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TECHNICAL CORRIGENDUM 1

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Information technology — Database languages — SQL —

Part 1:
Framework (SQL/Framework)

AMENDMENT 1: On-Line Analytical Processing (SQL/OLAP)

TECHNICAL CORRIGENDUM 1

Technologies de l'information — Langages de base de données — SQL —

Partie 1: Charpente (SQL/Charpente)

AMENDEMENT 1: Traitement analytique en ligne (SQL/OLAP)

RECTIFICATIF TECHNIQUE 1

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AMENDMENT 1

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Introduction

1. *Rationale: Add description of new Annex.*

Insert the following point:

- 21) Annex F, ‘‘Incompatibilities with ISO/IEC 9075:1992’’, is an informative Annex. It lists incompatibilities with the previous version of ISO/IEC 9075.

3.3.2.1 Clause, Subclause, and Table relationships

1. *Rationale: Add relationship for new Annex.*

Insert the following row into Table 1 ‘‘Clause, Subclause, and Table relationships’’:

Clause, Subclause, or Table in this part of ISO/IEC 9075	Corresponding Clause, Subclause, or Table from another part	Part containing correspondence
Annex F, ‘‘Incompatibilities with ISO/IEC 9075:1992’’	<i>(none)</i>	<i>(none)</i>

4.1.1 Operations involving numbers

1. *Rationale: Editorial.*

Replace the 7th bullet of the 1st paragraph with:

- <width bucket function> is a function of four arguments, returning an integer between 0 (zero) and the value of the final argument plus 1 (one), by assigning the first argument to an equi-width partitioning of the range of numbers between the second and third arguments. Values outside the range between the second and third arguments are assigned to either 0 (zero) or the value of the final argument plus 1 (one).

NOTE 2 – The semantics of <width bucket function> are illustrated in Figure 1, ‘‘Illustration of WIDTH_BUCKET Semantics’’.

5.1 <token> and <separator>

1. Rationale: Correct the BNF of <non-reserved word> and <reserved word>.

Replace the productions for <nonreserved word> and <reserved word> with:

```

<non-reserved word> ::=
    !! All alternatives from ISO/IEC 9075-2
    | !! All alternatives from ISO/IEC 9075-5
    | EXCLUDE
    | FOLLOWING
    | NULLS
    | OTHERS
    | PRECEDING
    | TIES
    | UNBOUNDED

<reserved word> ::=
    !! All alternatives from ISO/IEC 9075-2
    | !! All alternatives from ISO/IEC 9075-5
    | CEIL | CEILING | CORR | COVAR_POP | COVAR_SAMP | CUME_DIST
    | DENSE_RANK
    | EXP
    | FILTER | FLOOR
    | LN
    | OVER
    | PARTITION | PERCENTILE_CONT | PERCENTILE_DISC | PERCENT_RANK | POWER
    | RANGE | RANK | REGR_AVGX | REGR_AVGY | REGR_COUNT | REGR_INTERCEPT
    | REGR_R2 | REGR_SLOPE | REGR_SXX | REGR_SXY | REGR_SYY | ROW_NUMBER
    | SQRT | STDDEV_POP | STDDEV_SAMP
    | VAR_POP | VAR_SAMP
    | WIDTH_BUCKET | WINDOW | WITHIN
    
```

6.1 <set function specification>

1. Rationale: The definition of aggregated argument must overlay the definition in ISO/IEC 9075-2:1999 introduced by a correction elsewhere in this TC.

Replace Syntax Rule 5) with:

- 5) Replace SR 3.1) A <value expression> *VE* simply contained in a <set function specification> *SFE* is an aggregated argument of *SFE* if either *SFE* is not an <ordered set function> or *VE* is simply contained in a <within group specification>; otherwise, *VE* is a non-aggregated argument of *SFE*.

6.2 <numeric value function>

1. Rationale: Clarify the declared type of <numeric value function>

Replace Syntax Rules 1), 2) and 3) with:

- 1) Insert this SR The declared type of the result of <natural logarithm> is an implementation-defined approximate numeric type.
- 2) Insert this SR The declared type of the result of <exponential function> is an implementation-defined approximate numeric type.
- 3) Insert this SR The declared type of the result of <power function> is an implementation-defined approximate numeric type.

