop_name] ...]

prop_value_list:
  [prop_value [, prop_value] ...]
```

- `IF NOT EXISTS` VID



Note

- `IF NOT EXISTS` VID + Tag
- `IF NOT EXISTS`

- `tag_name` Tag Tag **CREATE TAG**



Caution

NebulaGraph 3.3.0 Tag Tag Graph nebula-graphd.conf --graph\_use\_vertex\_key=true  
Storage nebula-storaged.conf --use\_vertex\_key=true Tag INSERT VERTEX VALUES "1":();

- `property_name`

- `vid` ID NebulaGraph 3.3.0 **CREATE SPACE**

- `property_value` `prop_name_list` Tag NOT NULL **CREATE TAG**



`INSERT VERTEX openCypher CREATE`

- `INSERT VERTEX` NoSQL(key-value) `INSERT` SQL `UPSERT ( UPDATE OR INSERT )`
- `VID TAG` `IF NOT EXISTS`
- `VID TAG` TAG

```

#
nebula> CREATE TAG IF NOT EXISTS t1();
nebula> INSERT VERTEX t1() VALUES "10":();

nebula> CREATE TAG IF NOT EXISTS t2 (name string, age int);
nebula> INSERT VERTEX t2 (name, age) VALUES "11":("n1", 12);

#      "a13"    int
nebula> INSERT VERTEX t2 (name, age) VALUES "12":("n1", "a13");

#      2
nebula> INSERT VERTEX t2 (name, age) VALUES "13":("n3", 12), "14":("n4", 8);

nebula> CREATE TAG IF NOT EXISTS t3(p1 int);
nebula> CREATE TAG IF NOT EXISTS t4(p2 string);

#      Tag
nebula> INSERT VERTEX t3 (p1), t4(p2) VALUES "21": (321, "hello");

```

```

#
nebula> INSERT VERTEX t2 (name, age) VALUES "11":("n2", 13);
nebula> INSERT VERTEX t2 (name, age) VALUES "11":("n3", 14);
nebula> INSERT VERTEX t2 (name, age) VALUES "11":("n4", 15);
nebula> FETCH PROP ON t2 "11" YIELD properties(vertex);
+-----+
| properties(VERTEX)   |
+-----+
| {age: 15, name: "n4"} |
+-----+

```

```

nebula> CREATE TAG IF NOT EXISTS t5(p1 fixed_string(5) NOT NULL, p2 int, p3 int DEFAULT NULL);
nebula> INSERT VERTEX t5(p1, p2, p3) VALUES "001":("Abe", 2, 3);

#      p1      NULL
nebula> INSERT VERTEX t5(p1, p2, p3) VALUES "002":(NULL, 4, 5);
[ERROR (-1009)]: SemanticError: No schema found for `t5'

#      p3      NULL
nebula> INSERT VERTEX t5(p1, p2) VALUES "003":("cd", 5);
nebula> FETCH PROP ON t5 "003" YIELD properties(vertex);
+-----+
| properties(VERTEX)   |
+-----+
| {p1: "cd", p2: 5, p3: __NULL__} |
+-----+

#      p1      5
nebula> INSERT VERTEX t5(p1, p2) VALUES "004":("shalalalala", 4);
nebula> FETCH PROP ON t5 "004" YIELD properties(vertex);
+-----+
| properties(VERTEX)   |
+-----+
| {p1: "shala", p2: 4, p3: __NULL__} |
+-----+

```

**IF NOT EXISTS**

```

#      1
nebula> INSERT VERTEX t2 (name, age) VALUES "1":("n2", 13);

#      IF NOT EXISTS    1    1
nebula> INSERT VERTEX IF NOT EXISTS t2 (name, age) VALUES "1":("n3", 14);
nebula> FETCH PROP ON t2 "1" YIELD properties(vertex);
+-----+
| properties(VERTEX)   |
+-----+
| {age: 13, name: "n2"} |
+-----+

```

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## 4.11.2 DELETE VERTEX

`DELETE VERTEX`



NebulaGraph 2.x

NebulaGraph 3.3.0

`DELETE VERTEX`



- `DELETE VERTEX`

- `DELETE TAG` Tag

```
DELETE VERTEX <vid> [ , <vid> ... ] [WITH EDGE];
```

- `WITH EDGE` :

```
#     VID  `team1`  
nebula> DELETE VERTEX "team1";  
  
#     VID  `team1`  
nebula> DELETE VERTEX "team1" WITH EDGE;
```

```
#  
nebula> GO FROM "player100" OVER serve WHERE properties(edge).start_year == "2021" YIELD dst(edge) AS id | DELETE VERTEX $-.id;
```

NebulaGraph



- 
- `nebula-graphd.conf` `--storage_client_timeout_ms`

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### 4.11.3 UPDATE VERTEX

UPDATE VERTEX Tag

NebulaGraph CAS compare and set



Tag

```
UPDATE VERTEX ON <tag_name> <vid>
SET <update_prop>
[WHEN <condition>]
[YIELD <output>]
```

ON <tag_name>	Tag	Tag	ON player
<vid>	ID		"player100"
SET <update_prop>			SET age = age +1
WHEN <condition>	<condition>	false SET	WHEN name == "Tim"
YIELD <output>			YIELD name AS Name

```
//    "player101"
nebula> FETCH PROP ON player "player101" YIELD properties(vertex);
+-----+
| properties(VERTEX)           |
+-----+
| {age: 36, name: "Tony Parker"} |
+-----+

//    age      name      age
nebula> UPDATE VERTEX ON player "player101" \
          SET age = age + 2 \
          WHEN name == "Tony Parker" \
          YIELD name AS Name, age AS Age;
+-----+-----+
| Name        | Age   |
+-----+-----+
| "Tony Parker" | 38   |
+-----+-----+
```

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#### 4.11.4 UPSERT VERTEX

UPSERT VERTEX    UPDATE    INSERT



UPSERT VERTEX    Tag

UPSERT VERTEX    INSERT    UPSERT



UPSERT    UPDATE    INSERT

```
UPSERT VERTEX ON <tag> <vid>
SET <update_prop>
[WHEN <condition>]
[YIELD <output>]
```

ON <tag>	Tag	Tag	ON player
<vid>	ID	"player100"	
SET <update_prop>		SET age = age +1	
WHEN <condition>		WHEN name == "Tim"	
YIELD <output>		YIELD name AS Name	

WHEN    SET

- SET
- 
- Tag player    name    age
- SET    age=30

WHEN	name	age
		30
	NULL	30
		30
	NULL	30

```
//          "Empty set"
nebula> FETCH PROP ON * "player666", "player667", "player668" YIELD properties(vertex);
+-----+
| properties(VERTEX) |
+-----+
+-----+
Empty set

nebula> UPSERT VERTEX ON player "player666" \
    SET age = 30 \
    WHEN name == "Joe" \
    YIELD name AS Name, age AS Age;
+-----+
| Name      | Age      |
+-----+
| __NULL__ | 30      |
+-----+

nebula> UPSERT VERTEX ON player "player666" \
    SET age = 31 \
    WHEN name == "Joe" \
    YIELD name AS Name, age AS Age;
+-----+
| Name      | Age      |
+-----+
| __NULL__ | 30      |
+-----+

nebula> UPSERT VERTEX ON player "player667" \
    SET age = 31 \
    YIELD name AS Name, age AS Age;
+-----+
| Name      | Age      |
+-----+
| __NULL__ | 31      |
+-----+

nebula> UPSERT VERTEX ON player "player668" \
    SET name = "Amber", age = age + 1 \
    YIELD name AS Name, age AS Age;
+-----+
| Name      | Age      |
+-----+
| "Amber"  | __NULL__ |
+-----+
```

age                    age        NULL            age = age + 1        NULL            age                    age = age + 1

```
nebula> CREATE TAG IF NOT EXISTS player_with_default(name string, age int DEFAULT 20);  
Execution succeeded
```

```
nebula> UPSERT VERTEX ON player_with_default "player101" \
    SET age = age + 1 \
    YIELD name AS Name, age AS Age;
```

```
+-----+-----+
| Name      | Age   |
+-----+-----+
| __NULL__ | 21   |
+-----+-----+
```

WHEN

```

nebula> FETCH PROP ON player "player101" YIELD properties(vertex);
+-----+
| properties(VERTEX)           |
+-----+
| {age: 36, name: "Tony Parker"} |
+-----+


nebula> UPSERT VERTEX ON player "player101" \
    SET age = age + 2 \
    WHEN name == "Tony Parker" \
    YIELD name AS Name, age AS Age;
+-----+-----+
| Name        | Age   |
+-----+-----+
| "Tony Parker" | 38   |
+-----+-----+

```

WHEN

```
nebula> FETCH PROP ON player "player101" YIELD properties(vertex);
```

```
| properties(VERTEX)      |
+-----+
| {age: 38, name: "Tony Parker"} |
+-----+

nebula> UPSERT VERTEX ON player "player101" \
    SET age = age + 2 \
    WHEN name == "Someone else" \
    YIELD name AS Name, age AS Age;
+-----+-----+
| Name      | Age   |
+-----+-----+
| "Tony Parker" | 38  |
+-----+-----+
```

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## 4.12

### 4.12.1 INSERT EDGE

`INSERT EDGE` NebulaGraph `src_vid` `dst_vid`

`INSERT EDGE` Edge type `rank`

```
INSERT EDGE [IF NOT EXISTS] <edge_type> ( <prop_name_list> ) VALUES
<src_vid> -> <dst_vid>[@<rank>] : ( <prop_value_list> )
[ , <src_vid> -> <dst_vid>[@<rank>] : ( <prop_value_list> ), ... ];

<prop_name_list> ::= 
[ <prop_name> [, <prop_name> ] ...]

<prop_value_list> ::= 
[ <prop_value> [, <prop_value> ] ...]
```

- `IF NOT EXISTS` IF NOT EXISTS



#### Note

- `IF NOT EXISTS` <rank>
- `IF NOT EXISTS`

- `<edge_type>` Edge type Edge type Edge type CREATE EDGE

- `<prop_name_list>`

- `src_vid` ID

- `dst_vid` ID

- `rank` rank 0



openCypher rank

- `<prop_value_list>` prop\_name\_list Edge type Edge type NOT NULL  
CREATE EDGE

```
# 
nebula> CREATE EDGE IF NOT EXISTS e1();
nebula> INSERT EDGE e1 () VALUES "10"->"11":();

#      rank 1
nebula> INSERT EDGE e1 () VALUES "10"->"11"@1:();
```

```
nebula> CREATE EDGE IF NOT EXISTS e2 (name string, age int);
nebula> INSERT EDGE e2 (name, age) VALUES "11"->"13":("n1", 1);

#      2
nebula> INSERT EDGE e2 (name, age) VALUES \
"12"->"13":("n1", 1), "13"->"14":("n2", 2);
```

```
#      "a13"    int
nebula> INSERT EDGE e2 (name, age) VALUES "11"->"13":("n1", "a13");
```

```
#  
nebula> INSERT EDGE e2 (name, age) VALUES "11"->"13":("n1", 12);  
nebula> INSERT EDGE e2 (name, age) VALUES "11"->"13":("n1", 13);  
nebula> INSERT EDGE e2 (name, age) VALUES "11"->"13":("n1", 14);  
nebula> FETCH PROP ON e2 "11"->"13" YIELD edge AS e;  
+-----+  
| e |  
+-----+  
| [:e2 "11"->"13" @0 {age: 14, name: "n1"}] |  
+-----+
```

IF NOT EXISTS

```
#  
nebula> INSERT EDGE e2 (name, age) VALUES "14"->"15">@1:(n1", 12);  
# IF NOT EXISTS  
nebula> INSERT EDGE IF NOT EXISTS e2 (name, age) VALUES "14"->"15">@1:(n2", 13);  
nebula> FETCH PROP ON e2 "14"->"15">@1 YIELD edge AS e;  
+-----+  
| e |  
+-----+  
| [:e2 "14"->"15" @1 {age: 12, name: "n1"}] |  
+-----+
```

## Note

- NebulaGraph 3.3.0      Dangling edge      <edgetype>.\_src    <edgetype>.\_dst      VID
  - 
  - edge conflict
  - INSERT      INSERT      INSERT      storaged      INSERT      storaged      INSERT
- 

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## 4.12.2 DELETE EDGE

DELETE EDGE

DELETE VERTEX

```
DELETE EDGE <edge_type> <src_vid> -> <dst_vid>[@<rank>] [, <src_vid> -> <dst_vid>[@<rank>] ...]
```



rank      rank 0      rank

```
nebula> DELETE EDGE serve "player100" -> "team204"@0;
```

```
#           rank
nebula> GO FROM "player100" OVER follow \
    WHERE dst(edge) == "team204" \
    YIELD src(edge) AS src, dst(edge) AS dst, rank(edge) AS rank \
    | DELETE EDGE follow $-.src -> $-.dst @ $-.rank;
```

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### 4.12.3 UPDATE EDGE

UPDATE EDGE      Edge type

NebulaGraph    CAS compare and swap

```
UPDATE EDGE ON <edge_type>
<src_vid> -> <dst_vid> [@<rank>]
SET <update_prop>
[WHEN <condition>]
[YIELD <output>]
```

ON <edge_type>	Edge type	Edge type	ON serve
<src_vid>	ID		"player100"
<dst_vid>	ID		"team204"
<rank>	rank		10
SET <update_prop>			SET start_year = start_year +1
WHEN <condition>	<condition>	false SET	WHEN end_year < 2010
YIELD <output>			YIELD start_year AS Start_Year

```
// GO
nebula> GO FROM "player100" \
OVER serve \
YIELD properties(edge).start_year, properties(edge).end_year;
+-----+-----+
| properties(EDGE).start_year | properties(EDGE).end_year |
+-----+-----+
| 1997 | 2016 |
+-----+-----+

// start_year    end_year    start_year

nebula> UPDATE EDGE ON serve "player100" -> "team204"@0 \
SET start_year = start_year + 1 \
WHEN end_year > 2010 \
YIELD start_year, end_year;
+-----+-----+
| start_year | end_year |
+-----+-----+
| 1998 | 2016 |
+-----+-----+
```

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#### 4.12.4 UPSERT EDGE

UPSERT EDGE      UPDATE | INSERT

UPSERT EDGE      INSERT      UPSERT



UPSERT      UPDATE | INSERT

```
UPSERT EDGE ON <edge_type>
<src_vid> -> <dst_vid> [<rank>]
SET <update_prop>
[WHEN <condition>]
[YIELD <properties>]
```

ON <edge_type>	Edge type	Edge type	ON serve
<src_vid>	ID		"player100"
<dst_vid>	ID		"team204"
<rank>	rank		10
SET <update_prop>			SET start_year = start_year +1
WHEN <condition>			WHEN end_year < 2010
YIELD <output>			YIELD start_year AS Start_Year

WHEN      SET

- SET
- 
- 

- Edge type serve      start\_year      end\_year
- SET      end\_year = 2021

WHEN	start_year	end_year
		2021
	NULL	2021
		2021
	NULL	2021

```
//      serve      "Empty set"      serve
nebula> GO FROM "player666", "player667", "player668" \
OVER serve \
```

```

    YIELD properties(edge).start_year, properties(edge).end_year;
+-----+
| properties(EDGE).start_year | properties(EDGE).end_year |
+-----+
+-----+
Empty set

nebula> UPSERT EDGE on serve \
    "player666" -> "team200"@0 \
    SET end_year = 2021 \
    WHEN end_year == 2010 \
    YIELD start_year, end_year;
+-----+
| start_year | end_year |
+-----+
| __NULL__ | 2021 |
+-----+

nebula> UPSERT EDGE on serve \
    "player666" -> "team200"@0 \
    SET end_year = 2022 \
    WHEN end_year == 2010 \
    YIELD start_year, end_year;
+-----+
| start_year | end_year |
+-----+
| __NULL__ | 2021 |
+-----+

nebula> UPSERT EDGE on serve \
    "player667" -> "team200"@0 \
    SET end_year = 2022 \
    YIELD start_year, end_year;
+-----+
| start_year | end_year |
+-----+
| __NULL__ | 2022 |
+-----+

nebula> UPSERT EDGE on serve \
    "player668" -> "team200"@0 \
    SET start_year = 2000, end_year = end_year + 1 \
    YIELD start_year, end_year;
+-----+
| start_year | end_year |
+-----+
| 2000 | __NULL__ |
+-----+

```

end_year	end_year	NULL	end_year = end_year + 1	NULL	end_year	end_year = end_year + 1
----------	----------	------	-------------------------	------	----------	-------------------------

```

nebula> CREATE EDGE IF NOT EXISTS serve_with_default(start_year int, end_year int DEFAULT 2010);
Execution succeeded

nebula> UPSERT EDGE on serve_with_default \
    "player668" -> "team200" \
    SET end_year = end_year + 1 \
    YIELD start_year, end_year;
+-----+
| start_year | end_year |
+-----+
| __NULL__ | 2011 |
+-----+

```

### WHEN

```

nebula> MATCH (v:player{name:"Ben Simmons"})-[e:serve]-(v2) \
    RETURN e;
+-----+
| e |
+-----+
| [:serve "player149"->"team219" @0 {end_year: 2019, start_year: 2016}] |
+-----+

nebula> UPSERT EDGE on serve \
    "player149" -> "team219" \
    SET end_year = end_year + 1 \
    WHEN start_year == 2016 \
    YIELD start_year, end_year;
+-----+
| start_year | end_year |
+-----+
| 2016 | 2020 |
+-----+

```

WHEN

```
nebula> MATCH (v:player{name:"Ben Simmons"})-[e:serve]-(v2) \
    RETURN e;
+-----+
| e |
+-----+
| [:serve "player149"->"team219" @0 {end_year: 2020, start_year: 2016}] |
+-----+  
  
nebula> UPSERT EDGE on serve \
    "player149" -> "team219" \
    SET end_year = end_year + 1 \
    WHEN start_year != 2016 \
    YIELD start_year, end_year;
+-----+-----+
| start_year | end_year |
+-----+-----+
| 2016       | 2020       |
+-----+-----+
```

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## 4.13

### 4.13.1

NebulaGraph

NebulaGraph

- Tag Edge type
- REBUILD INDEX
- Tag Edge type Tag Edge type
- CREATE INDEX
- SHOW CREATE INDEX
- SHOW INDEXES
- DESCRIBE INDEX
- REBUILD INDEX
- SHOW INDEX STATUS
- DROP INDEX
- LOOKUP
- MATCH

Elastic Search

- 
- 256
- AND OR NOT

Note

listener

Elasticsearch

Elasticsearch

**NULL**

NULL

Cypher

Constrains

MySQL

nGQL

---

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## 4.13.2 CREATE INDEX

Tag Edge type      Tag Edge type      **CREATE TAG**    **CREATE EDGE**

LOOKUP MATCH

**CREATE INDEX**      Tag EdgeType      "Tag" "Edge type" "

- Tag Edge type      Tag Edge type      LOOKUP Tag player

- " "      age age == 19

Tag T A      i\_TA      Edge type

- i\_TA i\_T

- MATCH i\_T i\_TA

- LOOKUP i\_T i\_TA



LOOKUP Tag Edge type



Storage

256

1. NebulaGraph
- 2.
- 3.
4. **LOOKUP** **MATCH**      NebulaGraph



--disable\_auto\_compaction = false

LOOKUP REBUILD INDEX )

2 20

can't find xxx in the space

heartbeat\_interval\_secs

NebulaGraph



REBUILD INDEX    MATCH    LOOKUP

```
CREATE {TAG | EDGE} INDEX [IF NOT EXISTS] <index_name> ON {<tag_name> | <edge_name>} ([<prop_name_list>]) [COMMENT '<comment>'];
```

TAG | EDGE

IF NOT EXISTS

<index\_name>

iTagName\_propName

1~4    UTF-8

<tag\_name> | Tag   Edge  
<edge\_name>

<prop\_name\_list>    prop\_name(length)    Tag   Edge type    <prop\_name\_list>

COMMENT    256

### Tag/Edge type

```
nebula> CREATE TAG INDEX player_index on player();
```

```
nebula> CREATE EDGE INDEX follow_index on follow();
```

Tag   Edge type	LOOKUP	Tag	VID	VID	VID	rank	LOOKUP
-----------------	--------	-----	-----	-----	-----	------	--------

```
nebula> CREATE TAG INDEX IF NOT EXISTS player_index_0 on player(name(10));
```

Tag player	name	10	name	10
------------	------	----	------	----

```
#  
nebula> CREATE TAG IF NOT EXISTS var_string(p1 string);  
nebula> CREATE TAG INDEX IF NOT EXISTS var ON var_string(p1(10));  
  
#  
nebula> CREATE TAG IF NOT EXISTS fix_string(p1 FIXED_STRING(10));  
nebula> CREATE TAG INDEX IF NOT EXISTS fix ON fix_string(p1);
```

```
nebula> CREATE EDGE INDEX IF NOT EXISTS follow_index_0 on follow(degree);
```

Tag   Edge type)

```
nebula> CREATE TAG INDEX IF NOT EXISTS player_index_1 on player(name(10), age);
```



Tag   Edge type

**Note**

" " ..

---

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### 4.13.3 SHOW INDEXES

```
SHOW INDEXES          Tag    Edge type
```

```
SHOW {TAG | EDGE} INDEXES;
```

```
nebula> SHOW TAG INDEXES;
+-----+-----+-----+
| Index Name | By Tag   | Columns      |
+-----+-----+-----+
| "fix"       | "fix_string" | ["p1"]        |
| "player_index_0" | "player" | ["name"]      |
| "player_index_1" | "player" | ["name", "age"] |
| "var"        | "var_string" | ["p1"]        |
+-----+-----+-----+

nebula> SHOW EDGE INDEXES;
+-----+-----+-----+
| Index Name | By Edge  | Columns      |
+-----+-----+-----+
| "follow_index" | "follow" | []           |
+-----+-----+-----+
```

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#### 4.13.4 SHOW CREATE INDEX

SHOW CREATE INDEX Tag Edge type nGQL

```
SHOW CREATE {TAG | EDGE} INDEX <index_name>;
```

SHOW TAG INDEXES Tag SHOW CREATE TAG INDEX

```
nebula> SHOW TAG INDEXES;
+-----+-----+-----+
| Index Name | By Tag | Columns |
+-----+-----+-----+
| "player_index_0" | "player" | [] |
| "player_index_1" | "player" | ["name"] |
+-----+-----+-----+
nebula> SHOW CREATE TAG INDEX player_index_1;
+-----+-----+
| Tag Index Name | Create Tag Index |
+-----+-----+
| "player_index_1" | "CREATE TAG INDEX `player_index_1` ON `player` ( `name` (20) )"
+-----+-----+
```

#### Edge type

```
nebula> SHOW EDGE INDEXES;
+-----+-----+-----+
| Index Name | By Edge | Columns |
+-----+-----+-----+
| "follow_index" | "follow" | [] |
+-----+-----+-----+
nebula> SHOW CREATE EDGE INDEX follow_index;
+-----+-----+
| Edge Index Name | Create Edge Index |
+-----+-----+
| "follow_index" | "CREATE EDGE INDEX `follow_index` ON `follow` ()" |
+-----+-----+
```

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#### 4.13.5 DESCRIBE INDEX

DESCRIBE INDEX	Field	Type
----------------	-------	------

```
DESCRIBE {TAG | EDGE} INDEX <index_name>;
```

```
nebula> DESCRIBE TAG INDEX player_index_0;
+-----+
| Field | Type      |
+-----+
| "name" | "fixed_string(30)" |
+-----+

nebula> DESCRIBE TAG INDEX player_index_1;
+-----+
| Field | Type      |
+-----+
| "name" | "fixed_string(10)" |
| "age"  | "int64"   |
+-----+
```

---

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## 4.13.6 REBUILD INDEX



- **—** **LOOKUP** **MATCH**
- 

### CREATE INDEX



`rebuild_index_part_rate_limit` `rebuild_index_batch_size`

Storage

```
REBUILD {TAG | EDGE} INDEX [<index_name_list>];

<index_name_list>::=
    [index_name [, index_name] ...]
```

- ,
- **SHOW {TAG | EDGE} INDEX STATUS** **SHOW INDEX STATUS**

```
nebula> CREATE TAG IF NOT EXISTS person(name string, age int, gender string, email string);
nebula> CREATE TAG INDEX IF NOT EXISTS single_person_index ON person(name(10));

#      ID
nebula> REBUILD TAG INDEX single_person_index;
+-----+
| New Job Id |
+-----+
| 31          |
+-----+

#
nebula> SHOW TAG INDEX STATUS;
+-----+-----+
| Name           | Index Status |
+-----+-----+
| "single_person_index" | "FINISHED"   |
+-----+-----+

#      SHOW JOB <job_id>
nebula> SHOW JOB 31;
+-----+-----+-----+-----+-----+-----+
| Job Id(TaskId) | Command(Dest)     | Status       | Start Time        | Stop Time        | Error Code   |
+-----+-----+-----+-----+-----+-----+
| 31            | "REBUILD_TAG_INDEX" | "FINISHED"   | 2021-07-07T09:04:24.000 | 2021-07-07T09:04:24.000 | "SUCCEEDED"  |
| 0            | "storaged1"       | "FINISHED"   | 2021-07-07T09:04:24.000 | 2021-07-07T09:04:28.000 | "SUCCEEDED"  |
| 1            | "storaged2"       | "FINISHED"   | 2021-07-07T09:04:24.000 | 2021-07-07T09:04:28.000 | "SUCCEEDED"  |
| 2            | "storaged0"       | "FINISHED"   | 2021-07-07T09:04:24.000 | 2021-07-07T09:04:28.000 | "SUCCEEDED"  |
| "Total:3"    | "Succeeded:3"     | "Failed:0"    | "In Progress:0"      | ""              | ""          |
+-----+-----+-----+-----+-----+-----+
```

NebulaGraph

ID **SHOW JOB <job\_id>**

**SHOW JOB**

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## 4.13.7 SHOW INDEX STATUS

```
SHOW INDEX STATUS
```

- QUEUE
- RUNNING
- FINISHED
- FAILED
- STOPPED
- INVALID



### CREATE INDEX

```
SHOW {TAG | EDGE} INDEX STATUS;
```

```
nebula> SHOW TAG INDEX STATUS;
+-----+-----+
| Name      | Index Status |
+-----+-----+
| "player_index_0"    | "FINISHED"   |
| "player_index_1"    | "FINISHED"   |
+-----+-----+
```

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## 4.13.8 DROP INDEX

DROP INDEX

DROP INDEX

DROP TAG INDEX    DROP EDGE INDEX

```
DROP {TAG | EDGE} INDEX [IF EXISTS] <index_name>;
```

IF EXISTS

```
nebula> DROP TAG INDEX player_index_0;
```

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## 4.14

---

### 4.14.1



16

- LOOKUP
  - 
  - 256
  - Tag/Edge type
  - Tag/Edge type                  Tag/Edge type
  - Tag/Edge type
  - String
  - Tag/Edge type
  - 
  - NULL
  - Elasticsearch                  NebulaGraph                  text search not found
  - Elasticsearch
  - 
  - WHERE
  - 
  - Elasticsearch        NebulaGraph        Elasticsearch
  - ' \        Elasticsearch
  - NebulaGraph        listener        Elasticsearch
  - K8s        NebulaGraph
- 

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## 4.14.2

NebulaGraph

Elasticsearch

Elasticsearch

listener

Elasticsearch

### Elasticsearch

Elasticsearch

Kubernetes

Elasticsearch

Elasticsearch

Elasticsearch

NebulaGraph



ES 7.8    ES

Elasticsearch

ES

```
{
  "template": "nebula*",
  "settings": {
    "index": {
      "number_of_shards": 3,
      "number_of_replicas": 1
    }
  },
  "mappings": {
    "properties" : {
      "tag_id" : { "type" : "long" },
      "column_id" : { "type" : "text" },
      "value" :{ "type" : "keyword"}
    }
  }
}
```

```
"template": "nebula*"
"tag_id" : { "type" : "long" },
"column_id" : { "type" : "text" },
"value" :{ "type" : "keyword"}
```



nebula

```
curl -H "Content-Type: application/json; charset=utf-8" -XPUT http://127.0.0.1:9200/_template/nebula_index_template -d '
{
  "template": "nebula*",
  "settings": {
    "index": {
      "number_of_shards": 3,
      "number_of_replicas": 1
    }
  },
  "mappings": {
    "properties" : {
      "tag_id" : { "type" : "long" },
      "column_id" : { "type" : "text" },
      "value" :{ "type" : "keyword"}
    }
  }
}'
```

Elasticsearch

Elasticsearch

Elasticsearch

Elasticsearch

SIGN IN

Elasticsearch

Elasticsearch

IP

elastic\_ip:port

```
SIGN IN TEXT SERVICE (<elastic_ip:port>, {HTTP | HTTPS} [, "<username>", "<password>"] [, (<elastic_ip:port>, ...)];
```

```
nebula> SIGN IN TEXT SERVICE (127.0.0.1:9200, HTTP);
```



Elasticsearch

SIGN IN

```
SHOW TEXT SEARCH CLIENTS
```

```
SHOW TEXT SEARCH CLIENTS;
```

```
nebula> SHOW TEXT SEARCH CLIENTS;
+-----+-----+
| Host      | Port |
+-----+-----+
| "127.0.0.1" | 9200 |
+-----+-----+
```

```
SIGN OUT TEXT SERVICE
```

```
SIGN OUT TEXT SERVICE;
```

```
nebula> SIGN OUT TEXT SERVICE;
```

---

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#### 4.14.3 Raft listener

Elasticsearch	Storage	Raft listener	listener	Storage	Elasticsearch
•					
• NebulaGraph					
• Elasticsearch					
• Raft listener					
• NebulaGraph Metad Storage Graphd listener					
• " listener " listener listener listener					
<b>STORAGE</b>					
listener storaged		listener	NebulaGraph	Storage	RPM
DEB NebulaGraph					
<b>LISTENER</b>					
listener	nebula-storaged-listener.conf		etc		.production
<b>Storage</b>					
daemonize	true				
pid_file	pids_listener/nebula-storaged.pid	ID			
meta_server_addrs	-	Meta	IP	Meta	,
local_ip	-	listener	IP		
port	-	listener	RPC		
heartbeat_interval_secs	10	Meta	s		
listener_path	data/listener	listener	WAL		
data_path	data		data		
part_man_type	memory	memory	meta		
rocksdb_batch_size	4096				
rocksdb_block_cache	4	BlockBasedTable	MB		
engine_type	rocksdb	rocksdb	memory		
part_type	simple	simple	consensus		

 Note

listener IP 127.0.0.1

**LISTENER**

listener

```
./bin/nebula-storaged --flagfile <listener_config_path>/nebula-storaged-listener.conf
```

listener\_config\_path listener

**LISTENER NEBULAGRAPH**

NebulaGraph USE <space> listener

```
ADD LISTENER ELASTICSEARCH <listener_ip:port> [<listener_ip:port>, ...]
```

 Warning

listener IP

listener

```
nebula> ADD LISTENER ELASTICSEARCH 192.168.8.5:9789,192.168.8.6:9789;
```

**listener**

SHOW LISTENER listener

```
nebula> SHOW LISTENER;
+-----+-----+-----+
| PartId | Type      | Host          | Status   |
+-----+-----+-----+
| 1      | "ELASTICSEARCH" | "[192.168.8.5:46780]" | "ONLINE" |
| 2      | "ELASTICSEARCH" | "[192.168.8.5:46780]" | "ONLINE" |
| 3      | "ELASTICSEARCH" | "[192.168.8.5:46780]" | "ONLINE" |
+-----+-----+-----+
```

**listener**

REMOVE LISTENER ELASTICSEARCH listener

```
nebula> REMOVE LISTENER ELASTICSEARCH;
```

 Danger

listener listener ES

listener Elasticsearch

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#### 4.14.4

LOOKUP WHERE

## listener

```
Durant Tim Duncan David Beckham      player.name      LOOKUP ON player WHERE PREFIX(player.name,"d");
```

```
CREATE FULLTEXT {TAG | EDGE} INDEX <index_name> ON {<tag_name> | <edge_name>} ([<prop_name_list>]);
```

```
SHOW FULLTEXT INDEXES;
```

## REBUILD FULLTEXT INDEX:

```
DROP FULLTEXT INDEX <index_name>;
```

LOOKUP ON {<tag> | <edge type>} WHERE <expression> [YIELD <return list>];

<expression> ::=  
PREFIX | WILDCARD | REGEXP | FUZZY

```
<return_list>
    <prop_name> [AS <prop_alias>] [, <prop_name> [AS <prop_alias>]] ...
```

- PREFIX(schema\_name.prop\_name, prefix\_string, row\_limit, timeout)
  - WILDCARD(schema\_name.prop\_name, wildcard\_string, row\_limit, timeout)
  - REGEXP(schema\_name.prop\_name, regexp\_string, row\_limit, timeout)
  - FUZZY(schema\_name.prop\_name, fuzzy\_string, fuzziness, operator, row\_limit, timeout)
    - fuzziness AUTO Elasticsearch
    - operator OR and
    - row\_limit 100
    - timeout ms 200

```

// nebula> CREATE SPACE IF NOT EXISTS basketballplayer (partition_num=3,replica_factor=1, vid_type=fixed_string(30));
//
// nebula> SIGN IN TEXT SERVICE (127.0.0.1:9200, HTTP);
//
// nebula> SHOW TEXT SEARCH CLIENTS;
//
// nebula> USE basketballplayer;
//
//   listener    NebulaGraph
nebula> ADD LISTENER ELASTICSEARCH 192.168.8.5:9789;
//
//   listener    Online
nebula> SHOW LISTENER;
//
//   Tag
nebula> CREATE TAG IF NOT EXISTS player(name string, age int);
//
// nebula> CREATE TAG INDEX IF NOT EXISTS name ON player(name(20));
//
// nebula> REBUILD TAG INDEX;
//
//           `nebula`
nebula> CREATE FULLTEXT TAG INDEX nebula_index_1 ON player(name);
//
// nebula> REBUILD FULLTEXT INDEX;
//
// nebula> SHOW FULLTEXT INDEXES;
+-----+-----+-----+-----+
| Name      | Schema Type | Schema Name | Fields |
+-----+-----+-----+-----+
| "nebula_index_1" | "Tag"      | "player"     | "name"  |
+-----+-----+-----+-----+
//
nebula> INSERT VERTEX player(name, age) VALUES \
  "Russell Westbrook": ("Russell Westbrook", 30), \
  "Chris Paul": ("Chris Paul", 33), \
  "Boris Diaw": ("Boris Diaw", 36), \
  "David West": ("David West", 38), \
  "Danny Green": ("Danny Green", 31), \
  "Tim Duncan": ("Tim Duncan", 42), \
  "James Harden": ("James Harden", 29), \
  "Tony Parker": ("Tony Parker", 36), \
  "Aron Baynes": ("Aron Baynes", 32), \
  "Ben Simmons": ("Ben Simmons", 22), \
  "Blake Griffin": ("Blake Griffin", 30);

//
nebula> LOOKUP ON player WHERE PREFIX(player.name, "B") YIELD id(vertex);
+-----+
| id(VERTEX) |
+-----+
| "Boris Diaw" |
| "Ben Simmons" |
| "Blake Griffin" |
+-----+

nebula> LOOKUP ON player WHERE WILDCARD(player.name, "*ri*") YIELD player.name, player.age;
+-----+-----+
| name      | age |
+-----+-----+
| "Chris Paul" | 33 |
| "Boris Diaw" | 36 |
| "Blake Griffin" | 30 |
+-----+-----+

nebula> LOOKUP ON player WHERE WILDCARD(player.name, "*ri*") | YIELD count();
+-----+
| count(*) |
+-----+
| 3         |
+-----+-----+

nebula> LOOKUP ON player WHERE REGEXP(player.name, "R.*") YIELD player.name, player.age;
+-----+-----+
| name      | age |
+-----+-----+
| "Russell Westbrook" | 30 |
+-----+-----+

nebula> LOOKUP ON player WHERE REGEXP(player.name, ".*") YIELD id(vertex);
+-----+
| id(VERTEX) |
+-----+

```

```
+-----+
| "Danny Green"      |
| "David West"       |
| "Russell Westbrook" |
+-----+
...
nebula> LOOKUP ON player WHERE FUZZY(player.name, "Tim Dunncan", AUTO, OR) YIELD player.name;
+-----+
| name      |
+-----+
| "Tim Duncan" |
+-----+
//  
nebula> DROP FULLTEXT INDEX nebula_index_1;
```

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## 4.15

---

### 4.15.1 GET SUBGRAPH

GET SUBGRAPH

GET SUBGRAPH

```
GET SUBGRAPH [WITH PROP] [<step_count> STEPS] FROM {<vid>, <vid>...}
[{:IN | :OUT | BOTH} <edge_type>, <edge_type>...]
[WHERE <expression> [AND <expression> ...]]
YIELD [VERTICES AS <vertex_alias>] [, EDGES AS <edge_alias>];
```

- WITH PROP
- step\_count                    0 step\_count                    1
- vid                ID
- edge\_type      Edge type    IN OUT BOTH              Edge type      BOTH
- WHERE                        AND
- YIELD

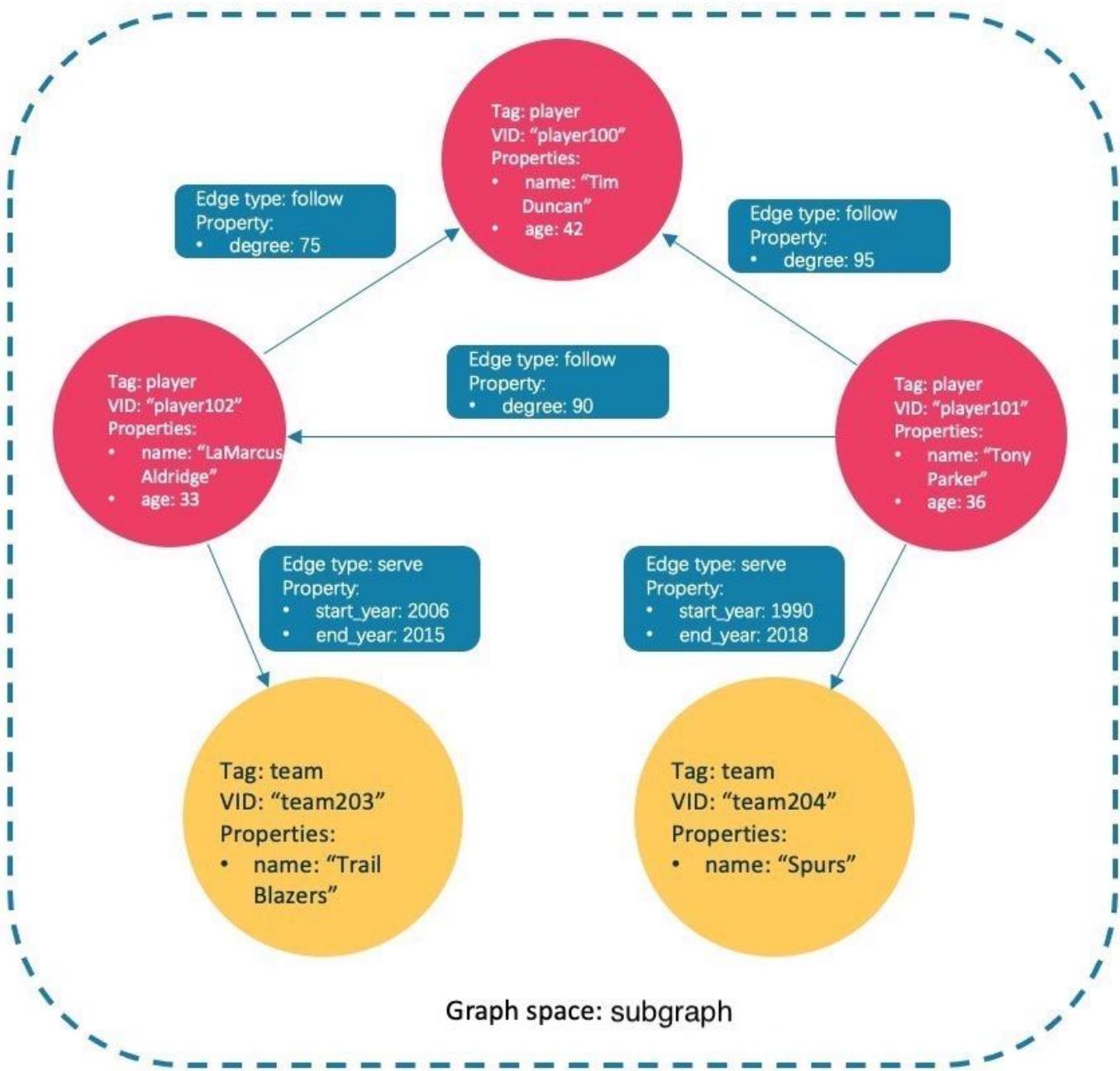


GET SUBGRAPH                  trail

#### WHERE

GET SUBGRAPH                  WHERE

- AND
- \$\$.tagName.propName
- edge\_type.propName
- 
- Schema                          geo



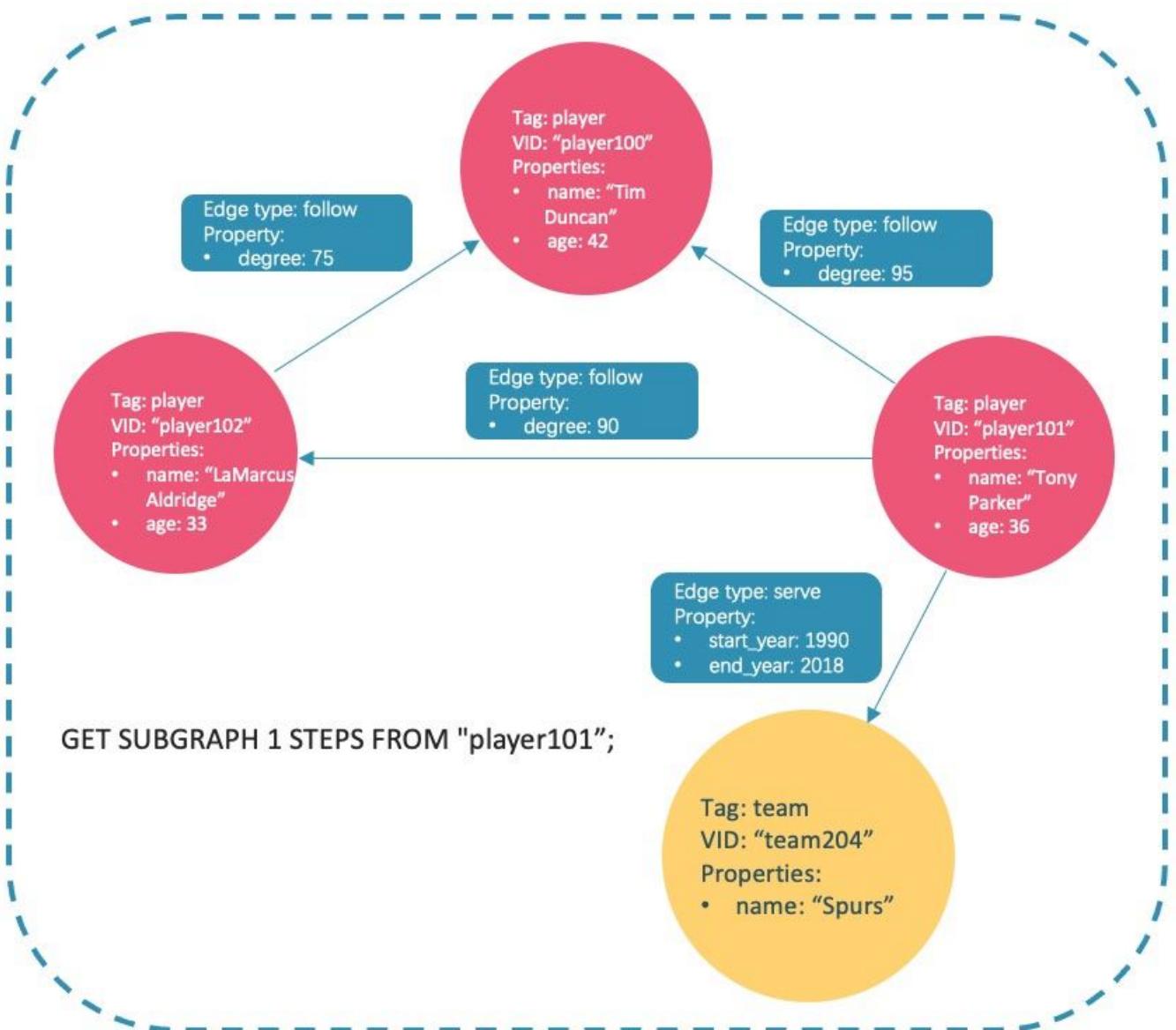
```

nebula> CREATE SPACE IF NOT EXISTS subgraph(partition_num=15, replica_factor=1, vid_type=fixed_string(30));
nebula> USE subgraph;
nebula> CREATE TAG IF NOT EXISTS player(name string, age int);
nebula> CREATE TAG IF NOT EXISTS team(name string);
nebula> CREATE EDGE IF NOT EXISTS follow(degree int);
nebula> CREATE EDGE IF NOT EXISTS serve(start_year int, end_year int);
nebula> INSERT VERTEX player(name, age) VALUES "player100":("Tim Duncan", 42);
nebula> INSERT VERTEX player(name, age) VALUES "player101":("Tony Parker", 36);
nebula> INSERT VERTEX player(name, age) VALUES "player102":("LaMarcus Aldridge", 33);
nebula> INSERT VERTEX team(name) VALUES "team203":("Trail Blazers"), "team204":("Spurs");
nebula> INSERT EDGE follow(degree) VALUES "player101" -> "player100":(95);
nebula> INSERT EDGE follow(degree) VALUES "player101" -> "player102":(90);
  
```

```
nebula> INSERT EDGE follow(degree) VALUES "player102" -> "player100":(75);
nebula> INSERT EDGE serve(start_year, end_year) VALUES "player101" -> "team204":(1999, 2018), "player102" -> "team203":(2006, 2015);
```

- player101 0~1 Edge type

```
nebula> GET SUBGRAPH 1 STEPS FROM "player101" YIELD VERTICES AS nodes, EDGES AS relationships;
+-----+
| nodes
relationships
+-----+
| [{"player101":player{}}, {"player102":player{}}, {"team204":team{}}, {"player100":player{}}, {"player101":player{}}, {"team203":team{}}, {"player102":player{}}, {"player100":player{}}]
| [:follow "player101"->"player102" @0 {}], [:serve "player101"->"team204" @0 {}], [:follow "player101"->"player100" @0 {}], [:follow "player102"->"player100" @0 {}]
| -----+
+-----+
```



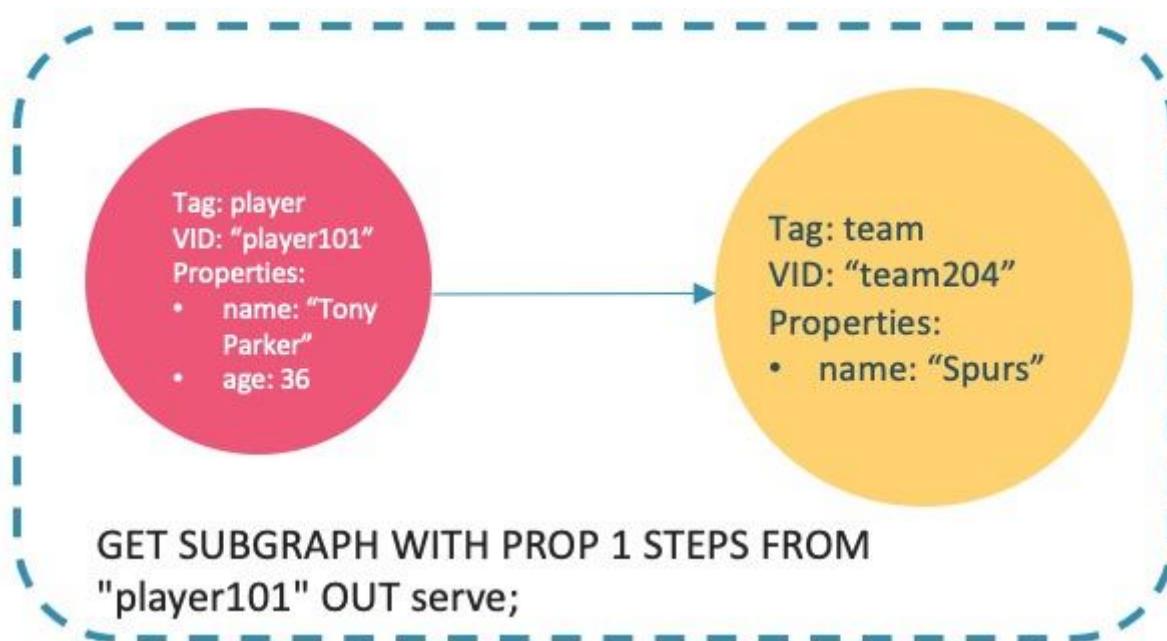
- player101 0~1 follow

```
nebula> GET SUBGRAPH 1 STEPS FROM "player101" IN follow YIELD VERTICES AS nodes, EDGES AS relationships;
+-----+-----+
| nodes | relationships |
+-----+-----+
| [{"player101":player{}}] | []
+-----+-----+
```

player101 follow player101

- player101 0~1 serve

```
nebula> GET SUBGRAPH WITH PROP 1 STEPS FROM "player101" OUT serve YIELD VERTICES AS nodes, EDGES AS relationships;
+-----+-----+
| nodes | relationships |
+-----+-----+
| [{"player101":player{age: 36, name: "Tony Parker"}}, [{"serve": "player101->team204"}], [{"team204":team{name: "Spurs"}}, []]] | []
+-----+-----+
```

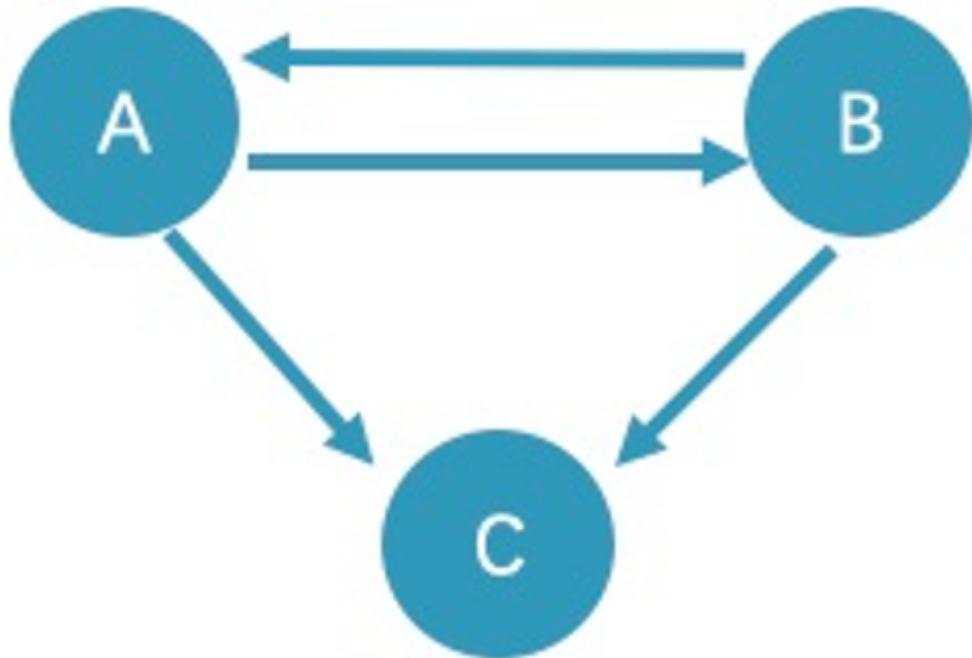


- player101 0~2 follow degree 90 30

```
nebula> GET SUBGRAPH WITH PROP 2 STEPS FROM "player101" \
    WHERE follow.degree > 90 AND $$ .player.age > 30 \
    YIELD VERTICES AS nodes, EDGES AS relationships;
+-----+-----+
| nodes | relationships |
|-----+-----+
| [{"player101":player{age: 36, name: "Tony Parker"}}, [{"follow": "player101->player125"}, [{"follow": "player101->player100"}], [{"follow": "player100->player101"}, {"follow": "player100->player125"}], [{"follow": "player125->player101"}, {"follow": "player125->player100"}]] | []
+-----+-----+
```

FAQ

## STEP\_COUNT



- GET SUBGRAPH 1 STEPS FROM "A"; A->B B->A A->C B->C
  - GET SUBGRAPH 1 STEPS FROM "A" IN follow; B->A A->B

MATCH GO

```
nebula> MATCH p= (v:player) -- (v2) WHERE id(v)=="A" RETURN p;  
nebula> GO 1 STEPS FROM "A" OVER follow YIELD src(edge).dst(edge);
```

STEP COUNT

```
nebula> GET SUBGRAPH 100 STEPS FROM "player101" OUT follow YIELD VERTICES AS nodes, EDGES AS relationships;
+-----+-----+
| nodes | relationships |
+-----+-----+
| [{"player101" :player{}}] | [[::follow "player101"->"player100" @0 {}], [::follow "player101"->"player102" @0 {}]] |
| [{"player100" :player{}}, {"player102" :player{}}] | [[::follow "player102"->"player100" @0 {}]] |
+-----+-----+
```

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## 4.15.2 FIND PATH

FIND PATH

### Note

nebula-graphd.conf	num_operator_threads	FIND PATH	num_operator_threads	2 ~ 10	Graph	CPU
Graph	CPU	Graph				

```

FIND { SHORTEST | ALL | NOLOOP } PATH [WITH PROP] FROM <vertex_id_list> TO <vertex_id_list>
OVER <edge_type_list> [REVERSELY | BIDIRECT]
[<WHERE clause>] [UPTO <N> STEPS]
YIELD path as <alias>
[| ORDER BY $-.path] [| LIMIT <M>];

<vertex_id_list> ::= 
    [vertex_id [, vertex_id] ...]

```

- SHORTEST
- ALL
- NOLOOP
- WITH PROP
- <vertex\_id\_list> ID , \$- \$var
- <edge\_type\_list> Edge type , \* Edge type
- REVERSELY | BIDIRECT REVERSELY BIDIRECT
- <WHERE clause> WHERE
- <N> 5
- <M>

### Note

FIND PATH trail

- 
- 
- WHERE
- graphd

```
(<vertex_id>)-[:<edge_type_name>@<rank>]->(<vertex_id>)
```

```

nebula> FIND SHORTEST PATH FROM "player102" TO "team204" OVER * YIELD path AS p;
+-----+
| p |
+-----+

```

```

| <("player102")-[:serve@0 {}]->("team204")> |
+-----+
nebula> FIND SHORTEST PATH WITH PROP FROM "team204" TO "player100" OVER * REVERSELY YIELD path AS p;
+-----+
| p |
+-----+
| <("team204" :team{name: "Spurs"})-<[:serve@0 {end_year: 2016, start_year: 1997}]-("player100" :player{age: 42, name: "Tim Duncan"})> |
+-----+


nebula> FIND ALL PATH FROM "player100" TO "team204" OVER * WHERE follow.degree is EMPTY or follow.degree >=0 YIELD path AS p;
+-----+
| p |
+-----+
| <"player100"-[:serve@0 {}]->("team204")> |
| <"player100"-[:follow@0 {}]->("player125")-[:serve@0 {}]->("team204")> |
| <"player100"-[:follow@0 {}]->("player101")-[:serve@0 {}]->("team204")> |
| ... |
+-----+


nebula> FIND NOLOOP PATH FROM "player100" TO "team204" OVER * YIELD path AS p;
+-----+
| p |
+-----+
| <("player100")-[:serve@0 {}]->("team204")> |
| <("player100")-[:follow@0 {}]->("player125")-[:serve@0 {}]->("team204")> |
| <("player100")-[:follow@0 {}]->("player101")-[:serve@0 {}]->("team204")> |
| <("player100")-[:follow@0 {}]->("player101")-[:follow@0 {}]->("player125")-[:serve@0 {}]->("team204")> |
| <("player100")-[:follow@0 {}]->("player101")-[:follow@0 {}]->("player102")-[:serve@0 {}]->("team204")> |
| ... |
+-----+

```

## FAQ

WHERE

WHERE

WHERE follow.degree is EMPTY or follow.degree >= 0

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## 4.16

### 4.16.1 EXPLAIN PROFILE

```
EXPLAIN      nGQL          nGQL  
PROFILE      nGQL
```

NebulaGraph

```
nGQL      action  action          action          action      operator  
SHOW TAGS    action  operator  Start  ShowTags    GO        10      action
```

- EXPLAIN

```
EXPLAIN [format= {"row" | "dot"}] <your_nGQL_statement>;
```

- PROFILE

```
PROFILE [format= {"row" | "dot"}] <your_nGQL_statement>;
```

```
EXPLAIN PROFILE      row      dot      format
```

**row****row**

- EXPLAIN

```
nebula> EXPLAIN format="row" SHOW TAGS;
Execution succeeded (time spent 327/892 us)
```

Execution Plan

id   name	dependencies	profiling data	operator info	
1   ShowTags   0			outputVar: [{"colNames":[], "name": "__ShowTags_1", "type": "DATASET"}]	
			inputVar:	

id   name	dependencies	profiling data	operator info	
0   Start   0			outputVar: [{"colNames":[], "name": "__Start_0", "type": "DATASET"}]	
			inputVar:	

- PROFILE

```
nebula> PROFILE format="row" SHOW TAGS;
+-----+
| Name |
+-----+
| player |
| team |
+-----+
Got 2 rows (time spent 2038/2728 us)
```

Execution Plan

id   name	dependencies	profiling data	operator info	
1   ShowTags   0		ver: 0, rows: 1, execTime: 42us, totalTime: 1177us	outputVar: [{"colNames":[], "name": "__ShowTags_1", "type": "DATASET"}]	
			inputVar:	

id   name	dependencies	profiling data	operator info	
0   Start   0		ver: 0, rows: 0, execTime: 1us, totalTime: 57us	outputVar: [{"colNames":[], "name": "__Start_0", "type": "DATASET"}]	
			inputVar:	

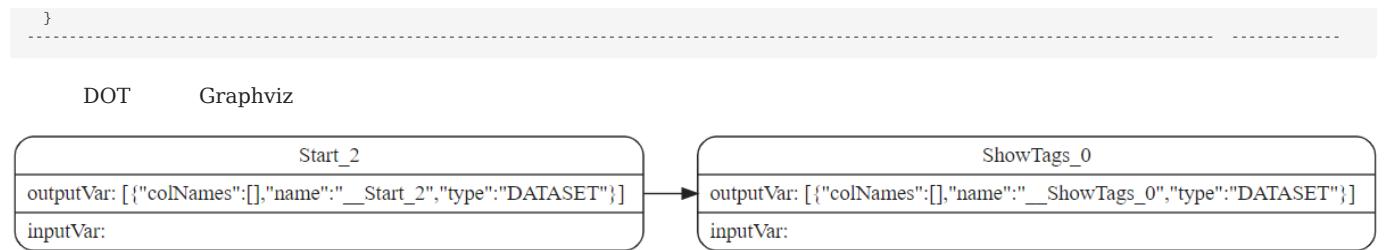
id	operator	ID
name	operator	
dependencies	operator	operator ID
profiling data	ver	operator rows operator execTime action totalTime action
operator info	operator	

**dot****dot****Graphviz****Graphviz****DOT****Graphviz****DOT****SVG JSON****Graphviz Online**

```
nebula> EXPLAIN format="dot" SHOW TAGS;
Execution succeeded (time spent 161/665 us)
Execution Plan
```

plan

```
graph TD
    rankdir=LR;
    "ShowTags_0"["ShowTags_0|outputVar: \[\{\\"colNames\":[\], \"name\": \"__ShowTags_0\", \"type\": \"DATASET\"\}\]\1|inputVar:\1", shape=Mrecord];
    "Start_2" --> "ShowTags_0";
    "Start_2"["Start_2|outputVar: \[\{\\"colNames\":[\], \"name\": \"__Start_2\", \"type\": \"DATASET\"\}\]\1|inputVar: \1", shape=Mrecord];
```



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## 4.16.2

KILL QUERY



God

```
KILL QUERY (session=<session_id>, plan=<plan_id>);
```

- session\_id ID
- plan\_id ID

ID ID SHOW QUERIES

```
nebula> KILL QUERY(SESSION=1625553545984255,PLAN=163);
```

```
[ERROR (-1005)]: ExecutionPlanId[1001] does not exist in current Session.
```

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## 4.17

Storage

COMPACT FLUSH STATS

**Note**

### 4.17.1 SUBMIT JOB COMPACT

SUBMIT JOB COMPACT      RocksDB      compact

compact      Storage

```
nebula> SUBMIT JOB COMPACT;
+-----+
| New Job Id |
+-----+
| 40          |
+-----+
```

### 4.17.2 SUBMIT JOB FLUSH

SUBMIT JOB FLUSH      RocksDB memfile

```
nebula> SUBMIT JOB FLUSH;
+-----+
| New Job Id |
+-----+
| 96          |
+-----+
```

### 4.17.3 SUBMIT JOB STATS

SUBMIT JOB STATS      SHOW STATS      SHOW STATS

**Note**

SUBMIT JOB STATS

```
nebula> SUBMIT JOB STATS;
+-----+
| New Job Id |
+-----+
| 9           |
+-----+
```

### 4.17.4 SUBMIT JOB DOWNLOAD/INGEST

SUBMIT JOB DOWNLOAD HDFS      SUBMIT JOB INGEST      SST      NebulaGraph      SST

SUBMIT JOB DOWNLOAD HDFS      HDFS      SST

SUBMIT JOB INGEST      SST

```
nebula> SUBMIT JOB DOWNLOAD HDFS "hdfs://192.168.10.100:9000/sst";
+-----+
| New Job Id |
+-----+
| 10          |
+-----+

nebula> SUBMIT JOB INGEST;
+-----+
| New Job Id |
+-----+
| 11          |
+-----+
```

#### 4.17.5 SHOW JOB

Meta	SUBMIT JOB	nebula-storaged SHOW JOB <job_id>
		job_id SUBMIT JOB

```
nebula> SHOW JOB 9;
+-----+-----+-----+-----+-----+-----+
| Job Id( taskId ) | Command(Dest) | Status | Start Time | Stop Time | Error Code |
+-----+-----+-----+-----+-----+-----+
| 8           | "STATS"    | "FINISHED" | 2022-10-18T08:14:45.000000 | 2022-10-18T08:14:45.000000 | "SUCCEEDED" |
| 0           | "192.168.8.129" | "FINISHED" | 2022-10-18T08:14:45.000000 | 2022-10-18T08:15:13.000000 | "SUCCEEDED" |
| "Total:1"   | "Succeeded:1" | "Failed:0"  | "In Progress:0"           | ""                   | ""           |
+-----+-----+-----+-----+-----+-----+
```

Job Id( taskId )	ID	ID
Command(Dest)	nebula-storaged	
Status		
Start Time		
Stop Time	FINISHED	FAILED STOPPED
Error Code		

QUEUE	Start Time
RUNNING	Start Time
FINISHED	Stop Time
FAILED	Stop Time
STOPPED	Stop Time
REMOVED	

```
Queue -- running -- finished -- removed
 \     \
  \     \ -- failed -- /
   \     \
    \ ----- stopped -- /
```

## 4.17.6 SHOW JOBS

`SHOW JOBS`

Meta	job_expired_secs	Meta
------	------------------	------

```
nebula> SHOW JOBS;
+-----+-----+-----+-----+
| Job Id | Command      | Status    | Start Time          | Stop Time          |
+-----+-----+-----+-----+
| 34     | "STATS"       | "FINISHED" | 2021-11-01T03:32:27.000000 | 2021-11-01T03:32:27.000000 |
| 33     | "FLUSH"        | "FINISHED" | 2021-11-01T03:32:15.000000 | 2021-11-01T03:32:15.000000 |
| 32     | "COMPACT"      | "FINISHED" | 2021-11-01T03:32:06.000000 | 2021-11-01T03:32:06.000000 |
| 31     | "REBUILD_TAG_INDEX" | "FINISHED" | 2021-10-29T05:39:16.000000 | 2021-10-29T05:39:17.000000 |
| 10     | "COMPACT"      | "FINISHED" | 2021-10-26T02:27:05.000000 | 2021-10-26T02:27:05.000000 |
+-----+-----+-----+-----+
```

## 4.17.7 STOP JOB

`STOP JOB <job_id>`

```
nebula> STOP JOB 22;
+-----+
| Result      |
+-----+
| "Job stopped" |
+-----+
```

## 4.17.8 RECOVER JOB

RECOVER JOB [<job_id>]	FAILED	STOPPED	<job_id>
------------------------	--------	---------	----------

```
nebula> RECOVER JOB;
+-----+
| Recovered job num |
+-----+
| 5 job recovered   |
+-----+
```

## 4.17.9 FAQ

SUBMIT JOB	HTTP	Storage	HTTP
------------	------	---------	------

```
curl "http://{$storage-ip}:19779/admin?space={space_name}&op=compact"
```

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## 5.

---

### 5.1

---

#### 5.1.1 1 NebulaGraph

RPM DEB Linux      RPM DEB      NebulaGraph



NebulaGraph

RPM/DEB

wget



- Linux      NebulaGraph      CentOS 7.x CentOS 8.x Ubuntu 16.04 Ubuntu 18.04 Ubuntu 20.04
- Linux      NebulaGraph

OSS

- release

URL

```
//Centos 7
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.el7.x86_64.rpm

//Centos 8
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.el8.x86_64.rpm

//Ubuntu 1604
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu1604.amd64.deb

//Ubuntu 1804
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu1804.amd64.deb

//Ubuntu 2004
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu2004.amd64.deb
```

Centos 7.5 3.3.0

```
wget https://oss-cdn.nebula-graph.com.cn/package/3.3.0/nebula-graph-3.3.0.el7.x86_64.rpm
wget https://oss-cdn.nebula-graph.com.cn/package/3.3.0/nebula-graph-3.3.0.el7.x86_64.rpm.sha256sum.txt
```

ubuntu 1804 3.3.0

```
wget https://oss-cdn.nebula-graph.com.cn/package/3.3.0/nebula-graph-3.3.0.ubuntu1804.amd64.deb
wget https://oss-cdn.nebula-graph.com.cn/package/3.3.0/nebula-graph-3.3.0.ubuntu1804.amd64.deb.sha256sum.txt
```

- (nightly)

### Danger

- nightly nightly
- nightly

#### URL

```
//Centos 7
https://oss-cdn.nebula-graph.com.cn/package/nightly/<yyyy.mm.dd>/nebula-graph-<yyyy.mm.dd>-nightly.el7.x86_64.rpm

//Centos 8
https://oss-cdn.nebula-graph.com.cn/package/nightly/<yyyy.mm.dd>/nebula-graph-<yyyy.mm.dd>-nightly.el8.x86_64.rpm

//Ubuntu 1604
https://oss-cdn.nebula-graph.com.cn/package/nightly/<yyyy.mm.dd>/nebula-graph-<yyyy.mm.dd>-nightly.ubuntu1604.amd64.deb

//Ubuntu 1804
https://oss-cdn.nebula-graph.com.cn/package/nightly/<yyyy.mm.dd>/nebula-graph-<yyyy.mm.dd>-nightly.ubuntu1804.amd64.deb

//Ubuntu 2004
https://oss-cdn.nebula-graph.com.cn/package/nightly/<yyyy.mm.dd>/nebula-graph-<yyyy.mm.dd>-nightly.ubuntu2004.amd64.deb
```

2021.11.24 Centos 7.5 2.x

```
wget https://oss-cdn.nebula-graph.com.cn/package/nightly/2021.11.24/nebula-graph-2021.11.24-nightly.el7.x86_64.rpm
wget https://oss-cdn.nebula-graph.com.cn/package/nightly/2021.11.24/nebula-graph-2021.11.24-nightly.el7.x86_64.rpm.sha256sum.txt
```

2021.11.24 Ubuntu 1804 2.x

```
wget https://oss-cdn.nebula-graph.com.cn/package/nightly/2021.11.24/nebula-graph-2021.11.24-nightly.ubuntu1804.amd64.deb
wget https://oss-cdn.nebula-graph.com.cn/package/nightly/2021.11.24/nebula-graph-2021.11.24-nightly.ubuntu1804.amd64.deb.sha256sum.txt
```

## NebulaGraph

- RPM

```
$ sudo rpm -ivh --prefix=<installation_path> <package_name>
```

--prefix NebulaGraph /usr/local/nebula/

3.3.0 RPM

```
sudo rpm -ivh nebula-graph-3.3.0.el7.x86_64.rpm
```

- DEB

```
$ sudo dpkg -i <package_name>
```

### Note

DEB NebulaGraph

/usr/local/nebula/

3.3.0 DEB

```
sudo dpkg -i nebula-graph-3.3.0.ubuntu1804.amd64.deb
```

- NebulaGraph

- [NebulaGraph](#)
- 

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### 5.1.2 2 NebulaGraph

#### NebulaGraph

```
nebula.service
```



```
nebula.service      /usr/local/nebula/scripts
```

```
$ sudo /usr/local/nebula/scripts/nebula.service
[-v] [-c <config_file_path>]
<start | stop | restart | kill | status>
<metad | graphd | storaged | all>
```

```
-v
```

```
-c          /usr/local/nebula/etc/
```

```
start
```

```
stop
```

```
restart
```

```
kill
```

```
status
```

```
metad          Meta
```

```
graphd         Graph
```

```
storaged       Storage
```

```
all
```

#### NebulaGraph

```
$ sudo /usr/local/nebula/scripts/nebula.service start all
[INFO] Starting nebula-metad...
[INFO] Done
[INFO] Starting nebula-graphd...
[INFO] Done
[INFO] Starting nebula-storaged...
[INFO] Done
```

#### NebulaGraph



```
kill -9
```

#### NebulaGraph

```
$ sudo /usr/local/nebula/scripts/nebula.service stop all
[INFO] Stopping nebula-metad...
[INFO] Done
[INFO] Stopping nebula-graphd...
[INFO] Done
[INFO] Stopping nebula-storaged...
[INFO] Done
```

## NebulaGraph

### NebulaGraph

```
$ sudo /usr/local/nebula/scripts/nebula.service status all
```

- NebulaGraph

```
[INFO] nebula-metad(33fd35e): Running as 29020, Listening on 9559
[INFO] nebula-graphd(33fd35e): Running as 29095, Listening on 9669
[WARN] nebula-storaged after v3.0.0 will not start service until it is added to cluster.
[WARN] See Manage Storage hosts:ADD HOSTS in https://docs.nebula-graph.io/
[INFO] nebula-storaged(33fd35e): Running as 29147, Listening on 9779
```



Note

NebulaGraph	nebula-storaged	nebula-storaged	nebula-metad	Storage	Storage	Storage	Ready
3.0.0	Storage	Storage	Meta	ADD HOSTS			
Storage							

- NebulaGraph NebulaGraph

```
[INFO] nebula-metad: Running as 25600, Listening on 9559
[INFO] nebula-graphd: Exited
[INFO] nebula-storaged: Running as 25646, Listening on 9779
```

NebulaGraph	Meta	Graph	Storage	etc	/usr/local/nebula/etc/
-------------	------	-------	---------	-----	------------------------

- 
- NebulaGraph

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### 5.1.3 3 NebulaGraph

Nebula Console NebulaGraph



NebulaGraph

Storage

NebulaGraph

- NebulaGraph
- Nebula Console NebulaGraph
- Nebula Console NebulaGraph



Nebula Console NebulaGraph

Nebula Console NebulaGraph

incompatible version

between client and server

1. Nebula Console

**Assets**



2. **Assets**

3. nebula-console



Windows

nebula-console.exe

4. Nebula Console nebula-console



Windows

```
$ chmod 111 nebula-console
```

5. nebula-console

## 6. NebulaGraph

- Linux macOS

```
$ ./nebula-console -addr <ip> -port <port> -u <username> -p <password>
[-t 120] [-e "nGQL_statement" | -f filename.nGQL]
```

- Windows

```
> nebula-console.exe -addr <ip> -port <port> -u <username> -p <password>
[-t 120] [-e "nGQL_statement" | -f filename.nGQL]
```

-h/-help		
-addr/-address	Graph	IP 127.0.0.1
-P/-port	Graph	9669
-u/-user	NebulaGraph	root
-p/-password		
-t/-timeout		120
-e/-eval		nGQL
-f/-file	nGQL	nGQL
-enable_ssl	NebulaGraph	SSL
-ssl_root_ca_path		CA
-ssl_cert_path		CRT
-ssl_private_key_path		

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## 5.1.4 Storage

NebulaGraph      Storage



NebulaGraph 3.0.0      ADD HOSTS      Storage

NebulaGraph

### 1. Storage

```
ADD HOSTS <ip>:<port> [,<ip>:<port> ...];
```

```
nebula> ADD HOSTS 192.168.10.100:9779, 192.168.10.101:9779, 192.168.10.102:9779;
```



IP      nebula-storaged.conf    local\_ip      IP      Storage

### 2.

```
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+-----+
| Host | Port | HTTP port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+-----+
| "192.168.10.100" | 9779 | 19669 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.1.0" |
| "192.168.10.101" | 9779 | 19669 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.1.0" |
| "192.168.10.102" | 9779 | 19669 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.1.0" |
+-----+-----+-----+-----+-----+-----+-----+
```

Status      Storage

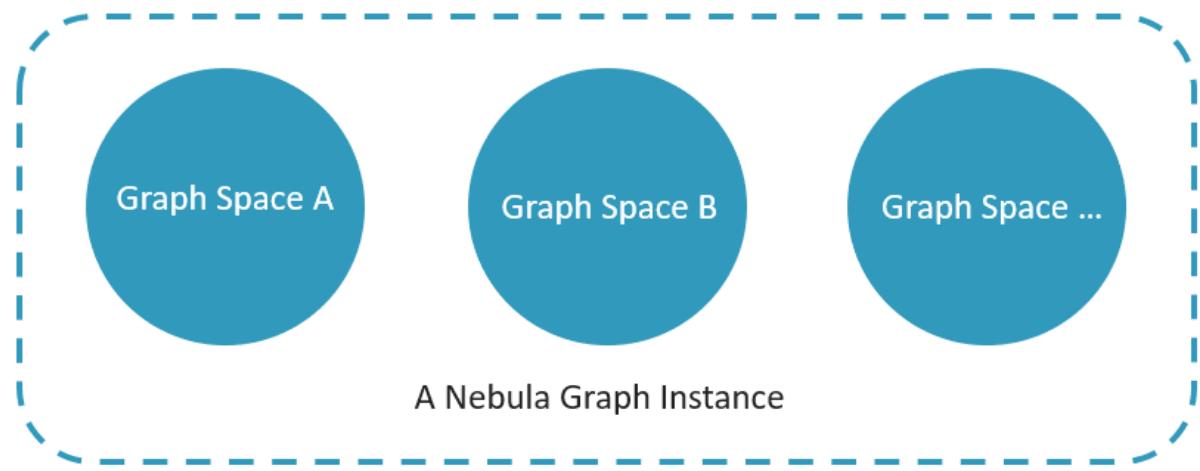
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## 5.1.5 4 nGQL CRUD

NebulaGraph Schema  
nGQL

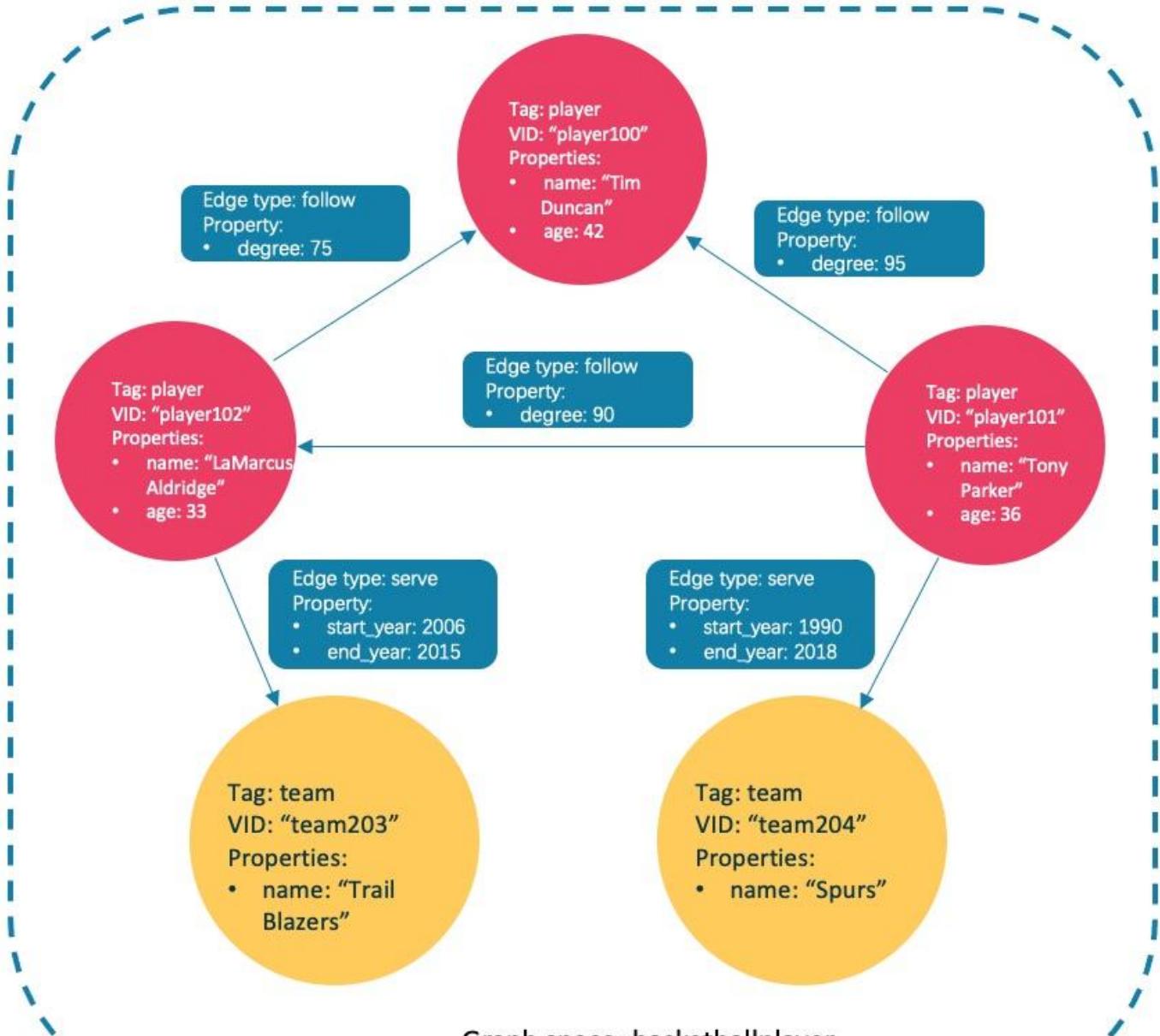
SCHEMA

NebulaGraph



Schema NebulaGraph Schema

Vertex	0
Tag	
Edge	
Edge type	



### Caution

NebulaGraph

2 20

- CREATE SPACE
- CREATE TAG
- CREATE EDGE
- ALTER TAG
- ALTER EDGE
- CREATE TAG INDEX
- CREATE EDGE INDEX

## Note

10 heartbeat\_interval\_secs

NGQL

```
CREATE SPACE [IF NOT EXISTS] <graph_space_name> (
[partition_num = <partition_number>,
[replica_factor = <replica_number>,
vid_type = {FIXED_STRING(<N>) | INT64}
)

[COMMENT = '<comment>'];
```

### CREATE SPACE

```
nebula> SHOW SPACES;
```

```
USE <graph_space_name>;
```

1. basketballplayer

```
nebula> CREATE SPACE basketballplayer(partition_num=15, replica_factor=1, vid_type=fixed_string(30));
```

## Note

[ERROR (-1005)]: Host not enough!

### Storage

2. SHOW HOSTS

```
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+
| Host | Port | HTTP port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "storaged0" | 9779 | 19669 | "ONLINE" | 5 | "basketballplayer:5" | "basketballplayer:5" | "3.1.0" |
| "storaged1" | 9779 | 19669 | "ONLINE" | 5 | "basketballplayer:5" | "basketballplayer:5" | "3.1.0" |
| "storaged2" | 9779 | 19669 | "ONLINE" | 5 | "basketballplayer:5" | "basketballplayer:5" | "3.1.0" |
+-----+-----+-----+-----+-----+-----+
```

### Leader distribution

### BALANCE LEADER

### Storage

3. basketballplayer

```
nebula[(none)]> USE basketballplayer;
```

### SHOW SPACES

```
nebula> SHOW SPACES;
+-----+
| Name |
+-----+
| "basketballplayer" |
+-----+
```

**Tag Edge type**

NGQL

```
CREATE {TAG | EDGE} [IF NOT EXISTS] {<tag_name> | <edge_type_name>}
(
<prop_name> <data_type> [NULL | NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>']
[{}, <prop_name> <data_type> [NULL | NOT NULL] [DEFAULT <default_value>] [COMMENT '<comment>']] ...
)
[TTL_DURATION = <ttl_duration>]
[TTL_COL = <prop_name>]
[COMMENT = '<comment>'];
```

CREATE TAG CREATE EDGE

Tag: player team Edge type: follow serve

player	Tag	name (string), age (int)
team	Tag	name (string)
follow	Edge type	degree (int)
serve	Edge type	start_year (int), end_year (int)

```
nebula> CREATE TAG player(name string, age int);
nebula> CREATE TAG team(name string);
nebula> CREATE EDGE follow(degree int);
nebula> CREATE EDGE serve(start_year int, end_year int);
```

INSERT Tag Edge type

NGQL

```
INSERT VERTEX [IF NOT EXISTS] [tag_props, [tag_props] ...]
VALUES <vid>: ([prop_value_list])

tag_props:
tag_name ([prop_name_list])

prop_name_list:
[prop_name [, prop_name] ...]

prop_value_list:
[prop_value [, prop_value] ...]
```

vid Vertex ID vid INSERT VERTEX

```
INSERT EDGE [IF NOT EXISTS] <edge_type> ( <prop_name_list> ) VALUES
<src_vid> -> <dst_vid>[@<rank>] : ( <prop_value_list> )
[, <src_vid> -> <dst_vid>[@<rank>] : ( <prop_value_list> ), ...];

<prop_name_list> ::= 
[ <prop_name> [, <prop_name>] ...]

