MICROSOFT® SQL SERVER™

TPC-E ACID TESTS REFERENCE

Version 1.14.0-1031

© Copyright Microsoft, 2008 - 2015

Jamie Reding (jamiere@microsoft.com)

SQL Server Performance Team
Microsoft Corporation

CONTENTS

INTRODUCTION 3

ACID STORED PROCEDURES 3

ATOMICITY 4

CONSISTENCY 5

ISOLATION 7

DURABILITY 13

INTRODUCTION

This document outlines the steps required to run the TPC-E ACID tests. Each test, Atomicity, Consistency, Isolation, and Durability are covered below.

ACID STORED PROCEDURES

The Microsoft TPC-E Benchmark kit implements the TPC-E ACID tests using instrumented TPC-E Stored Procedures. These stored procedures add additional timestamp data and echo of output to the standard TPC-E stored procedures.

INSTALLATION OF ACID STORED PROCEDURES

1. Open a command prompt.
2. Change to the MSTPCE.1.14.0-1031\ACID\AcidProcs directory.
3. Run AcidProc.cmd
    a. Enter the database server name. The default is the current machine.
    b. Enter the password for the 'sa' account. If you have not set the 'sa' password, please press enter to continue.
4. The output will be in AcidProc.out

Now you are ready to proceed with the ACID tests.

ATOMICITY

The TPC-E Atomicity tests are defined in Clause 7.2.2.

*Perform a market Trade-Order **Transaction** with the roll_it_back flag set to false. Verify that the appropriate rows have been inserted in the TRADE and TRADE_HISTORY tables.*

*Perform a market Trade-Order **Transaction** with the roll_it_back flag set to true. Verify that no rows associated with the rolled back Trade-Order have been added to the TRADE and TRADE_HISTORY tables.*

EXECUTION OF ATOMICITY TESTS

1. Open a command prompt.
2. Change to the MSTPCE.1.14.0-1031\ACID\Atomicity directory.
3. Run Atomicity.cmd
    a. Enter the database server name. The default is the current machine.
    b. Enter the password for the 'sa' account. If you have not set the 'sa' password, please press enter to continue.
4. The output will be in Atomicity_C.out and Atomicity_RB.out.

CONSISTENCY

The TPC-E Consistency conditions are defined in Clauses 7.3.2.

Consistency Conditions

Three consistency conditions are defined in the following clauses. Explicit demonstration that the conditions are satisfied is required for all three conditions.

Consistency condition 1

Entries in the BROKER and TRADE tables must satisfy the relationship:

B_NUM_TRADES = count(*)

For each broker defined by:

(B_ID = CA_B_ID) and (CA_ID = T_CA_ID) and (T_ST_ID = 'CMPT').

Consistency condition 2

Entries in the BROKER and TRADE tables must satisfy the relationship:

B_COMM_TOTAL = sum(T_COMM)

For each broker defined by:

(B_ID = CA_B_ID) and (CA_ID = T_CA_ID) and (T_ST_ID = 'CMPT').

Consistency condition 3

Entries in the HOLDING_SUMMARY and HOLDING tables must satisfy the relationship:

HS_QTY = sum(H_QTY)

For each holding summary defined by:

(HS_CA_ID = H_CA_ID) and (HS_S_SYMB = H_S_SYMB).

EXECUTION OF CONSISTENCY TESTS

1. Open a command prompt.
2. Change to the MSTPCE. 1.13.0-1027\ACID\Consistency directory.
3. Run Consistency.cmd
    a. Enter the database server name. The default is the current machine.
    b. Enter the password for the 'sa' account. If you have not set the 'sa' password, please press enter to continue.

4. The output will be in Consistency.out.

ISOLATION

The TPC-E Isolation tests are defined in Clauses 7.4.2.

EXECUTION OF ISOLATION TEST #1 (P3 TEST IN READ-WRITE)

The isolation tests require that you use the SQL Server Management Studio. You are required to copy values from one session to another and the Management Studio facilitates this. The instructions below assume that you are using the Management Studio.

