

数据仓库服务

8.1.3

性能白皮书

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1 概述

本性能测试基于TPC-H和TPC-DS标准测试集进行测试。

TPC-H

TPC-H由国际事务处理性能委员会（Transaction Processing Performance Council）制定发布，用于评测数据库的分析查询能力。TPC-H查询包含8张数据表和22条复杂SQL查询，大多数查询包含多表Join、子查询和Group By等。

TPC-DS

TPC-DS由国际事务处理性能委员会（Transaction Processing Performance Council）制定发布，用于决策支持系统测试基准，主要用于衡量大数据产品的分析性能。TPC-DS查询共包含24张表，99个查询测试语句。

2 测试结果

2.1 TPC-H 单并发查询

测试环境

表 2-1 测试环境

产品	规格	CPU	内存	存储	单节点 建议存 储	查询性 能 (TPC- H 1000X)	版本	节点 数
GaussD B(DWS)	8xlarg e	32U	256G	SSD云 盘	6400GB	596.90s	8.1.3	3

测试结果

如下为scale=1000的TPC-H的性能测试结果，查询执行时间以秒（s）为单位。

表 2-2 TPC-H 1000X 测试结果

编号	TPC-H查询	测试结果（s）
1	Q1	22.15
2	Q2	2.65
3	Q3	28.29
4	Q4	49.07
5	Q5	44.45

编号	TPC-H查询	测试结果 (s)
6	Q6	1.24
7	Q7	33.26
8	Q8	32.10
9	Q9	112.67
10	Q10	20.63
11	Q11	6.49
12	Q12	13.73
13	Q13	20.61
14	Q14	3.10
15	Q15	3.45
16	Q16	7.77
17	Q17	16.97
18	Q18	81.23
19	Q19	16.74
20	Q20	16.99
21	Q21	53.11
22	Q22	10.20
23	总时长 (s)	596.90

2.2 TPC-DS 单并发查询

测试环境

表 2-3 测试环境

产品	规格	CPU	内存	存储	单节点 建议存 储	查询性能 (TPC- DS 1000X)	版本	节点 数
GaussDB(DWS)	8xlarge	32U	256G	SSD云 盘	6400GB	1545.93 s	8.1.3	3

测试结果

如下为scale=1000的TPC-DS的性能测试结果，查询执行时间以秒（s）为单位。

表 2-4 TPC-DS 1000X 测试结果

编号	TPC-DS查询	测试结果 (s)
1	Q1	1.46
2	Q2	9.33
3	Q3	2.40
4	Q4	142.24
5	Q5	6.36
6	Q6	0.82
7	Q7	3.20
8	Q8	1.02
9	Q9	10.92
10	Q10	1.68
11	Q11	78.92
12	Q12	0.53
13	Q13	3.95
14	Q14	113.09
15	Q15	2.99
16	Q16	8.08
17	Q17	6.94
18	Q18	3.58
19	Q19	1.20
20	Q20	0.51
21	Q21	0.51
22	Q22	11.37
23	Q23	188.13
24	Q24	14.51
25	Q25	6.90
26	Q26	1.30
27	Q27	3.42

编号	TPC-DS查询	测试结果 (s)
28	Q28	18.44
29	Q29	5.27
30	Q30	1.09
31	Q31	7.13
32	Q32	2.21
33	Q33	2.35
34	Q34	4.00
35	Q35	3.60
36	Q36	10.27
37	Q37	0.56
38	Q38	52.97
39	Q39	7.00
40	Q40	1.29
41	Q41	0.08
42	Q42	0.66
43	Q43	2.99
44	Q44	3.05
45	Q45	1.38
46	Q46	5.86
47	Q47	10.98
48	Q48	2.32
49	Q49	3.54
50	Q50	10.30
51	Q51	13.90
52	Q52	0.63
53	Q53	1.68
54	Q54	6.27
55	Q55	0.57
56	Q56	1.60
57	Q57	4.76

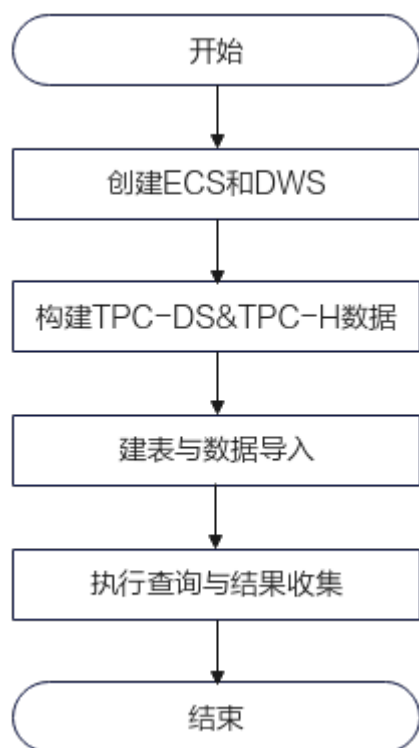
编号	TPC-DS查询	测试结果 (s)
58	Q58	1.89
59	Q59	20.85
60	Q60	3.21
61	Q61	1.89
62	Q62	1.83
63	Q63	2.10
64	Q64	35.18
65	Q65	14.18
66	Q66	2.71
67	Q67	231.01
68	Q68	5.41
69	Q69	1.48
70	Q70	10.46
71	Q71	5.34
72	Q72	7.81
73	Q73	2.19
74	Q74	49.95
75	Q75	19.64
76	Q76	6.32
77	Q77	2.55
78	Q78	136.59
79	Q79	8.08
80	Q80	4.90
81	Q81	1.77
82	Q82	1.32
83	Q83	0.46
84	Q84	0.52
85	Q85	3.43
86	Q86	5.01
87	Q87	53.19

编号	TPC-DS查询	测试结果 (s)
88	Q88	8.94
89	Q89	2.23
90	Q90	0.77
91	Q91	0.42
92	Q92	1.06
93	Q93	13.28
94	Q94	4.90
95	Q95	41.46
96	Q96	2.16
97	Q97	12.01
98	Q98	2.04
99	Q99	3.35
100	总时长 (s)	1545.93

3 测试方法

3.1 总体流程

图 3-1 整体流程



3.2 创建弹性云服务器 ECS 和数据仓库 DWS

3.2.1 创建弹性云服务器 ECS

参考《[弹性云服务器用户指南](#)》创建弹性云服务器，创建的规格可参见下表。

说明

由于TPC-DS、TPC-H数据集占用空间较大，以TPC-DS 1000X和TPC-H 1000X为例，分别占用930GB和1100GB。请创建弹性云服务器时，根据需要添加数据盘，举例如下：

- 单测TPC-DS或者TPC-H时：挂载2块超高IO 600GB数据盘。
- 同时测TPC-DS和TPC-H时：挂载2块超高IO 1200GB数据盘。

表 3-1 ECS 规格

计费模式	按需计费
区域	中国-香港
可用区	可用区1
CPU架构	鲲鹏计算
规格	鲲鹏通用计算增强型 kc1.8xlarge.2 32vCPUs 64 GiB
镜像	EulerOS 2.8 64bit with ARM (40GB)
数据盘	系统盘通用型SSD 40GB，数据盘要求如下： <ul style="list-style-type: none">• 单测TPC-DS或者TPC-H时：挂载2块超高IO 600GB数据盘。• 同时测TPC-DS和TPC-H时：挂载2块超高IO 1200GB数据盘。

3.2.2 创建数据仓库 DWS

参见“[创建集群](#)”章节创建DWS数据仓库。创建成功后，记录集群的内网IP。

须知

为确保ECS与DWS网络互通，DWS数据仓库需要与ECS在同一个区域，同一个虚拟私有云和子网下。

表 3-2 DWS 规格

区域	中国-香港
可用区	可用区1
产品类型	云数仓
节点规格	8xlarge 32 vCPUs 256GB
每节点可用存储	500GB
节点数	3

3.3 构建 TPC-H&TPC-DS 使用数据

3.3.1 准备数据构建工具编译环境

步骤1 远程连接ECS弹性云服务器。

步骤2 执行以下命令，安装git。

```
yum install git
```

步骤3 执行以下命令，安装gcc。

```
yum install gcc
```

----结束

3.3.2 TPC-H 数据构建

步骤1 从[官网](#)获取TPC-H工具。

步骤2 登录ECS云服务器，执行如下命令创建tpc-h存放目录。

```
mkdir -p /data1/script/tpch-kit/tpch1000X  
mkdir -p /data2/script/tpch-kit/tpch1000X
```

步骤3 将获取的TPC-H工具通过SFTP工具上传到ECS的 /data1/script/tpch-kit目录执行以下命令解压。

```
cd /data1/script/tpch-kit && unzip tpch_v3.0.0.zip
```

步骤4 执行如下命令编译生成数据构建工具dbgen。

须知

编译之前需要修改dbgen目录下的两个文件：makefile.suite和tpcd.h

1. 修改makefile.suite

#makefile.suite 的更改参数如下（103行-111行）

```
CC      = gcc  
# Current values for DATABASE are: INFORMIX, DB2, TDAT (Teradata)  
#                               SQLSERVER, SYBASE, ORACLE, VECTORWISE  
# Current values for MACHINE are: ATT, DOS, HP, IBM, ICL, MVS,  
#                               SGI, SUN, U2200, VMS, LINUX, WIN32  
# Current values for WORKLOAD are: TPCH
```

```
DATABASE = POSTGRESQL    #程序给定参数没有postgresql，修改tpcd.h 添加POSTGRESQL脚本  
MACHINE = LINUX  
WORKLOAD = TPCH
```

2. 修改tpcd.h

```
//在tpcd.h文件增加如下语句  
#ifndef POSTGRESQL  
#define GEN_QUERY_PLAN "EXPLAIN"  
#define START_TRAN    "BEGIN TRANSACTION"  
#define END_TRAN      "COMMIT;"  
#define SET_OUTPUT    ""  
#define SET_ROWCOUNT "LIMIT %d\n"  
#define SET_DBASE     ""  
#endif /* POSTGRESQL */
```

```
cd TPC-H_Tools_v3.0.0/dbgen
cp makefile.suite makefile
make -f makefile
cp -R /data1/script/tpch-kit/TPC-H_Tools_v3.0.0/ /data2/script/tpch-kit/
```

步骤5 登录ECS，执行如下命令生成tpch 1000X数据，本示例分两个数据盘同步生成tpch 1000x数据。

须知

Tpch 1000X数据文件总大小约1100GB，请确认ECS的磁盘空间足够。

1. 进入/data1/script/tpch-kit/TPC-H_Tools_v3.0.0/dbgen目录后，执行如下命令。

```
for c in {1..5};do (./dbgen -s 1000 -C 10 -S ${c} -f > /dev/null 2>&1 &);done
```

2. 进入/data2/script/tpch-kit/TPC-H_Tools_v3.0.0/dbgen目录后，执行如下命令。

```
for c in {6..10};do (./dbgen -s 1000 -C 10 -S ${c} -f > /dev/null 2>&1 &);done
```

其中：

- s 指定数据规模，本例为1000。
- C 指定分成几个chunk，本例为10。
- S 指定当前是第几个chunk，此处不需修改。

步骤6 执行以下命令，判断数据文件的生成进度。也可以通过ps ux|grep dsdgen，查看生成数据文件的进程是否退出。

```
du -sh /data1/script/tpch-kit/TPC-H_Tools_v3.0.0/dbgen/*.tbl*
du -sh /data2/script/tpch-kit/TPC-H_Tools_v3.0.0/dbgen/*.tbl*
```

步骤7 将Tpch 1000X数据转移至指定目录。

```
mv /data1/script/tpch-kit/TPC-H_Tools_v3.0.0/dbgen/*.tbl* /data1/script/tpch-kit/tpch1000X
mv /data2/script/tpch-kit/TPC-H_Tools_v3.0.0/dbgen/*.tbl* /data2/script/tpch-kit/tpch1000X
```

----结束

3.3.3 TPC-DS 数据构建

步骤1 登录ECS云服务器，执行如下命令创建tpc-ds存放目录。

```
mkdir -p /data1/script/tpcds-kit/tpcds1000X
mkdir -p /data2/script/tpcds-kit/tpcds1000X
```

步骤2 从[官网](#)获取TPC-DS数据构建工具dsdgen最新版本，并通过SFTP工具上传到ECS的 /data1/script/tpcds-kit目录。

步骤3 执行如下命令解压tpcds的包并编译生成数据构建工具dsdgen。

- “tpcds_3.2.0.zip” 替换为实际的软件包名。
- “DSGen-software-code-3.2.0rc1” 替换为实际解压的文件夹名。

```
cd /data1/script/tpcds-kit && unzip tpcds_3.2.0.zip
cd DSGen-software-code-3.2.0rc1/tools && make
```

步骤4 进入/data1/script/tpcds-kit/DSGen-software-code-3.2.0rc1/tools目录后，执行以下命令生成数据。

📖 说明

- 因为tpcds 1000X的数据，单个表的数据文件较大，我们采取分片生成的策略。
- Tpcds 1000X数据文件总大小约930GB，请确认ECS的磁盘空间足够。
- 由于生成的数据较大，只启动一个GDS导入数据会比较慢，建议均分两个数据盘来生成数据，如下示例，1-5分片存放至/data1/script/tpcds-kit/tpcds1000X，6-10分片存放至/data2/script/tpcds-kit/tpcds1000X

```
for c in {1..5};do (./dsdgen -scale 1000 -dir /data1/script/tpcds-kit/tpcds1000X -TERMINATE N -parallel 10 -child ${c} -force Y > /dev/null 2>&1 &);done  
for c in {6..10};do (./dsdgen -scale 1000 -dir /data2/script/tpcds-kit/tpcds1000X -TERMINATE N -parallel 10 -child ${c} -force Y > /dev/null 2>&1 &);done
```

其中：

- -scale 指定数据规模，本例为1000。
- -dir 指定生成数据文件存放的目录，本例为/data1/script/tpcds-kit/tpcds1000X,/data2/script/tpcds-kit/tpcds1000X。
- -TERMINATE 控制每行记录的末尾是否需要分隔符。
- -parallel 指定分片数，本例为10片。
- -child 指定当前是生成分片中的第几片，本例不需修改。

步骤5 执行以下命令，判断数据文件的生成进度。也可以通过`ps ux|grep dsdgen`，查看生成数据文件的进程是否退出。

```
du -sh /data1/script/tpcds-kit/tpcds1000X/*.dat  
du -sh /data2/script/tpcds-kit/tpcds1000X/*.dat
```

----结束

3.4 建表与数据导入

3.4.1 GDS 方式导入

3.4.1.1 安装和启动 GDS

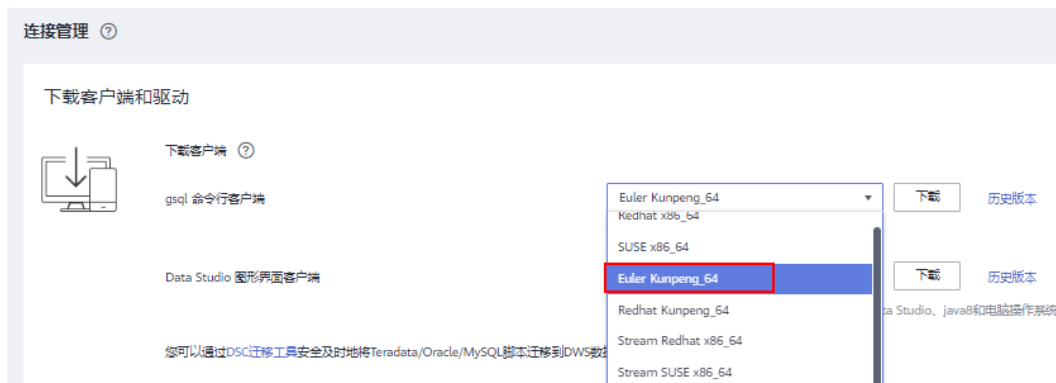
安装和启动 GDS

步骤1 登录GaussDB(DWS)管理控制台。

步骤2 在左侧导航栏中，单击“连接管理”。

步骤3 在“客户端”的下拉列表中，选择对应版本的GaussDB(DWS)客户端。

请根据集群版本和安装客户端的操作系统，选择对应版本。



步骤4 单击“下载”。

步骤5 将GDS工具包上传至ECS的/opt目录中，本例以上传Euler Kunpeng版本的工具包为例。

步骤6 在工具包所在目录下，解压工具包。

```
cd /opt/
unzip dws_client_8.1.x_euler_kunpeng_x64.zip
```

步骤7 创建用户gds_user及其所属的用户组gdsgrp。此用户用于启动GDS，且需要拥有读取数据源文件目录的权限。

```
groupadd gdsgrp
useradd -g gdsgrp gds_user
```

步骤8 修改工具包以及数据源文件目录属主为创建的用户gds_user及其所属的用户组gdsgrp。

```
chown -R gds_user:gdsgrp /opt/
chown -R gds_user:gdsgrp /data1
chown -R gds_user:gdsgrp /data2
```

步骤9 切换到gds_user用户。

```
su - gds_user
```

步骤10 执行环境依赖脚本（仅8.1.x版本适用）。

```
cd /opt/gds/bin
source gds_env
```

步骤11 启动GDS。

```
/opt/gds/bin/gds -d /data1/script/tpch-kit/tpch1000X -p 192.168.0.90:5000 -H 192.168.0.0/24 -l /opt/gds/gds01_log.txt -D #TPC-H使用
/opt/gds/bin/gds -d /data2/script/tpch-kit/tpch1000X -p 192.168.0.90:5001 -H 192.168.0.0/24 -l /opt/gds/gds02_log.txt -D #TPC-H使用
/opt/gds/bin/gds -d /data1/script/tpcds-kit/tpcds1000X/ -p 192.168.0.90:5002 -H 192.168.0.0/24 -l /opt/gds/gds03_log.txt -D #TPC-DS使用
/opt/gds/bin/gds -d /data2/script/tpcds-kit/tpcds1000X/ -p 192.168.0.90:5003 -H 192.168.0.0/24 -l /opt/gds/gds04_log.txt -D #TPC-DS使用
```

须知

- 命令中的斜体部分请根据实际填写，如果数据分片存放至多个数据盘目录，需要启动对应目录数量的GDS。
- 如果TPC-H和TPC-DS数据同时测试，需要启动以上4个GDS，如果只测试TPC-DS或TPC-H数据，请根据后面的“#xxx”备注启动对应的GDS服务即可。

- **-d dir:** 保存有待导入数据的数据文件所在目录。
- **-p ip:port:** GDS监听IP和监听端口。IP替换为ECS的内网IP，确保DWS能通过此IP与GDS的通讯；端口对于TPC-H取5000、5001，对于TPC-DS取5002、5003。
- **-H address_string:** 允许哪些主机连接和使用GDS服务。参数需为CIDR格式。此地址配置成DWS的集群内网网段(即GDS所在的ECS与DWS在同一个VPC下，以内网通讯即可)，例如192.168.0.0/24。
- **-l log_file:** 存放GDS的日志文件路径及文件名。
- **-D:** 后台运行GDS。仅支持Linux操作系统下使用。

----结束

3.4.1.2 使用 gsql 连接 DWS

使用 gsql 连接 DWS 集群

步骤1 进入到ECS的/opt目录下，并执行环境变量。

```
cd /opt
source gsql_env.sh
```

步骤2 执行以下命令连接DWS数据库。其中，<DWS的内网IP>、<用户dbadmin密码>从[创建数据仓库DWS](#)获取。

```
gsql -d gaussdb -h <DWS的内网IP> -U dbadmin -p 8000 -r -W <用户dbadmin密码>;
```

