

Apache ShardingSphere 与 openGauss 联合打造国产高性能分布式数据库方案

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Apache ShardingSphere PMC

SphereEx 基础设施研发工程师

- 负责在 ShardingSphere 中实现 openGauss 协议
- 在 16 节点达成 1000 万 tpmC 的目标中参与 ShardingSphere 性能优化
- 目前专注于 ShardingSphere-Proxy 研发及 ShardingSphere 性能优化

目录

1. Apache ShardingSphere 介绍

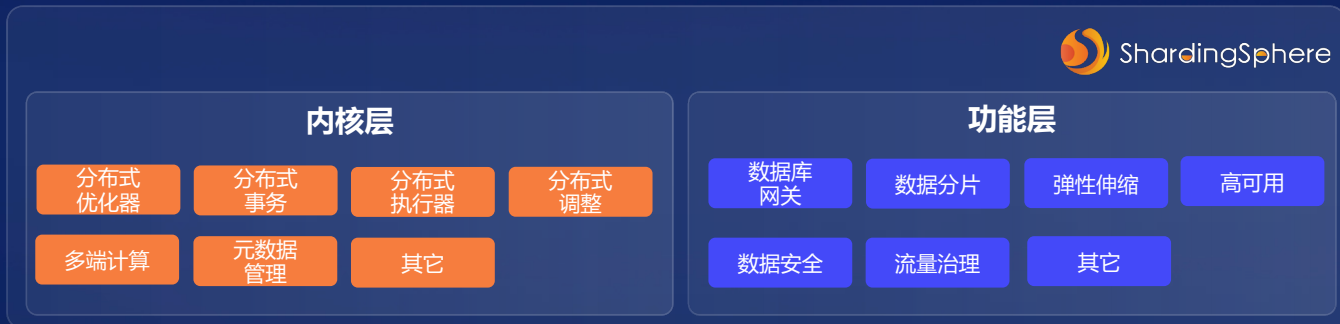