<prop_value_list> ::= 
[ <prop_value> [, <prop_value>] ...]
```

INSERT EDGE

- ```
nebula> INSERT VERTEX player(name, age) VALUES "player100":("Tim Duncan", 42);
nebula> INSERT VERTEX player(name, age) VALUES "player101":("Tony Parker", 36);
nebula> INSERT VERTEX player(name, age) VALUES "player102":("LaMarcus Aldridge", 33);
nebula> INSERT VERTEX team(name) VALUES "team203":("Trail Blazers"), "team204":("Spurs");
```
- ```
nebula> INSERT EDGE follow(degree) VALUES "player101" -> "player100":(95);
nebula> INSERT EDGE follow(degree) VALUES "player101" -> "player102":(90);
nebula> INSERT EDGE follow(degree) VALUES "player102" -> "player100":(75);
nebula> INSERT EDGE serve(start_year, end_year) VALUES "player101" -> "team204":(1999, 2018), "player102" -> "team203":(2006, 2015);
```

- GO                    GO                    YIELD
- FETCH
- LOOKUP               WHERE
- MATCH                NebulaGraph

NGQL

- GO

```
GO [[<M> TO] <N> STEPS ] FROM <vertex_list>
OVER <edge_type_list> [{REVERSELY | BIDIRECT}]
[ WHERE <conditions> ]
YIELD [DISTINCT] <return_list>
[ { SAMPLE <sample_list> | <limit_by_list_clause> } ]
[ | GROUP BY {<col_name> | expression> | <position>} YIELD <col_name>]
```

```
[| ORDER BY <expression> [{ASC | DESC}]]  
[| LIMIT [<offset>,<number_rows>];
```

- **FETCH**

- **Tag**

```
FETCH PROP ON {<tag_name>[, tag_name ...] | *}  
<vid> [, vid ...]  
YIELD <return_list> [AS <alias>];
```

- 

```
FETCH PROP ON <edge_type> <src_vid> -> <dst_vid>[@<rank>] [, <src_vid> -> <dst_vid> ...]  
YIELD <output>;
```

- **LOOKUP**

```
LOOKUP ON {<vertex_tag> | <edge_type>}  
[WHERE <expression> [AND <expression> ...]]  
YIELD <return_list> [AS <alias>];  
  
<return_list>  
  <prop_name> [AS <col_alias>] [, <prop_name> [AS <prop_alias>] ...];
```

- **MATCH**

```
MATCH <pattern> [<clause_1>] RETURN <output> [<clause_2>];
```

GO

- VID `player101` follow

```
nebula> GO FROM "player101" OVER follow YIELD id($$);  
+-----+  
| id($$) |  
+-----+  
| "player100" |
```

```
| "player102" |
+-----+
```

- VID player101 follow 35

```
nebula> GO FROM "player101" OVER follow WHERE properties($$).age >= 35 \
    YIELD properties($$).name AS Teammate, properties($$).age AS Age;
+-----+-----+
| Teammate | Age |
+-----+-----+
| "Tim Duncan" | 42 |
+-----+-----+
```

/

YIELD

\$\$

\

- VID player101 follow

\*

```
nebula> GO FROM "player101" OVER follow YIELD dst(edge) AS id | \
    GO FROM $.id OVER serve YIELD properties($$).name AS Team, \
    properties($^).name AS Player;
+-----+-----+
| Team | Player |
+-----+-----+
| "Trail Blazers" | "LaMarcus Aldridge" |
+-----+-----+
```

/

\$^

|

\$-

\*

### Note

```
nebula> $var = GO FROM "player101" OVER follow YIELD dst(edge) AS id; \
    GO FROM $var.id OVER serve YIELD properties($$).name AS Team, \
    properties($^).name AS Player;
+-----+-----+
| Team | Player |
+-----+-----+
| "Trail Blazers" | "LaMarcus Aldridge" |
+-----+-----+
```

**FETCH**

VID player100

```
nebula> FETCH PROP ON player "player100" YIELD properties(vertex);
+-----+
| properties(VERTEX) |
+-----+
| {age: 42, name: "Tim Duncan"} |
+-----+
```

## Note

LOOKUP MATCH

UPDATE UPSERT

UPSERT UPDATE INSERT UPSERT

## Note

partition UPSERT INSERT UPDATE partition

nGQL

- UPDATE

```
UPDATE VERTEX <vid> SET <properties to be updated>
[WHEN <condition>] [YIELD <columns>];
```

- UPDATE

```
UPDATE EDGE ON <edge_type> <source vid> -> <destination vid> [@rank]
SET <properties to be updated> [WHEN <condition>] [YIELD <columns to be output>];
```

- UPSERT

```
UPSERT {VERTEX <vid> | EDGE <edge_type>} SET <update_columns>
[WHEN <condition>] [YIELD <columns>];
```

- UPDATE VID player100 name FETCH

```
nebula> UPDATE VERTEX "player100" SET player.name = "Tim";
nebula> FETCH PROP ON player "player100" YIELD properties(vertex);
+-----+
| properties(VERTEX) |
+-----+
```

```
| {age: 42, name: "Tim"} |
+-----+
```

- UPDATE degree FETCH

```
nebula> UPDATE EDGE ON follow "player101" -> "player100" SET degree = 96;
nebula> FETCH PROP ON follow "player101" -> "player100" YIELD properties(edge);
+-----+
| properties(EDGE) |
+-----+
| {degree: 96} |
+-----+
```

- INSERT VID player111 UPSERT

```
nebula> INSERT VERTEX player(name,age) VALUES "player111":("David West", 38);
nebula> UPSERT VERTEX "player111" SET player.name = "David", player.age = $^.player.age + 11 \
WHEN $^.player.name == "David West" AND $^.player.age > 20 \
YIELD $^.player.name AS Name, $^.player.age AS Age;
+-----+-----+
| Name | Age |
+-----+-----+
| "David" | 49 |
+-----+-----+
```

## nGQL

- ```
DELETE VERTEX <vid1>[, <vid2>...]
```
- ```
DELETE EDGE <edge_type> <src_vid> -> <dst_vid>[@<rank>]
[, <src_vid> -> <dst_vid>...]
```
- ```
nebula> DELETE VERTEX "player111", "team203";
```
- ```
nebula> DELETE EDGE follow "player101" -> "team204";
```

## CREATE INDEX Tag Edge type



```
MATCH LOOKUP
```

```
" " MATCH LOOKUP
```

## nGQL

-

```
CREATE {TAG | EDGE} INDEX [IF NOT EXISTS] <index_name>
ON {<tag_name> | <edge_name>} ([<prop_name_list>]) [COMMENT = '<comment>'];
```

- REBUILD {TAG | EDGE} INDEX <index\_name>;

### Note

utf-8

3

10

30

LOOKUP MATCH

LOOKUP MATCH

Tag player name Tony Parker

```
//      name      player_index_1
nebula> CREATE TAG INDEX IF NOT EXISTS player_index_1 ON player(name(20));
//
//      REBUILD TAG INDEX player_index_1
+-----+
| New Job Id |
+-----+
| 31          |
+-----+

//      LOOKUP
nebula> LOOKUP ON player WHERE player.name == "Tony Parker" \
      YIELD properties(vertex).name AS name, properties(vertex).age AS age;
+-----+-----+
| name      | age   |
+-----+-----+
| "Tony Parker" | 36   |
+-----+-----+

//      MATCH
nebula> MATCH (v:player{name:"Tony Parker"}) RETURN v;
+-----+
| v           |
+-----+
| ("player101" :player{age: 36, name: "Tony Parker"}) |
```

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## 5.2 NebulaGraph

NebulaGraph

### 5.2.1

NebulaGraph NVMe SSD SSD IOPS Latency

- HDD IOPS
- NAS SAN HDFS Ceph
- RAID
- SSD AWS Provisioned IOPS SSD

### 5.2.2 CPU



3.0.2 NebulaGraph Docker Hub Docker ARM64 ARM macOS Docker Desktop ARM Linux Server  
NebulaGraph

### 5.2.3

CPU	x86_64
	4 GB
	10 GB SSD

Linux NebulaGraph 4.15 Linux



Linux NebulaGraph RPM DEB TAR

glibc	2.17	ldd --version
make	-	
m4	-	
git	-	
wget	-	
unzip	-	
xz	-	
readline-devel	-	
ncurses-devel	-	
zlib-devel	-	
g++	8.5.0	g++ -v
cmake	3.14.0	cmake --version
curl	-	
redhat-lsb-core	-	
libstdc++-static		CentOS 8+ RedHat 8+ Fedora
libasan		CentOS 8+ RedHat 8+ Fedora
bzip2	-	
cmake	build	

## 1.

- CentOS RedHat Fedora

```
$ yum update
$ yum install -y make \
    m4 \
    git \
    wget \
    unzip \
    xz \
    readline-devel \
    ncurses-devel \
    zlib-devel \
    gcc \
    gcc-c++ \
    cmake \
    curl \
    redhat-lsb-core \
    bzip2
//  CentOS 8+ RedHat 8+ Fedora      libstdc++-static  libasan
$ yum install -y libstdc++-static libasan
```

- Debian Ubuntu

```
$ apt-get update
$ apt-get install -y make \
    m4 \
    git \
    wget \
    unzip \
    xz-utils \
    curl \
    lsb-core \
    build-essential \
    libreadline-dev \
    ncurses-dev \
    cmake \
    bzip2
```

## 2. G++ CMake

```
$ g++ --version
$ cmake --version
```

## 3. CMake g++

## 5.2.4

CPU	x86_64
CPU	4
	8 GB
	100 GB SSD

Linux      NebulaGraph      3.9      Linux

metad meta	1
storaged	$\geq 1$
graphd	$\geq 1$

1 metad 1 storaged 1 graphd

NebulaGraph

	<b>metad</b>	<b>storaged</b>	<b>graphd</b>
A	1	1	1
B	-	1	1
C	-	1	1

## 5.2.5

CPU	x86_64
CPU	48
	256 GB
	2 * 1.6 TB NVMe SSD

Linux      NebulaGraph      3.9      Linux

NebulaGraph



metad meta	3	
storaged	$\geq 3$	
graphd	$\geq 3$	
3 metad	metad	meta
storaged		

	<b>metad</b>	<b>storaged</b>	<b>graphd</b>
A	1	1	1
B	1	1	1
C	1	1	1
D	-	1	1
E	-	1	1

## 5.2.6 NebulaGraph

### 3 NebulaGraph

Bytes	*	* 7.5 * 120%	*	* 7.5
Bytes	[ * 16 + RocksDB * (write_buffer_size * max_write_buffer_number + * )] * 120%		* 16 BloomFilter max_write_buffer_number RocksDB MemTable	write_buffer_size Memory usage in RocksDB
-	*		disk_partition_num_multiplier	2~20 SSD 20 HDD 2
• 1	7.5		16	* 50
csv		2.5		
• 2	120%			
20%				
• 3	RocksDB			
NebulaGraph	=	*	RocksDB --data_path etc nebula-storaged.conf	RocksDB
RocksDB			NebulaGraph RocksDB	

#### Note

nebula-storaged.conf --enable\_partitioned\_index\_filter=true bloom random-seek

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## 5.3

---

### 5.3.1 NebulaGraph

NebulaGraph

- 



NebulaGraph

- NebulaGraph

#### 1. NebulaGraph

- [ ] 3.3.0 NebulaGraph

```
$ git clone --branch release-3.3 https://github.com/vesoft-inc/nebula.git
```

- master

```
$ git clone https://github.com/vesoft-inc/nebula.git
```

#### 2. nebula

```
$ cd nebula
```

#### 3. build

```
$ mkdir build && cd build
```

#### 4. CMake makefile



/usr/local/nebula

-DCMAKE\_INSTALL\_PREFIX=<installation\_path>

CMake CMake

```
$ cmake -DCMAKE_INSTALL_PREFIX=/usr/local/nebula -DENABLE_TESTING=OFF -DCMAKE_BUILD_TYPE=Release ..
```

#### 5. NebulaGraph



-j N \(\min(\text{CPU}, \frac{(GB)}{2})\)

```
$ make -j{N} # E.g., make -j2
```

## 6. NebulaGraph

```
$ sudo make install
```

7. etc/ /usr/local/nebula/etc script nebula-

```
graph.conf nebula-metad.conf nebula-storaged.conf
```

**master**

master	master	NebulaGraph
--------	--------	-------------

1. nebula git pull upstream master
2. nebula/build make -j{N} make install

- NebulaGraph

## CMake

```
$ cmake -D<variable>=<value> ...
```

**CMake** (CMake)

**CMAKE\_INSTALL\_PREFIX**

```
CMAKE_INSTALL_PREFIX NebulaGraph /usr/local/nebula
```

**ENABLE\_WERROR**

```
ON warning error OFF
```

**ENABLE\_TESTING**

```
ON NebulaGraph OFF
```

**ENABLE\_ASAN**

```
OFF ASan AddressSanitizer NebulaGraph ON
```

**CMAKE\_BUILD\_TYPE**

```
CMAKE_BUILD_TYPE NebulaGraph build
```

- Debug

```
CMAKE_BUILD_TYPE build debug
```

- Release

```
build debug
```

- RelWithDebInfo

```
build debug
```

- MinSizeRel

```
build debug
```

```
ENABLE_INCLUDE_WHAT_YOU_USE
```

```
OFF      ON      include-what-you-use      makefile
```

```
NEBULA_USE_LINKER
```

- bfd ld.bfd
- lld , lld ld.lld
- gold gold ld.gold

```
CMAKE_C_COMPILER/CMAKE_CXX_COMPILER
```

```
CMake      C/C++
```

```
$ cmake -DCMAKE_C_COMPILER=<path_to_gcc/bin/gcc> -DCMAKE_CXX_COMPILER=<path_to_gcc/bin/g++> ..
$ cmake -DCMAKE_C_COMPILER=<path_to_clang/bin/clang> -DCMAKE_CXX_COMPILER=<path_to_clang/bin/clang++> ..
```

```
ENABLE_CCACHE
```

```
ENABLE_CCACHE ON      Ccache compiler cache
```

```
ccache      ENABLE_CCACHE=OFF      ccache      export CCACHE_DISABLE=true      ~/.ccache/
ccache.conf  disable=true      ccache official documentation
```

```
NEBULA_THIRDPARTY_ROOT
```

```
NEBULA_THIRDPARTY_ROOT      /opt/vesoft/third-party
```

1.

2. [third-party](#)

3. `make -j1`

---

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### 5.3.2 RPM DEB NebulaGraph

RPM DEB Linux

RPM DEB

NebulaGraph



NebulaGraph

RPM/DEB

wget



- Linux NebulaGraph CentOS 7.x CentOS 8.x Ubuntu 16.04 Ubuntu 18.04 Ubuntu 20.04
- Linux NebulaGraph

OSS

- release

URL

```
//Centos 7
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.el7.x86_64.rpm

//Centos 8
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.el8.x86_64.rpm

//Ubuntu 1604
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu1604.amd64.deb

//Ubuntu 1804
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu1804.amd64.deb

//Ubuntu 2004
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu2004.amd64.deb
```

Centos 7.5 3.3.0

```
wget https://oss-cdn.nebula-graph.com.cn/package/3.3.0/nebula-graph-3.3.0.el7.x86_64.rpm
wget https://oss-cdn.nebula-graph.com.cn/package/3.3.0/nebula-graph-3.3.0.el7.x86_64.rpm.sha256sum.txt
```

ubuntu 1804 3.3.0

```
wget https://oss-cdn.nebula-graph.com.cn/package/3.3.0/nebula-graph-3.3.0.ubuntu1804.amd64.deb
wget https://oss-cdn.nebula-graph.com.cn/package/3.3.0/nebula-graph-3.3.0.ubuntu1804.amd64.deb.sha256sum.txt
```

- (nightly)

### Danger

- nightly nightly
- nightly

#### URL

```
//Centos 7
https://oss-cdn.nebula-graph.com.cn/package/nightly/<yyyy.mm.dd>/nebula-graph-<yyyy.mm.dd>-nightly.el7.x86_64.rpm

//Centos 8
https://oss-cdn.nebula-graph.com.cn/package/nightly/<yyyy.mm.dd>/nebula-graph-<yyyy.mm.dd>-nightly.el8.x86_64.rpm

//Ubuntu 1604
https://oss-cdn.nebula-graph.com.cn/package/nightly/<yyyy.mm.dd>/nebula-graph-<yyyy.mm.dd>-nightly.ubuntu1604.amd64.deb

//Ubuntu 1804
https://oss-cdn.nebula-graph.com.cn/package/nightly/<yyyy.mm.dd>/nebula-graph-<yyyy.mm.dd>-nightly.ubuntu1804.amd64.deb

//Ubuntu 2004
https://oss-cdn.nebula-graph.com.cn/package/nightly/<yyyy.mm.dd>/nebula-graph-<yyyy.mm.dd>-nightly.ubuntu2004.amd64.deb
```

2021.11.24 Centos 7.5 2.x

```
wget https://oss-cdn.nebula-graph.com.cn/package/nightly/2021.11.24/nebula-graph-2021.11.24-nightly.el7.x86_64.rpm
wget https://oss-cdn.nebula-graph.com.cn/package/nightly/2021.11.24/nebula-graph-2021.11.24-nightly.el7.x86_64.rpm.sha256sum.txt
```

2021.11.24 Ubuntu 1804 2.x

```
wget https://oss-cdn.nebula-graph.com.cn/package/nightly/2021.11.24/nebula-graph-2021.11.24-nightly.ubuntu1804.amd64.deb
wget https://oss-cdn.nebula-graph.com.cn/package/nightly/2021.11.24/nebula-graph-2021.11.24-nightly.ubuntu1804.amd64.deb.sha256sum.txt
```

#### NebulaGraph

- RPM

```
$ sudo rpm -ivh --prefix=<installation_path> <package_name>
```

--prefix NebulaGraph /usr/local/nebula/

3.3.0 RPM

```
sudo rpm -ivh nebula-graph-3.3.0.el7.x86_64.rpm
```

- DEB

```
$ sudo dpkg -i <package_name>
```

### Note

DEB NebulaGraph

/usr/local/nebula/

3.3.0 DEB

```
sudo dpkg -i nebula-graph-3.3.0.ubuntu1804.amd64.deb
```

- NebulaGraph

- [NebulaGraph](#)
- 

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### 5.3.3 tar.gz NebulaGraph

tar.gz NebulaGraph

#### Note

- NebulaGraph 2.6.0 tar.gz
- Linux NebulaGraph CentOS 7.x CentOS 8.x Ubuntu 16.04 Ubuntu 18.04 Ubuntu 20.04
- Linux NebulaGraph

#### 1. NebulaGraph tar.gz

```
<release_version>

//Centos 7
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.el7.x86_64.tar.gz
//Checksum
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.el7.x86_64.tar.gz.sha256sum.txt

//Centos 8
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.el8.x86_64.tar.gz
//Checksum
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.el8.x86_64.tar.gz.sha256sum.txt

//Ubuntu 1604
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu1604.amd64.tar.gz
//Checksum
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu1604.amd64.tar.gz.sha256sum.txt

//Ubuntu 1804
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu1804.amd64.tar.gz
//Checksum
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu1804.amd64.tar.gz.sha256sum.txt

//Ubuntu 2004
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu2004.amd64.tar.gz
//Checksum
https://oss-cdn.nebula-graph.com.cn/package/<release_version>/nebula-graph-<release_version>.ubuntu2004.amd64.tar.gz.sha256sum.txt
```

#### CentOS 7.5 NebulaGraph release-3.3 tar.gz

```
wget https://oss-cdn.nebula-graph.com.cn/package/3.3.0/nebula-graph-3.3.0.el7.x86_64.tar.gz
```

#### 2. tar.gz NebulaGraph

```
tar -xvzf <tar.gz_file_name> -C <install_path>
```

- tar.gz\_file\_name tar.gz
- install\_path

```
tar -xvzf nebula-graph-3.3.0.el7.x86_64.tar.gz -C /home/joe/nebula/install
```

#### 3.

```
etc nebula-graphd.conf.default nebula-metad.conf.default nebula-storaged.conf.default .default
NebulaGraph
```

NebulaGraph

- NebulaGraph

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### 5.3.4 Docker Compose NebulaGraph

Docker Compose      NebulaGraph      NebulaGraph

- 

Docker

[Install Docker Engine](#)

Docker Compose

[Install Docker Compose](#)

Git

[Download Git](#)

- root      NebulaGraph      Docker      [Manage Docker as a non-root user](#)
- Docker
- Docker Compose      NebulaGraph      `nebula-docker-compose/data`

#### NebulaGraph

1. Git `nebula-docker-compose 3.3.0`

 **Danger**

master

```
$ git clone -b release-3.3 https://github.com/vesoft-inc/nebula-docker-compose.git
```

 **Note**

Docker Compose `x.y` `x.y` `z` Docker Compose `z` `z`

2. `nebula-docker-compose`

```
$ cd nebula-docker-compose/
```

3. NebulaGraph

 **Note**

NebulaGraph      NebulaGraph Console

```
[nebula-docker-compose]$ docker-compose up -d
Creating nebuladockercompose_metad0_1 ... done
Creating nebuladockercompose_metad2_1 ... done
Creating nebuladockercompose_metad1_1 ... done
Creating nebuladockercompose_graphd2_1 ... done
Creating nebuladockercompose_graphd1_1 ... done
Creating nebuladockercompose_graphd1_1 ... done
Creating nebuladockercompose_storaged0_1 ... done
Creating nebuladockercompose_storaged2_1 ... done
Creating nebuladockercompose_storaged1_1 ... done
```

## ↑ Compatibility

3.1 Docker-compose NebulaGraph Console Storage ADD HOSTS

### Note

#### NebulaGraph

NebulaGraph

- Nebula Console Graph 9669 NebulaGraph
- NebulaGraph Console Graph

1. docker-compose ps NebulaGraph Console

```
$ docker-compose ps
  Name          Command     State    Ports
-----+-----+-----+-----+
nebuladockercompose_console_1   sh -c sleep 3 && nebula-co ...
.....
```

2. NebulaGraph Console

```
$ docker exec -it nebuladockercompose_console_1 /bin/sh
/ #
```

3. NebulaGraph Console NebulaGraph

```
/ # ./usr/local/bin/nebula-console -u <user_name> -p <password> --address=graphd --port=9669
```

### Note

root

4.

```
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+-----+
| Host | Port | HTTP port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+-----+
| "storaged0" | 9779 | 19779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "x.x.x" |
| "storaged1" | 9779 | 19779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "x.x.x" |
| "storaged2" | 9779 | 19779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "x.x.x" |
+-----+-----+-----+-----+-----+-----+-----+
```

exit

#### NebulaGraph

docker-compose ps NebulaGraph

### Note

NebulaGraph 9669 nebula-docker-compose docker-compose.yaml NebulaGraph

```
$ docker-compose ps
nebuladockercompose_console_1   sh -c sleep 3 &&
```

```

nebula-co ...
nebuladockercompose_graphd1_1    /usr/local/nebula/bin/nebu ... Up   0.0.0.0:49174->19669/tcp,:::49174->19669/tcp, 0.0.0.0:49171->19670/tcp,:::49171->19670/tcp, 0.0.0.0:49177->9669/tcp,:::49177->9669/tcp
nebuladockercompose_graphd2_1    /usr/local/nebula/bin/nebu ... Up   0.0.0.0:49175->19669/tcp,:::49175->19669/tcp, 0.0.0.0:49172->19670/tcp,:::49172->19670/tcp, 0.0.0.0:49178->9669/tcp,:::49178->9669/tcp
nebuladockercompose_graphd_1     /usr/local/nebula/bin/nebu ... Up   0.0.0.0:49180->19669/tcp,:::49180->19669/tcp, 0.0.0.0:49179->19670/tcp,:::49179->19670/tcp, 0.0.0.0:49169->9669/tcp,:::49169->9669/tcp
nebuladockercompose_metad0_1    /usr/local/nebula/bin/nebu ... Up   0.0.0.0:49157->19559/tcp,:::49157->19559/tcp, 0.0.0.0:49154->19560/tcp,:::49154->19560/tcp, 0.0.0.0:49160->9559/tcp,:::49160->9559/tcp, 9560/tcp
nebuladockercompose_metad1_1    /usr/local/nebula/bin/nebu ... Up   0.0.0.0:49156->19559/tcp,:::49156->19559/tcp, 0.0.0.0:49153->19560/tcp,:::49153->19560/tcp, 0.0.0.0:49159->9559/tcp,:::49159->9559/tcp, 9560/tcp
nebuladockercompose_metad2_1    /usr/local/nebula/bin/nebu ... Up   0.0.0.0:49158->19559/tcp,:::49158->19559/tcp, 0.0.0.0:49155->19560/tcp,:::49155->19560/tcp, 0.0.0.0:49161->9559/tcp,:::49161->9559/tcp, 9560/tcp
nebuladockercompose_storaged0_1  /usr/local/nebula/bin/nebu ... Up   0.0.0.0:49166->19779/tcp,:::49166->19779/tcp, 0.0.0.0:49163->19780/tcp,:::49163->19780/tcp, 9777/tcp, 9778/tcp, 0.0.0.0:49169->9779/tcp,:::49169->9779/tcp, 9780/tcp
nebuladockercompose_storaged1_1  /usr/local/nebula/bin/nebu ... Up   0.0.0.0:49165->19779/tcp,:::49165->19779/tcp, 0.0.0.0:49162->19780/tcp,:::49162->19780/tcp, 9777/tcp, 9778/tcp, 0.0.0.0:49168->9779/tcp,:::49168->9779/tcp, 9780/tcp
nebuladockercompose_storaged2_1  /usr/local/nebula/bin/nebu ... Up   0.0.0.0:49167->19779/tcp,:::49167->19779/tcp, 0.0.0.0:49164->19780/tcp,:::49164->19780/tcp, 9777/tcp, 9778/tcp, 0.0.0.0:49170->9779/tcp,:::49170->9779/tcp, 9780/tcp

```

```
nebuladockercompose_graphd2_1 ,
```

```
docker ps      CONTAINER ID      2a6c56c405f5 )
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	NAMES
2a6c56c405f5	vesoft/nebula-graphd:nightly	" <code>/usr/local/nebula/b...</code> "	36 minutes ago	Up 36 minutes (healthy)	0.0.0.0:49230->9669/tcp, 0.0.0.0:49229->19669/tcp, 0.0.0.0:49228->19670/tcp
7042e0a8e83d	vesoft/nebula-storaged:nightly	<code>./bin/nebula-storag...</code>	36 minutes ago	Up 36 minutes (healthy)	9777-9778/tcp, 9780/tcp, 0.0.0.0:49227->9779/tcp, 0.0.0.0:49226->19779/tcp, 0.0.0.0:49225->19780/tcp
18e3ea63ad65	vesoft/nebula-storaged:nightly	<code>./bin/nebula-storag...</code>	36 minutes ago	Up 36 minutes (healthy)	9777-9778/tcp, 9780/tcp, 0.0.0.0:49219->9779/tcp, 0.0.0.0:49218->19779/tcp, 0.0.0.0:49217->19780/tcp
4dcabfe8677a	vesoft/nebula-graphd:nightly	<code>"<code>/usr/local/nebula/b...</code>"</code>	36 minutes ago	Up 36 minutes (healthy)	0.0.0.0:49224->9669/tcp, 0.0.0.0:49223->19669/tcp, 0.0.0.0:49222->19670/tcp
a74054c6ae25	vesoft/nebula-graphd:nightly	<code>"<code>/usr/local/nebula/b...</code>"</code>	36 minutes ago	Up 36 minutes (healthy)	0.0.0.0:9669->9669/tcp, 0.0.0.0:49221->19669/tcp, 0.0.0.0:49220->19670/tcp
880025a3858c	vesoft/nebula-storaged:nightly	<code>./bin/nebula-storag...</code>	36 minutes ago	Up 36 minutes (healthy)	9777-9778/tcp, 9780/tcp, 0.0.0.0:49216->9779/tcp, 0.0.0.0:49215->19779/tcp, 0.0.0.0:49214->19780/tcp
45736a32a23a	vesoft/nebula-metad:nightly	<code>./bin/nebula-metad ...</code>	36 minutes ago	Up 36 minutes (healthy)	9560/tcp, 0.0.0.0:49213->9559/tcp, 0.0.0.0:49212->19559/tcp, 0.0.0.0:49211->19560/tcp
3b2c90eb073e	vesoft/nebula-metad:nightly	<code>./bin/nebula-metad ...</code>	36 minutes ago	Up 36 minutes (healthy)	9560/tcp, 0.0.0.0:49207->9559/tcp, 0.0.0.0:49206->19559/tcp, 0.0.0.0:49205->19560/tcp
7bb31b7a5b3f	vesoft/nebula-metad:nightly	<code>./bin/nebula-metad ...</code>	36 minutes ago	Up 36 minutes (healthy)	9560/tcp, 0.0.0.0:49210->9559/tcp, 0.0.0.0:49209->19559/tcp, 0.0.0.0:49208->19560/tcp

```
[nebula-docker-compose]$ docker exec -it 2a6c56c405f5 bash
[root@2a6c56c405f5 nebula]#
```

## NebulaGraph

```
NebulaGraph      nebula-docker-compose/data  nebula-docker-compose/logs
```

```

nebula-docker-compose/
|-- docker-compose.yaml
|-- data
|   |-- meta0
|   |-- meta1
|   |-- meta2
|   |-- storage0
|   |-- storage1
|   |-- storage2
`-- logs
    |-- graph
    |-- graph1
    |-- graph2
    |-- meta0
    |-- meta1
    |-- meta2
    |-- storage0
    |-- storage1
    |-- storage2

```

## NebulaGraph

NebulaGraph

```
$ docker-compose down
```

```
Stopping nebuladockercompose_console_1 ... done
Stopping nebuladockercompose_graphd1_1 ... done
Stopping nebuladockercompose_graphd_1 ... done
Stopping nebuladockercompose_graphd2_1 ... done
Stopping nebuladockercompose_storaged1_1 ... done
Stopping nebuladockercompose_storaged0_1 ... done
Stopping nebuladockercompose_storaged2_1 ... done
Stopping nebuladockercompose_metad2_1 ... done
Stopping nebuladockercompose_metad0_1 ... done
Stopping nebuladockercompose_metad1_1 ... done
Removing nebuladockercompose_console_1 ... done
Removing nebuladockercompose_graphd1_1 ... done
Removing nebuladockercompose_graphd_1 ... done
Removing nebuladockercompose_graphd2_1 ... done
Removing nebuladockercompose_storaged1_1 ... done
Removing nebuladockercompose_storaged0_1 ... done
Removing nebuladockercompose_storaged2_1 ... done
Removing nebuladockercompose_metad2_1 ... done
Removing nebuladockercompose_metad0_1 ... done
Removing nebuladockercompose_metad1_1 ... done
Removing network nebuladockercompose_nebula-net
```



docker-compose down -v -v nightly

Docker Compose    NebulaGraph    nebula-docker-compose/docker-compose.yaml

#### DOCKER

nebula-docker-compose    docker-compose.yaml    ports

```
graphd:
  image: vesoft/nebula-graphd:release-3.3
  ...
  ports:
    - 9669:9669
    - 19669
    - 19670
```

9669:9669    9669    9669    19669    19669

/ NEBULAGRAPH    DOCKER

1. nebula-docker-compose/docker-compose.yaml    image
2. nebula-docker-compose    docker-compose pull    Graph    Storage    Meta    NebulaGraph Console
3. docker-compose up -d    NebulaGraph
4. NebulaGraph Console    NebulaGraph    SHOW HOSTS GRAPH    SHOW HOSTS STORAGE    SHOW HOSTS META

DOCKER-COMPOSE PULL    ERROR: TOOMANYREQUESTS

ERROR: toomanyrequests: You have reached your pull rate limit. You may increase the limit by authenticating and upgrading:  
<https://www.docker.com/increase-rate-limit>

Docker Hub

[Understanding Docker Hub Rate Limiting](#)

## NEBULAGRAPH CONSOLE

```
docker-compose pull      NebulaGraph      NebulaGraph Console
```

---

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### 5.3.5 RPM/DEB NebulaGraph

RPM DEB

#### Note

NebulaGraph

	<b>IP</b>	<b>graphd</b>	<b>storaged</b>	<b>metad</b>
A	192.168.10.111	1	1	1
B	192.168.10.112	1	1	1
C	192.168.10.113	1	1	1
D	192.168.10.114	1	1	-
E	192.168.10.115	1	1	-

- 5
- NTP

#### NEBULAGRAPH

NebulaGraph

- RPM DEB NebulaGraph
- NebulaGraph

NebulaGraph

NebulaGraph etc nebula-graphd.conf nebula-metad.conf nebula-storaged.conf

A	nebula-graphd.conf	nebula-storaged.conf	nebula-metad.conf
B	nebula-graphd.conf	nebula-storaged.conf	nebula-metad.conf
C	nebula-graphd.conf	nebula-storaged.conf	nebula-metad.conf
D	nebula-graphd.conf	nebula-storaged.conf	
E	nebula-graphd.conf	nebula-storaged.conf	

## Note

meta_server_addrs	Meta IP	local_ip	IP
-------------------	---------	----------	----

- Meta
- Graph
- Storage
- A
- nebula-graphd.conf

```
##### networking #####
# Comma separated Meta Server Addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-graphd process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.111
# Network device to listen on
--listen_netdev=any
# Port to listen on
--port=9669
```

- nebula-storaged.conf

```
##### networking #####
# Comma separated Meta server addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-storaged process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.111
# Storage daemon listening port
--port=9779
```

- nebula-metad.conf

```
##### networking #####
# Comma separated Meta Server addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-metad process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.111
# Meta daemon listening port
--port=9559
```

- B

- **nebula-graphd.conf**

```
#####
# networking #####
# Comma separated Meta Server Addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-graphd process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.112
# Network device to listen on
--listen_netdev=any
# Port to listen on
--port=9669
```

- **nebula-storaged.conf**

```
#####
# networking #####
# Comma separated Meta server addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-storaged process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.112
# Storage daemon listening port
--port=9779
```

- **nebula-metad.conf**

```
#####
# networking #####
# Comma separated Meta Server addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-metad process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.112
# Meta daemon listening port
--port=9559
```

- C

- nebula-graphd.conf

```
#####
# networking #####
# Comma separated Meta Server Addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-graphd process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.113
# Network device to listen on
--listen_netdev=any
# Port to listen on
--port=9669
```

- nebula-storaged.conf

```
#####
# networking #####
# Comma separated Meta server addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-storaged process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.113
# Storage daemon listening port
--port=9779
```

- nebula-metad.conf

```
#####
# networking #####
# Comma separated Meta Server addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-metad process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.113
# Meta daemon listening port
--port=9559
```

- D

- nebula-graphd.conf

```
#####
# networking #####
# Comma separated Meta Server Addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-graphd process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.114
# Network device to listen on
--listen_netdev=any
# Port to listen on
--port=9669
```

- nebula-storaged.conf

```
#####
# networking #####
# Comma separated Meta server addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-storaged process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.114
# Storage daemon listening port
--port=9779
```

- E

- nebula-graphd.conf

```
#####
# networking #####
# Comma separated Meta Server Addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-graphd process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.115
# Network device to listen on
--listen_netdev=any
# Port to listen on
--port=9669
```

- nebula-storaged.conf

```
#####
# networking #####
# Comma separated Meta server addresses
--meta_server_addrs=192.168.10.111:9559,192.168.10.112:9559,192.168.10.113:9559
# Local IP used to identify the nebula-storaged process.
# Change it to an address other than loopback if the service is distributed or
# will be accessed remotely.
--local_ip=192.168.10.115
# Storage daemon listening port
--port=9779
```

A	graphd storaged metad
B	graphd storaged metad
C	graphd storaged metad
D	graphd storaged
E	graphd storaged

## NebulaGraph

```
sudo /usr/local/nebula/scripts/nebula.service start <metad|graphd|storaged|all>
```

 Note

- graphd storaged metad all
- /usr/local/nebula NebulaGraph

## NebulaGraph

### CLI NebulaGraph Console

### graphd

### Storage

### SHOW HOSTS

```
$ ./nebula-console --addr 192.168.10.111 --port 9669 -u root -p nebula
2021/05/25 01:41:19 [INFO] connection pool is initialized successfully
Welcome to NebulaGraph!

> ADD HOSTS 192.168.10.111:9779, 192.168.10.112:9779, 192.168.10.113:9779, 192.168.10.114:9779, 192.168.10.115:9779;
> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+-----+
| Host | Port | HTTP port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+-----+
| "192.168.10.111" | 9779 | 19779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.1.0" |
| "192.168.10.112" | 9779 | 19779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.1.0" |
| "192.168.10.113" | 9779 | 19779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.1.0" |
```

```
| "192.168.10.114" | 9779 | 19779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.1.0" |
| "192.168.10.115" | 9779 | 19779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.1.0" |
+-----+-----+-----+-----+-----+-----+-----+
```

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### 5.3.6 NebulaGraph

NebulaGraph

- NebulaGraph Operator

- **NebulaGraph Operator** NebulaGraph Kubectl NebulaGraph Helm NebulaGraph
- 

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## 5.4 NebulaGraph

NebulaGraph Meta Storage Graph

NebulaGraph



NebulaGraph

### 5.4.1

NebulaGraph 3

RPC

NebulaGraph NebulaGraph 3 3 1

NebulaGraph

### 5.4.2

### 5.4.3

- 
- 

### 5.4.4

NebulaGraph NebulaGraph

### 5.4.5

NebulaGraph

NebulaGraph

**CMake** **makefile**

-

```
DENABLE_STANDALONE_VERSION=on  
cmake -DCMAKE_INSTALL_PREFIX=/usr/local/nebula -DENABLE_TESTING=OFF -DENABLE_STANDALONE_VERSION=on -DCMAKE_BUILD_TYPE=Release ..
```

NebulaGraph NebulaGraph

### 5.4.6

NebulaGraph /usr/local/nebula/etc

sudo cat nebula-standalone.conf.default

NebulaGraph

meta_port	9559	Meta
storage_port	9779	Storage
meta_data_path	data/meta	Meta

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## 5.5 NebulaGraph

NebulaGraph

### 5.5.1

`nebula.service`



`nebula.service` /usr/local/nebula/scripts

```
$ sudo /usr/local/nebula/scripts/nebula.service
[-v] [-c <config_file_path>]
<start | stop | restart | kill | status>
<metad | graphd | storaged | all>
```

-v

-c /usr/local/nebula/etc/

start

stop

restart

kill

status

metad Meta

graphd Graph

storaged Storage

all

### 5.5.2 NebulaGraph

```
$ sudo /usr/local/nebula/scripts/nebula.service start all
[INFO] Starting nebula-metad...
[INFO] Done
[INFO] Starting nebula-graphd...
[INFO] Done
[INFO] Starting nebula-storaged...
[INFO] Done
```

### 5.5.3 NebulaGraph



`kill -9`

NebulaGraph

```
$ sudo /usr/local/nebula/scripts/nebula.service stop all
[INFO] Stopping nebula-metad...
[INFO] Done
[INFO] Stopping nebula-graphd...
[INFO] Done
[INFO] Stopping nebula-storaged...
[INFO] Done
```

## 5.5.4 NebulaGraph

NebulaGraph

```
$ sudo /usr/local/nebula/scripts/nebula.service status all
```

- NebulaGraph

```
[INFO] nebula-metad(33fd35e): Running as 29020, Listening on 9559
[INFO] nebula-graphd(33fd35e): Running as 29095, Listening on 9669
[WARN] nebula-storaged after v3.0.0 will not start service until it is added to cluster.
[WARN] See Manage Storage hosts:ADD HOSTS in https://docs.nebula-graph.io/
[INFO] nebula-storaged(33fd35e): Running as 29147, Listening on 9779
```



NebulaGraph	nebula-storaged	nebula-storaged	nebula-metad	Storage	Storage	Ready
3.0.0	Storage	Storage	Meta	ADD HOSTS	Storage	Storage
<b>Storage</b>						

- NebulaGraph

NebulaGraph

```
[INFO] nebula-metad: Running as 25600, Listening on 9559  
[INFO] nebula-graphd: Exited  
[INFO] nebula-storaged: Running as 25646, Listening on 9779
```

# NebulaGraph Meta Graph Storage

etc /usr/local/nebula/etc/

## 5.5.5

- NebulaGraph

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## 5.6 NebulaGraph

Nebula Console    NebulaGraph



NebulaGraph

Storage

NebulaGraph

### 5.6.1

- NebulaGraph
- Nebula Console        NebulaGraph
- Nebula Console        NebulaGraph



Nebula Console    NebulaGraph

Nebula Console    NebulaGraph

incompatible version

between client and server

### 5.6.2

1. Nebula Console        **Assets**



#### 2. **Assets**

3.        nebula-console



Windows        nebula-console.exe

4.    Nebula Console        nebula-console



Windows

```
$ chmod 111 nebula-console
```

5.        nebula-console

## 6. NebulaGraph

- Linux macOS

```
$ ./nebula-console -addr <ip> -port <port> -u <username> -p <password>
[-t 120] [-e "nGQL_statement" | -f filename.nGQL]
```

- Windows

```
> nebula-console.exe -addr <ip> -port <port> -u <username> -p <password>
[-t 120] [-e "nGQL_statement" | -f filename.nGQL]
```

<code>-h/-help</code>		
<code>-addr/-address</code>	Graph	IP
		127.0.0.1
<code>-P/-port</code>	Graph	9669
<code>-u/-user</code>	NebulaGraph	root
<code>-p/-password</code>		
<code>-t/-timeout</code>		120
<code>-e/-eval</code>		nGQL
<code>-f/-file</code>	nGQL	nGQL
<code>-enable_ssl</code>	NebulaGraph	SSL
<code>-ssl_root_ca_path</code>		CA
<code>-ssl_cert_path</code>		CRT
<code>-ssl_private_key_path</code>		

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## 5.7 Storage

3.0.0

Storage

Storage

Meta

ADD HOSTS

Storage

### 5.7.1 Storage

Storage

```
ADD HOSTS <ip>:<port> [,<ip>:<port> ...];
ADD HOSTS "<hostname>:<port> [, "<hostname>:<port> ...];
```



- Storage 2 20 SHOW HOSTS
- IP 127.0.0.1:9779
- ADD HOSTS "foo-bar":9779
- Storage Storage

### 5.7.2 Storage

Storage



Storage Storage

```
DROP HOSTS <ip>:<port> [,<ip>:<port> ...];
DROP HOSTS "<hostname>:<port> [, "<hostname>:<port> ...];
```

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## 5.8

---

### 5.8.1 NebulaGraph 2.x 3.3.0

NebulaGraph 2.6.1 3.3.0 NebulaGraph 2.x 3.x

NebulaGraph 2.0.0 2.x 3.3.0 2.0.0 1.x 2.x 2.x  
3.x

#### Caution

2.0.0 1.x 3.3.0 3.3.0 share/resources date\_time\_zonespec.csv NebulaGraph  
[GitHub](#)

- 
- 
- Docker Docker Swarm Docker Compose K8s
- IP
- 4 alter schema default value [github known issues](#)
- 
- sudo

NebulaGraph NebulaGraph 3.3.0

- 
- nGQL
- YIELD
- FETCH GO LOOKUP FIND PATH GET SUBGRAPH YIELD
- MATCH Tag return v.name return v.player.name

#### Caution

[GitHub](#)

- NebulaGraph 3.3.0 TAR [Download](#)

**Note**

RPM/DEB

- Storage Meta data\_path nebula/data/storage nebula/data/meta

**Danger**

- 
- 
- a. SUBMIT JOB STATS
- b. SHOW JOBS

## 1. NebulaGraph

```
<nebula_install_path>/scripts/nebula.service stop all
```

```
nebula_install_path NebulaGraph
storaged flush 1 nebula.service status all
```

**Note**

20

[GitHub](#)

## 2. TAR bin NebulaGraph bin

**Note**

NebulaGraph

## 3. Graph

- session\_idle\_timeout\_secs [1,604800] 28800
- client\_idle\_timeout\_secs [1,604800] 28800

2.x

[Graph](#)

## 4. Meta

```
<nebula_install_path>/scripts/nebula-metad.service start
```

Meta leader

Graph NebulaGraph

[SHOW HOSTS meta](#) [SHOW META LEADER](#)

Meta Meta

**Note**[GitHub](#)

## 5. Graph Storage

**Note**[GitHub](#)

## 6. NebulaGraph

```
nebula> SHOW HOSTS;
nebula> SHOW HOSTS storage;
nebula> SHOW SPACES;
nebula> USE <space_name>
nebula> SHOW PARTS;
nebula> SUBMIT JOB STATS;
nebula> SHOW STATS;
nebula> MATCH (v) RETURN v LIMIT 5;
```

3.3.0

**FAQ****SPACE 0 NOT FOUND**

Space 0 not found  
 Space 0 Storage  
 Graph Storage

**PERMISSION DENIED**

sudo

SUBMIT JOB STATS SHOW STATS

STORAGE OFFLINE LEADER COUNT 0

Storage

ADD HOSTS &lt;ip&gt;:&lt;port&gt;[, &lt;ip&gt;:&lt;port&gt; ...];

ADD HOSTS 192.168.10.100:9779, 192.168.10.101:9779, 192.168.10.102:9779;

Meta

ADD HOSTS

Storage

heartbeat\_interval\_secs

Storage GitHub

SHOW JOBS JOB ID JOB

NebulaGraph 2.5.0 Job Pull request 2.5.0

?

A: [Release Note](#) Incompatibility

---

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## 5.8.2 NebulaGraph v3.x v3.3.0

NebulaGraph v3.x v3.3.0 v3.3.0 RPM/DEB v3.3.0

### RPM/DEB

1. [RPM/DEB](#)
2. NebulaGraph [NebulaGraph](#)



#### Caution

Tag	Graph	nebula-graphd.conf	--graph_use_vertex_key=true	Storage	nebula-storaged.conf
--use_vertex_key=true					

3.

- RPM

```
$ sudo rpm -Uvh <package_name>
```

```
$ sudo rpm -Uvh --prefix=<installation_path> <package_name>
```

- DEB

```
$ sudo dpkg -i <package_name>
```

4. [NebulaGraph](#)

1. NebulaGraph etc
2. NebulaGraph



#### Note

### Docker Compose



Docker Compose NebulaGraph

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## 5.9 NebulaGraph

---

NebulaGraph



NebulaGraph

Meta

### 5.9.1

NebulaGraph

**NebulaGraph**

### 5.9.2 1



Storage Meta

#### 1. Storage disk

```
##### Disk #####
# Root data path. Split by comma. e.g. --data_path=/disk1/path1/,/disk2/path2/
# One path per Rocksdb instance.
--data_path=/nebula/data/storage
```

#### 2. metad

#### 3.

### 5.9.3 2



cluster.id

--prefix /usr/local/nebula

**NebulaGraph**

NebulaGraph

**RPM** **NebulaGraph**

#### 1. NebulaGraph

```
$ rpm -qa | grep "nebula"
```

nebula-graph-3.3.0-1.x86\_64

#### 2. NebulaGraph

```
sudo rpm -e <nebula_version>
```

```
sudo rpm -e nebula-graph-3.3.0-1.x86_64
```

3.

### **DEB NebulaGraph**

1. NebulaGraph

```
$ dpkg -l | grep "nebula"
```

```
ii  nebula-graph  3.3.0  amd64      NebulaGraph Package built using CMake
```

2. NebulaGraph

```
sudo dpkg -r <nebula_version>
```

```
sudo dpkg -r nebula-graph
```

3.

### **Docker Compose NebulaGraph**

1. nebula-docker-compose NebulaGraph

```
docker-compose down -v
```

2. nebula-docker-compose

---

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## 6.

---

### 6.1

---

#### 6.1.1

NebulaGraph **gflags** flags NebulaGraph

**Note**

- NebulaGraph
- 



1.x CONFIGS

2.x CONFIGS

<binary> --help

```
#     Meta
$ /usr/local/nebula/bin/nebula-metad --help

#     Graph
$ /usr/local/nebula/bin/nebula-graphd --help

#     Storage
$ /usr/local/nebula/bin/nebula-storaged --help
```

/usr/local/nebula/bin/ NebulaGraph

curl

NebulaGraph

```
#     Meta
curl 127.0.0.1:19559/flags

#     Graph
curl 127.0.0.1:19669/flags

#     Storage
curl 127.0.0.1:19779/flags
```

**Note**

IP 127.0.0.1

## RPM/DEB TAR

NebulaGraph	<code>&lt;service_name&gt;.conf.default</code>	<code>&lt;service_name&gt;.conf.production</code>	RPM/DEB
<code>/usr/local/nebula/etc/</code>	TAR	<code>&lt;install_path&gt;/&lt;tar_package_directory&gt;/etc</code>	TAR
		<code>.default</code>	<code>.production</code>



IP	<code>local_ip</code>	NebulaGraph	3	Storage	3	IP
----	-----------------------	-------------	---	---------	---	----

**NebulaGraph**

Meta	<code>nebula-metad.conf.default</code>	<code>nebula-metad.conf.production</code>	Meta
Graph	<code>nebula-graphd.conf.default</code>	<code>nebula-graphd.conf.production</code>	Graph
Storage	<code>nebula-storaged.conf.default</code>	<code>nebula-storaged.conf.production</code>	Storage

<code>local_config</code>	<code>true</code>	NebulaGraph
---------------------------	-------------------	-------------



<code>local_config</code>	<code>false</code>	NebulaGraph	Meta
---------------------------	--------------------	-------------	------

## DOCKER COMPOSE

Docker Compose	<code>&lt;install_path&gt;/nebula-docker-compose/docker-compose.yaml</code>	command
----------------	---	---------

## NEBULAGRAPH OPERATOR

NebulaGraph Operator	Kubectl	YAML	<code>spec.{graphd storaged metad}.config</code>
----------------------	---------	------	--



Helm

NebulaGraph	NebulaGraph Config
-------------	--------------------

## NebulaGraph

- RPM/DEB TAR
    - a.
    - b. NebulaGraph
  - Docker Compose
    - a. <install\_path>/nebula-docker-compose/docker-compose.yaml
    - b. `nebula-docker-compose docker-compose up -d`
  - Kubectl
- 

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## 6.1.2 Meta

Meta	<code>nebula-metad.conf.default</code>	<code>nebula-metad.conf.production</code>	/usr/local/nebula/etc/
------	--	---	------------------------



- `local_config` false NebulaGraph Meta
- 

`.default` `.production` Meta

`nebula-metad.conf.default`

### basics

<code>daemonize</code>	true			
<code>pid_file</code>	<code>pids/nebula-metad.pid</code>	ID		
<code>timezone_name</code>	-	NebulaGraph the Time Zone with TZ	UTC+00:00:00 --timezone_name=UTC+08:00	Specifying



- NebulaGraph `timezone_name` TIMESTAMP UTC UTC
- `timezone_name` NebulaGraph NebulaGraph

**logging**

<code>log_dir</code>	<code>logs</code>	<code>Meta</code>							
<code>minloglevel</code>	<code>0</code>			<code>0</code>	<code>INFO</code>	<code>1</code>	<code>WARNING</code>	<code>2</code>	<code>ERROR</code>
		<code>FATAL</code>		<code>0</code>		<code>1</code>		<code>4</code>	<code>NebulaGraph</code>
<code>v</code>	<code>0</code>			<code>0</code>	<code>1</code>	<code>2</code>	<code>3</code>		
<code>logbufsecs</code>	<code>0</code>			<code>0</code>					
<code>redirect_stdout</code>	<code>true</code>								
<code>stdout_log_file</code>	<code>metad-</code> <code>stdout.log</code>								
<code>stderr_log_file</code>	<code>metad-</code> <code>stderr.log</code>								
<code>stderrthreshold</code>	<code>2</code>			<code>minloglevel</code>					
<code>timestamp_in_logfile_name</code>	<code>true</code>			<code>true</code>		<code>false</code>			

**networking**

<code>meta_server_addrs</code>	<code>127.0.0.1:9559</code>	<code>Meta</code>	<code>IP</code>	<code>Meta</code>	,				
<code>local_ip</code>	<code>127.0.0.1</code>	<code>Meta</code>	<code>IP</code>	<code>IP</code>	<code>nebula-metad</code>				
<code>port</code>	<code>9559</code>	<code>Meta</code>	<code>RPC</code>	<code>Meta</code>	<code>9559</code>	<code>+1</code>	<code>9560</code>		
<code>NebulaGraph</code>									
<code>ws_ip</code>	<code>0.0.0.0</code>	<code>HTTP</code>	<code>IP</code>						
<code>ws_http_port</code>	<code>19559</code>	<code>HTTP</code>							
<code>ws_storage_http_port</code>	<code>19779</code>	<code>HTTP</code>	<code>Storage</code>	<code>Storage</code>	<code>Storage</code>		<code>ws_http_port</code>		
			<code>NebulaGraph</code>						
<code>heartbeat_interval_secs</code>	<code>10</code>			<code>heartbeat_interval_secs</code>					

**Caution**IP `127.0.0.1/0.0.0.0`**storage**

<code>data_path</code>	<code>data/meta</code>	<code>meta</code>
------------------------	------------------------	-------------------

**misc**

<code>default_parts_num</code>	<code>100</code>
<code>default_replica_factor</code>	<code>1</code>

**rocksdb options**

rocksdb_wal_sync	true	RocksDB WAL
------------------	------	-------------

---

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### 6.1.3 Graph

Graph	<code>nebula-graphd.conf.default</code>	<code>nebula-graphd.conf.production</code>	<code>/usr/local/nebula/etc/</code>
-------	---	--	-------------------------------------

 **Caution**

- `local_config`    `false`    `NebulaGraph`    `Meta`
- 

`.default` `.production` `Graph`

`nebula-graphd.conf.default`

#### basics

<code>daemonize</code>	<code>true</code>				
<code>pid_file</code>	<code>pids/nebula-</code>	<code>ID</code>			
	<code>graphd.pid</code>				
<code>enable_optimizer</code>	<code>true</code>				
<code>timezone_name</code>	-	<code>NebulaGraph</code>	<code>UTC+00:00:00</code>	<code>--timezone_name=UTC+08:00</code>	<b>Specifying the Time Zone with TZ</b>
<code>local_config</code>	<code>true</code>				

 **Note**

- `NebulaGraph`    `timezone_name`    `TIMESTAMP`    `UTC`    `UTC`
- `timezone_name`    `NebulaGraph`    `NebulaGraph`

**logging**

log_dir	logs	Graph
minloglevel	0	0 INFO 1 WARNING 2 ERROR 3 FATAL 0 1 4 NebulaGraph
v	0	0 1 2 3
logbufsecs	0	0
redirect_stdout	true	
stdout_log_file	graphd- stdout.log	
stderr_log_file	graphd- stderr.log	
stderrthreshold	2	minloglevel
timestamp_in_logfile_name	true	true false

**query**

accept_partial_success	false
session_reclaim_interval_secs	10
max_allowed_query_size	4194304 4MB

**networking**

meta_server_addrs	127.0.0.1:9559	Meta	IP	Meta	,
local_ip	127.0.0.1	Graph	IP	IP	nebula-graphd
listen_netdev	any				
port	9669	Graph	RPC		
reuse_port	false		SO_REUSEPORT		
listen_backlog	1024	socket			net.core.somaxconn
client_idle_timeout_secs	28800		8	0	
session_idle_timeout_secs	28800		1~604800	8	
num_accept_threads	1				
num_netio_threads	0	IO	0	CPU	
num_worker_threads	0		0	CPU	
ws_ip	0.0.0.0	HTTP	IP		
ws_http_port	19669	HTTP			
heartbeat_interval_secs	10		heartbeat_interval_secs		
storage_client_timeout_ms	-	Graph	Storage	RPC	60000
slow_query_threshold_us	200000				
ws_meta_http_port	19559	HTTP	Meta	Meta	ws_http_port



IP 127.0.0.1/0.0.0.0

**charset and collate**

default_charset	utf8
default_collate	utf8_bin

**authorization**

enable_authorize	false
auth_type	password

**memory**

system_memory_high_watermark_ratio	0.8	NebulaGraph
------------------------------------	-----	-------------

**metrics**

enable_space_level_metrics	false	query_latency_us{space=basketballplayer}.avg.3600	curl
----------------------------	-------	---	------

**session**

max_sessions_per_ip_per_user	300	IP
------------------------------	-----	----

**experimental**

enable_experimental_feature	false	true false		
enable_toss	false	TOSS TOSS Transaction on Storage Side UPINSERT DELETE enable_experimental_feature true	INSERT UPDATE	1
enable_data_balance	true	enable_experimental_feature true		

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### 6.1.4 Storage

Storage nebula-storaged.conf.default nebula-storaged.conf.production /usr/local/nebula/etc/

#### Caution

- local\_config false Storage Meta
- 

.default .production Storage

nebula-storaged.conf.default nebula-  
storaged.conf.production

#### Note

Raft Listener Storage Raft listener

### basics

daemonize	true				
pid_file	pids/nebula-storaged.pid	ID			
timezone_name	-	NebulaGraph the Time Zone with TZ	UTC+00:00:00 --timezone_name=UTC+08:00		Specifying
local_config	true				

#### Note

- NebulaGraph timezone\_name TIMESTAMP UTC UTC
- timezone\_name NebulaGraph NebulaGraph

**logging**

log_dir	logs	Storage							
minloglevel	0	FATAL	0	0 INFO	1 WARNING	2 ERROR	3	4 NebulaGraph	
v	0		0	0 1 2 3					
logbufsecs	0		0						
redirect_stdout	true								
stdout_log_file	storaged- stdout.log								
stderr_log_file	storaged- stderr.log								
stderrthreshold	2		minloglevel						
timestamp_in_logfile_name	true		true false						

**networking**

meta_server_addrs	127.0.0.1:9559	Meta	IP	Meta	,				
local_ip	127.0.0.1	Storage	IP	IP	nebula-storaged				
port	9779	Storage NebulaGraph	RPC	Storage	9779	9777	9778	9780	
ws_ip	0.0.0.0	HTTP	IP						
ws_http_port	19779	HTTP							
heartbeat_interval_secs	10		heartbeat_interval_secs						

**Caution**

IP 127.0.0.1/0.0.0.0

**raft**

raft_heartbeat_interval_secs	30	Raft	
raft_rpc_timeout_ms	500	Raft	RPC
wal_ttl	14400	Raft WAL	

**disk**

data_path	data/storage	,	RocksDB
minimum_reserved_bytes	268435456		
rocksdb_batch_size	4096		
rocksdb_block_cache	4	BlockBasedTable	
disable_page_cache	false	NebulaGraph cache true NebulaGraph block cache	false page page cache
engine_type	rocksdb		
rocksdb_compression	lz4	no snappy lz4 lz4hc zlib bzip2 zstd	
rocksdb_compression_per_level	-		
enable_rocksdb_statistics	false	RocksDB	
rocksdb_stats_level	kExceptHistogramOrTimers	RocksDB kExceptTimers kExceptDetailedTimers kExceptTimeForMutex	kAll
enable_rocksdb_prefix_filtering	true	prefix bloom filter	
enable_rocksdb_whole_key_filtering	false	whole key bloom filter	
rocksdb_filtering_prefix_length	12	key prefix 12 ID+ ID 16 ID+ ID+TagID/Edge typeID	
enable_partitioned_index_filter	-	true bloom	random-seek

**Key-Value separation**

rocksdb_enable_kv_separation	false	BlobDB KV	
rocksdb_kv_separation_threshold	100	RocksDB KV flush compaction	blob
rocksdb_blob_compression	lz4	BlobDB no snappy lz4 lz4hc zlib bzip2 zstd	
rocksdb_enable_blob_garbage_collection	true	compaction	BlobDB

**misc**

`snapshot NebulaGraph`      `snapshot Raft`      `leader`

<code>auto_remove_invalid_space</code>	<code>true</code>	<code>DROP SPACE</code>	<code>true</code>
<code>num_io_threads</code>	<code>16</code>	<code>I/O</code>	<code>RPC</code>
<code>num_worker_threads</code>	<code>32</code>	<code>Storage</code>	<code>RPC</code>
<code>max_concurrent_subtasks</code>	<code>10</code>	<code>TaskManager</code>	
<code>snapshot_part_rate_limit</code>	<code>10485760</code>	<code>Raft leader</code>	<code>Raft group</code>
<code>snapshot_batch_size</code>	<code>1048576</code>	<code>Raft leader</code>	<code>Raft group</code>
<code>rebuild_index_part_rate_limit</code>	<code>4194304</code>	<code>Raft leader</code>	<code>Raft group</code>
<code>rebuild_index_batch_size</code>	<code>1048576</code>	<code>Raft leader</code>	<code>Raft group</code>

**rocksdb options**

<code>rocksdb_db_options</code>	<code>{}</code>	RocksDB database
<code>rocksdb_column_family_options</code>	<code>{"write_buffer_size":"67108864",  "max_write_buffer_number":"4",  "max_bytes_for_level_base":"268435456"}</code>	RocksDB column family
<code>rocksdb_block_based_table_options</code>	<code>{"block_size":"8192"}</code>	RocksDB block based table
<code>rocksdb options</code>	<code>{"&lt;option_name&gt;": "&lt;option_value&gt;"}</code>	,

**rocksdb\_db\_options | rocksdb\_column\_family\_options**• **rocksdb\_db\_options**

```
max_total_wal_size
delete_obsolete_files_period_micros
max_background_jobs
stats_dump_period_sec
compaction_readahead_size
writable_file_max_buffer_size
bytes_per_sync
wal_bytes_per_sync
delayed_write_rate
avoid_flush_during_shutdown
max_open_files
stats_persist_period_sec
stats_history_buffer_size
strict_bytes_per_sync
enable_rocksdb_prefix_filtering
enable_rocksdb_whole_key_filtering
rocksdb_filtering_prefix_length
num_compaction_threads
rate_limit
```

• **rocksdb\_column\_family\_options**

```
write_buffer_size
max_write_buffer_number
level0_file_num_compaction_trigger
level0_slowdown_writes_trigger
level0_stop_writes_trigger
target_file_size_base
target_file_size_multiplier
max_bytes_for_level_base
max_bytes_for_level_multiplier
disable_auto_compactions
```

**RocksDB**

max_edge_returned_per_vertex	space
------------------------------	-------

max_edge_returned_per_vertex	2147483647
------------------------------	------------

---

**Warning**

300 MB

storage	enable_partitioned_index_filter	true	rocksdb_block_cache	RocksDB
OOM				

---

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## 6.1.5 Linux

NebulaGraph    Linux

### ULIMIT

```
ulimit      shell
• ulimit
•
•          sudo
•          /etc/security/limits.conf
```

### ULIMIT -C

```
ulimit -c    core      unlimited
```

```
ulimit -c unlimited
```

### ULIMIT -N

```
ulimit -n      10
```

```
ulimit -n 130000
```

### VM.SWAPPINESS

vm.swappiness	swap	swap	0	0	swap
---------------	------	------	---	---	------

### VM.MIN\_FREE\_KBYTES

vm.min_free_kbytes	Linux	128 GB	vm.min_free_kbytes	5 GB
--------------------	-------	--------	--------------------	------

### VM.MAX\_MAP\_COUNT

vm.max_map_count	VMA	65530
------------------	-----	-------

### VM.DIRTY\_\*

vm.dirty_*
------------

### TRANSPARENT HUGE PAGE

THP transparent huge page

```
root# echo never > /sys/kernel/mm/transparent_hugepage/enabled
root# echo never > /sys/kernel/mm/transparent_hugepage/defrag
root# swapoff -a && swapon -a
```

GRUB	/etc/rc.local
------	---------------

THP
-----

### NET.IPV4.TCP\_SLOW\_START\_AFTER\_IDLE

net.ipv4.tcp_slow_start_after_idle	1	0
------------------------------------	---	---

## NET.CORE.SOMAXCONN

net.core.somaxconn	socket	128	1024
--------------------	--------	-----	------

## NET.IPV4.TCP\_MAX\_SYN\_BACKLOG

net.ipv4.tcp_max_syn_backlog	SYN_RECV	TCP	128	1024
------------------------------	----------	-----	-----	------

## NET.CORE.NETDEV\_MAX\_BACKLOG

net.core.netdev_max_backlog	1000	10000
-----------------------------	------	-------

## NET.IPV4.TCP\_KEEPALIVE\_\*

net.ipv4.tcp_keepalive_*	TCP	tcp_keepalive_time	tcp_keepalive_intvl
--------------------------	-----	--------------------	---------------------

## NET.IPV4.TCP\_WMEM/RMEM

TCP	/	(GB)	*	(ms)
-----	---	------	---	------

## SCHEDULER

SSD	scheduler	noop	none	/sys/block/DEV_NAME/queue/scheduler
-----	-----------	------	------	-------------------------------------

## KERNEL.CORE\_PATTERN

core	kernel.core_uses_pid	1
------	----------------------	---

## SYSCTL

- sysctl <conf\_name>

- sysctl -w <conf\_name>=<value>

- sysctl -p [<file\_path>]

Linux /etc/sysctl.conf

## PRLIMIT

prlimit	sudo	prlimit --nofile=140000 --pid=\$\$	140000	RedHat 7u
---------	------	------------------------------------	--------	-----------

---

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## 6.2

---

### 6.2.1

DBA                    DBA  
 NebulaGraph      **glog**      **gflags**      HTTP

`/usr/local/nebula/logs/`

NebulaGraph

• **minloglevel**                    0 INFO    1 WARNING    2 ERROR    3 FATAL    0    1    4  
 NebulaGraph

• **v**                    0 1 2 3

Meta    Graph    Storage      `/usr/local/nebula/etc/`

**gflags**

```
$ curl <ws_ip>:<ws_port>/flags
```

ws_ip	HTTP	IP	127.0.0.1
ws_port	HTTP	19559	Meta    19669    Graph    19779    Storage

- Meta

```
$ curl 127.0.0.1:19559/flags | grep 'minloglevel'
```

- Storage

```
$ curl 127.0.0.1:19779/flags | grep -w 'v'
```

```
$ curl -X PUT -H "Content-Type: application/json" -d '{"<key>:<value>[,<key>:<value>]}' "<ws_ip>:<ws_port>/flags"
```

key			
value			
ws_ip	HTTP	IP	127.0.0.1
ws_port	HTTP	19559	Meta 19669 Graph 19779 Storage

```
$ curl -X PUT -H "Content-Type: application/json" -d '{"minloglevel":0,"v":3}' "127.0.0.1:19779/flags" # storaged
$ curl -X PUT -H "Content-Type: application/json" -d '{"minloglevel":0,"v":3}' "127.0.0.1:19669/flags" # graphd
$ curl -X PUT -H "Content-Type: application/json" -d '{"minloglevel":0,"v":3}' "127.0.0.1:19559/flags" # metad
```

## NebulaGraph

### RocksDB

RocksDB	/usr/local/nebula/data/storage/nebula/\$id/data/LOG , \$id	RocksDB
---------	--	---------

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# 7.

---

## 7.1 NebulaGraph

NebulaGraph

HTTP

### 7.1.1

NebulaGraph

num\_queries.sum.600 NebulaGraph

num_queries										
	sum	SUM	AVG	RATE	P	P75	P95	P99	P999	
	600		5	60	600	3600	5	1	10	1

Graph

Space Level Metrics

Graph enable\_space\_level\_metrics true NebulaGraph



```
curl -G "http://192.168.8.40:19559/stats" {space=space_name}
num_active_queries{space=basketballplayer}.sum.5=0
```

### 7.1.2 HTTP

```
curl -G "http://<ip>:<port>/stats?stats=<metric_name_list> [&format=json]"
```

ip	IP						
port	HTTP	Meta	19559	Graph	19669	Storage	19779
metric_name_list	,						
&format=json	JSON						



NebulaGraph docker-compose ps

Graph 10

```
$ curl -G "http://192.168.8.40:19669/stats?stats=num_queries.sum.600"
num_queries.sum.600=400
```

- 

Meta	1	10	P99	1%
------	---	----	-----	----

```
$ curl -G "http://192.168.8.40:19559/stats?stats=heartbeat_latency_us.avg.60,heartbeat_latency_us.p99.600"
heartbeat_latency_us.avg.60=281
heartbeat_latency_us.p99.600=965
```

- 

JSON

Storage	10	JSON
---------	----	------

```
$ curl -G "http://192.168.8.40:19779/stats?stats=num_add_vertices.sum.600&format=json"
[{"value":1,"name":"num_add_vertices.sum.600"}]
```

- 

```
$ curl -G "http://192.168.8.40:19559/stats"
heartbeat_latency_us.avg.5=304
heartbeat_latency_us.avg.60=308
heartbeat_latency_us.avg.600=299
heartbeat_latency_us.avg.3600=285
heartbeat_latency_us.p75.5=652
heartbeat_latency_us.p75.60=669
heartbeat_latency_us.p75.600=651
heartbeat_latency_us.p75.3600=642
heartbeat_latency_us.p95.5=930
heartbeat_latency_us.p95.60=963
heartbeat_latency_us.p95.600=933
heartbeat_latency_us.p95.3600=929
heartbeat_latency_us.p99.5=986
heartbeat_latency_us.p99.60=1409
heartbeat_latency_us.p99.600=989
heartbeat_latency_us.p99.3600=986
num_heartbeats.rate.5=0
num_heartbeats.rate.60=0
num_heartbeats.rate.600=0
num_heartbeats.rate.3600=0
num_heartbeats.sum.5=2
num_heartbeats.sum.60=40
num_heartbeats.sum.600=394
num_heartbeats.sum.3600=2364
...
...
```

### 7.1.3

#### Graph

num_active_queries							
num_active_sessions							
	num_active_sessions.sum.5	5	10	30			-20
10-30							
num_aggregate_executors	Aggregate						
num_auth_failed_sessions_bad_username_password							
num_auth_failed_sessions_out_of_max_allowed	FLAG_OUT_OF_MAX_ALLOWED_CONNECTIONS						
num_auth_failed_sessions							
num_indexscan_executors	IndexScan						
num_killed_queries							
num_opened_sessions							
num_queries							
num_query_errors_leader_changes	Leader						
num_query_errors							
num_reclaimed_expired_sessions							
num_rpc_sent_to_metad_failed	Graphd	Metad	RPC				
num_rpc_sent_to_metad	Graphd	Metad	RPC				
num_rpc_sent_to_storaged_failed	Graphd	Storaged	RPC				
num_rpc_sent_to_storaged	Graphd	Storaged	RPC				
num_sentences	Graphd						
num_slow_queries							
num_sort_executors	Sort						
optimizer_latency_us							
query_latency_us							
slow_query_latency_us							
num_queries_hit_memory_watermark							

**Meta**

commit_log_latency_us	Raft	Commit
commit_snapshot_latency_us	Raft	Commit
<hr/>		
heartbeat_latency_us		
<hr/>		
num_heartbeats		
num_raft_votes	Raft	
transfer_leader_latency_us	Raft	Leader
num_agent_heartbeats		AgentHBProcessor
agent_heartbeat_latency_us		AgentHBProcessor
replicate_log_latency_us	Raft	
num_send_snapshot	Raft	
append_log_latency_us	Raft	
append_wal_latency_us	Raft	WAL
num_grant_votes	Raft	
num_start_elect	Raft	

**Storage**

add_edges_atomic_latency_us	TOSS
add_edges_latency_us	
add_vertices_latency_us	
commit_log_latency_us	Raft      Commit
commit_snapshot_latency_us	Raft      Commit
delete_edges_latency_us	
delete_vertices_latency_us	
get_neighbors_latency_us	
get_dst_by_src_latency_us	
num_get_prop	GetPropProcessor
num_get_neighbors_errors	GetNeighborsProcessor
num_get_dst_by_src_errors	GetDstBySrcProcessor
get_prop_latency_us	GetPropProcessor
num_edges_deleted	
num_edges_inserted	
num_raft_votes	Raft
num_rpc_sent_to_metad_failed	Storage    Metad    RPC
num_rpc_sent_to_metad	Storage    Metad    RPC
num_tags_deleted	Tag
num_vertices_deleted	
num_vertices_inserted	
transfer_leader_latency_us	Raft      Leader
lookup_latency_us	LookupProcessor
num_lookup_errors	LookupProcessor
num_scan_vertex	ScanVertexProcessor
num_scan_vertex_errors	ScanVertexProcessor
update_edge_latency_us	UpdateEdgeProcessor
num_update_vertex	UpdateVertexProcessor
num_update_vertex_errors	UpdateVertexProcessor
kv_get_latency_us	Getprocessor
kv_put_latency_us	PutProcessor
kv_remove_latency_us	RemoveProcessor
num_kv_get_errors	GetProcessor
num_kv_get	GetProcessor
num_kv_put_errors	PutProcessor

num_kv_put	PutProcessor
num_kv_remove_errors	RemoveProcessor
num_kv_remove	RemoveProcessor
forward_tranx_latency_us	
scan_edge_latency_us	ScanEdgeProcessor
num_scan_edge_errors	ScanEdgeProcessor
num_scan_edge	ScanEdgeProcessor
scan_vertex_latency_us	ScanVertexProcessor
num_add_edges	
num_add_edges_errors	
num_add_vertices	
num_start_elect	Raft
num_add_vertices_errors	
num_delete_vertices_errors	
append_log_latency_us	Raft
num_grant_votes	Raft
replicate_log_latency_us	Raft
num_delete_tags	Tag
num_delete_tags_errors	Tag
num_delete_edges	
num_delete_edges_errors	
num_send_snapshot	
update_vertex_latency_us	UpdateVertexProcessor
append_wal_latency_us	Raft WAL
num_update_edge	UpdateEdgeProcessor
delete_tags_latency_us	Tag
num_update_edge_errors	UpdateEdgeProcessor
num_get_neighbors	GetNeighborsProcessor
num_get_dst_by_src	GetDstBySrcProcessor
num_get_prop_errors	GetPropProcessor
num_delete_vertices	
num_lookup	LookupProcessor
num_sync_data	Storage Drainer
num_sync_data_errors	Storage Drainer
sync_data_latency_us	Storage Drainer

## Note

num_active_queries				
num_queries				
num_sentences		Graphd		
optimizer_latency_us				
query_latency_us				
num_slow_queries				
num_query_errors				
num_query_errors_leader_changes		Leader		
num_killed_queries				
num_aggregate_executors		Aggregate		
num_sort_executors		Sort		
num_indexscan_executors		IndexScan		
num_auth_failed_sessions_bad_username_password				
num_auth_failed_sessions				
num_opened_sessions				
num_queries_hit_memory_watermark				
num_reclaimed_expired_sessions				
num_rpc_sent_to_metad_failed	Graphd	Metad	RPC	
num_rpc_sent_to_metad	Graphd	Metad	RPC	
num_rpc_sent_to_storaged_failed	Graphd	Storaged	RPC	
num_rpc_sent_to_storaged	Graphd	Storaged	RPC	
slow_query_latency_us				

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## 7.2 RocksDB

NebulaGraph    RocksDB

NebulaGraph    RocksDB

### 7.2.1 RocksDB

RocksDB              RocksDB

1. nebula-storaged.conf    --enable\_rocksdb\_statistics    true    /use/local/nebula/etc
- 2.

### 7.2.2 RocksDB

HTTP              JSON

- 
- 

### 7.2.3

RocksDB

```
curl -L "http://${storage_ip}:${port}/rocksdb_stats"
```

```
curl -L "http://172.28.2.1:19779/rocksdb_stats"
rocksdb.blobdb.blob.file.bytes.read=0
rocksdb.blobdb.blob.file.bytes.written=0
rocksdb.blobdb.blob.file.bytes.synced=0
...
```

RocksDB

```
curl -L "http://${storage_ip}:${port}/rocksdb_stats?stats=${stats_name}"
```

```
rocksdb.bytes.read    rocksdb.block.cache.add
```

```
curl -L "http://172.28.2.1:19779/rocksdb_stats?stats=rocksdb.bytes.read,rocksdb.block.cache.add"
rocksdb.block.cache.add=14
rocksdb.bytes.read=1632
```

JSON    RocksDB

```
curl -L "http://${storage_ip}:${port}/rocksdb_stats?stats=${stats_name}&format=json"
```

```
rocksdb.bytes.read    rocksdb.block.cache.add    JSON
```

```
curl -L "http://172.28.2.1:19779/rocksdb_stats?stats=rocksdb.bytes.read,rocksdb.block.cache.add&format=json"
[
  {
    "rocksdb.block.cache.add": 1
  },
  {
    "rocksdb.bytes.read": 160
  }
]
```

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## 8.

---

### 8.1

---

#### 8.1.1

---

NebulaGraph NebulaGraph

NebulaGraph                    LDAP

NebulaGraph

1.        nebula-graphd.conf            /usr/local/nebula/etc/

- --enable\_authorize                  true    false

 **Note**

- root                NebulaGraph
- God                 root    nebula

• --failed\_login\_attempts              Graph                    Graph                    \*

• --password\_lock\_time\_in\_secs

2.        NebulaGraph

---

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## 8.1.2

NebulaGraph

NebulaGraph

### Note

- root NebulaGraph
- 

#### CREATE USER

CREATE USER NebulaGraph **God** root CREATE USER

- 

```
CREATE USER [IF NOT EXISTS] <user_name> [WITH PASSWORD '<password>'];
```

- IF NOT EXISTS
- user\_name
- password

- 

```
nebula> CREATE USER user1 WITH PASSWORD 'nebula';
nebula> SHOW USERS;
+-----+-----+
| Account | IP Whitelist |
+-----+-----+
| "root" | ""           |
| "user1" | ""           |
+-----+-----+
```

#### GRANT ROLE

GRANT ROLE **God** **Admin** GRANT ROLE

- 

```
GRANT ROLE <role_type> ON <space_name> TO <user_name>;
```

- 

```
nebula> GRANT ROLE USER ON basketballplayer TO user1;
```

**REVOKE ROLE**

REVOKE ROLE

**God****Admin**

REVOKE ROLE

REVOKE ROLE &lt;role\_type&gt; ON &lt;space\_name&gt; FROM &lt;user\_name&gt;;

nebula&gt; REVOKE ROLE USER ON basketballplayer FROM user1;

**DESCRIBE USER**

DESCRIBE USER

DESCRIBE USER <user\_name>;  
DESC USER <user\_name>;nebula> DESCRIBE USER user1;  
+-----+-----+  
| role | space |  
+-----+-----+  
| "ADMIN" | "basketballplayer" |  
+-----+-----+**SHOW ROLES**

SHOW ROLES

**root**

SHOW ROLES IN &lt;space\_name&gt;;

nebula> SHOW ROLES IN basketballplayer;  
+-----+-----+  
| Account | Role Type |  
+-----+-----+  
| "user1" | "ADMIN" |  
+-----+-----+**CHANGE PASSWORD**

CHANGE PASSWORD

CHANGE PASSWORD &lt;user\_name&gt; FROM '&lt;old\_password&gt;' TO '&lt;new\_password&gt;';

nebula&gt; CHANGE PASSWORD user1 FROM 'nebula' TO 'nebula123';

**ALTER USER**

ALTER USER

**God**

root

ALTER USER

ALTER USER &lt;user\_name&gt; WITH PASSWORD '&lt;password&gt;';

```
nebula> ALTER USER user2 WITH PASSWORD 'nebula';
nebula> SHOW USERS;
+-----+-----+
| Account | IP Whitelist |
+-----+-----+
| "root" | ""           |
| "user1" | ""           |
| "user2" | ""           |
+-----+-----+
```

**DROP USER**

DROP USER

**God**

DROP USER



DROP USER [IF EXISTS] &lt;user\_name&gt;;

nebula&gt; DROP USER user1;

**SHOW USERS**

SHOW USERS

**God**

SHOW USERS

SHOW USERS;

```
nebula> SHOW USERS;
+-----+-----+
| Account | IP Whitelist |
+-----+-----+
| "root" | ""           |
| "user1" | ""           |
| "user2" | "192.168.10.10" |
+-----+-----+
```

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### 8.1.3

#### NebulaGraph

- God
  - Linux root Windows administrator
- Meta
  - God root nebula



root

- nebula-graphd.conf /usr/local/nebula/etc/ --enable\_authorize true
- God
- God God root
- Admin
- Schema data
- 



ADMIN

- DBA
- Schema data
- 
- User
- Schema
- data
- Guest
- Schema data



- 
-

	<b>God</b>	<b>Admin</b>	<b>DBA</b>	<b>User</b>	<b>Guest</b>	<b>Basic</b>	
Read space	Y	Y	Y	Y	Y	Y	USE DESCRIBE SPACE
Read schema	Y	Y	Y	Y	Y	Y	DESCRIBE TAG DESCRIBE EDGE DESCRIBE TAG INDEX DESCRIBE EDGE INDEX
Write schema	Y	Y	Y				CREATE TAG ALTER TAG CREATE EDGE ALTER EDGE TAG DELETE TAG DROP EDGE CREATE TAG INDEX EDGE INDEX DROP TAG INDEX DROP EDGE INDEX
Write user	Y						CREATE USER DROP USER ALTER USER
Write role	Y	Y					GRANT REVOKE
Read data	Y	Y	Y	Y	Y	C	GO SET PIPE MATCH ASSIGNMENT LOOKUP YIELD ORDER BY FETCH VERTICES Find FETCH EDGES PATH LIMIT GROUP BY RETURN
Write data	Y	Y	Y	Y		C	INSERT VERTEX UPDATE VERTEX INSERT EDGE EDGE DELETE VERTEX DELETE EDGES DELETE TAG
Show operations	Y	Y	Y	Y	Y	Y	SHOW CHANGE PASSWORD
Job	Y	Y	Y	Y			SUBMIT JOB COMPACT SUBMIT JOB FLUSH SUBMIT STATS STOP JOB RECOVER JOB BUILD TAG INDEX EDGE INDEX INGEST DOWNLOAD
Write space		Y					CREATE SPACE DROP SPACE CREATE SNAPSHOT SNAPSHOT BALANCE CONFIG

 **Enterpriseonly**

Basic (Tag/Edge type )

 **Caution**

Show operations

SHOW SPACES

God

SHOW USERS SHOW SNAPSHOTS

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## 8.2 SSL

---

NebulaGraph      Graph    Meta    Storage      SSL      SSL

### 8.2.1

---

SSL

### 8.2.2

---

<code>cert_path</code>	-	PEM
<code>key_path</code>	-	
<code>password_path</code>	-	
<code>ca_path</code>	-	CA
<code>enable_ssl</code>	<code>false</code>	SSL
<code>enable_graph_ssl</code>	<code>false</code>	Graph      SSL
<code>enable_meta_ssl</code>	<code>false</code>	Meta      SSL

### 8.2.3

---

SSL      SSL      NebulaGraph

- `cert_path` `key_path` `password_path`
- CA
 

Certificate Authority	<code>cert_path</code> <code>key_path</code> <code>ca_path</code>
-----------------------	---

### 8.2.4

---

NebulaGraph

- Graph    Meta    Storage
 

<code>nebula-graphd.conf</code> <code>nebula-metad.conf</code> <code>nebula-storaged.conf</code>	<code>enable_ssl = true</code>
--	--------------------------------
- Graph
 

Graph	<code>nebula-graphd.conf</code>	<code>enable_graph_ssl = true</code>
-------	---------------------------------	--------------------------------------
- Meta
 

meta	<code>nebula-graphd.conf</code> <code>nebula-metad.conf</code> <code>nebula-storaged.conf</code>	<code>enable_meta_ssl = true</code>
------	--	-------------------------------------

### 8.2.5

---

1.