----结束

3.4.1.3 创建 GDS 外表并导入 TPC-H 数据

本文介绍如何通过GDS外表导入TPC-H 1000x数据，[表3-3](#)列出了TPC-H测试数据集中的表数据行数。

须知

TPC-DS请跳过本章节。

表数据行数

表 3-3 TPC-H

序号	表名	行数
1	region	5
2	nation	25
3	supplier	10,000,000
4	customer	150,000,000
5	part	200,000,000

序号	表名	行数
6	partsupp	800,000,000
7	orders	1,500,000,000
8	lineitem	5,999,989,709

操作步骤

步骤1 执行以下命令创建目标表（8张表）。

```

DROP TABLE IF EXISTS region;
CREATE TABLE region
(
  R_REGIONKEY INT NOT NULL,
  R_NAME CHAR(25) NOT NULL,
  R_COMMENT VARCHAR(152)
)
with (orientation = column)
distribute by replication;

DROP TABLE IF EXISTS nation;
CREATE TABLE nation
(
  N_NATIONKEY INT NOT NULL,
  N_NAME CHAR(25) NOT NULL,
  N_REGIONKEY INT NOT NULL,
  N_COMMENT VARCHAR(152)
)
with (orientation = column)
distribute by replication;

DROP TABLE IF EXISTS supplier;
CREATE TABLE supplier
(
  S_SUPPKEY INT NOT NULL,
  S_NAME CHAR(25) NOT NULL,
  S_ADDRESS VARCHAR(40) NOT NULL,
  S_NATIONKEY INT NOT NULL,
  S_PHONE CHAR(15) NOT NULL,
  S_ACCTBAL DECIMAL(15,2) NOT NULL,
  S_COMMENT VARCHAR(101) NOT NULL
)
with (orientation = column)
distribute by hash(S_SUPPKEY);

DROP TABLE IF EXISTS customer;
CREATE TABLE customer
(
  C_CUSTKEY INT NOT NULL,
  C_NAME VARCHAR(25) NOT NULL,
  C_ADDRESS VARCHAR(40) NOT NULL,
  C_NATIONKEY INT NOT NULL,
  C_PHONE CHAR(15) NOT NULL,
  C_ACCTBAL DECIMAL(15,2) NOT NULL,
  C_MKTSEGMENT CHAR(10) NOT NULL,
  C_COMMENT VARCHAR(117) NOT NULL
)
with (orientation = column)
distribute by hash(C_CUSTKEY);

DROP TABLE IF EXISTS part;
CREATE TABLE part

```

```
(
  P_PARTKEY INT NOT NULL,
  P_NAME VARCHAR(55) NOT NULL,
  P_MFGR CHAR(25) NOT NULL,
  P_BRAND CHAR(10) NOT NULL,
  P_TYPE VARCHAR(25) NOT NULL,
  P_SIZE INT NOT NULL,
  P_CONTAINER CHAR(10) NOT NULL,
  P_RETAILPRICE DECIMAL(15,2) NOT NULL,
  P_COMMENT VARCHAR(23) NOT NULL
)
with (orientation = column)
distribute by hash(P_PARTKEY);

DROP TABLE IF EXISTS partsupp;
CREATE TABLE partsupp
(
  PS_PARTKEY INT NOT NULL,
  PS_SUPPKEY INT NOT NULL,
  PS_AVAILQTY INT NOT NULL,
  PS_SUPPLYCOST DECIMAL(15,2) NOT NULL,
  PS_COMMENT VARCHAR(199) NOT NULL
)
with (orientation = column)
distribute by hash(PS_PARTKEY);

DROP TABLE IF EXISTS orders;
CREATE TABLE orders
(
  O_ORDERKEY BIGINT NOT NULL,
  O_CUSTKEY INT NOT NULL,
  O_ORDERSTATUS CHAR(1) NOT NULL,
  O_TOTALPRICE DECIMAL(15,2) NOT NULL,
  O_ORDERDATE DATE NOT NULL,
  O_ORDERPRIORITY CHAR(15) NOT NULL,
  O_CLERK CHAR(15) NOT NULL,
  O_SHIPPRIORITY INT NOT NULL,
  O_COMMENT VARCHAR(79) NOT NULL
)
with (orientation = column)
distribute by hash(O_ORDERKEY)
PARTITION BY RANGE(O_ORDERDATE)
(
  PARTITION O_ORDERDATE_1 VALUES LESS THAN('1993-01-01 00:00:00'),
  PARTITION O_ORDERDATE_2 VALUES LESS THAN('1994-01-01 00:00:00'),
  PARTITION O_ORDERDATE_3 VALUES LESS THAN('1995-01-01 00:00:00'),
  PARTITION O_ORDERDATE_4 VALUES LESS THAN('1996-01-01 00:00:00'),
  PARTITION O_ORDERDATE_5 VALUES LESS THAN('1997-01-01 00:00:00'),
  PARTITION O_ORDERDATE_6 VALUES LESS THAN('1998-01-01 00:00:00'),
  PARTITION O_ORDERDATE_7 VALUES LESS THAN('1999-01-01 00:00:00')
);

DROP TABLE IF EXISTS lineitem;
CREATE TABLE lineitem
(
  L_ORDERKEY BIGINT NOT NULL,
  L_PARTKEY INT NOT NULL,
  L_SUPPKEY INT NOT NULL,
  L_LINENUMBER INT NOT NULL,
  L_QUANTITY DECIMAL(15,2) NOT NULL,
  L_EXTENDEDPRICE DECIMAL(15,2) NOT NULL,
  L_DISCOUNT DECIMAL(15,2) NOT NULL,
  L_TAX DECIMAL(15,2) NOT NULL,
  L_RETURNFLAG CHAR(1) NOT NULL,
  L_LINestatus CHAR(1) NOT NULL,
  L_SHIPDATE DATE NOT NULL,
  L_COMMITDATE DATE NOT NULL,
  L_RECEIPTDATE DATE NOT NULL,
  L_SHIPINSTRUCT CHAR(25) NOT NULL,
```

```
L_SHIPMODE CHAR(10) NOT NULL,  
L_COMMENT  VARCHAR(44) NOT NULL  
)  
with (orientation = column)  
distribute by hash(L_ORDERKEY)  
PARTITION BY RANGE(L_SHIPDATE)  
(  
PARTITION L_SHIPDATE_1 VALUES LESS THAN('1993-01-01 00:00:00'),  
PARTITION L_SHIPDATE_2 VALUES LESS THAN('1994-01-01 00:00:00'),  
PARTITION L_SHIPDATE_3 VALUES LESS THAN('1995-01-01 00:00:00'),  
PARTITION L_SHIPDATE_4 VALUES LESS THAN('1996-01-01 00:00:00'),  
PARTITION L_SHIPDATE_5 VALUES LESS THAN('1997-01-01 00:00:00'),  
PARTITION L_SHIPDATE_6 VALUES LESS THAN('1998-01-01 00:00:00'),  
PARTITION L_SHIPDATE_7 VALUES LESS THAN('1999-01-01 00:00:00')  
);
```

步骤2 执行以下命令创建GDS外表（8张表）。

须知

以下每个外表的“gsfs://192.168.0.90:500x/xxx | gsfs://192.168.0.90:500x/xxx”中的IP地址和端口，请替换成[安装和启动GDS](#)中的对应的GDS的监听IP和端口，如启动两个GDS，则使用“|”区分。如果配置多个GDS服务器，需要将所有GDS的监听IP和端口配置到外表中。

```
DROP FOREIGN TABLE IF EXISTS region_load;  
CREATE FOREIGN TABLE region_load  
(  
R_REGIONKEY INT,  
R_NAME CHAR(25),  
R_COMMENT VARCHAR(152)  
)  
SERVER gsmpp_server  
OPTIONS(location 'gsfs://192.168.0.90:5000/region.tbl* | gsfs://192.168.0.90:5001/region.tbl*',  
format 'text',  
delimiter '|',  
encoding 'utf8',  
mode 'Normal')  
);  
  
DROP FOREIGN TABLE IF EXISTS nation_load;  
CREATE FOREIGN TABLE nation_load  
(  
N_NATIONKEY INT,  
N_NAME CHAR(25),  
N_REGIONKEY INT,  
N_COMMENT VARCHAR(152)  
)  
SERVER gsmpp_server  
OPTIONS(location 'gsfs://192.168.0.90:5000/nation.tbl* | gsfs://192.168.0.90:5001/nation.tbl*',  
format 'text',  
delimiter '|',  
encoding 'utf8',  
mode 'Normal')  
);  
  
DROP FOREIGN TABLE IF EXISTS supplier_load;  
CREATE FOREIGN TABLE supplier_load  
(  
S_SUPPKEY INT,  
S_NAME CHAR(25),  
S_ADDRESS VARCHAR(40),  
S_NATIONKEY INT,  
S_PHONE CHAR(15),  
S_ACCTBAL DECIMAL(15,2),
```

```

        S_COMMENT  VARCHAR(101)
    )
    SERVER gsmpp_server
    OPTIONS(location 'gsfs://192.168.0.90:5000/supplier.tbl*' | gsfs://192.168.0.90:5001/supplier.tbl*',
    format 'text',
    delimiter '|',
    encoding 'utf8',
    mode 'Normal'
    );

    DROP FOREIGN TABLE IF EXISTS customer_load;
    CREATE FOREIGN TABLE customer_load
    (
        C_CUSTKEY  INT,
        C_NAME     VARCHAR(25),
        C_ADDRESS  VARCHAR(40),
        C_NATIONKEY INT,
        C_PHONE    CHAR(15),
        C_ACCTBAL  DECIMAL(15,2),
        C_MKTSEGMENT CHAR(10),
        C_COMMENT  VARCHAR(117)
    )
    SERVER gsmpp_server
    OPTIONS(location 'gsfs://192.168.0.90:5000/customer.tbl*' | gsfs://192.168.0.90:5001/customer.tbl*',
    format 'text',
    delimiter '|',
    encoding 'utf8',
    mode 'Normal'
    );

    DROP FOREIGN TABLE IF EXISTS part_load;
    CREATE FOREIGN TABLE part_load
    (
        P_PARTKEY  INT,
        P_NAME     VARCHAR(55),
        P_MFGR     CHAR(25),
        P_BRAND    CHAR(10),
        P_TYPE     VARCHAR(25),
        P_SIZE     INT,
        P_CONTAINER CHAR(10),
        P_RETAILPRICE DECIMAL(15,2),
        P_COMMENT  VARCHAR(23)
    )
    SERVER gsmpp_server
    OPTIONS(location 'gsfs://192.168.0.90:5000/part.tbl*' | gsfs://192.168.0.90:5001/part.tbl*',
    format 'text',
    delimiter '|',
    encoding 'utf8',
    mode 'Normal'
    );

    DROP FOREIGN TABLE IF EXISTS partsupp_load;
    CREATE FOREIGN TABLE partsupp_load
    (
        PS_PARTKEY  INT,
        PS_SUPPKEY  INT,
        PS_AVAILQTY INT,
        PS_SUPPLYCOST DECIMAL(15,2),
        PS_COMMENT  VARCHAR(199)
    )
    SERVER gsmpp_server
    OPTIONS(location 'gsfs://192.168.0.90:5000/partsupp.tbl*' | gsfs://192.168.0.90:5001/partsupp.tbl*',
    format 'text',
    delimiter '|',
    encoding 'utf8',
    mode 'Normal'
    );

```

```
DROP FOREIGN TABLE IF EXISTS orders_load;
CREATE FOREIGN TABLE orders_load
(
  O_ORDERKEY    BIGINT,
  O_CUSTKEY     INT,
  O_ORDERSTATUS CHAR(1),
  O_TOTALPRICE  DECIMAL(15,2),
  O_ORDERDATE   DATE,
  O_ORDERPRIORITY CHAR(15),
  O_CLERK       CHAR(15),
  O_SHIPPRIORITY INT,
  O_COMMENT     VARCHAR(79)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5000/orders.tbl* | gsfs://192.168.0.90:5001/orders.tbl*',
format 'text',
delimiter '|',
encoding 'utf8',
mode 'Normal'
);

DROP FOREIGN TABLE IF EXISTS lineitem_load;
CREATE FOREIGN TABLE lineitem_load
(
  L_ORDERKEY    BIGINT,
  L_PARTKEY     INT,
  L_SUPPKEY     INT,
  L_LINENUMBER  INT,
  L_QUANTITY    DECIMAL(15,2),
  L_EXTENDEDPRICE DECIMAL(15,2),
  L_DISCOUNT   DECIMAL(15,2),
  L_TAX         DECIMAL(15,2),
  L_RETURNFLAG  CHAR(1),
  L_LINESTATUS  CHAR(1),
  L_SHIPDATE    DATE,
  L_COMMITDATE  DATE,
  L_RECEIPTDATE DATE,
  L_SHIPINSTRUCT CHAR(25),
  L_SHIPMODE    CHAR(10),
  L_COMMENT     VARCHAR(44)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5000/lineitem.tbl* | gsfs://192.168.0.90:5001/lineitem.tbl*',
format 'text',
delimiter '|',
encoding 'utf8',
mode 'Normal'
);
```

步骤3 执行以下命令导入数据。

```
INSERT INTO region SELECT * FROM region_load;
INSERT INTO nation SELECT * FROM nation_load;
INSERT INTO supplier SELECT * FROM supplier_load;
INSERT INTO customer SELECT * FROM customer_load;
INSERT INTO part SELECT * FROM part_load;
INSERT INTO partsupp SELECT * FROM partsupp_load;
INSERT INTO orders SELECT * FROM orders_load;
INSERT INTO lineitem SELECT * FROM lineitem_load;
```

----结束

3.4.1.4 创建 GDS 外表并导入 TPC-DS 数据

本文介绍如何通过GDS外表导入TPC-DS 1000x数据，[表3-4](#)列出了TPC-DS测试数据集
中的表数据行数。

须知

TPC-H请跳过本章节。

表数据行数

表 3-4 TPC-DS

序号	表名	行数
1	customer_address	6,000,000
2	customer_demographics	1,920,800
3	date_dim	73,049
4	warehouse	20
5	ship_mode	20
6	time_dim	86,400
7	reason	65
8	income_band	20
9	item	300,000
10	store	1,002
11	call_center	42
12	customer	12,000,000
13	web_site	54
14	household_demographics	7,200
15	web_page	3,000
16	promotion	1,500
17	catalog_page	30,000
18	inventory	783,000,000
19	catalog_returns	143,996,756
20	web_returns	71,997,522
21	store_returns	287,999,764
22	web_sales	720,000,376
23	catalog_sales	1,439,980,416
24	store_sales	2,879,987,999

操作步骤

步骤1 执行以下SQL创建目标表（共24张表）。

```
CREATE TABLE customer_address
(
  ca_address_sk      bigint      not null ,
  ca_address_id     char(16)    not null,
  ca_street_number  char(10)    ,
  ca_street_name    varchar(60) ,
  ca_street_type    char(15)    ,
  ca_suite_number   char(10)    ,
  ca_city           varchar(60) ,
  ca_county         varchar(30) ,
  ca_state          char(2)     ,
  ca_zip            char(10)    ,
  ca_country        varchar(20) ,
  ca_gmt_offset     decimal(5,2) ,
  ca_location_type  char(20)   ,
)
with (orientation = column)
distribute by hash (ca_address_sk);

CREATE TABLE customer_demographics
(
  cd_demo_sk        bigint      not null ,
  cd_gender         char(1)     ,
  cd_marital_status char(1)    ,
  cd_education_status char(20) ,
  cd_purchase_estimate  bigint ,
  cd_credit_rating   char(10)  ,
  cd_dep_count      bigint     ,
  cd_dep_employed_count  bigint ,
  cd_dep_college_count  bigint ,
)
with (orientation = column)
distribute by hash (cd_demo_sk);

CREATE TABLE date_dim
(
  d_date_sk        bigint      not null,
  d_date_id       char(16)    not null,
  d_date          date        ,
  d_month_seq     bigint      ,
  d_week_seq      bigint      ,
  d_quarter_seq   bigint      ,
  d_year         bigint      ,
  d_dow          bigint      ,
  d_moy          bigint      ,
  d_dom          bigint      ,
  d_qoy          bigint      ,
  d_fy_year      bigint      ,
  d_fy_quarter_seq  bigint    ,
  d_fy_week_seq  bigint      ,
  d_day_name     char(9)     ,
  d_quarter_name char(6)    ,
  d_holiday      char(1)    ,
  d_weekend      char(1)    ,
  d_following_holiday char(1) ,
  d_first_dom    bigint      ,
  d_last_dom     bigint      ,
  d_same_day_ly  bigint      ,
  d_same_day_lq  bigint      ,
  d_current_day  char(1)    ,
  d_current_week char(1)    ,
  d_current_month char(1)   ,
  d_current_quarter char(1) ,
  d_current_year char(1)   ,
)
```



```

)
with (orientation = column)
DISTRIBUTE by hash(d_date_sk)
PARTITION BY Range(d_year) (
    partition p1 values less than(1950),
    partition p2 values less than(2000),
    partition p3 values less than(2050),
    partition p4 values less than(2100),
    partition p5 values less than(3000),
    partition p6 values less than(maxvalue)
);

CREATE TABLE warehouse
(
    w_warehouse_sk          bigint          not null,
    w_warehouse_id         char(16)         not null,
    w_warehouse_name       varchar(20)
    w_warehouse_sq_ft      bigint
    w_street_number        char(10)
    w_street_name          varchar(60)
    w_street_type          char(15)
    w_suite_number         char(10)
    w_city                 varchar(60)
    w_county               varchar(30)
    w_state                char(2)
    w_zip                 char(10)
    w_country              varchar(20)
    w_gmt_offset           decimal(5,2)
)
with (orientation = column)
distribute by replication;

CREATE TABLE ship_mode
(
    sm_ship_mode_sk        bigint          not null,
    sm_ship_mode_id       char(16)         not null,
    sm_type                char(30)
    sm_code                char(10)
    sm_carrier            char(20)
    sm_contract           char(20)
)
with (orientation = column)
distribute by replication;

CREATE TABLE time_dim
(
    t_time_sk             bigint          not null,
    t_time_id            char(16)         not null,
    t_time               bigint
    t_hour              bigint
    t_minute            bigint
    t_second            bigint
    t_am_pm             char(2)
    t_shift             char(20)
    t_sub_shift         char(20)
    t_meal_time         char(20)
)
with (orientation = column)
distribute by hash (t_time_sk);

CREATE TABLE reason
(
    r_reason_sk          bigint          not null,
    r_reason_id         char(16)         not null,