2. ShardingSphere 与 openGauss 生态对接

3. ShardingSphere 与 openGauss 突破单机数据库性能瓶颈

Apache ShardingSphere 能力



SQL/DistSQL



连接

打造数据库上层标准



增强

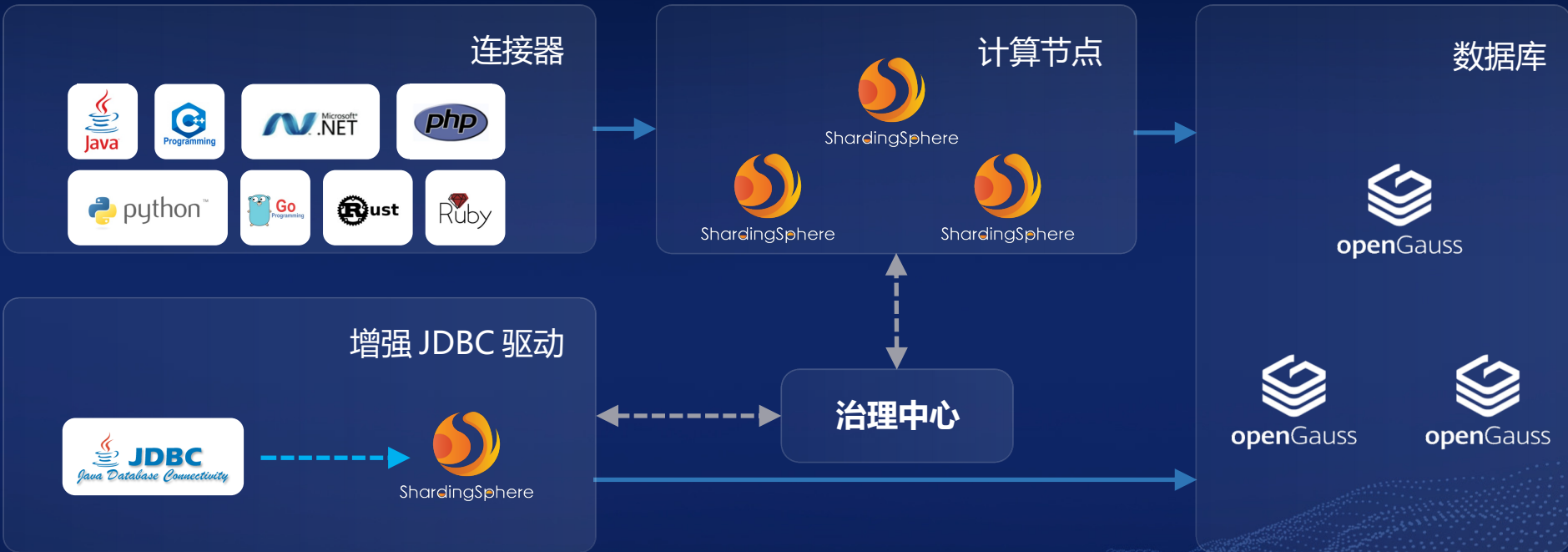
数据库计算增强引擎



可插拔

构建数据库功能生态

Apache ShardingSphere 部署架构



代表控制流量

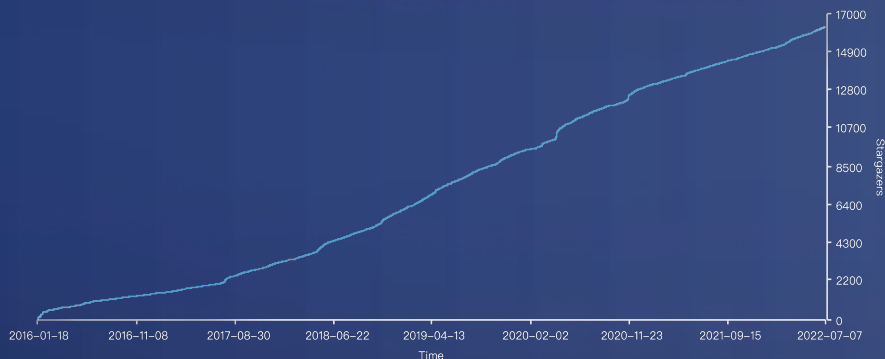


代表业务流量

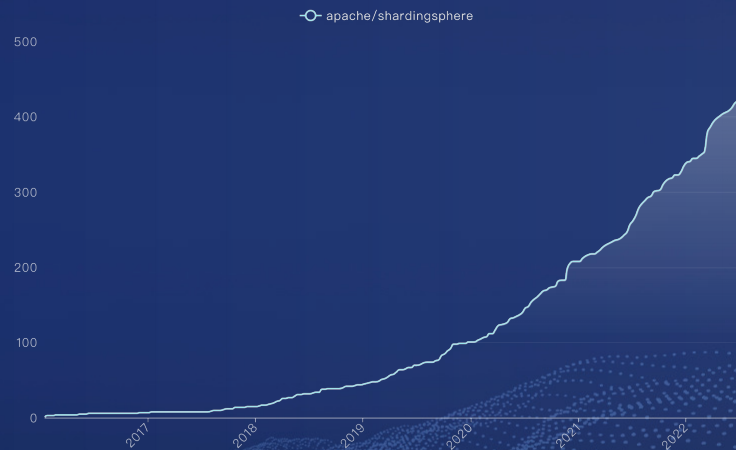
