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中华数据库行业协会

MSSQL转MySQL

关于我

- 王佩

- tutorabc DB manager
- 10+ 数据库经验,从事MSSQL,MySQL,Redis,MongoDB相关运维架构工作
- 热衷数据库自动化平台和分布式数据库的研究实践。
- 经历 Ctrip、SNDA 、7FGAME、Hujiang、tutorabc
- 微信:wangpei307

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01 目的意义

目的意义

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- 降低软件成本,目前MSSQL Licence 成本较高。
- 运维MySQL 的难度和成本相对较低、易自动化。
- MySQL社区十分活跃，学习成本较低。
- 较高的扩展性，更多周边服务的支持。

02 迁移步骤

整体迁移规划图

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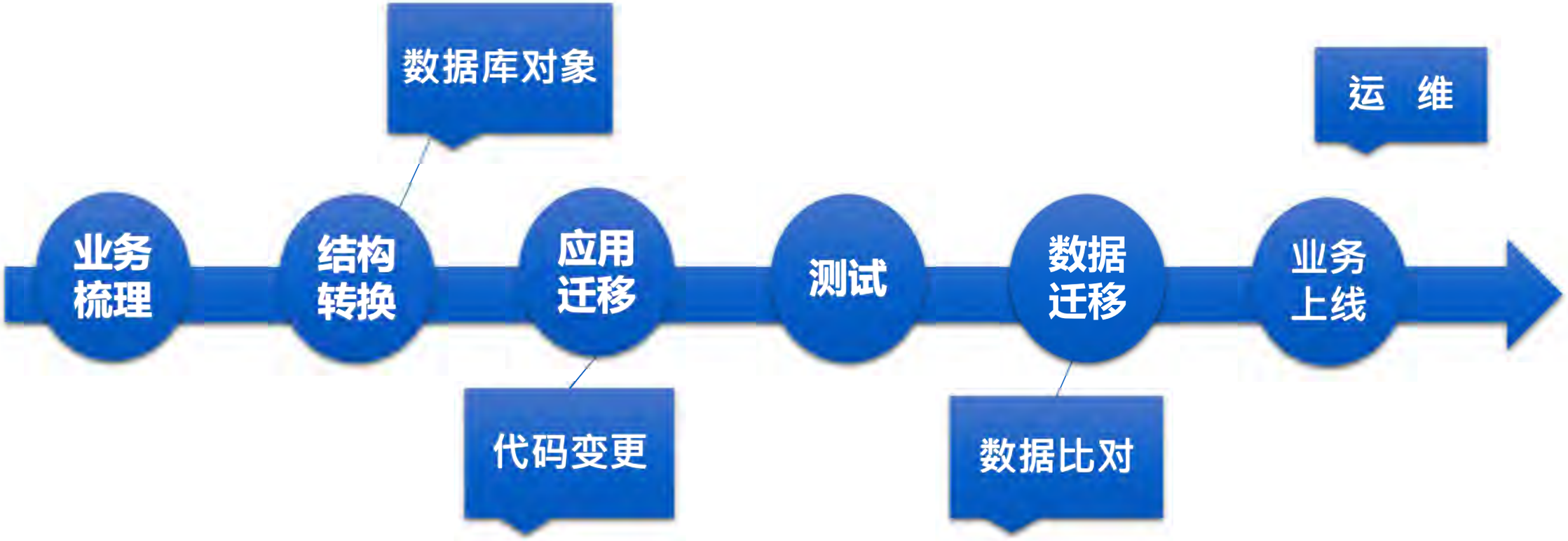

MySQL选型

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官方mysql 社区版（5.7+）

-- 官方目前的版本更新、bug修复较快。
-- 介于 percona-Server 和 MariaDB 之间。

Percona-Server

-- 运维管理方面比较优秀，比如xtrabackup、pt-toolkits
-- 最接近官方 Mysql Enterprise 发行版的版本。

MariaDB

-- 功能相对比较完善，丰富的存储引擎
-- 分支当中发展最快的开源数据库。

数据库对象对照表

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MSSQL	MySQL
Check Constraint	不支持
Roles	不支持，MySQL8.0+ 提供
JOB	支持，Event
LinkServer	支持，FEDERATED (不建议使用)
Partition table	支持
User-Defined type	不支持
Proc\View\Funtion	支持
Computed coulumn	支持 (mysql 5.7+)
Query Hits	部分支持