2.

Graph    Meta    Storage

```
--cert_path=xxxxxx  
--key_path=xxxxxx  
--password_path=xxxxxx  
--enable_ssl=true
```

3.

CA

nebula-test-run.py

---

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9.

## 9.1 NebulaGraph BR

### 9.1.1 Backup&Restore

## Backup&Restore BR CLI NebulaGraph

- - 
  - SSD HDD
  - Amazon S3 Alibaba Cloud OSS MinIO Ceph RGW
  - NebulaGraph
  -

- NebulaGraph v3.3.0
  - 
  - NebulaGraph Listener
    - NFS
    - Storage IP
  - DDL DML 2 5
  - 
  - NebulaGraph BR

BR

BR

1. BR
  2. BR
  3. BR

- NebulaGraph nebula-br 3 34

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## 9.1.2 BR

BR

BR	NebulaGraph	NebulaGraph Agent	Agent	NebulaGraph	BR	Agent
----	-------------	-------------------	-------	-------------	----	-------

<b>NebulaGraph</b>	<b>BR</b>	<b>Agent</b>
3.3.0	3.3.0	0.2.0
3.0.x ~ 3.2.x	0.6.1	0.1.0 ~ 0.2.0

**BR**

### 1. BR

```
 wget https://github.com/vesoft-inc/nebula-br/releases/download/v3.3.0/br-3.3.0-linux-amd64
```

### 2. br

```
 sudo mv br-3.3.0-linux-amd64 br
```

### 3. BR

```
 sudo chmod +x br
```

### 4. ./br version BR

```
[nebula-br]$ ./br version
Nebula Backup And Restore Utility Tool,V-3.3.0
```

BR

- Go 1.14.x
- make

### 1. nebula-br

```
 git clone https://github.com/vesoft-inc/nebula-br.git
```

### 2. br

```
 cd nebula-br
```

### 3. BR

```
 make
```

```
 bin/br version
```

```
[nebula-br]$ bin/br version
NebulaGraph Backup And Restore Utility Tool,V-3.3.0
```

## Agent

NebulaGraph Agent      RPC      BR

### 1. Agent

```
wget https://github.com/vesoft-inc/nebula-agent/releases/download/v0.2.0/agent-0.2.0-linux-amd64
```

### 2. Agent agent

```
sudo mv agent-0.2.0-linux-amd64 agent
```

### 3. Agent

```
sudo chmod +x agent
```

### 4. Agent



Agent      Meta      Agent      NebulaGraph

```
sudo nohup ./nebula_agent --agent=<agent_node_ip>:8888 --meta=<metad_node_ip>:9559 > nebula_agent.log 2>&1 &
```

- `--agent` Agent IP
- `--meta` Meta IP
- `--ratelimit` Bytes

```
sudo nohup ./nebula_agent --agent="192.168.8.129:8888" --meta="192.168.8.129:9559" --ratelimit=1048576 > nebula_agent.log 2>&1 &
```



--agent IP      Meta Storage      IP      127.0.0.1      Agent

### 5. Agent

```
nebula> SHOW HOSTS AGENT;
+-----+-----+-----+-----+-----+
| Host | Port | Status | Role | Git Info Sha | Version |
+-----+-----+-----+-----+-----+
| "192.168.8.129" | 8888 | "ONLINE" | "AGENT" | "96646b8" |      |
+-----+-----+-----+-----+-----+
```

E\_LIST\_CLUSTER\_NO\_AGENT\_FAILURE

<code>E_LIST_CLUSTER_NO_AGENT_FAILURE</code>	Agent	Agent	Meta	<code>SHOW HOSTS AGENT</code>	Agent
OFFLINE	Agent	Agent	--meta		

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### 9.1.3 BR

BR

BR

- BR Agent Agent
- NebulaGraph
- Meta Storage BR

 Note

NFS (Network File System)	Meta	Storage	BR	Alibaba Cloud OSS	Amazon S3
			BR		

BR

`./bin/br`

 Note

```
$ ./br backup full --meta <ip_address> --storage <storage_path>
```

- meta 192.168.8.129:9559 /home/nebula/backup/

 Caution

metad

 Caution

leader metad	metad	leader metad	<storage_path>/meta	follower meadt
--------------	-------	--------------	---------------------	----------------

```
$ ./br backup full --meta "192.168.8.129:9559" --storage "local:///home/nebula/backup/"
```

- meta 192.168.8.129:9559 s3 br-test backup

```
$ ./br backup full --meta "192.168.8.129:9559" --s3.endpoint "http://192.168.8.129:9000" --storage="s3://br-test/backup/" --s3.access_key=minioadmin --s3.secret_key=minioadmin --s3.region=default
```

-h, --help	-					
--debug	-					
--log	string	"br.log"				
--meta	string		meta			
--spaces	stringArray			--spaces nba_01 --spaces nba_02		
--storage	string		BR	<Schema>://<PATH>		
			Schema	local s3 s3	s3.access_key	
			s3.endpoint	s3.region s3.secret_key		
				PATH		
--	string					
s3.access_key						
--s3.endpoint	string		S3	URL http https		
--s3.region	string					
--	string					
s3.secret_key						

BR NebulaGraph BR

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#### 9.1.4 BR

BR NebulaGraph



- BR Agent Agent
- NebulaGraph
-

BR

./bin/br

1.

```
$ ./br show --storage <storage_path>
```

```
/home/nebula/backup
```

```
$ ./br show --storage "local:///home/nebula/backup"
```

NAME	CREATE TIME	SPACES	FULL BACKUP	ALL SPACES
BACKUP_2022_02_10_07_40_41	2022-02-10 07:40:41	basketballplayer	true	true
BACKUP_2022_02_11_08_26_43	2022-02-11 08:26:47	basketballplayer,foesa	true	true

```
s3      br-test      backup
```

```
$ ./br show --s3.endpoint "http://192.168.8.129:9000" --storage="s3://br-test/backup/" --s3.access_key=minioadmin --s3.secret_key=minioadmin --s3.region=default
```

-h, -help	-
--debug	-
--log	string "br.log"
--storage	string
	BR <Schema>://<PATH>
	Schema local s3 s3 s3.access_key
	s3.endpoint s3.region s3.secret_key
	PATH
--	string
s3.access_key	
--s3.endpoint	string S3 URL http https
--s3.region	string
--	string
s3.secret_key	

2.

```
$ ./br restore full --meta <ip_address> --storage <storage_path> --name <backup_name>
```

```
/home/nebula/backup/ meta 192.168.8.129:9559
```

```
$ ./br restore full --meta "192.168.8.129:9559" --storage "local:///home/nebula/backup/" --name BACKUP_2021_12_08_18_38_08
```

```
s3      br-test      backup      meta      192.168.8.129:9559
```

```
$ ./br restore full --meta "192.168.8.129:9559" --s3.endpoint "http://192.168.8.129:9000" --storage="s3://br-test/backup/" --s3.access_key=minioadmin --s3.secret_key=minioadmin --s3.region="default" --name BACKUP_2021_12_08_18_38_08
```

Restore succeed.

### Caution

IP

add host

Storage

-h, -help	-	-
--debug	-	
--log	string	"br.log"
--meta	string	meta
--name	string	
--storage	string	BR <Schema>://<PATH> Schema local s3 s3 s3.access_key s3.endpoint s3.region s3.secret_key PATH
--	string	
s3.access_key		
--s3.endpoint	string	S3 URL http https
--s3.region	string	
--	string	
s3.secret_key		

3.

```
$ ./br cleanup --meta <ip_address> --storage <storage_path> --name <backup_name>
```

-h, -help	-	-
--debug	-	
--log	string	"br.log"
--meta	string	meta
--name	string	
--storage	string	BR <Schema>://<PATH> Schema local s3 s3 s3.access_key s3.endpoint s3.region s3.secret_key PATH
--	string	
s3.access_key		
--s3.endpoint	string	S3 URL http https
--s3.region	string	
--	string	
s3.secret_key		

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## 9.2

---

NebulaGraph snapshot

### 9.2.1

NebulaGraph

God

### 9.2.2

- add host drop host create space drop space balance
- 
- /usr/local/nebula/data

### 9.2.3

NebulaGraph SNAPSHOT\_2021\_03\_09\_08\_43\_12 2021\_03\_09\_08\_43\_12 UTC

leader Meta Storage checkpoints

Linux find

```
$ find |grep 'SNAPSHOT_2021_03_09_08_43_12'
./data/meta2/nebula/0/checkpoints/SNAPSHOT_2021_03_09_08_43_12
./data/meta2/nebula/0/checkpoints/SNAPSHOT_2021_03_09_08_43_12/data
./data/meta2/nebula/0/checkpoints/SNAPSHOT_2021_03_09_08_43_12/data/000081.sst
...
```

### 9.2.4

CREATE SNAPSHOT

 Note

```
nebula> CREATE SNAPSHOT;
```

### 9.2.5

SHOW SNAPSHOTS

```
nebula> SHOW SNAPSHOTS;
+-----+-----+-----+
| Name      | Status | Hosts   |
+-----+-----+-----+
| "SNAPSHOT_2021_03_09_08_43_12" | "VALID" | "127.0.0.1:9779" |
| "SNAPSHOT_2021_03_09_09_10_52" | "VALID" | "127.0.0.1:9779" |
+-----+-----+-----+
```

Name	Snapshot	UTC
Status	VALID	INVALID
Hosts	Storage	IP

## 9.2.6

DROP Snapshot

```
DROP SNAPSHOT <snapshot_name>;
```

```
nebula> DROP SNAPSHOT SNAPSHOT_2021_03_09_08_43_12;
nebula> SHOW SNAPSHTS;
+-----+-----+-----+
| Name | Status | Hosts |
+-----+-----+-----+
| "SNAPSHOT_2021_03_09_09_10_52" | "VALID" | "127.0.0.1:9779" |
+-----+-----+-----+
```

## 9.2.7

shell

1. leader Meta Storage checkpoints 2 /usr/local/nebula/data/meta/  
nebula/0/checkpoints /usr/local/nebula/data/storage/nebula/3/checkpoints /usr/local/nebula/data/storage/nebula/4/checkpoints

```
$ ls /usr/local/nebula/data/meta/nebula/0/checkpoints/
SNAPSHOT_2021_03_09_09_10_52
$ ls /usr/local/nebula/data/storage/nebula/3/checkpoints/
SNAPSHOT_2021_03_09_09_10_52
$ ls /usr/local/nebula/data/storage/nebula/4/checkpoints/
SNAPSHOT_2021_03_09_09_10_52
```

2. data wal checkpoints data wal



Meta data wal      Meta leader      Meta leader      Meta

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# 10.

---

## 10.1 BALANCE

---

BALANCE	NebulaGraph	Storage	BALANCE	Storage	Storage
BALANCE					
BALANCE	LEADER		leader	ID	job_id

---

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# 11.

---

## 11.1 Compaction

Compaction

NebulaGraph Compaction

Compaction

NebulaGraph

Compaction

Compaction



Compaction

IO

NebulaGraph

Compaction

Compaction

Compaction

### 11.1.1 Compaction

Compaction

Compaction

Compaction

IO

### 11.1.2 Compaction

Compaction

TTL

Compaction



IO

```
nebula> USE <your_graph_space>;
nebula> SUBMIT JOB COMPACT;
```

ID

Compaction

```
nebula> SHOW JOB <job_id>;
```

### 11.1.3

NebulaGraph

- SUBMIT JOB COMPACT
- SUBMIT JOB COMPACT
- Compaction nebula-storaged.conf Compaction

```
#          20MB/S
--rocksdb_rate_limit=20 (in MB/s)
```

### 11.1.4 FAQ

#### Compaction

/usr/local/nebula/data/storage/nebula/{1}/data/

LOG

LOG.old.1625797988509303

```
** Compaction Stats [default] **
Level  Files   Size      Score Read(GB)  Rn(GB)  Rnp1(GB) Write(GB) Wnew(GB) Moved(GB) W-Amp Rd(MB/s) Wr(MB/s) Comp(sec) CompMergeCPU(sec) Comp(cnt) Avg(sec)
```

KeyIn	KeyDrop																
L0	2/0	2.46 KB	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.53	0.51	2		
0.264	0	0															
Sum	2/0	2.46 KB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.53	0.51	2		
0.264	0	0															
Int	0/0	0.00 KB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0		
0.000	0	0															

L0 compaction

#### Compaction

IO

#### Compaction

rocksdb\_rate\_limit 20MB/S /rocksdb\_rate\_limit 50MB/S

rocksdb\_rate\_limit

#### Compaction

RocksDB

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## 11.2 Storage

BALANCE

Raft leader

Storage

BALANCE



BALANCE

IP

### 11.2.1 leader

BALANCE LEADER leader

nebula&gt; BALANCE LEADER;

SHOW HOSTS

```
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+
| Host | Port | HTTP port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "192.168.10.100" | 9779 | 19779 | "ONLINE" | 4 | "basketballplayer:3" | "basketballplayer:8" | "3.1.0" |
| "192.168.10.101" | 9779 | 19779 | "ONLINE" | 8 | "basketballplayer:3" | "basketballplayer:8" | "3.1.0" |
| "192.168.10.102" | 9779 | 19779 | "ONLINE" | 3 | "basketballplayer:3" | "basketballplayer:8" | "3.1.0" |
| "192.168.10.103" | 9779 | 19779 | "ONLINE" | 0 | "basketballplayer:2" | "basketballplayer:7" | "3.1.0" |
| "192.168.10.104" | 9779 | 19779 | "ONLINE" | 0 | "basketballplayer:2" | "basketballplayer:7" | "3.1.0" |
| "192.168.10.105" | 9779 | 19779 | "ONLINE" | 0 | "basketballplayer:2" | "basketballplayer:7" | "3.1.0" |
+-----+-----+-----+-----+-----+-----+
```



NebulaGraph 3.3.0 Leader

Storage Error E\_RPC\_FAILURE

FAQ

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11.3

NebulaGraph

## Note

### 11.3.1

NebulaGraph

20-80

VID  
NebulaGraph

VID

### Tag Edge type

Tag      Edge type

NebulaGraph

Tag Edge type

### Tag/Edge type

Tag Edge type

## Schema

" " "

## schema-free

NebulaGraph 3.3.0 Schema

## " " Schema

## MySQL - ALTER TABLE

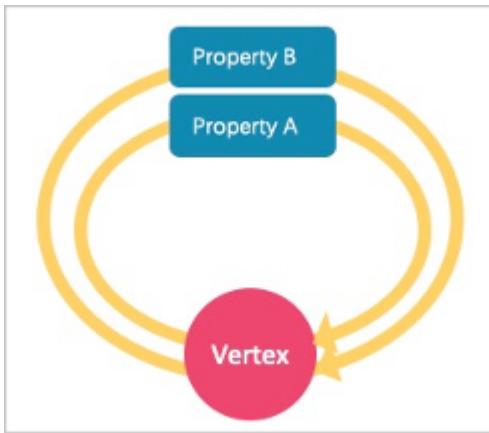
# " " Schema

NebulaGraph Schema

## ALTER TAG

List

List



```

// CREATE EDGE IF NOT EXISTS temp(tmp int);
nebula> INSERT EDGE temp(tmp) VALUES "player100"->"player100"@1:(1);
nebula> INSERT EDGE temp(tmp) VALUES "player100"->"player100"@2:(2);
nebula> INSERT EDGE temp(tmp) VALUES "player100"->"player100"@3:(3);

// GO FROM "player100" OVER temp YIELD properties(edge).tmp;
+-----+
| properties(EDGE).tmp |
+-----+
| 1 |
| 2 |
| 3 |
+-----+

// List
nebula> MATCH (v1:player)-[e:temp]->() return collect(e.tmp);
+-----+
| collect(e.tmp) |
+-----+
| [1, 2, 3] |
+-----+

```

- NebulaGraph      2 54

(Dangling edge)

NebulaGraph 3.3.0

**INSERT EDGE**

**DELETE VERTEX**

**WITH EDGE**

NebulaGraph 3.3.0

“ ” openCypher MERGE

**GO LOOKUP**

**MATCH**

```

//      "11"    "13"
nebula> CREATE EDGE IF NOT EXISTS e1 (name string, age int);
nebula> INSERT EDGE e1 (name, age) VALUES "11"->"13":("n1", 1);

// GO
nebula> GO FROM "11" over e1 YIELD properties(edge);
+-----+
| properties(EDGE) |
+-----+
| {age: 1, name: "n1"} |

```

```
+-----+
//    LOOKUP
nebula> LOOKUP ON e1 YIELD EDGE AS r;
+-----+
| r |
+-----+
| [:e2 "11"-->"13" @0 {age: 1, name: "n1"}] |
+-----+

//    MATCH
nebula> MATCH ()-[e:e1]->() RETURN e LIMIT 100;
+---+
| e |
+---+
Empty set (time spent 3153/3573 us)
```

- NebulaGraph 2 28



- NebulaGraph

Tag Edge type has

• “ ” ” ” (src)-[edge {P1, P2}]->(dst) edge P1, P2  
 (src)-[edge1]->(i\_node {P1, P2})-[edge2]->(dst) NebulaGraph 3.3.0 (src)-[edge {P1, P2}]->(dst)

(dst)<-[edge]-(src) GO FROM dst REVERSELY;

(src)-[edge]-(dst) GO FROM src BIDIRECT;

Tag

Tag

VID

VID

VID

2

write amplification

HBase/ES

NebulaGraph

## 11.3.2

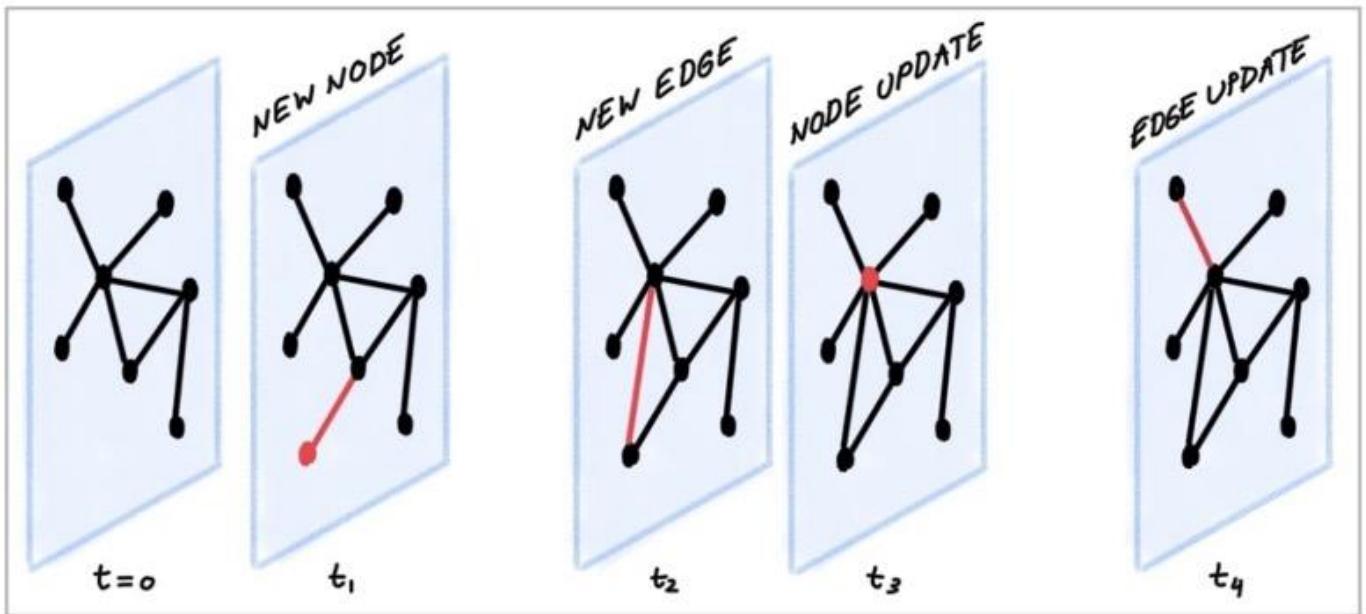
1

NebulaGraph 3.3.0

Rank

(int64)

Rank



## 11.3.3

[arrows.app](#)

- 
1. [https://blog.twitter.com/engineering/en\\_us/topics/insights/2021/temporal-graph-networks](https://blog.twitter.com/engineering/en_us/topics/insights/2021/temporal-graph-networks) ↪

---

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## 11.4

### 11.4.1 QPS

- NebulaGraph 3.3.0 — —QPS
- graphd graphd

NebulaGraph Algorithm

### 11.4.2

- NebulaGraph OLTP “ ” OLAP “ ”
- sst INSERT
- COMPACTON BALANCE
- NebulaGraph 3.3.0 NoSQL

### 11.4.3

- Graphd
- Storaged RocksDB LSM-tree BloomFilter
- Storaged (LRU) Cache

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## 11.5

---

NebulaGraph 3.3.0

EXPLAIN PROFILE

---

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## 11.6

### 11.6.1

V

NebulaGraph 3.3.0      Key-Value      VID      Key      Out-Edge Key-Value      In-Edge Key-Value  
 partition      LSM-tree

  [ ] [ ]      IO      Compact      IO      [ ] [ ]

1

**Note**

NebulaGraph

Spark

----- " Tag VID "

NebulaGraph 3.3.0      RocksDB      "      +  
 VID      Key-Value      Key

**NebulaGraph Index**

1

1. :

2. **Compact**      RocksDB

- A)-[ ]-> B) AB A) B)
   
" " "

- <- [depart] ->
   
depart Edge type Edge type depart\_ceair, depart\_csair

- -[ ]-> A
   
A A1 A2 A3,

```
1)-[ ]-> A1), 2)-[ ]-> A2), 2)-[ ]-> A3);
A1)-[ ]-> A), A2)-[ ]-> A), A3)-[ ]-> A).
```

A1 A2 A3	A1: 1-1000, A2: 1001-10000, A3: 10000+	A
A1 A2 A3		

---

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## 11.7

---

NebulaGraph

### 11.7.1

---

- 
- 
- 

### 11.7.2

---

- MATCH Pattern
- NebulaGraph
- BDD NebulaGraph
- BDD NebulaGraph
- NebulaGraph
- 
- | LDBC nGQL

### 11.7.3

---

- NebulaGraph Importer
- NebulaGraph 3.0
- NebulaGraph JDBC
- Nebula- | Norm ORM
- NebulaGraph Betweenness Centrality
- NebulaGraph Exchange SST
- logrotate NebulaGraph

##

- Nebula schema by 51 30



- 21 53



- Nebula Akulaku 40 03



- NebulaGraph 09 34



- 14 36

- 21 33
- 39 06
- OPPO 43 09
- NebulaGraph 47 40
- BIGO 53 47
- NebulaGraph Demo 39 54
- NebulaGraph Demo 1 01 55
- NebulaGraph 29 06

---

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## 12.

---

### 12.1

---

NebulaGraph                   NebulaGraph

- [NebulaGraph Console](#)    CLI
- [NebulaGraph CPP](#)    C++
- [NebulaGraph Java](#)    Java
- [NebulaGraph Python](#)    Python
- [NebulaGraph Go](#)    Go



NebulaGraph Java                   thread-safe



NebulaGraph

- [NebulaGraph PHP](#)
- [NebulaGraph Node](#)
- [NebulaGraph .net](#)
- [NebulaGraph JDBC](#)
- [NebulaGraph Carina](#)    Python ORM
- [NORM](#)    Golang ORM
- [Graph-Ocean](#)    Java ORM
- [NebulaGraph Ngbatis](#)    MyBatis    Java ORM

---

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## 12.2 Nebula Console

Nebula Console NebulaGraph

NebulaGraph

### 12.2.1 Nebula Console

Nebula Console

- [GitHub](#)
- [Install from source code](#)

### 12.2.2

#### NebulaGraph

nebula-console NebulaGraph

```
<path_of_console> -addr <ip> -port <port> -u <username> -p <password>
```

path\_of\_console Nebula Console

-h/-help			
-addr/-address	Graph	IP	127.0.0.1
-P/-port	Graph		9669
-u/-user	NebulaGraph		root
-p/-password			
-t/-timeout		120	
-e/-eval	nGQL		
-f/-file	nGQL	nGQL	
-enable_ssl	NebulaGraph	SSL	
-ssl_root_ca_path	CA		
-ssl_cert_path	CRT		
-ssl_private_key_path			

192.168.10.8 Graph

```
./nebula-console -addr 192.168.10.8 -port 9669 -u Joe -p Joespassword
```

Nebula Console

## Note

- VID

- SAMPLE

- 

- 

```
nebula> :param <param_name> => <param_value>;
```

```
nebula> :param p1 => "Tim Duncan";
nebula> MATCH (v:player{name:$p1})-[:follow]->(n)  RETURN v,n;
+-----+-----+
| v   | n   |
+-----+-----+
| ("player100" :player{age: 42, name: "Tim Duncan"}) | ("player125" :player{age: 41, name: "Manu Ginobili"}) |
| ("player100" :player{age: 42, name: "Tim Duncan"}) | ("player101" :player{age: 36, name: "Tony Parker"}) |
+-----+-----+
```

```
nebula> :param p2 => {"a":3,"b":false,"c":"Tim Duncan"};
nebula> RETURN $p2.b AS b;
+-----+
| b   |
+-----+
| false |
+-----+
```

- 

```
nebula> :params;
```

- 

```
nebula> :params <param_name>;
```

- 

```
nebula> :param <param_name> =>;
```

CSV      DOT

## Note

- Linux pwd
- 
- DOT [GraphvizOnline](#)
- CSV

```
nebula> :CSV <file_name.csv>;
```

- DOT

```
nebula> :dot <file_name.dot>;
```

```
nebula> :dot a.dot;
nebula> PROFILE FORMAT="dot" GO FROM "player100" OVER follow;
```

basketballplayer Schema SHOW

```
nebula> :play basketballplayer;
```

N

```
nebula> :repeat N;
```

```
nebula> :repeat 3;
nebula> GO FROM "player100" OVER follow YIELD dst(edge);
+-----+
| dst(EDGE) |
+-----+
| "player101" |
| "player125" |
+-----+
Got 2 rows (time spent 2602/3214 us)
```

Fri, 20 Aug 2021 06:36:05 UTC

```
+-----+
| dst(EDGE) |
+-----+
| "player101" |
| "player125" |
+-----+
Got 2 rows (time spent 583/849 us)
```

Fri, 20 Aug 2021 06:36:05 UTC

```
+-----+
| dst(EDGE) |
+-----+
| "player101" |
| "player125" |
+-----+
Got 2 rows (time spent 496/671 us)
```

Fri, 20 Aug 2021 06:36:05 UTC

Executed 3 times, (total time spent 3681/4734 us), (average time spent 1227/1578 us)

N Schema Schema

```
nebula> :sleep N;
```

:EXIT :QUIT NebulaGraph Nebula Console : quit

```
nebula> :QUIT;  
Bye root!
```

.....  
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## 12.3 NebulaGraph CPP

[NebulaGraph CPP](#)    [C++](#)

NebulaGraph

### 12.3.1

C++    GCC    4.8

### 12.3.2

NebulaGraph	NebulaGraph CPP
3.3.0	3.3.0
3.1.0 ~ 3.2.x	3.0.2
3.0.0	3.0.0
2.6.x	2.5.0
2.5.x	2.5.0
2.0.x	2.0.0

### 12.3.3 NebulaGraph CPP

NebulaGraph CPP

- C++    GCC    {10.1.0 | 9.3.0 | 9.2.0 | 9.1.0 | 8.3.0 | 7.5.0 | 7.1.0}    [gcc\\_preset\\_versions](#)

#### 1. NebulaGraph CPP

- NebulaGraph CPP    [--branch](#)    v3.3.0

```
$ git clone --branch release-3.3 https://github.com/vesoft-inc/nebula-cpp.git
```

- [master](#)

```
$ git clone https://github.com/vesoft-inc/nebula-cpp.git
```

#### 2. nebula-cpp

```
$ cd nebula-cpp
```

#### 3. build

```
$ mkdir build && cd build
```

#### 4. CMake makefile

### Note

```
/usr/local/nebula -DCMAKE_INSTALL_PREFIX=<installation_path>
```

```
$ cmake -DCMAKE_BUILD_TYPE=Release ..
```

### Note

```
g++ C++11 -DDISABLE_CXX11_ABI=ON
```

## 5. NebulaGraph CPP

```
-j N \(\min(\text{CPU} \ \ \frac{}{(GB)})\)
```

```
$ make -j{N}
```

## 6. NebulaGraph CPP

```
$ sudo make install
```

## 7.

```
$ sudo ldconfig
```

## 12.3.4

CPP SessionExample.cpp

### 1. SessionExample.cpp

### 2.

```
$ LIBRARY_PATH=<library_folder_path>:$LIBRARY_PATH g++ -std=c++11 SessionExample.cpp -I<include_folder_path> -lnebula_graph_client -o session_example
```

- library\_folder\_path NebulaGraph /usr/local/nebula/lib64
- include\_folder\_path NebulaGraph /usr/local/nebula/include

```
$ LIBRARY_PATH=/usr/local/nebula/lib64:$LIBRARY_PATH g++ -std=c++11 SessionExample.cpp -I/usr/local/nebula/include -lnebula_graph_client -o session_example
```

## 12.3.5

NebulaGraph CPP	Session Pool	Connection Pool	NebulaGraph	Connection Pool	Session
-----------------	--------------	-----------------	-------------	-----------------	---------

- Session Pool

[SessionPoolExample](#)

- Connection Pool

[SessionExample](#)

---

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## 12.4 NebulaGraph Java

[NebulaGraph Java](#)    [Java](#)    [NebulaGraph](#)

### 12.4.1

Java    8.0

### 12.4.2

NebulaGraph	NebulaGraph Java
3.3.0	3.3.0
3.0.0 ~ 3.2.0	3.0.0
2.6.x	2.6.1
2.0.x	2.0.0
2.0.0-rc1	2.0.0-rc1

### 12.4.3 NebulaGraph Java

- NebulaGraph Java    --branch    v3.3.0

```
$ git clone --branch release-3.3 https://github.com/vesoft-inc/nebula-java.git
```

- master

```
$ git clone https://github.com/vesoft-inc/nebula-java.git
```

### 12.4.4



IDEA    Maven    pom.xml



3.0.0-SNAPSHOT    release    3.0.0-SNAPSHOT

```
<dependency>
  <groupId>com.vesoft</groupId>
  <artifactId>client</artifactId>
  <version>3.0.0-SNAPSHOT</version>
</dependency>
```

pom.xml    release

```
<repositories>
  <repository>
    <id>snapshots</id>
    <url>https://oss.sonatype.org/content/repositories/snapshots/</url>
```

```
</repository>
</repositories>
```

Maven

JAR

NebulaGraph Java

Connection Pool Session Pool

Connection Pool

Session

- Session Pool

[GraphSessionPoolExample](#)

- Connection Pool

[GraphClientExample](#)

## 12.4.5 Java

---

- [java-jdbc](#)
  - [java-orm](#)
  - [java-springboot demo](#)
  - [ngbatis](#)
- 

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## 12.5 NebulaGraph Python

NebulaGraph Python    Python    NebulaGraph

### 12.5.1

Python    3.6

### 12.5.2

NebulaGraph	NebulaGraph Python
3.3.0	3.3.0
3.1.0 ~ 3.2.x	3.1.0
3.0.0 ~ 3.0.2	3.0.0
2.6.x	2.6.0
2.0.x	2.0.0
2.0.0-rc1	2.0.0rc1

### 12.5.3 NebulaGraph Python

#### pip

```
$ pip install nebula3-python==<version>
```

#### 1. NebulaGraph Python

- NebulaGraph Python    --branch    v3.3.0

```
$ git clone --branch release-3.3 https://github.com/vesoft-inc/nebula-python.git
```

- master

```
$ git clone https://github.com/vesoft-inc/nebula-python.git
```

#### 2. nebula-python

```
$ cd nebula-python
```

#### 3.

```
$ pip install .
```

## 12.5.4

NebulaGraph Python

Connection Pool Session Pool

Connection Pool

Session

- Session Pool

[SessinPoolExample.py](#)

Example of using session pool

- Connection Pool

[Example](#)

---

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## 12.6 NebulaGraph Go

NebulaGraph Go      Go      NebulaGraph

### 12.6.1

Go      1.13

### 12.6.2

NebulaGraph	NebulaGraph Go
3.3.0	3.3.0
3.2.x	3.2.0
3.1.0	3.1.0
3.0.0 ~ 3.0.2	3.0.0
2.6.x	2.6.0
2.0.x	2.0.0-GA

### 12.6.3 NebulaGraph Go

- NebulaGraph Go      --branch      v3.3.0

```
$ git clone --branch release-3.3 https://github.com/vesoft-inc/nebula-go.git
```

- master

```
$ git clone https://github.com/vesoft-inc/nebula-go.git
```

### 12.6.4

```
$ go get -u -v github.com/vesoft-inc/nebula-go@<tag>
```

tag      master      release-3.3

### 12.6.5

NebulaGraph GO      Connection Pool      Session Pool      Connection Pool      Session

- Session Pool

[session\\_pool\\_example.go](#)

[Usage example](#)

- Connection Pool

[graph\\_client\\_basic\\_example](#)    [graph\\_client\\_goroutines\\_example](#)

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## 13. NebulaGraph Cloud

---

NebulaGraph Cloud    Cloud    NebulaGraph

NebulaGraph

Cloud

- NebulaGraph Cloud
- AWS      NebulaGraph Cloud AWS
- Azure      NebulaGraph Cloud Azure



Cloud    3.3.0    Cloud    **NebulaGraph Cloud**

---

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## 14. NebulaGraph Studio

## 14.1 NebulaGraph Studio

### 14.1.1 NebulaGraph Studio

NebulaGraph Studio      Studio      Web      **NebulaGraph**      nGQL      NebulaGraph  
GitHub      [nebula-studio](#)



# Studio

RPM DEB tar Docker Studio Kubernetes Helm Studio Studio

Studio

Studio NebulaGraph

- | • Schema | Tag  | Edge Type | NebulaGraph |
|----------|------|-----------|-------------|
| •        |      |           |             |
| •        | nGQL | Schema    |             |

Studio

- NebulaGraph GUI Schema nGQL
  - nGQL NebulaGraph Query Language GUI

NebulaGraph

root

## Studio

NebulaGraph

Studio

NebulaGraph

## Note

Studio NebulaGraph

NebulaGraph	Studio
3.3.0	3.5.0
3.0.0 3.2.x	3.4.1 3.4.0
3.1.0	3.3.2
3.0.0	3.2.x
2.6.x	3.1.x
2.6.x	3.1.x
2.0 & 2.0.1	2.x
1.x	1.x

Studio Studio

The screenshot shows the Nebula Studio interface with the following details:

- Header:** Nebula Studio, Schema (highlighted), 导入 (Import), 控制台 (Console).
- Right Panel:**
  - 更新日志 (Update Log) button (highlighted with a red box).
  - 退出 (Logout) link.
  - v3.3.0-beta text.
- Left Panel:** 图空间列表 (Graph Space List) with a + 创建图空间 (Create Graph Space) button.
- Table:** Displays three graph spaces with the following data:
 

序号	名称	Partition Number	Replica Factor	Charset	Collate	Vid Type	Atomic Edge	Group	Comment	操作
1	basketball...	10	1	utf8	utf8_bin	FIXED_ST RING(32)	false	_EMPTY_	<a href="#">Schema</a>	...
2	hello_test	100	1	utf8	utf8_bin	INT64	false	_EMPTY_	<a href="#">Schema</a>	...
3	test	15	1	utf8	utf8_bin	FIXED_ST RING(30)	false	_EMPTY_	<a href="#">Schema</a>	...
- Pagination:** < > buttons, page number 1.

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## 14.1.2

Studio

Studio      x86\_64

Studio      CSV

CSV

### nGQL

nGQL

- USE <space\_name>      **Space**
- nGQL

Chrome    Studio

---

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## 14.2

---

### 14.2.1 Studio

RPM DEB tar Docker Studio

#### RPM Studio

RPM Studio

- NebulaGraph NebulaGraph
- Linux    CentOS    lsosf
- 

7001              Studio    web

---

#### 1. RPM

##### **NebulaGraph**

nebula-graph-studio-3.5.0.x86_64.rpm	nebula-graph-studio-3.5.0.x86_64.rpm.sha256	3.3.0
--------------------------------------	---	-------

#### 2. `sudo rpm -i <rpm_name>` RPM

Studio 3.5.0              /usr/local/nebula-graph-studio

```
$ sudo rpm -i nebula-graph-studio-3.5.0.x86_64.rpm
```

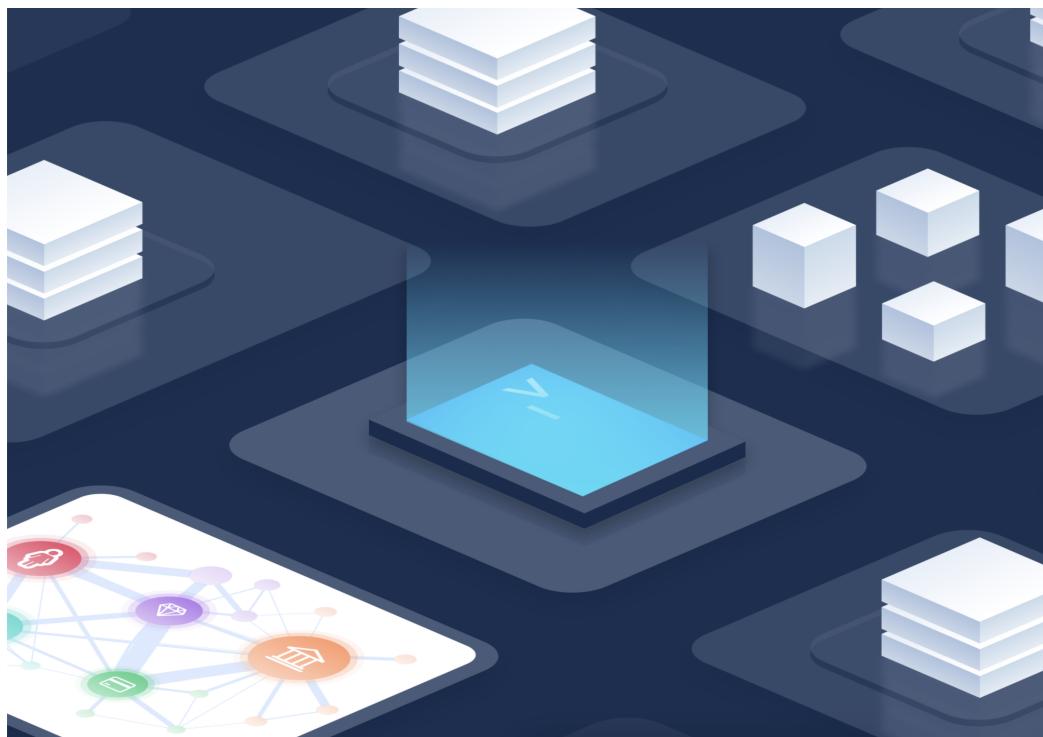
```
$ sudo rpm -i nebula-graph-studio-3.5.0.x86_64.rpm --prefix=<path>
```

PRM Studio

```
Start installing NebulaGraph Studio now...
NebulaGraph Studio has been installed.
NebulaGraph Studio started automatically.
```

#### 3. `http://<ip address>:7001`

Studio



Nebula Studio

配置数据库

Host

用户名

密码

连接

版本: v3.3.0-beta @ 中文 ▾

## Studio

```
$ sudo rpm -e nebula-graph-studio-3.5.0.x86_64
```

## PRM Studio

```
NebulaGraph Studio removed, bye-
```

```
$ bash /usr/local/nebula-graph-studio/scripts/rpm/start.sh
```

```
$ bash /usr/local/nebula-graph-studio/scripts/rpm/stop.sh
```

```
ERROR: bind EADDRINUSE 0.0.0.0:7001 7001
```

```
$ lsof -i:7001
```

## Studio

```
// studio
$ vi etc/studio-api.yaml

// Port: 7001 //

$ systemctl restart nebula-graph-studio.service
```

**DEB Studio**

DEB Studio

- NebulaGraph
- Linux Ubuntu
- 

7001 Studio web

- /usr/lib/systemd/system

## 1. DEB

**NebulaGraph**

nebula-graph-studio-3.5.0.x86_64.deb	nebula-graph-studio-3.5.0.x86_64.deb.sha256	3.3.0
--------------------------------------	---	-------

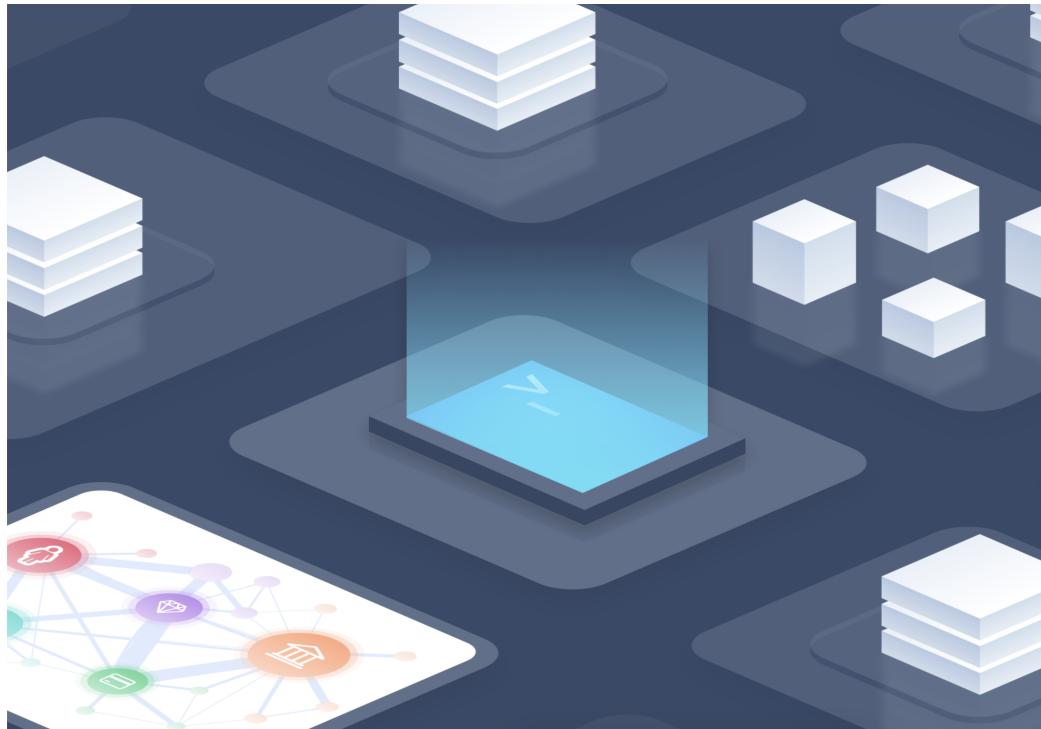
## 2. sudo dpkg -i &lt;deb\_name&gt; DEB

Studio 3.5.0

```
$ sudo dpkg -i nebula-graph-studio-3.5.0.x86_64.deb
```

## 3. http://&lt;ip address&gt;:7001

Studio



Nebula Studio

配置数据库

Host

用户名

密码

连接

版本: v3.3.0-beta @ 中文 ▾

Studio

```
$ sudo dpkg -r nebula-graph-studio
```

**tar Studio**

tar Studio

- NebulaGraph **NebulaGraph**
- 

7001

Studio web

## 1. tar

<b>Studio</b>	<b>NebulaGraph</b>
---------------	--------------------

<b>nebula-graph-studio-3.5.0.x86_64.tar.gz</b>	3.5.0	3.3.0
--	-------	-------

## 2. tar

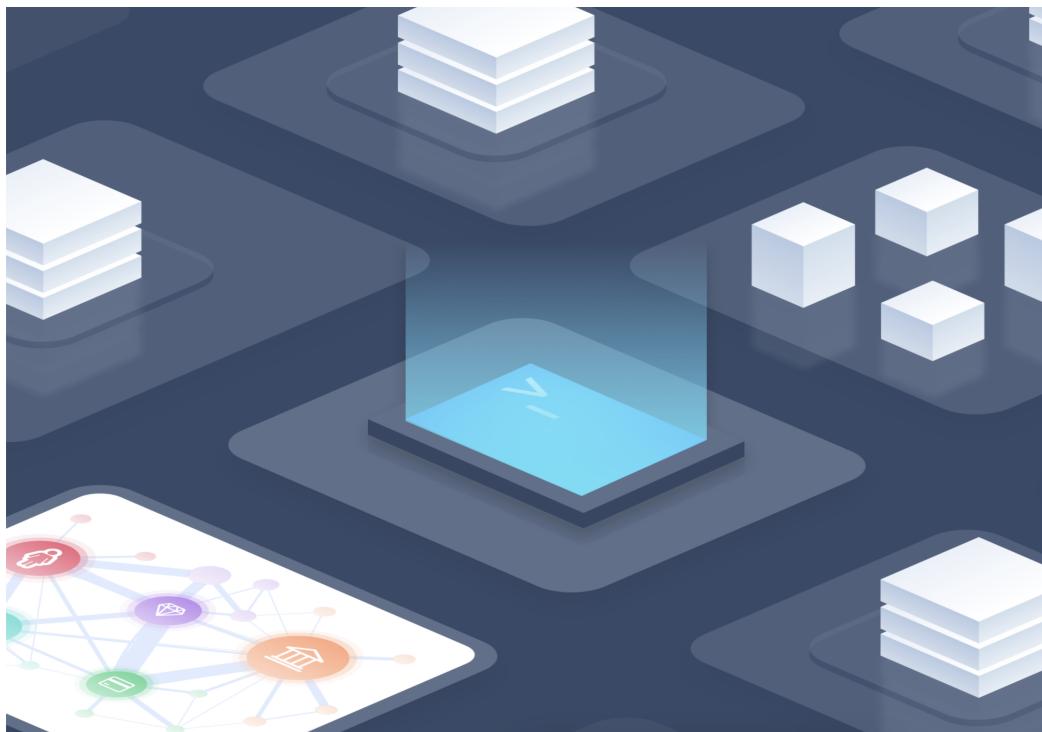
```
tar -xvf nebula-graph-studio-3.5.0.x86_64.tar.gz
```

## 3. nebula-graph-studio

```
$ cd nebula-graph-studio
$ ./server
```

4. <http://<ip address>:7001>

Studio



Nebula Studio

配置数据库

Host	<input type="text"/>
用户名	<input type="text"/>
密码	<input type="password"/> <input checked="" type="checkbox"/>
<b>连接</b>	
版本: v3.3.0-beta <span style="border: 1px solid #ccc; padding: 2px 5px;">@ 中文 ▾</span>	

```
kill <pid>
```

```
$ kill $(lsof -t -i :7001) # stop nebula-graph-studio
```

**Docker Studio**

Docker Studio

- NebulaGraph [NebulaGraph](#)
- Docker Studio [Docker Compose](#) [Docker Compose](#)
- 

7001

Studio web

- Docker Hub Docker [registry-mirrors](#) Docker

[registry-mirrors](#)

```
{  
  "registry-mirrors": [  
    "https://registry.docker-cn.com",  
    "http://hub-mirror.c.163.com",  
    "https://docker.mirrors.ustc.edu.cn"  
  ]  
}
```

/ Docker Desktop

Docker Daemon

Docker Studio NebulaGraph 3.3.0

## 1. Studio

### NebulaGraph

[nebula-graph-studio-3.5.0.tar.gz](#) 3.3.0

## 2. nebula-graph-studio-3.5.0

```
mkdir nebula-graph-studio-3.5.0 && tar -zxvf nebula-graph-studio-3.5.0.tar.gz -C nebula-graph-studio-3.5.0
```

## 3. nebula-graph-studio-3.5.0

```
cd nebula-graph-studio-3.5.0
```

## 4. Studio Docker

```
docker-compose pull
```

## 5. Studio -d

```
docker-compose up -d
```

### Docker Studio

```
Creating docker_web_1 ... done
```

## 6. http://<ip address>:7001



Docker Studio

[ifconfig](#)

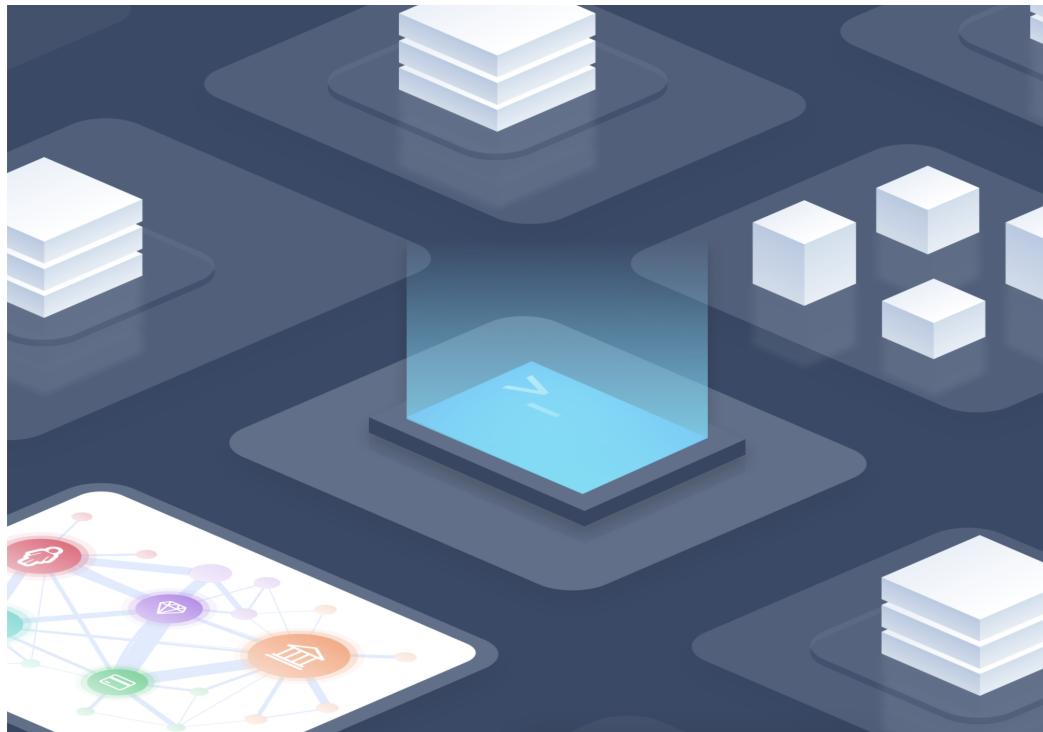
[ipconfig](#)

IP

Studio

<http://localhost:7001>

Studio



Nebula Studio

配置数据库

Host

用户名

密码

连接

版本: v3.3.0-beta © 中文 ▾

**Helm Studio**

Kubernetes    Helm    Studio

Studio

**Kubernetes**     $\geq 1.14$

**Helm**     $\geq 3.2.0$

**1. Studio**

```
$ git clone https://github.com/vesoft-inc/nebula-studio.git
```

**2. nebula-studio**

```
$ cd nebula-studio
```

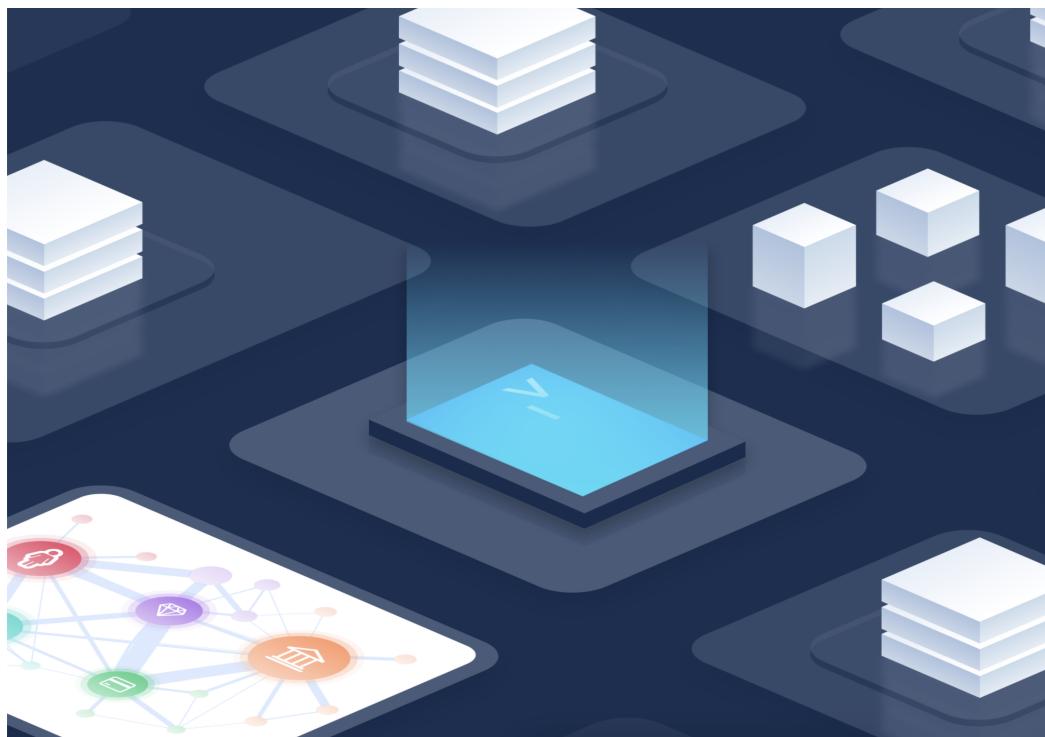
**3. Helm Chart my-studio**

```
$ helm upgrade --install my-studio --set service.type=NodePort --set service.port={30070} deployment/helm
```

**Helm Chart**

replicaCount	0	Deployment				
image.nebulaStudio.name	vesoft/nebula-graph-studio	nebula-graph-studio				
image.nebulaStudio.version	v3.2.0	nebula-graph-studio				
service.type	ClusterIP	NodePort	ClusterIP	LoadBalancer		
service.port	7001	nebula-graph-studio web				
service.nodePort	32701	Kubernetes	nebula-studio			
resources.nebulaStudio	{}	nebula-studio	/			
persistent.storageClassName	""	storageClass				
persistent.size	5Gi					

**4. http://<node\_address>:30070**    Studio



Nebula Studio

配置数据库

Host

用户名

密码

连接

版本: v3.3.0-beta 简体中文

```
$ helm uninstall my-studio
```

Studio

NebulaGraph

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## 14.2.2

Studio      NebulaGraph      Studio      NebulaGraph

NebulaGraph

- Studio      [Studio](#)
- NebulaGraph    Graph      IP      9669
- NebulaGraph



NebulaGraph

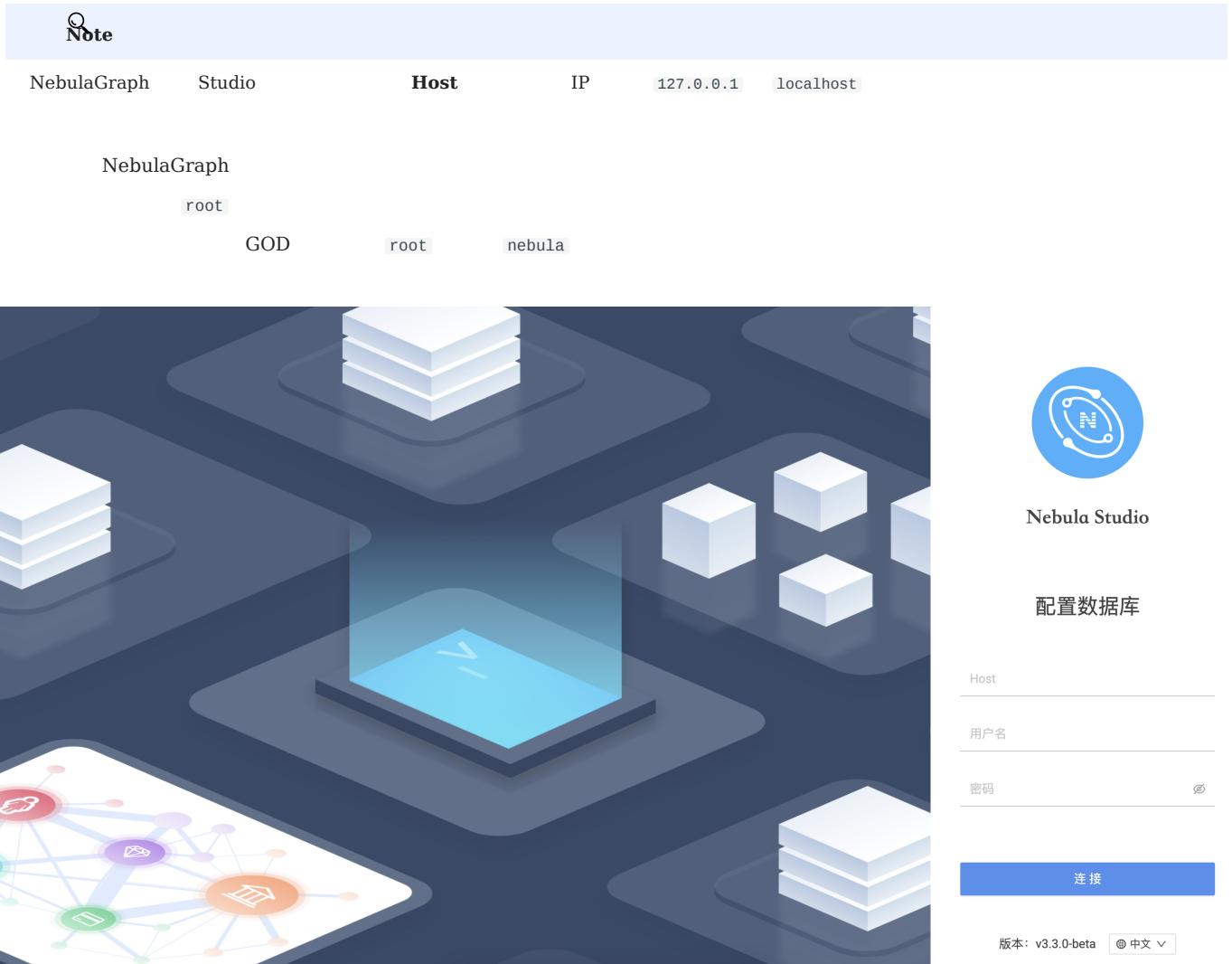
root

[NebulaGraph](#)

## NebulaGraph

### 1. Studio

- **Host** NebulaGraph Graph IP ip:port 9669



### 2.

30 30

## NebulaGraph

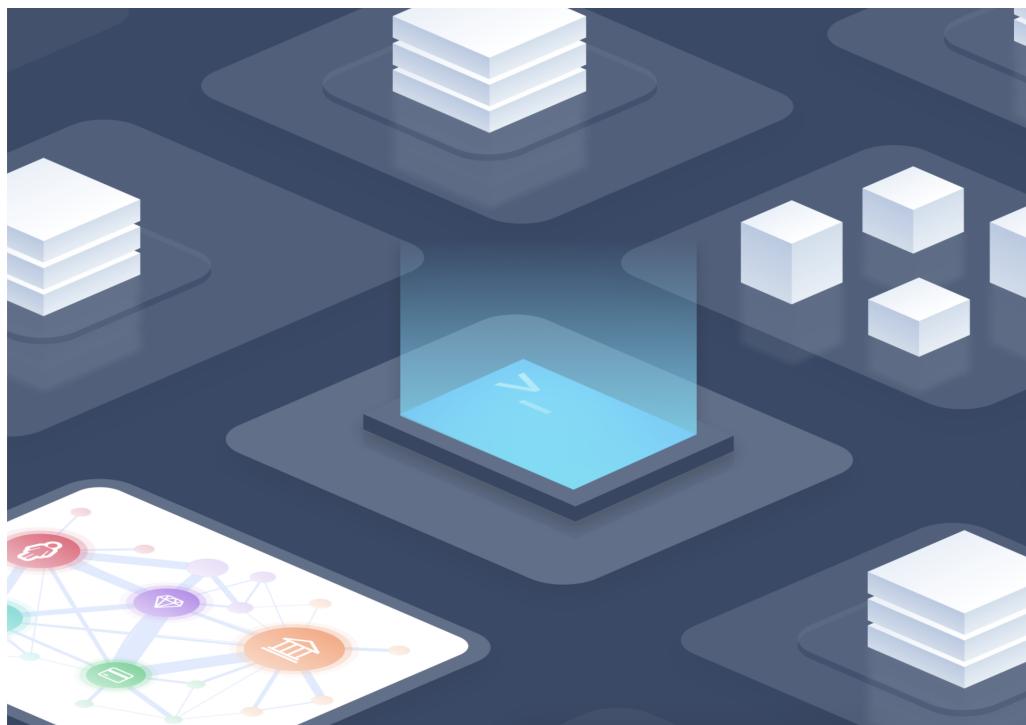
- **Schema** Schema
- 
- nGQL
- **Schema** Schema

**Note**

NebulaGraph

Studio

NebulaGraph



Nebula Studio

配置数据库

Host

用户名

密码

连接

版本: v3.3.0-beta

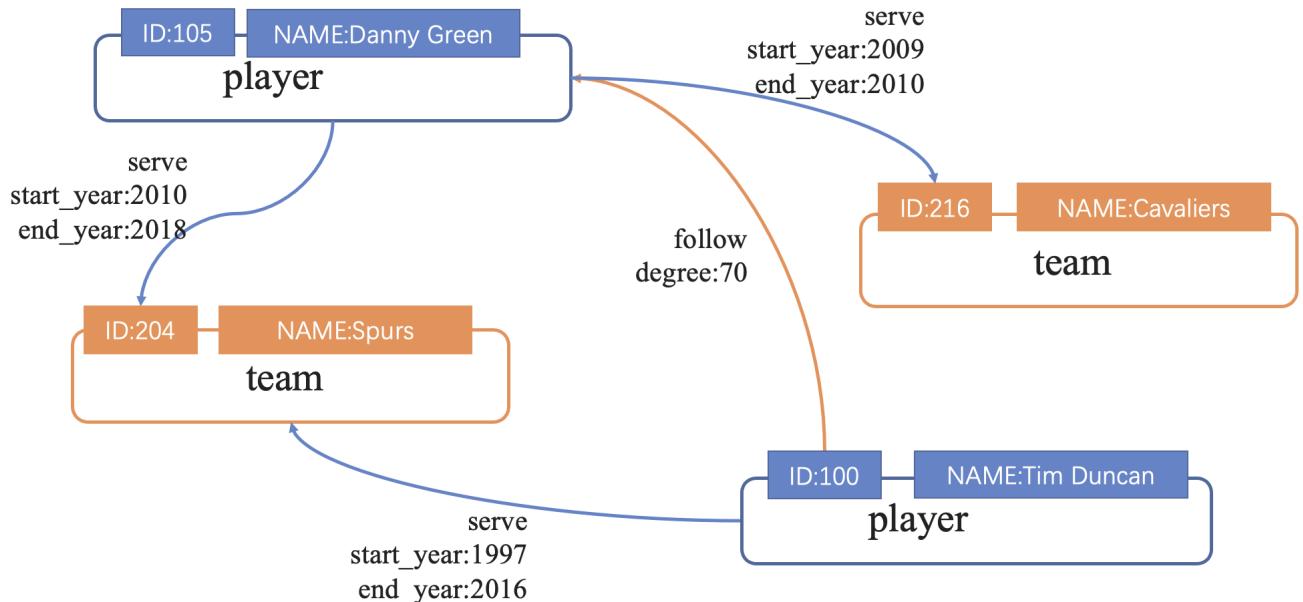
: January 13, 2023

## 14.3

### 14.3.1 Schema

Studio	NebulaGraph	Schema
Schema		
• Tag	Tag	
• Edge type		
NebulaGraph	basketballplayer	Schema
Schema		
Tag	<b>player</b>	- name string - age int
Tag	<b>team</b>	- name string
Edge type	<b>serve</b>	- start_year int - end_year int
Edge type	<b>follow</b>	- degree int

**player team serve/follow**



### 14.3.2 Schema

NebulaGraph      Schema      NebulaGraph      **Schema**      Schema

#### Note

- nebula-console      Schema      **NebulaGraph**      **NebulaGraph**
- Schema      Schema      **Schema**

Studio      Schema

- Studio      **NebulaGraph**
- GOD ADMIN DBA      **NebulaGraph**
- Schema
- 

#### Note

GOD      **Schema**

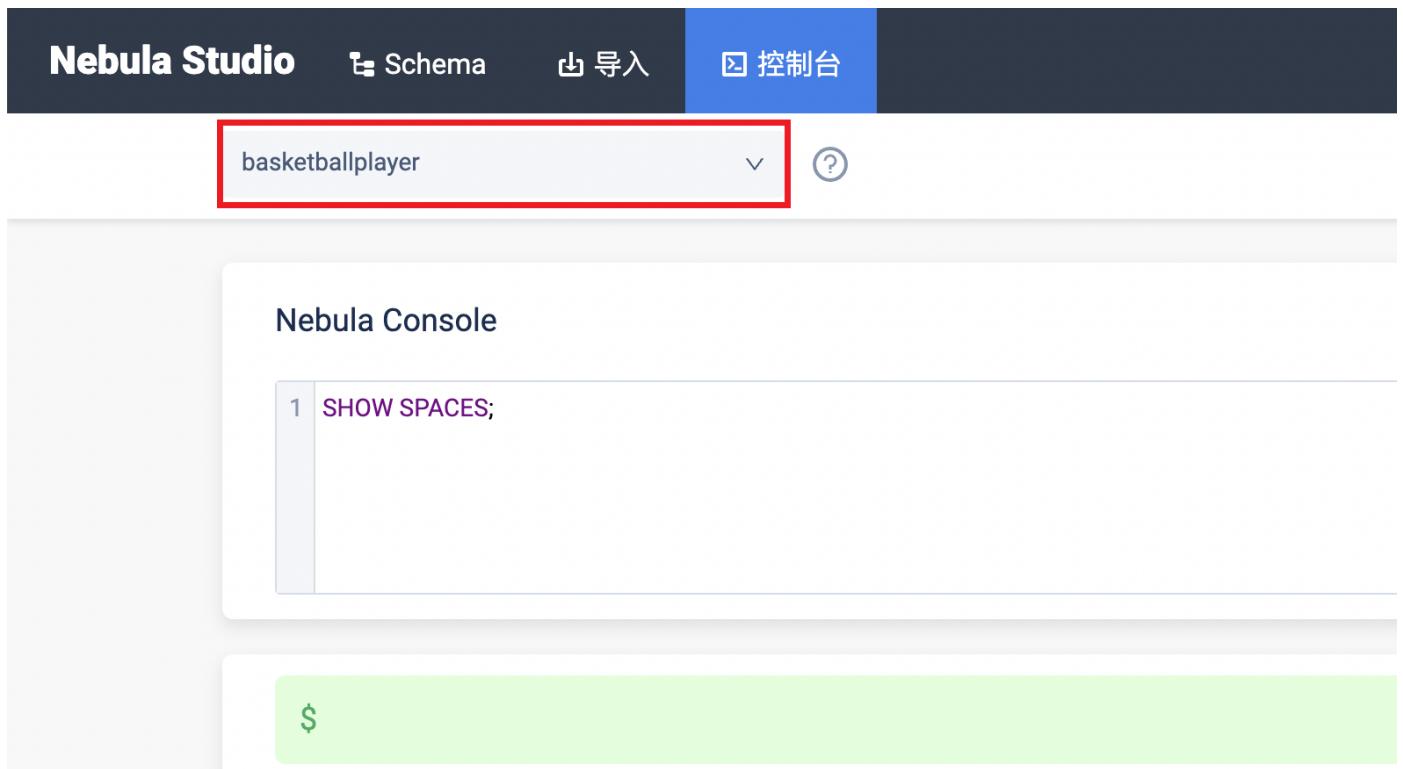
**Schema**      Schema

**Schema**      Schema

1. Tag      **Tag**
2. Edge type      **Edge type**

#### Schema

- 1.
2. **Space**      **basketballplayer**



3.

```
// Tag player 2
CREATE TAG player(name string, age int);

// Tag team 1
CREATE TAG team(name string);

// Edge type follow 1
CREATE EDGE follow(degree int);

// Edge type serve 2
CREATE EDGE serve(start_year int, end_year int);
```

Schema                  Tag    Edge type

```
// Tag
SHOW TAGS;

// Edge type
SHOW EDGES;

// Tag Edge type
DESCRIBE TAG player;
DESCRIBE TAG team;
DESCRIBE EDGE follow;
DESCRIBE EDGE serve;
```

Schema

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## 14.3.3

CSV Schema Studio

- Studio NebulaGraph
- NebulaGraph Schema
- CSV Schema
- GOD ADMIN DBA USER

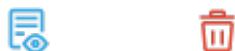
1.

2. CSV edge\_serve.csv edge\_follow.csv vertex\_player.csv vertex\_team.csv

**Note**

CSV CSV Schema

3.



Nebula Studio Schema 导入 控制台

上传文件 导入数据

+ 上传文件

**文件列表**

文件名	头字段	大小	操作
edge-宝可梦-database.csv	<input type="checkbox"/>	4.0	
edge_follow.csv	<input type="checkbox"/>	1.9	
edge_serve.csv	<input type="checkbox"/>	4.41 KB	
vertex-宝可梦-database.csv	<input type="checkbox"/>	20.86 KB	
vertex_player.csv	<input type="checkbox"/>	1.40 KB	
vertex_team.csv	<input type="checkbox"/>	472 B	

Column 0	Column 1	Column 2	Column 3
player100	team204	1997	2016
player101	team204	1999	2018
player101	team215	2018	2019



- 1.
- 2.
3. +

**Caution**

example.yaml NebulaGraph Importer CSV

•

•

•

• + vertex\_player.csv

vertices 1 verteID Select CSV Index vertexID

+ Tag player name Column 2 string age Column

1 int

+ edge\_follow.csv

edge 1 Edge Type

Edge type edge\_follow.csv srcId dstId Schema VID srcId

VID dstId VID rank

Nebula Studio Schema 导入 控制台

← 任务列表 / 创建导入任务

\* 图空间 basketballplayer \* 任务名称 test\_import

批处理量 60

\* 关联点 + 绑定数据源

vertices 1 vertex\_player.csv

vertexID: Column 0

Tag: player

属性	对应列标	类型
name	* Column 2	string
age	* Column 1	int

+ 添加 Tag

\* 关联边 + 绑定数据源

edge 1 edge\_follow.csv

Edge Type: follow

属性	对应列标	类型
srcId	* Column 0	string
dstId	* Column 1	string
rank	选择	int
degree	* Column 2	int

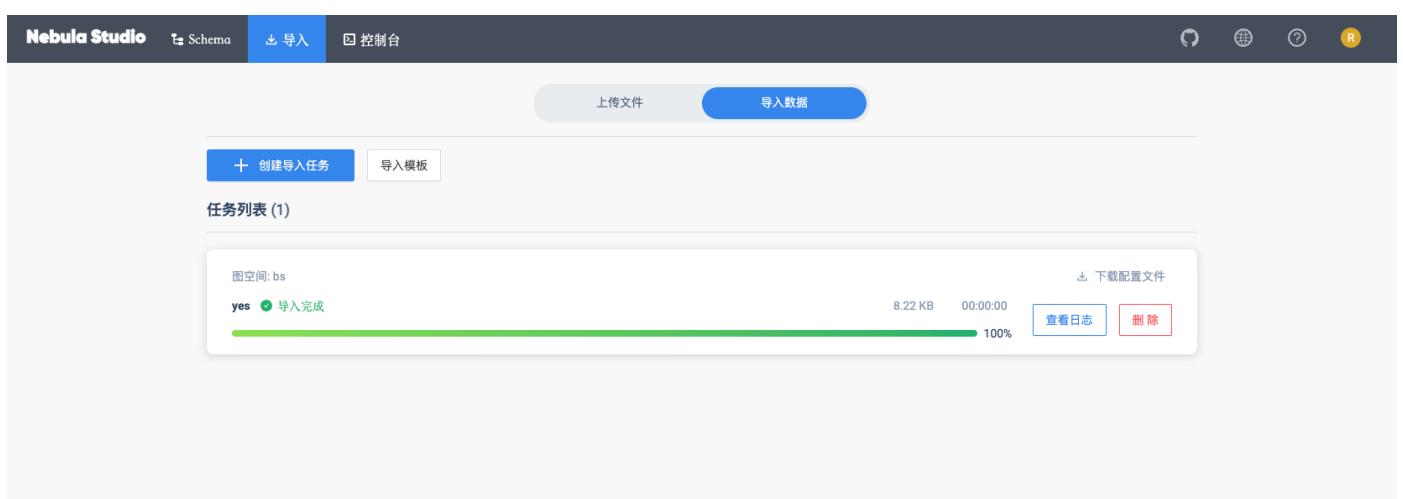
取消 导入

4.

## 5. NebulaGraph



6.



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## 14.3.4

Studio

Nebula Studio   Schema   导入   控制台 控制台

2 basketballplayer   3 ☆   4 ⌚   5 □   6 ▶ 运行

7 p1   8 1 MATCH (v:player) RETURN v LIMIT 3   9 \$ MATCH (v:player) RETURN v LIMIT 3   10 ☆   11 ↑   12 ^   13 ×

14 表格   15 可视化

**表格**

\$ MATCH (v:player) RETURN v LIMIT 3

执行时间消耗 0.00302 (s)

**可视化**

\$ MATCH (v:player) RETURN v LIMIT 3

v

(“player102” :player{age: 33, name: “LaMarcus Aldridge”})  
 (“player106” :player{age: 25, name: “Kyle Anderson”})  
 (“player115” :player{age: 40, name: “Kobe Bryant”})

共计 3 < 1 >

1

2

Studio

USE &lt;space\_name&gt;

3



4



15

5



6

nGQL



7



8

nGQL



; //

9

nGQL

10



11

CSV PNG

nGQL  
CSV PNG

CSV



12

/



nGQL



nGQL

.

13



nGQL

14

15



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### 14.3.5 Schema

Studio NebulaGraph

**Schema**

**Schema**

- Studio NebulaGraph
- NebulaGraph user
- NebulaGraph root

#### 1. Schema

2. +

- basketballplayer

• vid type	ID VID	FIXED_STRING(<N>)	INT64	FIXED_STRING(32)	VID
•	256	Statistics of basketball players			
•	partition_num replica_factor	100	1	CREATE SPACE	

nGQL nGQL

```
CREATE SPACE basketballplayer (partition_num = 100, replica_factor = 1, vid_type = FIXED_STRING(32)) COMMENT = "Statistics of basketball players"
```

3.

The screenshot shows the Nebula Studio interface with the 'Schema' tab selected. A modal dialog is open for creating a new graph space. The 'Name' field contains 'basketballplayer'. The 'Vid Type' dropdown is set to 'FIXED\_STRING' with a length of 32. The 'Description' field contains 'Statistics of basketball players'. Under 'Partition\_num' (optional), the value '100' is entered. Under 'Replica\_factor' (optional), the value '1' is entered. Below the form, a section titled '对应的nGQL语句' (The corresponding nGQL statement) displays the generated nGQL code: `CREATE SPACE `basketballplayer` (partition_num = 100, replica_factor = 1, vid_type = FIXED_STRING(32)) COMMENT = "Statistics of basketball players"`. At the bottom of the dialog are two buttons: '取消' (Cancel) and '创建' (Create).



## 1. Schema

2.

The screenshot shows the Nebula Studio interface with the 'Schema' tab selected. The main area displays a table titled '图空间列表' (Graph Space List) with the following columns: 序号 (Index), 名称 (Name), Partition Number, Replica Factor, Charset, Collate, Vid Type, Atomic Edge, Group, Comment, and 操作 (Operations). There are three entries in the table:

序号	名称	Partition Number	Replica Factor	Charset	Collate	Vid Type	Atomic Edge	Group	Comment	操作
1	basketball...	10	1	utf8	utf8_bin	FIXED_ST RING(32)	false	_EMPTY_	<a href="#">Schema</a>	<a href="#">更多</a>
2	hello_test	100	1	utf8	utf8_bin	INT64	false	_EMPTY_	<a href="#">Schema</a>	<a href="#">删除图空间</a> (highlighted with a red box)
3	test	15	1	utf8	utf8_bin	FIXED_ST RING(30)	false	_EMPTY_	<a href="#">Schema</a>	<a href="#">更多</a>

At the bottom right of the table, there are navigation buttons: <, 1 (highlighted with a blue box), and >. The top navigation bar includes tabs for 'Nebula Studio', 'Schema' (selected), '导入' (Import), '控制台' (Console), and icons for GitHub, Global, Help, and Refresh.

3.

## Schema

- Tag
- Edge type
- 

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**Tag**

NebulaGraph

Tag

**Schema**

Tag

**Schema**

Tag

Studio Tag

• Studio NebulaGraph

•

• GOD ADMIN DBA

TAG

1. **Schema**2. **Schema**

3.

4. +

5.

a. Tag player

b. Tag

c. Tag +

•

•

•

•

d. **TTL** Tag TTL TTL **TTL\_COL** **TTL\_DURATION** **TTL**6. **nGQL** nGQL

Nebula Studio Schema 导入 控制台

← 图空间列表 / 标签列表 / 创建标签 当前图空间: basketballplayer

\* 名称: player 描述:

定义属性

* 属性名称	* 数据类型	允许空值	默认值	描述
age	int	<input checked="" type="checkbox"/>		<input type="button" value="删除"/>
name	fixed_string	<input checked="" type="checkbox"/>		<input type="button" value="删除"/>

设置TTL (存活时间)

TTL_COL	TTL_DURATION
	请输入时间(s)

对应的nGQL语句:

```
1 CREATE tag `player` (`age` int NULL , `name` fixed_string(64) NULL )
```

取消

7.

Tag Tag

TAG

1. Schema
2. Schema
- 3.
- 4.



Tag

- 5.
- 
- 
- 
- +                              Tag
- TTL            TTL                        TTL
- TTL            TTL                    TTL                        TTL
- TTL            TTL                    TTL                    TTL\_COL    TTL\_DURATION                    TTL

**Note**

TTL                    TTL

TAG

**Danger**

Tag

1.                    **Schema**
2.                    **Schema**
- 3.
4.                    Tag                            
- 5.

Tag

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**Edge type**

NebulaGraph

Edge type

**Schema** Edge type**Schema** Edge type

Studio Edge type

- Studio NebulaGraph

- 

- GOD ADMIN DBA

1. **Schema****Schema**

3.

