ANSI X3H2-97-011

I S O
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION

January 21, 1997

Subject: SQL/Temporal

Status: Change Proposal

Title: A Second Addendum to Valid- and Transaction-time Proposals

Source: Expert's Contribution

Authors: Richard T. Snodgrass

Abstract: This document addresses the concerns voiced in MAD-220 [6].

References

[1] Melton, J. (ed.) *SQL/Temporal.* July, 1996. (ISO/IEC JTC 1/SC 21/WG 3 DBL-MCI-012.)

[2] Snodgrass, R. T., M. H. Böhlen, C. S. Jensen and A. Steiner. *Adding Valid Time to SQL/Temporal.* 1996. (ISO/IEC JTC1/SC21/WG3 DBL MAD-146r2, ANSI X3H2-96-501r2.)

[3] Snodgrass, R. T., M. H. Böhlen, C. S. Jensen and A. Steiner. *Adding Transaction Time to SQL/Temporal.* 1996. (ISO/IEC JTC1/SC21/WG3 DBL MAD-147r2, ANSI X3H2-96-502r1.)

[4] Snodgrass, R.T., "Addendum to Valid- and Transaction-time Proposals," ANSI X3H2-96-582, ISO/IEC JTC1/SC21/WG3 DBL MAD-203, December, 1996.

[5] Snodgrass, R.T., "Response to MAD-220," ANSI X3H2-97-010, ISO/IEC JTC1/SC21/WG3 DBL MAD-2??, January, 1997.

[6] UK response, *On Proposals for Valid-Time and Transaction-Time Support.* December 18, 1996. (ISO/IEC JTC1/SC21/WG3 DBL MAD-220)

1 Introduction

This document responds to the points made in MAD-220 [6] by proposing several minor corrections and change to the previous language proposals for adding valid-time and transaction-time support to SQL/Temporal [2, 3, 4]. We follow the section numbering and section titles of MAD-220.

2 Tutorial

There are no changes necessitated.

3 Temporal Upward Compatibility is Problematical

The concern voiced here was primarily that temporal upward compatibility does not represent a solution for *every* application, an assertion with which we totally agree. We hope that by showing that temporal support represents syntactic sugar, using the `EXPAND` construct, the objections to tables with temporal support have been addressed. Some of the specific points require additional changes.

Change 1: Add the following language opportunity to the end of Subclause 7.4 <query expression>.

Language opportunity: It would be useful for the definition of a function in PSM to restrict an argument to tables with valid-time (or transaction-time) support or to tables without valid-time (or transaction-time) support, or for the body of a function to test whether the table has valid-time (resp. transaction-time) support.

Change 2: Add the following language opportunity to the end of Subclause 12.3 <delete statement: positioned>.

Language opportunity: It would be useful to provide additional support in triggers for sequenced and nonsequenced modifications, making it possible to specify a trigger which is to find for each particular <time option> and/or to include means for a trigger to discover what was the <time option> of the statement that fired it.

Change 3: Add the following GR to the end of Subclause 10.6 <add valid definition>.

2. (Insert this GR) If T is a supertable, then an <add valid definition>, without further Access Rule checking, is effectively performed for each of its subtables, thereby adding valid-time support in these subtables.

Change 4: Add the following GR to the end of Subclause 10.9 <add transaction definition>.

2. (Insert this GR) If T is a supertable, then an <add transaction definition>, without further Access Rule checking, is effectively performed for each of its subtables, thereby adding transaction-time support in these subtables.

Change 5: Add the following GR to the end of Subclause 10.7 <drop valid definition>.

2. (Insert this GR) If T is a supertable, then let ST be the <table name> of any subtable of T. The following <alter table statement> is effectively executed without further Access Rule checking:

   ALTER TABLE ST DROP VALIDTIME

Change 6: Add the following GR to the end of Subclause 10.10 <drop transaction definition>.

2. (Insert this GR) If T is a supertable, then let ST be the <table name> of any subtable of T. The following <alter table statement> is effectively executed without further Access Rule checking:

   ALTER TABLE ST DROP TRANSACTIONTIME

4 The Specification Has Serious Deficiencies

The main point of this section is that the definition of sequenced queries is non-deterministic. We argued that the central question was rather whether normalization should be required or made optional, and then argued that leaving normalization optional was more consistent with the design of SQL.

Change 7: Add the following language opportunity to the end of Subclause 10.6 <add valid definition>.

Language opportunity: It would be useful to provide a default valid-time period for a table without valid-time support, to allow that table to participate in valid-time sequenced queries.

5 The Specification Has Other Non-Trivial Problems

Here we consider each point in turn.

1. **Change 8:** Insert the following SRs to Subclause 6.5 <period value expression>.

   4. (Insert this SR) A <validtime argument> that is an <item qualifier> shall not have the same name as some unqualified column name.
   5. (Insert this SR) A <transactiontime argument> that is an <item qualifier> shall not have the same name as some unqualified column name.

