

Tungsten Replicator Master Class

Basics: Working with Command Line Tools

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Topics

In this short course, we will

- Re-cap the previous Installation
- Explore the main Command Line Tools
 - `tpm`
 - `trepctl`
 - `thl`

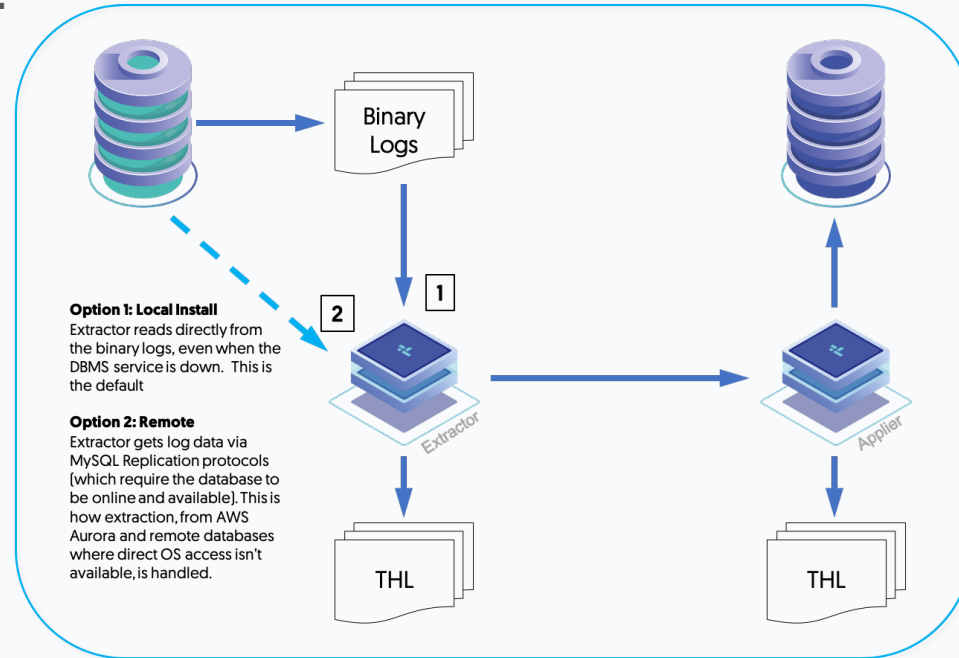


Installation Re-Cap



Tungsten Replicator

Simple MySQL/MySQL



Command Line Tools



tpm

- Tungsten Package Manager
- As well as using `tpm` for installs and updates, it can also be used for a number of other actions. You can issue `tpm help` for a list of possible options.
- Most common options:
 - `tools/tpm validate[-update]`
 - `[tools/]tpm update [--replace-release]`
 - `tools/tpm install`
 - `tpm diag` – Gathers package of stats for support!
 - `tpm mysql` – Launches the MySQL command-line client and connects to the MySQL server process running on the local host



trepctl

- Used to control and manage the replicator Java process
- Most common uses are
 - View replicator status
 - Stop/Start replication
 - Skip “safe” errors
- `trepctl help` to see all options



trepctl

- `trepctl services`
 - Short list output of all services running on the host
 - Shows basic information
- `trepctl [-service SERVICENAME] status [-r N]`
 - Shows the full status of the replicator
 - Specify `-service` if multiple services available
 - Specify `-r N` to refresh every *N* seconds or until CTRL+C
- `trepctl [-service SERVICENAME] status -name stages`
 - A more complete status view showing detailed output of each replicator stage



trepctl

- `trepctl [-service SERVICENAME] qs [-r N]`
 - Shows a quick summary of the replicator progress
 - Specify `-service` if multiple services available
 - Specify `-r N` to refresh every *N* seconds or until CTRL+C
- `trepctl [-service SERVICENAME] perf [-r N]`
 - Shows the status of each stage of the replication pipeline
 - Output differs between Primary and Replicas
 - Specify `-service` if there are multiple services available
 - Specify `-r N` to refresh every *N* seconds or until CTRL+C



