



NebulaGraph

NebulaGraph Database

master

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1. NebulaGraph 3.4.1

Note

2023-4-19 GitHub commit [c91fb06e90](#) " " #C65467

1.1

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

1.2

-
- [NebulaGraph](#)
-
-
-
-

1.3

Note

Caution

caution

Danger

danger

Performance



↑ Compatibility

nGQL openCypher nGQL



1.4

NebulaGraph Markdown

: February 8, 2023

2.

- 03 45



- 02 24

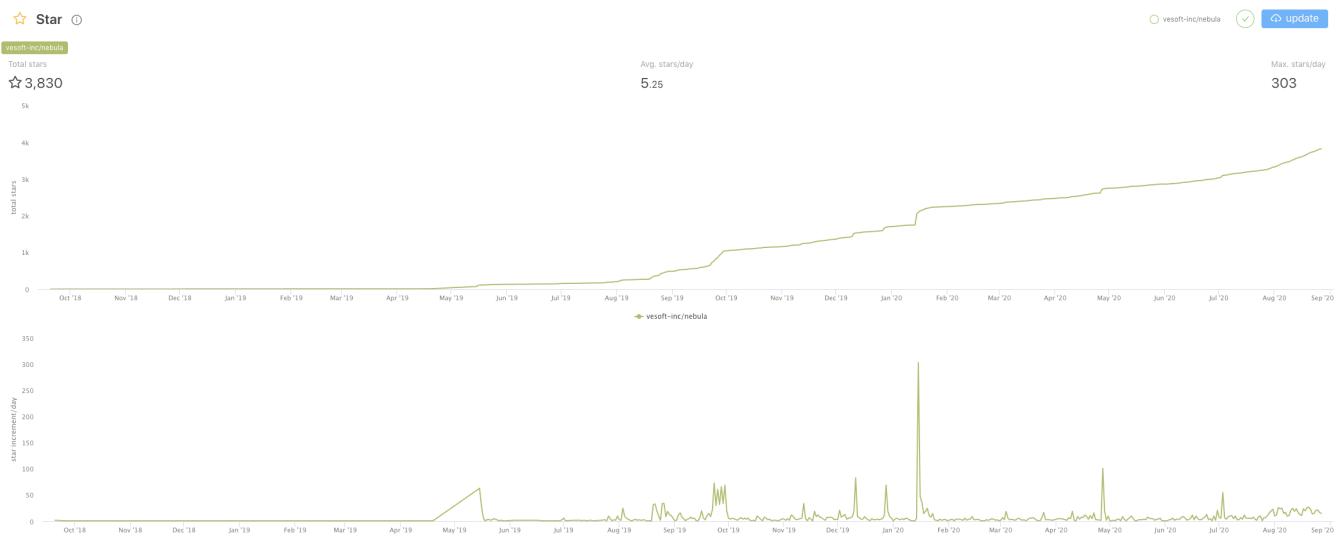


2.1

Amazon Facebook

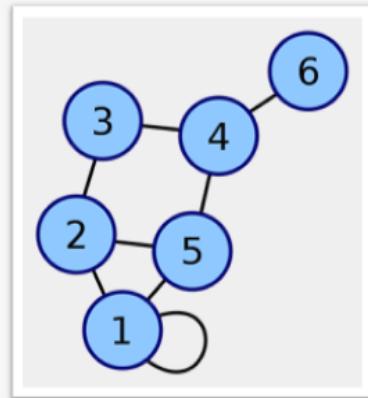
2.1.1

NebulaGraph GitHub

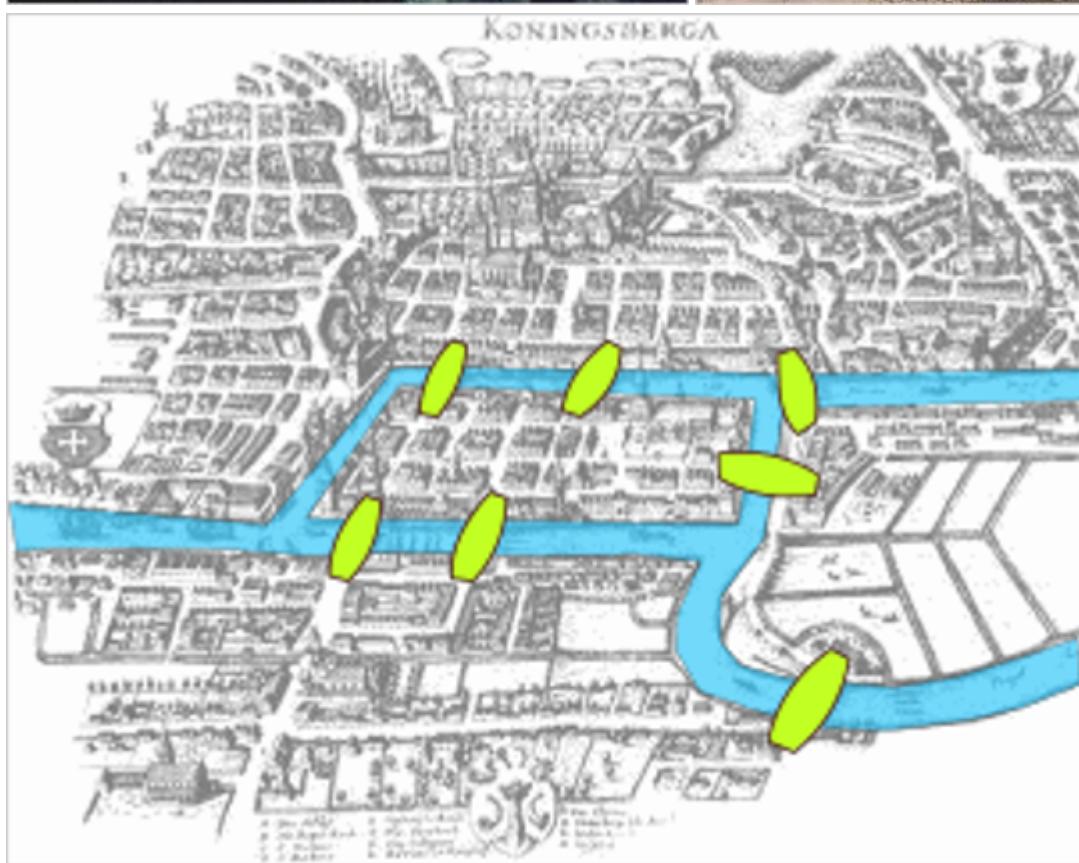




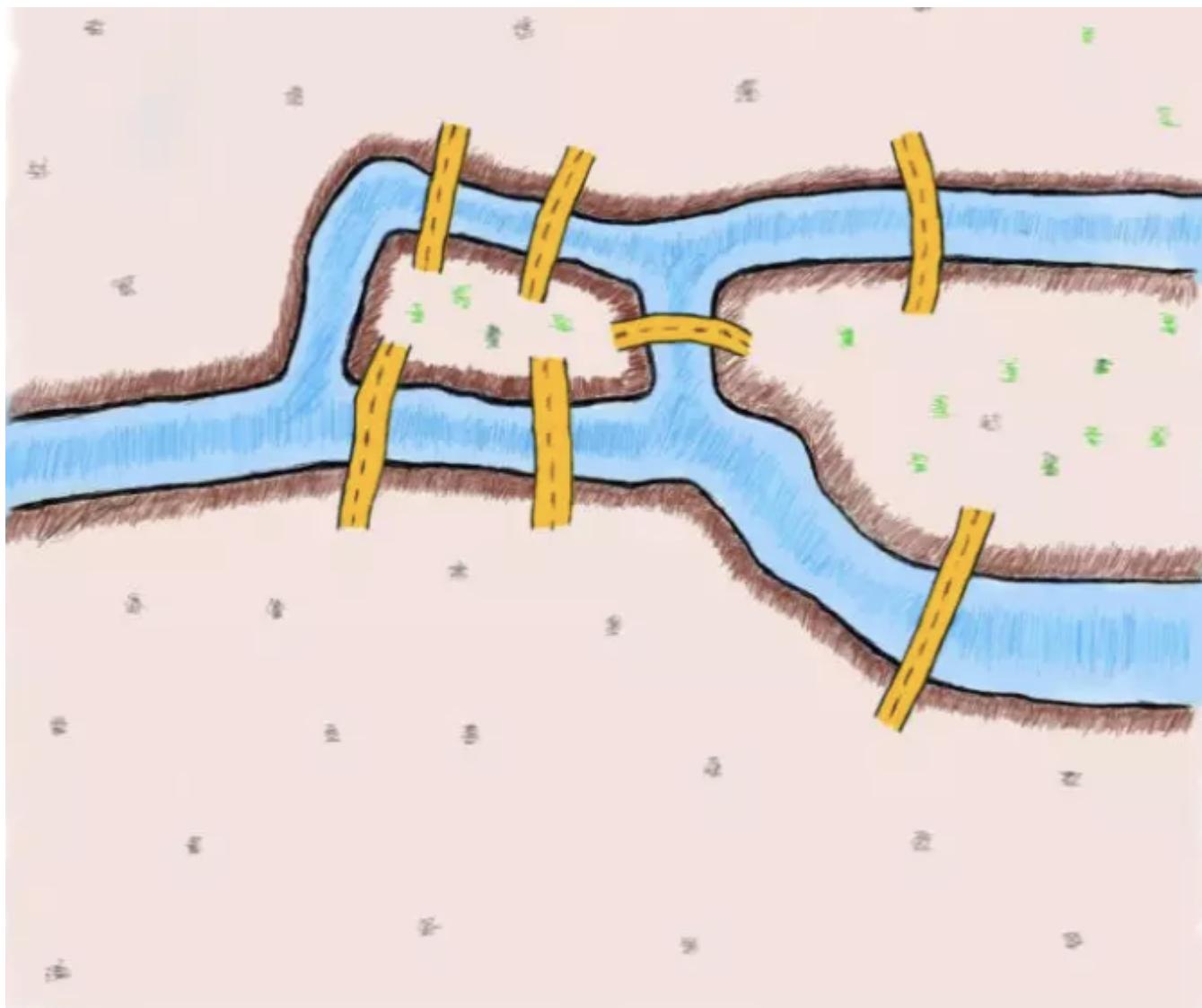
Graph: Image, Visual



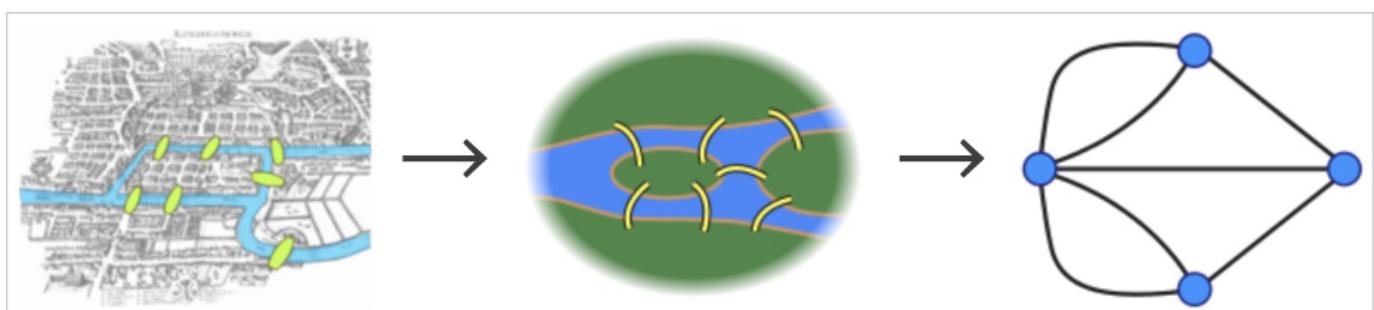
Graph: Network, Connection, Linked Data



1



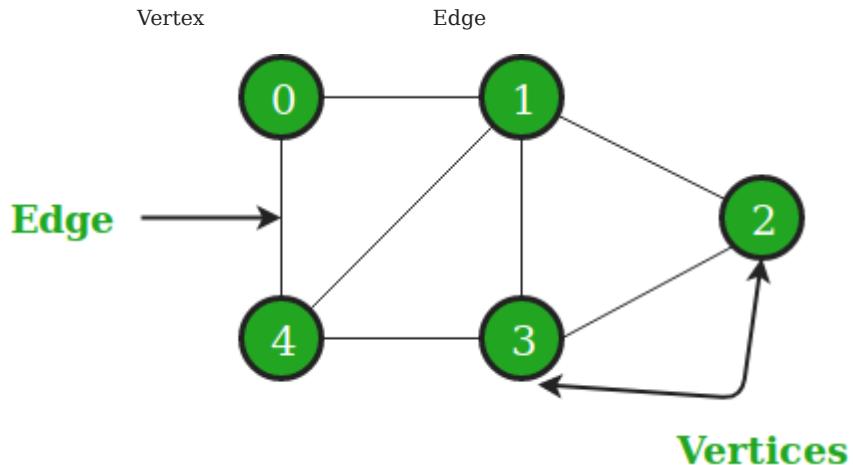
1735



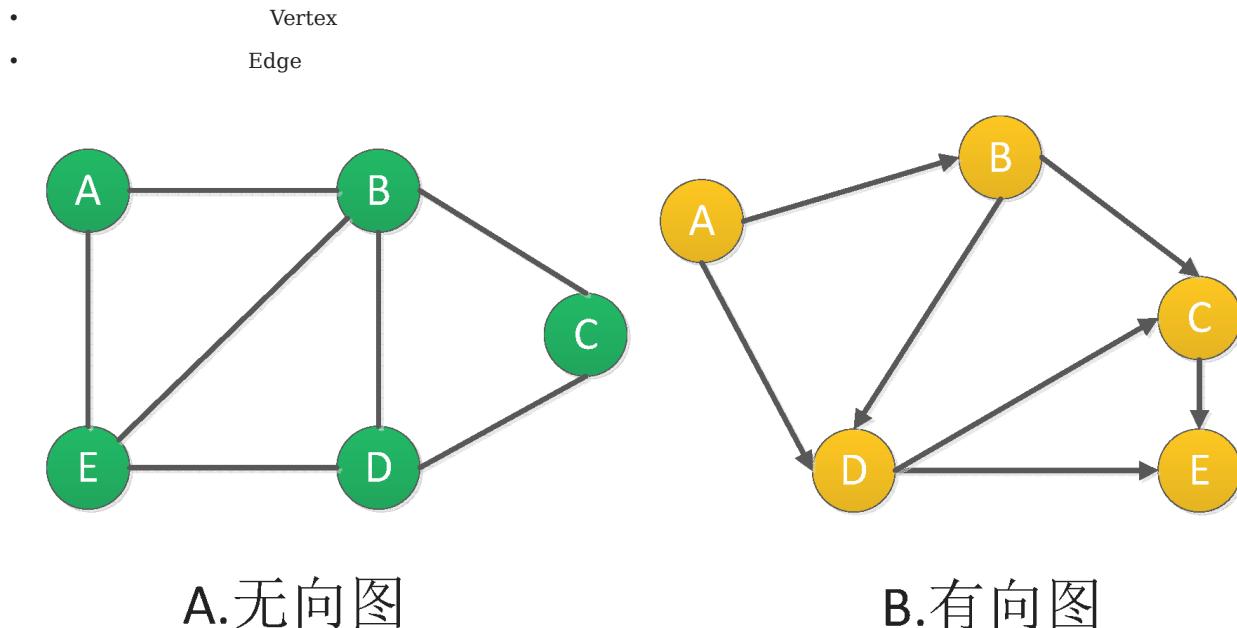
Graph

“ ” “ ”

1878

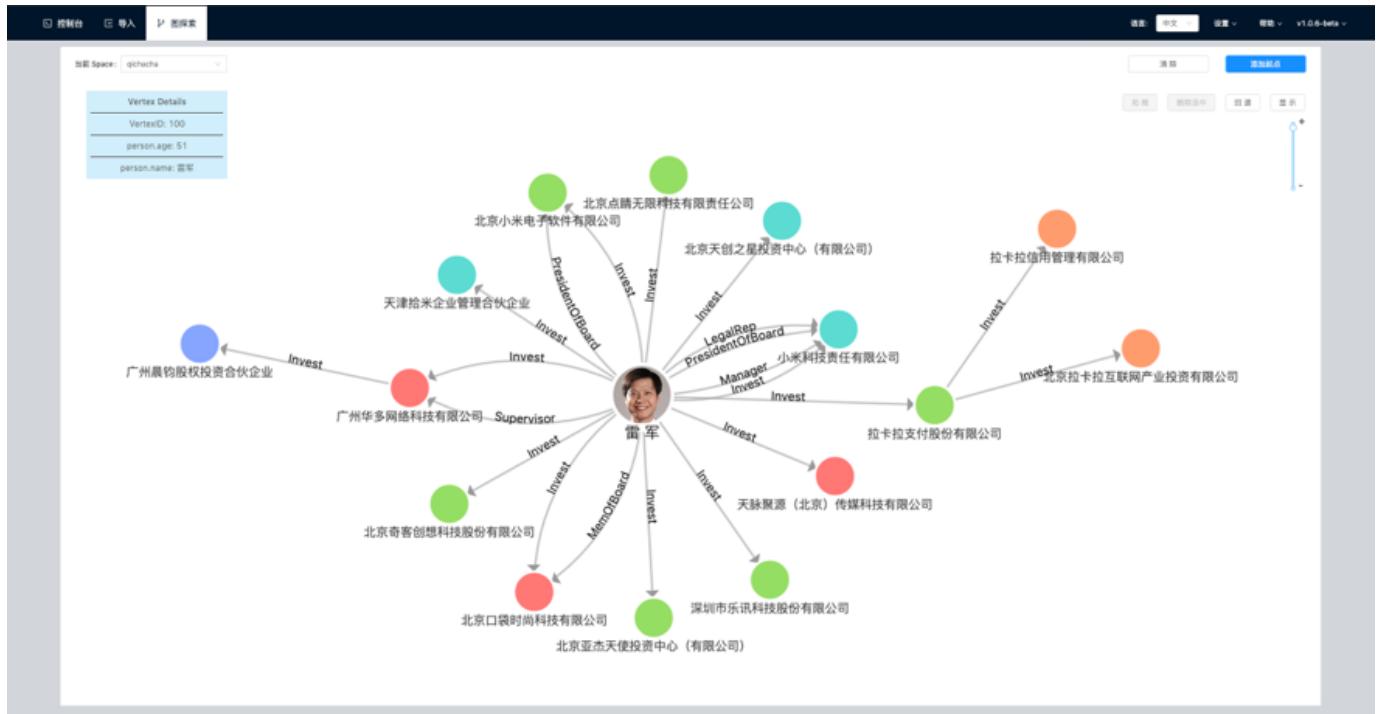


2.1.2

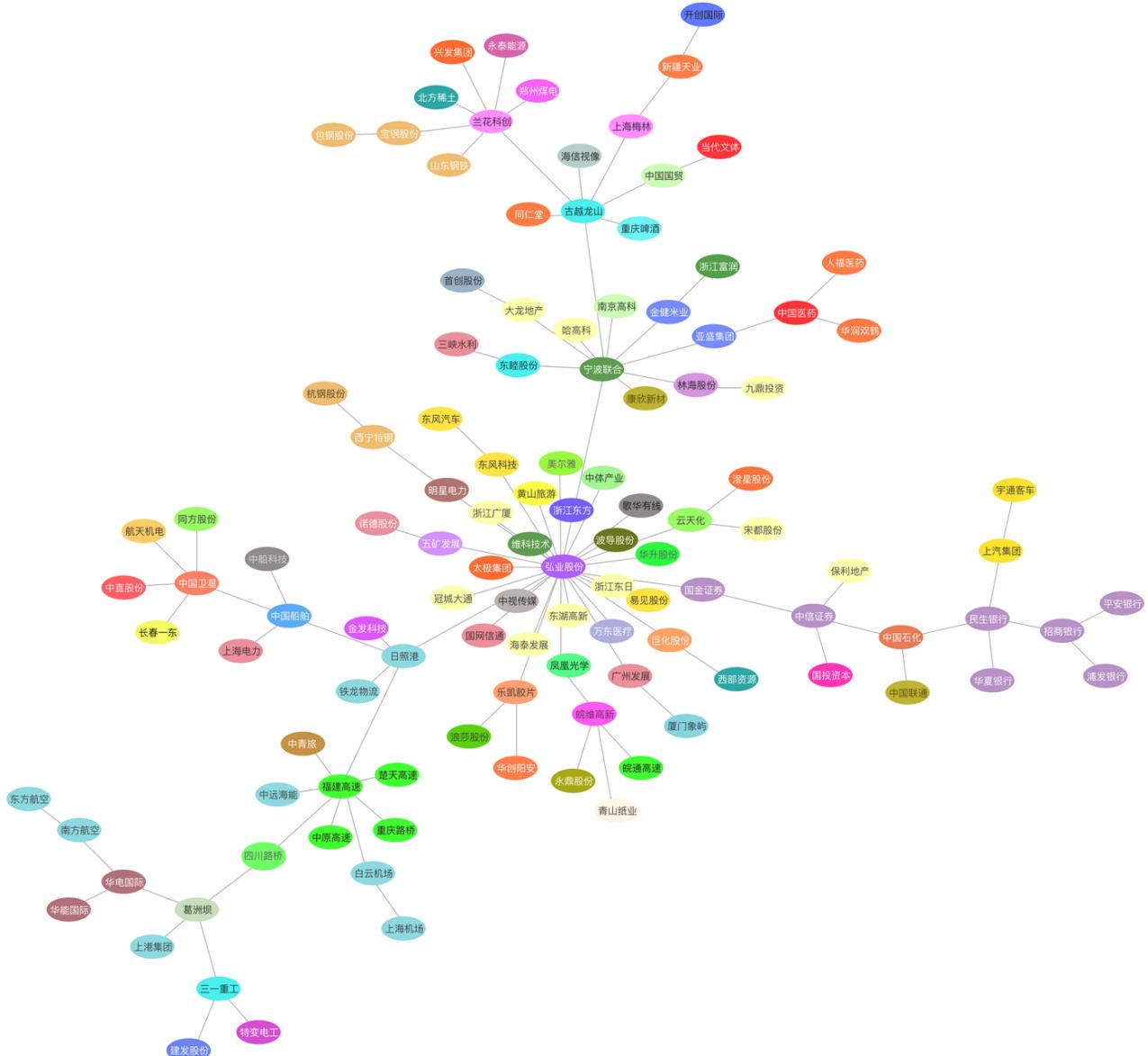


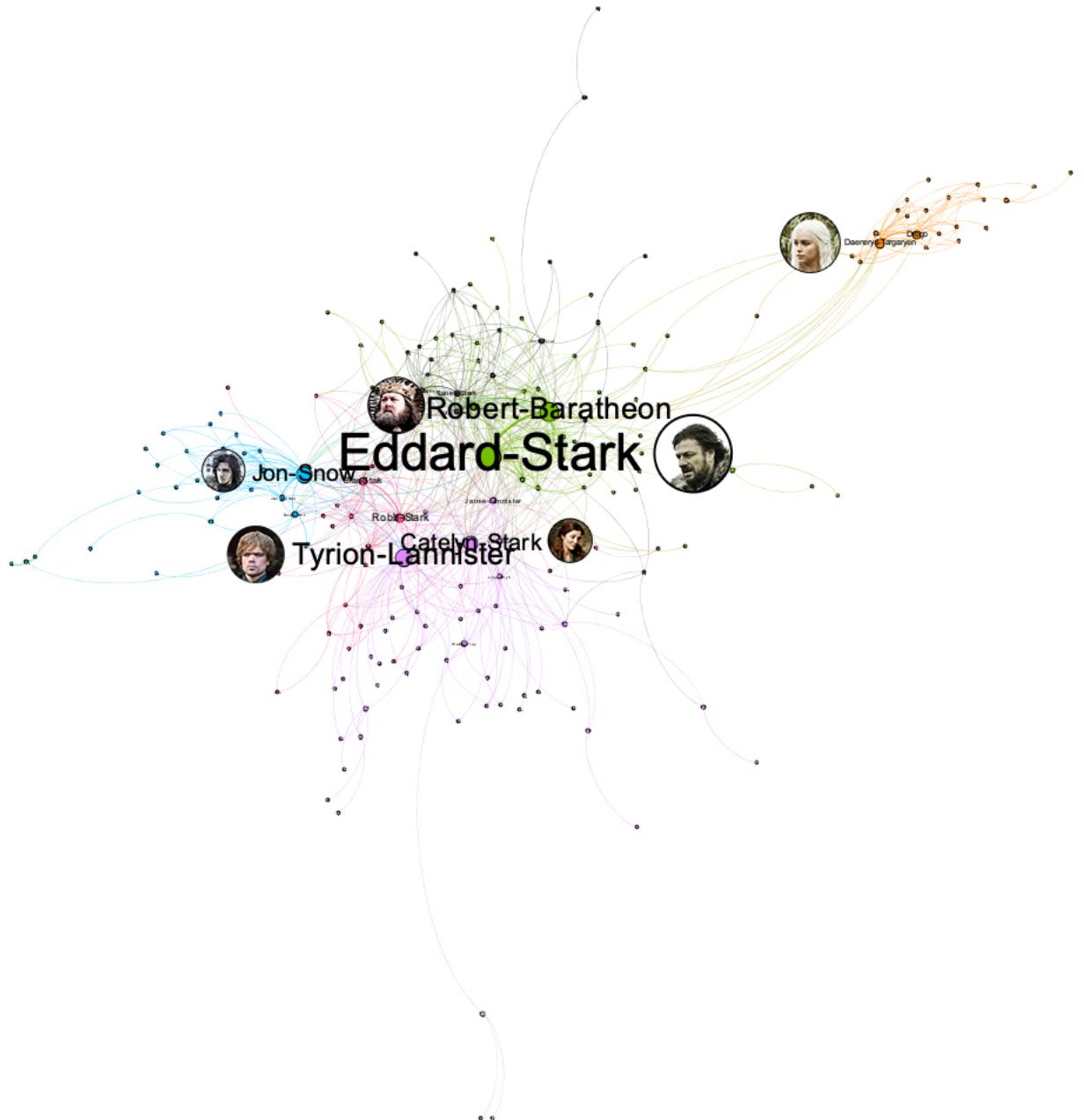
- properties

BOSS



2





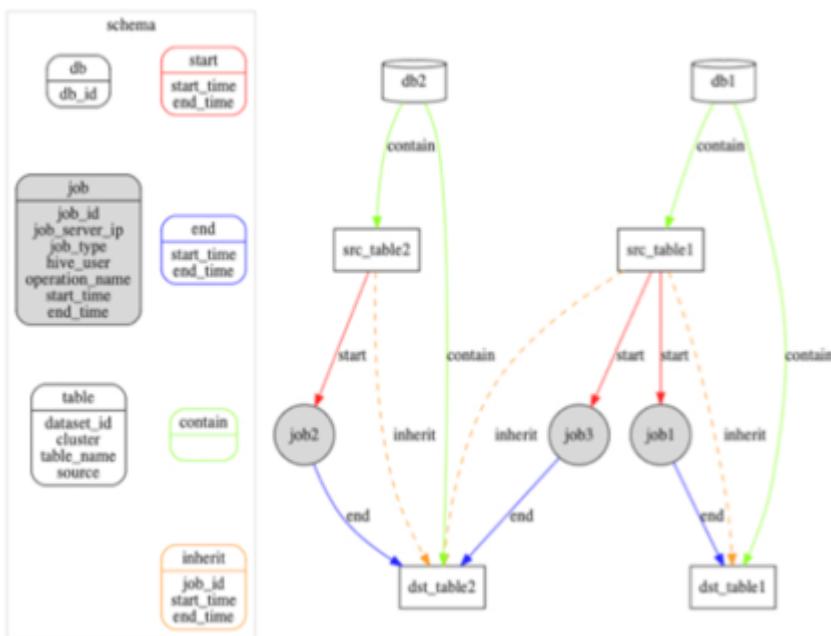
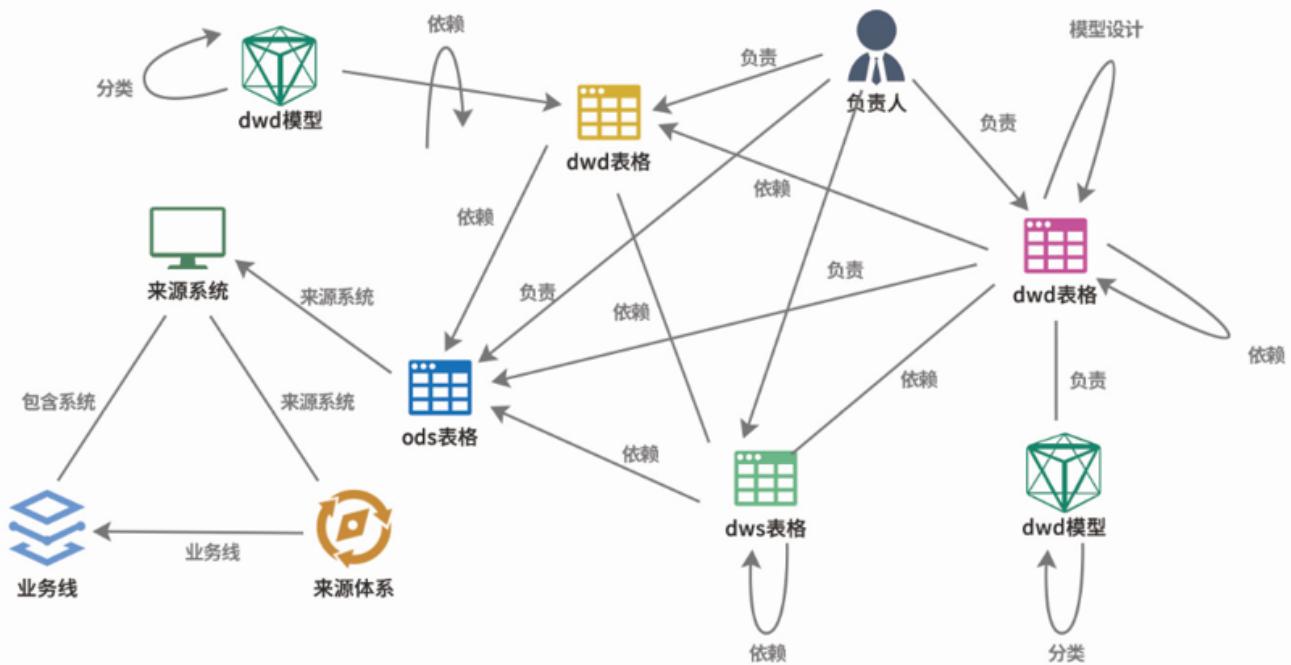
IT

Hive

Job

ETL ⁴

ETL



IT

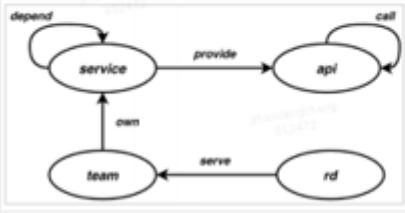
5

(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

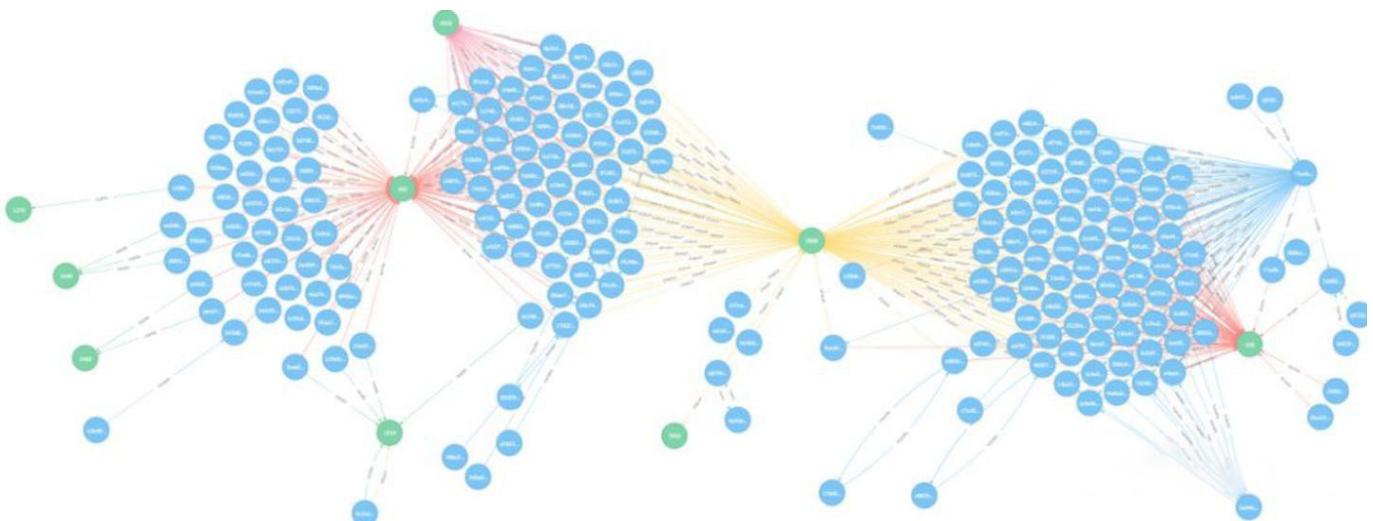
```
//查找最外层method到某个method的所有无环路径
(GO 1 to 30 STEPS FROM 2946345526231222882 OVER
method_call_method REVERSELY YIELD DISTINCT
method_call_method._dst AS id
MINUS
GO 1 to 30 STEPS FROM 2946345526231222882 OVER
method_call_method REVERSELY YIELD DISTINCT
method_call_method._src as id )
| FIND NOLOOP path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

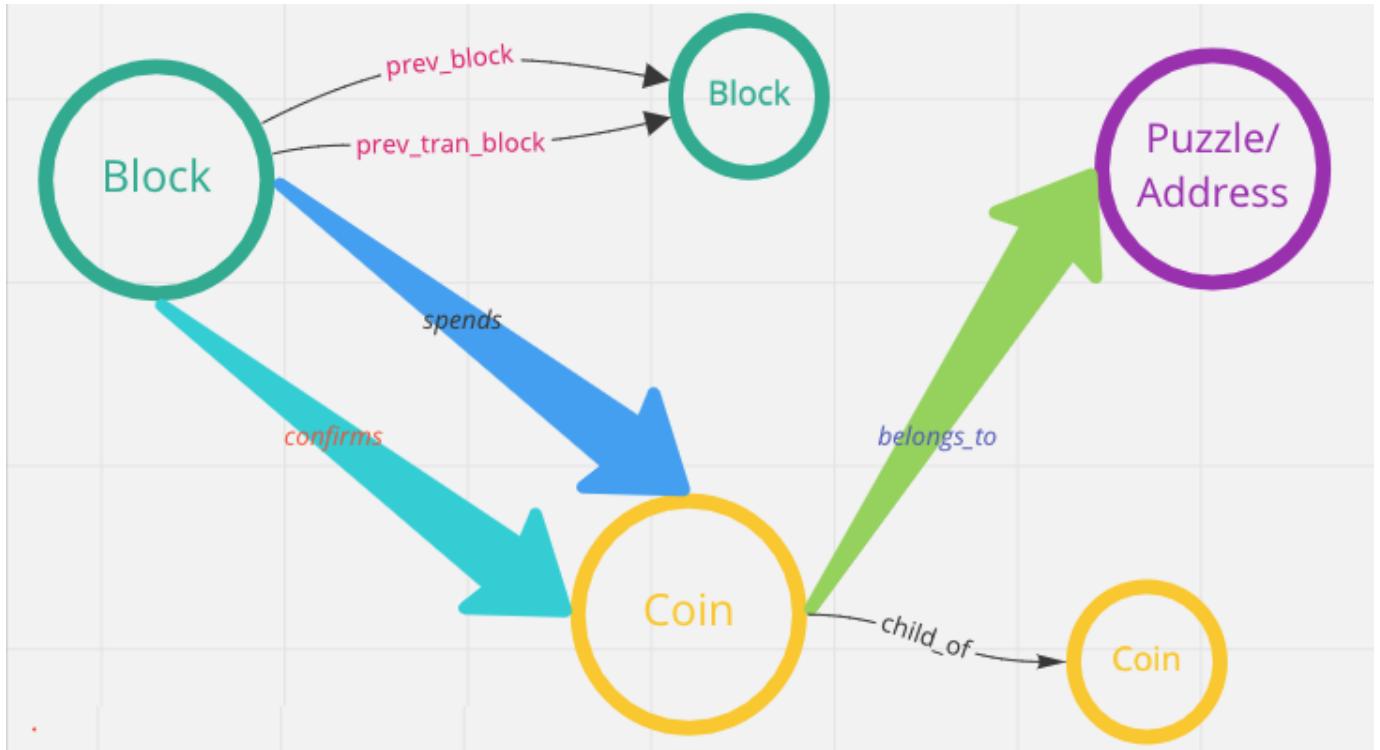


```
//确认两个method间是否有路径
FIND SINGLE SHORTEST PATH FROM hash("method1")
TO hash("method2") OVER method_call_method UPTO
30 STEPS
```

6

“ “ “ ”

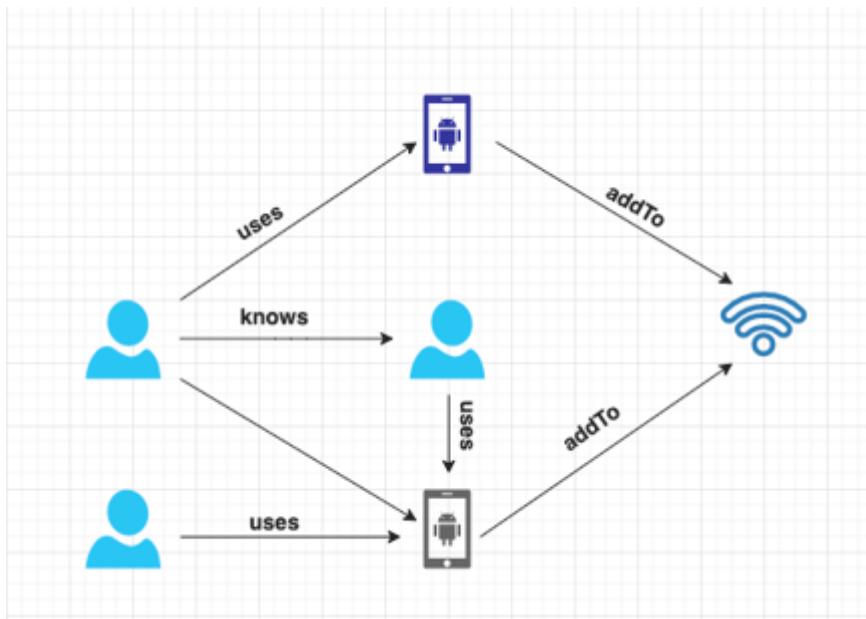




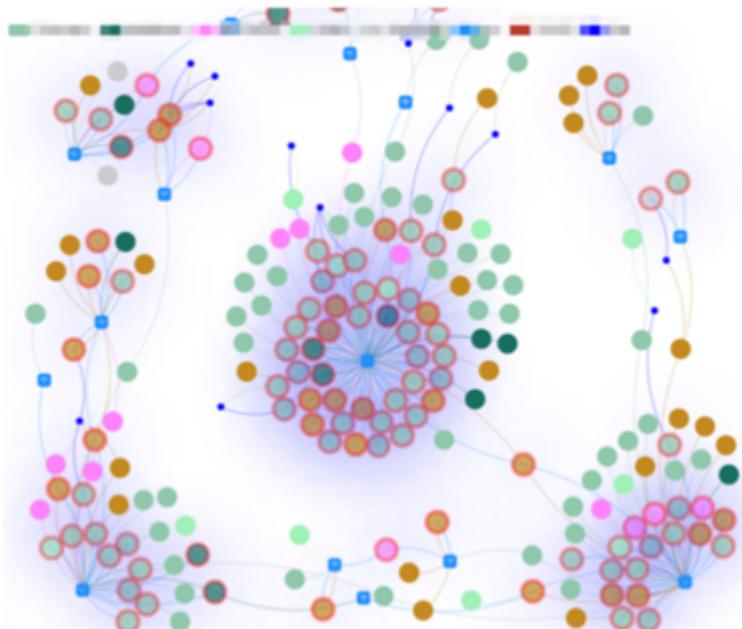
7

WIFI

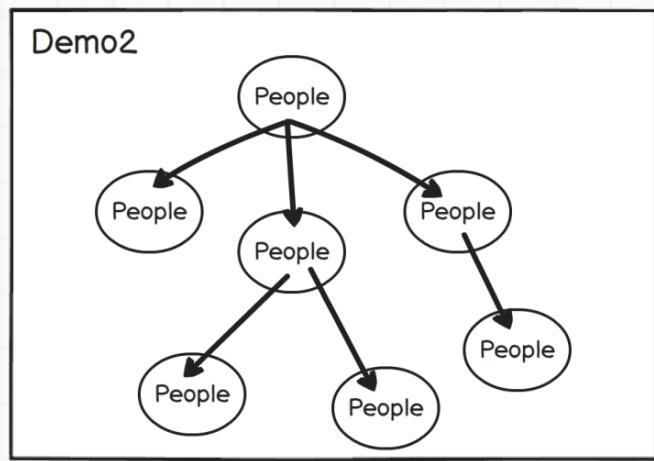
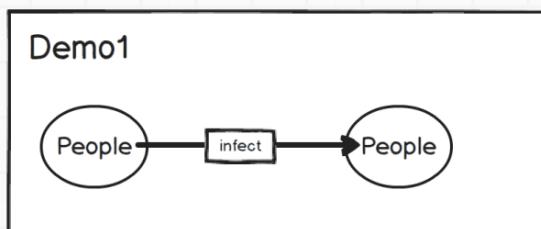
WIFI



360 7 8 9 10



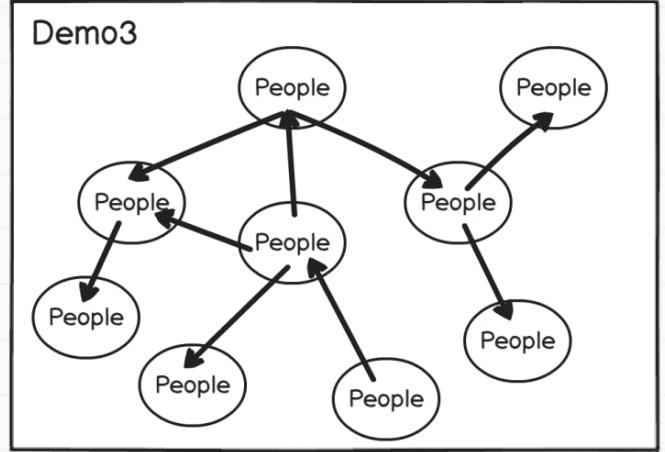
11



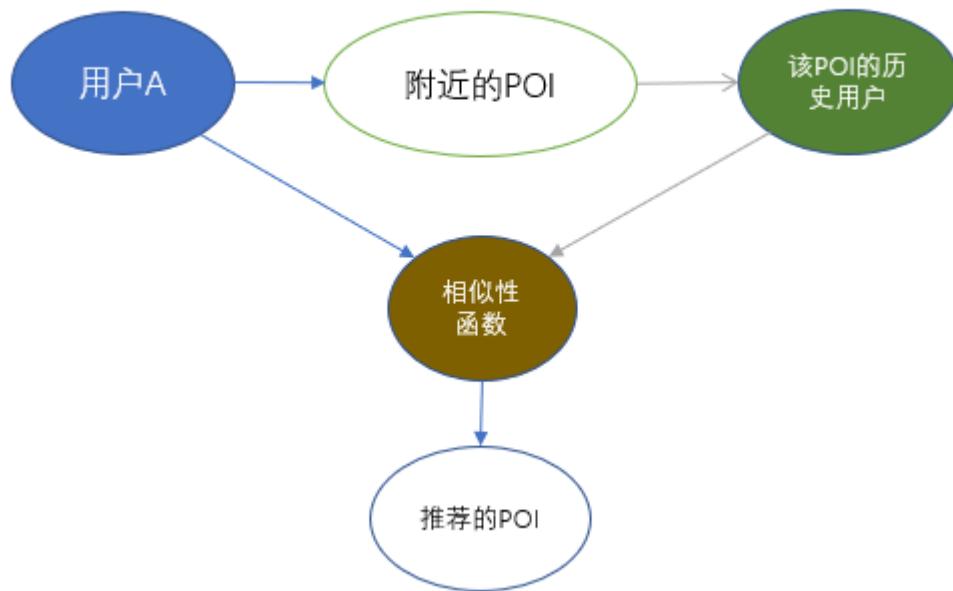
O2O

POI Point-of-Interest

12



APP



Screenshot 1: 搜索目的地 - 望京 新荟城

- 搜索框: 上午11:45 望京 新荟城
- 筛选: 目的地, 商户, 全站搜, 榜单, 内容
- 结果: 新荟城 (评分4.8, 16条评论) - 距离648m
包含「东方饺子王」等人气美食店
附近有停车位
42家品质商户优惠中
- 大家都在问: 平时几点开门, 有残疾人卫生间吗, 对面有停车位吗, 商场有理发店吗, 有什么推荐的餐厅, 有没有新风
- 附近商户: 美食 (江户前·日料海鲜放题), 购物 (新荟城购物中心), 休闲娱乐 (电影院), 图片 (望京), 酒店 (酒店), 地点 (景点)
- 评价: 4.59, 1268条, ¥285/人, 望京 海底捞
- 商家信息: 1176条, ¥148/人, 四川火锅, 望京 海底捞火锅 (望京新荟城店)
- 联系方式: 评价, 导航, 电话

Screenshot 2: 搜索目的地 - 望京SOHO

- 搜索框: 上午11:45 望京 SOHO
- 筛选: 目的地, 商户, 全站搜, 内容
- 结果: 望京SOHO (评分4.9, 2414条评论) - 距离1.4km
商场: 望京商务楼, 望京商务楼
设施: 干净卫生, 环境优雅
描述: “北京最适合拍婚纱夜景的地方”
- 附近餐厅: 香港汇 (评分4.54, 2668条评论) - 距离250m
商家信息: 90元可购100元香港汇大厅使用代金券
评价: 298元 2-3人套餐, 提供免费WiFi
- 评价: 4.48, 9083条评论, ¥105/人, 望京 望京一号
- 附近餐厅: 七寻八找·小酒小菜 (评分4.70, 1490条评论) - 距离1.8km
商家信息: 98元 2-3人套餐, 提供免费WiFi

Screenshot 3: 搜索目的地 - 望京 新荟城

- 搜索框: 上午11:54 望京 新荟城
- 筛选: 目的地, 商户, 全站搜, 内容
- 结果: 新荟城 (评分4.8, 16条评论) - 距离1.3km
包含「东方饺子王」等人气美食店
附近有停车位
42家品质商户优惠中
- 大家都在问: 平时几点开门, 有残疾人卫生间吗, 对面有停车位吗, 商场有理发店吗, 有什么推荐的餐厅, 有没有新风
- 附近商户: 美食 (江户前·日料海鲜放题), 购物 (新荟城购物中心), 休闲娱乐 (电影院), 图片 (望京), 酒店 (酒店), 地点 (景点)
- 评价: 4.59, 1268条, ¥285/人, 望京 海底捞
- 商家信息: 1176条, ¥148/人, 四川火锅, 望京 海底捞火锅 (望京新荟城店)
- 联系方式: 评价, 导航, 电话

vivo OPPO

2.1.3

XML/JSON

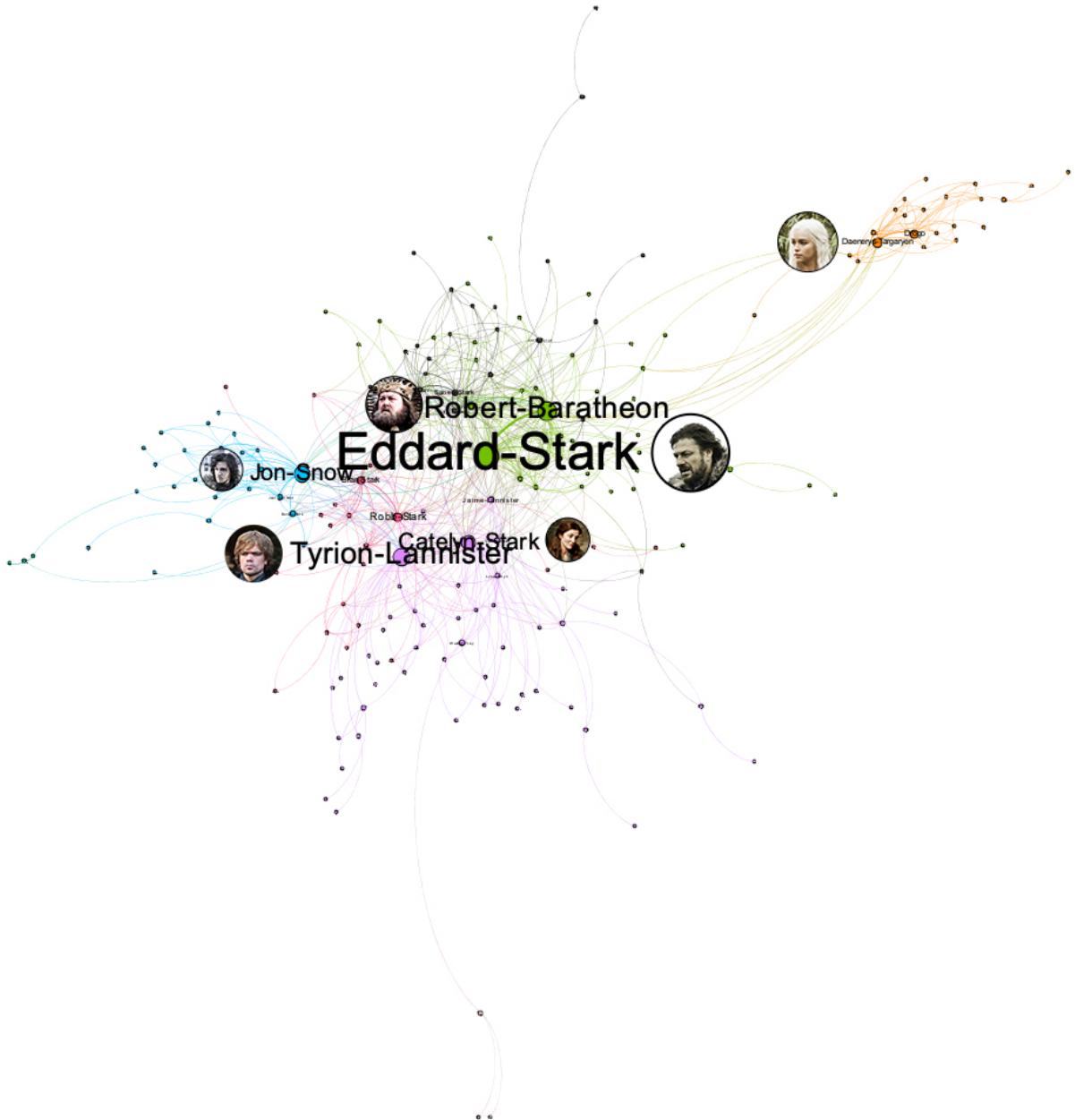
• “ ” “ ”

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

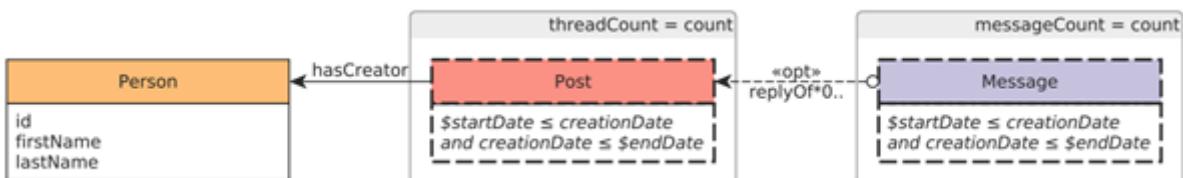
Id	Label	Interval	Modularity Class	betweenness	community	
-4364237027732478972	Arya-Stark	4	4	0.017495	0	0
-4973959390558533367	Gendry	0	0	0.0	0	0
-7025436182975816947	Hallis-Mollen	5	0	0.0	0	0
8249703968876499989	Raymun-Darry	0	0	0.0	0	0
-9085767779232784107	Hobb	3	0	0.0	1	1
7505218728385384214	Randyll-Tarly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





LDBC Person Posts Message ;



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-jgrapht-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> ↪
-

: September 23, 2022

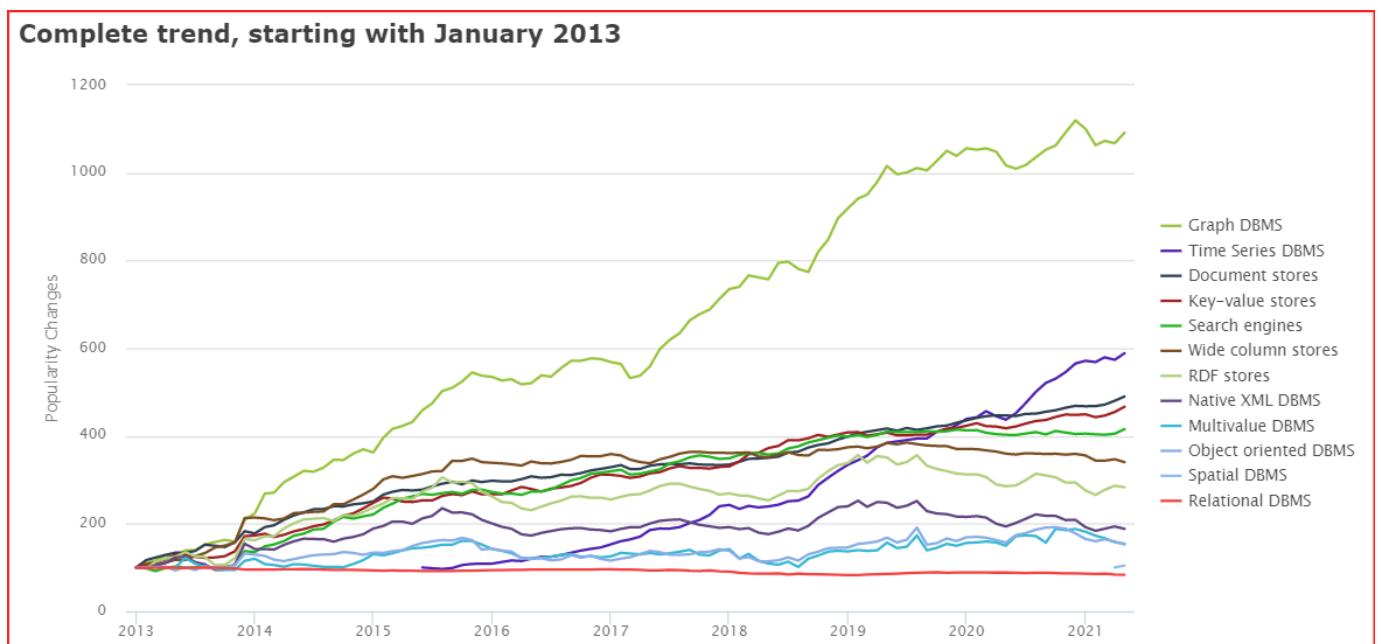
2.2

TTL UDF

2.2.1

DB-Engines

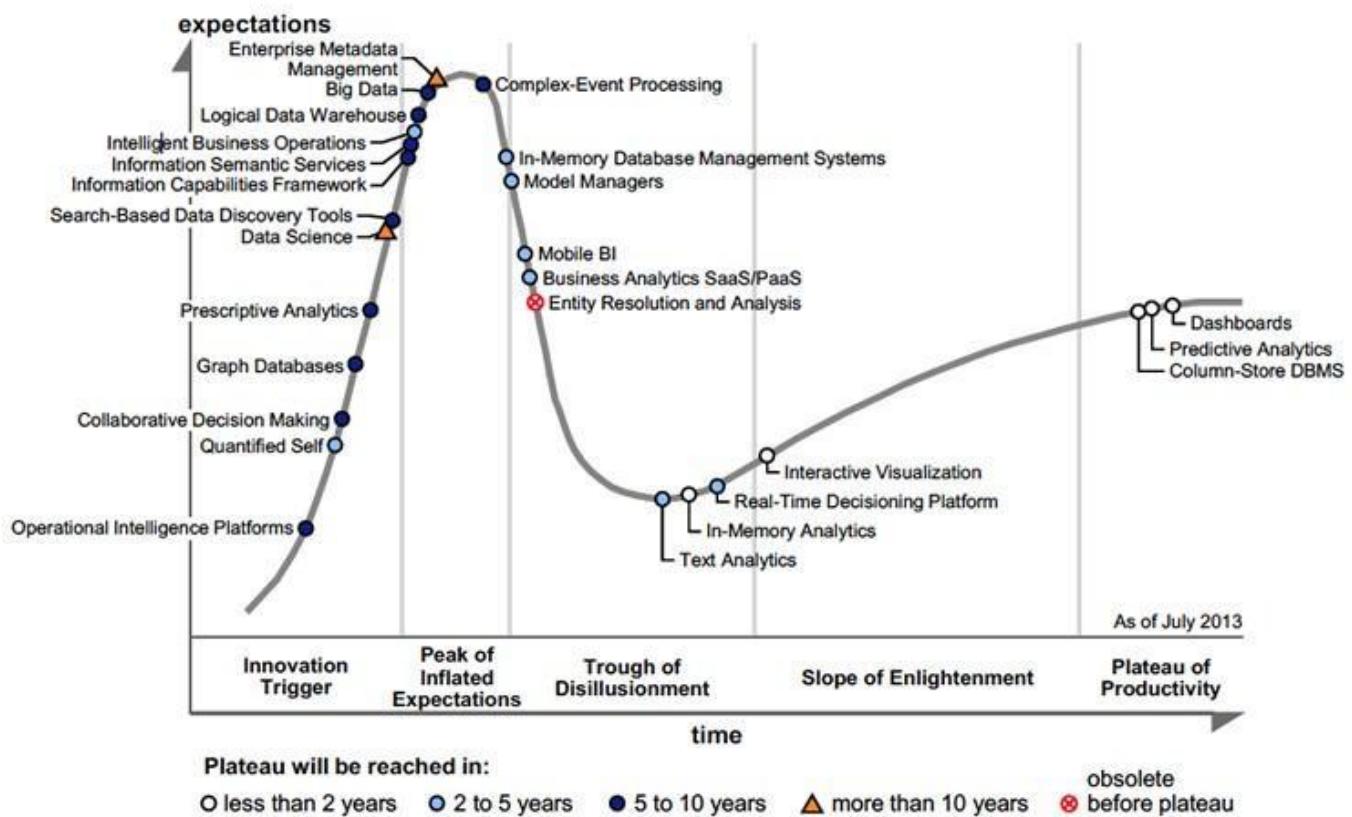
DB-Engines.com	2013	"	"	1			
		Google	IT		371	12	12



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

③

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

Source: Gartner
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Gartner

"

Graph Relates Everything

Gartner 2025

2021 10% 80%

Gartner

DB-Engines

verifiedmarketresearch⁴, ffnresearch⁵, marketsandmarkets⁶, gartner⁷
 (CAGR) 30-40 5-10%

2019 8 6 25%



2.2.2

Neo4j

1970 " CODASYL⁸ G/G+ ⁹ " Neo4j ()
 Neo4j

Neo4j
Languages¹⁰ ⁹

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 Gremlin¹¹
- 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	Johan Svensson			Neo4j	Neo4j
structure	Neo4j 1.4 2011	Neo4j 2.0 2013.12	key-value	Neo4j	search
" " " " "	" "	"	label	Neo4j	
		Neo4j		Cypher	Neo4j
2007 Neo4j		search structure			

GREMLIN

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

Marko

XPath Groovy

Gremlin

Groovy

DSL

CYPHER

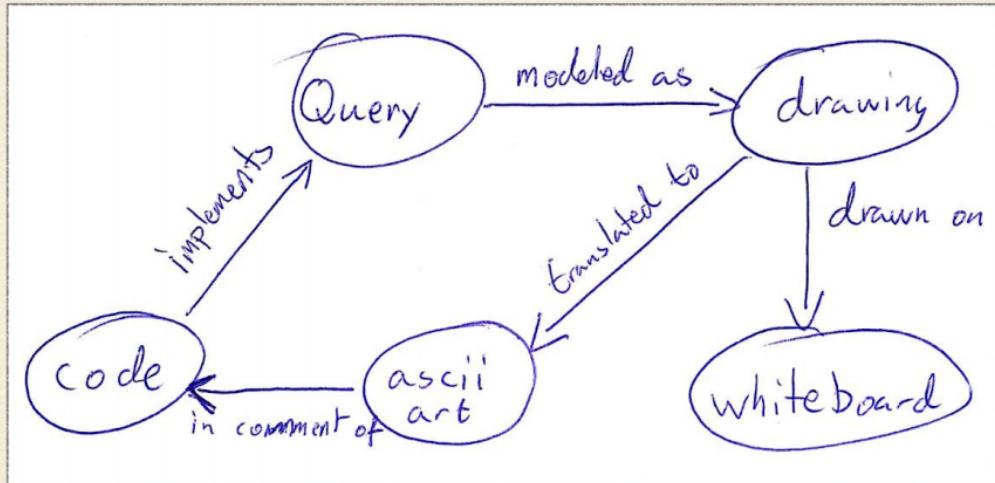
Gremlin	Neo4j Java API		Procedural		Gremlin	
	30	SQL	SQL	" "	" "	Neo4j
2010 Andrés Taylor	Neo4j SQL			2011 Neo4j 1.4		—Cypher

Cypher

"ASCII (ASCII art)"

Neo4j

The Origin of Cypher



The Origin of Cypher

(query) -- [MODELED_AS] --> (drawing)
 ^
 |
 [IMPLEMENTS]
 |
 |
 (code) <- [IN_COMMENT_OF] - (ascii art)

drawing
 |
 [TRANSLATED_TO]
 |
 v

```

MATCH (query)-[:MODELED_AS]->(drawing),
      (code)-[:IMPLEMENTES]->(query),
      (drawing)-[:TRANSLATED_TO]->(ascii_art)
      (ascii_art)-[:IN_COMMENT_OF]->(code)
WHERE query.id = {query_id}
RETURN code.source
  
```

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

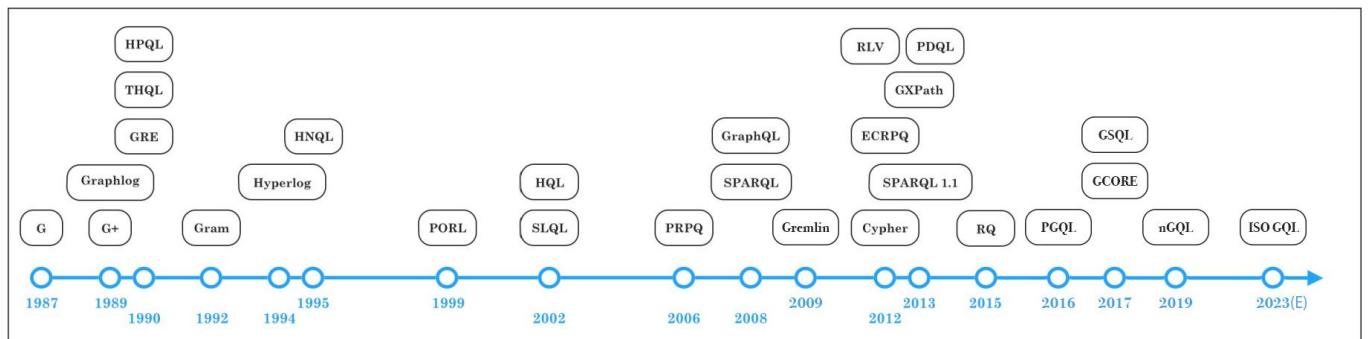
2015 Oracle PGX PGQL

2016 Linked Data Benchmarking Council, LDBC LDBC G-CORE

2018 Redis (library) RedisGraph Cypher

2019 ISO openCypher, PGQL, GSQ¹²L, and G-CORE

2019 NebulaGraph openCypher NebulaGraph Query Language, nGQL



2005-2010 Google " " Hadoop Cassandra

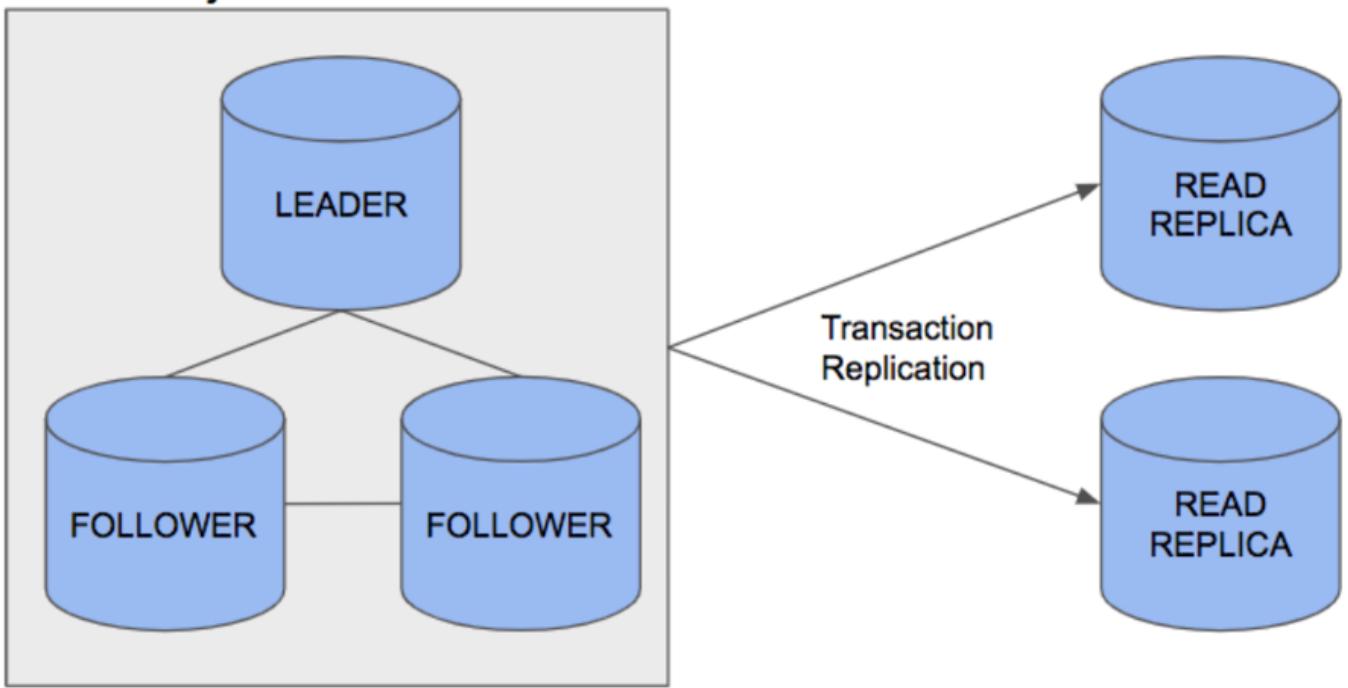
1. (Neo4j)

2.

Neo4j :

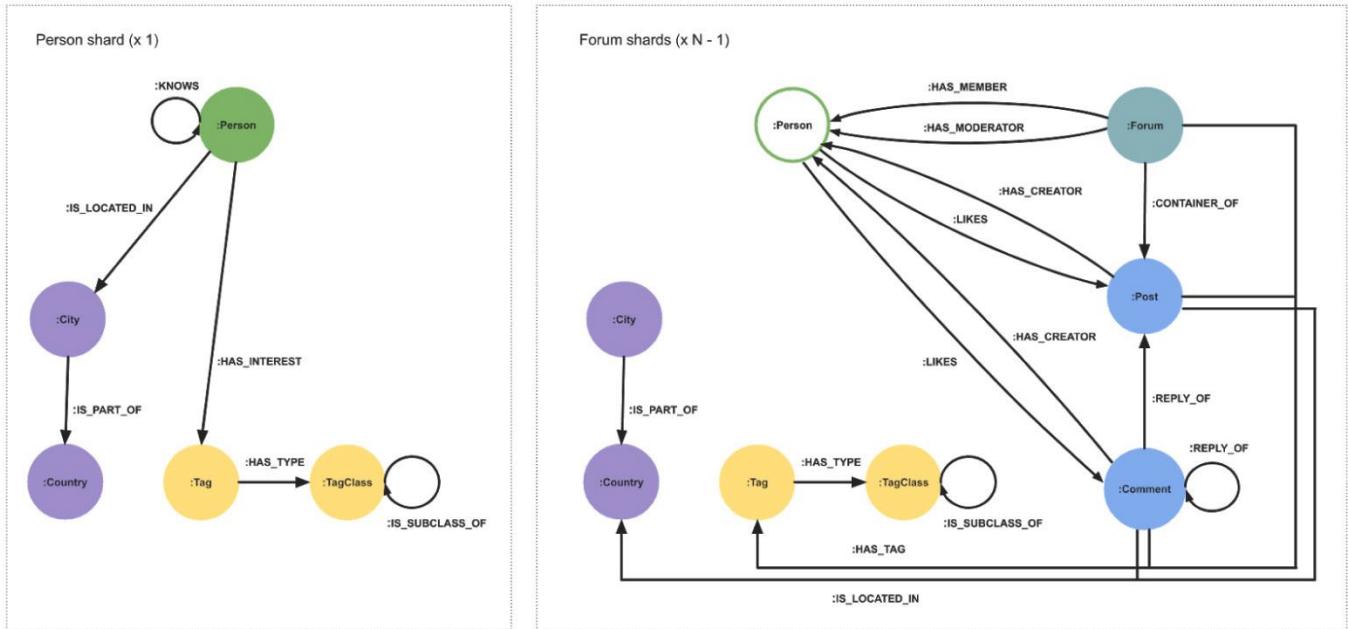
- Neo4j 3.X (Master-slave/slave)

Neo4j Causal Cluster

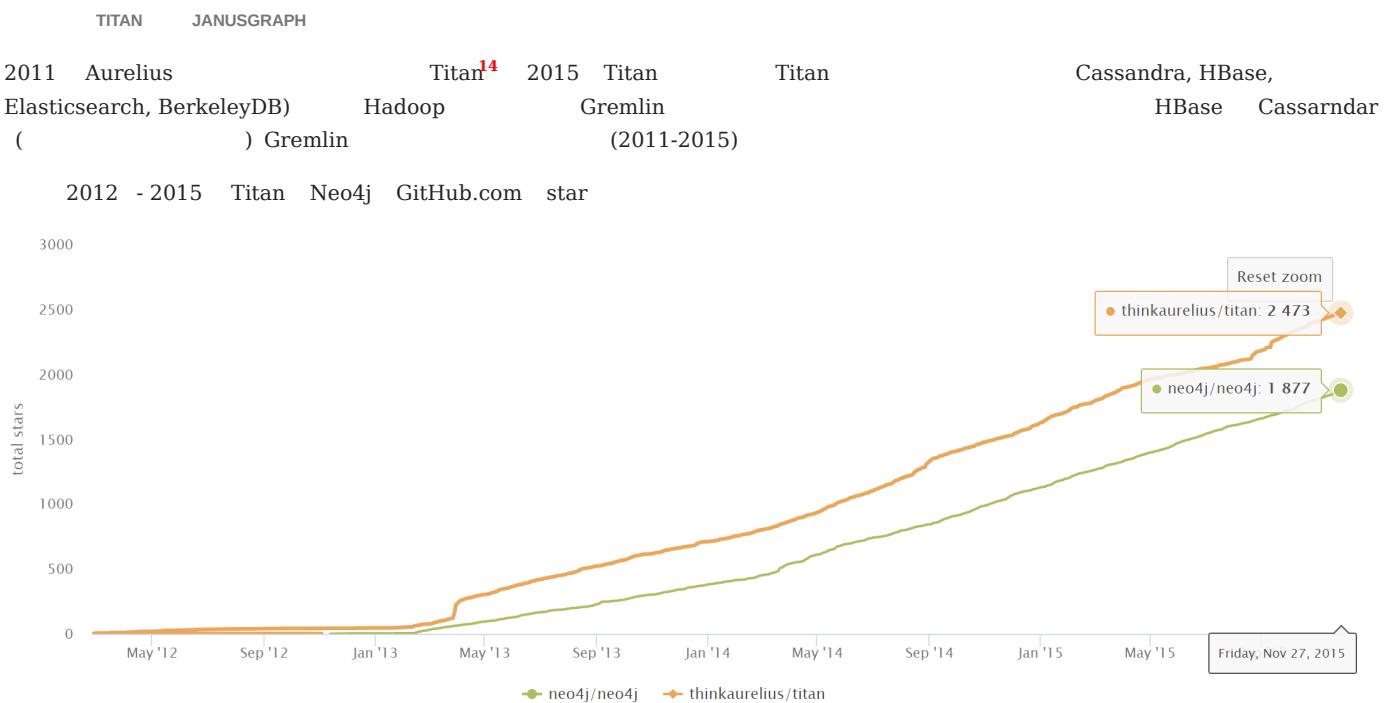
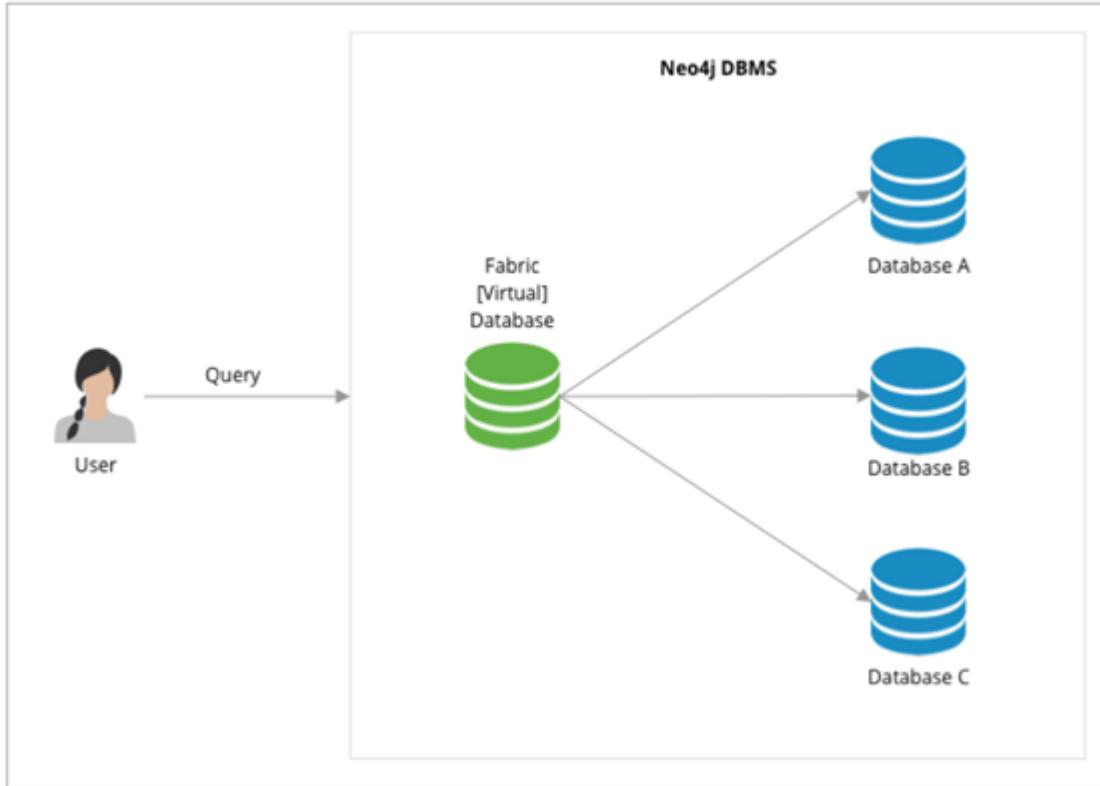


Cluster architecture

- Neo4j 4.X
- (Fabric¹³



```
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)