   Note to proposal reader: This disallows ambiguity between the two syntactic possibilities for <validtime argument>, resp. <transactiontime argument>.

2. **Change 9:** Replace SR1 of Subclause 6.5 <period valid expression> in MAD-146 [2] with the following.

   (a) (Insert this SR) Let T be the table associated with the <item qualifier> of <validtime argument>. Case:

      a) If T has valid-time support, then let P be the valid-time precision of T.

b) If T does not have valid-time support, then it shall have a field named VALIDTIME of a period data type. Let P be the precision of the element type of this field.

Change 10: Replace GR1a of Subclause 6.5 <period value expression> in MAD-147 [3] with the following.

a) If <transactiontime argument> is <item qualifier>, then let R be the row for which <transactiontime function> is evaluated.

3. VALIDTIME is a reserved word. Hence, there can be no user-defined column name of VALIDTIME.

   Change 11: Add to Annex D, "Incompatibilities with ISO/IEC 9075:1992" list 1) the following additional reserved words.

   — NONSEQUENCED
   — TRANSACTIONTIME
   — VALIDTIME

4. **Change 12:** Replace "of row type RT" in SR2 of Subclause 6.5 <period value expression> of MAD-146 with "a row R". Replace "RT" in that SR with "R".

   Change 13: Replace "of row type RT" in SR2 of Subclause 6.5 <period valid expression> of MAD-147 with "a row R". Replace "RT" in that SR with "R".

5. See the comment on item 3, above.

6. **Change 14:** Remove the language opportunity in Subclause 6.5 <period value expression> of MAD-146 and of MAD-147.

7. **Change 15:** Subclauses <query expression> and <query specification> of MAD-146 should be inserted immediately following Subclause 7.4 <expanding clause>.

8. It would be nice if that view, as well as others, were defined to be updatable. It seems that it would be straightforward to support updates on several classes of views.

9. The update would propagate to the base table, as specified, which would then follow according to the temporal upward compatibility semantics.

10. This concern has been addressed in Section 5 of [5].

11. **Change 16:** Replace "<period type>" in SR5 of Subclause 7.4 <query expression> with "a period type" in MAD-146.

    Change 17: Replace "<period type>" in SR1 of Subclause 7.4 <query expression> with "a period type" in MAD-147.

12. The first suggested change is appropriate. The "shall be"s are appropriate, because these statements do impose restrictions.

    Change 18: Remove "Let T be the result of the <query expression>." from SR6 of Subclause 7.4 <query expression> of MAD-146.

13. **Change 19:** Add the following SR to Subclause 7.4 <query expression>.

    (a) (Insert this SR) The *qualified simply underlying table*s of a <query expression> are the tables identified by those <table name>s, <query specification>s, and <derived table>s contained in the <query expression> without an intervening <derived table> or an intervening <join condition> or an intervening <from clause>.

Note to proposal reader: This adds "without an intervening <from clause>" to simply underlying tables.

Change 20: Replace "leaf underlying table with valid-time support with no intervening <from clause>" with "qualified simply underlying table with valid-time support" in the following GRs of MAD-146.

(a) GR3 of Subclause 7.4 <query expression>
(b) GR2 of Subclause 10.4 <table constraint definition>
(c) GR2 of Subclause 10.9 <assertion definition>
(d) GR1 of Subclause 12.2 <select statement: single row>
(e) GR1 of Subclause 12.4 <delete statement: searched>
(f) GR1 of Subclause 12.7 <update statement: searched>

Change 21: Replace "leaf underlying table with transaction-time support with no intervening <from clause>" with "qualified simply underlying table with transaction-time support" in the following GRs of MAD-147.

(a) GR1 of Subclause 7.4 <query expression>
(b) GR2 of Subclause 10.4 <table constraint definition>
(c) GR1 of Subclause 10.9 <assertion definition>
(d) GR1 of Subclause 12.2 <select statement: single row>
(e) GR1 of Subclause 12.4 <delete statement: searched>
(f) GR1 of Subclause 12.7 <update statement: searched>

14. I agree that "valid-time value" should replace the unadorned word 'state' throughout the specification.

Change 22: Replace 'state' without a preceding 'valid-time' with "valid-time value" in MAD-146 in the following locations.

(a) Second paragraph of Subclause 4.5 "Meaning of statements on tables with temporal support"
(b) GR2a of Subclause 7.4 <query expression>
(c) GR2a of Subclause 10.4 <table constraint definition>
(d) GR2a of Subclause 10.9 <assertion definition>
(e) GR1 of Subclause 12.2 <select statement: single row>
(f) GR1a of Subclause 12.4 <delete statement: searched>
(g) GR1a of Subclause 12.7 <update statement: searched>

Change 23: Replace 'state' without a preceding 'transaction-time' with "transaction-time value" in MAD-147 in the following locations.