2. Rationale: Correct the result data type of <floor function> and <ceiling function>.

Replace Syntax Rule 5) with:

- 5) Insert this SR If <floor function> is specified, then

Case:

 - a) If the declared type of the simply contained <numeric value expression> *NVE* is exact numeric, then the declared type of the result is exact numeric with implementation-defined precision, with the radix of *NVE*, and with scale 0 (zero).
 - b) Otherwise, the declared type of the result is approximate numeric with implementation-defined precision.

3. Rationale: Correct the result data type of <floor function> and <ceiling function>.

Replace Syntax Rule 6) with:

- 6) Insert this SR If <ceiling function> is specified, then

Case:

 - a) If the declared type of the simply contained <numeric value expression> *NVE* is exact numeric, then the declared type of the result is exact numeric with implementation-defined precision, with the radix of *NVE*, and with scale 0 (zero).
 - b) Otherwise, the declared type of the result is approximate numeric with implementation-defined precision.

4. Rationale: Correct the result data type of <floor function> and <ceiling function>.

Replace General Rule 4) with:

- 4) Insert this GR If <floor function> is specified, then let *V* be the value of the simply contained <numeric value expression> *NVE*.

Case:

- a) If V is the null value, then the result is the null value.
- b) Otherwise,

Case:

- i) If the most specific type of NVE is exact numeric, then the result is the greatest exact numeric value with scale 0 (zero) that is less than or equal to V . If this result is not representable by the result data type, then an exception condition is raised: *data exception — numeric value out of range*.
- ii) Otherwise, the result is the greatest whole number that is less than or equal to V . If this result is not representable by the result data type, then an exception condition is raised: *data exception — numeric value out of range*.

5. *Rationale: Correct the result data type of <floor function> and <ceiling function>.*

Replace General Rule 5) with:

- 5) Insert this GR If <ceiling function> is specified, then let V be the value of the simply contained <numeric value expression> NVE .

Case:

- a) If V is the null value, then the result is the null value.
- b) Otherwise,

Case:

- i) If the most specific type of NVE is exact numeric, then the result is the least exact numeric value with scale 0 (zero) that is greater than or equal to V . If this result is not representable by the result data type, then an exception condition is raised: *data exception — numeric value out of range*.
- ii) Otherwise, the result is the least whole number that is greater than or equal to V . If this result is not representable by the result data type, then an exception condition is raised: *data exception — numeric value out of range*.

6. *Rationale: Editorial.*

Replace General Rule 6) e) iii) with:

- 6) e) iii) Otherwise, the result is the greatest exact numeric value with scale 0 (zero) that is less than or equal to $((WBC * (WBB1 - WBO)) / (WBB1 - WBB2) + 1)$.

6.4 <value expression>

1. *Rationale: Define possibly non-deterministic <value expression>.*

Insert the following Syntax Rules:

- 2) Replace SR 9) f) An <aggregate function> that specifies MIN or MAX and that simply contains a <value expression> whose declared type is character string, user-defined type, or datetime with time zone.
- 3) Insert after SR 9) g) A <windowed table function> that specifies ROW_NUMBER or whose associated <window specification> specifies ROWS.

7.0 <table reference>

1. *Rationale: The scope of a <table reference> must include <window clause>*

Insert the following Subclause

7.0 <table reference>

Function

Reference a table

Format

No additional format items

Syntax Rules

- 1) Replaces SR 3) a) If a <table reference> *TR* is contained in a <from clause> *FC* with no intervening <query expression>, then the *scope clause SC* of *TR* is the <select statement: single row> or innermost <query specification> that contains *FC*. The scope of the exposed <correlation name> or exposed <table or query name> of *TR* is the <select list>, <where clause>, <group by clause>, <having clause>, and <window clause> of *SC*, together with every <lateral derived table> that is simply contained in *FC* and is preceded by *TR*, and every <collection derived table> that is simply contained in *FC* and is preceded by *TR* and the <join condition> of all <joined table>s contained in *SC* that contain *TR*. If *SC* is the <query specification> that is the <query expression body> of a simple table query *STQ*, then the scope of the exposed <correlation name> or exposed <table or query name> also includes the <order by clause> of *STQ*.

