

# 3.数据校验与修复工具调研

## 1.PingCAP的sync-diff-inspector工具

官方文档: <https://docs.pingcap.com/zh/tidb/stable/sync-diff-inspector-overview>

### 快速使用

下载页面: <https://docs.pingcap.com/zh/tidb/stable/download-ecosystem-tools>

这里在10.2.3.167环境已经下载并解压到tidb-community-toolkit目录下:

```
1 [root@localhost tools]# pwd
2 /usr/local/tools
3 [root@localhost tools]# ll
4 total 1163956
5 drwxr-xr-x 6 root root 4096 Jan 16 13:37 tidb-community-toolkit
6 -rw-r--r-- 1 root root 1191886466 Jan 12 18:27 tidb-community-toolkit-v7.5.0-
linux-amd64.tar.gz
```

为了快速使用，我们这里仅先将同一个表，既作为源，又作为目标，进行校验。

### 1.配置

在tidb-community-toolkit目录下新增配置文件:

#### config.toml

```
1 ##### Global config #####
2 check-thread-count = 4          # 检查数据的线程数量
3 export-fix-sql = true          # 如果开启，若表数据存在不一致，则输出用于修复的
                                # SQL语句
4 check-struct-only = false      # 只对比表结构而不对比数据
5 ##### Datasource config #####
6 [data-sources]
7 [data-sources.mysql1]           # 上游MySQL数据库配置（源端）
8     host = "10.2.3.167"
```

```
9      port = 3306
10     user = "user"
11     password = "Lachesis-mh_1024"
12 [data-sources.mysql2]          # 下游MySQL数据库配置（目标端）
13     host = "10.2.3.167"
14     port = 3306
15     user = "user"
16     password = "Lachesis-mh_1024"
17
18 ##### Task config #####
19 [task]
20     output-dir = "./output_1"
21     source-instances = ["mysql1"]          # 上游数据库，内容是data-sources声明的唯一标识id，分库分表场景下支持多个上游数据库，如：["mysql10", "mysql20"]
22     target-instance = "mysql2"           # 下游数据库，内容是data-sources声明的唯一标识id
23     target-check-tables = ["windranger_emr.pat_inhos_order_group_bak1"] # 需要比对的下游数据库的表，每个表需要包含数据库名和表名，两者由.隔开
```

## 2.执行

```
1 # ./sync_diff_inspector --config=./config.toml
2 A total of 1 tables need to be compared
3
4 Progress [>-----] 0%
0/0
5 Comparing the table structure of
` `windranger_emr` . `pat_inhos_order_group_bak1` `` ... equivalent
6 Comparing the table data of ``windranger_emr` . `pat_inhos_order_group_bak1` ``
... equivalent
7
8 Progress [=====>] 100%
0/0
9 A total of 1 table have been compared and all are equal.
10 You can view the comparision details through './output_1/sync_diff.log'
```

## 3.查看结果

输出文件：

```
1 # tree ./output_1
2 ./output_1
3   └── checkpoint
4     └── 8cf88e35534ead7225e205a6a8ae2911df262ef67ba58083e9fe15f61f1411a8
5   └── fix-on-mysql2
6   └── summary.txt
7   └── sync_diff.log
```

具体说明参见：<https://docs.pingcap.com/zh/tidb/stable/sync-diff-inspector-overview#%E8%BE%93%E5%87%BA%E6%96%87%E4%BB%B6>

查看校验与修复的汇总输出文件：

```
[root@localhost tidb-community-toolkit]# cat output_1/summary.txt
```

## Summary

### Source Database

```
host = "10.2.3.167"  
port = 3306  
user = "user"
```

### Target Databases

```
host = "10.2.3.167"  
port = 3306  
user = "user"
```

### Comparison Result

The table structure and data in following tables are equivalent

TABLE	UPCOUNT	DOWNCOUNT
`windranger_emr`.`pat_inhos_order_group_bak1`	28735078	28735078