1. Open the SQL Server Management Studio.
2. Open MSTPCE.1.14.0-1031\ACID\Isolation`\Scripts\Isolation1_S1.sql in the Management Studio. When prompted, connect to your database server.
3. Click on **Query/Results To/Results to Text** in the menu bar.
4. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation1_S2.sql in the Management Studio. When prompted, connect to your database server.
5. Click on **Query/Results To/Results to Text** in the menu bar.
6. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation1_S3.sql in the Management Studio. When prompted, connect to your database server.
7. Click on **Query/Results To/Results to Text** in the menu bar.
8. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation1_S4.sql in the Management Studio. When prompted, connect to your database server.
9. Click on **Query/Results To/Results to Text** in the menu bar.
10. Execute Isolation1_S1.
11. Scroll to the bottom of the Results window and record the “Trade ID Returned”.
12. Copy the Customer Account Used to the @acct_id variable near the top of Isolation1_S2.
13. Copy the Symbol Used to the @symbol variable near the top of Isolation1_S2.
14. Execute Isolation1_S2.
15. Scroll to the bottom of the Results window and record the “Trade ID Returned”.
16. Copy the Trade ID Used in the Isolation1_S1 results window to the @trade_id variable near the top of Isolation1_S3.
17. Copy the Trade ID Used in the Isolation1_S2 results window to the @trade_id variable near the top of Isolation1_S4.
18. Execute Isolation1_S3 and then execute Isolation1_S4. Note, the SQL code and the instrumented stored procedure will do the appropriate pausing as required in the specification.

VERIFICATION OF ISOLATION TEST #1 (P3 TEST IN READ-WRITE)

1. Record the "Holding Summary After First Execution of Trade Result Frame 1:" value of HS_QTY. This is found near the top of the results window of Isolation1_S3. Verify that this is set to 0.
    a. Iso1_S3 - Holding Summary After First Execution of Trade Result Frame 1: _____
2. Record the "Holding Summary After Second Execution of Trade Result Frame 1:" value of HS_QTY. This is found near the top of the results window of Isolation1_S3. Verify that this is set to 0.
    a. Iso1_S3 - Holding Summary After Second Execution of Trade Result Frame 1: _____
3. The Trade Result in Isolation1_S3 should now block with the Trade Result in Isolation1_S4.
4. Since the Isolation1_S3 was blocked from continuing, the verification will use the "Case B" as defined in Clause 7.4.2.1, Items 6B and 7B.
5. Record the "Holding Summary After Trade Result Frame 1:" value of HS_QTY. This is found near the top of the results window of Isolation1_S4. It should be 0.
    a. Iso1_S4 - Holding Summary After Trade Result Frame 1: _____

EXECUTION OF ISOLATION TEST #2 (P2 TEST IN READ-WRITE)

The isolation tests require that you use the SQL Server Management Studio. You are required to copy values from one session to another and the Management Studio facilitates this. The instructions below assume that you are using the Management Studio.

1. Open the SQL Server Management Studio.
2. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation2_S1.sql in the Management Studio. When prompted, connect to your database server.
3. Click on **Query/Results To/Results to Text** in the menu bar.
4. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation2_S2.sql in the Management Studio. When prompted, connect to your database server.
5. Click on **Query/Results To/Results to Text** in the menu bar.
6. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation2_S3.sql in the Management Studio. When prompted, connect to your database server.
7. Click on **Query/Results To/Results to Text** in the menu bar.
8. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation2_S4.sql in the Management Studio. When prompted, connect to your database server.
9. Click on **Query/Results To/Results to Text** in the menu bar.
10. Execute Isolation2_S1.
11. Scroll to the bottom of the Results window of Isolation2_S1 and record the "Holding Summary Quantity" and the "Trade ID Returned".
12. Copy the Customer Account Used from the Results window of Isolation2_S1 to the @acct_id variable near the top of Isolation2_S2.

13. Copy the Symbol Used from the Results window of Isolation2_S1 to the @symbol variable near the top of Isolation2_S2.
14. Execute Isolation2_S2.
15. Scroll to the bottom of the Results window of Isolation2_S2 and record the Trade ID Returned.
16. Copy the Trade ID Used in the Isolation2_S1 results window to the @trade_id variable near the top of Isolation2_S3.
17. Copy the Trade ID Used in the Isolation2_S2 results window to the @trade_id variable near the top of Isolation2_S4.
18. Execute Isolation2_S3 and then immediately execute Isolation2_S4. Note, the SQL code and the instrumented stored procedure will do the appropriate pausing as required in the specification.

