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Part 11: Information and definition schemas (SQL/Schemata)

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

Partie 11: Schémas des informations et des définitions (SQL/Schemata)

Reference number
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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC have not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents and https://patents.iec.ch. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

This fifth edition cancels and replaces the fourth edition (ISO/IEC 9075-11:2016), which has been technically revised. It also incorporates the Technical Corrigenda ISO/IEC 9075-9:2016/Cor.1:2019 and ISO/IEC 9075-9:2016/Cor.2:2022.

The main changes are as follows:

— improve the presentation and accuracy of the summaries of implementation-defined and implementation-dependent aspects of this document;

— introduction of several digital artifacts;

— alignment with updated ISO house style and other guidelines for creating standards.

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This fifth edition of ISO/IEC 9075-11 is designed to be used in conjunction with the following editions of other parts of the ISO/IEC 9075 series, all published in 2023:

— ISO/IEC 9075-1, sixth edition;

— ISO/IEC 9075-2, sixth edition;

— ISO/IEC 9075-3, sixth edition;

— ISO/IEC 9075-4, seventh edition;

— ISO/IEC 9075-9, fifth edition;

— ISO/IEC 9075-10, fifth edition;

— ISO/IEC 9075-13, fifth edition;

— ISO/IEC 9075-14, sixth edition;

— ISO/IEC 9075-15, second edition;

— ISO/IEC 9075-16, first edition.

A list of all parts in the ISO/IEC 9075 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

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Introduction

The organization of this document is as follows:

1) Clause 1, "Scope", specifies the scope of this document.

2) Clause 2, "Normative references", identifies additional standards that, through reference in this document, constitute provisions of this document.

3) Clause 3, "Terms and definitions", defines the terms and definitions used in this document.

4) Clause 4, "Concepts", presents concepts used in the definition of Persistent SQL modules.

5) Clause 5, "Lexical elements", defines the lexical elements of the language.

6) Clause 6, "Information Schema", defines viewed tables that contain schema information.

7) Clause 7, "Definition Schema", defines base tables on which the viewed tables containing schema information depend.

8) Clause 8, "Conformance", defines the criteria for conformance to this document.

9) Annex A, "SQL conformance summary", is an informative Annex. It summarizes the conformance requirements of the SQL language.

10) Annex B, "Implementation-defined elements", is an informative Annex. It lists those features for which the body of this document states that the syntax, the meaning, the returned results, the effect on SQL-data and/or schemas, or other aspect is partly or wholly implementation-defined.

11) Annex C, "Implementation-dependent elements", is an informative Annex. It lists those features for which the body of this document states that the syntax, the meaning, the returned results, the effect on SQL-data and/or schemas, or other aspect is partly or wholly implementation-dependent.

12) Annex D, "SQL optional feature taxonomy", is an informative Annex. It identifies the optional features of the SQL language specified in this document by an identifier and a short descriptive name. This taxonomy is used to specify conformance.

13) Annex E, "Deprecated features", is an informative Annex. It lists features that the responsible Technical Committee intends not to include in a future edition of this document.

14) Annex F, "Incompatibilities with ISO/IEC 9075:2016", is an informative Annex. It lists incompatibilities with the previous edition of this document.

15) Annex G, "Defect Reports not addressed in this edition of this document", is an informative Annex. It describes the Defect Reports that were known at the time of publication of this document. Each of these problems is a problem carried forward from the previous edition of the ISO/IEC 9075 series. No new problems have been created in the drafting of this document.

16) Annex H, "SQL mandatory feature taxonomy", is an informative Annex. It identifies mandatory features and subfeatures of the SQL language specified in this document by an identifier and a short descriptive name. This taxonomy is used to specify conformance to Core SQL.

In the text of this document, in Clause 6, "Information Schema", through Clause 8, "Conformance", Subclauses begin new pages. Any resulting blank space is not significant.

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Information technology — Database language SQL —

Part 11:
Information and Definition Schemas (SQL/Schemata)

1 Scope

This document specifies an Information Schema and a Definition Schema that describes the following information.

— The structure and integrity constraints of SQL-data.

— The security and authorization specifications relating to SQL-data.

— The features and subfeatures of the ISO/IEC 9075 series, and the support that each of these has in an SQL-implementation.

— The SQL-implementation information and sizing items of the ISO/IEC 9075 series and the values supported by an SQL-implementation.

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2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 9075-1, *Information technology — Database languages — SQL — Part 1: Framework (SQL/Framework)*

ISO/IEC 9075-2, *Information technology — Database languages — SQL — Part 2: Foundation (SQL/Foundation)*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 9075-1 and ISO/IEC 9075-2 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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4 Concepts

This Clause modifies Clause 4, "Concepts", in ISO/IEC 9075-2.

4.1 Notations and conventions

This Subclause modifies Subclause 4.1, "Notations and conventions", in ISO/IEC 9075-2.

4.1.1 Notations

This Subclause modifies Subclause 4.1.1, "Notations", in ISO/IEC 9075-2.

The notations used in this document are defined in ISO/IEC 9075-1.

4.1.2 Values in Descriptions

The Descriptions in Clause 7, "Definition Schema", sometimes specify values that are to appear in rows of base tables. When such a value is given as a sequence of capital letters enclosed in <double quote>s, it denotes the same value as would be denoted by the <character string literal> obtained by replacing the enclosing <double quote>s by <quote>s. The need for such notation arises when the column in question sometimes, in other rows, contains character strings denoting SQL expressions, possibly even <character string literal>s.

4.2 Introduction to the Definition Schema

The Definition Schema base tables are defined as being in a schema named DEFINITION_SCHEMA. The table definitions are as complete as the definitional power of SQL allows. The table definitions are supplemented with assertions where appropriate.

The only purpose of the Definition Schema is to provide a data model to support the Information Schema and to assist understanding. An SQL-implementation need do no more than simulate the existence of the Definition Schema, as viewed through the Information Schema views. The specification does not imply that an SQL-implementation shall provide the functionality in the manner described in the Definition Schema.

A Definition Schema *DS* completely describes all contents of every schema, excluding itself, but including the Information Schema, contained in the catalog *C* that contains *DS*. When some object, such as a constraint or a view, references an object contained in a schema contained in a catalog *OC*, $OC \neq C$, the reference to that object cannot be confirmed, because the information about objects contained in *OC* is not necessarily available to *DS*. The constraints defined in *DS* can thus guarantee consistency only within *C*.

Because the DEFINITION_SCHEMA references objects that are only defined in the INFORMATION_SCHEMA, it would not normally be possible to create these two schemata using the CREATE SCHEMA statements as written. It is assumed that an INFORMATION_SCHEMA and its underlying DEFINITION_SCHEMA are created in some implementation-dependent (UW003) way at the time that a catalog is created.