Apache ShardingSphere 社区

Apache ShardingSphere Stars 与 Contributors 增长时间线

- Stars 16k+
- Contributors 超 400 人



Stargazers



Contributor Over Time

Apache ShardingSphere 合作伙伴&用户



在 ShardingSphere 官网登记使用的公司 214 家，包括但不限于：



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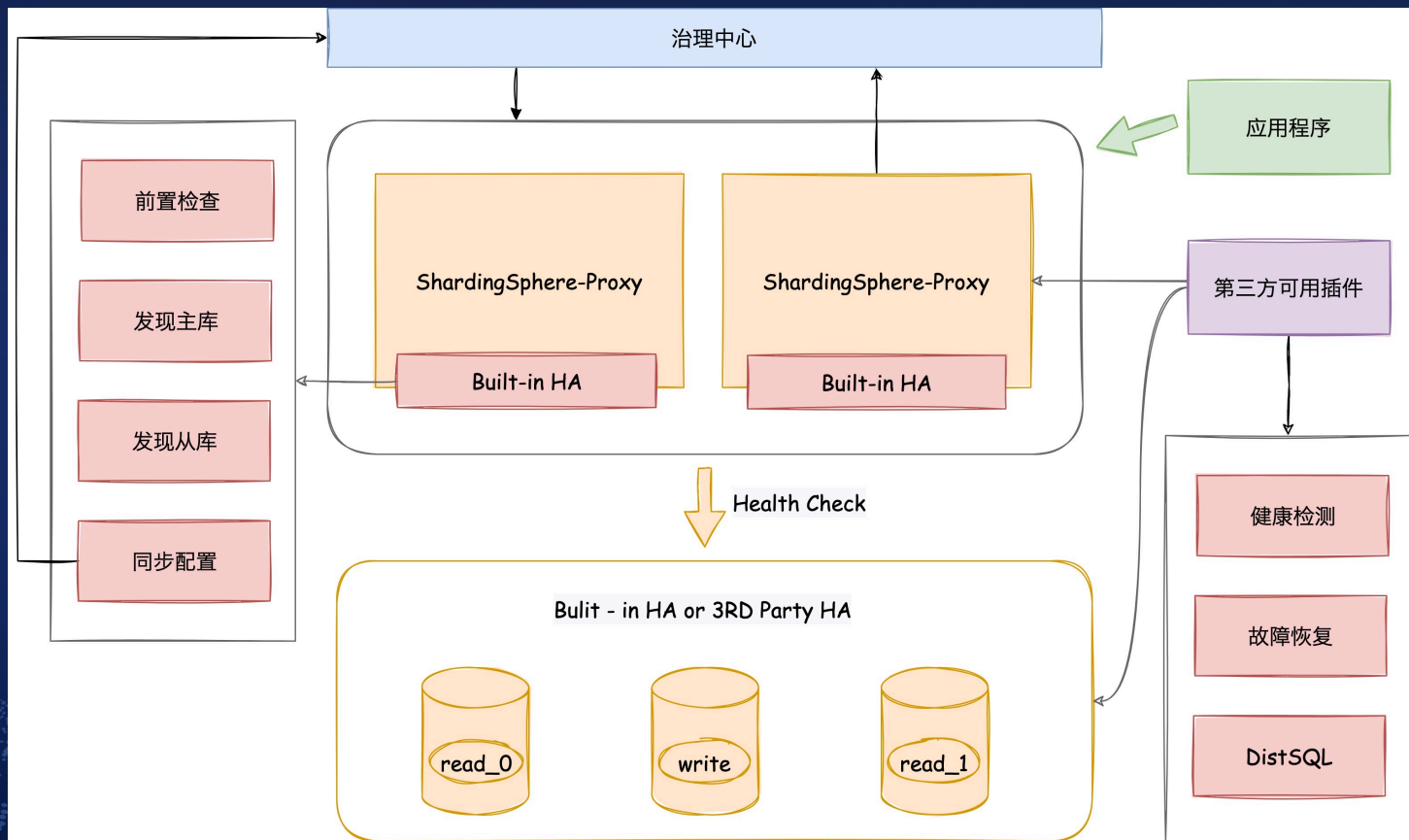
ShardingSphere 与 openGauss 生态对接