trepctl

- `trepctl [-service SERVICENAME] reset {OPTIONS}`
 - Performs a FULL reset of the replicator
 - **VERY** destructive if used incorrectly
 - Resets SEQNO to 0
- `trepctl [-service SERVICENAME] offline|online {OPTIONS}`
 - Bring a service online or offline
 - Can be used with various options to control how/when
 - Used with `-skip-seqno` to skip errors



trepctl status

```
appliedLastEventId      : mysql-bin.000005:0000000051631947;-1
appliedLastSeqno        : 166764
appliedLatency           : 0.769
autoRecoveryEnabled     : false
autoRecoveryTotal       : 0
channels                 : 1
clusterName              : alpha
currentEventId           : mysql-bin.000005:0000000051631947
currentTimeMillis       : 1578578135591
dataServerHost           : trainingdb1
extensions               :
host                     : trainingdb1
latestEpochNumber       : 9
masterConnectUri         : thl://localhost:/
masterListenUri          : thl://trainingdb1:2112/
```



trepctl status

```
appliedLastEventId      : mysql-bin.000005:0000000051631947;-1
appliedLastSeqno        : 166764
appliedLatency           : 0.769
autoRecoveryEnabled     : false
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clusterName              : alpha
currentEventId          : mysql-bin.000005:0000000051631947
currentTimeMillis       : 1578578135591
dataServerHost          : trainingdb1
extensions               :
host                     : trainingdb1
latestEpochNumber      : 9
masterConnectUri        : thl://localhost:/
masterListenUri         : thl:// trainingdb1 :2112/
```



On a Primary, the last ending binary log position written to the THL along with the Seqno for that event, and the latency between the database commit to the binlog and the THL write completion.

On a replica, displays the last event written to the target database with the corresponding Seqno, and the latency between the source database commit and the completed apply of that event to the target database.



trepctl status

```
appliedLastEventId      : mysql-bin.000005:0000000051631947;-1
appliedLastSeqno        : 166764
appliedLatency           : 0.769
autoRecoveryEnabled      : false
autoRecoveryTotal        : 0
channels                 : 1
clusterName              : alpha
currentEventId           : mysql-bin.000005:0000000051631947
currentTimeMillis        : 1578578135591
dataServerHost           : trainingdb1
extensions               :
host                     : trainingdb1
latestEpochNumber       : 9
masterConnectUri         : thl://localhost:/
masterListenUri          : thl:// trainingdb1 :2112/
```

← Auto-Recovery properties



trepctl status

```
appliedLastEventId      : mysql-bin.000005:0000000051631947;-1
appliedLastSeqno        : 166764
appliedLatency           : 0.769
autoRecoveryEnabled     : false
autoRecoveryTotal       : 0
channels                 : 1
clusterName              : alpha
currentEventId           : mysql-bin.000005:0000000051631947
currentTimeMillis       : 1578578135591
dataServerHost          : trainingdb1
extensions               :
host                     : trainingdb1
latestEpochNumber      : 9
masterConnectUri        : thl://localhost:/
masterListenUri         : thl://trainingdb1:2112/
```

← Current Binlog position of the database (NONE on Replicas)

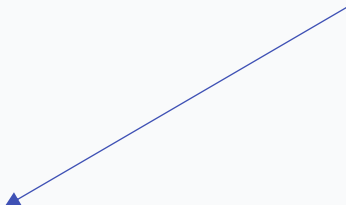


trepctl status

```
appliedLastEventId      : mysql-bin.000005:0000000051631947;-1
appliedLastSeqno        : 166764
appliedLatency           : 0.769
autoRecoveryEnabled      : false
autoRecoveryTotal        : 0
channels                  : 1
clusterName              : alpha
currentEventId           : mysql-bin.000005:0000000051631947
currentTimeMillis        : 1578578135591
dataServerHost           : trainingdb1
extensions                :
host                      : trainingdb1
latestEpochNumber       : 9
masterConnectUri         : thl://localhost:/
masterListenUri          : thl://trainingdb1:2112/
```