```

```

    r_reason_desc      char(100)
)
with (orientation = column)
distribute by replication;

CREATE TABLE income_band
(
    ib_income_band_sk  bigint      not null,
    ib_lower_bound     bigint
    ,
    ib_upper_bound     bigint
)
with (orientation = column)
distribute by replication;

CREATE TABLE item
(
    i_item_sk          bigint      not null,
    i_item_id          char(16)    not null,
    i_rec_start_date   date
    ,
    i_rec_end_date     date
    ,
    i_item_desc        varchar(200)
    ,
    i_current_price    decimal(7,2)
    ,
    i_wholesale_cost   decimal(7,2)
    ,
    i_brand_id         bigint
    ,
    i_brand            char(50)
    ,
    i_class_id         bigint
    ,
    i_class            char(50)
    ,
    i_category_id      bigint
    ,
    i_category         char(50)
    ,
    i_manufact_id      bigint
    ,
    i_manufact         char(50)
    ,
    i_size             char(20)
    ,
    i_formulation      char(20)
    ,
    i_color            char(20)
    ,
    i_units            char(10)
    ,
    i_container        char(10)
    ,
    i_manager_id       bigint
    ,
    i_product_name     char(50)
)
with (orientation = column)
distribute by hash (i_item_sk);

CREATE TABLE store
(
    s_store_sk         bigint      not null,
    s_store_id         char(16)    not null,
    s_rec_start_date   date
    ,
    s_rec_end_date     date
    ,
    s_closed_date_sk   bigint
    ,
    s_store_name       varchar(50)
    ,
    s_number_employees bigint
    ,
    s_floor_space      bigint
    ,
    s_hours            char(20)
    ,
    s_manager          varchar(40)
    ,
    s_market_id        bigint
    ,
    s_geography_class  varchar(100)
    ,
    s_market_desc      varchar(100)
    ,
    s_market_manager   varchar(40)
    ,
    s_division_id      bigint
    ,
    s_division_name    varchar(50)
    ,
    s_company_id       bigint
    ,
    s_company_name     varchar(50)
    ,
    s_street_number    varchar(10)
    ,
    s_street_name      varchar(60)
    ,
    s_street_type      char(15)
    ,
    s_suite_number     char(10)
    ,
    s_city             varchar(60)
    ,

```

```

s_county      varchar(30)      ,
s_state       char(2)        ,
s_zip         char(10)       ,
s_country     varchar(20)    ,
s_gmt_offset  decimal(5,2)   ,
s_tax_precentage decimal(5,2)
)
with (orientation = column)
distribute by replication;

CREATE TABLE call_center
(
cc_call_center_sk  bigint      not null,
cc_call_center_id char(16)     not null,
cc_rec_start_date  date         ,
cc_rec_end_date    date         ,
cc_closed_date_sk  bigint      ,
cc_open_date_sk    bigint      ,
cc_name            varchar(50)  ,
cc_class           varchar(50)  ,
cc_employees       bigint      ,
cc_sq_ft           bigint      ,
cc_hours           char(20)     ,
cc_manager         varchar(40)  ,
cc_mkt_id          bigint      ,
cc_mkt_class       char(50)     ,
cc_mkt_desc        varchar(100) ,
cc_market_manager  varchar(40)  ,
cc_division        bigint      ,
cc_division_name   varchar(50)  ,
cc_company         bigint      ,
cc_company_name    char(50)     ,
cc_street_number   char(10)     ,
cc_street_name     varchar(60)  ,
cc_street_type     char(15)     ,
cc_suite_number    char(10)     ,
cc_city            varchar(60)  ,
cc_county          varchar(30)  ,
cc_state           char(2)      ,
cc_zip             char(10)     ,
cc_country         varchar(20)  ,
cc_gmt_offset      decimal(5,2) ,
cc_tax_percentage  decimal(5,2)
)
with (orientation = column)
distribute by replication;

drop table if exists customer;
CREATE TABLE customer
(
c_customer_sk      bigint      not null,
c_customer_id     char(16)     not null,
c_current_cdemo_sk  bigint      ,
c_current_hdemo_sk  bigint      ,
c_current_addr_sk  bigint      ,
c_first_shipto_date_sk  bigint      ,
c_first_sales_date_sk  bigint      ,
c_salutation       char(10)    ,
c_first_name       char(20)    ,
c_last_name        char(30)    ,
c_preferred_cust_flag  char(1)  ,
c_birth_day        bigint      ,
c_birth_month      bigint      ,
c_birth_year       bigint      ,
c_birth_country    varchar(20)  ,
c_login            char(13)     ,
c_email_address    char(50)    ,
c_last_review_date_sk  char(10)
)

```

```

with (orientation = column)
distribute by hash (c_customer_sk);

CREATE TABLE web_site
(
  web_site_sk      bigint      not null,
  web_site_id     char(16)    not null,
  web_rec_start_date date      ,
  web_rec_end_date date      ,
  web_name        varchar(50) ,
  web_open_date_sk bigint     ,
  web_close_date_sk bigint    ,
  web_class       varchar(50) ,
  web_manager     varchar(40) ,
  web_mkt_id      bigint     ,
  web_mkt_class   varchar(50) ,
  web_mkt_desc    varchar(100) ,
  web_market_manager varchar(40) ,
  web_company_id  bigint     ,
  web_company_name char(50)   ,
  web_street_number char(10)  ,
  web_street_name  varchar(60) ,
  web_street_type  char(15)   ,
  web_suite_number char(10)   ,
  web_city        varchar(60) ,
  web_county      varchar(30) ,
  web_state       char(2)     ,
  web_zip         char(10)    ,
  web_country     varchar(20) ,
  web_gmt_offset  decimal(5,2) ,
  web_tax_percentage decimal(5,2)
)
with (orientation = column)
distribute by replication;

CREATE TABLE household_demographics
(
  hd_demo_sk      bigint      not null,
  hd_income_band_sk bigint    ,
  hd_buy_potential char(15)   ,
  hd_dep_count    bigint     ,
  hd_vehicle_count bigint
)
with (orientation = column)
distribute by hash (hd_demo_sk);

CREATE TABLE web_page
(
  wp_web_page_sk  bigint      not null,
  wp_web_page_id  char(16)    not null,
  wp_rec_start_date date      ,
  wp_rec_end_date date      ,
  wp_creation_date_sk bigint   ,
  wp_access_date_sk bigint    ,
  wp_autogen_flag char(1)    ,
  wp_customer_sk  bigint     ,
  wp_url         varchar(100) ,
  wp_type        char(50)    ,
  wp_char_count  bigint     ,
  wp_link_count  bigint     ,
  wp_image_count bigint     ,
  wp_max_ad_count bigint
)
with (orientation = column)
distribute by replication;

```

```

CREATE TABLE promotion
(
  p_promo_sk          bigint          not null,
  p_promo_id         char(16)        not null,
  p_start_date_sk    bigint          ,
  p_end_date_sk      bigint          ,
  p_item_sk          bigint          ,
  p_cost             decimal(15,2)   ,
  p_response_target  bigint          ,
  p_promo_name       char(50)        ,
  p_channel_dmail    char(1)         ,
  p_channel_email    char(1)         ,
  p_channel_catalog  char(1)         ,
  p_channel_tv       char(1)         ,
  p_channel_radio    char(1)         ,
  p_channel_press    char(1)         ,
  p_channel_event    char(1)         ,
  p_channel_demo     char(1)         ,
  p_channel_details  varchar(100)    ,
  p_purpose            char(15)        ,
  p_discount_active  char(1)         ,
)
with (orientation = column)
DISTRIBUTE BY HASH(p_promo_sk);

CREATE TABLE catalog_page
(
  cp_catalog_page_sk  bigint          not null,
  cp_catalog_page_id  char(16)        not null,
  cp_start_date_sk    bigint          ,
  cp_end_date_sk      bigint          ,
  cp_department       varchar(50)     ,
  cp_catalog_number   bigint          ,
  cp_catalog_page_number bigint      ,
  cp_description      varchar(100)    ,
  cp_type             varchar(100)    ,
)
with (orientation = column)
distribute by hash (cp_catalog_page_sk);

CREATE TABLE inventory
(
  inv_date_sk         bigint          not null,
  inv_item_sk         bigint          not null,
  inv_warehouse_sk    bigint          not null,
  inv_quantity_on_hand integer
)
with (orientation = column)
distribute by hash (inv_item_sk)
partition by range(inv_date_sk)
(
  partition p1 values less than(2451180),
  partition p2 values less than(2451545),
  partition p3 values less than(2451911),
  partition p4 values less than(2452276),
  partition p5 values less than(2452641),
  partition p6 values less than(2453006),
  partition p7 values less than(maxvalue)
)
;

CREATE TABLE catalog_returns
(
  cr_returned_date_sk  bigint          ,
  cr_returned_time_sk  bigint          ,
  cr_item_sk           bigint          not null,
  cr_refunded_customer_sk bigint      ,
  cr_refunded_cdemo_sk  bigint          ,
)

```

```

cr_refunded_hdemo_sk    bigint    ,
cr_refunded_addr_sk     bigint    ,
cr_returning_customer_sk bigint    ,
cr_returning_cdemo_sk   bigint    ,
cr_returning_hdemo_sk   bigint    ,
cr_returning_addr_sk    bigint    ,
cr_call_center_sk       bigint    ,
cr_catalog_page_sk      bigint    ,
cr_ship_mode_sk         bigint    ,
cr_warehouse_sk         bigint    ,
cr_reason_sk            bigint    ,
cr_order_number         bigint    not null,
cr_return_quantity      bigint    ,
cr_return_amount        decimal(7,2) ,
cr_return_tax           decimal(7,2) ,
cr_return_amt_inc_tax   decimal(7,2) ,
cr_fee                  decimal(7,2) ,
cr_return_ship_cost     decimal(7,2) ,
cr_refunded_cash        decimal(7,2) ,
cr_reversed_charge      decimal(7,2) ,
cr_store_credit         decimal(7,2) ,
cr_net_loss             decimal(7,2)
)
with (orientation = column)
distribute by hash (cr_item_sk)
partition by range(cr_returned_date_sk)
(
  partition p1 values less than(2450815),
  partition p2 values less than(2451180),
  partition p3 values less than(2451545),
  partition p4 values less than(2451911),
  partition p5 values less than(2452276),
  partition p6 values less than(2452641),
  partition p7 values less than(2453006),
  partition p8 values less than(maxvalue)
)
;

CREATE TABLE web_returns
(
  wr_returned_date_sk    bigint    ,
  wr_returned_time_sk    bigint    ,
  wr_item_sk             bigint    not null,
  wr_refunded_customer_sk bigint    ,
  wr_refunded_cdemo_sk   bigint    ,
  wr_refunded_hdemo_sk   bigint    ,
  wr_refunded_addr_sk    bigint    ,
  wr_returning_customer_sk bigint    ,
  wr_returning_cdemo_sk   bigint    ,
  wr_returning_hdemo_sk   bigint    ,
  wr_returning_addr_sk    bigint    ,
  wr_web_page_sk         bigint    ,
  wr_reason_sk           bigint    ,
  wr_order_number        bigint    not null,
  wr_return_quantity     bigint    ,
  wr_return_amt          decimal(7,2) ,
  wr_return_tax          decimal(7,2) ,
  wr_return_amt_inc_tax   decimal(7,2) ,
  wr_fee                 decimal(7,2) ,
  wr_return_ship_cost     decimal(7,2) ,
  wr_refunded_cash       decimal(7,2) ,
  wr_reversed_charge     decimal(7,2) ,
  wr_account_credit       decimal(7,2) ,
  wr_net_loss            decimal(7,2)
)
with (orientation = column)
distribute by hash (wr_item_sk)
partition by range(wr_returned_date_sk)

```

```
(
partition p1 values less than(2450815),
partition p2 values less than(2451180),
partition p3 values less than(2451545),
partition p4 values less than(2451911),
partition p5 values less than(2452276),
partition p6 values less than(2452641),
partition p7 values less than(2453006),
partition p8 values less than(maxvalue)
)
);

CREATE TABLE store_returns
(
sr_returned_date_sk    bigint           ,
sr_return_time_sk     bigint           ,
sr_item_sk            bigint           not null,
sr_customer_sk       bigint           ,
sr_cdemo_sk          bigint           ,
sr_hdemo_sk          bigint           ,
sr_addr_sk           bigint           ,
sr_store_sk          bigint           ,
sr_reason_sk         bigint           ,
sr_ticket_number     bigint           not null,
sr_return_quantity   bigint           ,
sr_return_amt        decimal(7,2)     ,
sr_return_tax        decimal(7,2)     ,
sr_return_amt_inc_tax decimal(7,2)     ,
sr_fee              decimal(7,2)     ,
sr_return_ship_cost  decimal(7,2)     ,
sr_refunded_cash    decimal(7,2)     ,
sr_reversed_charge   decimal(7,2)     ,
sr_store_credit      decimal(7,2)     ,
sr_net_loss         decimal(7,2)
)
with (orientation = column)
distribute by hash (sr_item_sk)
partition by range(sr_returned_date_sk)
(
partition p1 values less than (2451180) ,
partition p2 values less than (2451545) ,
partition p3 values less than (2451911) ,
partition p4 values less than (2452276) ,
partition p5 values less than (2452641) ,
partition p6 values less than (2453006) ,
partition p7 values less than (maxvalue)
)
);

CREATE TABLE web_sales
(
ws_sold_date_sk    bigint           ,
ws_sold_time_sk   bigint           ,
ws_ship_date_sk   bigint           ,
ws_item_sk        bigint           not null,
ws_bill_customer_sk  bigint           ,
ws_bill_cdemo_sk   bigint           ,
ws_bill_hdemo_sk   bigint           ,
ws_bill_addr_sk    bigint           ,
ws_ship_customer_sk  bigint           ,
ws_ship_cdemo_sk   bigint           ,
ws_ship_hdemo_sk   bigint           ,
ws_ship_addr_sk    bigint           ,
ws_web_page_sk     bigint           ,
ws_web_site_sk     bigint           ,
ws_ship_mode_sk    bigint           ,
ws_warehouse_sk   bigint           ,
ws_promo_sk        bigint
)
```

```

ws_order_number      bigint      not null,
ws_quantity          bigint
ws_wholesale_cost    decimal(7,2)
ws_list_price        decimal(7,2)
ws_sales_price       decimal(7,2)
ws_ext_discount_amt  decimal(7,2)
ws_ext_sales_price   decimal(7,2)
ws_ext_wholesale_cost decimal(7,2)
ws_ext_list_price    decimal(7,2)
ws_ext_tax           decimal(7,2)
ws_coupon_amt        decimal(7,2)
ws_ext_ship_cost     decimal(7,2)
ws_net_paid          decimal(7,2)
ws_net_paid_inc_tax  decimal(7,2)
ws_net_paid_inc_ship decimal(7,2)
ws_net_paid_inc_ship_tax decimal(7,2)
ws_net_profit        decimal(7,2)
)
with (orientation = column)
distribute by hash (ws_item_sk)
partition by range(ws_sold_date_sk)
(
  partition p1 values less than(2451180),
  partition p2 values less than(2451545),
  partition p3 values less than(2451911),
  partition p4 values less than(2452276),
  partition p5 values less than(2452641),
  partition p6 values less than(2453006),
  partition p7 values less than(maxvalue)
)
;

CREATE TABLE catalog_sales
(
  cs_sold_date_sk      bigint
  cs_sold_time_sk      bigint
  cs_ship_date_sk      bigint
  cs_bill_customer_sk  bigint
  cs_bill_cdemo_sk     bigint
  cs_bill_hdemo_sk     bigint
  cs_bill_addr_sk      bigint
  cs_ship_customer_sk  bigint
  cs_ship_cdemo_sk     bigint
  cs_ship_hdemo_sk     bigint
  cs_ship_addr_sk      bigint
  cs_call_center_sk    bigint
  cs_catalog_page_sk   bigint
  cs_ship_mode_sk      bigint
  cs_warehouse_sk      bigint
  cs_item_sk           bigint      not null,
  cs_promo_sk          bigint
  cs_order_number      bigint      not null,
  cs_quantity          bigint
  cs_wholesale_cost    decimal(7,2)
  cs_list_price        decimal(7,2)
  cs_sales_price       decimal(7,2)
  cs_ext_discount_amt  decimal(7,2)
  cs_ext_sales_price   decimal(7,2)
  cs_ext_wholesale_cost decimal(7,2)
  cs_ext_list_price    decimal(7,2)
  cs_ext_tax           decimal(7,2)
  cs_coupon_amt        decimal(7,2)
  cs_ext_ship_cost     decimal(7,2)
  cs_net_paid          decimal(7,2)
  cs_net_paid_inc_tax  decimal(7,2)
  cs_net_paid_inc_ship decimal(7,2)
  cs_net_paid_inc_ship_tax decimal(7,2)
  cs_net_profit        decimal(7,2)
)

```



```
with (orientation = column)
distribute by hash (cs_item_sk)
partition by range(cs_sold_date_sk)
(
  partition p1 values less than(2451180),
  partition p2 values less than(2451545),
  partition p3 values less than(2451911),
  partition p4 values less than(2452276),
  partition p5 values less than(2452641),
  partition p6 values less than(2453006),
  partition p7 values less than(maxvalue)
)
;

CREATE TABLE store_sales
(
  ss_sold_date_sk      bigint          ,
  ss_sold_time_sk     bigint          ,
  ss_item_sk          bigint          not null,
  ss_customer_sk      bigint          ,
  ss_cdemo_sk         bigint          ,
  ss_hdemo_sk         bigint          ,
  ss_addr_sk          bigint          ,
  ss_store_sk         bigint          ,
  ss_promo_sk         bigint          ,
  ss_ticket_number    bigint          not null,
  ss_quantity         bigint          ,
  ss_wholesale_cost   decimal(7,2)    ,
  ss_list_price       decimal(7,2)    ,
  ss_sales_price      decimal(7,2)    ,
  ss_ext_discount_amt decimal(7,2)    ,
  ss_ext_sales_price  decimal(7,2)    ,
  ss_ext_wholesale_cost decimal(7,2)  ,
  ss_ext_list_price   decimal(7,2)    ,
  ss_ext_tax          decimal(7,2)    ,
  ss_coupon_amt       decimal(7,2)    ,
  ss_net_paid         decimal(7,2)    ,
  ss_net_paid_inc_tax decimal(7,2)    ,
  ss_net_profit       decimal(7,2)
)
with (orientation = column)
distribute by hash (ss_item_sk)
partition by range(ss_sold_date_sk)
(
  partition p1 values less than(2451180),
  partition p2 values less than(2451545),
  partition p3 values less than(2451911),
  partition p4 values less than(2452276),
  partition p5 values less than(2452641),
  partition p6 values less than(2453006),
  partition p7 values less than(maxvalue)
)
;
```