+

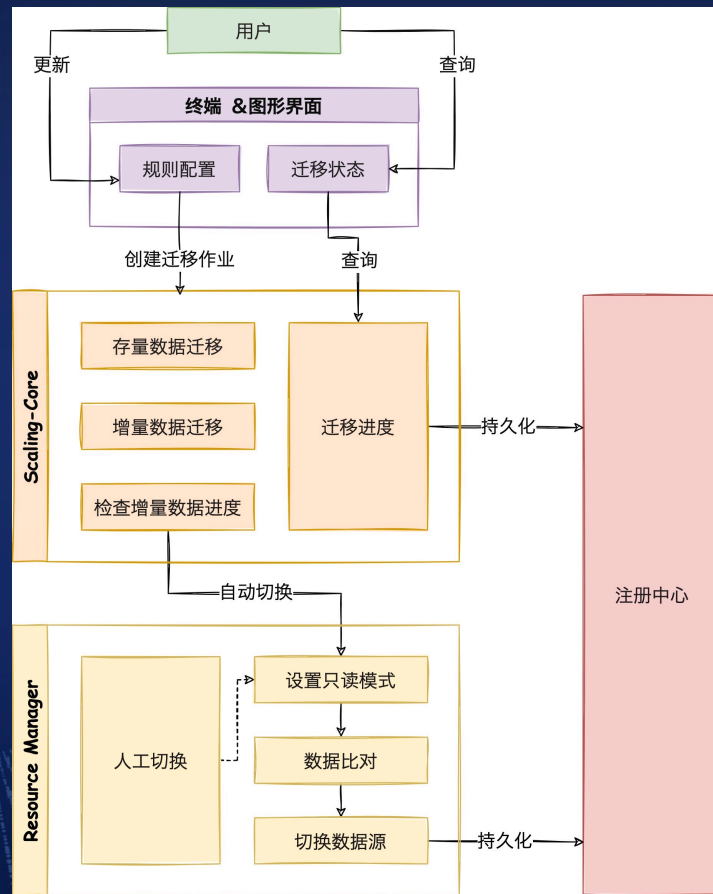


ShardingSphere 数据库发现支持 openGauss



ShardingSphere 弹性伸缩支持 openGauss

功能	MySQL	PostgreSQL	openGauss
全量迁移	支持	支持	支持
增量迁移	支持	支持	支持
自动建表	支持	支持	支持
DATA_MATCH 一致性校验	支持	支持	支持
CRC32_MATCH 一致性校验	支持	不支持	不支持



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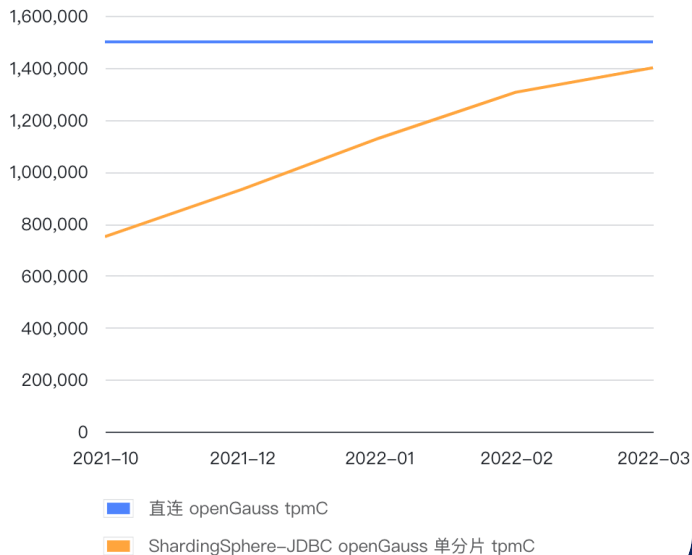
2. ShardingSphere 与 openGauss 生态对接