In addition to the descriptors created by the effective execution of the CREATE INFORMATION_SCHEMA statement, the DEFINITION_SCHEMA must also contain descriptions of other object defined by the standard, e.g., the character repertoire SQL_IDENTIFER.

The way in which certain constraints are expressed caters for the possibility that an object is being referenced that exists in a catalog that is outside the purview of the Definition Schema containing the reference in question. For example, the definition of the VIEW_TABLE_USAGE base table in Subclause 7.71, "VIEW_TABLE_USAGE base table", includes the following constraint:

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```
CONSTRAINT VIEW_TABLE_USAGE_CHECK_REFERENCES_TABLES
    CHECK ( TABLE_CATALOG NOT IN
            ( SELECT CATALOG_NAME
              FROM SCHEMATA )
          OR
            ( TABLE_CATALOG, TABLE_SCHEMA, TABLE_NAME ) IN
              ( SELECT TABLE_CATALOG, TABLE_SCHEMA, TABLE_NAME
                FROM TABLES ) )
```

Either the table being used by the view exists in a catalog within this Definition Schema's purview, in which case its existence is guaranteed, or it is assumed but not guaranteed to exist in some catalog that is outside this Definition Schema's purview.

Because <unqualified schema name>s are prohibited by SR 10) of Subclause 5.4, "Names and identifiers", in ISO/IEC 9075-2, from specifying DEFINITION_SCHEMA, the Definition Schema cannot normally be accessed in an SQL-statement. However, view definitions in the Information Schema assume the existence of the Definition Schema and reference base tables whose <schema name> is DEFINITION_SCHEMA. They use the Definition Schema to define the content of the Information Schema. Regardless of SR 14) of Subclause 5.4, "Names and identifiers", in ISO/IEC 9075-2, the <schema name> DEFINITION_SCHEMA is never qualified by a <catalog name>. It is implementation-defined (IA027) whether the DEFINITION_SCHEMA referenced by an INFORMATION_SCHEMA describes schemas in catalogs other than the catalog in which the INFORMATION_SCHEMA is located.

A base table in the Definition Schema is specified by:

— a Function, which summarizes the purpose and contents of the table;

— a Definition, giving the SQL statement(s) needed to define the table;

— a Description of the column values comprising a row of the table;

— an Initial Table Population detailing the initial contents of the table. An Initial Table Population entry of "None" implies that the table contents should be fully apparent from the Function, Definition, and Description; it does not necessarily imply that the table has no rows.

4.3 Introduction to the Information Schema

The views of the Information Schema are viewed tables defined in terms of the base tables of the Definition Schema.

The Information Schema views are defined as being in a schema named INFORMATION_SCHEMA, enabling these views to be accessed in the same way as other tables in other schemas. SELECT on most of these views is granted to PUBLIC WITH GRANT OPTION, so that they can be queried by all users and so that SELECT privilege can be further granted on views that reference these Information Schema views. No other privilege is granted on them, so they cannot be updated.

In order to provide access to the same information that is available via the INFORMATION_SCHEMA to an SQL-Agent in an SQL-environment where the SQL-implementation does not support Feature F391, "Long identifiers", alternative views are provided that use only short identifiers. The Information Schema also contains a small number of domains on which the columns of the Definition Schema are based. USAGE on all these domains is granted to PUBLIC WITH GRANT OPTION, so that they can be used by all users.

An SQL-implementation may define objects that are associated with INFORMATION_SCHEMA that are not defined in this Clause. SQL-implementations and future versions of the ISO/IEC 9075 series may also add columns to tables that are defined in this Clause.

NOTE 1 — The Information Schema tables are supposed to be represented in the Definition Schema in the same way as other tables, and are hence self-describing.

NOTE 2 — The Information Schema is a definition of the SQL data model, specified as an SQL-schema, in terms of <SQL schema statement>s as defined in the ISO/IEC 9075 series. Constraints defined in this Clause are not actual SQL constraints.

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4.3 Introduction to the Information Schema

The representation of an <identifier> in the base tables and views of the Information Schema is by a character string corresponding to its <identifier body> (in the case of a <regular identifier>) or its <delimited identifier body> (in the case of a <delimited identifier>). Within this character string, every lower-case letter appearing in a <regular identifier> is replaced by the equivalent upper-case letter, and every <double quote symbol> appearing in a <delimited identifier body> is replaced by a <double quote>. Where an <actual identifier> has multiple forms that are equal according to the rules of Subclause 8.2, "<comparison predicate>", in ISO/IEC 9075-2, the form stored is that encountered at definition time.

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5 Lexical elements

This Clause modifies Clause 5, "Lexical elements", in ISO/IEC 9075-2.

5.1 <token> and <separator>

This Subclause modifies Subclause 5.2, "<token> and <separator>", in ISO/IEC 9075-2.

Function

Specify lexical units (tokens and separators) that participate in SQL language.

Format

```
<reserved word> ::=
    !! All alternatives from ISO/IEC 9075-2

<non-reserved word> ::=
    !! All alternatives from ISO/IEC 9075-2
```

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6 Information Schema

This Clause is modified by Clause 20, "Information Schema", in ISO/IEC 9075-4.
This Clause is modified by Clause 24, "Information Schema", in ISO/IEC 9075-9.
This Clause is modified by Clause 14, "Information Schema", in ISO/IEC 9075-13.
This Clause is modified by Clause 21, "Information Schema", in ISO/IEC 9075-14.
This Clause is modified by Clause 18, "Information Schema", in ISO/IEC 9075-15.
This Clause is modified by Clause 15, "Information Schema", in ISO/IEC 9075-16.

6.1 Information Schema digital artifact

This Subclause is modified by Subclause 20.1, "Information Schema digital artifact", in ISO/IEC 9075-4.
This Subclause is modified by Subclause 24.1, "Information Schema digital artifact", in ISO/IEC 9075-9.
This Subclause is modified by Subclause 14.1, "Information Schema digital artifact", in ISO/IEC 9075-13.
This Subclause is modified by Subclause 21.1, "Information Schema digital artifact", in ISO/IEC 9075-14.
This Subclause is modified by Subclause 18.1, "Information Schema digital artifact", in ISO/IEC 9075-15.
This Subclause is modified by Subclause 15.1, "Information Schema digital artifact", in ISO/IEC 9075-16.

04 09 13 14 15 16 These schema definition and manipulation statements are also available from the ISO website as a "digital artifact". See `https://standards.iso.org/iso-iec/9075/-11/ed-5/en/` to download digital artifacts for this document. To download the schema definition and manipulation statements, select the file named `ISO_IEC_9075-11(E)_Schemata-schema-definition.sql`.

6.2 INFORMATION_SCHEMA Schema

Function

Identify the schema that is to contain the Information Schema tables.

Definition