步骤2 执行以下SQL语句创建GDS外表（共24张表）。

须知

以下每个外表的“gsfs://192.168.0.90:500x/xxx | gsfs://192.168.0.90:500x/xxx”中的IP地址和端口，请替换成[安装和启动GDS](#)中的对应的GDS的监听IP和端口，如启动两个GDS，则使用“|”区分。如果配置多个GDS服务器，需要将所有GDS的监听IP和端口配置到外表中。

```
DROP FOREIGN TABLE IF EXISTS customer_address_ext;
CREATE FOREIGN TABLE customer_address_ext
```

```
(
  ca_address_sk      bigint          ,
  ca_address_id     char(16)         ,
  ca_street_number  char(10)        ,
  ca_street_name    varchar(60)     ,
  ca_street_type    char(15)        ,
  ca_suite_number   char(10)        ,
  ca_city           varchar(60)     ,
  ca_county         varchar(30)     ,
  ca_state          char(2)         ,
  ca_zip            char(10)        ,
  ca_country        varchar(20)     ,
  ca_gmt_offset     decimal(5,2)    ,
  ca_location_type  char(20)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/customer_address.dat* | gsfs://192.168.0.90:5003/
customer_address.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with customer_address_err
;

DROP FOREIGN TABLE IF EXISTS customer_demographics_ext;
CREATE FOREIGN TABLE customer_demographics_ext
(
  cd_demo_sk      bigint          ,
  cd_gender       char(1)         ,
  cd_marital_status char(1)      ,
  cd_education_status char(20)   ,
  cd_purchase_estimate bigint     ,
  cd_credit_rating char(10)      ,
  cd_dep_count    bigint          ,
  cd_dep_employed_count bigint    ,
  cd_dep_college_count bigint
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/customer_demographics.dat* | gsfs://192.168.0.90:5003/
customer_demographics.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with customer_demographics_err
;

DROP FOREIGN TABLE IF EXISTS date_dim_ext;
CREATE FOREIGN TABLE date_dim_ext
(
  d_date_sk      bigint          ,
  d_date_id     char(16)         ,
  d_date        date             ,
  d_month_seq    bigint          ,
  d_week_seq     bigint          ,
  d_quarter_seq  bigint          ,
  d_year         bigint          ,
  d_dow         bigint          ,
  d_moy         bigint          ,
  d_dom         bigint          ,
  d_qoy         bigint          ,
  d_fy_year     bigint          ,
  d_fy_quarter_seq bigint      ,
  d_fy_week_seq  bigint          ,
  d_day_name     char(9)        ,
  d_quarter_name char(6)
)
```

```

d_holiday          char(1)          ,
d_weekend          char(1)          ,
d_following_holiday char(1)        ,
d_first_dom        bigint          ,
d_last_dom         bigint          ,
d_same_day_ly      bigint          ,
d_same_day_lq      bigint          ,
d_current_day      char(1)          ,
d_current_week     char(1)          ,
d_current_month    char(1)          ,
d_current_quarter  char(1)          ,
d_current_year     char(1)          ,
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/date_dim.dat*' | gsfs://192.168.0.90:5003/date_dim.dat*',
FORMAT 'TEXT',
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with date_dim_err
;

DROP FOREIGN TABLE IF EXISTS warehouse_ext;
CREATE FOREIGN TABLE warehouse_ext
(
w_warehouse_sk      bigint          ,
w_warehouse_id      char(16)         ,
w_warehouse_name    varchar(20)      ,
w_warehouse_sq_ft   bigint          ,
w_street_number     char(10)         ,
w_street_name       varchar(60)      ,
w_street_type       char(15)         ,
w_suite_number      char(10)         ,
w_city              varchar(60)      ,
w_county            varchar(30)      ,
w_state             char(2)          ,
w_zip              char(10)          ,
w_country           varchar(20)      ,
w_gmt_offset        decimal(5,2)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/warehouse.dat*' | gsfs://192.168.0.90:5003/warehouse.dat*',
FORMAT 'TEXT',
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with warehouse_err
;

DROP FOREIGN TABLE IF EXISTS ship_mode_ext;
CREATE FOREIGN TABLE ship_mode_ext
(
sm_ship_mode_sk      bigint          ,
sm_ship_mode_id      char(16)         ,
sm_type             char(30)          ,
sm_code             char(10)          ,
sm_carrier          char(20)          ,
sm_contract         char(20)          ,
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/ship_mode.dat*' | gsfs://192.168.0.90:5003/ship_mode.dat*',
FORMAT 'TEXT',
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with ship_mode_err

```

```

;
DROP FOREIGN TABLE IF EXISTS time_dim_ext;
CREATE FOREIGN TABLE time_dim_ext
(
t_time_sk          bigint          ,
t_time_id         char(16)         ,
t_time            bigint          ,
t_hour            bigint          ,
t_minute          bigint          ,
t_second          bigint          ,
t_am_pm           char(2)          ,
t_shift           char(20)         ,
t_sub_shift       char(20)         ,
t_meal_time       char(20)         ,
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/time_dim.dat*' | gsfs://192.168.0.90:5003/time_dim.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with time_dim_err
;

DROP FOREIGN TABLE IF EXISTS reason_ext;
CREATE FOREIGN TABLE reason_ext
(
r_reason_sk       bigint          ,
r_reason_id       char(16)         ,
r_reason_desc     char(100)        ,
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/reason.dat*' | gsfs://192.168.0.90:5003/reason.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with reason_err
;

DROP FOREIGN TABLE IF EXISTS income_band_ext;
CREATE FOREIGN TABLE income_band_ext
(
ib_income_band_sk  bigint          ,
ib_lower_bound     bigint          ,
ib_upper_bound     bigint          ,
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/income_band.dat*' | gsfs://192.168.0.90:5003/
income_band.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with income_band_err
;

DROP FOREIGN TABLE IF EXISTS item_ext;
CREATE FOREIGN TABLE item_ext
(
i_item_sk          bigint          ,
i_item_id         char(16)         ,
i_rec_start_date   date            ,
i_rec_end_date     date            ,
i_item_desc        varchar(200)    ,

```

```

i_current_price      decimal(7,2)      ,
i_wholesale_cost    decimal(7,2)      ,
i_brand_id          bigint           ,
i_brand             char(50)         ,
i_class_id         bigint           ,
i_class            char(50)         ,
i_category_id      bigint           ,
i_category         char(50)         ,
i_manufact_id     bigint           ,
i_manufact        char(50)         ,
i_size            char(20)         ,
i_formulation     char(20)         ,
i_color           char(20)         ,
i_units          char(10)         ,
i_container       char(10)         ,
i_manager_id     bigint           ,
i_product_name    char(50)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/item.dat* | gsfs://192.168.0.90:5003/item.dat*',
FORMAT 'TEXT',
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with item_err
;

DROP FOREIGN TABLE IF EXISTS store_ext;
CREATE FOREIGN TABLE store_ext
(
s_store_sk          bigint           ,
s_store_id         char(16)         ,
s_rec_start_date   date             ,
s_rec_end_date     date             ,
s_closed_date_sk   bigint           ,
s_store_name       varchar(50)      ,
s_number_employees bigint           ,
s_floor_space     bigint           ,
s_hours          char(20)         ,
s_manager        varchar(40)      ,
s_market_id      bigint           ,
s_geography_class varchar(100)     ,
s_market_desc    varchar(100)     ,
s_market_manager varchar(40)      ,
s_division_id    bigint           ,
s_division_name  varchar(50)      ,
s_company_id     bigint           ,
s_company_name   varchar(50)      ,
s_street_number  varchar(10)      ,
s_street_name    varchar(60)      ,
s_street_type    char(15)         ,
s_suite_number   char(10)         ,
s_city           varchar(60)      ,
s_county         varchar(30)      ,
s_state         char(2)           ,
s_zip           char(10)         ,
s_country       varchar(20)      ,
s_gmt_offset     decimal(5,2)     ,
s_tax_precentage decimal(5,2)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/store_[^rs]* | gsfs://192.168.0.90:5003/store_[^rs]*',
FORMAT 'TEXT',
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with store_err

```

```

;
DROP FOREIGN TABLE IF EXISTS call_center_ext;
CREATE FOREIGN TABLE call_center_ext
(
    cc_call_center_sk      bigint      ,
    cc_call_center_id     char(16)    ,
    cc_rec_start_date     date        ,
    cc_rec_end_date       date        ,
    cc_closed_date_sk     bigint      ,
    cc_open_date_sk       bigint      ,
    cc_name                varchar(50) ,
    cc_class               varchar(50) ,
    cc_employees           bigint      ,
    cc_sq_ft               bigint      ,
    cc_hours               char(20)    ,
    cc_manager             varchar(40) ,
    cc_mkt_id              bigint      ,
    cc_mkt_class           char(50)    ,
    cc_mkt_desc            varchar(100) ,
    cc_market_manager     varchar(40)  ,
    cc_division            bigint      ,
    cc_division_name      varchar(50)  ,
    cc_company             bigint      ,
    cc_company_name       char(50)    ,
    cc_street_number      char(10)    ,
    cc_street_name        varchar(60)  ,
    cc_street_type        char(15)    ,
    cc_suite_number       char(10)    ,
    cc_city                varchar(60) ,
    cc_county              varchar(30) ,
    cc_state               char(2)     ,
    cc_zip                 char(10)    ,
    cc_country             varchar(20)  ,
    cc_gmt_offset          decimal(5,2) ,
    cc_tax_percentage      decimal(5,2)
)
SERVER gsmp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/call_center.dat* | gsfs://192.168.0.90:5003/call_center.dat*',
FORMAT 'TEXT',
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with call_center_err
;

DROP FOREIGN TABLE IF EXISTS customer_ext;
CREATE FOREIGN TABLE customer_ext
(
    c_customer_sk      bigint      ,
    c_customer_id     char(16)    ,
    c_current_demo_sk  bigint      ,
    c_current_hdemo_sk  bigint      ,
    c_current_addr_sk  bigint      ,
    c_first_shipto_date_sk  bigint      ,
    c_first_sales_date_sk  bigint      ,
    c_salutation       char(10)    ,
    c_first_name       char(20)    ,
    c_last_name        char(30)    ,
    c_preferred_cust_flag  char(1)    ,
    c_birth_day        bigint      ,
    c_birth_month      bigint      ,
    c_birth_year       bigint      ,
    c_birth_country    varchar(20)  ,
    c_login            char(13)    ,
    c_email_address    char(50)    ,
    c_last_review_date_sk  char(10)
)

```

```

SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/customer_[^ad]* | gsfs://192.168.0.90:5003/customer_[^ad]*',
FORMAT 'TEXT',
DELIMITER '|',
encoding 'GBK',
mode 'Normal'
)
with customer_err
;

DROP FOREIGN TABLE IF EXISTS web_site_ext;
CREATE FOREIGN TABLE web_site_ext
(
web_site_sk          bigint          ,
web_site_id          char(16)         ,
web_rec_start_date   date             ,
web_rec_end_date     date             ,
web_name             varchar(50)      ,
web_open_date_sk     bigint           ,
web_close_date_sk    bigint           ,
web_class            varchar(50)      ,
web_manager          varchar(40)      ,
web_mkt_id           bigint           ,
web_mkt_class        varchar(50)      ,
web_mkt_desc         varchar(100)     ,
web_market_manager   varchar(40)     ,
web_company_id       bigint           ,
web_company_name     char(50)         ,
web_street_number    char(10)         ,
web_street_name      varchar(60)      ,
web_street_type      char(15)         ,
web_suite_number     char(10)         ,
web_city             varchar(60)      ,
web_county           varchar(30)      ,
web_state            char(2)          ,
web_zip              char(10)         ,
web_country          varchar(20)      ,
web_gmt_offset       decimal(5,2)     ,
web_tax_percentage   decimal(5,2)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/web_site.dat* | gsfs://192.168.0.90:5003/web_site.dat*',
FORMAT 'TEXT',
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with web_site_err
;

DROP FOREIGN TABLE IF EXISTS store_returns_ext;
CREATE FOREIGN TABLE store_returns_ext
(
sr_returned_date_sk  bigint          ,
sr_return_time_sk    bigint          ,
sr_item_sk           bigint          ,
sr_customer_sk       bigint          ,
sr_cdemo_sk          bigint          ,
sr_hdemo_sk          bigint          ,
sr_addr_sk           bigint          ,
sr_store_sk          bigint          ,
sr_reason_sk         bigint          ,
sr_ticket_number     bigint          ,
sr_return_quantity   bigint          ,
sr_return_amt        decimal(7,2)    ,
sr_return_tax        decimal(7,2)    ,
sr_return_amt_inc_tax decimal(7,2)    ,
sr_fee               decimal(7,2)    ,
sr_return_ship_cost  decimal(7,2)
)

```

```

    sr_refunded_cash    decimal(7,2)    ,
    sr_reversed_charge  decimal(7,2)    ,
    sr_store_credit     decimal(7,2)    ,
    sr_net_loss         decimal(7,2)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/store_returns.dat* | gsfs://192.168.0.90:5003/store_returns.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with store_returns_err
;

DROP FOREIGN TABLE IF EXISTS household_demographics_ext;
CREATE FOREIGN TABLE household_demographics_ext
(
    hd_demo_sk          bigint          ,
    hd_income_band_sk  bigint          ,
    hd_buy_potential   char(15)        ,
    hd_dep_count       bigint          ,
    hd_vehicle_count   bigint
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/household_demographics.dat* | gsfs://192.168.0.90:5003/
household_demographics.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with household_demographics_err
;

DROP FOREIGN TABLE IF EXISTS web_page_ext;
CREATE FOREIGN TABLE web_page_ext
(
    wp_web_page_sk      bigint          ,
    wp_web_page_id      char(16)        ,
    wp_rec_start_date   date            ,
    wp_rec_end_date     date            ,
    wp_creation_date_sk bigint          ,
    wp_access_date_sk   bigint          ,
    wp_autogen_flag     char(1)         ,
    wp_customer_sk      bigint          ,
    wp_url              varchar(100)    ,
    wp_type             char(50)         ,
    wp_char_count       bigint          ,
    wp_link_count       bigint          ,
    wp_image_count     bigint          ,
    wp_max_ad_count     bigint
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/web_page.dat* | gsfs://192.168.0.90:5003/web_page.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with web_page_err
;

DROP FOREIGN TABLE IF EXISTS promotion_ext;
CREATE FOREIGN TABLE promotion_ext
(
    p_promo_sk          bigint          ,
    p_promo_id          char(16)        ,
    p_start_date_sk     bigint
)

```



```

p_end_date_sk      bigint      ,
p_item_sk          bigint      ,
p_cost             decimal(15,2),
p_response_target  bigint      ,
p_promo_name       char(50)    ,
p_channel_dmail    char(1)     ,
p_channel_email    char(1)     ,
p_channel_catalog  char(1)     ,
p_channel_tv       char(1)     ,
p_channel_radio    char(1)     ,
p_channel_press    char(1)     ,
p_channel_event    char(1)     ,
p_channel_demo     char(1)     ,
p_channel_details  varchar(100),
p_purpose            char(15)    ,
p_discount_active  char(1)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/promotion.dat*' | gsfs://192.168.0.90:5003/promotion.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with promotion_err
;

DROP FOREIGN TABLE IF EXISTS catalog_page_ext;
CREATE FOREIGN TABLE catalog_page_ext
(
cp_catalog_page_sk      bigint      ,
cp_catalog_page_id      char(16)    ,
cp_start_date_sk        bigint      ,
cp_end_date_sk          bigint      ,
cp_department           varchar(50)  ,
cp_catalog_number       bigint      ,
cp_catalog_page_number  bigint      ,
cp_description          varchar(100) ,
cp_type                varchar(100)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/catalog_page.dat*' | gsfs://192.168.0.90:5003/
catalog_page.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with catalog_page_err
;

DROP FOREIGN TABLE IF EXISTS inventory_ext;
CREATE FOREIGN TABLE inventory_ext
(
inv_date_sk      bigint      ,
inv_item_sk      bigint      ,
inv_warehouse_sk bigint      ,
inv_quantity_on_hand integer
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/inventory.dat*' | gsfs://192.168.0.90:5003/inventory.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with inventory_err
;

```

```

DROP FOREIGN TABLE IF EXISTS catalog_returns_ext;
CREATE FOREIGN TABLE catalog_returns_ext
(
    cr_returned_date_sk    bigint           ,
    cr_returned_time_sk   bigint           ,
    cr_item_sk            bigint           ,
    cr_refunded_customer_sk bigint         ,
    cr_refunded_cdemo_sk  bigint           ,
    cr_refunded_hdemo_sk  bigint           ,
    cr_refunded_addr_sk   bigint           ,
    cr_returning_customer_sk bigint        ,
    cr_returning_cdemo_sk  bigint           ,
    cr_returning_hdemo_sk  bigint           ,
    cr_returning_addr_sk   bigint           ,
    cr_call_center_sk     bigint           ,
    cr_catalog_page_sk    bigint           ,
    cr_ship_mode_sk       bigint           ,
    cr_warehouse_sk       bigint           ,
    cr_reason_sk          bigint           ,
    cr_order_number       bigint           ,
    cr_return_quantity     bigint           ,
    cr_return_amount       decimal(7,2)    ,
    cr_return_tax          decimal(7,2)    ,
    cr_return_amt_inc_tax  decimal(7,2)    ,
    cr_fee                 decimal(7,2)    ,
    cr_return_ship_cost    decimal(7,2)    ,
    cr_refunded_cash       decimal(7,2)    ,
    cr_reversed_charge     decimal(7,2)    ,
    cr_store_credit        decimal(7,2)    ,
    cr_net_loss            decimal(7,2)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/catalog_returns.dat* | gsfs://192.168.0.90:5003/
catalog_returns.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with catalog_returns_err
;

DROP FOREIGN TABLE IF EXISTS web_returns_ext;
CREATE FOREIGN TABLE web_returns_ext
(
    wr_returned_date_sk    bigint           ,
    wr_returned_time_sk   bigint           ,
    wr_item_sk            bigint           ,
    wr_refunded_customer_sk bigint         ,
    wr_refunded_cdemo_sk  bigint           ,
    wr_refunded_hdemo_sk  bigint           ,
    wr_refunded_addr_sk   bigint           ,
    wr_returning_customer_sk bigint        ,
    wr_returning_cdemo_sk  bigint           ,
    wr_returning_hdemo_sk  bigint           ,
    wr_returning_addr_sk   bigint           ,
    wr_web_page_sk        bigint           ,
    wr_reason_sk          bigint           ,
    wr_order_number       bigint           ,
    wr_return_quantity     bigint           ,
    wr_return_amt          decimal(7,2)    ,
    wr_return_tax          decimal(7,2)    ,
    wr_return_amt_inc_tax  decimal(7,2)    ,
    wr_fee                 decimal(7,2)    ,
    wr_return_ship_cost    decimal(7,2)    ,
    wr_refunded_cash       decimal(7,2)    ,
    wr_reversed_charge     decimal(7,2)    ,
    wr_account_credit      decimal(7,2)    ,
    wr_net_loss            decimal(7,2)
)

```

```

)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/web_returns.dat*' | gsfs://192.168.0.90:5003/web_returns.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with web_returns_err
;

DROP FOREIGN TABLE IF EXISTS web_sales_ext;
CREATE FOREIGN TABLE web_sales_ext
(
  ws_sold_date_sk      bigint      ,
  ws_sold_time_sk     bigint      ,
  ws_ship_date_sk     bigint      ,
  ws_item_sk          bigint      ,
  ws_bill_customer_sk bigint      ,
  ws_bill_cdemo_sk    bigint      ,
  ws_bill_hdemo_sk    bigint      ,
  ws_bill_addr_sk     bigint      ,
  ws_ship_customer_sk bigint      ,
  ws_ship_cdemo_sk    bigint      ,
  ws_ship_hdemo_sk    bigint      ,
  ws_ship_addr_sk     bigint      ,
  ws_web_page_sk      bigint      ,
  ws_web_site_sk      bigint      ,
  ws_ship_mode_sk     bigint      ,
  ws_warehouse_sk     bigint      ,
  ws_promo_sk         bigint      ,
  ws_order_number     bigint      ,
  ws_quantity         bigint      ,
  ws_wholesale_cost   decimal(7,2) ,
  ws_list_price       decimal(7,2) ,
  ws_sales_price      decimal(7,2) ,
  ws_ext_discount_amt decimal(7,2) ,
  ws_ext_sales_price  decimal(7,2) ,
  ws_ext_wholesale_cost decimal(7,2) ,
  ws_ext_list_price   decimal(7,2) ,
  ws_ext_tax          decimal(7,2) ,
  ws_coupon_amt       decimal(7,2) ,
  ws_ext_ship_cost    decimal(7,2) ,
  ws_net_paid         decimal(7,2) ,
  ws_net_paid_inc_tax decimal(7,2) ,
  ws_net_paid_inc_ship decimal(7,2) ,
  ws_net_paid_inc_ship_tax decimal(7,2) ,
  ws_net_profit       decimal(7,2)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/web_sales.dat*' | gsfs://192.168.0.90:5003/web_sales.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with web_sales_err
;

DROP FOREIGN TABLE IF EXISTS catalog_sales_ext;
CREATE FOREIGN TABLE catalog_sales_ext
(
  cs_sold_date_sk      bigint      ,
  cs_sold_time_sk     bigint      ,
  cs_ship_date_sk     bigint      ,
  cs_bill_customer_sk  bigint      ,
  cs_bill_cdemo_sk    bigint      ,
  cs_bill_hdemo_sk    bigint      ,
  cs_bill_addr_sk     bigint