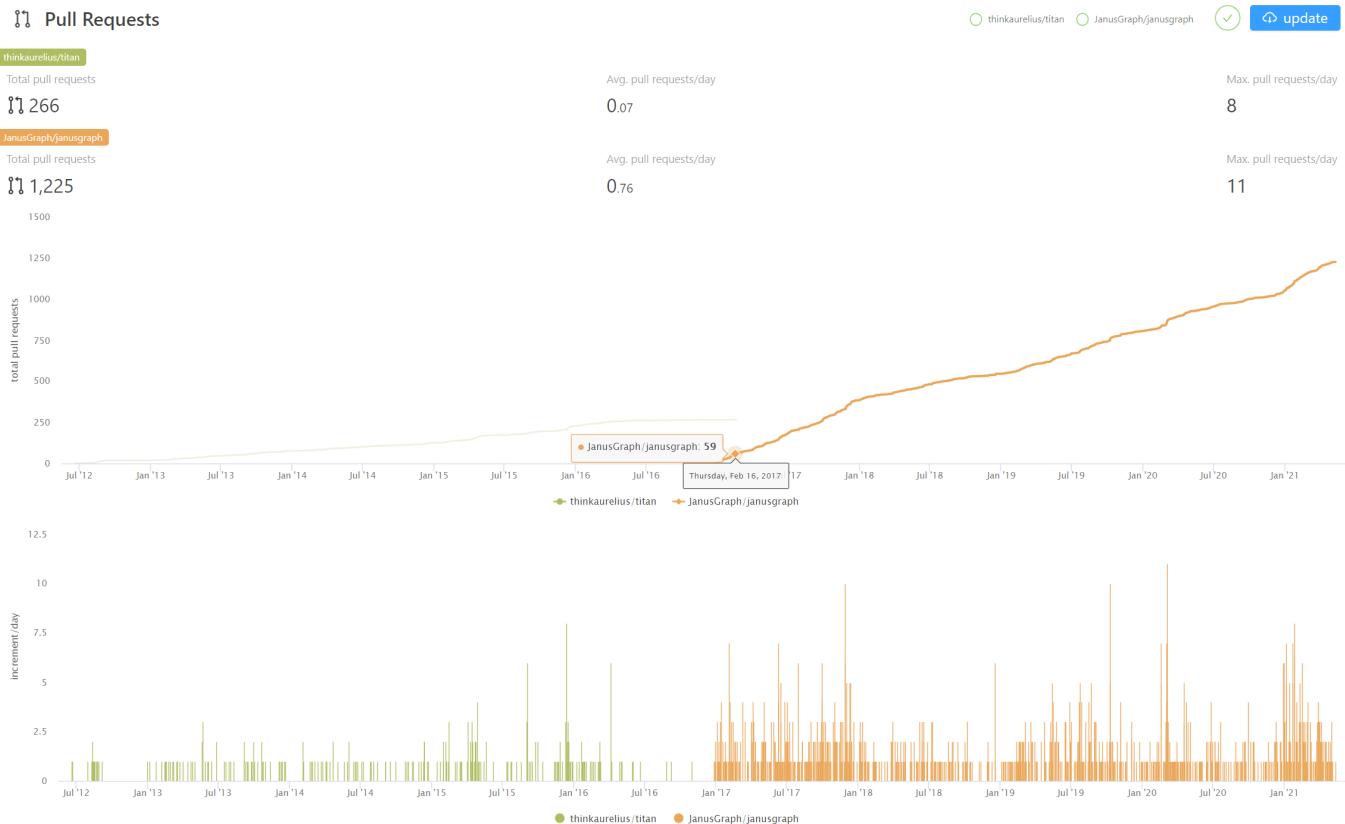
Aurelius(Titan)
Google, GRAKN.AI, Hortonworks, IBM and Amazon) 2017
JanusGraph

Linux
(fork) Titan

JanusGraph¹⁵

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	+ KV + AQL (, KV)
DGraph Labs	2016	DGraph	Apache Public License 2.0 + Dgraph Community License	RDF GraphQL GraphQL+-

Microsoft Azure Cosmos DB¹⁶
RDF Oracle graph¹⁸

Oracle

SQL key-value

Amazon AWS Neptune¹⁷

AWS

NEBULAGRAPH

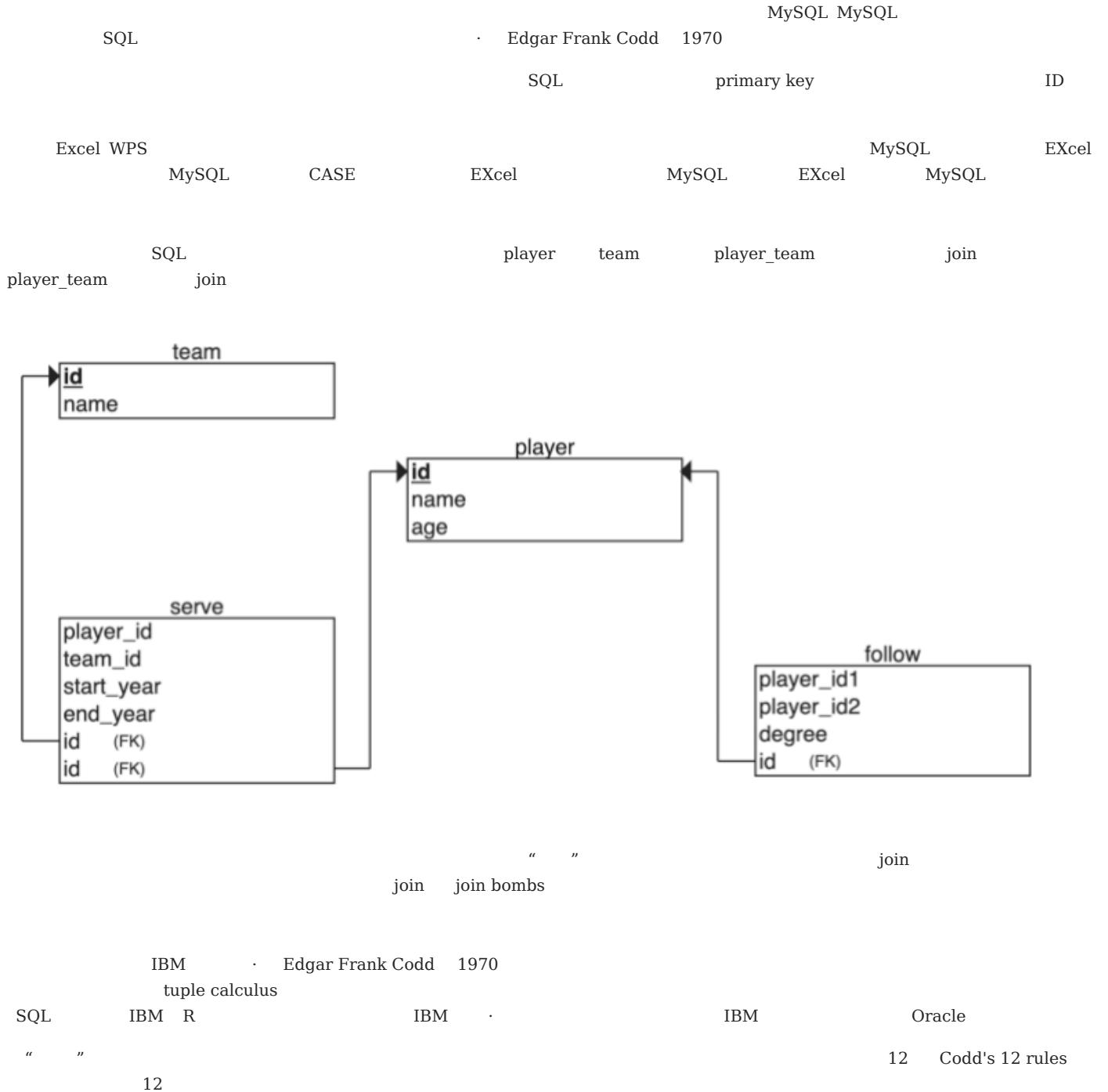
NebulaGraph

-
1. 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/> ↵
-

: August 9, 2022

2.3

2.3.1



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

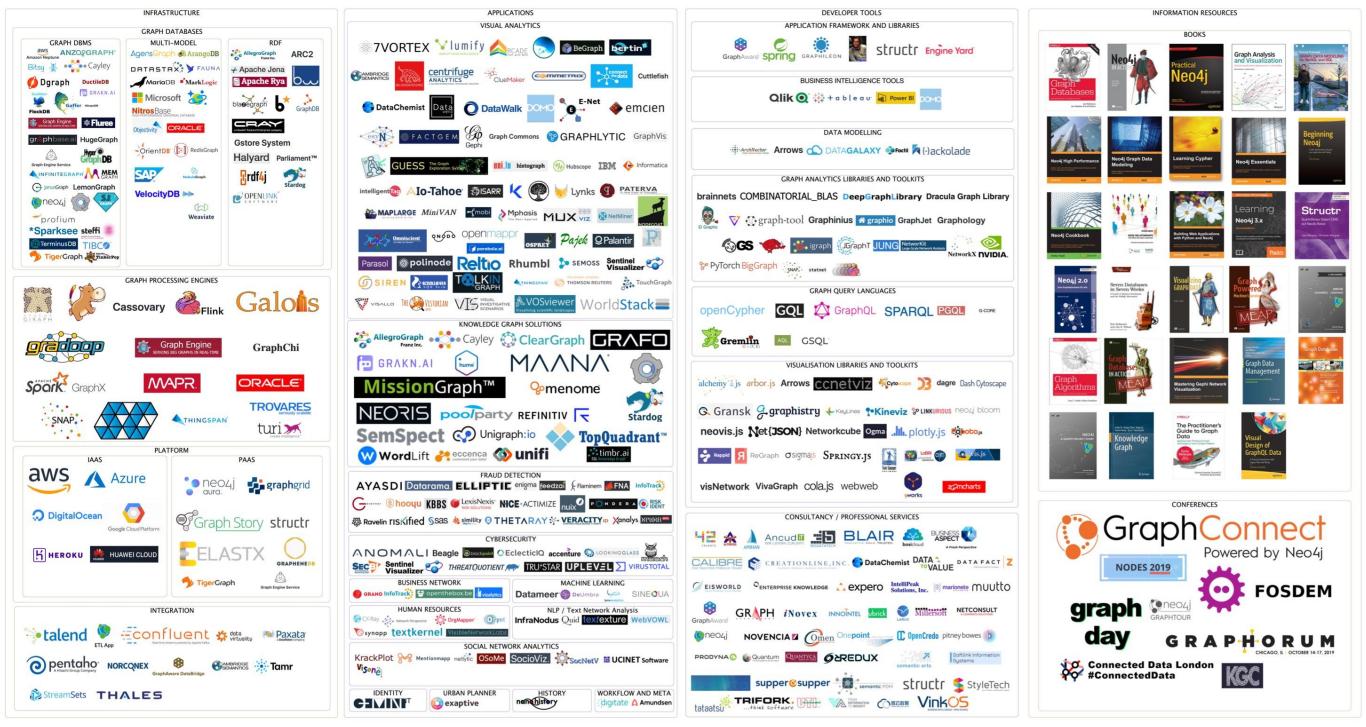
NoSQL	XML JOSN YAML	JSON	JSON
JSON	MongoDB CouchDB Terrastore		
NoSQL	NebulaGraph	NoSQL	NoSQL
		NoSQL	
			NebulaGraph Neo4j OrientDB

2.3.2

2020

1

GRAPH TECHNOLOGY LANDSCAPE 2020



2020_v2

()

• K

- (Pattern matching) /

" (subgraph isomorphism)" --

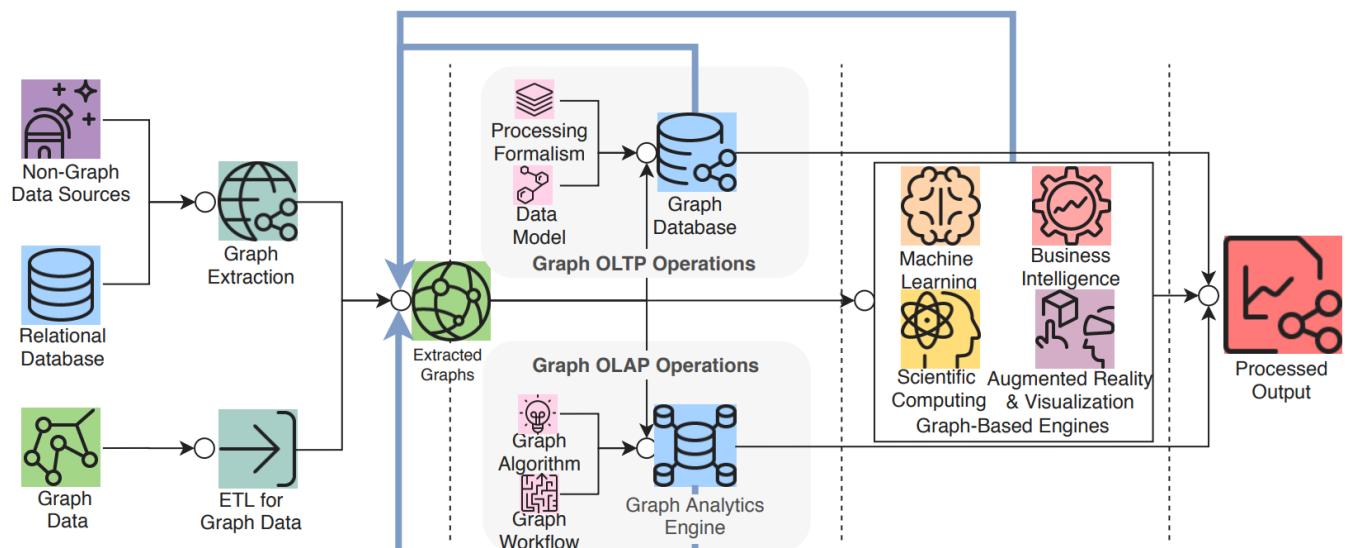
3

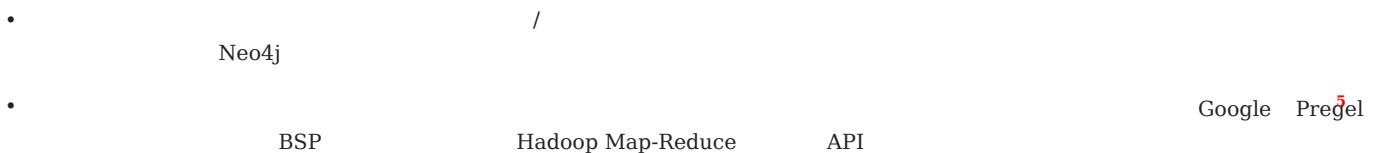
Graph G	Graph H	An isomorphism between G and H
		$f(a) = 1$ $f(b) = 6$ $f(c) = 8$ $f(d) = 3$ $f(g) = 5$ $f(h) = 2$ $f(i) = 4$ $f(j) = 7$

- (Regular Path Query) ——
- count

(Graph Database) (Graph processing)

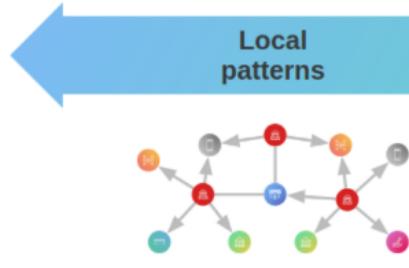
4 () () ETL (Graph OLTP) (Graph OLAP) BI





Query (e.g. Cypher/Python)

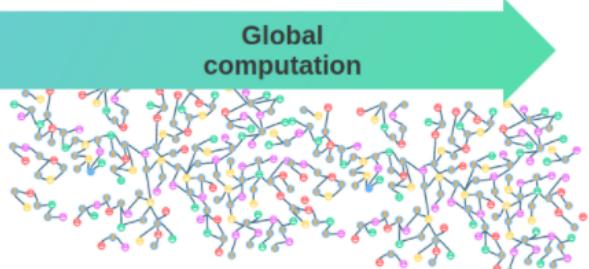
Real-time, local decisioning
and pattern matching



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

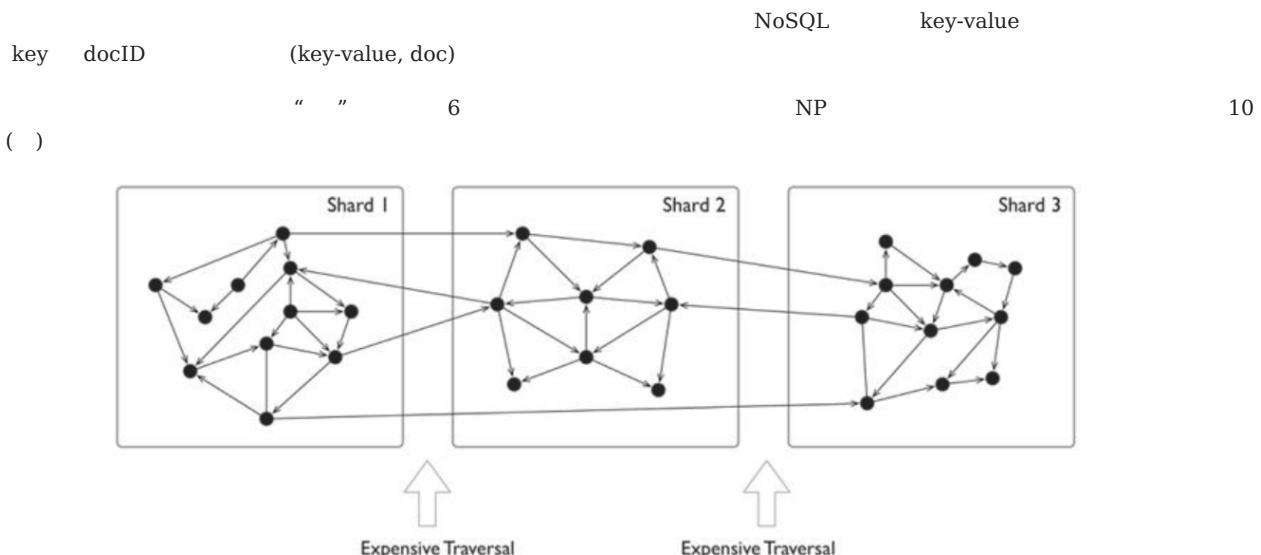
Graph Algorithms libraries

Global analysis
and iterations



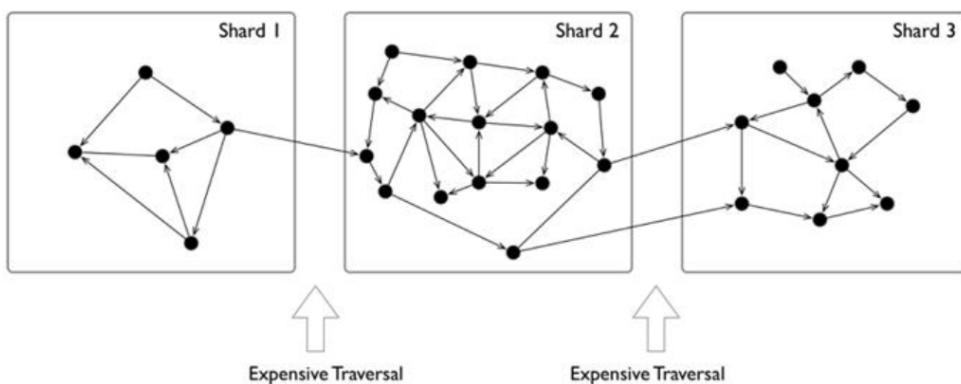
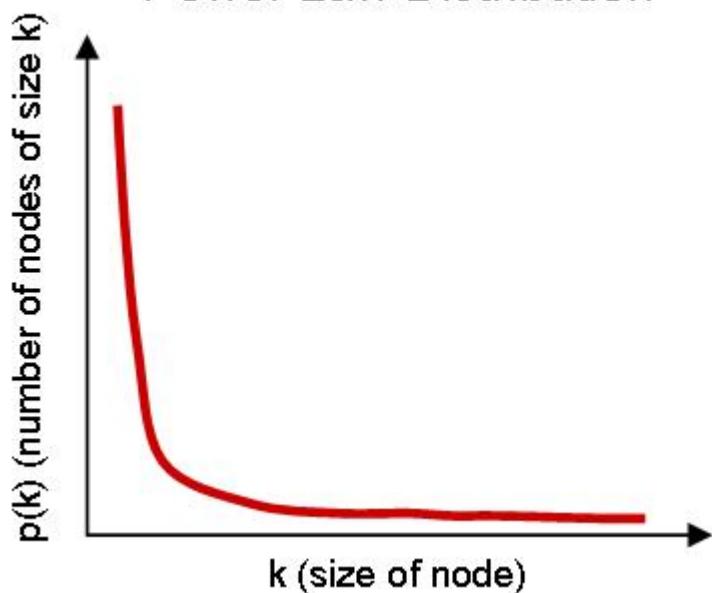
You're learning the overall structure of a
network, updating data, and predicting

6



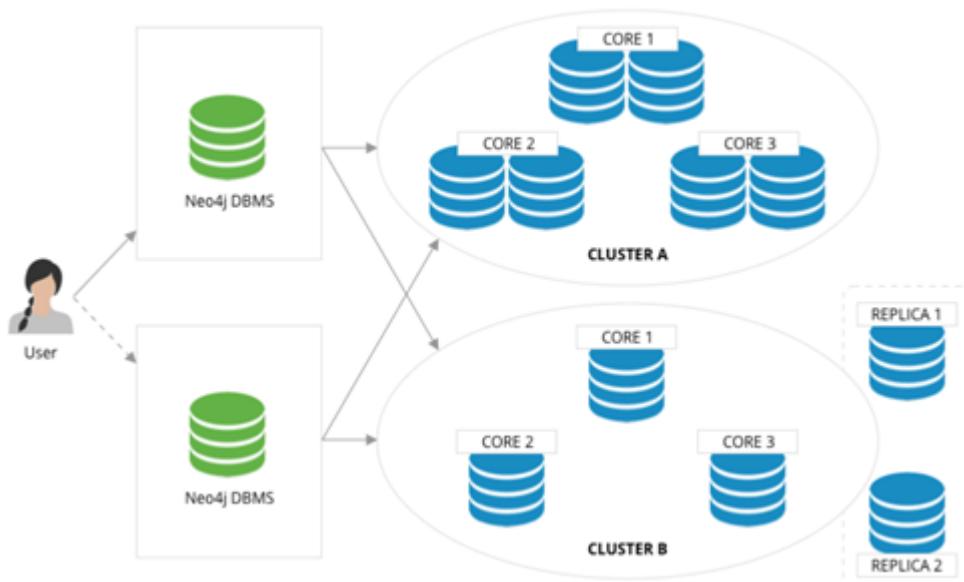
7

Power Law Distribution

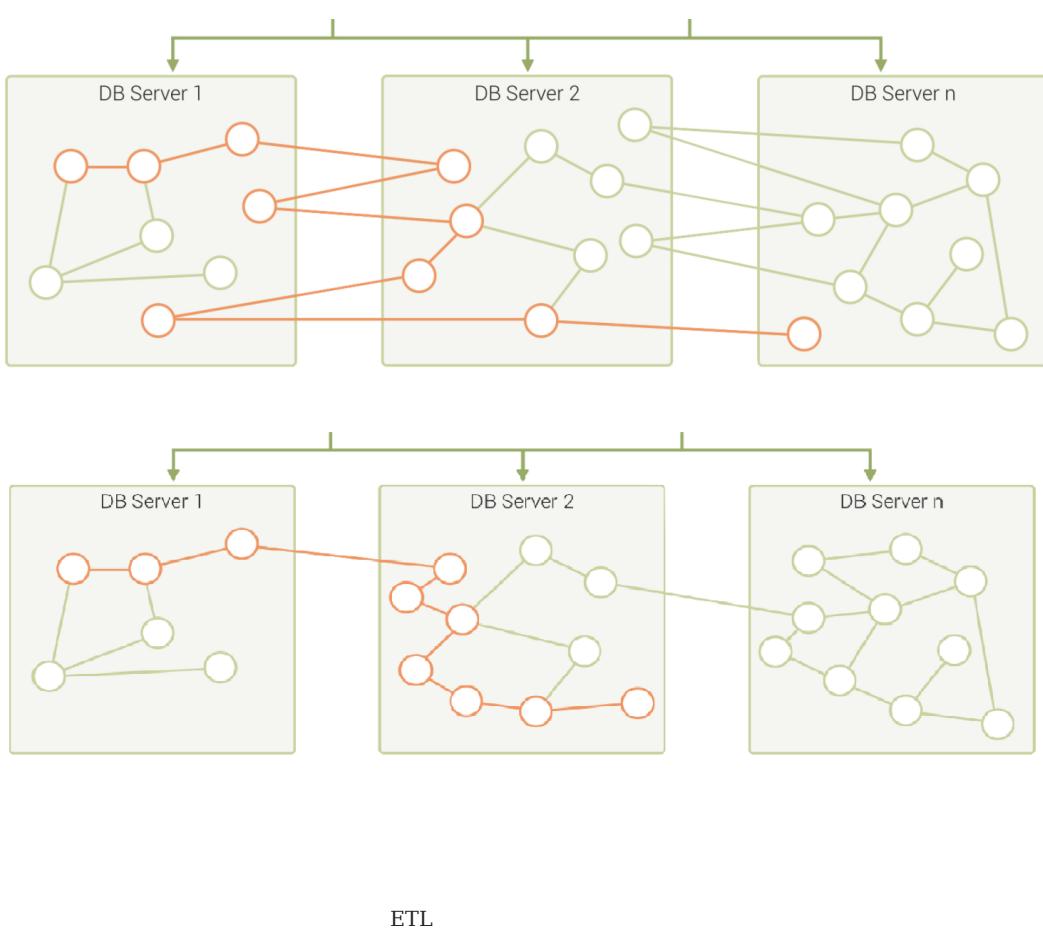


(Sharding)

Neo4j 4.x Fabric



-
- (View)
- Partition
- Sharding
- Partition
- **8**



9

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

SQLite Oracle

Note

- JGraphT¹⁰: Java (library)
- JUNG¹¹ BSD Java
- igraph¹²: Library, R python C
- NetworkX¹³: python
- Cytoscape¹⁴:
- Gephi¹⁵:
- arrows.app¹⁶ Cypher .

Benchmark

LDBC

LDBC¹⁷ Linked Data Benchmark Council Oracle Intel Neo4j TigerGraphSNB Social Network Benchmark
TPC-C, TPC-H SQL

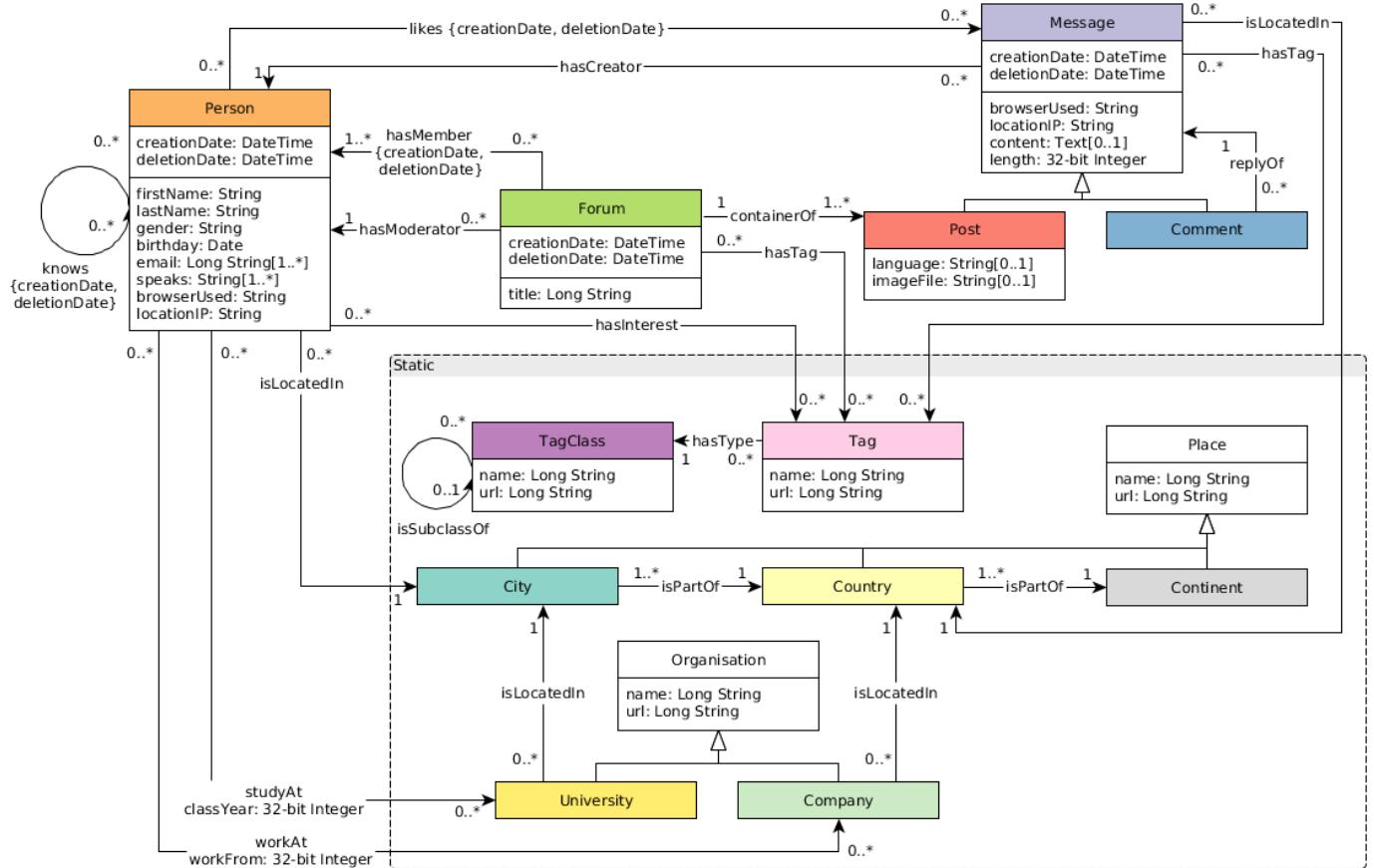
LDBC

Benchmark

Interactive

BI

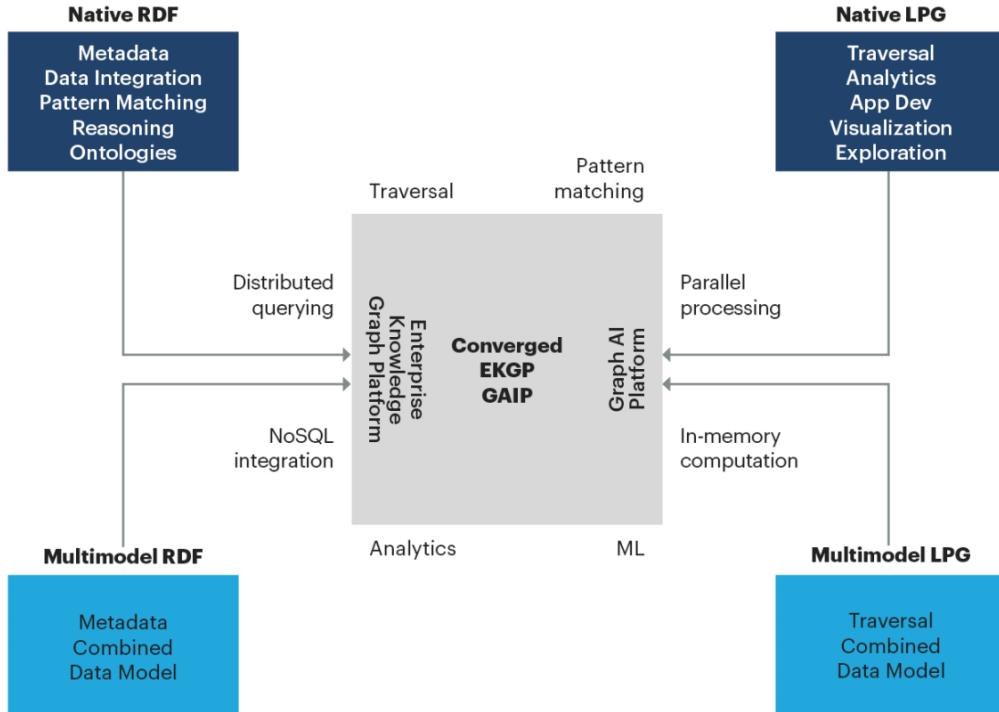
SNB



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**Gartner**

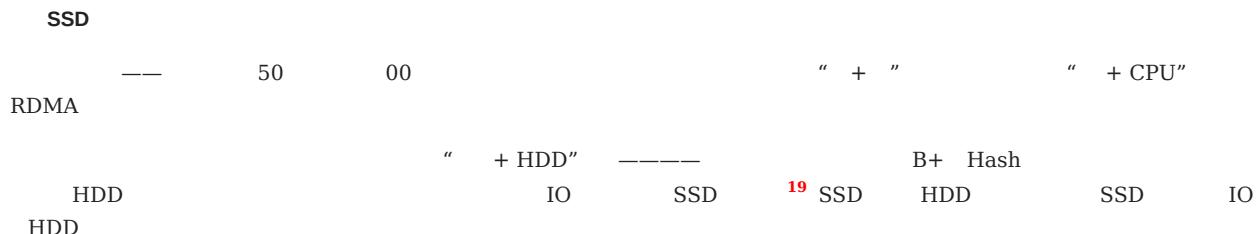
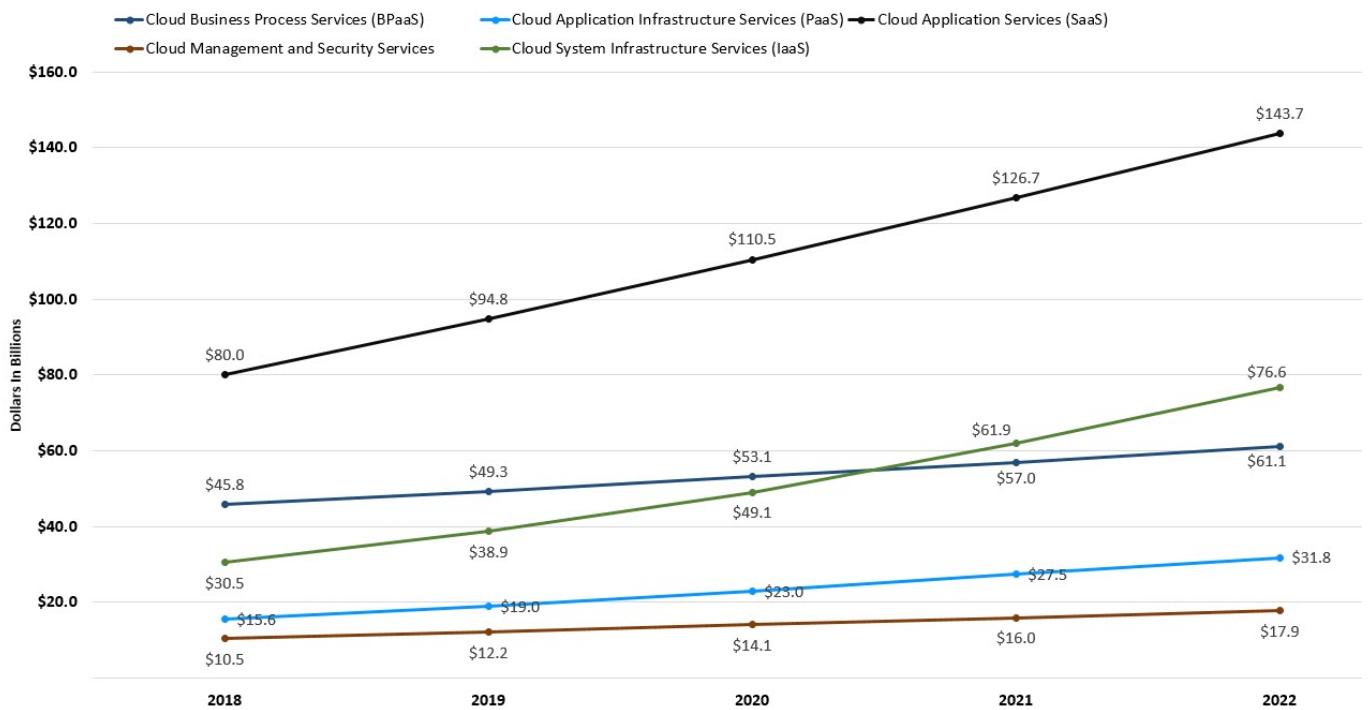
Gartner

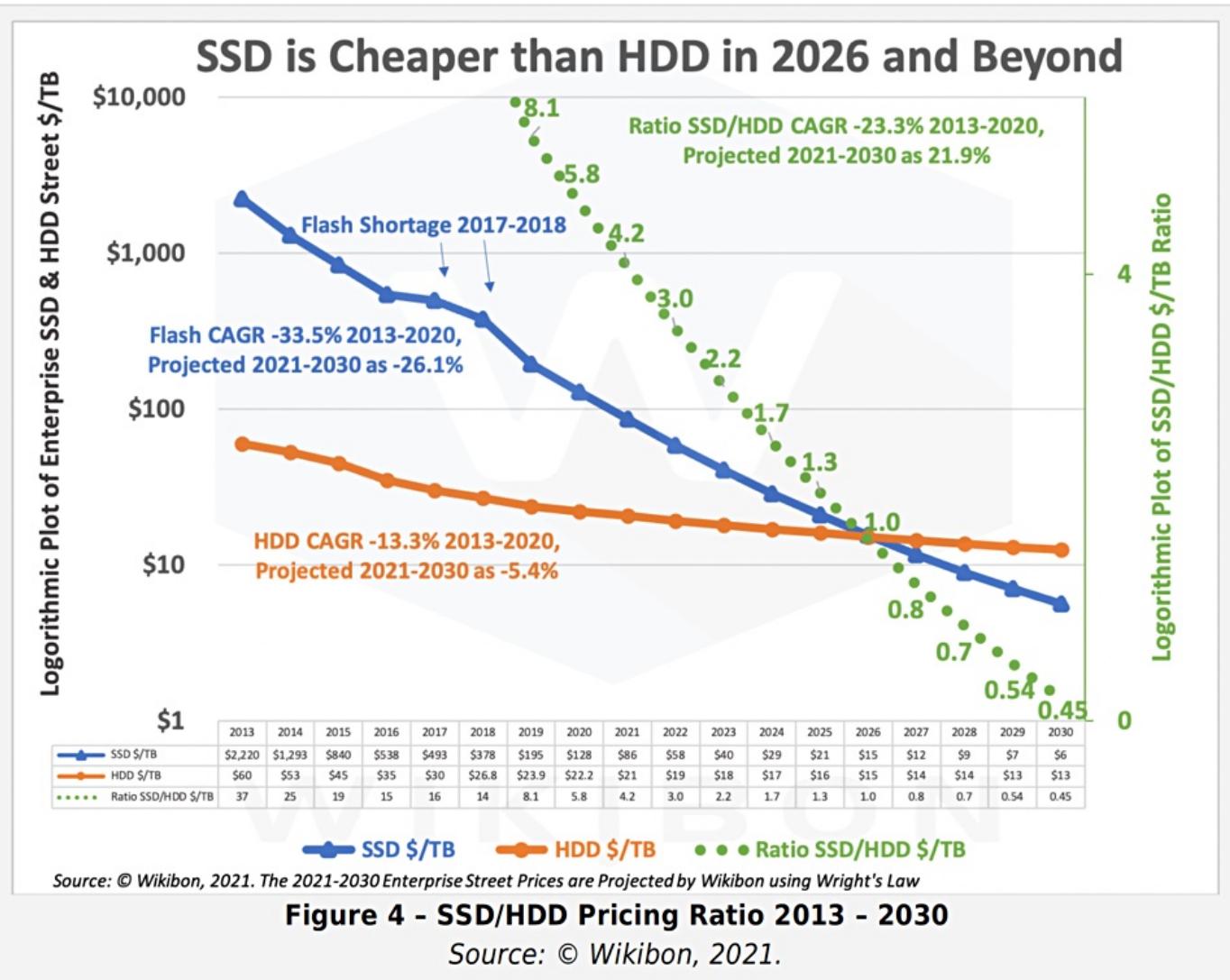
18

10

Worldwide Public Cloud Service Revenue Forecast, 2018 - 2022

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



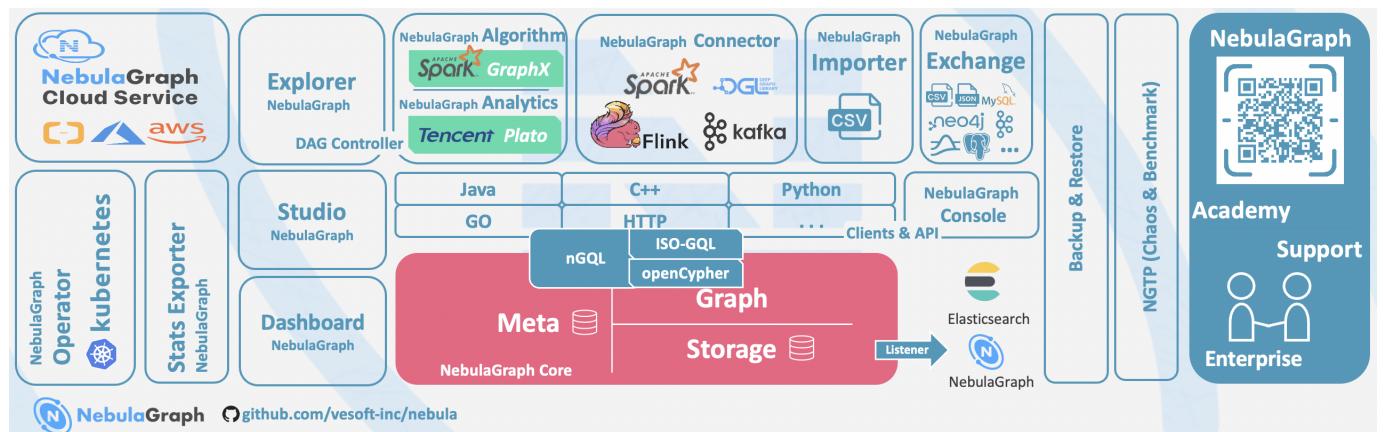


-
1. <https://graphaware.com/graphaware/2020/02/17/graph-technology-landscape-2020.html> ↵
 2. () []((mailto:min.wu@vesoft.com)) ↵
 3. https://en.wikipedia.org/wiki/Graph_isomorphism ↵
 4. The Future is Big Graphs! A Community View on Graph Processing Systems. <https://arxiv.org/abs/2012.06171> ↵
 5. 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 ↵
 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/> ↵
-

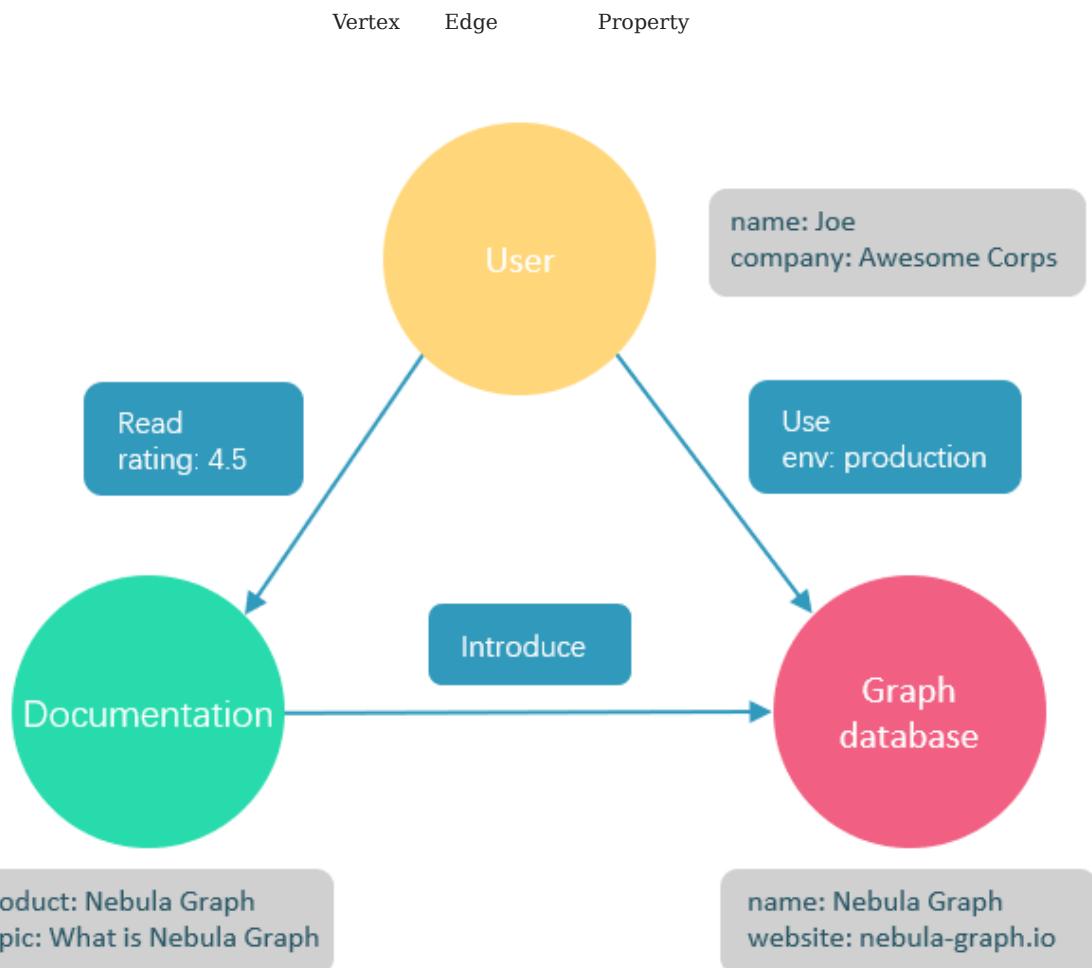
: August 9, 2022

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](#)
-

: December 23, 2022

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

 Note

NebulaGraph

 Compatibility

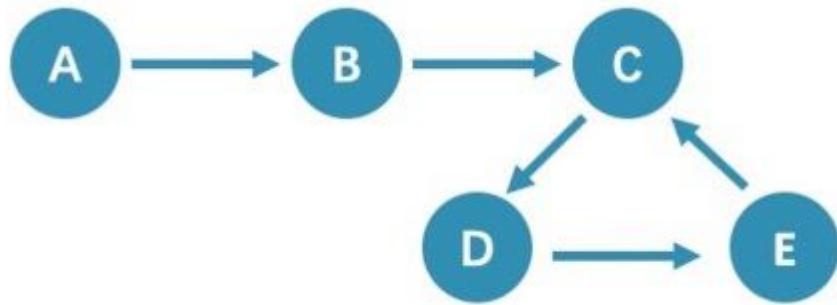
NebulaGraph 3.4.1 " " " " **INSERT VERTEX** **DELETE VERTEX** **INSERT EDGE**
DELETE EDGE

openCypher MERGE

: August 9, 2022

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 12, 2023

2.7 VID

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

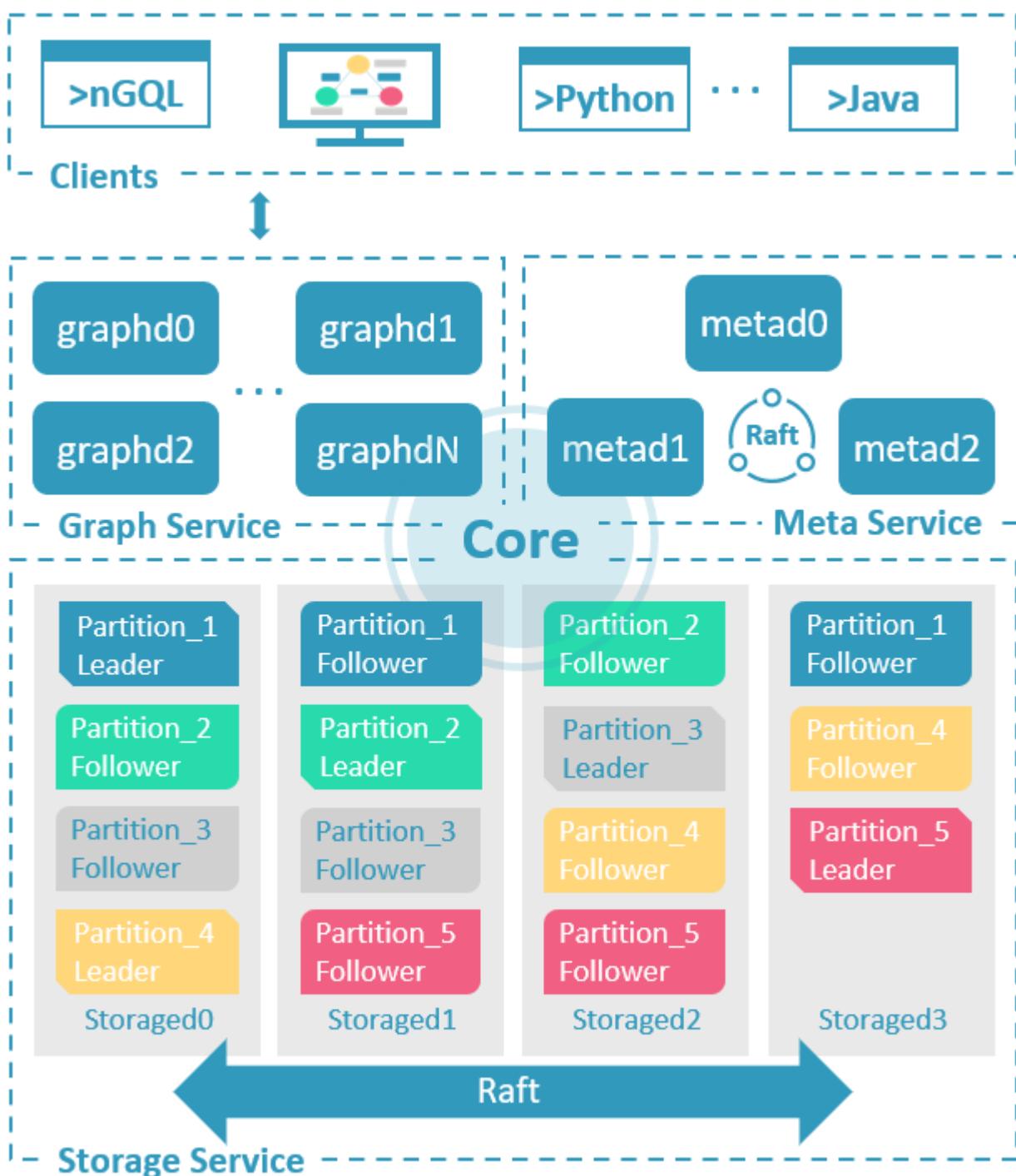
1. GO FROM "player100" OVER      start vid  "player100"
2. LOOKUP ON player WHERE player.name == "Tony Parker"      MATCH (v:player {name:"Tony Parker"})      player.name      start
vid
```

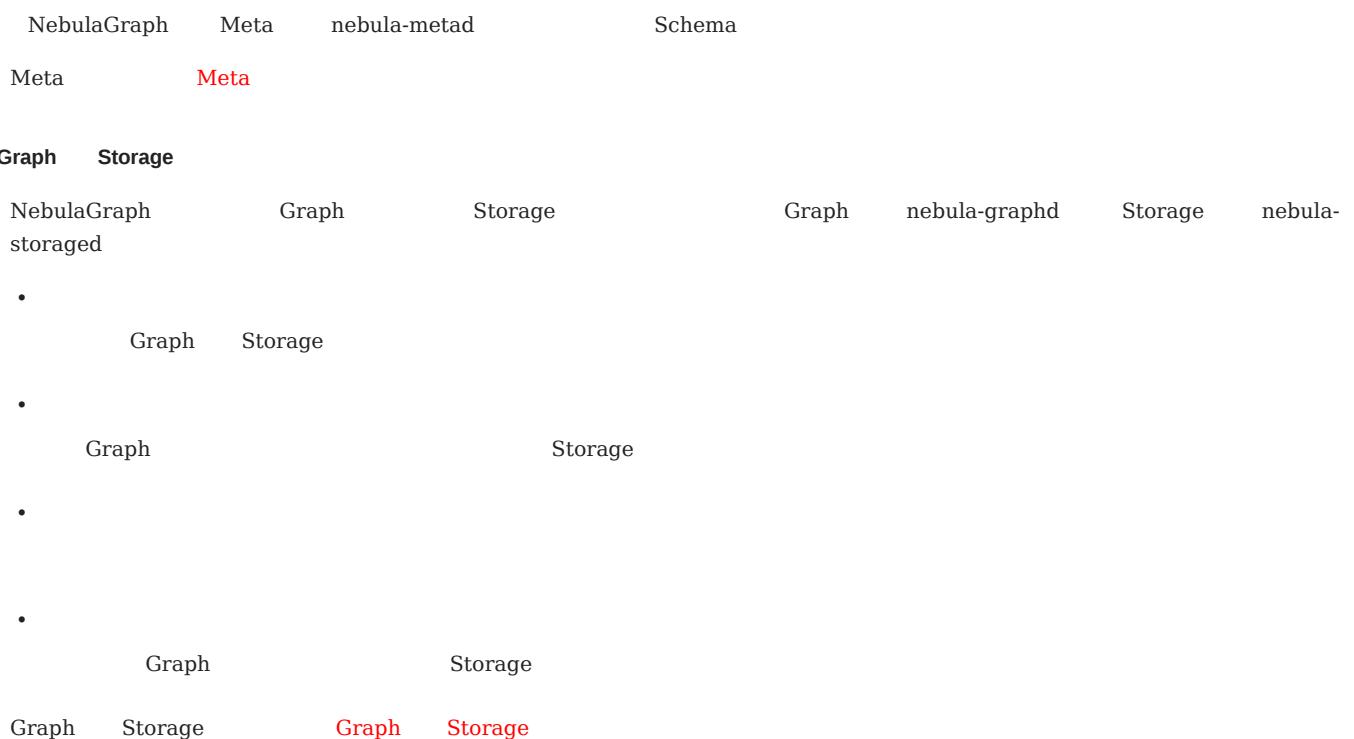
: April 18, 2023

2.8

2.8.1 NebulaGraph

NebulaGraph Graph Meta Storage
 NebulaGraph
 NebulaGraph



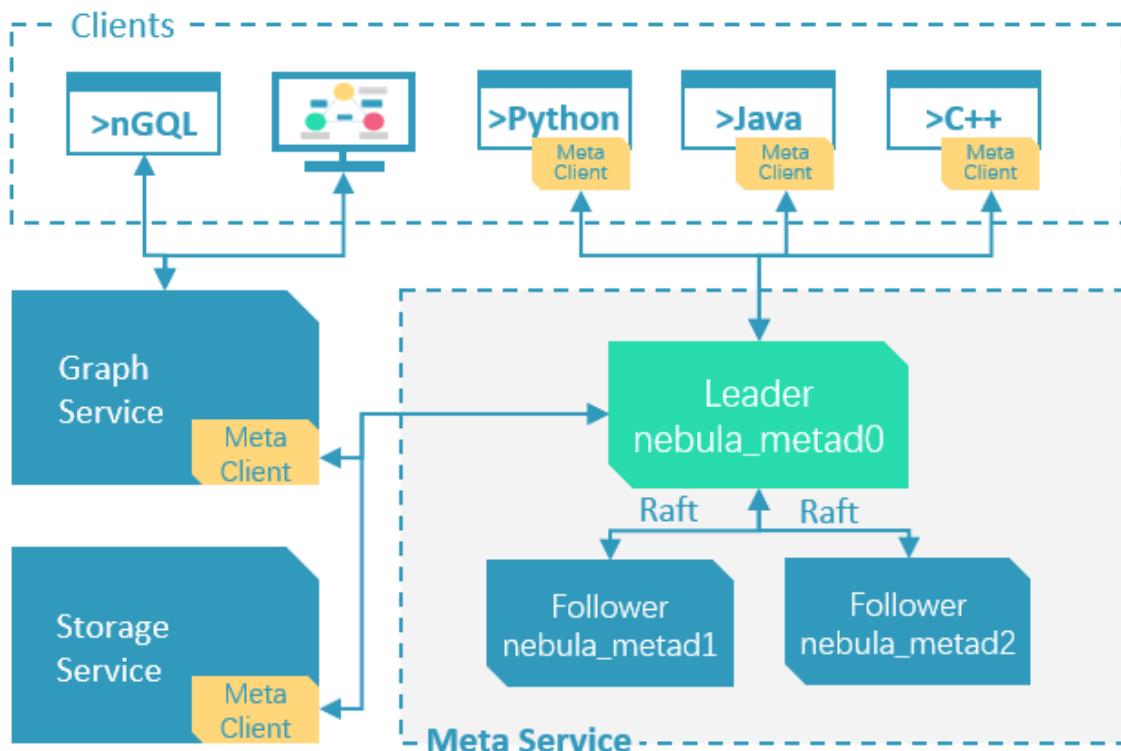
Meta

: August 9, 2022

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	leader	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

TTL

Meta

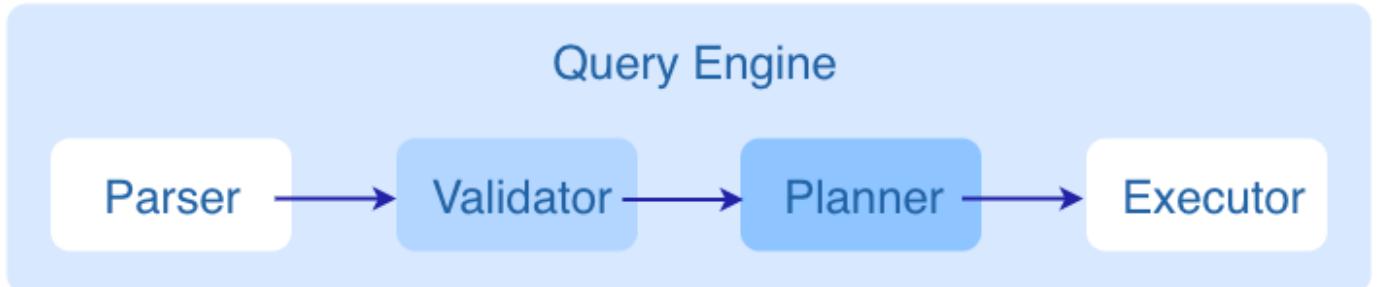
: August 9, 2022

2.8.3 Graph

Graph

Graph

Graph



Graph

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

Parser

Parser

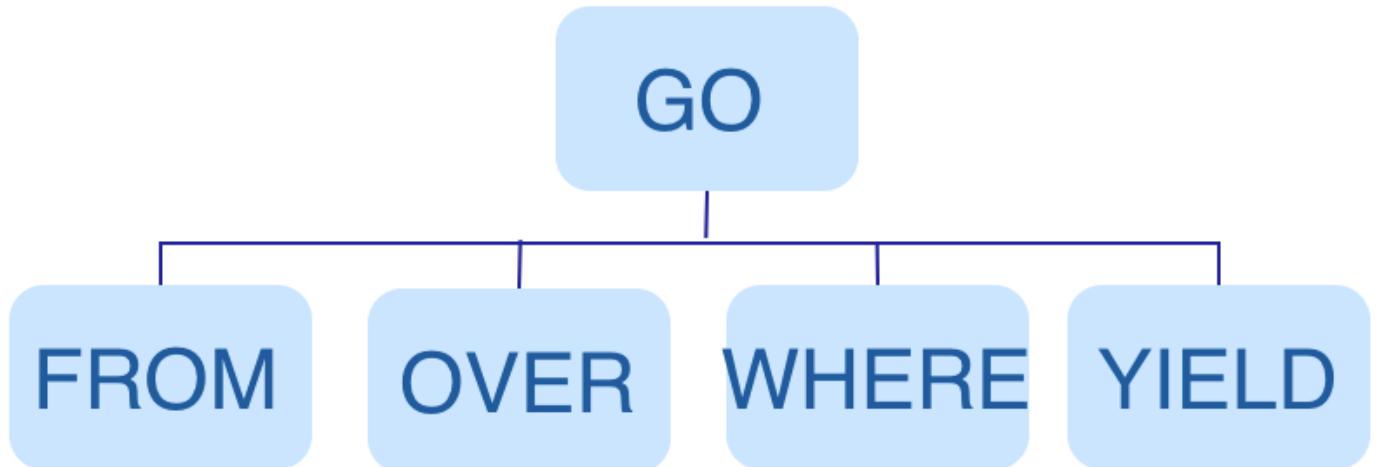
Flex

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
```

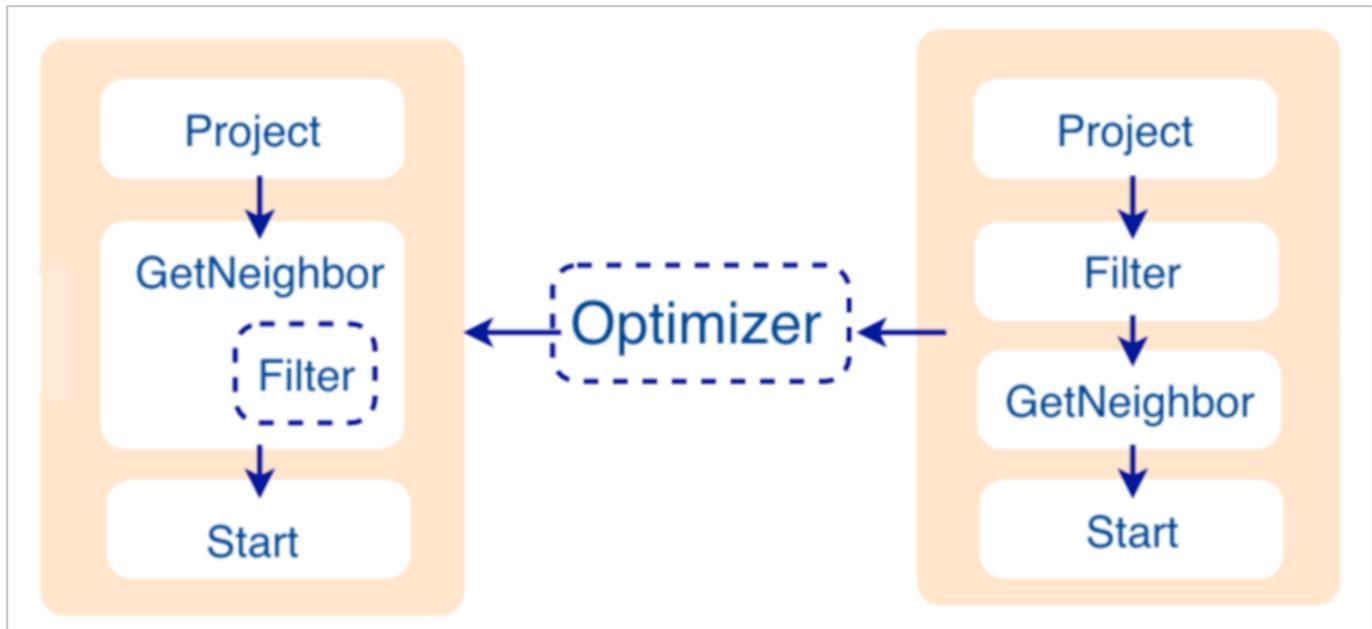
Validator

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/ | |
- | | | | | |
|-------------|-------------|-------------|-------------|-------------------------|
| RBO | Project | Validator | CBO | cost-based optimization |
| | Filter | Filter | Filter | |
| GetNeighbor | GetNeighbor | GetNeighbor | GetNeighbor | |
| Storage | Storage | 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

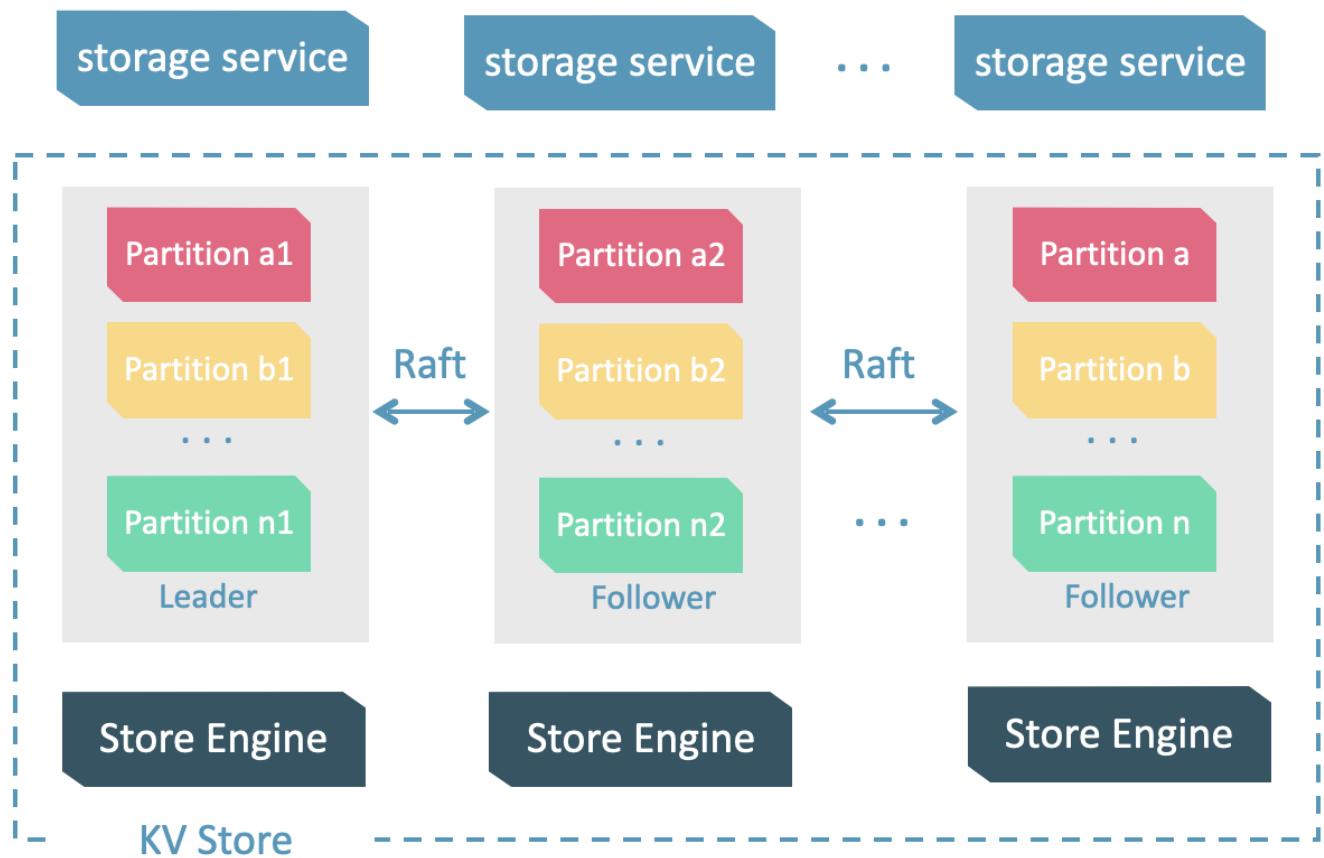
: August 9, 2022

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

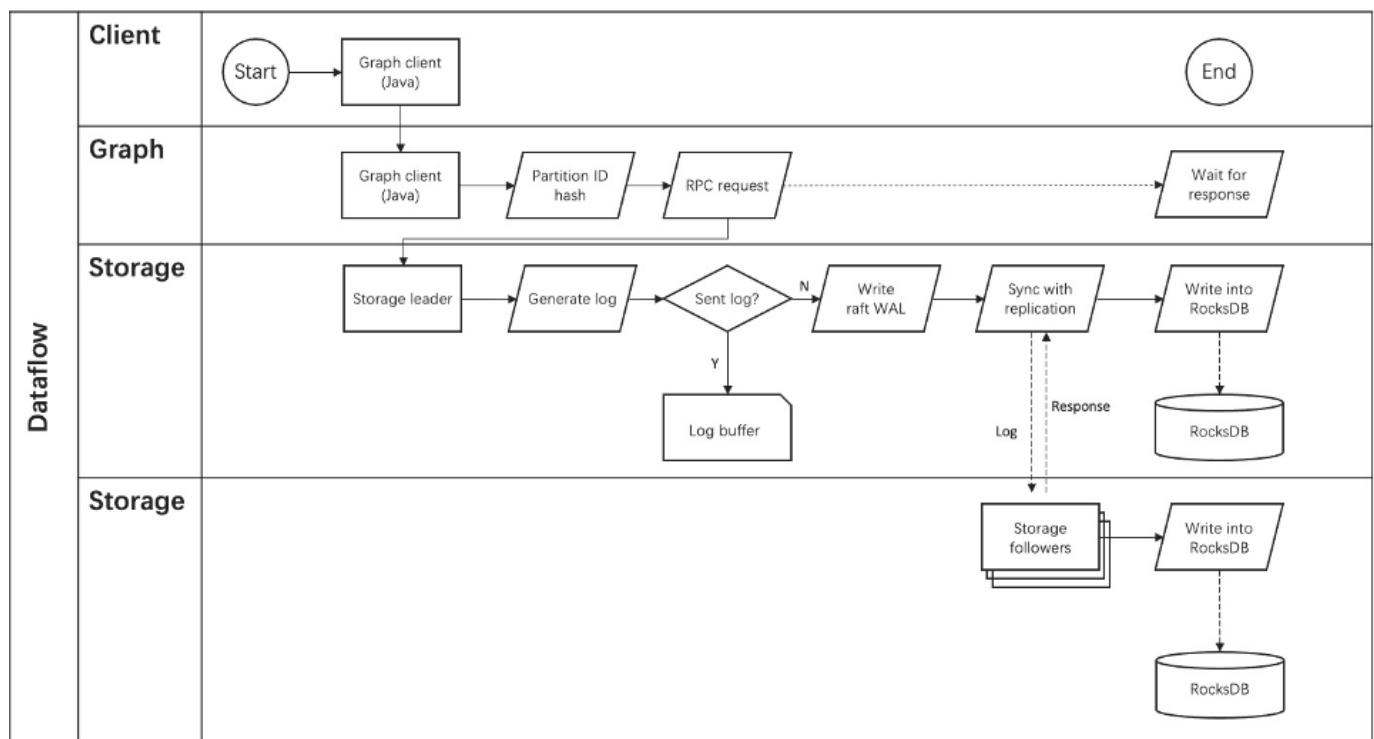
Storage **Multi Group Raft**

- 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

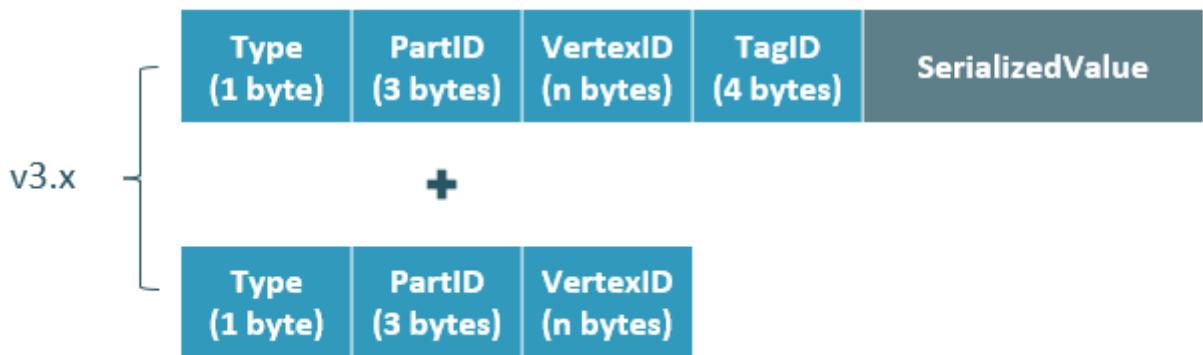
value

NebulaGraph 2.x 3.x

Tag

TagID

value key



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

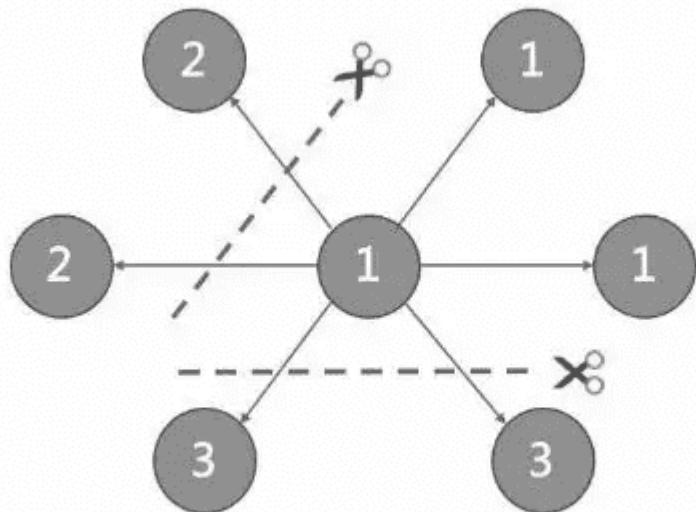
Type (1 byte)	PartID (3 bytes)	VertexID (n bytes)	EdgeType (4 bytes)	Rank (8 bytes)	VertexID (n bytes)	PlaceHolder (1 byte)	SerializedValue
------------------	---------------------	-----------------------	-----------------------	-------------------	-----------------------	-------------------------	-----------------

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

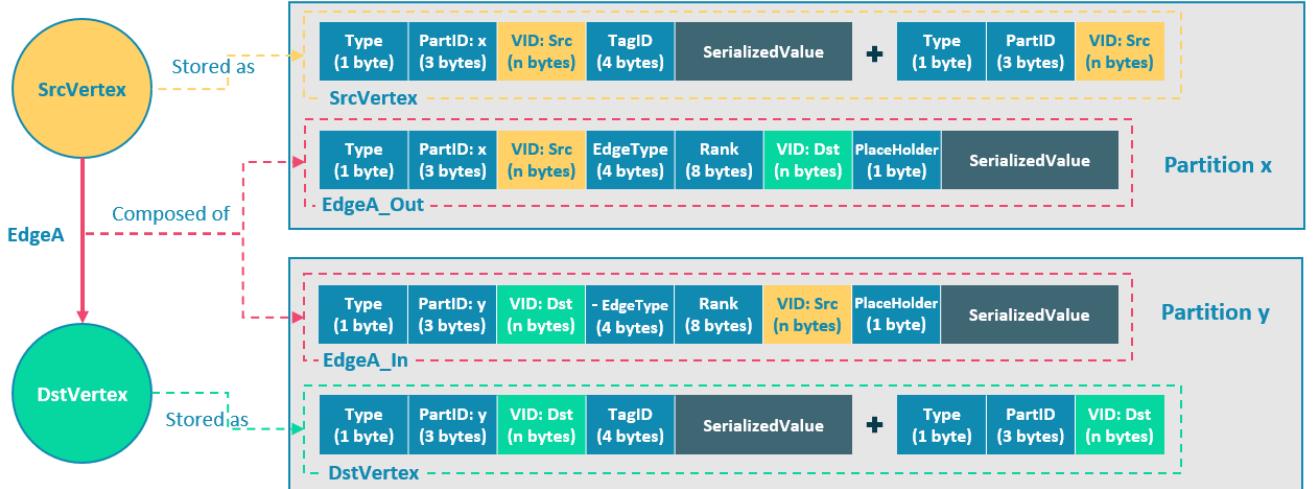
Schema NebulaGraph Schema Meta Schema

Partition NebulaGraph



NebulaGraph

key-value pair



	SrcVertex	EdgeA	DstVertex	(SrcVertex)-[EdgeA]->(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)-[]->() EdgeA_In	
EdgeA_Out	EdgeA_In	NebulaGraph		key value	