```
CREATE SCHEMA INFORMATION_SCHEMA
    AUTHORIZATION INFORMATION_SCHEMA;
```

Conformance Rules

None.

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6.3 INFORMATION_SCHEMA_CATALOG_NAME view

Function

Identify the catalog that contains the Information Schema.

Definition

```
CREATE VIEW INFORMATION_SCHEMA_CATALOG_NAME AS
    SELECT CATALOG_NAME
    FROM DEFINITION_SCHEMA.CATALOG_NAME
    WHERE CATALOG_NAME = 'CN';

GRANT SELECT ON TABLE INFORMATION_SCHEMA_CATALOG_NAME
    TO PUBLIC WITH GRANT OPTION;
```

Description

1) *CN* is the name of the catalog in which this Information Schema resides.

Conformance Rules

1) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.INFORMATION_SCHEMA_CATALOG_NAME.

2) Without Feature F651, “Catalog name qualifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.INFORMATION_SCHEMA_CATALOG_NAME.

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6.4 CARDINAL_NUMBER domain

Function

Define a domain that contains a non-negative number.

Definition

```
CREATE DOMAIN CARDINAL_NUMBER AS INTEGER
    CONSTRAINT CARDINAL_NUMBER_DOMAIN_CHECK
      CHECK ( VALUE >= 0 );

GRANT USAGE ON DOMAIN CARDINAL_NUMBER
    TO PUBLIC WITH GRANT OPTION;
```

Description

1) The domain CARDINAL_NUMBER contains non-negative numbers that are less than or equal to the implementation-defined (IL011) maximum for INTEGER.

Conformance Rules

1) Without Feature F251, “Domain support”, conforming SQL language shall not reference the domain INFORMATION_SCHEMA.CARDINAL_NUMBER.

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6.5 CHARACTER_DATA domain

Function

Define a domain that contains character data.

Definition

```
CREATE DOMAIN CHARACTER_DATA AS
    CHARACTER VARYING (ML)
    CHARACTER SET SQL_TEXT;

GRANT USAGE ON DOMAIN CHARACTER_DATA
    TO PUBLIC WITH GRANT OPTION;
```

Description

1) This domain specifies character data.

2) *ML* is the implementation-defined (IL006) maximum length of a variable-length character string.

Conformance Rules

1) Without Feature F251, “Domain support”, conforming SQL language shall not reference the domain INFORMATION_SCHEMA.CHARACTER_DATA.

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6.6 SQL_IDENTIFIER domain

Function

Define a domain that contains all valid <identifier body>s and <delimited identifier body>s.

Definition

```
CREATE DOMAIN SQL_IDENTIFIER AS
    CHARACTER VARYING (L)
    CHARACTER SET SQL_IDENTIFIER;

GRANT USAGE ON DOMAIN SQL_IDENTIFIER
    TO PUBLIC WITH GRANT OPTION;
```

Description

1) This domain specifies all variable-length character values that conform to the rules for formation and representation of an SQL <identifier body> or an SQL <delimited identifier body>.

   NOTE 3 — There is no way in SQL to specify a <domain constraint> that would be true for the body of every valid SQL <regular identifier> or <delimited identifier> and false for all other character string values.

2) *L* is the implementation-defined (IL005) maximum length of <identifier body> and <delimited identifier body>.

Conformance Rules

1) Without Feature F251, "Domain support", conforming SQL language shall not reference the domain INFORMATION_SCHEMA.SQL_IDENTIFIER.

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6.7 TIME_STAMP domain

Function

Define a domain that contains a timestamp.

Definition

```
CREATE DOMAIN TIME_STAMP AS TIMESTAMP(2) WITH TIME ZONE;

GRANT USAGE ON DOMAIN TIME_STAMP
    TO PUBLIC WITH GRANT OPTION;
```

Description

1) The domain TIME_STAMP contains an SQL timestamp value.

Conformance Rules

1) Without both Feature F251, “Domain support”, and Feature T011, “Timestamp in Information Schema”, conforming SQL language shall not reference the domain INFORMATION_SCHEMA.TIME_STAMP.

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6.8 YES_OR_NO domain

Function

Define a domain that contains a character string value, but allows only two possible strings, YES or NO.

Definition

```
CREATE DOMAIN YES_OR_NO AS
    CHARACTER VARYING (3)
    CHARACTER SET SQL_IDENTIFIER
      CONSTRAINT YES_OR_NO_CHECK
        CHECK (VALUE IN ( 'YES', 'NO' ) );

GRANT USAGE ON DOMAIN YES_OR_NO
    TO PUBLIC WITH GRANT OPTION;
```

Description

1) This Domain specifies all Boolean values, which are needed in the definition schema, encoded in the two strings 'YES' and 'NO'.

Conformance Rules

1) Without Feature F251, “Domain support”, conforming SQL language shall not reference the domain INFORMATION_SCHEMA.YES_OR_NO.

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6.9 ADMINISTRABLE_ROLE_AUTHORIZATIONS view

Function

Identify role authorizations for which the current user or role has WITH ADMIN OPTION.

Definition

```
CREATE VIEW ADMINISTRABLE_ROLE_AUTHORIZATIONS AS
    SELECT GRANTEE, ROLE_NAME, IS_GRANTABLE
    FROM DEFINITION_SCHEMA.ROLE_AUTHORIZATION_DESCRIPTORS
    WHERE ROLE_NAME IN
          ( SELECT ROLE_NAME
            FROM INFORMATION_SCHEMA.APPLICABLE_ROLES
            WHERE IS_GRANTABLE = 'YES' );

GRANT SELECT ON TABLE ADMINISTRABLE_ROLE_AUTHORIZATIONS
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature T331, “Basic roles”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.ADMINISTRABLE_ROLE_AUTHORIZATIONS.

2) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.ADMINISTRABLE_ROLE_AUTHORIZATIONS.

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6.10 APPLICABLE_ROLES view

Function

Identifies the applicable roles for the current user.