```

```

cs_ship_customer_sk    bigint    ,
cs_ship_demo_sk       bigint    ,
cs_ship_hdemo_sk      bigint    ,
cs_ship_addr_sk       bigint    ,
cs_call_center_sk     bigint    ,
cs_catalog_page_sk    bigint    ,
cs_ship_mode_sk       bigint    ,
cs_warehouse_sk       bigint    ,
cs_item_sk            bigint    ,
cs_promo_sk           bigint    ,
cs_order_number       bigint    ,
cs_quantity           bigint    ,
cs_wholesale_cost     decimal(7,2) ,
cs_list_price         decimal(7,2) ,
cs_sales_price        decimal(7,2) ,
cs_ext_discount_amt   decimal(7,2) ,
cs_ext_sales_price    decimal(7,2) ,
cs_ext_wholesale_cost decimal(7,2) ,
cs_ext_list_price     decimal(7,2) ,
cs_ext_tax            decimal(7,2) ,
cs_coupon_amt         decimal(7,2) ,
cs_ext_ship_cost      decimal(7,2) ,
cs_net_paid           decimal(7,2) ,
cs_net_paid_inc_tax   decimal(7,2) ,
cs_net_paid_inc_ship  decimal(7,2) ,
cs_net_paid_inc_ship_tax decimal(7,2) ,
cs_net_profit         decimal(7,2)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/catalog_sales.dat* | gsfs://192.168.0.90:5003/
catalog_sales.dat*',
FORMAT 'TEXT' ,
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with catalog_sales_err
;

DROP FOREIGN TABLE IF EXISTS store_sales_ext;
CREATE FOREIGN TABLE store_sales_ext
(
ss_sold_date_sk    bigint    ,
ss_sold_time_sk    bigint    ,
ss_item_sk         bigint    ,
ss_customer_sk     bigint    ,
ss_demo_sk         bigint    ,
ss_hdemo_sk        bigint    ,
ss_addr_sk         bigint    ,
ss_store_sk        bigint    ,
ss_promo_sk        bigint    ,
ss_ticket_number   bigint    ,
ss_quantity        bigint    ,
ss_wholesale_cost  decimal(7,2) ,
ss_list_price      decimal(7,2) ,
ss_sales_price     decimal(7,2) ,
ss_ext_discount_amt decimal(7,2) ,
ss_ext_sales_price decimal(7,2) ,
ss_ext_wholesale_cost decimal(7,2) ,
ss_ext_list_price  decimal(7,2) ,
ss_ext_tax         decimal(7,2) ,
ss_coupon_amt      decimal(7,2) ,
ss_net_paid        decimal(7,2) ,
ss_net_paid_inc_tax decimal(7,2) ,
ss_net_profit      decimal(7,2)
)
SERVER gsmpp_server
OPTIONS(location 'gsfs://192.168.0.90:5002/store_sales.dat* | gsfs://192.168.0.90:5003/store_sales.dat*',
FORMAT 'TEXT' ,

```

```
DELIMITER '|',
encoding 'utf8',
mode 'Normal'
)
with store_sales_err
;
```

步骤3 执行以下SQL语句导入数据。

```
INSERT INTO customer_address SELECT * FROM customer_address_ext;
INSERT INTO customer_demographics SELECT * FROM customer_demographics_ext;
INSERT INTO date_dim SELECT * FROM date_dim_ext;
INSERT INTO warehouse SELECT * FROM warehouse_ext;
INSERT INTO ship_mode SELECT * FROM ship_mode_ext;
INSERT INTO time_dim SELECT * FROM time_dim_ext;
INSERT INTO reason SELECT * FROM reason_ext;
INSERT INTO income_band SELECT * FROM income_band_ext;
INSERT INTO item SELECT * FROM item_ext;
INSERT INTO store SELECT * FROM store_ext;
INSERT INTO call_center SELECT * FROM call_center_ext;
INSERT INTO customer SELECT * FROM customer_ext;
INSERT INTO web_site SELECT * FROM web_site_ext;
INSERT INTO household_demographics SELECT * FROM household_demographics_ext;
INSERT INTO web_page SELECT * FROM web_page_ext;
INSERT INTO promotion SELECT * FROM promotion_ext;
INSERT INTO catalog_page SELECT * FROM catalog_page_ext;
INSERT INTO inventory SELECT * FROM inventory_ext;
INSERT INTO catalog_returns SELECT * FROM catalog_returns_ext;
INSERT INTO web_returns SELECT * FROM web_returns_ext;
INSERT INTO store_returns SELECT * FROM store_returns_ext;
INSERT INTO web_sales SELECT * FROM web_sales_ext;
INSERT INTO catalog_sales SELECT * FROM catalog_sales_ext;
INSERT INTO store_sales SELECT * FROM store_sales_ext;
```

----结束

3.5 执行查询与结果收集

3.5.1 通过编写 shell 脚本自动化执行查询和结果收集。

步骤1 登录ECS，进入到/opt目录下，使用vim命令生成query.conf和run_query.sh两个脚本文件。脚本内容如下，编辑后按:wq!保存脚本配置：

run_query.sh脚本如下：

```
#!/bin/bash
script_path=$(cd `dirname $0`;pwd)
query_mode=$1
query_path=$2
query_object=$3
query_log=${script_path}/query_log_`date +%y%m%d_%H%M%S`
source ${script_path}/query.conf

function usage()
{
    echo "[NOTICE]: This script is used to run queries and collect cost time, according to sepcified path and query file name."
    echo "    You can run the script as below:"
    echo -e ""
    echo "    1. config the query.conf file."
    echo "    2. run the script in batch mode. "
    echo "    eg. sh run_query.sh batch [query file's absolute path]"
    echo -e ""
    echo "    3. run the script in single mode."
    echo "    eg. sh run_query.sh single [query file's absolute path] [specified query file name]"
}
}
```

```

function log_file_init()
{
    mkdir -p ${query_log}/explain_log
    mkdir -p ${query_log}/pre_warm_log
    mkdir -p ${query_log}/query_test_log
    touch ${query_log}/query_result.csv
    echo "query name,cost time1,cost time2,cost time3,average cost" > ${query_log}/query_result.csv
}

function single_query()
{
    echo "[INFO]: Single mode query is to start."
    echo "*****${query_object} begin*****"
    collect_plan
    pre_warm
    query_test
    echo "*****${query_object} end*****"
    echo "[INFO]: Single mode query is finished."
    echo "[NOTICE]: Get more details by query_result.csv and other logs in ${query_log}."
}

function batch_query()
{
    echo "[INFO]: Batch mode query is to start."
    for query_object in `ls ${query_path}`
    do
        echo "*****${query_object} begin*****"
        collect_plan
        pre_warm
        query_test
        echo "*****${query_object} end*****"
    done
    echo "[INFO]: Batch mode query is finished."
    echo "[NOTICE]: Get more details by query_result.csv and other logs in ${query_log}."
}

function collect_plan()
{
    echo "[STEP1]: Starting to collect plan."
    echo "explain performance" > ${query_log}/explain_log/${query_object}.tmp
    cat ${query_path}/${query_object} >> ${query_log}/explain_log/${query_object}.tmp
    gsql -h ${cluster_ip} -d ${db_name} -p ${db_port} -U ${db_user} -W "${user_pwd}" -f ${query_log}/
    explain_log/${query_object}.tmp > ${query_log}/explain_log/${query_object}.explain 2>&1
    echo "[STEP1]: Finished."
}

function pre_warm()
{
    echo "[STEP2]: Starting to pre-warm."
    for i in {1..2}
    do
        gsql -h ${cluster_ip} -d ${db_name} -p ${db_port} -U ${db_user} -W "${user_pwd}" -f ${query_path}/${
        query_object} > ${query_log}/pre_warm_log/${query_object}.pre${i} 2>&1
    done
    echo "[STEP2]: Finished."
}

function query_test()
{
    time1=""
    time2=""
    time3=""
    echo "[STEP3]: Starting to do real test."
    for i in {1..3}
    do
        gsql -h ${cluster_ip} -d ${db_name} -p ${db_port} -U ${db_user} -W "${user_pwd}" -f ${query_path}/${
        query_object} > ${query_log}/query_test_log/${query_object}.real${i} 2>&1
        let "eval echo "time"${i}"=cat ${query_log}/query_test_log/${query_object}.real${i}grep "total time:""
    done
}

```

```
awk {'print$3}'"
done
time_ave=`echo "scale=2;(${time1}+${time2}+${time3})/3"|bc -l`
echo "${query_object},${time1},${time2},${time3},${time_ave}" >> ${query_log}/query_result.csv
echo "[step3]: Finished. The average time:${time_ave} ms."
}
case ${query_mode} in
single)log_file_init;single_query;;
batch)log_file_init;batch_query;;
*)usage;;
esac
```

query.conf为集群信息配置文件，包含如下五个变量

cluster_ip=127.0.0.1	集群主cn节点内网ip
db_name=tpcds_test	数据库名称
db_port=6000	数据库端口号
db_user=tpcds_user	数据库用户
user_pwd=123456	数据库用户密码

步骤2 编辑query.conf为集群对应的信息后，先执行**source gsql_env**变量后，执行**sh run_query.sh**即可开始查询执行和结果收集。

示例：**sh run_query.sh batch query1000x/**

参数1：批量执行选择batch，单个query执行选择single。

参数2：tpcds1000x或者tpch1000x query存放的绝对路径。

参数3：如果参数1选择batch，此参数忽略；如果参数1选择single，此参数为具体执行的query名称，例如Q1。

须知

1. gsql客户端的使用需要每次连接后，source gsql_env，执行查询脚本前请确认gsql可执行。
2. 每个查询默认会跑6次，第1次收集执行计划，第2，3次预热，第4到第6次正式查询，最终结果取后3次查询的平均值。
3. 查询脚本执行后会立即生成query_log_yymmdd_hhmmss名称的目录，其中
 - explain_log子目录存放查询计划。
 - pre_warm子目录存放预热执行结果。
 - query_test子目录存放正式查询执行结果。
 - query_result.csv文件，csv格式汇总所有查询的执行结果。

----结束

4 附录

4.1 TPC-H 测试集

您可以通过[命令生成方法](#)生成TPC-H测试集，也可以直接通过[脚本生成方法](#)生成，另我们已经给出完整的TPC-H[测试集](#)供您参考。

命令生成方法

TPC-H 22个标准查询SQL可以用如下方法生成。

步骤1 登录测试过程申请的ECS，执行如下命令。

```
cd /data1/script/tpch-kit/TPC-H_Tools_v3.0.0/dbgen
cp qgen queries
cp dists.dss queries
cd queries
for i in {1..22}
do
  ./qgen -s 1000 -d $i > Q$i
done
```

步骤2 生成的query无法直接使用，需要修改，修改项如下：

语句中含有LIMIT -1的需要删除LIMIT -1
Q15:将create view语句改为with语句，去除drop view语句。

----结束

脚本生成方法

推荐使用如下脚本直接生成GaussDB(DWS)可用的TPC-H查询：

```
# -*- coding: utf-8 -*-
import os
import sys
import re

def genseq(qgenfile, scale, query_dir):
    flags = os.O_WRONLY | os.O_CREAT | os.O_EXCL
    modes = stat.S_IWUSR | stat.S_IRUSR
    if not os.path.exists(query_dir):
        os.mkdir(query_dir)
    for i in range(1, 23):
```



```
cmd = qgenfile + ' -s ' + str(scale) + ' -d ' + str(i) + ' > ' + query_dir + '/Q' + str(i)
os.system(cmd)

os.chdir(query_dir)
for i in range(1, 23):
    with open("Q" + str(i), 'r') as fr:
        qlist = list(fr)
        for j in range(len(qlist)):
            if i == 15:
                if 'create view' in qlist[j]:
                    qlist[j] = qlist[j].replace('create view', 'with')
                elif '_suppkey;' in qlist[j]:
                    qlist[j] = qlist[j].replace(';\\n', '\\n')
                elif 'drop view' in qlist[j] or 'LIMIT -1' in qlist[j]:
                    qlist[j] = ""
                continue
            if 'LIMIT -1' in qlist[j]:
                qlist[j] = ""
            elif 'LIMIT -1' not in qlist[j] and 'LIMIT' in qlist[j]:
                qlist[j - 1] = qlist[j - 1].replace(';', '')
                qlist[j] = qlist[j].replace('LIMIT', 'limit').replace('\\n', '\\n')
        with os.fdopen(os.open("Q" + str(i), flags, modes), 'w') as fw:
            for z in range(len(qlist)):
                fw.write(qlist[z])
    print("TPCH Q1~Q22 query store at " + query_dir)

if __name__ == '__main__':
    if len(sys.argv) != 4:
        print("Wrong number of parameters! ")
        print("Usage: python3 gen_tpch_thpseq.py qgen_file_path scale query_dir")
        print("Parameter:
        qgen_file_path: tpch qgen文件路径
        scale: 生成查询对应的数据规模, 单位GB
        query_dir: 生成文件的存放路径")
        print("Notice: Make sure the qgen and dists.dss files are in the queries directory of the tpch tool ")
        print("Example:
        python3 gen_tpch_thpseq.py ./qgen 1000 tpch_query1000x")
        sys.exit(1)

    qgen_file_path = sys.argv[1]
    scale = sys.argv[2]
    query_dir = sys.argv[3]
    try:
        if not re.match(r'^\\.?(\\w+\\/?)+$', qgen_file_path):
            print("error param qgenfilepath:", qgen_file_path)
        if not re.match(r'^d+', scale):
            print("error param scale:", scale)
        if not re.match(r'^\\.?(\\w+\\/?)+$', query_dir):
            print("error param query_dir:", query_dir)
    except Exception as ex:
        print("exception: invalid param!")

    if not os.path.isfile(qgen_file_path):
        print("The file %s is not exist!" % qgen_file_path)
        sys.exit(1)

    genseq(qgen_file_path, int(scale), query_dir)
```

将脚本保存为gen_tpch_thpseq.py，并放在queries目录下，执行命令**python3 gen_tpch_thpseq.py ./qgen 1000 tpch1000x_query**，其中1000为数据规模，代表1000x，tpch1000x_query为22个sql保存的位置。

测试集

性能测试集中将执行以下22个查询SQL。

SQL1

```

select
  l_returnflag,
  l_linestatus,
  sum(l_quantity) as sum_qty,
  sum(l_extendedprice) as sum_base_price,
  sum(l_extendedprice * (1 - l_discount)) as sum_disc_price,
  sum(l_extendedprice * (1 - l_discount) * (1 + l_tax)) as sum_charge,
  avg(l_quantity) as avg_qty,
  avg(l_extendedprice) as avg_price,
  avg(l_discount) as avg_disc,
  count(*) as count_order
from
  lineitem
where
  l_shipdate <= date '1998-12-01' - interval '90' day (3)
group by
  l_returnflag,
  l_linestatus
order by
  l_returnflag,
  l_linestatus;

```

SQL2

```

select
  s_acctbal,
  s_name,
  n_name,
  p_partkey,
  p_mfgr,
  s_address,
  s_phone,
  s_comment
from
  part,
  supplier,
  partsupp,
  nation,
  region
where
  p_partkey = ps_partkey
  and s_suppkey = ps_suppkey
  and p_size = 15
  and p_type like '%BRASS'
  and s_nationkey = n_nationkey
  and n_regionkey = r_regionkey
  and r_name = 'EUROPE'
  and ps_supplycost = (
    select
      min(ps_supplycost)
    from
      partsupp,
      supplier,
      nation,
      region
    where
      p_partkey = ps_partkey
      and s_suppkey = ps_suppkey
      and s_nationkey = n_nationkey
      and n_regionkey = r_regionkey
      and r_name = 'EUROPE'
  )
order by
  s_acctbal desc,
  n_name,
  s_name,

```

```
p_partkey  
limit 100;
```

SQL3

```
select  
  l_orderkey,  
  sum(l_extendedprice * (1 - l_discount)) as revenue,  
  o_orderdate,  
  o_shippriority  
from  
  customer,  
  orders,  
  lineitem  
where  
  c_mktsegment = 'BUILDING'  
  and c_custkey = o_custkey  
  and l_orderkey = o_orderkey  
  and o_orderdate < date '1995-03-15'  
  and l_shipdate > date '1995-03-15'  
group by  
  l_orderkey,  
  o_orderdate,  
  o_shippriority  
order by  
  revenue desc,  
  o_orderdate  
limit 10;
```

SQL4

```
select  
  o_orderpriority,  
  count(*) as order_count  
from  
  orders  
where  
  o_orderdate >= date '1993-07-01'  
  and o_orderdate < date '1993-07-01' + interval '3' month  
  and exists (  
    select  
      *  
    from  
      lineitem  
    where  
      l_orderkey = o_orderkey  
      and l_commitdate < l_receiptdate  
  )  
group by  
  o_orderpriority  
order by  
  o_orderpriority;
```

SQL5

```
select  
  n_name,  
  sum(l_extendedprice * (1 - l_discount)) as revenue  
from  
  customer,  
  orders,  
  lineitem,  
  supplier,  
  nation,  
  region  
where  
  c_custkey = o_custkey
```

```

and l_orderkey = o_orderkey
and l_suppkey = s_suppkey
and c_nationkey = s_nationkey
and s_nationkey = n_nationkey
and n_regionkey = r_regionkey
and r_name = 'ASIA'
and o_orderdate >= date '1994-01-01'
and o_orderdate < date '1994-01-01' + interval '1' year
group by
    n_name
order by
    revenue desc;

```

SQL6

```

select
    sum(l_extendedprice * l_discount) as revenue
from
    lineitem
where
    l_shipdate >= date '1994-01-01'
and l_shipdate < date '1994-01-01' + interval '1' year
and l_discount between .06 - 0.01 and .06 + 0.01
and l_quantity < 24;

```

SQL7

```

select
    supp_nation,
    cust_nation,
    l_year,
    sum(volume) as revenue
from
    (
        select
            n1.n_name as supp_nation,
            n2.n_name as cust_nation,
            extract(year from l_shipdate) as l_year,
            l_extendedprice * (1 - l_discount) as volume
        from
            supplier,
            lineitem,
            orders,
            customer,
            nation n1,
            nation n2
        where
            s_suppkey = l_suppkey
            and o_orderkey = l_orderkey
            and c_custkey = o_custkey
            and s_nationkey = n1.n_nationkey
            and c_nationkey = n2.n_nationkey
            and (
                (n1.n_name = 'FRANCE' and n2.n_name = 'GERMANY')
                or (n1.n_name = 'GERMANY' and n2.n_name = 'FRANCE')
            )
            and l_shipdate between date '1995-01-01' and date '1996-12-31'
    ) as shipping
group by
    supp_nation,
    cust_nation,
    l_year
order by
    supp_nation,
    cust_nation,
    l_year;

