CDC ddl_time of ddl_history table

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Issue Background

The customer has a requirement to track the precise date and time (start time and end time) of the DDL statements executed on table enabled for Change Data Capture. The ddl_time in the cdc.ddl_history table shows the date and time of the DDL change made to the source table. However, the second and millisecond are always '0' which is ambiguous to determine the precise time. The cdc.lsn_time_mapping table returns row for each transaction having rows in change table and the tran_begin_time column and tran_end_time column can be used to determine the precise date and time of transaction committed. But it is not clear of which row is associated with row in the cdc.ddl_history table.

```
ALTER TABLE t1_cdc ALTER COLUMN C1 NVARCHAR(100)
ALTER TABLE t1_cdc ALTER COLUMN C1 NVARCHAR(50)

SELECT * FROM cdc.ddl_history
SELECT * FROM cdc.lsn_time_mapping
```

cdc.ddl_history

	source_object_id	object_id	required_column_update	ddl_command	ddl_lsn	ddl_time
1	1762105318	126623494	1	ALTER TABLE t1_cdc ALTER COLUMN C1 NVARCHAR(100)	0x000000C60000031000057	2022-04-16 18:30:00.000
2	1762105318	126623494	1	ALTER TABLE t1_cdc ALTER COLUMN C1 NVARCHAR(50)	0x000000C700001328002E	2022-04-16 18:31:00.000

cdc. lsn_time_mapping

	start_lsn	tran_begin_time	tran_end_time	tran_id	tran_begin_lsn
1	0x000000C400000B10006D	2022-04-16 18:28:58.480	2022-04-16 18:28:58.480	0x00	0x00000000000000000000
2	0x000000C6000000600002	2022-04-16 18:28:58.433	2022-04-16 18:29:04.873	0x000000014225	0x000000C400000AD00001
3	0x000000C6000003100058	2022-04-16 18:30:46.263	2022-04-16 18:30:46.277	0x0000000143BC	0x000000C6000003100001
4	0x000000C700001328002F	2022-04-16 18:31:22.933	2022-04-16 18:31:22.940	0x000000014421	0x000000C7000013280001
5	0x000000C8000012F00001	2022-04-16 18:36:27.750	2022-04-16 18:36:27.750	0x00	0x00000000000000000000
6	0x000000C8000015280001	2022-04-16 18:41:28.733	2022-04-16 18:41:28.733	0x00	0x00000000000000000000
7	0x000000C8000015C00005	2022-04-16 18:43:03.300	2022-04-16 18:43:03.300	0x0000000144D6	0x000000C8000015C00002
8	0x000000C8000017E80003	2022-04-16 18:43:04.477	2022-04-16 18:43:04.477	0x0000000144E2	0x000000C8000017E80001

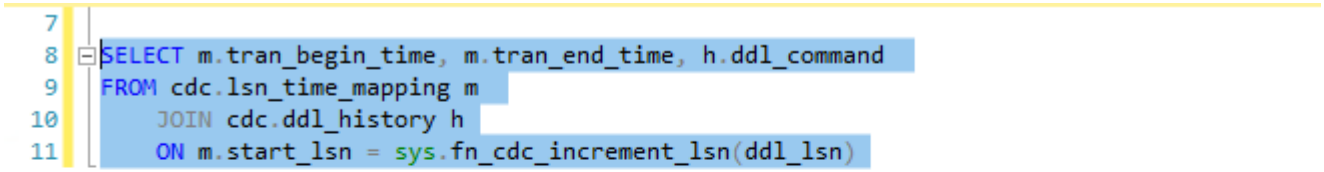
The ddl_time for second and millisecond always show '00.000'

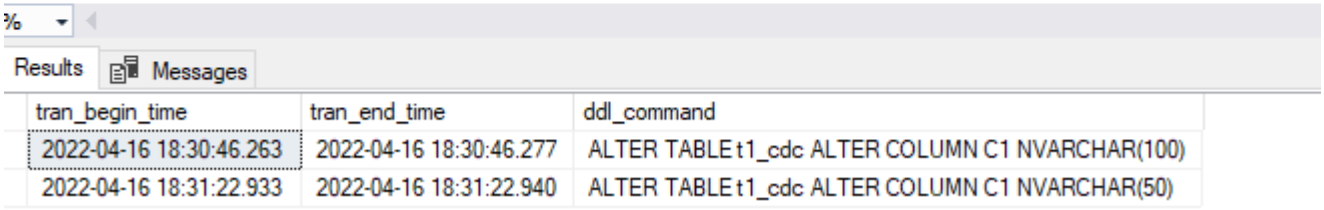
How to correlate between cdc.ddl_history and cdc.lsn_time_mapping tables

This query will give you the precise datetime of the DDL statements executed. Details are explained in the next section.