Definition

```
CREATE RECURSIVE VIEW APPLICABLE_ROLES ( GRANTEE, ROLE_NAME, IS_GRANTABLE ) AS
    ( ( SELECT GRANTEE, ROLE_NAME, IS_GRANTABLE
        FROM DEFINITION_SCHEMA.ROLE_AUTHORIZATION_DESCRIPTORS
        WHERE ( GRANTEE IN
                ( CURRENT_USER, 'PUBLIC' )
             OR
                GRANTEE IN
                ( SELECT ROLE_NAME
                  FROM ENABLED_ROLES ) ) )
      UNION
      ( SELECT RAD.GRANTEE, RAD.ROLE_NAME, RAD.IS_GRANTABLE
        FROM DEFINITION_SCHEMA.ROLE_AUTHORIZATION_DESCRIPTORS RAD
          JOIN
             APPLICABLE_ROLES R
            ON
               RAD.GRANTEE = R.ROLE_NAME ) );

GRANT SELECT ON TABLE APPLICABLE_ROLES
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature T331, “Basic roles”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.APPLICABLE_ROLES.

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6.11 ASSERTIONS view

Function

Identify the assertions defined in this catalog that are owned by a given user or role.

Definition

```
CREATE VIEW ASSERTIONS AS
    SELECT A.CONSTRAINT_CATALOG, A.CONSTRAINT_SCHEMA, A.CONSTRAINT_NAME,
           A.IS_DEFERRABLE, A.INITIALLY_DEFERRED
    FROM DEFINITION_SCHEMA.ASSERTIONS AS A
      JOIN
         DEFINITION_SCHEMA.SCHEMATA AS S
        ON ( ( A.CONSTRAINT_CATALOG, A.CONSTRAINT_SCHEMA )
           = ( S.CATALOG_NAME, S.SCHEMA_NAME ) )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
          OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND
          A.CONSTRAINT_CATALOG
        = ( SELECT ISCN.CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME AS ISCN );

GRANT SELECT ON TABLE ASSERTIONS
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F521, “Assertions”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.ASSERTIONS.

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6.12 ATTRIBUTES view

This Subclause is modified by Subclause 24.2, "ATTRIBUTES view", in ISO/IEC 9075-9.
This Subclause is modified by Subclause 21.4, "ATTRIBUTES view", in ISO/IEC 9075-14.

Function

Identify the attributes of user-defined types defined in this catalog that are accessible to a given user or role.

Definition

```
CREATE VIEW ATTRIBUTES AS
      SELECT DISTINCT
        UDT_CATALOG, UDT_SCHEMA, UDT_NAME,
        A.ATTRIBUTE_NAME, ORDINAL_POSITION, ATTRIBUTE_DEFAULT,
        DATA_TYPE, CHARACTER_MAXIMUM_LENGTH, CHARACTER_OCTET_LENGTH,
        D1.CHARACTER_SET_CATALOG, D1.CHARACTER_SET_SCHEMA, D1.CHARACTER_SET_NAME,
        D1.COLLATION_CATALOG, D1.COLLATION_SCHEMA, D1.COLLATION_NAME,
        NUMERIC_PRECISION, NUMERIC_PRECISION_RADIX, NUMERIC_SCALE,
        DATETIME_PRECISION, INTERVAL_TYPE, INTERVAL_PRECISION,
        D1.USER_DEFINED_TYPE_CATALOG AS ATTRIBUTE_UDT_CATALOG,
        D1.USER_DEFINED_TYPE_SCHEMA AS ATTRIBUTE_UDT_SCHEMA,
        D1.USER_DEFINED_TYPE_NAME AS ATTRIBUTE_UDT_NAME,
        D1.SCOPE_CATALOG, D1.SCOPE_SCHEMA, D1.SCOPE_NAME,
        MAXIMUM_CARDINALITY, A.DTD_IDENTIFIER, IS_DERIVED_REFERENCE_ATTRIBUTE,
        DECLARED_DATA_TYPE, DECLARED_NUMERIC_PRECISION,
        DECLARED_NUMERIC_SCALE
      FROM ( DEFINITION_SCHEMA.ATTRIBUTES AS A
           LEFT JOIN
             DEFINITION_SCHEMA.DATA_TYPE_DESCRIPTOR AS D1
             ON ( ( A.UDT_CATALOG, A.UDT_SCHEMA, A.UDT_NAME,
                    'USER-DEFINED TYPE', A.DTD_IDENTIFIER )
                = ( D1.OBJECT_CATALOG, D1.OBJECT_SCHEMA, D1.OBJECT_NAME,
                    D1.OBJECT_TYPE, D1.DTD_IDENTIFIER ) ) )
      WHERE ( A.UDT_CATALOG, A.UDT_SCHEMA, A.UDT_NAME ) IN
            ( SELECT UDTP.USER_DEFINED_TYPE_CATALOG,
                     UDTP.USER_DEFINED_TYPE_SCHEMA,
                     UDTP.USER_DEFINED_TYPE_NAME
              FROM DEFINITION_SCHEMA.USER_DEFINED_TYPE_PRIVILEGES AS UDTP
              WHERE ( UDTP.GRANTEE IN
                      ( 'PUBLIC', CURRENT_USER )
                    OR
                      UDTP.GRANTEE IN
                      ( SELECT ROLE_NAME
                        FROM ENABLED_ROLES ) ) )
        AND
            A.UDT_CATALOG
          = ( SELECT CATALOG_NAME
              FROM INFORMATION_SCHEMA_CATALOG_NAME );

GRANT SELECT ON TABLE ATTRIBUTES
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature S023, "Basic structured types", conforming SQL language shall not reference the view INFORMATION_SCHEMA.ATTRIBUTES.

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2) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.ATTRIBUTES.

3) [14]Without Feature T322, “Declared data type attributes”, conforming SQL language shall not reference the following columns in the view INFORMATION_SCHEMA.ATTRIBUTES:

   a) DECLARED_DATA_TYPE.

   b) DECLARED_NUMERIC_PRECISION.

   c) DECLARED_NUMERIC_SCALE.

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6.13 CHARACTER_SETS view

Function

Identify the character sets defined in this catalog that are accessible to a given user or role.

Definition

```
CREATE VIEW CHARACTER_SETS AS
    SELECT CHARACTER_SET_CATALOG, CHARACTER_SET_SCHEMA, CHARACTER_SET_NAME,
           CHARACTER_REPERTOIRE, FORM_OF_USE, DEFAULT_COLLATE_CATALOG,
           DEFAULT_COLLATE_SCHEMA, DEFAULT_COLLATE_NAME
    FROM DEFINITION_SCHEMA.CHARACTER_SETS
    WHERE ( CHARACTER_SET_CATALOG, CHARACTER_SET_SCHEMA, CHARACTER_SET_NAME,
            'CHARACTER SET') IN
            ( SELECT UP.OBJECT_CATALOG, UP.OBJECT_SCHEMA, UP.OBJECT_NAME,
                     UP.OBJECT_TYPE
              FROM DEFINITION_SCHEMA.USAGE_PRIVILEGES AS UP
              WHERE ( UP.GRANTEE IN
                      ( 'PUBLIC', CURRENT_USER )
                    OR
                      UP.GRANTEE IN
                      ( SELECT ROLE_NAME
                        FROM ENABLED_ROLES ) ) )
                AND
                    CHARACTER_SET_CATALOG
                  = ( SELECT CATALOG_NAME
                      FROM INFORMATION_SCHEMA_CATALOG_NAME );

GRANT SELECT ON TABLE CHARACTER_SETS
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.CHARACTER_SETS.