(a) Second paragraph of Subclause 4.5 "Meaning of statements on tables with temporal support"
(b) GR1a of Subclause 7.4 <query expression>
(c) GR2a of Subclause 10.4 <table constraint definition>
(d) GR1a of Subclause 10.9 <assertion definition>
(e) GR1 of Subclause 12.2 <select statement: single row>

Change 24: Replace ‘state’ in MAD-146 and MAD-147 with ‘value’ throughout.

15. **Change 25:** Replace “initial evaluation” with “initial result, that is, before the following replacements,” in the following GRs of MAD-146.

    (a) GR3 of Subclause 7.4 <query expression>
    (b) GR2 of Subclause 10.4 <table constraint definition>
    (c) GR2 of Subclause 10.9 <assertion definition>
    (d) GR1 of Subclause 12.2 <select statement: single row>
    (e) GR1 of Subclause 12.4 <delete statement: searched>
    (f) GR1 of Subclause 12.7 <update statement: searched>

    Change 26: Replace “initial evaluation” with “initial result, that is, before the following replacements,”in the following GRs of MAD-147.

    (a) GR1 of Subclause 7.4 <query expression>
    (b) GR2 of Subclause 10.4 <table constraint definition>
    (c) GR1 of Subclause 10.9 <assertion definition>
    (d) GR1 of Subclause 12.2 <select statement: single row>
    (e) GR1 of Subclause 12.4 <delete statement: searched>
    (f) GR1 of Subclause 12.7 <update statement: searched>

16. This has been addressed in the changes of item 15.

17. **Change 27:** Remove the word ‘final’ from the following GRs of MAD-146: GR2a)ii) of Subclause 7.4 <query expression> and GR1a)ii) of Subclause 12.2 <select statement: single row>.

    Change 28: Remove the word ‘final’ from the following GRs of MAD-147: GR1a)ii) of Subclause 7.4 <query expression> and GR1a)ii) of Subclause 12.2 <select statement: single row>.

18. **Change 29:** Replace “replaced with a table with no valid-time support with identical values for the columns” with “QVT replaced by the table without valid-time support comprising rows with identical values for the fields of the rows of QVT” in the following GRs of MAD-146.

    (a) GR2b of Subclause 7.4 <query expression>
    (b) GR2b of Subclause 10.4 <table constraint definition>
    (c) GR2b of Subclause 10.9 <assertion definition>
    (d) GR1b of Subclause 12.2 <select statement: single row>
    (e) GR1b of Subclause 12.4 <delete statement: searched>
    (f) GR1b of Subclause 12.7 <update statement: searched>

    Note to proposal reader: This mirrors the prose of the definition of *valid-time state of a table with valid-time support at a valid time*.

    Change 30: Replace “replaced with a table with no transaction-time support with identical values for the columns” with “QTT replaced by the table without transaction-time support comprising rows with identical values for the fields of the rows of QTT” in the following GRs of MAD-147.

    (a) GR1b of Subclause 7.4 <query expression>
    (b) GR2b of Subclause 10.4 <table constraint definition>

(c) GR1b of Subclause 10.9 <assertion definition>
(d) GR1b of Subclause 12.2 <select statement: single row>
(e) GR1b of Subclause 12.4 <delete statement: searched>
(f) GR1b of Subclause 12.7 <update statement: searched>

19. This exact prose was suggested by Jim Melton, and so appears to be sufficiently precise.

20. See comment 3, above. This column name *is* treated specially. The benefit is that external programs see the valid time without any extra effort, as just another column, with a special name.

21. This incompatibility arises precisely because VALIDTIME is now a reserved word (see item 3, above).

22. This was addressed in the addendum [4].

23. This needs to be changed to be consistent with MAD-147.

    Change 31: Replace “from the current timestamp to the end of time with a” with “VP such that BEGIN(VP) is CURRENT_TIMESTAMP and END(VP) is the end of time of” in the following GRs of MAD-146.

    (a) GR1b) case i) of Subclause 12.3 <delete statement: positioned>
    (b) GR1c of Subclause 12.4 <delete statement: searched>
    (c) GR1 of Subclause 12.5 <insert statement>
    (d) GR1b) case i) of Subclause 12.6 <update statement: positioned>
    (e) GR1c) case i) of Subclause 12.7 <update statement: searched>

24. **Change 32:** Replace GR1b) case ii) and GR1c) case ii) of Subclause 12.7 <update statement: searched> of MAD-146 with the following.

    ii) Otherwise, if the <search condition> is satisfied, then the update is performed on the row in accordance with the previous General Rules of this Subclause.

6 A Final Concern

In a private email, Hugh mentioned that “Under MAD-203, VALIDTIME VALUES(1) is allowed and returns a table with valid-time support...you would also need to specify the precision of the valid-time support of VALIDTIME VALUES(1).”

We just need to pick a precision for such cases.

Change 33: Add the following sentence to SR3 of Subclause 7.4 <query expression>.

If there is no such exposed table, query, or correlation name, the P shall be the precision of TIMESTAMP.