VERIFICATION OF ISOLATION TEST #2 (P2 TEST IN READ-WRITE) CASE A

1. Record the "Holding Summary After First Execution of Trade Result Frame 1:" value of HS_QTY. This is found near the top of the results window of Isolation2_S3.
    a. Iso2_S3 - Holding Summary After First Execution of Trade Result Frame 1: _____
2. Record the "Holding Summary After Second Execution of Trade Result Frame 1:" value of HS_QTY. This is found near the top of the results window of Isolation2_S3. This value should match the value returned in number 1 above.
    a. Iso2_S3 - Holding Summary After Second Execution of Trade Result Frame 1: _____
3. Record the "Holding Summary After Trade Result Frame 1:" value of HS_QTY. This is found near the top of the results window of Isolation2_S4.
    a. Iso2_S4 - Holding Summary After Trade Result Frame 1: _____
4. Since the Isolation2_S4 stalls in Frame 2, the verification will use the "Case A" as defined in Clause 7.4.2.2, Items 6A and 7A.
5. Verify that the HS_QTY remains the same for each read of HOLDING SUMMARY throughput Isolation2_S3.

VERIFICATION OF ISOLATION TEST #2 (P2 TEST IN READ-WRITE) CASE B

1. Record the "Holding Summary After First Execution of Trade Result Frame 1:" value of HS_QTY. This is found near the top of the results window of Isolation2_S3.
    a. Iso2_S3 - Holding Summary After First Execution of Trade Result Frame 1: _____
2. Record the "Holding Summary After Second Execution of Trade Result Frame 1:" value of HS_QTY. This is found near the top of the results window of Isolation2_S3. This value should match the value returned in number 1 above.
    a. Iso2_S3 - Holding Summary After Second Execution of Trade Result Frame 1: _____
3. Record the "Holding Summary After Trade Result Frame 1:" value of HS_QTY. This is found near the top of the results window of Isolation2_S4.
    a. Iso2_S4 - Holding Summary After Trade Result Frame 1: _____

4. Since the Isolation2_S3 stalls in Frame 2, the verification will use the "Case B" as defined in Clause 7.4.2.2, Items 6B and 7B.
5. Verify that the HS_QTY remains the same for each read of HOLDING SUMMARY throughput Isolation2_S3.

EXECUTION OF ISOLATION TEST #3 (P1 TEST IN READ-WRITE)

The isolation tests require that you use the SQL Server Management Studio. You are required to copy values from one session to another and the Management Studio facilitates this. The instructions below assume that you are using the Management Studio.

1. Open the SQL Server Management Studio.
2. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation3_S1.sql in the Management Studio. When prompted, connect to your database server.
3. Click on **Query/Results To/Results to Text** in the menu bar.
4. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation3_S2.sql in the Management Studio. When prompted, connect to your database server.
5. Click on **Query/Results To/Results to Text** in the menu bar.
6. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation3_S3.sql in the Management Studio. When prompted, connect to your database server.
7. Click on **Query/Results To/Results to Text** in the menu bar.
8. Execute Isolation3_S1. This script will initiate the Customer Position and execute two Trade Orders for the remainder of this isolation test to access.
9. Scroll to the bottom of the Results window of Isolation3_S1 and record the "Customer ID Used" and the "Customer Account Balance".
10. Copy the first Trade ID Returned from Isolation3_S1 to the top of Isolation3_S2.sql.
11. Copy the Customer Account Used from Isolation3_S1 to the top of Isolation3_S2.sql.
12. Copy the second Trade ID Returned from Isolation3_S1 to the top of Isolation3_S3.sql.
13. Copy the Customer Account Used from Isolation3_S1 to the top of Isolation3_S3.sql.
14. Execute Isolation3_S2, then immediately execute Isolation3_S3. Note, the SQL code and the instrumented stored procedure will do the appropriate pausing as required in the specification.
15. Scroll to the bottom of the Results window of Isolation3_S2 and record the Customer Account Balance and the Settlement Amount..
16. Scroll to the bottom of the Results window of Isolation3_S3 and record the Customer Account Balance and the Settlement Amount.