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6.14 CHECK_CONSTRAINT_ROUTINE_USAGE view

Function

Identify each SQL-invoked routine owned by a given user or role on which a domain constraint, table check constraint or assertion defined in this catalog is dependent.

Definition

```
CREATE VIEW CHECK_CONSTRAINT_ROUTINE_USAGE AS
    SELECT CCRU.CONSTRAINT_CATALOG, CCRU.CONSTRAINT_SCHEMA, CCRU.CONSTRAINT_NAME,
           CCRU.SPECIFIC_CATALOG, CCRU.SPECIFIC_SCHEMA, CCRU.SPECIFIC_NAME
    FROM DEFINITION_SCHEMA.CHECK_CONSTRAINT_ROUTINE_USAGE AS CCRU
      JOIN
         DEFINITION_SCHEMA.SCHEMATA AS S
        ON ( ( CCRU.SPECIFIC_CATALOG, CCRU.SPECIFIC_SCHEMA )
           = ( S.CATALOG_NAME, S.SCHEMA_NAME ) )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
          OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND
          CCRU.SPECIFIC_CATALOG
        = ( SELECT ISCN.CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME AS ISCN );

GRANT SELECT ON TABLE CHECK_CONSTRAINT_ROUTINE_USAGE
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F341, “Usage tables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.CHECK_CONSTRAINT_ROUTINE_USAGE.

2) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.CHECK_CONSTRAINT_ROUTINE_USAGE.

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6.15 CHECK_CONSTRAINTS view

Function

Identify the check constraints defined in this catalog that are owned by a given user or role.

Definition

```
CREATE VIEW CHECK_CONSTRAINTS AS
    SELECT CC.CONSTRAINT_CATALOG, CC.CONSTRAINT_SCHEMA,
           CC.CONSTRAINT_NAME, CC.CHECK_CLAUSE
    FROM DEFINITION_SCHEMA.CHECK_CONSTRAINTS AS CC
      JOIN
         DEFINITION_SCHEMA.SCHEMATA AS S
        ON ( ( CC.CONSTRAINT_CATALOG, CC.CONSTRAINT_SCHEMA )
           = ( S.CATALOG_NAME, S.SCHEMA_NAME ) )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
          OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND CC.CONSTRAINT_CATALOG
        = ( SELECT ISCN.CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME AS ISCN );

GRANT SELECT ON TABLE CHECK_CONSTRAINTS
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

None.

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6.16 COLLATIONS view

Function

Identify the character collations defined in this catalog that are accessible to a given user or role.

Definition

```
CREATE VIEW COLLATIONS AS
    SELECT COLLATION_CATALOG, COLLATION_SCHEMA, COLLATION_NAME,
           PAD_ATTRIBUTE
    FROM DEFINITION_SCHEMA.COLLATIONS
    WHERE ( COLLATION_CATALOG, COLLATION_SCHEMA, COLLATION_NAME,
            'COLLATION' ) IN
            ( SELECT UP.OBJECT_CATALOG, UP.OBJECT_SCHEMA, UP.OBJECT_NAME,
                     UP.OBJECT_TYPE
              FROM DEFINITION_SCHEMA.USAGE_PRIVILEGES AS UP
              WHERE ( UP.GRANTEE IN
                      ( 'PUBLIC', CURRENT_USER )
                    OR
                      UP.GRANTEE IN
                      ( SELECT ROLE_NAME
                        FROM ENABLED_ROLES ) ) )
      AND COLLATION_CATALOG
        = ( SELECT CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME );

GRANT SELECT ON TABLE COLLATIONS
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F690, “Collation support”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLLATIONS.

2) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLLATIONS.

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6.17 COLLATION_CHARACTER_SET_APPLICABILITY view

Function

Identify the character sets to which each collation is applicable.

Definition

```
CREATE VIEW COLLATION_CHARACTER_SET_APPLICABILITY AS
    SELECT CCSA.COLLATION_CATALOG, CCSA.COLLATION_SCHEMA, CCSA.COLLATION_NAME,
           CCSA.CHARACTER_SET_CATALOG, CCSA.CHARACTER_SET_SCHEMA, CCSA.CHARACTER_SET_NAME
    FROM DEFINITION_SCHEMA.COLLATION_CHARACTER_SET_APPLICABILITY AS CCSA
      JOIN
         DEFINITION_SCHEMA.SCHEMATA AS S
        ON ( ( CCSA.COLLATION_CATALOG, CCSA.COLLATION_SCHEMA )
           = ( S.CATALOG_NAME, S.SCHEMA_NAME ) )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
          OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND CCSA.COLLATION_CATALOG
        = ( SELECT ISCN.CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME AS ISCN );

GRANT SELECT ON TABLE COLLATION_CHARACTER_SET_APPLICABILITY
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLLATION_CHARACTER_SET_APPLICABILITY.

2) Without Feature F690, “Collation support”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLLATION_CHARACTER_SET_APPLICABILITY.

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6.18 COLUMN_COLUMN_USAGE view

Function

Identify each case where a generated column depends on a base column in a base table owned by a given user or role.

Definition

```
CREATE VIEW COLUMN_COLUMN_USAGE AS
    SELECT CCU.TABLE_CATALOG, CCU.TABLE_SCHEMA, CCU.TABLE_NAME,
           CCU.COLUMN_NAME, CCU.DEPENDENT_COLUMN
    FROM DEFINITION_SCHEMA.COLUMN_COLUMN_USAGE AS CCU
    JOIN
         DEFINITION_SCHEMA.SCHEMATA AS S
      ON ( CCU.TABLE_CATALOG, CCU.TABLE_SCHEMA )
       = ( S.CATALOG_NAME, S.SCHEMA_NAME )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
         OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND
          CCU.TABLE_CATALOG
        = ( SELECT ISCN.CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME AS ISCN );

GRANT SELECT ON TABLE COLUMN_COLUMN_USAGE
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature T175, “Generated columns”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLUMN_COLUMN_USAGE.

2) Without Feature F341, “Usage tables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLUMN_COLUMN_USAGE.

3) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLUMN_COLUMN_USAGE.

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6.19 COLUMN_DOMAIN_USAGE view

Function

Identify the columns defined that are dependent on a domain defined in this catalog and owned by a user or role.

Definition