Time Cost: 1m54.330992337s ← 校验耗时

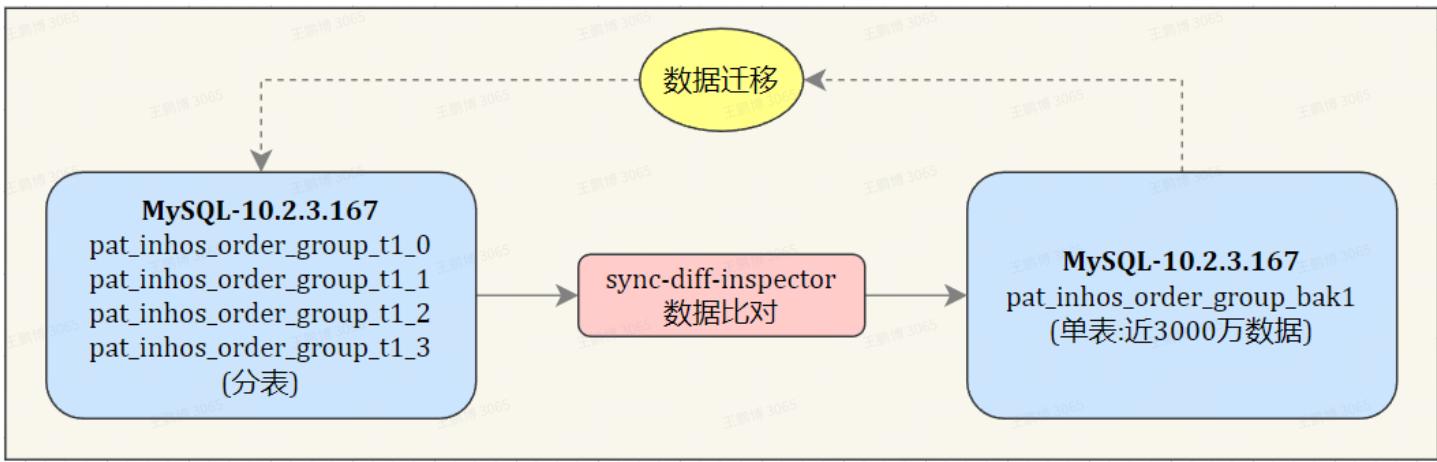
Average Speed: 36.621741MB/s

可以看到表结构和数据是相同的。

是否符合预期：是！

## 分库分表校验\_场景1

前提：准备单表和分库分表，并将单表中的数据已经迁移至分库分表。



## 1. 配置

在tidb-community-toolkit目录下新增配置文件：

**config\_order\_group.toml**

```

1 ##### Global config #####
2 check-thread-count = 4          # 检查数据的线程数量
3 export-fix-sql = true          # 如果开启，若表数据存在不一致，则输出用于修复的
4 check-struct-only = false      # 只对比表结构而不对比数据
5
6 ##### Datasource config #####
7 [data-sources.mysql1]          # 上游MySQL数据库配置（源端）
8     host = "10.2.3.167"
9     port = 3306
10    user = "user"
11    password = "Lachesis-mh_1024"
12    route-rules = ["rule1"]
13 [data-sources.mysql2]          # 下游MySQL数据库配置（目标端）
14     host = "10.2.3.167"
15     port = 3306
16     user = "user"
17     password = "Lachesis-mh_1024"
18
19 ##### Routes #####
20 # 如果需要对比大量的不同库名或者表名的数据，或者用于校验上游多个分表与下游总表的数据，可以通过table-rule来设置映射关系
21 [routes.rule1]
22 schema-pattern = "windranger_emr"          # 匹配数据源的库名，支持通配符 "*" 和 "?"
23 table-pattern = "pat_inhos_order_group_t1_[0-3]"  # 匹配数据源的表名，支持通配符 "*" 和 "?"
24 target-schema = "windranger_emr"           # 目标库名

```

```
25 target-table = "pat_inhos_order_group_bak1" # 目标表名
26
27 ##### Task config #####
28 [task]
29     output-dir = "./output_order_group_sharding"
30     source-instances = ["mysql1"] # 上游数据库, 内容是data-sources声明的唯一标识id, 分库分表场景下支持多个上游数据库, 如: ["mysql10", "mysql20"]
31     target-instance = "mysql2" # 下游数据库, 内容是data-sources声明的唯一标识id
32     target-check-tables = ["windranger_emr.pat_inhos_order_group_bak1"] # 需要比对的下游数据库的表, 每个表需要包含数据库名和表名, 两者由.隔开
```