VERIFICATION OF ISOLATION TEST #3 (P2 TEST IN READ-WRITE)

1. Record the Customer Account Balance from the bottom of the Results window of Isolation3_S1.
    a. Iso3_S1 – Customer Account Balance: _____
2. Record the Customer Account Balance and the Settlement Amount from the bottom of the Results window of Isolation3_S2.
    a. Iso3_S2 – Customer Account Balance: _____
    b. Iso3_S2 – Settlement Amount: _____
3. Record the Customer Account Balance and the Settlement Amount from the bottom of the Results window of Isolation3_S3.
    a. Iso3_S3 – Customer Account Balance: _____
    b. Iso3_S3 – Settlement Amount: _____
4. Since the Trade Result in Isolation3_S3 blocks until Isolation3_S2 completes, you may verify the results as follows:
    a. CA_BAL (from Isolation3_S1) + Settlement Amount (from Isolation3_S2) + Settlement Amount (from Isolation3_S3) = Customer Account Balance (from Isolation3_S3)

EXECUTION OF ISOLATION TEST #4 (P1 TEST IN READ-ONLY)

The isolation tests require that you use the SQL Server Management Studio. You are required to copy values from one session to another and the Management Studio facilitates this. The instructions below assume that you are using the Management Studio.

1. Open the SQL Server Management Studio.
2. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation4_S1.sql in the Management Studio. When prompted, connect to your database server.
3. Click on **Query/Results To/Results to Text** in the menu bar.
4. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation4_S2.sql in the Management Studio. When prompted, connect to your database server.
5. Click on **Query/Results To/Results to Text** in the menu bar.
6. Open MSTPCE.1.14.0-1031\ACID\Isolation\Scripts\Isolation4_S3.sql in the Management Studio. When prompted, connect to your database server.
7. Click on **Query/Results To/Results to Text** in the menu bar.
8. Execute Isolation4_S1. This script will initiate the Customer Position and execute a Trade Order for the remainder of this isolation test to access.
9. Scroll to the bottom of the Results window of Isolation4_S1 and record the “Customer ID Used”, “Customer Account ID Used”, “Customer Account Balance”, and the “Trade ID Returned”.
10. Copy the “Customer Account ID Used” from the Results window of Isolation4_S1 to the @acct_id variable near the top of Isolation4_S2.

11. Copy the “Trade ID Returned” from the Results window of Isolation4_S1 to the @trade_id variable near the top of Isolation4_S2.
12. Copy the “Customer ID” from the Results window of Isolation4_S1 to the @cust_id variable near the top of Isolation4_S3.
13. Copy the “Customer Account ID Used” from the Results window of Isolation4_S1 to the @acct_id variable near the top of Isolation4_S3.
17. Execute Isolation4_S2 and immediately execute Isolation4_S3.

VERIFICATION OF ISOLATION TEST #4 (P1 TEST IN READ-ONLY)

1. Record the Customer Account Balance from the bottom of the Results window of Isolation4_S1.
    a. Iso4_S1 – Customer Account Balance: _____
2. Record the Customer Account Balance and the Settlement Amount from the bottom of the Results window of Isolation4_S2.
    a. Iso4_S2 – Customer Account Balance: _____
    b. Iso4_S2 – Settlement Amount: _____
3. Record the Customer Account Balance from the bottom of the Results window of Isolation4_S3.
    a. Iso4_S3 – Customer Account Balance: _____
4. Since the Customer Position in Isolation4_S3 blocks until Isolation4_S2 completes, you may verify the results by CA_BAL (from Isolation4_S2) = Customer Account Balance (from Isolation4_S3)

DURABILITY

The TPC-E durability tests require simple rows counts from the SETTLEMENT table, therefore there are not any scripts provided. Please see Clauses 7.5.5.5 and 7.5.6.7 for details of the TPC-E durability process.

For reference, there are messages output in the SQL Server Errorlog to help you determine the start and end times of the different phases of the durability tests. They are:

- **Start of Database Recovery Time**
  - 2011-01-1 11:24:13.26 spid31s Starting up database 'tpce'.
- **End of Database Recovery Time**
  - 2014-01-1 11:26:23.63 spid5s Recovery is complete. This is an informational message only. No user action is required.