Hash

VID

Tag



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;
```

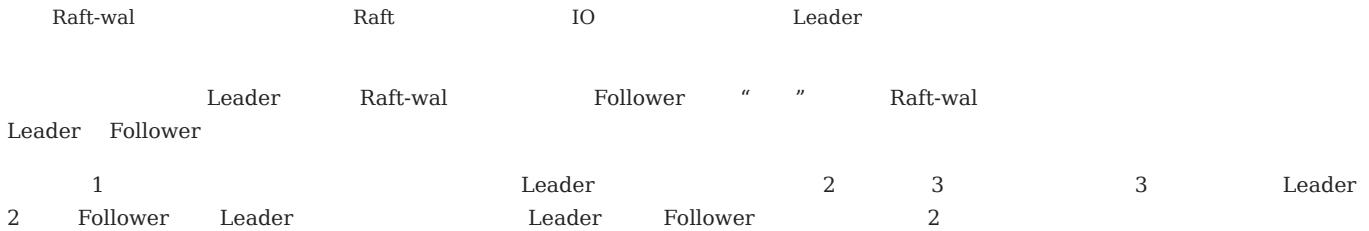
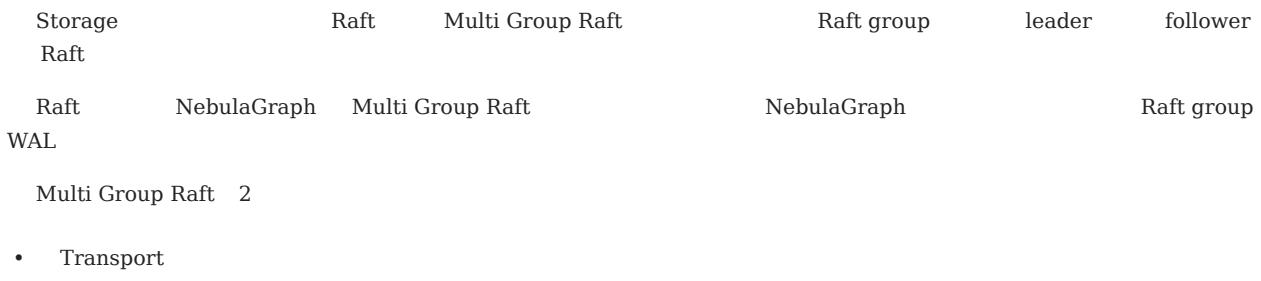
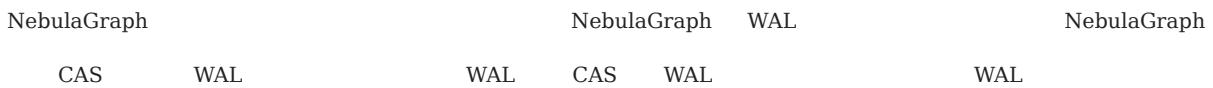
int64 int64 1

```
pId = vid % numParts + 1;
```

			%
numParts	VID	CREATE SPACE	partition_num
pId	VID	ID	
100	VID	1 101 1001	ID

Raft

RAFT

**Note****Note****MULTI GROUP RAFT****BATCH**

LEADER TRANSFER LEADERSHIP

leader	leader	leader	leader	leader	leader	
leader	leader	leader	follower	leader		
Raft group peer		group NebulaGraph		group		Diego Ongaro
						Raft Part class
						addPeer/ removePeer

HDFS

Storage	Raft	HDFS				
• Storage	Raft	leader	HDFS	DataNode	NameNode	
• Storage	leader	HDFS				
• Storage	HDFS					
• Storage	HDFS	HBase	HDFS	RPC		
Storage	HDFS					

: March 27, 2023

3.

3.1

Docker Desktop
NebulaGraph

NebulaGraph

Docker Desktop

NebulaGraph

3.1.1 Docker Desktop

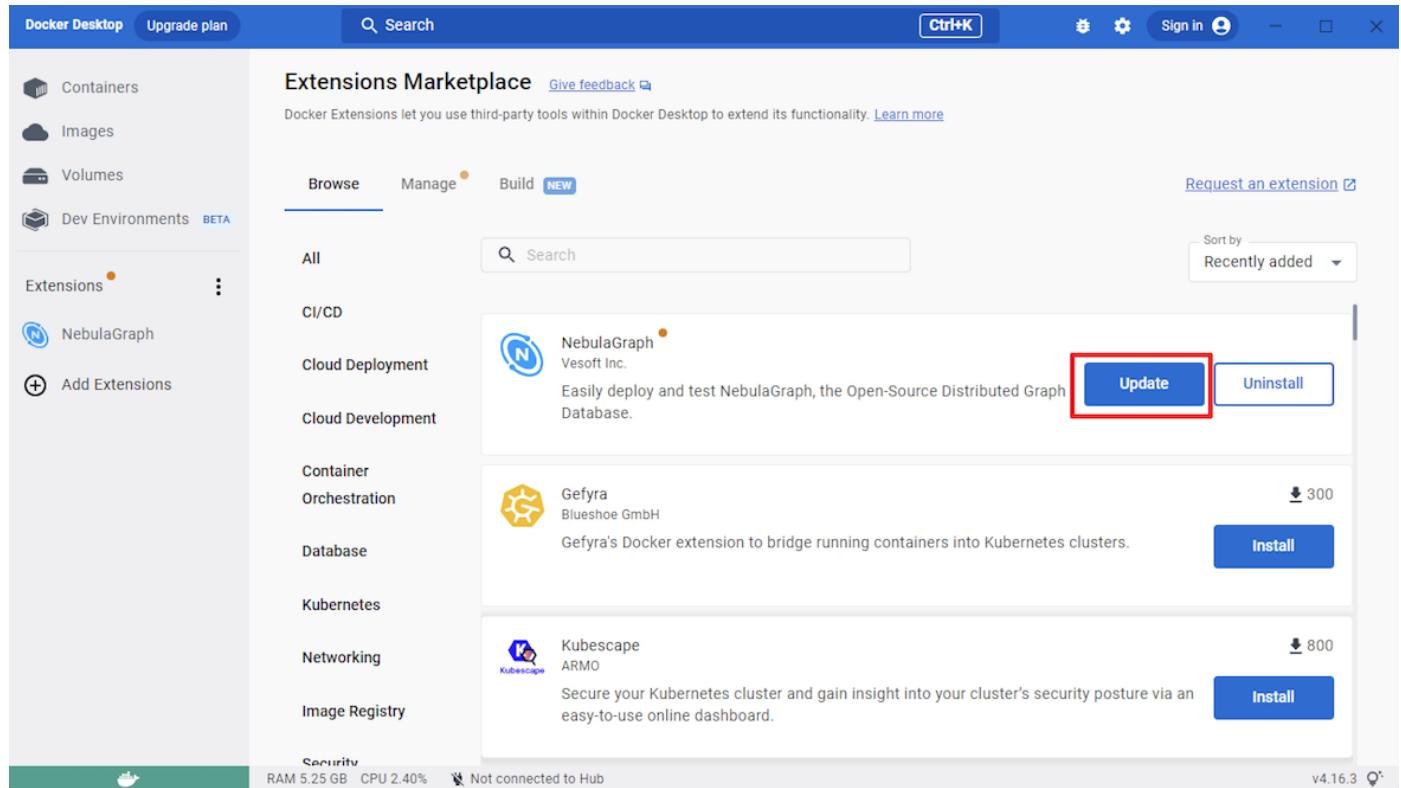
Docker Desktop NebulaGraph

1. Docker Desktop

The screenshot shows the Docker Desktop interface. At the top, there's a pink banner with a 'Caution' icon. Below it, a navigation bar includes 'Windows', 'Docker Desktop', and 'WSL 2'. The main area has tabs for 'Containers', 'Images', 'Volumes', 'Dev Environments (BETA)', and 'Extensions'. A search bar at the top right shows 'nebula'. Under the 'Extensions' tab, there's a list with one item: 'NebulaGraph' by Vesoft Inc. The listing includes a download count of '200', a status message 'Easily deploy and test NebulaGraph, the Open-Source Distributed Graph Database.', and an 'Install' button which is highlighted with a red box. Below the listing, there's an 'About' section with a brief description and a screenshot of a browser window showing the NebulaGraph interface.

5. NebulaGraph

[Update](#)



3.1.2



NebulaGraph

- 1.
2. **NebulaGraph**
3. **NebulaGraph**

NebulaGraph Cloud

NebulaGraph Cloud

3.1.3



NebulaGraph

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

RPM DEB NebulaGraph

NebulaGraph

3.1.4

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

: March 13, 2023

3.2

3.2.1

NebulaGraph

NebulaGraph

NebulaGraph
Cloud

NebulaGraph

NebulaGraph Cloud

NebulaGraph

NebulaGraph



NebulaGraph Cloud

3.4.0

NebulaGraph

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

NebulaGraph Cloud

30

NebulaGraph

NebulaGraph

30

NebulaGraph

00:00

NebulaGraph Cloud

	NebulaGraph		1	ECS						
	Graph	Storage	ECS		1	ECS	Explorer	1	ECS	
	Graph	Storage	ECS		3	3	ECS	Explorer	1	ECS

1.

2. **NebulaGraph**

3. NebulaGraph



4.



NebulaGraph

5. ID

6.

7. ECS

•

•

Month8. **NebulaGraph** ECS

9.

a. **VPC ID**

b.

c. **ID**

10.

11.

12.

13.

14.

15.
16.

 Note

17.

10

 Danger

1. **NebulaGraph**
2. **NebulaGraph**
3. NebulaGraph *

 Note

1

4. ID
- 5.
6. **NebulaGraph** ECS
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.

10

Q

1. RAM
- 2.
3. **NebulaGraph**

NebulaGraph

: September 30, 2022

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

: December 15, 2022

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

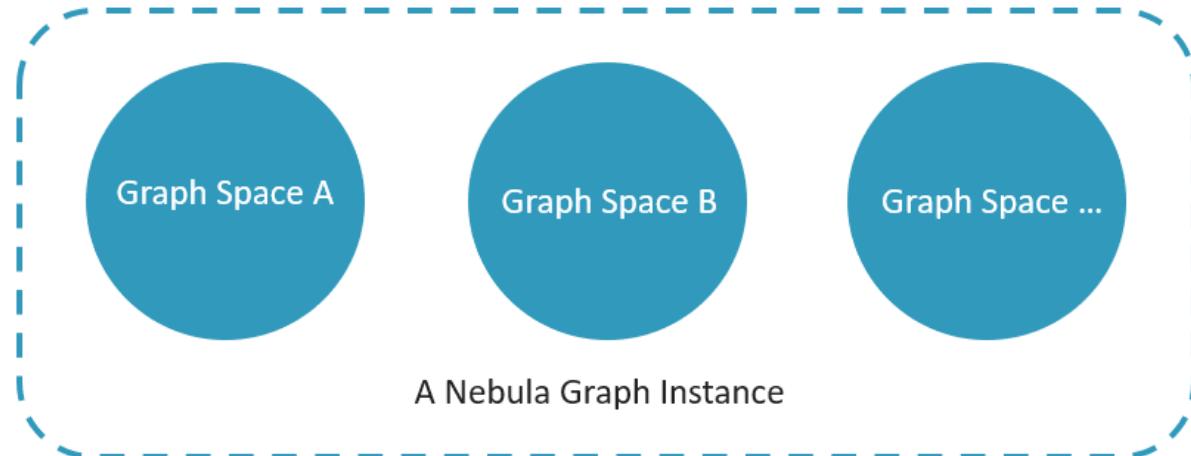
Explorer



nGQL

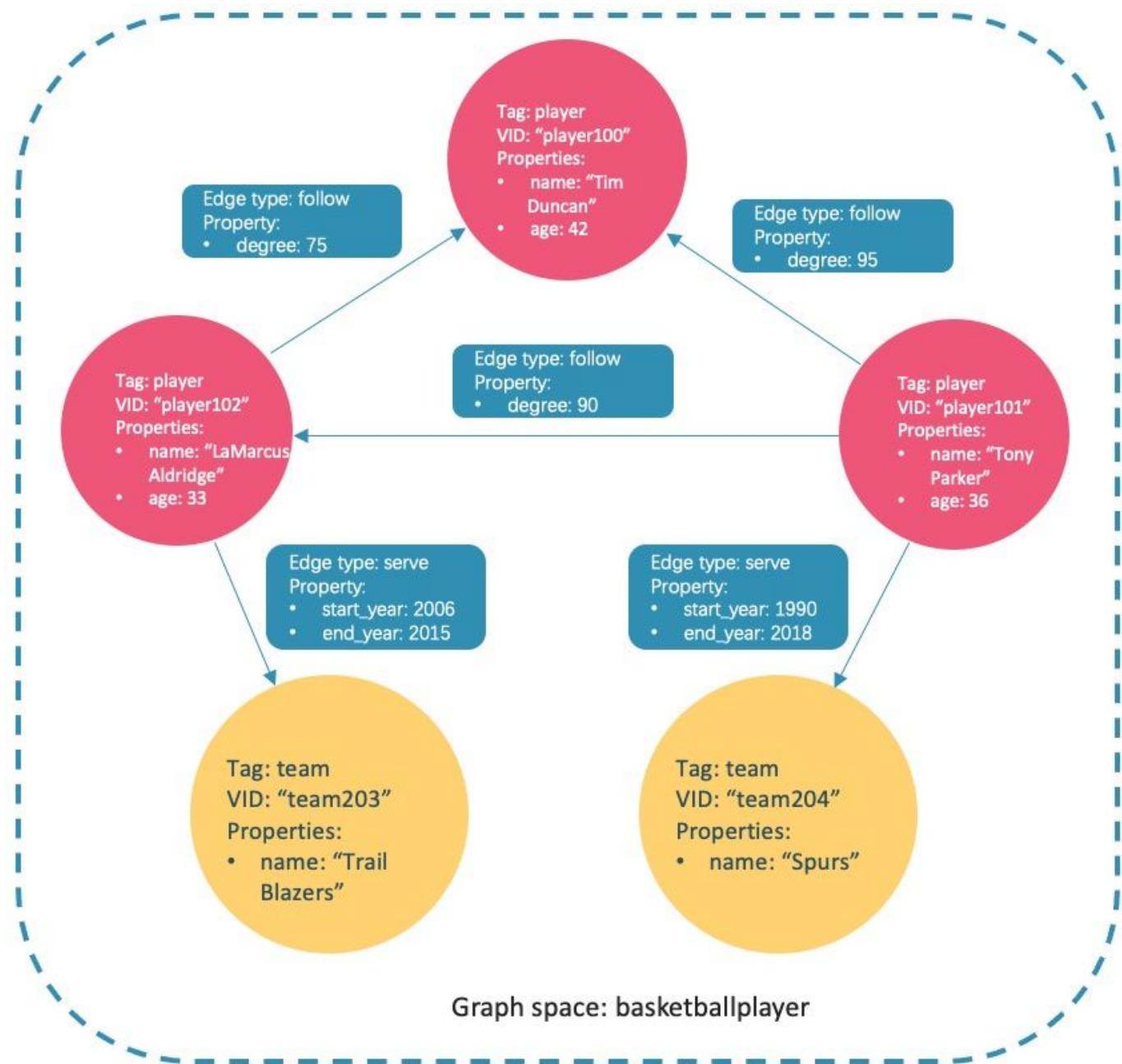
SCHEMA

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 | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "storaged0" | 9779 | "ONLINE" | 5 | "basketballplayer:5" | "basketballplayer:5" | "3.4.1" |
```

```
| "storaged1" | 9779 | "ONLINE" | 5 | "basketballplayer:5" | "basketballplayer:5" | "3.4.1" |
| "storaged2" | 9779 | "ONLINE" | 5 | "basketballplayer:5" | "basketballplayer:5" | "3.4.1" |
+-----+-----+-----+-----+-----+-----+-----+
```

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> {STEP|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"}) |
```

: September 30, 2022

3.3

3.3.1 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 3.4.1

```
wget https://oss-cdn.nebula-graph.com.cn/package/3.4.1/nebula-graph-3.4.1.el7.x86_64.rpm
wget https://oss-cdn.nebula-graph.com.cn/package/3.4.1/nebula-graph-3.4.1.el7.x86_64.rpm.sha256sum.txt
```

ubuntu 1804 3.4.1

```
wget https://oss-cdn.nebula-graph.com.cn/package/3.4.1/nebula-graph-3.4.1.ubuntu1804.amd64.deb
wget https://oss-cdn.nebula-graph.com.cn/package/3.4.1/nebula-graph-3.4.1.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/

3.4.1 RPM

```
sudo rpm -ivh nebula-graph-3.4.1.el7.x86_64.rpm
```

- DEB

```
$ sudo dpkg -i <package_name>
```

Note

DEB NebulaGraph

/usr/local/nebula/

3.4.1 DEB

```
sudo dpkg -i nebula-graph-3.4.1.ubuntu1804.amd64.deb
```

- License
 - [NebulaGraph](#)
 - [NebulaGraph](#)
-

: September 30, 2022

3.3.2 2 NebulaGraph

NebulaGraph

 **Enterpriseonly**

systemd

 **Danger**

`nebula.service`

 **Note**

`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`

<code>metad</code>	Meta
--------------------	------

<code>graphd</code>	Graph
---------------------	-------

<code>storaged</code>	Storage
-----------------------	---------

`all`

systemd

`NebulaGraph` `systemd` `systemctl`

Note

- NebulaGraph systemd .service etc/unit RPM/DEB NebulaGraph .service /usr/lib/systemd/system ExecStart NebulaGraph systemctl
- Dashboard NebulaGraph systemctl
- NebulaGraph .service /usr/lib/systemd/system .service ExecStart systemctl

```
$ systemctl <start | stop | restart | status > <nebula | nebula-metad | nebula-graphd | nebula-storaged>
```

start
stop
restart
status
nebula
nebula-metad Meta
nebula-graphd Graph
nebula-storaged Storage

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
```

```
$ systemctl start nebula
```

```
$ systemctl enable nebula
```

NebulaGraph

Danger

```
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
```

```
$ systemctl stop nebula
```

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

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
```

```
systemctl NebulaGraph
```

```
$ systemctl status nebula
● nebula.service
  Loaded: loaded (/usr/lib/systemd/system/nebula.service; disabled; vendor preset: disabled)
  Active: active (exited) since 2022-03-28 04:13:24 UTC; 1h 47min ago
    Process: 21772 ExecStart=/usr/local/ent-nightly/scripts/nebula.service start all (code=exited, status=0/SUCCESS)
  Main PID: 21772 (code=exited, status=0/SUCCESS)
    Tasks: 325
   Memory: 424.5M
      CGroup: /system.slice/nebula.service
          ├─21789 /usr/local/ent-nightly/bin/nebula-metad --flagfile /usr/local/ent-nightly/etc/nebula-metad.conf
          ├─21827 /usr/local/ent-nightly/bin/nebula-graphd --flagfile /usr/local/ent-nightly/etc/nebula-graphd.conf
          └─21900 /usr/local/ent-nightly/bin/nebula-storaged --flagfile /usr/local/ent-nightly/etc/nebula-storaged.conf

3 28 04:13:24 xxxxxx systemd[1]: Started nebula.service.
...
```

NebulaGraph	Meta	Graph	Storage	etc	/usr/local/nebula/etc/
-------------	------	-------	---------	-----	------------------------

• **NebulaGraph**

: September 30, 2022

3.3.3 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		

: September 30, 2022

3.3.4 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 | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "192.168.10.100" | 9779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.4.1" |
| "192.168.10.101" | 9779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.4.1" |
| "192.168.10.102" | 9779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.4.1" |
+-----+-----+-----+-----+-----+-----+
```

Status Storage

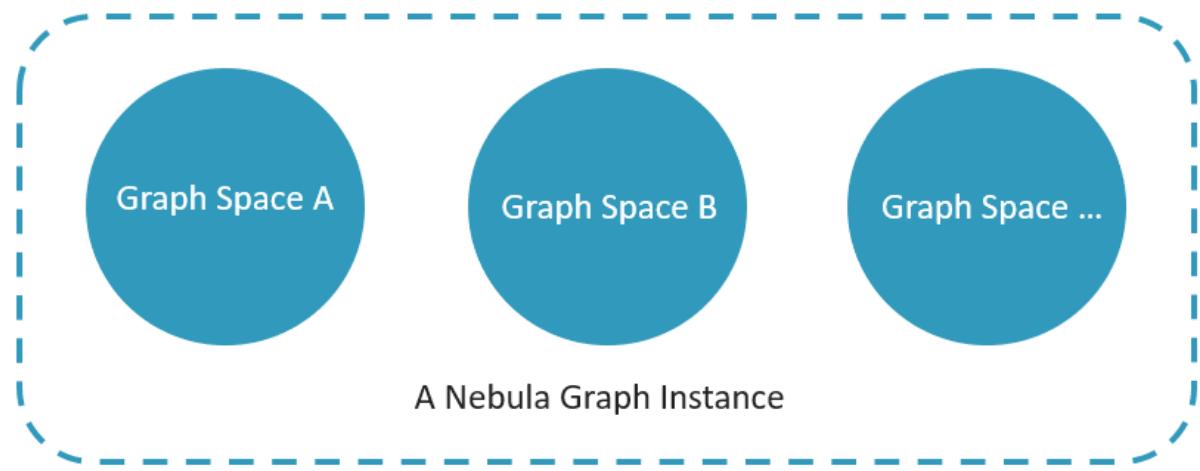
: January 17, 2023

3.3.5 4 nGQL CRUD

NebulaGraph Schema
nGQL

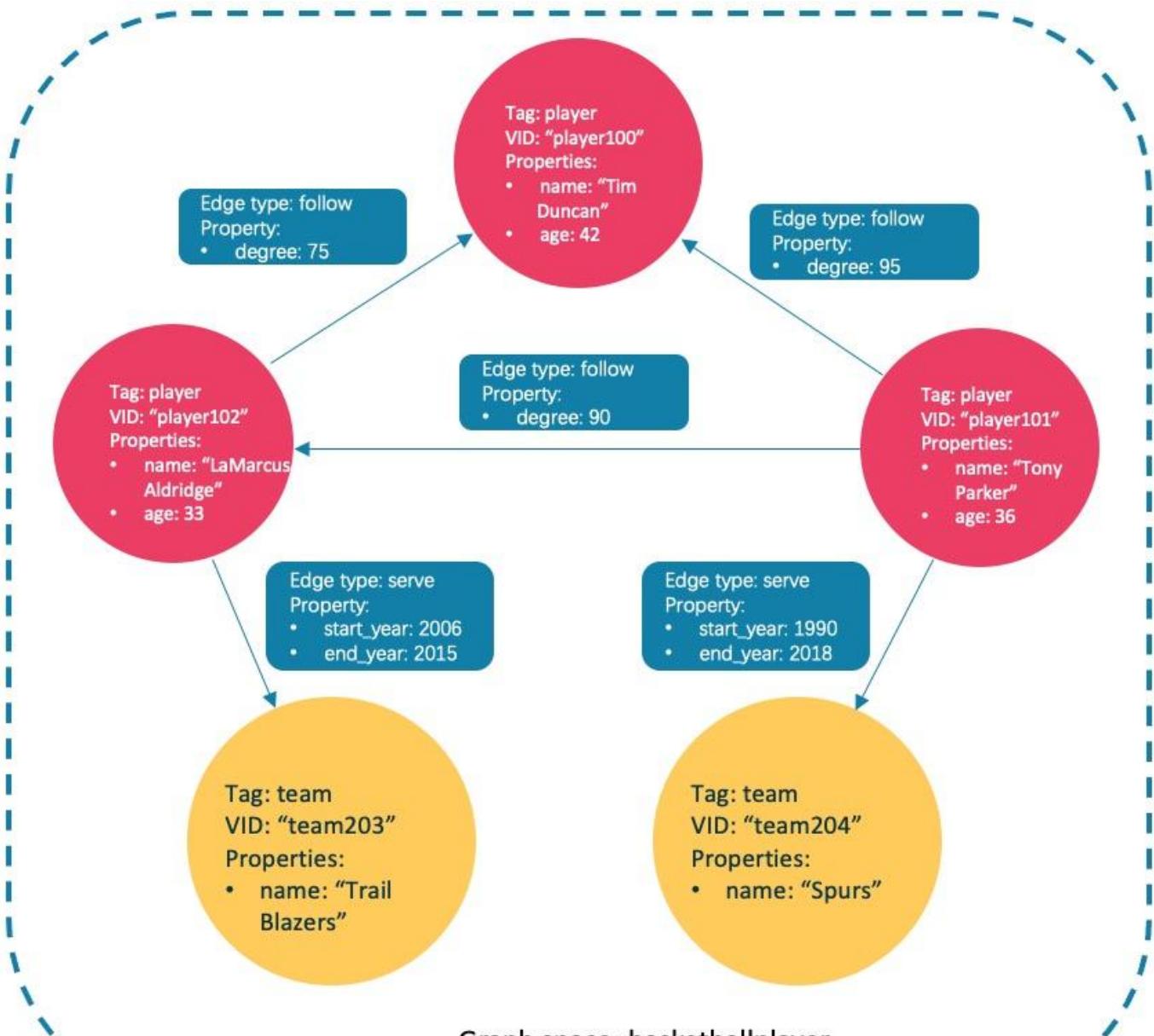
SCHEMA

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    | Status   | Leader count | Leader distribution           | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "storaged0" | 9779    | "ONLINE" | 5          | "basketballplayer:5"           | "basketballplayer:5"    | "3.4.1" |
| "storaged1" | 9779    | "ONLINE" | 5          | "basketballplayer:5"           | "basketballplayer:5"    | "3.4.1" |
| "storaged2" | 9779    | "ONLINE" | 5          | "basketballplayer:5"           | "basketballplayer:5"    | "3.4.1" |
+-----+-----+-----+-----+-----+-----+
```

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> {STEP|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"}) |
```

: September 30, 2022

3.4 nGQL

3.4.1

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()	π 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_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()

3.4.2

- 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	:	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 WHERE [i in kk where props[i] == "Tim Duncan"] RETURN v	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	[e]-	
	MATCH ()<-[e]-() RETURN e		
Edge type	MATCH ()-[e:follow]->() RETURN e	:<edge_type>	Edge type -
	MATCH (v:player{name:"Tim Duncan"})- [e:follow{degree:95}]->(v2) RETURN e	{<prop_name>: <prop_value>}	Edge type
	MATCH ()-[e]->() WITH e, properties(e) as props, keys(properties(e)) as kk WHERE [i in kk where props[i] == 90] RETURN e	[e:follow{likeness:95}]	Edge type
Edge type	MATCH (v:player{name:"Tim Duncan"})-[e:follow :serve]->(v2) RETURN e	Edge type [e:follow :serve]	Edge type
	MATCH (v:player{name:"Tim Duncan"})-[]->(v2)<- [e:serve]->(v3) RETURN v2, v3	Edge type :	Edge type
	MATCH p=(v:player{name:"Tim Duncan"})- [e:follow*2]->(v2) RETURN DISTINCT v2 AS Friends	:<edge_type>*<hop>	hop e
	MATCH p=(v:player{name:"Tim Duncan"})- [e:follow*1..3]->(v2) RETURN v2 AS Friends	minHop	minHop 1
		maxHop	maxHop e
Edge type	MATCH p=(v:player{name:"Tim Duncan"})-[e:follow serve*2]->(v2) RETURN DISTINCT v2	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()	Tag
		labels(v)	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 p	RETURN <path_name>	
	MATCH p=(v:player{name:"Tim Duncan"})-[]->(v2) 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	MATCH (m)-[]->(n) WHERE id(m)=="player100" OPTIONAL MATCH (n)-[]->(l)	
	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> {STEP|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
NULL
```

```
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

3.4.3

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	

3.4.4

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	

3.4.5 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

3.4.6 Edge type

CREATE EDGE	<code>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 = <ttx_duration>] [TTL_COL = <prop_name>] [COMMENT = '<comment>']</code>	<code>CREATE EDGE e1(p1 string, p2 int, p3 timestamp) TTL_DURATION = 100, TTL_COL = "p2"</code>	Edge type
DROP EDGE	<code>DROP EDGE [IF EXISTS] <edge_type_name></code>	<code>DROP EDGE e1</code>	Edge type
ALTER EDGE	<code>ALTER EDGE <edge_type_name> <alter_definition> [, alter_definition] ... [ttl_definition [, ttl_definition] ...] [COMMENT = '<comment>']</code>	<code>ALTER EDGE e1 ADD (p3 int, p4 string)</code>	Edge type
SHOW EDGES	<code>SHOW EDGES</code>	<code>SHOW EDGES</code>	Edge type
DESCRIBE EDGE	<code>DESC[RIBE] EDGE <edge_type_name></code>	<code>DESCRIBE EDGE follow</code>	Edge type

3.4.7

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

3.4.8

INSERT EDGE	<code>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>), ...]</code>	<code>INSERT EDGE e2 (name, age) VALUES "11"- >"13":("n1", 1)</code>	NebulaGraph
DELETE EDGE	<code>DELETE EDGE <edge_type> <src_vid> -> <dst_vid>[@<rank>] [, <src_vid> -> <dst_vid>[@<rank>] ...]</code>	<code>DELETE EDGE serve "player100" -> "team204"@0</code>	
UPDATE EDGE	<code>UPDATE EDGE ON <edge_type> <src_vid> -> <dst_vid> [@<rank>] SET <update_prop> [WHEN <condition>] [YIELD <output>]</code>	<code>UPDATE EDGE ON serve "player100" -> "team204"@0 SET start_year = start_year + 1</code>	Edge type
UPsert EDGE	<code>UPSERT EDGE ON <edge_type> <src_vid> -> <dst_vid> [@rank] SET <update_prop> [WHEN <condition>] [YIELD <properties>]</code>	<code>UPSERT EDGE on serve "player666" -> "team200"@0 SET end_year = 2021</code>	UPDATE INSERT

3.4.9

• 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	

3.4.10

GET SUBGRAPH [WITH PROP] [<step_count> {STEP STEPS}] FROM {<vid>, <vid>...} [{IN OUT BOTH} <edge_type>, <edge_type>...] YIELD [VERTICES AS <vertex_alias>] [,EDGES AS <edge_alias>]	GET SUBGRAPH 1 STEPS FROM "player100" YIELD VERTICES AS nodes, EDGES AS relationships	Edge type
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> {STEP STEPS}] YIELD path as <alias> [ORDER BY \$-.path] [LIMIT <M>]	FIND SHORTEST PATH FROM "player102" TO "team204" OVER * YIELD path as p	(<vertex_id>)-[:<edge_type_name>@<rank>]->(<vertex_id>)

3.4.11

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

3.4.12

- **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)
---	--

: April 18, 2023

4. nGQL

4.1 nGQL

4.1.1 nGQL

nGQL NebulaGraph Query Language NebulaGraph

nGQL

SQL

nGQL
9

issue NebulaGraph NebulaGraph 3.0

openCypher

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

: October 25, 2022

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)

Tag

nGQL

Tag Edge type

(a:player{name: "Tim Duncan", age: 42})

(a)-[e:follow{degree: 95}]->(b)

(a)-[]-(b)

(a)-[r]->(b)

Tag

(a)-[r:REL_TYPE]->(b)

Tag

Edge type

Edge type

|

(a)-[r:TYPE1|TYPE2]->(b)

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

3 2

2

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

variable-length edges

(a)-[*3..5]->(b)

*3..5 3 5

4 3 5 4 6 5

(a)-[*..5]->(b)

Note

(a)-[*3..]->(b) (a)-[*]->(b)

nGQL

p = (a)-[*3..5]->(b)

MATCH

:January 30, 2023

4.1.3

nGQL



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

Examples

nGQL

OpenCypher

- nGQL \ /* */
 - openCypher

/* openCypher

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

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

: August 9, 2022

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

: May 13, 2022

4.1.5

nGQL Schema

- `Comment`
- `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
DURATION
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

```

: March 27, 2023

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;
```

: February 2, 2023

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
-

: August 9, 2022

4.2.2

NebulaGraph BOOL true false

nGQL

-
- WHERE

: August 9, 2022

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 |
+-----+-----+-----+
| ""     | ""     | """   | """'  |
+-----+-----+-----+
```

: August 9, 2022

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.mssmsususus 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 2021-03-17

```
nebula> MATCH (v:date1) RETURN v.date1.p1 == date("2021-03-17");
+-----+
| (v.date1.p1==date("2021-03-17")) |
+-----+
| true
+-----+
```

4. 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
+-----+
```

5. Tag date1 p3 2023-01-01T00:00:00.000000

```
nebula> MATCH (v:date1) \
WHERE v.date1.p3 < datetime("2023-01-01T00:00:00.000000") \
RETURN v.date1.p3;
+-----+
| v.date1.p3
+-----+
| 2017-03-04T14:30:40.003000
+-----+
```

6. Tag school TIMESTAMP

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

7. 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"));
```

8. 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 |
+-----+-----+
```

:January 30, 2023

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"} |
+-----+
```

: August 9, 2022

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] |
+-----+

#
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      |
+-----+
| []   |
+-----+

#
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]

:January 7, 2022

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"} |
+-----+
```

:January 7, 2022

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 |
+-----+

```

:January 7, 2022

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__      |
+-----+-----+-----+-----+
```

: August 9, 2022

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))"



GEOGRAPHY INSERT VERTEX any_shape(geo) VALUES "1":("POINT(1 1)") geo INSERT VERTEX
any_shape(geo) VALUES "1":(ST_GeogFromText("POINT(1 1)"));

```
// 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);
```

: April 11, 2023

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"
+-----+-----+
```

---

: August 29, 2022

### 4.3.2

NebulaGraph

#### OpenCypher

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

v



MATCH e p=(v1)-[e\*2..2]->(v2)-[e\*2..2]->(v3)

#### nGQL

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



- ; nGQL

```
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"
+-----+
```

: March 13, 2023

### 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 3.4.1

```
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 3.4.1

: December 15, 2022

## 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__ |
+-----+-----+-----+
```

## IS [NOT] EMPTY

```
nebula> RETURN null IS EMPTY;
+-----+
| NULL IS EMPTY |
+-----+
| false |
+-----+

nebula> RETURN "a" IS NOT EMPTY;
+-----+
| "a" IS NOT EMPTY |
+-----+
| true |
+-----+

nebula> GO FROM "player100" OVER * WHERE properties($$).name IS NOT EMPTY YIELD dst(edge);
+-----+
| dst(EDGE) |
+-----+
| "team204" |
| "player101" |
| "player125" |
+-----+
```

: August 9, 2022

#### 4.4.2

NebulaGraph

AND

OR

NOT

XOR

NULL

NULL



0

: August 9, 2022

#### 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 \$- \$-.dstid

NebulaGraph

A | B

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

graphd A | B

: March 13, 2023

## 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"
+-----+-----+

```

: November 25, 2021

#### 4.4.5

UNION UNION ALL INTERSECT MINUS

nGQL

NebulaGraph



```
RETURN a,b,c UNION RETURN a,b,c a,b,c
```

#### 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> MATCH (v:player) \
WITH v.player.name AS n \
RETURN n ORDER BY n LIMIT 3 \
UNION \
UNWIND ["Tony Parker", "Ben Simmons"] AS n \
RETURN n;
+-----+
| n |
+-----+
| "Amar'e Stoudemire" |
| "Aron Baynes" |
| "Ben Simmons" |
| "Tony Parker" |
+-----+

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" |
+-----+

nebula> MATCH (v:player) \
WITH v.player.name AS n \
RETURN n ORDER BY n LIMIT 3 \
UNION ALL \
UNWIND ["Tony Parker", "Ben Simmons"] AS n \
RETURN n;
+-----+
| n |
+-----+
| "Amar'e Stoudemire" |
| "Aron Baynes" |
| "Ben Simmons" |
| "Tony Parker" |
| "Ben Simmons" |
+-----+

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

nebula> MATCH (v:player)-[e:follow]->(v2) \
 WHERE id(v) == "player102" \
 RETURN id(v2) AS id, e.degree AS Degree, v2.player.age AS Age \
 INTERSECT \
 MATCH (v:player)-[e:follow]->(v2) \
 WHERE id(v) == "player100" \
 RETURN id(v2) AS id, e.degree AS Degree, v2.player.age AS Age;
+-----+-----+
| id | Degree | Age |
+-----+-----+
+-----+-----+

nebula> UNWIND [1,2] AS a RETURN a \
 INTERSECT \
 UNWIND [1,2,3,4] AS a \
 RETURN a;
+---+
| a |
+---+
| 1 |
| 2 |
+---+
```

## MINUS

```
<left> MINUS <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) AS id \
 MINUS \
 GO FROM "player100" OVER follow YIELD dst(edge) AS id;
+-----+
| id |
+-----+
| "player100" |
```

```
+-----+
nebula> MATCH (v:player)-[e:follow]->(v2) \
 WHERE id(v) == "player102" \
 RETURN id(v2) AS id\
 MINUS \
 MATCH (v:player)-[e:follow]->(v2) \
 WHERE id(v) == "player100" \
 RETURN id(v2) AS id;
+-----+
| id |
+-----+
| "player100" |
+-----+
```

nebula> UNWIND [1,2,3] AS a RETURN a \
 MINUS \
 WITH 4 AS a \
 RETURN a;

```
+---+
| a |
+---+
| 1 |
| 2 |
| 3 |
+---+
```

| 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

: February 2, 2023

#### 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" |
+-----+
```

---

: August 9, 2022

## 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" |
+-----+

```

: August 9, 2022

## 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       | $x < y \leq z$ | $(x < y) \leq z$              |

---

: November 25, 2021

## 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
```

```
nebula> RETURN round(314.15926, 2);
+-----+
| round(314.15926,2) |
+-----+
| 314.16 |
+-----+

nebula> RETURN round(314.15926, -1);
+-----+
| round(314.15926,-(1)) |
+-----+
| 310.0 |
+-----+
```

**sqrt()**

**sqrt()**

```
sqrt(<expression>)

• expression double
 • double
```

```
nebula> RETURN sqrt(9);
+-----+
| sqrt(9) |
+-----+
| 3.0 |
+-----+
```

**cbrt()**

**cbrt()**

```
cbrt(<expression>)

• expression double
 • double
```

```
nebula> RETURN cbrt(8);
+-----+
| 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 |
+-----+
```

---

: December 15, 2022

## 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
+-----+
| age | collect(n.player.name) |
+-----+
| 24 | ["Giannis Antetokounmpo"] |
```

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

: December 15, 2022

### 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

```
+-----+
| length("basketball") |
+-----+
| 10 |
+-----+
```

```
+-----+
| length(p) |
```

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

**trim()**

trim()

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

- string
- string

```
+-----+
| trim(" basketball player ") |
+-----+
| "basketball player" |
+-----+
```

**ltrim()**

ltrim()

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

- string
- string

```
+-----+
| 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}} |
+-----+
```

---

:January 30, 2023

#### 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 |
+-----+-----+-----+-----+-----+
```

: December 15, 2022

#### 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() vertex
GO FROM "player100" OVER follow reversely YIELD properties($^) $^ player100
$^ properties($$) GO
```

### Caution

```
properties().<property_name> properties()
```

PROPERTIES(EDGE)

properties(edge)

  properties(edge)

- map

```
nebula> GO FROM "player100" OVER follow \
 YIELD properties(edge);
+-----+
| properties(EDGE) |
+-----+
| {degree: 95} |
| {degree: 95} |
+-----+
```

### Warning

```
properties(edge).<property_name> properties(edge)
```

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"->"player128" @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() LABELS()**

**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(&lt;edge&gt;)

- string

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

## SRC()

src() ID

src(&lt;edge&gt;)

- ID

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

## DST()

dst() ID

dst(&lt;edge&gt;)

- ID

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

&lt;!-- POC

## NONE\_DIRECT\_SRC()

none\_direct\_src() ID \_src \_dst \_rank \_type \_src

none\_direct\_src(&lt;edge&gt;)

```

nebula> MATCH (v:player)-[e:follow]->(v2) \
 WHERE none_direct_src(e) \
 IN ["player100", "player101"] \
 RETURN v2.player.age;
+-----+
| v2.player.age |
+-----+
| 36 |
| 41 |
| 42 |
| 33 |
| 41 |
+-----+

none_direct_dst()

none_direct_dst() ID `'_src` `'_dst` `'_rank` `'_type` `'_dst`
 `none_direct_dst(<edge>)`

``ngql
nebula> MATCH (v:player)-[e:follow]->(v2) \
 WHERE none_direct_dst(e) \
 IN ["player100", "player101"] \
 RETURN v2.player.age;
+-----+
| v2.player.age |
+-----+
| 36 |
| 42 |
| 42 |
| 42 |
| 42 |
...
+-----+
-->

startNode()

startNode() ID Tag
 `startNode(<path>)`

``ngql
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 |
+-----+
```

: April 12, 2023

## 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].player.age AS src1, nodes(p)[1].player.age AS dst2, \
 reduce(totalAge = 100, n IN nodes(p) | totalAge + n.player.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" @0 {end_year: 2016, start_year: 1997}}, {:follow "player100"->"player101" @0 {degree: 95}}, {:follow "player100"->"player125" @0 {degree: 95}}] |
+-----+
```

---

: February 3, 2023

## 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 |
+-----+
```

: December 15, 2022

## 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 &gt; 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__ |
+-----+
```

: September 23, 2022

## 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].player.name AS n1, nodes(p)[1].player.name AS n2, \
 all(n IN nodes(p) WHERE n.player.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.player.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"}}, ...

```

: February 3, 2023

## 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] |
+-----+

```

: May 13, 2022

## 4.5.11

### **openCypher**

NebulaGraph 3.4.1

UDF

---

: August 9, 2022

## 4.6

### 4.6.1 MATCH

| MATCH                                                                                                                                                                                                                    | Pattern          | NebulaGraph | RETURN                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|--------------------------------------|
|                                                                                                                                                                                                                          | basketballplayer | MATCH       |                                      |
|                                                                                                                                                                                                                          |                  |             |                                      |
| MATCH                                                                                                                                                                                                                    | GO               | LOOKUP      | MATCH                                |
|                                                                                                                                                                                                                          |                  |             | trail                                |
| MATCH                                                                                                                                                                                                                    |                  |             |                                      |
| <pre>MATCH &lt;pattern&gt; [&lt;clause_1&gt;] RETURN &lt;output&gt; [&lt;clause_2&gt;];</pre>                                                                                                                            |                  |             |                                      |
| <ul style="list-style-type: none"> <li>• pattern MATCH , (a)-[]-(b), (c)-[]-(d) Pattern</li> <li>• clause_1 WHERE WITH UNWIND OPTIONAL MATCH MATCH</li> <li>• output AS</li> <li>• clause_2 ORDER BY LIMIT</li> </ul>    |                  |             |                                      |
|                                                                                                                                                                                                                          |                  |             |                                      |
| • 3.5.0                                                                                                                                                                                                                  | MATCH            | MATCH       | LIMIT                                |
| • 3.0.0                                                                                                                                                                                                                  | Tag              | Tag         | RETURN < >.< > RETURN < >.<Tag >.< > |
|                                                                                                                                                                                                                          |                  |             |                                      |
| •                                                                                                                                                                                                                        |                  | Tag         |                                      |
| <pre>MATCH (v:player) RETURN v.player.name AS Name v:player v.player.name</pre>                                                                                                                                          |                  |             |                                      |
| • Tag Edge type                                                                                                                                                                                                          | Tag Edge type    | player Tag  | player Tag name                      |
| • MATCH                                                                                                                                                                                                                  |                  |             |                                      |
|                                                                                                                                                                                                                          |                  |             |                                      |
| <pre>nebula&gt; MATCH (v) \     RETURN v \     LIMIT 3;</pre>                                                                                                                                                            |                  |             |                                      |
| <pre>+-----+   v   +-----+   ("player102" :player{age: 33, name: "LaMarcus Aldridge"})     ("player106" :player{age: 25, name: "Kyle Anderson"})     ("player115" :player{age: 40, name: "Kobe Bryant"})   +-----+</pre> |                  |             |                                      |

TAG



```
NebulaGraph 3.0.0 Tag Tag Tag Tag MATCH NebulaGraph 3.0.0 Tag
LIMIT NebulaGraph 3.5.0 MATCH Tag Tag LIMIT MATCH
```

:<tag\_name> Tag

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

Tag :

```
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;
+-----+
| 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"}) |
+-----+
```



**openCypher**

openCypher 9 = nGQL == =

WHERE

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

## ID

ID      id()

```
nebula> MATCH (v) \
 WHERE id(v) == 'player101' \
 RETURN v;
```

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

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

```
nebula> MATCH (v) WHERE id(v) IN {"player100", "player101"} \
 RETURN v.player.name AS name;
```



nGQL 1.x

nGQL 2.x

```
nebula> MATCH (v:player{name:"Tim Duncan"})--(v2:player) \
 RETURN v2.player.name AS Name;
```

&lt; &gt;

```
--> v v2 v v2
nebula> MATCH (v:player{name:"Tim Duncan"})-->(v2:player) \
 RETURN v2.player.name AS Name;
```

## 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;
```

```
| "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"}-[: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"})> |
+-----+
```

## ↑ openCypher

nGQL @ rank openCypher rank

```
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     | NebulaGraph 3.5.0 | Edge Type | Edge Type | LIMIT             | MATCH |

```
nebula> MATCH ()-[e:follow]->() \
 RETURN e;
+-----+
| 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}] |
+-----+
```

WHERE

```
nebula> MATCH ()-[e]->() \
 WITH e, properties(e) as props, keys(properties(e)) as kk \
 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] |
|--|-----------|-------------------|-----------|---|-----------|------------------|

```
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"})
...
```

:<edge\_type>\*<hop>      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`  
`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>*`              `minHop 1 maxHop`

```
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
+-----+-----+
```

## Note

e                    -[e:follow\*0..3]->                    e

```
nebula> MATCH (v:player)-[e:like*1..3]->(n) \
 WHERE (n)-[e1..4]->(:player) \
 RETURN v;
```

## 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"}) |
+-----+-----+
```

## allShortestPaths

```
nebula> MATCH p = allShortestPaths((a:player{name:"Tim Duncan"})-[e*..5]-(b:player{name:"Tony Parker"})) \
 RETURN p;
+-----+
| p |
+-----+
| <"("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}]->("player101" :player{age: 36, name: "Tony Parker"})> | \
+-----+
```

## shortestPath

```
nebula> MATCH p = shortestPath((a:player{name:"Tim Duncan"})-[e*..5]-(b:player{name:"Tony Parker"})) \n
 RETURN p;
+-----+
| p
+-----+
| <("player100" :player{age: 42, name: "Tim Duncan"})->[:follow@0 {degree: 95}]-("player101" :player{age: 36, name: "Tony Parker"})> |
+-----+
```

**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 3.4.1 MATCH . GO , LOOKUP , | FETCH MATCH

---

: April 18, 2023

## 4.6.2 OPTIONAL MATCH



OPTIONAL MATCH Beta

OPTIONAL MATCH    MATCH    MATCH    NULL

### openCypher

nGQL    openCypher

OPTIONAL MATCH    WHERE

MATCH    OPTIONAL MATCH

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

| id(m)       | id(n)       | id(l)       |
|-------------|-------------|-------------|
| "player100" | "team204"   | NULL        |
| "player100" | "player101" | "team204"   |
| "player100" | "player101" | "team215"   |
| "player100" | "player101" | "player100" |
| "player100" | "player101" | "player102" |
| "player100" | "player101" | "player125" |
| "player100" | "player125" | "team204"   |
| "player100" | "player125" | "player100" |

MATCH    OPTIONAL MATCH

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

| id(m)       | id(n)       | id(l)       |
|-------------|-------------|-------------|
| "player100" | "player101" | "team204"   |
| "player100" | "player101" | "team215"   |
| "player100" | "player101" | "player100" |
| "player100" | "player101" | "player102" |
| "player100" | "player101" | "player125" |
| "player100" | "player125" | "team204"   |
| "player100" | "player125" | "player100" |

:January 30, 2023

### 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 [DISTINCT] <return_list> [AS <alias>]
[<clause>];

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

- `WHERE <expression>`      `AND`    `OR`      **WHERE**
- `YIELD`                          **YIELD**
- `DISTINCT`
- `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" @0 {degree: 90}] |
| [:follow "player118"->"player120" @0 {degree: 90}] |
| [:follow "player118"->"player131" @0 {degree: 90}] |
...
+-----+
| properties(EDGE).degree |
+-----+
| 90 |
| 90 |
...
+-----+
| degree |
+-----+
| -1 |
| -1 |
| 9 |
| 10 |
| 13 |
| 50 |
| 55 |
| 60 |
| 70 |
| 70 |
+-----+
+-----+
| $-.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](#)

---

: April 18, 2023

#### 4.6.4 GO

GO            GO            **walk**

##### openCypher

nGQL

```
GO [[<M> TO] <N> {STEP|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> {STEP|STEPS} N 1 N 0 NebulaGraph
 - M TO N {STEP|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      `NULL`
nebula> GO FROM "player100" OVER follow, serve \
    YIELD properties(edge).degree, properties(edge).start_year;
+-----+-----+
| properties(EDGE).degree | properties(EDGE).start_year |
+-----+-----+
| 95          | __NULL__        |
| 95          | __NULL__        |
| __NULL__    | 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;

```

```
+-----+-----+
| dst      | src          | age      |
+-----+-----+
| "player125" | ["player101"] | [41]     |
| "player100" | ["player125", "player101"] | [42, 42] |
| "player102" | ["player101"] | [33]     |
+-----+-----+-----+-----+
```

```
# nebula> $a = GO FROM "player100" OVER follow YIELD src(edge) AS src, dst(edge) AS dst; \
GO 2 STEPS FROM $a.dst OVER follow \
YIELD $a.src AS src, $a.dst, src(edge), dst(edge) \
| ORDER BY $.src | OFFSET 1 LIMIT 2;
+-----+-----+-----+-----+
| src      | $a.dst      | src(EDGE)  | dst(EDGE) |
+-----+-----+-----+-----+
| "player100" | "player125" | "player100" | "player101" |
| "player100" | "player101" | "player100" | "player125" |
+-----+-----+-----+-----+
```

```
# IS NOT EMPTY
nebula> GO FROM "player100" OVER follow WHERE properties($$).name IS NOT EMPTY YIELD dst(edge);
+-----+
| dst(EDGE) |
+-----+
| "player125" |
| "player101" |
+-----+
```

:January 17, 2023

4.6.5 FETCH

`FETCH`

`openCypher`

nGQL

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

<code>tag_name</code>	Tag
<code>*</code>	Tag
<code>vid</code>	ID
<code>YIELD</code>	<code>YIELD</code>
<code>AS</code>	

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" @1 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
+-----+
```

: February 2, 2023

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

: August 9, 2022

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

.....
: December 21, 2022

SHOW CREATE SPACE

SHOW CREATE SPACE

CREATE SPACE

SHOW CREATE SPACE <space_name>;

```
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))" |
+-----+
```

: February 3, 2023

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 = """"
+-----+-----+
```

: November 25, 2021

SHOW HOSTS

SHOW HOSTS leader Graph Storage Meta

Note

NebulaGraph

: January 17, 2023

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

: March 23, 2022

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

: September 21, 2022

SHOW PARTS

SHOW PARTS

SHOW PARTS [<part_id>];

```
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	

: November 25, 2021

SHOW ROLES

SHOW ROLES

- GOD ADMIN GOD
- DBA USER GUEST
-

SHOW ROLES IN <space_name>;

```
nebula> SHOW ROLES in basketballplayer;
+-----+-----+
| Account | Role Type |
+-----+-----+
| "user1" | "ADMIN"   |
+-----+-----+
```

: April 13, 2021

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

: March 23, 2022

SHOW SPACES

SHOW SPACES

CREATE SPACE

SHOW SPACES;

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

: November 25, 2021

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

: October 20, 2022

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

: November 25, 2021

SHOW USERS

SHOW USERS

GOD root SHOW USERS

SHOW USERS;

```
nebula> SHOW USERS;
+-----+-----+
| Account | IP Whitelist |
+-----+-----+
| "root" | ""           |
| "user1" | ""           |
| "user2" | "192.168.10.10" |
+-----+-----+
```

: March 16, 2022

SHOW SESSIONS

NebulaGraph

- exit API release **nebula-graphd.conf** session_idle_timeout_secs
- 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  |          |          |           |           |           |           |
+-----+-----+-----+-----+-----+-----+
| 165120858102296 | "root" | "basketballplayer" | 2022-04-29T08:27:38.102296 | 2022-04-29T08:50:46.282921 | "127.0.0.1:9669" | 0 | "127.0.0.1" |
| 1651199330300991 | "root" | "basketballplayer" | 2022-04-29T02:28:50.300991 | 2022-04-29T08:16:28.339038 | "127.0.0.1:9669" | 0 | "127.0.0.1" |
| 165112899847744 | "root" | "basketballplayer" | 2022-04-28T02:28:19.847744 | 2022-04-28T08:17:44.470210 | "127.0.0.1:9669" | 0 | "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 | "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 | "127.0.0.1" |
| 1650958897679595 | "root" | "" | 2022-04-26T07:41:37.679595 | 2022-04-26T07:41:37.683802 | "127.0.0.1:9669" | 0 | "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 | "127.0.0.1" |
+-----+-----+-----+-----+-----+-----+
```

SessionId	ID
UserName	
SpaceName	" "
CreateTime	timezone_name
UpdateTime	timezone_name
GraphAddr	Graph
Timezone	
ClientIp	IP

: March 27, 2023

SHOW QUERIES

SHOW QUERIES Session



• SHOW LOCAL QUERIES Session

• SHOW QUERIES Meta Session session_reclaim_interval_secs Meta

SHOW [LOCAL] QUERIES;

```

nebula> SHOW LOCAL QUERIES;
+-----+-----+-----+-----+-----+-----+-----+
| SessionID | ExecutionPlanID | User | Host | StartTime | DurationInUsec | Status | Query |
+-----+-----+-----+-----+-----+-----+-----+
| 1625463842921750 | 46 | "root" | "192.168.x.x":9669 | 2021-07-05T05:44:19.502903 | 0 | "RUNNING" | "SHOW LOCAL QUERIES;" |
+-----+-----+-----+-----+-----+-----+-----+

nebula> SHOW QUERIES;
+-----+-----+-----+-----+-----+-----+
| SessionID | ExecutionPlanID | User | Host | StartTime | DurationInUsec | Status | Query |
+-----+-----+-----+-----+-----+-----+
| 1625456037718757 | 54 | "user1" | "192.168.x.x":9669 | 2021-07-05T05:51:08.691318 | 1504502 | "RUNNING" | "MATCH p=(v:player)-[*1..4]-"
(v2) RETURN v2 AS Friends;" |
+-----+-----+-----+-----+-----+-----+
#      TOP 10
nebula> SHOW QUERIES | ORDER BY $-.DurationInUsec DESC | LIMIT 10;
+-----+-----+-----+-----+-----+-----+
| SessionID | ExecutionPlanID | User | Host | StartTime | DurationInUsec | Status | Query |
+-----+-----+-----+-----+-----+-----+
| 1625471375320831 | 98 | "user2" | "192.168.x.x":9669 | 2021-07-05T07:50:24.461779 | 2608176 | "RUNNING" | "MATCH (v:player)-[*1..4]-"
(v2) RETURN v2 AS Friends;" |
| 1625456037718757 | 99 | "user1" | "192.168.x.x":9669 | 2021-07-05T07:50:24.910616 | 2159333 | "RUNNING" | "MATCH (v:player)-[*1..4]-"
(v2) RETURN v2 AS Friends;" |
+-----+-----+-----+-----+-----+-----+

```

SessionID	ID
ExecutionPlanID	ID
User	
Host	
StartTime	
DurationInUsec	
Status	
Query	

: May 13, 2022

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				

: November 25, 2021

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
make-group-by-in-a-cypher-query **how-to-**

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

: December 15, 2022

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

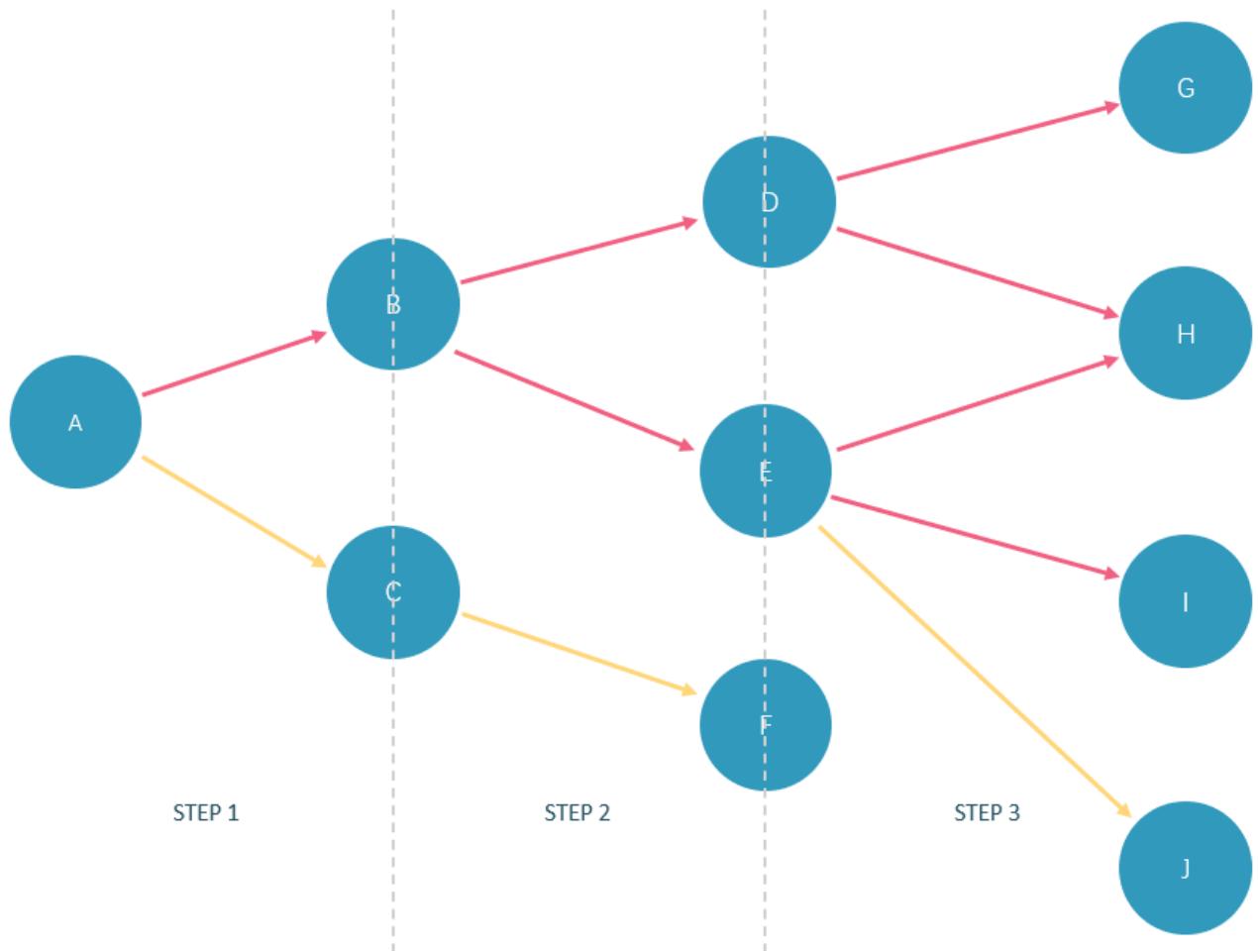
```
#              3
nebula> LOOKUP ON player YIELD id(vertex)|\
          LIMIT 3;
+-----+
| id(VERTEX)  |
+-----+
| "player100"  |
| "player101"  |
| "player102"  |
+-----+
#              2      3
nebula> GO FROM "player100" OVER follow REVERSELY \
          YIELD properties($$).name AS Friend, properties($$).age 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 <limit_list>      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
    STEPS
```



basketballplayer

```
nebula> GO 3 STEPS FROM "player100" \
OVER * \
YIELD properties($$).name AS NAME, properties($$).age AS Age \
LIMIT [3,3,3];
+-----+-----+
| NAME | Age |
+-----+-----+
| "Tony Parker" | 36 |
| "Manu Ginobili" | 41 |
| "Spurs" | __NULL__ |
+-----+-----+

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

:January 17, 2023

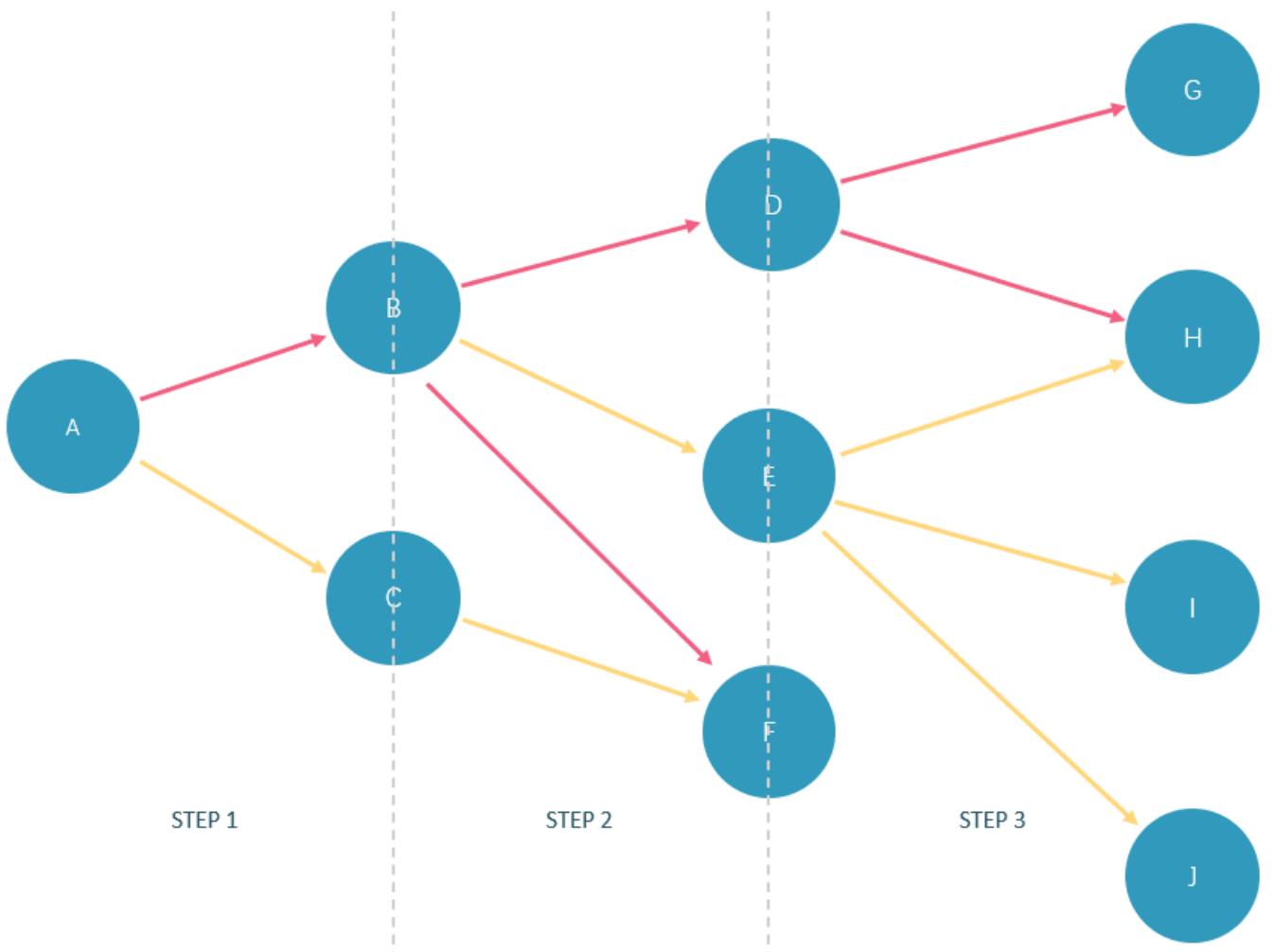
4.7.3 SAMPLE

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    |
+-----+-----+
| "Tony Parker" | 36    |
| "Manu Ginobili" | 41    |
| "Spurs"     | __NULL__ |
+-----+
```

```
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 |
| "Spurs" | __NULL__ |
| "Tim Duncan" | 42 |
| "Spurs" | __NULL__ |
| "Manu Ginobili" | 41 |
| "Spurs" | __NULL__ |
+-----+-----+
```

:January 17, 2023

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      |
+-----+
```

: March 27, 2023

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

<vertex_name>. <tag_name>. <property_name> <edge_name>. <property_name>

```
//
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 |
+-----+
```

```
//
nebula> MATCH (v:player{name:"Tim Duncan"})-[e]->() \
    RETURN e.start_year, e.degree \
+-----+
| e.start_year | e.degree |
+-----+
| __NULL__ | 95 |
| __NULL__ | 95 |
| 1997 | __NULL__ |
+-----+
```

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 <path_name>

```
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"})>
| <("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"})>
| <("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"})>
| <("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"})>
| <("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"})>
| <("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"})>
| <("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"})>
| <("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"})>
+-----+
+-----+

```

*

```

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
| e
| v2
+-----+
| ("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 <alias>

```

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 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	
+	-----+-----+	

: April 3, 2023

4.7.6 TTL

TTL Time To Live

openCypher

nGQL

- TTL Schema
- TTL INDEX
- Tag/Edge type INDEX TTL Tag TTL
- TTL INDEX

TTL

nGQL TTL

ttl_col	int timestamp
ttl_duration	64 ttl_duration 0

Caution

- Tag Edge type TTL NULL TTL
- Tag Edge type now() TTL Tag Edge type
- Tag
- Tag Tag Tag

Edge type

NebulaGraph

Compaction

Note

TTL Compaction

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> ALTER TAG t1 DROP (a);
```

• ttl_col

```
nebula> ALTER TAG t1 TTL_COL = "";
```

• ttl_duration 0 TTL Schema

```
nebula> ALTER TAG t1 TTL_DURATION = 0;
```

:January 9, 2023

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);			


```

    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"**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;
+-----+
| 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 |
...
```

:January 30, 2023

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

```
#   player      30      32
nebula> LOOKUP ON player \
    WHERE player.age < 32 and player.age >30 \
    YIELD DISTINCT properties(vertex).age as v;
+-----+
| v      |
+-----+
| 31    |
+-----+
```

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       |
+-----+

nebula> YIELD 1- -1;
+-----+
| (1--(1)) |
+-----+
| 2       |
+-----+

```

: April 3, 2023

4.7.9 WITH

WITH

openCypher

openCypher



nGQL WITH 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 |
+-----+

: May 13, 2022

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



nGQL

UNWIND

|

\$- UNWIND

|

\$-

```
<statement> | UNWIND $-.<var> AS <alias> <|> <clause>;
```

- openCypher UNWIND

```
<statement> UNWIND <list> AS <alias> <RETURN clause>
```

- UNWIND WITH DISTINCT



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": "Shaqquille 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")
+-----+
```

: September 7, 2022

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>	1	NebulaGraph
	2	
	3	1~4 UTF-8

SyntaxError

partition_num	20	HDD	2	3	60	100
---------------	----	-----	---	---	----	-----

replica_factor	3	1		1		
----------------	---	---	--	---	--	--

vid_type	ID	FIXED_STRING(<N>)	INT64	INT	INT64			
	FIXED_STRING(<N>)	N		UTF-8		N	12	vid_type

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 [IF NOT EXISTS] <new_graph_space_name> AS <old_graph_space_name>;
```

IF NOT EXISTS

<new_graph_space_name>	1~4 UTF-8		
	`	Schema	
	Edge type		Tag
<old_graph_space_name>			

```
#      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;
+-----+
+-----+ | Create
| Space      | 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)) comment =
= ''" |
+-----+
+-----+
```



Caution

2 20

heartbeat_interval_secs

<5

```
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+-----+
| Host   | Port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+-----+
| "storaged0" | 9779 | "ONLINE" | 8           | "basketballplayer:3, test:5" | "basketballplayer:10, test:10" | "3.1.0" |
| "storaged1" | 9779 | "ONLINE" | 9           | "basketballplayer:4, test:5" | "basketballplayer:10, test:10" | "3.1.0" |
| "storaged2" | 9779 | "ONLINE" | 3           | "basketballplayer:3"        | "basketballplayer:10, test:10" | "3.1.0" |
+-----+-----+-----+-----+-----+-----+-----+
```

```
nebula> BALANCE LEADER;
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+
| Host | Port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "storaged0" | 9779 | "ONLINE" | 7 | "basketballplayer:3, test:4" | "basketballplayer:10, test:10" | "3.4.1" |
| "storaged1" | 9779 | "ONLINE" | 7 | "basketballplayer:4, test:3" | "basketballplayer:10, test:10" | "3.4.1" |
| "storaged2" | 9779 | "ONLINE" | 6 | "basketballplayer:3, test:3" | "basketballplayer:10, test:10" | "3.4.1" |
+-----+-----+-----+-----+-----+-----+
```

: April 3, 2023

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 +

: August 9, 2022

4.8.3 SHOW SPACES

SHOW SPACES NebulaGraph

```
SHOW SPACES;
```

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

CREATE SPACE

: August 9, 2022

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)" |           |
+-----+-----+-----+-----+-----+
```

: May 13, 2022

4.8.5 CLEAR SPACE

CLEAR SPACE

Schema



CLEAR SPACE

SUBMIT JOB COMPACT

COMPACT

God

CLEAR SPACE

-
- CLEAR SPACE
- CLEAR SPACE CLEAR SPACE **Graph** storage_client_timeout_ms
- CLEAR SPACE CLEAR SPACE



NebulaGraph

CLEAR SPACE



NebulaGraph

SET VARIABLE read_only=true

NebulaGraph

CLEAR SPACE

SET VARIABLE read_only=false

CLEAR SPACE [IF EXISTS] <space_name>;

/

IF EXISTS

CLEAR SPACE

space_name

CLEAR SPACE basketballplayer;

CLEAR SPACE

- Tag
- Edge type
-

CLEAR SPACE

```

#      Tag   Edge type
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)

```

: December 23, 2022

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



DROP SPACE auto_remove_invalid_space false

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}

:January 11, 2023

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	1~4	UTF-8	
			Tag SyntaxError
<prop_name>	Tag	Tag	
<data_type>			
NULL \ NOT NULL	NULL	NULL	NOT NULL
DEFAULT			DEFAULT
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

: April 3, 2023

4.9.2 DROP TAG

DROP TAG	Tag		
	Tag		
• Tag	Tag	Compaction	---
• Tag	Tag	Tag	
Tag	Schema	Compaction	

↑↑compatibility

NebulaGraph 3.4.1 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;
```

: October 27, 2022

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 ,
- ADD CHANGE NOT NULL DEFAULT
- CHANGE
- FIXED_STRING INT
- FIXED_STRING STRING FLOAT DOUBLE

```
nebula> CREATE TAG IF NOT EXISTS t1 (p1 string, p2 int);
nebula> ALTER TAG t1 ADD (p3 int32, p4 fixed_string(10));
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 t1  p3      INT32  p4      FIXED_STRING(10)  STRING
nebula> ALTER TAG t1 CHANGE (p3 int64, p4 string);
```

Tag

Tag 2 20

heartbeat_interval_secs

: March 27, 2023

4.9.4 SHOW TAGS

SHOW TAGS Tag

SHOW TAGS

SHOW TAGS;

```
nebula> SHOW TAGS;
+-----+
| Name      |
+-----+
| "player"  |
| "team"    |
+-----+
```

: November 25, 2021

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

: November 25, 2021

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

:January 7, 2022

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>;

: August 9, 2022

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_name>	1 Edge type 2 Edge type 3 1~4	UTF-8	
		Edge type	SyntaxError
<prop_name>	Edge type	Edge type	
<data_type>			
NULL \ NOT NULL	NULL	NULL	NOT NULL DEFAULT
DEFAULT		NebulaGraph	
COMMENT	Edge type	256	
TTL_DURATION	64		0
TTL_COL	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";
```

: April 3, 2023

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;
```

: May 13, 2022

4.10.3 ALTER EDGE

ALTER EDGE Edge type TTL Time-To-Live

- ALTER EDGE
- ALTER EDGE [ERROR (-1005)]: Conflict! drop index
-
- FIXED_STRING INT
- FIXED_STRING STRING FLOAT DOUBLE

```
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 ,
- ADD | CHANGE NOT NULL DEFAULT

```
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

:January 30, 2023

4.10.4 SHOW EDGES

```
SHOW EDGES
```

Edge type

```
SHOW EDGES
```

```
SHOW EDGES;
```

```
nebula> SHOW EDGES;
+-----+
| Name      |
+-----+
| "follow"  |
| "serve"   |
+-----+
```

: November 25, 2021

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

: November 25, 2021

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 3.4.1 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 3.4.1 **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"} |
+-----+

```

: October 27, 2022

4.11.2 DELETE VERTEX

`DELETE VERTEX`



NebulaGraph 2.x

NebulaGraph 3.4.1

`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`

: August 9, 2022

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

: August 9, 2022

4.11.4 UPSERT VERTEX

UPSERT VERTEX **UPDATE** **INSERT**

Note

UPSERT VERTEX Tag

UPSERT VERTEX **INSERT** **UPSERT**

Caution

UPSERT TAG EDGE TYPE

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

: February 22, 2023

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 int 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 3.4.1 Dangling edge <edgetype>._src <edgetype>._dst VID
 -
 - edge conflict
 - INSERT INSERT INSERT storaged INSERT storaged INSERT
-

: March 27, 2023

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) == "player101" \
YIELD src(edge) AS src, dst(edge) AS dst, rank(edge) AS rank \
| DELETE EDGE follow $-.src -> $-.dst @ $-.rank;
```

: February 7, 2023

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

: September 21, 2022

4.12.4 UPSERT EDGE

UPSERT EDGE **UPDATE** **INSERT**

UPSERT EDGE **INSERT** **UPSERT**



UPSERT TAG EDGE TYPE

```
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	int	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       |
+-----+-----+
```

: March 27, 2023

4.13

4.13.1

NebulaGraph	Tag	Tag	Edge type	Edge type	Tag	Edge type
-------------	-----	-----	-----------	-----------	-----	-----------

NebulaGraph

-
- LOOKUP LOOKUP
- NebulaGraph
- 1

- 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

Elasticsearch

-
- AND OR NOT

 Note

NULL

NULL

Cypher

Constrains

MySQL

nGQL

: April 18, 2023

4.13.2 CREATE INDEX

Tag Edge type Tag Edge type **CREATE TAG** **CREATE EDGE**

CREATE INDEX Tag EdgeType "Tag" "Edge type" "

- Tag Edge type Tag Edge type LOOKUP Tag player

- " " age age == 19

Tag T A i_TA T i_T Edge type

- i_TA i_T

- MATCH LOOKUP i_T i_TA



LOOKUP Tag Edge type

Caution

Storage

256

1. NebulaGraph
- 2.
- 3.
4. **LOOKUP** **MATCH** NebulaGraph

Note

```
--disable_auto_compaction = false
      LOOKUP REBUILD INDEX )
      can't find xxx in the space
      2      20
      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

dæ

<tag_name> | Tag Edge
<edge_name>

<code><prop_name_list></code>	<code>prop_name(length)</code>	Tag	Edge type	<code><prop_name_list></code>
-------------------------------------	--------------------------------	-----	-----------	-------------------------------------

COMMENT 256

Tag/Edge type

```
nebula> CREATE TAG INDEX player_index on player();
```

```
nebula> CREATE EDGE INDEX follow_index on follow();
```

Tag Edge type L0OKUP 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 IF NOT EXISTS fix_string(p1 FIXED_STRING(10));
```

Tag Edge type)

```
nebula> CREATE TAG INDEX IF NOT EXISTS player_index_1 on player(name(10), age);
```



Tag Edge type

Note

: April 18, 2023

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

: March 7, 2022

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` ()"
+-----+-----+
```

: March 7, 2022

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

: October 27, 2021

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] ...]
```



```

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

: December 15, 2022

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

:January 13, 2022

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;
```

:January 17, 2023

4.14

4.14.1



14

- LOOKUP
 - nebula_ 256
 - Tag/Edge type Tag/Edge type
 - STRING FIXED_STRING
 - Tag/Edge type
 -
 - NULL
 - Elasticsearch
 -
 - WHERE
 - Elasticsearch NebulaGraph Elasticsearch
 - NebulaGraph listener Elasticsearch
 - K8s NebulaGraph
-

: February 2, 2023

4.14.2

NebulaGraph

Elasticsearch

Elasticsearch

listener

Elasticsearch

Elasticsearch

Elasticsearch

Kubernetes

Elasticsearch

Elasticsearch

7.x

Elasticsearch

Compatibility

NebulaGraph 3.4

Caution

- nebula_

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);
```

Note

Elasticsearch

SIGN IN

Caution

Elasticsearch

SIGN OUT

SIGN IN

Elasticsearch

```
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;
```

: February 2, 2023

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
STORAGE					
listener	storaged			listener	NebulaGraph
DEB	NebulaGraph			Storage	RPM
LISTENER					
listener		nebula-storaged-listener.conf		etc	.production
Storage					
daemonize	true				
pid_file		pids/nebula-storaged-listener.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;
```