## 2. 执行

```
1 # ./sync_diff_inspector --config=./config.toml
2 A total of 1 tables need to be compared
3
4 Progress [>-----] 0% 0/0
5 Comparing the table structure of
` `windranger_emr`.`pat_inhos_order_group_bak1` ... failure
6 Comparing the table data of ``windranger_emr`.`pat_inhos_order_group_bak1``
... equivalent
7 -----
8 Progress [=====>] 100% 0/0
9 The structure of `windranger_emr`.`pat_inhos_order_group_bak1` is not equal
10
11 The rest of tables are all equal.
12
13 A total of 1 tables have been compared, 0 tables finished, 1 tables failed, 0
tables skipped.
14 The patch file has been generated in
15     'output_order_group_sharding/fix-on-mysql2/'
16 You can view the comparision details through
    './output_order_group_sharding/sync_diff.log'
```

从上面日志看到, 校验结果是:

- 表结构不相同: 因为本来对比表名称就不同, 所以表结构是不同的。

- 表数据相同。

### 3. 查看结果

查看校验与修复的汇总输出文件：

```
[root@localhost tidb-community-toolkit]# cat ./output_order_group_sharding/summary.txt
Summary
```

#### Source Database

```
host = "10.2.3.167"
port = 3306
user = "user"
```

#### Target Databases

```
host = "10.2.3.167"
port = 3306
user = "user"
```

#### Comparison Result

表结构不是不相同么(⊙o⊙)...

The table structure and data in following tables are equivalent

The following tables contains inconsistent data

TABLE	RESULT	STRUCTURE EQUALITY	DATA DIFF ROWS	UPCOUNT	DOWNCOUNT
`windranger_emr`.`pat_inhos_order_group_bak1`	succeed	false	+0/-0	28735078	28735078

Time Cost: 4m2.743084715s  
Average Speed: 17.248689MB/s

注意：并不是像图中红字那样理解的！而是说以下展示的相同的表结构和表数据信息，可以看到并没有。接下来，展示的是表中不一致数据信息。

是否符合预期：是！

### 4. 扩展

这里假设我改动了单表的数据，看看能否根据工具生成最终的数据修复SQL？

```
1 UPDATE windranger_emr.pat_inhos_order_group_bak1 t SET t.create_person =
'system_001' WHERE t.seq_id = 2165679
```

重新执行，查看结果：

```
1 # ./sync_diff_inspector --config=./config_order_group.toml
```

```
2 A total of 1 tables need to be compared
3
4 Progress [>-----] 0%
0/0
5 Comparing the table structure of
`windranger_emr`.`pat_inhos_order_group_bak1` ... failure
6 Comparing the table data of `windranger_emr`.`pat_inhos_order_group_bak1` ...
... failure
7 -----
8 Progress [=====] 100%
0/0
9 The structure of `windranger_emr`.`pat_inhos_order_group_bak1` is not equal
10 The data of `windranger_emr`.`pat_inhos_order_group_bak1` is not equal
11
12 The rest of tables are all equal.
13
14 A total of 1 tables have been compared, 0 tables finished, 1 tables failed, 0
tables skipped.
15 The patch file has been generated in
16     'output_order_group_sharding/fix-on-mysql2/'
17 You can view the comparision details through
'./output_order_group_sharding/sync_diff.log'
```

从上面日志看到，校验结果是：

- 表结构不相同：因为本来对比表名称就不同，所以表结构是不同的。
- 表数据不相同：因为我们修改了一条记录。那具体的变动信息是哪些呢？有没有修复SQL呢？

查看校验与修复的汇总输出文件：

```
[root@localhost tidb-community-toolkit]# cat ./output_order_group_sharding/summary.txt
```

Summary

### Source Database

```
host = "10.2.3.167"  
port = 3306  
user = "user"
```

### Target Databases

```
host = "10.2.3.167"  
port = 3306  
user = "user"
```

### Comparison Result

The table structure and data in following tables are equivalent

The following tables contains inconsistent data 表包含不一致的数据信息

TABLE	RESULT	STRUCTURE EQUALITY	DATA DIFF ROWS	UPCOUNT	DOWNCOUNT
`windranger_emr`.`pat_inhos_order_group_bak1`	succeed	false	+1/-1	28735078	28735078