- Currently there are issues on the on-prem SQL Server where the DDL statements are not captured to the cdc.lsn_time_mapping table. Hence, this query might not return results for on-prem SQL Server.
- The query works on both Azure SQL DB and SQL MI.

```
SELECT m.tran_begin_time, m.tran_end_time, h.ddl_command
FROM cdc.lsn_time_mapping m
        JOIN cdc.ddl_history h
        ON m.start_lsn = sys.fn_cdc_increment_lsn(ddl_lsn)
```





tran_begin_time	tran_end_time	ddl_command
2022-04-16 18:30:46.263	2022-04-16 18:30:46.277	ALTER TABLE t1_cdc ALTER COLUMN C1 NVARCHAR(100)
2022-04-16 18:31:22.933	2022-04-16 18:31:22.940	ALTER TABLE t1_cdc ALTER COLUMN C1 NVARCHAR(50)

Details

This shows how the above query correlates the cdc.ddl_history with the cdc.lsn_time_mapping table. Basically, the query searches records in cdc.ddl_history based on the ddl_lsn value (incremented by 1) that matches with value of start_lsn using the search condition "m.start_lsn = sys.fn_cdc_increment_lsn(ddl_lsn)".

In this example, the ALTER TABLE statement was captured with the ddl_lsn value of "0x000000F500000280003D". If we increment this value by '1', this will match with the start_lsn value in the cdc.lsn_time_mapping table. To verify that "0x000000F500000280003E" (which is the start_lsn value), represents the commit transaction of the ALTER TABLE statement executed in this example, we examine the records in the transaction log.

cdc.ddl_history

	source_object_id	object_id	required_column_update	ddl_command	ddl_lsn	ddl_time
1	1762105318	126623494	1	ALTER TABLE t1_cdc ALTER COLUMN C1 NVARCHAR(100)	0x000000C6000003100057	2022-04-16 18:30:00.000
2	1762105318	126623494	1	ALTER TABLE t1_cdc ALTER COLUMN C1 NVARCHAR(50)	0x000000C700001328002E	2022-04-16 18:31:00.000
3	1762105318	126623494	1	alter table t1_cdc alter column c1 nvarchar(5)	0x000000C900001B38003C	2022-04-16 20:03:00.000
4	1762105318	126623494	1	ALTER TABLE t1_cdc ALTER COLUMN C1 NVARCHAR(30)	0x000000F200001F40001F	2022-04-18 09:20:00.000
		126623494	1	ALTER TABLE t1_cdc ALTER COLUMN C1 NVARCHAR(20)	0x000000F500000280003D	2022-04-18 09:34:00.000

cdc. lsn_time_mapping

	start_lsn	tran_begin_time	tran_end_time	tran_id	tran_begin_lsn
451	0x000000F1000015580001	2022-04-18 07:43:39.213	2022-04-18 07:43:39.213	0x00	0x00000000000000000000
452	0x000000F1000017C80001	2022-04-18 07:48:40.140	2022-04-18 07:48:40.140	0x00	0x00000000000000000000
453	0x000000F1000019C80001	2022-04-18 07:53:41.080	2022-04-18 07:53:41.080	0x00	0x00000000000000000000
454	0x000000F100001BC80001	2022-04-18 07:58:46.997	2022-04-18 07:58:46.997	0x00	0x00000000000000000000
455	0x000000F100001E580001	2022-04-18 08:03:47.947	2022-04-18 08:03:47.947	0x00	0x00000000000000000000
456	0x000000F2000000600001	2022-04-18 08:08:48.847	2022-04-18 08:08:48.847	0x00	0x00000000000000000000
457	0x000000F2000002580001	2022-04-18 08:13:49.800	2022-04-18 08:13:49.800	0x00	0x00000000000000000000
458	0x000000F2000004C80001	2022-04-18 08:18:50.763	2022-04-18 08:18:50.763	0x00	0x00000000000000000000
459	0x000000F2000006C00001	2022-04-18 08:23:51.720	2022-04-18 08:23:51.720	0x00	0x00000000000000000000
460	0x000000F2000008B80001	2022-04-18 08:28:52.653	2022-04-18 08:28:52.653	0x00	0x00000000000000000000
461	0x000000F200000B280001	2022-04-18 08:33:53.623	2022-04-18 08:33:53.623	0x00	0x00000000000000000000
462	0x000000F200000D200001	2022-04-18 08:38:54.550	2022-04-18 08:38:54.580	0x00	0x00000000000000000000
463	0x000000F200000F180001	2022-04-18 08:43:55.487	2022-04-18 08:43:55.487	0x00	0x00000000000000000000
464	0x000000F2000011800001	2022-04-18 08:48:56.427	2022-04-18 08:48:56.427	0x00	0x00000000000000000000
465	0x000000F2000013780001	2022-04-18 08:53:57.397	2022-04-18 08:53:57.397	0x00	0x00000000000000000000
466	0x000000F2000015700001	2022-04-18 08:58:58.320	2022-04-18 08:58:58.320	0x00	0x00000000000000000000
467	0x000000F2000018000001	2022-04-18 09:03:59.280	2022-04-18 09:03:59.280	0x00	0x00000000000000000000
468	0x000000F2000019F80001	2022-04-18 09:09:00.243	2022-04-18 09:09:00.243	0x00	0x00000000000000000000
469	0x000000F200001BF00001	2022-04-18 09:14:01.187	2022-04-18 09:14:01.187	0x00	0x00000000000000000000
470	0x000000F200001E880001	2022-04-18 09:19:02.153	2022-04-18 09:19:02.153	0x00	0x00000000000000000000
471	0x000000F200001F400020	2022-04-18 09:20:51.413	2022-04-18 09:20:51.420	0x00000001BB33	0x000000F200001F400001
472	0x000000F400000D500001	2022-04-18 09:25:53.750	2022-04-18 09:25:53.750	0x00	0x00000000000000000000
473	0x000000F400000F500001	2022-04-18 09:30:54.697	2022-04-18 09:30:54.697	0x00	0x00000000000000000000
474	0x000000F500000280003E	2022-04-18 09:34:27.900	2022-04-18 09:34:27.910	0x00000001BC1E	0x000000F5000002800001