3. ShardingSphere 与 openGauss 突破单机数据库性能瓶颈

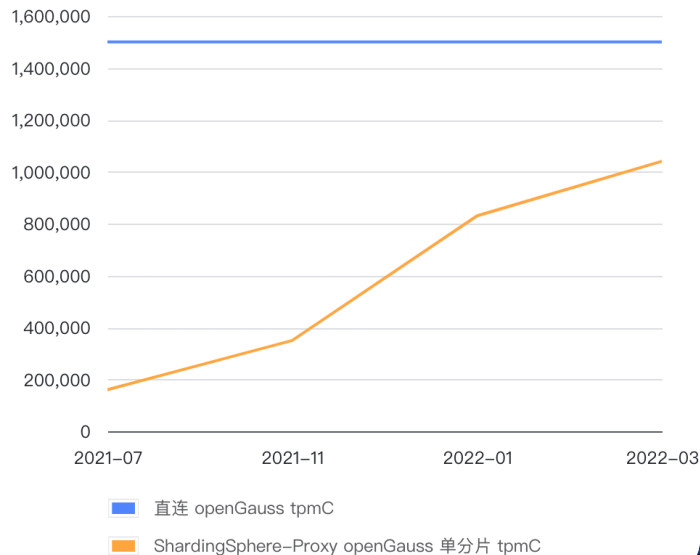
ShardingSphere 与 openGauss 的性能磨合过程



ShardingSphere-JDBC openGauss 单分片 tpmC



ShardingSphere-Proxy openGauss 单分片 tpmC



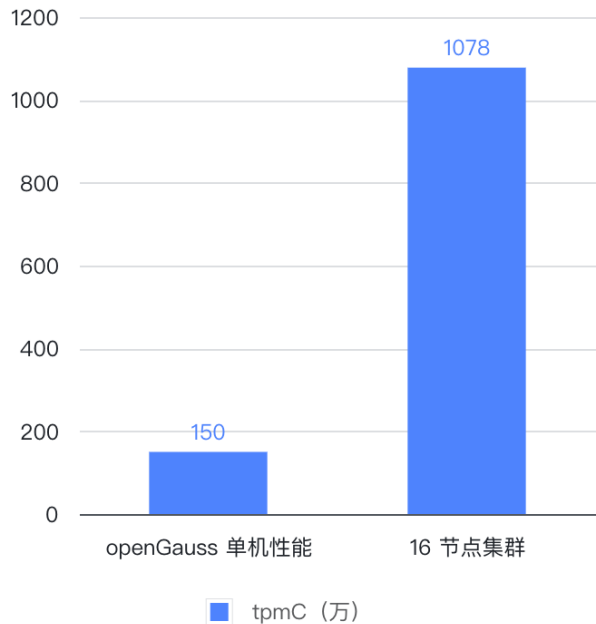
* 使用 BenchmarkSQL 在 128 Cores 鲲鹏 920 环境测试，数据量 1000 Warehouses，openGauss 基准线 150 万 tpmC