Time Cost: 3m59.433643854s  
Average Speed: 17.487100MB/s

此时，查看数据修复SQL：

```
[root@localhost tidb-community-toolkit]# tree output_order_group_sharding/  
output_order_group_sharding/  
├── checkpoint  
│   └── 544fd16ddfe48de09fc3594bb712788a3c0c2cc2984e0013bd3f4fdfcb9cd155  
├── fix-on-mysql2  
│   └── windranger_emr:pat_inhos_order_group_bak1:0:0-0-0:0.sql  
└── summary.txt  
sync_diff.log
```

查看具体的SQL：

```
[root@localhost tidb-community-toolkit]# cat output_order_group_sharding/fix-on-mysql2/windranger_emr:pat_inhos_order_group_bak1:0:  
0-0-0:0.sql  
-- table: windranger_emr.pat_inhos_order_group_bak1  
-- range in sequence: (seq_id) <= (2262080)  
/*  
  DIFF COLUMNS | `CREATE PERSON`  
  _____|_____  
 source data | 'system'  
 target data | 'system_001'  
*/  
REPLACE INTO `windranger_emr`.`pat_inhos_order_group_bak1`(`seq_id`, `group_unique_code`, `order_group_no`, `inhos_code`, `orderbar`, `pa  
ckage_bar`, `plan_time`, `order_sort_no`, `source_type`, `isprint`, `execute_status`, `execute_date`, `print_date`, `execute_person`, `print_<br>  
person`, `apply_time`, `is_dispensed`, `remark`, `reason`, `execute_type`, `start_execute_user`, `start_execute_date`, `start_check_user`, `end_<br>  
execute_user`, `end_execute_date`, `create_time`, `create_person`, `update_time`, `update_person`) VALUES (2165679, '107844532202160207<br>  
815846237', '815846237', '10784453', 'blrxy@107844532202160207815846237', NULL, '2022-02-16 02:07:12', 1, NULL, 0, 0, NULL, NULL, NULL, NULL,<br>  
, 0, NULL, NULL, 0, NULL, NULL, NULL, NULL, '2022-02-16 18:00:05', 'system', NULL, NULL);
```

可以看到，是我们先前更新的数据信息，该SQL的作用是将目标表数据更新为与源表一致。

可以看到这里是以上游表为参照，所以最终的目的是让下游表与上游表数据保持一致，通过官方文档证实！

一个 SQL 文件会包含该 chunk 的所属表以及表示的范围信息。对每个修复 SQL 语句，有三种情况：

- 下游数据库缺失行，则是 REPLACE 语句
- 下游数据库冗余行，则是 DELETE 语句
- 下游数据库行部分数据不一致，则是 REPLACE 语句，但会在 SQL 文件中通过注释的方法标明不同的列

```
-- table: sbtest.sbtest99
-- range in sequence: (3690708) < (id) <= (3720581)
/*
----- DIFF COLUMNS -----
| `K` | `C` | `PAD` |
|-----|
| source data | 2501808 | 'hello' |
|-----|
| target data | 5003616 | '0709824117-9809973320-4456050422' |
|-----|
|-----|
|-----|
|-----|
REPLACE INTO `sbtest`.`sbtest99`(`id`, `k`, `c`, `pad`) VALUES (3700000, 2501808, 'hello', 'world');
```

是否符合预期：是！

## Original Confluence page attachments

Name	Size	Created by	Created on	Labels	Comment
 image-2024-1-16_15-8-... 44.92KB	44.92 KB	王鹏博	2024-01-16T15:07:38.000+08:00		
 image-2024-1-16_15-6-... 41.68KB	41.68 KB	王鹏博	2024-01-16T15:05:24.000+08:00		
 image-2024-1-16_14-51-... 105.90KB	105.90 KB	王鹏博	2024-01-16T14:50:13.000+08:00		
 image-2024-1-16_14-45-... 93.99KB	93.99 KB	王鹏博	2024-01-16T14:44:25.000+08:00		

 image-2024-1-16_14-43-... 32.70KB	32.70 KB	王鹏博	2024-01-16T14:42:49.000+08:00		
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 image-2024-1-16_14-24-... 103.06KB	103.06 KB	王鹏博	2024-01-16T14:23:02.000+08:00		
 image-2024-1-16_14-0-... 78.58KB	78.58 KB	王鹏博	2024-01-16T13:59:20.000+08:00		