字段类型对照表

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INT/TINYINT/SMALLINT/BIGINT	INT/TINYINT/SMALLINT/BIGINT
NUMERIC/DECIMAL/MONEY	DECIMAL
FLOAT/REAL	FLOAT
CHAR/NCHAR	CHAR/LONGTEXT
VARCHAR/NVARCHAR	VARCHAR/MEDIUMTEXT/LONGTEXT
DATETIME/SMALLDATETIME	TIMESTAMP/DATETIME
BINARY	BINARY/MEDIUMBLOB/LONGBLOB
VARBINARY	VARBINARY/MEDIUMBLOB/LONGBLOB
SYSNAME	VARCHAR(160)
UNIQUEIDENTIFIER	VARCHAR(64)
XML	Text

转换原则

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- 多表JOIN 拆分
- 存储过程，函数 改成 inlineSQL
- 大表垂直、水平拆分.
- 约束在应用层解决

数据(全/增)量同步方案

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- 导入导出 （BCP\Load Data）
- Workbench (DataBase Migration)
- Microsoft SSIS Service
- Pehtaho Kettle
- Program (python,java…)

导入导出

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MSSQL:

BCP "select * from testmysql.dbo.dd" queryout d:\user.csv -c -t"\t" -T“

MySQL:

load data infile "/home/data/t_006.csv" into table dd

NOTICE：

1.BCP 需要指定 –t “\t”,否则报错。

ERROR 1265 (01000): Data truncated for column 'a' at row 1

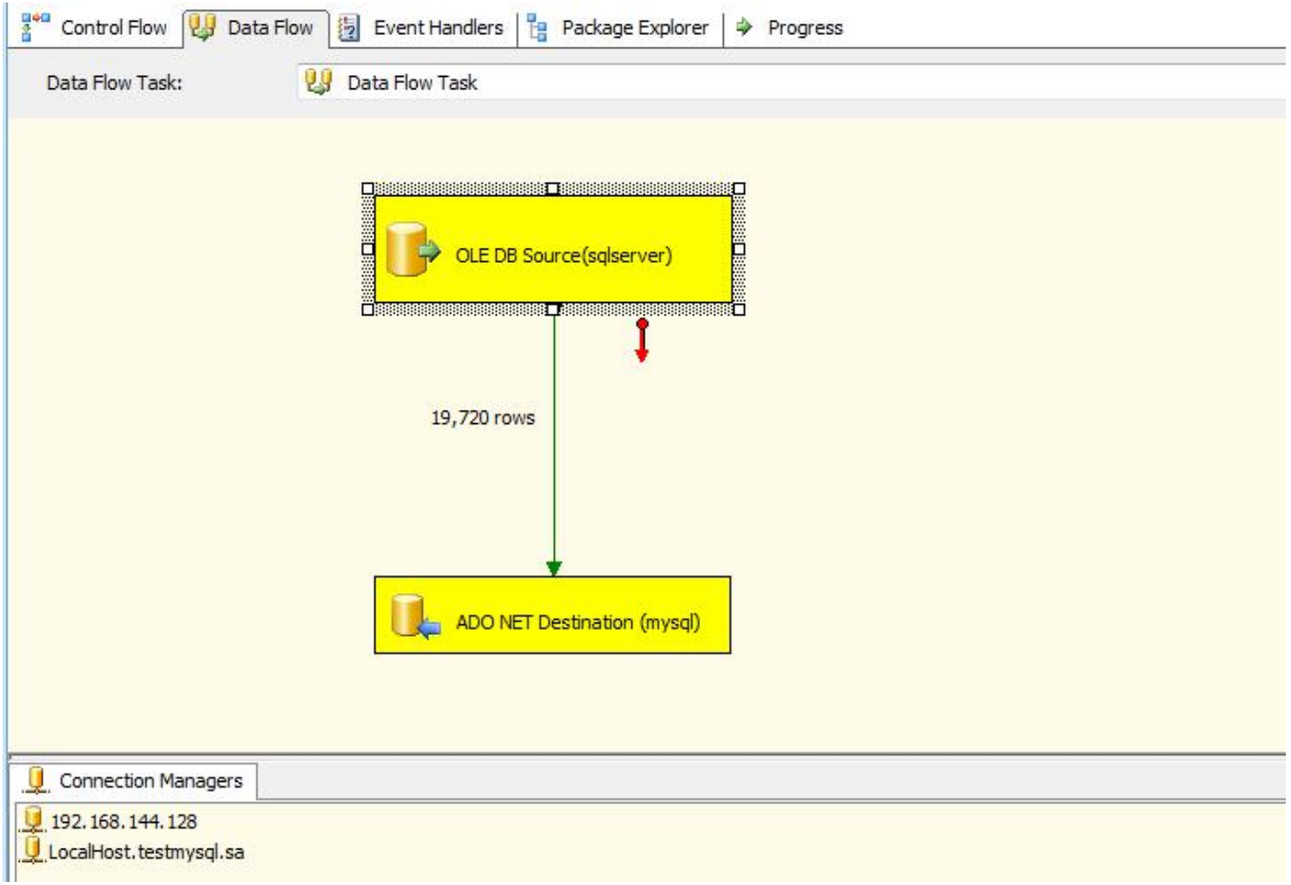
2.MSSQL 非字符类型为 NULL 值，load mysql 会报错 。

ERROR 1366 (HY000): Incorrect integer value: '' for column 'a' at row 1

3.MSSQL 转义字符 \, load mysql 会缺失。

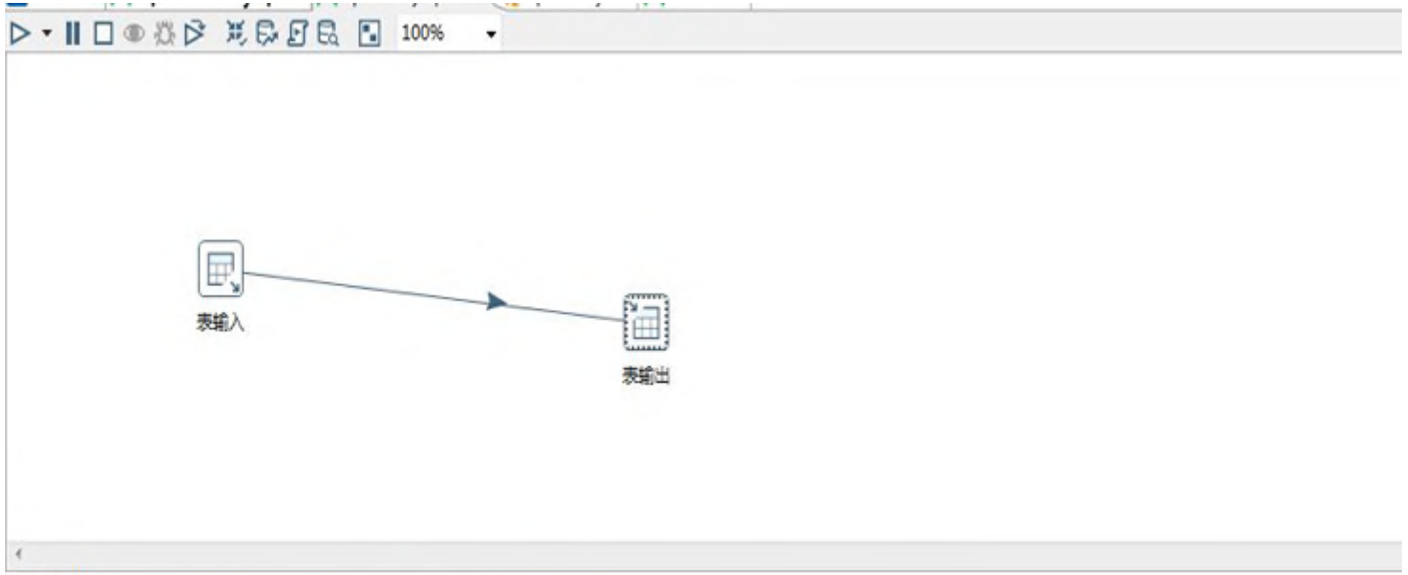
set sql_mode=NO_BACKSLASH_ESCAPES

SSIS



- MySQL Connector/ODBC (32/64) .
- mysql sql_mode= ‘ ANSI_QUOTES ’
- 非字符类型为NULL导入报错。

kettle



执行结果

执行历史 | 日志 | 步骤度量 | 性能图 | Metrics | Preview data

#	步骤名称	复制的记录行数	读	写	输入	输出	更新	拒绝	错误	激活	时间	速度 (条记录/秒)	Pri/in/out
1	表输入	0	0	51998	52000	0	0	0	0	在运行	33.3s	1,562	0/9998
2	表输出	0	42000	41000	0	41000	0	0	0	在运行	33.3s	1,261	9998/0