```

SQL8

```

select
  o_year,
  sum(case
    when nation = 'BRAZIL' then volume
    else 0
  end) / sum(volume) as mkt_share
from
  (
    select
      extract(year from o_orderdate) as o_year,
      l_extendedprice * (1 - l_discount) as volume,
      n2.n_name as nation
    from
      part,
      supplier,
      lineitem,
      orders,
      customer,
      nation n1,
      nation n2,
      region
    where
      p_partkey = l_partkey
      and s_suppkey = l_suppkey
      and l_orderkey = o_orderkey
      and o_custkey = c_custkey
      and c_nationkey = n1.n_nationkey
      and n1.n_regionkey = r_regionkey
      and r_name = 'AMERICA'
      and s_nationkey = n2.n_nationkey
      and o_orderdate between date '1995-01-01' and date '1996-12-31'
      and p_type = 'ECONOMY ANODIZED STEEL'
    ) as all_nations
group by
  o_year
order by
  o_year;

```

SQL9

```

select
  nation,
  o_year,
  sum(amount) as sum_profit
from
  (
    select
      n_name as nation,
      extract(year from o_orderdate) as o_year,
      l_extendedprice * (1 - l_discount) - ps_supplycost * l_quantity as amount
    from
      part,
      supplier,
      lineitem,
      partsupp,
      orders,
      nation
    where
      s_suppkey = l_suppkey
      and ps_suppkey = l_suppkey
      and ps_partkey = l_partkey
      and p_partkey = l_partkey
      and o_orderkey = l_orderkey
      and s_nationkey = n_nationkey
      and p_name like '%green%'
    ) as profit
group by

```

```
nation,  
o_year  
order by  
nation,  
o_year desc;
```

SQL10

```
select  
c_custkey,  
c_name,  
sum(L_extendedprice * (1 - L_discount)) as revenue,  
c_acctbal,  
n_name,  
c_address,  
c_phone,  
c_comment  
from  
customer,  
orders,  
lineitem,  
nation  
where  
c_custkey = o_custkey  
and l_orderkey = o_orderkey  
and o_orderdate >= date '1993-10-01'  
and o_orderdate < date '1993-10-01' + interval '3' month  
and l_returnflag = 'R'  
and c_nationkey = n_nationkey  
group by  
c_custkey,  
c_name,  
c_acctbal,  
c_phone,  
n_name,  
c_address,  
c_comment  
order by  
revenue desc  
limit 20;
```

SQL11

```
select  
ps_partkey,  
sum(ps_supplycost * ps_availqty) as value  
from  
partsupp,  
supplier,  
nation  
where  
ps_suppkey = s_suppkey  
and s_nationkey = n_nationkey  
and n_name = 'GERMANY'  
group by  
ps_partkey having  
sum(ps_supplycost * ps_availqty) > (  
select  
sum(ps_supplycost * ps_availqty) * 0.0000001000  
from  
partsupp,  
supplier,  
nation  
where  
ps_suppkey = s_suppkey  
and s_nationkey = n_nationkey  
and n_name = 'GERMANY'  
)
```

```
order by
  value desc;
```

SQL12

```
select
  l_shipmode,
  sum(case
    when o_orderpriority = '1-URGENT'
      or o_orderpriority = '2-HIGH'
    then 1
    else 0
  end) as high_line_count,
  sum(case
    when o_orderpriority <> '1-URGENT'
      and o_orderpriority <> '2-HIGH'
    then 1
    else 0
  end) as low_line_count
from
  orders,
  lineitem
where
  o_orderkey = l_orderkey
  and l_shipmode in ('MAIL', 'SHIP')
  and l_commitdate < l_receiptdate
  and l_shipdate < l_commitdate
  and l_receiptdate >= date '1994-01-01'
  and l_receiptdate < date '1994-01-01' + interval '1' year
group by
  l_shipmode
order by
  l_shipmode;
```

SQL13

```
select
  c_count,
  count(*) as custdist
from
  (
    select
      c_custkey,
      count(o_orderkey)
    from
      customer left outer join orders on
        c_custkey = o_custkey
        and o_comment not like '%special%requests%'
    group by
      c_custkey
  ) as c_orders (c_custkey, c_count)
group by
  c_count
order by
  custdist desc,
  c_count desc;
```

SQL14

```
select
  100.00 * sum(case
    when p_type like 'PROMO%'
      then l_extendedprice * (1 - l_discount)
    else 0
  end) / sum(l_extendedprice * (1 - l_discount)) as promo_revenue
from
  lineitem,
  part
```

```
where
  l_partkey = p_partkey
  and l_shipdate >= date '1995-09-01'
  and l_shipdate < date '1995-09-01' + interval '1' month;
```

SQL15

```
with revenue (supplier_no, total_revenue) as --change view to cte
(
  select
    l_suppkey,
    sum(l_extendedprice * (1 - l_discount))
  from
    lineitem
  where
    l_shipdate >= date '1996-01-01'
    and l_shipdate < date '1996-01-01' + interval '3 month'
  group by
    l_suppkey
)
select
  s_suppkey,
  s_name,
  s_address,
  s_phone,
  total_revenue
from
  supplier,
  revenue
where
  s_suppkey = supplier_no
  and total_revenue = (
    select
      max(total_revenue)
    from
      revenue
  )
order by
  s_suppkey;
```

SQL16

```
select
  p_brand,
  p_type,
  p_size,
  count(distinct ps_suppkey) as supplier_cnt
from
  partsupp,
  part
where
  p_partkey = ps_partkey
  and p_brand <> 'Brand#45'
  and p_type not like 'MEDIUM POLISHED%'
  and p_size in (49, 14, 23, 45, 19, 3, 36, 9)
  and ps_suppkey not in (
    select
      s_suppkey
    from
      supplier
    where
      s_comment like '%Customer%Complaints%'
  )
group by
  p_brand,
  p_type,
  p_size
order by
  supplier_cnt desc,
```



```
p_brand,  
p_type,  
p_size;
```

SQL17

```
select  
  sum(L_extendedprice) / 7.0 as avg_yearly  
from  
  lineitem,  
  part  
where  
  p_partkey = L_partkey  
  and p_brand = 'Brand#23'  
  and p_container = 'MED BOX'  
  and L_quantity < (  
    select  
      0.2 * avg(L_quantity)  
    from  
      lineitem  
    where  
      L_partkey = p_partkey  
  );
```

SQL18

```
select  
  c_name,  
  c_custkey,  
  o_orderkey,  
  o_orderdate,  
  o_totalprice,  
  sum(L_quantity)  
from  
  customer,  
  orders,  
  lineitem  
where  
  o_orderkey in (  
    select  
      L_orderkey  
    from  
      lineitem  
    group by  
      L_orderkey having  
        sum(L_quantity) > 300  
  )  
  and c_custkey = o_custkey  
  and o_orderkey = L_orderkey  
group by  
  c_name,  
  c_custkey,  
  o_orderkey,  
  o_orderdate,  
  o_totalprice  
order by  
  o_totalprice desc,  
  o_orderdate  
limit 100;
```

SQL19

```
select  
  sum(L_extendedprice * (1 - L_discount)) as revenue  
from  
  lineitem,  
  part  
where
```

```
(
  p_partkey = L_partkey
  and p_brand = 'Brand#12'
  and p_container in ('SM CASE', 'SM BOX', 'SM PACK', 'SM PKG')
  and L_quantity >= 1 and L_quantity <= 1 + 10
  and p_size between 1 and 5
  and L_shipmode in ('AIR', 'AIR REG')
  and L_shipinstruct = 'DELIVER IN PERSON'
)
or
(
  p_partkey = L_partkey
  and p_brand = 'Brand#23'
  and p_container in ('MED BAG', 'MED BOX', 'MED PKG', 'MED PACK')
  and L_quantity >= 10 and L_quantity <= 10 + 10
  and p_size between 1 and 10
  and L_shipmode in ('AIR', 'AIR REG')
  and L_shipinstruct = 'DELIVER IN PERSON'
)
or
(
  p_partkey = L_partkey
  and p_brand = 'Brand#34'
  and p_container in ('LG CASE', 'LG BOX', 'LG PACK', 'LG PKG')
  and L_quantity >= 20 and L_quantity <= 20 + 10
  and p_size between 1 and 15
  and L_shipmode in ('AIR', 'AIR REG')
  and L_shipinstruct = 'DELIVER IN PERSON'
);
```

SQL20

```
select
  s_name,
  s_address
from
  supplier,
  nation
where
  s_suppkey in (
    select
      ps_suppkey
    from
      partsupp
    where
      ps_partkey in (
        select
          p_partkey
        from
          part
        where
          p_name like 'forest%'
      )
    and ps_availqty > (
      select
        0.5 * sum(L_quantity)
      from
        lineitem
      where
        L_partkey = ps_partkey
        and L_suppkey = ps_suppkey
        and L_shipdate >= date '1994-01-01'
        and L_shipdate < date '1994-01-01' + interval '1' year
    )
  )
  and s_nationkey = n_nationkey
  and n_name = 'CANADA'
order by
  s_name;
```

SQL21

```

select
  s_name,
  count(*) as numwait
from
  supplier,
  lineitem l1,
  orders,
  nation
where
  s_suppkey = l1.l_suppkey
  and o_orderkey = l1.l_orderkey
  and o_orderstatus = 'F'
  and l1.l_receiptdate > l1.l_commitdate
  and exists (
    select
      *
    from
      lineitem l2
    where
      l2.l_orderkey = l1.l_orderkey
      and l2.l_suppkey <> l1.l_suppkey
  )
  and not exists (
    select
      *
    from
      lineitem l3
    where
      l3.l_orderkey = l1.l_orderkey
      and l3.l_suppkey <> l1.l_suppkey
      and l3.l_receiptdate > l3.l_commitdate
  )
  and s_nationkey = n_nationkey
  and n_name = 'SAUDI ARABIA'
group by
  s_name
order by
  numwait desc,
  s_name
limit 100;

```

SQL22

```

select
  cntrycode,
  count(*) as numcust,
  sum(c_acctbal) as totacctbal
from
  (
    select
      substring(c_phone from 1 for 2) as cntrycode,
      c_acctbal
    from
      customer
    where
      substring(c_phone from 1 for 2) in
        ('13', '31', '23', '29', '30', '18', '17')
      and c_acctbal > (
        select
          avg(c_acctbal)
        from
          customer
        where
          c_acctbal > 0.00
          and substring(c_phone from 1 for 2) in
            ('13', '31', '23', '29', '30', '18', '17')
      )
  )

```

```
        and not exists (  
            select  
                *  
            from  
                orders  
            where  
                o_custkey = c_custkey  
        )  
    ) as custsale  
group by  
    centrycode  
order by  
    centrycode;
```

4.2 TPC-DS 测试集

您可以通过[命令生成方法](#)生成TPC-DS测试集，也可以直接通过[脚本生成方法](#)生成，另我们已经给出前面20个的TPC-DS[测试集](#)供您参考。

命令生成方法

TPC-DS标准99个SQL查询语句可用如下方法生成：

步骤1 准备工作。生成TPC-DS查询语句前需要修改query_templates目录下的文件：

1. 登录测试过程申请的ECS，进入/data1/script/tpcds-kit/DSTGen-software-code-3.2.0rc1/query_templates目录。

```
cd /data1/script/tpcds-kit/DSTGen-software-code-3.2.0rc1/query_templates
```

2. 新建文件hwdws.tpl，内容为：

```
define __LIMITA = "";  
define __LIMITB = "";  
define __LIMITC = "limit %d";  
define __BEGIN = "-- begin query " + [_QUERY] + " in stream " + [_STREAM] + " using template " +  
[_TEMPLATE];  
define __END = "-- end query " + [_QUERY] + " in stream " + [_STREAM] + " using template " +  
[_TEMPLATE];
```

3. 因TPC-DS工具中SQL语句生成模板有语法错误，需修改query77.tpl，将135行的
' , coalesce(returns, 0) returns' 改为 '**, coalesce(returns, 0) as returns**' 。

步骤2 执行以下命令生成查询语句。

```
./dsqgen -input ../query_templates/templates.lst -directory ../query_templates/ -scale 1000 -dialect  
hwdws
```

执行后会生成query_0.sql文件，里面放着99个标准SQL语句，需要手动去切分成99个文件。

步骤3 生成的标准查询中如下日期函数语法在DWS暂不支持，需要手动进行修改：

```
Q5: and (cast('2001-08-19' as date) + 14 days)  
修改为
```

```
and (cast('2001-08-19' as date) + 14)
```

```
Q12:and (cast('1999-02-28' as date) + 30 days)
```

```
修改为
```

```
and (cast('1999-02-28' as date) + 30)
```

```
Q16:(cast('1999-4-01' as date) + 60 days)
```

```
修改为
```

```
(cast('1999-4-01' as date) + 60)
```

```
Q20:and (cast('1998-05-05' as date) + 30 days)
```

```
修改为
```

```
and (cast('1998-05-05' as date) + 30)
```

```
Q21:and d_date between (cast ('2000-05-19' as date) - 30 days)
修改为
and d_date between (cast ('2000-05-19' as date) - 30)

and (cast ('2000-05-19' as date) + 30 days)
修改为
and (cast ('2000-05-19' as date) + 30)

Q32:(cast('1999-02-22' as date) + 90 days)
修改为
(cast('1999-02-22' as date) + 90)

Q37:and d_date between cast('1998-04-29' as date) and (cast('1998-04-29' as date) + 60 days)
修改为
and d_date between cast('1998-04-29' as date) and (cast('1998-04-29' as date) + 60)

Q40:and d_date between (cast ('2002-05-10' as date) - 30 days)
修改为
and d_date between (cast ('2002-05-10' as date) - 30)

and (cast ('2002-05-10' as date) + 30 days)
修改为
and (cast ('2002-05-10' as date) + 30)

Q77:and (cast('1999-08-29' as date) + 30 days)
修改为
and (cast('1999-08-29' as date) + 30)

Q80:and (cast('2002-08-04' as date) + 30 days)
修改为
and (cast('2002-08-04' as date) + 30)

Q82:and d_date between cast('1998-01-18' as date) and (cast('1998-01-18' as date) + 60 days)
修改为
and d_date between cast('1998-01-18' as date) and (cast('1998-01-18' as date) + 60)

Q92:(cast('2001-01-26' as date) + 90 days)
修改为
(cast('2001-01-26' as date) + 90)

Q94:(cast('1999-5-01' as date) + 60 days)
修改为
(cast('1999-5-01' as date) + 60)

Q95:(cast('1999-4-01' as date) + 60 days)
修改为
(cast('1999-4-01' as date) + 60)

Q98:and (cast('2002-04-01' as date) + 30 days)
修改为
and (cast('2002-04-01' as date) + 30)
```

----结束

脚本生成方法

建议使用如下脚本直接生成GaussDB(DWS)可用的SQL语句:

```
# -*- coding: utf-8 -*-
import os
import sys
import re
import stat

def gen_thp_seq(dsqgen_file, scale, query_dir):
    flags = os.O_WRONLY | os.O_CREAT | os.O_EXCL
    modes = stat.S_IWUSR | stat.S_IRUSR
```

```

if not os.path.exists(query_dir):
    os.mkdir(query_dir)

cmd = dsqgen_file + ' -input ../query_templates/templates.lst -directory ../query_templates/ -scale ' +
str(scale) + ' -dialect hwdws'
os.system(cmd)
with open('query_0.sql', 'r') as f1:
    line = f1.readline()
    queryname = ""
    while line:
        if '-- begin' in line.strip():
            #line:'-- begin query 1 in stream 0 using template query96.tpl\n'
            queryname = line.split(' ')[-1][5:-5]
            fquery = os.fdopen(os.open(query_dir + '/Q' + queryname, flags, modes), 'w+')
            line = f1.readline()
            continue

        if not queryname or line == '\n':
            line = f1.readline()
            continue

        if '-- end' in line.strip():
            fquery.close()
            line = f1.readline()
            continue

        if 'days' in line:
            line = line.replace('days', "")
            fquery.write(line)
            line = f1.readline()

print("TPCDS Q1-Q99 query store at " + query_dir)
os.system('rm -rf query_0.sql')

if __name__ == '__main__':
    if len(sys.argv) != 4:
        print("Wrong number of parameters! ")
        print("Usage: python3 gen_tpcds_thpseq.py dsqgen_file_path scale query_dir")
        print("Parameter:
        qgen_file_path: tpcds dsqgen文件路径
        scale: 生成查询对应的数据规模
        query_dir: 生成文件的存放路径")
        print("Example:
        python3 gen_tpcds_thpseq.py ./dsqgen 1000 tpcds_query1000x")
        sys.exit(1)

    dsqgen_file_path = sys.argv[1]
    scale = sys.argv[2]
    query_dir = sys.argv[3]
    try:
        if not re.match(r'^\.?\\(\\w+\\?)?$', dsqgen_file_path):
            print("error param qgenfilepath:", dsqgen_file_path)
        if not re.match(r'\\d+', scale):
            print('error param scale:', scale)
        if not re.match(r'^\.?\\(\\w+\\?)?$', query_dir):
            print('error param query_dir:', query_dir)
    except Exception as ex:
        print('exception: invalid param!')

    if not os.path.isfile(dsqgen_file_path):
        print("The file %s is not exist!" % dsqgen_file_path)
        sys.exit(1)

    gen_thp_seq(dsqgen_file_path, int(scale), query_dir)

```

将以上脚本保存在gen_tpcds_thpseq.py，执行命令**python3 gen_tpcds_thpseq.py ./dsqgen 1000 tpcds_query1000x**可获得99个SQL语句，其中1000为数据规模，代表TPCDS 1000x，tpcds_query1000x为生成的SQL语句存放的位置。

测试集

TPC-DS测试集共包括99个SQL查询，本章节仅体现前20个SQL。其他请根据以上方法生成。

SQL1

```
with customer_total_return as
(select sr_customer_sk as ctr_customer_sk
,sr_store_sk as ctr_store_sk
,sum(SR_RETURN_AMT_INC_TAX) as ctr_total_return
from store_returns
,date_dim
where sr_returned_date_sk = d_date_sk
and d_year =2001
group by sr_customer_sk
,sr_store_sk)
select c_customer_id
from customer_total_return ctr1
,store
,customer
where ctr1.ctr_total_return > (select avg(ctr_total_return)*1.2
from customer_total_return ctr2
where ctr1.ctr_store_sk = ctr2.ctr_store_sk)
and s_store_sk = ctr1.ctr_store_sk
and s_state = 'PA'
and ctr1.ctr_customer_sk = c_customer_sk
order by c_customer_id
limit 100;
```