masterConnectUri shows the source THL server we are connected to

masterListenUri shows the THL server listener protocol, host and port information for replicas to connect with



trepctl status

```
maximumStoredSeqNo      : 166764
minimumStoredSeqNo      : 0
offlineRequests         : NONE
pendingError            : NONE
pendingErrorCode        : NONE
pendingErrorEventId     : NONE
pendingErrorSeqno       : -1
pendingExceptionMessage : NONE
pipelineSource          : /var/lib/mysql
relativeLatency         : 580.591
resourceJdbcDriver      : org.drizzle.jdbc.DrizzleDriver
resourceJdbcUrl         : jdbc:mysql:thin://trainingdb1:13306/${DBNAME}. . .
resourcePrecedence      : 99
resourceVendor          : mysql
rmiPort                 : 10000
```



trepctl status

```
maximumStoredSeqNo      : 166764
minimumStoredSeqNo      : 0
offlineRequests         : NONE
pendingError            : NONE
pendingErrorCode        : NONE
pendingErrorEventId     : NONE
pendingErrorSeqno       : -1
pendingExceptionMessage : NONE
pipelineSource          : /var/lib/mysql
relativeLatency         : 580.591
resourceJdbcDriver      : org.drizzle.jdbc.DrizzleDriver
resourceJdbcUrl         : jdbc:mysql:thin:// trainingdb1:13306 /${DBNAME}. . .
resourcePrecedence     : 99
resourceVendor          : mysql
rmiPort                 : 10000
```

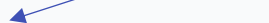
When the Replicator goes into an OFFLINE : ERROR state, these fields will show all the associated information. Always check the `trepctl.log` file for more detail as needed.



trepctl status

```
maximumStoredSeqNo      : 166764
minimumStoredSeqNo      : 0
offlineRequests         : NONE
pendingError            : NONE
pendingErrorCode        : NONE
pendingErrorEventId     : NONE
pendingErrorSeqno       : -1
pendingExceptionMessage : NONE
pipelineSource          : /var/lib/mysql
relativeLatency         : 580.591
resourceJdbcDriver      : org.drizzle.jdbc.DrizzleDriver
resourceJdbcUrl         : jdbc:mysql:thin://trainingdb1:13306/${DBNAME}. . .
resourcePrecedence     : 99
resourceVendor          : mysql
rmiPort                 : 10000
```

The current source of THL. A Primary will show the binary log directory, a Replica will match the masterListenURI from the extractor.



trepctl status

```
maximumStoredSeqNo      : 166764
minimumStoredSeqNo      : 0
offlineRequests         : NONE
pendingError            : NONE
pendingErrorCode        : NONE
pendingErrorEventId     : NONE
pendingErrorSeqno       : -1
pendingExceptionMessage : NONE
pipelineSource          : /var/lib/mysql
relativeLatency         : 580.591
resourceJdbcDriver      : org.drizzle.jdbc.DrizzleDriver
resourceJdbcUrl         : jdbc:mysql:thin://trainingdb1:13306/${DBNAME}. . .
resourcePrecedence      : 99
resourceVendor          : mysql
rmiPort                 : 10000
```

Latency between *NOW* and the timestamp of the last event in the local THL.



trepctl status

```
role                : master
seqnoType           : java.lang.Long
serviceName         : alpha
serviceType         : local
simpleServiceName    : alpha
siteName            : default
sourceId            : trainingdb1
state               : ONLINE
timeInStateSeconds  : 85641.738
timezone            : GMT
transitioningTo     :
uptimeSeconds       : 85673.511
useSSLConnection    : false
version             : Tungsten Clustering 6.1.4 build 44
```



trepctl status

```
role                : master ← Current role : master, slave
seqnoType           : java.lang.Long
serviceName         : training1
serviceType        : local
simpleServiceName   : training1
siteName            : default
sourceId            : trainingdb1
state               : ONLINE ←
timeInStateSeconds : 85641.738
timezone            : GMT
transitioningTo    :
uptimeSeconds       : 85673.511
useSSLConnection   : false
version             : Tungsten Clustering 6.1.4 build 44
```