4. +

5.

a. Edge type serve

b. Edge type

c. Edge type +

- 

- 

- 

- 

- 

d. **TTL** Edge type TTL TTL **TTL\_COL** **TTL\_DURATION** **TTL**6. **nGQL** nGQL

The screenshot shows the Nebula Studio Schema interface. The top navigation bar includes tabs for Nebula Studio, Schema, Import, and Control Panel. The current view is under the Schema tab, specifically in the basketballplayer graph space, creating a new edge type named 'serve'. The 'serve' edge type has four properties defined: start\_year (int), end\_year (int), teamID (string), and playerID (string). The TTL section is collapsed. The generated nGQL code for creating the edge type is shown in the bottom panel.

* 属性名称	* 数据类型	允许空值	默认值	描述
start_year	int	<input checked="" type="checkbox"/>		
end_year	int	<input checked="" type="checkbox"/>		
teamID	string	<input checked="" type="checkbox"/>		
playerID	string	<input checked="" type="checkbox"/>		

```

1 CREATE edge `serve` (`start_year` int NULL , `end_year` int NULL , `teamID` string NULL , `playerID` string NULL )
  
```

7.

Edge Type

Edge type

## EDGE TYPE

**Schema** Edge type

1. **Schema**

**Schema**

3.

4.



Edge Type

5.

•

•

•

•

+

• TTL

**TTL**

**TTL**

•

TTL

**TTL**

**TTL**

•

Note

TTL

**TTL**

## EDGE TYPE

Danger

Edge type

1. **Schema**

**Schema**

3.

4.

Edge type



Edge type

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Tag Edge type

**Schema**

**Schema**



Tag Edge type

Studio

- Studio NebulaGraph
- Tag Edge type
- GOD ADMIN DBA

#### 1. **Schema**

**Schema**

2.

3.

4. +

5.

a. **Tag Edge type Edge type**

b. Tag Edge type **follow**

c. **follow\_index**

d.

e. + degree



LOOKUP

LOOKUP

6.

**nGQL**

nGQL

\* 索引类型  
Edge Type

\* 关联 edge 名称  
follow

\* 索引名称  
follow\_index

描述  
follow\_index

索引属性(可拖拽排序)  
+ 添加属性

`degree` X

✓ 对应的nGQL语句

```
1 CREATE EDGE INDEX `follow_index` ON `follow`(`degree`) COMMENT "follow_index"
```

取消 创建

7.

## 1. Schema

## Schema

2.

3.

4.

5.

## 1. Schema

## Schema

2.

3.

4.

5.



REBUILD INDEX

## 1. Schema

## Schema

2.

- 3.
  - 4.
  5. 
  - 6.
- 

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### 14.3.6 Schema

Studio Schema Schema Schema

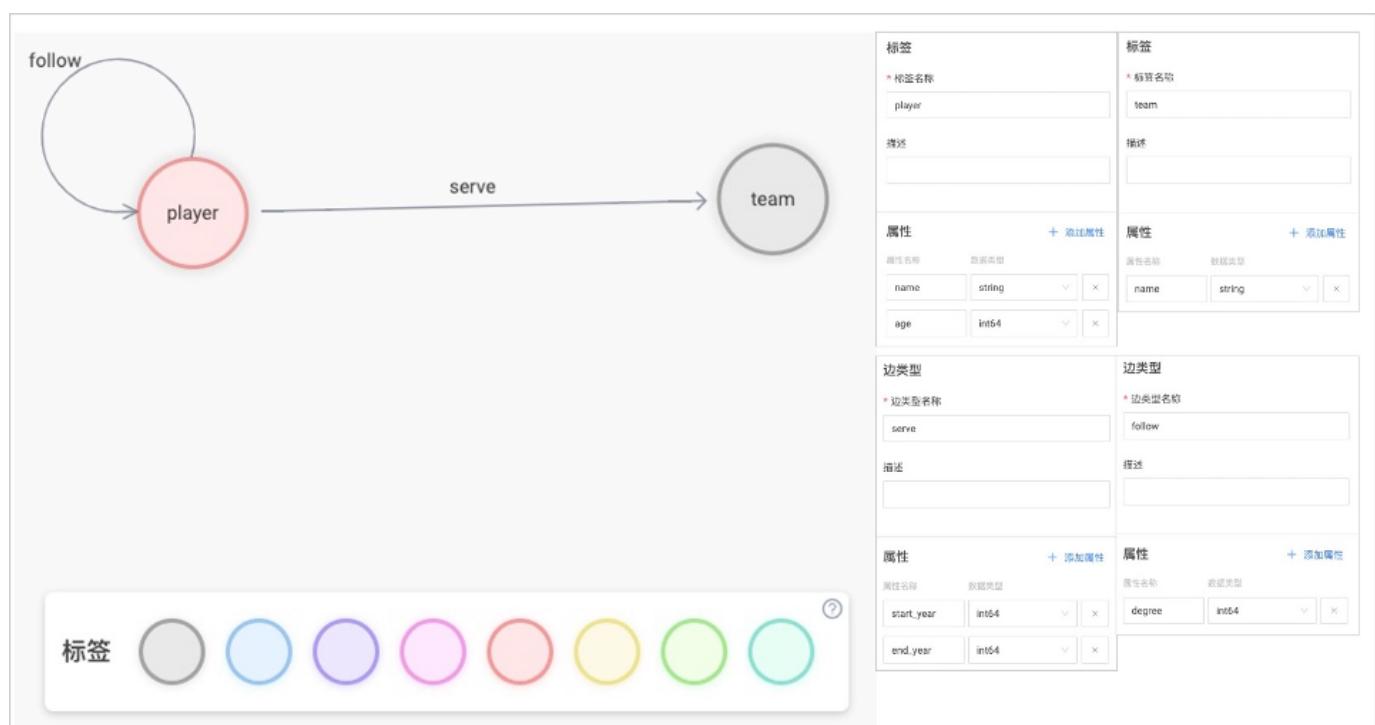
- Schema
- Schema
- Schema PNG



#### Schema

basketballplayer Schema Schema

- 1.
2. Tag Tag
3. Tag player name age
4. Tag team name
5. Tag player Tag team serve start\_year end\_year
6. Tag player follow degree
- 7.



#### Schema

1. Schema

## 2. Schema

**Note**

- CREATE SPACE
- Schema

**Schema**

Schema

**Note**

Schema

**Schema**

Schema

**Schema**

Schema PNG

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## 14.4

---

### 14.4.1

Studio

1 HOST

NebulaGraph	Graph	IP	graph_server_ip	9669	NebulaGraph	Studio	IP
127.0.0.1	localhost	0.0.0.0					

2

NebulaGraph

3 NEBULAGRAPH

NebulaGraph

- Linux NebulaGraph NebulaGraph
- Docker Compose RPM NebulaGraph NebulaGraph

NebulaGraph 4 NebulaGraph

 Note

docker-compose up -d NebulaGraph docker-compose down NebulaGraph

4 GRAPH

Studio telnet <graph\_server\_ip> 9669 NebulaGraph Graph

- Studio NebulaGraph
- NebulaGraph

NebulaGraph NebulaGraph

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## 14.4.2 Studio

Studio 127.0.0.1:7001 0.0.0.0:7001

1.

Studio x86\_64 Studio x86\_64

2. STUDIO

- RPM DEB Studio systemctl status nebula-graph-studio
- tar Studio sudo lsof -i:7001
- Docker-compose Studio docker-compose ps

State Up

Name	Command	State	Ports
nebula-web-docker_client_1	./nebula-go-api	Up	0.0.0.0:32782->8080/tcp
nebula-web-docker_importer_1	nebula-importer --port=569 ...	Up	0.0.0.0:32783->5699/tcp
nebula-web-docker_nginx_1	/docker-entrypoint.sh ngn ...	Up	0.0.0.0:7001->7001/tcp, 80/tcp
nebula-web-docker_web_1	docker-entrypoint.sh npm r ...	Up	0.0.0.0:32784->7001/tcp



docker-compose up -d Studio docker-compose down Studio

Studio Studio

3.

Studio localhost:7001 127.0.0.1:7001 0.0.0.0:7001 Studio  
<studio\_server\_ip>:7001 studio\_server\_ip Studio IP

4.

curl <studio\_server\_ip>:7001 -I HTTP/1.1 200 OK

- Studio
- Studio

Studio NebulaGraph

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### 14.4.3

---

1. NebulaGraph Docker Compose NebulaGraph `docker-compose pull && docker-compose up -d` Docker
  2. Studio
  3. GitHub [nebula](#) [nebula-web-docker](#)
  - 4.
- 

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## 15. NebulaGraph Dashboard

---

### 15.1 NebulaGraph Dashboard

NebulaGraph Dashboard    Dashboard    NebulaGraph    Dashboard    **NebulaGraph**  
Dashboard

 **Enterpriseonly**

#### 15.1.1

- CPU
- IP
- 
- 

#### 15.1.2

Dashboard

- 
- 
- 

#### 15.1.3

14      14

 **Note**

**prometheus**    **prometheus**

#### 15.1.4

NebulaGraph    Dashboard

<b>NebulaGraph</b>	<b>Dashboard</b>
3.3.0	3.2.0
2.5.0 ~ 3.2.0	3.1.0
2.5.x ~ 3.1.0	1.1.1
2.0.1 ~ 2.5.1	1.0.2
2.0.1 ~ 2.5.1	1.0.1

---

## 15.1.5

Release

---

## 15.1.6

NebulaGraph Dashboard Demo v3.0 2 57

---

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## 15.2 Dashboard

Dashboard 5

TAR

NebulaGraph Dashboard

[GitHub NebulaGraph dashboard](#)

### 15.2.1

Dashboard

- NebulaGraph [NebulaGraph](#)
- 9200
- 9100
- 9090
- 8090
- 7003

• Linux CentOS v10.12.0 Node.js 1.13 Go

### 15.2.2 Dashboard

TAR [nebula-dashboard-3.2.0.x86\\_64.tar.gz](#)

### 15.2.3

```
tar -xvf nebula-dashboard-3.2.0.x86_64.tar.gz      nebula-dashboard/vendors      4
```

node-exporter	CPU	9100
nebula-stats-exporter	IP	9200
prometheus		9090
nebula-http-gateway	HTTP nGQL	NebulaGraph 8090

### 15.2.4 Docker Compose Dashboard

Docker Compose Dashboard

Dashboard

Docker

1. NebulaGraph [nebula-dashboard](#) [vendors/node-exporter](#) [node-exporter](#)

```
nohup ./node-exporter --web.listen-address=:9100 &
```



[node-exporter](#)

## 2. Dashboard nebula-dashboard Dashboard

## a. vendors/nebula-stats-exporter config.yaml NebulaGraph HTTP IP

```

clusters:
  - name: nebula
    instances:
      - name: metad0
        endpointIP: 192.168.8.157
        endpointPort: 19559
        componentType: metad
      - name: metad1
        endpointIP: 192.168.8.155
        endpointPort: 19559
        componentType: metad
      - name: metad2
        endpointIP: 192.168.8.154
        endpointPort: 19559
        componentType: metad
      - name: graphd0
        endpointIP: 192.168.8.157
        endpointPort: 19669
        componentType: graphd
      - name: graphd1
        endpointIP: 192.168.8.155
        endpointPort: 19669
        componentType: graphd
      - name: graphd2
        endpointIP: 192.168.8.154
        endpointPort: 19669
        componentType: graphd
      - name: storaged0
        endpointIP: 192.168.8.157
        endpointPort: 19779
        componentType: storaged
      - name: storaged1
        endpointIP: 192.168.8.155
        endpointPort: 19779
        componentType: storaged
      - name: storaged2
        endpointIP: 192.168.8.154
        endpointPort: 19779
        componentType: storaged

```

## b. vendors/prometheus prometheus.yaml node-exporter nebula-stats-exporter

```

global:
  scrape_interval: 5s # 1
  evaluation_interval: 5s # 1
scrape_configs:
  - job_name: 'node-exporter'
    static_configs:
      - targets: [
        '192.168.8.154:9100',
        '192.168.8.155:9100',
        '192.168.8.157:9100' # node-exporter IP
      ]
  - job_name: 'nebula-stats-exporter'
    static_configs:
      - targets: [
        'nebula-stats-exporter:9200', # nebula-stats-exporter
      ]

```

## c. nebula-dashboard config.json

```
{
  "port": 7003,
  "proxy": {
    "gateway": {
      "target": "nebula-http-gateway:8090" # nebula-http-gateway
    },
    "prometheus": {
      "target": "prometheus:9090" # Prometheus
    },
    "graph": {
      "target": "graphd:19669" # Graph
    },
    "storage": {
      "target": "graphd:19779" # Storage
    }
  },
  "nebulaServer": {
    "ip": "192.168.8.131", # Graph IP
    "port": 9669 # Graph
  }
}
```

### 3. Dashboard

```
docker network create nebula-net
```

### 4. nebula-dashboard Dashboard

```
docker-compose -f docker-compose.yaml up -d
```

```
docker-compose.yaml
```

### 5. docker ps

- <IP>:9200 nebula-stats-exporter
- <IP>:9100 node-exporter
- <IP>:9090 prometheus
- <IP>:8090 nebula-http-gateway
- <IP>:7003 dashboard

## 15.2.5 Dashboard

`node-exporter`



`node-exporter`

`node-exporter`

```
$ nohup ./node-exporter --web.listen-address=:9100 &
```

<IP>:9100

nebula-stats-exporter



nebula-dashboard      nebula-stats-exporter

1. nebula-stats-exporter config.yaml HTTP

```
clusters:
  - name: nebula
    instances:
      - name: metad0
        endpointIP: 192.168.8.157
        endpointPort: 19559
        componentType: metad
      - name: metad1
        endpointIP: 192.168.8.155
        endpointPort: 19559
        componentType: metad
      - name: metad2
        endpointIP: 192.168.8.154
        endpointPort: 19559
        componentType: metad
      - name: graphd0
        endpointIP: 192.168.8.157
        endpointPort: 19669
        componentType: graphd
      - name: graphd1
        endpointIP: 192.168.8.155
        endpointPort: 19669
        componentType: graphd
      - name: graphd2
        endpointIP: 192.168.8.154
        endpointPort: 19669
        componentType: graphd
      - name: storaged0
        endpointIP: 192.168.8.157
        endpointPort: 19779
        componentType: storaged
      - name: storaged1
        endpointIP: 192.168.8.155
        endpointPort: 19779
        componentType: storaged
      - name: storaged2
        endpointIP: 192.168.8.154
        endpointPort: 19779
        componentType: storaged
```

2.

```
$ nohup ./nebula-stats-exporter --listen-address=:9200 --bare-metal --bare-metal-config=./config.yaml &
```

<IP>:9200

**prometheus**

nebula-dashboard      prometheus

## 1.    prometheus      prometheus.yaml      node-exporter      nebula-stats-exporter      IP

```
global:
  scrape_interval:      5s
  evaluation_interval: 5s
scrape_configs:
- job_name: 'nebula-stats-exporter'
  static_configs:
    - targets: [
        '192.168.xx.100:9200' # nebula-stats-exporter     IP
    ]
- job_name: 'node-exporter'
  static_configs:
    - targets: [
        '192.168.xx.100:9100', # node-exporter     IP
        '192.168.xx.101:9100'
    ]
```

- scrape\_interval                        1
- evaluation\_interval                    1

## 2.

```
$ nohup ./prometheus --config.file=../prometheus.yaml &
```

&lt;IP&gt;:9090

**nebula-http-gateway**

nebula-dashboard      nebula-http-gateway

**nebula-http-gateway**

```
$ nohup ./nebula-htpd &
```

&lt;IP&gt;:8090

**dashboard**

## 1.    nebula-dashboard      config.json

```
port: 7003
proxy:
  gateway:
    target: "127.0.0.1:8090" // nebula-http-gateway     IP
  prometheus:
    target: "127.0.0.1:9090" // Prometheus     IP
  graph:
    target: "127.0.0.1:19669" //     Graph
  storage:
    target: "127.0.0.1:19779" //     Storage
  nebulaServer:
    ip: "192.168.8.143" // Graph     IP
    port: 9669 // Graph
  ...
```

## 2.    nebula-dashboard

```
$ nohup ./dashboard &
```

&lt;IP&gt;:7003

### 15.2.6 Dashboard

- Docker Compose      Dashboard      docker-compose stop
- Dashboard      kill <pid>

```
$ kill $(lsof -t -i :9100) # node-exporter
$ kill $(lsof -t -i :9200) # nebula-stats-exporter
$ kill $(lsof -t -i :9090) # prometheus
$ kill $(lsof -t -i :8090) # nebula-http-gateway
$ kill $(lsof -t -i :7003) # dashboard
```

### 15.2.7

#### Dashboard

### 15.2.8 Mac node-exporter

- Mac      'brew install node\_exporter'      node-exporter
- 'brew services start node\_exporter'      node-exporter
- http://localhost:9100/

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## 15.3 Dashboard

Dashboard

Dashboard

### 15.3.1

- Dashboard [Dashboard](#)
- Chrome 89 [Chrome](#)

### 15.3.2

1. `nebula-dashboard` IP [`<IP>:7003`](#)
2. NebulaGraph

#### Note

NebulaGraph [config.json](#) [Graph](#) [IP](#) [Dashboard](#)

- NebulaGraph [Dashboard](#)
  - NebulaGraph [root](#) [Dashboard](#)
3. NebulaGraph

#### Note

[config.json](#) [NebulaGraph](#) , [Dashboard](#)



4.

---

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## 15.4 Dashboard

### Dashboard

#### 15.4.1



#### 15.4.2

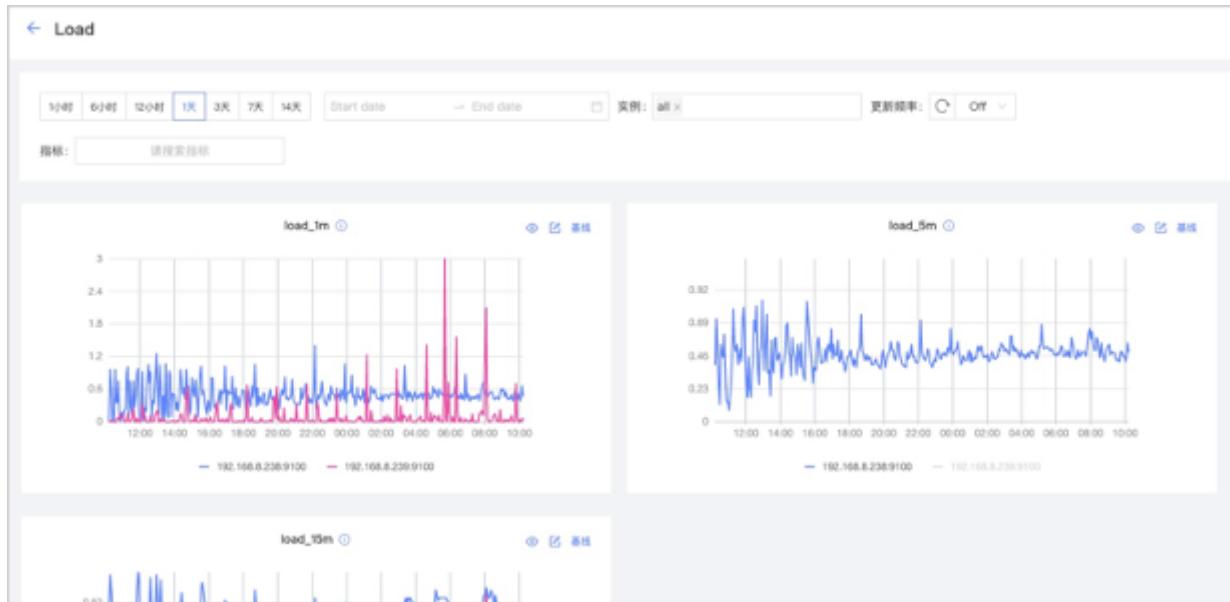
->

CPU Memory Load Disk Network In/Out

- 14                    1    6    12    1    3    7    14



Load



#### 15.4.3

->

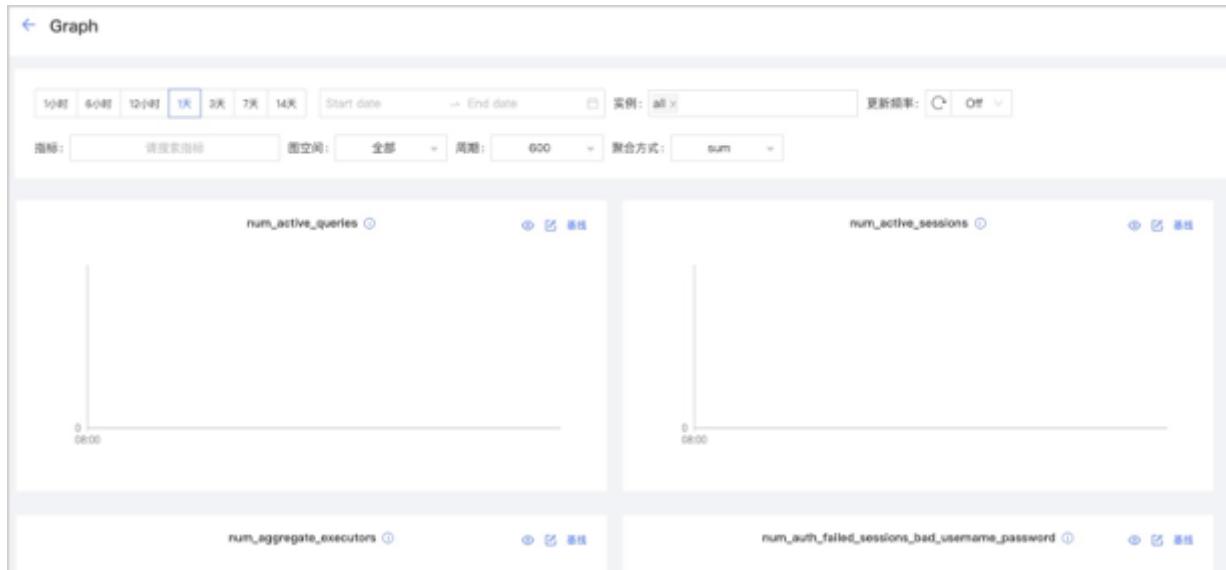
Graph Meta Storage

### Note

- 14                    1     6     12     1     3     7     14



Graph



- Graph

### Caution

Graph      enable\_space\_level\_metrics true      Graph



Graph

## Dashboard

查询条件 X

周期:  ▼

指标:  ▼ (i)

图空间:  ▼

聚合方式:  ▼

基线:

取消 确认

## 15.4.4

[NebulaGraph](#)[Storage](#)[Storage Leader](#)[NebulaGraph](#)

集群管理 / 信息总览

[← 信息总览](#)

### Storage Leader 分布

服务	Leader 数量	Leader 分布
192.168.8.129	0	No valid partition

版本

服务	版本
Graph Service	3.1.0-ent
Storage Service	3.1.0-ent
Meta Service	3.1.0-ent

服务信息

Host	Port	Status	Git Info Sha	Leader Count	Partition Distribution	Leader Distribution
192.168.8.129	9779	ONLINE	cfa65a1	0	No valid partition	No valid partition

请选择图空间

Partition 分布

服务	分片数
没有数据	No Data

分片信息

#### STORAGE LEADER

Leader      Leader

- **Balance Leader**      NebulaGraph      Leader      Leader      Storage
- Leader

NebulaGraph

## Storage

Host	
Port	
Status	
Git Info Sha	Commit ID
Leader Count	Leader
Partition Distribution	
Leader Distribution	Leader

## PARTITION

Storage IP Storage

Partition ID	
Leader	leader IP
Peers	IP
Losts	IP

ID

Graph Storage

## 15.4.5

- 
- 
- Dashboard
- 
- 

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## 15.5

Dashboard      NebulaGraph

### 15.5.1

#### Note

- Linux
- Byte                          1 KB/s        Bytes/s
- v1.0.2        Dashboard    Buff    Cache

#### CPU

cpu_utilization	CPU	
cpu_idle	CPU	
cpu_wait	IO	CPU
cpu_user	NebulaGraph	CPU
cpu_system	NebulaGraph	CPU

memory_utilization
memory_used
memory_free

load_1m	1
load_5m	5
load_15m	15

disk\_used\_percentage  
 disk\_used  
 disk\_free  
 disk\_readbytes  
 disk\_writebytes  
 disk\_readiops  
 disk\_writeiops  
 inode\_utilization      inode

---

network\_in\_rate  
 network\_out\_rate  
 network\_in\_errs  
 network\_out\_errs  
 network\_in\_packets  
 network\_out\_packets

---

## 15.5.2

---

5    60    600    3600                5    1    10    1

rate  
 sum  
 avg  
 P75                          75%  
 P95                          95%  
 P99                          99%  
 P999                        99.9%

---

### Note

[Dashboard](#)

[Dashboard](#)

**Graph**

num_active_queries							
num_active_sessions							
	num_active_sessions.sum.5	5	10	30			-20
	10-30						
num_aggregate_executors	Aggregate						
num_auth_failed_sessions_bad_username_password							
num_auth_failed_sessions_out_of_max_allowed	FLAG_OUT_OF_MAX_ALLOWED_CONNECTIONS						
num_auth_failed_sessions							
num_indexscan_executors	IndexScan						
num_killed_queries							
num_opened_sessions							
num_queries							
num_query_errors_leader_changes	Leader						
num_query_errors							
num_reclaimed_expired_sessions							
num_rpc_sent_to_metad_failed	Graphd	Metad	RPC				
num_rpc_sent_to_metad	Graphd	Metad	RPC				
num_rpc_sent_to_storaged_failed	Graphd	Storaged	RPC				
num_rpc_sent_to_storaged	Graphd	Storaged	RPC				
num_sentences	Graphd						
num_slow_queries							
num_sort_executors	Sort						
optimizer_latency_us							
query_latency_us							
slow_query_latency_us							
num_queries_hit_memory_watermark							

**Meta**

commit_log_latency_us	Raft	Commit
commit_snapshot_latency_us	Raft	Commit
<hr/>		
heartbeat_latency_us		
<hr/>		
num_heartbeats	Raft	
num_raft_votes	Raft	
transfer_leader_latency_us	Raft	Leader
num_agent_heartbeats	AgentHBProcessor	
agent_heartbeat_latency_us	AgentHBProcessor	
replicate_log_latency_us	Raft	
num_send_snapshot	Raft	
append_log_latency_us	Raft	
append_wal_latency_us	Raft	WAL
num_grant_votes	Raft	
num_start_elect	Raft	

**Storage**

add_edges_atomic_latency_us	TOSS
add_edges_latency_us	
add_vertices_latency_us	
commit_log_latency_us	Raft      Commit
commit_snapshot_latency_us	Raft      Commit
delete_edges_latency_us	
delete_vertices_latency_us	
get_neighbors_latency_us	
get_dst_by_src_latency_us	
num_get_prop	GetPropProcessor
num_get_neighbors_errors	GetNeighborsProcessor
num_get_dst_by_src_errors	GetDstBySrcProcessor
get_prop_latency_us	GetPropProcessor
num_edges_deleted	
num_edges_inserted	
num_raft_votes	Raft
num_rpc_sent_to_metad_failed	Storage    Metad    RPC
num_rpc_sent_to_metad	Storage    Metad    RPC
num_tags_deleted	Tag
num_vertices_deleted	
num_vertices_inserted	
transfer_leader_latency_us	Raft      Leader
lookup_latency_us	LookupProcessor
num_lookup_errors	LookupProcessor
num_scan_vertex	ScanVertexProcessor
num_scan_vertex_errors	ScanVertexProcessor
update_edge_latency_us	UpdateEdgeProcessor
num_update_vertex	UpdateVertexProcessor
num_update_vertex_errors	UpdateVertexProcessor
kv_get_latency_us	Getprocessor
kv_put_latency_us	PutProcessor
kv_remove_latency_us	RemoveProcessor
num_kv_get_errors	GetProcessor
num_kv_get	GetProcessor
num_kv_put_errors	PutProcessor

num_kv_put	PutProcessor
num_kv_remove_errors	RemoveProcessor
num_kv_remove	RemoveProcessor
forward_tranx_latency_us	
scan_edge_latency_us	ScanEdgeProcessor
num_scan_edge_errors	ScanEdgeProcessor
num_scan_edge	ScanEdgeProcessor
scan_vertex_latency_us	ScanVertexProcessor
num_add_edges	
num_add_edges_errors	
num_add_vertices	
num_start_elect	Raft
num_add_vertices_errors	
num_delete_vertices_errors	
append_log_latency_us	Raft
num_grant_votes	Raft
replicate_log_latency_us	Raft
num_delete_tags	Tag
num_delete_tags_errors	Tag
num_delete_edges	
num_delete_edges_errors	
num_send_snapshot	
update_vertex_latency_us	UpdateVertexProcessor
append_wal_latency_us	Raft WAL
num_update_edge	UpdateEdgeProcessor
delete_tags_latency_us	Tag
num_update_edge_errors	UpdateEdgeProcessor
num_get_neighbors	GetNeighborsProcessor
num_get_dst_by_src	GetDstBySrcProcessor
num_get_prop_errors	GetPropProcessor
num_delete_vertices	
num_lookup	LookupProcessor
num_sync_data	Storage Drainer
num_sync_data_errors	Storage Drainer
sync_data_latency_us	Storage Drainer

## Note

num_active_queries				
num_queries				
num_sentences	Graphd			
optimizer_latency_us				
query_latency_us				
num_slow_queries				
num_query_errors				
num_query_errors_leader_changes	Leader			
num_killed_queries				
num_aggregate_executors	Aggregate			
num_sort_executors	Sort			
num_indexscan_executors	IndexScan			
num_auth_failed_sessions_bad_username_password				
num_auth_failed_sessions				
num_opened_sessions				
num_queries_hit_memory_watermark				
num_reclaimed_expired_sessions				
num_rpc_sent_to_metad_failed	Graphd	Metad	RPC	
num_rpc_sent_to_metad	Graphd	Metad	RPC	
num_rpc_sent_to_storaged_failed	Graphd	Storaged	RPC	
num_rpc_sent_to_storaged	Graphd	Storaged	RPC	
slow_query_latency_us				

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## 16. NebulaGraph Dashboard

### 16.1 NebulaGraph Dashboard

NebulaGraph Dashboard      Dashboard      NebulaGraph      Dashboard  
 NebulaGraph Dashboard

The screenshot shows the NebulaGraph Dashboard interface. On the left is a dark sidebar with navigation links like 'Nebula Dashboard' (selected), '集群管理', '权限管理', '任务中心', '平台设置', '帮助中心', and 'nebula'. The main content area has several sections:

- 集群总览**: Shows '当前集群: explorer131' and a '集群总览' card with service counts (运行服务 1, 异常服务 0).
- 集群监控**: Includes '节点监控' (CPU usage chart) and '服务监控' (line charts for 'num\_queries' and 'num\_slow\_queries').
- 告警**: Shows a message '没有数据'.
- 集群信息**: Displays cluster details: '集群名称: explorer131', '创建时间: 2022-06-30 11:53:00', '过期时间: 2023-06-28 23:59:59', '创建用户: nebula', and '版本: 企业版 v3.2.0'.
- 状态列表**: Shows a 'Graph 服务' status summary with 1 running service and 0 abnormal services.

#### 16.1.1

- NebulaGraph
- 
- 14
- 
- Storage Graph
- 
- IP
- CPU
- 
- 

#### 16.1.2

- 
-

- 
- 

### 16.1.3

- 14 14
- 2.5.0 NebulaGraph
- Chrome Dashboard
- 

#### Note

`prometheus`

`prometheus`

### 16.1.4

NebulaGraph Dashboard

<b>NebulaGraph</b>	<b>Dashboard</b>
3.3.0	3.2.4 3.2.3 3.2.2 3.2.1 3.2.0
2.5.0 ~ 3.2.0	3.1.2 3.1.1 3.1.0
2.5.x ~ 3.1.0	3.0.4
2.5.1 ~ 3.0.0	1.1.0
2.0.1 ~ 2.6.1	1.0.2
2.0.1 ~ 2.6.1	1.0.1
2.0.1 ~ 2.6.1	1.0.0

### 16.1.5

- [NebulaGraph Dashboard Demo](#) v3.0 2 57

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## 16.2 NebulaGraph Dashboard License

License Dashboard	NebulaGraph Dashboard License	License	NebulaGraph Dashboard	NebulaGraph
----------------------	----------------------------------	---------	-----------------------	-------------

### 16.2.1

- License NebulaGraph Dashboard
- License License
- License
- License 14
- 30
- 14
- 14

### 16.2.2

NebulaGraph Dashboard License



NebulaGraph Dashboard 30 License

### 16.2.3 NebulaGraph Dashboard License

NebulaGraph Dashboard License nebula.license

```
-----License Content Start-----
{
  "vendor": "vesoft",
  "organization": "doc",
  "issuedate": "2022-06-06T16:00:00.000Z",
  "expirationDate": "2023-05-31T15:59:59.000Z",
  "product": "nebula_graph_dashboard",
  "version": ">=3.2.0",
  "licenseType": "enterprise",
  "gracePeriod": 14,
  "clusterCode": "BAIAEAiAQAAG"
}
-----License Content End-----

-----License Key Start-----
Rrjip5cxXXXXXXXXXXXX5zKoQ==
-----License Key End-----
```

## License

vendor	
organization	
issuedDate	License
expirationDate	License
product	NebulaGraph Dashboard
	nebula_graph_dashboard
version	
licenseType	License
	enterprise samll_bussiness pro individual
gracePeriod	License 0
clusterCode	License

## 16.2.4

NebulaGraph Dashboard License **Dashboard**

## 16.2.5

NebulaGraph Dashboard License

1. NebulaGraph Dashboard License nebula.license
2. NebulaGraph Dashboard /usr/local/nebula-dashboard-ent License License

**Note**

NebulaGraph Dashboard License Dashboard License

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## 16.3 Dashboard

---

Dashboard

### 16.3.1

Dashboard

- Dashboard    Dashboard    NebulaGraph
- Dashboard    SQLite    MySQL    Dashboard                  MySQL        5.7    MySQL              dashboard              utf8

 Note

SQLite    Dashboard                  SQLite

•

7005	Dashboard	web
------	-----------	-----

9090	Prometheus
------	------------

9200	nebula-stats-exporter
------	-----------------------

9093	Alertmanager	Prometheus	Dashboard
------	--------------	------------	-----------

9100	node-exporter	CPU
------	---------------	-----

- License

 Enterpriseonly

License    License    **NebulaGraph Dashboard**

### 16.3.2 TAR

---

1. TAR

 Enterpriseonly

Dashboard

2. tar -xzvf TAR

```
$ tar -xzvf nebula-dashboard-ent-<version>.linux-amd64.tar.gz -C <install_path>
```

```
$ tar -xzvf nebula-dashboard-ent-3.2.4.linux-amd64.tar.gz -C /usr/local/
```

3. vim /usr/local/nebula-dashboard-ent/etc/config.yaml

```

Name: dashboard-api
Host: 0.0.0.0 # Dashboard
Port: 7005 # Dashboard
MaxBytes: 1073741824 # Http ContentLength 1048576 0 ~ 8388608
Timeout: 15000 #
Debug: # Debug
Enable: false
Log: # Dashboard
KeepDays: 7 #
Mode: console #
Database:
  Dialect: sqlite # SQLite MySQL SQLite
  AutoMigrate: true # true
  Host: 127.0.0.1 # MySQL IP
  Port: 3306 # MySQL
  Username: root # MySQL
  Password: nebula # MySQL
  Name: dashboard #

# exporter
Exporter:
  NodePort: 9100 # node-exporter
  NebulaPort: 9200 # nebula-stats-exporter

#
Proxy:
  PrometheusAddr: 127.0.0.1:9090 # prometheus IP
  AlertmanagerAddr: 127.0.0.1:9093 # alertmanager IP

# LDAP
Mail:
  Host: smtp.office365.com # SMTP
  Port: 587 # SMTP
  Username: "" # SMTP
  Password: "" # SMTP

#
System:
  WebAddress: http://127.0.0.1:7005 # Dashboard Dashboard
  MessageStore: 90 # 90

# LDAP
LDAP:
  Server: ldap://127.0.0.1 # LDAP
  BindDN: cn=admin,dc=vesoft,dc=com # LDAP
  BindPassword: "" # LDAP
  BaseDN: dc=vesoft,dc=com #
  UserFilter: "&(objectClass=*)" #
  EmailKey: mail # LDAP

```

#### 4. License nebula-dashboard-ent

```
$ cp -r <license> <dashboard_path>
```

```
$ cp -r nebula.license /usr/local/nebula-dashboard-ent
```

#### 5. Dashboard

##### Dashboard

```
$ cd /usr/local/nebula-dashboard-ent/scripts
$ sudo ./dashboard.service start all
```

```
Prometheus nebula-dashboard-server nebula-stats-exporter Alertmanager Dashboard
```

```
$ cd scripts
$ sudo ./dashboard.service start prometheus # Prometheus
$ sudo ./dashboard.service start webserver # nebula-dashboard-server
$ sudo ./dashboard.service start exporter # nebula-stats-exporter
$ sudo ./dashboard.service start alertmanager # Alertmanager
```



Dashboard

scripts

dashboard.service restart all

Dashboard

## Dashboard

Dashboard      dashboard.service

```
$ sudo <dashboard_path>/dashboard/scripts/dashboard.service
[-v] [-h]
<start|stop|status> <prometheus|webserver|exporter|gateway|all>
```

dashboard_path	Dashboard
-v	
-h	
start	
stop	
status	
prometheus	prometheus
webserver	webserver
exporter	exporter
gateway	gateway
all	

## Dashboard

```
$ sudo /dashboard/scripts/dashboard.service start all # Dashboard
$ sudo /dashboard/scripts/dashboard.service stop all # Dashboard
$ sudo /dashboard/scripts/dashboard.service status all # Dashboard
$ sudo /dashboard/scripts/dashboard.service restart all # Dashboard
```

### 16.3.3 RPM

#### 1. RPM

 **Enterpriseonly**

Dashboard

2. sudo rpm -ivh <package\_name>      RPM

Dashboard      /usr/local/nebula-dashboard-ent

```
sudo rpm -ivh nebula-dashboard-ent-<version>.x86_64.rpm
```

```
sudo rpm -ivh nebula-dashboard-ent-xxx.rpm --prefix=<path>
```

3. License nebula-dashboard-ent

```
$ cp -r <license> <dashboard_path>
```

```
$ cp -r nebula.license /usr/local/nebula-dashboard-ent
```

4.

```
sudo systemctl list-dependencies nebula-dashboard.target #
sudo systemctl start nebula-dashboard.target #
```

```
sudo systemctl {status|stop|start} {nbd-prometheus.service|nbd-alert-manager.service|nbd-stats-exporter.service|nbd-webserver.service}
```

5. LDAP vim /usr/local/nebula-dashboard-ent/etc/config.yaml

```
# LDAP
mail:
  host: smtp.office365.com # SMTP
  port: 587 # SMTP
  username: "" # SMTP
  password: "" # SMTP
#
system:
  webAddress: http://127.0.0.1:7005 # Dashboard
  messageStore: 90 # 90
# LDAP
ldap:
  server: ldap://127.0.0.1 # LDAP
  bindDN: cn=admin,dc=vesoft,dc=com # LDAP
  bindPassword: "" # LDAP
  baseDN: dc=vesoft,dc=com #
  userFilter: "&(objectClass=*)" #
  emailKey: mail # LDAP
```

/var/log/messages Dashboard

```
sudo cat /var/log/messages
```

Dashboard

```
journalctl -u {nbd-prometheus.service|nbd-alert-manager.service|nbd-stats-exporter.service|nbd-webserver.service} -b
```

Prometheus

```
journalctl -u nbd-prometheus.service -b
```

RPM Dashboard

```
sudo rpm -e <package_name>
```

## 16.3.4 DEB

1. DEB

 Enterpriseonly

Dashboard

2. sudo dpkg -i <package\_name> DEB

Dashboard /usr/local/nebula-dashboard-ent

```
sudo dpkg -i nebula-dashboard-ent-3.2.4.ubuntu1804.amd64.deb
```



DEB Dashboard

### 3. License nebula-dashboard-ent

```
$ cp -r <license> <dashboard_path>
```

```
$ cp -r nebula.license /usr/local/nebula-dashboard-ent
```

### 4.

```
sudo systemctl list-dependencies nebula-dashboard.target #
sudo systemctl start nebula-dashboard.target #
```

```
sudo {systemctl status|stop|start} {nbd-prometheus.service|nbd-alert-manager.service|nbd-stats-exporter.service|nbd-webserver.service}
```

### 5. LDAP OAuth2.0

vim /usr/local/nebula-dashboard-ent/etc/config.yaml

```
# LDAP OAuth2.0
mail:
  host: smtp.office365.com # SMTP
  port: 587 # SMTP
  username: "" # SMTP
  password: "" # SMTP
#
system:
  webAddress: http://127.0.0.1:7005 # Dashboard
  messageStore: 90 # 90
```

/var/log/syslog Dashboard

```
sudo cat /var/log/syslog
```

Dashboard

```
journalctl -u {nbd-prometheus.service|nbd-alert-manager.service|nbd-stats-exporter.service|nbd-webserver.service} -b
```

Prometheus

```
journalctl -u nbd-prometheus.service -b
```

DEB Dashboard

```
sudo dpkg -r <package_name>
```

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## 16.4 Dashboard

Dashboard

Dashboard

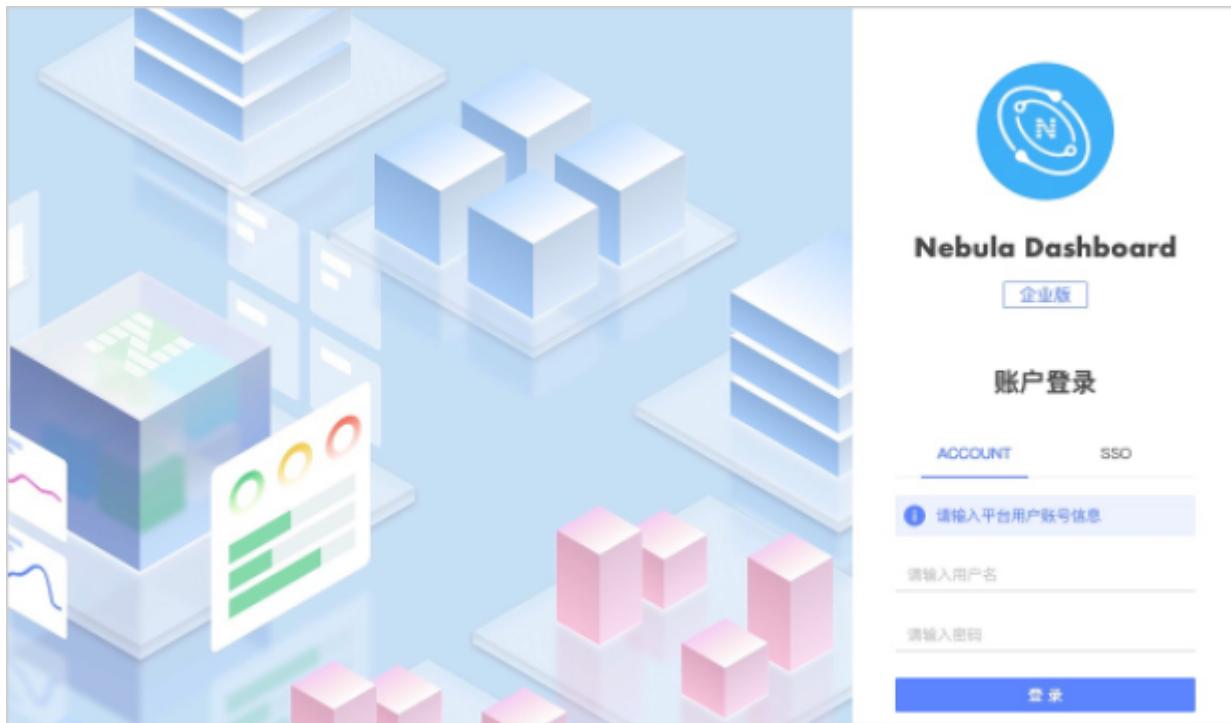
### 16.4.1

- Dashboard [Dashboard](#)
- Chrome 89 [Chrome](#)

### 16.4.2

1. Dashboard IP [http://<ip\\_address>:7005](http://<ip_address>:7005)

Dashboard



NebulaGraph Dashboard

2. nebula nebula Dashboard



Dashboard LDAP OAuth2.0

Dashboard

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## 16.5

---

### 16.5.1

---

Dashboard



1. Dashboard
- 2.

3.  
• 15  
• NebulaGraph

 **Note**

[Dashboard](#)    [NebulaGraph](#)    [NebulaGraph](#)

•

 **Note**

[NebulaGraph](#)    [License](#)

- Host SSH SSH

- SSH SSH

- SSH Dashboard passphrase

**添加节点**

\* Host ?: 192.168.8.129

\* SSH 端口号 ?: 22

\* SSH 用户 ?: vesoft

\* 认证方式:  SSH密码  SSH密钥

\* SSH 密码: \*\*\*\*\*

\* 安装包: nebula-graph-ent-3.1.2.el7.x86\_64.rpm ▾

安装路径 ?: .nebula/cluster

节点名: node1

取消 确认

**CSV**

4. 3 NebulaGraph

节点: 已添加1个节点

添加节点		批量导入节点		自动添加服务				添加 Meta		添加 Graph		添加Storage	
1	节点名称	节点Host	CPU(核)	内存(GB)	磁盘(GB)	安装包	服务类型	操作					
	<input checked="" type="checkbox"/> Node_1	192.168.8.129	4	8.01	52.43	nebula-graph-ent-3.1.0-ent.el7.x86_64.rpm	没有服务, 请添加服务					<a href="#">编辑</a>	<a href="#">删除</a>

5. Meta Graph Storage HTTP

6.

7. installing 3-10 healthy unhealthy

---

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## 16.5.2

[Dashboard](#)

[DEB](#) [RPM](#)

[Dashboard](#)

[Docker](#) [Kubernetes](#)

### Caution

#### NebulaGraph

1. <meta|graph|storage>\_server\_addrs local\_ip IP IP
  
- 2.
3. NebulaGraph
  - Graphd Host < Graphd IP>:< IP>: 192.168.8.157:9669
  - NebulaGraph vesoft
  - NebulaGraph nebula

### Note

NebulaGraph root NebulaGraph NebulaGraph NebulaGraph NebulaGraph

- 4.
- 15 create\_1027
- SSH sudo

### Notice

- SSH NebulaGraph sudo **sudo**
- CSV CSV
  -

集群名称:

节点: 已添加5个 未授权4个 已授权1个 **批量授权**

节点Host	CPU(核)	内存(GB)	磁盘(GB)	服务类型	状态	操作
192.168.8.154				Storage	Metad	<b>授权</b>
192.168.8.155				Storage	Metad	<b>授权</b>
192.168.8.157	16	32.79	92.27	Storage	Metad	<b>已授权</b>
192.168.8.158				Storage		<b>授权</b>
127.0.0.1				Graphd		<b>授权</b>

5.

---

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## 16.6

---

### 16.6.1

Dashboard

Dashboard

Dashboard

- 
- 
- 
- 
- 
- 

Graphd Storaged Metad

emergency > critical > warning                5

- NebulaGraph
- NebulaGraph
- NebulaGraph        License

 **Enterpriseonly**

NebulaGraph

- NebulaGraph        Dashboard
- NebulaGraph



- CPU





- `query_latency_us`      `slow_query_latency_us`



---

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## 16.6.2

Dashboard

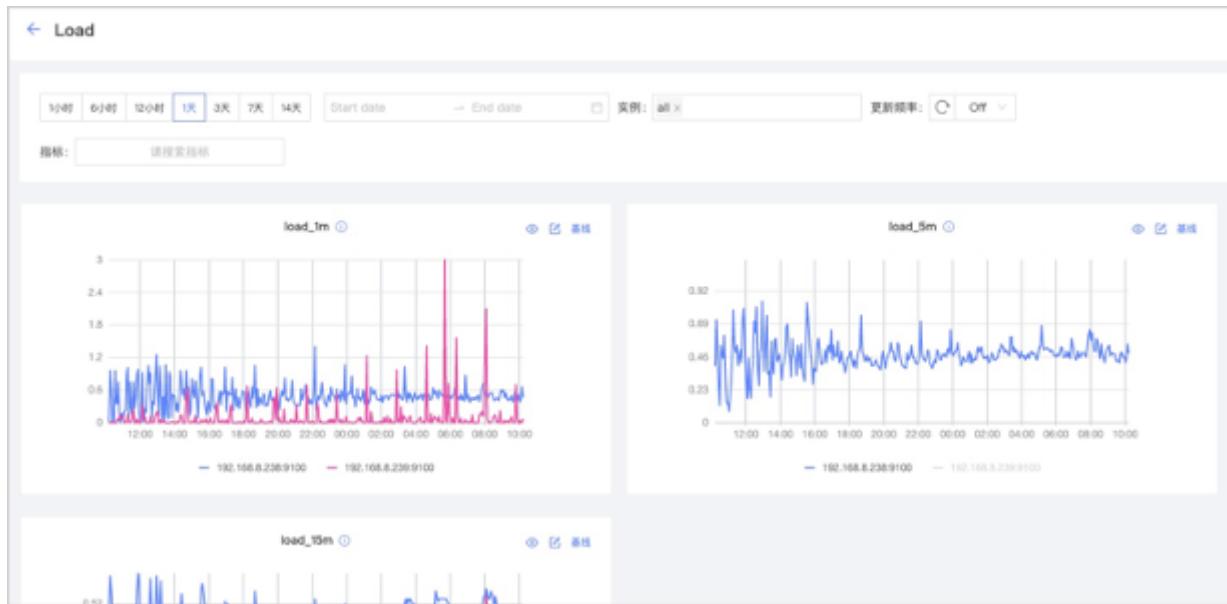
Dashboard

-> ->

CPU Memory Load Disk Network In/Out

- 14 1 6 12 1 3 7 14
- 
- 
- 
- 
- 

Load



- 
- 
- 
- 

-> ->

Graph Meta Storage

## Note

- 14                    1     6     12     1     3     7     14



Graph



- 
- 
- 
- 



- Graph

## Caution

Graph      enable\_space\_level\_metrics true



Graph

Dashboard

查询条件 X

周期:  ▼

指标:  ▼ i

图空间:  ▼

聚合方式:  ▼

基线:

取消 确认

Dashboard

->



1. Note

2.

3. CPU

4. emergency>critical>warning

5

#### 4 Graph

1. num\_active\_sessions
2. num\_slow\_queries
3. num\_active\_queries
4. num\_query\_errors

1. QPS (Query Per Second)

2. Storage add\_edges\_latency\_us add\_vertices\_latency\_us

1. cpu\_utilization
2. memory\_utilization
3. load\_1m
4. disk\_readbytes
5. disk\_writebytes

**Note**

- 100 13
  - $100 \geq 80 \geq 60 \geq 60$
  - $(1 - / ) * 100\%$
  - emergency 40 emergency 10
- 

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### 16.6.3

#### NebulaGraph

##### Dashboard

严重级别	告警名称	指标类型	Target	触发时间	状态	更新状态
emergency	eteadfad severity: emergency alert name: eteadf...	node	192.168.8.243:9100	2022-02-09 11:12:26	Unsolved	<button>去处理</button> <button>已解决</button>

- >
- 2

- 1     6     12     1     3     7     14
- unsolved

nebula-dashboard-ent/config/config.yaml                      messageStore                      NebulaGraph Dashboard              90  
[Dashboard](#)

Dashboard

1. Dashboard

2. ->

3.

4.

a.

253

emergency critical warning

Min

b.

graphd storaged metad

AND

Min

c.

d.



- 
- 
- 

**active**      **disable**



Dashboard

**active**      **disable**



Webhook      Webhook      Webhook

1. Dashboard
  2. ->
  3.
    - **Mail**
    - **Webhook**,    Webhook      Webhook
- 

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## 16.6.4

NebulaGraph Storage Storage Leader NebulaGraph

1. Dashboard

2.

3. ->



Graph NebulaGraph Dashboard

集群管理 / 信息总览  
← 信息总览

**Storage Leader 分布**

服务	Leader 数量	Leader 分布
192.168.8.129	0	No valid partition

**服务信息**

Host	Port	Status	Git Info Sha	Leader Count	Partition Distribution	Leader Distribution
192.168.8.129	9779	ONLINE	cfa5a1	0	No valid partition	No valid partition

**Partition 分布**

服务	分片数
没有数据	No Data

**版本**

- Graph Service**: 服务 192.168.8.129:9669, 版本 3.1.0-ent
- Storage Service**: 服务 192.168.8.129:9779, 版本 3.1.0-ent
- Meta Service**: 服务 192.168.8.129:9559, 版本 3.1.0-ent

**分区信息**

## STORAGE LEADER

Leader	Leader			
• <b>Balance Leader</b>	NebulaGraph	Leader	Leader	Storage
•	Leader			

NebulaGraph

Storage

Host			
Port			
Status			
Git Info Sha	Commit ID		
Leader Count	Leader		
Partition Distribution			
Leader Distribution	Leader		

## PARTITION

•	Storage	IP	Storage		
• <b>Balance Data</b>					
• <b>Balance Data Remove</b>	Storage		Storage	Storage	IP

Partition ID			
Leader	leader	IP	
Peers		IP	
Losses		IP	

ID

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- 
- Session
- 

1. Dashboard

2.

3. ->

1.

1 6 12 1 3 7 14



2.

集群管理 / 集群诊断

[← 集群诊断](#)
创建诊断报告:

→  自定义

1小时

6小时

12小时

1天

3天

7天

14天

开始诊断

报告ID	诊断时间	诊断区间	状态	操作
2	2022-04-11 11:42:13	2022-04-10 10:05:44-2022-04-11 10:05:44	success	<a href="#">详情</a>

3. generating success

PDF

- 
- 
- 
- Network
- Session
- 
-

num_queries_hit_memory_watermark	nGQL
graphd_down	Graph
storaged_down	Storage
metad_down	Meta
node-exporter down	

## 基本信息

### 诊断区间

START_TIME	END_TIME
2022-03-30 03:12:29	2022-03-30 03:12:29

### 节点信息

HOST	INSTANCE	CPU (Core)	MEMORY (GB)	DISK (GB)
192.168.8.129	metad*1 graphd*1 storaged*1	4	8.01	52.43

### 服务信息

NAME	TYPE	HOST	PORT	HTTP_PORT	STATUS
192.168.8.129-metad	metad	192.168.8.129	9559	19559	running
192.168.8.129-graphd	graphd	192.168.8.129	9669	19669	running
192.168.8.129-storaged	storaged	192.168.8.129	9779	19779	running

### Leader分布

Storage Service	Number of Leaders	Leader Distribution
192.168.8.129:9779	0	

- 

- CPU

HOST	IP
INSTANCE	metad*1 graphd*1 storaged*1
CPU	CPU Core
MEMORY	GB
DISK	GB

- NebulaGraph IP HTTP

- **Leader** Storage Leader

Storage Service	Storage	
Number of Leaders	Storage	Leader
Leader Distribution	Storage	Leader

## 负载

### CPU使用率

Node	Avg	Max	Min
192.168.8.129:9100	0.30%	0.30%	0.30%

### 内存使用率

Node	Avg	Max	Min
192.168.8.129:9100	11.62%	11.62%	11.62%

### 磁盘使用率

Disk	Avg	Max	Min
▼ 192.168.8.129:9100	67.56%	67.56%	67.56%
-- /dev/sda1	67.56%	67.56%	67.56%

AVG      MAX      MIN

- %
- **CPU**      CPU      %
- %

### Network

## Network

### NetworkOut

Node	Avg (Bytes/s)	Max (Bytes/s)	Min (Bytes/s)
▼ 192.168.8.129:9100	11882.18	11882.18	11882.18
-- eth0	11882.18	11882.18	11882.18

### NetworkIn

Node	Avg (Bytes/s)	Max (Bytes/s)	Min (Bytes/s)
▼ 192.168.8.129:9100	8208.09	8208.09	8208.09
-- eth0	8208.09	8208.09	8208.09

AVG      MAX      MIN

- **NetworkOut**      Bytes/s
- **NetworkIn**      Bytes/s

**Session****Session**

Sessions	Total
num_opened_sessions	
num_auth_failed_sessions	
num_active_sessions	
num_reclaimed_expired_sessions	

[Graph](#)    [Session](#)[num\\_opened\\_sessions](#)[num\\_auth\\_failed\\_sessions](#)[num\\_active\\_sessions](#)[num\\_reclaimed\\_expired\\_sessions](#)

## • Graph

### Graph

该表显示的是 Graph 服务稳定性相关指标。TOTAL为总数，ERROR为发生错误的个数，P75周期内响应耗时从小到大排列，顺序处于 75% 位置的分位数值。P95周期内响应耗时从小到大排列，顺序处于 95% 位置的分位数值。P99周期内响应耗时从小到大排列，顺序处于 99% 位置的分位数值。P999周期内响应耗时从小到大排列，顺序处于 99.9% 位置的分位数值。

METRIC_NAME	TOTAL	ERROR	P75	P95	P99	P999
slow_queries	0		-2147.483648s	-2147.483648s	-2147.483648s	-2147.483648s
num_killed_queries	0					
num_queries_hit_memory_watermark	0					
num_rpc_sent_to_metad	0	0				
query	0	0	-2147.483648s	-2147.483648s	-2147.483648s	-2147.483648s

METRIC_NAME	query			
	slow_queries			
	num_killed_queries			
	num_queries_hit_memory_watermark	nGQL		
	num_rpc_sent_to_metad	Graphd	Metad	RPC

## • Meta

### Meta

该表显示的是 Meta 服务稳定性相关指标。TOTAL为总数，ERROR为发生错误的个数，P75周期内响应耗时从小到大排列，顺序处于 75% 位置的分位数值。P95周期内响应耗时从小到大排列，顺序处于 95% 位置的分位数值。P99周期内响应耗时从小到大排列，顺序处于 99% 位置的分位数值。P999周期内响应耗时从小到大排列，顺序处于 99.9% 位置的分位数值。

METRIC_NAME	TOTAL	P75	P95	P99
heartbeat	0	-2147.483648s	-2147.483648s	-2147.483648s

METRIC_NAME	heartbeat
-------------	-----------

## • Storage

### Storage

该表显示的是 Storage 服务 稳定性相关指标。TOTAL为总数，ERROR为发生错误的个数，P75周期内响应耗时从小到大排列，顺序处于 75% 位置的分位数值。P95周期内响应耗时从小到大排列，顺序处于 95% 位置的分位数值。P99周期内响应耗时从小到大排列，顺序处于 99% 位置的分位数值。P999周期内响应耗时从小到大排列，顺序处于 99.9% 位置的分位数值。

METRIC_NAME	TOTAL	ERROR	P75	P95	P99
delete_edges	0	0	-2147.483648s	-2147.483648s	-2147.483648s
delete_tags	0	0	-2147.483648s	-2147.483648s	-2147.483648s
num_rpc_sent_to_metad	0	0			
delete_vertices	0	0	-2147.483648s	-2147.483648s	-2147.483648s

METRIC_NAME	delete_vertices			
	delete_edges			
	delete_tags	Tag		
	num_rpc_sent_to_metad	Storaged	Metad	RPC

TOTAL		
<hr/>		
ERROR		
P75	P75	75%
P95	P95	95%
P99	P99	99%
P999	P999	99.9%

## Graph Meta Storage

---

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## 16.6.5

Host    SSH            CPU

1. Dashboard
  - 2.
  3. ->

Host      SSH      SSH

- SSH      [SSH](#)
  - SSH      [Dashboard](#)      [passphrase](#)



### Balance Data   Balance Leader



- 10

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Host / /

1. Dashboard

2.

3. ->

 Danger

/

•

•



---

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## Storage Graph

1. Dashboard
- 2.
3. ->

- 
- 



- Storage/Graph
- Storage      Graph

---

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owner owner operator

1. Dashboard

2.

3. ->

•

 Note

Dashboard

- 
- owner owner

---

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## Dashboard

NebulaGraph



- •  
•



- |   | <b>3.0.0</b> NebulaGraph | <b>3.2.1</b> | <b>3.3.0</b> |
|---|--------------------------|--------------|--------------|
| • |                          |              |              |
| • |                          |              |              |
| • |                          |              |              |
| • | License                  |              |              |
| • |                          |              |              |

1. Dashboard
  - 2.
  3. ->
  4. **NebulaGraph**



1.

- | 2. | NebulaGraph    | NebulaGraph |
|----|----------------|-------------|
|    | version update |             |

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**NebulaGraph Dashboard****NebulaGraph**

UI

NebulaGraph

Backup &amp; Restore BR

NebulaGraph Dashboard

NebulaGraph

NebulaGraph Dashboard

BR

S3

OSS MinIO Ceph RGW

**Note**

- 
- 
- 
- 
- 

- [Dashboard](#) [NebulaGraph](#)
- S3

1. [NebulaGraph Dashboard](#)

2.

3. ->



- 1.
2. **S3**
- 3.

s3.access_key	Access Key ID	AKIAI44QH8DHBxxxx
s3.endpoint	URL	https://s3.us-east-2.amazonaws.com {bucket_name}.s3.us-west-2.amazonaws.com
s3.region	us-east-1	
s3.secret_key	Access Key Secret	je7MtGbClwBF/2Zp9Utk/h3yCoxxxx
storage path	s3	s3://br-test/backup/

OSS Amazon S3

- Amazon S3

* s3.access_key:	LTAI5tEwhrcm[REDACTED]
* s3.endpoint:	https://s3.us-west-2.amazonaws.com/
* s3.region:	us-west-2
* s3.secret_key:	MfjNFKNf56Y[REDACTED]
* storage path:	s3://nebula-br-test/

- OSS

* s3.access_key:	LTAI5tK[REDACTED]
* s3.endpoint:	https://oss-cn-hangzhou.aliyuncs.com
* s3.region:	oss-cn-hangzhou
* s3.secret_key:	7dl9l9ll[REDACTED]
* storage path:	s3://nebula-br-test/

### Caution

OSS      oss      s3      oss://nebula-br-test/      s3://nebula-br-test/

4.  
5.

- NebulaGraph
- 
- QPS 0 QPS 0



NebulaGraph

6.

备份列表		恢复列表				S3配置	创建备份		
<input type="text"/> 请输入备份名称		SUCCESS ▾ 1小时 6小时 1天 30天		2022-05-28 14:07 → 2022-06-27 14:07					
备份名称	备份时间	状态	备份图空间	备份方式	存储路径	操作			
BACKUP_2022_06_24_09_48_46	2022-06-24 17:48:46	success	nba	s3	s3://nebula-br-test/	<button>恢复</button>	<button>恢复历史</button>	<button>查看日志</button>	<button>删除</button>
BACKUP_2022_06_24_03_18_31	2022-06-24 11:18:31	success	nba	s3	s3://nebula-br-test/	<button>恢复</button>	<button>恢复历史</button>	<button>查看日志</button>	<button>删除</button>

- 30
- running success failed
- 
- 



7.

s3://nebula-br-test

- Amazon S3:

Amazon S3 > Buckets > nebula-br-test

**nebula-br-test** Info

Objects (46)

Objects are the fundamental entities stored in Amazon S3. You can use [Amazon S3 inventory](#) to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. [Learn more](#)

[Copy S3 URI](#)  [Copy URL](#)  [Download](#)  [Open](#)  [Delete](#)  [Actions](#)  [Create folder](#)  [Upload](#)

BACKUP\_2022\_06\_20\_03\_ × 3 matches ◀ 1 ▶ ⌂

Name	Type	Last modified	Size	Storage class
meta/	Folder	-	-	-
data/	Folder	-	-	-
BACKUP_2022_06_20_03_16_11.meta	meta	June 20, 2022, 11:17:23 (UTC+08:00)	3.2 KB	Standard

- OSS:

oss://nebula-br-test/

[上传](#)  [创建目录](#)  [全选](#)  [下载](#)  [复制](#)  [更多](#)  [按名称前缀过滤](#)  Q 1 ⌂ 区域: oss-chn-hangzhou ☰ grid

名称	类型 / 大小	最后修改时间	操作
BACKUP_2022_06_21_14_35_58	目录		<a href="#">下载</a>   <a href="#">删除</a>

 **Danger**

 **Caution**

- 1.
- 2.
- 3.

- NebulaGraph
- 
- 

4.

备份列表		恢复列表						S3配置
恢复记录ID		备份名称	状态	恢复时间	恢复的图空间	存储路径	操作人	操作
31		BACKUP_2022_06_24_03_18_31	success	2022-06-27 14:23:13	nba	s3://nebula-br-test/	nebula	<a href="#">查看日志</a>
16		BACKUP_2022_06_20_06_05_00	success	2022-06-27 14:23:13	nba	s3://nebula-br-test/	nebula	<a href="#">查看日志</a>

- 
- 30
- ID
- `running success failed`

 **Note**

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## 16.6.6

Dashboard

Dashboard

1    6    12    1    3    7    14

---

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## 16.6.7

Dashboard

Dashboard

•

• NebulaGraph

 Note

•

NebulaGraph

 Note

---

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## 16.7

NebulaGraph Dashboard

 Note

LDAP      OAuth2.0

### 16.7.1

Dashboard

nebula      nebula

Dashboard

LDAP      OAuth2.0

#### LDAP

Dashboard

LDAP Lightweight Directory Access Protocol

Dashboard

#### OAuth2.0

Dashboard

OAuth2.0      access\_token

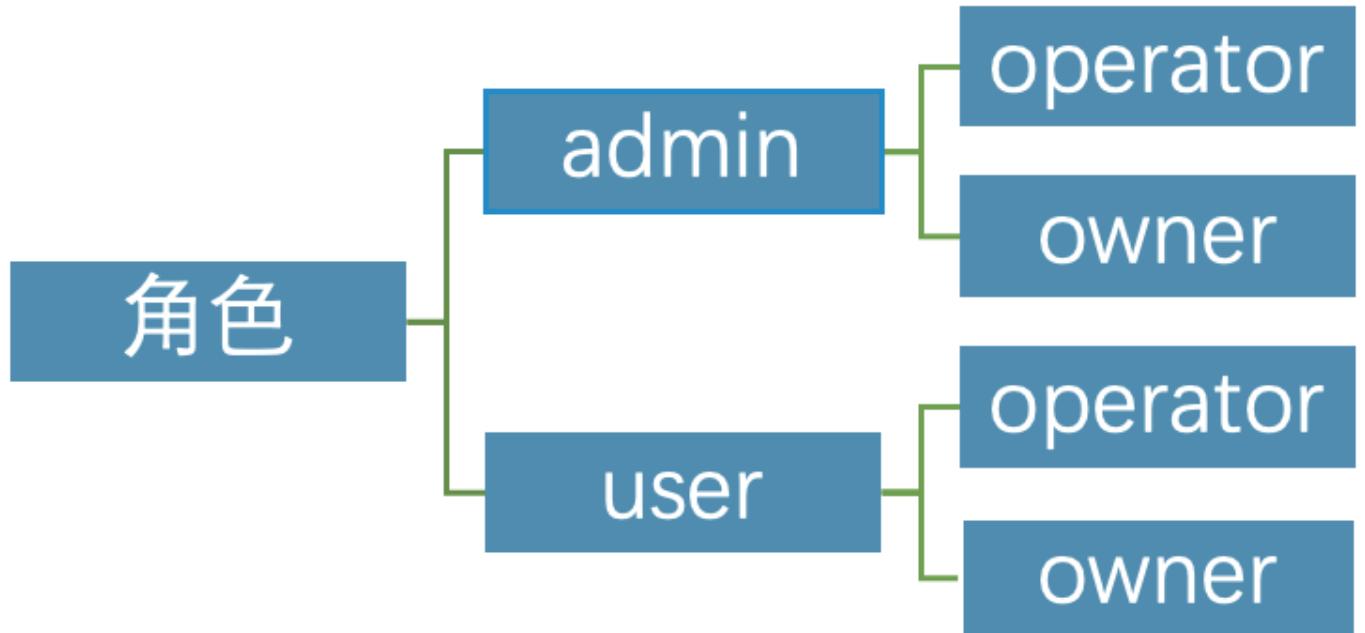
Dashboard

### 16.7.2

Dashboard

admin      user

owner      operator



admin	1.	1.	admin
	2.	2.	admin operator
	3.	3.	admin user operator
	4.	4.	owner admin admin user
			admin
<hr/>			
user	1.	1.	
	2. admin user	2.	user
	3. owner		
<hr/>			
operator	1.	1.	
	2.	2.	operator
	3.		
	4.		
<hr/>			
owner	1. operator	1.	
	2.	2.	owner
	3. operator		
	4. owner		

### 16.7.3

admin

- 1. Dashboard
- 2.
- LDAP OAuth2.0 **Accept** Dashboard  
Dashboard
- 

### 16.7.4

- 
- **ldap oauth2.0 platform platform**
- **admin user**
- owner
-

## 16.7.5

- 
  - 
- 

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## 16.8

---

NebulaGraph Dashboard

NebulaGraph Dashboard

### 16.8.1

---

- ID
- 

### 16.8.2

---

- 
- 

### 16.8.3

---

---

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## 16.9

---

### 16.9.1

---

Logo

1. Dashboard

2.

Logo

---

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## 16.9.2

### Webhook

1. Dashboard

2.

Dashboard

•

SMTP	SMTP
	SMTP
Use SSL	SSL
SMTP	SMTP
SMTP	SMTP

•

Dashboard

WEBHOOK

Dashboard      Webhook

->**Webhook**

**Webhook URL**

Webhook

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### 16.9.3

NebulaGraph Dashboard

LDAP

OAuth2.0

Dashboard

LDAP

OAuth2.0

#### Note

- 
- LDAP OAuth2.0

#### LDAP

1. Dashboard

2. ->**LDAP**

LDAP Server Address	ldap://192.168.10.100	LDAP
Bind DN	cn=admin,dc=vesoft,dc=com	LDAP
Password	123456	LDAP
Base DN	dc=vesoft,dc=com	
User Filter	&(objectClass=*)	
Email Key	mail	LDAP

#### OAuth2.0

1. Dashboard

2. ->**OAuth2.0**

ClientId	4953xxx- mmnoge13xx.apps.googleusercontent.com	ClientId
ClientSecret	GOCxxx-xaytomFexxx	ClientSecret
RedirectURL	http://dashboard.vesoft-inc.com/login	Dashboard URL
AuthURL	https://accounts.google.com/o/oauth2/auth	URL
TokenURL	https://oauth2.googleapis.com/token	access_token URL
UserInfoURL	https://www.googleapis.com/oauth2/v1/ userinfo	URL
Username Key	email	
Organization	vesoft company	
OAuth	email	OAuth scope
		OAuth2.0 scope
		Username Key

---

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## 16.9.4

NebulaGraph Dashboard

NebulaGraph

- admin
- 

### 1. Dashboard

2.

平台设置 /

← 安装包管理

安装包名称	版本	大小	创建时间	操作
nebula-graph-2.6.2.el7.x86_64.rpm	社区版-v2.6.2	64.40MB	2022-06-07 10:36:25	<button>删除</button>
nebula-graph-2.6.2.ubuntu1804.amd64.deb	社区版-v2.6.2	83.57MB	2022-06-07 10:36:26	<button>删除</button>
nebula-graph-3.0.2.el7.x86_64.rpm	社区版-v3.0.2	69.58MB	2022-03-29 10:18:03	<button>删除</button>
nebula-graph-3.1.0.el7.x86_64.rpm	社区版-v3.1.0	70.53MB	2022-06-07 11:03:04	<button>删除</button>
nebula-graph-3.1.0.ubuntu1804.amd64.deb	社区版-v3.1.0	92.60MB	2022-06-07 10:36:29	<button>删除</button>

1.



- v2.5
- CentOS 7/8 Ubuntu 1604/1804/2004
- RPM DEB tar.gz

2.

package download success

RPM DEB tar.gz

package upload success

REQUEST ENTITY TOO LARGE

Nginx 1 MB nginx.conf http{} client\_max\_body\_size 200m; 200 MB

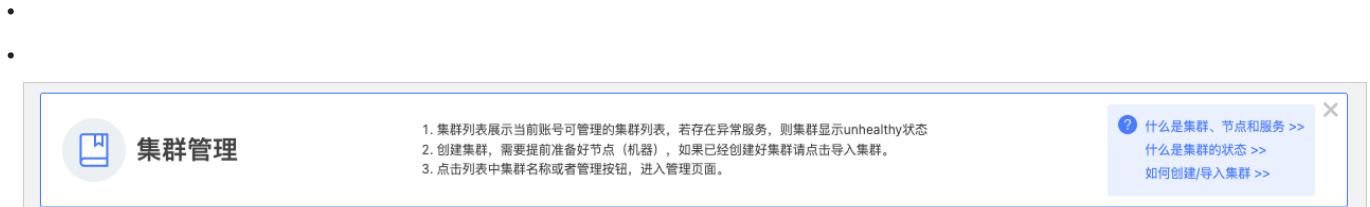
---

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## 16.9.5

1. Dashboard

2.