: February 2, 2023

4.14.4

LOOKUP WHERE

listener

```
player      player      name      name      Kevin Durant  Tim Duncan
David Beckham      player.name      LOOKUP ON player WHERE PREFIX(player.name, "D");
                                                               David Beckham
```

```
CREATE FULLTEXT {TAG | EDGE} INDEX <index_name> ON {<tag_name> | <edge_name>} ([<prop_name>]);
```

```
SHOW FULLTEXT INDEXES;
```

```
REBUILD FULLTEXT INDEX;
```



Storage nebula-storaged.conf snapshot_send_files=false

```
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_`
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;

```

: February 2, 2023

## 4.15

---

### 4.15.1 GET SUBGRAPH

GET SUBGRAPH

GET SUBGRAPH

```
GET SUBGRAPH [WITH PROP] [<step_count> {STEP|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

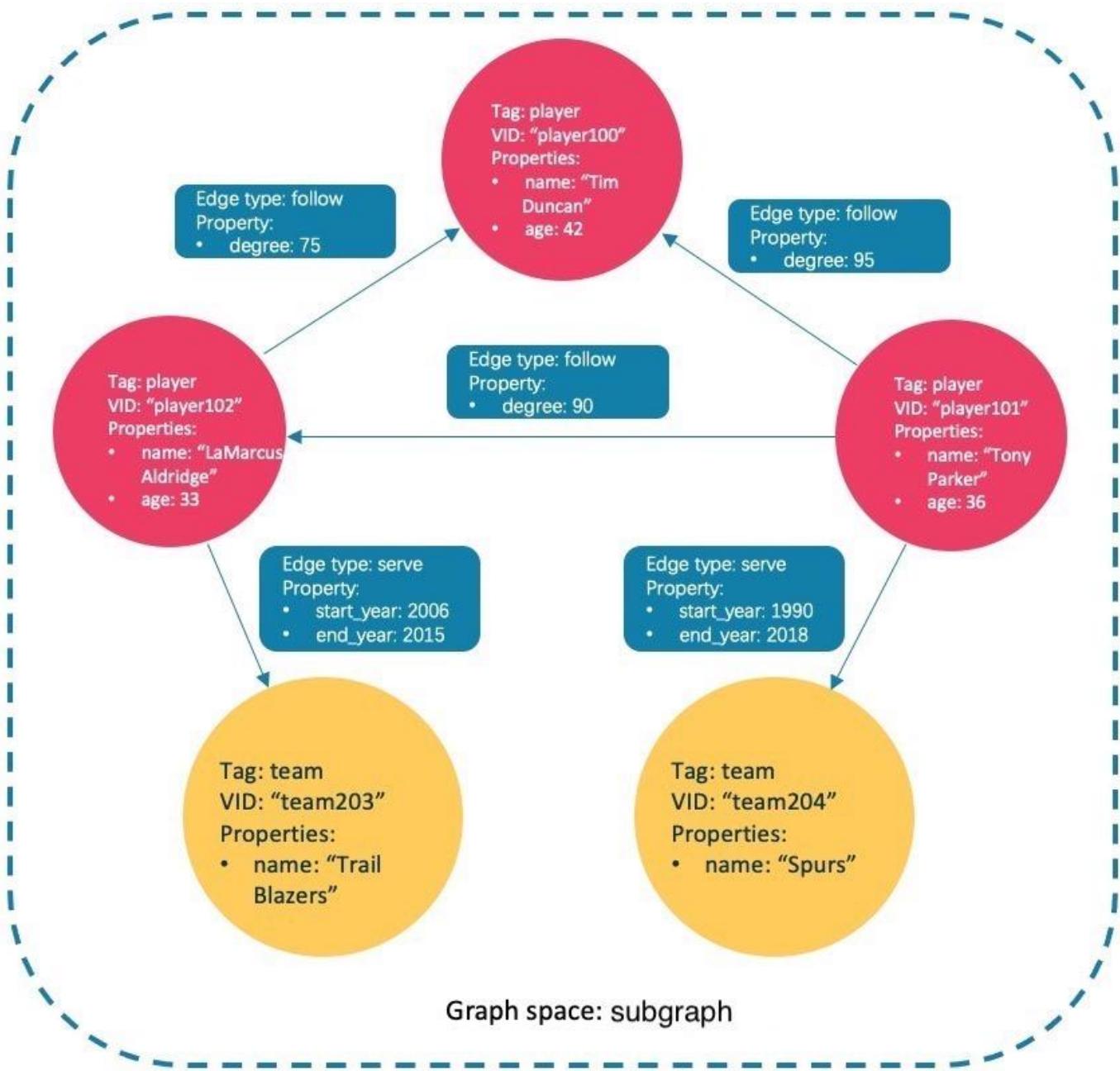


GET SUBGRAPH                  trail

#### WHERE

GET SUBGRAPH                  WHERE

- AND
- \$\$.tagName.propName
- edge\_type.propName
- 
- Schema                        geo



```

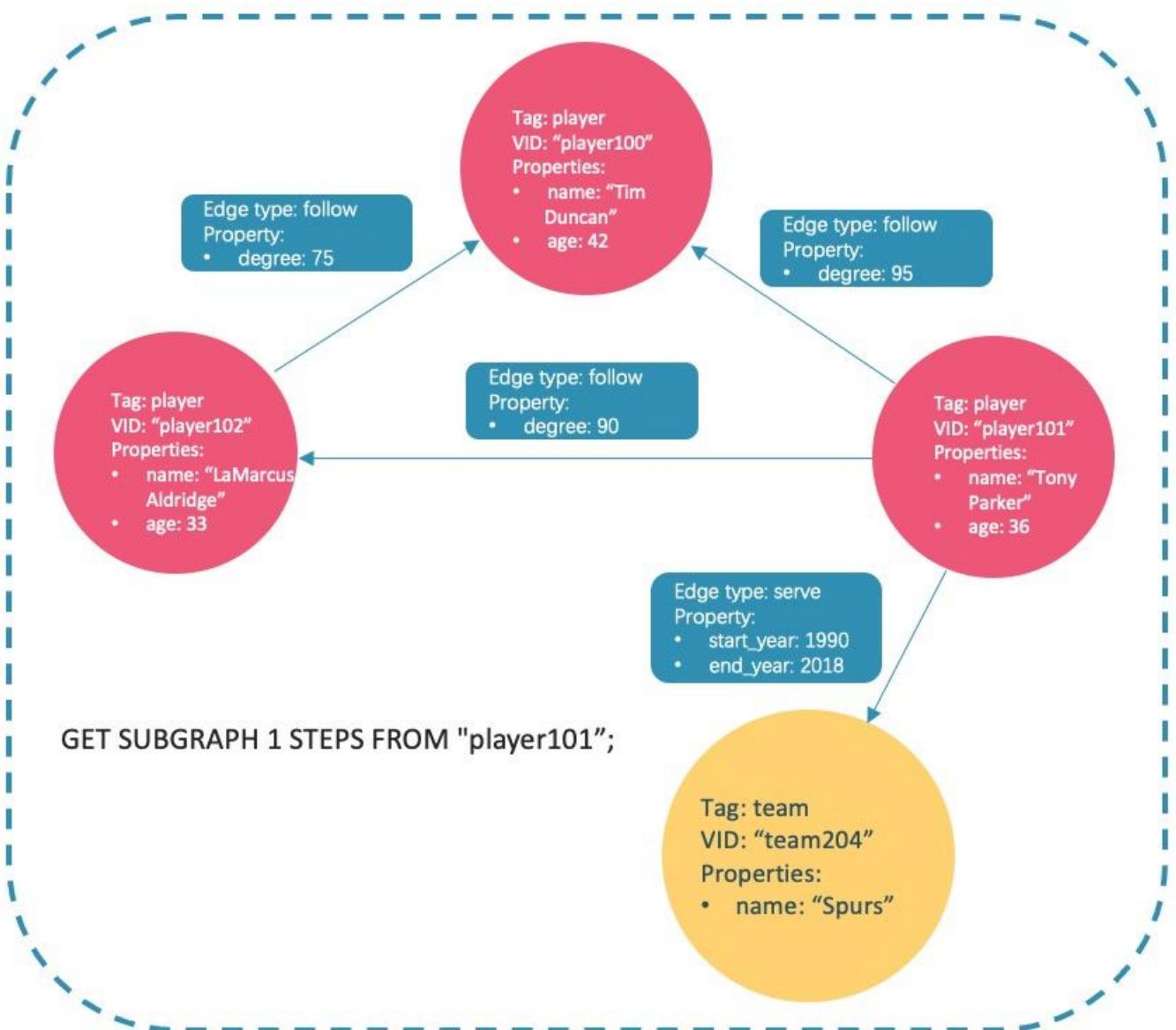
nebula> CREATE SPACE IF NOT EXISTS subgraph(partition_num=15, replica_factor=1, vid_type=fixed_string(30));
nebula> USE subgraph;
nebula> CREATE TAG IF NOT EXISTS player(name string, age int);
nebula> CREATE TAG IF NOT EXISTS team(name string);
nebula> CREATE EDGE IF NOT EXISTS follow(degree int);
nebula> 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 {}]
| -----+
+-----+
```



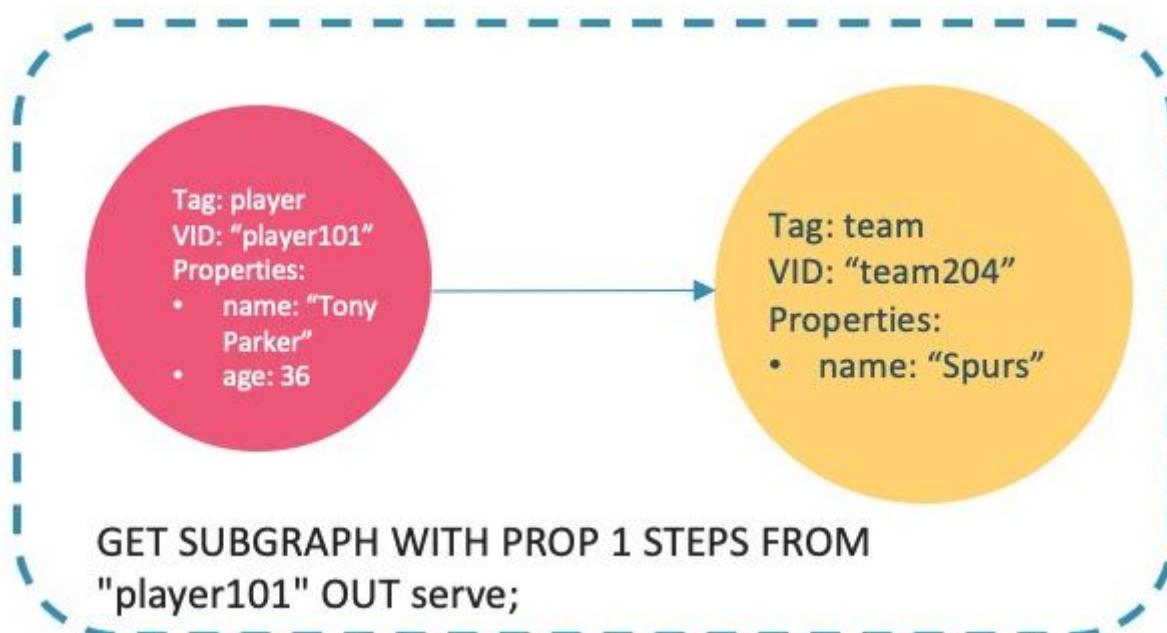
- player101 0~1 follow

```
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": @0 {end_year: 2018, start_year: 1999}}], [{"team204": team{name: "Spurs"}}, []] |
+-----+-----+
```

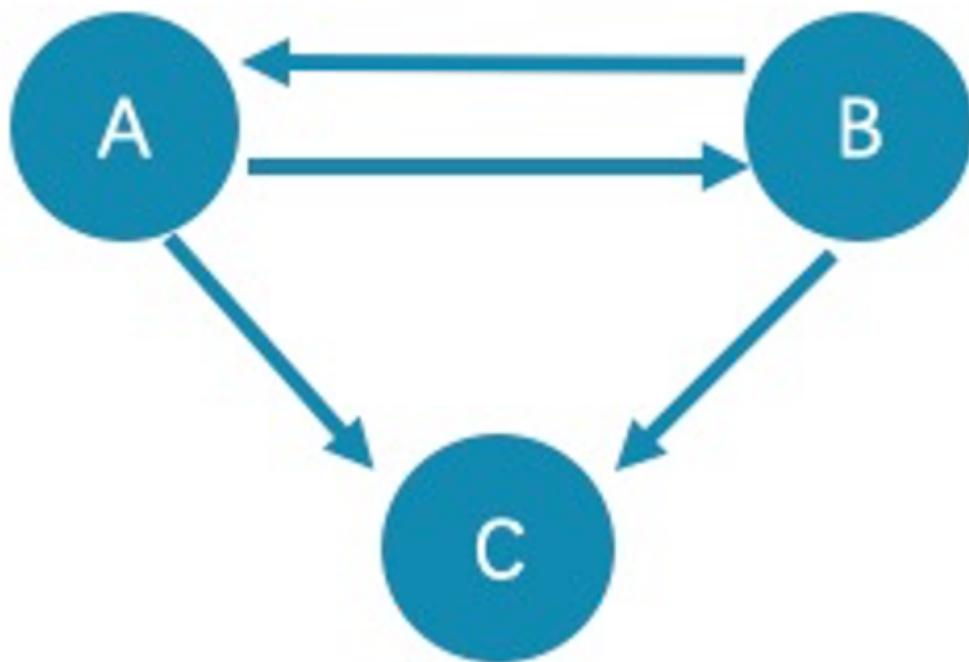


- player101 0~2 follow degree 90 30

```
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->player100": @0 {degree: 95}}], [{"player100": player{age: 42, name: "Tim Duncan"}}, []] |
+-----+-----+
```

## 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 {}]] |
+-----+-----+

```

: March 13, 2023

## 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> {STEP|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

: December 30, 2022

## 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" | "tck"}] <your_nGQL_statement>;
```

- PROFILE

```
PROFILE [format= {"row" | "dot" | "tck"}] <your_nGQL_statement>;
```

```
EXPLAIN PROFILE row dot tck 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 |
|----------------|-----|----------|------|----------|----------|--------|-----------|--------|
|----------------|-----|----------|------|----------|----------|--------|-----------|--------|

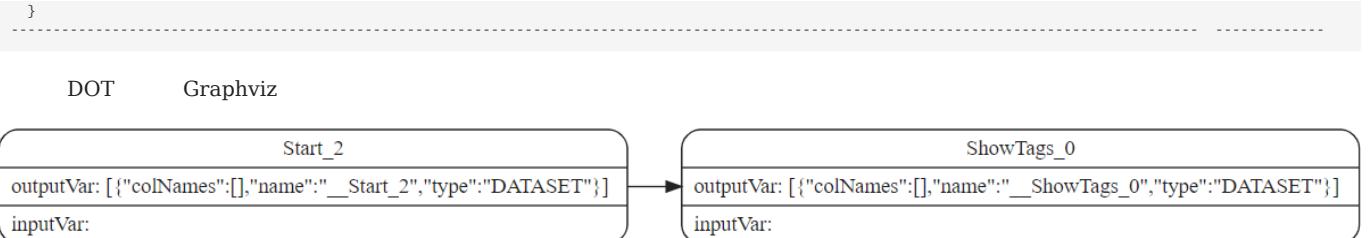
| operator info | operator |
|---------------|----------|
|---------------|----------|

**dot****dot****Graphviz****Graphviz****DOT****Graphviz****DOT****SVG****Graphviz Online**

```
nebula> EXPLAIN format="dot" SHOW TAGS;
Execution succeeded (time spent 161/665 us)
Execution Plan
```

```
plan
```

```
digraph exec_plan {
 rankdir=LR;
 "ShowTags_0"[label="ShowTags_0"]outputVar: \[\{"colNames":[], "name": "__ShowTags_0", "type": "DATASET"\}\]\1|inputVar:\1", shape=Mrecord;
 "Start_2"->"ShowTags_0";
 "Start_2"[label="Start_2"]outputVar: \[\{"colNames":[], "name": "__Start_2", "type": "DATASET"\}\]\1|inputVar: \1", shape=Mrecord;
```

**tck**

tck

tck

TCK case

- EXPLAIN

```
nebula> EXPLAIN format="tck" FETCH PROP ON player "player_1","player_2","player_3" YIELD properties(vertex).name as name, properties(vertex).age as age;
Execution succeeded (time spent 261μs/613.718μs)
```

Execution Plan (optimize time 28 us)

| id | name        | dependencies | profiling data | operator info |
|----|-------------|--------------|----------------|---------------|
| 2  | Project     | 1            |                |               |
| 1  | GetVertices | 0            |                |               |
| 0  | Start       |              |                |               |

Wed, 22 Mar 2023 23:15:52 CST

- PROFILE

```
nebula> PROFILE format="tck" FETCH PROP ON player "player_1","player_2","player_3" YIELD properties(vertex).name as name, properties(vertex).age as age;
```

| name         | age |
|--------------|-----|
| "Piter Park" | 24  |
| "aaa"        | 24  |
| "ccc"        | 24  |

Got 3 rows (time spent 1.474ms/2.19677ms)

Execution Plan (optimize time 41 us)

| id | name        | dependencies | profiling data                                                                                                   | operator info |
|----|-------------|--------------|------------------------------------------------------------------------------------------------------------------|---------------|
| 2  | Project     | 1            | {"rows":3, "version":0}                                                                                          |               |
| 1  | GetVertices | 0            | {"resp[0]":{"exec":232(us), "host":127.0.0.1:9779, "total":758(us)}, "rows":3, "total_rpc":875(us), "version":0} |               |
| 0  | Start       |              | {"rows":0, "version":0}                                                                                          |               |

Wed, 22 Mar 2023 23:16:13 CST

: March 31, 2023

## 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.
```

---

: May 13, 2022

### 4.16.3 KILL SESSION

KILL SESSION      Session

#### Note

- root
- KILL SESSION      Graph       $2^* \text{ session_reclaim_interval_secs}$       120

KILL SESSION

•

```
KILL {SESSION|SESSIONS} <SessionId>
```

- {SESSION|SESSIONS}      SESSION      SESSIONS
- <SessionId>      Session ID      **SHOW SESSIONS**      ID

•

```
SHOW SESSIONS
| YIELD $-.SessionId AS sid [WHERE <filter_clause>]
| KILL {SESSION|SESSIONS} $-.sid
```

#### Note

KILL SESSION      SHOW SESSIONS      KILL SESSION

- [WHERE <filter\_clause>]
- WHERE      <filter\_expression>      WHERE \$-.CreateTime < datetime("2022-12-14T18:00:00")
- WHERE      SessionId      UserName      SpaceName      CreateTime      UpdateTime      GraphAddr      Timezone      ClientIp      **SHOW SESSIONS**
- {SESSION|SESSIONS}      SESSION      SESSIONS

#### Caution

•

```
nebula> KILL SESSION 1672887983842984
```

•

• 2023-01-05T18:00:00

```
nebula> SHOW SESSIONS | YIELD $-.SessionId AS sid WHERE $-.CreateTime < datetime("2023-01-05T18:00:00") | KILL SESSIONS $-.sid
```

•

```
nebula> SHOW SESSIONS | YIELD $-.SessionId AS sid, $-.CreateTime as CreateTime | ORDER BY $-.CreateTime ASC | LIMIT 2 | KILL SESSIONS $-.sid
```

• session\_user1

```
nebula> SHOW SESSIONS | YIELD $-.SessionId as sid WHERE $-.UserName == "session_user1" | KILL SESSIONS $-.sid
```

•

```
nebula> SHOW SESSIONS | YIELD $-.SessionId as sid | KILL SESSION $-.sid
//
```

```
nebula> SHOW SESSIONS | KILL SESSIONS $-.SessionId
```

 **Caution**

---

:January 31, 2023

## 4.17

Storage

COMPACT FLUSH STATS



Note

### 4.17.1 SUBMIT JOB BALANCE DATA



Enterpriseonly



Caution

- SUBMIT JOB STATS REBUILD INDEX
- 
- 

SUBMIT JOB BALANCE DATA

ID

```
nebula> SUBMIT JOB BALANCE DATA;
+-----+
| New Job Id |
+-----+
| 28 |
+-----+
```

### 4.17.2 SUBMIT JOB COMPACT

SUBMIT JOB COMPACT

RocksDB compact

compact

Storage

```
nebula> SUBMIT JOB COMPACT;
+-----+
| New Job Id |
+-----+
| 40 |
+-----+
```

### 4.17.3 SUBMIT JOB FLUSH

SUBMIT JOB FLUSH

RocksDB memfile

```
nebula> SUBMIT JOB FLUSH;
+-----+
| New Job Id |
+-----+
| 96 |
+-----+
```

#### 4.17.4 SUBMIT JOB STATS

SUBMIT JOB STATS

SHOW STATS

**SHOW STATS**

NebulaGraph

SUBMIT JOB STATS

```
nebula> SUBMIT JOB STATS;
+-----+
| New Job Id |
+-----+
| 9 |
+-----+
```

#### 4.17.5 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 |
+-----+
```

#### 4.17.6 SHOW JOB

Meta SUBMIT JOB nebula-storaged SHOW JOB &lt;job\_id&gt;

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 -- /
```

## 4.17.7 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
+-----+-----+-----+-----+
```

## 4.17.8 STOP JOB

STOP JOB &lt;job\_id&gt;

```
nebula> STOP JOB 22;
+-----+
```

```
| Result |
+-----+
| "Job stopped" |
+-----+
```

#### 4.17.9 RECOVER JOB

```
RECOVER JOB [<job_id>] FAILED STOPPED <job_id>
```

```
nebula> RECOVER JOB;
+-----+
| Recovered job num |
+-----+
| 5 job recovered |
+-----+
```

#### 4.17.10 FAQ

```
SUBMIT JOB HTTP Storage HTTP
```

```
curl "http://{storaged-ip}:19779/admin?space={space_name}&op=compact"
```

: October 20, 2022

## 5.

---

### 5.1 NebulaGraph

NebulaGraph

#### 5.1.1

| NebulaGraph | NVMe SSD | SSD | IOPS | Latency |
|-------------|----------|-----|------|---------|
|-------------|----------|-----|------|---------|

- HDD IOPS
- NAS SAN HDFS Ceph
- RAID
- SSD AWS Provisioned IOPS SSD

#### 5.1.2 CPU

 **Enterprise only**

ARM Apple Mac M1

 **Note**

3.0.2 NebulaGraph Docker Hub Docker ARM64 ARM macOS Docker Desktop ARM Linux Server  
NebulaGraph

#### 5.1.3

|     |           |
|-----|-----------|
| CPU | x86_64    |
|     | 4 GB      |
|     | 10 GB SSD |

Linux NebulaGraph 4.15 Linux

 **Note**

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++

## 5.1.4

|     |            |
|-----|------------|
| 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             |

### 5.1.5

|     |                     |
|-----|---------------------|
| 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             |

### 5.1.6 NebulaGraph

#### 3 NebulaGraph

|       |                                                                                      |              |                                                                                         |                   |
|-------|--------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------|-------------------|
| Bytes | *                                                                                    | * 7.5 * 120% | *                                                                                       | * 7.5             |
| Bytes | [ * 16 + RocksDB *<br>(write_buffer_size *<br>max_write_buffer_number) + ] *<br>120% |              | * 16 BloomFilter<br>max_write_buffer_number RocksDB<br>MemTable Memory usage in RocksDB | write_buffer_size |
| -     | *                                                                                    |              | disk_partition_num_multiplier                                                           | 2~20              |
|       |                                                                                      |              | SSD 20 HDD 2                                                                            |                   |
| • 1   | 7.5                                                                                  |              | 16                                                                                      | * 50              |
| • 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

#### Caution

RocksDB 70M RocksDB 100

: February 2, 2023

## 5.2

### 5.2.1 NebulaGraph

NebulaGraph



NebulaGraph

- NebulaGraph

#### 1. NebulaGraph

- [ ] 3.4.1 NebulaGraph

```
$ git clone --branch release-3.4 https://github.com/vesoft-inc/nebula.git
```

- master

```
$ git clone https://github.com/vesoft-inc/nebula.git
```

#### 2. nebula/third-party NebulaGraph

```
$ cd nebula/third-party
$./install-third-party.sh
```

#### 3. nebula build

```
$ cd ..
$ 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  $\lfloor \min(\text{CPU}, \frac{(GB)}{2}) \rfloor$

```
$ make -j{N} # E.g., make -j2
```

## 6. NebulaGraph

```
$ sudo make install
```

7. etc/ /usr/local/nebula/etc  
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

- License
- 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`

---

: April 3, 2023

## 5.2.2 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 3.4.1

```
wget https://oss-cdn.nebula-graph.com.cn/package/3.4.1/nebula-graph-3.4.1.el7.x86_64.rpm
wget https://oss-cdn.nebula-graph.com.cn/package/3.4.1/nebula-graph-3.4.1.el7.x86_64.rpm.sha256sum.txt
```

ubuntu 1804 3.4.1

```
wget https://oss-cdn.nebula-graph.com.cn/package/3.4.1/nebula-graph-3.4.1/ubuntu1804.amd64.deb
wget https://oss-cdn.nebula-graph.com.cn/package/3.4.1/nebula-graph-3.4.1/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/

### 3.4.1 RPM

```
sudo rpm -ivh nebula-graph-3.4.1.el7.x86_64.rpm
```

- DEB

```
$ sudo dpkg -i <package_name>
```

### Note

DEB NebulaGraph

/usr/local/nebula/

### 3.4.1 DEB

```
sudo dpkg -i nebula-graph-3.4.1.ubuntu1804.amd64.deb
```

- [License](#)
  - [NebulaGraph](#)
  - [NebulaGraph](#)
- 

: August 9, 2022

### 5.2.3 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-3.4 tar.gz

```
wget https://oss-cdn.nebula-graph.com.cn/package/3.4.1/nebula-graph-3.4.1.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-3.4.1.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

- [License](#)
  - [NebulaGraph](#)
- 

: December 15, 2022

## 5.2.4 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 3.4.0`

 **Danger**

master

```
$ git clone -b release-3.4 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_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 | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+-----+
"storaged0"	9779	"ONLINE"	0	"No valid partition"	"No valid partition"	"3.4.1"
"storaged1"	9779	"ONLINE"	0	"No valid partition"	"No valid partition"	"3.4.1"
"storaged2"	9779	"ONLINE"	0	"No valid partition"	"No valid partition"	"3.4.1"
+-----+-----+-----+-----+-----+-----+-----+
```

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, 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-3.4
 ...
 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
```

---

: March 27, 2023

## 5.2.5 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](#)

### LICENSE

NebulaGraph License [NebulaGraph](#) [License](#)

NebulaGraph

NebulaGraph etc [nebula-graphd.conf](#) [nebula-metad.conf](#) [nebula-storaged.conf](#)

|   |                                    |                                      |                                   |
|---|------------------------------------|--------------------------------------|-----------------------------------|
| A | <a href="#">nebula-graphd.conf</a> | <a href="#">nebula-storaged.conf</a> | <a href="#">nebula-metad.conf</a> |
| B | <a href="#">nebula-graphd.conf</a> | <a href="#">nebula-storaged.conf</a> | <a href="#">nebula-metad.conf</a> |
| C | <a href="#">nebula-graphd.conf</a> | <a href="#">nebula-storaged.conf</a> | <a href="#">nebula-metad.conf</a> |
| D | <a href="#">nebula-graphd.conf</a> | <a href="#">nebula-storaged.conf</a> |                                   |
| E | <a href="#">nebula-graphd.conf</a> | <a href="#">nebula-storaged.conf</a> |                                   |

## 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 | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "192.168.10.111" | 9779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.4.1" |
| "192.168.10.112" | 9779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.4.1" |
| "192.168.10.113" | 9779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.4.1" |
```

```
| "192.168.10.114" | 9779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.4.1" |
| "192.168.10.115" | 9779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.4.1" |
+-----+-----+-----+-----+-----+-----+-----+
```

: March 13, 2023

## 5.2.6 NebulaGraph

NebulaGraph

- NebulaGraph Dashboard
  - NebulaGraph Operator
- 
- **NebulaGraph Dashboard** NebulaGraph
  - **NebulaGraph Operator** NebulaGraph      Kubectl    NebulaGraph      Helm    NebulaGraph

### Note

[inquiry@vesoft.com](mailto:inquiry@vesoft.com)    NebulaGraph

: August 9, 2022

## 5.3 NebulaGraph

NebulaGraph Meta Storage Graph

NebulaGraph



NebulaGraph

### 5.3.1

NebulaGraph 3

RPC

NebulaGraph NebulaGraph 3 3 1

NebulaGraph

### 5.3.2

### 5.3.3

- 
- 

### 5.3.4

NebulaGraph NebulaGraph

### 5.3.5

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

### 5.3.6

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    |

: August 9, 2022

## 5.4 NebulaGraph License

NebulaGraph License

License

 **Enterpriseonly**

License

License

### 5.4.1

- License NebulaGraph
- License License
- License
- License 14
- 30
- 14
- 14

### 5.4.2 NebulaGraph License

License nebula.license

```
-----License Content Start-----
{
 "vendor": "vesoft",
 "organization": "doc",
 "issuedDate": "2022-04-06T16:00:00.000Z",
 "expirationDate": "2022-05-31T15:59:59.000Z",
 "product": "nebula_graph",
 "version": ">3.0.0",
 "licenseType": "enterprise",
 "gracePeriod": 14,
 "graphdSpec": {
 "nodes": 3
 },
 "storageSpec": {
 "nodes": 3
 },
 "clusterCode": "BAIAEAiAQAG"
}
-----License Content End-----
-----License Key Start-----
coffFcOxxxxxxxxxxxxhnzgaxrQ==
-----License Key End-----
```

## License

|                |             |              |                |         |            |  |
|----------------|-------------|--------------|----------------|---------|------------|--|
| vendor         |             |              |                |         |            |  |
| organization   |             |              |                |         |            |  |
| issuedDate     | License     |              |                |         |            |  |
| expirationDate | License     |              |                |         |            |  |
| product        | NebulaGraph | nebula_graph |                |         |            |  |
| version        |             |              |                |         |            |  |
| licenseType    | License     | enterprise   | saml_bussiness | pro     | individual |  |
| gracePeriod    |             |              | License        | 0       |            |  |
| graphdSpec     | Graph       | NebulaGraph  | Graph          | Graph   |            |  |
| storagedSpec   | Storage     | NebulaGraph  | Storage        | Storage |            |  |
| clusterCode    |             | License      |                |         |            |  |

### 5.4.3 NebulaGraph License

1. NebulaGraph
2. NebulaGraph [RPM](#) [DEB](#) [NebulaGraph](#)
3. License nebula.license
4. License Meta Meta share/resources/

 Note

License

### 5.4.4 NebulaGraph License

1. inquiry@vesoft.com NebulaGraph License
2. Meta Meta share/resources/ License nebula.license License
3. Storage Graph License 14 Storage Graph

 Note

License Graph Storage License

### 5.4.5 NebulaGraph License

- License
 

```
cat License cat share/resources/nebula.license
```
- HTTP License
 

```
NebulaGraph Meta HTTP 19559 License curl -G "http://192.168.10.101:19559/license"
```

## 5.4.6

NebulaGraph

---

: March 27, 2023

## 5.5 NebulaGraph

---

NebulaGraph

 **Enterpriseonly**

systemd

 **Danger**

### 5.5.1

---

`nebula.service`

 **Note**

`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 systemd

---

NebulaGraph

systemd

systemctl

### Note

- NebulaGraph      systemd      .service      etc/unit      RPM/DEB      NebulaGraph      .service      /usr/lib/systemd/system      ExecStart      NebulaGraph      systemctl
- Dashboard      NebulaGraph      systemctl
- NebulaGraph      .service      /usr/lib/systemd/system      .service      ExecStart      systemctl

```
$ systemctl <start | stop | restart | status > <nebula | nebula-metad | nebula-graphd | nebula-storaged>
```

|                              |
|------------------------------|
| start                        |
| stop                         |
| restart                      |
| status                       |
| nebula                       |
| nebula-metad      Meta       |
| nebula-graphd      Graph     |
| nebula-storaged      Storage |

### 5.5.3 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
```

```
$ systemctl start nebula
```

```
$ systemctl enable nebula
```

### 5.5.4 NebulaGraph

### Danger

```
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
```

```
$ systemctl stop nebula
```

## 5.5.5 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 | Ready |
|-------------|-----------------|-----------------|--------------|-----------|---------|-------|
| 3.0.0       | Storage         | Storage         | Meta         | ADD HOSTS | Storage |       |
| 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
```

systemctl NebulaGraph

```
$ systemctl status nebula
● nebula.service
 Loaded: loaded (/usr/lib/systemd/system/nebula.service; disabled; vendor preset: disabled)
 Active: active (exited) since 2022-03-28 04:13:24 UTC; 1h 47min ago
 Process: 21772 ExecStart=/usr/local/ent-nightly/scripts/nebula.service start all (code=exited, status=0/SUCCESS)
 Main PID: 21772 (code=exited, status=0/SUCCESS)
 Tasks: 325
 Memory: 424.5M
 CPU: 0.000 CPU(s) since start
 CGroup: /system.slice/nebula.service
 ├─21789 /usr/local/ent-nightly/bin/nebula-metad --flagfile /usr/local/ent-nightly/etc/nebula-metad.conf
 ├─21827 /usr/local/ent-nightly/bin/nebula-graphd --flagfile /usr/local/ent-nightly/etc/nebula-graphd.conf
 └─21900 /usr/local/ent-nightly/bin/nebula-storaged --flagfile /usr/local/ent-nightly/etc/nebula-storaged.conf

3 28 04:13:24 xxxxxx systemd[1]: Started nebula.service.
```

NebulaGraph Meta Graph Storage etc /usr/local/nebula/etc/

5.5.6

- NebulaGraph

: August 9, 2022

## 5.6 NebulaGraph

Nebula Console NebulaGraph



NebulaGraph Storage

NebulaGraph

### 5.6.1

- NebulaGraph
- Nebula Console NebulaGraph
- Nebula Console NebulaGraph



Nebula Console NebulaGraph  
between client and server

incompatible version

### 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]
```

|                       |             |              |
|-----------------------|-------------|--------------|
| -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 |             |              |

: August 9, 2022

## 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> ...];
```

**Note**

- Storage 2 20 SHOW HOSTS
- IP 127.0.0.1:9779
- ADD HOSTS "foo-bar":9779
- Storage Storage

### 5.7.2 Storage

Storage

**Note**

Storage Storage

```
DROP HOSTS <ip>:<port> [,<ip>:<port> ...];
DROP HOSTS "<hostname>:<port> [, "<hostname>:<port> ...];
```

: August 12, 2022

## 5.8

---

### 5.8.1 NebulaGraph 3.4.1

NebulaGraph 2.6.1 3.4.1 NebulaGraph 2.x 3.x 3.4.1

|                   |         |       |       |     |     |     |
|-------------------|---------|-------|-------|-----|-----|-----|
| NebulaGraph 2.5.0 | 2.x 3.x | 3.4.1 | 2.5.0 | 1.x | 2.x | 2.5 |
| 3.4.1             |         |       |       |     |     |     |

#### Caution

|        |     |       |       |                 |                        |             |
|--------|-----|-------|-------|-----------------|------------------------|-------------|
| 2.0.0  | 1.x | 3.4.1 | 3.4.1 | 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 3.4.1

- 
- 
- 
- nGQL
  - YIELD
  - FETCH GO LOOKUP FIND PATH GET SUBGRAPH YIELD
  - MATCH Tag return v.name return v.player.name
  -

|                                                                                       |                    |         |    |                                  |    |
|---------------------------------------------------------------------------------------|--------------------|---------|----|----------------------------------|----|
| NebulaGraph                                                                           | Elasticsearch (ES) | SIGN IN | ES | cURL                             | ES |
| curl -XDELETE -u <es_username>:<es_password> '<es_access_ip>:<port>/<fullindex_name>' |                    |         |    | curl -XDELETE -u elastic:elastic |    |
| 'http://192.168.8.223:9200/nebula_index_2534'                                         | ES                 | -u      |    |                                  |    |

[GitHub](#)

- NebulaGraph 3.4.1

[Download](#)

RPM/DEB TAR

- Storage Meta `data_path` `nebula/data/storage nebula/data/meta`



- 
- 
- 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
```

[GitHub](#)

|                                   |     |     |       |                                 |                                          |         |
|-----------------------------------|-----|-----|-------|---------------------------------|------------------------------------------|---------|
| 3.0.0                             | Tag | Tag | Graph | <code>nebula-graphd.conf</code> | <code>--graph_use_vertex_key=true</code> | Storage |
| <code>nebula-storaged.conf</code> |     |     |       |                                 |                                          |         |

## 2.

|                  |             |                  |
|------------------|-------------|------------------|
| <code>bin</code> | NebulaGraph | <code>bin</code> |
|------------------|-------------|------------------|



NebulaGraph

## 3. Graph

- session\_idle\_timeout\_secs [1,604800] 28800
- client\_idle\_timeout\_secs [1,604800] 28800

2.x

Graph

## 4. Meta

&lt;nebula\_install\_path&gt;/scripts/nebula-metad.service start

Meta leader

Graph

NebulaGraph

SHOW HOSTS meta SHOW META LEADER

Meta

Meta



GitHub

## 5. Graph Storage



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;
```

3.4.1

## FAQ

SPACE 0 NOT FOUND

Space 0 not found

Space ID 0 &lt;nebula\_storagepath&gt;/data/storage/nebula/0

Space 0 Storage

GRAPH STORAGE

Graph

PERMISSION DENIED

sudo

SUBMIT JOB STATS SHOW STATS

STORAGE OFFLINE LEADER COUNT 0

### Storage

```
ADD HOSTS <ip>:<port>[, <ip>:<port> ...];
```

```
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

---

: March 27, 2023

## 5.8.2 NebulaGraph 3.x 3.4.1

NebulaGraph 3.1.0 v3.x v3.4.1

- NebulaGraph 3.x x < 4 3.4.1 3.4.0 3.4.1 **NebulaGraph 3.4.1**

!!! note

```
NebulaGraph 3.0.0 3.1.0 3.4.1 [NebulaGraph 2.x 3.1.0](https://docs.nebula-graph.com.cn/3.1.0/4.deployment-and-installation/3.upgrade-nebula-graph/upgrade-nebula-graph-to-latest/)
```

- IP
- 1.5
- NebulaGraph Elasticsearch (ES) SIGN IN ES

### Note

```
cURL ES curl -XDELETE -u <es_username>:<es_password> '<es_access_ip>:<port>/<fullindex_name>' curl -XDELETE -u elastic:elastic 'http://192.168.8.223:9200/nebula_index_2534' ES -u
```

## 1. NebulaGraph v3.4.1

### Note

RPM /usr/local/nebulagraph-ent-3.4 RPM

### Caution

3.4.1 Meta Storage --data\_path 3.x --data\_path

## 2. NebulaGraph v3.x **NebulaGraph** nebula.service status all

## 3. NebulaGraph v3.4.1

## Storage Meta

- Storage

```
sudo ./bin/db_upgrader --max_concurrent_parts=<num> --src_db_path=<source_storage_data_path> --dst_db_path=<destination_storage_data_path>
```

|                        |                                          |
|------------------------|------------------------------------------|
| --max_concurrent_parts | 1                                        |
| --src_db_path          | /usr/local/nebula-ent-3.1.0/data/storage |
| --dst_db_path          | /usr/local/nebula-ent-3.4/data/storage   |

```
sudo ./bin/db_upgrader --max_concurrent_parts=20 --src_db_path=/usr/local/nebula-ent-3.1.0/data/storage --dst_db_path=/usr/local/nebula-ent-3.4/data/storage
```

```
/usr/local/nebula-ent-3.1.0/data/storage /usr/local/nebula-ent-3.1.0/data2/storage
```

```
sudo ./bin/db_upgrader --src_db_path=/usr/local/nebula-ent-3.1.0/data/storage --dst_db_path=/usr/local/nebula-ent-3.4/data/storage
```

```
sudo ./bin/db_upgrader --src_db_path=/usr/local/nebula-ent-3.1.0/data2/storage --dst_db_path=/usr/local/nebula-ent-3.4/data2/storage
```

- Meta

```
sudo ./bin/meta_upgrader --src_meta_path=<source_meta_data_path> --dst_meta_path=<destination_meta_data_path>
```

|                 |      |                                       |
|-----------------|------|---------------------------------------|
| --src_meta_path | Meta | /usr/local/nebula-ent-3.1.0/data/meta |
| --dst_meta_path | Meta | /usr/local/nebula-ent-3.4/data/meta   |

```
sudo ./bin/meta_upgrader --src_meta_path=/usr/local/nebula-ent-3.1.0/data/meta --dst_meta_path=/usr/local/nebula-ent-3.4/data/meta
```

|        |      |      |
|--------|------|------|
| Meta   | Meta | Meta |
| v3.4.1 | data |      |

4. License v3.4.1 share/resources

5. NebulaGraph v3.4.1

```
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;
```

## Docker Compose



Docker Compose NebulaGraph

---

: March 27, 2023

## 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-3.4.1-1.x86\_64

#### 2. NebulaGraph

```
sudo rpm -e <nebula_version>
```

```
sudo rpm -e nebula-graph-3.4.1-1.x86_64
```

3.

### **DEB NebulaGraph**

1. NebulaGraph

```
$ dpkg -l | grep "nebula"
```

```
ii nebula-graph 3.4.1 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

---

: September 30, 2022

## 6.

---

### 6.1

---

#### 6.1.1

NebulaGraph **gflags** flags NebulaGraph

 **Enterpriseonly**

#### 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            | <service_name>.conf.default <service_name>.conf.production | RPM/DEB                                        |
| /usr/local/nebula/etc/ | TAR                                                        | <install_path>/<tar_package_directory>/etc TAR |
|                        |                                                            | .default .production                           |

### Caution

IP local\_ip NebulaGraph 3 Storage 3 IP

### NebulaGraph

|         |                                                              |         |
|---------|--------------------------------------------------------------|---------|
| Meta    | nebula-metad.conf.default nebula-metad.conf.production       | Meta    |
| Graph   | nebula-graphd.conf.default nebula-graphd.conf.production     | Graph   |
| Storage | nebula-storaged.conf.default nebula-storaged.conf.production | Storage |

local\_config true NebulaGraph

### Caution

local\_config false NebulaGraph Meta

DOCKER COMPOSE

Docker Compose <install\_path>/nebula-docker-compose/docker-compose.yaml command

NEBULAGRAPH OPERATOR

NebulaGraph Operator Kubectl YAML spec.{graphd|storaged|metad}.config

### Note

Helm

NebulaGraph **NebulaGraph Config**

NebulaGraph

### Caution

## 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

curl NebulaGraph Storage wal\_ttl 600

```
curl -X PUT -H "Content-Type: application/json" -d'{"wal_ttl":"600"}' -s "http://192.168.15.6:19779/flags"
{"wal_ttl":"600"} 192.168.15.6:19779 Storage IP HTTP
```

### Caution

- local\_config true
- 

---

: March 13, 2023

## 6.1.2 Meta

|      |                                                        |                        |
|------|--------------------------------------------------------|------------------------|
| Meta | nebula-metad.conf.default nebula-metad.conf.production | /usr/local/nebula/etc/ |
|------|--------------------------------------------------------|------------------------|

 Caution

- `local_config false` NebulaGraph Meta
- 

`.default .production Meta`

`nebula-metad.conf.default`

 Caution

`local_config true`

### basics

|               |                       |             |              |  |
|---------------|-----------------------|-------------|--------------|--|
| daemonize     | true                  |             |              |  |
| pid_file      | pids/nebula-metad.pid | ID          |              |  |
| timezone_name | -                     | NebulaGraph | UTC+00:00:00 |  |

**Specifying the Time Zone with TZ**

`timezone_name=UTC+08:00`

|              |                                |         |         |         |
|--------------|--------------------------------|---------|---------|---------|
| license_path | share/resources/nebula.license | License | License | License |
|--------------|--------------------------------|---------|---------|---------|

 Note

- NebulaGraph `timezone_name` TIMESTAMP UTC UTC
- `timezone_name` NebulaGraph NebulaGraph

**logging**

| log_dir                   | logs       | Meta    |             |           |               |   |      |   |   |   |
|---------------------------|------------|---------|-------------|-----------|---------------|---|------|---|---|---|
| minloglevel               | 0          |         | 0 INFO      | 1 WARNING | 2 ERROR       |   |      |   |   |   |
|                           |            | 3 FATAL | 0           | 1         | 4 NebulaGraph |   |      |   |   |   |
| v                         | 0          | VLOG    | VLOG        | VLOG      | v             | 0 | 1    | 2 | 3 | 4 |
|                           |            | VLOG    | Logging     |           |               | 5 | glog |   |   |   |
|                           |            |         |             |           | Verbose       |   |      |   |   |   |
| logbufsecs                | 0          |         | 0           |           |               |   |      |   |   |   |
| redirect_stdout           | true       |         |             |           |               |   |      |   |   |   |
| stdout_log_file           | metad-     |         |             |           |               |   |      |   |   |   |
|                           | stdout.log |         |             |           |               |   |      |   |   |   |
| stderr_log_file           | metad-     |         |             |           |               |   |      |   |   |   |
|                           | stderr.log |         |             |           |               |   |      |   |   |   |
| stderrthreshold           | 3          |         | 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      | Meta | IP                      | IP      | nebula-metad |              |  |  |  |  |
| port                    | 9559           | Meta | RPC                     | Meta    | 9559         | +1           |  |  |  |  |
|                         |                | 9560 | NebulaGraph             |         |              |              |  |  |  |  |
| ws_ip                   | 0.0.0.0        | HTTP | IP                      |         |              |              |  |  |  |  |
| ws_http_port            | 19559          | HTTP |                         |         |              |              |  |  |  |  |
| ws_storage_http_port    | 19779          | HTTP | Storage                 | Storage |              | ws_http_port |  |  |  |  |
|                         |                |      | NebulaGraph             |         |              |              |  |  |  |  |
| heartbeat_interval_secs | 10             |      | heartbeat_interval_secs |         |              |              |  |  |  |  |

**Caution**

IP 127.0.0.1/0.0.0.0

**storage**

|           |           |      |  |  |  |  |  |  |  |  |
|-----------|-----------|------|--|--|--|--|--|--|--|--|
| data_path | data/meta | meta |  |  |  |  |  |  |  |  |
|-----------|-----------|------|--|--|--|--|--|--|--|--|

**misc**

|                        |     |
|------------------------|-----|
| default_parts_num      | 100 |
| default_replica_factor | 1   |

**rocksdb options**

|                  |      |             |
|------------------|------|-------------|
| rocksdb_wal_sync | true | RocksDB WAL |
|------------------|------|-------------|

**Black box**

 **Enterpriseonly**

|                                    |           |
|------------------------------------|-----------|
| ng_black_box_switch                | true      |
| ng_black_box_home                  | black_box |
| ng_black_box_dump_period_seconds   | 5         |
| ng_black_box_file_lifetime_seconds | 1800      |

: March 13, 2023

### 6.1.3 Graph

|       |                                         |                                            |                                     |
|-------|-----------------------------------------|--------------------------------------------|-------------------------------------|
| Graph | <code>nebula-graphd.conf.default</code> | <code>nebula-graphd.conf.production</code> | <code>/usr/local/nebula/etc/</code> |
|-------|-----------------------------------------|--------------------------------------------|-------------------------------------|



- `local_config false`      NebulaGraph      Meta
- 

`.default .production Graph`

`nebula-graphd.conf.default`



`local_config true`

#### basics

|                               |                           |                                         |                           |  |
|-------------------------------|---------------------------|-----------------------------------------|---------------------------|--|
| <code>daemonize</code>        | <code>true</code>         |                                         |                           |  |
| <code>pid_file</code>         | <code>pids/nebula-</code> | ID                                      |                           |  |
|                               | <code>graphd.pid</code>   |                                         |                           |  |
| <code>enable_optimizer</code> | <code>true</code>         |                                         |                           |  |
| <code>timezone_name</code>    | -                         | NebulaGraph                             | <code>UTC+00:00:00</code> |  |
|                               |                           | <b>Specifying the Time Zone with TZ</b> |                           |  |
|                               |                           | <code>timezone_name=UTC+08:00</code>    |                           |  |
| <code>local_config</code>     | <code>true</code>         |                                         |                           |  |



- NebulaGraph      `timezone_name`      TIMESTAMP      UTC      UTC
- `timezone_name`      NebulaGraph      NebulaGraph

**logging**

| log_dir                   | logs                  | Graph                   |             |       |      |           |         |
|---------------------------|-----------------------|-------------------------|-------------|-------|------|-----------|---------|
| minloglevel               | 0                     | 3 FATAL                 | 0           | 1     | INFO | 2 WARNING | 3 ERROR |
| v                         | 0                     | VLOG<br>VLOG<br>Logging | VLOG<br>v   | 0     | 1    | 2         | 3       |
| logbufsecs                | 0                     |                         | 0           |       |      |           |         |
| redirect_stdout           | true                  |                         |             |       |      |           |         |
| stdout_log_file           | graphd-<br>stdout.log |                         |             |       |      |           |         |
| stderr_log_file           | graphd-<br>stderr.log |                         |             |       |      |           |         |
| stderrthreshold           | 3                     |                         | minloglevel |       |      |           |         |
| timestamp_in_logfile_name | true                  |                         | true        | false |      |           |         |

**query**

|                               |         |         |      |
|-------------------------------|---------|---------|------|
| accept_partial_success        | false   |         |      |
| session_reclaim_interval_secs | 60      | Session | Meta |
| max_allowed_query_size        | 4194304 | 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          |        |         | 1~604800                | 8                                         |
| session_idle_timeout_secs | 28800          |        |         | 1~604800                | 8                                         |
| num_accept_threads        | 1              |        |         |                         |                                           |
| num_netio_threads         | 0              | IO     | 0       | CPU                     |                                           |
| num_max_connections       | 0              |        |         | 0                       | = num_max_connections / num_netio_threads |
| 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   |                         |                                           |
| enable_record_slow_query  | true           |        |         | NebulaGraph             |                                           |
| slow_query_limit          | 100            |        |         | NebulaGraph             |                                           |
| slow_query_threshold_us   | 200000         |        |         |                         |                                           |
| ws_meta_http_port         | 19559          | HTTP   | Meta    | Meta                    | ws_http_port                              |

**Caution**

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                        |     |

**audit**

 **Enterpriseonly**

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_data_balance         | true  | enable_experimental_feature true |

**Black box**

 **Enterpriseonly**

|                                    |           |
|------------------------------------|-----------|
| ng_black_box_switch                | true      |
| ng_black_box_home                  | black_box |
| ng_black_box_dump_period_seconds   | 5         |
| ng_black_box_file_lifetime_seconds | 1800      |

**memory tracker**

|                                             |          |                                |
|---------------------------------------------|----------|--------------------------------|
| memory_tracker_limit_ratio                  | 0.8      | NebulaGraph                    |
|                                             | /(- - -) | Graphd                         |
|                                             | 50%      | 0.5                            |
| memory_tracker.untracked_reserved_memory_mb | 50       | MB                             |
| memory_tracker_detail_log                   | false    | true                           |
| memory_tracker_detail_log_interval_ms       | 60000    | memory_tracker_detail_log true |
| memory_purge_enabled                        | true     | true                           |
| memory_purge_interval_seconds               | 10       | memory_purge_enabled true      |

: April 3, 2023

## 6.1.4 Macro Rendering Error

**UndefinedError:** 'comm' is undefined

```
Traceback (most recent call last):
 File "/opt/hostedtoolcache/Python/3.8.16/x64/lib/python3.8/site-packages/mkdocs_macros/plugin.py", line 480, in render
 return md_template.render(**page_variables)
 File "/opt/hostedtoolcache/Python/3.8.16/x64/lib/python3.8/site-packages/jinja2/environment.py", line 1301, in render
 self.environment.handle_exception()
 File "/opt/hostedtoolcache/Python/3.8.16/x64/lib/python3.8/site-packages/jinja2/environment.py", line 936, in handle_exception
 raise rewrite_traceback_stack(source=source)
 File "<template>", line 83, in top-level template code
 File "/opt/hostedtoolcache/Python/3.8.16/x64/lib/python3.8/site-packages/jinja2/environment.py", line 485, in getattr
 return getattr(obj, attribute)
jinja2.exceptions.UndefinedError: 'comm' is undefined
```

: April 12, 2023

## 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 |
|---------|------|------------------------------------|--------|-----------|

---

: August 9, 2022

## 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
```

|                      |      |       |                                            |
|----------------------|------|-------|--------------------------------------------|
| <code>ws_ip</code>   | HTTP | IP    | 127.0.0.1                                  |
| <code>ws_port</code> | 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 |
|---------|------------------------------------------------------------|---------|

---

: August 9, 2022

## 6.2.2

NebulaGraph

Graph

 **Enterpriseonly**

login

Graph

exit

Graph

ddl

CREATE SPACE | DROP SPACE | CREATE TAG | DROP TAG | ALTER TAG | DELETE TAG | CREATE EDGE | DROP EDGE  
ALTER EDGE | CREATE INDEX | DROP INDEX | CREATE FULLTEXT INDEX | DROP FULLTEXT INDEX

DDL

dql

MATCH | LOOKUP | GO | FETCH | GET SUBGRAPH | FIND PATH | UNWIND | GROUP BY | ORDER BY | YIELD | LIMIT  
RETURN | REBUILD INDEX | REBUILD FULLTEXT INDEX

DQL

dml

INSERT VERTEX | DELETE VERTEX | UPDATE VERTEX | UPSERT VERTEX | INSERT EDGE | DELETE EDGE | UPDATE  
EDGE | UPSERT EDGE

DML

dcl

CREATE USER | GRANT ROLE | REVOKE ROLE | CHANGE PASSWORD | ALTER USER | DROP USER | CREATE SNAPSHOT  
DROP SNAPSHOT | ADD LISTENER | REMOVE LISTENER | BALANCE | SUBMIT JOB | STOP JOB | RECOVER JOB | ADD  
DRAINER | REMOVE DRAINER | SIGN IN DRAINER SERVICE | SIGN OUT DRAINER SERVICE | DOWNLOAD HDFS  
INGEST

DCL

util

SHOW HOSTS | SHOW USERS | SHOW ROLES | SHOW SNAPSHOTS | SHOW SPACES | SHOW PARTS | SHOW TAGS | SHOW  
EDGES | SHOW INDEXES | SHOW CREATE SPACE | SHOW CREATE TAG/EDGE | SHOW CREATE INDEX | SHOW INDEX  
STATUS | SHOW LISTENER | SHOW TEXT SEARCH CLIENTS | SHOW DRAINER CLIENTS | SHOW FULLTEXT INDEXES  
SHOW CONFIGS | SHOW CHARSET | SHOW COLLATION | SHOW STATS | SHOW SESSIONS | SHOW META LEADER | SHOW  
DRAINERS | SHOW QUERIES | SHOW JOB | SHOW JOBS | DESCRIBE INDEX | DESCRIBE EDGE | DESCRIBE TAG  
DESCRIBE SPACE | DESCRIBE USER | USE SPACE | SIGN IN TEXT SERVICE | SIGN OUT TEXT SERVICE | EXPLAIN  
PROFILE | KILL QUERY

unknown

-

Graph

nebula-graphd.conf

/usr/local/nebula/etc/nebula-graphd.conf

 **Note**

Graph

|                           |                            |      |                                        |                                 |                              |             |
|---------------------------|----------------------------|------|----------------------------------------|---------------------------------|------------------------------|-------------|
| enable_audit              | false                      |      |                                        |                                 |                              |             |
| audit_log_handler         | file                       | file | es                                     | Elasticsearch                   | Elasticsearch                | 7.x         |
|                           |                            | 8.x  |                                        |                                 |                              |             |
| audit_log_file            | ./logs/audit/<br>audit.log |      | audit_log_handler=file                 |                                 |                              |             |
| audit_log_strategy        | synchronous                |      | audit_log_handler=file<br>asynchronous |                                 | asynchronous<br>synchronous  | synchronous |
| audit_log_max_buffer_size | 1048576                    |      | audit_log_handler=file                 | audit_log_strategy=asynchronous |                              |             |
| audit_log_format          | xml                        |      | audit_log_handler=file                 |                                 | xml json csv                 |             |
| audit_log_es_address      | -                          |      | audit_log_handler=es                   | Elasticsearch                   | IP1:port1,<br>IP2:port2, ... |             |
| audit_log_es_user         | -                          |      | audit_log_handler=es                   | Elasticsearch                   |                              |             |
| audit_log_es_password     | -                          |      | audit_log_handler=es                   | Elasticsearch                   |                              |             |
| audit_log_es_batch_size   | 1000                       |      | audit_log_handler=es                   | Elasticsearch                   |                              |             |
| audit_log_exclude_spaces  | -                          |      | ,                                      |                                 |                              |             |
| audit_log_categories      | login,exit                 |      | ,                                      |                                 |                              |             |

/usr/local/nebula/logs/audit/audit.log      XML

### Note

NebulaGraph

```
<AUDIT_RECORD
CATEGORY="util"
TIMESTAMP="2022-04-07 02:31:38"
TERMINAL=""
CONNECTION_ID="1649298693144580"
CONNECTION_STATUS="0"
CONNECTION_MESSAGE=""
USER="root"
CLIENT_HOST="127.0.0.1"
HOST="192.168.8.111"
SPACE="1"
QUERY="use basketballplayer1"
QUERY_STATUS="-1005"
QUERY_MESSAGE="SpaceNotFound: "
/>
<AUDIT_RECORD
CATEGORY="util"
TIMESTAMP="2022-04-07 02:31:39"
TERMINAL=""
CONNECTION_ID="1649298693144580"
CONNECTION_STATUS="0"
CONNECTION_MESSAGE=""
USER="root"
CLIENT_HOST="127.0.0.1"
HOST="192.168.8.111"
SPACE="1"
QUERY="use basketballplayer"
QUERY_STATUS="0"
```

```
 QUERY_MESSAGE=""
 />
```

|                    |    |
|--------------------|----|
| CATEGORY           |    |
| TIMESTAMP          |    |
| TERMINAL           |    |
| CONNECTION_ID      | ID |
| CONNECTION_STATUS  | 0  |
| CONNECTION_MESSAGE |    |
| USER               |    |
| CLIENT_HOST        | IP |
| HOST               | IP |
| SPACE              |    |
| QUERY              |    |
| QUERY_STATUS       | 0  |
| QUERY_MESSAGE      |    |

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: January 9, 2023

# 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

Note

```
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 |      |       |       |       |         |       |

Note

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
```

- |         |    |      |
|---------|----|------|
| 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_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_trnx_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                          |           |          |     |  |

## Graph Meta Storage

context\_switches\_total

cpu\_seconds\_total CPU

memory\_bytes\_gauge

open\_filedesc\_gauge

read\_bytes\_total

write\_bytes\_total

---

: August 9, 2022

## 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
 }
]
```

: August 9, 2022

## 7.3

---

### 7.3.1

NebulaGraph



NebulaGraph

CPU/Memory/Network IO

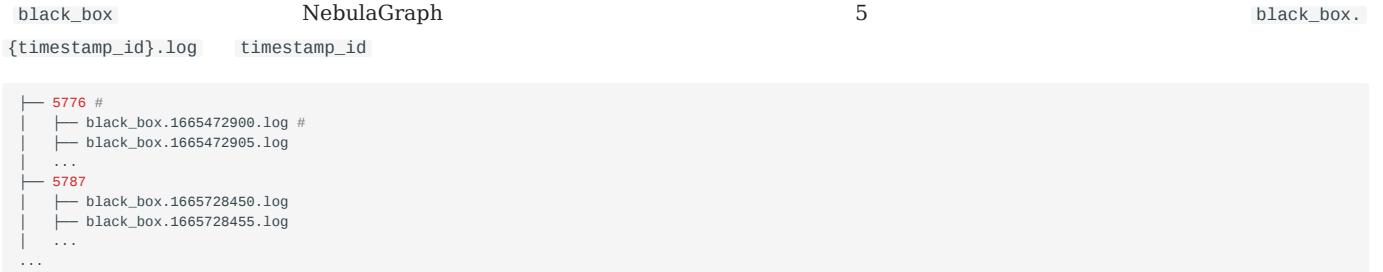
**PROC**

NebulaGraph

**black\_box**

NebulaGraph

**Black box**



30 1800 30

NebulaGraph

**Black box**

NebulaGraph Black Box

**Nebula-BBox**

CSV

NebulaGraph Black Box

: March 27, 2023

### 7.3.2 NebulaGraph Black Box

NebulaGraph Black Box    Nebula-BBox

Linux    Nebula-BBox

 **Enterpriseonly**

Nebula-BBox    NebulaGraph

#### Nebula-BBox

Nebula-BBox

- Terminal User Interface, TUI
- CSV
- 
- 
- /
- Linux macOS Windows

NebulaGraph    Nebula-BBox

#### NebulaGraph

#### Nebula-BBox

3.4.1

3.4.0

#### Nebula-BBox

RPM DEB TAR Docker

RPM

Nebula-BBox

1. RPM

 **Enterpriseonly**

Nebula-BBox

2. `sudo rpm -i <rpm>`    RPM

```
sudo rpm -i nebula-bbox-<version>.x86_64.rpm
```

Nebula-BBox    nebula-bbox    /usr/bin/

#### Nebula-BBox

`nebula-bbox -h/--help`    Nebula-BBox

 **Caution**

|           |             |             |             |             |           |            |
|-----------|-------------|-------------|-------------|-------------|-----------|------------|
| /usr/bin/ | Nebula-BBox | nebula-bbox | Nebula-BBox | Nebula-BBox | /usr/bbox | /usr/bbox/ |
|-----------|-------------|-------------|-------------|-------------|-----------|------------|

**NEBULA-BBOX**

```
nebula-bbox version Nebula-BBox
```

```
nebula-bbox metrics Nebula-BBox PROC(5)
```

Nebula-BBox

```
nebula-bbox view [(-o|--output=tui|csv) [--metrics name[,name ...]] [flags] (FILE | DIRECTORY ...)]
```

|                           |                    |                              |            |            |
|---------------------------|--------------------|------------------------------|------------|------------|
| <b>-o</b> <b>--output</b> | <b>Nebula-BBox</b> | <b>tui</b>                   | <b>csv</b> | <b>tui</b> |
|                           |                    | Terminal User Interface, TUI |            |            |
|                           | <b>tui</b>         |                              |            |            |
|                           | <b>csv</b>         |                              |            | CSV        |

|                  |                    |                                               |
|------------------|--------------------|-----------------------------------------------|
| <b>--metrics</b> | <b>Nebula-BBox</b> | <b>nebula-bbox metrics</b>                    |
|                  |                    | <b>--metrics &lt;name&gt;,&lt;name&gt;...</b> |

|              |                      |           |                     |            |                   |
|--------------|----------------------|-----------|---------------------|------------|-------------------|
| <b>flags</b> | <b>--output-file</b> | <b>-o</b> | <b>--output</b>     | <b>csv</b> | <b>CSV</b>        |
|              | <b>--start-time</b>  |           |                     |            |                   |
|              | <b>--end-time</b>    |           | <b>--start-time</b> |            |                   |
|              | <b>--duration</b>    |           | <b>--start-time</b> |            | <b>--end-time</b> |

NebulaGraph /usr/local/nebula /usr/local/nebula/black\_box

### Note

`nebula-bbox metrics`    Nebula-BBox

---

`nebula-bbox view /usr/local/nebula/black_box/<pid>/black_box.<timestamp>.log`

---

`nebula-bbox view /usr/local/nebula/black_box/<pid>/black_box.<timestamp1>.log /usr/local/nebula/black_box/<pid>/black_box.<timestamp2>.log`

---

`nebula-bbox view /usr/local/nebula/black_box`

---

`nebula-bbox view /usr/local/nebula/black_box/<pid1> /usr/local/nebula/black_box/<pid2>`

---

`nebula-bbox view /usr/local/nebula/black_box/<pid1> /usr/local/nebula/black_box/<pid2> /usr/local/nebula/black_box/<pid3>/black_box.<timestamp>.log`

---

`nebula-bbox view --metrics <name> /usr/local/nebula/black_box/<pid>/black_box.<timestamp>.log`

---

`nebula-bbox view --metrics <name> /usr/local/nebula/black_box`

CSV

---

`nebula-bbox view --metrics <name1>[,<name2> ...] --output csv --output-file <csv_filename>.csv /usr/local/nebula/black_box`

---

`nebula-bbox view --metrics <name1>[,<name2> ...] /usr/local/nebula/black_box`

2022 9 6 12 00

---

`nebula-bbox view --start-time "Tue, 06 Sep 2022 12:00:00 +0800" /usr/local/nebula/black_box`

---

`Tue, 06 Sep 2022 12:00:00 +0800 2022-09-06T12:00:00+08:00 2022-09-06 04:00:00 +0800`

2022 9 6 12 00 1

---

`nebula-bbox view --start-time "Tue, 06 Sep 2022 12:00:00 +0800" --duration 1h /usr/local/nebula/black_box h m s`

2022 9 6 12 00  
2022 9 6 13 00

---

`nebula-bbox view --start-time "2022-09-06 04:00:00 +0800" --end-time "2022-09-06 05:00:00 +0800" /usr/local/nebula/black_box`

### TUI

TUI                      Time    NebulaGraph              Pid              ServerName

| NebulaGraph Black Box View   |         |            |                                               |          |            |             |           |            |            |                              |                            |                  |   |
|------------------------------|---------|------------|-----------------------------------------------|----------|------------|-------------|-----------|------------|------------|------------------------------|----------------------------|------------------|---|
| Time                         | Pid     | ServerName | CPUModelName                                  | CPUcores | CPUThreads | CPU.Sockets | LoadAvg5m | LoadAvg10m | LoadAvg15m | CurrentKernelScheduleEntries | TotalKernelScheduleEntries | MemInfo:MemTotal | _ |
| Tue Oct 18 09:51:43 CST 2022 | 1910021 | Graph      | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32       | 128        | 2           | 28        | 22.98      | 15.05      | 3                            | 5721                       | 1 1              |   |
| Tue Oct 18 09:51:43 CST 2022 | 1910018 | Storage    | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32       | 128        | 2           | 28        | 22.98      | 15.05      | 2                            | 5721                       | 1 1              |   |
| Tue Oct 18 09:51:43 CST 2022 | 1910065 | Graph      | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32       | 128        | 2           | 28        | 22.98      | 15.05      | 1                            | 5721                       | 1 1              |   |
| Tue Oct 18 09:51:44 CST 2022 | 1989956 | Meta       | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32       | 128        | 2           | 25.76     | 22.6       | 14.97      | 1                            | 5721                       | 1 1              |   |
| Tue Oct 18 09:52:13 CST 2022 | 1910018 | Storage    | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32       | 128        | 2           | 28        | 22.98      | 15.05      | 2                            | 5721                       | 1 1              |   |

## TUI

F1

Left

Right

Down

Up

Ctrl-A Home

Ctrl-E End

Ctrl-T

Ctrl-B

Enter

Escape

## FAQ

TUI

?

| NebulaGraph Black Box View   |        |         |                                               |        |        |         |          |           |           |            |                       |                    |         |      |
|------------------------------|--------|---------|-----------------------------------------------|--------|--------|---------|----------|-----------|-----------|------------|-----------------------|--------------------|---------|------|
| Title                        | pid    | cpuName | CPUModelName                                  | NCores | PUTime | PSocket | PadAvail | PadAvailS | PadAvailD | PadAvailDS | CurrentKernelSchedule | NextKernelSchedule | Entries | Info |
| Tue Oct 18 09:51:43 CST 2022 | 910021 | Graph   | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 28       | 22.98     | 15.05     | 3          | 1                     | 5721               | 1       |      |
| Tue Oct 18 09:51:43 CST 2022 | 910018 | Storage | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 28       | 22.98     | 15.05     | 2          | 1                     | 5721               | 1       |      |
| Tue Oct 18 09:51:43 CST 2022 | 910065 | Graph   | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 28       | 22.98     | 15.05     | 1          | 1                     | 5721               | 1       |      |
| Tue Oct 18 09:51:44 CST 2022 | 909956 | Meta    | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 25.76    | 22.6      | 14.97     | 1          | 1                     | 5721               | 1       |      |
| Tue Oct 18 09:52:00 CST 2022 | 910007 | Storage | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 28       | 22.98     | 15.05     | 3          | 1                     | 5721               | 1       |      |
| Tue Oct 18 09:52:13 CST 2022 | 910065 | Graph   | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 28       | 22.98     | 15.05     | 1          | 1                     | 5721               | 1       |      |
| Tue Oct 18 09:52:13 CST 2022 | 910021 | Graph   | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 28       | 22.98     | 15.05     | 3          | 1                     | 5721               | 1       |      |
| Tue Oct 18 09:52:14 CST 2022 | 909956 | Meta    | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 25.76    | 22.6      | 14.97     | 1          | 1                     | 5721               | 1       |      |
| Tue Oct 18 09:52:43 CST 2022 | 910018 | Storage | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 28       | 22.98     | 15.05     | 2          | 1                     | 5721               | 1       |      |
| Tue Oct 18 09:52:43 CST 2022 | 910022 | Graph   | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 28       | 22.98     | 15.05     | 3          | 1                     | 5721               | 1       |      |
| Tue Oct 18 09:52:43 CST 2022 | 910007 | Storage | Intel(R) Xeon(R) Platinum 8352Y CPU @ 2.20GHz | 32     | 128    | 2       | 28       | 22.98     | 15.05     | 2          | 1                     | 5721               | 1       |      |

Linux

export LC\_CTYPE="en\_US.UTF-8"

: March 27, 2023

## 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

**OpenLDAP**

OpenLDAP                    LDAP

OPENLDAP

 Enterpriseonly

OpenLDAP

OpenLDAP

: September 28, 2022

## 8.1.2

NebulaGraph

NebulaGraph



- 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

- 

```
CREATE USER [IF NOT EXISTS] <user_name> [WITH PASSWORD '<password>'][WITH IP WHITELIST <ip_list>];
```

- ip\_list IP IP NebulaGraph IP ,
- 

```
nebula> CREATE USER user1 WITH PASSWORD 'nebula';
nebula> SHOW USERS;
+-----+-----+
| Account | IP Whitelist |
+-----+-----+
| "root" | "" |
| "user1" | "" |
+-----+-----+
```

- 

```
nebula> CREATE USER user2 WITH PASSWORD 'nebula' WITH IP WHITELIST 192.168.10.10,192.168.10.12;
nebula> SHOW USERS;
+-----+-----+
| Account | IP Whitelist |
+-----+-----+
| "user2" | "192.168.10.10,192.168.10.12" |
+-----+-----+
```

**GRANT ROLE**

GRANT ROLE

**God**      **Admin**

GRANT ROLE

GRANT ROLE &lt;role\_type&gt; ON &lt;space\_name&gt; TO &lt;user\_name&gt;;

nebula&gt; 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 <user_name> FROM '<old_password>' TO '<new_password>';
```

```
•
nebula> CHANGE PASSWORD user1 FROM 'nebula' TO 'nebula123';
```

**ALTER USER**

ALTER USER

**God**

root

ALTER USER

```
•
ALTER USER <user_name> WITH PASSWORD '<password>';
```

```
•
ALTER USER <user_name> WITH PASSWORD '<password>' [WITH IP WHITELIST <ip_list>];
```

```
•
nebula> ALTER USER user2 WITH PASSWORD 'nebula';
nebula> SHOW USERS;
+-----+-----+
| Account | IP Whitelist |
+-----+-----+
"root"	""
"user1"	""
"user2"	""
+-----+-----+
```

 **Enterprise only**

WITH IP WHITELIST

IP

IP

NebulaGraph

```
nebula> ALTER USER user2 WITH PASSWORD 'nebula' WITH IP WHITELIST 192.168.10.10;
```

**DROP USER**

DROP USER

**God**

DROP USER

**Note**

```
DROP USER [IF EXISTS] <user_name>;
```

```
nebula> 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"
+-----+-----+
```

: October 20, 2022

### 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
- Basic
- Schema
- Tag Edge Type

⌚**Enterpriseonly**

Basic

⌚**Note**

- 
- 

|                 | <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<br>DESCRIBE EDGE INDEX                                                                  |
| Write schema    | Y          | Y            | Y          |             |              |              | CREATE TAG ALTER TAG CREATE EDGE ALTER EDGE<br>TAG DELETE TAG DROP EDGE CREATE TAG INDEX<br>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<br>ORDER BY FETCH VERTICES Find FETCH EDGES<br>PATH LIMIT GROUP BY RETURN                   |
| Write data      | Y          | Y            | Y          | Y           |              | C            | INSERT VERTEX UPDATE VERTEX INSERT EDGE<br>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<br>STATS STOP JOB RECOVER JOB BUILD TAG INDEX<br>EDGE INDEX INGEST DOWNLOAD                |
| Write space     |            | Y            |            |             |              |              | CREATE SPACE DROP SPACE CREATE SNAPSHOT<br>SNAPSHOT BALANCE CONFIG                                                                    |

⌚**Enterpriseonly**

Basic (Tag/Edge type )

⚠**Caution**

Show operations

SHOW SPACES

God

SHOW USERS SHOW SNAPSHOTS

**Basic ( )****Caution**

- Basic Tag/Edge

```
GRANT { OPTION[,OPTION] } [TAG { * | <tag>[,...] } | EDGE { * | <edge_type>[, ...] }] TO <user_name>;
OPTION = { READ | WRITE }
```

- Basic Tag/Edge

```
REVOKE { OPTION[,OPTION] } [TAG { * | <tag>[,...] } | EDGE { * | <edge_type>[, ...] }] TO <user_name>;
OPTION = { READ | WRITE }
```

- 

```
SHOW GRANTS [<user_name>]
```

- Basic Tag/Edge
- GOD ADMIN GRANT REVOKE
- Basic GRANT REVOKE
- Basic Tag
- UPDATE UPSERT

```
test
nebula> CREATE USER test WITH PASSWORD 'nebula';

test Basic
nebula> GRANT ROLE BASIC ON basketballplayer TO test;

basketballplayer
nebula> use basketballplayer;

test Tag `player` Edge Type `follow` `serve`
Tag/Edge
nebula> GRANT READ, WRITE TAG player EDGE follow, serve TO test;

test > SHOW GRANTS test;
+-----+-----+-----+-----+
| user | READ(TAG) | READ(EDGE) | WRITE(TAG) | WRITE(EDGE) |
+-----+-----+-----+-----+
| "test" | ["player"] | ["follow", "serve"] | ["player"] | ["follow", "serve"] |
+-----+-----+-----+-----+

test Edge Type
nebula> REVOKE READ,WRITE EDGE * FROM test;

test
nebula> SHOW GRANTS test;
+-----+-----+-----+-----+
| user | READ(TAG) | READ(EDGE) | WRITE(TAG) | WRITE(EDGE) |
+-----+-----+-----+-----+
| "test" | ["player"] | [] | ["player"] | [] |
+-----+-----+-----+-----+

Basic
nebula> MATCH (v:player)-[:likex]-() RETURN v;
[ERROR (-1008)]: PermissionError: Edge `likex` does not exist or is not readable.
```

**Caution**

Basic

Tag/Edge Type

Tag/Edge Type

Tag/Edge Type

Edge Type

Edge Type

Tag

Tag

---

: February 7, 2023

#### 8.1.4 OpenLDAP

| NebulaGraph | OpenLDAP | OpenLDAP | DN | Distinguished Name |
|-------------|----------|----------|----|--------------------|
|-------------|----------|----------|----|--------------------|

 enterpriseonly

OpenLDAP

NebulaGraph NebulaGraph Meta

## OpenLDAP DN

OpenLDAP

## SIMPLEBINDAUTH

## Graph

OpenLDAP

DN

DN

OpenLDAP

## SEARCHBINDAUTH

## Graph

NebulaGraph OpenLDAP uid

- OpenLDAP
  - OpenLDAP
  - OpenLDAP

OpenLDAP      test2      passwdtest2

### 1. NebulaGraph      OpenLDAP      test2

```
nebula> CREATE USER test2 WITH PASSWORD '';
nebula> GRANT ROLE ADMIN ON basketballplayer TO test2;
```



NebulaGraph

### 2. nebula-graphd.conf      /usr/local/nebula/etc/

- 

```

--local_config=true

--enable_authorize=true
password ldap cloud
--auth_type=ldap
OpenLDAP
--ldap_server=192.168.8.211
OpenLDAP
--ldap_port=389
OpenLDAP Schema
--ldap_scheme=ldap
DN
--ldap_prefix=uid=
DN
--ldap_suffix=,ou=it,dc=sys,dc=com
```

- 

```

--local_config=true

--enable_authorize=true
password ldap cloud
--auth_type=ldap
OpenLDAP
--ldap_server=192.168.8.211
OpenLDAP
--ldap_port=389
OpenLDAP Schema
--ldap_scheme=ldap
DN
--ldap_basedn=ou=it,dc=sys,dc=com
OpenLDAP
--ldap_binddn=cn=admin,dc=example,dc=org
OpenLDAP
--ldap_bindpasswd=admin
```

### 3. NebulaGraph

### 4.

```
$./nebula-console --addr 127.0.0.1 --port 9669 -u test2 -p passwdtest2
2021/09/08 03:49:39 [INFO] connection pool is initialized successfully
Welcome to NebulaGraph!
```



OpenLDAP      NebulaGraph      root

---

:January 17, 2023

## 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**

---

: August 9, 2022

## 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.x
- 
- NebulaGraph Listener
- NFS
- Storage              IP
- DDL    DML                      2      5
- 
- NebulaGraph              BR

**BR**

BR

1.    **BR**
2.    **BR**
3.    **BR**

- **NebulaGraph**              **nebula-br**      3    34

: March 13, 2023

### 9.1.2 BR

BR      K8s Operator    BR      K8s    br

BR      NebulaGraph      NebulaGraph Agent    Agent      NebulaGraph      BR    Agent

| <b>NebulaGraph</b> | <b>BR</b> | <b>Agent</b>  |
|--------------------|-----------|---------------|
| 3.3.0 ~ 3.4.1      | 3.3.0     | 3.4.0 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/v3.4.0/agent-3.4.0-linux-amd64
```

### 2. Agent agent

```
sudo mv agent-3.4.0-linux-amd64 agent
```

### 3. Agent

```
sudo chmod +x agent
```

### 4. Agent



Agent      Meta      Agent      NebulaGraph

```
sudo nohup ./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 ./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 |                               |       |

: April 12, 2023

### 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 |
|                           |      |         | <b>BR</b> |                   |           |

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

: March 13, 2023

#### 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.



IP

add host

Storage

|               |        |                                                                                                         |
|---------------|--------|---------------------------------------------------------------------------------------------------------|
| -h, -help     | -      | -                                                                                                       |
| --debug       | -      |                                                                                                         |
| --log         | string | "br.log"                                                                                                |
| --meta        | string | meta                                                                                                    |
| --name        | string |                                                                                                         |
| --storage     | string | BR <Schema>://<PATH><br>Schema local s3 s3 s3.access_key<br>s3.endpoint s3.region s3.secret_key<br>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><br>Schema local s3 s3 s3.access_key<br>s3.endpoint s3.region s3.secret_key<br>PATH |
| --            | string |                                                                                                         |
| s3.access_key |        |                                                                                                         |
| --s3.endpoint | string | S3 URL http https                                                                                       |
| --s3.region   | string |                                                                                                         |
| --            | string |                                                                                                         |
| s3.secret_key |        |                                                                                                         |

: December 15, 2022

## 9.2 NebulaGraph BR

### 9.2.1 Backup&Restore

Backup&Restore    BR                  CLI                  NebulaGraph BR                  NebulaGraph

 **Enterpriseonly**

NebulaGraph

- 
- 
- 
- 
- 
- SSD    HDD                  NFS
- Amazon S3                  Alibaba Cloud OSS    MinIO   Ceph RGW
- 

- NebulaGraph                  v3.4.1
- **Listener**
- 
- NFS
- DDL    DML                  2       5
- Storage                  IP
- 
- NebulaGraph                  BR

1.      **BR**
- 2.
- 3.