SQL2

```
with wscs as
(select sold_date_sk
,sales_price
from (select ws_sold_date_sk sold_date_sk
,ws_ext_sales_price sales_price
from web_sales
union all
select cs_sold_date_sk sold_date_sk
,cs_ext_sales_price sales_price
from catalog_sales)),
wswscs as
(select d_week_seq,
sum(case when (d_day_name='Sunday') then sales_price else null end) sun_sales,
sum(case when (d_day_name='Monday') then sales_price else null end) mon_sales,
sum(case when (d_day_name='Tuesday') then sales_price else null end) tue_sales,
sum(case when (d_day_name='Wednesday') then sales_price else null end) wed_sales,
sum(case when (d_day_name='Thursday') then sales_price else null end) thu_sales,
sum(case when (d_day_name='Friday') then sales_price else null end) fri_sales,
sum(case when (d_day_name='Saturday') then sales_price else null end) sat_sales
from wscs
,date_dim
where d_date_sk = sold_date_sk
group by d_week_seq)
select d_week_seq1
,round(sun_sales1/sun_sales2,2)
,round(mon_sales1/mon_sales2,2)
,round(tue_sales1/tue_sales2,2)
,round(wed_sales1/wed_sales2,2)
,round(thu_sales1/thu_sales2,2)
```

```

,round(fri_sales1/fri_sales2,2)
,round(sat_sales1/sat_sales2,2)
from
(select wswscs.d_week_seq d_week_seq1
,sun_sales sun_sales1
,mon_sales mon_sales1
,tue_sales tue_sales1
,wed_sales wed_sales1
,thu_sales thu_sales1
,fri_sales fri_sales1
,sat_sales sat_sales1
from wswscs,date_dim
where date_dim.d_week_seq = wswscs.d_week_seq and
d_year = 1999) y,
(select wswscs.d_week_seq d_week_seq2
,sun_sales sun_sales2
,mon_sales mon_sales2
,tue_sales tue_sales2
,wed_sales wed_sales2
,thu_sales thu_sales2
,fri_sales fri_sales2
,sat_sales sat_sales2
from wswscs
,date_dim
where date_dim.d_week_seq = wswscs.d_week_seq and
d_year = 1999+1) z
where d_week_seq1=d_week_seq2-53
order by d_week_seq1;

```

SQL3

```

select dt.d_year
,item.i_brand_id brand_id
,item.i_brand brand
,sum(ss_ext_sales_price) sum_agg
from date_dim dt
,store_sales
,item
where dt.d_date_sk = store_sales.ss_sold_date_sk
and store_sales.ss_item_sk = item.i_item_sk
and item.i_manufact_id = 125
and dt.d_moy=11
group by dt.d_year
,item.i_brand
,item.i_brand_id
order by dt.d_year
,sum_agg desc
,brand_id
limit 100;

```

SQL4

```

with year_total as (
select c_customer_id customer_id
,c_first_name customer_first_name
,c_last_name customer_last_name
,c_preferred_cust_flag customer_preferred_cust_flag
,c_birth_country customer_birth_country
,c_login customer_login
,c_email_address customer_email_address
,d_year dyear
,sum(((ss_ext_list_price-ss_ext_wholesale_cost-ss_ext_discount_amt)+ss_ext_sales_price)/2) year_total
,'s' sale_type
from customer
,store_sales
,date_dim
where c_customer_sk = ss_customer_sk
and ss_sold_date_sk = d_date_sk
group by c_customer_id

```



```

,c_first_name
,c_last_name
,c_preferred_cust_flag
,c_birth_country
,c_login
,c_email_address
,d_year
union all
select c_customer_id customer_id
,c_first_name customer_first_name
,c_last_name customer_last_name
,c_preferred_cust_flag customer_preferred_cust_flag
,c_birth_country customer_birth_country
,c_login customer_login
,c_email_address customer_email_address
,d_year dyear
,sum(((cs_ext_list_price-cs_ext_wholesale_cost-cs_ext_discount_amt)+cs_ext_sales_price)/2) year_total
,'c' sale_type
from customer
,catalog_sales
,date_dim
where c_customer_sk = cs_bill_customer_sk
and cs_sold_date_sk = d_date_sk
group by c_customer_id
,c_first_name
,c_last_name
,c_preferred_cust_flag
,c_birth_country
,c_login
,c_email_address
,d_year
union all
select c_customer_id customer_id
,c_first_name customer_first_name
,c_last_name customer_last_name
,c_preferred_cust_flag customer_preferred_cust_flag
,c_birth_country customer_birth_country
,c_login customer_login
,c_email_address customer_email_address
,d_year dyear
,sum(((ws_ext_list_price-ws_ext_wholesale_cost-ws_ext_discount_amt)+ws_ext_sales_price)/2)
year_total
,'w' sale_type
from customer
,web_sales
,date_dim
where c_customer_sk = ws_bill_customer_sk
and ws_sold_date_sk = d_date_sk
group by c_customer_id
,c_first_name
,c_last_name
,c_preferred_cust_flag
,c_birth_country
,c_login
,c_email_address
,d_year
)
select
t_s_secyear.customer_id
,t_s_secyear.customer_first_name
,t_s_secyear.customer_last_name
,t_s_secyear.customer_preferred_cust_flag
from year_total t_s_firstyear
,year_total t_s_secyear
,year_total t_c_firstyear
,year_total t_c_secyear
,year_total t_w_firstyear
,year_total t_w_secyear
where t_s_secyear.customer_id = t_s_firstyear.customer_id

```

```

and t_s_firstyear.customer_id = t_c_secyear.customer_id
and t_s_firstyear.customer_id = t_c_firstyear.customer_id
and t_s_firstyear.customer_id = t_w_firstyear.customer_id
and t_s_firstyear.customer_id = t_w_secyear.customer_id
and t_s_firstyear.sale_type = 's'
and t_c_firstyear.sale_type = 'c'
and t_w_firstyear.sale_type = 'w'
and t_s_secyear.sale_type = 's'
and t_c_secyear.sale_type = 'c'
and t_w_secyear.sale_type = 'w'
and t_s_firstyear.dyear = 2000
and t_s_secyear.dyear = 2000+1
and t_c_firstyear.dyear = 2000
and t_c_secyear.dyear = 2000+1
and t_w_firstyear.dyear = 2000
and t_w_secyear.dyear = 2000+1
and t_s_firstyear.year_total > 0
and t_c_firstyear.year_total > 0
and t_w_firstyear.year_total > 0
and case when t_c_firstyear.year_total > 0 then t_c_secyear.year_total / t_c_firstyear.year_total else null
end
      > case when t_s_firstyear.year_total > 0 then t_s_secyear.year_total / t_s_firstyear.year_total else null
end
and case when t_c_firstyear.year_total > 0 then t_c_secyear.year_total / t_c_firstyear.year_total else null
end
      > case when t_w_firstyear.year_total > 0 then t_w_secyear.year_total / t_w_firstyear.year_total else
null end
order by t_s_secyear.customer_id
      ,t_s_secyear.customer_first_name
      ,t_s_secyear.customer_last_name
      ,t_s_secyear.customer_preferred_cust_flag
limit 100;

```

SQL5

```

with sssr as
(select s_store_id,
      sum(sales_price) as sales,
      sum(profit) as profit,
      sum(return_amt) as returns,
      sum(net_loss) as profit_loss
from
  ( select ss_store_sk as store_sk,
        ss_sold_date_sk as date_sk,
        ss_ext_sales_price as sales_price,
        ss_net_profit as profit,
        cast(0 as decimal(7,2)) as return_amt,
        cast(0 as decimal(7,2)) as net_loss
    from store_sales
  union all
  select sr_store_sk as store_sk,
        sr_returned_date_sk as date_sk,
        cast(0 as decimal(7,2)) as sales_price,
        cast(0 as decimal(7,2)) as profit,
        sr_return_amt as return_amt,
        sr_net_loss as net_loss
    from store_returns
  ) salesreturns,
  date_dim,
  store
where date_sk = d_date_sk
      and d_date between cast('2002-08-05' as date)
                        and (cast('2002-08-05' as date) + 14 )
      and store_sk = s_store_sk
group by s_store_id)
,
csr as
(select cp_catalog_page_id,
      sum(sales_price) as sales,

```

```

sum(profit) as profit,
sum(return_amt) as returns,
sum(net_loss) as profit_loss
from
( select cs_catalog_page_sk as page_sk,
  cs_sold_date_sk as date_sk,
  cs_ext_sales_price as sales_price,
  cs_net_profit as profit,
  cast(0 as decimal(7,2)) as return_amt,
  cast(0 as decimal(7,2)) as net_loss
from catalog_sales
union all
select cr_catalog_page_sk as page_sk,
  cr_returned_date_sk as date_sk,
  cast(0 as decimal(7,2)) as sales_price,
  cast(0 as decimal(7,2)) as profit,
  cr_return_amount as return_amt,
  cr_net_loss as net_loss
from catalog_returns
) salesreturns,
date_dim,
catalog_page
where date_sk = d_date_sk
and d_date between cast('2002-08-05' as date)
and (cast('2002-08-05' as date) + 14 )
and page_sk = cp_catalog_page_sk
group by cp_catalog_page_id)
,
wsr as
(select web_site_id,
  sum(sales_price) as sales,
  sum(profit) as profit,
  sum(return_amt) as returns,
  sum(net_loss) as profit_loss
from
( select ws_web_site_sk as wsr_web_site_sk,
  ws_sold_date_sk as date_sk,
  ws_ext_sales_price as sales_price,
  ws_net_profit as profit,
  cast(0 as decimal(7,2)) as return_amt,
  cast(0 as decimal(7,2)) as net_loss
from web_sales
union all
select ws_web_site_sk as wsr_web_site_sk,
  wr_returned_date_sk as date_sk,
  cast(0 as decimal(7,2)) as sales_price,
  cast(0 as decimal(7,2)) as profit,
  wr_return_amt as return_amt,
  wr_net_loss as net_loss
from web_returns left outer join web_sales on
( wr_item_sk = ws_item_sk
and wr_order_number = ws_order_number)
) salesreturns,
date_dim,
web_site
where date_sk = d_date_sk
and d_date between cast('2002-08-05' as date)
and (cast('2002-08-05' as date) + 14 )
and wsr_web_site_sk = web_site_sk
group by web_site_id)
select channel
, id
, sum(sales) as sales
, sum(returns) as returns
, sum(profit) as profit
from
(select 'store channel' as channel
, 'store' || s_store_id as id
, sales

```

```

, returns
, (profit - profit_loss) as profit
from ssr
union all
select 'catalog channel' as channel
, 'catalog_page' || cp_catalog_page_id as id
, sales
, returns
, (profit - profit_loss) as profit
from csr
union all
select 'web channel' as channel
, 'web_site' || web_site_id as id
, sales
, returns
, (profit - profit_loss) as profit
from wsr
) x
group by rollup (channel, id)
order by channel
, id
limit 100;

```

SQL6

```

select a.ca_state state, count(*) cnt
from customer_address a
, customer c
, store_sales s
, date_dim d
, item i
where a.ca_address_sk = c.c_current_addr_sk
and c.c_customer_sk = s.ss_customer_sk
and s.ss_sold_date_sk = d.d_date_sk
and s.ss_item_sk = i.i_item_sk
and d.d_month_seq =
(select distinct (d_month_seq)
from date_dim
where d_year = 1998
and d_moy = 7 )
and i.i_current_price > 1.2 *
(select avg(j.i_current_price)
from item j
where j.i_category = i.i_category)
group by a.ca_state
having count(*) >= 10
order by cnt, a.ca_state
limit 100;

```

SQL7

```

select i_item_id,
avg(ss_quantity) agg1,
avg(ss_list_price) agg2,
avg(ss_coupon_amt) agg3,
avg(ss_sales_price) agg4
from store_sales, customer_demographics, date_dim, item, promotion
where ss_sold_date_sk = d_date_sk and
ss_item_sk = i_item_sk and
ss_demo_sk = cd_demo_sk and
ss_promo_sk = p_promo_sk and
cd_gender = 'M' and
cd_marital_status = 'U' and
cd_education_status = 'College' and
(p_channel_email = 'N' or p_channel_event = 'N') and
d_year = 1999
group by i_item_id

```

```
order by i_item_id
limit 100;
```

SQL8

```
select s_store_name
      ,sum(ss_net_profit)
from store_sales
     ,date_dim
     ,store
  (select ca_zip
   from (
        SELECT substr(ca_zip,1,5) ca_zip
        FROM customer_address
        WHERE substr(ca_zip,1,5) IN (
            '74804','87276','13428','49436','56281','79805',
            '46826','68570','20368','28846','41886',
            '68164','68097','16113','18727','96789',
            '63317','57937','19554','69911','83554',
            '84246','61336','46999','25229','15960',
            '61657','28058','64558','39712','74928',
            '34018','87826','69733','26479','73630',
            '88683','61704','81441','42706','54175',
            '45152','49049','30850','63980','40484',
            '71665','63755','23769','79855','24308',
            '28241','16343','25663','85999','46359',
            '93691','34706','99973','74947','60316',
            '58637','48063','81363','19268','66228',
            '78136','16368','99907','58139','17043',
            '89764','14834','25152','70158','76080',
            '81251','83972','48635','54671','35602',
            '10788','57325','46354','92707','41103',
            '89761','31840','69225','76139','18826',
            '12556','51692','20579','50965','32136',
            '71357','16309','82922','59273','40999',
            '73273','93217','65679','12653','16978',
            '27319','41973','65580','56237','17799',
            '53192','63632','37089','65994','58048',
            '14388','58085','80614','40042','79194',
            '42268','61913','97332','37349','72146',
            '52681','18176','39332','89283','69023',
            '84175','11520','33483','60169','93562',
            '10097','14536','70276','64042','22822',
            '87229','51528','70269','44519','48044',
            '78170','81440','60315','14543','30719',
            '13240','62325','35517','51529','98085',
            '79007','16582','95187','15625','88780',
            '38656','74607','75117','62819','31929',
            '27665','88890','98611','53527','48652',
            '10324','62273','17726','36232','38526',
            '50705','61179','30363','54408','58631',
            '23622','50319','33299','78829','91267',
            '25571','60347','44750','62797','10713',
            '46494','91163','20973','42007','54724',
            '89203','12561','71116','60404','70589',
            '66744','46074','69138','34737','25092',
            '59246','74778','40140','89476','71030',
            '89861','93207','44996','34850','48752',
            '79574','29570','76507','79728','43195',
            '47596','46415','42514','68144','14169',
            '17041','75747','33630','19378','32618',
            '78704','75807','76800','80916','87272',
            '37109','21714','14867','83806','33895',
            '80637','20658','75224','92772','55791',
            '58603','31681','38788','91922','42465',
            '74371','72854','75746','80383','75909',
            '37151','82077','80604','66771','46075',
            '58723','15380','83174','53615','50347',
            '98340','68957','63361','18705','47629',
```

```
'76013','68572','50588','31168','41563',
'38936','88746','19052','75648','46403',
'24332','54711','28218','80432','53870',
'25049','32562','94211','99803','49133',
'21202','50005','17953','14324','85525',
'51984','37304','69870','64321','66962',
'66453','40619','91199','54400','28804',
'65544','27059','31143','20303','52429',
'24476','91458','52514','55145','99015',
'51657','10001','96434','38325','39628',
'83338','62381','67697','61542','86076',
'89833','32657','56881','93983','85031',
'57530','56318','46934','34740','79458',
'88443','15861','56034','24808','32336',
'34312','96450','12923','91876','53509',
'30241','35816','52377','23946','23644',
'16413','35796','59100','21689','49199',
'40062','82510','14072','78823','49158',
'99933','75399','11365','44799','77549',
'19569','39186','78909','68143','70468',
'14944','33047','98329','42262','68647',
'65754','27357','56372','18073','12363',
'64467','26221','32914','70431','42436',
'55316','33335','27701','44687','22360',
'76124','44007','59525','51574','71555',
'43130','64199','19616','94285')
intersect
select ca_zip
from (SELECT substr(ca_zip,1,5) ca_zip,count(*) cnt
FROM customer_address, customer
WHERE ca_address_sk = c_current_addr_sk and
c_preferred_cust_flag='Y'
group by ca_zip
having count(*) > 10)A1)A2) V1
where ss_store_sk = s_store_sk
and ss_sold_date_sk = d_date_sk
and d_qoy = 1 and d_year = 1999
and (substr(s_zip,1,2) = substr(V1.ca_zip,1,2))
group by s_store_name
order by s_store_name
limit 100;
```

SQL9

```
select case when (select count(*)
from store_sales
where ss_quantity between 1 and 20) > 40845849
then (select avg(ss_ext_tax)
from store_sales
where ss_quantity between 1 and 20)
else (select avg(ss_net_paid)
from store_sales
where ss_quantity between 1 and 20) end bucket1 ,
case when (select count(*)
from store_sales
where ss_quantity between 21 and 40) > 5712087
then (select avg(ss_ext_tax)
from store_sales
where ss_quantity between 21 and 40)
else (select avg(ss_net_paid)
from store_sales
where ss_quantity between 21 and 40) end bucket2,
case when (select count(*)
from store_sales
where ss_quantity between 41 and 60) > 30393328
then (select avg(ss_ext_tax)
from store_sales
where ss_quantity between 41 and 60)
else (select avg(ss_net_paid)
```

```

        from store_sales
        where ss_quantity between 41 and 60) end bucket3,
    case when (select count(*)
              from store_sales
              where ss_quantity between 61 and 80) > 46385791
    then (select avg(ss_ext_tax)
          from store_sales
          where ss_quantity between 61 and 80)
    else (select avg(ss_net_paid)
          from store_sales
          where ss_quantity between 61 and 80) end bucket4,
    case when (select count(*)
              from store_sales
              where ss_quantity between 81 and 100) > 29981928
    then (select avg(ss_ext_tax)
          from store_sales
          where ss_quantity between 81 and 100)
    else (select avg(ss_net_paid)
          from store_sales
          where ss_quantity between 81 and 100) end bucket5
from reason
where r_reason_sk = 1
;

```

SQL10

```

select
    cd_gender,
    cd_marital_status,
    cd_education_status,
    count(*) cnt1,
    cd_purchase_estimate,
    count(*) cnt2,
    cd_credit_rating,
    count(*) cnt3,
    cd_dep_count,
    count(*) cnt4,
    cd_dep_employed_count,
    count(*) cnt5,
    cd_dep_college_count,
    count(*) cnt6
from
    customer c, customer_address ca, customer_demographics
where
    c.c_current_addr_sk = ca.ca_address_sk and
    ca_county in ('Clark County','Richardson County','Tom Green County','Sullivan County','Cass County') and
    cd_demo_sk = c.c_current_demo_sk and
    exists (select *
            from store_sales, date_dim
            where c.c_customer_sk = ss_customer_sk and
                  ss_sold_date_sk = d_date_sk and
                  d_year = 2000 and
                  d_moy between 1 and 1+3) and
    (exists (select *
            from web_sales, date_dim
            where c.c_customer_sk = ws_bill_customer_sk and
                  ws_sold_date_sk = d_date_sk and
                  d_year = 2000 and
                  d_moy between 1 AND 1+3) or
    exists (select *
            from catalog_sales, date_dim
            where c.c_customer_sk = cs_ship_customer_sk and
                  cs_sold_date_sk = d_date_sk and
                  d_year = 2000 and
                  d_moy between 1 and 1+3))
group by cd_gender,
         cd_marital_status,
         cd_education_status,
         cd_purchase_estimate,

```

```

        cd_credit_rating,
        cd_dep_count,
        cd_dep_employed_count,
        cd_dep_college_count
order by cd_gender,
        cd_marital_status,
        cd_education_status,
        cd_purchase_estimate,
        cd_credit_rating,
        cd_dep_count,
        cd_dep_employed_count,
        cd_dep_college_count
limit 100;