```
CREATE VIEW COLUMN_DOMAIN_USAGE AS
    SELECT DOMAIN_CATALOG, DOMAIN_SCHEMA, DOMAIN_NAME,
           C.TABLE_CATALOG, C.TABLE_SCHEMA, C.TABLE_NAME, C.COLUMN_NAME
    FROM ( DEFINITION_SCHEMA.COLUMNS AS C
         JOIN
           ( DEFINITION_SCHEMA.DOMAINS AS D
           JOIN
             DEFINITION_SCHEMA.SCHEMATA AS S
             ON ( ( D.DOMAIN_CATALOG, D.DOMAIN_SCHEMA )
                = ( S.CATALOG_NAME, S.SCHEMA_NAME ) ) )
         USING ( DOMAIN_CATALOG, DOMAIN_SCHEMA, DOMAIN_NAME ) )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
          OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND
          DOMAIN_NAME IS NOT NULL
      AND
          DOMAIN_CATALOG
        = ( SELECT ISCN.CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME AS ISCN );

GRANT SELECT ON TABLE COLUMN_DOMAIN_USAGE
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F251, “Domain support”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLUMN_DOMAIN_USAGE.

2) Without Feature F341, “Usage tables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLUMN_DOMAIN_USAGE.

3) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLUMN_DOMAIN_USAGE.

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6.20 COLUMN_PRIVILEGES view

Function

Identify the privileges on columns of tables defined in this catalog that are available to or granted by a given user or role.

Definition

```
CREATE VIEW COLUMN_PRIVILEGES AS
    SELECT GRANTOR, GRANTEE, TABLE_CATALOG, TABLE_SCHEMA, TABLE_NAME, COLUMN_NAME,
           PRIVILEGE_TYPE, IS_GRANTABLE
    FROM DEFINITION_SCHEMA.COLUMN_PRIVILEGES
    WHERE ( GRANTEE IN
            ( 'PUBLIC', CURRENT_USER )
         OR
            GRANTEE IN
            ( SELECT ROLE_NAME
              FROM ENABLED_ROLES )
         OR
            GRANTOR
          = CURRENT_USER
         OR
            GRANTOR IN
            ( SELECT ROLE_NAME
              FROM ENABLED_ROLES ) )
      AND
          TABLE_CATALOG
        = ( SELECT CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME );

GRANT SELECT ON TABLE COLUMN_PRIVILEGES
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F231, “Privilege tables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLUMN_PRIVILEGES.

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6.21 COLUMN_UDT_USAGE view

Function

Identify the columns defined that are dependent on a user-defined type defined in this catalog and owned by a given user or role.

Definition

```
CREATE VIEW COLUMN_UDT_USAGE AS
    SELECT DTD.USER_DEFINED_TYPE_CATALOG AS UDT_CATALOG,
           DTD.USER_DEFINED_TYPE_SCHEMA AS UDT_SCHEMA,
           DTD.USER_DEFINED_TYPE_NAME AS UDT_NAME,
           C.TABLE_CATALOG, C.TABLE_SCHEMA, C.TABLE_NAME, C.COLUMN_NAME
    FROM ( DEFINITION_SCHEMA.COLUMNS AS C
         JOIN
           ( DEFINITION_SCHEMA.DATA_TYPE_DESCRIPTOR AS DTD
           JOIN
             DEFINITION_SCHEMA.SCHEMATA AS S
           ON ( DTD.USER_DEFINED_TYPE_CATALOG, DTD.USER_DEFINED_TYPE_SCHEMA )
            = ( S.CATALOG_NAME, S.SCHEMA_NAME ) )
         ON ( ( C.TABLE_CATALOG, C.TABLE_SCHEMA, C.TABLE_NAME,
                'TABLE', C.DTD_IDENTIFIER )
            = ( DTD.OBJECT_CATALOG, DTD.OBJECT_SCHEMA, DTD.OBJECT_NAME,
                DTD.OBJECT_TYPE, DTD.DTD_IDENTIFIER ) ) )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
          OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND
          DTD.DATA_TYPE = 'USER-DEFINED';

GRANT SELECT ON TABLE COLUMN_UDT_USAGE
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F341, “Usage tables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLUMN_UDT_USAGE.

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6.22 COLUMNS view

This Subclause is modified by Subclause 24.4, "COLUMNS view", in ISO/IEC 9075-9.
This Subclause is modified by Subclause 21.5, "COLUMNS view", in ISO/IEC 9075-14.

Function

Identify the columns of tables defined in this catalog that are accessible to a given user or role.