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## 16.10

Dashboard      NebulaGraph

### 16.10.1



- Linux
- Byte 1 KB/s Bytes/s
- Dashboard Buff Cache

#### CPU

cpu_utilization	CPU
cpu_idle	CPU
cpu_wait	IO CPU
cpu_user	NebulaGraph CPU
cpu_system	NebulaGraph CPU

memory_utilization
memory_used
memory_free

load_1m	1
load_5m	5
load_15m	15

disk\_used\_percentage  
 disk\_used  
 disk\_free  
 disk\_readbytes  
 disk\_writebytes  
 disk\_readiops  
 disk\_writeiops  
 inode\_utilization      inode

---

network\_in\_rate  
 network\_out\_rate  
 network\_in\_errs  
 network\_out\_errs  
 network\_in\_packets  
 network\_out\_packets

---

**16.10.2**

5    60    600    3600                5    1    10    1

---

rate  
 sum  
 avg  
 P75                          75%  
 P95                          95%  
 P99                          99%  
 P999                        99.9%

---

**Note**

[Dashboard](#)

[Dashboard](#)

**Graph**

num_active_queries							
num_active_sessions							
	num_active_sessions.sum.5	5	10	30			-20
	10-30						
num_aggregate_executors	Aggregate						
num_auth_failed_sessions_bad_username_password							
num_auth_failed_sessions_out_of_max_allowed	FLAG_OUT_OF_MAX_ALLOWED_CONNECTIONS						
num_auth_failed_sessions							
num_indexscan_executors	IndexScan						
num_killed_queries							
num_opened_sessions							
num_queries							
num_query_errors_leader_changes	Leader						
num_query_errors							
num_reclaimed_expired_sessions							
num_rpc_sent_to_metad_failed	Graphd	Metad	RPC				
num_rpc_sent_to_metad	Graphd	Metad	RPC				
num_rpc_sent_to_storaged_failed	Graphd	Storaged	RPC				
num_rpc_sent_to_storaged	Graphd	Storaged	RPC				
num_sentences	Graphd						
num_slow_queries							
num_sort_executors	Sort						
optimizer_latency_us							
query_latency_us							
slow_query_latency_us							
num_queries_hit_memory_watermark							

**Meta**

commit_log_latency_us	Raft	Commit
commit_snapshot_latency_us	Raft	Commit
<hr/>		
heartbeat_latency_us		
<hr/>		
num_heartbeats	Raft	
num_raft_votes	Raft	
transfer_leader_latency_us	Raft	Leader
num_agent_heartbeats	AgentHBProcessor	
agent_heartbeat_latency_us	AgentHBProcessor	
replicate_log_latency_us	Raft	
num_send_snapshot	Raft	
append_log_latency_us	Raft	
append_wal_latency_us	Raft	WAL
num_grant_votes	Raft	
num_start_elect	Raft	

**Storage**

add_edges_atomic_latency_us	TOSS
add_edges_latency_us	
add_vertices_latency_us	
commit_log_latency_us	Raft      Commit
commit_snapshot_latency_us	Raft      Commit
delete_edges_latency_us	
delete_vertices_latency_us	
get_neighbors_latency_us	
get_dst_by_src_latency_us	
num_get_prop	GetPropProcessor
num_get_neighbors_errors	GetNeighborsProcessor
num_get_dst_by_src_errors	GetDstBySrcProcessor
get_prop_latency_us	GetPropProcessor
num_edges_deleted	
num_edges_inserted	
num_raft_votes	Raft
num_rpc_sent_to_metad_failed	Storage    Metad    RPC
num_rpc_sent_to_metad	Storage    Metad    RPC
num_tags_deleted	Tag
num_vertices_deleted	
num_vertices_inserted	
transfer_leader_latency_us	Raft      Leader
lookup_latency_us	LookupProcessor
num_lookup_errors	LookupProcessor
num_scan_vertex	ScanVertexProcessor
num_scan_vertex_errors	ScanVertexProcessor
update_edge_latency_us	UpdateEdgeProcessor
num_update_vertex	UpdateVertexProcessor
num_update_vertex_errors	UpdateVertexProcessor
kv_get_latency_us	Getprocessor
kv_put_latency_us	PutProcessor
kv_remove_latency_us	RemoveProcessor
num_kv_get_errors	GetProcessor
num_kv_get	GetProcessor
num_kv_put_errors	PutProcessor

num_kv_put	PutProcessor
num_kv_remove_errors	RemoveProcessor
num_kv_remove	RemoveProcessor
forward_tranx_latency_us	
scan_edge_latency_us	ScanEdgeProcessor
num_scan_edge_errors	ScanEdgeProcessor
num_scan_edge	ScanEdgeProcessor
scan_vertex_latency_us	ScanVertexProcessor
num_add_edges	
num_add_edges_errors	
num_add_vertices	
num_start_elect	Raft
num_add_vertices_errors	
num_delete_vertices_errors	
append_log_latency_us	Raft
num_grant_votes	Raft
replicate_log_latency_us	Raft
num_delete_tags	Tag
num_delete_tags_errors	Tag
num_delete_edges	
num_delete_edges_errors	
num_send_snapshot	
update_vertex_latency_us	UpdateVertexProcessor
append_wal_latency_us	Raft WAL
num_update_edge	UpdateEdgeProcessor
delete_tags_latency_us	Tag
num_update_edge_errors	UpdateEdgeProcessor
num_get_neighbors	GetNeighborsProcessor
num_get_dst_by_src	GetDstBySrcProcessor
num_get_prop_errors	GetPropProcessor
num_delete_vertices	
num_lookup	LookupProcessor
num_sync_data	Storage Drainer
num_sync_data_errors	Storage Drainer
sync_data_latency_us	Storage Drainer

## Note

num_active_queries				
num_queries				
num_sentences	Graphd			
optimizer_latency_us				
query_latency_us				
num_slow_queries				
num_query_errors				
num_query_errors_leader_changes	Leader			
num_killed_queries				
num_aggregate_executors	Aggregate			
num_sort_executors	Sort			
num_indexscan_executors	IndexScan			
num_auth_failed_sessions_bad_username_password				
num_auth_failed_sessions				
num_opened_sessions				
num_queries_hit_memory_watermark				
num_reclaimed_expired_sessions				
num_rpc_sent_to_metad_failed	Graphd	Metad	RPC	
num_rpc_sent_to_metad	Graphd	Metad	RPC	
num_rpc_sent_to_storaged_failed	Graphd	Storaged	RPC	
num_rpc_sent_to_storaged	Graphd	Storaged	RPC	
slow_query_latency_us				

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## 16.11 FAQ

---

Dashboard

### 16.11.1

- Dashboard NebulaGraph
- NebulaGraph
- NebulaGraph Metad Storage Graphd

### 16.11.2

- installing 3 10
- healthy
- unhealthy

### 16.11.3

SSH Dashboard SSH

### 16.11.4

NebulaGraph Dashboard Storage Graph Metad

### 16.11.5 Meta

Meta NebulaGraph Meta Meta Dashboard Meta

### 16.11.6

- Storage Dashboard Storage -> Storage Leader Partition  
Balance Leader Balance Data
- Storage Storage -> Partition Balance Data Remove Storage  
Storage
- Graph

### 16.11.7 Dashboard

- License Dashboard sudo ./dashboard.service start all
- License

Dashboard cat logs/webserver.log Dashboard NebulaGraph

### 16.11.8 NebulaGraph

Dashboard NebulaGraph RPM DEB nebula-dashboard-ent/download/nebula-graph

---

16.11.9	"ssh "
<b>Host</b>	127.0.0.1 Dashboard NebulaGraph
Host IP	IP
Docker	"ssh " Dashboard Docker

---

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# 17. NebulaGraph Explorer

---

## 17.1 NebulaGraph Explorer

---

NebulaGraph Explorer      Explorer      Web      NebulaGraph

 **Enterpriseonly**

- Nebula Explorer
-  30 Explorer

### 17.1.1

---

Explorer

- 
- 

### 17.1.2

---

- 
- nGQL
- VID Tag Subgraph
- 
- 
- 
- Explorer

### 17.1.3

---

NebulaGraph            Explorer

NebulaGraph      Explorer

NebulaGraph      **NebulaGraph**

### 17.1.4

NebulaGraph      Explorer

<b>NebulaGraph</b>	<b>Explorer</b>
3.3.0	3.2.1 3.2.0
3.1.0 ~ 3.2.x	3.1.0
3.0.0 ~ 3.1.0	3.0.0
2.5.x ~ 3.0.0	2.2.0
2.6.x	2.1.0
2.5.x	2.0.0

### 17.1.5

- NebulaGraph Explore Demo Show 2 54

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## 17.2

---

### 17.2.1 Explorer

RPM DEB TAR Explorer

Explorer

- NebulaGraph [NebulaGraph](#)

•

7002

Explorer web

 **Caution**

Explorer 7002 conf/app.conf httpport

- Linux CentOS
- License

 **Enterpriseonly**

License License [Nebula Explorer](#)

- HDFS namenode 8020 datanode 50010

 **Caution**

HDFS

Explorer 3.2.0 Dag Controller Dag Controller Dag Controller Explorer  
**Workflow**

**RPM**

1. RPM

 **Enterpriseonly**

Explorer

## 2. sudo rpm -i &lt;rpm&gt; RPM

Explorer /usr/local/nebula-explorer

sudo rpm -i nebula-explorer-&lt;version&gt;.x86\_64.rpm

--prefix

sudo rpm -i nebula-explorer-&lt;version&gt;.x86\_64.rpm --prefix=&lt;path&gt;

## 3. License

sudo cp -r &lt;license&gt; &lt;explorer\_path&gt;

sudo cp -r nebula.license /usr/local/nebula-explorer

## 4. Dag Controller

**Dag Controller**

## 5. nebula-explorer

```
cd nebula-explorer
#   Explorer
sudo ./scripts/start.sh
#   Dag Controller
sudo ./dag-ctrl/scripts/start.sh
```

## systemctl

```
systemctl status nebula-explorer #
systemctl stop nebula-explorer #
systemctl start nebula-explorer #
```

```
sudo ./scripts/start.sh #   Explorer
sudo ./scripts/stop.sh #   Explorer
sudo ./dag-ctrl/scripts/start.sh #   Dag Controller
sudo ./dag-ctrl/scripts/stop.sh #   Dag Controller
```

## Explorer

sudo rpm -e nebula-explorer-&lt;version&gt;.x86\_64

**DEB****⑤ enterpriseonly**

## Explorer

## 1. DEB

**⑤ enterpriseonly**

## Explorer

## 2. sudo dpkg -i &lt;package\_name&gt; DEB

Explorer /usr/local/nebula-explorer

sudo dpkg -i nebula-explorer-3.2.1.x86\_64.deb

 **Note**

DEB      Explorer

3. License nebula-explorer

```
sudo cp -r <license> <explorer_path>
```

```
sudo cp -r nebula.license /usr/local/nebula-explorer
```

4. Dag Controller      **Dag Controller**

5. nebula-explorer

```
cd nebula-explorer
#   Explorer
sudo ./lib/start.sh

#       Dag Controller
sudo ./dag-ctrl/scripts/start.sh
```

```
sudo systemctl status nebula-explorer.service
```

```
sudo systemctl stop nebula-explorer.service
```

Explorer

```
sudo dpkg -r nebula-explorer
```

**TAR**

1. TAR

 **Enterpriseonly**

Explorer

2. tar -xvf tar

```
tar -xvf nebula-explorer-<version>.tar.gz
```

3. License nebula-explorer

```
cp -r <license> <explorer_path>
```

```
cp -r nebula.license /usr/local/nebula-explorer
```

4. Dag Controller      **Dag Controller**

5. nebula-explorer

```
cd nebula-explorer
```

```
#     Explorer    Dag Controller
sudo ./scripts/start.sh

#     Explorer
sudo nohup ./nebula-explorer-server > explorer.log 2>&1 &
```

```
kill pid
```

```
kill $(lsof -t -i :7002)
```

### Dag Controller

Dag Controller	DAG	DAG	NebulaGraph Analytics
Dag Controller	NebulaGraph Analytics	Dag Controller	NebulaGraph Analytics
Analytics	NebulaGraph	HDFS	NebulaGraph
	Dag Controller		Dag Controller

1. Dag Controller    SSH    NebulaGraph Analytics    NebulaGraph Analytics    SSH
- A    Dag Controller    SSH    NebulaGraph Analytics    B    B-1    A

```
//
$ ssh-keygen -t rsa

//      A          B-1          A          B-1
$ ssh-copy-id -i ~/.ssh/id_rsa.pub <B_user>@<B_IP>
```

A    B-2    B-3    B

2. Dag Controller    eval \$(ssh-agent)    ssh-agent    ssh-add ~/.ssh/id\_rsa    ssh-agent

### Note

ssh-agent    SSH

3. dag-ctrl-api.yaml    dag-ctrl/etc/dag-ctrl-api.yaml    NebulaGraph Analytics

```
#
Name: task-api

Host: 0.0.0.0      # Dag Controller    IP
Port: 9002        # Dag Controller
Timeout: 60000     # HTTP

Log:             #           https://go-zero.dev/cn/docs/blog/tool/logx/
  Mode: file      #
  KeepDays: 7     #
  Path: logs      #
  Level: info     #
  Compress: false  #

# NebulaGraph Analytics      SSH
SSH:
  UserName: vesoft
  Port: 22

#
JobPool:
  Sleep: 3      # 3
  Size: 3       #      3
TaskPool:
  CheckStatusSleep: 1   # 1
  Size: 10      #      10
Dag:
  VarDataListMaxSize: 100    #      HDFS      100

#
Debug:
  Enable: false  #      Debug

# Explorer    Dag Controller
RsaPriKey: |
  -----BEGIN RSA PRIVATE KEY-----
  MIICXAIBAAKBgQDcR0keIMmmV...
```

```
-----END RSA PRIVATE KEY-----
RsaPubKey: |
-----BEGIN RSA PUBLIC KEY-----
MIGJAQBNXHSR4gyaZ7uet7...
-----END RSA PUBLIC KEY-----
```

4. tasks.yaml      dag-ctrl/etc/tasks.yaml      exec\_file      exec\_file      run\_algo.sh



### Note

- NebulaGraph Analytics      scripts
- 
- 

```
exec_file: /home/xxx/nebula-analytics/scripts/run_algo.sh
```

[http://<ip\\_address>:7002](http://<ip_address>:7002)

Explorer



 Note

Nebula Explorer

Explorer

NebulaGraph

---

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## 17.2.2

Explorer      NebulaGraph      OAuth2.0

### NebulaGraph

- Explorer      [Explorer](#)
- NebulaGraph      Graph      IP      9669
- NebulaGraph

### OAuth2.0

#### Caution

OAuth2.0      Beta

#### Note

OAuth2.0      Explorer      config/app-config.yaml

### OAuth

Enable	false	OAuth2.0
ClientId	4953xxx- mmnoge13xx.apps.googleusercontent.com	ClientId
ClientSecret	GOCxxx-xaytomFexxx	ClientSecret
RedirectURL	http://dashboard.vesoft-inc.com/login	Dashboard URL
AuthURL	https://accounts.google.com/o/oauth2/auth	URL
TokenURL	https://oauth2.googleapis.com/token	access_token URL
UserInfoURL	https://www.googleapis.com/oauth2/v1/ userinfo	URL
UsernameKey	email	
Organization	vesoft company	
TokenName	oauth_token	Cookie Token
Scope	email	OAuth scope      OAuth2.0      scope UsernameKey
AvatarKey	picture	Avatar Key

Explorer      OAuth

## NebulaGraph

### 1. Explorer

• **Host** NebulaGraph Graph IP ip:port 9669



- NebulaGraph Explorer Host IP 127.0.0.1 localhost
- NebulaGraph NebulaGraph
- NebulaGraph
- root
- GOD root nebula
- 

### 2.



30 30



>

Explorer NebulaGraph

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### 17.2.3 NebulaGraph Explorer License

NebulaGraph Explorer License

- License NebulaGraph Explorer
- License License
- License
- License 14
- 30
- 14
- 14

NebulaGraph Explorer License



NebulaGraph Explorer License

30 License

### NebulaGraph Explorer License

NebulaGraph Explorer License nebula.license

```
-----License Content Start-----
{
  "vendor": "vesoft",
  "organization": "doc",
  "issuedDate": "2022-06-06T16:00:00.000Z",
  "expirationDate": "2023-05-31T15:59:59.000Z",
  "product": "nebula_graph_explorer",
  "version": ">=3.2.0",
  "licenseType": "enterprise",
  "gracePeriod": 14,
  "clusterCode": "BAIAEAiAQAAAG"
}
-----License Content End-----

-----License Key Start-----
Rrjip5cxxxxxxxxxxxx52kQ==
```

## License

vendor	
organization	
issuedDate	License
expirationDate	License
product	NebulaGraph Explorer
	nebula_graph_explorer
version	
licenseType	License
	enterprise samll_bussiness pro individual
gracePeriod	License 0
clusterCode	License

NebulaGraph Explorer [NebulaGraph Explorer](#)

### NebulaGraph Explorer License

1. NebulaGraph Explorer License nebula.license
2. NebulaGraph Explorer /usr/local/nebula-explorer License License

#### Note

NebulaGraph Explorer license Explorer License

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## 17.3

NebulaGraph Explorer

NebulaGraph Explorer

NebulaGraph Explorer



### 17.3.1

/

**Explorer**

**Visual Query**

**Workflow**



Schema

Schema



NebulaGraph

Schema



NebulaGraph



NebulaGraph

nGQL



nGQL



NebulaGraph Explorer



NebulaGraph



## 17.3.2

**Note**

Explorer

Explorer



VID Tag



Explorer

## 17.3.3

**Note**

Explorer

## Explorer

- - 
  - 
  - 
  - 
  - 
  -
- 

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## 17.4

### 17.4.1 Schema

Explorer   Schema

Schema

Schema

- Schema
- Schema
- Schema PNG

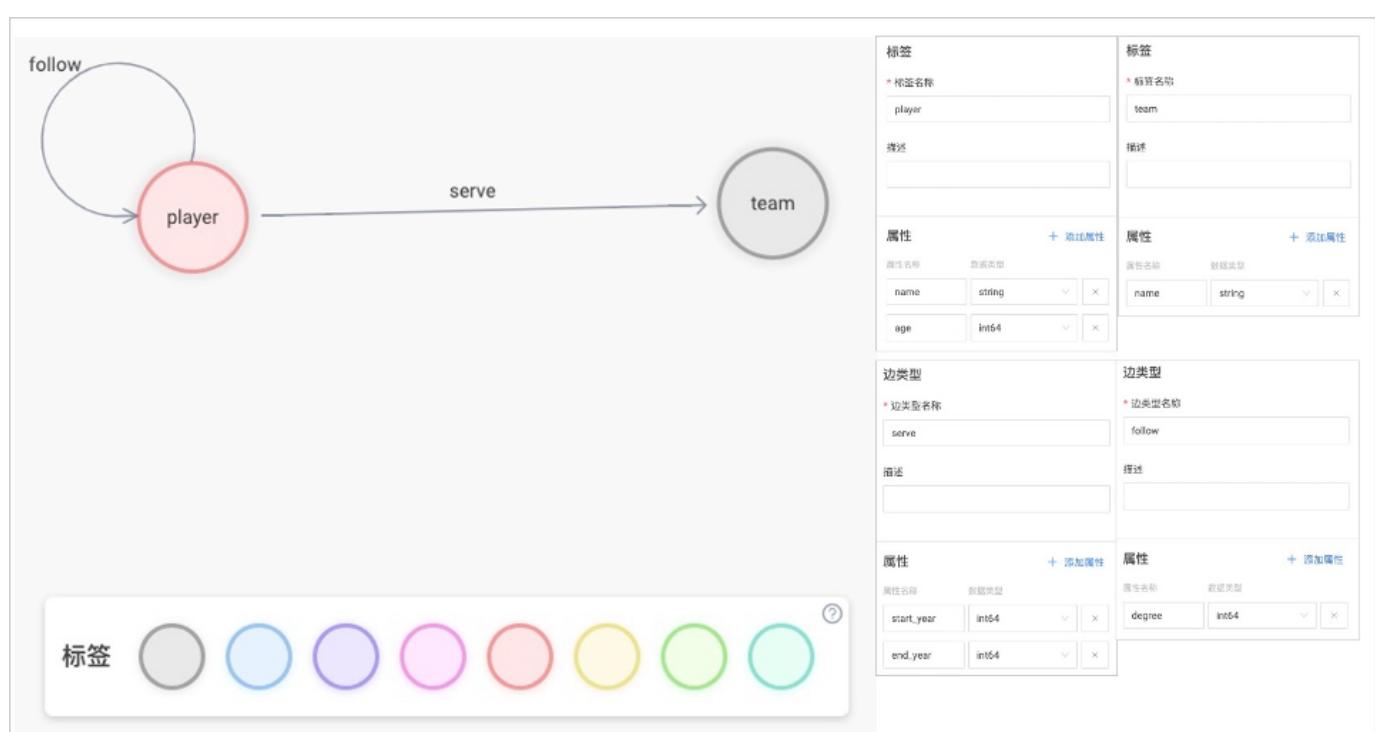


#### Schema

basketballplayer Schema

Schema

- 1.
2. Tag Tag
3. Tag player name age
4. Tag team name
5. Tag player Tag team serve start\_year end\_year
6. Tag player follow degree
- 7.



**Schema**

1. Schema
2. Schema



CREATE SPACE

- Schema

**Schema**

Schema



Schema

**Schema**

Schema

**Schema**

Schema PNG

---

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## 17.4.2 Schema

Explorer      Schema

### Note

- Schema      Schema      Schema
  - nGQL      Schema
- 
- GOD ADMIN DBA      NebulaGraph
  - Schema

### Note

GOD      Schema



1.

2. CREATE SPACE

3.

/

1.

Schema

2.

3. CREATE TAG CREATE EDGE

### Note

TTL      TTL

4.

**Note**

- Tag Edge type
- 

1.

**Schema**

2.

3. **CREATE INDEX****Note**

LOOKUP

LOOKUP

4.

1.

**Schema**

2.

**Schema**

1.

**Schema**2. **Schema****Schema**

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### 17.4.3

Explorer      CSV      NebulaGraph

- NebulaGraph      Schema
- CSV      Schema
- GOD ADMIN DBA      **NebulaGraph**



1.      CSV



CSV

2.      A blue eye icon with a magnifying glass symbol over it.

1.

## Caution

example.yaml

NebulaGraph Importer

CSV

- 
- 
- 
- 
- **vertices 1**      `vertexID`      **Select CSV Index**      VID
- **Tag**      **Tag**      Tag
- 

[← 任务列表 / 创建导入任务](#)

\* 图空间  \* 任务名称

批处理量

\* 关联点 \* 关联边

+ 固定数据源

vertices 1 vertex\_player.csv

属性	对应列	类型
name	* Column 2	string
age	* Column 1	int

+ 添加 Tag

+ 固定数据源

edge 1 edge\_follow.csv

Edge Type	对应列	类型
srcId	* Column 0	string
dstId	* Column 1	string
rank	选择	int
degree	* Column 2	int

[取消](#) [导入](#)

2. , NebulaGraph

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## 17.4.4

Explorer

nGQL

The screenshot shows the Nebula Graph nGQL console interface. At the top, there is a search bar with the text "basketballplayer" and a dropdown arrow icon. Below the search bar are several buttons: a red circle with the number 1, a dropdown arrow, a question mark, a save as template button (red circle with 6), and a run button (blue background with white play icon). To the right of the run button are five small icons: a star, a refresh, a clipboard, and a blue circle with the number 5.

The main area contains a code editor with the following query:

```
1 MATCH (v:player) RETURN v LIMIT 10;
```

This query is highlighted with a green background. To the right of the code editor are four small icons: a star, an up arrow, a down arrow, and a close button. Below the code editor, the results are displayed in a table format. A sidebar on the left shows a "表格" (Table) icon (red circle with 14) and a "可视化" (Visualization) icon (red circle with 15).

v
("player102" :player{age: 33, name: "LaMarcus Aldridge"})
("player106" :player{age: 25, name: "Kyle Anderson"})
("player115" :player{age: 40, name: "Kobe Bryant"})
("player129" :player{age: 37, name: "Dwyane Wade"})
("player138" :player{age: 38, name: "Paul Gasol"})
("player108" :player{age: 36, name: "Boris Diaw"})
("player122" :player{age: 30, name: "DeAndre Jordan"})
("player123" :player{age: 28, name: "Ricky Rubio"})
("player139" :player{age: 34, name: "Marc Gasol"})
("player142" :player{age: 29, name: "Klay Thompson"})

At the bottom of the results table, there are navigation buttons for "共计 10" (Total 10), page numbers (1, 2, 3, 4, 5), and arrows. Below the table, the text "执行时间消耗 0.002957 (s)" (Execution time consumption 0.002957 (s)) is displayed. At the very bottom right, there are two buttons: "保存为模板" (Save as template) and "导入图探索" (Import graph exploration).

1	nGQL	USE <space_name>
2		
3		15
4		
5	nGQL	
6	nGQL	
7	nGQL	;
8		//
9	nGQL	
10		
11	CSV	PNG
	nGQL	
	CSV	PNG
12	/	nGQL
13		nGQL
14		
15		

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## 17.4.5

NebulaGraph Explorer

nGQL

nGQL

NebulaGraph

Schema



1. +

**编辑模板**

\* 模板名称:  \* 图空间:

描述:

\* 查詢模版:

输入:

参数名称	示例	描述	操作
name	Tim Duncan	指定球员姓名	删除

test

basketballplayer

```
MATCH (v:player{name:"${name}"})--(v2:player)
RETURN v2.player.name AS Name;
```

nGQL  
{name}

+  
Tim Duncan

\$



Note

+

2.

- 
  - 
  - 
  - 
  - 
  - 
  - 
- 

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## 17.4.6

NebulaGraph Explorer

Explorer God Admin



用户列表 授权

+ 创建用户

请输入关键字搜索

账号	IP 白名单	操作
root		查看 修改密码
test11		查看 修改密码 剔除用户



root

1.

IP IP NebulaGraph IP , NebulaGraph



2.

1.

root

2.

root	Admin
------	-------

3.

**Note**

root

- 
- 
- root
- 
- 
- 
- 
- 
- 
- 

**Note**

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## 17.5

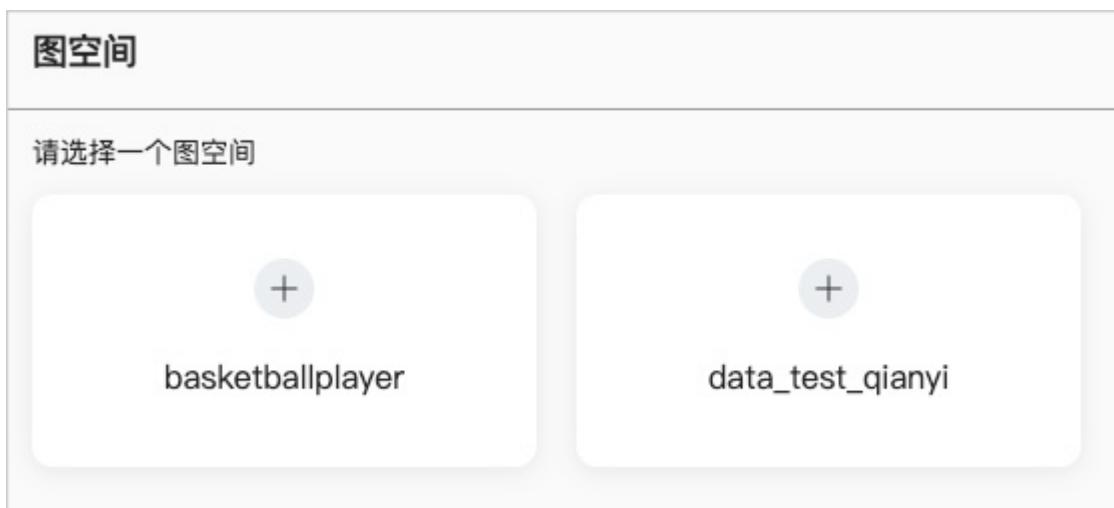
### 17.5.1

Explorer

Explorer

Explorer

Explorer



1.  
Explorer

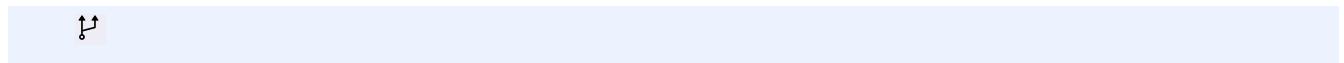


2.

Note

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## 17.5.2



3.0.0 NebulaGraph

Explorer 

- VID
- Tag
- 
- 

VID

ID VID

VID

 Note

VID

basketballplayer

Nebula Explorer **Explorer** Visual Query

basketballplayer  

2D 模式 3D 模式 鸟瞰:  | 出入度权重:  | 信息检测:   | 编辑:    



当前画板没有点数据, 请[快速开始 \(随机导入数据\)](#)

101%

TAG

Tag

Note

Tag

Tag

10      30      40

**Tag 查询**

2D 模式    3D 模式       

\* Tag:

结果数量限制:

\* 选择索引:

筛选条件

字段	运算符	值
age	>	30
<hr/> AND <hr/>		
age	!=	40

VID

VID

1

Note

VID VID Enter

VID Kings Suns 2 server like





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### 17.5.3

Tag

- **Tag**
  - Tag
  - Tag Tag
  - Tag Tag
  - Tag
  - Tag Tag Tag
  - Tag Tag
  - Tag

## 1 TAG PLAYER

1.

## 2. player

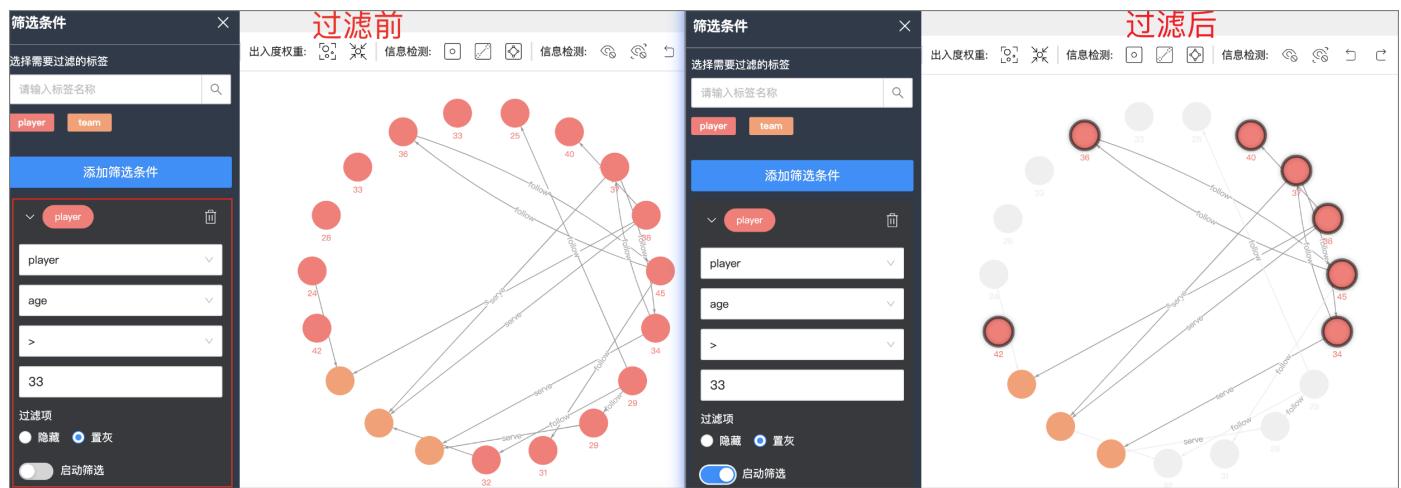
### 3. Tag team



33

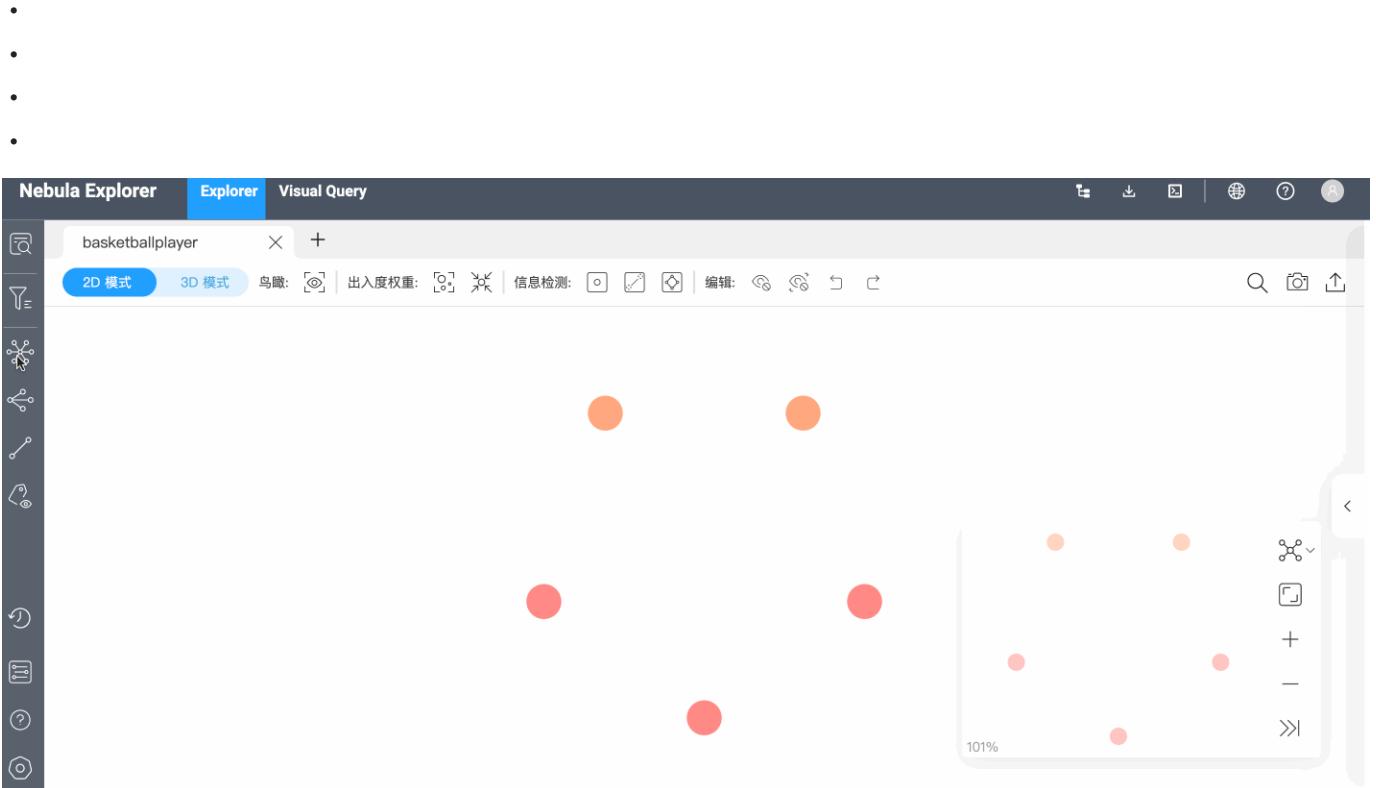
1.

2. player age > 33  
3.  
4.



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## 17.5.4



1.



Tag

2.

Shift

**Note**



Shift

1.



2. Shift



### Note

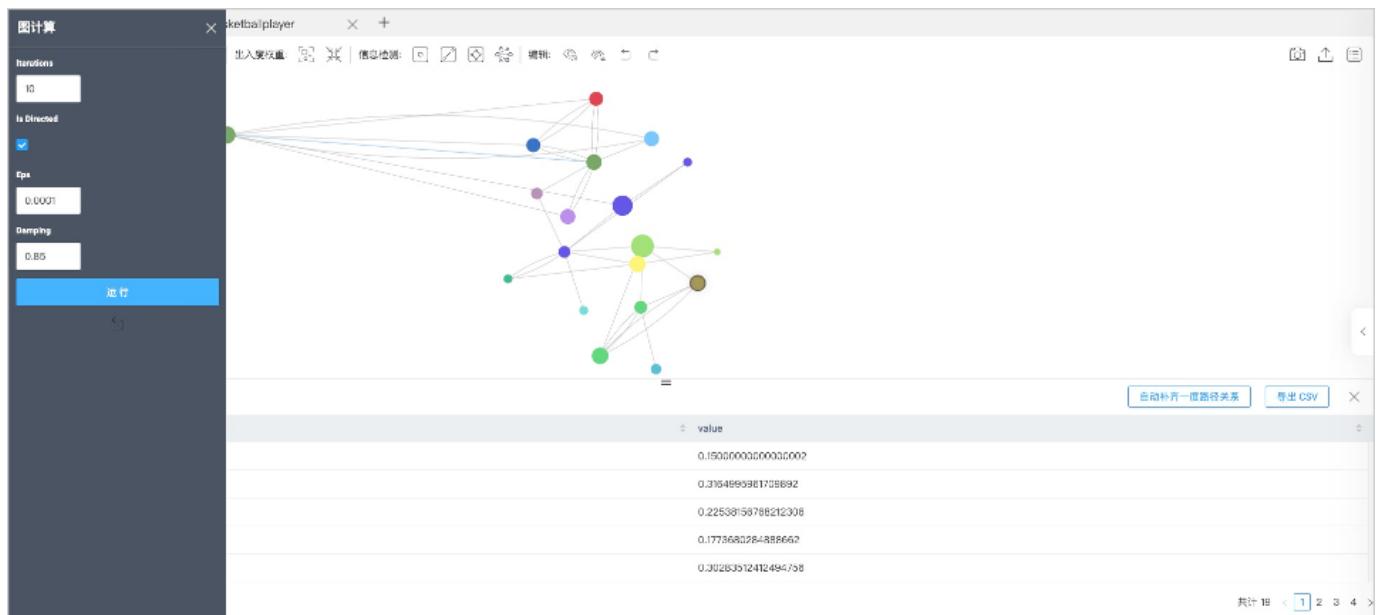
- 90% 90%
  - 100% 100%
- 

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## 17.5.5

**Note****Workflow**

1. 
- 2.
- 3.
- 4.
- 
- **CSV** **CSV**



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17.5.6

---

- 
- INT
- Edge type
- 
- 

1

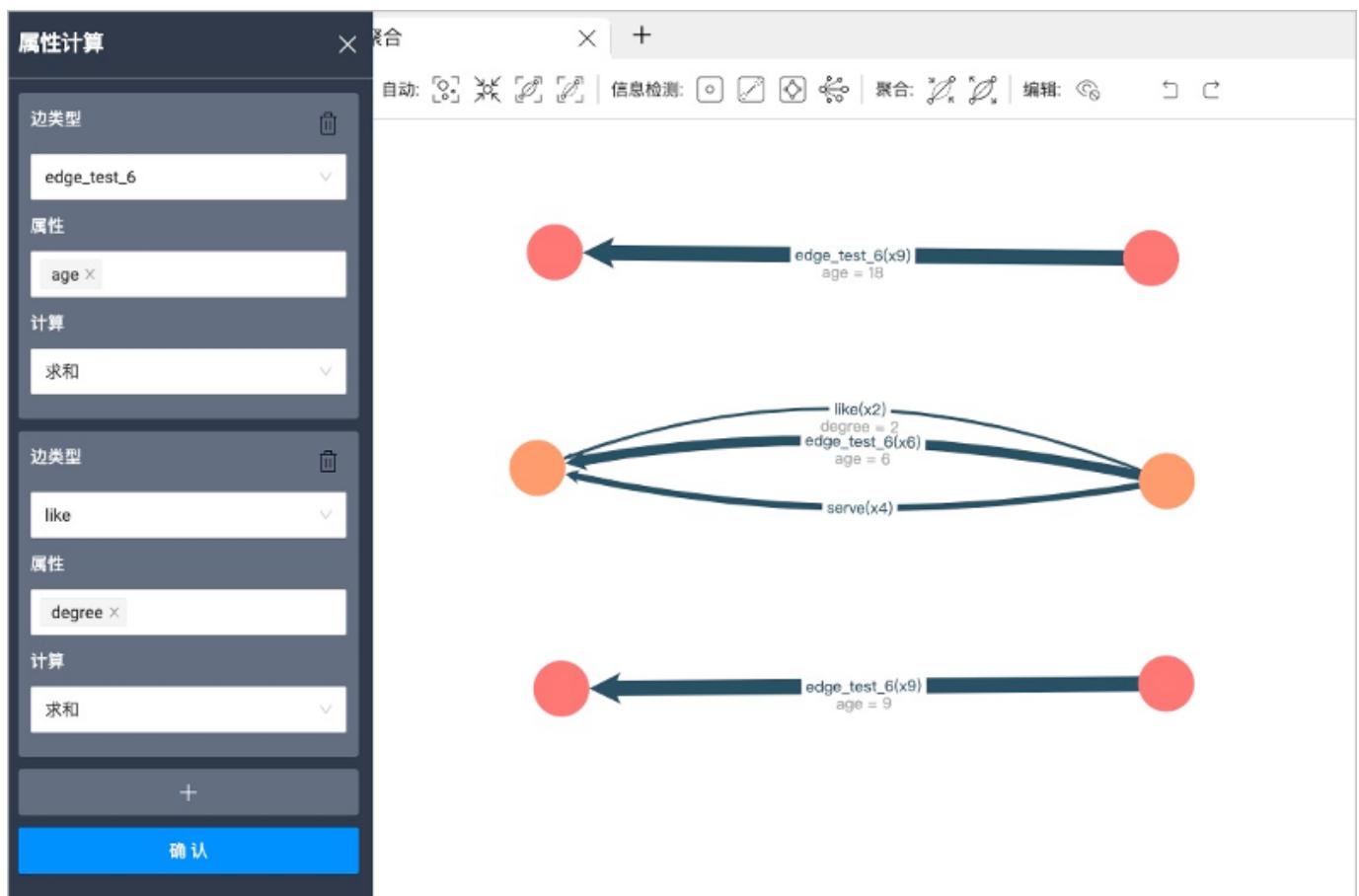
1.



2. +

3.

+ Edge type



2

- 1.
- 2.
- 3.

---

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## 17.6

### ↑ Compatibility

3.0.0 NebulaGraph

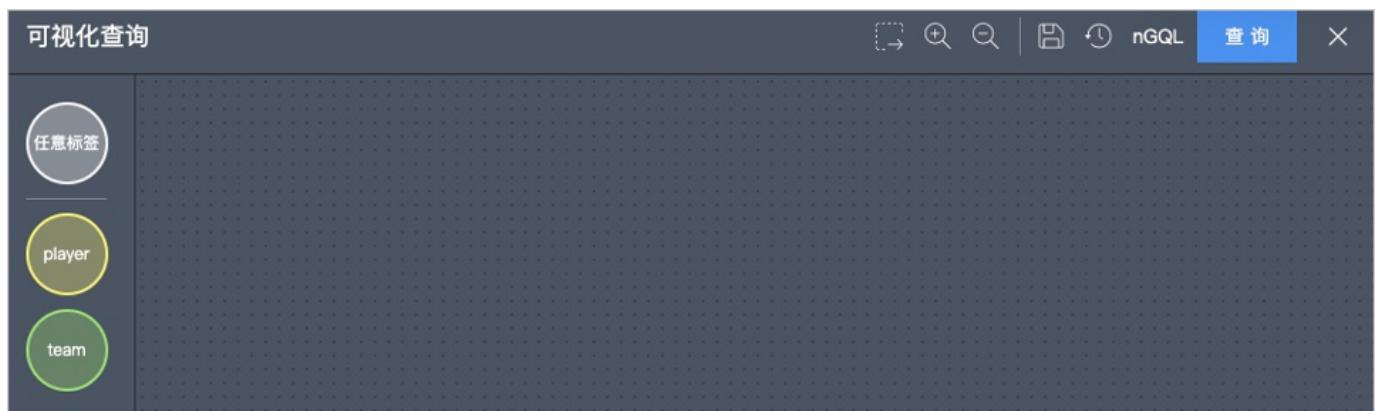
### Note

Explorer

### 17.6.1

- 
- MATCH

### 17.6.2



Explorer

**Visual Query**

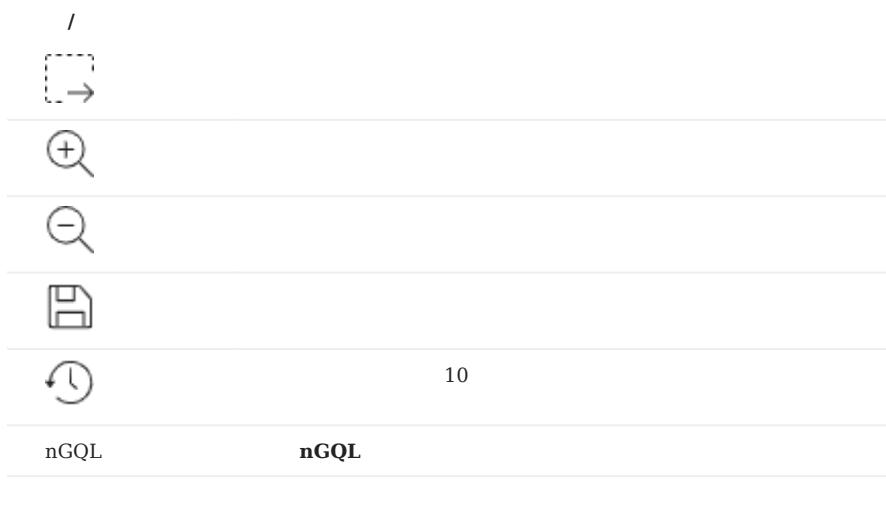
Tag ( player team)

Tag

### Note

Tag

Tag



## 17.6.3

1. Tag Tag
- 2.
- 3.

▼ 点

标签名

player × team ×

▼ 筛选条件 ② +

字段	运算符	值
player.age	==	30

• Tag

### Note

0 Tag

- 0 Tag Tag
- Tag Tag
- Tag Tag

### Note

Tag

4.



• Edge Type

### Note

Edge Type

- Edge Type Edge Type
- Edge Type Edge Type

### Note

Edge Type

5. ( )  RETURN
- 6.

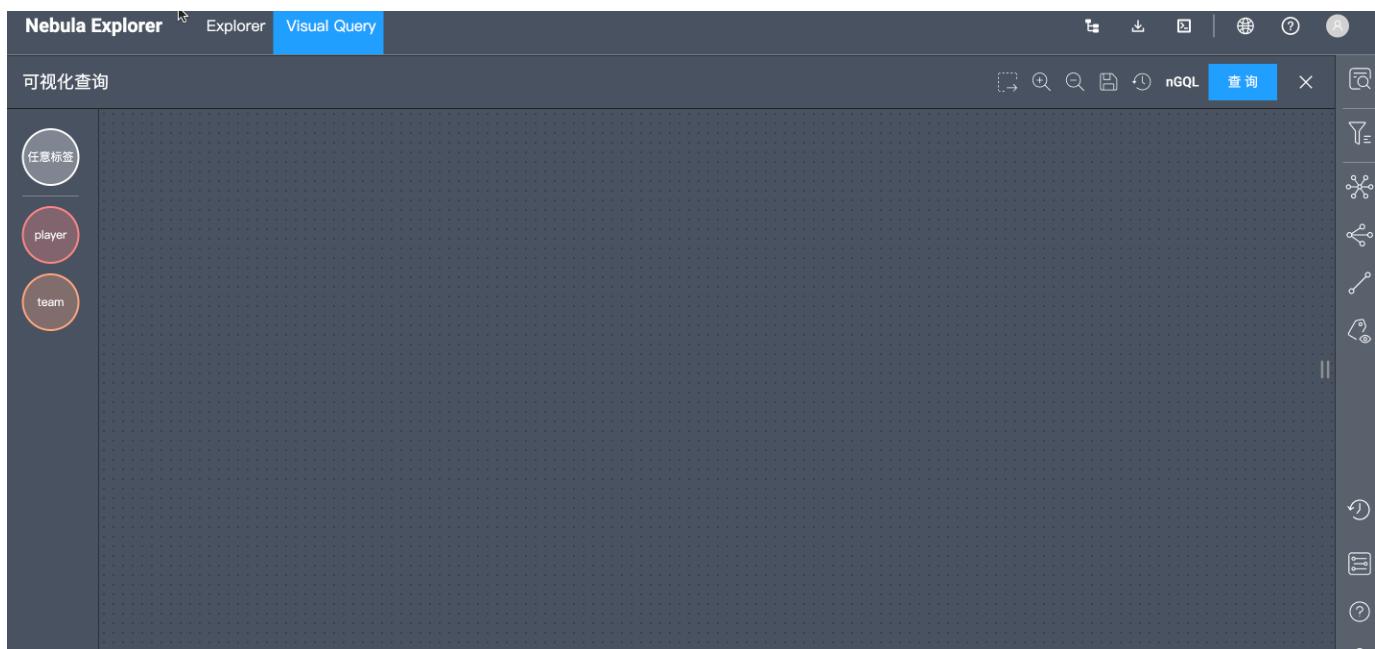
### 17.6.4

1

Yao Ming

35

6



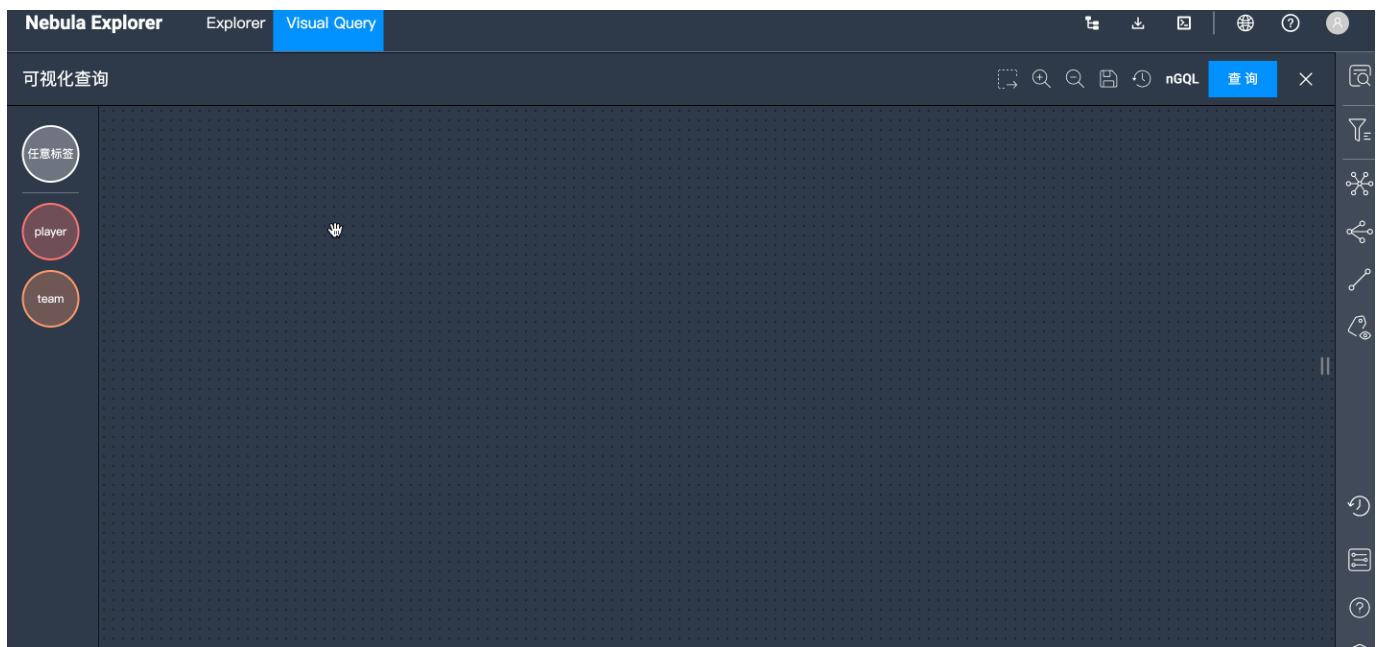
1. Tag            2. player    1. team
- 2.

  - a. player.name == Yao Ming
  - b. follow        1
  - c. player.age > 35
  - d. serve          1
  - e.  serve
  - f.                6

3.                6

2

30

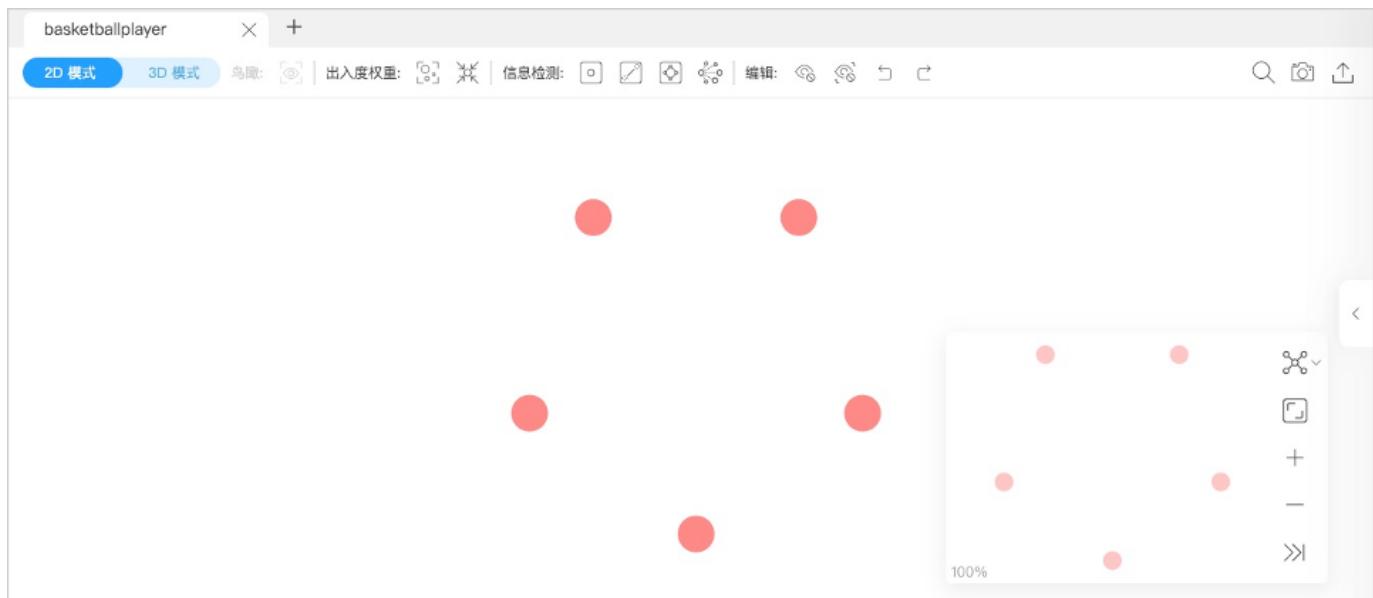


1. Tag 3 player 1 team
2.
  - a. follow 1
  - b. serve 1
  - c. serve 1
- d. player.age > 30
- e. serve 1
- f.  serve
- 3.

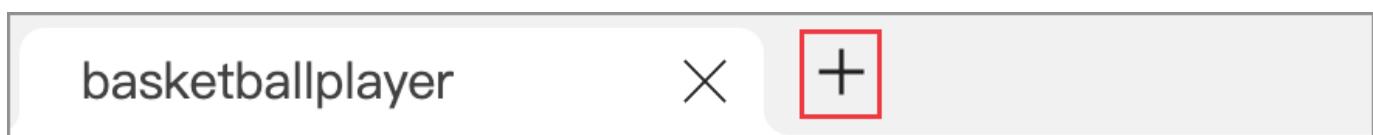
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## 17.7

### 17.7.1



+



2D    3D

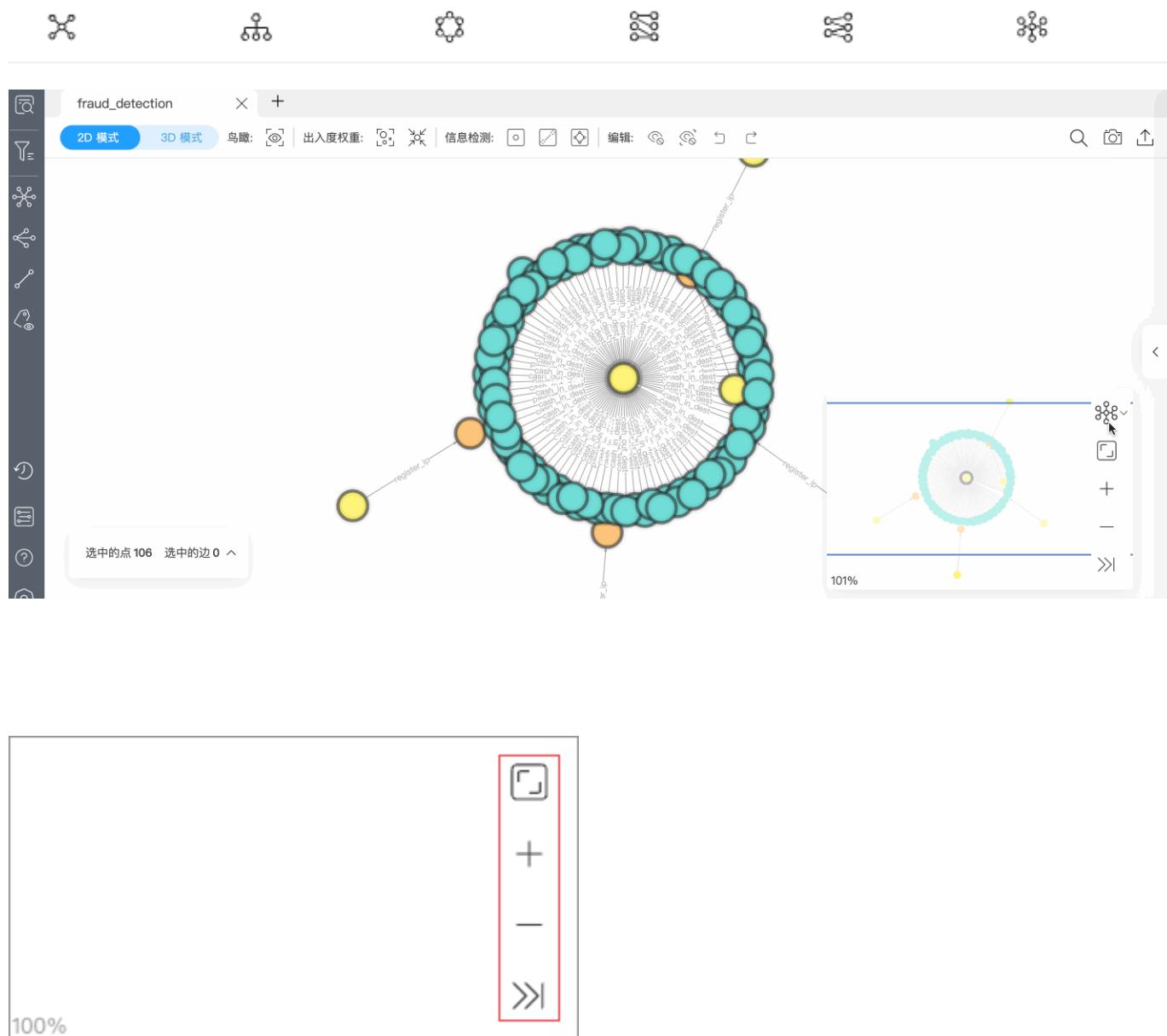
CSV

- [拍照](#)
- [CSV](#) CSV
- [PNG](#)

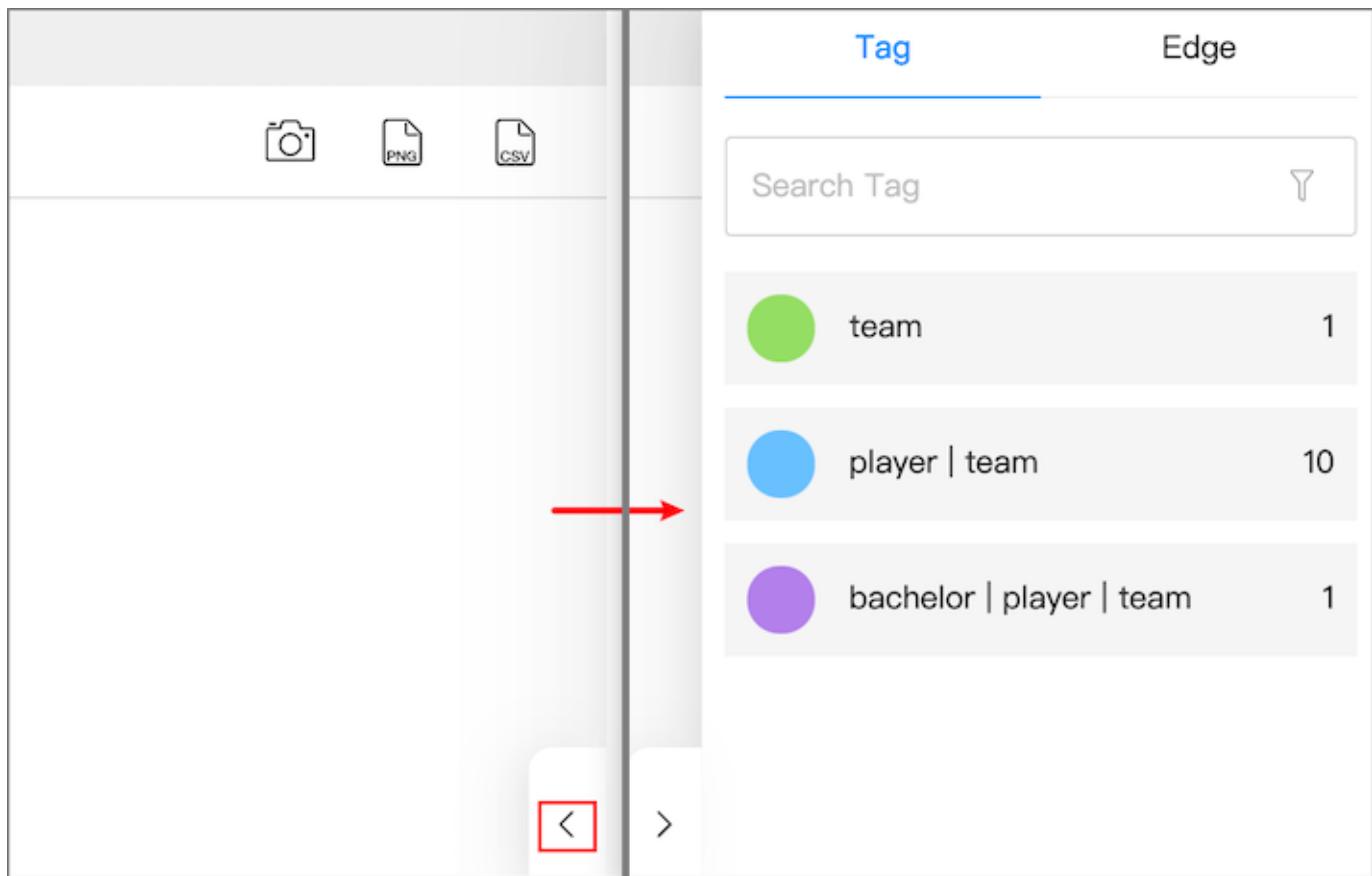


VID Tag

Explorer 6



&lt;



- Tag Edge type
- Tag Edge type Tag

Note

		player	5
--	---	--------	---

颜色 尺寸 图标 [图片](#)

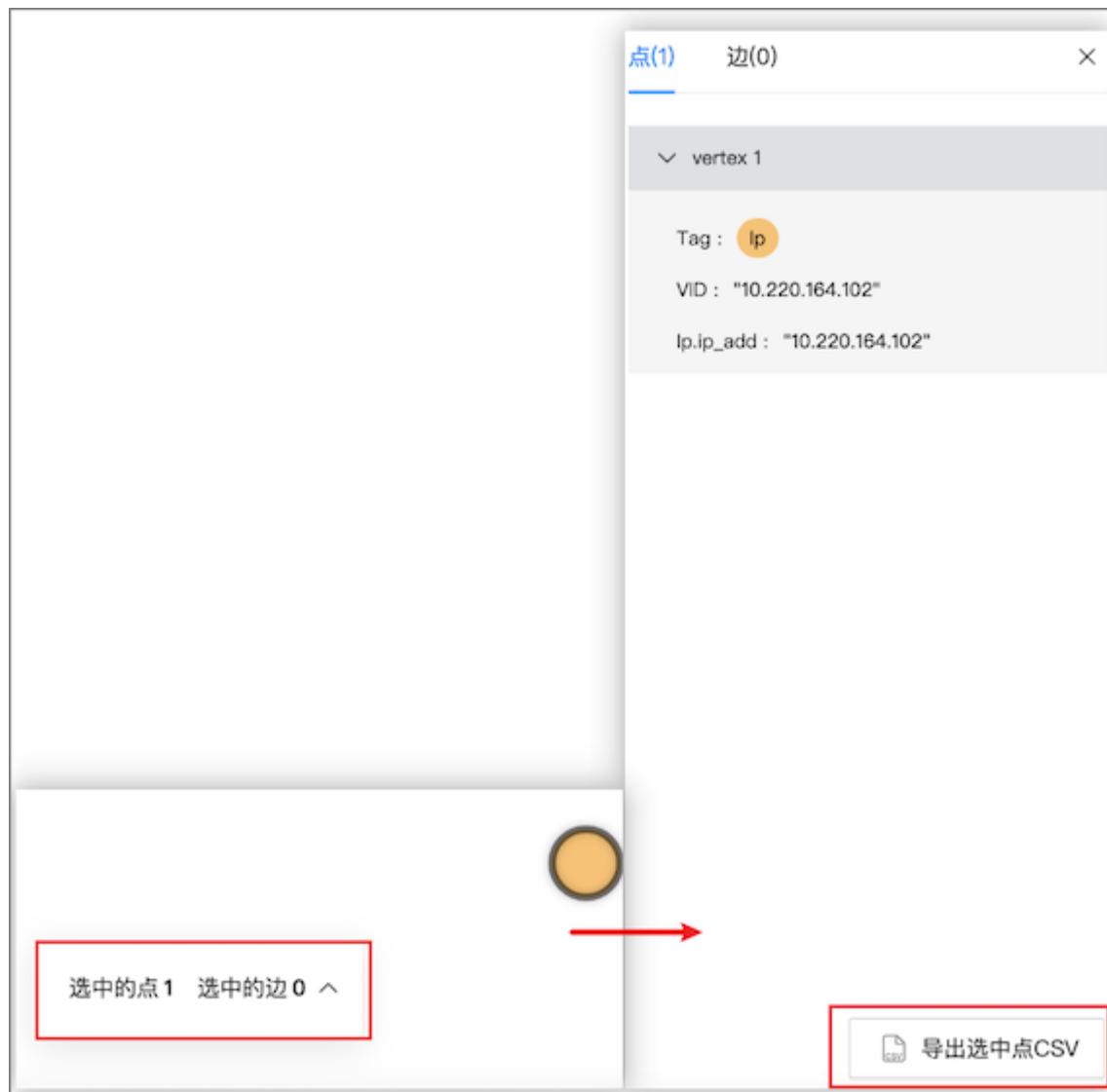
Please upload a picture with size less than 200px \* 200px

{number}

{number}

CSV



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## 17.7.2

Explorer    **2D**    **3D**

2D

3D

**Note**

3D

**2D**

2D



1

N

## Note

2D                  5000

2D

- 
- 
- 
- 

3D

2D 模式

3D 模式

鸟瞰:  ▾

画质: 普通

重新受力



3D

3D

2D

2D

20000    2000



3.0.0      NebulaGraph

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### 17.7.3

#### Explorer

1.



2.

3.



- 50
- 

Explorer



- A blue downward arrow icon.
- JSON A blue square with a white arrow pointing right and the word "JSON" next to it.
- A blue trash can icon.

JSON

JSON

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## 17.8

### 17.8.1

Nebula Explorer

Nebula Explorer      Component  
Workflow

Dag Controller



Task

Job

Explorer

Nebula Analytics

- 
- 
- 
- 

- Dag Controller    Nebula Analytics      [NebulaGraph Analytics](#)      [Explorer](#)

- 

- HDFS

- NebulaGraph    HDFS

- 

- HDFS    NebulaGraph

- NebulaGraph

- HDFS

## 17.8.2

NebulaGraph    HDFS    NebulaGraph Analytics

- 3.3.0        NebulaGraph Analytics        [NebulaGraph Analytics](#)
- Dag Controller        [Explorer](#)

1. Explorer

**Workflow**

2.

3.

**配置**

**Nebula Graph 配置**

Graphd	Graphd Timeout(ms)
192.168.8.131:9669	60000
Metad Timeout(ms)	Storage Timeout(ms)
60000	60000

**HDFS 配置**

+ 添加

hdfs1	X
hdfs://192.168.8.100:9000/t...	
root	
hdfs2	X
hdfs://192.168.8.101:9000/t...	
root	

**Nebula Analytics 节点配置**

+ 添加

192.168.8.131	X
192.168.8.132	X
192.168.8.133	X

**取消**      **确认**

NebulaGraph	Graph	Explorer	Graph				
HDFS	HDFS 192.168.8.100:9000/test	HDFS Analytics	fs.defaultFS HDFS	HDFS	HDFS	HDFS	hdfs://
NebulaGraph Analytics	NebulaGraph Analytics						

4.

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### 17.8.3

---

- NebulaGraph      HDFS      CSV
-

```
MATCH    MATCH (v1:player)--(v2)    RETURN id(v1), id(v2);      PageRank
```

1. Explorer
- 2.
3. ->**Query**

**Workflow**

query\_1

▼ 查询语言

basketballplayer

```
1 MATCH (v1:player)--(v2) RETURN id(v1), id(v2);
```

**解析参数**

▶ 输入

▼ 输出 [+ 添加参数](#)

output0: id(v1) [编辑](#) [X](#)

output1: id(v2) [编辑](#) [X](#)

▶ 结果

Query [编辑](#)

---

nGQL      nGQL

---

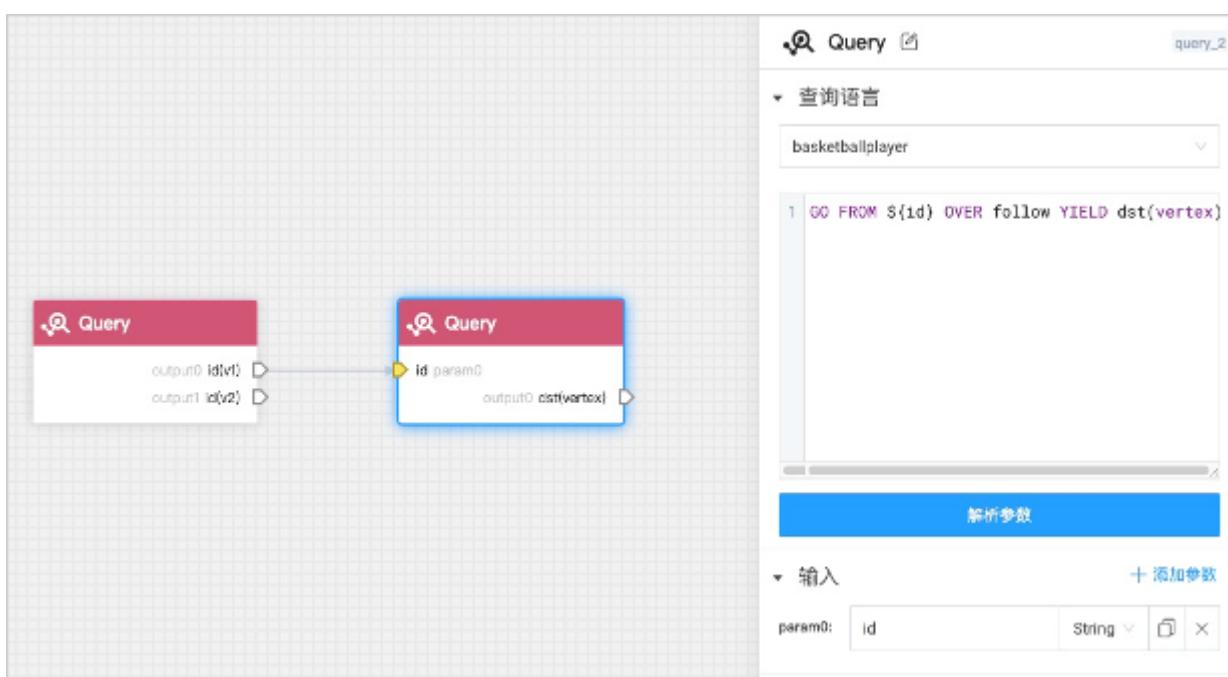
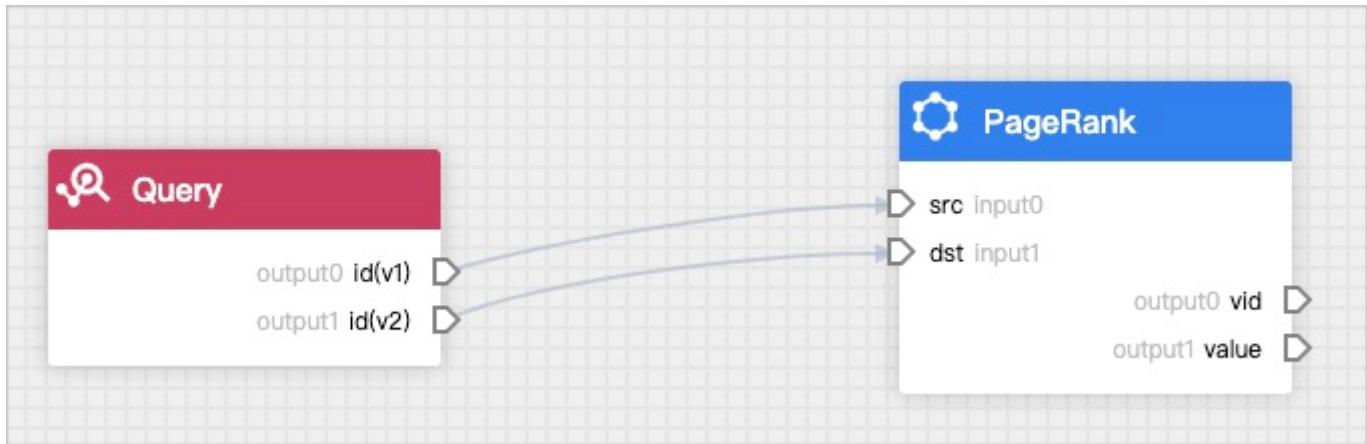
AS

---

HDFS

**Note**

4. ->**PageRank**      output0      input0      output1      input1



5.

### PageRank

输入

Nebula Graph	<b>Dependence</b>	HDFS
src:	Query.id(v1)	v
dst:	Query.id(v2)	v

参数配置

Iterations:	10
Is Directed:	<input checked="" type="checkbox"/>
Eps:	0.0001
Damping:	0.85

输出

执行配置

结果

PageRank		NebulaGraph	Dependence	HDFS	HDFS
		HDFS	NebulaGraph	ID	
		HDFS	HDFS	Tag	Tag
		NebulaGraph			
		HDFS			

6.



 Note

Backspace

---

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## 17.8.4

---

1. Explorer

### **Workflow**

2.

•

•

•

•

•



•

•



---

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## 17.8.5

---

1. Explorer                   **Workflow**

2.                           ID

•

•

•

•

• **Explorer**

CSV

•

•

---

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## 17.8.6 API

### API

API

```
api-open/v1/workflows/<workflow_id>/jobs
<workflow_id> ID
```

<code>workflow_id</code>	number	-	<code>4216617528</code>	ID
				ID

Headers

<code>Content-Type</code>	string	-	application/ json	
<code>explorer_token</code>	string	-	<code>eyJhbxxx</code>	Token

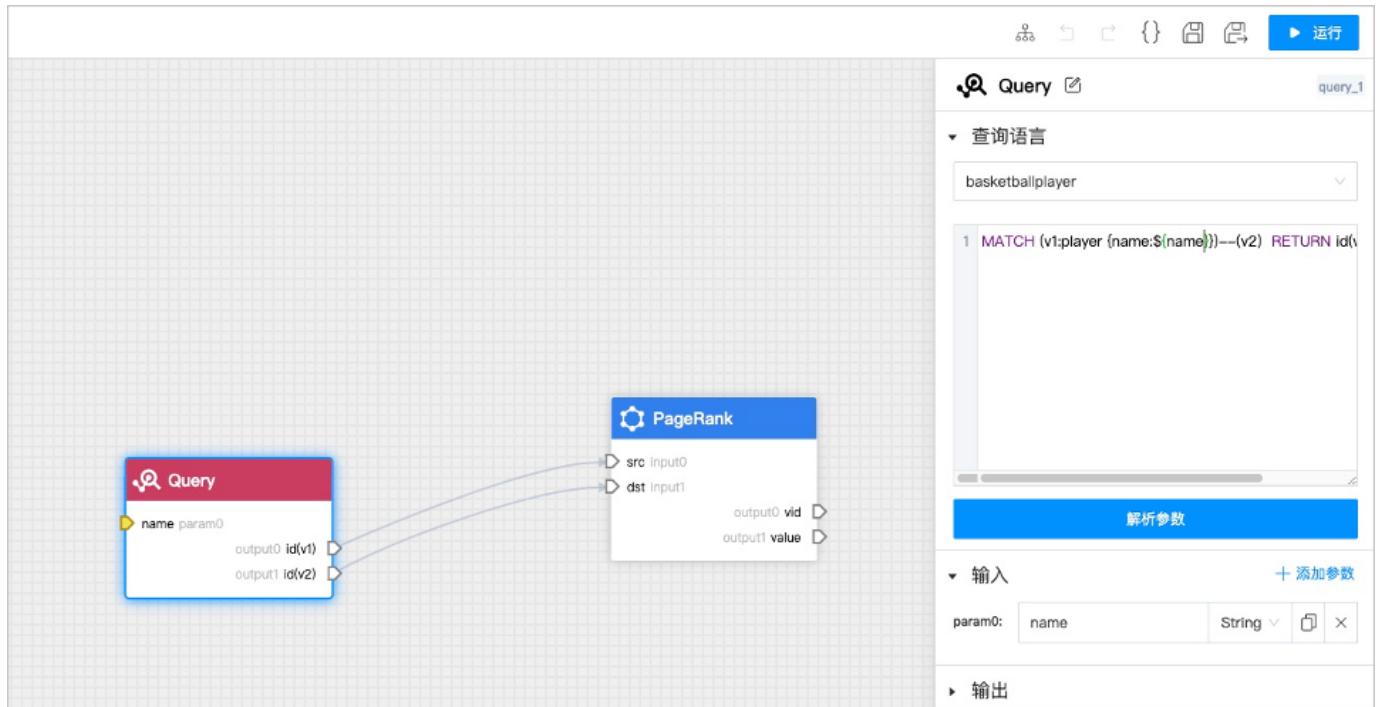
Token [API](#)

Body



<code>input</code>	object	-	-	
- <code>task_id</code>	object	-	<code>query_1</code>	ID
- <code>param_name:</code> <code>param_value</code>	string: {string number}	-	<code>param0:</code> <code>player100</code>	<code>param_name</code> <code>param_value</code>

nGQL name Tim Duncan



```
curl -i -X POST -H "Content-Type: application/json" -H "Cookie: explorer_token=eyJhb...x" -d '{"input":{"query_1":{"name":"Tim Duncan"}}}' http://192.168.8.145:7002/api-open/v1/workflows/4216617528/jobs
```

code	number	0	0	API
message	string	Success		
data	object	-		
- id	string	107	ID	

```
{
  "cookie": [],
  "Content-Type": "application/json",
  "Traceparent": "00-1ba128615cdc2226c921973a689e9f1b-7630b12963494672-00",
  "Date": "Fri, 15 Jul 2022 07:19:25 GMT",
  "Content-Length": "48"
}

{
  "code": 0,
  "data": {
    "id": 107
  },
  "message": "Success"
}
```

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## API

### API

api-open/v1/jobs

### Headers

Content-Type	string	-	application/json
explorer_token	string	-	eyJhbxxx Token Token <a href="#">API</a>

### Body

filter	object	-	-
- name	string	-	workflow_q745a_20220715092236
- status	number	-	2 <a href="#">API</a>
- fromCreateTime	number	-	1657848036000
- toCreateTime	number	-	1657848157000
-	string	desc	- desc
orderByCreateTime			asc
pageSize	number	10	-
page	number	1	-

### Note

jobs? Body filter URL { "status": 2, "orderByCreateTime": "asc"}

```
curl -i -X GET -H "Content-Type: application/json" -H "Cookie: explorer_token=eyJhbxxx" http://192.168.8.145:7002/api-open/v1/jobs?filter=%7B%20%22status%22%3A%202%2C%20%22orderByCreateTime%22%3A%20%22asc%22%7D&pageSize=10&page=1
```

code	number	0	0	API
message	string	Success		
data	object	-		
- total	number	2		
- Page	number	1		
- PageSize	number	10		
- items	object	-		
- id	number	105	ID	
- name	string	workflow_q745a_20220715090915		
- workflowId	string	4216617528	ID	
-	string	workflow_q745a		
workflowName				
- status	number	2	API	
-	number	1657847358000		
runBeginTime				
- runEndTime	number	1657847364000		
- createTime	number	1657847355906		

```
{
  "cookie": [],
  "Content-Type": "application/json",
  "Traceparent": "00-d3a1943f5baf46771e9afc629e0b5d40-920db2f06142f5ff-00",
  "Date": "Fri, 15 Jul 2022 06:17:21 GMT",
  "Content-Length": "512"
}

{
  "code": 0,
  "data": {
    "items": [
      {
        "id": 105,
        "name": "workflow_q745a_20220715090915",
        "workflowId": "4216617528",
        "workflowName": "workflow_q745a",
        "status": 2,
        "runBeginTime": 1657847358000,
        "runEndTime": 1657847364000,
        "createTime": 1657847355906
      },
      {
        "id": 106,
        "name": "workflow_q745a_20220715092236",
        "workflowId": "4216617528",
        "workflowName": "workflow_q745a",
        "status": 2,
        "runBeginTime": 1657848157000,
        "runEndTime": 1657848163000,
        "createTime": 1657848156290
      }
    ],
    "total": 2,
    "Page": 1,
    "PageSize": 10
  },
  "message": "Success"
}
```

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## API

## API

api-open/v1/workflows/&lt;workflow\_id&gt;/jobs

&lt;workflow\_id&gt; ID

workflow_id	number	-	4216617528	ID
-------------	--------	---	------------	----

## Headers

Content-Type	string	-	application/json	
explorer_token	string	-	eyJhbxxx	Token

Token API

## Body

filter	object	-	-	
- name	string	-	workflow_q745a_20220715092236	
- status	number	-	2	API
- fromCreateTime	number	-	1657848036000	
- toCreateTime	number	-	1657848157000	
-	string	desc	-	desc
orderByCreateTime				asc
pageSize	number	10	-	
page	number	1	-	

## Note

jobs? Body filter URL {"status": 2, "fromCreateTime": 1657874100000}

```
curl -i -X GET -H "Content-Type: application/json" -H "Cookie: explorer_token=eyJhbxxx" http://192.168.8.145:7002/api-open/v1/workflows/4216617528/jobs?filter=%7B%22status%22%3A%202%2C%20%20%22fromCreateTime%22%3A%201657874100000%7D&pageSize=10&page=1
```

code	number	0	0	API
message	string	Success		
data	object	-		
- total	number	2		
- Page	number	1		
- PageSize	number	10		
- items	object	-		
- id	number	105	ID	
- name	string	workflow_q745a_20220715090915		
- workflowId	string	4216617528	ID	
-	string	workflow_q745a		
workflowName				
- status	number	2	API	
-	number	1657847358000		
runBeginTime				
- runEndTime	number	1657847364000		
- createTime	number	1657847355906		

```
{
  "cookie": [],
  "Content-Type": "application/json",
  "Traceparent": "00-008c3056686dd3f3be38b8eda42a917e-b5616e30434cb803-00",
  "Date": "Fri, 15 Jul 2022 08:44:06 GMT",
  "Content-Length": "297"
}
{
  "code": 0,
  "data": {
    "items": [
      {
        "id": 115,
        "name": "workflow_q745a_20220715163650",
        "workflowId": "4216617528",
        "workflowName": "workflow_q745a",
        "status": 2,
        "runBeginTime": 1657874212000,
        "runEndTime": 1657874218000,
        "createTime": 1657874210088
      }
    ],
    "total": 1,
    "Page": 1,
    "PageSize": 10
  },
  "message": "Success"
}
```

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## API

## API

```
api-open/v1/jobs/<job_id>
```

<job\_id> ID

job_id	number	-	1964	ID	API
--------	--------	---	------	----	-----

## Headers

Content-Type	string	-	application/ json		
explorer_token	string	-	eyJhbxxx	Token	API

## Body

```
curl -i -X GET -H "Content-Type: application/json" -H "Cookie: "explorer_token=eyJhbxxx"" http://192.168.8.145:7002/api-open/v1/jobs/1964
```

code	number	0	0	API
message	string	Success		
data	object	-		
- id	number	1964	ID	
- name	string	workflow_xkkjf_20220712103332		
- workflowId	string	3992429968	ID	
- workflowName	string	workflow_xkkjf		
- status	number	2		API
- tasks	object	-		
- id	string	f93dea90fc3a11ecac7e6da0662c195b	ID	
- name	string	BFS		
-	datetime	2022-07-12T10:33:35+08:00		
runBeginTime				
- runEndTime	datetime	2022-07-12T10:33:38+08:00		
- status	number	2		API

```
{
  "cookie": [],
  "Content-Type": "application/json",
  "Traceparent": "00-3db17c9fd9e0a4c3824973471523d214-4384705e523dce83-00",
  "Date": "Fri, 15 Jul 2022 09:08:20 GMT",
  "Content-Length": "400"
}
{
  "code": 0,
  "data": {
    "id": 1964,
    "name": "workflow_xkkjf_20220712103332",
    "workflowId": "3992429968",
    "workflowName": "workflow_xkkjf",
    "status": 2,
    "tasks": [
      {
        "id": "f93dea90fc3a11ecac7e6da0662c195b",
        "name": "BFS",
        "runBeginTime": "2022-07-12T10:33:35+08:00",
        "runEndTime": "2022-07-12T10:33:38+08:00",
        "status": 2
      }
    ],
    "runBeginTime": 1657593215000,
    "runEndTime": 1657593218000,
    "createTime": 1657593212505
  },
  "message": "Success"
}
```

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## API

## API

```
api-open/v1/jobs/<job_id>/cancel
```

<job\_id> ID

job_id	number	-	1964	ID	API
--------	--------	---	------	----	-----

## Headers

Content-Type	string	-	application/x-www-form-urlencoded		
explorer_token	string	-	eyJhbxxx	Token	<a href="#">API</a>

## Body

```
curl -i -X PUT -H "Content-Type: application/x-www-form-urlencoded" -H "Cookie: \"explorer_token=eyJhbxxx\"" http://192.168.8.145:7002/api-open/v1/jobs/30600/cancel
```

code	number	0	0	<a href="#">API</a>
message	string	Success		
data	object	-		
- success	bool	true		

```
{
  "cookie": [],
  "Content-Type": "application/json",
  "Traceparent": "00-8b4b47413a211d9b5e0839aadcc712052-4a98bae37fe5948a-00",
  "Date": "Mon, 18 Jul 2022 01:45:08 GMT",
  "Content-Length": "54"
}
{
  "code": 0,
  "data": {
    "success": true
  },
  "message": "Success"
}
```

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## API

### API

```
api-open/v1/jobs/<job_id>/tasks/<task_id>/sample_result
```

- <job\_id> ID
- <task\_id> ID

job_id	number	-	29987	ID	API
task_id	number	-	8c171f70fb6f11ecac7e6da0662c195b	ID	API

### Headers

Content-Type	string	-	application/x-www-form-urlencoded		
explorer_token	string	-	eyJhbxxx	Token	API

### Body

limit	number	10	-		
-------	--------	----	---	--	--

```
curl -i -X GET -H "Content-Type: application/x-www-form-urlencoded" -H "Cookie: "explorer_token=eyJhbxxx"" http://192.168.8.145:7002/api-open/v1/jobs/29987/tasks/8c171f70fb6f11ecac7e6da0662c195b/sample_result?limit=1000
```

code	number	0	0	API
message	string	Success		
data	object	-		
- items	list	-		
- result	string	"player110","0.150000"	2 3	

```
{
  "cookie": [],
  "Content-Type": "application/json",
  "Traceparent": "00-14047b04b6810be06be22e010f500506-4c310a844b824a7f-00",
  "Date": "Fri, 15 Jul 2022 09:36:56 GMT",
  "Content-Length": "2014"
}
```

```
{  
    "code": 0,  
    "data": {  
        "items": [  
            [ "player110",  
              "0.150000"  
            ],  
            [ "team219",  
              "0.452126"  
            ],  
            ....  
            [ "player121",  
              "0.262148"  
            ]  
        },  
        "message": "Success"  
    }  
}
```

---

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## 17.9

---

NebulaGraph Explorer      iframe

### 17.9.1

Explorer

### 17.9.2

- Explorer
- 

### 17.9.3

1. Explorer      config/app-config.yaml

```
#   CertFile  KeyFile
CertFile: "./config/NebulaGraphExplorer.crt"
KeyFile: "./config/NebulaGraphExplorer.key"

#   IframeMode.Enable  true
IframeMode:
  Enable: true
#   URI
# Origins:
# - "http://192.168.8.8"
```

2. config      openssl

```
openssl req -newkey rsa:4096 -x509 -sha512 -days 365 -nodes -subj "/CN=NebulaGraphExplorer.com" -out NebulaGraphExplorer.crt -keyout NebulaGraphExplorer.key
```

- -newkey
- -x509
- -sha512
- -days -x509
- -nodes
- -subj
- -out
- -keyout

3.      iframe      Explorer

4. postMessage

```
{ type: 'NebulaGraphExploreLogin',
  data: {
    authorization: 'WyJyb290IiwibmVidWxhIl0=',
    host: '192.168.8.240:9669',
    space: 'basketballplayer'
  }
}
```

- type      NebulaGraphExploreLogin
- data
- authorization      NebulaGraph      Base64      [ ' ', ' ' ]      [ 'root', 'nebula' ]      WyJyb290IiwibmVidWxhIl0=
- host      NebulaGraph      Graph
- space

5. Explorer

**Note**RPM/DEB    Explorer    `sudo ./nebula-explorer-server &``./scripts/start.sh`

6.