Current State, can be :

- ONLINE
- ONLINE:DEGRADED
- ONLINE:DEGRADED-BINLOG-FULLY-READ
- OFFLINE:NORMAL
- SUSPECT
- OFFLINE:ERROR
- GOING-ONLINE:SYNCHRONISING
- GOING-ONLINE:RESTORING
- GOING-ONLINE:PROVISIONING



Applied Latency vs Relative Latency

The `appliedLatency` is the latency between the commit time of the **source** event and the time the last committed transaction reached the end of the corresponding pipeline within the replicator.

Within a **primary**, this indicates the latency between the transaction commit time and when it was written to the THL.

In a **replica**, it indicates the latency between the commit time on the **primary** database and when the transaction has been committed to the destination database.

Clocks must be synchronized across hosts for this information to be accurate. The latency is measured in seconds.

Increasing latency may indicate that the destination database is unable to keep up with the transactions from the primary. In replicators that are operating with parallel apply, `appliedLatency` indicates the latency of the trailing channel. Because the parallel apply mechanism does not update all channels simultaneously, the figure shown may trail significantly from the actual latency.

The `relativeLatency` is the latency between **now** and timestamp of the last event written into the local THL.

This information gives an indication of how fresh the incoming THL information is.

On a **primary**, it indicates whether the primary is keeping up with transactions generated on the primary database.

On a **replica**, it indicates how up to date the THL read from the extractor is.

A large value can either indicate that the database is not busy, that a large transaction is currently being read from the source database or from the primary replicator, or that the replicator has stalled for some reason.

An increasing `relativeLatency` on the replica may indicate that the replicator may have stalled and stopped applying changes to the database.



thl

- Interface for viewing the contents of the THL
- `thl help` to view all command options
- `thl info` – Show a summary of the THL available on disk
- `thl list` will product a lot of output, always use with options to filter the result set
 - `-low|from SEQ` – Start from supplied seqno
 - `-high|to SEQ` – Stop at supplied seqno
 - `-first` – Show first seqno available
 - `-first N` – Show first *N* entries
 - `-last` – Show last seqno available
 - `-last N` – Show last *N* entries
- `thl index` – re-index THL – can help to speed up replicator restarts
- `thl purge` – Use with **CARE** since this command will **REMOVE** ALL THL on disk for that service



thl

```
SEQ# = 2 / FRAG# = 0 (last frag)
- FILE = thl.data.00000000001
- TIME = 2020-01-08 13:50:52.0
- EPOCH# = 0
- EVENTID = mysql-bin.000005:00000000000000939;12297
- SOURCEID = db1
- METADATA = [mysql_server_id=101;unsafe_for_block_commit;dbms_type=mysql;tz_aware=true; \
- service=training1;shard=hr]
- TYPE = com.continuent.tungsten.replicator.event.ReplDBMSEvent
- OPTIONS = [##charset = UTF-8, autocommit = 1, sql_auto_is_null = 0, foreign_key_checks = 1, \
unique_checks = 1, auto_increment_increment = 2, auto_increment_offset = 1, \
sql_mode = 'NO_ENGINE_SUBSTITUTION,NO_AUTO_CREATE_USER,ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES, \
ERROR_FOR_DIVISION_BY_ZERO,NO_ZERO_DATE,NO_ZERO_IN_DATE', character_set_client = 33, \
collation_connection = 33, collation_server = 8]
- SCHEMA = hr
- SQL(0) = CREATE TABLE regions
  ( region_id      INT NOT NULL AUTO_INCREMENT PRIMARY KEY
  , region_name    VARCHAR(25)
  )
```