Increment ddl_lsn to match with start_lsn

This shows the contents of the transaction log after running the ALTER TABLE statement. Notice the LSN value at the 45th row is the value that is recorded in the cdc.ddl_history(ddl_lsn), and the LSN value at the 46th row is the recorded in the cdc.lsn_time_mapping(start_lsn). We will not go into details of the transaction sequence from the 45th to 46th row (of why these two rows are in separate operations “LOP_REPL_COMMAND” and “LOP_COMMIT_XACT”) , but you can see that the "m.start_lsn = sys.fn_cdc_increment_lsn(ddl_lsn)" condition in the query can be used to get the precise timestamp of the DDL statement.

```
15  select [Current LSN], Operation, Context, [Transaction ID], [Previous LSN]
16      , [Begin Time], [End Time], [Transaction Name], [Oldest Active Transaction ID], [Description]
17  from fn_dblog(null, null) where [Transaction ID] = '0000:0001bc1e'
18
```

Transaction log records

	Current LSN	Operation	Context	Transaction ID	Previous LSN	Begin Time	End Time	Transaction Name	Oldest Active
1	000000F5:00000280:0001	LOP_BEGIN_XACT	LCX_NULL	0000:0001bc1e	00000000:00000000:0000	2022/04/18 09:34:27:900	NULL	ALTER TABLE	0000:0001bc
2	000000F5:00000280:0002	LOP_LOCK_XACT	LCX_NULL	0000:0001bc1e	000000F5:00000280:0001	NULL	NULL	NULL	NULL
3	000000F5:00000280:0003	LOP_REPL_COMMAND	LCX_NULL	0000:0001bc1e	000000F5:00000280:0002	NULL	NULL	NULL	NULL
4	000000F5:00000280:0005	LOP_INSERT_ROWS	LCX_CLUSTERED	0000:0001bc1e	000000F5:00000280:0003	NULL	NULL	NULL	NULL
5	000000F5:00000280:0006	LOP_REPL_COMMAND	LCX_NULL	0000:0001bc1e	000000F5:00000280:0005	NULL	NULL	NULL	NULL
6	000000F5:00000280:0007	LOP_INSERT_ROWS	LCX_CLUSTERED	0000:0001bc1e	000000F5:00000280:0006	NULL	NULL	NULL	NULL

Begin time and end time of the DDL statement. These are recorded in the cdc.lsn_time_mapping table

37	000000F5:00000280:0033	LOP_HOBT_DELTA	LCX_NULL	0000:0001bc1e	000000F5:00000280:0032	NULL	NULL	NULL	NULL
38	000000F5:00000280:0034	LOP_HOBT_DELTA	LCX_NULL	0000:0001bc1e	000000F5:00000280:0033	NULL	NULL	NULL	NULL
39	000000F5:00000280:0035	LOP_HOBT_DELTA	LCX_NULL	0000:0001bc1e	000000F5:00000280:0034	NULL	NULL	NULL	NULL
40	000000F5:00000280:0036	LOP_HOBT_DELTA	LCX_NULL	0000:0001bc1e	000000F5:00000280:0035	NULL	NULL	NULL	NULL
41	000000F5:00000280:0037	LOP_HOBT_DELTA	LCX_NULL	0000:0001bc1e	000000F5:00000280:0036	NULL	NULL	NULL	NULL
42	000000F5:00000280:0038	LOP_HOBT_DELTA	LCX_NULL	0000:0001bc1e	000000F5:00000280:0037	NULL	NULL	NULL	NULL
43	000000F5:00000280:003A	LOP_MODIFY_COLU...	LCX_CLUSTERED	0000:0001bc1e	000000F5:00000280:0038	NULL	NULL	NULL	NULL
44	000000F5:00000280:003C	LOP_MODIFY_ROW	LCX_CLUSTERED	0000:0001bc1e	000000F5:00000280:003A	NULL	NULL	NULL	NULL
45	000000F5:00000280:003D	LOP_REPL_COMMAND	LCX_NULL	0000:0001bc1e	000000F5:00000280:003C	NULL	NULL	NULL	NULL
46	000000F5:00000280:003E	LOP_COMMIT_XACT	LCX_NULL	0000:0001bc1e	000000F5:00000280:0001	NULL	2022/04/18 09:34:27:910	NULL	NULL

Commit LSN

cdc.ddl_history(ddl_lsn)

How good have you found this content?