: March 27, 2023

## 9.2.2 BR

NebulaGraph

BR

BR

BR

NebulaGraph Agent

Agent

NebulaGraph

/

BR

Agent

**NebulaGraph****BR****Agent**

3.4.1

3.4.1 3.4.0

3.4.0

**BR**

BR

CLI

NebulaGraph

1.

 **Enterpriseonly**

BR

2. `sudo rpm -i <rpm>` RPM

BR

/usr/local/br-ent/

`sudo rpm -i nebula-br-ent-<version>.x86_64.rpm`

BR

`./br version`

```
[br-ent]$./br version
Nebula Backup And Restore Utility Tool,V-3.4.1
```

**Agent**

NebulaGraph Agent

RPC

BR

## 1. Agent

```
wget https://github.com/vesoft-inc/nebula-agent/releases/download/v3.4.0/agent-3.4.0-linux-amd64
```

## 2. Agent agent

```
sudo mv agent-3.4.0-linux-amd64 agent
```

## 3. Agent

```
sudo chmod +x agent
```

## 4. Agent



Agent            Meta            Agent            NebulaGraph

```
sudo nohup ./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 ./agent --agent="192.168.8.129:8888" --meta="192.168.8.129:9559" --ratelimit=1048576 > nebula_agent.log 2>&1 &
```

## 5. Agent

```
nebula> SHOW HOSTS AGENT;
+-----+-----+-----+-----+-----+
| Host | Port | Status | Role | Git Info Sha | Version |
+-----+-----+-----+-----+-----+
| "192.168.8.129" | 8888 | "ONLINE" | "AGENT" | "96646b8" | |
+-----+-----+-----+-----+-----+
```

---

: March 27, 2023

### 9.2.3 BR

BR      NebulaGraph      Amazon S3

- NebulaGraph      `usr/local/nebula-ent/data`

- DDL    DML
- 

- `wal_ttl`
- Agent    NebulaGraph

- NebulaGraph
- BR      Agent      Agent
- Meta    Storage    BR

#### Note

S3

BR

```
./br backup full --meta <ip_address:port> --s3.access_key <access_key> --s3.secret_key <secret_key> --s3.region <region_name> --storage s3://<storage_path> --s3.endpoint <endpoint_url>
```

Meta      192.168.8.129:9559      Amazon S3    `nebula-br-test`      /

```
./br backup full --meta 192.168.8.129:9559 --s3.access_key QImbbGDjfQExxx --s3.secret_key dVSJZf17tnoFq7Z5zt6sfxxxx --s3.region us-east-1 --storage s3://nebula-br-test/ --s3.endpoint http://192.168.8.xxx:9000/
```

#### Caution

NFS Network File System      Meta    Storage    BR      Alibaba Cloud OSS    Amazon S3

|                                                        |                                                 |                                    |                                                                        |          |
|--------------------------------------------------------|-------------------------------------------------|------------------------------------|------------------------------------------------------------------------|----------|
| leader metad<br><code>&lt;storage_path&gt;/meta</code> | leader partition<br><code>follower metad</code> | metad    partition    replica    1 | leader metad<br><code>&lt;storage_path&gt;/&lt;partition_id&gt;</code> | follower |
| partition                                              | leader partition                                |                                    |                                                                        |          |

BR

### Note

```
./br backup full --meta <ip_address:port> --storage local://<storage_path>
```

|      |                    |          |
|------|--------------------|----------|
| Meta | 192.168.8.129:9559 | /backup/ |
|------|--------------------|----------|

```
./br backup full --meta "192.168.8.129:9559" --storage "local:///backup/"
```

leader metad leader partition

```

└── BACKUP_2022_08_12_08_41_19.meta
 data storage
 └── 1 ID
 ├── 1 ID
 │ data
 │ ├── 000033.sst
 │ ├── 000035.sst
 │ ├── 000037.sst
 │ ├── 000039.sst
 │ ├── CURRENT
 │ ├── MANIFEST-000004
 │ └── OPTIONS-000007
 └── wal
 ├── 000000000000000001.wal
 ├── 00000000000000267.wal
 ├── 00000000000000324.wal
 └── commitlog.id
 └── 10 ID
 ...
 └── meta meta
 ...

```

### Caution

### Note

S3

BR

```
./br backup incr --meta <ip_address:port> --s3.access_key <access_key> --s3.secret_key <secret_key> --s3.region <region_name> --storage s3://<storage_path>
--s3.endpoint <endpoint_url> --base <backup_file_name>
```

|      |                    |                            |           |                |   |
|------|--------------------|----------------------------|-----------|----------------|---|
| Meta | 192.168.8.129:9559 | BACKUP_2022_08_11_09_11_07 | Amazon S3 | nebula-br-test | / |
|------|--------------------|----------------------------|-----------|----------------|---|

```
./br backup incr --meta 192.168.8.129:9559 --s3.access_key QImbbGDjfQExxx --s3.secret_key dVSJZf17tnoFq7Z5zt6sfxxxx --s3.region us-east-1 --storage s3://
nebula-br-test/ --s3.endpoint http://192.168.8.xxx:9000/ --base BACKUP_2022_08_11_09_11_07
```

BR

## Note

```
./br backup incr --meta <ip_address:port> --storage local://<storage_path> --base <backup_file_name>
```

|      |                    |                            |          |
|------|--------------------|----------------------------|----------|
| Meta | 192.168.8.129:9559 | BACKUP_2022_08_11_09_11_07 | /backup/ |
|------|--------------------|----------------------------|----------|

```
./br backup incr --meta "192.168.8.129:9559" --storage "local:///backup/" --base BACKUP_2022_08_11_09_11_07
```

|             |      |                  |     |      |                  |   |
|-------------|------|------------------|-----|------|------------------|---|
| leader meta | ID 1 | leader partition | wal | ID 4 | leader partition | , |
| data wal    |      |                  |     |      |                  |   |

```
└── BACKUP_2022_08_12_08_58_23.meta
 ├── data storage
 │ ├── 1 (ID)
 │ │ └── 1 (ID)
 │ │ └── wal wal
 │ │ ├── 0000000000000000671.wal
 │ │ ├── 0000000000000000700.wal
 │ │ └── commitlog.id
 ...
 └── 4 (ID)
 └── 1
 ├── data data
 │ ├── 000009.sst
 │ ├── CURRENT
 │ ├── MANIFEST-000004
 │ ├── OPTIONS-000007
 │ └── wal wal
 │ ├── 0000000000000000001.wal
 │ └── commitlog.id
 └── meta meta
 ...

```

|                     |                                                                                                                                     |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| -h, --help          | -                                                                                                                                   |
| --debug             | -                                                                                                                                   |
| --log               | string<br>"br.log"                                                                                                                  |
| --concurrency       | int<br>5                                                                                                                            |
| --meta              | string<br>Meta                                                                                                                      |
| --storage           | string<br><schema>://<storage_path><br>schema s3 local<br>s3 s3.access_key s3.endpoint s3.region<br>s3.secret_key<br><storage_path> |
| --<br>s3.access_key | string                                                                                                                              |
| --s3.endpoint       | string<br>S3 URL http https                                                                                                         |
| --s3.region         | string                                                                                                                              |
| --<br>s3.secret_key | string                                                                                                                              |
| --base              | string                                                                                                                              |

BR br.log

```
{"level":"info","msg":"full upload storaged partition finished, progress: 1/20","time":"2023-03-15T02:13:20.946Z"}
{"level":"info","msg":"full upload storaged partition finished, progress: 2/20","time":"2023-03-15T02:13:21.154Z"}
{"level":"info","msg":"full upload storaged partition finished, progress: 3/20","time":"2023-03-15T02:13:21.537Z"}
```

NebulaGraph



---

: March 27, 2023

#### 9.2.4 BR

NebulaGraph

- 
- 
- **BR**      **Agent**      Agent
- NebulaGraph
- Storage

BR

1.

•

```
./br show --storage local://<storage_path>
```

```
/backup/
```

```
./br show --storage "local:///backup/"
```

| NAME                       | CREATE TIME         | SPACES              | FULL BACKUP | ALL SPACES | BASE BACKUP NAME           |
|----------------------------|---------------------|---------------------|-------------|------------|----------------------------|
| BACKUP_2022_08_11_06_12_43 | 2022-08-11 06:12:43 | basketballplayer    | true        | true       |                            |
| BACKUP_2022_08_11_08_27_14 | 2022-08-11 08:27:15 | basketballplayer,br | false       | true       | BACKUP_2022_08_11_06_12_43 |

• S3

```
nebula-br-test /
```

```
./br show --s3.access_key QImbbGDjfQEYxxxx --s3.secret_key dVSJZf17tnoFq7Z5zt6sfYnvi63bxxxx --s3.region us-east-1 --storage s3://nebula-br-test/ --s3.endpoint http://192.168.8.xxx:9000/
```

2.

•

```
./br restore full --meta <ip_address> --storage <storage_path> --name <backup_name>
```

```
/backup/ BACKUP_2022_08_11_09_11_07 Meta 192.168.8.129:9559
```

```
./br restore full --meta "192.168.8.129:9559" --storage "local:///backup/" --name BACKUP_2022_08_11_09_11_07
```

•

S3

```
nebula-br-test /
```

```
BACKUP_2022_08_12_07_37_02
```

```
Meta
```

```
192.168.8.129:9559
```

```
./br restore full --meta 192.168.8.129:9559 --s3.accesskey QImbbGDjfQEYxxxx --s3.secretkey dVSJZf17tnoFq7Z5zt6sfYnvi63bxxxx --s3.region us-east-1 --storage s3://nebula-br-test/ --s3.endpoint http://192.168.8.xxx:9000/ --log "3.log" --name BACKUP_2022_08_12_07_37_02
```

Restore succeed.



BR

3.



BR

•

```
./br cleanup --meta 192.168.8.129:9559 --storage "local:///backup/" --name BACKUP_2022_08_11_09_11_07
```

•

```
./br cleanup --meta 192.168.8.129:9559 --s3.accesskey QImbbGDjfQEYxxxx --s3.secretkey dVSJZf17tnoFq7Z5zt6sfYnvi63bxxxx --s3.region us-east-1 --storage s3://nebula-br-test/ --s3.endpoint http://192.168.8.xxx:9000/ --name BACKUP_2022_08_12_07_37_02
```

|               |        |                                           |   |
|---------------|--------|-------------------------------------------|---|
| -h, -help     | -      | -                                         | - |
| --debug       | -      | -                                         | - |
| --log         | string | "br.log"                                  | - |
| --concurrency | int    | -                                         | 5 |
| --meta        | string | meta                                      | - |
| --name        | string | -                                         | - |
| --storage     | string | <schema>://<storage_path>                 | - |
|               |        | schema   s3 local                         | - |
|               |        | s3    s3.access_key s3.endpoint s3.region | - |
|               |        | s3.secret_key                             | - |
|               |        | <storage_path>                            | - |
| --            | string | -                                         | - |
| s3.access_key | -      | -                                         | - |
| --s3.endpoint | string | S3       URL    http   https              | - |
| --s3.region   | string | -                                         | - |
| --            | string | -                                         | - |
| s3.secret_key | -      | -                                         | - |

BR br.log

```
{"level":"info","msg":"download storaged partition finished, progress: 1/20","time":"2023-03-15T02:16:43.430Z"}
 {"level":"info","msg":"download storaged partition finished, progress: 2/20","time":"2023-03-15T02:16:43.431Z"}
 {"level":"info","msg":"download storaged partition finished, progress: 3/20","time":"2023-03-15T02:16:43.763Z"}
```

: March 27, 2023

## 9.3

---

NebulaGraph snapshot

### 9.3.1

NebulaGraph

God

### 9.3.2

- add host drop host create space drop space balance
- 
- /usr/local/nebula/data

### 9.3.3

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
...
```

### 9.3.4

CREATE SNAPSHOT

**Note**

```
nebula> CREATE SNAPSHOT;
```

### 9.3.5

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      |

### 9.3.6

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

### 9.3.7



DROP SPACE

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 |
|------|------|-----|------|--------|------|--------|------|

:January 11, 2023

# 10.

---

## 10.1 BALANCE

---

BALANCE NebulaGraph Storage      BALANCE Storage      Storage

BALANCE

BALANCE LEADER      leader      ID job\_id

---

: April 12, 2023

## 10.2

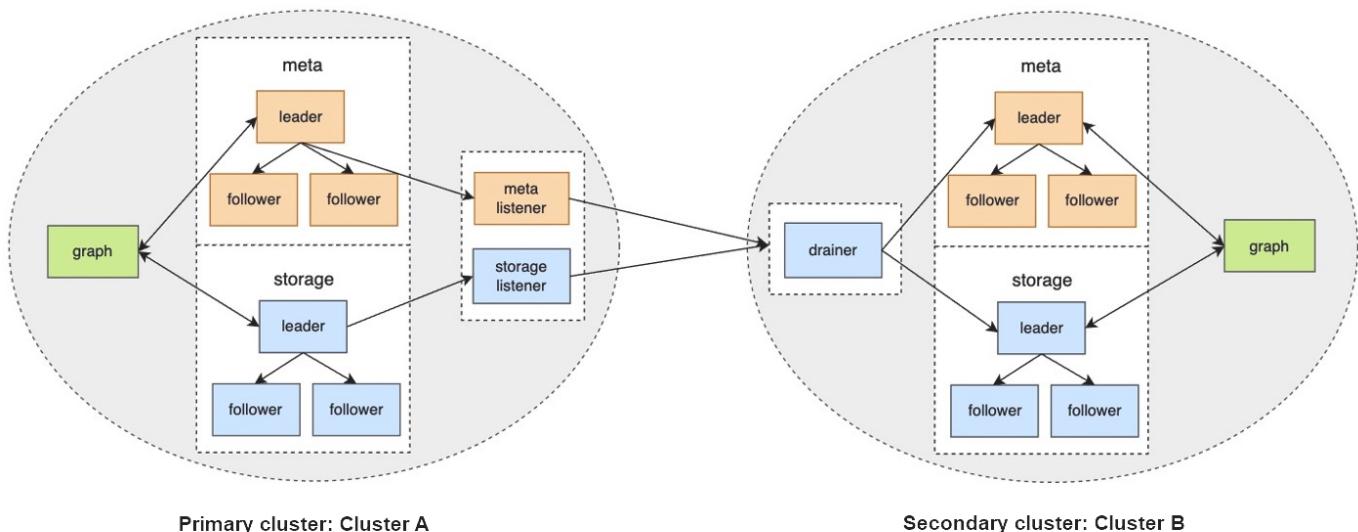
NebulaGraph

A

B

 **Enterprise only**

### 10.2.1



|         |   |             |                |   |               |                  |          |         |
|---------|---|-------------|----------------|---|---------------|------------------|----------|---------|
| A       | a | B           | b              | a | Meta listener | Storage listener | listener | drainer |
| drainer |   | Meta client | Storage client |   |               |                  |          |         |

### 10.2.2

- 
- 
-

### 10.2.3

- NebulaGraph
- 
- 
- 1 1 1 -> 1-> 2-> 3
- Meta listener Meta Storage listener Storage
- 1 1 Meta listener 1 Storage listener listener 1 drainer
- listener WAL drainer listener WAL WAL
- 
- God root
- 

### 10.2.4

- 2 listener drainer
- License

```
A IP 192.168.10.101 Graph Meta Storage
B IP 192.168.10.102 Graph Meta Storage
listener IP 192.168.10.103 Meta listener Storage listener
drainer IP 192.168.10.104 drainer
```

#### 1. listener drainer

1. NebulaGraph
- nebula-graphd.conf nebula-metad.conf nebula-storaged.conf
- listener nebula-metad-listener.conf nebula-storaged-listener.conf
- drainer nebula-drainerd.conf

 Note

- .default .production
- IP local\_ip 127.0.0.1
- nebula-graphd.conf enable\_authorize=true
- nebula-metad.conf nebula-storaged.conf --snapshot\_send\_files=false
- meta\_server\_addrs
- listener meta\_server\_addrs IP meta\_sync\_listener listener IP
- drainer meta\_server\_addrs IP

2. listener License share/resources/

### 3. NebulaGraph

- sudo scripts/nebula.service start all
  - listener
  - Meta listener sudo bin/nebula-metad --flagfile etc/nebula-metad-listener.conf
  - Storage listener sudo bin/nebula-storaged --flagfile etc/nebula-storaged-listener.conf
  - drainer sudo scripts/nebula-drainerd.service start

## 4. Storage listener

### 5. Storage drainer

2.

1. basketballplayer

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

2. basketballplayer drainer

```
nebula> USE basketballplayer;
// drainer
nebula> SIGN IN DRAINER SERVICE(192.168.10.104:9889);
//
nebula> SHOW DRAINER CLIENTS;
+-----+-----+-----+
| Type | Host | Port |
+-----+-----+-----+
| "DRAINER" | "192.168.10.104" | 9889 |
+-----+-----+-----+
```



drainer SIGN IN DRAINER SERVICE(192.168.8.x:9889),(192.168.8.x:9889)

### 3. listener

```
// listener replication_basketballplayer
nebula> ADD LISTENER SYNC META 192.168.10.103:9569 STORAGE 192.168.10.103:9789 TO SPACE replication_basketballplayer;
// listener
nebula> SHOW LISTENER SYNC;
+-----+-----+-----+-----+
| PartId | Type | Host | SpaceName | Status |
+-----+-----+-----+-----+
0	"SYNC"	"192.168.10.103":9569	"replication_basketballplayer"	"ONLINE"
1	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
2	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
3	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
4	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
5	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
6	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
7	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
8	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
9	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
10	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
11	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
12	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
13	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
14	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
15	"SYNC"	"192.168.10.103":9789	"replication_basketballplayer"	"ONLINE"
+-----+-----+-----+-----+
```

 **Note**

Storage listener ADD LISTENER SYNC META 192.168.10.xxx:9569 STORAGE 192.168.10.xxx:9789,192.168.10.xxx:9789 TO SPACE replication\_basketballplayer

### 4. replication\_basketballplayer

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

### 5. replication\_basketballplayer drainer

```
nebula> USE replication_basketballplayer;
// drainer
nebula> ADD DRAINER 192.168.10.104:9889;
// drainer
nebula> SHOW DRAINERS;
+-----+-----+
| Host | Status |
+-----+-----+
| "192.168.10.104":9889 | "ONLINE" |
+-----+-----+
```

 **Note**

drainer ADD DRAINER 192.168.8.x:9889,192.168.8.x:9889

### 6. replication\_basketballplayer

 **Note**

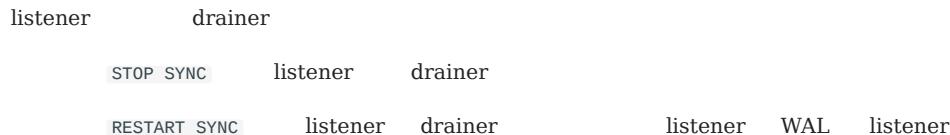
```
//
nebula> SET VARIABLES read_only=true;
//
nebula> GET VARIABLES read_only;
+-----+-----+-----+
| name | type | value |
+-----+-----+-----+
| "read_only" | "bool" | true |
+-----+-----+-----+
```

**3.****7. Schema**

```
nebula> USE basketballplayer;
nebula> CREATE TAG player(name string, age int);
nebula> CREATE EDGE follow(degree 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 EDGE follow(degree) VALUES "player101" -> "player100":(95);
```

**8.**

```
nebula> USE replication_basketballplayer;
nebula> SUBMIT JOB STATS;
nebula> SHOW STATS;
+-----+-----+-----+
| Type | Name | Count |
+-----+-----+-----+
"Tag"	"player"	2
"Edge"	"follow"	1
"Space"	"vertices"	2
"Space"	"edges"	1
+-----+-----+-----+		
nebula> FETCH PROP ON player "player100" YIELD properties(vertex);		
+-----+		
properties(VERTEX)		
+-----+		
{age: 42, name: "Tim Duncan"}		
+-----+		
nebula> GO FROM "player101" OVER follow YIELD dst(edge);		
+-----+		
dst(EDGE)		
+-----+		
"player100"		
+-----+
```

**10.2.5 /****10.2.6**

SHOW SYNC STATUS                    SHOW SYNC STATUS

```
//
nebula> INSERT VERTEX player(name,age) VALUES "player102":("LaMarcus Aldridge", 33);
nebula> INSERT VERTEX player(name,age) VALUES "player102":("LaMarcus Aldridge", 33);
nebula> INSERT VERTEX player(name,age) VALUES "player103":("Rudy Gay", 32);
nebula> INSERT VERTEX player(name,age) VALUES "player104":("Marco Belinelli", 32);

//
nebula> SHOW SYNC STATUS;
+-----+-----+-----+-----+
| PartId | Sync Status | LogId Lag | Time Latency |
+-----+-----+-----+-----+
0	"ONLINE"	0	0
1	"ONLINE"	0	0
2	"ONLINE"	0	0
3	"ONLINE"	0	0
4	"ONLINE"	0	0
5	"ONLINE"	1	46242122
6	"ONLINE"	0	0
7	"ONLINE"	0	0
8	"ONLINE"	0	0
9	"ONLINE"	0	0
```

```

10	"ONLINE"	0	0
11	"ONLINE"	0	0
12	"ONLINE"	0	0
13	"ONLINE"	0	0
14	"ONLINE"	0	0
15	"ONLINE"	0	0
+-----+-----+-----+
//

nebula> SHOW SYNC STATUS;
+-----+-----+-----+-----+
| PartId | Sync Status | LogId Lag | Time Latency |
+-----+-----+-----+
0	"ONLINE"	0	0
1	"ONLINE"	0	0
2	"ONLINE"	0	0
3	"ONLINE"	0	0
4	"ONLINE"	0	0
5	"ONLINE"	0	0
6	"ONLINE"	0	0
7	"ONLINE"	0	0
8	"ONLINE"	0	0
9	"ONLINE"	0	0
10	"ONLINE"	0	0
11	"ONLINE"	0	0
12	"ONLINE"	0	0
13	"ONLINE"	0	0
14	"ONLINE"	0	0
15	"ONLINE"	0	0
+-----+-----+-----+

```

SHOW SYNC STATUS

| PartId       | ID       | 0        | Meta listener | Meta    | ID  | Storage listener | Storage |
|--------------|----------|----------|---------------|---------|-----|------------------|---------|
| Sync Status  | listener |          |               |         |     |                  |         |
|              | ONLINE   | listener |               | drainer |     |                  |         |
|              | OFFLINE  | listener |               | drainer |     |                  |         |
| LogId Lag    | Log ID   | 0        | Log           |         |     |                  |         |
| Time Latency | Log      | WAL      |               | Log     | WAL |                  |         |
|              | 0        |          | ms            |         |     |                  |         |

SHOW DRAINER SYNC STATUS

Meta Storage

```

nebula> SHOW DRAINER SYNC STATUS;
+-----+-----+-----+-----+
| PartId | Sync Status | LogId Lag | Time Latency |
+-----+-----+-----+
0	"ONLINE"	0	0
1	"ONLINE"	0	0
2	"ONLINE"	0	0
3	"ONLINE"	0	0
4	"ONLINE"	0	0
5	"ONLINE"	0	0
6	"ONLINE"	0	0
7	"ONLINE"	0	0
8	"ONLINE"	0	0
9	"ONLINE"	0	0
10	"ONLINE"	0	0
11	"ONLINE"	0	0
12	"ONLINE"	0	0
13	"ONLINE"	0	0
14	"ONLINE"	0	0
15	"ONLINE"	0	0
+-----+-----+-----+

```

SHOW DRAINER SYNC STATUS

| PartId       | ID      | 0       | Meta    | ID                         | Storage                    | ID  |
|--------------|---------|---------|---------|----------------------------|----------------------------|-----|
| Sync Status  | drainer |         |         |                            |                            |     |
|              | ONLINE  | drainer | WAL     | metaClient / storageClient |                            |     |
|              | OFFLINE | drainer | WAL     | metaClient / storageClient |                            |     |
| LogId Lag    | Log ID  |         | drainer | Log                        | metaClient / storageClient |     |
|              | 0       |         | drainer | Log                        |                            |     |
| Time Latency | drainer |         | Log     | WAL                        | Log                        | WAL |
|              | 0       | drainer |         |                            |                            |     |
|              |         | ms      |         |                            |                            |     |

10.2.7

**Note**

listener      IP 192.168.10.105      drainer      IP 192.168.10.106

1.

```
nebula> USE basketballplayer;
nebula> SET VARIABLES read_only=true;
```

2.

a.

```
nebula> SHOW SYNC STATUS;
```

a.

```
nebula> USE replication_basketballplayer;
nebula> SHOW DRAINER SYNC STATUS;
```

| LogId | Lag | Time | Latency |
|-------|-----|------|---------|
|       |     |      | 0       |

3.

```
nebula> SET VARIABLES read_only=false;
```



4. drainer

```
nebula> REMOVE DRAINER;
```

5.

drainer      listener

```
nebula> USE basketballplayer;
// drainer
nebula> SET VARIABLES read_only=false;
nebula> SIGN OUT DRAINER SERVICE;
nebula> REMOVE LISTENER SYNC;
```

6.



drainer

```
// drainer
nebula> ADD DRAINER 192.168.10.106:9889;
//
nebula> SET VARIABLES read_only=true;
```

7.



Meta listener   Storage listener

```
nebula> USE replication_basketballplayer;
nebula> SIGN IN DRAINER SERVICE(192.168.10.106:9889);
nebula> ADD LISTENER SYNC META 192.168.10.105:9569 STORAGE 192.168.10.105:9789 TO SPACE basketballplayer;
```

## 10.2.8

|                                    | <b>God</b> | <b>Admin</b> | <b>DBA</b> | <b>User</b> | <b>Guest</b> |
|------------------------------------|------------|--------------|------------|-------------|--------------|
| SIGN IN / SIGN OUT DRAINER SERVICE | ✓          |              |            |             |              |
| ADD / REMOVE LISTENER SYNC         | ✓          | ✓            | ✓          |             |              |
| SHOW DRAINER CLIENTS               | ✓          | ✓            | ✓          | ✓           | ✓            |
| SHOW LISTENER SYNC                 | ✓          | ✓            | ✓          | ✓           | ✓            |
| ADD / REMOVE DRAINER               | ✓          | ✓            | ✓          |             |              |
| SET VARIABLES read_only            | ✓          |              |            |             |              |
| SHOW DRAINERS                      | ✓          | ✓            | ✓          | ✓           | ✓            |

## 10.2.9

| <b>data</b> | <b>data</b> |        |     |         |      |     |      |     |
|-------------|-------------|--------|-----|---------|------|-----|------|-----|
| data        | listener    | leader | WAL | drainer | data | WAL | data | WAL |
| drainer     |             |        |     |         |      |     |      |     |

### **data**

### **Schema**

| Schema | Schema | Schema | Schema | Schema | Schema |
|--------|--------|--------|--------|--------|--------|
|--------|--------|--------|--------|--------|--------|

### **Schema**

| Schema | data   | Meta listener | Storage listener | data | drainer | Schema |
|--------|--------|---------------|------------------|------|---------|--------|
| Schema | Schema |               |                  |      |         |        |

|          |     |         |
|----------|-----|---------|
| listener | WAL | drainer |
|----------|-----|---------|

- listener/drainer/ WAL drainer listener WAL drainer

SHOW SYNC STATUS

SHOW DRAINER SYNC STATUS

**WAL**

WAL

--wal-ttl

Meta Storage

--snapshot\_send\_files=false

---

:January 30, 2023

# 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

: September 2, 2022

## 11.2 Storage

BALANCE

Raft leader

Storage

BALANCE

 Danger

BALANCE

IP

### 11.2.1

 Enterpriseonly Note

BALANCE DATA

Storage

## NebulaGraph Storage

### 1. SHOW HOSTS

```
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+
| Host | Port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "192.168.8.101" | 9779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.4.1" |
| "192.168.8.100" | 9779 | "ONLINE" | 15 | "basketballplayer:15" | "basketballplayer:15" | "3.4.1" |
+-----+-----+-----+-----+-----+-----+
```

### 2. basketballplayer BALANCE DATA

```
nebula> USE basketballplayer;
nebula> BALANCE DATA;
+-----+
| New Job Id |
+-----+
| 25 |
+-----+
```

### 3. ID SHOW JOB <job\_id>

```
nebula> SHOW JOB 25;
+-----+-----+-----+-----+-----+-----+
| Job Id(spaceId:partId) | Command(src->dst) | Status | Start Time | Stop Time | State |
+-----+-----+-----+-----+-----+-----+
| 25 | "DATA_BALANCE" | "FINISHED" | 2023-01-17T06:24:35.000000 | 2023-01-17T06:24:35.000000 | "SUCCEEDED" |
| "Total:0" | "Succeeded:0" | "Failed:0" | "In Progress:0" | "Invalid:0" | "" |
+-----+-----+-----+-----+-----+-----+
```

### 4. SHOW HOSTS

#### Note

BALANCE DATA leader leader **leader**

```
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+
| Host | Port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "192.168.8.101" | 9779 | "ONLINE" | 7 | "basketballplayer:7" | "basketballplayer:7" | "3.4.1" |
| "192.168.8.100" | 9779 | "ONLINE" | 8 | "basketballplayer:8" | "basketballplayer:8" | "3.4.1" |
+-----+-----+-----+-----+-----+-----+
```

**RECOVER JOB <job\_id>** NebulaGraph

STOP JOB <job\_id>

- 
- Job stopped

#### Note

STOP JOB <job\_id> INVALID SUCCEEDED FAILED SHOW JOB <job\_id>

**RECOVER JOB <job\_id>**

### Note

- NebulaGraph                    start time                    failed job                    finished job                    stopped job1 ->  
finished job2 -> stopped job3                    job3                    job1

Storage

BALANCE DATA REMOVE &lt;ip:port&gt; [,&lt;ip&gt;:&lt;port&gt; ...]

192.168.8.100:9779

```
nebula> BALANCE DATA REMOVE 192.168.8.100:9779;
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+
| Host | Port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
| "192.168.8.101" | 9779 | "ONLINE" | 15 | "basketballplayer:15" | "basketballplayer:15" | "3.4.1" |
| "192.168.8.100" | 9779 | "ONLINE" | 0 | "No valid partition" | "No valid partition" | "3.4.1" |
+-----+-----+-----+-----+-----+-----+
```

### Note

Storage

Storage

Storage

## 11.2.2 leader

BALANCE LEADER leader

nebula&gt; BALANCE LEADER;

SHOW HOSTS

```
nebula> SHOW HOSTS;
+-----+-----+-----+-----+-----+-----+
| Host | Port | Status | Leader count | Leader distribution | Partition distribution | Version |
+-----+-----+-----+-----+-----+-----+
"192.168.10.100"	9779	"ONLINE"	4	"basketballplayer:3"	"basketballplayer:8"	"3.4.1"
"192.168.10.101"	9779	"ONLINE"	8	"basketballplayer:3"	"basketballplayer:8"	"3.4.1"
"192.168.10.102"	9779	"ONLINE"	3	"basketballplayer:3"	"basketballplayer:8"	"3.4.1"
"192.168.10.103"	9779	"ONLINE"	0	"basketballplayer:2"	"basketballplayer:7"	"3.4.1"
"192.168.10.104"	9779	"ONLINE"	0	"basketballplayer:2"	"basketballplayer:7"	"3.4.1"
"192.168.10.105"	9779	"ONLINE"	0	"basketballplayer:2"	"basketballplayer:7"	"3.4.1"
+-----+-----+-----+-----+-----+-----+
```

### Caution

NebulaGraph 3.4.1 Leader

Storage Error E\_RPC\_FAILURE

FAQ

:January 30, 2023

## 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

“      ”      ”

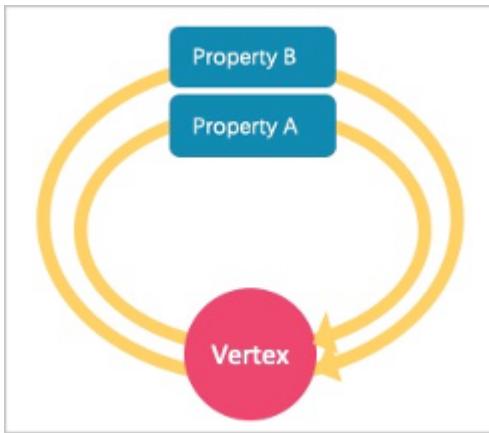
schema-free

NebulaGraph 3.4.1    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 3.4.1

**INSERT EDGE**

**DELETE VERTEX**

**WITH EDGE**

NebulaGraph 3.4.1

“ ” 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;
+---+
| 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 3.4.1 (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

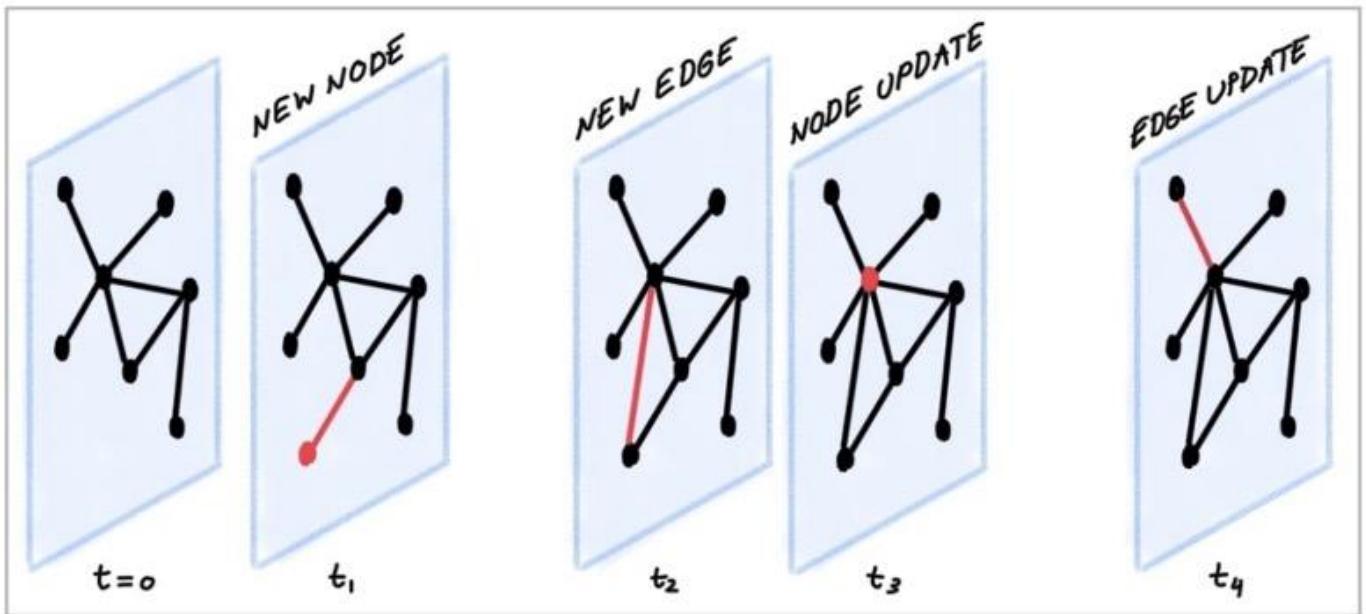
1

NebulaGraph 3.4.1

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) ↪
- 

: April 18, 2023

11.4

### 11.4.1 QPS

- NebulaGraph 3.4.1
  -

**NebulaGraph Algorithm**

— QPS  
graphd graphd

## 11.4.2

- NebulaGraph OLTP " " OLAP " "
  - sst INSERT
  - COMPACTION BALANCE
  - NebulaGraph 3.4.1 NoSQL

### 11.4.3



: August 9, 2022

## 11.5

---

NebulaGraph 3.4.1

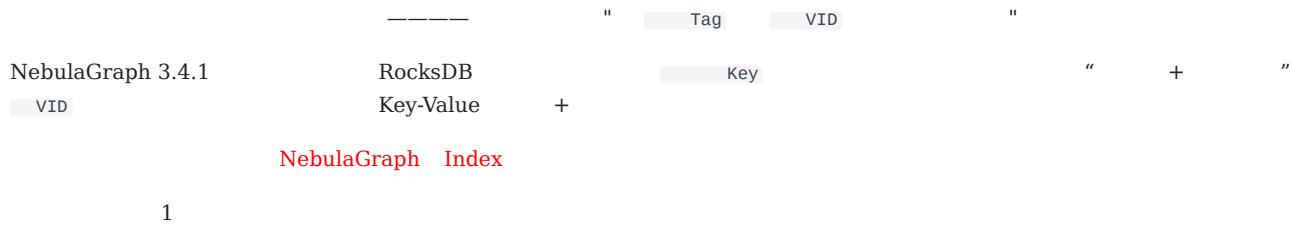
EXPLAIN PROFILE

---

: August 9, 2022

## 11.6

### 11.6.1



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 | A | A1: 1-1000, A2: 1001-10000, A3: 10000+ | A |
| A1 A2 A3 |   |                                        |   |

---

: August 9, 2022

## 11.7 AutoFDO

AutoFDO

NebulaGraph AutoFDO

AutoFDO

[AutoFDO Wiki](#)

### 11.7.1

- perf

```
sudo apt-get update
sudo apt-get install -y linux-tools-common \
linux-tools-generic \
linux-tools-'uname -r'
```

- autofdo tool

```
sudo apt-get update
sudo apt-get install -y autofdo
```

#### autofdo tool

### NebulaGraph

NebulaGraph

NebulaGraph

CMAKE\_BUILD\_TYPE=Release CMAKE\_BUILD\_TYPE=RelWithDebInfo

```
$ cmake -DCMAKE_INSTALL_PREFIX=/usr/local/nebula -DENABLE_TESTING=OFF -DCMAKE_BUILD_TYPE=RelWithDebInfo ..
```

### 11.7.2

[NebulaGraph Bench](#)

**FindShortestPath Go1Step Go2Step Go3Step InsertPersonScenario** 5

#### Note

#### TopN

### 11.7.3

#### AutoFDO

1.

storaged graphd metad pid

```
$ nebula.service status all
[INFO] nebula-metad: Running as 305422, Listening on 9559
[INFO] nebula-graphd: Running as 305516, Listening on 9669
[INFO] nebula-storaged: Running as 305707, Listening on 9779
```

2. nebula-graphd nebula-storaged perf record

```
perf record -p 305516,305707 -b -e br_inst_retired.near_taken:pp -o ~/FindShortestPath.data
```

### Note

nebula-graphd nebula-storaged nebula-metad nebula-metad

### 3. FindShortestPath

```
cd NebulaGraph-Bench
python3 run.py stress run -s benchmark -scenario find_path.FindShortestPath -a localhost:9669 --args='-u 100 -i 100000'
```

### 4. Ctrl + C perf record

### 5. Go1Step Go2Step Go3Step InsertPersonScenario 4

### Gcov

```
create_gcov --binary=$NEBULA_HOME/bin/nebula-storaged \
--profile=~/FindShortestPath.data \
--gcov=~/FindShortestPath-storaged.gcov \
-gcov_version=1

create_gcov --binary=$NEBULA_HOME/bin/nebula-graphd \
--profile=~/FindShortestPath.data \
--gcov=~/FindShortestPath-graphd.gcov \
-gcov_version=1
```

**FindShortestPath      Go1Step Go2Step Go3Step InsertPersonScenario 4      Gcov**

```
profile_merger ~/FindShortestPath-graphd.gcov \
~/FindShortestPath-storaged.gcov \
~/go1step-storaged.gcov \
~/go1step-graphd.gcov \
~/go2step-storaged.gcov \
~/go2step-graphd.gcov \
~/go3step-storaged.gcov \
~/go3step-master-graphd.gcov \
~/InsertPersonScenario-storaged.gcov \
~/InsertPersonScenario-graphd.gcov
```

fbdata.afdo

### 11.7.4

### NebulaGraph

-fauto-profile      NebulaGraph

```
diff --git a/cmake/nebula/GeneralCompilerConfig.cmake b/cmake/nebula/GeneralCompilerConfig.cmake
@@ -20,6 +20,8 @@ add_compile_options(-Wshadow)
add_compile_options(-Wnon-virtual-dtor)
add_compile_options(-Woverloaded-virtual)
add_compile_options(-Wignored-qualifiers)
+add_compile_options(-fauto-profile=~/fbdata.afdo)
```

### Note

fbdata.afdo      make clean      fbdata.afdo

## 11.7.5

|                     |                                                                                     |
|---------------------|-------------------------------------------------------------------------------------|
| CPU Processor#      | 2                                                                                   |
| Sockets             | 2                                                                                   |
| NUMA                | 2                                                                                   |
| CPU Type            | Intel(R) Xeon(R) Platinum 8380 CPU @ 2.30GHz                                        |
| Cores per Processor | 40C80T                                                                              |
| Cache               | L1 data: 48KB L1 i: 32KB L2: 1.25MB per physical core L3: shared 60MB per processor |
| Memory              | Micron DDR4 3200MT/s 16GB16Micron DDR4 3200MT/s 16GB16                              |
| SSD Disk            | INTEL SSDPE2KE016T8                                                                 |
| SSD R/W Sequential  | 3200 MB/s (read) / 2100 MB/s(write)                                                 |
| Nebula Version      | master with commit id 51d84a4ed7d2a032a337e3b996c927e3bc5d1415                      |
| Kernel              | 4.18.0-408.el8.x86_64                                                               |



|                         | Average Latency(LiB) | Default Binary | Optimized Binary with AutoFDO | P95 Latency (LiB)    | Default Binary | Optimized Binary with AutoFDO |
|-------------------------|----------------------|----------------|-------------------------------|----------------------|----------------|-------------------------------|
| <b>FindShortestPath</b> | <b>1</b>             | 8072.52        | 7260.10                       | <b>1</b>             | 22102.00       | 19108.00                      |
|                         | <b>2</b>             | 8034.32        | 7218.59                       | <b>2</b>             | 22060.85       | 19006.00                      |
|                         | <b>3</b>             | 8079.27        | 7257.24                       | <b>3</b>             | 22147.00       | 19053.00                      |
|                         | <b>4</b>             | 8087.66        | 7221.39                       | <b>4</b>             | 22143.00       | 19050.00                      |
|                         | <b>5</b>             | 8044.77        | 7239.85                       | <b>5</b>             | 22181.00       | 19055.00                      |
|                         | <b>STDDEVP</b>       | 20.57          | 17.34                         | <b>STDDEVP</b>       | 41.41          | 32.36                         |
|                         | <b>Mean</b>          | 8063.71        | 7239.43                       | <b>Mean</b>          | 22126.77       | 19054.40                      |
|                         | <b>STDDEVP/ Mean</b> | 0.26%          | 0.24%                         | <b>STDDEVP/ Mean</b> | 0.19%          | 0.17%                         |
|                         | <b>Opt/Default</b>   | 100.00%        | <b>10.22%</b>                 | <b>Opt/ Default</b>  | 100.00%        | <b>13.89%</b>                 |
| <b>Go1Step</b>          | <b>1</b>             | 422.53         | 418.37                        | <b>1</b>             | 838.00         | 850.00                        |
|                         | <b>2</b>             | 432.37         | 402.44                        | <b>2</b>             | 866.00         | 815.00                        |
|                         | <b>3</b>             | 437.45         | 407.98                        | <b>3</b>             | 874.00         | 836.00                        |
|                         | <b>4</b>             | 429.16         | 408.38                        | <b>4</b>             | 858.00         | 838.00                        |
|                         | <b>5</b>             | 446.38         | 411.32                        | <b>5</b>             | 901.00         | 837.00                        |
|                         | <b>STDDEVP</b>       | 8.02           | 5.20                          | <b>STDDEVP</b>       | 20.63          | 11.30                         |
|                         | <b>Mean</b>          | 433.58         | 409.70                        | <b>Mean</b>          | 867.40         | 835.20                        |
|                         | <b>STDDEVP/ Mean</b> | 1.85%          | 1.27%                         | <b>STDDEVP/ Mean</b> | 2.38%          | 1.35%                         |
|                         | <b>Opt/Default</b>   | 100.00%        | <b>5.51%</b>                  | <b>Opt/ Default</b>  | 100.00%        | <b>3.71%</b>                  |
| <b>Go2Step</b>          | <b>1</b>             | 2989.93        | 2824.29                       | <b>1</b>             | 10202.00       | 9656.95                       |
|                         | <b>2</b>             | 2957.22        | 2834.55                       | <b>2</b>             | 10129.00       | 9632.40                       |
|                         | <b>3</b>             | 2962.74        | 2818.62                       | <b>3</b>             | 10168.40       | 9624.70                       |
|                         | <b>4</b>             | 2992.39        | 2817.27                       | <b>4</b>             | 10285.10       | 9647.50                       |
|                         | <b>5</b>             | 2934.85        | 2834.91                       | <b>5</b>             | 10025.00       | 9699.65                       |
|                         | <b>STDDEVP</b>       | 21.53          | 7.57                          | <b>STDDEVP</b>       | 85.62          | 26.25                         |
|                         | <b>Mean</b>          | 2967.43        | 2825.93                       | <b>Mean</b>          | 10161.90       | 9652.24                       |
|                         | <b>STDDEVP/ Mean</b> | 0.73%          | 0.27%                         | <b>STDDEVP/ Mean</b> | 0.84%          | 0.27%                         |
|                         | <b>Opt/Default</b>   | 100.00%        | <b>4.77%</b>                  | <b>Opt/ Default</b>  | 100.00%        | <b>5.02%</b>                  |
| <b>Go3Step</b>          | <b>1</b>             | 93551.97       | 89406.96                      | <b>1</b>             | 371359.55      | 345433.50                     |
|                         | <b>2</b>             | 92418.43       | 89977.25                      | <b>2</b>             | 368868.00      | 352375.20                     |
|                         | <b>3</b>             | 92587.67       | 90339.25                      | <b>3</b>             | 365390.15      | 356198.55                     |

| Average Latency(LiB)            | Default Binary                  | Optimized Binary with AutoFDO | P95 Latency (LiB)               | Default Binary      | Optimized Binary with AutoFDO |
|---------------------------------|---------------------------------|-------------------------------|---------------------------------|---------------------|-------------------------------|
| <b>4</b>                        | 93371.64                        | 92458.95                      | <b>4</b>                        | 373578.15           | 365177.75                     |
| <b>5</b>                        | 94046.05                        | 89943.44                      | <b>5</b>                        | 373392.25           | 352576.00                     |
| <b>STDDEV<sub>P</sub></b>       | 609.07                          | 1059.54                       | <b>STDDEV<sub>P</sub></b>       | 3077.38             | 6437.52                       |
| <b>Mean</b>                     | 93195.15                        | 90425.17                      | <b>Mean</b>                     | 370517.62           | 354352.20                     |
| <b>STDDEV<sub>P</sub>/ Mean</b> | 0.65%                           | 1.17%                         | <b>STDDEV<sub>P</sub>/ Mean</b> | 0.83%               | 1.82%                         |
| <b>Opt/Default</b>              | 100.00%                         | <b>2.97%</b>                  | <b>Opt/ Default</b>             | 100.00%             | <b>4.36%</b>                  |
| <i>InsertPerson</i>             | <b>1</b>                        | 2022.86                       | <b>1</b>                        | 2689.00             | 2633.45                       |
|                                 | <b>2</b>                        | 1966.05                       | <b>2</b>                        | 2620.45             | 2555.00                       |
|                                 | <b>3</b>                        | 1985.25                       | <b>3</b>                        | 2546.00             | 2593.00                       |
|                                 | <b>4</b>                        | 2026.73                       | <b>4</b>                        | 2564.00             | 2394.00                       |
|                                 | <b>5</b>                        | 2007.55                       | <b>5</b>                        | 2676.00             | 2581.00                       |
|                                 | <b>STDDEV<sub>P</sub></b>       | 23.02                         | <b>STDDEV<sub>P</sub></b>       | 57.45               | 82.62                         |
|                                 | <b>Mean</b>                     | 2001.69                       | <b>Mean</b>                     | 2619.09             | 2551.29                       |
|                                 | <b>STDDEV<sub>P</sub>/ Mean</b> | 1.15%                         | <b>STDDEV<sub>P</sub>/ Mean</b> | 2.19%               | 3.24%                         |
|                                 | <b>Opt/Default</b>              | 100.00%                       | <b>3.30%</b>                    | <b>Opt/ Default</b> | 100.00% <b>2.59%</b>          |

: March 13, 2023

## 11.8

---

NebulaGraph

### 11.8.1

---

- 
- 
- 

### 11.8.2

---

- MATCH Pattern
- NebulaGraph
- BDD NebulaGraph
- BDD NebulaGraph
- NebulaGraph
- 
- | LDBC nGQL

### 11.8.3

---

- 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

---

: September 23, 2022

## 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

---

: September 16, 2022

## 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](#)    [Profile/Explain](#)

## 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;
```

- PROFILE/EXPLAIN

```
nebula> :profile <file_name>;
```

```
nebula> :explain <file_name>;
```

## Note

Studio      CSV

GitHub issue

```
nebula> :profile profile.log
nebula> PROFILE GO FROM "player102" OVER serve YIELD dst(edge);
nebula> :profile profile.dot
nebula> PROFILE FORMAT="dot" GO FROM "player102" OVER serve YIELD dst(edge);
nebula> :explain explain.log
nebula> EXPLAIN GO FROM "player102" OVER serve YIELD dst(edge);
```

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!
```

: February 2, 2023

## 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 v3.4.0

```
$ git clone --branch release-3.4 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 \(\min(\text{CPU} \ \ \frac{\text{GB}}{2})\)
```

```
$ 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](#)

---

: October 31, 2022

## 12.4 NebulaGraph Java

**NebulaGraph Java** Java NebulaGraph

### 12.4.1

Java 8.0

### 12.4.2

| <b>NebulaGraph</b> | <b>NebulaGraph Java</b> |
|--------------------|-------------------------|
| 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 v3.4.0

```
$ git clone --branch release-3.4 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](#)
- 

: October 31, 2022

## 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    v3.4.0

```
$ git clone --branch release-3.4 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](#)

---

: October 31, 2022

## 12.6 NebulaGraph Go

**NebulaGraph Go**      Go      **NebulaGraph**

### 12.6.1

Go      1.13

### 12.6.2

<b>NebulaGraph</b>	<b>NebulaGraph Go</b>
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`      v3.4.0

```
$ git clone --branch release-3.4 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-3.4`

### 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](#)

## 13. NebulaGraph Cloud

---

### 13.1 NebulaGraph Cloud

---

NebulaGraph Cloud    Cloud    NebulaGraph    NebulaGraph

#### 13.1.1

---

- NebulaGraph
- Nebula Dashboard    Nebula Explorer    nGQL
- Nebula Console
- 
- 

#### 13.1.2

---

- Cloud    5-10    NebulaGraph
- Cloud    NebulaGraph    Raft
- Cloud    Web    NebulaGraph

#### 13.1.3

---

NebulaGraph Cloud

NebulaGraph Cloud    05    37

: March 13, 2023

## 13.2 Nebula Graph Cloud

---

### 13.2.1

---

NebulaGraph Cloud

- 
- RAM
- AliyunECSFullAccess
- AliyunVPCFullAccess
- AliyunROSFulAccess
- AliyunCloudMonitorFullAccess
- AliyunComputeNestUserFullAccess

NebulaGraph Cloud

---

---

30

NebulaGraph

NebulaGraph

30

NebulaGraph

00:00

## NebulaGraph Cloud

NebulaGraph		1 ECS				
Graph	Storage	ECS	1 ECS	Explorer	1 ECS	
Graph	Storage	ECS	3 ECS	Explorer	1 ECS	

1.

2. **NebulaGraph**

3. NebulaGraph

4.

 Note

NebulaGraph

5. ID

6.

7. ECS

•

•

**Month**8. **NebulaGraph** ECS

9.

a. **VPC ID**

b.

c. **ID**

10.

11.

12.

13.

14.

15.

16.

 Note

17.

10

 **Danger**1. **NebulaGraph**2. **NebulaGraph**

3. NebulaGraph \*

 **Note**

1

4. ID

5.

6. **NebulaGraph** ECS

7.

8.

9.

10.

11.

12.

13.

10

Q

1. RAM

2.

3. **NebulaGraph**

: March 13, 2023

## 13.2.2

NebulaGraph

1.



2.

**ID**

3.      Graph    Storage    Explorer   Dashboard

**NebulaGraph**

NebulaGraph Cloud

NEBULAGRAPH

NebulaGraph

Graph                  IP

NebulaGraph

1.   Graph        ECS                  IP

2.                  NebulaGraph                  IP                  TCP 9669



Graph        9669

3.   Graph        IP        9669        NebulaGraph



IP

EXPLORER   NEBULAGRAPH

NebulaGraph

1. **Explorer** Nebula Explorer
2. Explorer NebulaGraph

**NebulaGraph**

NebulaGraph Cloud      Dashboard      Dashboard      NebulaGraph      **Dashboard**

---

: March 13, 2023

### 13.2.3

NebulaGraph Cloud

- Storage      Storage
- Graph           NebulaGraph Dashboard      Graph      Graph

1.

2. ID



Note

3.

4.

5.

a. **ESS**

b. **ID**

• Storage      **ng-storage**

• Graph        **ng-graph**

c.

• **ECS**

• **ECS**

d. **ECS**

e.

f.

6.

7. ECS

---

: March 13, 2023

## 13.2.4

---

: June 30, 2022

## 14. NebulaGraph Studio

## 14.1 NebulaGraph Studio

### 14.1.1 NebulaGraph Studio

NebulaGraph Studio      Studio      Web      **NebulaGraph**      nGQL      NebulaGraph  
GitHub      **nebula-studio**

Note

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
3.4.0 ~ 3.4.1	3.6.0 3.5.1 3.5.0
3.3.0	3.5.1 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

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_	<button>Schema</button>	⋮
2	hello_test	100	1	utf8	utf8_bin	INT64	false	_EMPTY_	<button>Schema</button>	⋮
3	test	15	1	utf8	utf8_bin	FIXED_ST RING(30)	false	_EMPTY_	<button>Schema</button>	⋮

: March 13, 2023

## 14.1.2

Studio

Studio      x86\_64

Studio      CSV

CSV

### nGQL

nGQL

- USE <space\_name>      **Space**
- nGQL

Chrome    Studio

---

: December 15, 2022

## 14.2

---

### 14.2.1 Studio

RPM DEB tar Docker Studio

#### RPM Studio

RPM Studio

- NebulaGraph **NebulaGraph**
- Linux CentOS lsof
- 

7001 Studio web

---

#### 1. RPM

##### **NebulaGraph**

nebula-graph-studio-3.6.0.x86_64.rpm	nebula-graph-studio-3.6.0.x86_64.rpm.sha256	3.4.1
--------------------------------------	---------------------------------------------	-------

#### 2. `sudo rpm -i <rpm_name>` RPM

Studio 3.6.0 /usr/local/nebula-graph-studio

```
$ sudo rpm -i nebula-graph-studio-3.6.0.x86_64.rpm
```

```
$ sudo rpm -i nebula-graph-studio-3.6.0.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



## Studio

```
$ sudo rpm -e nebula-graph-studio-3.6.0.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 **NebulaGraph**

- Linux Ubuntu

- 

7001 Studio web

- /usr/lib/systemd/system

1. DEB

**NebulaGraph**

<a href="#">nebula-graph-studio-3.6.0.x86_64.deb</a>	<a href="#">nebula-graph-studio-3.6.0.x86_64.deb.sha256</a>	3.4.1
------------------------------------------------------	-------------------------------------------------------------	-------

2. `sudo dpkg -i <deb_name>` DEB

Studio 3.6.0

```
$ sudo dpkg -i nebula-graph-studio-3.6.0.x86_64.deb
```

3. `http://<ip address>:7001`

Studio



Studio

```
$ sudo dpkg -r nebula-graph-studio
```

**tar** **Studio**

**tar** **Studio**

- NebulaGraph **NebulaGraph**
- 

7001

Studio web

1. **tar**

<b>Studio</b>	<b>NebulaGraph</b>
nebula-graph-studio-3.6.0.x86_64.tar.gz	3.6.0
3.4.1	

2. **tar**

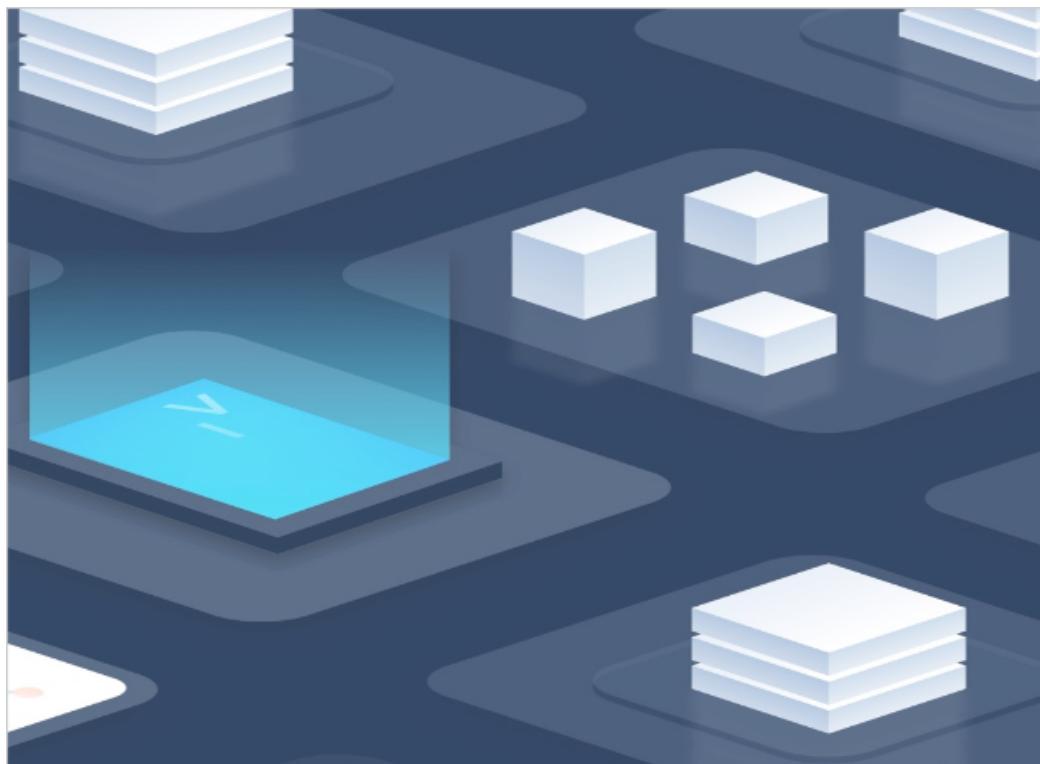
```
tar -xvf nebula-graph-studio-3.6.0.x86_64.tar.gz
```

3. **nebula-graph-studio**

```
$ cd nebula-graph-studio
$./server
```

4. **http://<ip address>:7001**

Studio



```
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 3.4.1

## 1. Studio

### NebulaGraph

[nebula-graph-studio-3.6.0.tar.gz](#) 3.4.1

## 2. nebula-graph-studio-3.6.0

```
mkdir nebula-graph-studio-3.6.0 && tar -zxvf nebula-graph-studio-3.6.0.tar.gz -C nebula-graph-studio-3.6.0
```

## 3. nebula-graph-studio-3.6.0

```
cd nebula-graph-studio-3.6.0
```

## 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

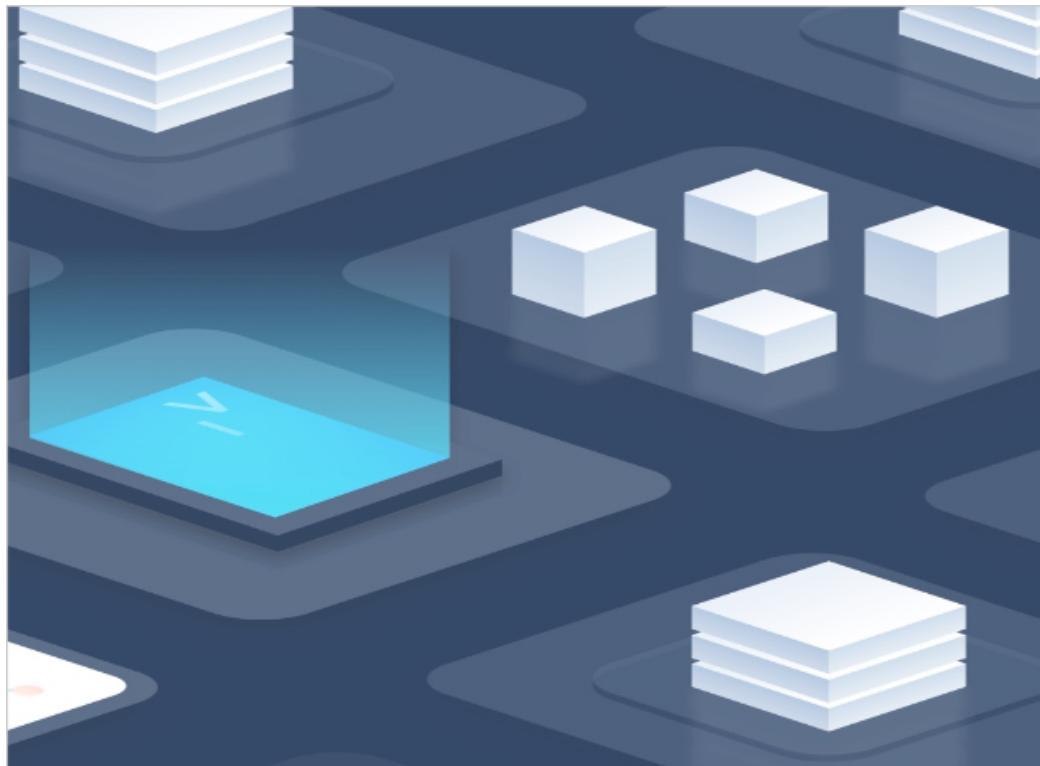
ipconfig

IP

Studio

<http://localhost:7001>

Studio



**NebulaGraph Studio**

配置数据库

连接数据库说明文档>

Graphd IP 地址 : 9669

用户名

密码

连接

版本: 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	v3.6.0	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](http://<node_address>:30070)

Studio



```
$ helm uninstall my-studio
```

Studio

NebulaGraph

: March 13, 2023

## 14.2.2

Studio

NebulaGraph

Studio

NebulaGraph

NebulaGraph

- Studio **Studio**

- NebulaGraph Graph IP 9669

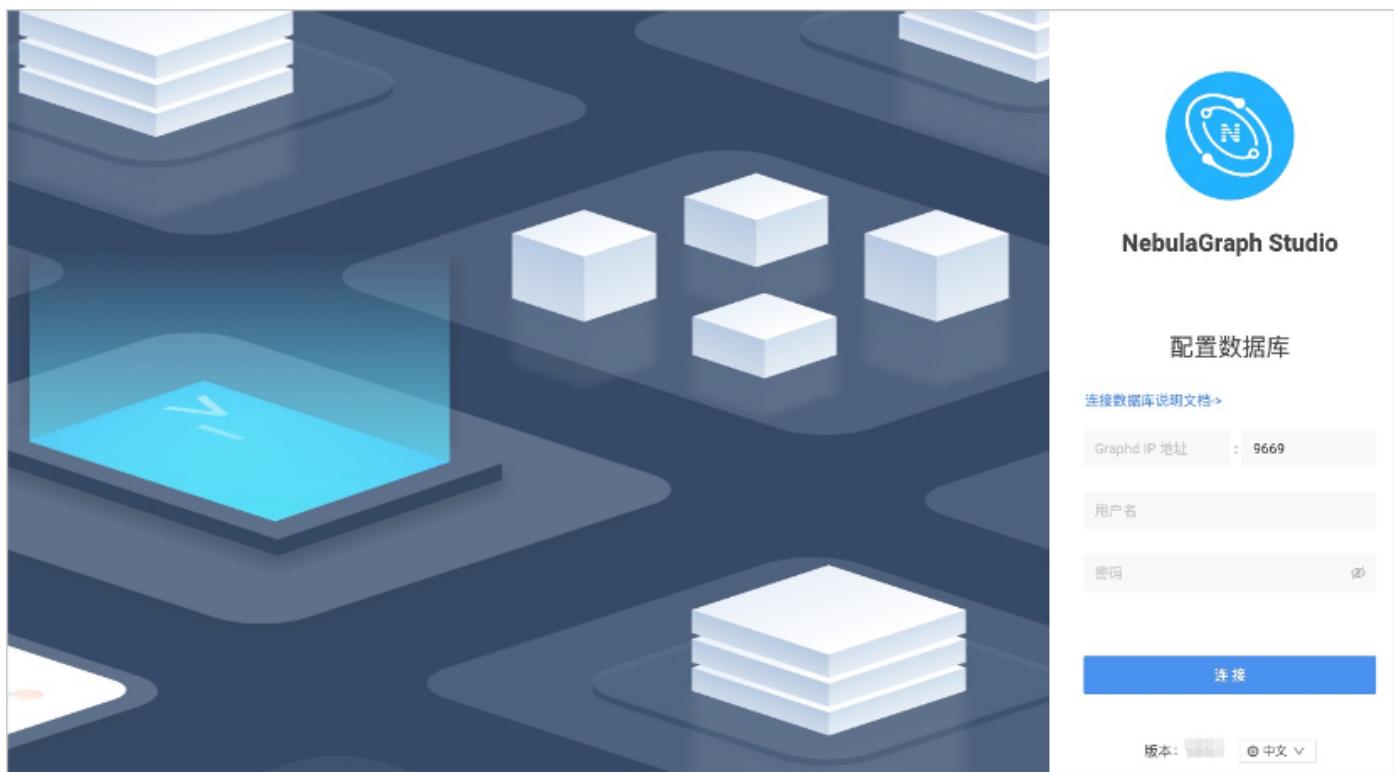
- NebulaGraph

## NebulaGraph

1.

`http://<ip_address>:7001`

Studio



2. Studio

- **Graphd IP** NebulaGraph Graph IP 192.168.10.100

### Note

- NebulaGraph Studio IP 127.0.0.1 localhost
- NebulaGraph

- **Port** Graphd 9669

- NebulaGraph
- root
- GOD root nebula
- 

3.

### Note

30 30



NebulaGraph

- **Schema** Schema
- 
- nGQL
- **Schema** Schema



NebulaGraph

---

:January 30, 2023

## 14.3

### 14.3.1 Schema

Studio      NebulaGraph      Schema

Schema

- Tag      Tag
- Edge type      Edge type

NebulaGraph      **basketballplayer**      Schema

Schema

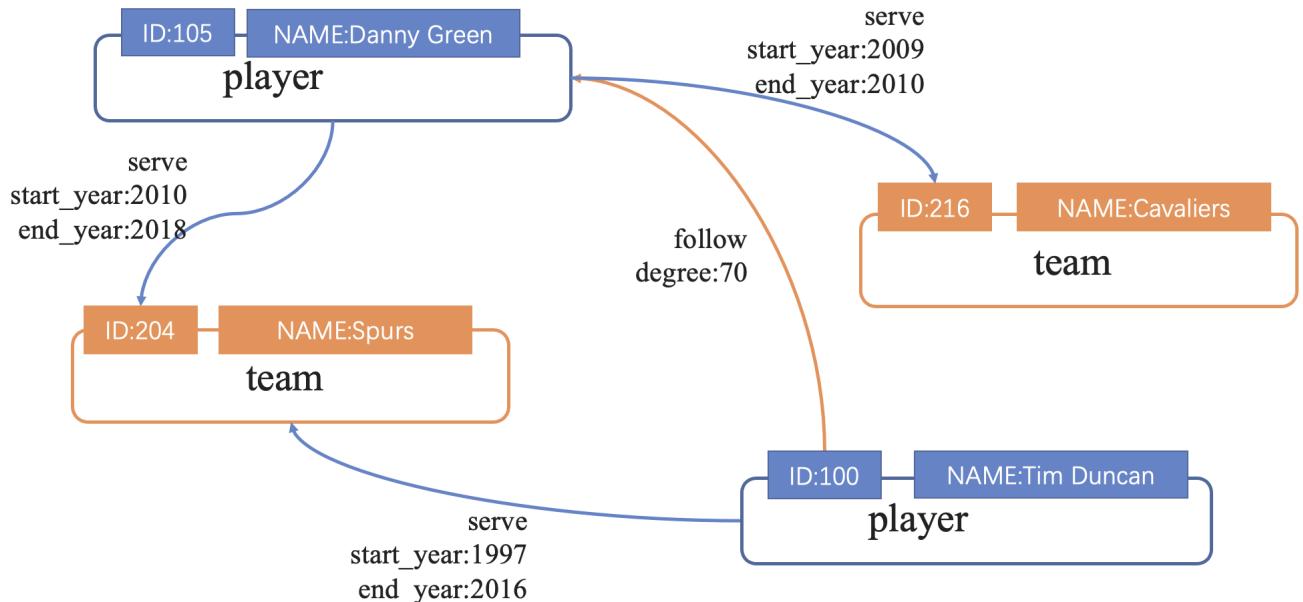
Tag	<b>player</b>	- name string - age int
-----	---------------	----------------------------

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**

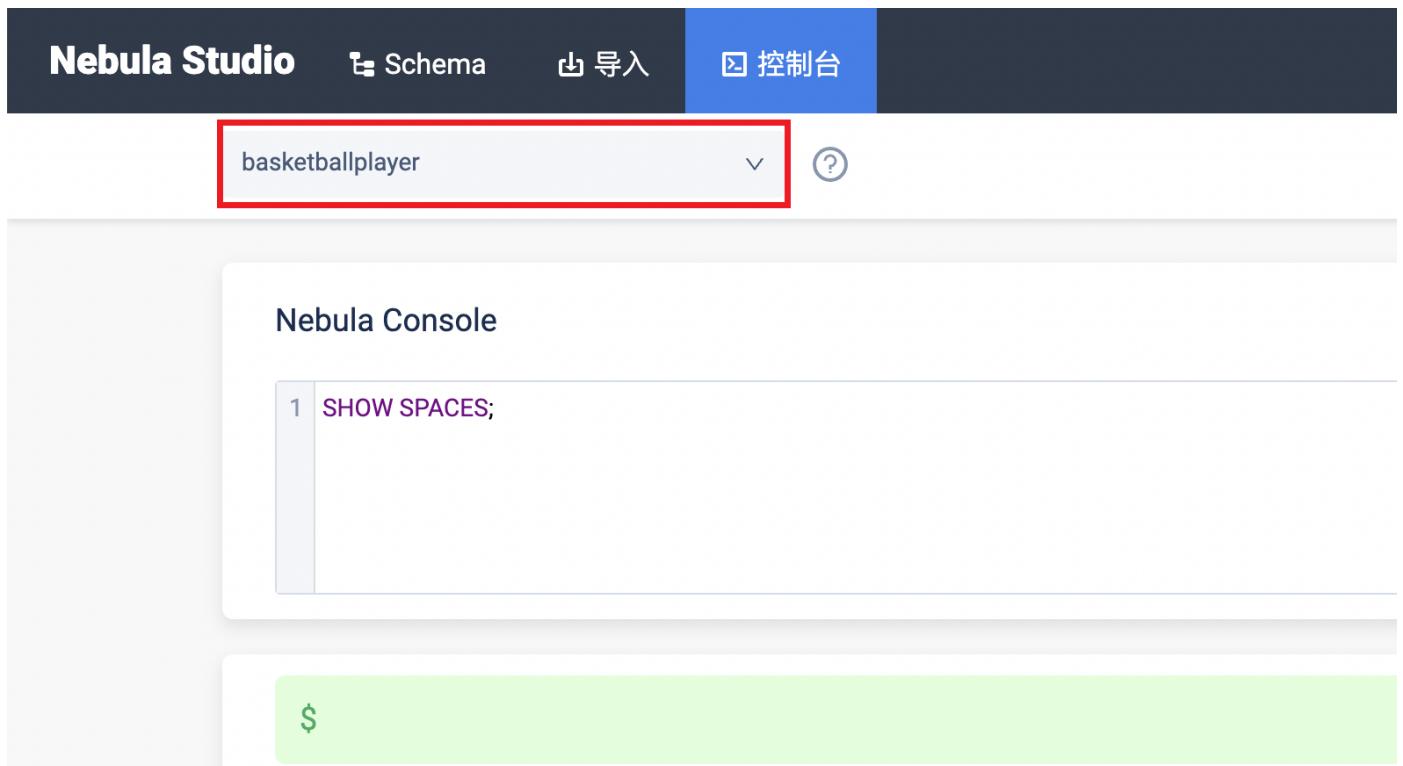
**Schema** Schema

**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

: October 28, 2022

## 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

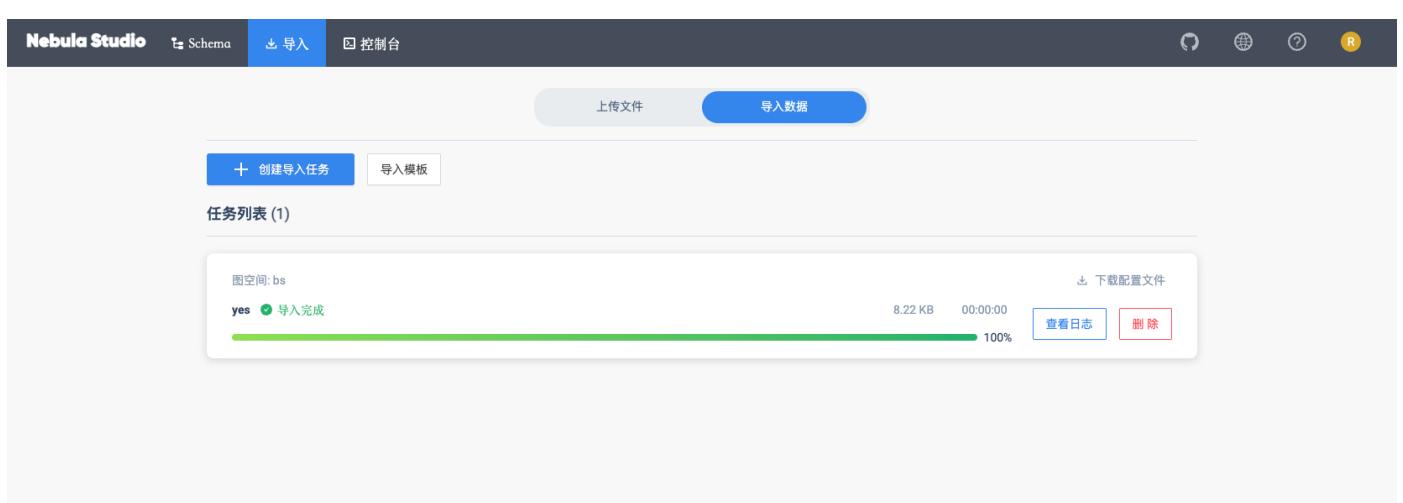
取消 导入

4.