thl

```
SEQ# = 2 / FRAG# = 0 (last frag) ← Global Sequence number for the event
- FILE = thl.data.00000000001
- TIME = 2020-01-08 13:50:52.0
- EPOCH# = 0
- EVENTID = mysql-bin.000005:00000000000000939;12297
- SOURCEID = db1
- METADATA = [mysql_server_id=101;unsafe_for_block_commit;dbms_type=mysql;tz_aware=true; \
- service=training1;shard=hr]
- TYPE = com.continuent.tungsten.replicator.event.ReplDBMSEvent
- OPTIONS = [##charset = UTF-8, autocommit = 1, sql_auto_is_null = 0, foreign_key_checks = 1, \
unique_checks = 1, auto_increment_increment = 2, auto_increment_offset = 1, \
sql_mode = 'NO_ENGINE_SUBSTITUTION,NO_AUTO_CREATE_USER,ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES, \
ERROR_FOR_DIVISION_BY_ZERO,NO_ZERO_DATE,NO_ZERO_IN_DATE', character_set_client = 33, \
collation_connection = 33, collation_server = 8]
- SCHEMA = hr
- SQL(0) = CREATE TABLE regions
  ( region_id      INT NOT NULL AUTO_INCREMENT PRIMARY KEY
  , region_name    VARCHAR(25)
  )
```



thl

SEQ# = 2 / FRAG# = 0 (last frag)

```
- FILE = thl.data.0000000001 ← Associated THL File on Disk
- TIME = 2020-01-08 13:50:52.0
- EPOCH# = 0
- EVENTID = mysql-bin.000005:0000000000000939;12297
- SOURCEID = db1
- METADATA = [mysql_server_id=101;unsafe_for_block_commit;dbms_type=mysql;tz_aware=true; \
- service=training1;shard=hr]
- TYPE = com.continuent.tungsten.replicator.event.ReplDBMSEvent
- OPTIONS = [##charset = UTF-8, autocommit = 1, sql_auto_is_null = 0, foreign_key_checks = 1, \
unique_checks = 1, auto_increment_increment = 2, auto_increment_offset = 1, \
sql_mode = 'NO_ENGINE_SUBSTITUTION,NO_AUTO_CREATE_USER,ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES, \
ERROR_FOR_DIVISION_BY_ZERO,NO_ZERO_DATE,NO_ZERO_IN_DATE', character_set_client = 33, \
collation_connection = 33, collation_server = 8]
- SCHEMA = hr
- SQL(0) = CREATE TABLE regions
  ( region_id      INT NOT NULL AUTO_INCREMENT PRIMARY KEY
  , region_name    VARCHAR(25)
  )
```



thl

```
SEQ# = 2 / FRAG# = 0 (last frag)
- FILE = thl.data.00000000001
- TIME = 2020-01-08 13:50:52.0
- EPOCH# = 0
- EVENTID = mysql-bin.000005:00000000000000939;12297
- SOURCEID = db1
- METADATA = [mysql_server_id=101;unsafe_for_block_commit;dbms_type=mysql;tz_aware=true; \
- service=training1;shard=hr]
- TYPE = com.continuent.tungsten.replicator.event.ReplDBMSEvent
- OPTIONS = [##charset = UTF-8, autocommit = 1, sql_auto_is_null = 0, foreign_key_checks = 1, \
unique_checks = 1, auto_increment_increment = 2, auto_increment_offset = 1, \
sql_mode = 'NO_ENGINE_SUBSTITUTION,NO_AUTO_CREATE_USER,ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES, \
ERROR_FOR_DIVISION_BY_ZERO,NO_ZERO_DATE,NO_ZERO_IN_DATE', character_set_client = 33, \
collation_connection = 33, collation_server = 8]
- SCHEMA = hr
- SQL(0) = CREATE TABLE regions
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  )
```

Commit time to Binary Logs



thl

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- SOURCEID = db1
- METADATA = [mysql_server_id=101;unsafe_for_block_commit;dbms_type=mysql;tz_aware=true; \
- service=training1;shard=hr]
- TYPE = com.continuent.tungsten.replicator.event.ReplDBMSEvent
- OPTIONS = [##charset = UTF-8, autocommit = 1, sql_auto_is_null = 0, foreign_key_checks = 1, \
unique_checks = 1, auto_increment_increment = 2, auto_increment_offset = 1, \
sql_mode = 'NO_ENGINE_SUBSTITUTION,NO_AUTO_CREATE_USER,ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES, \
ERROR_FOR_DIVISION_BY_ZERO,NO_ZERO_DATE,NO_ZERO_IN_DATE', character_set_client = 33, \
collation_connection = 33, collation_server = 8]
- SCHEMA = hr
- SQL(0) = CREATE TABLE regions
  ( region_id      INT NOT NULL AUTO_INCREMENT PRIMARY KEY
    , region_name  VARCHAR(25)
  )
```

Associated Binary Log File and Position



th1