Definition

```
CREATE VIEW COLUMNS AS
    SELECT DISTINCT
      TABLE_CATALOG, TABLE_SCHEMA, TABLE_NAME,
      C.COLUMN_NAME, ORDINAL_POSITION, COLUMN_DEFAULT, IS_NULLABLE,
      COALESCE (D1.DATA_TYPE, D2.DATA_TYPE) AS DATA_TYPE,
      COALESCE (D1.CHARACTER_MAXIMUM_LENGTH, D2.CHARACTER_MAXIMUM_LENGTH)
               AS CHARACTER_MAXIMUM_LENGTH,
      COALESCE (D1.CHARACTER_OCTET_LENGTH, D2.CHARACTER_OCTET_LENGTH)
               AS CHARACTER_OCTET_LENGTH,
      COALESCE (D1.NUMERIC_PRECISION, D2.NUMERIC_PRECISION)
               AS NUMERIC_PRECISION,
      COALESCE (D1.NUMERIC_PRECISION_RADIX, D2.NUMERIC_PRECISION_RADIX)
               AS NUMERIC_PRECISION_RADIX,
      COALESCE (D1.NUMERIC_SCALE, D2.NUMERIC_SCALE)
               AS NUMERIC_SCALE,
      COALESCE (D1.DATETIME_PRECISION, D2.DATETIME_PRECISION)
               AS DATETIME_PRECISION,
      COALESCE (D1.INTERVAL_TYPE, D2.INTERVAL_TYPE)
               AS INTERVAL_TYPE,
      COALESCE (D1.INTERVAL_PRECISION, D2.INTERVAL_PRECISION)
               AS INTERVAL_PRECISION,
      COALESCE (D1.CHARACTER_SET_CATALOG, D2.CHARACTER_SET_CATALOG)
               AS CHARACTER_SET_CATALOG,
      COALESCE (D1.CHARACTER_SET_SCHEMA, D2.CHARACTER_SET_SCHEMA)
               AS CHARACTER_SET_SCHEMA,
      COALESCE (D1.CHARACTER_SET_NAME, D2.CHARACTER_SET_NAME)
               AS CHARACTER_SET_NAME,
      COALESCE (D1.COLLATION_CATALOG, D2.COLLATION_CATALOG)
               AS COLLATION_CATALOG,
      COALESCE (D1.COLLATION_SCHEMA, D2.COLLATION_SCHEMA)
               AS COLLATION_SCHEMA,
      COALESCE (D1.COLLATION_NAME, D2.COLLATION_NAME)
               AS COLLATION_NAME,
      DOMAIN_CATALOG, DOMAIN_SCHEMA, DOMAIN_NAME,
      COALESCE (D1.USER_DEFINED_TYPE_CATALOG, D2.USER_DEFINED_TYPE_CATALOG)
               AS UDT_CATALOG,
      COALESCE (D1.USER_DEFINED_TYPE_SCHEMA, D2.USER_DEFINED_TYPE_SCHEMA)
               AS UDT_SCHEMA,
      COALESCE (D1.USER_DEFINED_TYPE_NAME, D2.USER_DEFINED_TYPE_NAME)
               AS UDT_NAME,
      COALESCE (D1.SCOPE_CATALOG, D2.SCOPE_CATALOG) AS SCOPE_CATALOG,
      COALESCE (D1.SCOPE_SCHEMA, D2.SCOPE_SCHEMA) AS SCOPE_SCHEMA,
      COALESCE (D1.SCOPE_NAME, D2.SCOPE_NAME) AS SCOPE_NAME,
      COALESCE (D1.MAXIMUM_CARDINALITY, D2.MAXIMUM_CARDINALITY)
               AS MAXIMUM_CARDINALITY,
      COALESCE (D1.DTD_IDENTIFIER, D2.DTD_IDENTIFIER)
               AS DTD_IDENTIFIER,
      IS_SELF_REFERENCING, IS_IDENTITY, IDENTITY_GENERATION,
      IDENTITY_START, IDENTITY_INCREMENT,
      IDENTITY_MAXIMUM, IDENTITY_MINIMUM, IDENTITY_CYCLE,
      IS_GENERATED, GENERATION_EXPRESSION, IS_SYSTEM_TIME_PERIOD_START,
      IS_SYSTEM_TIME_PERIOD_END, SYSTEM_TIME_PERIOD_TIMESTAMP_GENERATION,
      IS_UPDATABLE,
```

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```
      COALESCE (D1.DECLARED_DATA_TYPE, D2.DECLARED_DATA_TYPE)
               AS DECLARED_DATA_TYPE,
      COALESCE (D1.DECLARED_NUMERIC_PRECISION, D2.DECLARED_NUMERIC_PRECISION)
               AS DECLARED_NUMERIC_PRECISION,
      COALESCE (D1.DECLARED_NUMERIC_SCALE, D2.DECLARED_NUMERIC_SCALE)
               AS DECLARED_NUMERIC_SCALE
    FROM ( ( DEFINITION_SCHEMA.COLUMNS AS C
           LEFT JOIN
             DEFINITION_SCHEMA.DATA_TYPE_DESCRIPTOR AS D1
             ON ( ( C.TABLE_CATALOG, C.TABLE_SCHEMA, C.TABLE_NAME,
                    'TABLE', C.DTD_IDENTIFIER )
                = ( D1.OBJECT_CATALOG, D1.OBJECT_SCHEMA, D1.OBJECT_NAME,
                    D1.OBJECT_TYPE, D1.DTD_IDENTIFIER ) ) ) )
         LEFT JOIN
           DEFINITION_SCHEMA.DATA_TYPE_DESCRIPTOR AS D2
           ON ( ( C.DOMAIN_CATALOG, C.DOMAIN_SCHEMA, C.DOMAIN_NAME,
                  'DOMAIN', C.DTD_IDENTIFIER )
              = ( D2.OBJECT_CATALOG, D2.OBJECT_SCHEMA, D2.OBJECT_NAME,
                  D2.OBJECT_TYPE, D2.DTD_IDENTIFIER ) )
    WHERE ( C.TABLE_CATALOG, C.TABLE_SCHEMA, C.TABLE_NAME, C.COLUMN_NAME ) IN
            ( SELECT CP.TABLE_CATALOG, CP.TABLE_SCHEMA, CP.TABLE_NAME, CP.COLUMN_NAME
              FROM DEFINITION_SCHEMA.COLUMN_PRIVILEGES AS CP
              WHERE ( CP.GRANTEE IN
                      ( 'PUBLIC', CURRENT_USER )
                    OR
                      CP.GRANTEE IN
                      ( SELECT ROLE_NAME
                        FROM ENABLED_ROLES ) ) )
      AND
          C.TABLE_CATALOG
        = ( SELECT CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME );

GRANT SELECT ON TABLE COLUMNS
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.COLUMNS.

2) Without Feature T175, “Generated columns”, conforming SQL language shall not reference the following columns in the view INFORMATION_SCHEMA.COLUMNS:

   a) IS_GENERATED.

   b) GENERATION_EXPRESSION.

3) Without Feature T111, “Updatable joins, unions, and columns”, conforming SQL language shall not reference the following column in the view INFORMATION_SCHEMA.COLUMNS:

   a) IS_UPDATABLE.

4) Without Feature T322, “Declared data type attributes”, conforming SQL language shall not reference the following columns in the view INFORMATION_SCHEMA.COLUMNS:

   a) DECLARED_DATA_TYPE.

   b) DECLARED_NUMERIC_PRECISION.

   c) DECLARED_NUMERIC_SCALE.

5) [14]Without Feature T180, “System-versioned tables”, conforming SQL language shall not reference the following columns in the view INFORMATION_SCHEMA.COLUMNS:

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a) IS_SYSTEM_TIME_PERIOD_START.

b) IS_SYSTEM_TIME_PERIOD_END.

c) SYSTEM_TIME_PERIOD_TIMESTAMP_GENERATION.

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6.23 CONSTRAINT_COLUMN_USAGE view

Function

Identify the columns used by referential constraints, unique constraints, check constraints, and assertions defined in this catalog and owned by a given user or role.