- sqljdbc_6.0
- mysql-connector-java-5.1.41-bin.jar

同步方案对比

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方案名称	执行时间	优势	缺点
BCP\load data	412S	1.速度快	1.无法自动化 2.容易数据异常
SQLyog	1046S	1.配置简单，选项丰富 2.自动映射	1.速度相对较慢 2.无法自动化
Workbench	923S	1.配置简单，选项丰富 2.自动映射(索引)	1.容易异常报错 2.无法自定义语句
SSIS	1654S	1.功能强大	1.速度慢 2.限制比较多
kettle	868S	1.功能强大 2.速度较快	1.配置复杂
program	1780S	1.灵活	1.速度慢

变更记录

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- Replication

  TimeStamp、Sp_Ms_Del

- Always On

  CDC

- Program

全/增量比对（ python ）

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1

```
mysql:
  host: 192.168.144.128
  port: 3306
  user: [redacted]
  password: [redacted]
  database: tpcc

mssql:
  host: 192.168.236.153
  port: 1433
  user: [redacted]
  password: [redacted]
  database: tpcc

redis:
  host: 127.0.0.1
  port: 26079
  db : 4

metadata:
  - name : stock_compare
    mysql-table: stock
    mssql-table: stock
    page-size: 100
    page-model: 2
    mysql-primary-key: s_i_id,s_w_id
    mssql-primary-key: s_i_id,s_w_id
    mysql-columns: ["s_i_id","s_w_id","s_data", "s_dist_01", "s_remote_cnt"]
    mssql-columns: ["s_i_id","s_w_id",ltrim(RTRIM(s_data)) as "s_data", ltrim(RTRIM(s_dist_01)) as "s_dist_01", "s_remote_cnt"]
    mysql-order-by: s_i_id,s_w_id
    mssql-order-by: s_i_id,s_w_id
    mysql-where-sql: 'where 1=1'
    mssql-where-sql: 'where 1=1'
  - name : item_compare
    mysql-table: item
    mssql-table: item
    page-size: 100
    page-model: 1
    mysql-primary-key: itemid
    mssql-primary-key: itemid
    mysql-columns: ["i_id","i_name","s_data", "i_price", "i_data"]
    mssql-columns: ["i_id",ltrim(RTRIM(i_name)) as "i_name", "i_price", ltrim(RTRIM(i_data)) as "i_data"]
    mysql-order-by: itemid
    mssql-order-by: itemid
    mysql-where-sql: 'where 1=1'
    mssql-where-sql: 'where 1=1'
```