* ShardingSphere 使用数据分片规则与 MOD 算法，分 1 库，不分表

ShardingSphere 与 openGauss 联合突破单机数据库性能瓶颈

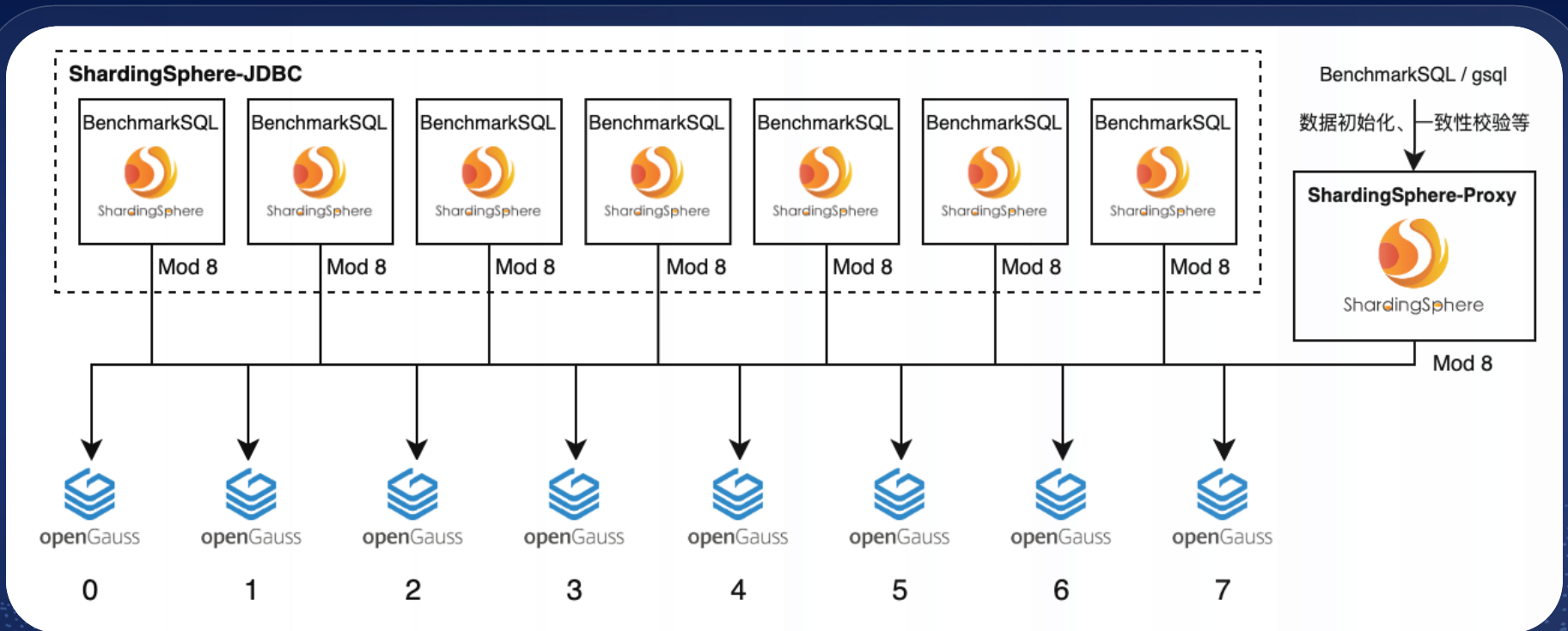


tpmC (万)

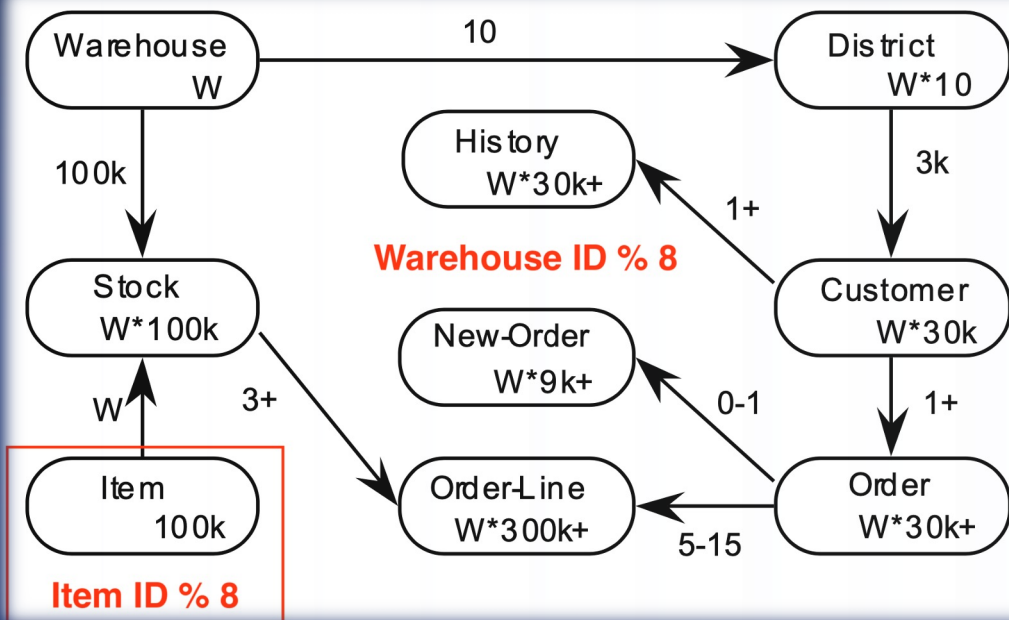


配置	8 × openGauss	7 × ShardingSphere-JDBC	1 × ShardingSphere-Proxy
CPU	128 核 2 路鲲鹏 920	128 核 2 路鲲鹏 920	128 核 2 路鲲鹏 920
内存	768 GB	768 GB	768 GB
系统盘	1 TB	1 TB	1 TB
数据盘	3 × 4 TB NVMe SSD	无	无
网卡	25 Gbps	25 Gbps	25 Gbps