```
SEQ# = 2 / FRAG# = 0 (last frag)
- FILE = th1.data.00000000001
- TIME = 2020-01-08 13:50:52.0
- EPOCH# = 0
- EVENTID = mysql-bin.000005:0000000000000939;12297
- SOURCEID = db1 ← Source of transaction (Should be a Primary!)
- METADATA = [mysql_server_id=101;unsafe_for_block_commit;dbms_type=mysql;tz_aware=true; \
- service=training1;shard=hr]
- TYPE = com.continuent.tungsten.replicator.event.ReplDBMSEvent
- OPTIONS = [##charset = UTF-8, autocommit = 1, sql_auto_is_null = 0, foreign_key_checks = 1, \
unique_checks = 1, auto_increment_increment = 2, auto_increment_offset = 1, \
sql_mode = 'NO_ENGINE_SUBSTITUTION,NO_AUTO_CREATE_USER,ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES, \
ERROR_FOR_DIVISION_BY_ZERO,NO_ZERO_DATE,NO_ZERO_IN_DATE', character_set_client = 33, \
collation_connection = 33, collation_server = 8]
- SCHEMA = hr
- SQL(0) = CREATE TABLE regions
  ( region_id      INT NOT NULL AUTO_INCREMENT PRIMARY KEY
  , region_name    VARCHAR(25)
  )
```



th1

```
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- FILE = th1.data.00000000001
- TIME = 2020-01-08 13:50:52.0
- EPOCH# = 0
- EVENTID = mysql-bin.000005:0000000000000939;12297
- SOURCEID = db1
- METADATA = [mysql_server_id=101;unsafe_for_block_commit;dbms_type=mysql;tz_aware=true; \
- service=training1;shard=hr]
- TYPE = com.continuent.tungsten.replicator.event.ReplDBMSEvent
- OPTIONS = [##charset = UTF-8, autocommit = 1, sql_auto_is_null = 0, foreign_key_checks = 1, \
unique_checks = 1, auto_increment_increment = 2, auto_increment_offset = 1, \
sql_mode = 'NO_ENGINE_SUBSTITUTION,NO_AUTO_CREATE_USER,ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES, \
ERROR_FOR_DIVISION_BY_ZERO,NO_ZERO_DATE,NO_ZERO_IN_DATE', character_set_client = 33, \
collation_connection = 33, collation_server = 8]
- SCHEMA = hr
- SQL(0) = CREATE TABLE regions
  ( region_id      INT NOT NULL AUTO_INCREMENT PRIMARY KEY
  , region_name    VARCHAR(25)
  )
```

Metadata



thl

```
SEQ# = 2 / FRAG# = 0 (last frag)
- FILE = thl.data.000000000001
- TIME = 2020-01-08 13:50:52.0
- EPOCH# = 0
- EVENTID = mysql-bin.000005:0000000000000939;12297
- SOURCEID = db1
- METADATA = [mysql_server_id=101;unsafe_for_block_commit;dbms_type=mysql;tz_aware=true; \
- service=training1;shard=hr]
- TYPE = com.continuent.tungsten.replicator.event.ReplDBMSEvent
- OPTIONS = [##charset = UTF-8, autocommit = 1, sql_auto_is_null = 0, foreign_key_checks = 1, \
unique_checks = 1, auto_increment_increment = 2, auto_increment_offset = 1, \
sql_mode = 'NO_ENGINE_SUBSTITUTION,NO_AUTO_CREATE_USER,ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES, \
ERROR_FOR_DIVISION_BY_ZERO,NO_ZERO_DATE,NO_ZERO_IN_DATE', character_set_client = 33, \
collation_connection = 33, collation_server = 8]
- SCHEMA = hr
- SQL(0) = CREATE TABLE regions
  ( region_id      INT NOT NULL AUTO_INCREMENT PRIMARY KEY
    , region_name  VARCHAR(25)
  )
```

The database schema that the following SQL is being applied to



thl