2

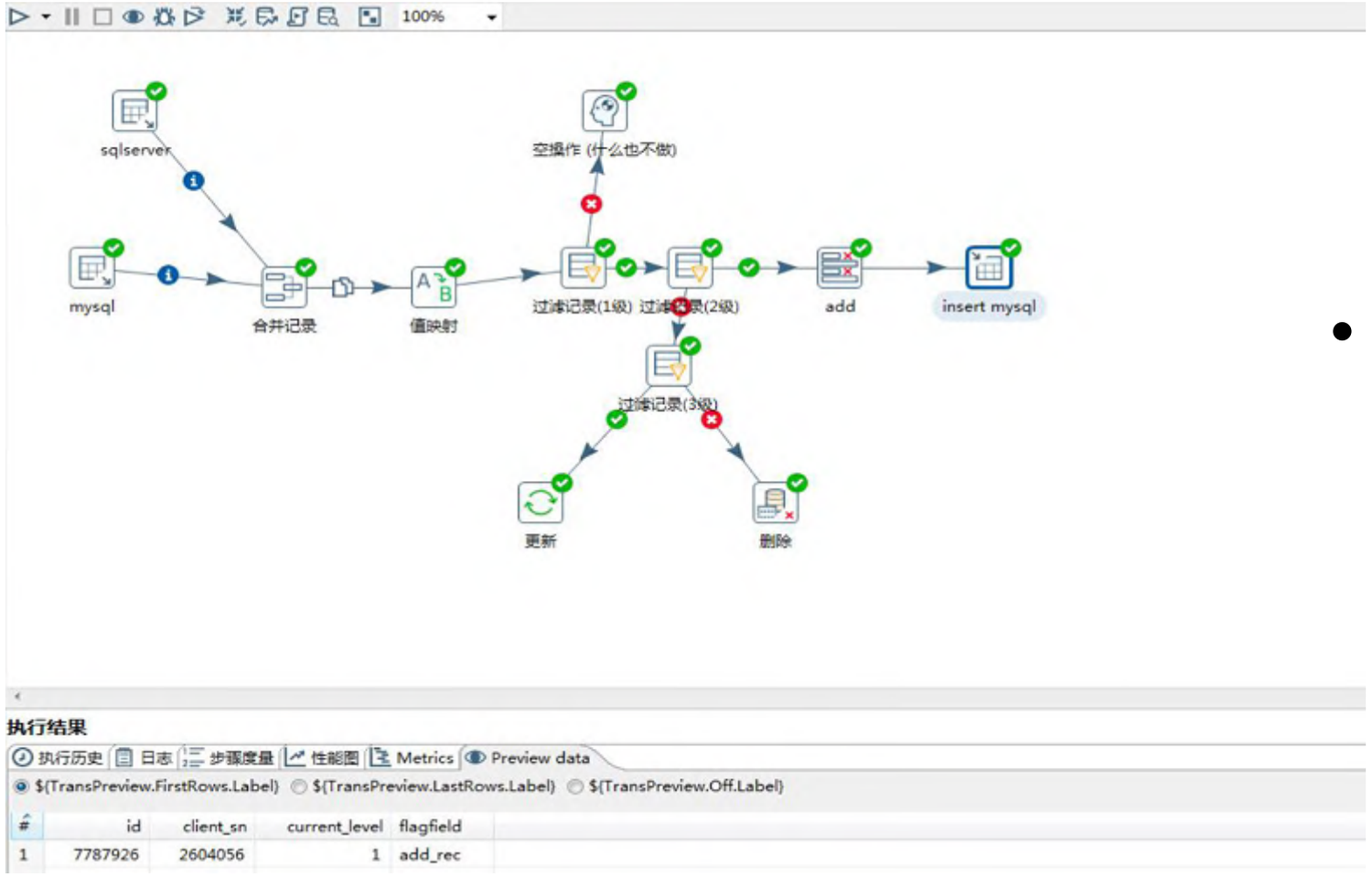
```
[root@localhost dbcompare]# python3.4 compare.py
### Run Page From 0 To 24 ####
### Run Page From 24 To 48 ####
### Run Page From 48 To 72 ####
### Run Page From 72 To 100 ####
select s_i_id,s_w_id,ltrim(RTRIM(s_data)) as "s_data",ltrim(RTRIM(s_dist_01)) as "s_dist_01",s_remote_cnt from stock2  where 1=1  and id >= 72
000 and id < 730000 order by id
select s_i_id,s_w_id,ltrim(RTRIM(s_data)) as "s_data",ltrim(RTRIM(s_dist_01)) as "s_dist_01",s_remote_cnt from stock2  where 1=1  and id >= 48
000 and id < 490000 order by id
select s_i_id,s_w_id,ltrim(RTRIM(s_data)) as "s_data",ltrim(RTRIM(s_dist_01)) as "s_dist_01",s_remote_cnt from stock2  where 1=1  and id >= 24
000 and id < 250000 order by id
select s_i_id,s_w_id,ltrim(RTRIM(s_data)) as "s_data",ltrim(RTRIM(s_dist_01)) as "s_dist_01",s_remote_cnt from stock2  where 1=1  and id >= 0
nd id < 10000 order by id
select s_i_id,s_w_id,s_data,s_dist_01,s_remote_cnt from stock3  where 1=1  and id >= 720000 and id < 730000 order by id
select s_i_id,s_w_id,s_data,s_dist_01,s_remote_cnt from stock3  where 1=1  and id >= 0 and id < 10000 order by id
select s_i_id,s_w_id,s_data,s_dist_01,s_remote_cnt from stock3  where 1=1  and id >= 480000 and id < 490000 order by id
select s_i_id,s_w_id,s_data,s_dist_01,s_remote_cnt from stock3  where 1=1  and id >= 240000 and id < 250000 order by id
select s_i_id,s_w_id,ltrim(RTRIM(s_data)) as "s_data",ltrim(RTRIM(s_dist_01)) as "s_dist_01",s_remote_cnt from stock2  where 1=1  and id >= 73
000 and id < 740000 order by id
select s_i_id,s_w_id,ltrim(RTRIM(s_data)) as "s_data",ltrim(RTRIM(s_dist_01)) as "s_dist_01",s_remote_cnt from stock2  where 1=1  and id >= 49
000 and id < 500000 order by id
select s_i_id,s_w_id,ltrim(RTRIM(s_data)) as "s_data",ltrim(RTRIM(s_dist_01)) as "s_dist_01",s_remote_cnt from stock2  where 1=1  and id >= 10
00 and id < 20000 order by id
select s_i_id,s_w_id,ltrim(RTRIM(s_data)) as "s_data",ltrim(RTRIM(s_dist_01)) as "s_dist_01",s_remote_cnt from stock2  where 1=1  and id >= 25
000 and id < 260000 order by id
select s_i_id,s_w_id,s_data,s_dist_01,s_remote_cnt from stock3  where 1=1  and id >= 730000 and id < 740000 order by id
select s_i_id,s_w_id,s_data,s_dist_01,s_remote_cnt from stock3  where 1=1  and id >= 490000 and id < 500000 order by id
select s_i_id,s_w_id,s_data,s_dist_01,s_remote_cnt from stock3  where 1=1  and id >= 10000 and id < 20000 order by id
select s_i_id,s_w_id,s_data,s_dist_01,s_remote_cnt from stock3  where 1=1  and id >= 250000 and id < 260000 order by id
```