Explorer

basketballplayer



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## 17.10

---

Explorer

### 17.10.1

---

Shift

Shift

### 17.10.2

---

Enter

Shift + '.'

Shift + '+'

Shift + 'l'

Ctrl/Cmd + 'z'

Ctrl/Cmd + Shift + 'z'

Ctrl/Cmd + 'a'

+ 'del'

+ Shift + 'del'

---

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## 17.11 FAQ

---

Explorer

### 17.11.1 Graph

#### Dag Controller

Dag Controller

NebulaGraph Analytics

HDFS

NebulaGraph

### 17.11.2

---

### 17.11.3

---

Dag Controller

Graph

Graph

NebulaGraph Analytics

### 17.11.4 HDFS

running

HDFS

```
<configuration>
<property>
  <name>ipc.client.connect.timeout</name>
  <value>3000</value>
</property>

<property>
  <name>ipc.client.connect.max.retries.on.timeouts</name>
  <value>3</value>
</property>
</configuration>
```

### 17.11.5 Err:dial unix: missing address

---

dag-ctrl/etc/dag-ctrl-api.yaml      SSH    UserName

### 17.11.6 bash: /home/xxx/nebula-analytics/scripts/run\_algo.sh: No such file or directory

---

dag-ctrl/etc/tasks.yaml      exec\_file

### 17.11.7 /lib64/libm.so.6: version 'GLIBC\_2.29' not found (required by /home/vesoft/jdk-18.0.1/jre/lib/amd64/server/libjvm.so)

---

JDK18      YUM      GLIBC\_2.29      JDK1.8      nebula-analytics/scripts/set\_env.sh      JDK

### 17.11.8 handshake failed: ssh: unable to authenticate, attempted methods [none publickey], no supported methods remain

---

.ssh      .ssh/authorized\_keys      .ssh      744      .ssh/authorized\_keys      600

17.11.9

There are 0 NebulaGraph Analytics available. clusterSize should be less than or equal to it

17.11.9

There are 0 NebulaGraph Analytics available. clusterSize should be less than or equal to it

1. SSH

Dag Controller

ssh <user\_name>@<node\_ip>



Dag Controller Analytics

2. Dag Controller

- etc/dag-ctrl-api.yaml SSH Dag Controller SSH
- etc/tasks.yaml
- scripts/set\_env.sh Hadoop Java

3. Dag Controller

17.11.10

no available namenodes: dial tcp xx.xx.xx.xx:8020: connect: connection timed out

HDFS namenode 8020

17.11.11

org.apache.hadoop.net.ConnectTimeoutException: 60000 millis timeout

HDFS datanode 50010

- Check failed: false close hdfs-file failed
- org.apache.hadoop.ipc.RemoteException(java.io.IOException): File /analytics/xx/tasks/analytics\_xxx/xxx.csv could only be replicated to 0 nodes instead of minReplication

17.11.12

broadcast.hpp:193] Check failed: (size\_t)recv\_bytes >= sizeof(chunk\_tail\_t) recv message too small: 0

clusterSize processes

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# 18. NebulaGraph Importer

## 18.1 NebulaGraph Importer

NebulaGraph Importer    Importer    **NebulaGraph**    CSV    Importer    CSV    NebulaGraph

### 18.1.1

Importer    CSV    NebulaGraph

### 18.1.2

- 
- CSV

### 18.1.3

[Release notes](#)

### 18.1.4

NebulaGraph Importer

- NebulaGraph
- [Docker Compose](#)
- [RPM/DEB](#)
- 
- NebulaGraph    Schema    Tag    Edge type    `clientSettings.postStart.commands`
- Importer    Golang    [Golang](#)

### 18.1.5

yaml              CSV              NebulaGraph

#### 1. [Release](#)

2.

```
$ ./<binary_package_name> --config <yaml_config_file_path>
```

1.

```
$ git clone -b release-3.1 https://github.com/vesoft-inc/nebula-importer.git
```

### Note

NebulaGraph 2.x 3.x rpc

2. nebula-importer

```
$ cd nebula-importer
```

3.

```
$ make build
```

4.

```
$ ./nebula-importer --config <yaml_config_file_path>
```

### Note

yaml

1.

```
$ git clone -b release-3.1 https://github.com/vesoft-inc/nebula-importer.git
```

2.

```
$ cd nebula-importer
$ go mod vendor
$ cd .. && tar -zcvf nebula-importer.tar.gz nebula-importer
```

3.

4.

```
$ tar -zxf nebula-importer.tar.gz
$ cd nebula-importer
$ go build -mod vendor cmd/importer.go
```

## Docker

Docker

Go

NebulaGraph Importer

CSV

```
$ docker run --rm -ti \
--network=host \
-v <config_file>:<config_file> \
-v <csv_data_dir>:<csv_data_dir> \
vesoft/nebula-importer:<version>
--config <config_file>
```

- <config\_file> yaml
- <csv\_data\_dir> CSV
- <version> NebulaGraph 3.x v3

### Note

Docker

## 18.1.6

NebulaGraph Importer nebula-importer/examples/v2/example.yaml

NebulaGraph

/



```
version: v2
description: example
removeTempFiles: false
```

version	v2
description	example
removeTempFiles	false

NebulaGraph

```
clientSettings:
  retry: 3
  concurrency: 10
  channelBufferSize: 128
  space: test
  connection:
    user: user
    password: password
    address: 192.168.11.13:9669,192.168.11.14:9669
    # # local_config false           UPDATE CONFIGS
    # postStart:
    #   commands: |
    #     UPDATE CONFIGS storage:wal_ttl=3600;
    #     UPDATE CONFIGS storage:rocksdb_column_family_options = { disable_auto_compactions = true };
    #   afterPeriod: 8s
    # preStop:
    #   commands: |
```

```
#     UPDATE CONFIGS storage:wal_ttl=86400;
#     UPDATE CONFIGS storage:rocksdb_column_family_options = { disable_auto_compactions = false };
```

clientSettings.retry	3	nGQL
clientSettings.concurrency	10	NebulaGraph
clientSettings.channelBufferSize	128	NebulaGraph
clientSettings.space	-	NebulaGraph
clientSettings.connection.user	-	NebulaGraph
clientSettings.connection.password	-	NebulaGraph
clientSettings.connection.address	-	Graph
clientSettings.postStart.commands	-	NebulaGraph
clientSettings.postStart.afterPeriod	-	commands
clientSettings.preStop.commands	-	NebulaGraph

## Schema

```
workingDir: ./data/
logPath: ./err/test.log
files:
  - path: ./student.csv
    failDataPath: ./err/student.csv
    batchSize: 128
    limit: 10
    inorder: false
    type: csv
    csv:
      withHeader: false
      withLabel: false
      delimiter: ","
```

workingDir	-	path	failDataPath
		./data/student.csv	./data/err/student.csv
logPath	-		
files.path	-		*
files.failDataPath	-		
files.batchSize	128		
files.limit	-		
files.inOrder	-	false	
files.type	-		
files.csv.withHeader	false	CSV	
files.csv.withLabel	false	LABEL	
files.csv.delimiter	","	CSV	

## SCHEMA

Schema      Meta      Schema

```

schema:
  type: vertex
  vertex:
    vid:
      index: 1
      function: hash
      prefix: abc
    tags:
      - name: student
        props:
          - name: age
            type: int
            index: 2
          - name: name
            type: string
            index: 1
          - name: gender
            type: string
  
```

files.schema.type	-	Schema	vertex	edge
files.schema.vertex.vid.index	-	ID	CSV	
files.schema.vertex.vid.function	-	VID	hash	
files.schema.vertex.vid.type	-	ID	int   string	
files.schema.vertex.vid.prefix	-	vid	function , VID	prefix , function VID
files.schema.vertex.tags.name	-	Tag		
files.schema.vertex.tags.props.name	-	Tag	NebulaGraph	Tag
files.schema.vertex.tags.props.type	-		bool   int   float   double   string   time   timestamp   date   datetime geography(linestring)   geography(polygon)	
files.schema.vertex.tags.props.index	-	CSV		

## Note

CSV      0      0      1

```

schema:
  type: edge
  edge:
    name: follow
    srcVID:
      index: 0
      function: hash
    dstVID:
      index: 1
      function:
    rank:
      index: 2
    props:
      - name: grade
  
```

```
type: int
index: 3
```

		Schema	vertex	edge
files.schema.type	-	Edge type		
files.schema.edge.name	-	ID	CSV	
files.schema.edge.srcVID.index	-	VID		hash
files.schema.edge.srcVID.function	-	ID	CSV	
files.schema.edge.dstVID.index	-	VID		hash
files.schema.edge.dstVID.function	-	rank	CSV	
files.schema.edge.rank.index	-	Edge type	NebulaGraph	Edge type
files.schema.edge.props.name	-	bool	int	float double timestamp string
files.schema.edge.props.type	-	geo		
files.schema.edge.props.index	-	CSV		

## 18.1.7 CSV header

Importer CSV

- 
- 

## 18.1.8

- [—NebulaGraph Importer](#) 3 09

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## 18.2

header CSV      withHeader true CSV



CSV      header Importer      header      Schema      yaml

### 18.2.1

CSV

•

`student_with_header.csv`

```
:VID(string),student.name:string,student.age:int,student.gender:string
student100,Monica,16,female
student101,Mike,18,male
student102,Jane,17,female
```

ID      name    age    gender

•

`follow_with_header.csv`

```
:SRC_VID(string),:DST_VID(string),:RANK,follow.degree:double
student100,student101,0,92.5
student101,student100,1,85.6
student101,student102,2,93.2
student100,student102,1,96.2
```

ID      ID      rank      degree

### 18.2.2

rank

- :VID      ID      :VID(type)      :VID(string)    :VID(int)
- :SRC\_VID      ID      :SRC\_VID(type)
- :DST\_VID      ID      :DST\_VID(type)
- :RANK      rank
- :IGNORE
- :LABEL      +      -

```
:LABEL,
+,
```



:LABEL      CSV      header

Tag Edge type <tag\_name/edge\_name>.<prop\_name>:<prop\_type>

- <tag\_name/edge\_name> Tag Edge type
- <prop\_name>
- <prop\_type> bool int float double timestamp string string

student.name:string follow.degree:double

### 18.2.3

```
#     NebulaGraph      3.x      v3
version: v3

description: example

#
removeTempFiles: false

clientSettings:

# nGQL
retry: 3

# NebulaGraph
concurrency: 10

#     NebulaGraph
channelBufferSize: 128

#             NebulaGraph
space: student

#
connection:
  user: root
  password: nebula
  address: 192.168.11.13:9669

postStart:
  #     NebulaGraph
  commands: |
    DROP SPACE IF EXISTS student;
    CREATE SPACE IF NOT EXISTS student(partition_num=5, replica_factor=1, vid_type=FIXED_STRING(20));
    USE student;
    CREATE TAG student(name string, age int, gender string);
    CREATE EDGE follow(degree int);

  #
  afterPeriod: 15s

preStop:
  #     NebulaGraph
  commands: |

#
logPath: ./err/test.log

# CSV
files:

  #
  - path: ./student_with_header.csv

  #
  failDataPath: ./err/studenterr.csv

  #
batchSize: 10

  #
  limit: 10

  #
  inOrder: true

  #             CSV
  type: csv

csv:
  #
  withHeader: true

  #
  withLabel: false

  #
  CSV
```

```
delimiter: ","

schema:
  # Schema      vertex   edge
  type: vertex

#
- path: ./follow_with_header.csv
  failDataPath: ./err/followerr.csv
  batchSize: 10
  limit: 10
  inOrder: true
  type: csv
  csv:
    withHeader: true
    withLabel: false
  schema:
    # Schema      edge
    type: edge
  edge:
    # Edge type
    name: follow

  #
  # rank
  withRanking: true
```

### Note

ID      clientSettings.postStart.commands

---

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## 18.3

---

header CSV      withHeader false CSV

### 18.3.1

CSV

•

`student_without_header.csv`

```
student100,Monica,16,female
student101,Mike,18,male
student102,Jane,17,female
```

ID	name	age	gender
----	------	-----	--------

•

`follow_without_header.csv`

```
student100,student101,0,92.5
student101,student100,1,85.6
student101,student102,2,93.2
student100,student102,1,96.2
```

ID	ID	rank	degree
----	----	------	--------

### 18.3.2

```
#     NebulaGraph      3.x      v3
version: v3

description: example

#
removeTempFiles: false

clientSettings:

# nGQL
retry: 3

# NebulaGraph
concurrency: 10

#     NebulaGraph
channelBufferSize: 128

#     NebulaGraph
space: student

#
connection:
  user: root
  password: nebula
  address: 192.168.11.13:9669

postStart:
  #     NebulaGraph
  commands: |
    DROP SPACE IF EXISTS student;
    CREATE SPACE IF NOT EXISTS student(partition_num=5, replica_factor=1, vid_type=FIXED_STRING(20));
    USE student;
    CREATE TAG student(name string, age int, gender string);
    CREATE EDGE follow(degree int);

#
afterPeriod: 15s

preStop:
  #     NebulaGraph
  commands: |

#
logPath: ./err/test.log
```

```

# CSV
files:
  #
  - path: ./student_without_header.csv

  #
  failDataPath: ./err/studentterr.csv

  #
  batchSize: 10

  #
  limit: 10

  #
  inOrder: false
  type: csv

  csv:
    #
    withHeader: false

    #
    withLabel: false

    #
    delimiter: ","

schema:
  # Schema      vertex   edge
  type: vertex

vertex:
  #
  ID
  vid:
    # ID      CSV      CSV      0
    index: 0

    # ID      int     string   NebulaGraph   INT64   FIXED_STRING
    type: string

  # Tag
  tags:
    # Tag
    - name: student

    # Tag
    props:
      #
      - name: name

      #
      type: string

      #
      CSV
      index: 1

      - name: age
      type: int
      index: 2
      - name: gender
      type: string
      index: 3

  #
  - path: ./follow_without_header.csv
  failDataPath: ./err/followerr.csv
  batchSize: 10
  limit: 10
  inOrder: true
  type: csv
  csv:
    withHeader: false
    withLabel: false
  schema:
    # Schema      edge
    type: edge
  edge:
    # Edge type
    name: follow

    #
    rank
    withRanking: true

    #
    ID
    srcVID:
      #
      type: string

```

```

#      ID      CSV
index: 0

#      ID
dstVID:
  type: string
index: 1

# rank
rank:
  # rank      CSV           index      rank
  index: 2

# Edge type
props:
  #
  - name: degree

  #
  type: double

#      CSV
index: 3

```

### Note

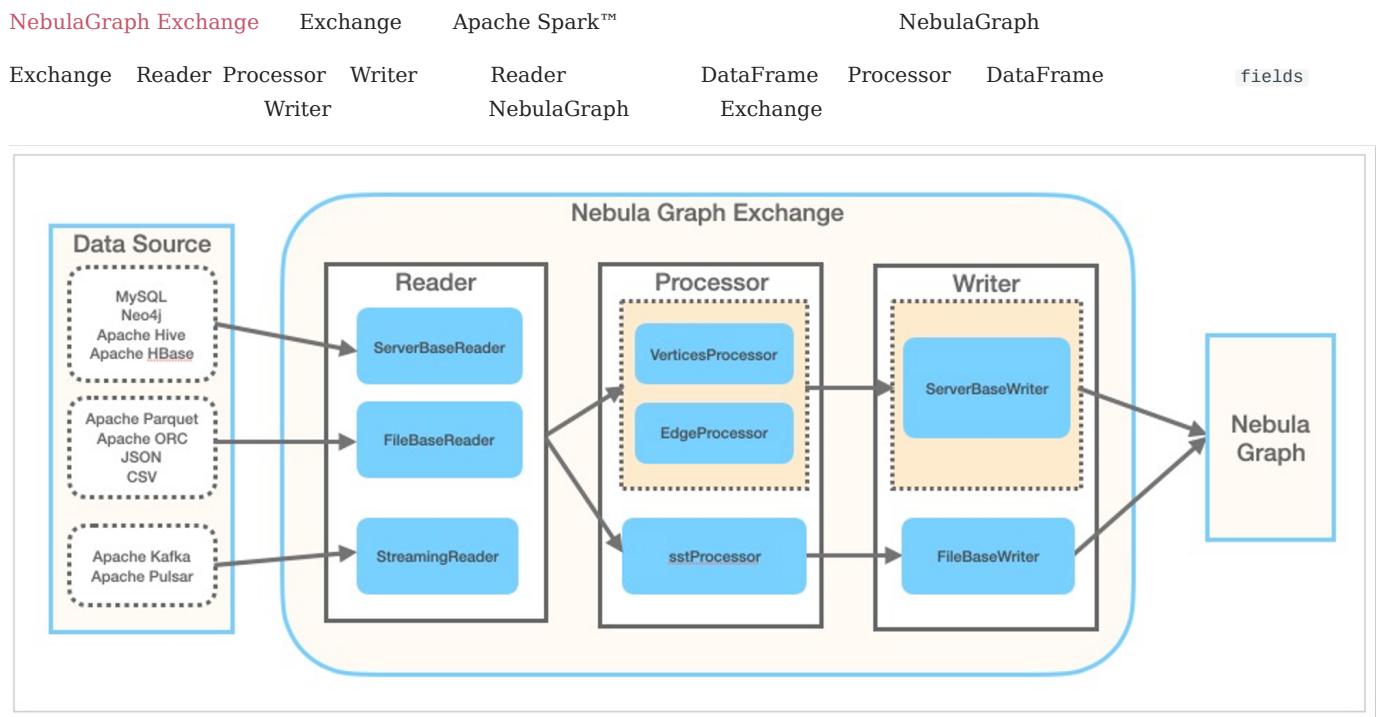
- CSV        0        0        1
  - ID        clientSettings.postStart.commands
  - index        CSV
  - ID
  - ID        ID    withRanking true        rank
- 

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# 19. NebulaGraph Exchange

## 19.1 NebulaGraph Exchange

### 19.1.1 NebulaGraph Exchange



Exchange GitHub NebulaGraph

### Exchange

- Kafka Pulsar NebulaGraph
- MySQL HDFS NebulaGraph
- NebulaGraph SST NebulaGraph
- NebulaGraph

**Enterpriseonly**

Exchange NebulaGraph

## Exchange

- NebulaGraph
- SST SST
- SSL Exchange NebulaGraph SSL
- 



Neo4j

- Graph
- Tag Edge type Tag Edge type
- Apache Spark™
- HOCON Human-Optimized Config Object Notation

NebulaGraph Exchange      JAR      NebulaGraph      Spark

<b>Exchange</b>	<b>NebulaGraph</b>	<b>Spark</b>
nebula-exchange_spark_3.0-3.0-SNAPSHOT.jar	nightly	3.3.x 3.2.x 3.1.x 3.0.x
nebula-exchange_spark_2.4-3.0-SNAPSHOT.jar	nightly	2.4.x
nebula-exchange_spark_2.2-3.0-SNAPSHOT.jar	nightly	2.2.x
nebula-exchange_spark_3.0-3.3.0.jar	3.x.x	3.3.x 3.2.x 3.1.x 3.0.x
nebula-exchange_spark_2.4-3.3.0.jar	3.x.x	2.4.x
nebula-exchange_spark_2.2-3.3.0.jar	3.x.x	2.2.x
nebula-exchange_spark_3.0-3.0.0.jar	3.x.x	3.3.x 3.2.x 3.1.x 3.0.x
nebula-exchange_spark_2.4-3.0.0.jar	3.x.x	2.4.x
nebula-exchange_spark_2.2-3.0.0.jar	3.x.x	2.2.x
nebula-exchange-2.6.3.jar	2.6.1 2.6.0	2.4.x
nebula-exchange-2.6.2.jar	2.6.1 2.6.0	2.4.x
nebula-exchange-2.6.1.jar	2.6.1 2.6.0	2.4.x
nebula-exchange-2.6.0.jar	2.6.1 2.6.0	2.4.x
nebula-exchange-2.5.2.jar	2.5.1 2.5.0	2.4.x
nebula-exchange-2.5.1.jar	2.5.1 2.5.0	2.4.x
nebula-exchange-2.5.0.jar	2.5.1 2.5.0	2.4.x
nebula-exchange-2.1.0.jar	2.0.1 2.0.0	2.4.x
nebula-exchange-2.0.1.jar	2.0.1 2.0.0	2.4.x
nebula-exchange-2.0.0.jar	2.0.1 2.0.0	2.4.x

JAR      maven

Exchange 3.3.0

NebulaGraph

nGQL

NebulaGraph

- HDFS
- Apache Parquet
- Apache ORC
- JSON
- CSV
- Apache HBase™
- 
- Hive
- MaxCompute

- Neo4j Client 2.4.5-M1
- 
- MySQL
- PostgreSQL
- Oracle
- ClickHouse
- Apache Kafka®
- / Apache Pulsar 2.4.5
- JDBC

nGQL

Exchange

SST

Console SST

Release

- NebulaGraph ——Exchange 3 08

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## 19.1.2

Exchange 3.3.0

Exchange 3.x

- CentOS 7
- macOS

Exchange

- Java 1.8
- Scala 2.10.7 2.11.12 2.12.10
- Apache Spark      Exchange                  Spark

### Note

Exchange      Spark      JAR      Spark      2.4      nebula-exchange\_spark\_2.4-3.3.0.jar

#### Spark 2.2

CSV

JSON

ORC

Parquet

HBase

MySQL

PostgreSQL

Oracle

ClickHouse

Neo4j

Hive

MaxCompute

Pulsar

Kafka

NebulaGraph

#### Spark 2.4

#### Spark 3

#### Hadoop Distributed File System (HDFS)

- HDFS
- SST

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## 19.2 NebulaGraph Exchange

NebulaGraph Exchange JAR

### 19.2.1 JAR

Exchange JAR

Exchange NebulaGraph

### 19.2.2 JAR

Exchange JAR

Exchange

 **Enterpriseonly**

Exchange NebulaGraph

- [Maven](#)
- [Spark](#)      [Spark](#)

#### 1. nebula-exchange

```
git clone -b release-3.3 https://github.com/vesoft-inc/nebula-exchange.git
```

#### 2. nebula-exchange

```
cd nebula-exchange
```

#### 3. Exchange Spark Exchange

- [Spark 2.2](#)

```
mvn clean package -Dmaven.test.skip=true -Dgpg.skip -Dmaven.javadoc.skip=true \
-p1 nebula-exchange_spark_2.2 -am -Pscala-2.11 -Pspark-2.2
```

- [Spark 2.4](#)

```
mvn clean package -Dmaven.test.skip=true -Dgpg.skip -Dmaven.javadoc.skip=true \
-p1 nebula-exchange_spark_2.4 -am -Pscala-2.11 -Pspark-2.4
```

- [Spark 3.0](#)

```
mvn clean package -Dmaven.test.skip=true -Dgpg.skip -Dmaven.javadoc.skip=true \
-p1 nebula-exchange_spark_3.0 -am -Pscala-2.12 -Pspark-3.0
```

nebula-exchange\_spark\_x.x/target/      nebula-exchange\_spark\_x.x-release-3.3.jar      x.x      Spark      2.4

 **Note**

JAR

NebulaGraph Java Client

[Releases](#)

target/classes/application.conf

- Maven libexec/conf/settings.xml mirror

```
<mirror>
<id>alimaven</id>
<mirrorOf>central</mirrorOf>
<name>aliyun maven</name>
<url>http://maven.aliyun.com/nexus/content/repositories/central/</url>
</mirror>
```

---

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19.3

### 19.3.1

NebulaGraph

```
<spark_install_path>/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-2.x.y.jar_path> -c <application.conf_path>
```

- reload

reload -r reload

```
<spark_install_path>/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-2.x.y.jar_path> -c <application.conf_path> -r "<reload_file_path>"
```

Note

JAR

FAQ

yarn-cluster --conf

```
$SPARK_HOME/bin/spark-submit --master yarn-cluster \
--class com.vesoft.nebula.exchange.Exchange \
--files application.conf \
--conf spark.driver.extraClassPath=./ \
--conf spark.executor.extraClassPath=./ \
nebula-exchange-3.3.0.jar \
--application.conf
```

--class

--master **Spark master URL** **master-urls**

-c / --config

-h / --hive

Hive

-D / --dry

Spark

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### 19.3.2

NebulaGraph Exchange [application.conf](#)  
CSV [csv\\_application.conf](#)

- Spark

- Hive

- NebulaGraph

- 

- 

#### Spark

Spark

spark.app.name	string	-	Spark
spark.driver.cores	int	1	CPU
spark.driver.maxResultSize	string	1G 1M 0	Spark collect
spark.executor.memory	string	1G	Spark 512M 1G
spark.cores.max	int	16	" " Mesos CPU Spark spark.deploy.defaultCores Mesos infinite

#### Hive

Spark Hive [Hive](#)

hive.warehouse	string	-	HDFS warehouse hdfs://
hive.connectionURL	string	-	JDBC URL "jdbc:mysql:// 127.0.0.1:3306/hive_spark? characterEncoding=UTF-8"
hive.connectionDriverName	string	"com.mysql.jdbc.Driver"	
hive.connectionUserName	list[string]	-	
hive.connectionPassword	list[string]	-	



nebula.address.graph	list[string]	["127.0.0.1:9669"]	Graph	IP	,
					["ip1:port1","ip2:port2","ip3:port3"]
nebula.address.meta	list[string]	["127.0.0.1:9559"]	Meta	IP	,
					["ip1:port1","ip2:port2","ip3:port3"]
nebula.user	string	-	NebulaGraph		
nebula.pswd	string	-			
nebula.space	string	-			
nebula.ssl.enable.graph	bool	false	Exchange	Graph	SSL
			true	SSL	Exchange
				SSL	
nebula.ssl.enable.meta	bool	false	Exchange	Meta	SSL
			true	SSL	Exchange
				SSL	
nebula.ssl.sign	string	ca	ca	CA	self
nebula.ssl.ca.param.caCrtFilePath	string	"/path/caCrtFilePath"	nebula.ssl.sign	ca	CA
nebula.ssl.ca.param.crtFilePath	string	"/path/crtFilePath"	nebula.ssl.sign	ca	CRT
nebula.ssl.ca.param.keyFilePath	string	"/path/keyFilePath"	nebula.ssl.sign	ca	
nebula.ssl.self.param.crtFilePath	string	"/path/crtFilePath"	nebula.ssl.sign	self	CRT
nebula.ssl.self.param.keyFilePath	string	"/path/keyFilePath"	nebula.ssl.sign	self	
nebula.ssl.self.param.password	string	"nebula"	nebula.ssl.sign	self	
nebula.path.local	string	"/tmp"	SST	SST	
nebula.path.remote	string	"/sst"	SST	SST	
nebula.path.hdfs.namenode	string	"hdfs://name_node:9000"	SST	HDFS	namenode
nebula.connection.timeout	int	3000	Thrift	ms	
nebula.connection.retry	int	3	Thrift		
nebula.execution.retry	int	3	nGQL		
nebula.error.max	int	32			Spark
nebula.error.output	string	/tmp/errors			nGQL

nebula.rate.limit	int	1024
nebula.rate.timeout	int	1000

### Note

NebulaGraph	Tag	Tag	Tag	Exchange	nebula.enableTagless	true
-------------	-----	-----	-----	----------	----------------------	------

```
nebula: {
    address: {
        graph: ["127.0.0.1:9669"]
        meta: ["127.0.0.1:9559"]
    }
    user: root
    pswd: nebula
    space: test
    enableTagless: true
    .....
}
```

tags.name	string	-	NebulaGraph	Tag
tags.type.source	string	-		csv
tags.type.sink	string	client		client SST
tags.fields	list[string]	-		CSV [_c0, _c1, _c2]
tags.nebula.fields	list[string]	-	NebulaGraph	tags.fields [_c1, _c2] [name, age] name age
tags.vertex.field	string	-	ID	CSV _c0 ID
tags.batch	int	256		NebulaGraph
tags.partition	int	32		Spark

PARQUET/JSON/ORC

tags.path	string	-	HDFS	hdfs://
CSV				
tags.path	string	-	HDFS	hdfs://
tags.separator	string	,	,	,
tags.header	bool	true		

## HIVE

tags.exec	string	-	select name,age from mooc.users
-----------	--------	---	---------------------------------

## MAXCOMPUTE

tags.table	string	-	MaxCompute
tags.project	string	-	MaxCompute
tags.odpsUrl	string	-	MaxCompute odpsUrl
tags.tunnelUrl	string	-	MaxCompute tunnelUrl
tags.accessKeyId	string	-	MaxCompute accessKeyId
tags.accessKeySecret	string	-	MaxCompute accessKeySecret
tags.partitionSpec	string	-	MaxCompute
tags.numPartitions	int	1	MaxCompute Spark MaxCompute
tags.sentence	string	-	SQL table

## NEO4J

tags.exec	string	-	match (n:label) return n.neo4j-field-0
tags.server	string	"bolt://127.0.0.1:7687"	Neo4j
tags.user	string	-	Neo4j
tags.password	string	-	Neo4j
tags.database	string	-	Neo4j
tags.check_point_path	string	/tmp/test	

## MYSQL/POSTGRESQL

tags.host	string	-	MySQL/PostgreSQL
tags.port	string	-	MySQL/PostgreSQL
tags.database	string	-	
tags.table	string	-	
tags.user	string	-	MySQL/PostgreSQL
tags.password	string	-	
tags.sentence	string	-	"select teamid, name from team order by teamid"

## ORACLE

tags.url	string	-	Oracle
tags.driver	string	-	Oracle
tags.user	string	-	Oracle
tags.password	string	-	
tags.table	string	-	
tags.sentence	string	-	"select playerid, name, age from player"

## CLICKHOUSE

tags.url	string	-	ClickHouse JDBC URL
tags.user	string	-	ClickHouse
tags.password	string	-	
tags.numPartition	string	-	ClickHouse
tags.sentence	string	-	

## HBASE

tags.host	string	127.0.0.1	Hbase
tags.port	string	2181	Hbase
tags.table	string	-	
tags.columnFamily	string	-	column family

## PULSAR

tags.service	string	"pulsar://localhost:6650"	Pulsar
tags.admin	string	"http://localhost:8081"	pulsar admin.url
tags.options.<topic\ topics\ \ topicsPattern>	string	-	Pulsar topic topics topicsPattern
tags.interval.seconds	int	10	

## KAFKA

tags.service	string	-	Kafka
tags.topic	string	-	
tags.interval.seconds	int	10	

SST

tags.path	string	-	SST		
tags.repartitionWithNebula	bool	true	SST	NebulaGraph DOWNLOAD	partition INGEST SST

tags edges

edges.name	string	-	NebulaGraph	Edge type
edges.type.source	string	-		csv
edges.type.sink	string	client		client SST
edges.fields	list[string]	-		CSV [_c0, _c1, _c2]
edges.nebula.fields	list[string]	-	NebulaGraph [_c2, _c3]	edges.fields [start_year, end_year]
edges.source.field	string	-		_c0
edges.target.field	string	-		_c1
edges.ranking	int	-	rank	rank 0
edges.batch	int	256	NebulaGraph	
edges.partition	int	32	Spark	

SST

edges.path	string	-	SST		
edges.repartitionWithNebula	bool	true	SST	NebulaGraph DOWNLOAD	partition INGEST SST

## NEBULAGRAPH

edges.path	string	"hdfs://namenode:9000/path/edge"	CSV	Exchange	HDFS
			"follow"	"file:///path/edge"	"file:///home/nebula/edge/follow"
			Edge	Edge	
edges.noField	bool	false	true VID VID	VID VID	Rank Rank
edges.return.fields	list	[]		start_year ["start_year", "end_year"]	end_year edges.noField false

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## 19.4 NebulaGraph Exchange

### 19.4.1 CSV

Exchange      HDFS      CSV      NebulaGraph  
NebulaGraph      CSV      **NebulaGraph Importer**

basketballplayer

MacOS

- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- Hadoop 2.9.2
- NebulaGraph 3.3.0      **Docker Compose**
- **NebulaGraph**
- Graph      Meta      IP
- NebulaGraph
- Exchange      **Exchange**      Exchange 3.3.0
- Spark
- NebulaGraph      Schema      Tag      Edge type
- HDFS      Hadoop
- NebulaGraph

## 1 NEBULAGRAPH SCHEMA

CSV NebulaGraph Schema

## 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

## 2. NebulaGraph Console basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
    (partition_num = 10, \
     replica_factor = 1, \
     vid_type = FIXED_STRING(30));

##      basketballplayer
nebula> USE basketballplayer;

##      Tag player
nebula> CREATE TAG player(name string, age int);

##      Tag team
nebula> CREATE TAG team(name string);

##      Edge type follow
nebula> CREATE EDGE follow(degree int);

##      Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2 CSV

## 1. CSV Schema



Exchange CSV

## 2. CSV

3

Exchange target/classes/application.conf CSV csv\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
    executor: {
      memory:1G
    }
  }

  cores: {
    max: 16
  }
}
```

```

}

# NebulaGraph
nebula: {
    address: {
        # Graph     Meta     IP
        #
        # "ip1:port", "ip2:port", "ip3:port"
        graph: ["127.0.0.1:9669"]
        meta: ["127.0.0.1:9559"]
    }
}

#      NebulaGraph
user: root
pswd: nebula

#
space: basketballplayer
connection: {
    timeout: 3000
    retry: 3
}
execution: {
    retry: 3
}
error: {
    max: 32
    output: /tmp/errors
}
rate: {
    limit: 1024
    timeout: 1000
}
}

#
tags: [
    # Tag player
{
    # NebulaGraph     Tag
    name: player
    type: {
        # CSV
        source: csv

        #      NebulaGraph Client   SST
        sink: client
    }

    # CSV
    # HDFS          hdfs://      "hdfs://ip:port/xx/xx"
    #           file://      "file:///tmp/xx.csv"
    path: "hdfs://192.168.*.*:9000/data/vertex_player.csv"

    # CSV          [_c0, _c1, _c2, ..., _cn]
    # CSV
    fields: [_c1, _c2]

    # NebulaGraph
    # fields  nebula.fields
    nebula.fields: [age, name]

    # VID
    # vertex      fields   csv.fields
    # NebulaGraph 3.3.0      VID
    vertex: {
        field_c0
        # policy:hash
    }

    #
    separator: ","
}

#      CSV
header: true
# CSV          header  false   false
header: false

#      NebulaGraph
batch: 256

#      Spark
partition: 32
}

# Tag team
{
    # NebulaGraph     Tag
    name: team
    type: {
        # CSV
        source: csv

        #      NebulaGraph Client   SST
        sink: client
    }
}

```

```

}

#   CSV
#       HDFS          hdfs://      "hdfs://ip:port/xx/xx"
#           file://      "file:///tmp/xx.csv"
path: "hdfs://192.168.*.*:9000/data/vertex_team.csv"

#   CSV      [_c0, _c1, _c2, ..., _cn]
#   CSV
fields: [_c1]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [name]

#       VID
# vertex      fields  csv.fields
# NebulaGraph 3.3.0          VID
vertex: {
    field:_c0
    # policy:hash
}

# separator: ","
header: true
#   CSV      header  true
#   CSV      header  false   false
header: false

#   NebulaGraph
batch: 256

#   Spark
partition: 32
}

# ]
edges: [
    # Edge type follow
{
    #   NebulaGraph      Edge type
    name: follow
    type: {
        #   CSV
        source: csv

        #   NebulaGraph Client  SST
        sink: client
    }

    #   CSV
    #       HDFS          hdfs://      "hdfs://ip:port/xx/xx"
    #           file://      "file:///tmp/xx.csv"
path: "hdfs://192.168.*.*:9000/data/edge_follow.csv"

#   CSV      [_c0, _c1, _c2, ..., _cn]
#   CSV
fields: [_c2]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [degree]

#       VID
# vertex      fields  csv.fields
# NebulaGraph 3.3.0          VID
source: {
    field: _c0
}
target: {
    field: _c1
}

# separator: ","
rank

#ranking: rank

#   CSV      header  true
#   CSV      header  false   false
header: false

#   NebulaGraph
batch: 256

#   Spark
partition: 32
}

```

```

#   Edge type serve
{
  #   NebulaGraph      Edge type
  name: serve
  type: {
    #           CSV
    source: csv

    #           NebulaGraph Client  SST
    sink: client
  }

  #   CSV
  #   HDFS          hdfs://      "hdfs://ip:port/xx/xx"
  #           file:///      "file:///tmp/xx.csv"
  path: "hdfs://192.168.*.*:9000/data/edge_serve.csv"

  #   CSV          [_c0, _c1, _c2, ..., _cn]
  #   CSV
  fields: [_c2,_c3]

  #   NebulaGraph
  # fields  nebula.fields
  nebula.fields: [start_year, end_year]

  #
  # vertex      fields  csv.fields
  #   NebulaGraph 3.3.0      VID
  source: {
    field: _c0
  }
  target: {
    field: _c1
  }

  #
  separator: ","
  #rank
  #ranking: _c5

  #   CSV      header  true
  #   CSV      header  false   false
  header: false

  #   NebulaGraph
  batch: 256

  #   Spark
  partition: 32
}

]
#
}

```

#### 4 NEBULAGRAPH

CSV NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <csv_application.conf_path>
```

#### Note

JAR

maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/csv_application.conf
```

batchSuccess.<tag\_name/edge\_name> batchSuccess.follow: 300

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NebulaGraph NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

**SHOW STATS**

## NebulaGraph

---

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## 19.4.2 JSON

Exchange      HDFS      JSON      NebulaGraph

basketballplayer

- player

```
{"id": "player100", "age": 42, "name": "Tim Duncan"}  
{"id": "player101", "age": 36, "name": "Tony Parker"}  
{"id": "player102", "age": 33, "name": "LaMarcus Aldridge"}  
{"id": "player103", "age": 32, "name": "Rudy Gay"}  
...
```

- team

```
{"id": "team200", "name": "Warriors"}  
{"id": "team201", "name": "Nuggets"}  
...
```

- follow

```
{"src": "player100", "dst": "player101", "degree": 95}  
{"src": "player101", "dst": "player102", "degree": 90}  
...
```

- serve

```
{"src": "player100", "dst": "team204", "start_year": "1997", "end_year": "2016"}  
{"src": "player101", "dst": "team204", "start_year": "1999", "end_year": "2018"}  
...
```

MacOS

- 
- CPU 1.7 GHz Quad-Core Intel Core i7
  - 16 GB
- Spark 2.3.0
- Hadoop 2.9.2
- NebulaGraph 3.3.0    [Docker Compose](#)

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange Exchange Exchange 3.3.0
- Spark
- NebulaGraph Schema Tag Edge type
- HDFS Hadoop
- NebulaGraph

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

### 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

### 2. NebulaGraph Console basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
  (partition_num = 10, \
  replica_factor = 1, \
  vid_type = FIXED_STRING(30));

##     basketballplayer
nebula> USE basketballplayer;

##     Tag player
nebula> CREATE TAG player(name string, age int);

##     Tag team
nebula> CREATE TAG team(name string);

##     Edge type follow
nebula> CREATE EDGE follow(degree int);

##     Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2 JSON

1. JSON Schema
2. JSON

3.

Exchange	target/classes/application.conf	JSON	json_application.conf
----------	---------------------------------	------	-----------------------

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
    executor: {
      memory:1G
    }

    cores: {
      max: 16
    }
  }

  # NebulaGraph
  nebula: {
    address:{ 
      # Graph     Meta     IP
      #
      #   "ip1:port","ip2:port","ip3:port"
      graph:["127.0.0.1:9669"]
      meta:["127.0.0.1:9559"]
    }
  }

  # NebulaGraph
  user: root
  pswd: nebula

  #
  space: basketballplayer
  connection: {
    timeout: 3000
    retry: 3
  }
  execution: {
    retry: 3
  }
  error: {
    max: 32
    output: /tmp/errors
  }
  rate: {
    limit: 1024
    timeout: 1000
  }
}

#
tags: [
  # Tag player
  {
    # NebulaGraph     Tag
    name: player
    type: {
      # JSON
      source: json

      # NebulaGraph Client   SST
      sink: client
    }

    # JSON
    # HDFS           hdfs://      "hdfs://ip:port/xx/xx"
    # file://        "file:///tmp/xx.json"
    path: "hdfs://192.168.*.*:9000/data/vertex_player.json"

    # fields   JSON   key       value     NebulaGraph
    # ,
    fields: [age,name]

    # NebulaGraph
    # fields   nebula.fields
    nebula.fields: [age, name]

    # VID
    # vertex   JSON
    # NebulaGraph 3.3.0          VID
    vertex: {
      field:id
    }

    # NebulaGraph
    batch: 256
  }
]
```

```

#   Spark
partition: 32
}

#   Tag team
{
#     NebulaGraph      Tag
name: team
type: {
#       JSON
source: json

#           NebulaGraph Client  SST
sink: client
}

#   JSON
#       HDFS          hdfs://    "hdfs://ip:port/xx/xx"
#           file://    "file:///tmp/xx.json"
path: "hdfs://192.168.*.*:9000/data/vertex_team.json"

#   fields  JSON   key        value    NebulaGraph
#   ,
fields: [name]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [name]

#   VID
# vertex   JSON
#   NebulaGraph 3.3.0          VID
vertex: {
field:id
}

#           NebulaGraph
batch: 256

#   Spark
partition: 32
}

#
]

#
edges: [
#   Edge type follow
{
#     NebulaGraph      Edge type
name: follow
type: {
#       JSON
source: json

#           NebulaGraph Client  SST
sink: client
}

#   JSON
#       HDFS          hdfs://    "hdfs://ip:port/xx/xx"
#           file://    "file:///tmp/xx.json"
path: "hdfs://192.168.*.*:9000/data/edge_follow.json"

#   fields  JSON   key        value    NebulaGraph
#   ,
fields: [degree]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [degree]

#
# vertex   JSON
#   NebulaGraph 3.3.0          VID
source: {
field: src
}
target: {
field: dst
}

#   rank
#ranking: rank

#           NebulaGraph
batch: 256

#   Spark
partition: 32
}

#   Edge type serve
{

```

```

#   NebulaGraph      Edge type
name: serve
type: {
    #           JSON
    source: json

    #           NebulaGraph Client  SST
    sink: client
}

#   JSON
#   HDFS          hdfs://      "hdfs://ip:port/xx/xx"
#   file://        "file:///tmp/xx.json"
path: "hdfs://192.168.*.*:9000/data/edge_serve.json"

#   fields      JSON     key       value      NebulaGraph
#
#fields: [start_year,end_year]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [start_year, end_year]

#
# vertex      JSON
# NebulaGraph 3.3.0      VID
source: {
    field: src
}
target: {
    field: dst
}

#   rank
#ranking: _c5

#   NebulaGraph
batch: 256

#   Spark
partition: 32
}

]
#
}

```

## 4 NEBULAGRAPH

JSON NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <json_application.conf_path>
```



JAR maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/json_application.conf
```

batchSuccess.&lt;tag\_name/edge\_name&gt; batchSuccess.follow: 300

## 5

NebulaGraph NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

[SHOW STATS](#)

## 6 NEBULAGRAPH

NebulaGraph

:January 13, 2023

### 19.4.3 ORC

Exchange      HDFS      ORC      NebulaGraph  
NebulaGraph      ORC      **NebulaGraph Importer**

basketballplayer

MacOS

- 
- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- Hadoop 2.9.2
- NebulaGraph 3.3.0      **Docker Compose**
  
- **NebulaGraph**
- Graph      Meta      IP
- NebulaGraph
- Exchange      **Exchange**      Exchange 3.3.0
- Spark
- NebulaGraph      Schema      Tag      Edge type
- HDFS      Hadoop
- NebulaGraph

## 1 NEBULAGRAPH SCHEMA

ORC NebulaGraph Schema

## 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

## 2. NebulaGraph Console basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
    (partition_num = 10, \
     replica_factor = 1, \
     vid_type = FIXED_STRING(30));

##      basketballplayer
nebula> USE basketballplayer;

##      Tag player
nebula> CREATE TAG player(name string, age int);

##      Tag team
nebula> CREATE TAG team(name string);

##      Edge type follow
nebula> CREATE EDGE follow(degree int);

##      Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2 ORC

## 1. ORC Schema

## 2. ORC

3

Exchange target/classes/application.conf ORC orc\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
    executor: {
      memory: 1G
    }

    cores: {
      max: 16
    }
  }

  # NebulaGraph
  nebula: {
    address: {
      # Graph   Meta   IP
      # , ,
      # "ip1:port", "ip2:port", "ip3:port"
    }
  }
}
```

```

graph:["127.0.0.1:9669"]
meta:["127.0.0.1:9559"]
}

#      NebulaGraph
user: root
pswd: nebula

#
space: basketballplayer
connection: {
    timeout: 3000
    retry: 3
}
execution: {
    retry: 3
}
error: {
    max: 32
    output: /tmp/errors
}
rate: {
    limit: 1024
    timeout: 1000
}
}

#
tags: [
    #      Tag player
{
    #      NebulaGraph      Tag
    name: player
    type: {
        #          ORC
        source: orc

        #      NebulaGraph Client  SST
        sink: client
    }
}

#      ORC
#      HDFS          hdf://      "hdfs://ip:port/xx/xx"
#      file://      "file:///tmp/xx.orc"
path: "hdfs://192.168.*.*:9000/data/vertex_player.orc"

#   fields      ORC     key       value      NebulaGraph
#
fields: [age, name]

#      NebulaGraph
# fields  nebula.fields
nebula.fields: [age, name]

#      VID
# vertex      ORC
#      NebulaGraph 3.3.0      VID
vertex: {
    field:id
}

#      NebulaGraph
batch: 256

#      Spark
partition: 32
}

#      Tag team
{
    #      NebulaGraph      Tag
    name: team
    type: {
        #          ORC
        source: orc

        #      NebulaGraph Client  SST
        sink: client
    }

#      ORC
#      HDFS          hdf://      "hdfs://ip:port/xx/xx"
#      file://      "file:///tmp/xx.orc"
path: "hdfs://192.168.*.*:9000/data/vertex_team.orc"

#   fields      ORC     key       value      NebulaGraph
#
fields: [name]

#      NebulaGraph
# fields  nebula.fields
nebula.fields: [name]

#      VID

```

```

# vertex      ORC
#   NebulaGraph 3.3.0          VID
vertex: {
  field:id
}

#       NebulaGraph
batch: 256

#       Spark
partition: 32
}

# 
]

#
edges: [
#   Edge type follow
{
#   NebulaGraph      Edge type
name: follow
type: {
#       ORC
source: orc

#       NebulaGraph Client  SST
sink: client
}

#   ORC
#   HDFS           hdfs://    "hdfs://ip:port/xx/xx"
#   file://        "file:///tmp/xx.orc"
path: "hdfs://192.168.*.*:9000/data/edge_follow.orc"

#   fields      ORC     key      value      NebulaGraph
#   ,
fields: [degree]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [degree]

#
# vertex      ORC
#   NebulaGraph 3.3.0          VID
source: {
  field: src
}
target: {
  field: dst
}

#       rank
#ranking: rank

#       NebulaGraph
batch: 256

#       Spark
partition: 32
}

#   Edge type serve
{
#   NebulaGraph      Edge type
name: serve
type: {
#       ORC
source: orc

#       NebulaGraph Client  SST
sink: client
}

#   ORC
#   HDFS           hdfs://    "hdfs://ip:port/xx/xx"
#   file://        "file:///tmp/xx.orc"
path: "hdfs://192.168.*.*:9000/data/edge_serve.orc"

#   fields      ORC     key      value      NebulaGraph
#   ,
fields: [start_year,end_year]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [start_year, end_year]

#
# vertex      ORC
#   NebulaGraph 3.3.0          VID
source: {
  field: src
}
target: {
}

```

```

        field: dst
    }

    #          rank
    #ranking: _c5

    #          NebulaGraph
    batch: 256

    #          Spark
    partition: 32
}

]

#
}

```

**4 NEBULAGRAPH**

ORC NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <orc_application.conf_path>
```



JAR maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/orc_application.conf
```

```
batchSuccess.<tag_name/edge_name>           batchSuccess.follow: 300
```

**5**

NebulaGraph NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

**SHOW STATS**

**6 NEBULAGRAPH**

NebulaGraph

---

: January 13, 2023

#### 19.4.4 Parquet



basketballplayer

MacOS

- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- Hadoop 2.9.2
- NebulaGraph 3.3.0 Docker Compose

- NebulaGraph

- Graph Meta IP
- NebulaGraph
- Exchange Exchange Exchange 3.3.0
- Spark
- NebulaGraph Schema Tag Edge type
- HDFS Hadoop
- NebulaGraph

## 1 NEBULAGRAPH SCHEMA

Parquet NebulaGraph Schema

### 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

### 2. NebulaGraph Console basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
    (partition_num = 10, \
     replica_factor = 1, \
     vid_type = FIXED_STRING(30));

##      basketballplayer
nebula> USE basketballplayer;

##      Tag player
nebula> CREATE TAG player(name string, age int);

##      Tag team
nebula> CREATE TAG team(name string);

##      Edge type follow
nebula> CREATE EDGE follow(degree int);

##      Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2 PARQUET

### 1. Parquet Schema

### 2. Parquet

3

Exchange target/classes/application.conf Parquet parquet\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
    executor: {
      memory: 1G
    }

    cores: {
      max: 16
    }
  }

  # NebulaGraph
  nebula: {
    address: {
      # Graph     Meta     IP
      #           ,
      #       "ip1:port", "ip2:port", "ip3:port"
    }
  }
}
```

```

graph:["127.0.0.1:9669"]
meta:["127.0.0.1:9559"]
}

#      NebulaGraph
user: root
pswd: nebula

#
space: basketballplayer
connection: {
  timeout: 3000
  retry: 3
}
execution: {
  retry: 3
}
error: {
  max: 32
  output: /tmp/errors
}
rate: {
  limit: 1024
  timeout: 1000
}
}

#
tags: [
  #      Tag player
  {
    #      NebulaGraph      Tag
    name: player
    type: {
      #          Parquet
      source: parquet

      #      NebulaGraph Client  SST
      sink: client
    }
  }

  #      Parquet
  #      HDFS           hdfs://      "hdfs://ip:port/xx/xx"
  #      file://         "file:///tmp/xx.csv"
  path: "hdfs://192.168.11.139000/data/vertex_player.parquet"

  # fields   Parquet   key       value   NebulaGraph
  #
  fields: [age, name]

  #      NebulaGraph
  # fields  nebula.fields
  nebula.fields: [age, name]

  #      VID
  # vertex  Parquet
  #      NebulaGraph 3.3.0      VID
  vertex: {
    field:id
  }

  #      NebulaGraph
  batch: 256

  #      Spark
  partition: 32
}

#      Tag team
{
  #      NebulaGraph      Tag
  name: team
  type: {
    #          Parquet
    source: parquet

    #      NebulaGraph Client  SST
    sink: client
  }

  #      Parquet
  #      HDFS           hdfs://      "hdfs://ip:port/xx/xx"
  #      file://         "file:///tmp/xx.csv"
  path: "hdfs://192.168.11.13:9000/data/vertex_team.parquet"

  # fields   Parquet   key       value   NebulaGraph
  #
  fields: [name]

  #      NebulaGraph
  # fields  nebula.fields
  nebula.fields: [name]

  #      VID
}

```

```

# vertex      Parquet
#   NebulaGraph 3.3.0          VID
vertex: {
  field:id
}

#       NebulaGraph
batch: 256

#       Spark
partition: 32
}

# 
]

#
edges: [
#   Edge type follow
{
#   NebulaGraph      Edge type
name: follow
type: {
#       Parquet
source: parquet

#       NebulaGraph Client  SST
sink: client
}

#   Parquet
#       HDFS           hdfs://    "hdfs://ip:port/xx/xx"
#       file://        "file:///tmp/xx.csv"
path: "hdfs://192.168.11.13:9000/data/edge_follow.parquet"

#   fields      Parquet     key         value      NebulaGraph
#   ,
fields: [degree]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [degree]

#
# vertex      Parquet
#   NebulaGraph 3.3.0          VID
source: {
  field: src
}
target: {
  field: dst
}

#       rank
#ranking: rank

#       NebulaGraph
batch: 256

#       Spark
partition: 32
}

#   Edge type serve
{
#   NebulaGraph      Edge type
name: serve
type: {
#       Parquet
source: parquet

#       NebulaGraph Client  SST
sink: client
}

#   Parquet
#       HDFS           hdfs://    "hdfs://ip:port/xx/xx"
#       file://        "file:///tmp/xx.csv"
path: "hdfs://192.168.11.13:9000/data/edge_serve.parquet"

#   fields      Parquet     key         value      NebulaGraph
#   ,
fields: [start_year,end_year]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [start_year, end_year]

#
# vertex      Parquet
#   NebulaGraph 3.3.0          VID
source: {
  field: src
}
target: {
}

```

```

        field: dst
    }

#           rank
#ranking: _c5

#           NebulaGraph
batch: 256

#           Spark
partition: 32
}

]

#
}

```

**4 NEBULAGRAPH**

Parquet      NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <parquet_application.conf_path>
```



JAR      maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/parquet_application.conf
```

batchSuccess.&lt;tag\_name/edge\_name&gt;      batchSuccess.follow: 300

5

NebulaGraph      NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

SHOW STATS

6      NEBULAGRAPH

NebulaGraph

:January 13, 2023

### 19.4.5 HBase

Exchange    HBase    NebulaGraph

basketballplayer

HBase    player team follow serve

```

hbase(main):002:0> scan "player"
ROW                               COLUMN+CELL
player100                          column=cf:age, timestamp=1618881347530, value=42
player100                          column=cf:name, timestamp=1618881354604, value=Tim Duncan
player101                          column=cf:age, timestamp=1618881369124, value=36
player101                          column=cf:name, timestamp=1618881379102, value=Tony Parker
player102                          column=cf:age, timestamp=1618881386987, value=33
player102                          column=cf:name, timestamp=1618881393370, value=LaMarcus Aldridge
player103                          column=cf:age, timestamp=1618881402002, value=32
player103                          column=cf:name, timestamp=1618881407882, value=Rudy Gay
...
hbase(main):003:0> scan "team"
ROW                               COLUMN+CELL
team200                           column=cf:name, timestamp=1618881445563, value=Warriors
team201                           column=cf:name, timestamp=1618881453636, value=Nuggets
...
hbase(main):004:0> scan "follow"
ROW                               COLUMN+CELL
player100                          column=cf:degree, timestamp=1618881804853, value=95
player100                          column=cf:dst_player, timestamp=1618881791522, value=player101
player101                          column=cf:degree, timestamp=1618881824685, value=90
player101                          column=cf:dst_player, timestamp=1618881816042, value=player102
...
hbase(main):005:0> scan "serve"
ROW                               COLUMN+CELL
player100                          column=cf:end_year, timestamp=1618881899333, value=2016
player100                          column=cf:start_year, timestamp=1618881890117, value=1997
player100                          column=cf:teamid, timestamp=1618881875739, value=team204
...

```

MacOS

- 
- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- Hadoop 2.9.2
- HBase 2.2.7
- NebulaGraph 3.3.0    Docker Compose

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange Exchange Exchange 3.3.0
- Spark
- NebulaGraph Schema Tag Edge type
- Hadoop

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

### 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

### 2. NebulaGraph basketballplayer Schema

```
##  
nebula> CREATE SPACE basketballplayer \  
  (partition_num = 10, \  
   replica_factor = 1, \  
   vid_type = FIXED_STRING(30));  
  
##      basketballplayer  
nebula> USE basketballplayer;  
  
##      Tag player  
nebula> CREATE TAG player(name string, age int);  
  
##      Tag team  
nebula> CREATE TAG team(name string);  
  
##      Edge type follow  
nebula> CREATE EDGE follow(degree int);  
  
##      Edge type serve  
nebula> CREATE EDGE serve(start_year int, end_year int);
```

2

Exchange target/classes/application.conf HBase hbase\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
  }
  cores: {
```

```

        max: 16
    }
}

# NebulaGraph
nebula: {
    address: {
        # NebulaGraph Graph Meta IP
        #           "ip1:port", "ip2:port", "ip3:port"
        #           (, )
        graph: ["127.0.0.1:9669"]
        meta: ["127.0.0.1:9559"]
    }
    # NebulaGraph
    user: root
    pswd: nebula
    # NebulaGraph
    space: basketballplayer
    connection: {
        timeout: 3000
        retry: 3
    }
    execution: {
        retry: 3
    }
    error: {
        max: 32
        output: /tmp/errors
    }
    rate: {
        limit: 1024
        timeout: 1000
    }
}
#
tags: [
    # Tag player
    # rowkey      "rowkey",
{
    # NebulaGraph Tag
    name: player
    type: {
        # HBase
        source: hbase
        # NebulaGraph Client SST
        sink: client
    }
    host:192.168.*.*
    port:2181
    table:"player"
    columnFamily:"cf"

    # fields     player         value     NebulaGraph
    # fields   nebula.fields
    #
    fields: [age,name]
    nebula.fields: [age,name]

    # NebulaGraph VID
    # rowkey    VID      "rowkey"
    vertex: {
        field:rowkey
    }

    # NebulaGraph
    batch: 256

    # Spark
    partition: 32
}
# Tag team
{
    name: team
    type: {
        source: hbase
        sink: client
    }
    host:192.168.*.*
    port:2181
    table:"team"
    columnFamily:"cf"
    fields: [name]
    nebula.fields: [name]
    vertex: {
        field:rowkey
    }
    batch: 256
    partition: 32
}
]

#
edges: [

```

```

#   Edge type follow
{
  # NebulaGraph      Edge type
  name: follow

  type: {
    #
    #          HBase
    source: hbase

    #
    #          NebulaGraph Client  SST
    sink: client
  }

  host:192.168.*.*
  port:2181
  table:"follow"
  columnFamily:"cf"

  #   fields      follow      value      NebulaGraph
  # fields    nebula.fields
  #
  fields: [degree]
  nebula.fields: [degree]

  #   source      follow      rowkey
  #   target      follow      dst_player
  source:{ field:rowkey
  }

  target:{ field:dst_player
  }

  #
  #rank
  #ranking: rank

  #
  #          NebulaGraph
  batch: 256

  #
  # Spark
  partition: 32
}

#   Edge type serve
{
  name: serve
  type: {
    source: hbase
    sink: client
  }
  host:192.168.*.*
  port:2181
  table:"serve"
  columnFamily:"cf"

  fields: [start_year,end_year]
  nebula.fields: [start_year,end_year]
  source:{ field:rowkey
  }

  target:{ field:teamid
  }

  #
  #rank
  #ranking: rank

  batch: 256
  partition: 32
}
]
}

```

### 3 NEBULAGRAPH

HBase      NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <hbase_application.conf_path>
```



JAR

maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/hbase_application.conf
```

```
batchSuccess.<tag_name/edge_name>          batchSuccess.follow: 300
```

4

NebulaGraph NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

```
SHOW STATS
```

5 NEBULAGRAPH

NebulaGraph

---

:January 13, 2023

## 19.4.6 MySQL/PostgreSQL

## Exchange MySQL NebulaGraph PostgreSQL NebulaGraph

## basketballplayer

MySQL basketball player team follow serve

MacOS

- CPU 1.7 GHz Quad-Core Intel Core i7
  - 16 GB
  - Spark 2.4.7
  - Hadoop 2.9.2
  - MySQL 8.0.23
  - NebulaGraph 3.3.0 Docker Compose

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange Exchange Exchange 3.3.0
- Spark
- NebulaGraph Schema Tag Edge type
- Hadoop

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

### 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

### 2. NebulaGraph basketballplayer Schema

```
##  
nebula> CREATE SPACE basketballplayer \  
  (partition_num = 10, \  
   replica_factor = 1, \  
   vid_type = FIXED_STRING(30));  
  
##      basketballplayer  
nebula> USE basketballplayer;  
  
##      Tag player  
nebula> CREATE TAG player(name string, age int);  
  
##      Tag team  
nebula> CREATE TAG team(name string);  
  
##      Edge type follow  
nebula> CREATE EDGE follow(degree int);  
  
##      Edge type serve  
nebula> CREATE EDGE serve(start_year int, end_year int);
```

2

Exchange target/classes/application.conf MySQL mysql\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
  }
  cores: {
```

```

        max: 16
    }

}

# NebulaGraph
nebula: {
    address: {
        #      NebulaGraph  Graph   Meta      IP
        #          "ip1:port","ip2:port","ip3:port"
        #          (,
        graph:["127.0.0.1:9669"]
        meta:["127.0.0.1:9559"]
    }
    #      NebulaGraph
    user: root
    pswd: nebula
    #      NebulaGraph
    space: basketballplayer
    connection: {
        timeout: 3000
        retry: 3
    }
    execution: {
        retry: 3
    }
    error: {
        max: 32
        output: /tmp/errors
    }
    rate: {
        limit: 1024
        timeout: 1000
    }
}
#
tags: [
    # Tag player
{
    # NebulaGraph      Tag
    name: player
    type: {
        #           MySQL
        source: mysql
        #           NebulaGraph Client  SST
        sink: client
    }
}

host:192.168.*.*
port:3306
database:"basketball"
table:"player"
user:"test"
password:"123456"
sentence:"select playerid, age, name from player order by playerid"

#   fields     player      value      NebulaGraph
#   fields     nebula.fields
#
fields: [age,name]
nebula.fields: [age,name]

#      NebulaGraph      VID
vertex: {
    field:playerid
}

#      NebulaGraph
batch: 256

# Spark
partition: 32
}
#
# Tag team
{
    name: team
    type: {
        source: mysql
        sink: client
    }
}

host:192.168.*.*
port:3306
database:"basketball"
table:"team"
user:"test"
password:"123456"
sentence:"select teamid, name from team order by teamid"

fields: [name]
nebula.fields: [name]
vertex: {
    field: teamid
}
batch: 256

```

```

        partition: 32
    }

]

#
edges: [
    #   Edge type follow
{
    # NebulaGraph      Edge type
    name: follow

    type: {
        #           MySQL
        source: mysql

        #           NebulaGraph
        #           NebulaGraph Client  SST
        sink: client
    }

    host:192.168.*.*
    port:3306
    database:"basketball"
    table:"follow"
    user:"test"
    password:"123456"
    sentence:"select src_player,dst_player,degree from follow order by src_player"

    #   fields      follow       value     NebulaGraph
    # fields  nebula.fields
    #
    fields: [degree]
    nebula.fields: [degree]

    #   source      follow
    #   target      follow
    source: {
        field: src_player
    }

    target: {
        field: dst_player
    }

    #           rank
    #ranking: rank

    #           NebulaGraph
    batch: 256

    # Spark
    partition: 32
}

#   Edge type serve
{
    name: serve
    type: {
        source: mysql
        sink: client
    }

    host:192.168.*.*
    port:3306
    database:"basketball"
    table:"serve"
    user:"test"
    password:"123456"
    sentence:"select playerid,teamid,start_year,end_year from serve order by playerid"
    fields: [start_year,end_year]
    nebula.fields: [start_year,end_year]
    source: {
        field: playerid
    }
    target: {
        field: teamid
    }

    #           rank
    #ranking: rank

    batch: 256
    partition: 32
}
]
}

```

## 3 NEBULAGRAPH

MySQL NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <mysql_application.conf_path>
```

### Note

JAR maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/mysql_application.conf
```

```
batchSuccess.<tag_name/edge_name>           batchSuccess.follow: 300
```

4

NebulaGraph NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

```
SHOW STATS
```

5 NEBULAGRAPH

NebulaGraph

---

:January 13, 2023

## 19.4.7 Oracle

Exchange      Oracle      NebulaGraph

### basketballplayer

Oracle      basketball      player team follow serve

```
oracle> desc player;
+-----+-----+-----+
| Column | Null | Type |
+-----+-----+-----+
| PLAYERID | - | VARCHAR2(30) |
| NAME | - | VARCHAR2(30) |
| AGE | - | NUMBER |
+-----+-----+-----+

oracle> desc team;
+-----+-----+-----+
| Column | Null | Type |
+-----+-----+-----+
| TEAMID | - | VARCHAR2(30) |
| NAME | - | VARCHAR2(30) |
+-----+-----+-----+

oracle> desc follow;
+-----+-----+-----+
| Column | Null | Type |
+-----+-----+-----+
| SRC_PLAYER | - | VARCHAR2(30) |
| DST_PLAYER | - | VARCHAR2(30) |
| DEGREE | - | NUMBER |
+-----+-----+-----+

oracle> desc serve;
+-----+-----+-----+
| Column | Null | Type |
+-----+-----+-----+
| PLAYERID | - | VARCHAR2(30) |
| TEAMID | - | VARCHAR2(30) |
| START_YEAR | - | NUMBER |
| END_YEAR | - | NUMBER |
+-----+-----+-----+
```

### MacOS

- 
- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- Hadoop 2.9.2
- NebulaGraph 3.3.0      Docker Compose

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange Exchange Exchange 3.3.0
- Spark
- NebulaGraph Schema Tag Edge type
- Hadoop

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

### 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

### 2. NebulaGraph basketballplayer Schema

```
##  
nebula> CREATE SPACE basketballplayer \  
  (partition_num = 10, \  
   replica_factor = 1, \  
   vid_type = FIXED_STRING(30));  
  
##      basketballplayer  
nebula> USE basketballplayer;  
  
##      Tag player  
nebula> CREATE TAG player(name string, age int);  
  
##      Tag team  
nebula> CREATE TAG team(name string);  
  
##      Edge type follow  
nebula> CREATE EDGE follow(degree int);  
  
##      Edge type serve  
nebula> CREATE EDGE serve(start_year int, end_year int);
```

2

Exchange target/classes/application.conf Oracle oracle\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
  }
  cores: {
```

```

        max: 16
    }

}

# NebulaGraph
nebula: {
    address: {
        #      NebulaGraph  Graph      Meta      IP
        #          "ip1:port","ip2:port","ip3:port"
        #          (,
        graph:["127.0.0.1:9669"]
        meta:["127.0.0.1:9559"]
    }
    #      NebulaGraph
    user: root
    pswd: nebula
    #      NebulaGraph
    space: basketballplayer
    connection: {
        timeout: 3000
        retry: 3
    }
    execution: {
        retry: 3
    }
    error: {
        max: 32
        output: /tmp/errors
    }
    rate: {
        limit: 1024
        timeout: 1000
    }
}
#
tags: [
{
    # NebulaGraph      Tag
    name: player
    type: {
        #          Oracle
        source: oracle
        #      NebulaGraph Client   SST
        sink: client
    }
}

url:"jdbc:oracle:thin:@host:1521:db"
driver: "oracle.jdbc.driver.OracleDriver"
user: "root"
password: "123456"
table: "basketball.player"
sentence: "select playerid, name, age from player"

# fields      player           value     NebulaGraph
# fields      nebula.fields
#
fields: [age,name]
nebula.fields: [age,name]

#      NebulaGraph      VID
vertex: {
    field:playerid
}

#      NebulaGraph
batch: 256

# Spark
partition: 32
}
#  Tag team
{
    name: team
    type: {
        source: oracle
        sink: client
    }
}

url:"jdbc:oracle:thin:@host:1521:db"
driver: "oracle.jdbc.driver.OracleDriver"
user: "root"
password: "123456"
table: "basketball.team"
sentence: "select teamid, name from team"

fields: [name]
nebula.fields: [name]
vertex: {
    field: teamid
}
batch: 256
partition: 32
}

```

```

]

#
edges: [
  #   Edge type follow
  {
    # NebulaGraph      Edge type
    name: follow

    type: {
      #          Oracle
      source: oracle

      #      NebulaGraph
      #      NebulaGraph Client  SST
      sink: client
    }

    url:"jdbc:oracle:thin:@host:1521:db"
    driver: "oracle.jdbc.driver.OracleDriver"
    user: "root"
    password: "123456"
    table: "basketball.follow"
    sentence: "select src_player, dst_player, degree from follow"

    #   fields      follow      value      NebulaGraph
    # fields  nebula.fields
    #
    fields: [degree]
    nebula.fields: [degree]

    #   source      follow
    # target      follow
    source: {
      field: src_player
    }

    target: {
      field: dst_player
    }

    #       rank
    #ranking: rank

    #      NebulaGraph
    batch: 256

    # Spark
    partition: 32
  }

  #   Edge type serve
  {
    name: serve
    type: {
      source: oracle
      sink: client
    }

    url:"jdbc:oracle:thin:@host:1521:db"
    driver: "oracle.jdbc.driver.OracleDriver"
    user: "root"
    password: "123456"
    table: "basketball.serve"
    sentence: "select playerid, teamid, start_year, end_year from serve"

    fields: [start_year,end_year]
    nebula.fields: [start_year,end_year]
    source: {
      field: playerid
    }
    target: {
      field: teamid
    }

    #       rank
    #ranking: rank

    batch: 256
    partition: 32
  }
]
}

```

### 3 NEBULAGRAPH

Oracle      NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <oracle_application.conf_path>
```

**Note**

JAR maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/oracle_application.conf
```

```
batchSuccess.<tag_name/edge_name>           batchSuccess.follow: 300
```

4

NebulaGraph NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

**SHOW STATS**

5 NEBULAGRAPH

NebulaGraph

:January 13, 2023

## 19.4.8 ClickHouse

Exchange      ClickHouse      NebulaGraph

basketballplayer

MacOS

- 
- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- Hadoop 2.9.2
- ClickHouse docker yandex/clickhouse-server tag: latest(2021.07.01)
- NebulaGraph 3.3.0 [Docker Compose](#)

- [NebulaGraph](#)

- Graph      Meta      IP
- NebulaGraph
- Exchange      [Exchange](#)      Exchange 3.3.0
- Spark
- NebulaGraph      Schema      Tag      Edge type
- Hadoop

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

## 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

## 2. NebulaGraph basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
    (partition_num = 10, \
     replica_factor = 1, \
     vid_type = FIXED_STRING(30));

##      basketballplayer
nebula> USE basketballplayer;

##      Tag player
nebula> CREATE TAG player(name string, age int);

##      Tag team
nebula> CREATE TAG team(name string);

##      Edge type follow
nebula> CREATE EDGE follow(degree int);

##      Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2

Exchange target/classes/application.conf ClickHouse clickhouse\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: Nebula Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
    cores: {
      max: 16
    }
  }

  # NebulaGraph
  nebula: {
    address: {
      # NebulaGraph Graph Meta IP
      #           "ip1:port","ip2:port","ip3:port"
      #           (,,
      graph:["127.0.0.1:9669"]
      meta:["127.0.0.1:9559"]
    }
    # NebulaGraph
    user: root
    pswd: nebula
    # NebulaGraph
    space: basketballplayer
    connection: {
      timeout: 3000
      retry: 3
    }
    execution: {
      retry: 3
    }
  }
}
```

```

}
error: {
  max: 32
  output: /tmp/errors
}
rate: {
  limit: 1024
  timeout: 1000
}
#
tags: [
  # Tag player
  {
    name: player
    type: {
      # ClickHouse
      source: clickhouse
      # NebulaGraph Client SST
      sink: client
    }
  }
  # ClickHouse JDBC URL
  url:"jdbc:clickhouse://192.168.*.*:8123/basketballplayer"
  user:"user"
  password:"123456"
  # ClickHouse
  numPartition:"5"
  table:"player"
  sentence:"select * from player"
  # fields      player          value      NebulaGraph
  # fields      nebula.fields
  #
  fields: [name,age]
  nebula.fields: [name,age]
  # NebulaGraph VID
  vertex: {
    field:playerid
    # policy:hash
  }
  # NebulaGraph
  batch: 256
  # Spark
  partition: 32
}

# Tag team
{
  name: team
  type: {
    source: clickhouse
    sink: client
  }
  url:"jdbc:clickhouse://192.168.*.*:8123/basketballplayer"
  user:"user"
  password:"123456"
  numPartition:"5"
  table:"team"
  sentence:"select * from team"
  fields: [name]
  nebula.fields: [name]
  vertex: {
    field:teamid
  }
  batch: 256
  partition: 32
}
]

#
edges: [
  # Edge type follow
  {
    # NebulaGraph     Edge type
    name: follow

    type: {
      # ClickHouse
      source: clickhouse
      # NebulaGraph
      # NebulaGraph Client SST
      sink: client
    }
  }
  # ClickHouse JDBC URL
  url:"jdbc:clickhouse://192.168.*.*:8123/basketballplayer"
]

```

```

user:"user"
password:"123456"

# ClickHouse
numPartition:"5"

table:"follow"
sentence:"select * from follow"

#   fields      follow      value    NebulaGraph
#   fields      nebula.fields
#
fields: [degree]
nebula.fields: [degree]

#   source      follow
source: {
  field:src_player
}

#   target      follow
target: {
  field:dst_player
}

#       rank
#ranking: rank

#       NebulaGraph
batch: 256

# Spark
partition: 32
}

#   Edge type serve
{
  name: serve
  type: {
    source: clickhouse
    sink: client
  }
  url:"jdbc:clickhouse://192.168.*.*:8123/basketballplayer"
  user:"user"
  password:"123456"
  numPartition:"5"
  sentence:"select * from serve"
  fields: [start_year,end_year]
  nebula.fields: [start_year,end_year]
  source: {
    field:playerid
  }
  target: {
    field:teamid
  }

#       rank
#ranking: rank

batch: 256
partition: 32
}
]
}

```

### 3 NEBULAGRAPH

ClickHouse      NebulaGraph

```

${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c
<clickhouse_application.conf_path>

```



JAR                  maven

```

${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-
exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/clickhouse_application.conf

```

batchSuccess.<tag\_name/edge\_name>      batchSuccess.follow: 300

4

NebulaGraph      NebulaGraph Studio

GO FROM "player100" OVER follow;

[SHOW STATS](#)

5      NEBULAGRAPH

NebulaGraph

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### 19.4.9 Neo4j

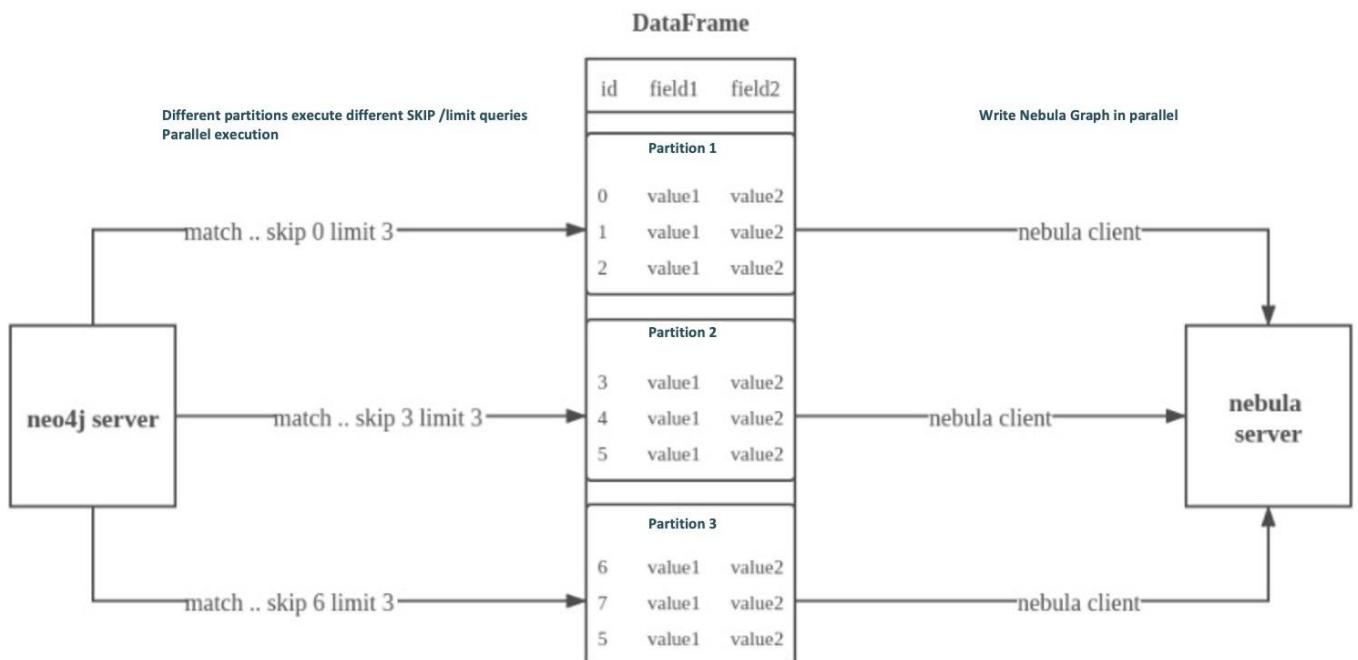
Exchange      Neo4j      NebulaGraph

Exchange      **Neo4j Driver 4.0.1**      Neo4j  
Spark

Exchange      Neo4j

1. Exchange      Reader      exec      Cypher RETURN      COUNT(\*)      Spark
2.                check\_point\_path      Reader      Reader      Spark
3.      Spark      Exchange      Reader      Cypher      SKIP      LIMIT      Neo4j Driver      Spark
4. Reader      DataFrame

Exchange      Neo4j      NebulaGraph



basketballplayer

MacOS

- CPU Intel(R) Xeon(R) CPU E5-2697 v3 @ 2.60GHz
- CPU 14
- 251 GB
- Spark 2.4.6 pre-build for Hadoop 2.7
- Neo4j 3.5.20 Community Edition
- NebulaGraph 3.3.0 [Docker Compose](#)

- [NebulaGraph](#)
- Graph Meta IP
- NebulaGraph
- Exchange [Exchange](#) Exchange 3.3.0
- Spark
- NebulaGraph Schema Tag Edge type

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

## 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

## 2. NebulaGraph Console basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
    (partition_num = 10, \
     replica_factor = 1, \
     vid_type = FIXED_STRING(30));

##      basketballplayer
nebula> USE basketballplayer;

##      Tag player
nebula> CREATE TAG player(name string, age int);

##      Tag team
nebula> CREATE TAG team(name string);

##      Edge type follow
nebula> CREATE EDGE follow(degree int);

##      Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2

Neo4j

Neo4j

Neo4j

## 3

Exchange target/classes/application.conf neo4j\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }

    driver: {
      cores: 1
      maxResultSize: 1G
    }

    executor: {
      memory:1G
    }

    cores:{ 
      max: 16
    }
  }

  # NebulaGraph
  nebula: {
    address:{ 
      graph:["127.0.0.1:9669"]
      meta:["127.0.0.1:9559"]
    }
    user: root
    pswd: nebula
    space: basketballplayer
  }
}
```

```

connection: {
    timeout: 3000
    retry: 3
}

execution: {
    retry: 3
}

error: {
    max: 32
    output: /tmp/errors
}

rate: {
    limit: 1024
    timeout: 1000
}
}

#
tags: [
    # Tag player
{
    name: player
    type: {
        source: neo4j
        sink: client
    }
    server: "bolt://192.168.*.*:7687"
    user: neo4j
    password:neo4j
    database:neo4j
    exec: "match (n:player) return n.id as id, n.age as age, n.name as name"
    fields: [age,name]
    nebula.fields: [age,name]
    vertex: {
        field:id
    }
    partition: 10
    batch: 1000
    check_point_path: /tmp/test
}
# Tag team
{
    name: team
    type: {
        source: neo4j
        sink: client
    }
    server: "bolt://192.168.*.*:7687"
    user: neo4j
    password:neo4j
    # bolt 3 does not support `select database`, please do not config database
    # database:neo4j
    exec: "match (n:team) return n.id as id,n.name as name order by id(n)"
    fields: [name]
    nebula.fields: [name]
    vertex: {
        field:id
    }
    partition: 10
    batch: 1000
    check_point_path: /tmp/test
}
]

#
edges: [
    # Edge type follow
{
    name: follow
    type: {
        source: neo4j
        sink: client
    }
    server: "bolt://192.168.*.*:7687"
    user: neo4j
    password:neo4j
    database:neo4j
    exec: "match (a:player)-[r:follow]-(b:player) return a.id as src, b.id as dst, r.degree as degree order by id(r)"
    fields: [degree]
    nebula.fields: [degree]
    source: {
        field: src
    }
    target: {
        field: dst
    }
    #ranking: rank
    partition: 10
    batch: 1000
    check_point_path: /tmp/test
}
]

```