## 5. NebulaGraph



6.



: August 9, 2022

## 14.3.4

Studio

Nebula Studio   Schema   导入   控制台 控制台

2 basketballplayer   3 3 4 5 6 7 8 9 10 11 12 13

Nebula Console

7 p1   8 1 MATCH (v:player) RETURN v LIMIT 3   14 表格   15 可视化

9 \$ MATCH (v:player) RETURN v LIMIT 3   10 ☆ 11 12 13

14 表格

15 可视化

player115   player106   player102

执行时间消耗 0.00302 (s)

\$ MATCH (v:player) RETURN v LIMIT 3

表格

可视化

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



: October 28, 2022

### 14.3.5 Schema

Studio NebulaGraph

**Schema**

**Schema**

- Studio NebulaGraph
- NebulaGraph user
- NebulaGraph root

#### 1. **Schema**

2. +

- basketballplayer

• <b>vid type</b>	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:

```
1 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>

Below the table are navigation buttons: <, 1 (highlighted with a blue box), and >. To the right of the table, there are additional buttons for 'Schema' and 'Clone Graph Space'.

3.

## Schema

- Tag
- Edge type
- 

: August 9, 2022

**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** **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\_COL    TTL\_DURATION            TTL

**Note**

TTL            TTL

TAG

**Danger**

Tag

1.            **Schema**  
2.            **Schema**  
3.  
4.        Tag                        
5.

Tag

: August 9, 2022

**Edge type**

NebulaGraph	Edge type	<b>Schema</b>	Edge type	<b>Schema</b>	Edge type
-------------	-----------	---------------	-----------	---------------	-----------

Studio	Edge type
--------	-----------

- Studio      NebulaGraph

- 

- GOD ADMIN    DBA

1.      **Schema**

2.      **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). Each property is nullable (checked) and has a default value field. A checkbox for setting TTL is present but unchecked. Below the properties, the corresponding nGQL create statement is shown:

```

1 CREATE edge `serve` (`start_year` int NULL , `end_year` int NULL , `teamID` string NULL , `playerID` string NULL)

```

At the bottom are '取消' (Cancel) and '创建' (Create) buttons.

7.

Edge Type

Edge type

## EDGE TYPE

**Schema** Edge type

1. **Schema**

**Schema**

3.

4.



Edge Type

5.

•

•

•

•

+

• TTL **TTL** **TTL**

• TTL **TTL** **TTL** **TTL**

• TTL **TTL** **TTL** **TTL** **TTL\_COL** **TTL\_DURATION** **TTL**



Note

TTL **TTL**

## EDGE TYPE



Edge type

1. **Schema**

**Schema**

3.

4.

Edge type



Edge type

: August 9, 2022

Tag Edge type

**Schema**

**Schema**



Tag Edge type

Studio

- Studio NebulaGraph
- Tag Edge type
- GOD ADMIN DBA

#### 1. **Schema**

**Schema**

3.

4. +

5.

a. **Tag Edge type Edge type**

b. Tag Edge type **follow**

**follow\_index**

d.

e. +

degree



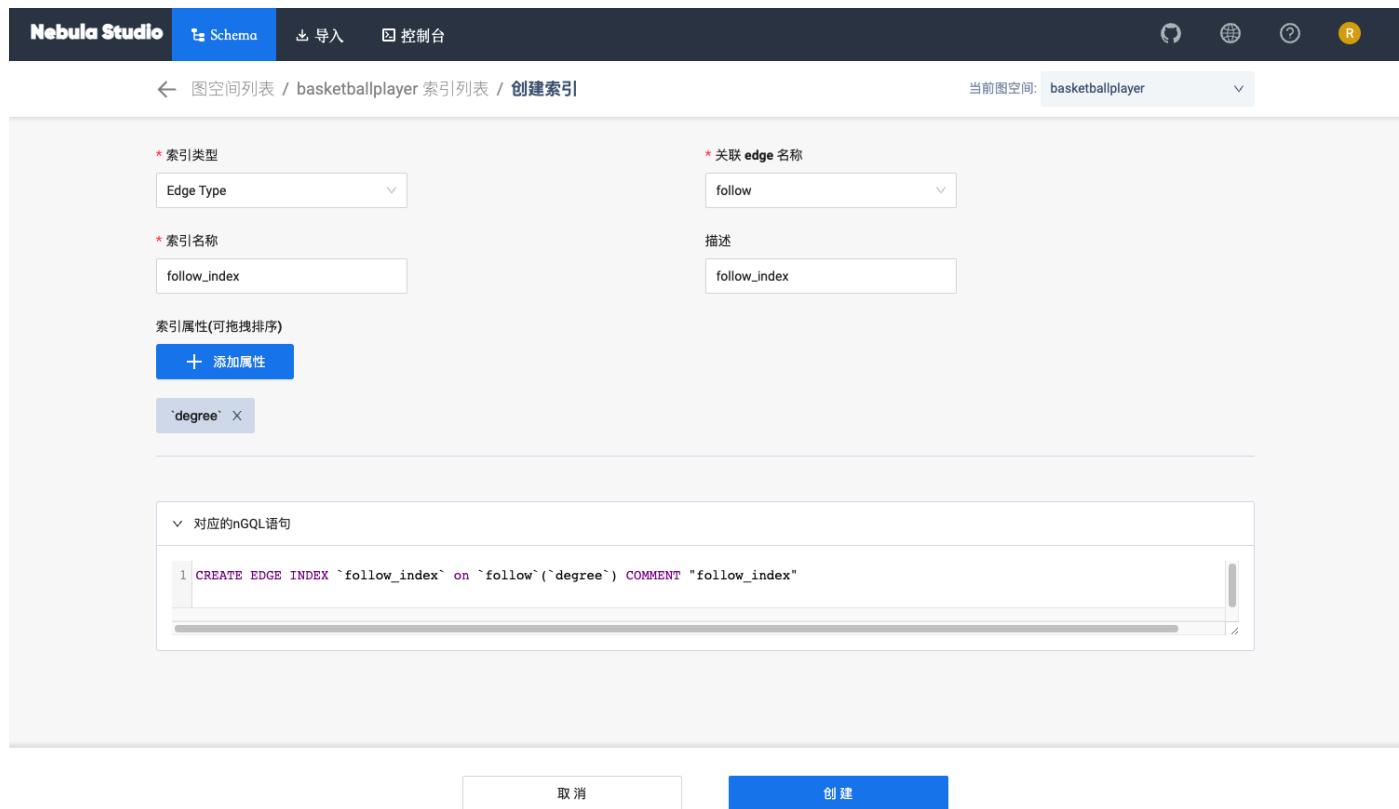
LOOKUP

**LOOKUP**

6.

**nGQL**

nGQL



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.
- 

: August 9, 2022

**Schema**

Studio      Schema

1.      **Schema****Schema**3.      **Schema**      **Schema**

- Schema DDL      Schema      Tag Edge type
  - Schema
  - Schema
- 

:January 30, 2023

### 14.3.6 Schema

Studio Schema Schema Schema

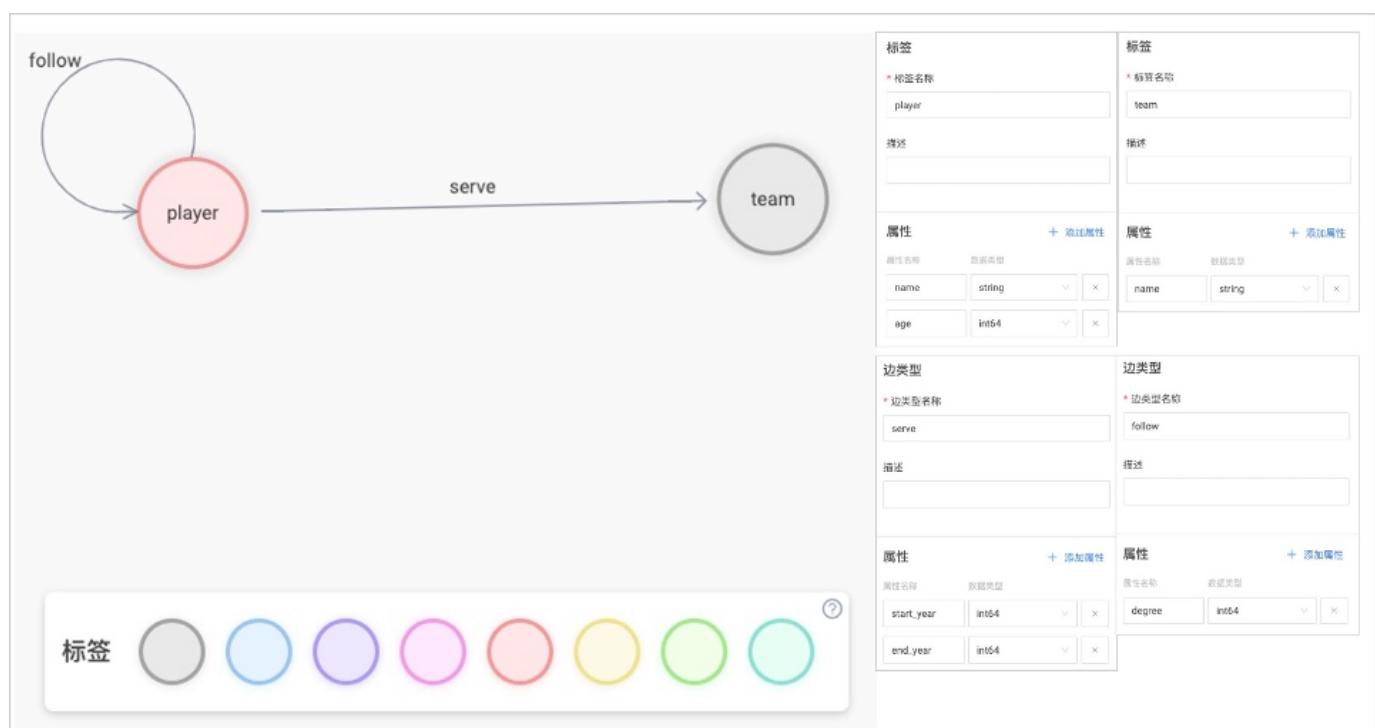
- Schema
- Schema
- Schema PNG



#### 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



- CREATE SPACE
- Schema

**Schema**

Schema



Schema

**Schema**

Schema

**Schema**

Schema PNG

: October 28, 2022

## 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**

: August 9, 2022

## 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 ngin ...	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

: August 9, 2022

### 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.
- 

: August 9, 2022

## 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>
3.4.0 ~ 3.4.1	3.4.0 3.2.0
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

: March 13, 2023

## 15.2 Dashboard

TAR NebulaGraph Dashboard  
[Dashboard](#) [GitHub NebulaGraph dashboard](#)

### 15.2.1

- Dashboard
- NebulaGraph [NebulaGraph](#)
  - 9200
  - 9100
  - 9090
  - 8090
  - 7003
  - node-exporter [Prometheus](#)

### 15.2.2

1. TAR [nebula-dashboard-3.4.0.x86\\_64.tar.gz](#)
  2. tar -xvf nebula-dashboard-3.4.0.x86\_64.tar.gz
  3. nebula-dashboard config.yaml
- 4

nebula-http-gateway	8090	HTTP	nGQL	NebulaGraph
nebula-stats-exporter	9200	IP		
node-exporter	9100	CPU		
prometheus	9090			

```
port: 7003 # Web
gateway:
 ip: hostIP # Dashboard IP
 port: 8090
 https: false # HTTPS
 runmode: dev # dev test prod
stats-exporter:
 ip: hostIP # Dashboard IP
 nebulaPort: 9200
 https: false # HTTPS
node-exporter:
 - ip: nebulaHostIP_1 # NebulaGraph IP
 port: 9100
 https: false # HTTPS
 # - ip: nebulaHostIP_2
 # port: 9100
 # https: false
prometheus:
 ip: hostIP # Dashboard IP
 prometheusPort: 9090
 https: false # HTTPS
 scrape_interval: 5s # 1
 evaluation_interval: 5s # 1
#
nebula-cluster:
```

```

name: 'default' #
metad:
- name: metad0
 endpointIP: nebulaMetadIP # Meta IP
 port: 9559
 endpointPort: 19559
- name: metad1
endpointIP: nebulaMetadIP
port: 9559
endpointPort: 19559
graphd:
- name: graphd0
 endpointIP: nebulaGraphdIP # Graph IP
 port: 9669
 endpointPort: 19669
- name: graphd1
endpointIP: nebulaGraphdIP
port: 9669
endpointPort: 19669
storaged:
- name: storaged0
 endpointIP: nebulaStorageIP # Storage IP
 port: 9779
 endpointPort: 19779
- name: storaged1
endpointIP: nebulaStorageIP
port: 9779
endpointPort: 19779

```

4. ./dashboard.service start all

Dashboard

config.yaml

docker-compose up -d



config.yaml

docker-compose.yaml

docker-compose stop

Dashboard

### 15.2.3 Dashboard

Dashboard

dashboard.service

```
sudo <dashboard_path>/dashboard.service
[-v] [-h]
<start|restart|stop|status> <prometheus|webserver|exporter|gateway|all>
```

dashboard_path	Dashboard
-v	
-h	
start	
restart	
stop	
status	
prometheus	prometheus
webserver	webserver
exporter	exporter
gateway	gateway
all	

### Note

Dashboard      ./dashboard.service -version

## 15.2.4

### Dashboard

: February 7, 2023

## 15.3 Dashboard

---

Dashboard

Dashboard

### 15.3.1

---

- Dashboard **Dashboard**
- Chrome 89      Chrome

### 15.3.2

---

1. Dashboard IP <IP>:7003
2. NebulaGraph
  - NebulaGraph      Dashboard
  - NebulaGraph      root      Dashboard

3.

---

: February 7, 2023

## 15.4 Dashboard

### Dashboard

#### 15.4.1



#### 15.4.2

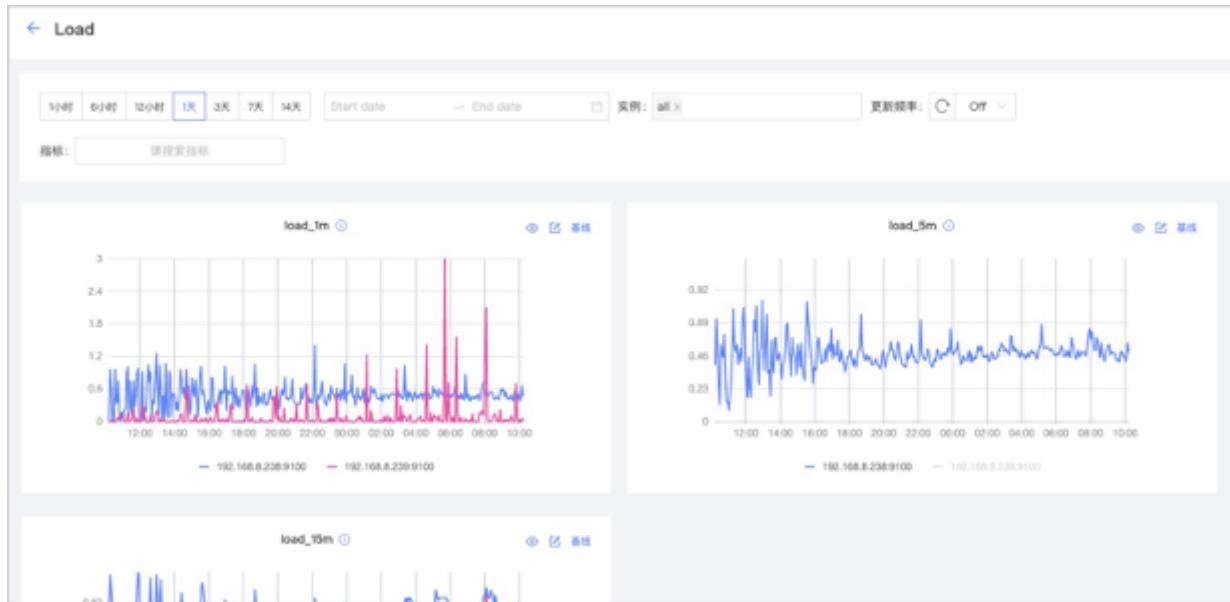
->

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	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	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

版本	详情
Graph Service	
服务	版本
192.168.8.129:9669	3.1.0-enterprise
Storage Service	
服务	版本
192.168.8.129:9779	3.1.0-enterprise
Meta Service	
服务	版本
192.168.8.129:9559	3.1.0-enterprise

## 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

## 15.4.5

- 
- 
- Dashboard
- 
- 

: February 7, 2023

## 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_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_trnx_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				

## Graph Meta Storage

context\_switches\_total

cpu\_seconds\_total CPU

memory\_bytes\_gauge

open\_filedesc\_gauge

read\_bytes\_total

write\_bytes\_total

---

: October 19, 2022

# 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 area has several sections: '集群总览' (Cluster Overview) with a '集群概况' (Cluster Summary) card showing 1 node, 1 running Graphd service, 1 running Storage service, and 1 running Metad service; '节点监控' (Node Monitoring) with a CPU usage chart; '服务监控' (Service Monitoring) with two line charts for 'num\_queries' and 'num\_slow\_queries'; '告警' (Alerts) with a message '没有数据'; '集群信息' (Cluster Information) with details like name, creation time, and version; and '状态列表' (Status List) for 'Graph 服务'.

### 16.1.1

- NebulaGraph
- 
- 
- 
- 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>
3.4.0 ~ 3.4.1	3.4.2 3.4.1 3.4.0 3.2.4 3.2.3 3.2.2 3.2.1 3.2.0
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

: March 27, 2023

## 16.2 Dashboard

Dashboard

### 16.2.1

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**

### 16.2.2 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-3.4.2.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 # console file console webserver.log file access.log error.log severe.log slow.log stat.log
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

### 16.2.3 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
```

RPM Dashboard

```
sudo rpm -e <package_name>
```

## 16.2.4 DEB

### 1. DEB

 **Enterpriseonly**

Dashboard

### 2. sudo dpkg -i <package\_name> DEB

Dashboard

/usr/local/nebula-dashboard-ent

```
sudo dpkg -i nebula-dashboard-ent-3.4.2.ubuntu1804.amd64.deb
```

 **Note**

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
```

DEB Dashboard

```
sudo dpkg -r <package_name>
```

## 16.2.5 Dashboard

Dashboard dashboard.service

```
sudo <dashboard_path>/scripts/dashboard.service
[-v] [-h]
<start|restart|stop|status> <prometheus|webserver|exporter|gateway|all>
```

dashboard_path	Dashboard
-v	
-h	
start	
restart	
stop	
status	
prometheus	prometheus
webserver	webserver
exporter	exporter
gateway	gateway
all	

### Note

Dashboard      `./dashboard.service -version`

## 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
```

## 16.2.6

logs      Dashboard

```
cat logs/prometheus.log
```

alertmanager.log	Alertmanager
nebula-stats-exporter.log	nebula-stats-exporter
prometheus.log	Prometheus
<hr/>	
webserver.log	Dashboard      Dashboard      Log.Mode    console
access.log	Dashboard      Log.Mode    file
error.log	Dashboard      Log.Mode    file
severe.log	Dashboard      Log.Mode    file
slow.log	Dashboard      Log.Mode    file
stat.log	Dashboard      Log.Mode    file

## 16.2.7

---

### Dashboard

---

: February 2, 2023

## 16.3 Dashboard

Dashboard

Dashboard

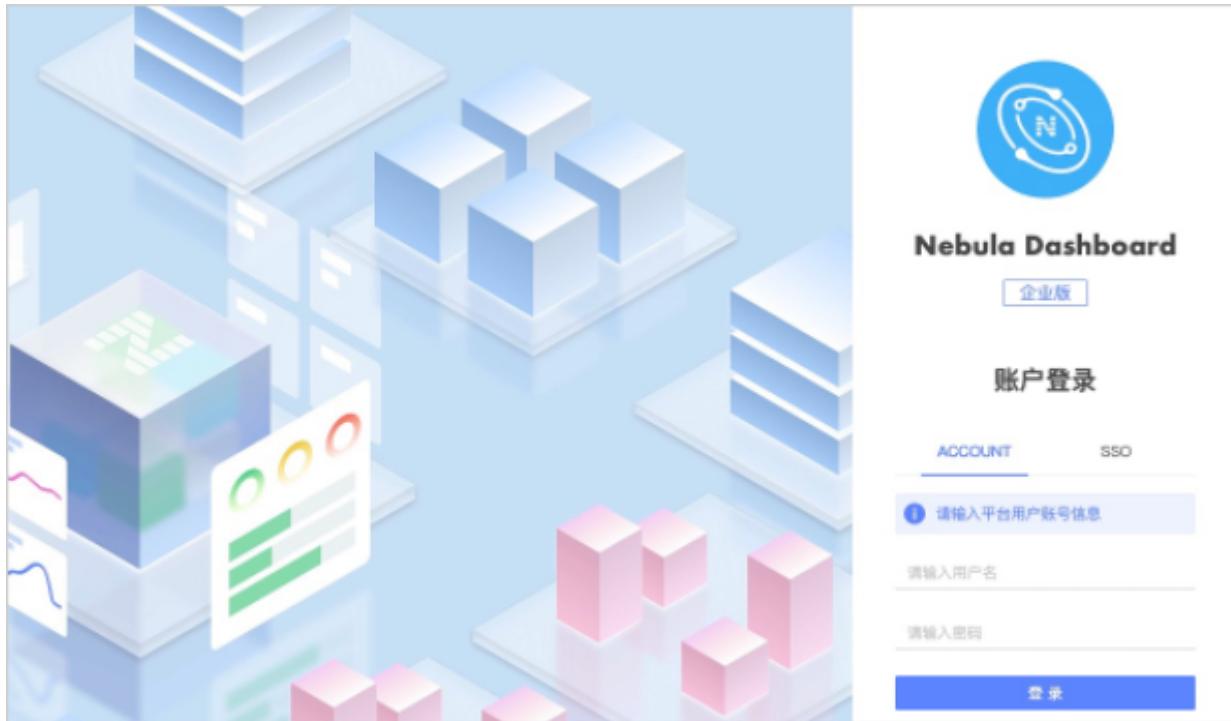
### 16.3.1

- Dashboard **Dashboard**
- Chrome 89 Chrome

### 16.3.2

1. Dashboard IP [http://<ip\\_address>:7005](http://<ip_address>:7005)

Dashboard



NebulaGraph Dashboard

2. nebula nebula Dashboard



Dashboard LDAP OAuth2.0

Dashboard

: December 15, 2022

## 16.4 NebulaGraph Dashboard License

License                   NebulaGraph Dashboard                   License                   NebulaGraph Dashboard                   NebulaGraph  
Dashboard           License

### 16.4.1

- License    NebulaGraph Dashboard
- License        License
- License
- License        14
- 30
- 14
- 14

### 16.4.2

NebulaGraph Dashboard            License



**NebulaGraph Dashboard        30        License**

### 16.4.3 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	

### 16.4.4

NebulaGraph Dashboard    License    **Dashboard**

### 16.4.5

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

: November 1, 2022

## 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

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"/>	<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>

2 [自动添加服务](#) [添加 Meta](#) [添加 Graph](#) [添加Storage](#)

5. Meta Graph Storage HTTP

6.

7. installing 3-10 healthy unhealthy

---

: December 15, 2022

## 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.

---

: August 9, 2022

## 16.6

### 16.6.1

Dashboard

Dashboard

Dashboard

- 
- 
- 
- 
- 
- 

Graphd Storaged Metad

emergency > critical > warning 5

- NebulaGraph
- NebulaGraph
- NebulaGraph License

 **Enterpriseonly**

NebulaGraph

- NebulaGraph Dashboard
- NebulaGraph



 **Enterpriseonly**

NebulaGraph

- License License
- **License** License

- CPU



- `query_latency_us` `slow_query_latency_us`



---

: September 8, 2022

## 16.6.2

Dashboard

Dashboard

-> ->

CPU Memory Load Disk Network In/Out

• 14      1    6    12    1    3    7    14

•

•



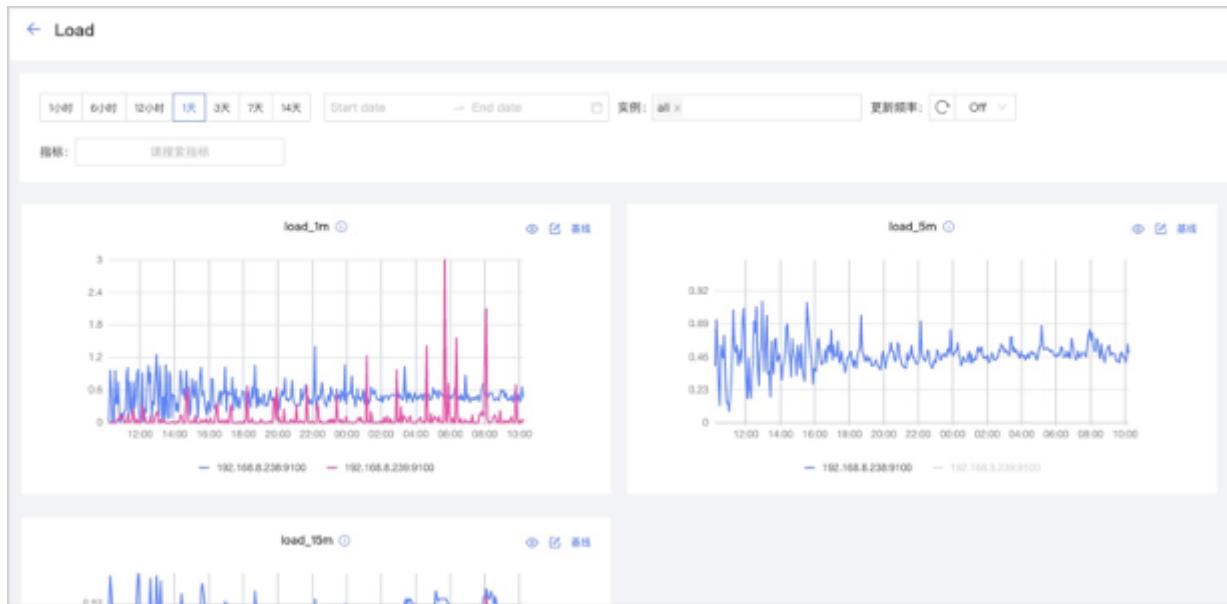
•



•



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
- 

: December 15, 2022

### 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**





2



Webhook      Webhook      Webhook

1. Dashboard
  2.                  ->
  3.
    - **Mail**
    - **Webhook**,    Webhook      Webhook
- 

: February 2, 2023

## 16.6.4

DBA

NebulaGraph Dashboard

- 
- 

NebulaGraph Graph enable\_record\_slow\_query = true **Graph**

1. Dashboard

2.

3. ->

μs

running killing

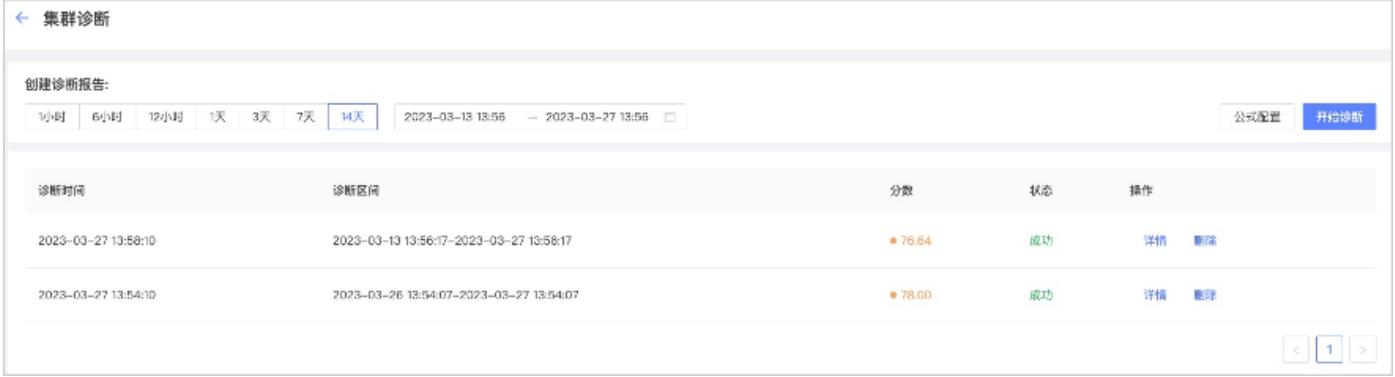
μs

DDL DQL DML DCL UTIL UNKNOWN

DBA

Note

: April 10, 2023

- - Session
  -
1. Dashboard
- 2.
3. ->
1. 
-  Caution
- 2.
- ```
weight    weight(value>conditionValue , weightValue)
(value - conditionValue * timeRange)/((maxValue - conditionValue) * timeRange) * weightValue
```
- value
 - conditionValue
 - timeRange avg 1
 - maxValue 100 conditionValue 2
- ```
weight(hit_memory_times > 10 * days, 10) 2 hit_memory_times = 40 (40 - 10 * 2)/((10*2 - 10) * 2) * 10 = 10
```
3. 
- 4.

- 
- 
- CPU
- 
- Host
- CPU
- 
- Session
- Graph Meta Storage
- 
- 

[HTML](#) [PDF](#)

---

: April 10, 2023

## 16.6.5

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
无数据	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

- **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
- **Balance Data**
- **Balance Data Remove** Storage Storage Storage IP

Partition ID	
Leader	leader IP
Peers	IP
Losts	IP

ID

: September 8, 2022

## Dashboard



NebulaGraph 3.4.0 NebulaGraph 3.3.0

1. Dashboard
  - 2.
  3. ->
  4. Graph NebulaGraph Dashboard
  - 5.



- STOPPED BALANCE DATA

: February 7, 2023

[NebulaGraph](#)[Graph](#)[Dashboard](#) **Enterprise only**

NebulaGraph

1. Dashboard

2.

3. -&gt;

 **Note**

Graph

•

•

•

•

•

3

:January 17, 2023

DBA

DBA

Dashboard

1. Dashboard

2.

3. ->

 Note

- 
- 
- 
- 3

---

: March 13, 2023

16.6.6

Host    SSH            CPU

1. Dashboard
  - 2.
  3. ->

Host      SSH      SSH

- SSH
  - SSH



### Balance Data   Balance Leader



- • •

: October 28, 2022

**Graph      Storage**

NebulaGraph

1. Dashboard

2.

3. -&gt;



Balance Data Balance Leader

CSV

CSV

1.

**X**

2.



3.



- graphd storaged metad
- 
- Storage Balance Data Remove

192.168.8.143 192.168.8.167 Storage      192.168.8.169 Graph

节点: 已添加3个节点

添加节点		批量导入节点					添加 Graph			添加Storage		重置
节点名称	节点Host	CPU(核)	内存(GB)	磁盘(GB)	服务类型							
<input type="checkbox"/> 无	192.168.8.169	4	8.01	73.4	Graphd	Metad	Storage	<input type="button" value="x"/>	<input type="button" value="删除"/>	<input type="button" value="重置"/>		
<input checked="" type="checkbox"/> 无	192.168.8.143	4	8.01	41.94	Graphd	<input type="button" value="x"/>	Storage	<input type="button" value="x"/>	<input type="button" value="删除"/>	<input type="button" value="重置"/>		
<input checked="" type="checkbox"/> 无	192.168.8.167	4	8.01	73.4	Graphd	<input type="button" value="x"/>	Storage	<input type="button" value="x"/>	<input type="button" value="删除"/>	<input type="button" value="重置"/>		

服务:

 meta 服务

Host	端口号	操作
192.168.8.169	9559 19559 19560	<input type="button" value="编辑"/>

 graph 服务

Host	端口号	操作
192.168.8.169	9669 19669 19670	<input type="button" value="编辑"/>
192.168.8.143	9669 19669 19670	<input type="button" value="编辑"/>
192.168.8.167	9669 19669 19670	<input type="button" value="编辑"/>

 storage 服务

Host	端口号	操作
192.168.8.169	9779 19779 19780	<input type="button" value="编辑"/>
192.168.8.143	9779 19779 19780	<input type="button" value="编辑"/>
192.168.8.167	9779 19779 19780	<input type="button" value="编辑"/>

: October 28, 2022

Host

1. Dashboard

2.

3. ->

 Danger

/

•

•

•



•

---

: February 2, 2023

1. Dashboard

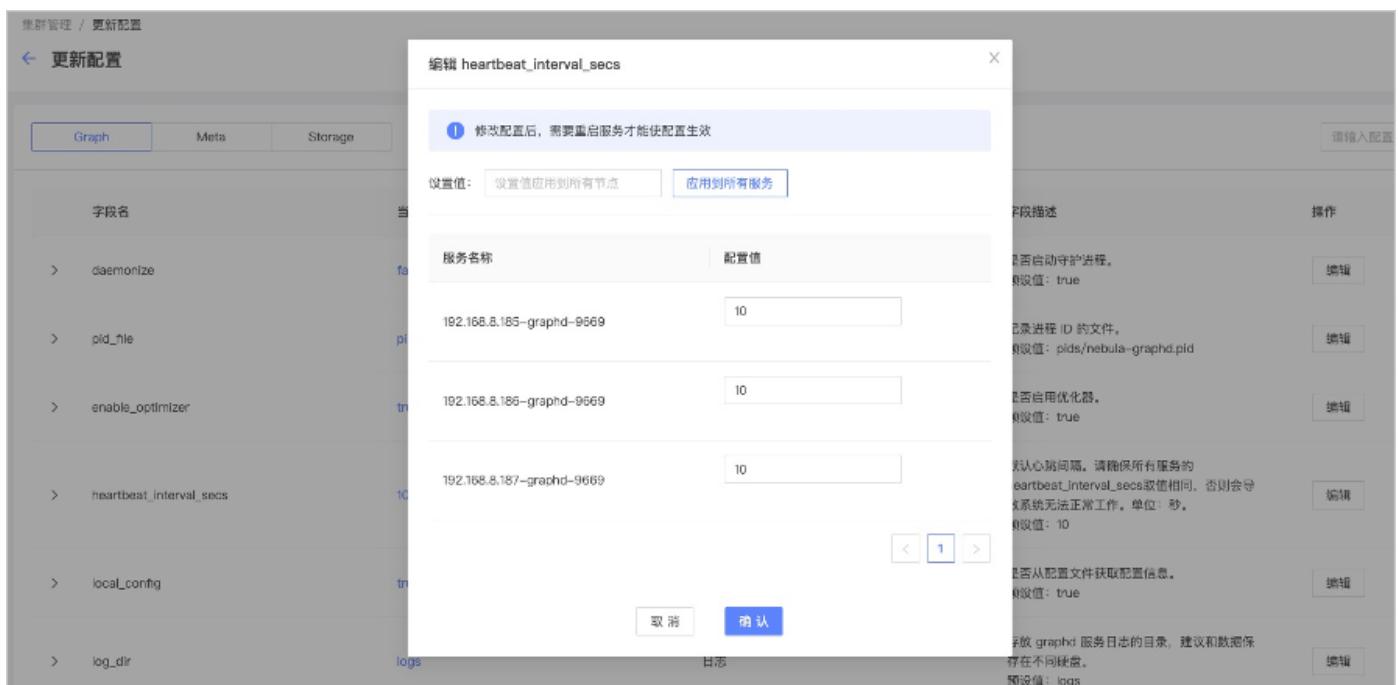
2.

3. ->

1.

2.

3.



4.

Danger

: January 9, 2023

owner owner operator

1. Dashboard

2.

3. ->

•



Dashboard

•



• owner owner

---

: September 8, 2022

[Dashboard](#)[NebulaGraph](#)

- 
- 
- 



- **3.0.0** NebulaGraph      **3.2.1**      **3.3.0**
- 
- License
- 

1. Dashboard

2.

3.           ->

4.           **NebulaGraph**



5.           Dashboard    License      NebulaGraph



NebulaGraph

6.

7.           **NebulaGraph**      **NebulaGraph**  
version update

: March 13, 2023

NebulaGraph Dashboard

NebulaGraph

UI

NebulaGraph Backup & 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.  
6.

- NebulaGraph
- 
- QPS 0 QPS 0



NebulaGraph

7.

The screenshot shows the Amazon S3 backup list interface. It displays a single successful backup job named "BACKUP\_2022\_12\_26\_03\_04\_44". The backup was completed at 2022-12-26 11:04:44 and is located at s3://nebula-br-test/. The status is "success". The backup type is "全数据库" (Full Database). The storage class is "s3". The "操作" (Operations) section includes links for "恢复" (Restore), "恢复历史" (Restore History), "查看日志" (View Log), and "删除" (Delete).



8.

s3://nebula-br-test

- Amazon S3:

The screenshot shows the Amazon S3 bucket details for "nebula-br-test". The "Objects" tab is selected, showing 46 objects. One object, "BACKUP\_2022\_06\_20\_03", is highlighted. The table lists the object name, type, last modified date, size, and storage class. The storage class is "Standard".

- OSS:

The screenshot shows the OSS bucket details for "oss://nebula-br-test/". The table lists objects by name, type, last modified, and size. One object, "BACKUP\_2022\_06\_21\_14\_35\_58", is highlighted. The "操作" (Operations) column includes links for "下载" (Download) and "删除" (Delete).



1.  
2.  
3.  
4.

**Note**

5.

- NebulaGraph
- 
- QPS 0 QPS 0

**Note****Caution**

- 
- 
-

1.  
2.  
3.

- NebulaGraph

- 
- 
- 4.

备份列表		恢复列表						S3配置
Q 请输入备份名称		请选择状态		1小时	6小时	1天	30天	2022-05-28 14:08 → 2022-06-27 14:08
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

: March 27, 2023

## 16.6.7

Dashboard

Dashboard

1    6    12    1    3    7    14

---

: May 30, 2022

## 16.6.8

Dashboard

Dashboard

•

• NebulaGraph

 Note

•

• NebulaGraph

 Note

---

: August 9, 2022

## 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

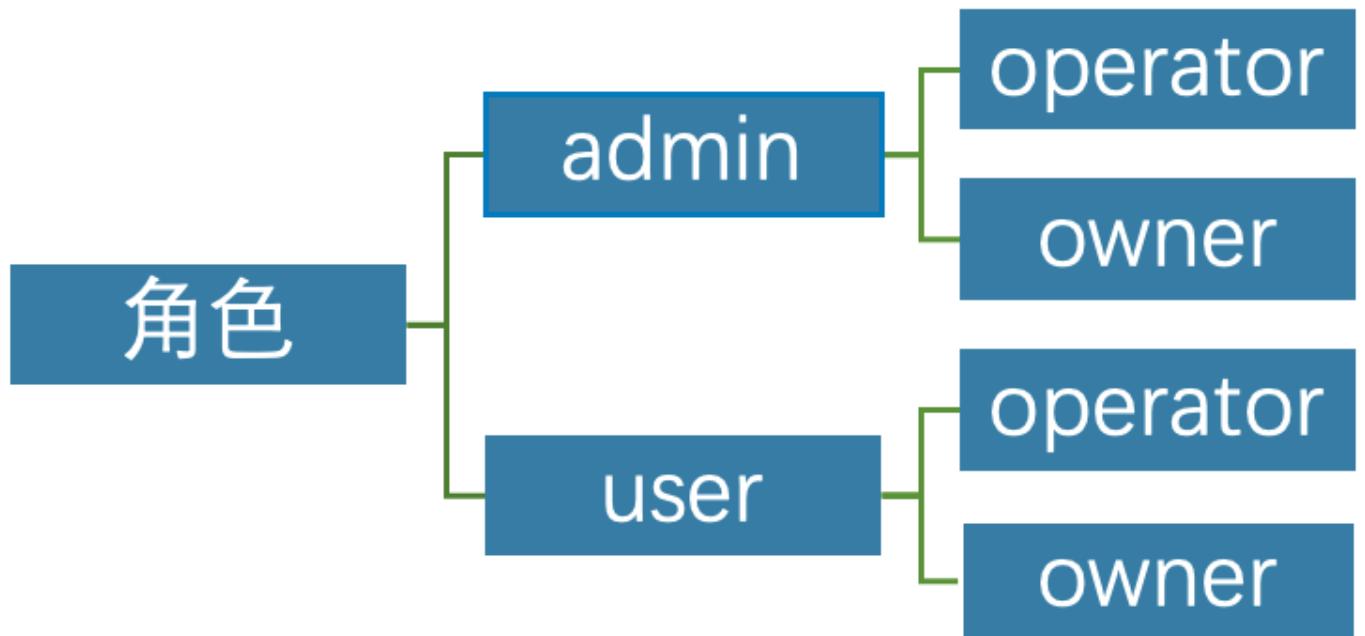
Dashboard

### 16.7.2

Dashboard

admin user

owner operator



admin

- 1.
- 2.
- 3.
- 4.

1. admin
2. admin operator
3. admin user operator
4. owner admin user  
admin

user

- 1.
2. admin user
3. owner

- 1.
2. user

operator

- 1.
- 2.
- 3.
- 4.

- 1.
2. operator

owner

1. operator
- 2.
3. operator
4. owner

### 16.7.3

admin

1. Dashboard

2.

- LDAP OAuth2.0  
Dashboard

**Accept**

Dashboard



LDAP

LDAP

Dashboard

user

•

### 16.7.4

- 
- **ldap oauth2.0 platform platform**
- **admin user**
- owner
- 

### 16.7.5

- A blue square icon with a white pencil and paper symbol.
- A red square icon with a white trash can symbol.

: February 2, 2023

## 16.8

---

NebulaGraph Dashboard

### 16.8.1

---

- 
- 

### 16.8.2

---

- **install**
- **scale**
- **version update**
- **package upload**
- **package download**
- **package deploy**

### 16.8.3

---

NebulaGraph Dashboard

### 16.8.4

---

- ID
- 

### 16.8.5

---

- 
- 

---

: February 2, 2023

## 16.9

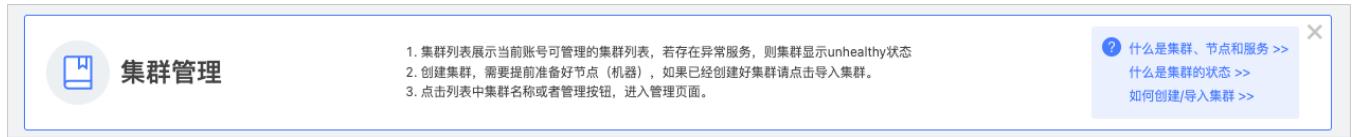
### 16.9.1

Logo

1. Dashboard

2.

- Logo
- 
- 



: December 30, 2022

## 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

: September 8, 2022

### 16.9.3

NebulaGraph Dashboard

LDAP

OAuth2.0

Dashboard

LDAP

OAuth2.0



- 

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

LDAP 2 LDAP

- 
- LDAP Dashboard user

#### 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 Username Key      scope

## OAuth2.0

---

: February 2, 2023

## 16.9.4

NebulaGraph Dashboard

NebulaGraph

- admin
- 

### 1. Dashboard

2.

平台设置 /

← 安装包管理

操作	创建时间	大小	版本	安装包名称
<button>删除</button>	2022-06-07 10:36:25	64.40MB	社区版-v2.6.2	nebula-graph-2.6.2.el7.x86_64.rpm
<button>删除</button>	2022-06-07 10:36:26	83.57MB	社区版-v2.6.2	nebula-graph-2.6.2.ubuntu1804.amd64.deb
<button>删除</button>	2022-03-29 10:18:03	69.58MB	社区版-v3.0.2	nebula-graph-3.0.2.el7.x86_64.rpm
<button>删除</button>	2022-06-07 11:03:04	70.53MB	社区版-v3.1.0	nebula-graph-3.1.0.el7.x86_64.rpm
<button>删除</button>	2022-06-07 10:36:29	92.60MB	社区版-v3.1.0	nebula-graph-3.1.0.ubuntu1804.amd64.deb

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

---

: November 1, 2022

## 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_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_trnx_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				

## Graph Meta Storage

context\_switches\_total

cpu\_seconds\_total CPU

memory\_bytes\_gauge

open\_filedesc\_gauge

read\_bytes\_total

write\_bytes\_total

---

: October 19, 2022

## 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

---

: August 9, 2022

# 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      **root**      Explorer

NebulaGraph      Explorer

NebulaGraph      **NebulaGraph**

## 17.1.4

NebulaGraph      Explorer

<b>NebulaGraph</b>	<b>Explorer</b>
3.4.0 ~ 3.4.1	3.4.0 3.2.1 3.2.0
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

: March 13, 2023

## 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](#)



License License [Nebula Explorer](#)

- HDFS namenode 8020 datanode 50010



HDFS

Explorer 3.2.0 Dag Controller Dag Controller Dag Controller Explorer  
**Workflow**

#### RPM

1. RPM



Explorer

2. `sudo rpm -i <rpm>` RPM  
 Explorer /usr/local/nebula-explorer

```
sudo rpm -i nebula-explorer-<version>.x86_64.rpm
```

```
--prefix
```

```
sudo rpm -i nebula-explorer-<version>.x86_64.rpm --prefix=<path>
```

3. License

```
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 ./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-<version>.x86_64
```

## DEB

1. DEB

 **Enterpriseonly**

Explorer

2. `sudo dpkg -i <package_name>` DEB

Explorer /usr/local/nebula-explorer

```
sudo dpkg -i nebula-explorer-3.4.0.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

**⑤Enterpriseonly**

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-----
MIGJAQGBANXHSR4gyaZXuet7...
-----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
```

[Explorer](#)

---

:January 17, 2023

## 17.2.2

Explorer      NebulaGraph      OAuth2.0

### NebulaGraph

- Explorer      [Explorer](#)
- NebulaGraph    Graph      IP      9669
- NebulaGraph
- Chrome 89      Chrome

### OAuth2.0



OAuth2.0      Beta



OAuth2.0      Explorer      config/app-config.yaml

### OAuth

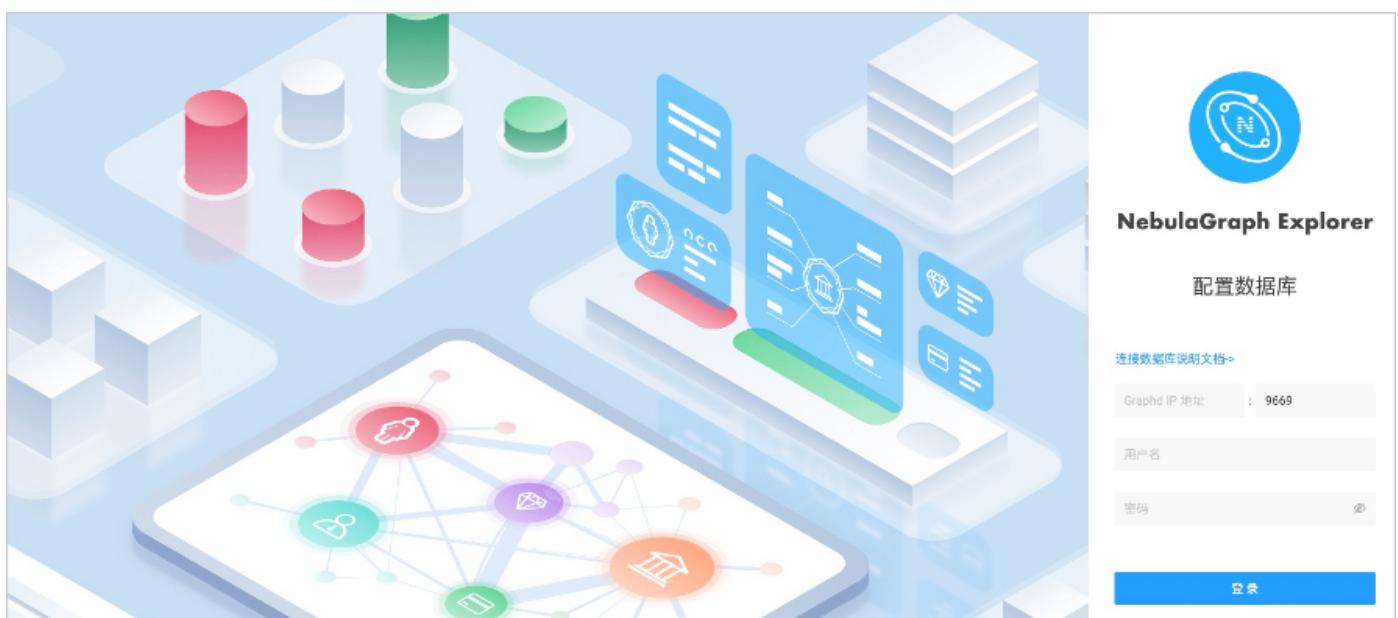
Enable	false	OAuth2.0
ClientID	4953xxx- mmnoge13xx.apps.googleusercontent.com	ClientId
ClientSecret	GOCxxx-xaytomFexxx	ClientSecret
RedirectURL	http://dashboard.vesoft-inc.com/login	Dashboard URL
AuthURL	https://accounts.google.com/o/oauth2/auth	URL
TokenURL	https://oauth2.googleapis.com/token	access_token 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.

[http://<ip\\_address>:7002](http://<ip_address>:7002)

Explorer



### Note

Nebula Explorer

2. Explorer

- **Graphd IP** NebulaGraph Graph IP 192.168.10.100

### Note

- NebulaGraph Explorer IP 127.0.0.1 localhost
- NebulaGraph NebulaGraph

- **Port** Graphd 9669

- NebulaGraph
- root
- GOD root nebula
- 

3.

### Note

30 30

[Explorer](#)[NebulaGraph](#)

---

: January 30, 2023

### 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-----
Rrjip5cxxxxxxxxxxxxx52kQ==
```

## 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

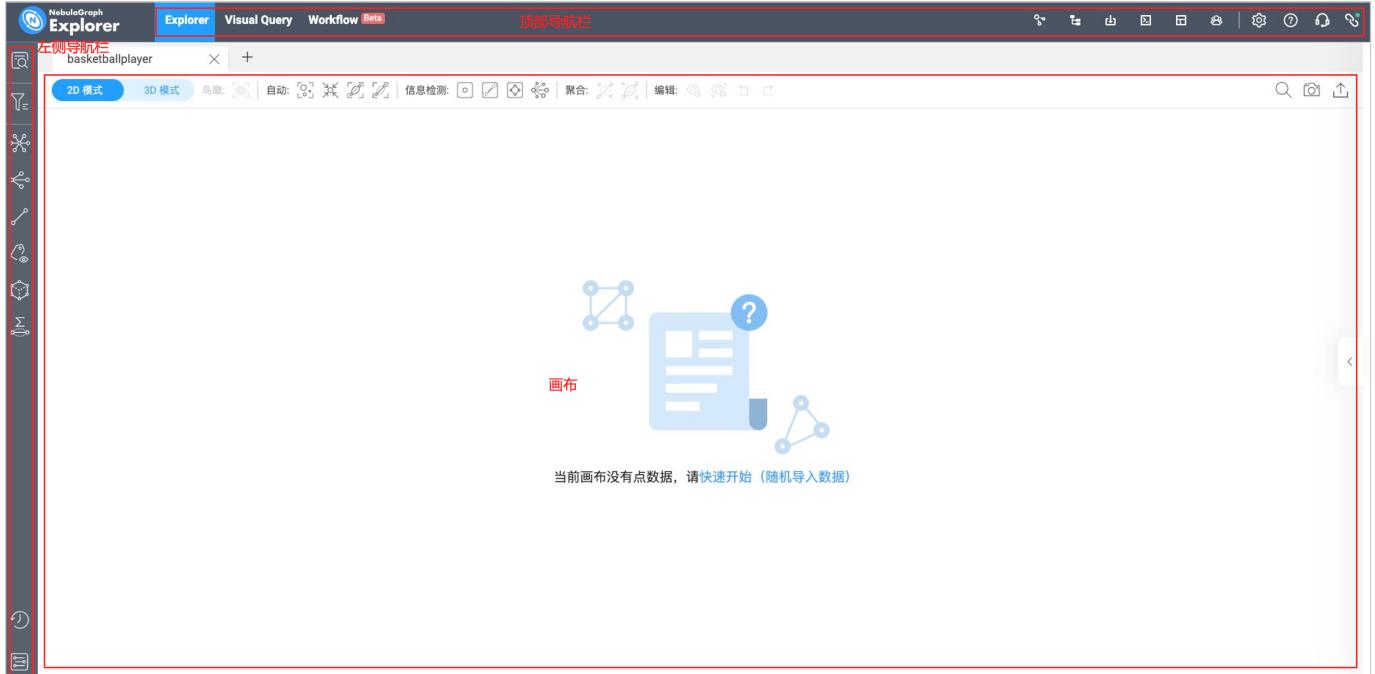
: November 1, 2022

## 17.3

NebulaGraph Explorer

NebulaGraph Explorer

NebulaGraph Explorer



### 17.3.1

/

#### Explorer

#### Visual Query

#### Workflow



Workflow



Schema

Schema



NebulaGraph

Schema



NebulaGraph



NebulaGraph

nGQL



nGQL



Explorer

Beta



NebulaGraph



NebulaGraph



### 17.3.2

#### Note

Explorer

Explorer



VID Tag



17.3.3

Note

Explorer

Explorer

- 
- 
- 
- 
- 
- 
- 

:January 11, 2023

## 17.4

### 17.4.1 Schema

Explorer   Schema

Schema

Schema

- Schema
- Schema
- Schema PNG

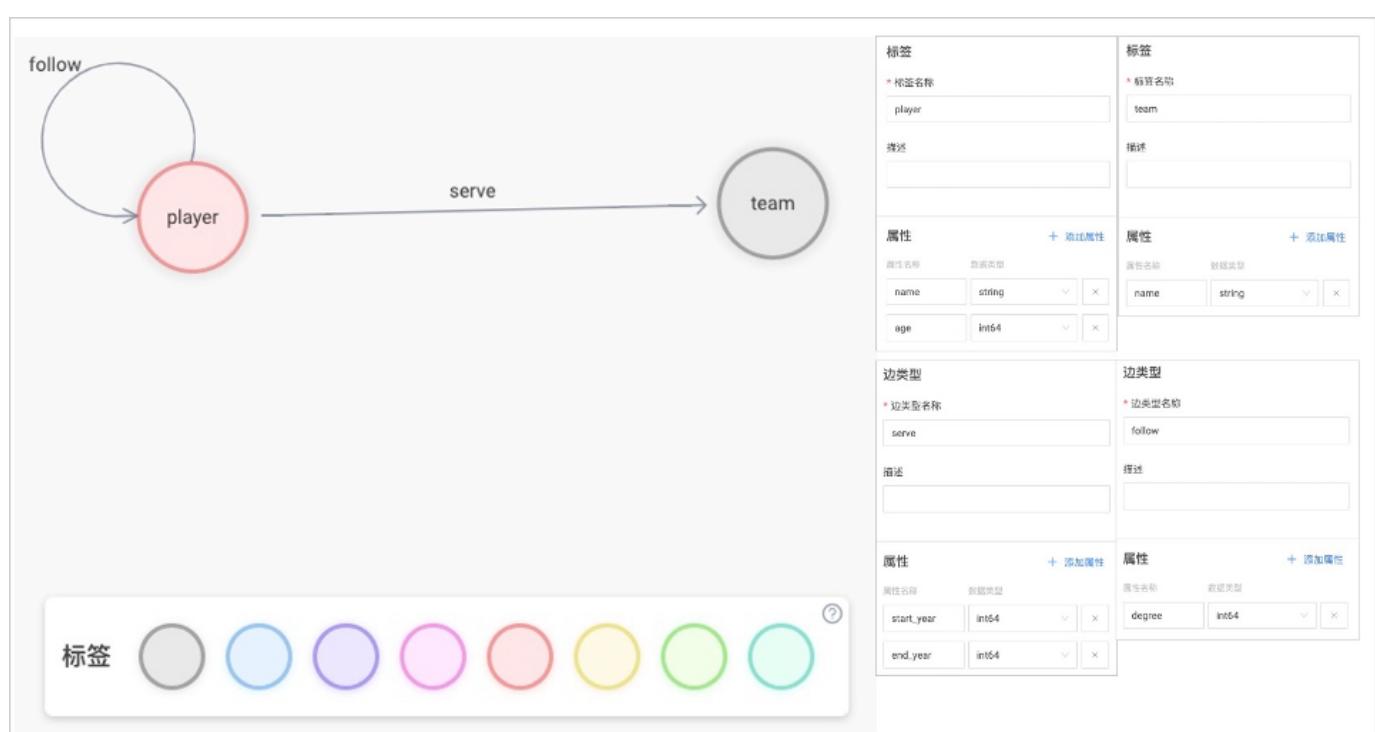


#### Schema

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

---

: December 15, 2022

## 17.4.2 Schema

Explorer      Schema



- Schema      Schema      **Schema**
  - nGQL      Schema
- 
- GOD ADMIN DBA      **NebulaGraph**
  - Schema



GOD      **Schema**



1.

2.      **CREATE SPACE**

3.

/

1.

**Schema**

2.

3.      **CREATE TAG CREATE EDGE**



TTL      **TTL**

4.

**Note**

- Tag Edge type
- 

1.

**Schema**

2.

3. **CREATE INDEX****Note**

LOOKUP

LOOKUP

4.

1.

**Schema**

2.

**Schema****Note****Schema**

1.

**Schema**2. **Schema**      **Schema**

- Schema DDL      Schema      Tag Edge type
- Schema
- Schema

:January 11, 2023

### 17.4.3

Explorer      CSV      NebulaGraph

- NebulaGraph      Schema
- CSV      Schema
- GOD ADMIN DBA      **NebulaGraph**



1.      CSV



CSV

2.      A small blue eye icon with a magnifying glass.

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  
basketballplayer

\* 任务名称  
test\_import

批处理量  
60

\* 关联点

+ 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

\* 关联边

+ 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

: December 15, 2022

## 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 red circle with the number 5.

The main area contains a code editor with the following query:

```
1 MATCH (v:player) RETURN v LIMIT 10;
```

Below the code editor is a green highlighted section containing the same query:

```
9 $ MATCH (v:player) RETURN v LIMIT 10;
```

To the right of the highlighted section are four small icons: a star, an up arrow, a down arrow, and a close button. On the far left of the code editor is a red circle with the number 7. To the right of the code editor is a red circle with the number 8.

On the left side of the interface, there is a sidebar with two buttons: a grid icon labeled "表格" (Table) and a visualization icon labeled "可视化" (Visualization). The "表格" button is highlighted with a red circle and the number 14. The "可视化" button is also highlighted with a red circle and the number 15.

The main results panel displays a list of 10 player nodes, each represented by a row of text:

- ("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 panel, there is a page navigation bar with the text "共计 10" and buttons for page numbers 1, <, and >. Below the results panel is a status bar with the text "执行时间消耗 0.002957 (s)" and two buttons: "保存为模板" and "导入图探索".

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		

: December 15, 2022

## 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.

- 
  - 
  - 
  - 
  - 
  - 
  - 
- 

: December 30, 2022

## 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

- 
- 
- IP root
- root
- 
- 
- 
- 
- 
- 

**Note**

:January 9, 2023

## 17.5

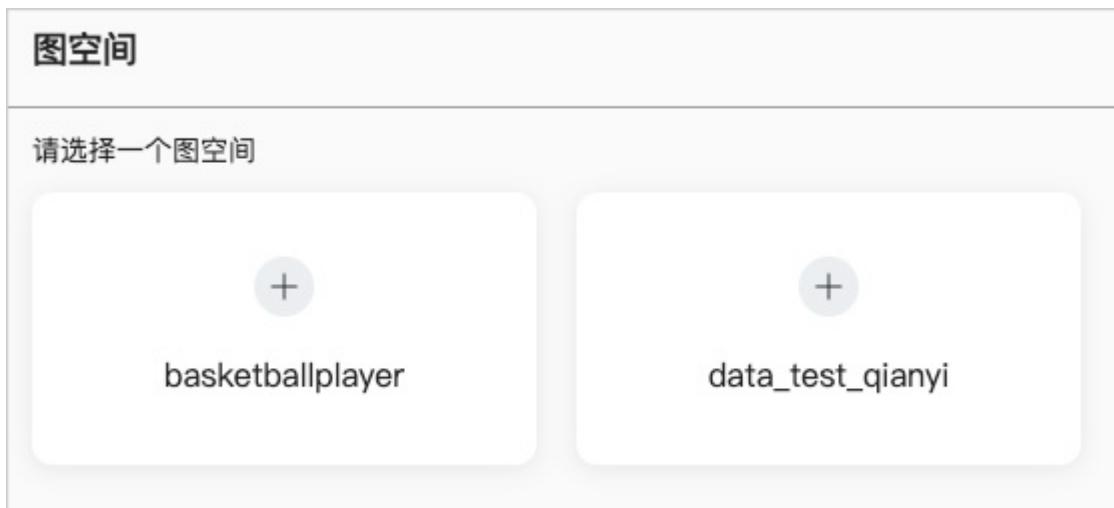
### 17.5.1

Explorer

Explorer

Explorer

Explorer



1.  
Explorer



2.

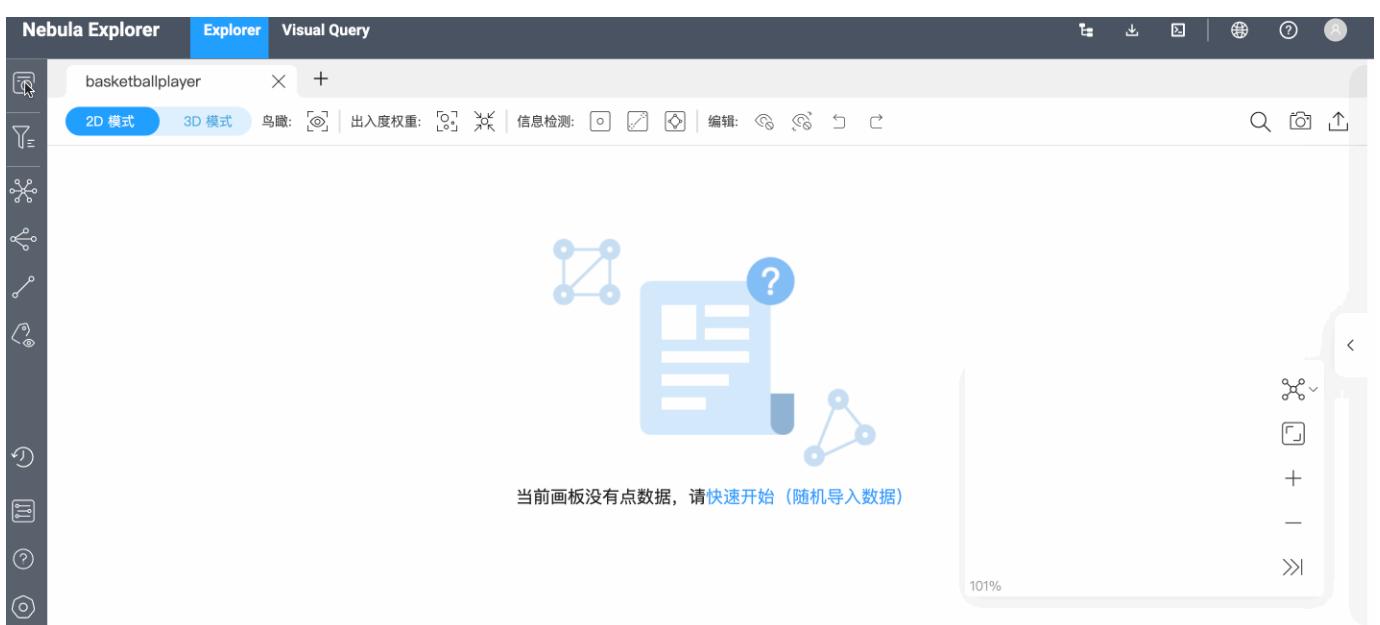
Note

: July 18, 2022

## 17.5.2



3.0.0 NebulaGraph



TAG

Tag

Note

Tag

Tag

10      30      40

**Tag 查询**

2D 模式    3D 模式            

\* Tag: player

结果数量限制: 10

\* 选择索引: player\_age\_index (age)

筛选条件 +

字段	运算符	值
age	>	30

AND

age	!=	40
-----	----	----

VID

VID

1

Note

VID VID Enter

VID Kings Suns 2 server like





: December 15, 2022

17.5.3

Tag

- **Tag**
  - Tag
  - Tag Tag
  - Tag Tag
  - Tag
  - Tag Tag Tag
  - Tag Tag
  - Tag

## 1 TAG PLAYER

1.

## 2. player

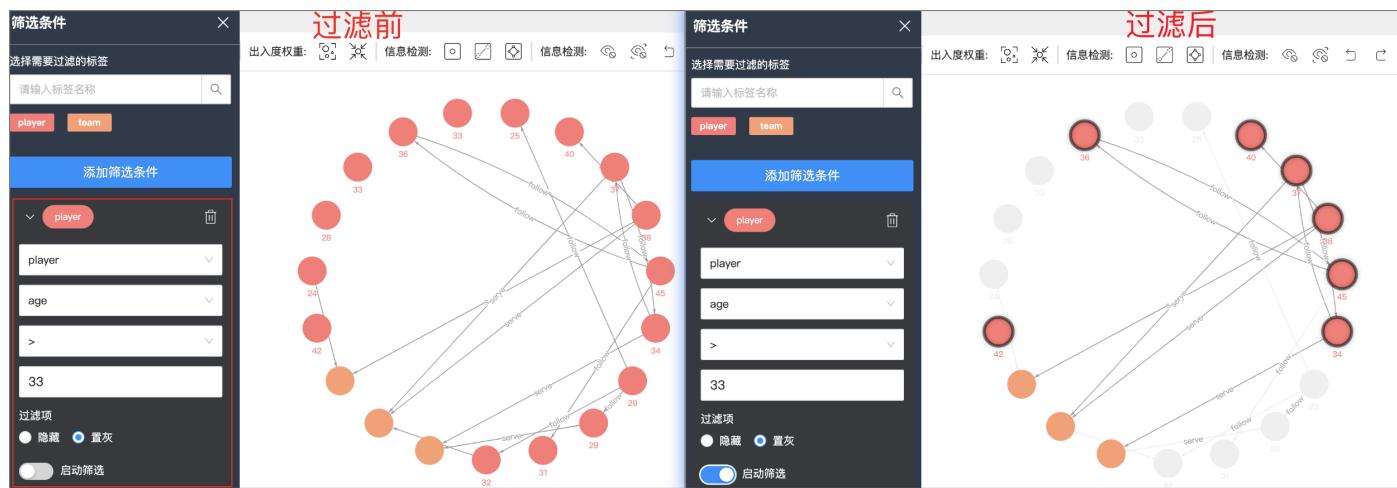
### 3. Tag team



33

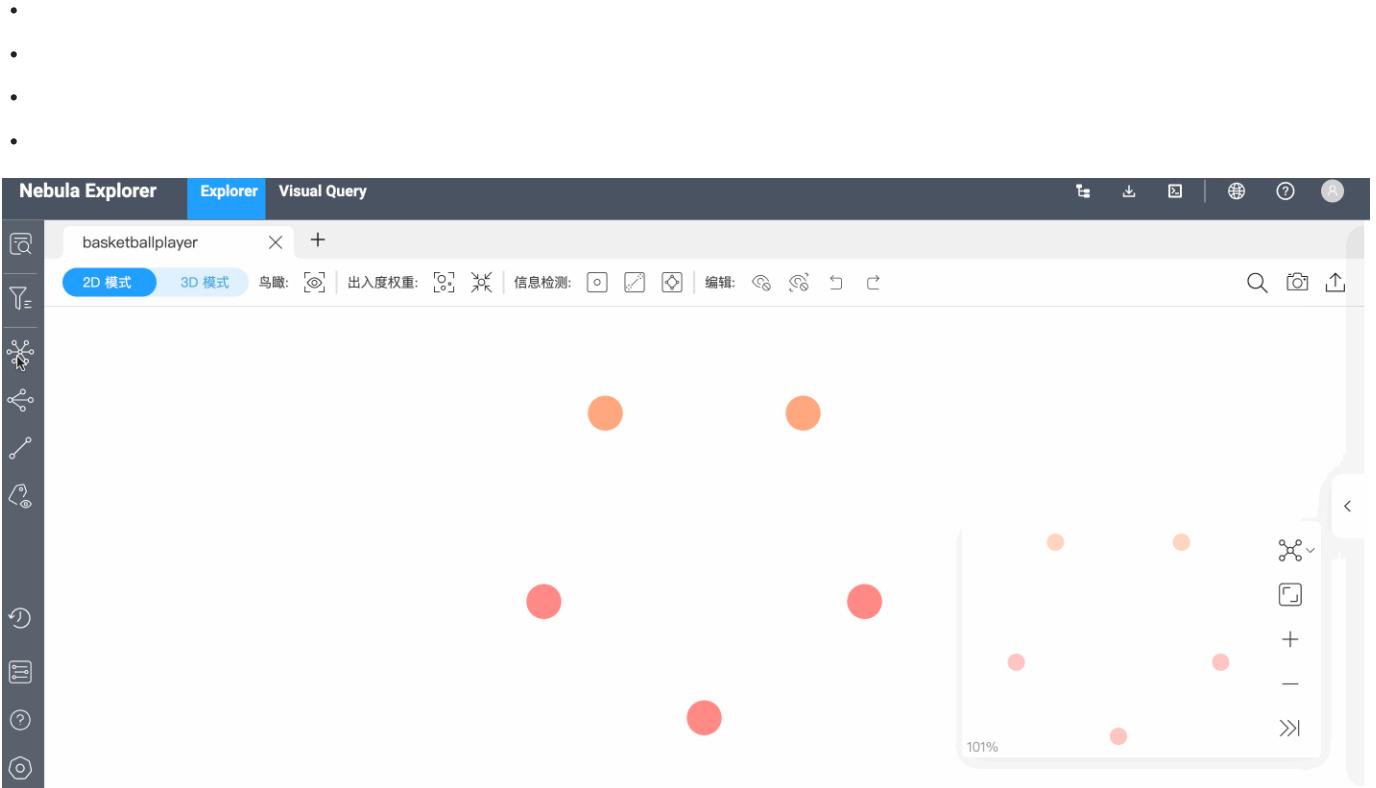
1.

2. player age > 33  
3.  
4.



: July 5, 2022

## 17.5.4



1.



Tag

2.

Shift

**Note**



Shift

1.



2. Shift



### Note

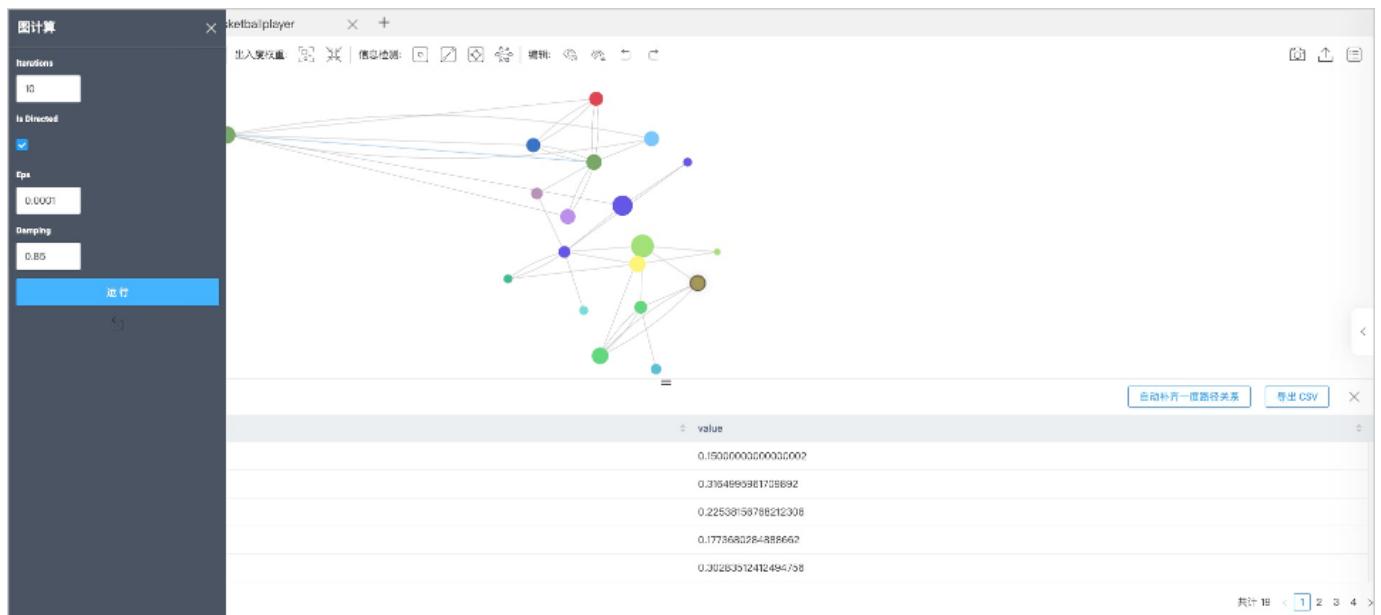
- 90% 90%
  - 100% 100%
- 

:July 5, 2022

## 17.5.5

**Note****Workflow**

1. 
- 2.
- 3.
- 4.
- 
- **CSV** **CSV**



: July 5, 2022

17.5.6

---

- 
- INT
- Edge type
- 
- 

1

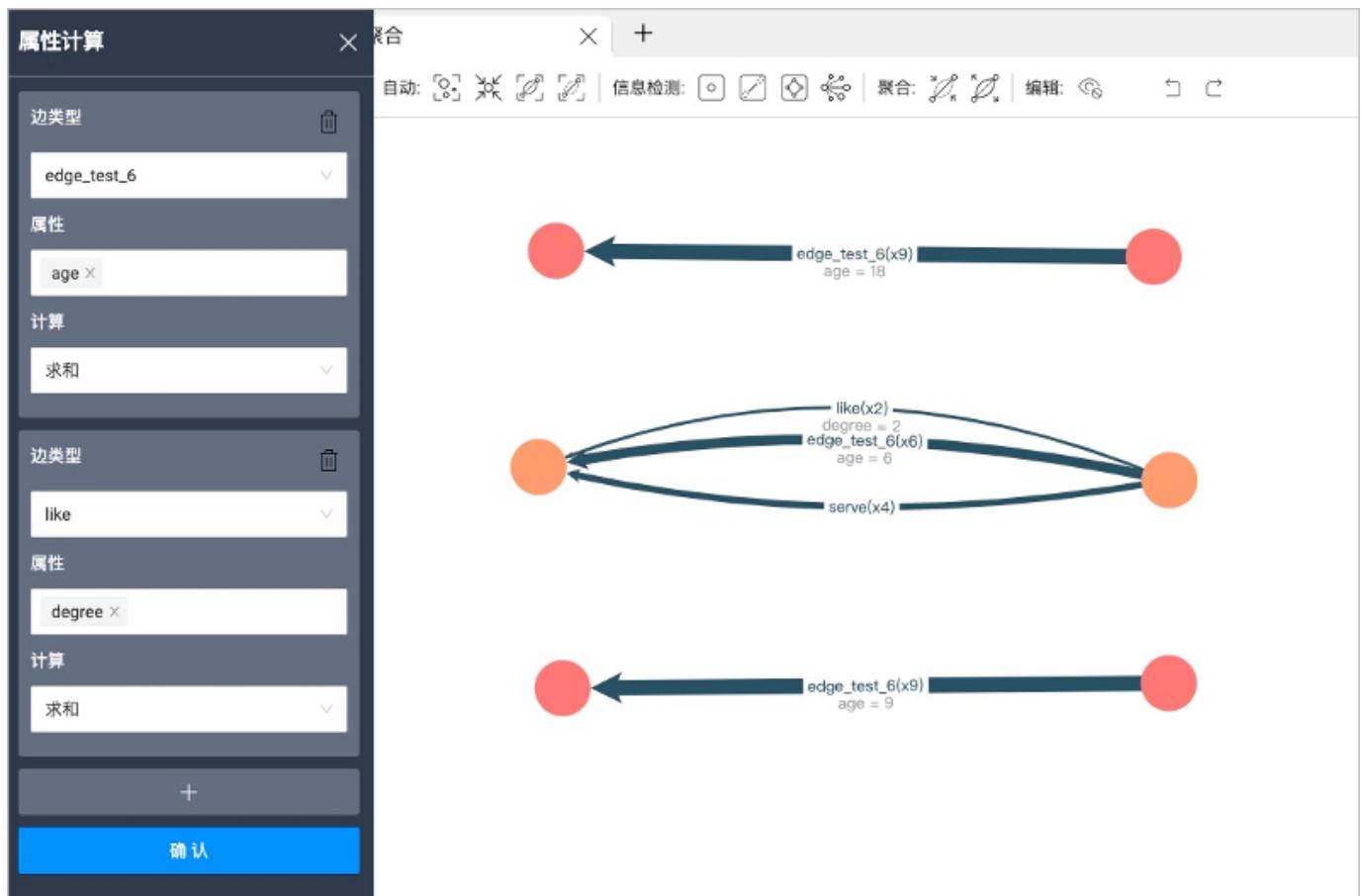
1.



2. +

3.

+ Edge type



2

- 1.
- 2.
- 3.

---

: September 28, 2022

## 17.6

### ↑ Compatibility

3.0.0 NebulaGraph

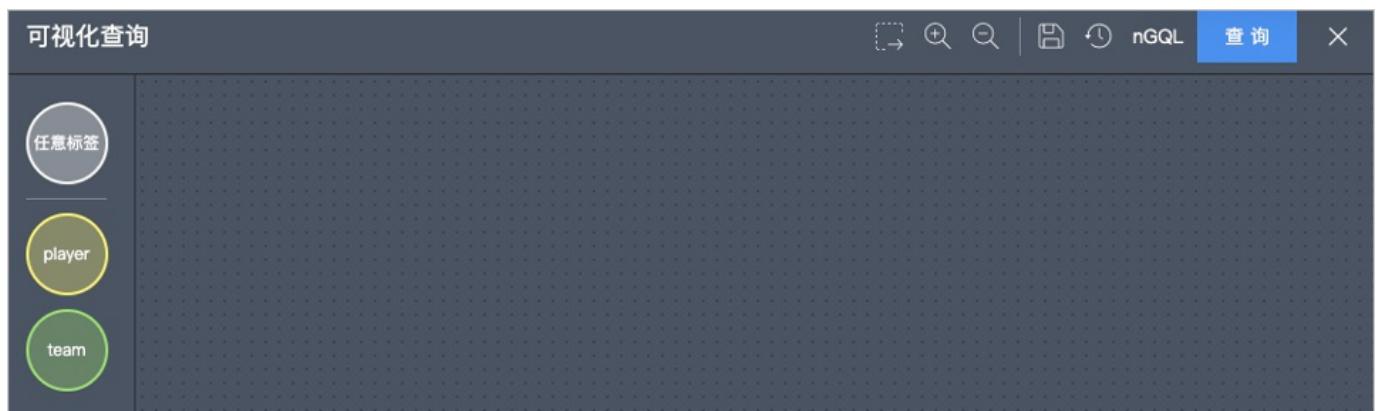
### Note

Explorer

## 17.6.1

- 
- MATCH

## 17.6.2



Explorer

**Visual Query**

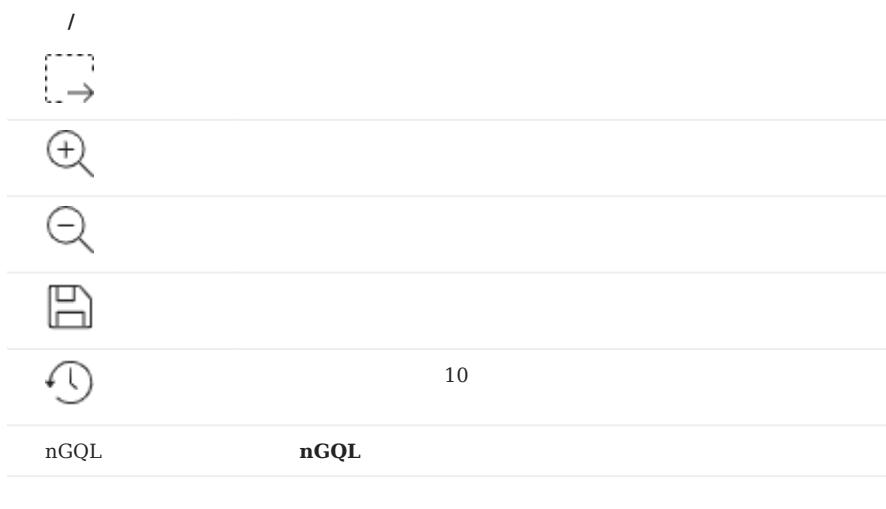
Tag ( player team)

Tag

### Note

Tag

Tag



## 17.6.3

1. Tag Tag
- 2.
- 3.

This screenshot displays a modal dialog box. At the top are two buttons: '复制' (Copy) and '删除' (Delete). Below this is a section titled '▼ 点' (Point) under '标签名' (Tags), which lists 'player' and 'team' with small 'X' icons to their right. Further down is a '筛选条件' (Filter Condition) section with a '+' button. It contains three fields: '字段' (Field) with 'player.age', '运算符' (Operator) with '==', and '值' (Value) with '30'. There is also a trash can icon next to the value field.

### 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.

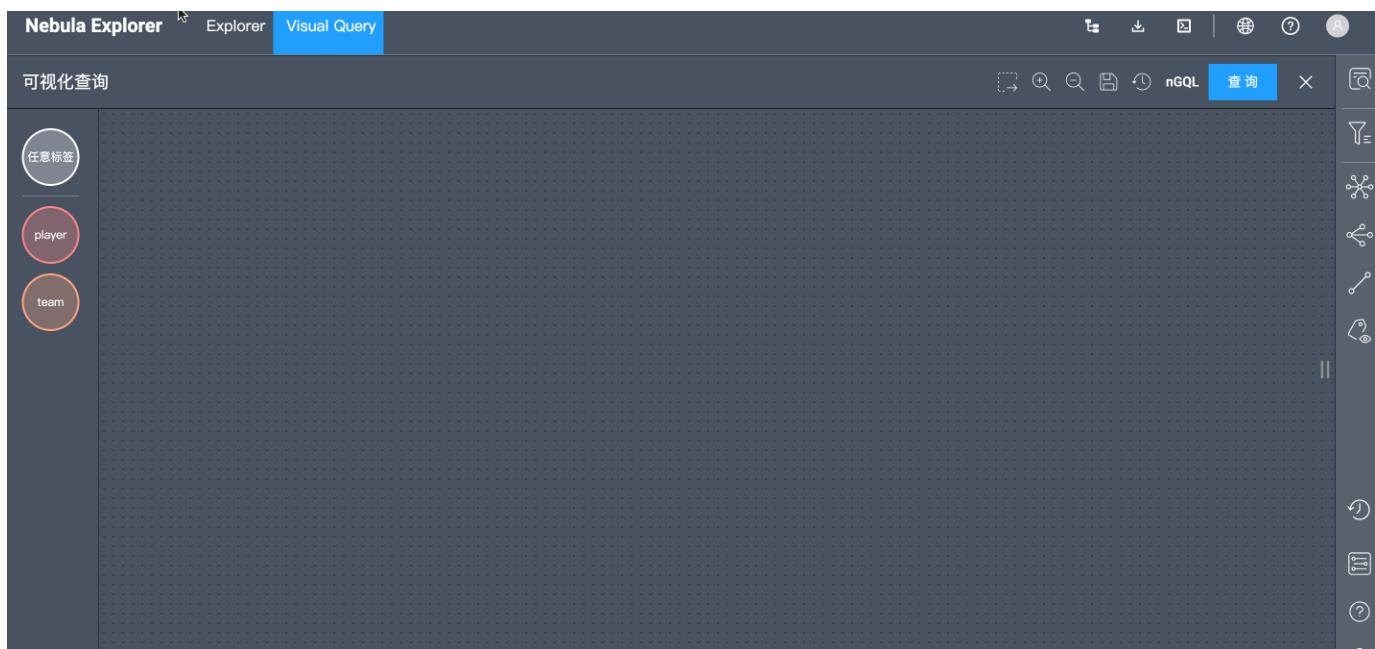
## 17.6.4

1

Yao Ming

35

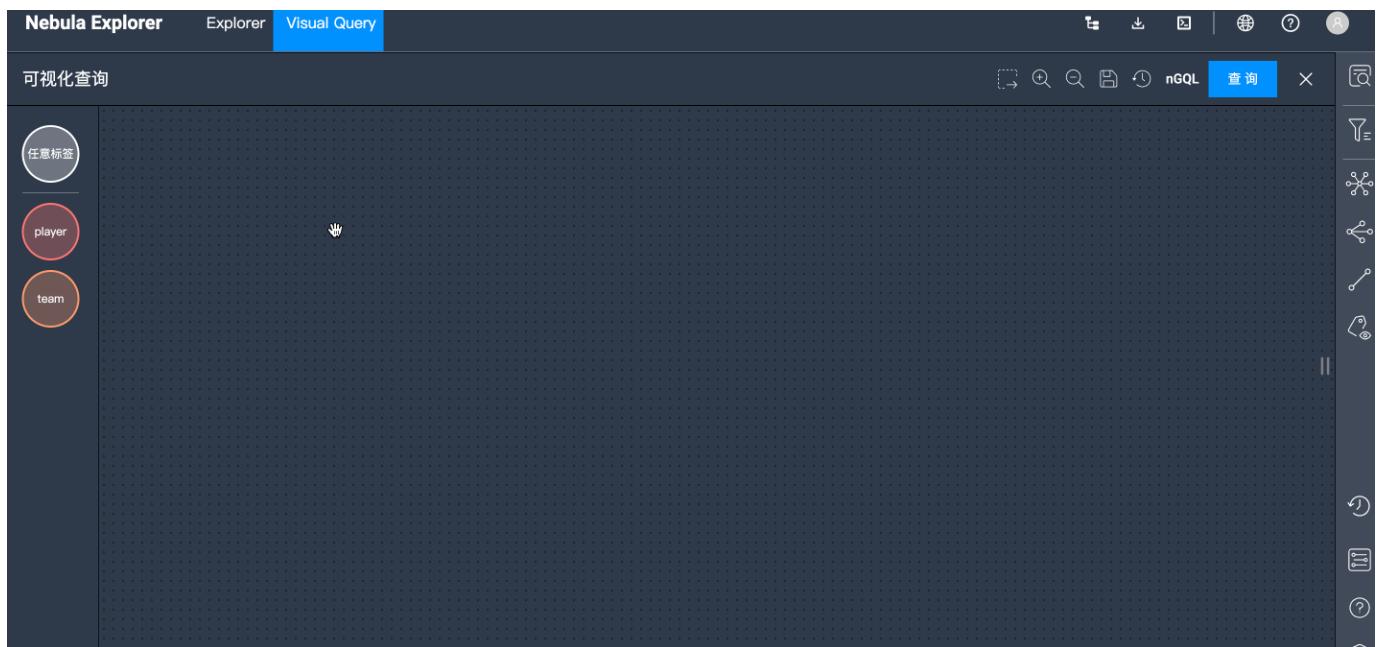
6



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

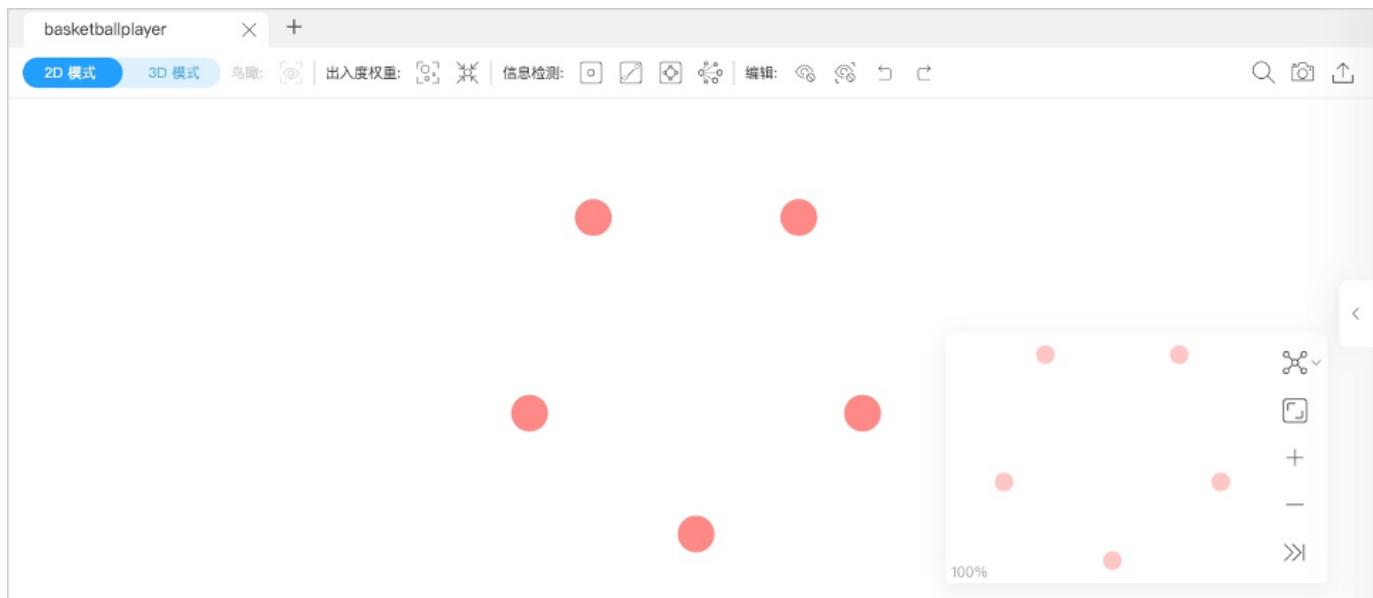


1. Tag 3 player 1 team
2.
  - a. follow 1
  - b. serve 1
  - c. serve 1
  - d. player.age > 30
  - e. serve 1
  - f.  serve
- 3.

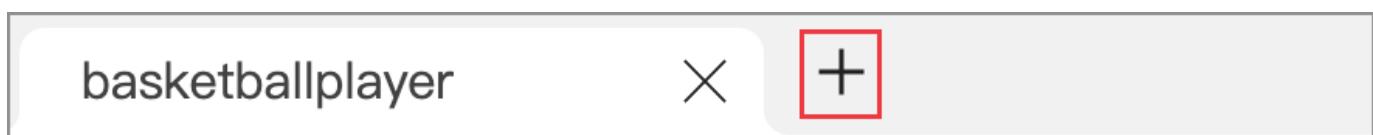
: August 9, 2022

## 17.7

### 17.7.1



+

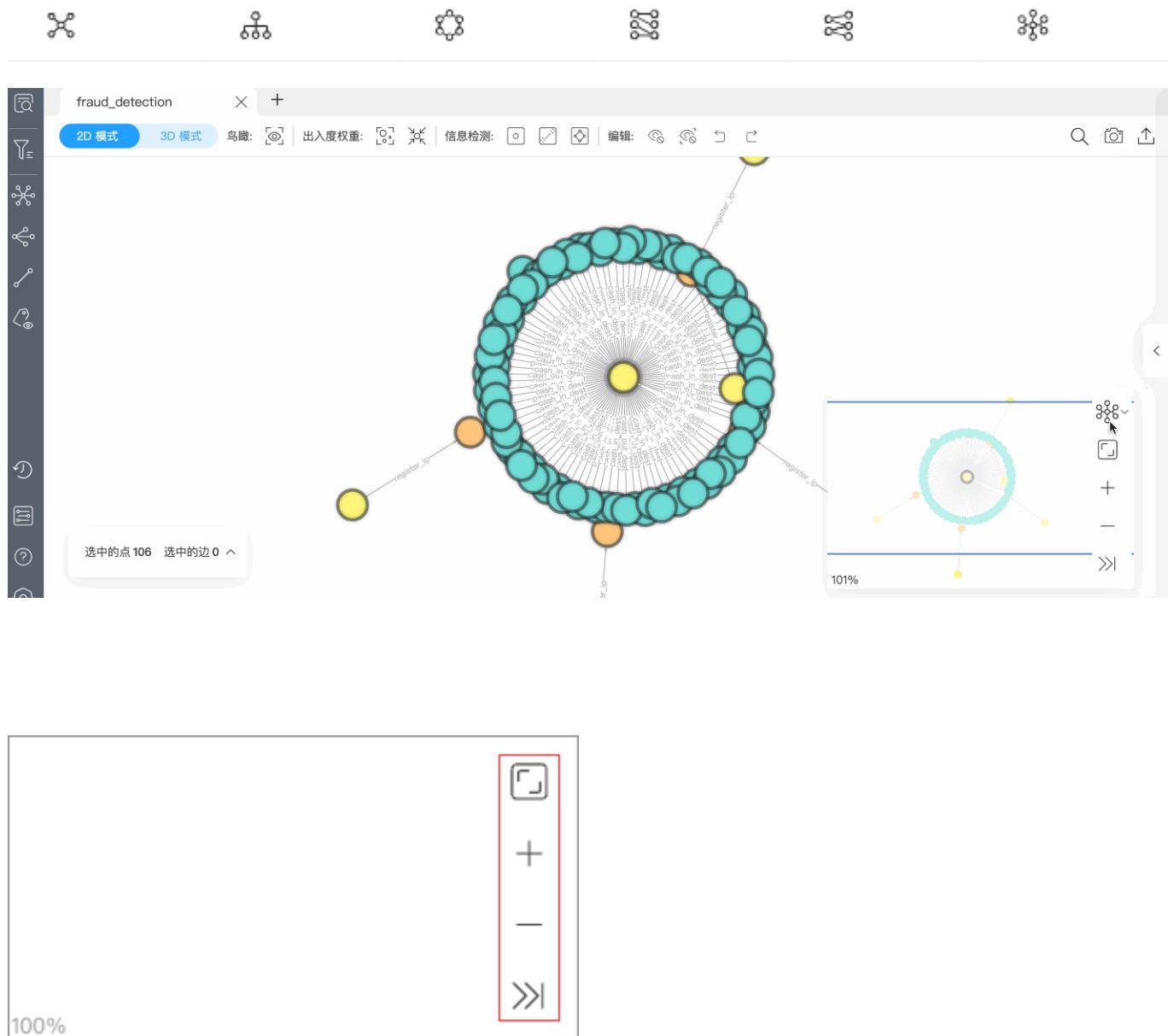


CSV

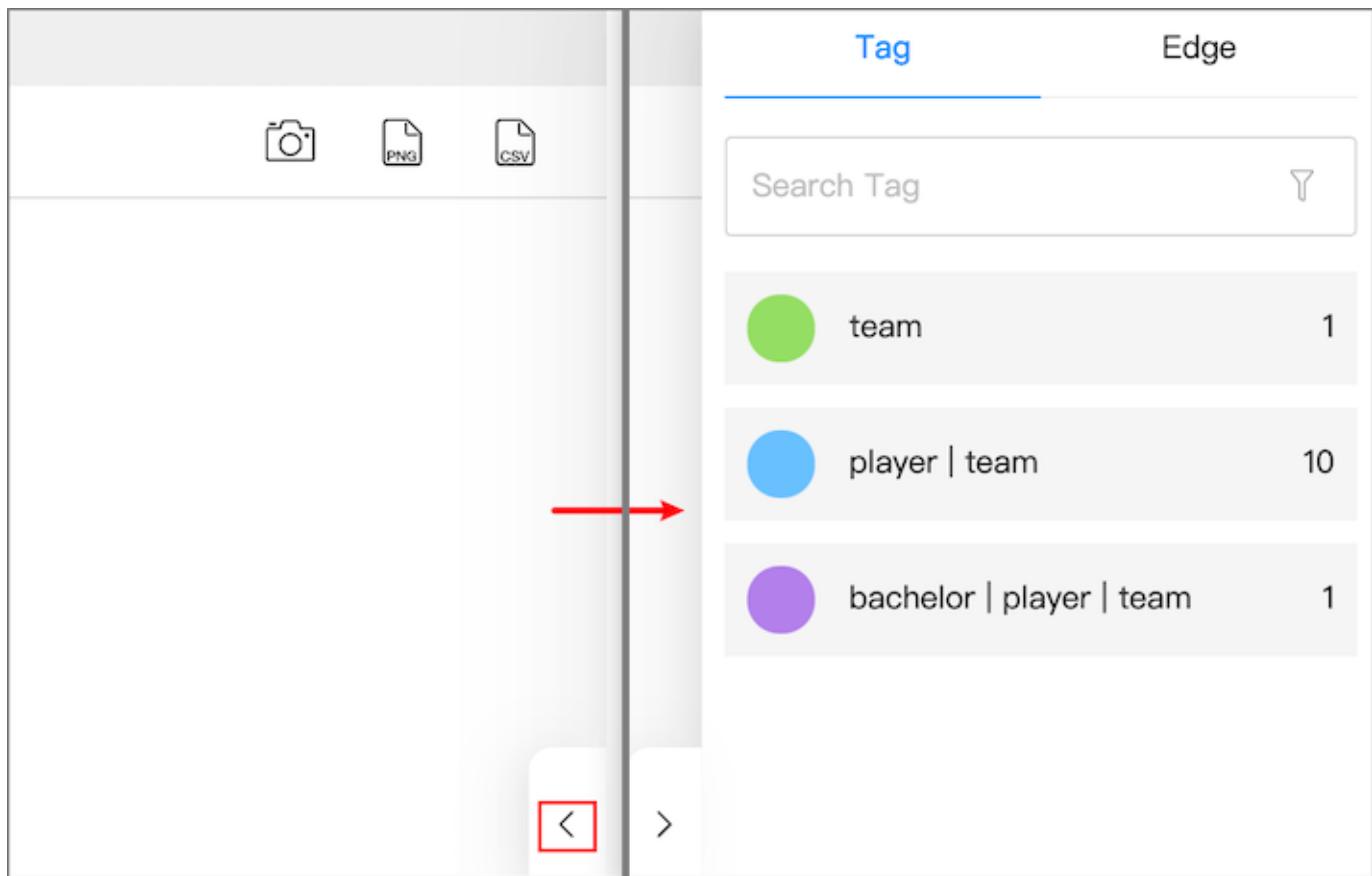
- 
  -  CSV CSV
  -  PNG

VID Tag

Explorer 6



&lt;



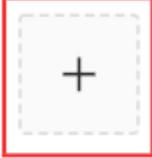
- Tag Edge type
- Tag Edge type Tag

Note

		player	5
--	-----------------------------------------------------------------------------------	--------	---

颜色 尺寸 图标 [图片](#)

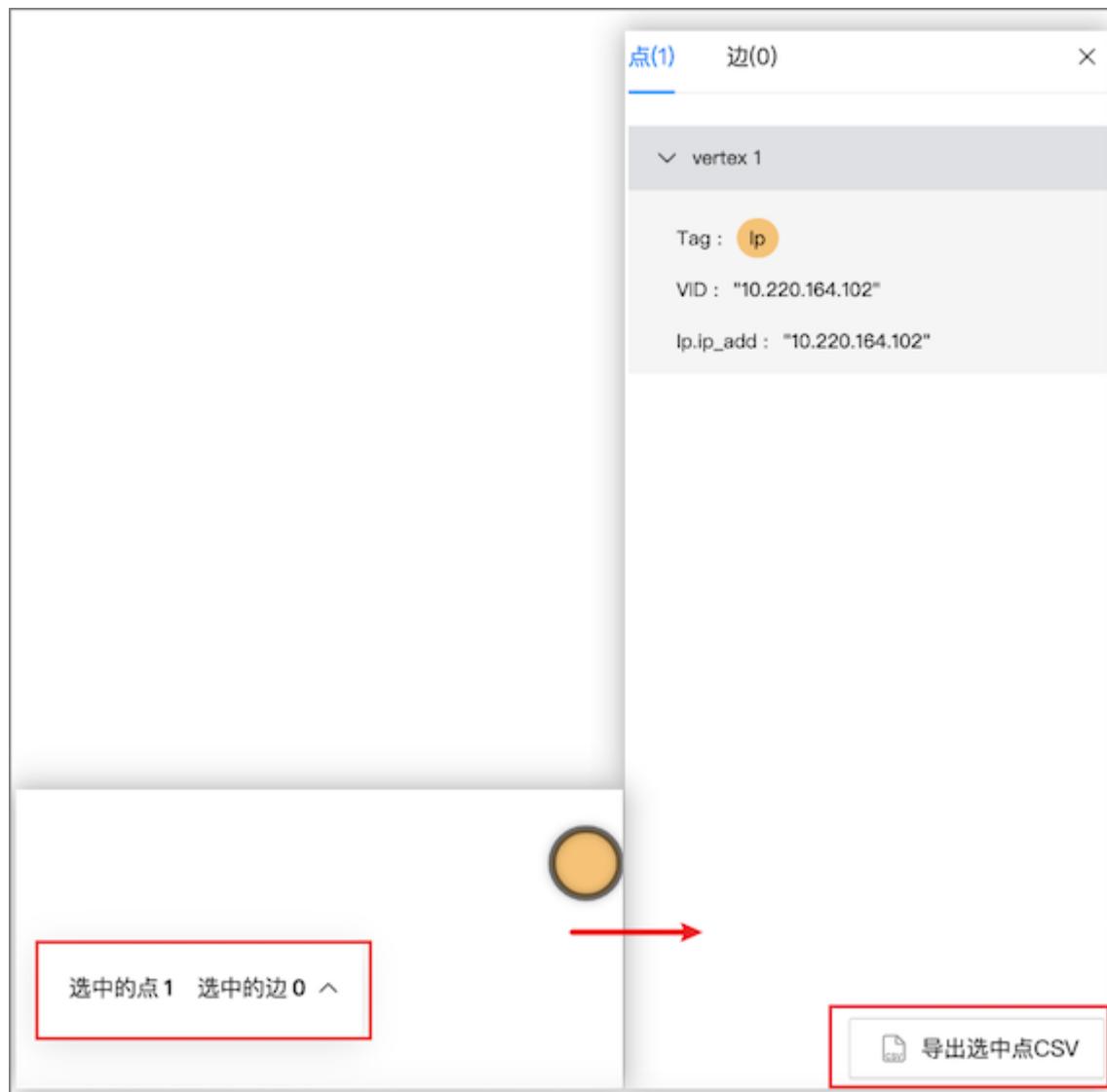
Please upload a picture with size less than 200px \* 200px

{number}

{number}

CSV



: October 27, 2022

## 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

: October 27, 2022

### 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

: May 13, 2022

## 17.8

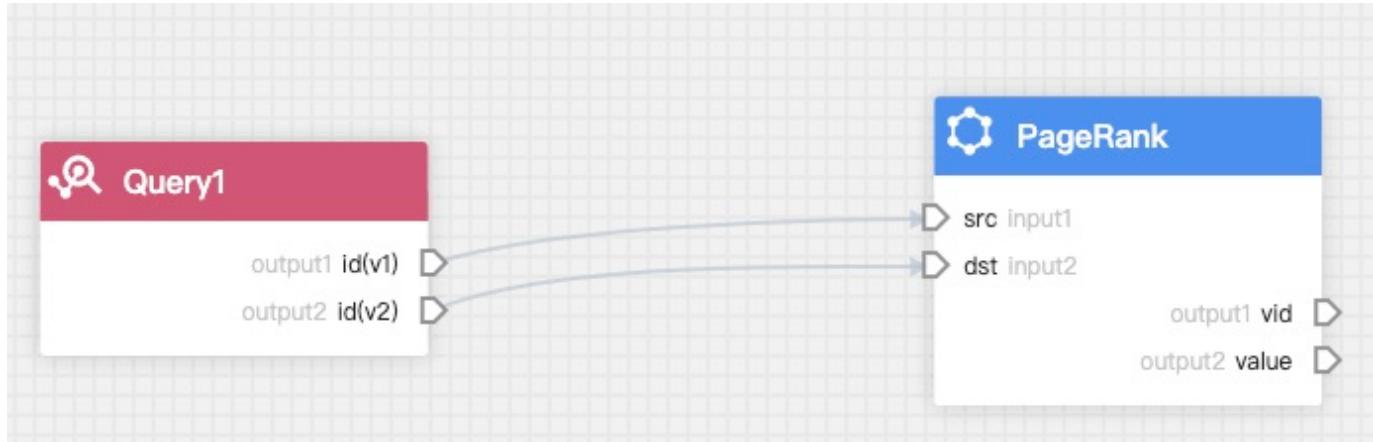
### 17.8.1

Nebula Explorer

Nebula Explorer  
Workflow

Component

Dag Controller



- 

- 

- 

- 

 Workflow

- 

Dag Controller Nebula Analytics  

- 

 HDFS

- 

NebulaGraph HDFS

- 

HDFS NebulaGraph

NebulaGraph

HDFS

: January 11, 2023

## 17.8.2

NebulaGraph    HDFS    NebulaGraph Analytics

- 3.4.0    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.

: December 15, 2022

### 17.8.3

---

- NebulaGraph      HDFS      CSV
-

```
MATCH MATCH (v1:player)--(v2) RETURN id(v1), id(v2); PageRank
```

1. Explorer
- 2.
3. ->**Query**

**Workflow**

The screenshot shows a configuration window for a query named "query\_1".

- Query Language:** basketballplayer
- Query Text:**

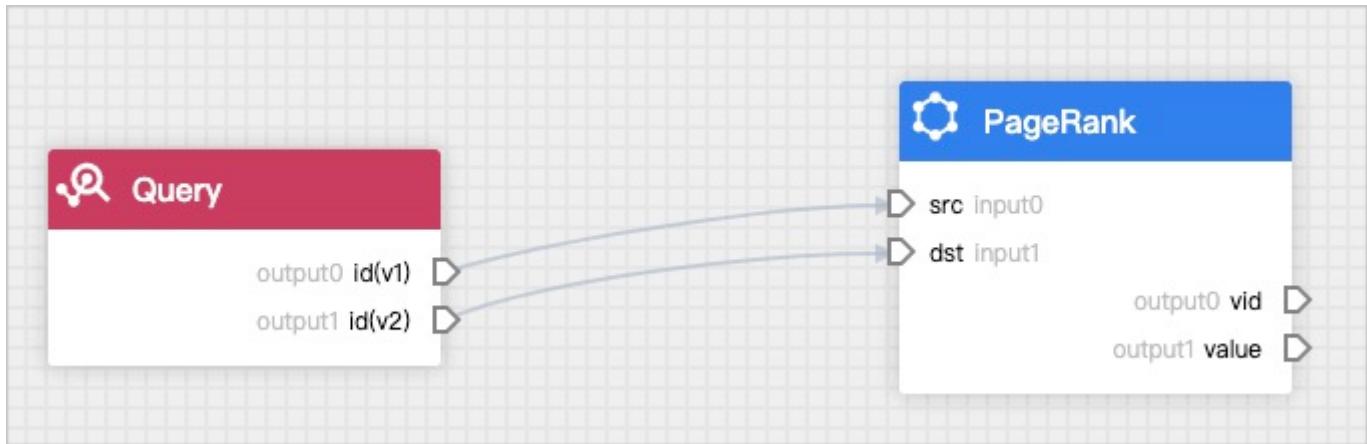
```
1 MATCH (v1:player)--(v2) RETURN id(v1), id(v2);
```
- Parse Parameters:** A blue button at the bottom of the query text area.
- Input:** None listed.
- Output:**
  - output0: id(v1)
  - output1: id(v2)
- Result:** None listed.

**Query**

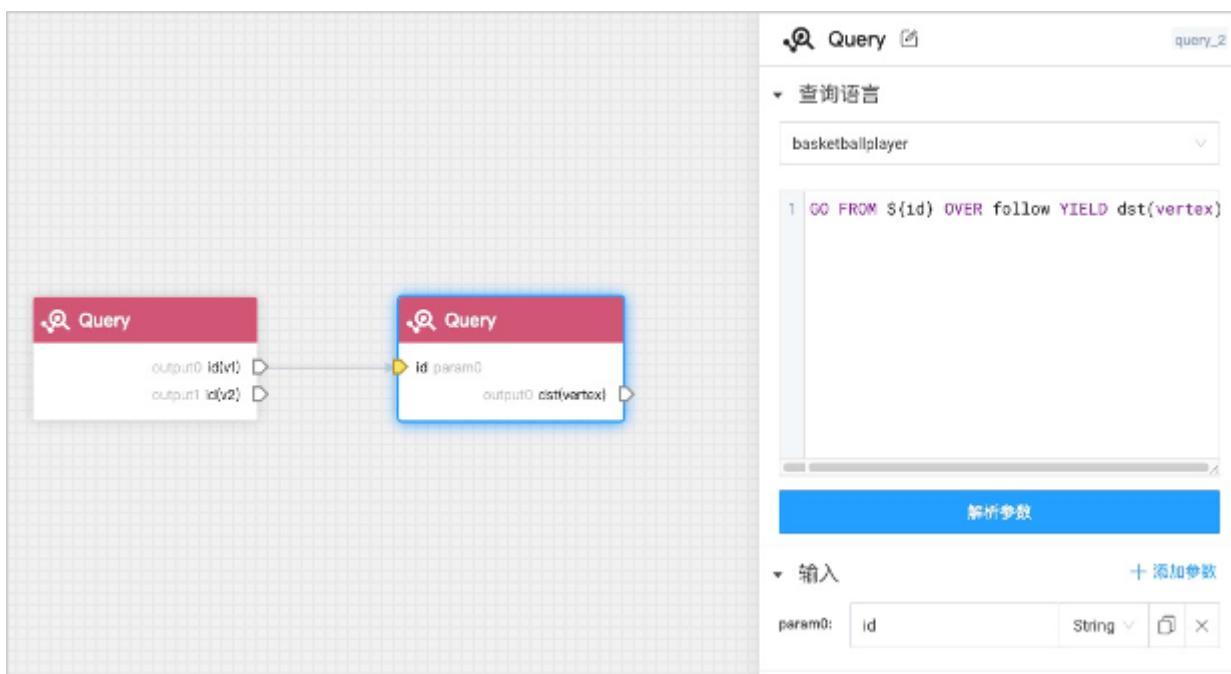
The screenshot shows a query editor with the following components:

- Query Type:** nGQL
- Output:** AS
- Storage:** HDFS
- Note:** A light blue header bar containing the word "Note".

4. ->**PageRank**



```
GO FROM ${id} OVER follow YIELD dst(vertex) ${id}
```



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

---

: October 20, 2022

## 17.8.4

---

1. Explorer

### **Workflow**

2.

•

•

•

•

•



•

•



---

: July 5, 2022

## 17.8.5

---

1. Explorer                   **Workflow**

2.                           ID

- 
- 
- 
- 

• **Explorer**                   CSV

- 
- 

---

: July 5, 2022

## 17.8.6 API

### API

NebulaGraph Explorer API

API

- 
- 
- 
- 
- 
- 

curl API

```
curl <options> http://<explorer_address>:<explorer_port>/<api_path>?{<body>}
```

- <options> curl -X -H -d **curl**
- <explorer\_address> NebulaGraph Explorer
- <explorer\_port> NebulaGraph Explorer
- <api\_path> API api-open/v1/jobs
- <body> API Body

TOKEN

API Token Token

```
curl -i -X POST -H "Content-Type: application/json" -H "Authorization: Bearer <account_base64_encode>" -d '{"address":"<nebula_address>","port":<nebula_port>}' http://<explorer_address>:<explorer_port>/api-open/v1/connect
```

- <account\_base64\_encode> Base64 NebulaGraph root 123 ["root", "123"] Base64 WyJyb290IiwiMTIzIl0=
- <nebula\_address> NebulaGraph
- <nebula\_port> NebulaGraph
- <explorer\_address> NebulaGraph Explorer
- <explorer\_port> NebulaGraph Explorer

```
curl -i -X POST -H "Content-Type: application/json" -H "Authorization: Bearer WyJyb290IiwiMTIzIl0=" -d '{"address":"192.168.8.111","port":9669}' http://192.168.8.145:7002/api-open/v1/connect
```

```
HTTP/1.1 200 OK
Content-Type: application/json
Set-Cookie: explorer_token=eyJhbxxx; Path=/; # Max-Age=259200; HttpOnly
Traceparent: 00-1c3f55cd81e13a2331ed88155ce0bf-2b97474943563f20-# 00
Date: Thu, 14 Jul 2022 06:47:01 GMT
Content-Length: 54

{
 "code": 0,
 "data": {
```

```

 "success": true
 },
 "message": "Success"
}

```

- `explorer_token` Token
- `Max-Age` Token 259200 3 config/app-config.yaml

- API

```
{
 code: 0,
 message: 'Success',
 data: <ResponseData> //
}
```

- API

```
{
 code: 40004000,
 message: '<ErrBadRequest>', //
}
```

40004000	<code>ErrBadRequest</code>
40004001	<code>ErrParam</code>
40104000	<code>ErrUnauthorized</code>
40104001	<code>ErrSession</code>
40304000	<code>ErrForbidden</code>
40404000	<code>ErrNotFound</code>
50004000	<code>ErrInternalServerError</code>
50004001	<code>ErrInternalDatabase</code>
50004002	<code>ErrInternalController</code>
50004003	<code>ErrInternalLicense</code>
90004000	<code>ErrUnknown</code>

/

0
1
2
3
4
5

---

: March 13, 2023

**API****API**

api-open/v1/workflows/&lt;workflow\_id&gt;/jobs

&lt;workflow\_id&gt; ID

workflow_id	number	-	4216617528	ID
-------------	--------	---	------------	----

**Headers**

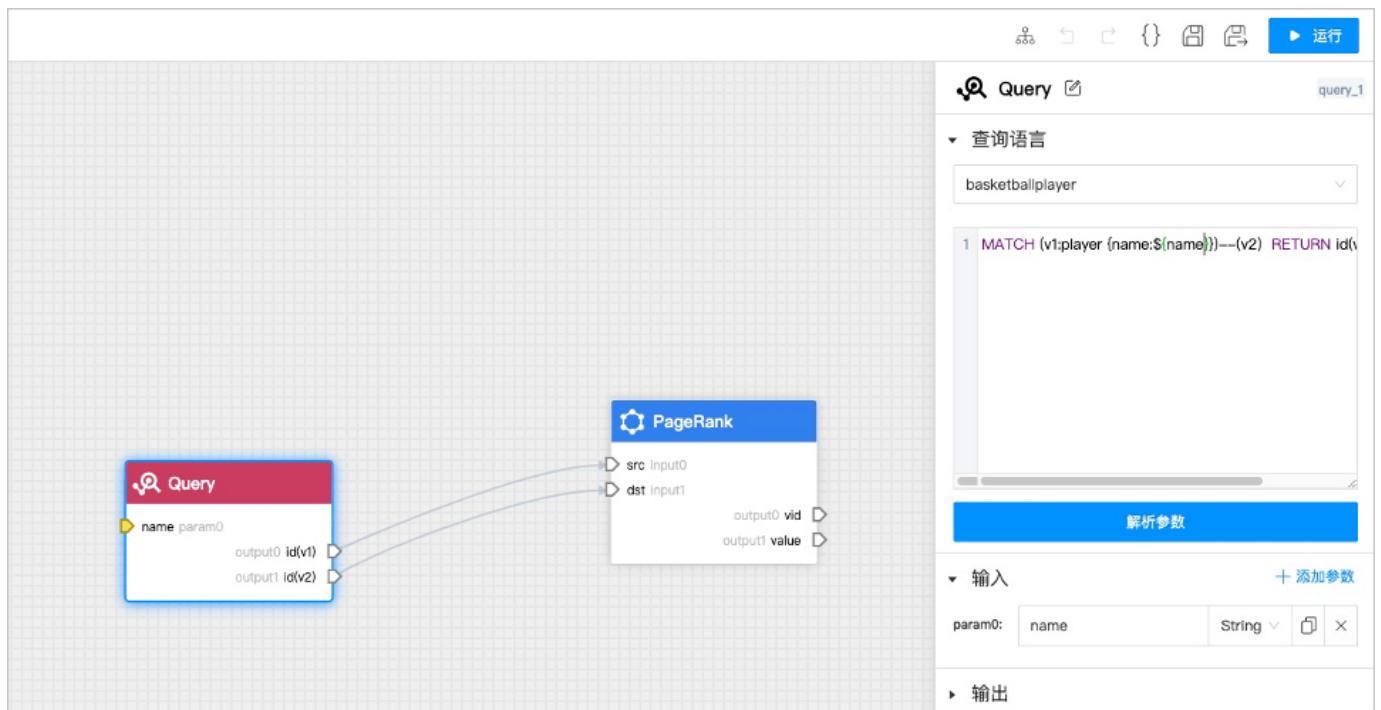
Content-Type	string	-	application/json	
explorer_token	string	-	eyJhbxxx	Token

Token API

**Body**

input	object	-	-	
- task_id	object	-	query_1	ID
- param_name: param_value	string: {string number}	-	param0: player100	param_name param_value

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"
}
```

: July 18, 2022

## 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
orderByCreateTime	string	desc	- desc 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"
}
```

: July 18, 2022

## 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	<a href="#">API</a>
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		<a href="#">API</a>
-	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"
}
```

: July 18, 2022

## 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"
}
```

: July 18, 2022

## 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	API

## 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	API
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"
}
```

: July 18, 2022

## 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 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",
 "0.15000"
],
 ["team219",
 "0.452126"
],

 ["player121",
 "0.262148"
]
],
 "message": "Success"
 }
}
```

---

: July 18, 2022

## 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

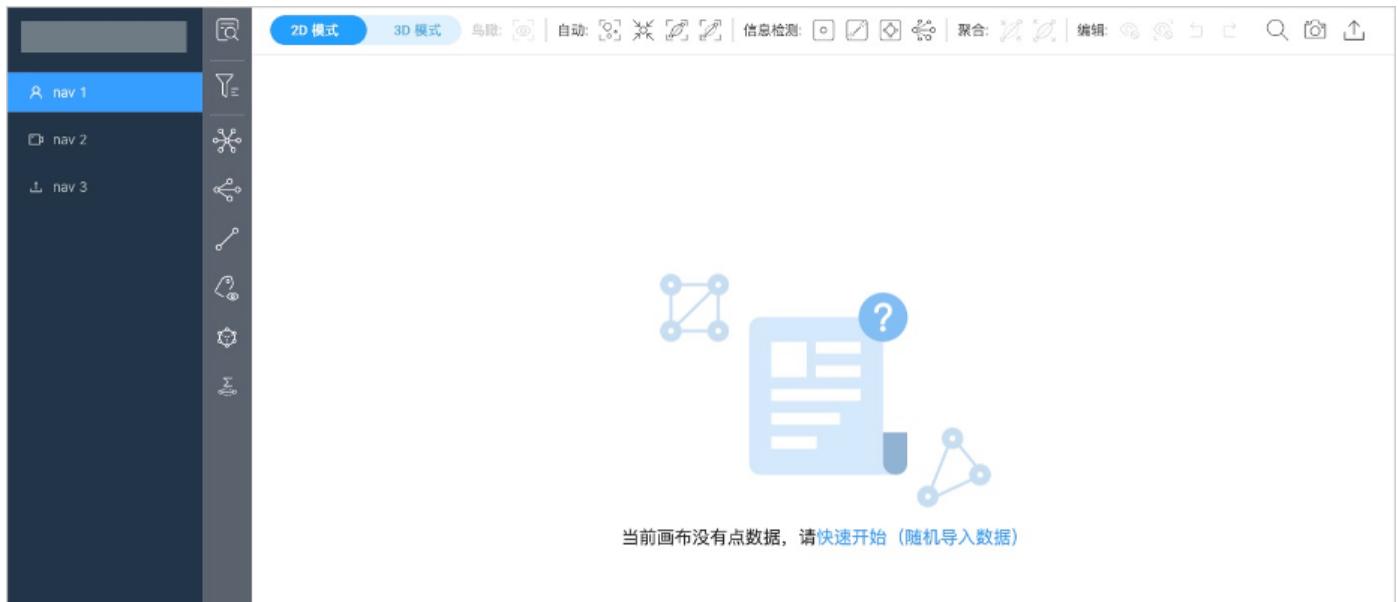
5. Explorer

**Note**RPM/DEB    Explorer    `sudo ./nebula-explorer-server &``./scripts/start.sh`

6.

Explorer

basketballplayer



: October 26, 2022

## 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'

+ 'Backspace'

+ Shift + 'Backspace'

---

: January 11, 2023

## 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

: December 15, 2022

# 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-3.4 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-3.4 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
 batchSize: 128
 limit: 10
 inorder: false
 type: csv
 csv:
 withHeader: false
 withLabel: false
```

```
delimiter: ","
lazyQuotes: false
```

workingDir	-	path	failDataPath
		./data/student	./data/err/student
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 Ctrl+C	"\x03" "\u0003" yaml 0x03
files.csv.lazyQuotes	false	LazyQuotes	

## SCHEMA

Schema	Meta	Schema
.		

```
schema:
 type: vertex
vertex:
 vid:
 index: 1
 concatItems: # "c1{index0}c2{index1}2"
 - "c1"
 - 0
 - c2
 - 1
 - "2"
 function: hash
 prefix: abc
tags:
 - name: student
 props:
 - name: age
 type: int
 index: 2
 - name: name
 type: string
 index: 1
 - name: gender
 type: string
 defaultValue: "male"
 - name: phone
 type: string
 nullable: true
 - name: email
 type: string
 nullable: true
 nullValue: "__NULL__"
 - name: address
 type: string
 nullable: true
 alternativeIndices:
```

- 7
- 8

		Schema	vertex	edge
files.schema.type	-			
files.schema.vertex.vid.index	-	ID	CSV	
files.schema.vertex.vid.concatItem	-		string	int
files.schema.vertex.vid.function	-	VID	hash	
files.schema.vertex.vid.type	-	ID	int	string
files.schema.vertex.vid.prefix	-	vid	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
		geography(linestring)	geography(poly)	
files.schema.vertex.tags.props.index	-	CSV		
files.schema.vertex.tags.props.nullable	false	NULL	true	false
files.schema.vertex.tags.props.nullValue	""	nullable	true	nullValue
files.schema.vertex.tags.props.alternativeIndices	-	nullable	false	CSV
files.schema.vertex.tags.props.defaultValue	-	nullable	false	
		index	alternativeIndices	
		nullValue		

### 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

: February 3, 2023

## 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

```

version: v2

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

 #
 batchSize: 10

 #
 limit: 10

 #
 inOrder: false
 inOrder: true

 #
 type: csv

csv:
 #
 withHeader: true

 #
 withLabel: false

 #
 csv
 delimiter: ","

```

```
schema:
Schema vertex edge
type: vertex

- path: ./follow_with_header.csv
failDataPath: ./err/followerr
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

---

: March 13, 2023

## 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

```
version: v2

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/studenterr

#
batchSize: 10

#
limit: 10

#
inOrder: false
inOrder: true

#
type: csv
type: csv

csv:
#
withHeader: false

#
withLabel: false

#
delimiter: ","

schema:
Schema vertex edge
type: vertex

vertex:

#
id: vertex
ID CSV CSV 0
index: 0

#
type: string
type: string

#
tags: tag
Tag
- name: student

#
props: prop

- name: name

#
type: string
type: string

#
index: 1

-
name: age
type: int
index: 2
-
name: gender
type: string
index: 3

#
path: ./follow_without_header.csv
failDataPath: ./err/followerr
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
type: string

```

```

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

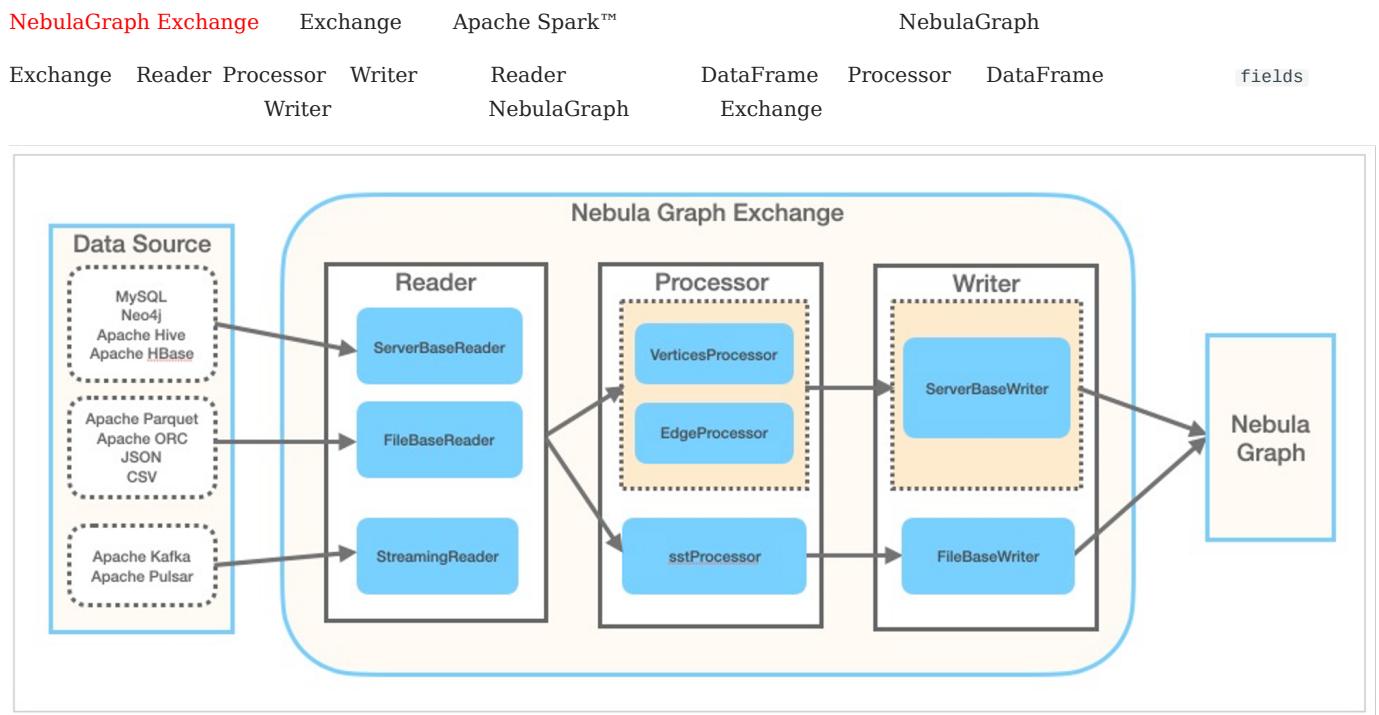
- CSV 0 0 1
  - ID clientSettings.postStart.commands
  - index CSV
  - ID
  - ID withRanking true rank
- 

: March 13, 2023

# 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_3.0-3.4.0.jar		3.x.x	3.3.x 3.2.x 3.1.x 3.0.x
nebula-exchange_spark_2.4-3.4.0.jar		3.x.x	2.4.x
nebula-exchange_spark_2.2-3.4.0.jar		3.x.x	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 3.4.0

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	<a href="#">SST</a>
Exchange	NebulaGraph	<a href="#">CSV</a>		

## Release

- [NebulaGraph](#) ——Exchange 3 08

: March 13, 2023

## 19.1.2

Exchange 3.4.0

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\_2.4-3.4.0.jar

#### **Spark 2.2**

#### **Spark 2.4**

#### **Spark 3**

CSV

JSON

ORC

Parquet

HBase

MySQL

PostgreSQL

Oracle

ClickHouse

Neo4j

Hive

MaxCompute

Pulsar

Kafka

NebulaGraph

Hadoop Distributed File System (HDFS)

- HDFS
- SST

: October 31, 2022

## 19.2 NebulaGraph Exchange

NebulaGraph Exchange JAR

### 19.2.1 JAR

Exchange JAR

Exchange **NebulaGraph**

### 19.2.2 JAR

Exchange JAR

Exchange

 **Enterprise only**

Exchange **NebulaGraph**

- **Maven**
- **Spark** **Spark**

#### 1. nebula-exchange

```
git clone -b release-3.4 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-3.4.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>
```

---

: August 9, 2022

## 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                  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-3.4.0.jar \
-c application.conf
```

--class

--master

Spark    master

URL    master-urls

-c / --config

-h / --hive

false

Hive

-D / --dry

false

tags    edges

-r / --reload

reload

Spark

[Spark Configuration](#)

: December 15, 2022

### 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]	-	



<code>nebula.address.graph</code>	<code>list[string]</code>	<code>["127.0.0.1:9669"]</code>	<code>Graph</code>	<code>IP</code>	,
					<code>["ip1:port1","ip2:port2","ip3:port3"]</code>
<code>nebula.address.meta</code>	<code>list[string]</code>	<code>["127.0.0.1:9559"]</code>	<code>Meta</code>	<code>IP</code>	,
					<code>["ip1:port1","ip2:port2","ip3:port3"]</code>
<code>nebula.user</code>	<code>string</code>	-			<code>NebulaGraph</code>
<code>nebula.pswd</code>	<code>string</code>	-			
<code>nebula.space</code>	<code>string</code>	-			
<code>nebula.ssl.enable.graph</code>	<code>bool</code>	<code>false</code>	<code>Exchange</code>	<code>Graph</code>	<code>SSL</code>
			<code>true</code>	<code>SSL</code>	<code>Exchange</code>
				<code>SSL</code>	
<code>nebula.ssl.enable.meta</code>	<code>bool</code>	<code>false</code>	<code>Exchange</code>	<code>Meta</code>	<code>SSL</code>
			<code>true</code>	<code>SSL</code>	<code>Exchange</code>
				<code>SSL</code>	
<code>nebula.ssl.sign</code>	<code>string</code>	<code>ca</code>		<code>ca CA</code>	<code>self</code>
<code>nebula.ssl.ca.param.caCrtFilePath</code>	<code>string</code>	<code>"/path/caCrtFilePath"</code>	<code>nebula.ssl.sign</code>	<code>ca</code>	<code>CA</code>
<code>nebula.ssl.ca.param.crtFilePath</code>	<code>string</code>	<code>"/path/crtFilePath"</code>	<code>nebula.ssl.sign</code>	<code>ca</code>	<code>CRT</code>
<code>nebula.ssl.ca.param.keyFilePath</code>	<code>string</code>	<code>"/path/keyFilePath"</code>	<code>nebula.ssl.sign</code>	<code>ca</code>	
<code>nebula.ssl.self.param.crtFilePath</code>	<code>string</code>	<code>"/path/crtFilePath"</code>	<code>nebula.ssl.sign</code>	<code>self</code>	<code>CRT</code>
<code>nebula.ssl.self.param.keyFilePath</code>	<code>string</code>	<code>"/path/keyFilePath"</code>	<code>nebula.ssl.sign</code>	<code>self</code>	
<code>nebula.ssl.self.param.password</code>	<code>string</code>	<code>"nebula"</code>	<code>nebula.ssl.sign</code>	<code>self</code>	
<code>nebula.path.local</code>	<code>string</code>	<code>"/tmp"</code>	<code>SST</code>	<code>SST</code>	
<code>nebula.path.remote</code>	<code>string</code>	<code>"/sst"</code>	<code>SST</code>	<code>SST</code>	
<code>nebula.path.hdfs.namenode</code>	<code>string</code>	<code>"hdfs://name_node:9000"</code>	<code>SST</code>	<code>HDFS</code>	<code>namenode</code>
<code>nebula.connection.timeout</code>	<code>int</code>	<code>3000</code>	<code>Thrift</code>	<code>ms</code>	
<code>nebula.connection.retry</code>	<code>int</code>	<code>3</code>	<code>Thrift</code>		
<code>nebula.execution.retry</code>	<code>int</code>	<code>3</code>	<code>nGQL</code>		
<code>nebula.error.max</code>	<code>int</code>	<code>32</code>			<code>Spark</code>
<code>nebula.error.output</code>	<code>string</code>	<code>/tmp/errors</code>		<code>nGQL</code>	

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	,	\u0001, ^A, ASCII \u0001 UNICODE \u0002, ^B ASCII \u0002 UNICODE \u0003, ^C ASCII \u0003 UNICODE \u0003	
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	-	<pre>"select teamid, name from team order by teamid"</pre>

## ORACLE

tags.url	string	-	Oracle
tags.driver	string	-	Oracle
tags.user	string	-	Oracle
tags.password	string	-	
tags.table	string	-	
tags.sentence	string	-	<pre>"select playerid, name, age from player"</pre>

## 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 partition DOWNLOAD INGEST SST

## NEBULAGRAPH

**Enterpriseonly**

NebulaGraph	NebulaGraph	Exchange	
tags.path	string	"hdfs://namenode:9000/path/vertex"	CSV HDFS vertex/player" "file:///home/nebula/vertex/player" Tag
tags.noField	bool	false	true VID false VID
tags.return.fields	list	[]	name age tags.noField false ["name", "age"]

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	
<b>SST</b>				
edges.path	string	-	SST	
edges.repartitionWithNebula	bool	true	SST	NebulaGraph DOWNLOAD INGEST SST partition
<b>NEBULAGRAPH</b>				
edges.path	string	"hdfs:// namenode: 9000/path/ edge"	CSV follow home/nebula/edge/follow"	Exchange "hdfs://192.168.8.177:9000/edge/ "file:///path/edge" "file:/// Edge Edge
edges.noField	bool	false	true VID VID Rank	VID VID Rank false
edges.return.fields	list	[]	start_year ["start_year", "end_year"]	end_year edges.noField false

: February 9, 2023

## 19.4 NebulaGraph Exchange

### 19.4.1 CSV



basketballplayer

MacOS

- 
- CPU 1.7 GHz Quad-Core Intel Core i7
- 16 GB
- Spark 2.4.7
- Hadoop 2.9.2
- NebulaGraph 3.4.1 [Docker Compose](#)
- [NebulaGraph](#)
- Graph Meta IP
- NebulaGraph
- Exchange [Exchange](#) Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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 3.4.1 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 3.4.1 VID
vertex: {
 field:_c0
 # policy:hash
}

#
separator: ","

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]

 #
 # vertex fields csv.fields
 # NebulaGraph 3.4.1 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 3.4.1 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-3.4.0.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-3.4.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/csv_application.conf
```

batchSuccess.<tag\_name/edge\_name> batchSuccess.follow: 300

5

NebulaGraph NebulaGraph Studio

```
LOOKUP ON player YIELD id(vertex);
```

[SHOW STATS](#)

6 NEBULAGRAPH

NebulaGraph

---

: March 13, 2023

## 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 3.4.1    [Docker Compose](#)

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange **Exchange** Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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 nebula.fields
 nebula.fields: [age, name]

 # NebulaGraph
 # fields nebula.fields
 nebula.fields: [age, name]

 # VID
 # vertex JSON
 # NebulaGraph 3.4.1 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 3.4.1 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 3.4.1 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 3.4.1 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-3.4.0.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-3.4.0.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

```
LOOKUP ON player YIELD id(vertex);
```

SHOW STATS

## 6 NEBULAGRAPH

NebulaGraph

: March 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 3.4.1 **Docker Compose**

- **NebulaGraph**

- Graph      Meta      IP
- NebulaGraph
- Exchange      **Exchange**      Exchange 3.4.0
- 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 3.4.0
 }
 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
NebulaGraph k8s Leader Meta
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 3.4.1 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 3.4.1 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 3.4.1 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 3.4.1 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-3.4.0.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-3.4.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/orc_application.conf
```

```
batchSuccess.<tag_name/edge_name> batchSuccess.follow: 300
```

## 5

NebulaGraph NebulaGraph Studio

```
LOOKUP ON player YIELD id(vertex);
```

SHOW STATS

## 6 NEBULAGRAPH

NebulaGraph

: March 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 3.4.1 Docker Compose

- NebulaGraph

- Graph Meta IP
- NebulaGraph
- Exchange Exchange Exchange 3.4.0
- 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 3.4.0
 }
 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
NebulaGraph k8s Leader Meta
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 hdf:// "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 3.4.1 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 hdf:// "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 3.4.1 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 3.4.1 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 3.4.1 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-3.4.0.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-3.4.0.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

```
LOOKUP ON player YIELD id(vertex);
```

SHOW STATS

## 6 NEBULAGRAPH

NebulaGraph

: March 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 3.4.1    Docker Compose

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange **Exchange** Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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
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-3.4.0.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-3.4.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/hbase_application.conf
```

```
batchSuccess.<tag_name/edge_name> batchSuccess.follow: 300
```

4

NebulaGraph NebulaGraph Studio

```
LOOKUP ON player YIELD id(vertex);
```

```
SHOW STATS
```

5 NEBULAGRAPH

NebulaGraph

---

: March 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 3.4.1      **Docker Compose**

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange **Exchange** Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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-3.4.0.jar_path> -c <mysql_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-3.4.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/mysql_application.conf
```

batchSuccess.<tag\_name/edge\_name> batchSuccess.follow: 300

4

NebulaGraph NebulaGraph Studio

```
LOOKUP ON player YIELD id(vertex);
```

**SHOW STATS**

5 NEBULAGRAPH

NebulaGraph

: March 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 3.4.1 [Docker Compose](#)

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange **Exchange** Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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-3.4.0.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-3.4.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/oracle_application.conf
```

```
batchSuccess.<tag_name/edge_name> batchSuccess.follow: 300
```

4

NebulaGraph NebulaGraph Studio

```
LOOKUP ON player YIELD id(vertex);
```

**SHOW STATS**

5 NEBULAGRAPH

NebulaGraph

: March 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 3.4.1 [Docker Compose](#)

- [NebulaGraph](#)

- Graph      Meta      IP
- NebulaGraph
- Exchange      [Exchange](#)      Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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-3.4.0.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-3.4.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes	clickhouse_application.conf

```

```
batchSuccess.<tag_name/edge_name> batchSuccess.follow: 300
4
NebulaGraph NebulaGraph Studio

LOOKUP ON player YIELD id(vertex);

SHOW STATS
5 NEBULAGRAPH
NebulaGraph
.....
: March 13, 2023
```

### 19.4.9 Neo4j

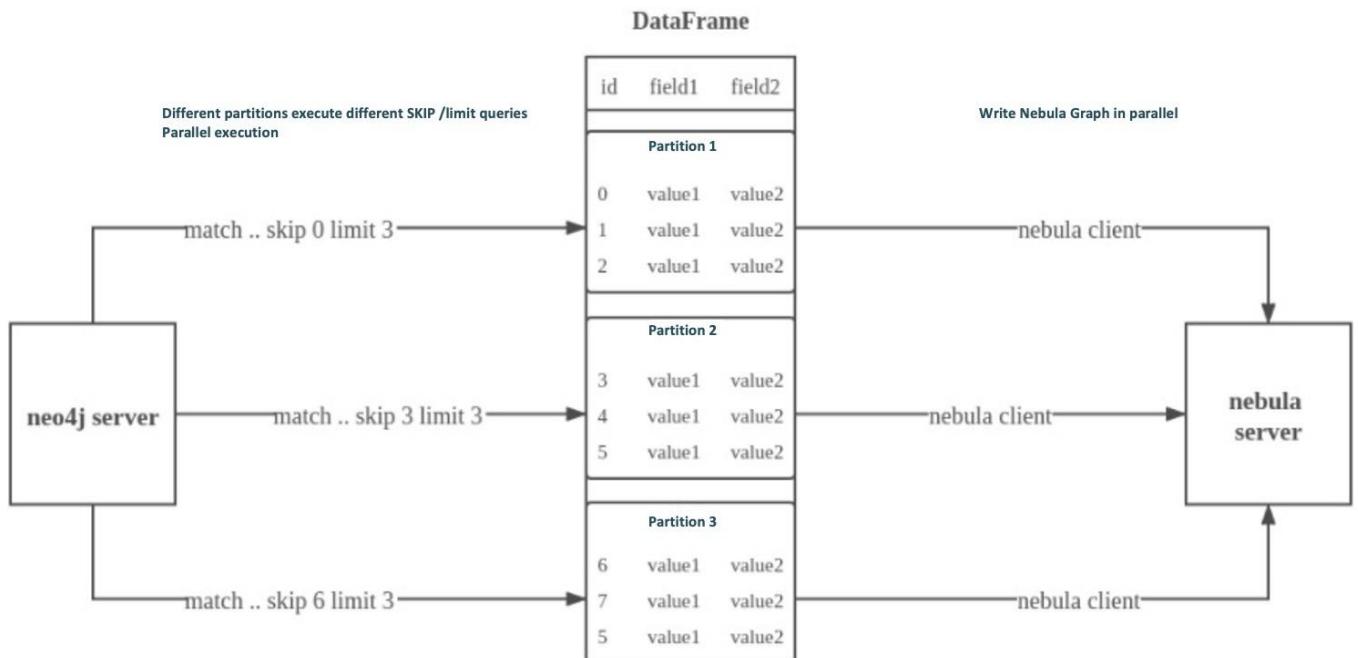
Exchange      Neo4j      NebulaGraph

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 3.4.1 **Docker Compose**

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange **Exchange** Exchange 3.4.0
- 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 3.4.0
 }

 driver: {
 cores: 1
 maxResultSize: 1G
 }

 executor: {
 memory:1G
 }

 cores:{
 max: 16
 }
 }

 # NebulaGraph
 nebula: {
 address:{
 graph:["127.0.0.1:9669"]
 # Meta
 # NebulaGraph k8s Leader Meta
 meta:["127.0.0.1:9559"]
 }
 user: root
 pswd: nebulag
 }
}
```

```

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	Neo4j
tags.vertex edges.vertex							
NebulaGraph	ID	Neo4j	NebulaGraph	ID	Neo4j	ID	Neo4j
NebulaGraph							
NebulaGraph							
check_point_path							
partition							

## 4 NEBULAGRAPH

NebulaGraph

```
`${SPARK_HOME}/bin/spark-submit --master "local" --class com.vesoft.nebula.exchange.Exchange <nebula-exchange-3.4.0.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-3.4.0.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

```
LOOKUP ON player YIELD id(vertex);
```

SHOW STATS

## NebulaGraph

---

: March 13, 2023

## 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 3.4.1      [Docker Compose](#)

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange Exchange Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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: hive
 # 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 Client SST

 # 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-3.4.0.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-3.4.0.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

```
LOOKUP ON player YIELD id(vertex);
```

**SHOW STATS**

#### 6 NEBULAGRAPH

NebulaGraph

---

: March 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 3.4.1      **Docker Compose**

- **NebulaGraph**

- Graph      Meta      IP
- NebulaGraph
- Exchange      **Exchange**      Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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
 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-3.4.0.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-3.4.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/maxcompute_application.conf
```

```
batchSuccess.<tag_name/edge_name> batchSuccess.follow: 300
```

4

NebulaGraph      NebulaGraph Studio

```
LOOKUP ON player YIELD id(vertex);
```

SHOW STATS

5      NEBULAGRAPH

NebulaGraph

---

: March 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 3.4.1      **Docker Compose**
  
- **NebulaGraph**
- Graph      Meta      IP
- NebulaGraph
- Exchange      **Exchange**      Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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 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-3.4.0.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-3.4.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/pulsar_application.conf
```

batchSuccess.<tag\_name/edge\_name>      batchSuccess.follow: 300

4

NebulaGraph      NebulaGraph Studio

LOOKUP ON player YIELD id(vertex);

**SHOW STATS**

5      NEBULAGRAPH

NebulaGraph

: March 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 3.4.1 [Docker Compose](#)
- [NebulaGraph](#)
- Graph      Meta      IP
  - NebulaGraph
- Exchange      [Exchange](#)      Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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 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-3.4.0.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-3.4.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/kafka_application.conf
```

batchSuccess.<tag\_name/edge\_name>                  batchSuccess.follow: 300

4

NebulaGraph      NebulaGraph Studio

```
LOOKUP ON player YIELD id(vertex);
```

**SHOW STATS**

5      NEBULAGRAPH

NebulaGraph

---

: March 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 3.4.1      Docker Compose

- **NebulaGraph**
- Graph Meta IP
- NebulaGraph
- Exchange **Exchange** Exchange 3.4.0
- 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 3.4.0
 }
 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
 # NebulaGraph k8s Leader Meta
 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-3.4.0.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-3.4.0.jar -c /root/nebula-exchange/nebula-exchange/target/classes/jdbc_application.conf
```

```
batchSuccess.<tag_name/edge_name> batchSuccess.follow: 300
```

5

NebulaGraph      NebulaGraph Studio

```
LOOKUP ON player YIELD id(vertex);
```

**SHOW STATS**

6      NEBULAGRAPH

NebulaGraph

: March 13, 2023

## 19.4.15 SST

SST	Sorted String Table	HDFS	NebulaGraph	CSV
-----	---------------------	------	-------------	-----

- Linux SST
- Default
- Exchange 3.4.0 **GEOGRAPHY** SST

### Exchange

- **nGQL** NebulaGraph
- SST Console SST NebulaGraph  
SST

- Schema

 **Caution**

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({"file1.sst", "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;
}
```

<code>IngestExternalFile()</code>	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 3.4.1

- **NebulaGraph 3.4.1**

- 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 3.4.0
- 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 3.4.0
 }

 master:local

 driver: {
 cores: 1
 maxResultSize: 1G
 }

 executor: {
 memory:1G
 }
 }
}
```

```

cores: {
 max: 16
}
}

NebulaGraph
nebula: {
 address: {
 graph:["127.0.0.1:9669"]
 # Meta
 # NebulaGraph k8s Leader Meta
 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 3.4.1 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 3.4.1 VID
vertex: {
field:_c0
}

#
separator: ","
header: true
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 3.4.1 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 3.4.1 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-3.4.0.jar_path> -c <ssst_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-3.4.0.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

LOOKUP ON player YIELD id(vertex);

**SHOW STATS**

7 NEBULAGRAPH

NebulaGraph

: March 13, 2023

### 19.4.16 NebulaGraph

Exchange    NebulaGraph    CSV    NebulaGraph

 **Enterpriseonly**

Exchange    NebulaGraph

Linux

CPU	4 Intel(R) Xeon(R) Platinum 8260 CPU @ 2.30GHz
-----	------------------------------------------------

16G
-----

50G
-----

CentOS 7.9.2009

JDK	1.8.0
-----	-------

Hadoop	2.10.1
--------	--------

Scala	2.12.11
-------	---------

Spark	2.4.7
-------	-------

NebulaGraph	3.4.1
-------------	-------

NebulaGraph    **basketballplayer**    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
-----------	-------	------------------------------

1. **NebulaGraph**    Exchange JAR

2.

Exchange    NebulaGraph    `export_to_csv.conf` `export_to_nebula.conf`    **Exchange**

- CSV

```

Use the command to submit the exchange job:

spark-submit \
--master "spark://master_ip:7077" \
--driver-memory=2G --executor-memory=30G \
--total-executor-cores=60 --executor-cores=20 \
--class com.vesoft.nebula.exchange.Exchange \
nebula-exchange-3.0-SNAPSHOT.jar -c export_to_csv.conf

{
 # Spark config
 spark: {
 app: {
 name: NebulaGraph Exchange
 }
 }

 # Nebula Graph config
 # if you export nebula data to csv, please ignore these nebula config
 nebula: {
 address:{
 graph:["127.0.0.1:9669"]

 # the address of any of the meta services.
 # if your NebulaGraph server is in virtual network like k8s, please config the leader address of meta.
 meta:["127.0.0.1:9559"]
 }
 user: root
 pswd: nebula
 space: test
 }

 # nebula client connection parameters
 connection {
 # socket connect & execute timeout, unit: millisecond
 timeout: 30000
 }

 error: {
 # max number of failures, if the number of failures is bigger than max, then exit the application.
 max: 32
 # failed data will be recorded in output path, format with ngql
 output: /tmp/errors
 }

 # use google's RateLimiter to limit the requests send to NebulaGraph
 rate: {
 # the stable throughput of RateLimiter
 limit: 1024
 # Acquires a permit from RateLimiter, unit: MILLISECONDS
 # if it can't be obtained within the specified timeout, then give up the request.
 timeout: 1000
 }
}

Processing tags
tags: [
 {
 # you can ignore the tag name when export nebula data to csv
 name: tag-name-1
 type: {
 source: nebula
 sink: csv
 }
 metaAddress:"127.0.0.1:9559"
 space:"test"
 label:"person"
 # config the fields you want to export from nebula
 fields: [nebula-field-0, nebula-field-1, nebula-field-2]
 noFields:false # default false, if true, just export id
 partition: 60
 # config the path to save your csv file. if your file is not in hdfs, config "file:///path/ test.csv"
 path: "hdfs://ip:port/path/person"
 separator: ","
 header: true
 }
]

process edges
edges: [
 {
 # you can ignore the edge name when export nebula data to csv
 name: edge-name-1
 type: {
 source: nebula
 sink: csv
 }
 metaAddress:"127.0.0.1:9559"
 space:"test"
 label:"friend"
 # config the fields you want to export from nebula
 fields: [nebula-field-0, nebula-field-1, nebula-field-2]
 noFields:false # default false, if true, just export id
 partition: 60
 # config the path to save your csv file. if your file is not in hdfs, config "file:///path/ test.csv"
 }
]

```

```

 path: "hdfs://ip:port/path/friend"
 separator: ","
 header: true
 }
]
}

Use the command to submit the exchange job:

spark-submit \
--master "spark://master_ip:7077" \
--driver-memory=2G --executor-memory=30G \
--total-executor-cores=60 --executor-cores=20 \
--class com.vesoft.nebula.exchange.Exchange \
nebula-exchange-3.0-SNAPSHOT.jar -c export_to_nebula.conf

{
 # Spark config
 spark: {
 app: {
 name: NebulaGraph Exchange
 }
 }

 # Nebula Graph config, just config the sink nebula information
 nebula: {
 address:{}
 graph:["127.0.0.1:9669"]

 # the address of any of the meta services.
 # if your NebulaGraph server is in virtual network like k8s, please config the leader address of meta.
 meta:["127.0.0.1:9559"]
 }
 user: root
 pswd: nebula
 space: test

 # nebula client connection parameters
 connection {
 # socket connect & execute timeout, unit: millisecond
 timeout: 30000
 }

 error: {
 # max number of failures, if the number of failures is bigger than max, then exit the application.
 max: 32
 # failed data will be recorded in output path, format with ngql
 output: /tmp/errors
 }

 # use google's RateLimiter to limit the requests send to NebulaGraph
 rate: {
 # the stable throughput of RateLimiter
 limit: 1024
 # Acquires a permit from RateLimiter, unit: MILLISECONDS
 # if it can't be obtained within the specified timeout, then give up the request.
 timeout: 1000
 }
}

Processing tags
tags: [
 {
 name: tag-name-1
 type: {
 source: nebula
 sink: client
 }
 # data source nebula config
 metaAddress:"127.0.0.1:9559"
 space:"test"
 label:"person"
 # mapping the fields of the original NebulaGraph to the fields of the target NebulaGraph.
 fields: [source_nebula-field-0, source_nebula-field-1, source_nebula-field-2]
 nebula.fields: [target_nebula-field-0, target_nebula-field-1, target_nebula-field-2]
 limit:10000
 vertex: _vertexId # must be `_vertexId`
 batch: 2000
 partition: 60
 }
]

process edges
edges: [
 {
 name: edge-name-1
 type: {
 source: csv
 sink: client
 }
 # data source nebula config
 }
]
}

```

```

metaAddress:"127.0.0.1:9559"
space:"test"
label:"friend"
fields: [source_nebula-field-0, source_nebula-field-1, source_nebula-field-2]
nebula.fields: [target_nebula-field-0, target_nebula-field-1, target_nebula-field-2]
limit:1000
source: '_srcId' # must be '_srcId'
target: '_dstId' # must be '_dstId'
ranking: source_nebula-field-2
batch: 2000
partition: 60
}
]
}

```

### 3. NebulaGraph



Driver Executor

```

<spark_install_path>/bin/spark-submit --master "spark://<master_ip>:7077" \
--driver-memory=2G --executor-memory=30G \
--total-executor-cores=60 --executor-cores=20 \
--class com.vesoft.nebula.exchange.Exchange nebula-exchange-x.y.z.jar_path> \
-c <conf_file_path>

```

### CSV

```

$./spark-submit --master "spark://192.168.10.100:7077" \
--driver-memory=2G --executor-memory=30G \
--total-executor-cores=60 --executor-cores=20 \
--class com.vesoft.nebula.exchange.Exchange ~/exchange-ent/nebula-exchange-ent-3.4.0.jar \
-c ~/exchange-ent/export_to_csv.conf

```

### 4.

- CSV

#### CSV

```

$ hadoop fs -ls /vertex/player
Found 11 items
-rw-r--r-- 3 nebula supergroup 0 2021-11-05 07:36 /vertex/player/_SUCCESS
-rw-r--r-- 3 nebula supergroup part-00000-17293020-ba2e-4243-b834-34495c0536b3-c000.csv
-rw-r--r-- 3 nebula supergroup 160 2021-11-05 07:36 /vertex/player/ part-00001-17293020-ba2e-4243-b834-34495c0536b3-c000.csv
-rw-r--r-- 3 nebula supergroup 163 2021-11-05 07:36 /vertex/player/ part-00002-17293020-ba2e-4243-b834-34495c0536b3-c000.csv
-rw-r--r-- 3 nebula supergroup 172 2021-11-05 07:36 /vertex/player/ part-00003-17293020-ba2e-4243-b834-34495c0536b3-c000.csv
-rw-r--r-- 3 nebula supergroup 172 2021-11-05 07:36 /vertex/player/ part-00004-17293020-ba2e-4243-b834-34495c0536b3-c000.csv
-rw-r--r-- 3 nebula supergroup 144 2021-11-05 07:36 /vertex/player/ part-00005-17293020-ba2e-4243-b834-34495c0536b3-c000.csv
-rw-r--r-- 3 nebula supergroup 173 2021-11-05 07:36 /vertex/player/ part-00006-17293020-ba2e-4243-b834-34495c0536b3-c000.csv
-rw-r--r-- 3 nebula supergroup 160 2021-11-05 07:36 /vertex/player/ part-00007-17293020-ba2e-4243-b834-34495c0536b3-c000.csv
-rw-r--r-- 3 nebula supergroup 148 2021-11-05 07:36 /vertex/player/ part-00008-17293020-ba2e-4243-b834-34495c0536b3-c000.csv
-rw-r--r-- 3 nebula supergroup 125 2021-11-05 07:36 /vertex/player/ part-00009-17293020-ba2e-4243-b834-34495c0536b3-c000.csv
-rw-r--r-- 3 nebula supergroup 119 2021-11-05 07:36 /vertex/player/

```

SUBMIT JOB STATS SHOW STATS

: March 27, 2023

## 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	mirrorOf *
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- ...
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- ...
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- ...
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			
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			
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			

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

```
<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.y.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

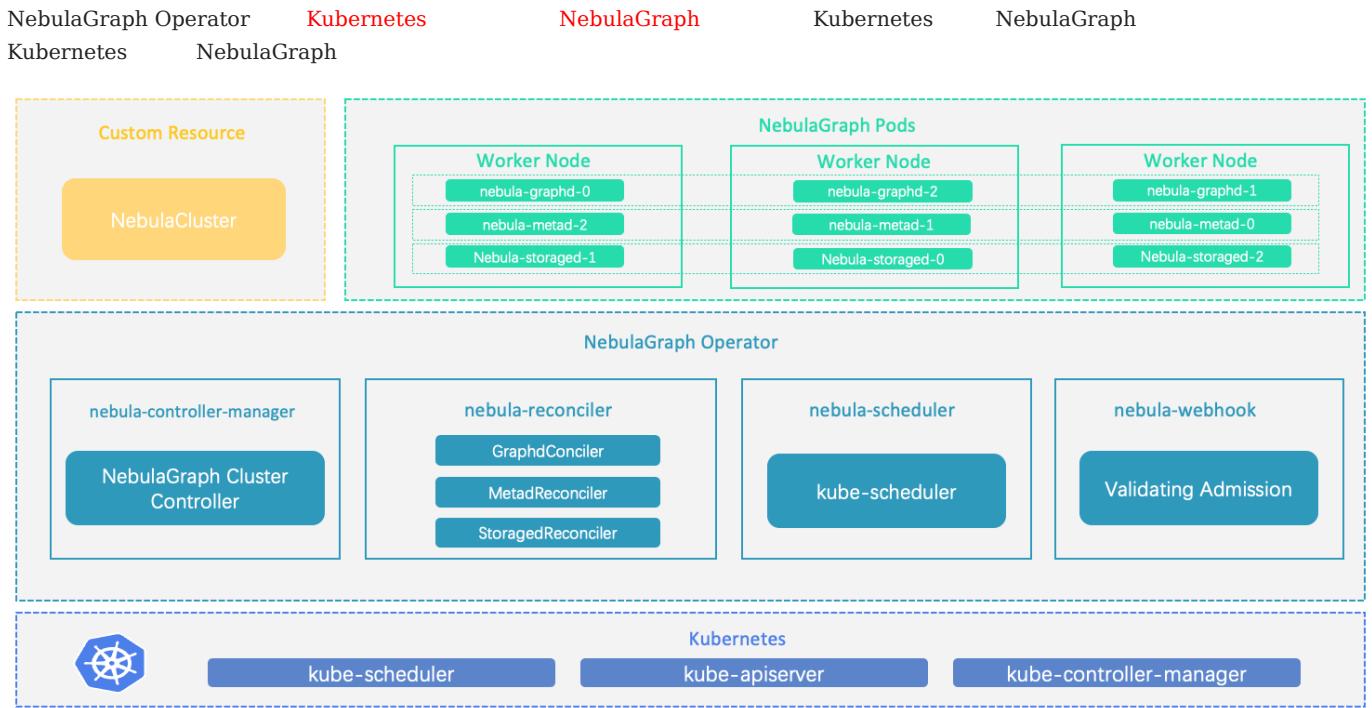
---

: December 15, 2022

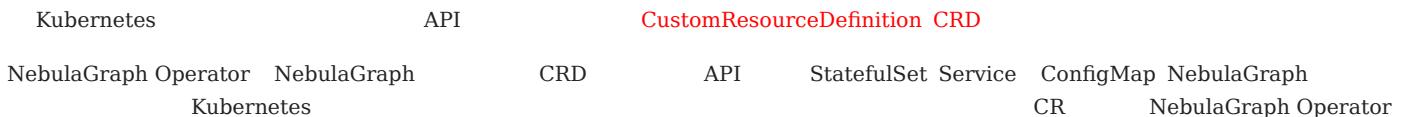
## 20. NebulaGraph Operator

### 20.1 NebulaGraph Operator

#### 20.1.1



#### 20.1.2



#### 20.1.3

##### NebulaGraph Operator

- NebulaGraph Operator  
Kubectl    NebulaGraph    Helm    NebulaGraph  
CR    NebulaGraph Operator    NebulaGraph
- NebulaGraph  
Kubectl    Helm  
NebulaGraph    NebulaGraph Operator  
YAML
- 3.0.0    NebulaGraph    3.4.0
- NebulaGraph    S3  
NebulaGraph Operator
- 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 ~ 3.4.1	1.3.0 1.4.0 ~ 1.4.2
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

---

: April 12, 2023

## 20.2

---

NebulaGraph Operator   NebulaGraph

1. **NebulaGraph Operator**
  2. NebulaGraph  
    Kubectl   NebulaGraph      Helm   NebulaGraph
  3. **NebulaGraph**
- 

: August 9, 2022

## 20.3 Macro Rendering Error

**UndefinedError:** 'operation' is undefined

```
Traceback (most recent call last):
 File "/opt/hostedtoolcache/Python/3.8.16/x64/lib/python3.8/site-packages/mkdocs_macros/plugin.py", line 480, in render
 return md_template.render(**page_variables)
 File "/opt/hostedtoolcache/Python/3.8.16/x64/lib/python3.8/site-packages/jinja2/environment.py", line 1301, in render
 self.environment.handle_exception()
 File "/opt/hostedtoolcache/Python/3.8.16/x64/lib/python3.8/site-packages/jinja2/environment.py", line 936, in handle_exception
 raise rewrite_traceback_stack(source=source)
 File "<template>", line 78, in top-level template code
 File "/opt/hostedtoolcache/Python/3.8.16/x64/lib/python3.8/site-packages/jinja2/environment.py", line 485, in getattr
 return getattr(obj, attribute)
jinja2.exceptions.UndefinedError: 'operation' is undefined
```

: April 19, 2023

## 20.4 NebulaGraph

### 20.4.1 Kubectl NebulaGraph



1.x NebulaGraph Operator    3.x NebulaGraph

- [NebulaGraph Operator](#)
- [StorageClass](#)
- [License](#)

**Enterpriseonly**

NebulaGraph

License

nebula

NebulaGraph

1.