3

```
[root@localhost dbcompare]# more logger.log

INFO:root:task[stock_compare_0] => b'(6, 1, 'mWsFcuUbKNbBwEBWsqEzCnxJw', 'j5j7pcyxmlgxyithW4RTdEm', 0)'
INFO:root:task[stock_compare_0] => b'(7, 1, 'eXofmgyTJhnadSbmUfqLu#cgzo', 'OvAGlPEqxdkJOtS2mngQxLgr', 0)'
INFO:root:task[stock_compare_0] => b'(5, 1, 'sAbURrCuAVFxQxyyIVzoZIoMyYldGpAvqyuC3ij', 'DjzUQIFUmBBPmbLjvaZEDW', 0)'
INFO:root:task[stock_compare_0] => b'(8, 1, 'GvpYvNdvuLacfARPuvsxVeotpYbs1oSwmI', 'GYuzso15g5xWjqbbLCjfiQm', 0)'
INFO:root:task[stock_compare_0] => b'(9, 1, 'UGRJPajbiZxnYlJuBBQFhjWfWDKXQG7lEE', 'ulWQEQprtN4U2ZBWyzzUUBI', 0)'
INFO:root:task[stock_compare_0] => b'(4, 1, 'agaL5vGkGwxA6fQjwyYwvSbmuzNd2', 'SbKTJaFQmH7SaqMXeNlVFtx7', 0)'
INFO:root:task[stock_compare_0] => b'(3, 1, '4QDnYmmuSeLLBWvIumeEmnjvCSCpIBMMaLrIf', 'v5NlqBBZyQbEGGr1jvAaTIE', 0)'
INFO:root:task[stock_compare_0] => b'(10, 1, 'EbGNSZGaFrBpRbSmSWMHwIjxuayUqoBdQxJ2', 'wCwkUWdP5IJuJwkRPXBuGoYR', 0)'
```

全/增量比对（kettle）



- char字符串长度,trim()