16 节点性能测试组网



TPC-C ShardingSphere 数据分片方案



绑定表（分片规则一致的表，多表 Join 避免笛卡尔积、跨库关联）：

- Warehouse + Customer
- Stock + District + Order-Line

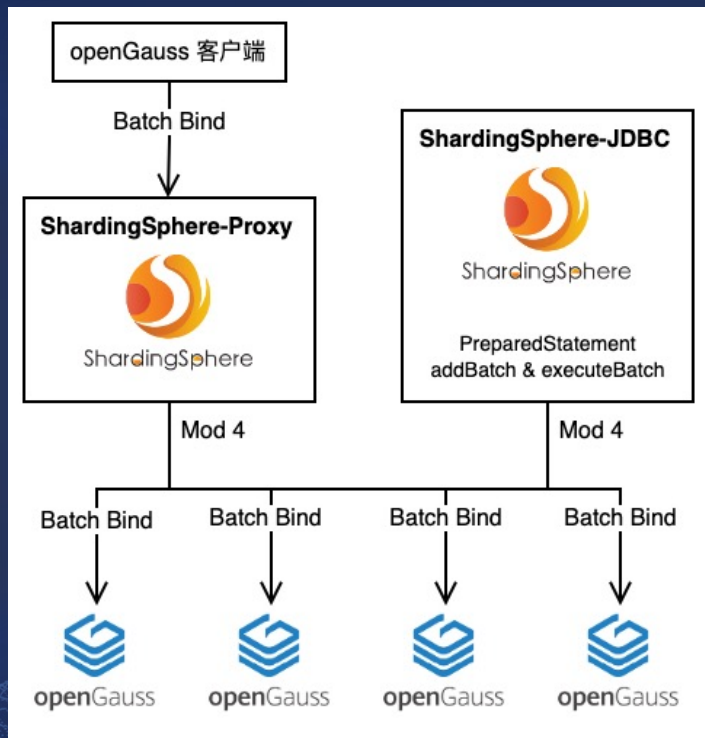
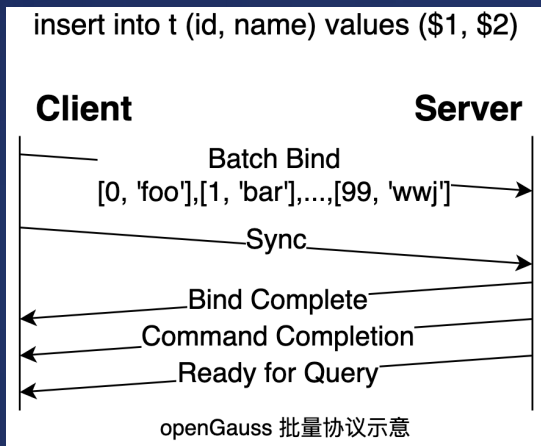
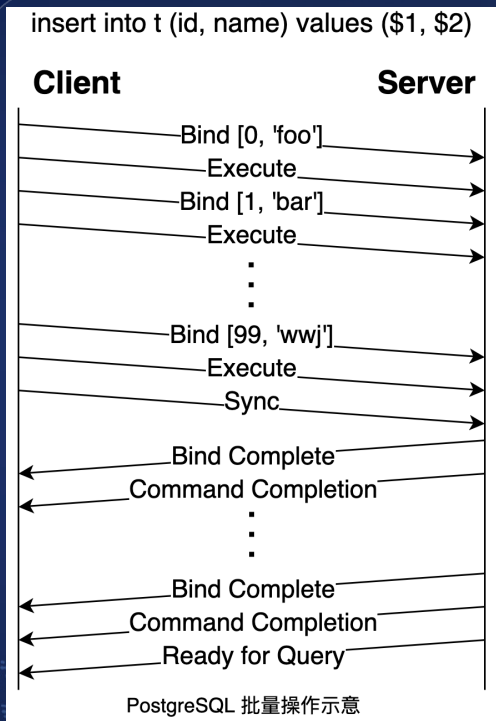
ShardingSphere 性能调优