•

```
apps_v1alpha1_nebulacluster.yaml
```

metadata.name	-	NebulaGraph
spec.graphd.replicas	1	Graphd
spec.graphd.images	vesoft/nebula-graphd	Graphd
spec.graphd.version	v3.4.1	Graphd
spec.graphd.service		Graphd Service
spec.graphd.logVolumeClaim.storageClassName	-	Graphd Storage Classes
spec.metad.replicas	1	Metad
spec.metad.images	vesoft/nebula-metad	Metad
spec.metad.version	v3.4.1	Metad
spec.metad.dataVolumeClaim.storageClassName	-	Metad Storage Classes
spec.metad.logVolumeClaim.storageClassName	-	Metad Storage Classes
spec.storaged.replicas	3	Storaged
spec.storaged.images	vesoft/nebula-storaged	Storaged
spec.storaged.version	v3.4.1	Storaged
spec.storaged.dataVolumeClaims.resources.requests.storage	-	Storaged  /usr/local/nebula/ data1 /usr/local/nebula/data2
spec.storaged.dataVolumeClaims.resources.storageClassName	-	Storaged Storage Classes
spec.storaged.logVolumeClaim.storageClassName	-	Storaged Storage Classes
spec.reference.name	-	
spec.schedulerName	-	
spec.imagePullPolicy	NebulaGraph Image pull policy	
spec.logRotate	-	
spec.enablePVReclaim	false	PVC PV

- apps\_v1alpha1\_nebulacluster.yaml

spec.metad.license	-	NebulaGraph	License
spec.storaged.enableAutoBalance	false		Storage
spec.enableBR	false	BR	

### ⑥ enterpriseonly

NebulaGraph inquiry@vesoft.com NebulaGraph

## 2. License

### ⑥ enterpriseonly

- NebulaGraph
- NebulaGraph

```
kubectl create secret generic nebula-license --from-file=nebula.license
```

### License

```
kubectl get secrets nebula-license -o yaml
```

## 3. NebulaGraph

```
kubectl create -f apps_v1alpha1_nebulacluster.yaml
```

```
nebulacluster.apps.nebula-graph.io/nebula created
```

## 4. NebulaGraph

```
kubectl get nebulaclusters nebula
```

NAME	GRAPHD-DESIRED	GRAPHD-READY	METAD-DESIRED	METAD-READY	STORAGED-DESIRED	STORAGED-READY	AGE
nebula	1	1	1	1	3	3	86s

- NebulaGraph
- v1.1.0 NebulaGraph Operator NebulaGraph

```
apps_v1alpha1_nebulacluster.yaml replicas NebulaGraph
```

NebulaGraph Storage 5

1. apps\_v1alpha1\_nebulacluster.yaml storaged.replicas 3 5

```
storaged:
 resources:
 requests:
 cpu: "500m"
 memory: "500Mi"
 limits:
 cpu: "1"
 memory: "1Gi"
 replicas: 5
 image: vesoft/nebula-storaged
 version: v3.4.1
 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
```

2. NebulaGraph CR

```
kubectl apply -f apps_v1alpha1_nebulacluster.yaml
```

3. Storage

```
kubectl get pods -l app.kubernetes.io/cluster=nebula
```

NAME	READY	STATUS	RESTARTS	AGE
nebula-graphd-0	1/1	Running	0	2m
nebula-metad-0	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
nebula-storaged-3	1/1	Running	0	5m
nebula-storaged-4	1/1	Running	0	5m

Storage 5

apps\_v1alpha1\_nebulacluster.yaml replicas



NebulaGraph Graph Storage Meta

Kubectl NebulaGraph

```
kubectl delete -f apps_v1alpha1_nebulacluster.yaml
```

NebulaGraph

---

: April 19, 2023

## 20.4.2 Helm NebulaGraph



1.x NebulaGraph Operator    3.x NebulaGraph

- [NebulaGraph Operator](#)
- [StorageClass](#)
- License

**Enterpriseonly**

NebulaGraph                      License

### NebulaGraph

#### 1. NebulaGraph Operator Helm

```
helm repo add nebula-operator https://vesoft-inc.github.io/nebula-operator/charts
```

#### 2. Helm

```
helm repo update
```

#### 3.

```
export NEBULA_CLUSTER_NAME=nebula # NebulaGraph
export NEBULA_CLUSTER_NAMESPACE=nebula # NebulaGraph
export STORAGE_CLASS_NAME=fast-disks # NebulaGraph
```

#### 4. NebulaGraph

```
kubectl create namespace "${NEBULA_CLUSTER_NAMESPACE}"
```

#### 5. License

**Enterpriseonly**

- NebulaGraph
- NebulaGraph

```
kubectl create secret generic nebula-license --from-file=nebula.license
```

License

```
kubectl get secrets nebula-license -o yaml
```

#### 6. 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}" \
NebulaGraph
--set nebula.version=v3.4.1 \
```

```
nebula-cluster chart
--version=1.4.2
```

### Enterpriseonly

```
NebulaGraph --set nebula.metad.license.secretName=nebula-license --set
nebula.metad.license.licenseKey=nebula.license
```

## 7. NebulaGraph

```
kubectl -n "${NEBULA_CLUSTER_NAMESPACE}" get pod -l "app.kubernetes.io/cluster=${NEBULA_CLUSTER_NAME}"
```

- NebulaGraph
- v1.1.0      NebulaGraph Operator      NebulaGraph
 

NebulaGraph	replicas	Nebualal Graph
NebulaGraph	Storage	5      2

```
helm upgrade "${NEBULA_CLUSTER_NAME}" nebula-operator/nebula-cluster \
--namespace="${NEBULA_CLUSTER_NAMESPACE}" \
--set nameOverride=${NEBULA_CLUSTER_NAME} \
--set nebula.storageClassName="${STORAGE_CLASS_NAME}" \
--set nebula.storaged.replicas=5
```

NebulaGraph      replicas

### Caution

NebulaGraph      Graph      Storage      Meta

**nebula-cluster/values.yaml**      nebula-cluster chart

**NebulaGraph      Chart**

## Helm

```
helm uninstall "${NEBULA_CLUSTER_NAME}" --namespace="${NEBULA_CLUSTER_NAMESPACE}"
```

```
helm uninstall nebula --namespace=nebula
```

## NebulaGraph

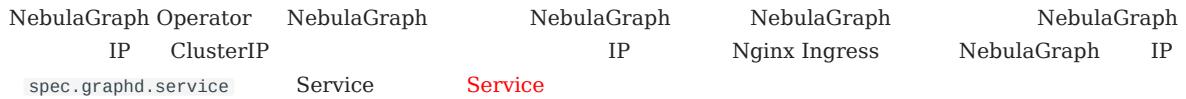
NebulaGraph Chart

nameOverride	nil	Chart
nebula.version	v3.4.1	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	

: April 19, 2023

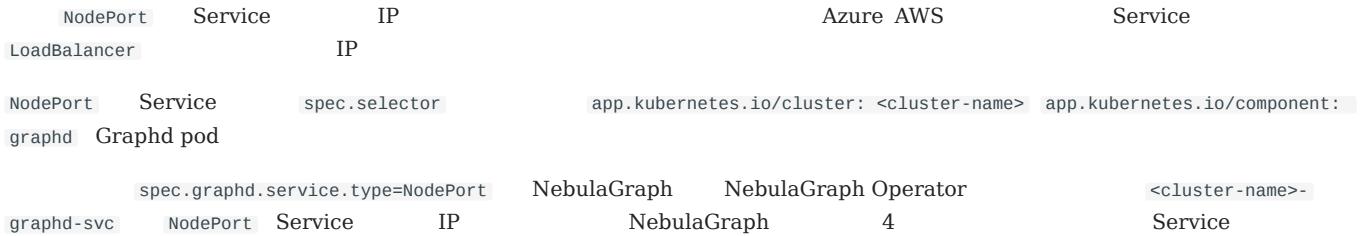
## 20.5 Nebular Operator NebulaGraph



### 20.5.1



### 20.5.2 NodePort NebulaGraph NebulaGraph



## 1. graphd-nodeport-service.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 # Service NodePort
```

- NebulaGraph 9669 19669 Graph HTTP
- targetPort Pod

## 2. Service

```
kubectl create -f graphd-nodeport-service.yaml
```

## 3. Service NebulaGraph

```
kubectl get services -l app.kubernetes.io/cluster=<nebula> #<nebula>
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
nebula-graphd-svc-nodeport	NodePort	10.107.153.129	<none>	9669:32236/TCP,19669:31674/TCP,19670:31057/TCP	24h
...					

NodePort Service 32236

## 4. IP NebulaGraph

```
kubectl run -ti --image vesoft/nebula-console:v3.4.0 --restart=Never -- <nebula_console_name> -addr <node_ip> -port <node_port> -u <username> -p <password>
```

```
kubectl run -ti --image vesoft/nebula-console:v3.4.0 --restart=Never -- nebula-console -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-console
- -addr NebulaGraph IP 192.168.8.24
- -port NebulaGraph 32236
- -u NebulaGraph root
- -p

### 20.5.3 NebulaGraph NebulaGraph

ClusterIP	Service	Pod	NebulaGraph	Service	IP	Graph	9669	NebulaGraph
<b>ClusterIP</b>								

#### 1. graphd-clusterip-service.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
 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: ClusterIP # Service ClusterIP
```

- NebulaGraph 9669 19669 Graph HTTP
- targetPort Pod

#### 2. Service

```
kubectl create -f graphd-clusterip-service.yaml
```

#### 3. 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
...
```

#### 4. <cluster-name>-graphd-svc Service IP NebulaGraph

```
kubectl run -ti --image vesoft/nebula-console:v3.4.0 --restart=Never -- <nebula_console_name> -addr <cluster_ip> -port <service_port> -u <username> -p <password>
```

```
kubectl run -ti --image vesoft/nebula-console:v3.4.0 --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:v3.4.0 --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 - <service_port> Graph 9669
```

#### 20.5.4 Ingress NebulaGraph

Pod	Pod	Ingress	Ingress	Pod
Nginx Ingress	Kubernetes Ingress	Ingress Controller	Kubernetes Ingress	Watch
Ingress	Nginx	Nginx		Kubernetes
HostNetwork	DaemonSet	Nginx Ingress	NebulaGraph	Ingress
HostNetwork	Nginx Ingress	Pod		Nginx Ingress
DaemonSet				Nginx Ingress
Ingress	TCP UDP	nginx-ingress-controller	--tcp-services-configmap --udp-services-configmap	ConfigMap
ConfigMap			< / >:< >	
		tcp-services	ConfigMap	

```
apiVersion: v1
kind: ConfigMap
metadata:
 name: tcp-services
 namespace: nginx-ingress
data:
 9769: "default/nebula-graphd-svc:9669"
```

## 1. nginx-ingress-daemonset-hostnetwork.yaml

```
nginx-ingress-daemonset-hostnetwork.yaml YAML
```



**YAML**      [nginx-ingress](#)      `kubectl create namespace 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:v3.4.0 --restart=Never -- <nebula_console_name> -addr <host_ip> -port <external_port> -u <username> -p <password>
```

```
kubectl run -ti --image vesoft/nebula-console:v3.4.0 --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)]>
```

---

: April 19, 2023

## 20.6 NebulaGraph

### 20.6.1 NebulaGraph

NebulaGraph	Meta Storage Graph	NebulaGraph	YAML	config config
ConfigMap	ConfigMap	/usr/local/nebula/etc/		



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: v3.4.1
 storageClaim:
 resources:
 requests:
 storage: 2Gi
 storageClassName: fast-disks
 config: // Graph
 "enable_authorize": "true"
 "auth_type": "password"
...
```

Meta Storage config spec.metad.config spec.storaged.config

3. kubectl apply -f nebula\_cluster.yaml  
 enable\_authorize auth\_type Graph ConfigMap nebula-graphd

HTTP

Pod

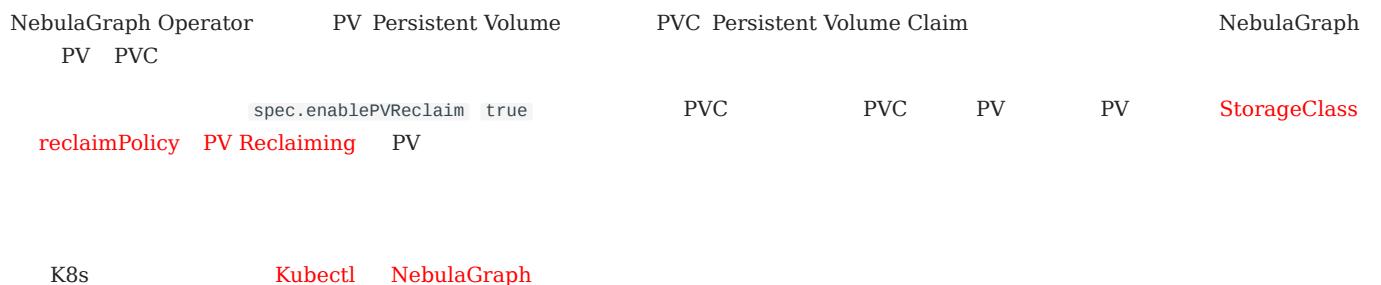


Meta Storage Graph

Meta Storage Graph

: April 19, 2023

## 20.6.2 PV



`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: v3.4.1
imagePullPolicy: IfNotPresent
metad:
 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: v3.4.1
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: v3.4.1
```

```
3. kubectl apply -f nebula_cluster.yaml
```

PVC PV PV

---

: March 27, 2023

### 20.6.3 Storage

 **Enterpriseonly**

NebulaGraph Storage

Storage Storage Storage  
NebulaGraph Storage Pods Ready BALANCE DATA BALANCE LEADER

CR enableAutoBalance

K8s Kubectl NebulaGraph

nebula nebula\_cluster.yaml YAML enableAutoBalance

## 1. nebulas

```
kubectl edit nebulaclusters.apps.nebula-graph.io nebulas
```

## 2. YAML spec.storaged enableAutoBalance true

```
apiVersion: apps.nebula-graph.io/v1alpha1
kind: NebulaCluster
metadata:
 name: nebulas
spec:
 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: v3.4.1
 imagePullPolicy: IfNotPresent
 metad:
 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: v3.4.1
 nodeSelector:
 nebula: cloud
 reference:
 name: statefulsets.apps
 version: v1
 schedulerName: default-scheduler
 storaged:
 enableAutoBalance: true // true Storage
 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: v3.4.1
 ...

```

- enableAutoBalance true Storage
- enableAutoBalance false Storage
- enableAutoBalance Storage Storage

3. `kubectl apply -f nebula_cluster.yaml`

---

: December 15, 2022

## 20.6.4

NebulaGraph graphd metad storaged /usr/local/nebula/logs

NebulaGraph `kubectl logs`

### Storage

```
// Storage Pod nebula-storaged-0
$ kubectl get pods -l app.kubernetes.io/component=storaged
NAME READY STATUS RESTARTS AGE
nebula-storaged-0 1/1 Running 0 45h
...
// Storage storaged
$ kubectl exec -it nebula-storaged-0 -c storaged -- /bin/bash

// Storage
$ cd /usr/local/nebula/logs
```

Operator sidecar

NebulaGraph sidecar sidecar `logrotate`

YAML `spec.logRotate`

```
...
spec:
 graphd:
 config:
 # true false
 "timestamp_in_logfile_name": "false"
 metad:
 config:
 "timestamp_in_logfile_name": "false"
 storaged:
 config:
 "timestamp_in_logfile_name": "false"
 logRotate: #
 # 5 0
 rotate: 5
 # 200M
 size: "200M"
```

`fluent-bit`

Operator `glog`



Operator

YAML `config env`

```
...
spec:
 graphd:
 config:
 # false
 "redirect_stdout": "false"
 # INFO WARNING ERROR FATAL 0 1 2 3
 "stderrthreshold": "0"
 env:
 - name: GLOG_logtostderr #
 value: "1" # 1 0
 image: vesoft/nebula-graphd
 replicas: 1
 resources:
```

```
requests:
 cpu: 500m
 memory: 500Mi
service:
 externalTrafficPolicy: Local
 type: NodePort
 version: v3.4.1
metad:
 config:
 redirect_stdout: "false"
 stderrthreshold: "0"
 dataVolumeClaim:
 resources:
 requests:
 storage: 1Gi
 storageClassName: ebs-sc
 env:
 - name: GLOG_logtostderr
 value: "1"
 image: vesoft/nebula-metad
...
...
```

---

: April 19, 2023

## 20.7 NebulaGraph

NebulaGraph Operator    NebulaGraph



1.x    NebulaGraph Operator    3.x    NebulaGraph

### 20.7.1

- NebulaGraph Operator    NebulaGraph
- NebulaGraph 3.0.0    3.4.0
- NebulaGraph

### 20.7.2 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    v3.4.1

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: v3.4.1 // 3.0.0 v3.4.1
 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: v3.4.1 // 3.0.0 v3.4.1
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: v3.4.1 // 3.0.0 v3.4.1
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_v1alpha1_nebulacluster.yaml
```

### 4. 2 v3.4.1

```
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:v3.4.1
1 vesoft/nebula-metad:v3.4.1
3 vesoft/nebula-storaged:v3.4.1

```

## 20.7.3 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

### v3.4.1 NebulaGraph

```
helm upgrade "${NEBULA_CLUSTER_NAME}" nebula-operator/nebula-cluster \
--namespace="${NEBULA_CLUSTER_NAMESPACE}" \
--set nameOverride=${NEBULA_CLUSTER_NAME} \
--set nebula.version=v3.4.1
```

```
--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:v3.4.1
 1 vesoft/nebula-metad:v3.4.1
 3 vesoft/nebula-storaged:v3.4.1
```

## 20.7.4

Storage	Leader	YAML	enableForceUpdate	Leader
---------	--------	------	-------------------	--------

---

: March 27, 2023

## 20.8 NebulaGraph

NebulaGraph		NebulaGraph	Raft
Raft	Leader	Leader	Follower
Operator	NebulaGraph		Leader
Operator	NebulaGraph	Leader	Leader
Leader		Operator	enableForceUpdate
Leader			true

20.8.1

Operator	NebulaGraph
•	NebulaGraph
•	NebulaGraph

20.8.2

YAML	spec.storage.enableForceUpdate	true	false
enableForceUpdate	true	Leader	Leader
 Caution			false
enableForceUpdate	true	Pod	

```
...
spec:
...
storaged:
 enableForceUpdate: true // true
```

: March 27, 2023

## 20.9 NebulaGraph Operator

Kubernetes NebulaGraph

 Enterpriseonly

Kubernetes NebulaGraph

### 20.9.1

NebulaGraph BR NebulaGraph NebulaGraph Operator BR Kubernetes NebulaGraph

NebulaGraph Operator Job NebulaGraph

NebulaGraph Operator NebulaRestore NebulaGraph  
NebulaGraph

### 20.9.2

NebulaGraph Operator

- Nebula Operator >= 1.4.0
- Kubernetes NebulaGraph
- YAML spec.enableBR true

```
// YAML
apiVersion: apps.nebula-graph.io/v1alpha1
kind: NebulaCluster
metadata:
 name: nebula
spec:
 enableBR: true // true
...
```

- S3 AWS S3 Minio
- 

### 20.9.3

- NebulaGraph Operator

- DDL DML 2 5
- 
- wal\_ttl
- 

S3 Job NebulaGraph  
Job YAML

```
apiVersion: batch/v1
kind: Job
metadata:
 name: nebula-full-backup
```

```

spec:
 parallelism: 1
 ttlSecondsAfterFinished: 60
 template:
 spec:
 restartPolicy: OnFailure
 containers:
 - image: vesoft/br-ent:v3.4.1
 imagePullPolicy: Always
 name: backup
 command:
 - /bin/sh
 - -ecx
 - exec /usr/local/bin/nebula-br backup full
 - --meta $META_ADDRESS:9559
 - --storage s3://$BUCKET
 - --s3.access_key $ACCESS_KEY
 - --s3.secret_key $SECRET_KEY
 - --s3.region $REGION
 - --s3.endpoint https://s3.$REGION.amazonaws.com

```

spec.template.spec.containers[0].command

Job

YAML

YAML

YAML

```

apiVersion: batch/v1
kind: Job
metadata:
 name: nebula-incr-backup
spec:
 parallelism: 1
 ttlSecondsAfterFinished: 60
 template:
 spec:
 restartPolicy: OnFailure
 containers:
 - image: vesoft/br-ent:v3.4.1
 imagePullPolicy: Always
 name: backup
 command:
 - /bin/sh
 - -ecx
 - exec /usr/local/bin/nebula-br backup incr
 - --meta $META_ADDRESS:9559
 - --base $BACKUP_NAME
 - --storage s3://$BUCKET
 - --s3.access_key $ACCESS_KEY
 - --s3.secret_key $SECRET_KEY
 - --s3.region $REGION
 - --s3.endpoint https://s3.$REGION.amazonaws.com

```

spec.parallelism

1

spec.ttlSecondsAfterFinished

60

spec.template.spec.containers[0].image

vesoft/br-ent:v3.4.1

NebulaGraph BR

spec.template.spec.containers[0].command

-

S3

**Job            Kubernetes Jobs**

Job    YAML

kubectl apply -f &lt;backup\_file\_name&gt;.yaml

BACKUP\_2023\_02\_12\_10\_04\_16

## 20.9.4

---

- 
- 

S3	Secret	S3	NebulaRestore	Operator
NebulaGraph				

BACKUP\_2023\_02\_12\_10\_04\_16      YAML

```
apiVersion: v1
kind: Secret
metadata:
 name: aws-s3-secret
type: Opaque
data:
 access-key: QVNJQVE0WFxxxx
 secret-key: ZFj6OEfdCdxenMwVGxxxx

apiVersion: apps.nebula-graph.io/v1alpha1
kind: NebulaRestore
metadata:
 name: restore1
spec:
 br:
 clusterName: nebula
 backupName: "BACKUP_2023_02_12_10_04_16"
 concurrency: 5
 s3:
 region: "us-west-2"
 bucket: "nebula-br-test"
 endpoint: "https://s3.us-west-2.amazonaws.com"
 secretName: "aws-s3-secret"
```

- Secret

metadata.name	-	Secret	
type	Opaque	Secret	Types of Secret
data.access-key	-	S3	AccessKey
data.secret-key	-	S3	SecretKey

- NebulaRestore

metadata.name	-	NebulaRestore	
spec.br.clusterName	-		
spec.br.backupName	-		
spec.br.concurrency	5		5
spec.br.s3.region	-	S3	
spec.br.s3.bucket	-		S3
spec.br.s3.endpoint	-	S3	
spec.br.s3.secretName	-	S3	Secret

**YAML**

```
kubectl apply -f <restore_file_name>.yaml
```

**NebulaRestore**

```
kubectl get rt <NebulaRestore_name> -w
```

---

: March 13, 2023

## 20.10

---

NebulaGraph Operator	NebulaGraph NebulaGraph    1 Storage Pod	NebulaGraph Nebular Operator
----------------------	---------------------------------------------	---------------------------------

### 20.10.1

---

**NebulaGraph Operator**

### 20.10.2

---

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

---

: August 9, 2022

## 20.11

---

### 20.11.1 NebulaGraph Operator v1.x NebulaGraph

---

v1.x NebulaGraph DNS NebulaGraph Operator DNS

### 20.11.2

---

Pod NebulaGraph Operator

### 20.11.3

---

### 20.11.4 Operator replica NebulaGraph replica

---

Operator replica K8s Pod replica NebulaGraph

---

.....

: November 1, 2022

# 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
IS_CALC_MODULARITY	false
IS_OUTPUT_MODULARITY	false
	true
	nebula_output_types
	NebulaGraph
	--nebula_output_props --
	Explorer
	NebulaGraph
IS_STAT_COMMUNITY	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	$0 \sim 1$				
IS_OUTPUT_MODULARITY	false	true	nebula_output_types	NebulaGraph	--nebula_output_props	--
IS_STAT_COMMUNITY	false			Explorer		NebulaGraph

- 

VID	vid_type	ID			
LABEL	VID	ID			

### ConnectedComponent

ConnectedComponent	strongly connected component	weakly
connected component		

 Note

NebulaGraph Analytics

- NebulaGraph Analytics

- 

IS_DIRECTED	true	false			
IS_CALC_MODULARITY	false				
IS_OUTPUT_MODULARITY	false	true	nebula_output_types	NebulaGraph	--nebula_output_props
IS_STAT_COMMUNITY	false			Explorer	NebulaGraph

- 

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				
IS_OUTPUT_MODULARITY	false	true	nebula_output_types	NebulaGraph	--nebula_output_props -- Explorer NebulaGraph
IS_STAT_COMMUNITY	false				

- 

VID	vid_type	ID	
LABEL	VID	ID	

**InfoMap**

InfoMap

PageRank

## Note

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



NebulaGraph Analytics

- NebulaGraph Analytics

- 

root	100	VID
stat	width, depth	

- 

VALUE	list	stat
-------	------	------

**HyperANF**

HyperANF



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

: March 13, 2023

## 21.2 NebulaGraph Algorithm

---

<b>NebulaGraph Algorithm</b>	Algorithm	<b>GraphX</b>	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 ~ 3.4.x	3.x.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

---

- String SparkSQL **dense\_rank** String Long
- DataFrame

#### ↑ Compatibility

Algorithm v3.1.0 ID ID INT String

## 21.2.4

### NebulaGraph Algorithm

PageRank		pagerank	double/string
Louvain		louvain	int/string
KCore	K	kcore	int/string
LabelPropagation		lpa	int/string
Hang		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
DFS		dfs	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 -Dgpg.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
NebulaGraph Edge type
weightCols: ["start_year"]
}

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
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 betweennedss
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

: March 13, 2023

## 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>
3.4.0 ~ 3.4.1	3.4.0
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      NebulaGraph Analytics      SSH

```
$ sudo rpm -ivh <analytics_package_name> --prefix <install_path>
$ sudo chown <user>:<user> -R <install path>
```

```
$ sudo rpm -ivh nebula-analytics-3.4.0-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



MPICH      MPICH      TCP      10000    10100      set\_env.sh      MPIR\_CVAR\_CH3\_PORT\_RANGE

```
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_addrs=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
#NUM=3
#
#CORES=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

---

: March 13, 2023

## 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

: November 1, 2022

## 21.5 NebulaGraph Explorer Workflow

NebulaGraph Explorer    Workflow

 **Enterpriseonly**

Nebula Explorer

---

: November 1, 2022

## 22. NebulaGraph Spark Connector

---

NebulaGraph Spark Connector      Spark      Spark      NebulaGraph      NebulaGraph Spark Connector      Reader  
Writer

- Reader

Spark SQL	NebulaGraph	Edge type	Spark	DataFrame
-----------	-------------	-----------	-------	-----------

- Writer

Spark SQL	DataFrame	NebulaGraph
-----------	-----------	-------------

### NebulaGraph Spark Connector

#### 22.1

---

NebulaGraph Spark Connector    NebulaGraph      Spark

<b>Spark Connector</b>	<b>NebulaGraph</b>	<b>Spark</b>
nebula-spark-connector_3.0-3.0-SNAPSHOT.jar	nightly	3.x
nebula-spark-connector_2.2-3.0-SNAPSHOT.jar	nightly	2.2.x
nebula-spark-connector-3.0-SNAPSHOT.jar	nightly	2.4.x
nebula-spark-connector_2.2-3.4.0.jar	3.x	2.2.x
nebula-spark-connector-3.4.0.jar	3.x	2.4.x
nebula-spark-connector_2.2-3.3.0.jar	3.x	2.2.x
nebula-spark-connector-3.3.0.jar	3.x	2.4.x
nebula-spark-connector-3.0.0.jar	3.x	2.4.x
nebula-spark-connector-2.6.1.jar	2.6.0, 2.6.1	2.4.x
nebula-spark-connector-2.6.0.jar	2.6.0, 2.6.1	2.4.x
nebula-spark-connector-2.5.1.jar	2.5.0, 2.5.1	2.4.x
nebula-spark-connector-2.5.0.jar	2.5.0, 2.5.1	2.4.x
nebula-spark-connector-2.1.0.jar	2.0.0, 2.0.1	2.4.x
nebula-spark-connector-2.0.1.jar	2.0.0, 2.0.1	2.4.x
nebula-spark-connector-2.0.0.jar	2.0.0, 2.0.1	2.4.x

#### 22.2

---

NebulaGraph Spark Connector

- NebulaGraph
- NebulaGraph
- NebulaGraph
- **NebulaGraph Algorithm**

## 22.3

---

NebulaGraph Spark Connector 3.4.0

- 
- ID ID ID
- Reader
- Reader NebulaGraph Graphx VertexRDD EdgeRDD Long ID
- SparkSQL DataSourceV2 NebulaGraph
- insert update delete insert update delete
- NebulaGraph SSL

## 22.4

---

**Release notes**

### 22.5 NebulaGraph Spark Connector

---

#### 22.5.1

1. nebula-spark-connector

```
$ git clone -b release-3.4 https://github.com/vesoft-inc/nebula-spark-connector.git
```

2. nebula-spark-connector

3. Spark



Spark

- Spark 2.4

```
$ mvn clean package -Dmaven.test.skip=true -Dgpg.skip -Dmaven.javadoc.skip=true -pl nebula-spark-connector -am -Pscala-2.11 -Pspark-2.4
```

- Spark 2.2

```
$ mvn clean package -Dmaven.test.skip=true -Dgpg.skip -Dmaven.javadoc.skip=true -pl nebula-spark-connector_2.2 -am -Pscala-2.11 -Pspark-2.2
```

- Spark 3.x

```
$ mvn clean package -Dmaven.test.skip=true -Dgpg.skip -Dmaven.javadoc.skip=true -pl nebula-spark-connector_3.0 -am -Pscala-2.12 -Pspark-3.0
```

target nebula-spark-connector-3.4.0-SHAPSHOT.jar

#### 22.5.2 Maven

---

## 22.6

NebulaGraph Spark Connector NebulaGraph

```
NebulaGraph
spark.read.nebula().loadVerticesToDF()
spark.read.nebula().loadEdgesToDF()

dataframe NebulaGraph
dataframe.write.nebula().writeVertices()
dataframe.write.nebula().writeEdges()

nebula()
```

### 22.6.1 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

withMetaAddress	Meta withGraphAddress		ip1:port1, ip2:port2, ...
withConnectionRetry	NebulaGraph Java Client	NebulaGraph	1
withExecuteRetry	NebulaGraph Java Client		1
withTimeout	NebulaGraph Java Client	6000	ms

- ReadNebulaConfig NebulaGraph

withSpace	NebulaGraph			
withLabel	NebulaGraph	Tag	Edge type	
withNoColumn	false	true	withReturnCols	
withReturnCols	List(property1, property2, ...)		List()	
withLimit	NebulaGraph Java Storage Client		1000	
withPartitionNum	NebulaGraph	Spark	100	partition_num

## 22.6.2 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>

## 22.6.3

: March 13, 2023

## 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**

---

: August 9, 2022

## 24. NebulaGraph Bench

---

NebulaGraph Bench      LDBC      NebulaGraph

### 24.1

---

- NebulaGraph
- NebulaGraph

### 24.2

---

Release

NebulaGraph Bench

---

: August 9, 2022

## 25.

---

### 25.1 Release Note

---

25.1.1 NebulaGraph    3.4.1 release notes

---

- [#5336](#)
  - [#5383](#)
- 

: March 13, 2023

---

[25.1.2 NebulaGraph](#) [3.4.1 release notes](#)

- -
- 

: March 27, 2023

## 25.1.3 NebulaGraph Studio

### v3.6.0

- - Schema
  - 
  - 
  - 
  - 
  - 
  - #
  - 
  - 
  - 
  - Schema
  - **Schema**
  - Schema
- 

: February 3, 2023

## 25.1.4 NebulaGraph Dashboard

### v3.4.0

- - **dashboard.service**      Dashboard      Dashboard
  - Meta
  - 
  - 
  - 
  - num\_queries
- 

: February 2, 2023

## 25.1.5 NebulaGraph Dashboard

### v3.4.2

- 
- 
- NebulaGraph v3.4.1

### v3.4.1

- 
- RPM nebula-agent
- goconfig
- 30 gracePeriod 0

**v3.4.0**

- 
- NebulaGraph
- NebulaGraph
- 
- 
- **dashboard.service**      Dashboard      Dashboard
- 
- 
- 
- NebulaGraph
- 
- 
- 
- Graph
- 
- Meta
- 
- LDAP
- 
- 
- NebulaGraph
- Asianux Linux 7 (Core)
- 
- 
- 
- num\_queries
- 
- 
- NebulaGraph
- 
- 

---

: March 27, 2023

## 25.1.6 NebulaGraph Explorer

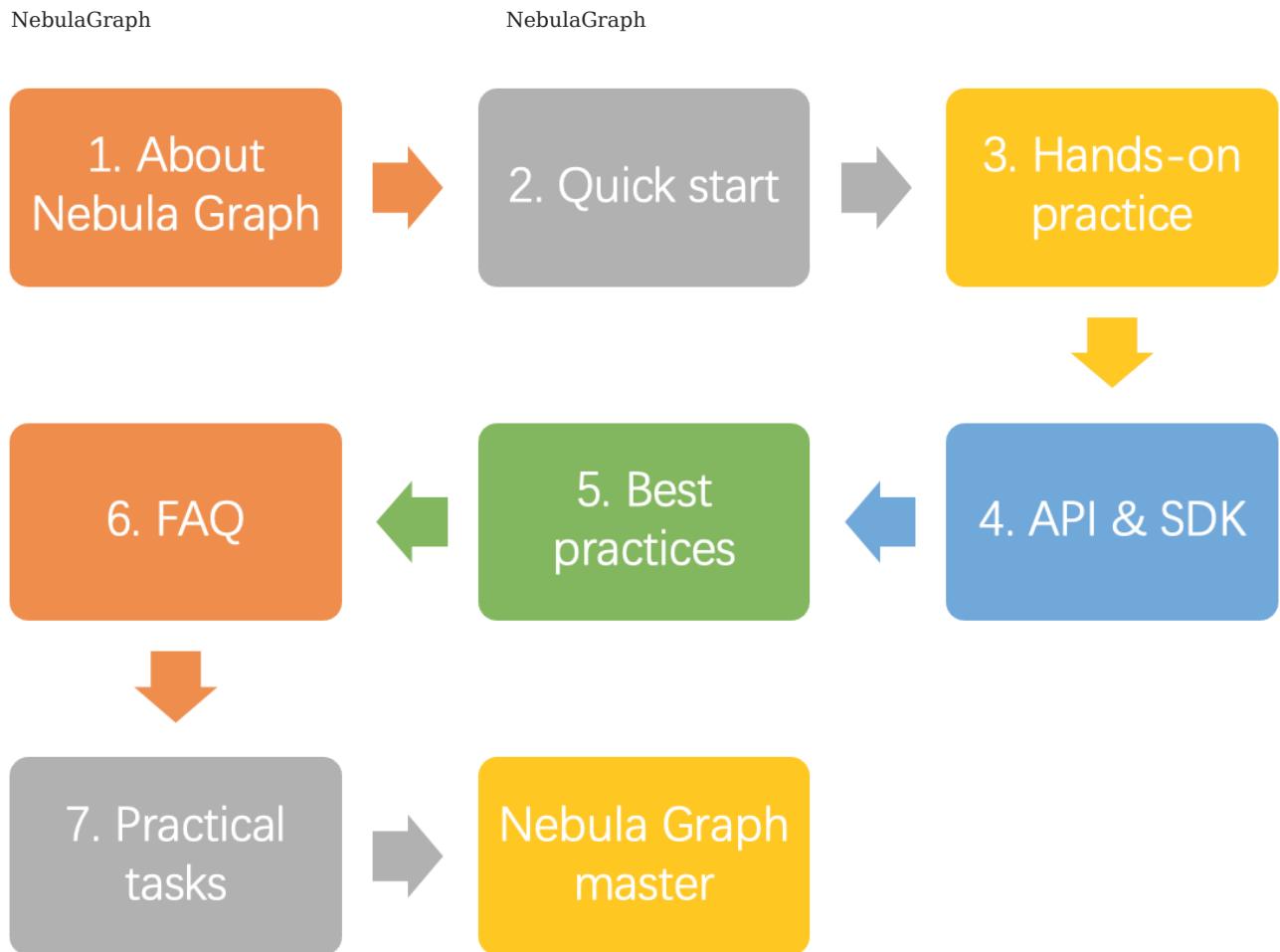
### v3.4.0

- 
- Schema
- Beta
- 
- 
- 
- 
- #
- # //
- 
- IP
- VID
- 
- 
- 
- Workflow
- 
- 
- 
- 
- 
- Tag
- 
- 
- Schema
- 
- 
- 
- 
- 
- 
-

- - 
  - `demo_basketballplayer`
  - 
  - Workflow
- 

: February 2, 2023

## 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
- 

: December 15, 2022

## 25.3 License

---

License NebulaGraph License License License

### 25.3.1 NebulaGraph

NebulaGraph NebulaGraph License  
NebulaGraph License

### 25.3.2 NebulaGraph Dashboard

NebulaGraph Dashboard NebulaGraph Dashboard License NebulaGraph Dashboard License

### 25.3.3 NebulaGraph Explorer

NebulaGraph Explorer Web NebulaGraph  
NebulaGraph Explorer NebulaGraph Explorer License NebulaGraph Explorer License

### 25.3.4 License

Dashboard/Explorer/NebulaGraph License  
Dashboard Explorer NebulaGraph License  
NebulaGraph License Meta Meta Graph Storage  
NebulaGraph License data NebulaGraph  
Meta Graph Storage

License License

License

License License

- License
- 30
- 14 NebulaGraph/Dashboard/Explorer
- License
- 7
- License

License inquiry@vesoft.com

: August 9, 2022

## 25.4 FAQ

---

NebulaGraph 3.4.1

[NebulaGraph](#)

[GitHub issue](#)

### 25.4.1

NebulaGraph

[issue](#) NebulaGraph



1. " "
2. Markdown "Commit changes" GitHub pull request
3. [CLA](#) 2 reviewer

### 25.4.2



NebulaGraph 3.4.1

NebulaGraph 1.x 2.x

[NebulaGraph](#)

### 25.4.3

**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.

```

## 25.4.4

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
<b>Storage</b>						

**NebulaGraph**

NebulaGraph Console 2.6.0 NebulaGraph

(Dangling edge)

NebulaGraph 3.4.1                    " "      openCypher    MERGE      **INSERT VERTEX, DELETE VERTEX, INSERT EDGE, DELETE EDGE**

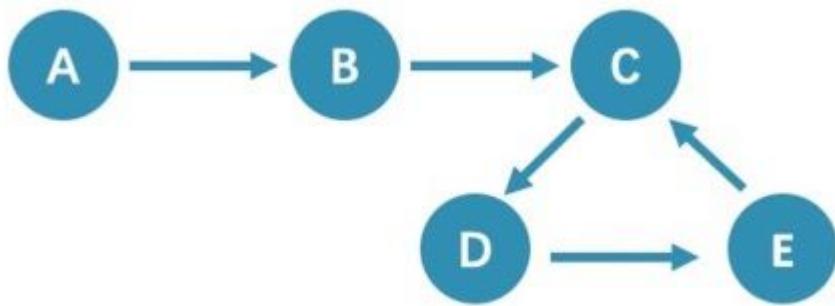
```
CREATE SPACE replica_factor 2
```

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 Edge type

?

$$\alpha = n \quad \alpha = k$$

```
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

25.4.5

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`



```
$ file core.1316027
core.1316027: ELF 64-bit LSB core file, x86-64, version 1 (SYSV), SVR4-style, from '/home/workspace/fork/nebula-debug/bin/nebula-metad --flagfile /home/k', real uid: 1008, effective uid: 1008, real gid: 1008, effective gid: 1008, execfn: '/home/workspace/fork/nebula-debug/bin/nebula-metad', platform: 'x86_64'

$ gdb /home/workspace/fork/nebula-debug/bin/nebula-metad core.1316027

$(gdb) bt
#0 0x000007f9de58fecf5 in __memcpy_ssse3_back () from /lib64/libc.so.6
#1 0x000000000eb2299 in void std::__cxx11::basic_string<char, std::char_traits<char>, std::allocator<char>>::_M_construct<char*>(char*, char*, std::forward_iterator_tag) ()
#2 0x000000000ef71a7 in nebula::meta::cpp2::QueryDesc::QueryDesc(nebula::meta::cpp2::QueryDesc const&) ()
...
...
```

dmp

Core

NebulaGraph

**systemctl**      **NebulaGraph**

1. systemctl enable metad graphd storaged

```
[root]# systemctl enable nebula-metad.service
Created symlink from /etc/systemd/system/multi-user.target.wants/nebula-metad.service to /usr/lib/systemd/system/nebula-metad.service.
[root]# systemctl enable nebula-graphd.service
Created symlink from /etc/systemd/system/multi-user.target.wants/nebula-graphd.service to /usr/lib/systemd/system/nebula-graphd.service.
[root]# systemctl enable nebula-storaged.service
Created symlink from /etc/systemd/system/multi-user.target.wants/nebula-storaged.service to /usr/lib/systemd/system/nebula-storaged.service.
```

2. metad graphd storaged service



service	- PIDFile	ExecStart	ExecReload	ExecStop	- RestartSec	( )	-
StartLimitInterval	10	5	0	-	LimitNOFILE	1024	
metad	service						

```
$ vi /usr/lib/systemd/system/nebula-metad.service

[Unit]
Description=Nebula Graph Metad Service
After=network.target

[Service]
Type=forking
Restart=always
RestartSec=15s
PIDFile=/usr/local/nebula/pids/nebula-metad.pid
ExecStart=/usr/local/nebula/scripts/nebula.service start metad
ExecReload=/usr/local/nebula/scripts/nebula.service restart metad
ExecStop=/usr/local/nebula/scripts/nebula.service stop metad
PrivateTmp=true
StartLimitInterval=0
LimitNOFILE=1024

[Install]
WantedBy=multi-user.target
```

graphd service

```
$ vi /usr/lib/systemd/system/nebula-graphd.service

[Unit]
Description=Nebula Graph Graphd Service
After=network.target

[Service]
Type=forking
Restart=always
RestartSec=15s
PIDFile=/usr/local/nebula/pids/nebula-graphd.pid
ExecStart=/usr/local/nebula/scripts/nebula.service start graphd
ExecReload=/usr/local/nebula/scripts/nebula.service restart graphd
ExecStop=/usr/local/nebula/scripts/nebula.service stop graphd
PrivateTmp=true
StartLimitInterval=0
LimitNOFILE=1024

[Install]
WantedBy=multi-user.target
```

storaged service

```
$ vi /usr/lib/systemd/system/nebula-storaged.service
[Unit]
Description=Nebula Graph Storaged Service
After=network.target

[Service]
Type=forking
Restart=always
RestartSec=15s
PIDFile=/usr/local/nebula/pids/nebula-storaged.pid
ExecStart=/usr/local/nebula/scripts/nebula.service start storaged
ExecReload=/usr/local/nebula/scripts/nebula.service restart storaged
ExecStop=/usr/local/nebula/scripts/nebula.service stop storaged
PrivateTmp=true
StartLimitInterval=0
LimitNOFILE=1024

[Install]
WantedBy=multi-user.target
```

### 3. reload

```
[root]# sudo systemctl daemon-reload
```

### 4.

```
$ systemctl restart nebula-metad.service
$ systemctl restart nebula-graphd.service
$ systemctl restart nebula-storaged.service
```

## 25.4.6

---

Meta	9559, 9560, 19559
Graph	9669, 19669
Storage	9777 ~ 9780, 19779

NebulaGraph

1	NebulaGraph	TCP	9669	Graph	RPC	Graph	
2	NebulaGraph	TCP	19669	Graph	HTTP		
3	NebulaGraph	TCP	19670	Graph	HTTP/2	3.x	
4	NebulaGraph	TCP	9559	Meta	RPC	Graph	Storage
5	NebulaGraph	TCP	9560	Meta	Raft		
6	NebulaGraph	TCP	19559	Meta	HTTP		
7	NebulaGraph	TCP	19560	Meta	HTTP/2	3.x	
8	NebulaGraph	TCP	9777	Storage	Drainer		
9	NebulaGraph	TCP	9778	Storage	Admin		
10	NebulaGraph	TCP	9779	Storage	RPC	Graph	
11	NebulaGraph	TCP	9780	Storage	Raft		
12	NebulaGraph	TCP	19779	Storage	HTTP		
13	NebulaGraph	TCP	19780	Storage	HTTP/2	3.x	
14	NebulaGraph	TCP	8888	Agent NebulaGraph	Agent	Agent	
15	NebulaGraph	TCP	9789 9790 9788	Raft Listener Elasticsearch	Storage		
				Storage Listener 9790 9788	9789		Storage
16	NebulaGraph	TCP	9200	NebulaGraph	Elasticsearch	HTTP	
17	NebulaGraph	TCP	9569 9570 9568	Meta Listener 9570 9568	9569	Meta	
18	NebulaGraph	TCP	9889 9890 9888	Drainer 9890 9888	9889	Storage	Meta
19	NebulaGraph Studio	TCP	7001	Studio	Web		
20	NebulaGraph Dashboard	TCP	8090	Nebula nGQL	HTTP Gateway NebulaGraph		HTTP
21	NebulaGraph Dashboard	TCP	9200	Nebula Stats Exporter			IP
22	NebulaGraph Dashboard	TCP	9100	Node Exporter			CPU
23	NebulaGraph Dashboard	TCP	9090	Prometheus			
24	NebulaGraph Dashboard	TCP	7003	Dashboard	Web		
25	NebulaGraph Dashboard	TCP	7005	Dashboard	Web		
26		TCP	9093				

	/	NebulaGraph Dashboard		Alertmanager Dashboard	Prometheus
27	NebulaGraph Explorer	TCP	7002	Explorer	Web

telnet

telnet &lt;ip&gt; &lt;port&gt;



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
```

**max\_sessions\_per\_ip\_per\_user**

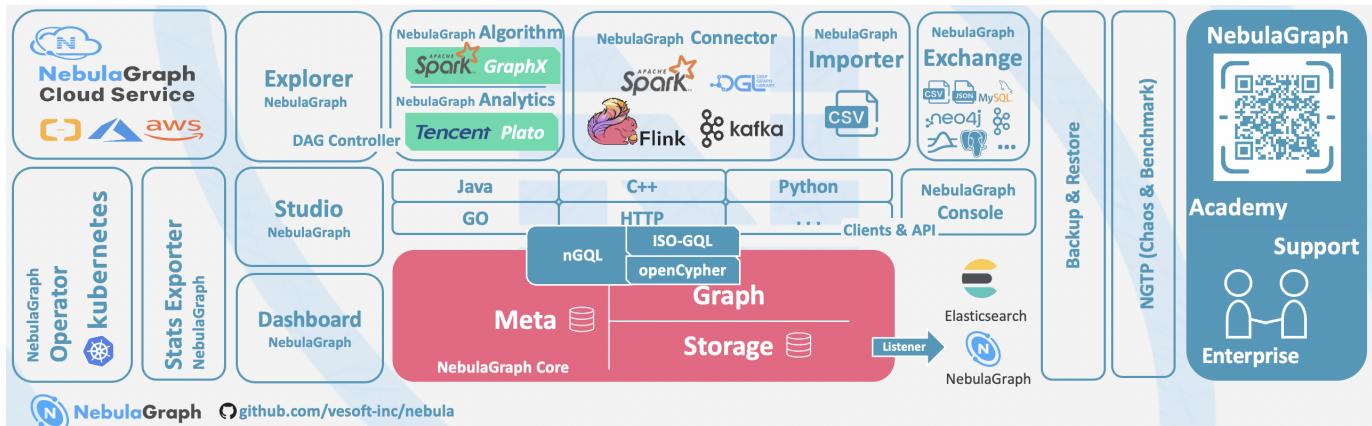
max\_sessions\_per\_ip\_per\_user NebulaGraph

Fail to create a new session from connection pool, fail to authenticate, error: Create Session failed: Too many sessions created from 127.0.0.1 by user root. the threshold is 2. You can change it by modifying 'max\_sessions\_per\_ip\_per\_user' in nebula-graphd.conf

1. KILL SESSION Session
2. Graph nebula\_graphd.conf max\_sessions\_per\_ip\_per\_user Graph
3. Graph nebula\_graphd.conf session\_idle\_timeout\_secs Graph

: April 18, 2023

25.5



Note

- |   | X.Y.Z   | X,       | Y,                  | Z  |
|---|---------|----------|---------------------|----|
| • | Y       | 6        |                     | 3  |
| • | Y       | 3        |                     | Y  |
| • | RC      |          | (Release Candidate) | RC |
| • | nightly | SNAPSHOT |                     |    |
| • |         |          |                     |    |

## Incompatibility



## 25.5.1 NebulaGraph Studio

NebulaGraph Studio      Studio      Web      NebulaGraph DBMS      nGQL

## Note

Studio NebulaGraph

NebulaGraph

Studio

v3.4.1

v3.6.0

## 25.5.2 NebulaGraph Dashboard

NebulaGraph Dashboard	Dashboard	NebulaGraph	<b>NebulaGraph Dashboard</b>
<b>NebulaGraph</b>	<b>Dashboard</b>		
v3.4.1	v3.4.0		

## 25.5.3 NebulaGraph Dashboard

NebulaGraph Dashboard	Dashboard	NebulaGraph
<b>NebulaGraph Dashboard</b>		
<b>NebulaGraph</b>	<b>Dashboard</b>	
v3.4.1	v3.4.2	

## 25.5.4 NebulaGraph Explorer

NebulaGraph Explorer	Explorer	Web	NebulaGraph
<b>NebulaGraph Explorer</b>			
<b>NebulaGraph</b>	<b>Explorer</b>		
v3.4.1	v3.4.0		

## 25.5.5 NebulaGraph Stats Exporter

nebula-stats-exporter	Prometheus
<b>NebulaGraph</b>	<b>Stats Exporter</b>
v3.4.1	v3.3.0

## 25.5.6 NebulaGraph Exchange

NebulaGraph Exchange	Exchange	Apache Spark™	NebulaGraph
<b>NebulaGraph Exchange</b>			
<b>NebulaGraph</b>	<b>Exchange</b>	<b>Exchange</b>	
v3.4.1	v3.4.0	v3.4.0	

## 25.5.7 NebulaGraph Operator

NebulaGraph Operator	Operator	Kubernetes	NebulaGraph	Kubernetes	NebulaGraph
Kubernetes	NebulaGraph		<b>NebulaGraph Operator</b>		
<b>NebulaGraph</b>	<b>Operator</b>				
v3.4.1	v1.4.2				

### 25.5.8 NebulaGraph Importer

NebulaGraph Importer	Importer	NebulaGraph	CSV	Importer	CSV	NebulaGraph
<b>NebulaGraph Importer</b>						
<b>NebulaGraph</b>	<b>Importer</b>					
v3.4.1	v3.4.0					

### 25.5.9 NebulaGraph Spark Connector

NebulaGraph Spark Connector	Spark	Spark	NebulaGraph	NebulaGraph Spark Connector	Reader
<b>Writer</b>					
<b>NebulaGraph</b>	<b>Spark Connector</b>				
v3.4.1	v3.4.0				

### 25.5.10 NebulaGraph Flink Connector

NebulaGraph Flink Connector	Flink	NebulaGraph	NebulaGraph	NebulaGraph
<b>NebulaGraph Flink Connector</b>				
<b>NebulaGraph</b>	<b>Flink Connector</b>			
v3.4.1	v3.3.0			

### 25.5.11 NebulaGraph Algorithm

NebulaGraph Algorithm	Algorithm	GraphX	Spark	Spark	NebulaGraph
lib	DataFrame	<b>NebulaGraph Algorithm</b>			
<b>NebulaGraph</b>	<b>Algorithm</b>				
v3.4.1	v3.0.0				

### 25.5.12 NebulaGraph Analytics

NebulaGraph Analytics	Plato	Plato	NebulaGraph	NebulaGraph Analytics
<b>NebulaGraph Analytics</b>				
<b>NebulaGraph</b>	<b>Analytics</b>			
v3.4.1	v3.4.0			

### 25.5.13 NebulaGraph Console

NebulaGraph Console	NebulaGraph	CLI	NebulaGraph
<b>NebulaGraph Console</b>			
<b>NebulaGraph</b>	<b>Console</b>		
v3.4.1	v3.4.0		

### 25.5.14 NebulaGraph Docker Compose

Docker Compose	NebulaGraph	Docker Compose	NebulaGraph
<b>NebulaGraph Docker Compose</b>			
<b>NebulaGraph</b>	<b>Docker Compose</b>		
v3.4.1	v3.4.0		

### 25.5.15 Backup & Restore

<b>Backup&amp;Restore</b>	BR	CLI	NebulaGraph
---------------------------	----	-----	-------------

<b>NebulaGraph</b>	<b>BR</b>
v3.4.1	v3.3.0

### 25.5.16 Backup & Restore ( )

<b>Backup&amp;Restore</b>	CLI	NebulaGraph BR	NebulaGraph
---------------------------	-----	----------------	-------------

<b>NebulaGraph</b>	<b>BR</b>
v3.4.1	v3.4.1

### 25.5.17 NebulaGraph Bench

<b>NebulaGraph Bench</b>	NebulaGraph	LDBC v0.3.3
--------------------------	-------------	-------------

<b>NebulaGraph</b>	<b>Bench</b>
v3.4.1	v1.2.0

### 25.5.18 API SDK

#### Compatibility

X.Y.\*

<b>NebulaGraph</b>	<b>commit id</b>
v3.4.1	C++
v3.4.1	Go
v3.4.1	Python
v3.4.1	Java
v3.4.1	HTTP

### 25.5.19

- Rust Client
- Node.js Client
- Object Graph Mapping Library (OGM, or ORM)
- 

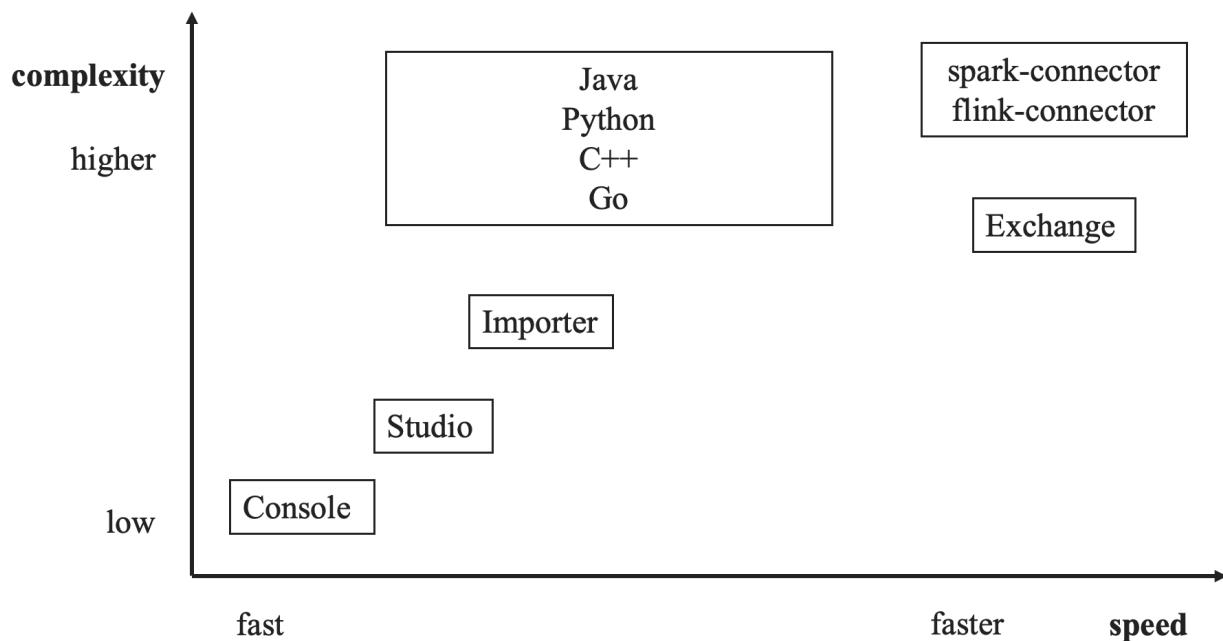
: December 15, 2022

## 25.6

---

NebulaGraph 3.4.1

- `-f` nGQL
- `studio` csv
- `importer` csv
- `Exchange` Neo4j, Hive, MySQL Spark
- `Spark-connector/Flink-connector` (Spark/Flink)
- `C++/GO/Java/Python SDK`



: September 30, 2022

## 25.7

---

### 25.7.1

---

#### GitHub

[GitHub](#)

[CLA](#)

[CLA](#)

[vesoft inc. Contributor License Agreement](#)

[Sign in with GitHub to agree](#)

[info@vesoft.com](mailto:info@vesoft.com)

### 25.7.2

---

NebulaGraph      [Markdown](#)

### 25.7.3

---

#### 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	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



-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

25.7.4

[How to add test cases](#)

## 25.7.5

### 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](#)

---

: August 9, 2022

## 25.8 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 

This PR adds several utilities such as `GenericThreadPool`, `GenericWorker`, `Barrier`, `Latch`, `ThreadLocalPtr` and some other convenience things.

Member  ...

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  
06a5db  
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

v2.0.0  
91039db  
Verified

## Nebula Graph v2.0 GA

jude-zhu released this on Mar 23

[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

11. 2022.7 v3.2.0

12. 2022.10 v3.3.0

13. 2023.2 v3.4.0

1. NebulaGraph 1.x

RocksDB HBase

NebulaGraph 2.x

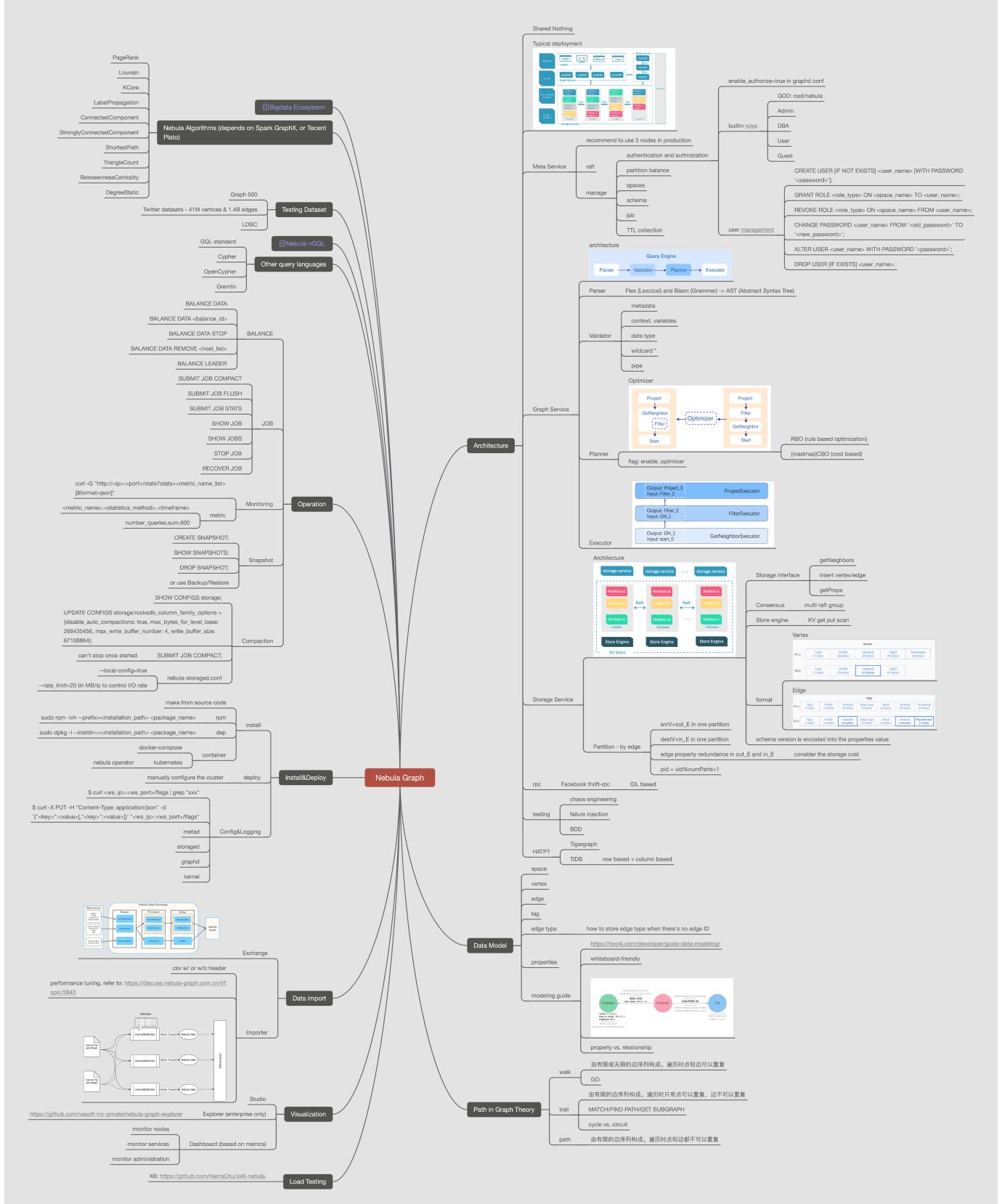
HBase



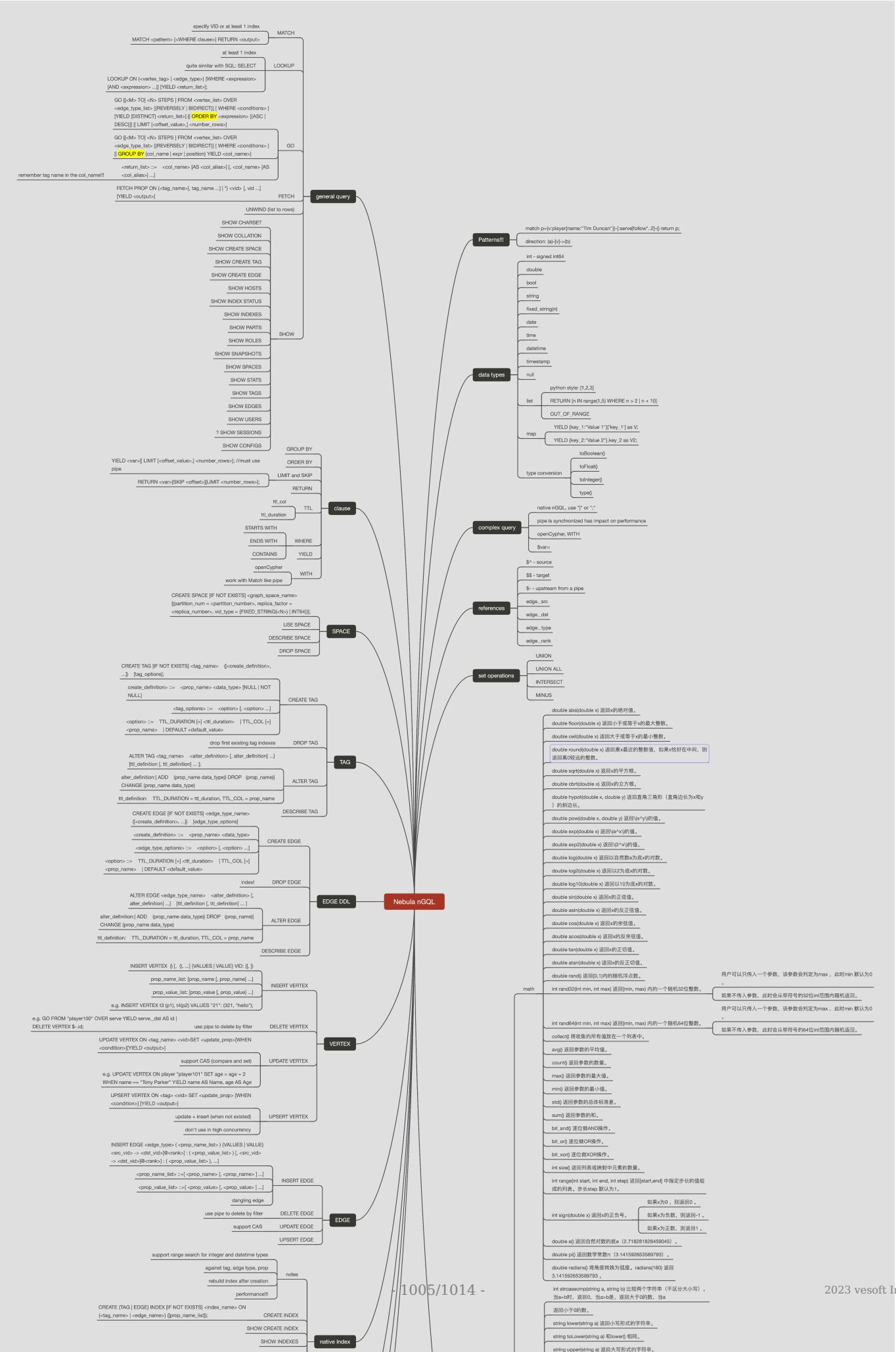
: March 13, 2023

## 25.9

### NebulaGraph



nGQL



---

: August 9, 2022

## 25.10

---

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_DRAINER_NOT_FOUND	-21	drainer
E_DRAINER_CLIENT_NOT_FOUND	-22	drainer
E_PART_STOPPED	-23	partition
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
E_INVALID_PARM	-2009
E_WRONGCLUSTER	-2010
E_ZONE_NOT_ENOUGH	-2011
E_ZONE_IS_EMPTY	-2012
E_SCHEMA_NAME_EXISTS	-2013
E RELATED INDEX EXISTS	-2014
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_GRAPH_MEMORY_EXCEEDED	-2600	Graph
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
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
E_STORAGE_MEMORY_EXCEEDED	-3600	Storage
E_LOG_GAP	-4001	drainer
E_LOG_STALE	-4002	drainer
E_INVALID_DRAINER_STORE	-4003	drainer
E_SPACE_MISMATCH	-4004	
E_PART_MISMATCH	-4005	
E_DATA_CONFLICT	-4006	
E_REQ_CONFLICT	-4007	
E_DATA_ILLEGAL	-4008	
E_CACHE_CONFIG_ERROR	-5001	
E_NOT_ENOUGH_SPACE	-5002	
E_CACHE_MISS	-5003	
E_POOL_NOT_FOUND	-5005	
E_NODE_NUMBER_EXCEED_LIMIT	-7001	
E_PARSING_LICENSE_FAILURE	-7002	
E_UNKNOWN	-8000	

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