迁移方案

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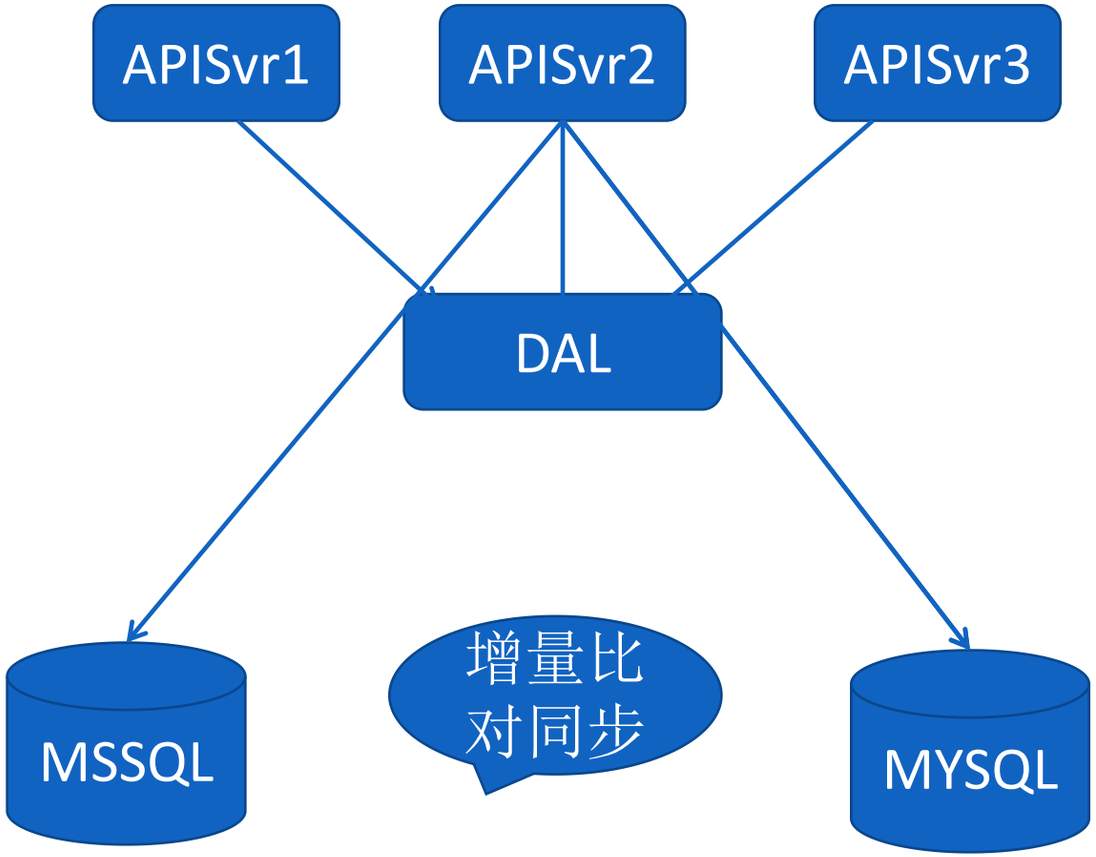

- 全\增量迁移
- 部署双写程序(开关)
- 全\增量比对同步
- 切换开关访问MySQL

03 问题集

问题点(一)

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- 日期类型

  mysql 默认是到s，精确到ms、μs，需要将字段设置成timestamp(3)、timestamp(6);

```
mysql> create table abc (dt timestamp(3)  not null default CURRENT_TIMESTAMP(3),b varchar(10));
Query OK, 0 rows affected (0.02 sec)

mysql> insert into abc(b) select 'aaa';
Query OK, 1 row affected (0.00 sec)
Records: 1  Duplicates: 0  Warnings: 0

mysql> select * from abc;
+-------------------------+------+
| dt                      | b    |
+-------------------------+------+
| 2017-04-20 11:01:37.642 | aaa  |
+-------------------------+------+
1 row in set (0.00 sec)
```

- 浮点类型

  float ,money … 转换decimal

```
mysql> insert into test_float (col1)  select '1257.1256';
Query OK, 1 row affected (0.00 sec)
Records: 1  Duplicates: 0  Warnings: 0

mysql> select * from test_float;
+---------+
| col1    |
+---------+
| 1257.13 |
+---------+
```

问题点（二）

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索引

- primary key
  mysql 主键索引必须是聚集索引，mssql 可以将主键索引和聚集索引拆分

- 索引大小限制
  ERROR 1071 (423000): Specified key was too long; max key length is 767 bytes

- 联合索引最多支持16列

问题点（三）

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My.cnf

- explicit_defaults_for_timestamp=1
- innodb_large_prefix = ON
- character-set-server = utf8mb4
- log-bin-trust-function-creators = 1
- innodb_strict_mode = 1

- Sql_mode=NO_ENGINE_SUBSTITUTION,STRICT_TRANS_TABLES,
ONLY_FULL_GROUP_BY,
ERROR_FOR_DIVISION_BY_ZERO,NO_ZERO_IN_DATE

运维相关

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- 安装配置
- 备份还原
- 管理工具
- 高可用
- 监控
- ....

未来展望

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THANK YOU！