General Rules

No additional General Rules

Conformance Rules

No additional Conformance Rules

7.5 <window clause>

1. *Rationale: Define missing symbol.*

Replace Syntax Rule 4) with:

- 4) Each <column reference> contained in the <window partition clause> or <window order clause> of *WDEF* shall unambiguously reference a column of the derived table *T* that is the result of *TE*. A column referenced in a <window partition clause> is a *partitioning column*.
NOTE 7 — If *T* is a grouped table, then the <column reference>s contained in <window partition clause> or <window order clause> must reference columns of the grouped table obtained by performing the syntactic transformation in Subclause 7.6, “<query specification>”.

7.6 <query specification>

1. *Rationale: Correct symbol.*

Replace Syntax Rule 3) m) with:

- 4) m) If $N_2 = 0$ (zero), then let *CRL* be a zero-length string; otherwise, let *CRL* be:

$$CR_1 \text{ AS } CRI_1, CR_2 \text{ AS } CRI_2, \dots, CR_{N_2} \text{ AS } CRI_{N_2}$$

2. *Rationale: Correct the definition of possibly non-deterministic.*

Replace Syntax Rule 4 with:

- 4) Insert after SR (1)d) The <window clause> contains a reference to a column *C* of *T* that has a data type of character string, user-defined type, TIME WITH TIME ZONE, or TIMESTAMP WITH TIME ZONE, and the functional dependency $G \twoheadrightarrow C$, where *G* is the set consisting of the grouping columns of *T*, holds in *T*.

8.1 <aggregate function>

1. *Rationale: Clarify the declared type of numeric set functions*

Replace Syntax Rule 6) with:

- 6) If COUNT is specified, then the declared type of the result is an implementation-defined exact numeric type with scale of 0 (zero).

Replace Syntax Rule 7) g) with:

- 7) g) If SUM or AVG is specified, then:
 - i) *DT* shall be a numeric type or an interval type.
 - ii) If SUM is specified and *DT* is exact numeric with scale *S*, then the declared type of the result is an implementation-defined exact numeric type with scale *S*.

- iii) If AVG is specified and *DT* is exact numeric, then the declared type of the result is an implementation-defined exact numeric type with precision not less than the precision of *DT* and scale not less than the scale of *DT*.
- iv) If *DT* is approximate numeric, then the declared type of the result is an implementation-defined approximate numeric type with precision not less than the precision of *DT*.
- v) If *DT* is interval, then the declared type of the result is interval with the same precision as *DT*.

Replace Syntax Rule 7) h) with:

- 7) h) If VAR_POP or VAR_SAMP is specified, then the declared type of the result is an implementation-defined approximate numeric type. If *DT* is an approximate numeric type, then the precision of the result is not less than the precision of *DT*.

Replace Syntax Rule 9) c) with:

- 9) c) Case:
 - i) The declared type of REGR_COUNT is an implementation-defined exact numeric type with scale of 0 (zero).
 - ii) Otherwise, the declared type of the result is an implementation-defined approximate numeric type. If the declared type *DTDVE* of *DVE* is an approximate numeric type, then the precision of the result is not less than the precision of *DTDVE*. If the declared type *DTIVE* of *I'VE* is an approximate numeric type, then the precision of the result is not less than the precision of *DTIVE*.

2. *Rationale: SQL-implementations might need to raise exception conditions during the computation of <aggregate function>.*

Insert the following General Rule:

- 0) If during the computation of the result of *AF* an intermediate result is not representable in the declared type of the intermediate result, then an exception condition is raised: *data exception — numeric value out of range*.

3. *Rationale: Correct set operator.*

Replace General Rule 5) g) with:

- 5) g) The result is the result of the <scalar subquery>

```
( SELECT WIFTVAl
  FROM ( SELECT MARKER, WIFT() OVER ( ORDER BY WSP1, ... , WSPK )
        FROM ( SELECT 0, SK1, ... , SKK
              FROM TNAME
              UNION ALL
              VALUES ( 1, VE1, ... , VEK )
              ) AS TXNAME ( MARKER, CN1, ... , CNK )
        ) AS TEMPTABLE ( MARKER, WIFTVAl )
 WHERE MARKER = 1 )
```