```

SQL11

```

with year_total as (
select c_customer_id customer_id
      ,c_first_name customer_first_name
      ,c_last_name customer_last_name
      ,c_preferred_cust_flag customer_preferred_cust_flag
      ,c_birth_country customer_birth_country
      ,c_login customer_login
      ,c_email_address customer_email_address
      ,d_year dyear
      ,sum(ss_ext_list_price-ss_ext_discount_amt) year_total
      ,'s' sale_type
from customer
   ,store_sales
   ,date_dim
where c_customer_sk = ss_customer_sk
     and ss_sold_date_sk = d_date_sk
group by c_customer_id
        ,c_first_name
        ,c_last_name
        ,c_preferred_cust_flag
        ,c_birth_country
        ,c_login
        ,c_email_address
        ,d_year
union all
select c_customer_id customer_id
      ,c_first_name customer_first_name
      ,c_last_name customer_last_name
      ,c_preferred_cust_flag customer_preferred_cust_flag
      ,c_birth_country customer_birth_country
      ,c_login customer_login
      ,c_email_address customer_email_address
      ,d_year dyear
      ,sum(ws_ext_list_price-ws_ext_discount_amt) year_total
      ,'w' sale_type
from customer
   ,web_sales
   ,date_dim
where c_customer_sk = ws_bill_customer_sk
     and ws_sold_date_sk = d_date_sk
group by c_customer_id
        ,c_first_name
        ,c_last_name
        ,c_preferred_cust_flag
        ,c_birth_country
        ,c_login
        ,c_email_address
        ,d_year
)
select
        t_s_secyear.customer_id
        ,t_s_secyear.customer_first_name
        ,t_s_secyear.customer_last_name

```



```

        ,t_s_secyear.customer_birth_country
from year_total t_s_firstyear
     ,year_total t_s_secyear
     ,year_total t_w_firstyear
     ,year_total t_w_secyear
where t_s_secyear.customer_id = t_s_firstyear.customer_id
     and t_s_firstyear.customer_id = t_w_secyear.customer_id
     and t_s_firstyear.customer_id = t_w_firstyear.customer_id
     and t_s_firstyear.sale_type = 's'
     and t_w_firstyear.sale_type = 'w'
     and t_s_secyear.sale_type = 's'
     and t_w_secyear.sale_type = 'w'
     and t_s_firstyear.dyear = 2001
     and t_s_secyear.dyear = 2001+1
     and t_w_firstyear.dyear = 2001
     and t_w_secyear.dyear = 2001+1
     and t_s_firstyear.year_total > 0
     and t_w_firstyear.year_total > 0
     and case when t_w_firstyear.year_total > 0 then t_w_secyear.year_total / t_w_firstyear.year_total else
0.0 end
     > case when t_s_firstyear.year_total > 0 then t_s_secyear.year_total / t_s_firstyear.year_total else 0.0
end
order by t_s_secyear.customer_id
     ,t_s_secyear.customer_first_name
     ,t_s_secyear.customer_last_name
     ,t_s_secyear.customer_birth_country
limit 100;

```

SQL12

```

select i_item_id
     ,i_item_desc
     ,i_category
     ,i_class
     ,i_current_price
     ,sum(ws_ext_sales_price) as itemrevenue
     ,sum(ws_ext_sales_price)*100/sum(sum(ws_ext_sales_price)) over
       (partition by i_class) as renumeratio
from
     web_sales
     ,item
     ,date_dim
where
     ws_item_sk = i_item_sk
     and i_category in ('Music', 'Shoes', 'Children')
     and ws_sold_date_sk = d_date_sk
     and d_date between cast('2000-05-14' as date)
       and (cast('2000-05-14' as date) + 30 )
group by
     i_item_id
     ,i_item_desc
     ,i_category
     ,i_class
     ,i_current_price
order by
     i_category
     ,i_class
     ,i_item_id
     ,i_item_desc
     ,renumeratio
limit 100;

```

SQL13

```

select avg(ss_quantity)
     ,avg(ss_ext_sales_price)
     ,avg(ss_ext_wholesale_cost)
     ,sum(ss_ext_wholesale_cost)
from store_sales

```

```

,store
,customer_demographics
,household_demographics
,customer_address
,date_dim
where s_store_sk = ss_store_sk
and ss_sold_date_sk = d_date_sk and d_year = 2001
and((ss_hdemo_sk=hd_demo_sk
and cd_demo_sk = ss_cdemo_sk
and cd_marital_status = 'U'
and cd_education_status = '4 yr Degree'
and ss_sales_price between 100.00 and 150.00
and hd_dep_count = 3
)or
(ss_hdemo_sk=hd_demo_sk
and cd_demo_sk = ss_cdemo_sk
and cd_marital_status = 'D'
and cd_education_status = '2 yr Degree'
and ss_sales_price between 50.00 and 100.00
and hd_dep_count = 1
) or
(ss_hdemo_sk=hd_demo_sk
and cd_demo_sk = ss_cdemo_sk
and cd_marital_status = 'S'
and cd_education_status = 'Advanced Degree'
and ss_sales_price between 150.00 and 200.00
and hd_dep_count = 1
))
and((ss_addr_sk = ca_address_sk
and ca_country = 'United States'
and ca_state in ('IL', 'WI', 'TN')
and ss_net_profit between 100 and 200
) or
(ss_addr_sk = ca_address_sk
and ca_country = 'United States'
and ca_state in ('MO', 'OK', 'WA')
and ss_net_profit between 150 and 300
) or
(ss_addr_sk = ca_address_sk
and ca_country = 'United States'
and ca_state in ('NE', 'VA', 'GA')
and ss_net_profit between 50 and 250
))
;

```

SQL14

```

with cross_items as
(select i_item_sk ss_item_sk
from item,
(select iss.i_brand_id brand_id
,iss.i_class_id class_id
,iss.i_category_id category_id
from store_sales
,item iss
,date_dim d1
where ss_item_sk = iss.i_item_sk
and ss_sold_date_sk = d1.d_date_sk
and d1.d_year between 2000 AND 2000 + 2
intersect
select ics.i_brand_id
,ics.i_class_id
,ics.i_category_id
from catalog_sales
,item ics
,date_dim d2
where cs_item_sk = ics.i_item_sk
and cs_sold_date_sk = d2.d_date_sk
and d2.d_year between 2000 AND 2000 + 2

```

```

intersect
select iws.i_brand_id
      ,iws.i_class_id
      ,iws.i_category_id
from web_sales
      ,item iws
      ,date_dim d3
where ws_item_sk = iws.i_item_sk
      and ws_sold_date_sk = d3.d_date_sk
      and d3.d_year between 2000 AND 2000 + 2)
where i_brand_id = brand_id
      and i_class_id = class_id
      and i_category_id = category_id
),
avg_sales as
(select avg(quantity*list_price) average_sales
 from (select ss_quantity quantity
           ,ss_list_price list_price
       from store_sales
           ,date_dim
       where ss_sold_date_sk = d_date_sk
           and d_year between 2000 and 2000 + 2
       union all
       select cs_quantity quantity
           ,cs_list_price list_price
       from catalog_sales
           ,date_dim
       where cs_sold_date_sk = d_date_sk
           and d_year between 2000 and 2000 + 2
       union all
       select ws_quantity quantity
           ,ws_list_price list_price
       from web_sales
           ,date_dim
       where ws_sold_date_sk = d_date_sk
           and d_year between 2000 and 2000 + 2) x)
select channel, i_brand_id,i_class_id,i_category_id,sum(sales), sum(number_sales)
from(
  select 'store' channel, i_brand_id,i_class_id
        ,i_category_id,sum(ss_quantity*ss_list_price) sales
        , count(*) number_sales
  from store_sales
        ,item
        ,date_dim
  where ss_item_sk in (select ss_item_sk from cross_items)
        and ss_item_sk = i_item_sk
        and ss_sold_date_sk = d_date_sk
        and d_year = 2000+2
        and d_moy = 11
  group by i_brand_id,i_class_id,i_category_id
  having sum(ss_quantity*ss_list_price) > (select average_sales from avg_sales)
  union all
  select 'catalog' channel, i_brand_id,i_class_id,i_category_id, sum(cs_quantity*cs_list_price) sales,
count(*) number_sales
  from catalog_sales
        ,item
        ,date_dim
  where cs_item_sk in (select ss_item_sk from cross_items)
        and cs_item_sk = i_item_sk
        and cs_sold_date_sk = d_date_sk
        and d_year = 2000+2
        and d_moy = 11
  group by i_brand_id,i_class_id,i_category_id
  having sum(cs_quantity*cs_list_price) > (select average_sales from avg_sales)
  union all
  select 'web' channel, i_brand_id,i_class_id,i_category_id, sum(ws_quantity*ws_list_price) sales , count(*)
number_sales
  from web_sales
        ,item

```

```

        ,date_dim
    where ws_item_sk in (select ss_item_sk from cross_items)
        and ws_item_sk = i_item_sk
        and ws_sold_date_sk = d_date_sk
        and d_year = 2000+2
        and d_moy = 11
    group by i_brand_id,i_class_id,i_category_id
        having sum(ws_quantity*ws_list_price) > (select average_sales from avg_sales)
) y
group by rollup (channel, i_brand_id,i_class_id,i_category_id)
order by channel,i_brand_id,i_class_id,i_category_id
limit 100;
with cross_items as
(select i_item_sk ss_item_sk
 from item,
(select iss.i_brand_id brand_id
 ,iss.i_class_id class_id
 ,iss.i_category_id category_id
 from store_sales
 ,item iss
 ,date_dim d1
 where ss_item_sk = iss.i_item_sk
 and ss_sold_date_sk = d1.d_date_sk
 and d1.d_year between 2000 AND 2000 + 2
 intersect
select ics.i_brand_id
 ,ics.i_class_id
 ,ics.i_category_id
 from catalog_sales
 ,item ics
 ,date_dim d2
 where cs_item_sk = ics.i_item_sk
 and cs_sold_date_sk = d2.d_date_sk
 and d2.d_year between 2000 AND 2000 + 2
 intersect
select iws.i_brand_id
 ,iws.i_class_id
 ,iws.i_category_id
 from web_sales
 ,item iws
 ,date_dim d3
 where ws_item_sk = iws.i_item_sk
 and ws_sold_date_sk = d3.d_date_sk
 and d3.d_year between 2000 AND 2000 + 2) x
where i_brand_id = brand_id
 and i_class_id = class_id
 and i_category_id = category_id
),
avg_sales as
(select avg(quantity*list_price) average_sales
 from (select ss_quantity quantity
 ,ss_list_price list_price
 from store_sales
 ,date_dim
 where ss_sold_date_sk = d_date_sk
 and d_year between 2000 and 2000 + 2
 union all
select cs_quantity quantity
 ,cs_list_price list_price
 from catalog_sales
 ,date_dim
 where cs_sold_date_sk = d_date_sk
 and d_year between 2000 and 2000 + 2
 union all
select ws_quantity quantity
 ,ws_list_price list_price
 from web_sales
 ,date_dim
 where ws_sold_date_sk = d_date_sk

```

```

        and d_year between 2000 and 2000 + 2) x)
select  this_year.channel ty_channel
        ,this_year.i_brand_id ty_brand
        ,this_year.i_class_id ty_class
        ,this_year.i_category_id ty_category
        ,this_year.sales ty_sales
        ,this_year.number_sales ty_number_sales
        ,last_year.channel ly_channel
        ,last_year.i_brand_id ly_brand
        ,last_year.i_class_id ly_class
        ,last_year.i_category_id ly_category
        ,last_year.sales ly_sales
        ,last_year.number_sales ly_number_sales
from
(select 'store' channel, i_brand_id,i_class_id,i_category_id
      ,sum(ss_quantity*ss_list_price) sales, count(*) number_sales
from store_sales
      ,item
      ,date_dim
where ss_item_sk in (select ss_item_sk from cross_items)
      and ss_item_sk = i_item_sk
      and ss_sold_date_sk = d_date_sk
      and d_week_seq = (select d_week_seq
                        from date_dim
                        where d_year = 2000 + 1
                          and d_moy = 12
                          and d_dom = 17)
group by i_brand_id,i_class_id,i_category_id
having sum(ss_quantity*ss_list_price) > (select average_sales from avg_sales)) this_year,
(select 'store' channel, i_brand_id,i_class_id
      ,i_category_id, sum(ss_quantity*ss_list_price) sales, count(*) number_sales
from store_sales
      ,item
      ,date_dim
where ss_item_sk in (select ss_item_sk from cross_items)
      and ss_item_sk = i_item_sk
      and ss_sold_date_sk = d_date_sk
      and d_week_seq = (select d_week_seq
                        from date_dim
                        where d_year = 2000
                          and d_moy = 12
                          and d_dom = 17)
group by i_brand_id,i_class_id,i_category_id
having sum(ss_quantity*ss_list_price) > (select average_sales from avg_sales)) last_year
where this_year.i_brand_id= last_year.i_brand_id
      and this_year.i_class_id = last_year.i_class_id
      and this_year.i_category_id = last_year.i_category_id
order by this_year.channel, this_year.i_brand_id, this_year.i_class_id, this_year.i_category_id
limit 100;

```

SQL15

```

select  ca_zip
        ,sum(cs_sales_price)
from catalog_sales
      ,customer
      ,customer_address
      ,date_dim
where cs_bill_customer_sk = c_customer_sk
      and c_current_addr_sk = ca_address_sk
      and ( substr(ca_zip,1,5) in ('85669', '86197','88274','83405','86475',
                                  '85392', '85460', '80348', '81792')
           or ca_state in ('CA','WA','GA')
           or cs_sales_price > 500)
      and cs_sold_date_sk = d_date_sk
      and d_qoy = 2 and d_year = 1999
group by ca_zip
order by ca_zip
limit 100;

```

SQL16

```
select
  count(distinct cs_order_number) as "order count"
, sum(cs_ext_ship_cost) as "total shipping cost"
, sum(cs_net_profit) as "total net profit"
from
  catalog_sales cs1
, date_dim
, customer_address
, call_center
where
  d_date between '1999-2-01' and
    (cast('1999-2-01' as date) + 60 )
and cs1.cs_ship_date_sk = d_date_sk
and cs1.cs_ship_addr_sk = ca_address_sk
and ca_state = 'TX'
and cs1.cs_call_center_sk = cc_call_center_sk
and cc_county in ('Barrow County','Luce County','Mobile County','Richland County',
  'Wadena County'
)
and exists (select *
  from catalog_sales cs2
  where cs1.cs_order_number = cs2.cs_order_number
  and cs1.cs_warehouse_sk <> cs2.cs_warehouse_sk)
and not exists(select *
  from catalog_returns cr1
  where cs1.cs_order_number = cr1.cr_order_number)
order by count(distinct cs_order_number)
limit 100;
```

SQL17

```
select i_item_id
, i_item_desc
, s_state
, count(ss_quantity) as store_sales_quantitycount
, avg(ss_quantity) as store_sales_quantityave
, stddev_samp(ss_quantity) as store_sales_quantitystdev
, stddev_samp(ss_quantity)/avg(ss_quantity) as store_sales_quantitycov
, count(sr_return_quantity) as store_returns_quantitycount
, avg(sr_return_quantity) as store_returns_quantityave
, stddev_samp(sr_return_quantity) as store_returns_quantitystdev
, stddev_samp(sr_return_quantity)/avg(sr_return_quantity) as store_returns_quantitycov
, count(cs_quantity) as catalog_sales_quantitycount ,avg(cs_quantity) as catalog_sales_quantityave
, stddev_samp(cs_quantity) as catalog_sales_quantitystdev
, stddev_samp(cs_quantity)/avg(cs_quantity) as catalog_sales_quantitycov
from store_sales
, store_returns
, catalog_sales
, date_dim d1
, date_dim d2
, date_dim d3
, store
, item
where d1.d_quarter_name = '2000Q1'
and d1.d_date_sk = ss_sold_date_sk
and i_item_sk = ss_item_sk
and s_store_sk = ss_store_sk
and ss_customer_sk = sr_customer_sk
and ss_item_sk = sr_item_sk
and ss_ticket_number = sr_ticket_number
and sr_returned_date_sk = d2.d_date_sk
and d2.d_quarter_name in ('2000Q1','2000Q2','2000Q3')
and sr_customer_sk = cs_bill_customer_sk
and sr_item_sk = cs_item_sk
and cs_sold_date_sk = d3.d_date_sk
and d3.d_quarter_name in ('2000Q1','2000Q2','2000Q3')
group by i_item_id
```

```
,i_item_desc
,s_state
order by i_item_id
,i_item_desc
,s_state
limit 100;
```

SQL18

```
select i_item_id,
ca_country,
ca_state,
ca_county,
avg( cast(cs_quantity as decimal(12,2))) agg1,
avg( cast(cs_list_price as decimal(12,2))) agg2,
avg( cast(cs_coupon_amt as decimal(12,2))) agg3,
avg( cast(cs_sales_price as decimal(12,2))) agg4,
avg( cast(cs_net_profit as decimal(12,2))) agg5,
avg( cast(c_birth_year as decimal(12,2))) agg6,
avg( cast(cd1.cd_dep_count as decimal(12,2))) agg7
from catalog_sales, customer_demographics cd1,
customer_demographics cd2, customer, customer_address, date_dim, item
where cs_sold_date_sk = d_date_sk and
cs_item_sk = i_item_sk and
cs_bill_demo_sk = cd1.cd_demo_sk and
cs_bill_customer_sk = c_customer_sk and
cd1.cd_gender = 'M' and
cd1.cd_education_status = 'Primary' and
c_current_demo_sk = cd2.cd_demo_sk and
c_current_addr_sk = ca_address_sk and
c_birth_month in (10,1,8,7,3,5) and
d_year = 1998 and
ca_state in ('NE','OK','NC'
,'CO','ID','AR','MO')
group by rollup (i_item_id, ca_country, ca_state, ca_county)
order by ca_country,
ca_state,
ca_county,
i_item_id
limit 100;
```

SQL19

```
select i_brand_id brand_id, i_brand brand, i_manufact_id, i_manufact,
sum(ss_ext_sales_price) ext_price
from date_dim, store_sales, item, customer, customer_address, store
where d_date_sk = ss_sold_date_sk
and ss_item_sk = i_item_sk
and i_manager_id=62
and d_moy=11
and d_year=2000
and ss_customer_sk = c_customer_sk
and c_current_addr_sk = ca_address_sk
and substr(ca_zip,1,5) <> substr(s_zip,1,5)
and ss_store_sk = s_store_sk
group by i_brand
,i_brand_id
,i_manufact_id
,i_manufact
order by ext_price desc
,i_brand
,i_brand_id
,i_manufact_id
,i_manufact
limit 100 ;
```

SQL20

```
select i_item_id
       ,i_item_desc
       ,i_category
       ,i_class
       ,i_current_price
       ,sum(cs_ext_sales_price) as itemrevenue
       ,sum(cs_ext_sales_price)*100/sum(sum(cs_ext_sales_price)) over
         (partition by i_class) as revenueratio
from   catalog_sales
       ,item
       ,date_dim
where  cs_item_sk = i_item_sk
       and i_category in ('Sports', 'Shoes', 'Women')
       and cs_sold_date_sk = d_date_sk
       and d_date between cast('2001-03-21' as date)
         and (cast('2001-03-21' as date) + 30)
group by i_item_id
       ,i_item_desc
       ,i_category
       ,i_class
       ,i_current_price
order by i_category
       ,i_class
       ,i_item_id
       ,i_item_desc
       ,revenueratio
limit 100;
```