ShardingSphere 相关优化：

- 网卡队列绑核 0-15，ShardingSphere 进程绑核 16-127
- 使用毕昇 JDK 17，并根据运行状况调整 JVM 参数
- 结合 async-profiler 采样，优化 ShardingSphere 代码逻辑、代码细节

```
1 [|||||] 92.1% 33 [|||||] 95.5% 65 [|||||] 88.9% 97 [|||||] 92.4%
2 [|||||] 93.5% 34 [|||||] 94.0% 66 [|||||] 89.0% 98 [|||||] 92.5%
3 [|||||] 92.3% 35 [|||||] 94.7% 67 [|||||] 88.3% 99 [|||||] 92.1%
4 [|||||] 92.3% 36 [|||||] 92.2% 68 [|||||] 89.0% 100 [|||||] 92.3%
5 [|||||] 92.4% 37 [|||||] 94.3% 69 [|||||] 88.9% 101 [|||||] 92.2%
6 [|||||] 93.9% 38 [|||||] 94.8% 70 [|||||] 89.0% 102 [|||||] 92.4%
7 [|||||] 93.6% 39 [|||||] 93.0% 71 [|||||] 89.9% 103 [|||||] 92.3%
8 [|||||] 93.5% 40 [|||||] 94.2% 72 [|||||] 88.7% 104 [|||||] 92.4%
9 [|||||] 91.2% 41 [|||||] 94.0% 73 [|||||] 88.9% 105 [|||||] 92.2%
10 [|||||] 92.4% 42 [|||||] 94.1% 74 [|||||] 89.5% 106 [|||||] 92.3%
11 [|||||] 96.2% 43 [|||||] 94.8% 75 [|||||] 88.8% 107 [|||||] 94.8%
12 [|||||] 92.5% 44 [|||||] 94.2% 76 [|||||] 89.0% 108 [|||||] 91.6%
13 [|||||] 92.4% 45 [|||||] 94.7% 77 [|||||] 88.7% 109 [|||||] 92.3%
14 [|||||] 93.1% 46 [|||||] 94.2% 78 [|||||] 89.7% 110 [|||||] 91.6%
15 [|||||] 95.4% 47 [|||||] 94.2% 79 [|||||] 89.1% 111 [|||||] 92.1%
16 [|||||] 96.1% 48 [|||||] 94.2% 80 [|||||] 88.9% 112 [|||||] 91.9%
17 [|||||] 90.9% 49 [|||||] 93.0% 81 [|||||] 89.5% 113 [|||||] 92.2%
18 [|||||] 91.1% 50 [|||||] 92.2% 82 [|||||] 89.7% 114 [|||||] 92.4%
19 [|||||] 90.3% 51 [|||||] 92.2% 83 [|||||] 89.0% 115 [|||||] 92.3%
20 [|||||] 90.3% 52 [|||||] 91.8% 84 [|||||] 89.2% 116 [|||||] 92.3%
21 [|||||] 90.3% 53 [|||||] 92.4% 85 [|||||] 88.8% 117 [|||||] 92.3%
22 [|||||] 90.4% 54 [|||||] 92.3% 86 [|||||] 89.0% 118 [|||||] 92.3%
23 [|||||] 90.3% 55 [|||||] 91.4% 87 [|||||] 88.7% 119 [|||||] 92.3%
24 [|||||] 90.6% 56 [|||||] 92.4% 88 [|||||] 88.2% 120 [|||||] 91.7%
25 [|||||] 90.4% 57 [|||||] 92.3% 89 [|||||] 89.0% 121 [|||||] 92.1%
26 [|||||] 90.4% 58 [|||||] 92.2% 90 [|||||] 89.7% 122 [|||||] 92.3%
27 [|||||] 90.4% 59 [|||||] 92.2% 91 [|||||] 88.8% 123 [|||||] 92.2%
28 [|||||] 90.6% 60 [|||||] 92.3% 92 [|||||] 89.0% 124 [|||||] 92.3%
29 [|||||] 91.0% 61 [|||||] 92.3% 93 [|||||] 89.5% 125 [|||||] 92.2%
30 [|||||] 90.4% 62 [|||||] 92.8% 94 [|||||] 88.8% 126 [|||||] 92.3%
31 [|||||] 90.5% 63 [|||||] 92.2% 95 [|||||] 88.9% 127 [|||||] 92.2%
32 [|||||] 91.0% 64 [|||||] 92.2% 96 [|||||] 89.0% 128 [|||||] 92.3%
Mem[|||||]
Swp[|||||]
25.5G/126G Tasks: 48, 793 thr: 128 running
0K/4.00G Load average: 178.46 111.68 55.91
Uptime: 5 days, 10:04:10
```

ShardingSphere 深度适配 openGauss 批量协议



欢迎关注 Apache ShardingSphere



Apache ShardingSphere Website : <https://shardingsphere.apache.org>

Apache ShardingSphere GitHub : <https://github.com/apache/shardingsphere>

Apache ShardingSphere Slack Channel : <https://apacheshardingsphere.slack.com>