```
SEQ# = 2 / FRAG# = 0 (last frag)
- FILE = thl.data.00000000001
- TIME = 2020-01-08 13:50:52.0
- EPOCH# = 0
- EVENTID = mysql-bin.000005:0000000000000939;12297
- SOURCEID = db1
- METADATA = [mysql_server_id=101;unsafe_for_block_commit;dbms_type=mysql;tz_aware=true; \
- service=training1;shard=hr]
- TYPE = com.continuent.tungsten.replicator.event.ReplDBMSEvent
- OPTIONS = [##charset = UTF-8, autocommit = 1, sql_auto_is_null = 0, foreign_key_checks = 1, \
unique_checks = 1, auto_increment_increment = 2, auto_increment_offset = 1, \
sql_mode = 'NO_ENGINE_SUBSTITUTION,NO_AUTO_CREATE_USER,ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES, \
ERROR_FOR_DIVISION_BY_ZERO,NO_ZERO_DATE,NO_ZERO_IN_DATE', character_set_client = 33, \
collation_connection = 33, collation_server = 8]
- SCHEMA = hr
- SQL(0) = CREATE TABLE regions
  ( region_id      INT NOT NULL AUTO_INCREMENT PRIMARY KEY
  , region_name    VARCHAR(25)
  )
```

← DDL Statement



thl

```
SEQ# = 5 / FRAG# = 0 (last frag)
- FILE = thl.data.00000000001
- TIME = 2020-01-08 13:51:38.0
- EPOCH# = 0
- EVENTID = mysql-bin.000005:00000000000001746;-1
- SOURCEID = db1
- METADATA = [mysql_server_id=101;dbms_type=mysql;tz_aware=true;service=training1;shard=hr]
- TYPE = com.continuent.tungsten.replicator.event.ReplDBMSEvent
- OPTIONS = [foreign_key_checks = 1, unique_checks = 1, time_zone = '+00:00', ##charset = UTF-8]
- SQL(0) =
- ACTION = INSERT
- SCHEMA = hr
- TABLE = regions
- ROW# = 0
- COL(1: ) = 1
- COL(2: ) = europe
```

← Row Change Data



Without pkey filter

When the PrimaryKey
(pkey) filter is enabled,
the key information is
optimized to only
contain the actual
primary keys for the
row-based THL record.

With pkey filter

UPDATE

```
- SQL(0) =  
- ACTION = UPDATE  
- SCHEMA = hr  
- TABLE = regions  
- ROW# = 0  
- COL(1: ) = 1  
- COL(2: ) = Europe  
- KEY(1: ) = 1  
- KEY(2: ) = europe
```

```
- SQL(0) =  
- ACTION = UPDATE  
- SCHEMA = hr  
- TABLE = regions  
- ROW# = 0  
- COL(1: ) = 1  
- COL(2: ) = Europe  
- KEY(1: ) = 1
```

DELETE

```
- SQL(0) =  
- ACTION = DELETE  
- SCHEMA = hr  
- TABLE = regions  
- ROW# = 0  
- KEY(1: ) = 1  
- KEY(2: ) = Europe
```

```
- SQL(0) =  
- ACTION = DELETE  
- SCHEMA = hr  
- TABLE = regions  
- ROW# = 0  
- KEY(1: ) = 1
```



Summary

What we have learnt today

- How to use the command line tools
 - `tpm`
 - `trepctl`
 - `thl`
- How to interpret status output



Next Steps

In the next session we will

- Discuss Maintenance Operations
 - Updating paramaters
 - auto-recovery
 - thl
 - Upgrades



THANK YOU FOR LISTENING

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