```

}
#   Edge type serve
{
  name: serve
  type: {
    source: neo4j
    sink: client
  }
  server: "bolt://192.168.*.*:7687"
  user: neo4j
  password:neo4j
  # bolt 3 does not support `select database`, please do not config database
  #database:neo4j
  exec: "match (a:player)-[r:serve]-(b:team) return a.id as src, b.id as dst, r.start_year as start_year, r.end_year as end_year order by id(r)"
  fields: [start_year,end_year]
  nebula.fields: [start_year,end_year]
  source: {
    field: src
  }
  target: {
    field: dst
  }
  #ranking: rank
  partition: 10
  batch: 1000
  check_point_path: /tmp/test
}
]
}

```

exec

tags.exec	edges.exec	Cypher	Cypher	ORDER BY		
			ID	partition		
ORDER BY						
Exchange	Spark	SKIP LIMIT Cypher	tags.exec	edges.exec	Cypher	SKIP LIMIT
tags.vertex	edges.vertex					
NebulaGraph	ID		Neo4j	NebulaGraph	ID	Neo4j
NebulaGraph			NebulaGraph		Neo4j	
check_point_path						
partition						

## 4 NEBULAGRAPH

NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <neo4j_application.conf_path>
```



JAR

maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/neo4j_application.conf
```

batchSuccess.&lt;tag\_name/edge\_name&gt; batchSuccess.follow: 300

## 5

NebulaGraph NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

SHOW STATS

## NebulaGraph

---

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## 19.4.10 Hive

Exchange      Hive      NebulaGraph

### basketballplayer

Hive      basketball      player team follow serve

```
scala> spark.sql("describe basketball.player").show
+-----+-----+-----+
|col_name|data_type|comment|
+-----+-----+-----+
|playerid| string| null|
| age| bigint| null|
| name| string| null|
+-----+-----+-----+

scala> spark.sql("describe basketball.team").show
+-----+-----+-----+
| col_name|data_type|comment|
+-----+-----+-----+
| teamid| string| null|
| name| string| null|
+-----+-----+-----+

scala> spark.sql("describe basketball.follow").show
+-----+-----+-----+
| col_name|data_type|comment|
+-----+-----+-----+
|src_player| string| null|
|dst_player| string| null|
| degree| bigint| null|
+-----+-----+-----+

scala> spark.sql("describe basketball.serve").show
+-----+-----+-----+
| col_name|data_type|comment|
+-----+-----+-----+
| playerid| string| null|
| teamid| string| null|
|start_year| bigint| null|
| end_year| bigint| null|
+-----+-----+-----+
```

Hive      bigint      NebulaGraph      int

### MacOS

- 
- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- Hadoop 2.9.2
- Hive 2.3.7 Hive Metastore      MySQL 8.0.22
- NebulaGraph 3.3.0      [Docker Compose](#)

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange Exchange Exchange 3.3.0
- Spark
- NebulaGraph Schema Tag Edge type
- Hadoop Hive Metastore MySQL

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

### 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

### 2. NebulaGraph basketballplayer Schema

```
##  
nebula> CREATE SPACE basketballplayer \  
  (partition_num = 10, \  
   replica_factor = 1, \  
   vid_type = FIXED_STRING(30));  
  
##      basketballplayer  
nebula> USE basketballplayer;  
  
##      Tag player  
nebula> CREATE TAG player(name string, age int);  
  
##      Tag team  
nebula> CREATE TAG team(name string);  
  
##      Edge type follow  
nebula> CREATE EDGE follow(degree int);  
  
##      Edge type serve  
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2 SPARK SQL HIVE SQL

spark-shell Spark Hive

```
scala> sql("select playerid, age, name from basketball.player").show  
scala> sql("select teamid, name from basketball.team").show  
scala> sql("select src_player, dst_player, degree from basketball.follow").show  
scala> sql("select playerid, teamid, start_year, end_year from basketball.serve").show
```

basketball.player

playerid	age	name
----------	-----	------

```
+-----+-----+
|player100| 42|      Tim Duncan|
|player101| 36|      Tony Parker|
|player102| 33|LaMarcus Aldridge|
|player103| 32|      Rudy Gay|
|player104| 32| Marco Belinelli|
+-----+-----+
...
```

3

Exchange    target/classes/application.conf    Hive    [hive\\_application.conf](#)

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
    cores: {
      max: 16
    }
  }

  #   Spark   Hive
  #hive: {
  #  waredir: "hdfs://NAMENODE_IP:9000/apps/svr/hive-xxx/warehouse/"
  #  connectionURL: "jdbc:mysql://your_ip:3306/hive_spark?characterEncoding=UTF-8"
  #  connectionDriverName: "com.mysql.jdbc.Driver"
  #  connectionUserName: "user"
  #  connectionPassword: "password"
  #}

  # NebulaGraph
  nebula: {
    address: {
      # NebulaGraph Graph Meta IP
      #           "ip1:port", "ip2:port", "ip3:port"
      #           (, )
      graph: ["127.0.0.1:9669"]
      meta: ["127.0.0.1:9559"]
    }
    #       NebulaGraph
    user: root
    pswd: nebula
    #   NebulaGraph
    space: basketballplayer
    connection: {
      timeout: 3000
      retry: 3
    }
    execution: {
      retry: 3
    }
    error: {
      max: 32
      output: /tmp/errors
    }
    rate: {
      limit: 1024
      timeout: 1000
    }
  }
  #
  tags: [
    #   Tag player
    {
      # NebulaGraph     Tag
      name: player
      type: {
        #           hive
        source: NebulaGraph Client SST
        sink: client
      }
      #       basketball   player     SQL
      exec: "select playerid, age, name from basketball.player"

      #   fields     player     value     NebulaGraph
      # fields   nebula.fields
      #
      fields: [age, name]
      nebula.fields: [age, name]

      #       NebulaGraph     VID
      vertex: {
        field: playerid
      }
    }
  ]
}
```

```

}

#      NebulaGraph
batch: 256

# Spark
partition: 32
}
# Tag team
{
  name: team
  type: {
    source: hive
    sink: client
  }
  exec: "select teamid, name from basketball.team"
  fields: [name]
  nebula.fields: [name]
  vertex: {
    field: teamid
  }
  batch: 256
  partition: 32
}

]

# edges: [
#   Edge type follow
{
  # NebulaGraph      Edge type
  name: follow

  type: {
    #          hive
    source: hive

    #      NebulaGraph
    #      NebulaGraph Client  SST
    sink: client
  }

  #      basketball  follow      SQL
  exec: "select src_player, dst_player, degree from basketball.follow"

  # fields      follow      value      NebulaGraph
  # fields      nebula.fields
  #
  fields: [degree]
  nebula.fields: [degree]

  # source      follow
  # target      follow
  source: {
    field: src_player
  }

  target: {
    field: dst_player
  }

  #      rank
  #ranking: rank

  #      NebulaGraph
  batch: 256

  # Spark
  partition: 32
}

#   Edge type serve
{
  name: serve
  type: {
    source: hive
    sink: client
  }
  exec: "select playerid, teamid, start_year, end_year from basketball.serve"
  fields: [start_year,end_year]
  nebula.fields: [start_year,end_year]
  source: {
    field: playerid
  }
  target: {
    field: teamid
  }

  #      rank
  #ranking: rank

  batch: 256
  partition: 32
}

```

```

    }
]
```

#### 4 NEBULAGRAPH

Hive      NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <hive_application.conf_path> -h
```



JAR

maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/hive_application.conf -h
```

```
batchSuccess.<tag_name/edge_name>                    batchSuccess.follow: 300
```

#### 5

NebulaGraph      NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

[SHOW STATS](#)

#### 6 NEBULAGRAPH

NebulaGraph

: January 13, 2023

### 19.4.11 MaxCompute

Exchange      MaxCompute      NebulaGraph

basketballplayer

MacOS

- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- Hadoop 2.9.2
- MaxCompute
- NebulaGraph 3.3.0      Docker Compose

- NebulaGraph

- Graph      Meta      IP
- NebulaGraph
- Exchange      Exchange      Exchange 3.3.0
- Spark
- NebulaGraph      Schema      Tag      Edge type
- Hadoop

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

## 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

## 2. NebulaGraph basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
    (partition_num = 10, \
     replica_factor = 1, \
     vid_type = FIXED_STRING(30));

##      basketballplayer
nebula> USE basketballplayer;

##      Tag player
nebula> CREATE TAG player(name string, age int);

##      Tag team
nebula> CREATE TAG team(name string);

##      Edge type follow
nebula> CREATE EDGE follow(degree int);

##      Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2

Exchange target/classes/application.conf MaxCompute

maxcompute\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
    cores: {
      max: 16
    }
  }

  # NebulaGraph
  nebula: {
    address: {
      # NebulaGraph Graph Meta IP
      #           "ip1:port","ip2:port","ip3:port"
      #           (,,
      graph:["127.0.0.1:9669"]
      meta:["127.0.0.1:9559"]
    }
    # NebulaGraph
    user: root
    pswd: nebula
    # NebulaGraph
    space: basketballplayer
    connection: {
      timeout: 3000
      retry: 3
    }
    execution: {
      retry: 3
    }
  }
}
```

```

}
error: {
  max: 32
  output: /tmp/errors
}
rate: {
  limit: 1024
  timeout: 1000
}
#
tags: [
  # Tag player
  {
    name: player
    type: {
      # MaxCompute
      source: maxcompute
      # NebulaGraph Client SST
      sink: client
    }
  }
  # MaxCompute
  table:player

  # MaxCompute
  project:project

  # MaxCompute odpsUrl tunnelUrl
  # https://help.aliyun.com/document_detail/34951.html
  odpsUrl:"http://service.cn-hangzhou.maxcompute.aliyun.com/api"
  tunnelUrl:"http://dt.cn-hangzhou.maxcompute.aliyun.com"

  # MaxCompute accessKeyId accessKeySecret
  accessKeyId:xxx
  accessKeySecret:xxx

  # MaxCompute
  partitionSpec:"dt='partition1'"

  # MaxCompute Spark MaxCompute 1
  numPartitions:100

  # SQL table
  sentence:"select id, name, age, playerid from player where id < 10"

  # fields player value NebulaGraph
  # fields nebula.fields
  #
  fields:[name, age]
  nebula.fields:[name, age]

  # NebulaGraph VID
  vertex:{ field: playerid }

  # NebulaGraph
  batch: 256

  # Spark
  partition: 32
}

# Tag team
{
  name: team
  type: {
    source: maxcompute
    sink: client
  }
  table:team
  project:project
  odpsUrl:"http://service.cn-hangzhou.maxcompute.aliyun.com/api"
  tunnelUrl:"http://dt.cn-hangzhou.maxcompute.aliyun.com"
  accessKeyId:xxx
  accessKeySecret:xxx
  partitionSpec:"dt='partition1'"
  sentence:"select id, name, teamid from team where id < 10"
  fields:[name]
  nebula.fields:[name]
  vertex:{ field: teamid }
  batch: 256
  partition: 32
}
]

#
edges: [
  # Edge type follow
  {
    # NebulaGraph Edge type
  }
]

```

```

name: follow

type:{          MaxCompute
#           MaxCompute
source:maxcompute

#       NebulaGraph
#       NebulaGraph Client   SST
sink:client
}

# MaxCompute
table:follow

# MaxCompute
project:project

# MaxCompute      odpsUrl    tunnelUrl
#      https://help.aliyun.com/document_detail/34951.html
odpsUrl:"http://service.cn-hangzhou.maxcompute.aliyun.com/api"
tunnelUrl:"http://dt.cn-hangzhou.maxcompute.aliyun.com"

# MaxCompute      accessKeyId    accessKeySecret
accessKeyId:xxx
accessKeySecret:xxx

# MaxCompute
partitionSpec:"dt='partition1'"


#   SQL          table
sentence:"select * from follow"

#   fields      follow        value      NebulaGraph
#   fields      nebula.fields
#
fields:[degree]
nebula.fields:[degree]

#   source      follow
source:{      field: src_player
}

#   target      follow
target:{      field: dst_player
}

#   rank
#ranking: rank

# Spark
partition:10

#       NebulaGraph
batch:10
}

#   Edge type serve
{
name: serve
type:{      source:maxcompute
           sink:client
}
table:serve
project:project
odpsUrl:"http://service.cn-hangzhou.maxcompute.aliyun.com/api"
tunnelUrl:"http://dt.cn-hangzhou.maxcompute.aliyun.com"
accessKeyId:xxx
accessKeySecret:xxx
partitionSpec:"dt='partition1'"
sentence:"select * from serve"
fields:[start_year,end_year]
nebula.fields:[start_year,end_year]
source:{      field: playerid
}
target:{      field: teamid
}

#   rank
#ranking: rank

partition:10
batch:10
}
]
}

```

### 3 NEBULAGRAPH

MaxCompute      NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <maxcompute_application.conf_path>
```



JAR      maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/maxcompute_application.conf
```

batchSuccess.<tag\_name/edge\_name>      batchSuccess.follow: 300

4

NebulaGraph      NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

SHOW STATS

5      NEBULAGRAPH

NebulaGraph

---

:January 13, 2023

## 19.4.12 Pulsar

Exchange      Pulsar      NebulaGraph

MacOS

- 
- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- NebulaGraph 3.3.0    [Docker Compose](#)
- [NebulaGraph](#)
- Graph      Meta      IP
- NebulaGraph
- Exchange      [Exchange](#)      Exchange 3.3.0
- Spark
- NebulaGraph      Schema      Tag    Edge type
- Pulsar

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

## 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

## 2. NebulaGraph basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
    (partition_num = 10, \
     replica_factor = 1, \
     vid_type = FIXED_STRING(30));

##      basketballplayer
nebula> USE basketballplayer;

##      Tag player
nebula> CREATE TAG player(name string, age int);

##      Tag team
nebula> CREATE TAG team(name string);

##      Edge type follow
nebula> CREATE EDGE follow(degree int);

##      Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2

Exchange target/classes/application.conf Pulsar pulsar\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
    cores: {
      max: 16
    }
  }

  # NebulaGraph
  nebula: {
    address: {
      # NebulaGraph Graph Meta IP
      # "ip1:port", "ip2:port", "ip3:port"
      # (, )
      graph: ["127.0.0.1:9669"]
      meta: ["127.0.0.1:9559"]
    }
    # NebulaGraph
    user: root
    pswd: nebula
    # NebulaGraph
    space: basketballplayer
    connection: {
      timeout: 3000
      retry: 3
    }
    execution: {
      retry: 3
    }
    error: {
  }
```

```

        max: 32
        output: /tmp/errors
    }
    rate: {
        limit: 1024
        timeout: 1000
    }
}
#
tags: [
    # Tag player
{
    # NebulaGraph      Tag
    name: player
    type: {
        #                  Pulsar
        source: pulsar
        # NebulaGraph Client  SST
        sink: client
    }
    # Pulsar
    service: "pulsar://127.0.0.1:6650"
    # pulsar admin.url
    admin: "http://127.0.0.1:8081"
    # Pulsar          topic topics  topicsPattern
    options: {
        topics: "topic1,topic2"
    }

    # fields     player           value   NebulaGraph
    # fields    nebula.fields
    #
    fields: [age,name]
    nebula.fields: [age,name]

    #             NebulaGraph  VID
    vertex:{      field:playerid
}

    #             NebulaGraph
batch: 10

    # Spark
partition: 10
#
interval.seconds: 10
}
# Tag team
{
    name: team
    type: {
        source: pulsar
        sink: client
    }
    service: "pulsar://127.0.0.1:6650"
    admin: "http://127.0.0.1:8081"
    options: {
        topics: "topic1,topic2"
    }
    fields: [name]
    nebula.fields: [name]
    vertex:{      field:teamid
}
batch: 10
partition: 10
interval.seconds: 10
}
]

#
edges: [
    # Edge type follow
{
    # NebulaGraph      Edge type
    name: follow

    type: {
        #                  Pulsar
        source: pulsar

        #             NebulaGraph
        #             NebulaGraph Client  SST
        sink: client
    }
    # Pulsar
    service: "pulsar://127.0.0.1:6650"
    # pulsar admin.url
    admin: "http://127.0.0.1:8081"
    # Pulsar          topic topics  topicsPattern
    options: {

```

```

    topics: "topic1,topic2"
}

#   fields      follow      value     NebulaGraph
# fields  nebula.fields
#
fields: [degree]
nebula.fields: [degree]

#   source      follow
#   target      follow
source:{ 
    field:src_player
}

target:{ 
    field:dst_player
}

#       rank
#ranking: rank

#       NebulaGraph
batch: 10

# Spark
partition: 10

#
interval.seconds: 10
}

#   Edge type serve
{
name: serve
type: {
    source: Pulsar
    sink: client
}
service: "pulsar://127.0.0.1:6650"
admin: "http://127.0.0.1:8081"
options: {
    topics: "topic1,topic2"
}

fields: [start_year,end_year]
nebula.fields: [start_year,end_year]
source:{ 
    field:playerid
}

target:{ 
    field:teamid
}

#       rank
#ranking: rank

batch: 10
partition: 10
interval.seconds: 10
}
}
}

```

### 3 NEBULAGRAPH

Pulsar      NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <pulsar_application.conf_path>
```



JAR

maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/pulsar_application.conf
```

batchSuccess.<tag\_name/edge\_name>                    batchSuccess.follow: 300

4

NebulaGraph NebulaGraph Studio

GO FROM "player100" OVER follow;

[SHOW STATS](#)

5 NEBULAGRAPH

NebulaGraph

:January 13, 2023

### 19.4.13 Kafka

Exchange      Kafka      NebulaGraph

MacOS

- 
- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- NebulaGraph 3.3.0    [Docker Compose](#)
  
- [NebulaGraph](#)
- Graph      Meta      IP
  - NebulaGraph
- Exchange      [Exchange](#)      Exchange 3.3.0
  - Spark
- NebulaGraph      Schema      Tag    Edge type
- Kafka

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

## 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

## 2. NebulaGraph basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
    (partition_num = 10, \
     replica_factor = 1, \
     vid_type = FIXED_STRING(30));

##      basketballplayer
nebula> USE basketballplayer;

##      Tag player
nebula> CREATE TAG player(name string, age int);

##      Tag team
nebula> CREATE TAG team(name string);

##      Edge type follow
nebula> CREATE EDGE follow(degree int);

##      Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2

Exchange target/classes/application.conf Kafka kafka\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }
    driver: {
      cores: 1
      maxResultSize: 1G
    }
    cores: {
      max: 16
    }
  }

  # NebulaGraph
  nebula: {
    address: {
      # NebulaGraph Graph Meta IP
      # "ip1:port", "ip2:port", "ip3:port"
      # (, )
      graph: ["127.0.0.1:9669"]
      meta: ["127.0.0.1:9559"]
    }
    # NebulaGraph
    user: root
    pswd: nebula
    # NebulaGraph
    space: basketballplayer
    connection: {
      timeout: 3000
      retry: 3
    }
    execution: {
      retry: 3
    }
    error: {
  }
```

```

    max: 32
    output: /tmp/errors
}
rate: {
    limit: 1024
    timeout: 1000
}
}
#
tags: [
    # Tag player
{
    # NebulaGraph      Tag
    name: player
    type: {
        #           Kafka
        source: kafka
        #           NebulaGraph Client   SST
        sink: client
    }
    # Kafka
    service: "127.0.0.1:9092"
    #
    topic: "topic_name1"

    # fields      Kafka value          ,   Spark Structured Streaming   Kafka      JSON      value      fields      JSON      key
    fields: [personName, personAge]
    # fields      key     NebulaGraph   key   value          personName  value  NebulaGraph  name  personAge  value  age
    nebula.fields: [name, age]

    #           NebulaGraph   VID
    #           key     key     VID      name
    vertex:{ field:personId
}

    #           NebulaGraph
batch: 10

    # Spark
partition: 10
#
interval.seconds: 10
}
# Tag team
{
    name: team
    type: {
        source: kafka
        sink: client
    }
    service: "127.0.0.1:9092"
    topic: "topic_name2"
    fields: [key]
    nebula.fields: [name]
    vertex:{ field:teamId
}
batch: 10
partition: 10
interval.seconds: 10
}

]

#
edges: [
    # Edge type follow
{
    # NebulaGraph      Edge type
    name: follow

    type: {
        #           Kafka
        source: kafka

        #           NebulaGraph
        #           NebulaGraph Client   SST
        sink: client
    }

    # Kafka
    service: "127.0.0.1:9092"
    #
    topic: "topic_name3"

    # fields      Kafka value          ,   Spark Structured Streaming   Kafka      JSON      value      fields      JSON      key
    fields: [degree]
    # fields      key     NebulaGraph   key   value          degree   value  NebulaGraph  degree
    nebula.fields: [degree]

    # source      topic
    # target      topic
    source:{

}

```

```

        field:srcPersonId
    }

    target:{
        field:dstPersonId
    }

    #      rank
    #ranking: rank

    #      NebulaGraph
    batch: 10

    # Spark
    partition: 10

    #
    interval.seconds: 10
}

#   Edge type serve
{
    name: serve
    type: {
        source: kafka
        sink: client
    }
    service: "127.0.0.1:9092"
    topic: "topic_name4"

    fields: [startYear,endYear]
    nebula.fields: [start_year,end_year]
    source:{
        field:personId
    }

    target:{
        field:teamId
    }

    #      rank
    #ranking: rank

    batch: 10
    partition: 10
    interval.seconds: 10
}
]
```

### 3 NEBULAGRAPH

Kafka      NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <kafka_application.conf_path>
```



JAR                  maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/kafka_application.conf
```

batchSuccess.<tag\_name/edge\_name>                  batchSuccess.follow: 300

4

NebulaGraph      NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

**SHOW STATS**

5    NEBULAGRAPH

NebulaGraph

: January 13, 2023

19.4.14 JDBC

JDBC JDBC MySQL Exchange JDBC NebulaGraph

basketballplayer

MySQL basketball player team follow serve

MacOS

- CPU 1.7 GHz Quad-Core Intel Core i7
  - 16 GB
  - Spark 2.3.0
  - Hadoop 2.9.2
  - NebulaGraph 3.3.0 Docker Compose

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange Exchange Exchange 3.3.0
- Spark
- NebulaGraph Schema Tag Edge type
- HDFS Hadoop
- NebulaGraph

## 1 NEBULAGRAPH SCHEMA

NebulaGraph Schema

### 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

### 2. NebulaGraph Console basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
  (partition_num = 10, \
  replica_factor = 1, \
  vid_type = FIXED_STRING(30));

##     basketballplayer
nebula> USE basketballplayer;

##     Tag player
nebula> CREATE TAG player(name string, age int);

##     Tag team
nebula> CREATE TAG team(name string);

##     Edge type follow
nebula> CREATE EDGE follow(degree int);

##     Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

### 2.

Exchange target/classes/application.conf JDBC

jdbc\_application.conf

```
{
# Spark
spark: {
  app: {
    name: NebulaGraph Exchange 3.3.0
  }
  driver: {
    cores: 1
  }
}
```

```

        maxResultSize: 1G
    }
    executor: {
        memory:1G
    }

    cores: {
        max: 16
    }
}

# NebulaGraph
nebula: {
    address: {
        # Graph      Meta      IP
        #
        # "ip1:port","ip2:port","ip3:port"
        graph:["127.0.0.1:9669"]
        meta:["127.0.0.1:9559"]
    }
}

#      NebulaGraph
user: root
pswd: nebula

#
space: basketballplayer
connection: {
    timeout: 3000
    retry: 3
}
execution: {
    retry: 3
}
error: {
    max: 32
    output: /tmp/errors
}
rate: {
    limit: 1024
    timeout: 1000
}
}

tags: [
    # Tag player
    {
        # NebulaGraph      Tag
        name: player
        type: {
            # JDBC
            source: jdbc

            # NebulaGraph Client  SST
            sink: client
        }
    }
]

# JDBC      URL      MySql
url:"jdbc:mysql://127.0.0.1:3306/basketball?useUnicode=true&characterEncoding=utf-8"

# JDBC
driver:"com.mysql.cj.jdbc.Driver"

#
user:root
password:"12345"

table:player
sentence:"select playerid, age, name from player order by playerid"

#           https://spark.apache.org/docs/latest/sql-data-sources-jdbc.html
partitionColumn:playerid   #
lowerBound:1                #
upperBound:5                #
numPartitions:5             #

fetchSize:2                 #

#   fields      player      value      NebulaGraph
#   fields      nebula.fields
#
fields: [age,name]          '
nebula.fields: [age,name]

#      NebulaGraph      VID
vertex: {
    field:playerid
}

#      NebulaGraph
batch: 256

```

```

# Spark
partition: 32
}
#   Tag team
{
  name: team
  type: {
    source: jdbc
    sink: client
  }

  url:"jdbc:mysql://127.0.0.1:3306/basketball?useUnicode=true&characterEncoding=utf-8"
  driver:"com.mysql.cj.jdbc.Driver"
  user:root
  password:"12345"
  table:team
  sentence:"select teamid, name from team order by teamid"
  partitionColumn:teamid
  lowerBound:1
  upperBound:5
  numPartitions:5
  fetchSize:2

  fields: [name]
  nebula.fields: [name]
  vertex: {
    field: teamid
  }
  batch: 256
  partition: 32
}

]

#
edges: [
  #   Edge type follow
  {
    # NebulaGraph      Edge type
    name: follow

    type: {
      #           JDBC
      source: jdbc

      #           NebulaGraph
      #           NebulaGraph Client   SST
      sink: client
    }

    url:"jdbc:mysql://127.0.0.1:3306/basketball?useUnicode=true&characterEncoding=utf-8"
    driver:"com.mysql.cj.jdbc.Driver"
    user:root
    password:"12345"
    table:follow
    sentence:"select src_player,dst_player,degree from follow order by src_player"
    partitionColumn:src_player
    lowerBound:1
    upperBound:5
    numPartitions:5
    fetchSize:2

    #   fields      follow      value      NebulaGraph
    #   fields      nebula.fields
    #           ,
    fields: [degree]
    nebula.fields: [degree]

    #   source      follow
    #   target      follow
    source: {
      field: src_player
    }

    target: {
      field: dst_player
    }

    #           rank
    #ranking: rank

    #           NebulaGraph
    batch: 256

    # Spark
    partition: 32
  }

  #   Edge type serve
  {
    name: serve
    type: {
      source: jdbc
    }
  }
]

```

```

    sink: client
}

url:"jdbc:mysql://127.0.0.1:3306/basketball?useUnicode=true&characterEncoding=utf-8"
driver:"com.mysql.cj.jdbc.Driver"
user:root
password:"12345"
table:serve
sentence:"select playerid,teamid,start_year,end_year from serve order by playerid"
partitionColumn:playerid
lowerBound:1
upperBound:5
numPartitions:5
fetchSize:2

fields: [start_year,end_year]
nebula.fields: [start_year,end_year]
source: {
  field: playerid
}
target: {
  field: teamid
}

# rank
#ranking: rank

batch: 256
partition: 32
}
]
}

```

#### 4 NEBULAGRAPH

JDBC      NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <jdbc_application.conf_path>
```



JAR                  maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/jdbc_application.conf
```

batchSuccess.<tag\_name/edge\_name>                  batchSuccess.follow: 300

5

NebulaGraph      NebulaGraph Studio

```
GO FROM "player100" OVER follow;
```

**SHOW STATS**

6      NEBULAGRAPH

NebulaGraph

---

:January 13, 2023

## 19.4.15 SST

SST	Sorted String Table	HDFS	NebulaGraph	CSV
-----	---------------------	------	-------------	-----

- Linux SST
- Default
- Exchange 3.3.0 GEOGRAPHY SST

### Exchange

- nGQL NebulaGraph
- SST Console SST NebulaGraph  
SST



10

NebulaGraph RocksDB RocksDB API SST  
SST SST Exchange Reader sstProcessor sstWriter

#### 1. Reader

2. sstProcessor NebulaGraph Schema SST HDFS SST
3. sstWriter SST Key
4. SST RocksDB IngestExternalFile() SST NebulaGraph

```
IngestExternalFileOptions info;
#     SST
Status s = db_->IngestExternalFile({"home/usr/file1.sst", "home/usr/file2.sst"}, info);
if (!s.ok()) {
    printf("Error while adding file %s and %s, Error %s\n",
        file_path1.c_str(), file_path2.c_str(), s.ToString().c_str());
    return 1;
}
```

IngestExternalFile()	RocksDB	RocksDB	SST	Memtable	Memtable	flush
SST	LSM					

basketballplayer

MacOS

- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- Hadoop 2.9.2
- NebulaGraph 3.3.0

- **NebulaGraph 3.3.0**

- Graph Meta IP
  - NebulaGraph
- Meta `--ws_storage_http_port` Storage `--ws_http_port` 19779
- Graph `--ws_meta_http_port` Meta `--ws_http_port` 19559
- Schema Tag Edge type
- Exchange jar Exchange 3.3.0
- Spark
- JDK 1.8 JAVA\_HOME
- Hadoop Storage

 **Note**

- SST
- SST Storage Hadoop
- INGEST SST Storage `--move_files=true` NebulaGraph INGEST SST `mv` data `--`
  - `move_files` false NebulaGraph `cp` SST

## 1 NEBULAGRAPH SCHEMA

CSV NebulaGraph Schema

## 1. Schema NebulaGraph Schema

Tag	player	name string, age int
Tag	team	name string
Edge Type	follow	degree int
Edge Type	serve	start_year int, end_year int

## 2. NebulaGraph Console basketballplayer Schema

```
## nebula> CREATE SPACE basketballplayer \
    (partition_num = 10, \
     replica_factor = 1, \
     vid_type = FIXED_STRING(30));

##      basketballplayer
nebula> USE basketballplayer;

##      Tag player
nebula> CREATE TAG player(name string, age int);

##      Tag team
nebula> CREATE TAG team(name string);

##      Edge type follow
nebula> CREATE EDGE follow(degree int);

##      Edge type serve
nebula> CREATE EDGE serve(start_year int, end_year int);
```

## 2 CSV

## 1. CSV Schema



CSV

## 2. CSV

3

Exchange target/classes/application.conf sst\_application.conf

```
{
  # Spark
  spark: {
    app: {
      name: NebulaGraph Exchange 3.3.0
    }

    master:local

    driver: {
      cores: 1
      maxResultSize: 1G
    }

    executor: {
      memory:1G
    }
  }
}
```

```

cores: {
    max: 16
}
}

# NebulaGraph
nebula: {
    address: {
        graph: ["127.0.0.1:9669"]
        meta: ["127.0.0.1:9559"]
    }
    user: root
    pswd: nebula
    space: basketballplayer
}

# SST
path:{ 
    #           SST
    local:"/tmp"

    # SST      HDFS
    remote:"/sst"

    # HDFS  NameNode
    hdfs.namenode: "hdfs://*.**.*:9000"
}

#
connection: {
    # socket
    timeout: 30000
}

error: {
    # 
    max: 32
    #
    output: /tmp/errors
}

# Google Guava RateLimiter      NebulaGraph
rate: {
    # RateLimiter
    limit: 1024

    # RateLimiter
    timeout: 1000
}
}

#
tags: [
    # Tag player
{
    #   NebulaGraph      Tag
    name: player
    type: {
        #           CSV
        source: csv

        #           NebulaGraph Client  SST
        sink: sst
    }

    #           CSV
    #           HDFS          hdfs://      "hdfs://ip:port/xx/xx.csv"
    path: "hdfs://*.**.*:9000/dataset/vertex_player.csv"

    #           CSV          [ _c0, _c1, _c2, ..., _cn ]
    #           CSV
    fields: [ _c1, _c2 ]

    #   NebulaGraph
    # fields  nebula.fields
    nebula.fields: [age, name]

    #           VID
    # vertex      fields  csv.fields
    # NebulaGraph 3.3.0          VID
    vertex: {
        field: _c0
    }

    #
    separator: ","
}

#           CSV      header  true
#           CSV      header  false   false
header: false

#           NebulaGraph
batch: 256

```

```

#   Spark
partition: 32

#   SST      NebulaGraph      partition
repartitionWithNebula: false
}

#   Tag team
{
#   NebulaGraph      Tag
name: team
type: {
#       CSV
source: csv

#       NebulaGraph Client  SST
sink: sst
}

#   CSV
#   HDFS          hdf://      "hdfs://ip:port/xx/xx.csv"
path: "hdfs://*.*.*:9000/dataset/vertex_team.csv"

#   CSV          [_c0, _c1, _c2, ..., _cn]
#   CSV
fields: [_c1]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [name]

#       VID
# vertex      fields  csv.fields
# NebulaGraph 3.3.0          VID
vertex: {
field:_c0
}

#
separator: ","
'

#   CSV      header  true
#   CSV      header  false   false
header: false

#       NebulaGraph
batch: 256

#   Spark
partition: 32

#   SST      NebulaGraph      partition
repartitionWithNebula: false
}

#
]

#
edges: [
#   Edge type follow
{
#   NebulaGraph      Edge type
name: follow
type: {
#       CSV
source: csv

#       NebulaGraph Client  SST
sink: sst
}

#   CSV
#   HDFS          hdf://      "hdfs://ip:port/xx/xx.csv"
path: "hdfs://*.*.*:9000/dataset/edge_follow.csv"

#   CSV          [_c0, _c1, _c2, ..., _cn]
#   CSV
fields: [_c2]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [degree]

#       VID
# vertex      fields  csv.fields
# NebulaGraph 3.3.0          VID
source: {
field: _c0
}
target: {
field: _c1
}

#
,

```

```

separator: ","
#      rank
#ranking: rank

#   CSV      header  true
#   CSV      header  false   false
header: false

#      NebulaGraph
batch: 256

#      Spark
partition: 32

#   SST      NebulaGraph      partition
repartitionWithNebula: false
}

#   Edge type serve
{
#   NebulaGraph      Edge type
name: serve
type: {
#   CSV
source: csv

#      NebulaGraph Client  SST
sink: sst
}

#   CSV          [_c0, _c1, _c2, ..., _cn]
#   CSV
fields: [_c2,_c3]

#   NebulaGraph
# fields  nebula.fields
nebula.fields: [start_year, end_year]

#
# vertex      fields  csv.fields
# NebulaGraph 3.3.0      VID
source: {
field: _c0
}
target: {
field: _c1
}

#
separator: ","
#      rank
#ranking: _c5

#   CSV      header  true
#   CSV      header  false   false
header: false

#      NebulaGraph
batch: 256

#      Spark
partition: 32

#   SST      NebulaGraph      partition
repartitionWithNebula: false
}

]
#
}

```

## 4 SST

CSV SST

```
`${SPARK_HOME}/bin/spark-submit --master "local" --conf spark.sql.shuffle.partitions=<shuffle_concurrency> --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.3.0.jar_path> -c <sst_application.conf_path>
```

### Note

SST      Spark shuffle      `spark.sql.shuffle.partitions`

### Note

JAR      maven

```
`${SPARK_HOME}/bin/spark-submit --master "local" --conf spark.sql.shuffle.partitions=200 --class com.vesoft.nebula.exchange.Exchange /root/nebula-exchange/nebula-exchange/target/nebula-exchange-3.3.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/sst_application.conf
```

HDFS /sst nebula.path.remote      SST

### Note

Schema      Tag      Edge type      SST      SST      Space ID Tag ID Edge ID

5 SST

### Note

- Storage      Hadoop      HADOOP\_HOME JAVA\_HOME
- Meta      `--ws_storage_http_port`      Storage      `--ws_http_port`      19779
- Graph      `--ws_meta_http_port`      Meta      `--ws_http_port`      19559

NebulaGraph      SST

1.

```
nebula> USE basketballplayer;
```

2.      SST

```
nebula> SUBMIT JOB DOWNLOAD HDFS "hdfs://<hadoop_address>:<hadoop_port>/<sst_file_path>";
```

```
nebula> SUBMIT JOB DOWNLOAD HDFS "hdfs://*.*.*:9000/sst";
```

3.      SST

```
nebula> SUBMIT JOB INGEST;
```

### Note

- NebulaGraph      `data/storage/nebula`      Space ID      download      SST  
download
- SUBMIT JOB INGEST;

6

NebulaGraph NebulaGraph Studio

GO FROM "player100" OVER follow;

[SHOW STATS](#)

7 NEBULAGRAPH

NebulaGraph

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## 19.5 Exchange

### 19.5.1

**Q central Could not resolve dependencies for project xxx**

```
Maven libexec/conf/settings.xml mirror

<mirror>
  <id>alimaven</id>
  <mirrorOf>central</mirrorOf>
  <name>aliyun maven</name>
  <url>http://maven.aliyun.com/nexus/content/repositories/central/</url>
</mirror>

mirrorOf * central *,!SparkPackagesRepo,!bintray-streamnative-maven
```

```
Exchange pom.xml Maven central pom.xml maven
central
```

**Q Exchange SNAPSHOT**

```
Could not find artifact com.vesoft:client:jar:xxx-SNAPSHOT
```

```
maven SNAPSHOT maven central SNAPSHOT
maven setting.xml profiles
```

```
<profile>
  <activation>
    <activeByDefault>true</activeByDefault>
  </activation>
  <repositories>
    <repository>
      <id>snapshots</id>
      <url>https://oss.sonatype.org/content/repositories/snapshots/</url>
      <snapshots>
        <enabled>true</enabled>
      </snapshots>
    </repository>
  </repositories>
</profile>
```

### 19.5.2

**Q java.lang.ClassNotFoundException: com.vesoft.nebula.exchange.Exchange**

```
Yarn-Cluster --conf
```

```
$SPARK_HOME/bin/spark-submit --class com.vesoft.nebula.exchange.Exchange \
--master yarn-cluster \
--files application.conf \
--conf spark.driver.extraClassPath=./ \
--conf spark.executor.extraClassPath=./ \
nebula-exchange-3.0.0.jar \
-c application.conf
```

**Q method name xxx not found**

```
Meta Graph Storage
```

**Q NoSuchMethod MethodNotFound Exception in thread "main" java.lang.NoSuchMethodError**

```
JAR Exchange Spark Scala Hive
```

Q Exchange Hive Exception in thread "main" org.apache.spark.sql.AnalysisException: Table or view not found

```
exchange      -h    table  database      spark-sql      exec  exec
```

**Q** com.facebook.thrift.protocol.TProtocolException: Expected protocol id xxxx

NebulaGraph

- RPM DEB --port
  - docker docker

`nebula-docker-compose`      `docker-compose ps`

Name	Command	State	Ports
nebula-docker-compose_graphd_1	/usr/local/nebula/bin/nebu ...	Up (healthy)	0.0.0.0:33205->19669/tcp, 0.0.0.0:33204->19670/tcp, 0.0.0.0:9669->9669/ ...
tcp			
nebula-docker-compose_metad0_1	./bin/nebula-metad --flagf ...	Up (healthy)	0.0.0.0:33165->19559/tcp, 0.0.0.0:33162->19560/tcp, 0.0.0.0:33167- ...
>9559/tcp, 9560/tcp			
nebula-docker-compose_metad1_1	./bin/nebula-metad --flagf ...	Up (healthy)	0.0.0.0:33166->19559/tcp, 0.0.0.0:33163->19560/tcp, 0.0.0.0:33168- ...
>9559/tcp, 9560/tcp			
nebula-docker-compose_metad2_1	./bin/nebula-metad --flagf ...	Up (healthy)	0.0.0.0:33161->19559/tcp, 0.0.0.0:33160->19560/tcp, 0.0.0.0:33164- ...
>9559/tcp, 9560/tcp			
nebula-docker-compose_storaged0_1	./bin/nebula-storaged --fl ...	Up (healthy)	0.0.0.0:33180->19779/tcp, 0.0.0.0:33178->19780/tcp, 9777/tcp, 9778/ ...
tcp, 0.0.0.0:33183->19779/tcp, 9780/tcp			
nebula-docker-compose_storaged1_1	./bin/nebula-storaged --fl ...	Up (healthy)	0.0.0.0:33175->19779/tcp, 0.0.0.0:33172->19780/tcp, 9777/tcp, 9778/ ...
tcp, 0.0.0.0:33177->19779/tcp, 9780/tcp			
nebula-docker-compose_storaged2_1	./bin/nebula-storaged --fl ...	Up (healthy)	0.0.0.0:33184->19779/tcp, 0.0.0.0:33181->19780/tcp, 9777/tcp, 9778/ ...
tcp, 0.0.0.0:33185->19779/tcp, 9780/tcp			

Ports docker

- |           |                   |
|-----------|-------------------|
| - Graph   | 9669              |
| - Meta    | 33167 33168 33164 |
| - Storage | 33183 33177 33185 |

Q Exception in thread "main" com.facebook.thrift.protocol.TProtocolException: The field 'code' has been assigned the invalid value -4

## Exchange NebulaGraph

Q Hive NebulaGraph

Hive JAR

```
--conf spark.executor.extraJavaOptions=-Dfile.encoding=utf-8  
  
<spark_install_path>/bin/spark-submit --master "local" \  
--conf spark.driver.extraJavaOptions=-Dfile.encoding=utf-8 \  
--conf spark.executor.extraJavaOptions=-Dfile.encoding=utf-8  
--class com.vesoft.nebula.exchange Exchange \  
<nebula.exchange-3.x.v.jar path> -c <application.conf path>
```

YARN

```
<spark_install_path>/bin/spark-submit \
--class com.vesoft.nebula.exchange.Exchange \
--master yarn-cluster \
--files <application.conf_path> \
--conf spark.driver.extraClassPath=./ \
--conf spark.executor.extraClassPath=./ \
--conf spark.driver.extraJavaOptions=-Dfile.encoding=utf-8 \
--conf spark.executor.extraJavaOptions=-Dfile.encoding=utf-8 \
<nebula-exchange-3.x.y.jar_path> \
-c application.conf
```

**Q Hive schema**

Spark Hive Schema version 1.2.0 does not match metastore's schema version 2.1.0 Metastore is not upgraded or corrupt  
 Hive metastore schema Spark metastore

1. Hive Hive metastore MySQL version Spark metastore

Hive MySQL metastore hive hive.VERSION version

```
update hive.VERSION set SCHEMA_VERSION="2.1.0" where VER_ID=1
```

2. Hive hive-site.xml

```
<property>
<name>hive.metastore.schema.verification</name>
<value>false</value>
</property>
```

3. Hive

**Q: SST org.rocksdb.RocksDBException: While open a file for appending: /path/sst/1-xxx.sst: No such file or directory**

1. /path

2. Spark /path

---

19.5.3**Q**

- batch NebulaGraph nGQL
- partition Spark
- nebula.rate NebulaGraph
  - limit
  - timeout

Storage leader

---

19.5.4**Q Exchange NebulaGraph**

Exchange

**Q Exchange Spark Writer**

Exchange	Spark Writer	Spark	NebulaGraph	Exchange	Spark Writer
Exchange					
•	MySQL Neo4j Hive HBase Kafka Pulsar				
•	Spark Writer	Spark HDFS	String NebulaGraph Schema Exchange		
	NebulaGraph	Schema	String double Exchange String		double

**Q Exchange**

Exchange

NebulaGraph Exchange test result

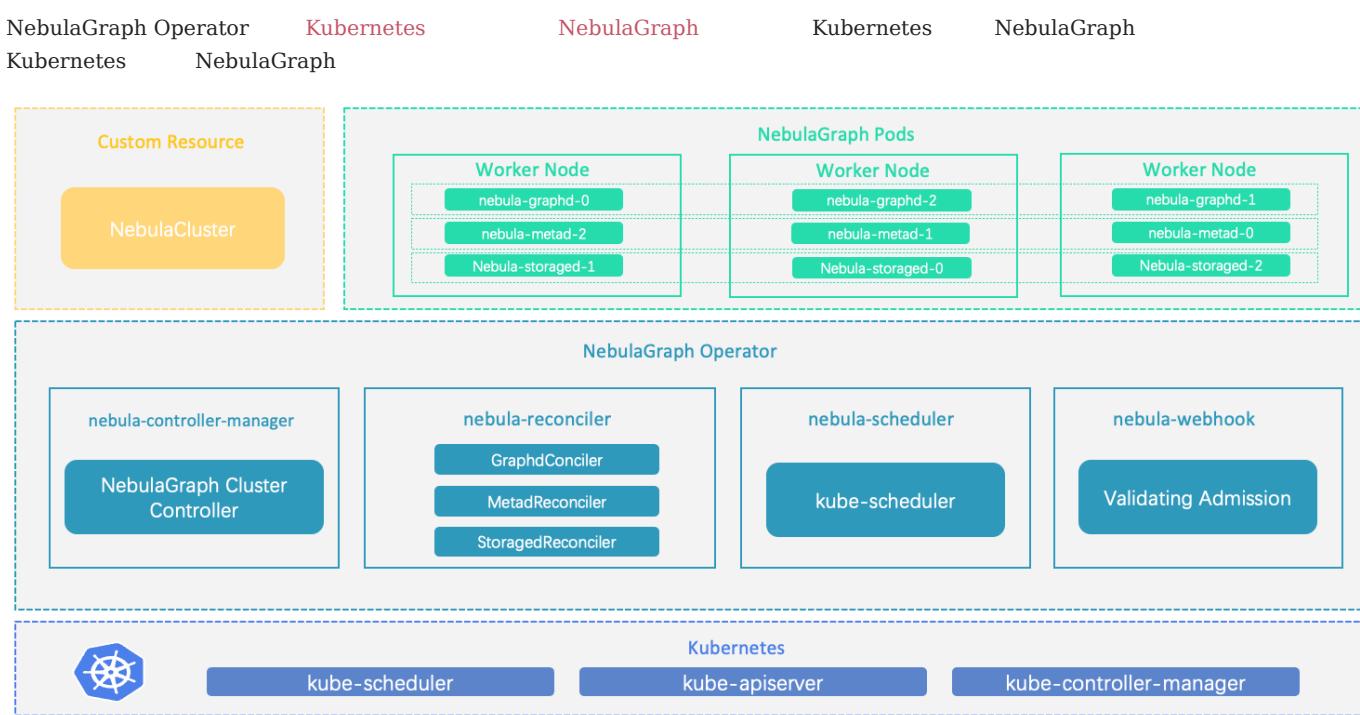
---

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## 20. NebulaGraph Operator

## 20.1 NebulaGraph Operator

20.1.1



## 20.1.2



20.1.3

NebulaGraph Operator

- |  |                      |                      |                      |                      |
|--|----------------------|----------------------|----------------------|----------------------|
|  | NebulaGraph Operator | CR                   | NebulaGraph Operator | NebulaGraph          |
|  | Kubectl NebulaGraph  | Helm                 | NebulaGraph          |                      |
|  | NebulaGraph          | NebulaGraph          | NebulaGraph Operator | YAML                 |
|  | Kubeclt              | Helm                 |                      |                      |
|  | 3.0.0                | NebulaGraph          | 3.3.x                |                      |
|  | NebulaGraph Operator | NebulaGraph          |                      | NebulaGraph Operator |
|  |                      | NebulaGraph Operator | Pods                 | NebulaGraph          |

## 20.1.4

---

NebulaGraph Operator v1.x NebulaGraph NebulaGraph

<b>NebulaGraph</b>	<b>NebulaGraph Operator</b>
3.0.0 ~ 3.3.x	1.3.0
3.0.0 ~ 3.3.x	1.0.0 1.1.0 1.2.0
2.5.x ~ 2.6.x	0.9.0
2.5.x	0.8.0



- 1.x NebulaGraph Operator 3.x NebulaGraph.
- 0.9.0 NebulaGraph Operator 0.9.0 NebulaGraph Operator 0.8.0 2.5.x NebulaGraph  
2.5.x NebulaGraph 0.9.0 Operator 2.6.x

NebulaGraph Operator NebulaGraph NebulaGraph Operator NebulaGraph

## 20.1.5

---

[Release](#)

---

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## 20.2

---

NebulaGraph Operator   NebulaGraph

1. NebulaGraph Operator
  2. NebulaGraph
    - Kubectl   NebulaGraph      Helm    NebulaGraph
  3. NebulaGraph
- 

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## 20.3 NebulaGraph Operator

## Helm NebulaGraph Operator

20.3.1

NebulaGraph Operator NebulaGraph NebulaGraph

20.3.2

NebulaGraph Operator NebulaGraph Operator

Kubernetes	$\geq 1.16$
Helm	$\geq 3.2.0$
CoreDNS	$\geq 1.6.0$

## Note

- |           | RBAC | DNS | Pods | DNS | NebulaGraph | DNS | x.default.svc.cluster.local |
|-----------|------|-----|------|-----|-------------|-----|-----------------------------|
| • CoreDNS |      |     |      |     |             |     |                             |

### 20.3.3

NebulaGraph Operator

- ## 1. NebulaGraph Operator chart Helm

```
helm repo add nebula-operator https://vesoft-inc.github.io/nebula-operator/charts
```

2. Helm

```
helm repo update
```

## Helm helm repo

- ### 3. NebulaGraph Operator

```
helm install nebula-operator nebula-operator/nebula-operator --namespace=<namespace_name> --version=${chart_version}
```

### 1.3.0 Operator

```
helm install nebula-operator nebula-operator/nebula-operator --namespace=nebula-operator-system --version=1.3.0
```

- |         |                            |       |   |
|---------|----------------------------|-------|---|
| •       | nebula-operator-system     |       | kubectl create namespace nebula-operator-system |
| • 1.3.0 | NebulaGraph Operator chart | Chart | helm search repo -l nebula-operator Chart       |
|         | NebulaGraph Operator chart |       | <b>Chart</b>                                    |

## Chart

```
helm show values [CHART] [flags]
```

```
[abby@master ~]$ helm show values nebula-operator/nebula-operator
image:
  nebulaOperator:
    image: vesoft/nebula-operator:v1.3.0
    imagePullPolicy: Always
  kubeRBACProxy:
    image: gcr.io/kubebuilder/kube-rbac-proxy:v0.8.0
    imagePullPolicy: Always
  kubeScheduler:
    image: k8s.gcr.io/kube-scheduler:v1.18.8
    imagePullPolicy: Always

imagePullSecrets: []
kubernetesClusterDomain: ""

controllerManager:
  create: true
  replicas: 2
  env: []
  resources:
    limits:
      cpu: 200m
      memory: 200Mi
    requests:
      cpu: 100m
      memory: 100Mi

admissionWebhook:
  create: true

scheduler:
  create: true
  schedulerName: nebula-scheduler
  replicas: 2
  env: []
  resources:
    limits:
      cpu: 200m
      memory: 200Mi
    requests:
      cpu: 100m
      memory: 100Mi
...
...
```

image.nebulaOperator.image	vesoft/nebula-operator:v1.3.0	NebulaGraph Operator	1.3.0
image.nebulaOperator.imagePullPolicy	IfNotPresent		
imagePullSecrets	-		
kubernetesClusterDomain	cluster.local		
controllerManager.create	true	controller-manager	
controllerManager.replicas	2	controller-manager	
admissionWebhook.create	true	Admission Webhook	
shceduler.create	true	Scheduler	
shceduler.schedulerName	nebula-scheduler		
shceduler.replicas	2	nebula-scheduler	

<code>helm install [NAME] [CHART] [flags]</code>	<a href="#">Chart</a>	<a href="#">Chart</a>	<a href="#">Chart</a>
NebulaGraph Operator	NebulaGraph Operator	AdmissionWebhook	AdmissionWebhook

```
helm install nebula-operator nebula-operator/nebula-operator --namespace=<nebula-operator-system> --set admissionWebhook.create=false
```

Helm      `helm install`

## NebulaGraph Operator

### 1. Helm

```
helm repo update
```

### 2. --set --values NebulaGraph Operator

- --set
- --values (-f) YAML

### Chart

NebulaGraph Operator AdmissionWebhook

AdmissionWebhook

```
helm upgrade nebula-operator nebula-operator/nebula-operator --namespace=nebula-operator-system --version=1.3.0 --set admissionWebhook.create=false
```

Helm

## NebulaGraph Operator



- 0.9.0 NebulaGraph Operator 1.x
- 1.x NebulaGraph Operator 3.x NebulaGraph

### 1. Helm

```
helm repo update
```

### 2. NebulaGraph Operator 1.3.0

```
helm upgrade nebula-operator nebula-operator/nebula-operator --namespace=<namespace_name> --version=1.3.0
```

```
helm upgrade nebula-operator nebula-operator/nebula-operator --namespace=nebula-operator-system --version=1.3.0
```

```
Release "nebula-operator" has been upgraded. Happy Helming!
NAME: nebula-operator
LAST DEPLOYED: Tue Nov 16 02:21:08 2021
NAMESPACE: nebula-operator-system
STATUS: deployed
REVISION: 3
TEST SUITE: None
NOTES:
NebulaGraph Operator installed!
```

### 3. CRD



Operator      CRD      NebulaGraph      CRD      [apps.nebula-graph.io\\_nebulaclusters.yaml](#)

#### a. NebulaGraph Operator chart

```
helm pull nebula-operator/nebula-operator --version=1.3.0
```

- --version :

#### b. tar -zxvf

```
1.3.0 chart /tmp
```

```
tar -zxvf nebula-operator-1.3.0.tgz -C /tmp
```

- -C /tmp :

### 4. nebula-operator CRD

```
kubectl apply -f crds/nebulacluster.yaml
```

```
customresourcedefinition.apiextensions.k8s.io/nebulaclusters.apps.nebula-graph.io configured
```

## NebulaGraph Operator

### 1. NebulaGraph Operator chart

```
helm uninstall nebula-operator --namespace=<nebula-operator-system>
```

## 2. CRD

```
kubectl delete crd nebulaclusters.apps.nebula-graph.io
```

## 20.3.4

NebulaGraph Operator

NebulaGraph

Kubectl

NebulaGraph

Helm

NebulaGraph

---

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## 20.4 NebulaGraph

### 20.4.1 Kubectl NebulaGraph



1.x NebulaGraph Operator    3.x NebulaGraph

- [NebulaGraph Operator](#)

nebula

NebulaGraph

1.

- apps\_v1alpha1\_nebulacluster.yaml

```

apiVersion: apps.nebula-graph.io/v1alpha1
kind: NebulaCluster
metadata:
  name: nebula
spec:
  graphd:
    resources:
      requests:
        cpu: "500m"
        memory: "500Mi"
    limits:
      cpu: "1"
      memory: "1Gi"
    replicas: 1
    image: vesoft/nebula-graphd
    version: v3.3.0
    logVolumeClaim:
      resources:
        requests:
          storage: 2Gi
      storageClassName: fast-disks
  metad:
    resources:
      requests:
        cpu: "500m"
        memory: "500Mi"
    limits:
      cpu: "1"
      memory: "1Gi"
    replicas: 1
    image: vesoft/nebula-metad
    version: v3.3.0
    logVolumeClaim:
      resources:
        requests:
          storage: 2Gi
      storageClassName: fast-disks
  dataVolumeClaim:
    resources:
      requests:
        storage: 2Gi
      storageClassName: fast-disks
  storaged:
    resources:
      requests:
        cpu: "500m"
        memory: "500Mi"
    limits:
      cpu: "1"
      memory: "1Gi"
    replicas: 1
    image: vesoft/nebula-storaged
    version: v3.3.0
    logVolumeClaim:
      resources:
        requests:
          storage: 2Gi
      storageClassName: fast-disks
  dataVolumeClaims: # Operator 1.3.0
  - resources:
      requests:
        storage: 2Gi
      storageClassName: fast-disks
  - resources:
      requests:
        storage: 2Gi
      storageClassName: fast-disks
  enableAutoBalance: true
reference:
  name: statefulsets.apps
  version: v1
schedulerName: default-scheduler
nodeSelector:
  nebula: cloud
imagePullPolicy: Always
unsatisfiableAction: ScheduleAnyway

```

metadata.name	-	NebulaGraph
spec.graphd.replicas	1	Graphd
spec.graphd.images	vesoft/nebula-graphd	Graphd
spec.graphd.version	v3.3.0	Graphd
spec.graphd.service	-	Graphd Service
spec.graphd.logVolumeClaim.storageClassName	-	Graphd
spec.metad.replicas	1	Metad
spec.metad.images	vesoft/nebula-metad	Metad
spec.metad.version	v3.3.0	Metad
spec.metad.dataVolumeClaim.storageClassName	-	Metad
spec.metad.logVolumeClaim.storageClassName	-	Metad
spec.storaged.replicas	3	Storaged
spec.storaged.images	vesoft/nebula-storaged	Storaged
spec.storaged.version	v3.3.0	Storaged
spec.storaged.dataVolumeClaims.resources.requests.storage	-	Storaged  /usr/local/nebula/ data1 /usr/local/nebula/data2
spec.storaged.dataVolumeClaims.resources.storageClassName	-	Storaged
spec.storaged.logVolumeClaim.storageClassName	-	Storaged
spec.storaged.enableAutoBalance	true	
spec.reference.name	-	
spec.schedulerName	-	
spec.imagePullPolicy	NebulaGraph Image pull policy	

## 2. NebulaGraph

```
kubectl create -f apps_vialpha1_nebulacluster.yaml
```

```
nebulacluster.apps.nebula-graph.io/nebula created
```

## 3. NebulaGraph

```
kubectl get nebulaclusters.apps.nebula-graph.io nebula
```

NAME	GRAPHD-DESIRED	GRAPHD-READY	METAD-DESIRED	METAD-READY	STORAGED-DESIRED	STORAGED-READY	AGE
nebula	1	1	1	1	3	3	86s

- NebulaGraph

Kubectl NebulaGraph

```
kubectl delete -f apps_v1alpha1_nebulacluster.yaml
```

NebulaGraph

---

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## 20.4.2 Helm NebulaGraph



1.x NebulaGraph Operator    3.x NebulaGraph

- [NebulaGraph Operator](#)

### NebulaGraph

1. NebulaGraph Operator chart    Helm    1 2 3

```
helm repo add nebula-operator https://vesoft-inc.github.io/nebula-operator/charts
```

2. Helm

```
helm repo update
```

3. Helm

```
export NEBULA_CLUSTER_NAME=nebula      # NebulaGraph
export NEBULA_CLUSTER_NAMESPACE=nebula # NebulaGraph
export STORAGE_CLASS_NAME=fast-disks   # NebulaGraph     StorageClass
```

4. NebulaGraph

```
kubectl create namespace "${NEBULA_CLUSTER_NAMESPACE}"
```

5. NebulaGraph

```
helm install "${NEBULA_CLUSTER_NAME}" nebula-operator/nebula-cluster \
--namespace="${NEBULA_CLUSTER_NAMESPACE}" \
--set nameOverride=${NEBULA_CLUSTER_NAME} \
--set nebula.storageClassName="${STORAGE_CLASS_NAME}"
```

6. NebulaGraph

```
kubectl -n "${NEBULA_CLUSTER_NAMESPACE}" get pod -l "app.kubernetes.io/cluster=${NEBULA_CLUSTER_NAME}"
```

NAME	READY	STATUS	RESTARTS	AGE
nebula-graphd-0	1/1	Running	0	5m34s
nebula-graphd-1	1/1	Running	0	5m34s
nebula-metad-0	1/1	Running	0	5m34s
nebula-metad-1	1/1	Running	0	5m34s
nebula-metad-2	1/1	Running	0	5m34s
nebula-storaged-0	1/1	Running	0	5m34s
nebula-storaged-1	1/1	Running	0	5m34s
nebula-storaged-2	1/1	Running	0	5m34s

- [NebulaGraph](#)

### Helm

```
helm uninstall "${NEBULA_CLUSTER_NAME}" --namespace="${NEBULA_CLUSTER_NAMESPACE}"
```

```
helm uninstall nebula --namespace=nebula
```

NebulaGraph

NebulaGraph Chart

nameOverride	nil	Chart
nebula.version	v3.3.0	NebulaGraph
nebula.imagePullPolicy	IfNotPresent	NebulaGraph Image pull policy
nebula.storageClassName	nil	StorageClass
nebula.schedulerName	default-scheduler	NebulaGraph
nebula.reference	{"name": "statefulsets.apps", "version": "v1"}	NebulaGraph
nebula.graphd.image	vesoft/nebula-graphd	Graphd nebula.version
nebula.graphd.replicas	2	Graphd
nebula.graphd.env	[]	Graphd
nebula.graphd.resources	{"resources": {"requests": {"cpu": "500m", "memory": "500Mi"}, "limits": {"cpu": "1", "memory": "1Gi"}}}	Graphd
nebula.graphd.logStorage	500Mi	Graphd
nebula.graphd.podLabels	{}	Graphd Pod
nebula.graphd.podAnnotations	{}	Graphd Pod
nebula.graphd.nodeSelector	{}	Graphd pod
nebula.graphd.tolerations	{}	Graphd pod
nebula.graphd.affinity	{}	Graphd pod
nebula.graphd.readinessProbe	{}	Graphd pod
nebula.graphd.sidecarContainers	{}	Graphd pod Sidecar Containers
nebula.graphd.sidecarVolumes	{}	Graphd pod Sidecar Volumes
nebula.metad.image	vesoft/nebula-metad	Metad nebula.version
nebula.metad.replicas	3	Metad
nebula.metad.env	[]	Metad
nebula.metad.resources	{"resources": {"requests": {"cpu": "500m", "memory": "500Mi"}, "limits": {"cpu": "1", "memory": "1Gi"}}}	Metad
nebula.metad.logStorage	500Mi	Metad
nebula.metad.dataStorage	1Gi	Metad
nebula.metad.license	{}	NebulaGraph License
nebula.metad.podLabels	{}	Metad Pod

nebula.metad.podAnnotations	{}	Metad	Pod
nebula.metad.nodeSelector	{}	Metad	pod
nebula.metad.tolerations	{}	Metad	pod
nebula.metad.affinity	{}	Metad	pod
nebula.metad.readinessProbe	{}	Metad	pod
nebula.metad.sidecarContainers	{}	Metad pod	Sidecar Containers
nebula.metad.sidecarVolumes	{}	Metad pod	Sidecar Volumes
nebula.storaged.image	vesoft/nebula-storaged	Storaged nebula.version	
nebula.storaged.replicas	3	Storaged	
nebula.storaged.env	[]	Storaged	
nebula.storaged.resources	{"resources": {"requests": {"cpu": "500m", "memory": "500Mi"}, "limits": {"cpu": "1", "memory": "1Gi"}}}	Storaged	
nebula.storaged.logStorage	500Mi	Storaged	
nebula.storaged.dataStorage	1Gi	Storaged	
nebula.storaged.podLabels	{}	Storaged	Pod
nebula.storaged.podAnnotations	{}	Storaged	Pod
nebula.storaged.nodeSelector	{}	Storaged	pod
nebula.storaged.tolerations	{}	Storaged	pod
nebula.storaged.affinity	{}	Storaged	pod
nebula.storaged.readinessProbe	{}	Storaged	pod
nebula.storaged.sidecarContainers	{}	Storaged pod	Sidecar Containers
nebula.storaged.sidecarVolumes	{}	Storaged Pod	Sidecar Volumes
imagePullSecrets	[]	Secret	

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## 20.5 NebulaGraph

### 20.5.1 NebulaGraph

NebulaGraph Meta Storage Graph CR NebulaGraph YAML config config  
ConfigMap



Helm NebulaGraph

config

```
Config map[string]string `json:"config,omitempty"`
```

K8s

Kubectl NebulaGraph

nebula nebula\_cluster.yaml YAML

Graph config

1. nebula

```
kubectl edit nebulaclusters.apps.nebula-graph.io nebula
```

2. YAML spec.graphd.config enable\_authorize auth\_type

```
apiVersion: apps.nebula-graph.io/v1alpha1
kind: NebulaCluster
metadata:
  name: nebula
  namespace: default
spec:
  graphd:
    resources:
      requests:
        cpu: "500m"
        memory: "500Mi"
      limits:
        cpu: "1"
        memory: "1Gi"
    replicas: 1
    image: vesoft/nebula-graphd
    version: v3.3.0
    storageClaim:
      resources:
        requests:
          storage: 2Gi
      storageClassName: fast-disks
    config: // Graph
    "enable_authorize": "true"
    "auth_type": "password"
...
```

3. kubectl apply -f nebula\_cluster.yaml

enable\_authorize auth\_type Graph ConfigMap nebula-graphd

Meta Storage Graph

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## 20.5.2 PV

NebulaGraph Operator	PV Persistent Volume	PVC Persistent Volume Claim	NebulaGraph
PV	PVC		
CR	enablePVReclaim	PV	
		NebulaGraph	enablePVReclaim true
K8s	Kubectl	NebulaGraph	

`nebula`      `nebula_cluster.yaml`    YAML      `enablePVReclaim`

1. nebula

```
kubectl edit nebulaclusters.apps.nebula-graph.io nebula
```

```
2. YAML spec enablePVReclaim true
```

```
apiVersion: apps.nebula-graph.io/v1alpha1
kind: NebulaCluster
metadata:
  name: nebula
spec:
  enablePVRClaim: true //      true
graphd:
  image: vesoft/nebula-graphd
  logVolumeClaim:
    resources:
      requests:
        storage: 2Gi
    storageClassName: fast-disks
replicas: 1
resources:
  limits:
    cpu: "1"
    memory: 1Gi
  requests:
    cpu: 500m
    memory: 500Mi
version: v3.3.0
imagePullPolicy: IfNotPresent
metadata:
  dataVolumeClaim:
    resources:
      requests:
        storage: 2Gi
    storageClassName: fast-disks
  image: vesoft/nebula-metad
logVolumeClaim:
  resources:
    requests:
      storage: 2Gi
    storageClassName: fast-disks
replicas: 1
resources:
  limits:
    cpu: "1"
    memory: 1Gi
  requests:
    cpu: 500m
    memory: 500Mi
version: v3.3.0
nodeSelector:
  nebula: cloud
reference:
  name: statefulsets.apps
  version: v1
schedulerName: default-scheduler
storageD:
  dataVolumeClaims:
    - resources:
        requests:
          storage: 2Gi
      storageClassName: fast-disks
    - resources:
        requests:
          storage: 2Gi
      storageClassName: fast-disks
  image: vesoft/nebula-storaged
logVolumeClaim:
  resources:
    requests:
      storage: 2Gi
    storageClassName: fast-disks
replicas: 3
resources:
  limits:
    cpu: "1"
    memory: 1Gi
  requests:
    cpu: 500m
    memory: 500Mi
version: v3.3.0
```

```
3. kubectl apply -f nebula cluster.yaml
```

---

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## 20.6 NebulaGraph

NebulaGraph Operator    NebulaGraph



1.x    NebulaGraph Operator    3.x    NebulaGraph

### 20.6.1

- NebulaGraph Operator    NebulaGraph
- NebulaGraph 3.0.0    3.3.x

### 20.6.2 Kubectl    NebulaGraph

NebulaGraph              Kubectl    NebulaGraph

NebulaGraph    3.0.0    YAML    apps\_v1alpha1\_nebulacluster.yaml

1.

```
kubectl get pods -l app.kubernetes.io/cluster=nebula -o jsonpath=".items[*].spec.containers[*].image" | tr -s '[:space:]' '\n' | sort |uniq -c
```

```
1 vesoft/nebula-graphd:v3.0.0
1 vesoft/nebula-metad:v3.0.0
3 vesoft/nebula-storaged:v3.0.0
```

2.    apps\_v1alpha1\_nebulacluster.yaml    version    3.0.0    v3.3.0

YAML

```
apiVersion: apps.nebula-graph.io/v1alpha1
kind: NebulaCluster
metadata:
  name: nebula
spec:
  graphd:
    resources:
      requests:
        cpu: "500m"
        memory: "500Mi"
      limits:
        cpu: "1"
        memory: "1Gi"
    replicas: 1
    image: vesoft/nebula-graphd
    version: v3.3.0 // 3.0.0 v3.3.0
    service:
      type: NodePort
      externalTrafficPolicy: Local
    logVolumeClaim:
      resources:
        requests:
          storage: 2Gi
          storageClassName: fast-disks
  metad:
    resources:
      requests:
        cpu: "500m"
        memory: "500Mi"
      limits:
        cpu: "1"
        memory: "1Gi"
    replicas: 1
```

```

image: vesoft/nebula-metad
version: v3.3.0 // 3.0.0 v3.3.0
dataVolumeClaim:
  resources:
    requests:
      storage: 2Gi
      storageClassName: fast-disks
logVolumeClaim:
  resources:
    requests:
      storage: 2Gi
      storageClassName: fast-disks
storaged:
  resources:
    requests:
      cpu: "500m"
      memory: "500Mi"
    limits:
      cpu: "1"
      memory: "1Gi"
replicas: 3
image: vesoft/nebula-storaged
version: v3.3.0 // 3.0.0 v3.3.0
dataVolumeClaims:
- resources:
  - requests:
    storage: 2Gi
    storageClassName: fast-disks
- resources:
  - requests:
    storage: 2Gi
    storageClassName: fast-disks
logVolumeClaim:
  resources:
    requests:
      storage: 2Gi
      storageClassName: fast-disks
reference:
  name: statefulsets.apps
  version: v1
schedulerName: default-scheduler
imagePullPolicy: Always

```

### 3. CR

```
kubectl apply -f apps_vialpha1_nebulacluster.yaml
```

### 4. 2 v3.3.0

```
kubectl get pods -l app.kubernetes.io/cluster=nebula -o jsonpath=".items[*].spec.containers[*].image" | tr -s '[[:space:]]' '\n' | sort |uniq -c
```

```

1 vesoft/nebula-graphd:v3.3.0
1 vesoft/nebula-metad:v3.3.0
3 vesoft/nebula-storaged:v3.3.0

```

## 20.6.3 Helm NebulaGraph

NebulaGraph

Helm NebulaGraph

### 1. Helm

```
helm repo update
```

### 2. Helm

```

export NEBULA_CLUSTER_NAME=nebula      # NebulaGraph
export NEBULA_CLUSTER_NAMESPACE=nebula  # NebulaGraph

```

### 3. NebulaGraph

v3.3.0 NebulaGraph

```
helm upgrade "${NEBULA_CLUSTER_NAME}" nebula-operator/nebula-cluster \
--namespace="${NEBULA_CLUSTER_NAMESPACE}" \
--set nameOverride=${NEBULA_CLUSTER_NAME} \
--set nebula.version=v3.3.0
```

--set nebula.version

4.

```
$ kubectl -n "${NEBULA_CLUSTER_NAMESPACE}" get pod -l "app.kubernetes.io/cluster=${NEBULA_CLUSTER_NAME}"
NAME        READY   STATUS    RESTARTS   AGE
nebula-graphd-0  1/1    Running   0          2m
nebula-graphd-1  1/1    Running   0          2m
nebula-metad-0   1/1    Running   0          2m
nebula-metad-1   1/1    Running   0          2m
nebula-metad-2   1/1    Running   0          2m
nebula-storaged-0 1/1    Running   0          2m
nebula-storaged-1 1/1    Running   0          2m
nebula-storaged-2 1/1    Running   0          2m
```

```
$ kubectl get pods -l app.kubernetes.io/cluster=nebula -o jsonpath=".items[*].spec.containers[*].image" | tr -s '[[:space:]]' '\n' | sort |uniq -c
1 vesoft/nebula-graphd:v3.3.0
1 vesoft/nebula-metad:v3.3.0
3 vesoft/nebula-storaged:v3.3.0
```

---

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## 20.7 Nebular Operator NebulaGraph

NebulaGraph Operator NebulaGraph NebulaGraph NebulaGraph NebulaGraph

### 20.7.1

NebulaGraph Operator NebulaGraph Kubectl NebulaGraph Helm NebulaGraph

### 20.7.2 NebulaGraph NebulaGraph

NebulaGraph Operator	NebulaGraph	NebulaGraph Operator	<code>&lt;cluster-name&gt;-graphd-svc</code>	ClusterIP
Service	Service IP	NebulaGraph		

#### 1. Service

```
$ kubectl get service -l app.kubernetes.io/cluster=<nebula> #<nebula>
NAME          TYPE        CLUSTER-IP      EXTERNAL-IP    PORT(S)           AGE
nebula-graphd-svc   ClusterIP   10.98.213.34  <none>        9669/TCP,19669/TCP,19670/TCP   23h
nebula-metad-headless   ClusterIP   None          <none>        9559/TCP,19559/TCP,19560/TCP   23h
nebula-storaged-headless   ClusterIP   None          <none>        9779/TCP,19779/TCP,19780/TCP,9778/TCP   23h
```

ClusterIP	Service	ClusterIP
-----------	---------	-----------

#### 2. `<cluster-name>-graphd-svc` Service IP NebulaGraph

```
kubectl run -ti --image vesoft/nebula-console:v3.3.1 --restart=Never -- <nebula_console_name> -addr <cluster_ip> -port <service_port> -u <username> -p <password>
```

```
kubectl run -ti --image vesoft/nebula-console:v3.3.1 --restart=Never -- nebula-console -addr 10.98.213.34 -port 9669 -u root -p vesoft
```

- `--image` NebulaGraph NebulaGraph Console
- `<nebula-console>` Pod
- `-addr` Graphd IP ClusterIP Service IP
- `-port` Graphd 9669
- `-u` NebulaGraph root
- `-p`

If you don't see a command prompt, try pressing enter.

```
(root@nebula) [(none)]>
```

**FQDN** `<cluster-name>-graphd.<cluster-namespace>.svc.<CLUSTER_DOMAIN>`

```
kubectl run -ti --image vesoft/nebula-console:v3.3.1 --restart=Never -- <nebula_console_name> -addr <cluster_name>-graphd-svc.default.svc.cluster.local -port <service_port> -u <username> -p <password>
```

CLUSTER\_DOMAIN cluster.local

### 20.7.3 NodePort NebulaGraph NebulaGraph

NodePort	Service	IP	Azure AWS	Service	LoadBalancer
NodePort	Service	spec.selector	app.kubernetes.io/cluster: <cluster-name>	app.kubernetes.io/component:	
graphd	Graphd	pod			

## 1. graphd-nodeport-service.yaml YAML

```
apiVersion: v1
kind: Service
metadata:
  labels:
    app.kubernetes.io/cluster: nebula
    app.kubernetes.io/component: graphd
    app.kubernetes.io/managed-by: nebula-operator
    app.kubernetes.io/name: nebula-graph
  name: nebula-graphd-svc-nodeport
  namespace: default
spec:
  externalTrafficPolicy: Local
  ports:
    - name: thrift
      port: 9669
      protocol: TCP
      targetPort: 9669
    - name: http
      port: 19669
      protocol: TCP
      targetPort: 19669
  selector:
    app.kubernetes.io/cluster: nebula
    app.kubernetes.io/component: graphd
    app.kubernetes.io/managed-by: nebula-operator
    app.kubernetes.io/name: nebula-graph
  type: NodePort
```

- NebulaGraph      9669      19669      Graph

- targetPort      Pod

## 2. Service

```
kubectl create -f graphd-nodeport-service.yaml
```

## 3. Service NebulaGraph

```
kubectl get services
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
nebula-graphd-svc	ClusterIP	10.98.213.34	<none>	9669/TCP,19669/TCP,19670/TCP	23h
nebula-graphd-svc-nodeport	NodePort	10.107.153.129	<none>	9669:32236/TCP,19669:31674/TCP,19670:31057/TCP	24h
nebula-metad-headless	ClusterIP	None	<none>	9559/TCP,19559/TCP,19560/TCP	23h
nebula-storaged-headless	ClusterIP	None	<none>	9779/TCP,19779/TCP,19780/TCP,9778/TCP	23h

NodePort	Service	32236
----------	---------	-------

## 4. IP NebulaGraph

```
kubectl run -ti --image vesoft/nebula-console:v3.3.1 --restart=Never -- <nebula_console_name> -addr <node_ip> -port <node_port> -u <username> -p <password>
```

```
kubectl run -ti --image vesoft/nebula-console:v3.3.1 --restart=Never -- nebula-console2 -addr 192.168.8.24 -port 32236 -u root -p vesoft
If you don't see a command prompt, try pressing enter.
```

```
(root@nebula) [(none)]>
```

- --image      NebulaGraph      NebulaGraph Console
- <nebula-console>      Pod      nebula-console2
- -addr      NebulaGraph      IP      192.168.8.24
- -port      NebulaGraph      32236
- -u      NebulaGraph      root
- -p

## 20.7.4 Ingress NebulaGraph

Nginx Ingress    Kubernetes Ingress  
Nginx            7

Nginx Ingress Watch Kubernetes Ingress Ingress Nginx

## HostNetwork DaemonSet

## Nginx Ingress                    NebulaGraph

HostNetwork Nginx Ingress Pod  
DaemonSet

## Nginx Ingress

Ingress ConfigMap	TCP	UDP	nginx-ingress-controller	--tcp-services-configmap	--udp-services-configmap	ConfigMap
	<	/	>:<	>		

## tcp-services ConfigMap

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: tcp-services
  namespace: nginx-ingress
data:
  # update
  9769: "default/nebula-graphd-svc:9669"
```

1. `nginx-ingress-daemonset-hostnetwork.yaml`

`nginx-ingress-daemonset-hostnetwork.yaml` YAML



YAML

nginx-ingress

`kubectl create namesapce nginx-ingress`

2. worker2 IP 192.168.8.160

YAML

nginx-ingress-controller DaemonSet

`kubectl label node worker2 nginx-ingress=true`

3. Nginx Ingress

`kubectl create -f nginx-ingress-daemonset-hostnetwork.yaml`

```
configmap/nginx-ingress-controller created
configmap/tcp-services created
serviceaccount/nginx-ingress created
serviceaccount/nginx-ingress-backend created
clusterrole.rbac.authorization.k8s.io/nginx-ingress created
clusterrolebinding.rbac.authorization.k8s.io/nginx-ingress created
role.rbac.authorization.k8s.io/nginx-ingress created
rolebinding.rbac.authorization.k8s.io/nginx-ingress created
service/nginx-ingress-controller-metrics created
service/nginx-ingress-default-backend created
service/nginx-ingress-proxy-tcp created
daemonset.apps/nginx-ingress-controller created
```

Nginx Ingress	Nginx Ingress	hostNetwork	Nginx Ingress	IP 192.168.8.160	9769
NebulaGraph					

4. NebulaGraph Console IP 192.168.8.160 NebulaGraph

`kubectl run -ti --image vesoft/nebula-console:v3.3.1 --restart=Never -- <nebula_console_name> -addr <host_ip> -port <external_port> -u <username> -p <password>`

`kubectl run -ti --image vesoft/nebula-console:v3.3.1 --restart=Never -- nebula-console -addr 192.168.8.160 -port 9769 -u root -p vesoft`

- `--image` NebulaGraph NebulaGraph Console
- `<nebula-console>` Pod nebula-console
- `-addr` Nginx Ingress IP 192.168.8.160
- `-port` 9769
- `-u` NebulaGraph root
- `-p`

If you don't see a command prompt, try pressing enter.

(root@nebula) [(none)]>

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## 20.8

NebulaGraph Operator	NebulaGraph	NebulaGraph
NebulaGraph	1 Storage Pod	Nebular Operator

### 20.8.1

NebulaGraph Operator

### 20.8.2

1. NebulaGraph                   Kubectl   NebulaGraph                   Helm   NebulaGraph
2. Pods      Running    <cluster\_name>-storaged-2 Pod

```
kubectl delete pod <cluster-name>-storaged-2 --now
```

<cluster\_name> NebulaGraph

3. NebulaGraph Operator                    <cluster-name>-storaged-2 Pod

```
kubectl get pods   <cluster-name>-storaged-2 Pod
```

```
...
nebula-cluster-storaged-1    1/1    Running        0        5d23h
nebula-cluster-storaged-2    0/1    ContainerCreating   0        1s
...
```

```
...
nebula-cluster-storaged-1    1/1    Running        0        5d23h
nebula-cluster-storaged-2    1/1    Running        0        4m2s
...
```

<cluster-name>-storaged-2    ContainerCreating   Running

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## 20.9

---

### 20.9.1 NebulaGraph Operator v1.x NebulaGraph

v1.x NebulaGraph DNS NebulaGraph Operator DNS

### 20.9.2

Pod NebulaGraph Operator

### 20.9.3

### 20.9.4 Operator replica NebulaGraph replica

Operator replica K8s Pod replica NebulaGraph

---

.....

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# 21.

---

## 21.1

---

### Note

NebulaGraph Analytics    NebulaGraph Algorithm

### Note

	PageRank	DegreeWithTime	SSSP	APSP	LPA	HANP	Louvain	weight
--	----------	----------------	------	------	-----	------	---------	--------

- HDFS    CSV    `src dst`    `weight`
- NebulaGraph    `src dst`    `weight`

### 21.1.1

#### PageRank

PageRank	PageRank	PageRank	PageRank
----------	----------	----------	----------

- NebulaGraph Analytics

- 

ITERATIONS	10	
IS_DIRECTED	true	false
EPS	0.0001	
DAMPING	0.85	

- 

VID	vid_type	ID
VALUE	double	PageRank

#### KCore

KCore	K
-------	---

- NebulaGraph Analytics

- 

TYPE	vertex	vertex	subgraph	vertex	subgraph
KMIN	1		K	TYPE = subgraph	
KMAX	1000000		K	TYPE = subgraph	

- TYPE=vertex

VID	vid_type	ID
VALUE	int	

- TYPE=subgraph

VID	vid_type	ID
VALUE	VID	

## DegreeCentrality NStepDegree

DegreeCentrality



NebulaGraph Analytics

- NebulaGraph Analytics

- 

STEP	3	-1
BITS	6	hyperloglog
TYPE	both	in out both

- TYPE=both

VID	vid_type	ID
BOTH_DEGREE	int	
OUT_DEGREE	int	
IN_DEGREE	int	

- TYPE=out

VID	vid_type	ID
OUT_DEGREE	int	

- TYPE=in

VID	vid_type	ID
IN_DEGREE	int	

## DegreeWithTime

DegreeWithTime



NebulaGraph Analytics

- 

TYPE	both	in out both
BEGIN_TIME	-	yyyy-MM-dd HH:mm:ss.SSS
END_TIME	-	yyyy-MM-dd HH:mm:ss.SSS

- TYPE=both

VID	vid_type	ID
BOTH_DEGREE	int	
OUT_DEGREE	int	
IN_DEGREE	int	

- TYPE=out

VID	vid_type	ID
OUT_DEGREE	int	

- TYPE=in

VID	vid_type	ID
IN_DEGREE	int	

## BetweennessCentrality

BetweennessCentrality

- NebulaGraph Analytics

- 

ITERATIONS	10	
IS_DIRECTED	true	false
CHOSEN	-1	ID -1
CONSTANT	2	

- 

VID	vid_type	ID
VALUE	double	

## ClosenessCentrality

ClosenessCentrality

- NebulaGraph Analytics

- 

IS_DIRECTED	true	false
NUM_SAMPLES	10	

- 

VID	vid_type	ID
VALUE	double	

## 21.1.2

### APSP

APSP



NebulaGraph Analytics

- 

VID1	vid_type	ID
VID2	vid_type	ID
DISTANCE	double	VID1 VID2

**SSSP**

SSSP

- NebulaGraph Analytics

- 

ROOT	-	VID
•		
VID	vid_type	ID
DISTANCE	double	ROOT VID

**BFS**

BFS

- NebulaGraph Analytics

- 

IS_DIRECTED	true	false
ROOT	-	VID
•		
ROOT	vid_type	ID
VISITED	int	ROOT

**ShortestPath**

ShortestPath

- NebulaGraph Analytics

- 

src	"100"
dst	"200"
•	
•	

VALUE	list	src, vid1,vid2...dst
-------	------	----------------------

**21.1.3****LPA**

LPA

- NebulaGraph Analytics

- 

ITERATIONS	10	
IS_DIRECTED	true	false
IS_CALC_MODULARITY	false	
•		
•		

VID	vid_type	ID
LABEL	VID	ID

**HANP**

HANP Hop Attenuation &amp; Node Preference LPA

- NebulaGraph Analytics

- 

ITERATIONS	10	
IS_DIRECTED	true	false
PREFERENCE	1.0	m>0 m<0 m=0
HOP_ATT	0.1	0 ~ 1

- 

VID	vid_type	ID
LABEL	VID	ID

### ConnectedComponent

ConnectedComponent	strongly connected component	weakly
connected component		



NebulaGraph Analytics

- NebulaGraph Analytics

- 

IS_DIRECTED	true	false
IS_CALC_MODULARITY	false	

- 

VID	vid_type	ID
LABEL	VID	ID

### Louvain

Louvain

- NebulaGraph Analytics

- 

IS_DIRECTED	true	false
OUTER_ITERATION	20	
INNER_ITERATION	10	
IS_CALC_MODULARITY	false	

- 

VID	vid_type	ID
LABEL	VID	ID

## InfoMap

InfoMap PageRank



NebulaGraph Analytics

- NebulaGraph Analytics

- 

pagerank_iter	10	PageRank
pagerank_threshold	0.0001	PageRank
teleport_prob	0.15	
inner_iter	3	
outer_iter	2	
comm_info_num	100	

- 

VID	vid_type	ID
LABEL	VID	ID

## 21.1.4

### TriangleCount

TriangleCount

- NebulaGraph Analytics

- 

OPT	3	1	2	3
REMOVED_DUPLICATION_EDGE	true			
REMOVED_SELF_EDGE	true			

- OPT=1

COUNT	int
-------	-----

- OPT=2

VID	vid_type	ID
COUNT	int	

- OPT=3

VID1	VID	A	ID
VID2	VID	B	ID
VID3	VID	C	ID

## Node2Vec

Node2Vec	DeepWalk	SGD	D
	DeepWalk		

- NebulaGraph Analytics

- 

is_weighted	false
p	1.0
q	0.5
epoch	1
step	10
rate	0.02

-

**Tree\_stat**

Tree\_stat

**Note**

NebulaGraph Analytics

- NebulaGraph Analytics

- 

root	100	VID
stat	width, depth	

- 

VALUE	list	stat
-------	------	------

**HyperANF**

HyperANF

**Note**

NebulaGraph Analytics

- NebulaGraph Analytics

- 

bits	6	HyperLogLog	bit	6~16
------	---	-------------	-----	------

- 

VALUE	double
-------	--------

**21.1.5****ClusteringCoefficient**

ClusteringCoefficient

- NebulaGraph Analytics

- 

TYPE	local	local	global
REMOVED_DUPLICATION_EDGE	true		
REMOVED_SELF_EDGE	true		

- TYPE=local

VID	vid_type	ID
VALUE	double	

- TYPE=global

VID	vid_type	ID
VALUE	double	

## 21.1.6

### Jaccard

Jaccard

- NebulaGraph Analytics

- 

IDS1	-	VID	A	VID	,
IDS2	-	VID	B	VID	,
REMOVED_SELF_EDGE	true				

- 

VID1	vid_type	ID
VID2	vid_type	ID
VALUE	double	VID1 VID2

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## 21.2 NebulaGraph Algorithm

---

<b>NebulaGraph Algorithm</b>	Algorithm	GraphX	Spark	Spark	NebulaGraph
lib	DataFrame				

### 21.2.1

---

NebulaGraph Algorithm	NebulaGraph
-----------------------	-------------

<b>NebulaGraph</b>	<b>NebulaGraph Algorithm</b>
nightly	3.0-SNAPSHOT
3.0.0 ~ 3.3.x	3.0.0
2.6.x	2.6.x
2.5.0 2.5.1	2.5.0
2.0.0 2.0.1	2.1.0

### 21.2.2

---

Algorithm

- NebulaGraph [NebulaGraph](#)
- Spark 2.4.x
- Scala 2.11
- Github Algorithm [Maven](#)

### 21.2.3

---

- ID ID INT String
- String SparkSQL dense\_rank String Long
- DataFrame

## 21.2.4

### NebulaGraph Algorithm

PageRank		pagerank	double/string
Louvain		louvain	int/string
KCore	K	kcore	int/string
LabelPropagation		lpa	int/string
Hanp		hanp	int/string
ConnectedComponent		cc	int/string
StronglyConnectedComponent		scc	int/string
ShortestPath		shortestpath	string
TriangleCount		trianglecount	int/string
GraphTriangleCount		count	int
BetweennessCentrality		betweenness	double/string
ClosenessCentrality		closeness	double/string
DegreeStatic		degree,inDegree,outDegree	int/string
ClusteringCoefficient		clustercoefficient	double/string
Jaccard		jaccard	string
BFS		bfs	string
Node2Vec	-	node2vec	string

### Note

NebulaGraph Tag

## 21.2.5

### NebulaGraph Algorithm

1. NebulaGraph Spark Connector   NebulaGraph                          DataFrame
2. DataFrame      GraphX
3. GraphX         PageRank    Louvain

### Scala

## 21.2.6 NebulaGraph Algorithm

1. nebula-algorithm

```
$ git clone -b v3.0.0 https://github.com/vesoft-inc/nebula-algorithm.git
```

## 2. nebula-algorithm

```
$ cd nebula-algorithm
```

## 3.

```
$ mvn clean package -Dpgp.skip -Dmaven.javadoc.skip=true -Dmaven.test.skip=true
```

nebula-algorithm/target                    nebula-algorithm-3.x.x.jar

## Maven

### 21.2.7

lib 10

## 1. pom.xml

```
<dependency>
  <groupId>com.vesoft</groupId>
  <artifactId>nebula-algorithm</artifactId>
  <version>3.0.0</version>
</dependency>
```

## 2. PageRank

### Note

DataFrame                                  NebulaGraph      Rank

```
val prConfig = new PRConfig(5, 1.0)
val louvainResult = PageRankAlgo.apply(spark, data, prConfig, false)
```

ID	String	PageRank	ID	String	Long	Long	ID	String
----	--------	----------	----	--------	------	------	----	--------

## 1.

```
{
  # Spark
  spark: {
    app: {
      name: LPA
      # Spark
      partitionNum:100
    }
    master:local
  }

  data: {
    # nebula csv json
    source: nebula
    # nebula csv json
    sink: nebula
    #
    hasWeight: false
  }

  # NebulaGraph
  nebula: {
    # NebulaGraph
    nebula.read
    read: {
      # Meta IP , "ip1:port1,ip2:port2"
    }
  }
}
```

```

#      docker-compose          docker-compose
#      `docker-compose ps`      metaAddress: "192.168.*.10:9559"
# NebulaGraph
space:basketballplayer
# NebulaGraph Edge type,    labels
labels: ["serve"]
# NebulaGraph   Edge type
weightCols: ["start_year"]           Edge type
}

#             NebulaGraph  nebula.write
write:{

# Graph      IP                  ,          "ip1:port1,ip2:port2"
# docker-compose          docker-compose
# `docker-compose ps`      graphAddress: "192.168.*.11:9669"
# Meta       IP                  ,          "ip1:port1,ip2:port2"
# docker-compose          docker-compose
# `docker-compose ps`      metaAddress: "192.168.*.12:9559"
user:root
pswd:nebula
#                      Tag
# NebulaGraph Tag
space:nb
# NebulaGraph Tag      Tag Tag
# PageRank pagerank
# Louvain louvain
# ConnectedComponent cc
# StronglyConnectedComponent scc
# LabelPropagation lpa
# ShortestPath shortestpath
# DegreeStatic degree inDegree outDegree
# KCore kcore
# TriangleCount trianglecount
# BetweennessCentrality betweenness
tag:pagerank
}

}

local: {
#             csv      json      local.read
read:{

filePath: "hdfs://127.0.0.1:9000/edge/work_for.csv"
#      CSV      [ _c0, _c1, _c2, ..., _cn]      json
#      ID
srcId:"_c0"
#      ID
dstId:"_c1"
#
weight: "_c2"
#      CSV
header: false
#      CSV
delimiter:","
}

}

#             csv      text      local.write
write:{

resultPath:/tmp/
}

algorithm: {

# pagerank louvain connectedcomponent labelpropagation shortestpaths
# degreestatic kcore stronglyconnectedcomponent trianglecount
# betweenness graphtriangleCount
executeAlgo: pagerank

# PageRank
pagerank: {
    maxIter: 10
    resetProb: 0.15
}

# Louvain
louvain: {
    maxIter: 20
    internalIter: 10
    tol: 0.5
}

# ...
}
}

```

 Note

sink: nebula      NebulaGraph      TAG

2.

```
`${SPARK_HOME}/bin/spark-submit --master <mode> --class com.vesoft.nebula.algorithm.Main <nebula-algorithm-3.0.0.jar_path> -p <application.conf_path>
```

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.algorithm.Main /root/nebula-algorithm/target/nebula-algorithm-3.0-SNAPSHOT.jar -p /root/nebula-algorithm/src/main/resources/application.conf
```

## 21.2.8

- [—NebulaGraph Algorithm](#) 2 36

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## 21.3 NebulaGraph Analytics

NebulaGraph Analytics

NebulaGraph

### 21.3.1

- Nebula Analytics
- [Nebula Analytics License](#)
- 2.2.x [HDFS](#)
- 1.8 JDK

### 21.3.2

NebulaGraph CSV	HDFS	CSV	CSV	NebulaGraph Analytics	NebulaGraph	HDFS	CSV
--------------------	------	-----	-----	-----------------------	-------------	------	-----

### 21.3.3

NebulaGraph

### 21.3.4

NebulaGraph Analytics NebulaGraph

<b>NebulaGraph</b>	<b>NebulaGraph Analytics</b>
3.3.0	3.3.0
3.1.0 ~ 3.2.x	3.2.0
3.0.x	1.0.x
2.6.x	0.9.0

### 21.3.5

#### NebulaGraph Analytics

APSP

SSSP

BFS

ShortestPath

PageRank

KCore

K

DegreeCentrality

DegreeWithTime

BetweennessCentrality

ClosenessCentrality

TriangleCount

Node2Vec

Tree\_stat

HyperANF

LPA

HANP

WCC

LOUVAIN

InfoMap

Clustering Coefficient

Jaccard

### 21.3.6 NebulaGraph Analytics

#### 1. NebulaGraph Analytics

```
$ sudo rpm -ivh <analytics_package_name> --prefix <install_path>
$ sudo chown <user>:<user> -R <install path>
```

```
$ sudo rpm -ivh nebula-analytics-3.3.0-centos.x86_64.rpm --prefix=/home/vesoft/nebula-analytics
$ sudo chown vesoft:vesoft -R /home/vesoft/nebula-analytics
```

#### 2. set\_env.sh      nebula-analytics/scripts/set\_env.sh      Hadoop      JDK

```
export HADOOP_HOME=<hadoop_path>
export JAVA_HOME=<java_path>
```

#### 3. License      NebulaGraph Analytics      scripts

21.3.7

---

## 1. NebulaGraph Analytics

scripts

```
$ cd scripts
```

2.

- NebulaGraph

a. `nebula.conf` NebulaGraph

```
#      NebulaGraph
--retry=3
#
--space=baskeyballplayer

#      NebulaGraph
#
--edges=LIKES
#           _rank
##--edge_data_fields
#
--read_batch_size=10000

#      NebulaGraph
# NebulaGraph graphd
--graph_server_addr=192.168.8.100:9669
# NebulaGraph
--user=root
# NebulaGraph
--password=nebula
# NebulaGraph : insert update
--mode=insert
# NebulaGraph Tag
--tag=pageRank
# NebulaGraph Tag
--prop=pr
# NebulaGraph Tag
--type=double
#
--write_batch_size=1000
#
--err_file=/home/xxx/analytics/err.txt

#
#
--graphd_timeout=60000
--metad_timeout=60000
--storaged_timeout=60000
```

b. `run_pagerank.sh`

```
#          1     NUMA     node
WNUM=3
#
WCORES=4
#
#      nebula.conf      NebulaGraph
INPUT=${INPUT:="nebula:$PROJECT/scripts/nebula.conf"}
#      HDFS      CSV
# #INPUT=${INPUT:="$PROJECT/data/graph/v100_e2150_ua_c3.csv"}

#
#      NebulaGraph      NebulaGraph      nebula.conf
OUTPUT=${OUTPUT:="nebula:$PROJECT/scripts/nebula.conf"}
#      HDFS      CSV
# OUTPUT=${OUTPUT:='hdfs://192.168.8.100:9000/_test/output'}

# true      false
IS_DIRECTED=${IS_DIRECTED:=true}
#      ID
NEED_ENCODE=${NEED_ENCODE:=true}
#      ID      string int32 int64
VTYPE=${VTYPE:=int32}
#      distributed      ID      single      ID
ENCODER=${ENCODER:="distributed"}
# PageRank
EPS=${EPS:=0.0001}
DAMPING=${DAMPING:=0.85}
#
ITERATIONS=${ITERATIONS:=100}
```

- HDFS CSV

```
run_pagerank.sh
```

```
#          1     NUMA     node
WNUM=3
#
WCORES=4
#
#      nebula.conf    NebulaGraph
# INPUT=${INPUT:="nebula:$PROJECT/scripts/nebula.conf"}
#      HDFS    CSV
INPUT=${INPUT:="$PROJECT/data/graph/v100_e2150_ua_c3.csv"}

#
#      NebulaGraph      NebulaGraph      nebula.conf
# OUTPUT=${OUTPUT:="nebula:$PROJECT/scripts/nebula.conf"}
#      HDFS    CSV
OUTPUT=${OUTPUT:='hdfs://192.168.8.100:9000/_test/output'}

# true    false
IS_DIRECTED=${IS_DIRECTED:=true}
#      ID
NEED_ENCODE=${NEED_ENCODE:=true}
#      ID      string int32 int64
VTYPE=${VTYPE:=int32}
#      distributed   ID      single      ID
ENCODER=${ENCODER:="distributed"}
# PageRank
EPS=${EPS:=0.0001}
DAMPING=${DAMPING:=0.85}
#
ITERATIONS=${ITERATIONS:=100}
```

3. cluster NebulaGraph Analytics

```
# NebulaGraph Analytics      IP  :
192.168.8.200:1
192.168.8.201:1
192.168.8.202:1
```

4.

```
./run_pagerank.sh
```

5.

- NebulaGraph nebula.conf
- HDFS CSV CSV OUTPUT .gz

---

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## 21.4 NebulaGraph Analytics License

License License	NebulaGraph Analytics	License	NebulaGraph Analytics	NebulaGraph Analytics
--------------------	-----------------------	---------	-----------------------	-----------------------

### 21.4.1

- License NebulaGraph Analytics
- License License
- License
- License 14
- 30
- 14
- 14

### 21.4.2

NebulaGraph Analytics License



NebulaGraph Analytics

30

License

### 21.4.3 NebulaGraph Analytics License

NebulaGraph Analytics License nebula.license

```
-----License Content Start-----
{
  "vendor": "vesoft",
  "organization": "vesoft",
  "issuedate": "2022-11-01T16:00:00.000Z",
  "expirationDate": "2023-11-01T15:59:59.000Z",
  "product": "nebula_graph_analytics",
  "version": ">3.0.0",
  "licenseType": "enterprise",
  "gracePeriod": 14,
  "analytics": {
    "nodes": 3,
    "vcpu": 3
  }
}
-----License Content End-----

-----License Key Start-----
Rrjip5c+xxxxxxxxxxxxxk5Yg==
-----License Key End-----
```

## License

vendor					
organization					
issuedDate	License				
expirationDate	License				
product	NebulaGraph Analytics		nebula_graph_analytics		
version					
licenseType	License	enterprise	small_business	pro	individual
gracePeriod		License		0	
nodes	Analytics				
vcpu	Analytics				
clusterCode		License			

### 21.4.4

NebulaGraph Analytics License [NebulaGraph Analytics](#)

### 21.4.5

NebulaGraph Analytics License

1. NebulaGraph Analytics License `nebula.license`
2. NebulaGraph Analytics `/usr/local/nebula-analytics/scripts/` License License

#### Note

NebulaGraph Analytics License Analytics License

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## 21.5 NebulaGraph Explorer Workflow

NebulaGraph Explorer    Workflow

 **Enterpriseonly**

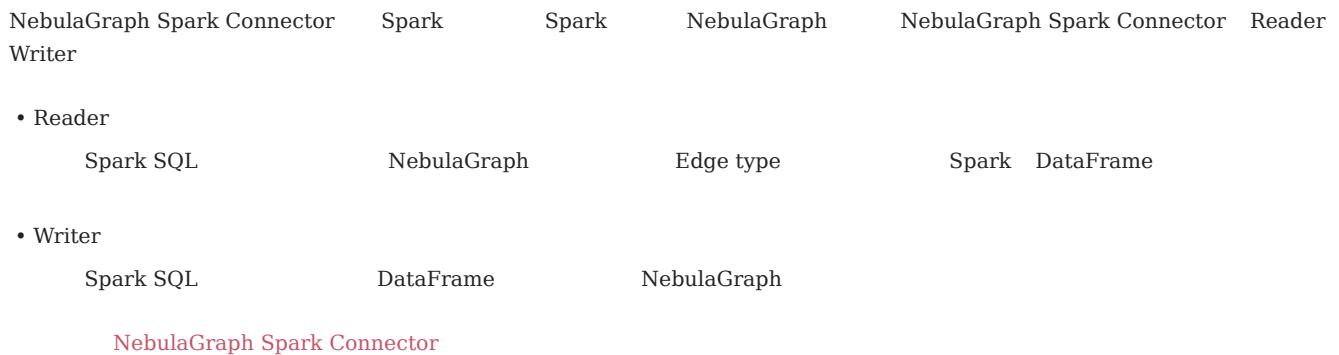
Nebula Explorer

---

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## 22. NebulaGraph Spark Connector

---



### 22.1

---

NebulaGraph Spark Connector

- NebulaGraph
- NebulaGraph
- NebulaGraph
- NebulaGraph Algorithm

### 22.2

---

NebulaGraph Spark Connector 3.3.0

- ID ID ID
- Reader
- Reader NebulaGraph Graphx VertexRDD EdgeRDD Long ID
- SparkSQL DataSourceV2 NebulaGraph
- insert update delete insert update delete
- NebulaGraph SSL

### 22.3

---

[Release notes](#)

## 22.4 NebulaGraph Spark Connector

### 22.4.1



Spark 2.4.x 2.2.x

#### 1. nebula-spark-connector

```
$ git clone -b release-3.3 https://github.com/vesoft-inc/nebula-spark-connector.git
```

#### 2. Spark

- Spark 2.4.x

##### a. nebula-spark-connector

```
cd nebula-spark-connector/nebula-spark-connector
```

##### b.

```
$ mvn clean package -Dmaven.test.skip=true -Dgpg.skip -Dmaven.javadoc.skip=true
```

- Spark 2.2.x

##### a. nebula-spark-connector\_2.2

```
cd nebula-spark-connector/nebula-spark-connector_2.2
```

##### b.

```
$ mvn clean package -Dmaven.test.skip=true -Dgpg.skip -Dmaven.javadoc.skip=true
```

target nebula-spark-connector-3.3.0-SNAPSHOT.jar

### 22.4.2 Maven

## 22.5

NebulaGraph Spark Connector NebulaGraph

```
# NebulaGraph
spark.read.nebula().loadVerticesToDF()
spark.read.nebula().loadEdgesToDF()

# dataframe NebulaGraph
dataframe.write.nebula().writeVertices()
dataframe.write.nebula().writeEdges()

nebula()
```

### 22.5.1 NebulaGraph

```
val config = NebulaConnectionConfig
  .builder()
  .withMetaAddress("127.0.0.1:9559")
  .withConenctionRetry(2)
  .withExecuteRetry(2)
  .withTimeout(6000)
```

```

.build()

val nebulaReadVertexConfig: ReadNebulaConfig = ReadNebulaConfig
    .builder()
    .withSpace("test")
    .withLabel("person")
    .withNoColumn(false)
    .withReturnCols(List("birthday"))
    .withLimit(10)
    .withPartitionNum(10)
    .build()
val vertex = spark.read.nebula(config, nebulaReadVertexConfig).loadVerticesToDF()

val nebulaReadEdgeConfig: ReadNebulaConfig = ReadNebulaConfig
    .builder()
    .withSpace("test")
    .withLabel("knows")
    .withNoColumn(false)
    .withReturnCols(List("degree"))
    .withLimit(10)
    .withPartitionNum(10)
    .build()
val edge = spark.read.nebula(config, nebulaReadEdgeConfig).loadEdgesToDF()

```

- `NebulaConnectionConfig`    `NebulaGraph`

<code>withMetaAddress</code>	<code>Meta</code>	<code>,</code>	<code>ip1:port1,ip2:port2,...</code>
	<code>withGraphAddress</code>		
<code>withConnectionRetry</code>	<code>NebulaGraph Java Client</code>	<code>NebulaGraph</code>	<code>1</code>
<code>withExecuteRetry</code>	<code>NebulaGraph Java Client</code>		<code>1</code>
<code>withTimeout</code>	<code>NebulaGraph Java Client</code>	<code>6000</code>	<code>ms</code>

- `ReadNebulaConfig`    `NebulaGraph`

<code>withSpace</code>	<code>NebulaGraph</code>			
<code>withLabel</code>	<code>NebulaGraph</code>	<code>Tag</code>	<code>Edge type</code>	
<code>withNoColumn</code>		<code>false</code>	<code>true</code>	<code>withReturnCols</code>
<code>withReturnCols</code>			<code>List(property1,property2,...)</code>	<code>List()</code>
<code>withLimit</code>		<code>NebulaGraph Java Storage Client</code>		<code>1000</code>
<code>withPartitionNum</code>	<code>NebulaGraph</code>	<code>Spark</code>	<code>100</code>	<code>partition_num</code>

## 22.5.2 NebulaGraph



`DataFrame`    `NebulaGraph`

```

val config = NebulaConnectionConfig
    .builder()
    .withMetaAddress("127.0.0.1:9559")
    .withGraphAddress("127.0.0.1:9669")
    .withConenctionRetry(2)
    .build()

val nebulaWriteVertexConfig: WriteNebulaVertexConfig = WriteNebulaVertexConfig
    .builder()
    .withSpace("test")
    .withTag("person")
    .withVidField("id")
    .withVidPolicy("hash")
    .withVidAsProp(true)
    .withUser("root")
    .withPasswd("nebula")
    .withBatch(512)

```

```
.build()
df.write.nebula(config, nebulaWriteVertexConfig).writeVertices()

val nebulaWriteEdgeConfig: WriteNebulaEdgeConfig = WriteNebulaEdgeConfig
  .builder()
  .withSpace("test")
  .withEdge("friend")
  .withSrcIdField("src")
  .withSrcPolicy(null)
  .withDstIdField("dst")
  .withDstPolicy(null)
  .withRankField("degree")
  .withSrcAsProperty(true)
  .withDstAsProperty(true)
  .withRankAsProperty(true)
  .withUser("root")
  .withPasswd("nebula")
  .withBatch(512)
  .build()
df.write.nebula(config, nebulaWriteEdgeConfig).writeEdges()
```

insert      withWriteMode      update    delete

```
val config = NebulaConnectionConfig
  .builder()
  .withMetaAddress("127.0.0.1:9559")
  .withGraphAddress("127.0.0.1:9669")
  .build()

val nebulaWriteVertexConfig = WriteNebulaVertexConfig
  .builder()
  .withSpace("test")
  .withTag("person")
  .withVidField("id")
  .withVidAsProp(true)
  .withBatch(512)
  .withWriteMode(WriteMode.UPDATE)
```

```
.build()
df.write.nebula(config, nebulaWriteVertexConfig).writeVertices()
```

- `NebulaConnectionConfig`    `NebulaGraph`

<code>withMetaAddress</code>	<code>Meta</code>	,	<code>ip1:port1,ip2:port2,...</code>
<code>withGraphAddress</code>	<code>Graph</code>	,	<code>ip1:port1,ip2:port2,...</code>
<code>withConnectionRetry</code>	<code>NebulaGraph Java Client</code>	<code>NebulaGraph</code>	<code>1</code>

- `WriteNebulaVertexConfig`

<code>withSpace</code>	<code>NebulaGraph</code>						
<code>withTag</code>	<code>Tag</code>						
<code>withVidField</code>	<code>DataFrame</code>	<code>ID</code>					
<code>withVidPolicy</code>	<code>ID</code>	<code>NebulaGraph</code>	<code>HASH</code>				
<code>withVidAsProp</code>	<code>DataFrame</code>	<code>ID</code>		<code>false</code>	<code>true</code>	<code>Tag</code>	<code>VidField</code>
<code>withUser</code>	<code>NebulaGraph</code>						
<code>withPasswd</code>	<code>NebulaGraph</code>						
<code>withBatch</code>		<code>512</code>	<code>withWriteMode</code>	<code>update</code>		<code>512</code>	
<code>withWriteMode</code>			<code>insert</code>	<code>update</code>	<code>delete</code>		<code>insert</code>
<code>withDeleteEdge</code>			<code>false</code>	<code>withWriteMode</code>	<code>delete</code>		

- `WriteNebulaEdgeConfig`

<code>withSpace</code>	<code>NebulaGraph</code>				
<code>withEdge</code>	<code>Edge type</code>				
<code>withSrcIdField</code>	<code>DataFrame</code>				
<code>withSrcPolicy</code>		<code>NebulaGraph</code>	<code>HASH</code>		
<code>withDstIdField</code>	<code>DataFrame</code>				
<code>withDstPolicy</code>		<code>NebulaGraph</code>	<code>HASH</code>		
<code>withRankField</code>	<code>DataFrame</code>	<code>rank</code>	<code>rank</code>		
<code>withSrcAsProperty</code>	<code>DataFrame</code> <code>SrcIdField</code>		<code>false</code>	<code>true</code>	<code>Edge type</code>
<code>withDstAsProperty</code>	<code>DataFrame</code> <code>DstIdField</code>		<code>false</code>	<code>true</code>	<code>Edge type</code>
<code>withRankAsProperty</code>	<code>DataFrame</code> <code>RankField</code>	<code>rank</code>		<code>false</code>	<code>true</code>
<code>withUser</code>	<code>NebulaGraph</code>				
<code>withPasswd</code>	<code>NebulaGraph</code>				
<code>withBatch</code>		<code>512</code>	<code>withWriteMode</code>	<code>update</code>	<code>512</code>
<code>withWriteMode</code>		<code>insert</code>	<code>update</code>	<code>delete</code>	<code>insert</code>

## 22.5.3

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## 23. NebulaGraph Flink Connector

---

NebulaGraph Flink Connector

Flink

NebulaGraph

NebulaGraph

NebulaGraph

[NebulaGraph Flink Connector](#)

### 23.1

---

NebulaGraph Flink Connector

- NebulaGraph
- NebulaGraph
- NebulaGraph

### 23.2

---

[Release notes](#)

---

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## 24. NebulaGraph Bench

---

NebulaGraph Bench      LDBC      NebulaGraph

### 24.1

---

- NebulaGraph
- NebulaGraph

### 24.2

---

Release

NebulaGraph Bench

---

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## 25.

---

### 25.1 Release Note

#### 25.1.1 NebulaGraph 3.3.0 release notes

- k-hop #4560 #4736 #4566 #4582 #4558 #4556 #4555 #4516 #4531 #4522 #4754 #4762
- GO JOIN #4599 #4750
- GET SUBGRAPH #4357
- GetNeighbors #4671
- FIND SHORTEST PATH #4672
- #4626
- #4498
- job manager #4446 #4442 #4444 #4460 #4500 #4633 #4654 #4663 #4722 #4742
- flag TOSS enable\_toss BALANCE DATA enable\_data\_balance #4728
- #4550
- JSON\_EXTRACT #4743

- `#4724`
- `MATCH #4780`
- `#4706`
- `OPTIONAL MATCH OPTIONAL MATCH WHERE MATCH #4670`
- `LOOKUP #4664`
- `LOOKUP YIELD DISTINCT #4651`
- `ColumnExpression #4413`
- `GO id($$) #4768`
- `MATCH IN #4748`
- `MATCH #4771`
- `MATCH pattern #4778`
- `Tag Edge Tag Edge #4616`
  - `#4524`
- `datetime #4448`
- `enable_breakpad #4623`
- `metad #4610`
  - `#4409`
- `ENABLE_CCACHE #4648`
- `#4628`
- `COUNT(DISTINCT *) #4553`
- `Tag #4629`

---

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## 25.1.2 NebulaGraph Studio

### v3.5.0

- 
- Schema Schema
- 
- demo
- //
- 
- 
- 
- 
- 
- Int8/16/32 fixed\_string

---

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## 25.1.3 NebulaGraph Dashboard

---

### v3.2.0

- - 
  - Storage
  - 
  -
- 

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## 25.1.4 NebulaGraph Dashboard

---

### v3.2.4

- 
- NebulaGraph 3.1.3 3.4

### v3.2.3

- 
- NebulaGraph 3.3.0

### v3.2.2

- 
- 
- 
- RPM DEB Dashboard

### v3.2.1

- 
- NebulaGraph 3.3.0
- 
- NebulaGraph 3.3.0 BR

**v3.2.0**

- - 
  - OAuth2.0
  - 
  - 
  - 
  - 
  - Storage
  - 
  - 
  - 
  - 
  - SSH
  - 
  - Dashboard      NebulaGraph
  - 
  - prometheus   alertmanager
  - 
  - 
  - 
  - 
  -
- 

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## 25.1.5 NebulaGraph Explorer

### v3.2.1

- 
- HTTP    500
- 

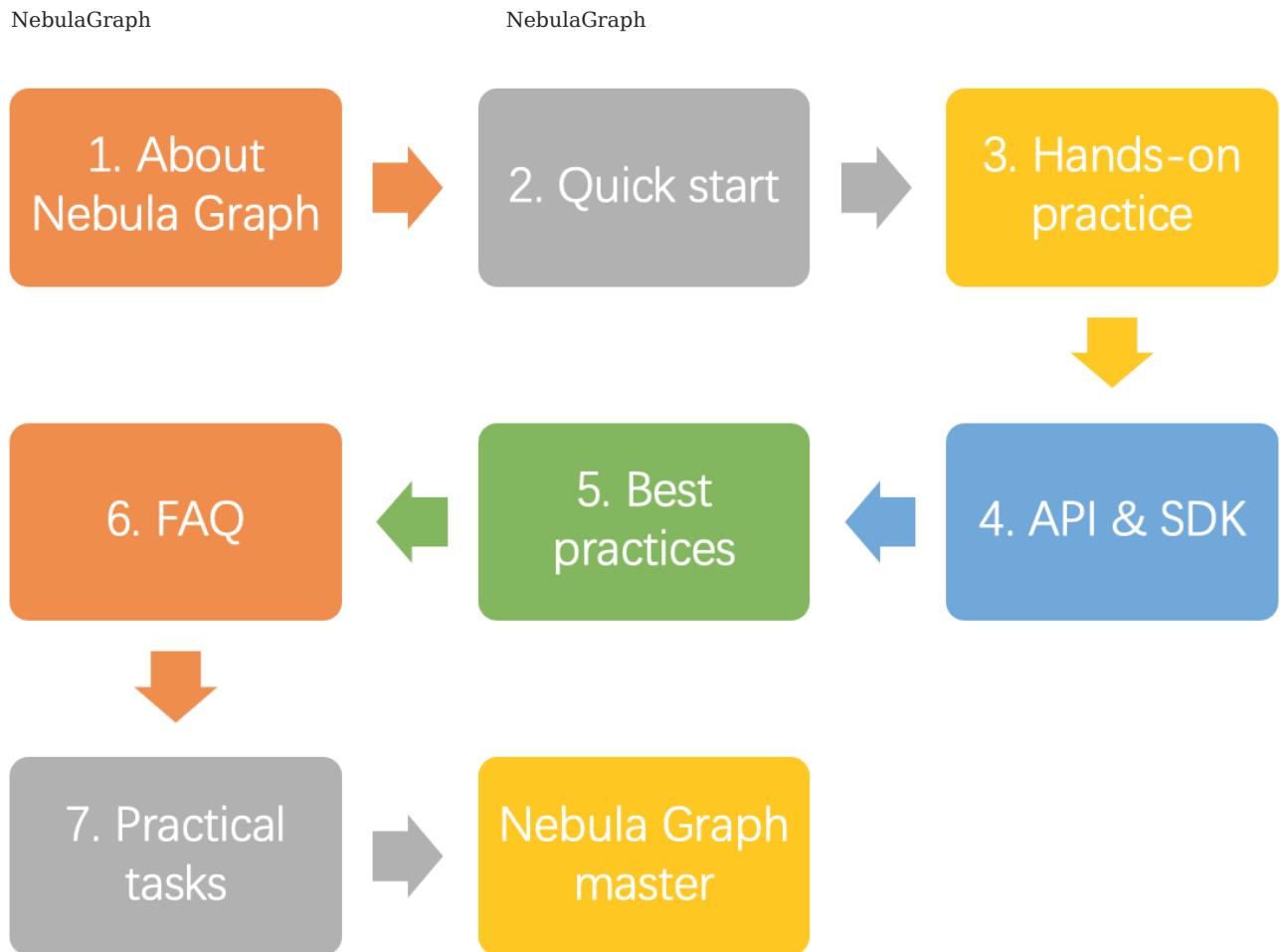
### v3.2.0

- 
- 
- Schema                 Schema
- iFrame
- OAuth 2.0            OAuth2.0        Explorer
- Explorer
- nGQL
- 
- node2vec
- 
- Dag Controller
- demo
- 
- //
- 
- 
- 
- 
- 
- 
- 
- 
- 3D
- Int8/16/32   fixed\_string

---

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## 25.2 NebulaGraph



NebulaGraph

CI/CP

### 25.2.1 1. NebulaGraph

#### 1.1 NebulaGraph

PPT

NebulaGraph

NebulaGraph

NebulaGraph

NebulaGraph 3

#### 1.2

---

1.3

---

1.4

---

1.5

Meta

Graph

Storage

---

---

25.2.2 2.

## 2.1 NebulaGraph

RPM/DEB

TAR

Docker

NebulaGraph

---

## 2.2 NebulaGraph

NebulaGraph

---

## 2.3 NebulaGraph

NebulaGraph

---

## 2.4 nGQL

nGQL

---

## 25.2.3 3.

---

### 3.1

RPM/DEB      NebulaGraph

---

### 3.2

NebulaGraph

---

### 3.3 Nebula

Meta

---

Graph

---

Storage

---

Linux

---

### 3.4

---

---

**3.5**

•

---

OpenLDAP

---

---

•

---

Storage

---

•

---

Nebula

---

---

RocksDB

---

•

• SSL

---

SSL

---

**3.6**

---

Nebula schema

---

-

---

Compaction

---

-

**3.7**

Nebula Studio	Nebula Studio	Nebula Studio
Nebula Dashboard	Nebula Dashboard	Nebula Dashboard
Nebula Explorer		Nebula Explorer

Nebula Importer	Nebula Importer		
Nebula Spark Connector	-		
Nebula Flink Connector	-		
Nebula Exchange	NebulaGraph	—Exchange	Exchange SST
Nebula Exchange	-		

Nebula BR	NebulaGraph	nebula-br
-----------	-------------	-----------

Nebula Bench
--------------

Nebula Operator	Nebula Operator
-----------------	-----------------

Nebula Algorithm	Nebula Algorithm
------------------	------------------

Nebula Console
----------------

Nebula CPP
------------

Nebula Java
-------------

Nebula Python
---------------

Nebula Go
-----------

## 25.2.4 4.

---

API & SDK

---

## 25.2.5 5.

---

&

LDBC nGQL

---

NebulaGraph Betweenness Centrality

---

Akulaku

---

NebulaGraph

---

NebulaGraph

---

NebulaGraph

---

@BOSS

---

## 25.2.6 6.

---

FAQ

---

## 25.2.7 7.

---

NebulaGraph

NebulaGraph

---

Studio Dashboard Explorer

Studio Dashboard Explorer

K6 NebulaGraph

K6 NebulaGraph

LDBC

LDBC nGQL

LDBC K

LDBC interactive-short-1.cypher

## 25.2.8 8. CI/CP

---

NebulaGraph 2

- NebulaGraph Certified Insider (NGCI)

NebulaGraph

NebulaGraph

- NebulaGraph Certified Professional (NGCP)

NebulaGraph

NebulaGraph

NebulaGraph

NebulaGraph

## 25.2.9

- NebulaGraph
  - NebulaGraph 2.4
  - NebulaGraph 2.8
- 

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## 25.3 FAQ

---

NebulaGraph 3.3.0

[NebulaGraph](#)

[GitHub issue](#)

### 25.3.1

NebulaGraph

[issue](#) NebulaGraph



1. " "
2. Markdown "Commit changes" GitHub pull request
3. [CLA](#) 2 reviewer

### 25.3.2



NebulaGraph 3.3.0

NebulaGraph 1.x 2.x

[NebulaGraph](#)

### 25.3.3

**SemanticError: Missing yield clause.**

NebulaGraph 3.0.0

LOOKUP GO FETCH YIELD

[YIELD](#)

**Host not enough!**

3.0.0

Storage

Storage

Meta

ADD HOSTS

Storage

Storage

**To get the property of the vertex in 'v.age', should use the format 'var.tag.prop'**

3.0.0

pattern

Tag

Tag

RETURN .

RETURN .Tag .

**Storage Error E\_RPC\_FAILURE**

Graph Storage

Storage

- nebula-graphd.conf --storage\_client\_timeout\_ms storage\_client\_timeout\_ms=60000 nebula-graphd.conf Storage client ms -- --local\_config=true
- LIMIT GO MATCH
- Storaged OOM (dmesg |grep nebula)
- Storage SSD
-

```
The leader has changed. Try again later
```

```
1-N (N==partition      meta client   leader    1-2
```

```
NebulaGraph      df -h
```

### Exchange Connectors Algorithm      SNAPSHOT

```
Could not find artifact com.vesoft:client:jar:xxx-SNAPSHOT
```

```
maven      SNAPSHOT maven central      SNAPSHOT
maven setting.xml profiles
```

```
<profile>
<activation>
  <activeByDefault>true</activeByDefault>
</activation>
<repositories>
  <repository>
    <id>snapshots</id>
    <url>https://oss.sonatype.org/content/repositories/snapshots/</url>
    <snapshots>
      <enabled>true</enabled>
    </snapshots>
  </repository>
</repositories>
</profile>
```

```
[ERROR (-1004)]: SyntaxError: syntax error near
```

```
YIELD RETURN
```

```
can't solve the start vids from the sentence
```

```
VID      VID
```

```
> GO FROM ${vids} ...
> MATCH (src) WHERE id(src) == ${vids}
#      VID
```

```
# CREATE TAG INDEX IF NOT EXISTS i_player ON player(name(20));
# REBUILD TAG INDEX i_player;

> LOOKUP ON player WHERE player.name == "abc" | ... YIELD ...
> MATCH (src) WHERE src.name == "abc" ...
#      name      VID
```

```
can't solve the start vids from the sentence
```

```
Wrong vertex id type: 1001
```

```
VID      create space    INT64  FIXED_STRING(N)      create space
```

```
The VID must be a 64-bit integer or a string fitting space vertex id length limit.
```

```
VID      create space
```

```
edge conflict  vertex conflict
```

Storage

```

RPC failure in MetaClient: Connection refused

metad      metad  graphd

• metad      metad      metad

• telnet meta-ip:port

•



nebula-graph.INFO      StorageClientBase.inl:214] Request to "x.x.x.x":9779 failed:
N6apache6thrift9transport19TTransportExceptionE: Timed Out

storaged

• compaction

• Graph   Storage   RPC      nebula-graphd.conf      --storage_client_timeout_ms      ms      60000

nebula-storaged.INFO      MetaClient.cpp:65] Heartbeat failed, status:Wrong cluster!      nebula-metad.INFO
HBProcessor.cpp:54] Reject wrong cluster host "x.x.x.x":9771!

metad ip      storage

storage      /usr/local/nebula      cluster.id      storaged

Storage Error: More than one request trying to add/update/delete one edge/vertex at the same time.

```

## 25.3.4

time spent

SHOW SPACES

```

nebula> SHOW SPACES;
+-----+
| Name      |
+-----+
| "basketballplayer" |
+-----+
Got 1 rows (time spent 1235/1934 us)

```

- 1235
- 1934

**NebulaGraph nebula-storaged**

nebula-storaged	nebula-storaged	nebula-metad	Storage	Storage	Ready	3.0.0
Meta	Storage	Storage	Meta	ADD HOSTS	Meta	Storage
Storage						

**NebulaGraph**

NebulaGraph Console 2.6.0 NebulaGraph

(Dangling edge)

NebulaGraph 3.3.0 " " openCypher MERGE  
**VERTEX, INSERT EDGE, DELETE EDGE** **INSERT VERTEX, DELETE**

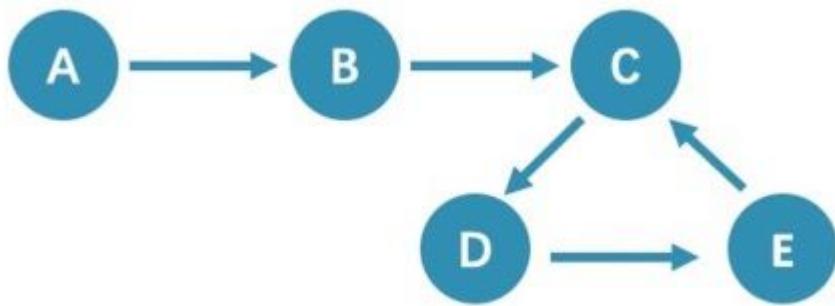
**CREATE SPACE** **replica\_factor** **2**

Storage Raft

```
1  replica_factor    1
    replica_factor=2          replica_factor=4          replica_factor=3
replica_factor
    replica_factor=3          replica_factor=1
```

**GO MATCH**

- **GO**
- **RETURN**
- Storage **max\_edge\_returned\_per\_vertex**
- 
- GO **walk**
- MATCH **openCypher trail**



A	5	C	A->B->C->D->E->C	6	GO	D	A->B->C->D->E->C->D	C->D	MATCH
GO	MATCH	MATCH	GO						

**Tag** **Edge type**

**show-stats**

## Tag Edge type

1.

```
> CREATE TAG INDEX IF NOT EXISTS i_player ON player();
> REBUILD TAG INDEX i_player;
```

2. LOOKUP MATCH

```
> LOOKUP ON player;
> MATCH (n:player) RETURN n;
```

INDEX LOOKUP MATCH

## Tag/EdgeType

nGQL

Tag/EdgeType LIMIT

MATCH (n) RETURN (n). Scan vertices or edges need to specify a limit number, or limit number can not push down.

NebulaGraph Algorithm

Tag/Edge Type Union

Tag Edge type

?

" " "

```
nebula > MATCH (s)-[e]->() WHERE id(s) == "given" RETURN count(e); #
nebula > MATCH (s)<-[e]-() WHERE id(s) == "given" RETURN count(e); #
```

OOM

" "

NebulaGraph Algorithm

## 25.3.5

NebulaGraph /usr/local/nebula/logs/ INFO nebula-graphd.INFO, nebula-storaged.INFO, nebula-metad.INFO .WARNING .ERROR

NebulaGraph glog glog

- crontab Glog should delete old log files automatically

- logrotate logrotate NebulaGraph timestamp\_in\_logfile\_name false

## NebulaGraph

nebula-console SHOW HOSTS META SHOW HOSTS

bin	./<binary_name> --version	version	GitHub	commit ID
-----	---------------------------	---------	--------	-----------

```
$ ./nebula-graphd --version
```

- Docker Compose

Docker Compose    NebulaGraph

```
docker exec -it nebula-docker-compose_graphd_1 bash
cd bin/
./nebula-graphd --version
```

- RPM/DEB

```
rpm -qa |grep nebula
```

Host	Host	OFFLINE
------	------	---------

OFFLINE	Host
---------	------

## 25.3.6

Meta	9559, 9560, 19559
------	-------------------

Graph	9669, 19669
-------	-------------

Storage	9777 ~ 9780, 19779
---------	--------------------

telnet

```
telnet <ip> <port>
```



telnet

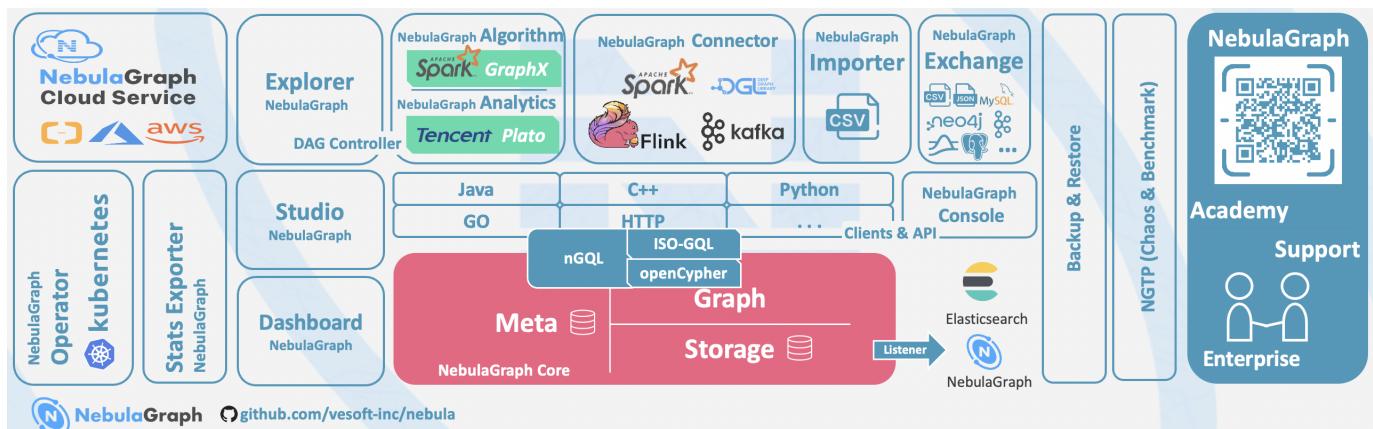
telnet

```
//
$ telnet 192.168.1.10 9669
Trying 192.168.1.10...
Connected to 192.168.1.10.
Escape character is '^}'.

//
$ telnet 192.168.1.10 9777
Trying 192.168.1.10...
telnet: connect to address 192.168.1.10: Connection refused
```

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## 25.4



### Note

- X.Y.Z      X, Y, Z
- Y      6      3
- Y      3      Y
- RC      (Release Candidate)      RC
- nightly    SNAPSHOT
- 

### ↑ Compatibility

- X.Y.Z1    X.Y.Z2 :      bugfix
- X.Y1.\*    X.Y2.\* :      API      X.Y2.\*
- X1.\*.\*    X2.\*.\* :      API
- X.Y.Z2    X.Y.Z1
- 2.x      NebulaGraph 3.x

### 25.4.1 NebulaGraph Studio

NebulaGraph Studio	Studio	Web	NebulaGraph DBMS	nGQL
NebulaGraph Studio				

### Note

Studio	NebulaGraph
--------	-------------

**NebulaGraph**

v3.3.0

**Studio**

v3.5.0

## 25.4.2 NebulaGraph Dashboard

NebulaGraph Dashboard	Dashboard	NebulaGraph	<a href="#">NebulaGraph Dashboard</a>
<b>NebulaGraph</b>	<b>Dashboard</b>		
v3.3.0	v3.2.0		

## 25.4.3 NebulaGraph Dashboard

NebulaGraph Dashboard	Dashboard	NebulaGraph
<a href="#">NebulaGraph Dashboard</a>		
<b>NebulaGraph</b>	<b>Dashboard</b>	
v3.3.0	v3.2.4	

## 25.4.4 NebulaGraph Explorer

NebulaGraph Explorer	Explorer	Web	NebulaGraph
<a href="#">NebulaGraph Explorer</a>			
<b>NebulaGraph</b>	<b>Explorer</b>		
v3.3.0	v3.2.1		

## 25.4.5 NebulaGraph Stats Exporter

nebula-stats-exporter	Prometheus
<a href="#">NebulaGraph Stats Exporter</a>	
<b>NebulaGraph</b>	<b>Stats Exporter</b>

## 25.4.6 NebulaGraph Exchange

NebulaGraph Exchange	Exchange	Apache Spark™	NebulaGraph
<a href="#">NebulaGraph Exchange</a>			
<b>NebulaGraph</b>	<b>Exchange</b>	<b>Exchange</b>	
v3.3.0	v3.3.0	v3.0.0	

## 25.4.7 NebulaGraph Operator

NebulaGraph Operator	Operator	Kubernetes	NebulaGraph	Kubernetes	NebulaGraph
Kubernetes	NebulaGraph		<a href="#">NebulaGraph Operator</a>		
<b>NebulaGraph</b>	<b>Operator</b>				

#### 25.4.8 NebulaGraph Importer

NebulaGraph Importer	Importer	NebulaGraph	CSV	Importer	CSV	NebulaGraph
<b>NebulaGraph Importer</b>						
<b>NebulaGraph</b>	<b>Importer</b>					
v3.3.0	v3.1.0					

#### 25.4.9 NebulaGraph Spark Connector

NebulaGraph Spark Connector	Spark	Spark	NebulaGraph	NebulaGraph Spark Connector	Reader
<b>Writer</b>					
<b>NebulaGraph</b>	<b>Spark Connector</b>				
v3.3.0	v3.3.0				

#### 25.4.10 NebulaGraph Flink Connector

NebulaGraph Flink Connector	Flink	NebulaGraph	NebulaGraph	NebulaGraph
<b>NebulaGraph Flink Connector</b>				
<b>NebulaGraph</b>	<b>Flink Connector</b>			
v3.3.0	v3.3.0			

#### 25.4.11 NebulaGraph Algorithm

NebulaGraph Algorithm	Algorithm	GraphX	Spark	Spark	NebulaGraph
lib	DataFrame	<b>NebulaGraph Algorithm</b>			
<b>NebulaGraph</b>	<b>Algorithm</b>				
v3.3.0	v3.0.0				

#### 25.4.12 NebulaGraph Analytics

NebulaGraph Analytics	Plato	Plato	NebulaGraph	NebulaGraph Analytics
<b>NebulaGraph Analytics</b>				
<b>NebulaGraph</b>	<b>Analytics</b>			
v3.3.0	v3.3.0			

#### 25.4.13 NebulaGraph Console

NebulaGraph Console	NebulaGraph	CLI	NebulaGraph
<b>NebulaGraph Console</b>			
<b>NebulaGraph</b>	<b>Console</b>		
v3.3.0	v3.3.1		

#### 25.4.14 NebulaGraph Docker Compose

Docker Compose	NebulaGraph	Docker Compose	NebulaGraph
<b>NebulaGraph Docker Compose</b>			
<b>NebulaGraph</b>	<b>Docker Compose</b>		
v3.3.0	v3.3.0		

### 25.4.15 Backup & Restore

<a href="#">Backup&amp;Restore</a>	BR	CLI	NebulaGraph
------------------------------------	----	-----	-------------

<b>NebulaGraph</b>	<b>BR</b>
--------------------	-----------

v3.3.0	v3.3.0
--------	--------

### 25.4.16 NebulaGraph Bench

<a href="#">NebulaGraph Bench</a>	NebulaGraph	LDBC v0.3.3
-----------------------------------	-------------	-------------

<b>NebulaGraph</b>	<b>Bench</b>
--------------------	--------------

v3.3.0	v1.2.0
--------	--------

### 25.4.17 API SDK

#### ↑ Compatibility

X.Y.\*

<b>NebulaGraph</b>	<b>commit id</b>
--------------------	------------------

v3.3.0	C++
--------	-----

v3.3.0	Go
--------	----

v3.3.0	Python
--------	--------

v3.3.0	Java
--------	------

v3.3.0	HTTP
--------	------

### 25.4.18

- [Rust Client](#)
- [Node.js Client](#)
- Object Graph Mapping Library (OGM, or ORM)
- 

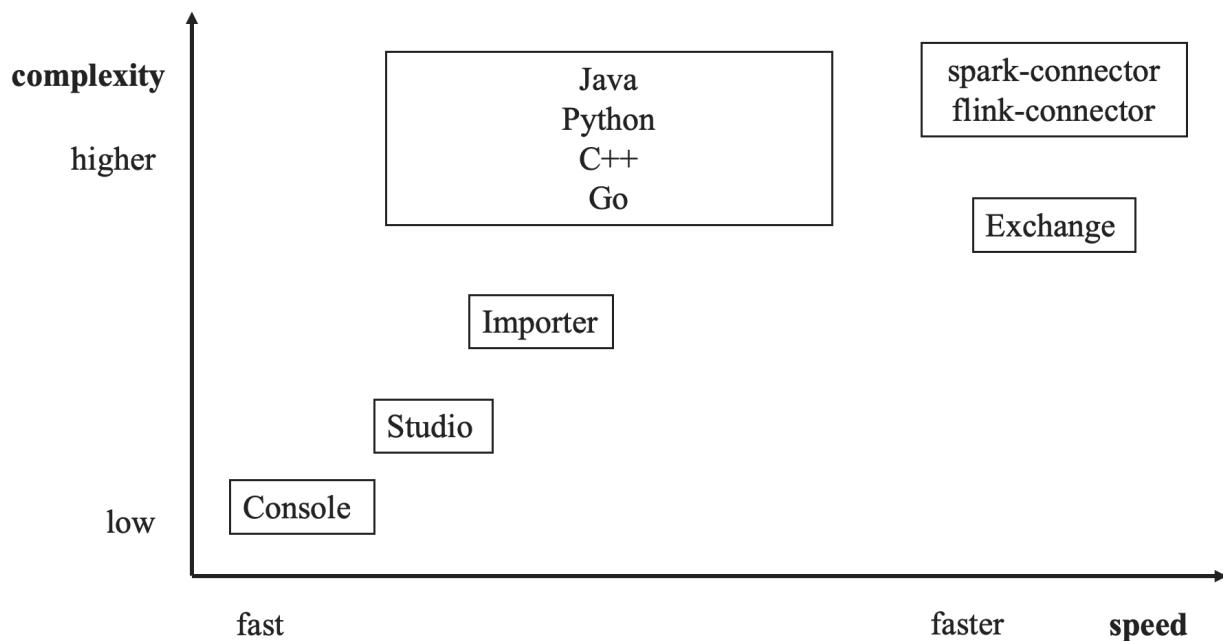
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## 25.5

---

NebulaGraph 3.3.0

- -f nGQL
- studio csv
- importer csv
- Exchange Neo4j, Hive, MySQL Spark
- Spark-connector/Flink-connector (Spark/Flink)
- C++/GO/Java/Python SDK



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## 25.6

---

### 25.6.1

---

**GitHub**

[GitHub](#)

[CLA](#)

[CLA](#)

[vesoft inc. Contributor License Agreement](#)

[Sign in with GitHub to agree](#)

[info@vesoft.com](mailto:info@vesoft.com)

### 25.6.2

---

NebulaGraph      [Markdown](#)

### 25.6.3

---

#### Step 1    GitHub fork

NebulaGraph      [NebulaGraph](#)

1. [github.com/vesoft-inc/nebula](https://github.com/vesoft-inc/nebula)
2. [Fork](#)      fork NebulaGraph

#### Step 2

- 1.

```
#  
working_dir=$HOME/Workspace
```

2. user      GitHub

```
user={GitHub }
```

- 3.

```
mkdir -p $working_dir  
cd $working_dir  
git clone https://github.com/$user/nebula.git  
# git clone git@github.com:$user/nebula.git  
  
cd $working_dir/nebula  
git remote add upstream https://github.com/vesoft-inc/nebula.git  
# git remote add upstream git@github.com:vesoft-inc/nebula.git  
  
#  
git remote set-url --push upstream no_push  
  
#  
#  
# origin git@github.com:$(user)/nebula.git (fetch)  
# origin git@github.com:$(user)/nebula.git (push)
```

```
# upstream https://github.com/vesoft-inc/nebula (fetch)
# upstream no_push (push)
git remote -v
```

#### 4. pre-commit hook

NebulaGraph pre-commit hook .git

hook commit

```
cd $working_dir/nebula/.git/hooks
ln -s $working_dir/nebula/.linters/cpp/hooks/pre-commit.sh .
```

pre-commit hook

```
cd $working_dir/nebula/.git/hooks
chmod +x pre-commit
```

### Step 3

1.

```
cd $working_dir/nebula
git fetch upstream
git checkout master
git rebase upstream/master
```

2.

```
git checkout -b myfeature
```

#### Note

PR	commits	upstream/master	commits	squash	commit	origin/master	upstream/
		commits	origin/master				
master	hard reset						

```
git fetch upstream
git checkout master
git reset --hard upstream/master
git push --force origin master
```

### Step 4

-

NebulaGraph cpplint Google

- Bug
- NebulaGraph

### Note

```
-DENABLE_TESTING = ON
```

- nebula

```
cd nebula/build
ctest -j$(nproc)
```

## Step 5

```
#      myfeature
git fetch upstream
git rebase upstream/master
```

PR

head

## Step 6 Commit

```
git commit -a
```

```
--amend
```

## Step 7 Push

push GitHub

```
git push origin myfeature
```

## Step 8 pull request

1. fork [https://github.com/\\$user/nebula](https://github.com/$user/nebula) \$user )
2. myfeature Compare & pull request

## Step 9

pull request

25.6.4

[How to add test cases](#)

## 25.6.5

### Step 1

Slack      NebulaGraph

NebulaGraph Contrib

- info@vesoft.com
- NebulaGraphbot
- Slack [Join Slack](#)

### Step 2

NebulaGraph      NebulaGraph Contrib      ID

### Step 3

NebulaGraph Contrib      Maintain

GitHub      [Transferring a repository owned by your user account](#)

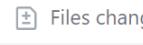
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## 25.7 NebulaGraph

1. 2018.9.5 @dutor

[Feature] Added some concurrent utilities, GenericThreadPool, etc.

 dutor merged 2 commits into `vesoft-inc:master` from `dutor:master`  on Sep 5, 2018

 Conversation 21  Commits 2  Checks 0  Files changed 24

 dutor commented on Sep 4, 2018 • edited  Member  ...

This PR adds several utilities such as `GenericThreadPool`, `GenericWorker`, `Barrier`, `Latch`, `ThreadLocalPtr` and some other convenience things.

2. 2019.5 v0.1.0 alpha ,



v1.0.0-beta, v1.0.0-rc1, v1.0.0-rc2, v1.0.0-rc3, v1.0.0-rc4

[Pre-release](#) v0.1.0  
-O b0d817f[Compare ▾](#)

## Nebula Graph v0.1.0

darionyaphet released this on May 14, 2019 · 1075 commits to master since this release

This is the first release of *Nebula Graph*, a brand new, fast and distributed graph database.

### Available Features

- Physical data isolation with Graph Space
- Strongly typed schema support
- Vertices and edges insertion
- Graph traversal(the `GO` statement)
- Variable definition and reference
- Piping query result between statements
- Client API in C++, Golang and Java

### Features Coming Soon

- Raft support
- Query based on secondary index(the `LOOKUP` statement)
- Sub-graph retrieval(the `MATCH` statement)
- User defined function call
- User management

### Try Out

A Docker image is available for trial purpose. You can get it by following the guide [here](#).

▼ Assets 2

[Source code \(zip\)](#) [Source code \(tar.gz\)](#)

3. 2019.7 HBaseCon

<sup>1</sup>@dangleptr



4. 2020.3 v1.0 v2.0

5. 2020.6 v1.0.0 GA

## V1.0.0 GA

v1.0.0  
06a5db4  
Verified

jude-zhu released this on Jun 10, 2020 · 146 commits to master since this release

[Compare](#)

### Basic Features

- Online DDL & DML. Support updating schemas and data without stopping or affecting your ongoing operations.
- Graph traversal. `go` statement supports forward/reverse and bidirectional graph traversal. `GO minHops TO maxHops` is supported to get variable hops relationships.
- Aggregate. Support aggregation functions such as `GROUP BY`, `ORDER BY`, and `LIMIT`.
- Composite query. Support composite clauses: `UNION`, `UNION DISTINCT`, `INTERSECT`, and `MINUS`.
- PIPE statements. The result yielded from the previous statement could be piped to the next statement as input.
- Use defined variables. Support user-defined variables to pass the result of a query to another.
- Index. Both the single-property index and composite index are supported to make searches of related data more efficient. `LOOKUP ON` statement is to query on the index.

### Advanced Features

- Privilege Management. Support user authentication and role-based access control. Nebula Graph can easily integrate with third-party authentication systems. There are five built-in roles in Nebula Graph: `GO0`, `ADMIN`, `DBA`, `USER`, and `GUEST`. Each role has its corresponding privileges.
- Support Reservoir Sampling, which will retrieve  $k$  elements randomly for the sampling of the supernode at the complexity of  $O(n)$ .
- Cluster snapshot. Support creating snapshots for the cluster as an online backup strategy.
- TTL. Support TTL to expire items after a certain amount of time automatically.
- Operation & Maintenance
  - Scale in/out. Support online scale in/out and load balance for storage
  - `HOSTS` clause to manage storage hosts
  - `CONFIGS` clause to manage configuration options
- Job Manager & Scheduler. A tool for job managing and scheduling. Currently, `COMPACT` and `FLUSH` jobs are supported.
- Graph Algorithms. Support finding the full path and the shortest path between vertices.
- Provide OLAP interfaces to integrate with third-party graph analytics platforms.
- Support multiple character sets and collations. The default `CHARSET` and `COLLATE` are `utf8` and `utf8_bin`.

### Clients

- Java Client. Support source code building and downloading from the MVN repository, see [Java Client](#) for more details.
- Python Client. Support source code building and installation with pip, see [Python Client](#) for more details.
- Golang Client. Install the client with the command `go get -u -v github.com/vesoft-inc/nebula-go`, see [Go Client](#) for more details.

### Nebula Graph Studio

A graphical user interface for working with Nebula Graph. Support querying, designing schema, data loading, and graph exploring. See [Nebula Graph Studio](#) for more details.

6. 2021.3

v2.0 GA

## Nebula Graph v2.0 GA

jude-zhu released this on Mar 23

Verified

Compare

### New Features

- `vertexID` supports both `Integer` and `String`.
- New data types:
  - `NULL`: the property can be set to `NULL`. `NOT NULL` constraint is also supported
  - Composite types: `LIST`, `SET`, and `MAP`(Cannot be set as property types)
  - Temporal types: `DATE` and `DATETIME`
  - `FIXED_STRING`: a fixed size `String`
- Full-text indexes are supported to do prefix, wildcard, regex, and fuzzy search on a string property.
- Explain & Profile outputs the execution plan of an nGQL statement and execution profile.
- Subgraph to retrieve vertices and edges reachable from the start vertices.
- Support to collect statistics of the graph space.
- OpenCypher compatibility
  - Partially support the `MATCH` clause
  - Support `RETURN`, `WITH`, `UNWIND`, `LIMIT` & `SKIP` clauses
- More built-in functions
  - Predicate functions
  - Scalar functions
  - List functions
  - Aggregating functions
  - Mathematical functions
  - String functions
  - Temporal functions

### Improvements

- Optimize the performance of inserting, updating, and deleting data with indexes.
- `LOOKUP ON` filtering data supports `OR` and `AND` operators.
- `FIND PATH` supports finding paths with or without regard to direction, and also supports excluding cycles in paths.
- `SHOW HOSTS graph/meta/storage` supports to retrieve the basic information of graphd/metad/storage hosts.

### Changelog

- The data type of `vertexID` must be specified when creating a graph space.
- `FETCH PROP ON` returns a composite object if not specify the result set.
- Changed the default port numbers of `metad`, `graphd`, and `storage`.
- Refactor metrics counters.

### Nebula-graph Console

Supports local commands mode. `:set csv` outputs the query results to the console and the specified CSV file. For more information, please refer to <https://github.com/vesoft-inc/nebula-console>.

### Clients

Support connection pool and load balance.

- cpp client <https://github.com/vesoft-inc/nebula-cpp>
- java client <https://github.com/vesoft-inc/nebula-java>
- python client <https://github.com/vesoft-inc/nebula-python>
- go client <https://github.com/vesoft-inc/nebula-go>

### Nebula Graph Studio

With Studio, you can create a graph schema, load data, execute nGQL statements, and explore graphs in one stop. For more information, please refer to <https://github.com/vesoft-inc/nebula-web-docker>.

### Known Issues

- #860

7. 2021.8 v2.5.0

8. 2021.10 v2.6.0

9. 2022.2 v3.0.0

10. 2022.4 v3.1.0

1. NebulaGraph 1.x

RocksDB HBase

NebulaGraph 2.x

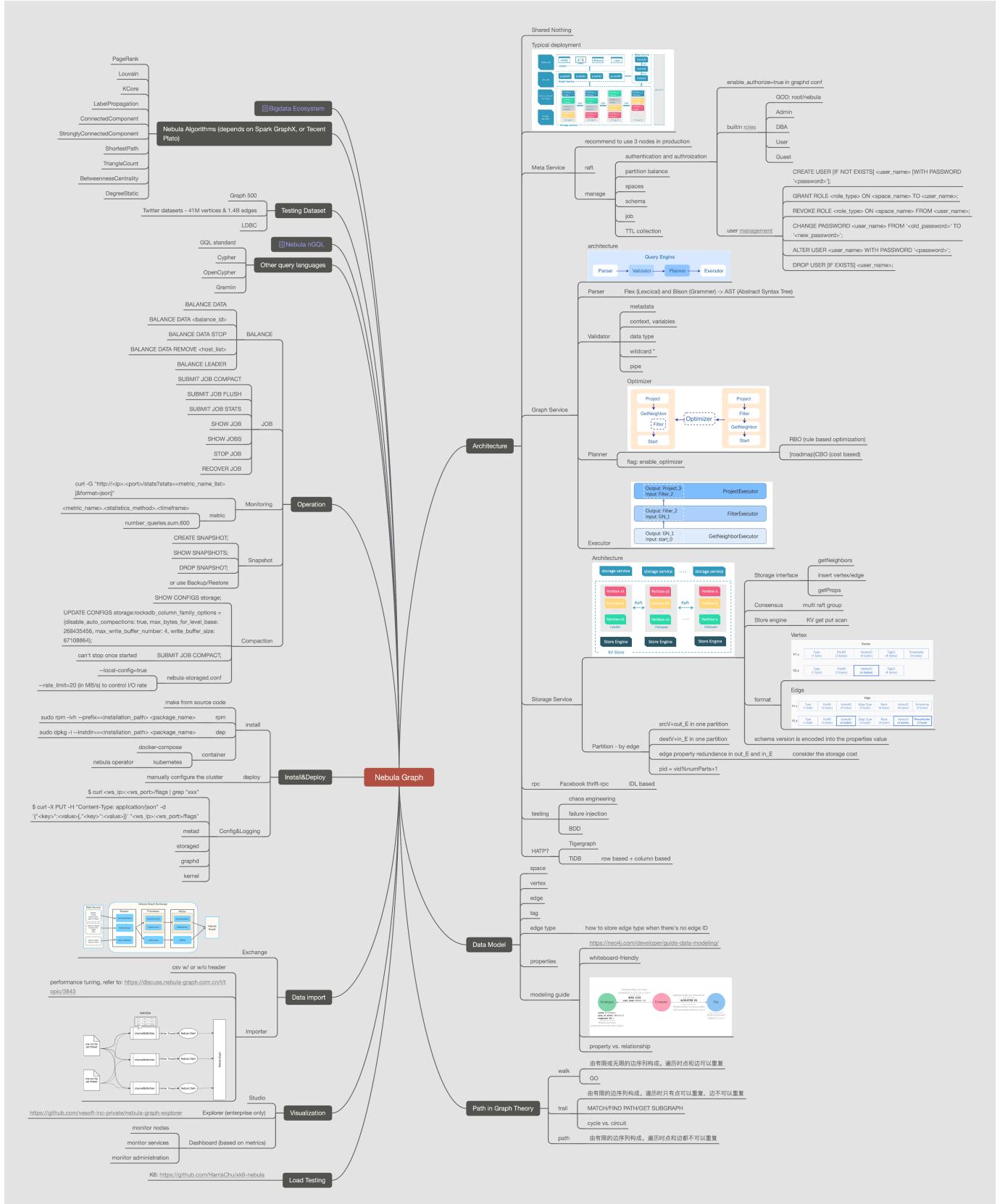
HBase



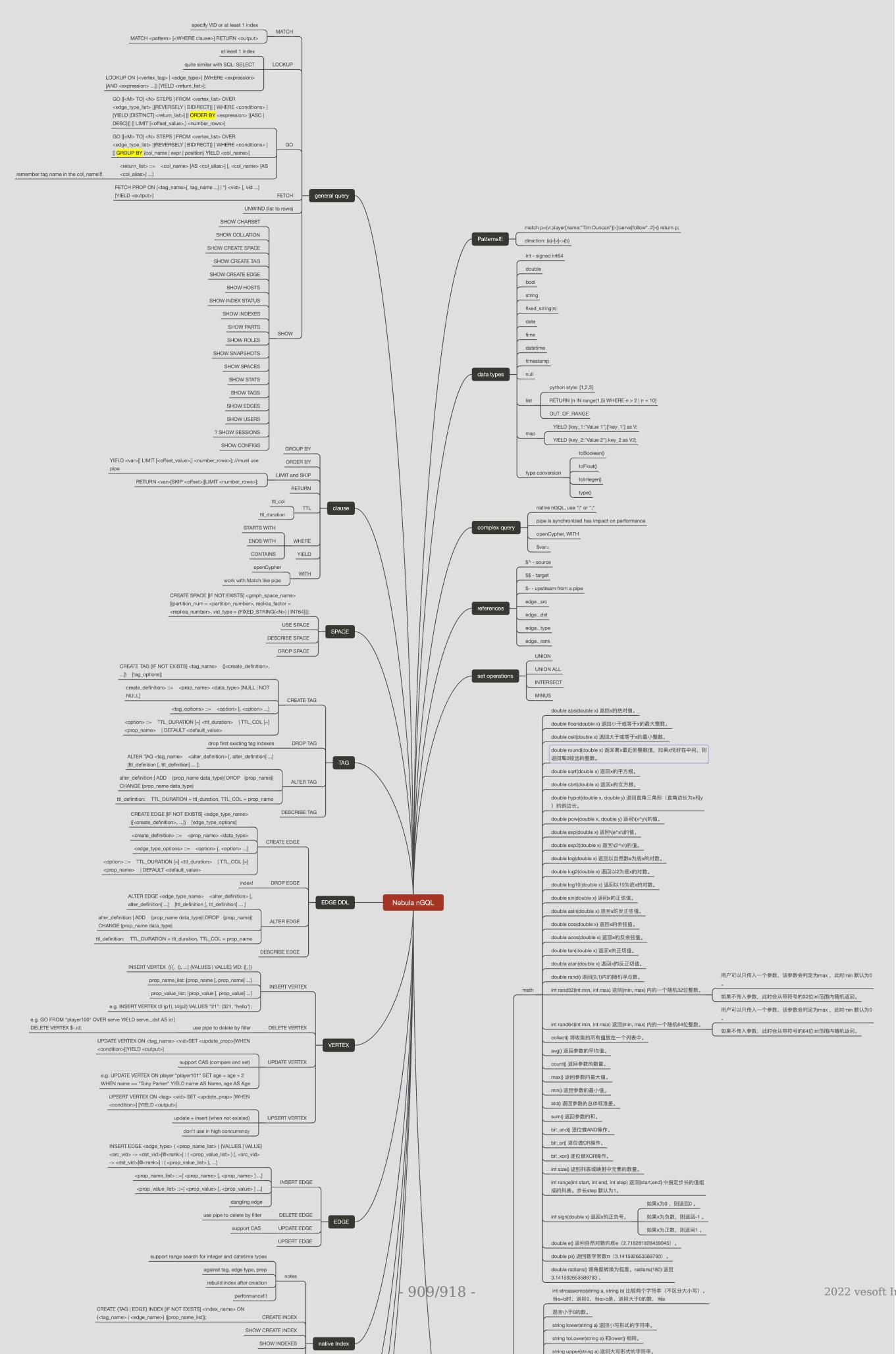
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25.8

NebulaGraph



nGQL



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## 25.9

---

NebulaGraph

 Note

- GitHub
- 0

E_DISCONNECTED	-1	
E_FAIL_TO_CONNECT	-2	
E_RPC_FAILURE	-3	RPC
E_LEADER_CHANGED	-4	Raft leader
E_SPACE_NOT_FOUND	-5	
E_TAG_NOT_FOUND	-6	Tag
E_EDGE_NOT_FOUND	-7	Edge type
E_INDEX_NOT_FOUND	-8	
E_EDGE_PROP_NOT_FOUND	-9	
E_TAG_PROP_NOT_FOUND	-10	Tag
E_ROLE_NOT_FOUND	-11	
E_CONFIG_NOT_FOUND	-12	
E_MACHINE_NOT_FOUND	-13	
E_LISTENER_NOT_FOUND	-15	listener
E_PART_NOT_FOUND	-16	
E_KEY_NOT_FOUND	-17	key
E_USER_NOT_FOUND	-18	
E_STATS_NOT_FOUND	-19	
E_SERVICE_NOT_FOUND	-20	
E_BACKUP_FAILED	-24	
E_BACKUP_EMPTY_TABLE	-25	
E_BACKUP_TABLE_FAILED	-26	
E_PARTIAL_RESULT	-27	multiget
E_REBUILD_INDEX_FAILED	-28	
E_INVALID_PASSWORD	-29	
E_FAILED_GET_ABS_PATH	-30	
E_BAD_USERNAME_PASSWORD	-1001	
E_SESSION_INVALID	-1002	
E_SESSION_TIMEOUT	-1003	
E_SYNTAX_ERROR	-1004	
E_EXECUTION_ERROR	-1005	
E_STATEMENT_EMPTY	-1006	
E_BAD_PERMISSION	-1008	
E_SEMANTIC_ERROR	-1009	
E_TOO_MANY_CONNECTIONS	-1010	

E_PARTIAL_SUCCEEDED	-1011	
E_NO_HOSTS	-2001	
E_EXISTED	-2002	
E_INVALID_HOST	-2003	
E_UNSUPPORTED	-2004	
E_NOT_DROP	-2005	
E_CONFIG_IMMUTABLE	-2007	
E_CONFLICT	-2008	meta
E_INVALID_PARM	-2009	
E_WRONGCLUSTER	-2010	
E_ZONE_NOT_ENOUGH	-2011	listener
E_ZONE_IS_EMPTY	-2012	
E_SCHEMA_NAME_EXISTS	-2013	Schema
E RELATED INDEX EXISTS	-2014	Tag Edge Type
E RELATED SPACE EXISTS	-2015	
E_STORE_FAILURE	-2021	
E_STORE_SEGMENT_ILLEGAL	-2022	
E_BAD_BALANCE_PLAN	-2023	
E_BALANCED	-2024	
E_NO_RUNNING_BALANCE_PLAN	-2025	
E_NO_VALID_HOST	-2026	
E_CORRUPTED_BALANCE_PLAN	-2027	
E_IMPROPER_ROLE	-2030	
E_INVALID_PARTITION_NUM	-2031	
E_INVALID_REPLICA_FACTOR	-2032	
E_INVALID_CHARSET	-2033	
E_INVALID_COLLATE	-2034	
E_CHARSET_COLLATE_NOT_MATCH	-2035	
E_SNAPSHOT_FAILURE	-2040	
E_BLOCK_WRITE_FAILURE	-2041	
E_ADD_JOB_FAILURE	-2044	
E_STOP_JOB_FAILURE	-2045	
E_SAVE_JOB_FAILURE	-2046	
E_BALANCER_FAILURE	-2047	
E_JOB_NOT_FINISHED	-2048	

E_TASK_REPORT_OUT_DATE	-2049	
E_JOB_NOT_IN_SPACE	-2050	
E_JOB_NEED_RECOVER	-2051	
E_JOB_ALREADY_FINISH	-2052	
E_JOB_SUBMITTED	-2053	
E_JOB_NOT_STOPPABLE	-2054	
E_JOB_HAS_NO_TARGET_STORAGE	-2055	leader
E_INVALID_JOB	-2065	
E_BACKUP_BUILDING_INDEX	-2066	
E_BACKUP_SPACE_NOT_FOUND	-2067	
E_RESTORE_FAILURE	-2068	
E_SESSION_NOT_FOUND	-2069	
E_LIST_CLUSTER_FAILURE	-2070	
E_LIST_CLUSTER_GET_ABS_PATH_FAILURE	-2071	
E_LIST_CLUSTER_NO_AGENT_FAILURE	-2072	agent
E_QUERY_NOT_FOUND	-2073	query
E_AGENT_HB_FAILURE	-2074	agent
E_CONSENSUS_ERROR	-3001	
E_KEY_HAS_EXISTS	-3002	key
E_DATA_TYPE_MISMATCH	-3003	
E_INVALID_FIELD_VALUE	-3004	
E_INVALID_OPERATION	-3005	
E_NOT_NULLABLE	-3006	
E_FIELD_UNSET	-3007	
E_OUT_OF_RANGE	-3008	
E_DATA_CONFLICT_ERROR	-3010	
E_WRITE_STALLED	-3011	
E_IMPROPER_DATA_TYPE	-3021	
E_INVALID_SPACEVIDLEN	-3022	VID
E_INVALID_FILTER	-3031	
E_INVALID_UPDATER	-3032	
E_INVALID_STORE	-3033	KV
E_INVALID_PEER	-3034	peer
E_RETRY_EXHAUSTED	-3035	
E_TRANSFER_LEADER_FAILED	-3036	leader

E_INVALID_STAT_TYPE	-3037		
E_INVALID_VID	-3038	VID	
E_LOAD_META_FAILED	-3040		
E_FAILED_TO_CHECKPOINT	-3041	checkpoint	
E_CHECKPOINT_BLOCKED	-3042	checkpoint	
E_FILTER_OUT	-3043		
E_INVALID_DATA	-3044		
E_MUTATE_EDGE_CONFLICT	-3045		
E_MUTATE_TAG_CONFLICT	-3046		
E_OUTDATED_LOCK	-3047		
E_INVALID_TASK_PARA	-3051		
E_USER_CANCEL	-3052		
E_TASK_EXECUTION_FAILED	-3053		
E_PLAN_IS_KILLED	-3060		
E_NO_TERM	-3070		
E_OUTDATED_TERM	-3071	leader	leader
E_WRITE_WRITE_CONFLICT	-3073		
E_RAFT_UNKNOWN_PART	-3500		
E_RAFT_LOG_GAP	-3501	raft	
E_RAFT_LOG_STALE	-3502	raft	
E_RAFT_TERM_OUT_OF_DATE	-3503		
E_RAFT_UNKNOWN_APPEND_LOG	-3504		
E_RAFT_WAITING_SNAPSHOT	-3511		
E_RAFT_SENDING_SNAPSHOT	-3512		
E_RAFT_INVALID_PEER	-3513		
E_RAFT_NOT_READY	-3514	Raft	
E_RAFT_STOPPED	-3515	Raft	
E_RAFT_BAD_ROLE	-3516		
E_RAFT_WAL_FAIL	-3521	WAL	
E_RAFT_HOST_STOPPED	-3522		
E_RAFT_TOO_MANY_REQUESTS	-3523		
E_RAFT_PERSIST_SNAPSHOT_FAILED	-3524		
E_RAFT_RPC_EXCEPTION	-3525	RPC	
E_RAFT_NO_WAL_FOUND	-3526	WAL	
E_RAFT_HOST_PAUSED	-3527		

E_RAFT_WRITE_BLOCKED	-3528	
E_RAFT_BUFFER_OVERFLOW	-3529	
E_RAFT_ATOMIC_OP_FAILED	-3530	
E_LEADERLEASE FAILED	-3531	leader
E_RAFT_CAUGHT_UP	-3532	Raft

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<https://docs.nebula-graph.com.cn/3.3.0>