Definition

```
CREATE VIEW CONSTRAINT_COLUMN_USAGE AS
    SELECT AC.TABLE_CATALOG, AC.TABLE_SCHEMA, AC.TABLE_NAME, AC.COLUMN_NAME,
           AC.CONSTRAINT_CATALOG, AC.CONSTRAINT_SCHEMA, AC.CONSTRAINT_NAME
    FROM ( ( SELECT CCU.TABLE_CATALOG, CCU.TABLE_SCHEMA, CCU.TABLE_NAME, CCU.COLUMN_NAME,
                    CCU.CONSTRAINT_CATALOG, CCU.CONSTRAINT_SCHEMA, CCU.CONSTRAINT_NAME
             FROM DEFINITION_SCHEMA.CHECK_COLUMN_USAGE AS CCU )
         UNION
           ( SELECT KCU.TABLE_CATALOG, KCU.TABLE_SCHEMA, KCU.TABLE_NAME, KCU.COLUMN_NAME,
                    RC.CONSTRAINT_CATALOG, RC.CONSTRAINT_SCHEMA, RC.CONSTRAINT_NAME
             FROM DEFINITION_SCHEMA.REFERENTIAL_CONSTRAINTS AS RC
                JOIN
                  DEFINITION_SCHEMA.KEY_COLUMN_USAGE AS KCU
                  ON
                     ( RC.UNIQUE_CONSTRAINT_CATALOG, RC.UNIQUE_CONSTRAINT_SCHEMA,
                       RC.UNIQUE_CONSTRAINT_NAME )
                   = ( KCU.CONSTRAINT_CATALOG, KCU.CONSTRAINT_SCHEMA,
                       KCU.CONSTRAINT_NAME ) )
         UNION
           ( SELECT KCU.TABLE_CATALOG, KCU.TABLE_SCHEMA, KCU.TABLE_NAME, KCU.COLUMN_NAME,
                    CONSTRAINT_CATALOG, CONSTRAINT_SCHEMA, CONSTRAINT_NAME
             FROM DEFINITION_SCHEMA.KEY_COLUMN_USAGE AS KCU
                JOIN
                  DEFINITION_SCHEMA.TABLE_CONSTRAINTS AS TC
                USING ( CONSTRAINT_CATALOG, CONSTRAINT_SCHEMA, CONSTRAINT_NAME )
             WHERE TC.CONSTRAINT_TYPE IN
                   ( 'UNIQUE', 'PRIMARY KEY' ) ) ) AS AC (TABLE_CATALOG, TABLE_SCHEMA,
                                                          TABLE_NAME, COLUMN_NAME,
                                                          CONSTRAINT_CATALOG,
                                                          CONSTRAINT_SCHEMA,
                                                          CONSTRAINT_NAME)
        JOIN
          DEFINITION_SCHEMA.SCHEMATA AS S
          ON
             ( ( AC.TABLE_CATALOG, AC.TABLE_SCHEMA )
             = ( S.CATALOG_NAME, S.SCHEMA_NAME ) )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
          OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND AC.CONSTRAINT_CATALOG
        = ( SELECT ISCN.CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME AS ISCN );

GRANT SELECT ON TABLE CONSTRAINT_COLUMN_USAGE
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F341, “Usage tables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.CONSTRAINT_COLUMN_USAGE.

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2) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.CONSTRAINT_COLUMN_USAGE.

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6.24 CONSTRAINT_PERIOD_USAGE view

Function

Identify the periods used by referential constraints, unique constraints, check constraints, and assertions defined in this catalog and owned by a given user or role.

Definition

```
CREATE VIEW CONSTRAINT_PERIOD_USAGE AS
    SELECT AC.TABLE_CATALOG, AC.TABLE_SCHEMA, AC.TABLE_NAME,
           AC.PERIOD_NAME, AC.CONSTRAINT_CATALOG, AC.CONSTRAINT_SCHEMA,
           AC.CONSTRAINT_NAME
    FROM ( ( SELECT CPU.TABLE_CATALOG, CPU.TABLE_SCHEMA, CPU.TABLE_NAME, CPU.PERIOD_NAME,
                    CPU.CONSTRAINT_CATALOG, CPU.CONSTRAINT_SCHEMA, CPU.CONSTRAINT_NAME
             FROM DEFINITION_SCHEMA.CHECK_PERIOD_USAGE AS CPU )
         UNION
           ( SELECT KPU.TABLE_CATALOG, KPU.TABLE_SCHEMA, KPU.TABLE_NAME, KPU.PERIOD_NAME,
                    RC.CONSTRAINT_CATALOG, RC.CONSTRAINT_SCHEMA, RC.CONSTRAINT_NAME
             FROM DEFINITION_SCHEMA.REFERENTIAL_CONSTRAINTS AS RC
                JOIN
                  DEFINITION_SCHEMA.KEY_PERIOD_USAGE AS KPU
                  ON
                     ( RC.UNIQUE_CONSTRAINT_CATALOG, RC.UNIQUE_CONSTRAINT_SCHEMA,
                       RC.UNIQUE_CONSTRAINT_NAME )
                   = ( KPU.CONSTRAINT_CATALOG, KPU.CONSTRAINT_SCHEMA,
                       KPU.CONSTRAINT_NAME ) )
         UNION
           ( SELECT KPU.TABLE_CATALOG, KPU.TABLE_SCHEMA, KPU.TABLE_NAME, KPU.PERIOD_NAME,
                    CONSTRAINT_CATALOG, CONSTRAINT_SCHEMA, CONSTRAINT_NAME
             FROM DEFINITION_SCHEMA.KEY_PERIOD_USAGE AS KPU
                JOIN
                  DEFINITION_SCHEMA.TABLE_CONSTRAINTS AS TC
                USING ( CONSTRAINT_CATALOG, CONSTRAINT_SCHEMA, CONSTRAINT_NAME )
             WHERE TC.CONSTRAINT_TYPE IN
                   ( 'UNIQUE', 'PRIMARY KEY' ) ) ) AS AC (TABLE_CATALOG, TABLE_SCHEMA,
                                                          TABLE_NAME, PERIOD_NAME,
                                                          CONSTRAINT_CATALOG,
                                                          CONSTRAINT_SCHEMA,
                                                          CONSTRAINT_NAME)
        JOIN
          DEFINITION_SCHEMA.SCHEMATA AS S
          ON
             ( ( AC.TABLE_CATALOG, AC.TABLE_SCHEMA )
             = ( S.CATALOG_NAME, S.SCHEMA_NAME ) )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
          OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND AC.CONSTRAINT_CATALOG
        = ( SELECT ISCN.CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME AS ISCN );

GRANT SELECT ON TABLE CONSTRAINT_PERIOD_USAGE
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F341, “Usage tables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.CONSTRAINT_PERIOD_USAGE.

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2) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.CONSTRAINT_PERIOD_USAGE.

3) Without Feature T181, “Application-time period tables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.CONSTRAINT_PERIOD_USAGE.

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6.25 CONSTRAINT_TABLE_USAGE view

Function

Identify the tables that are used by referential constraints, unique constraints, check constraints, and assertions defined in this catalog and owned by a given user or role.

Definition

```
CREATE VIEW CONSTRAINT_TABLE_USAGE AS
    SELECT AC.TABLE_CATALOG, AC.TABLE_SCHEMA, AC.TABLE_NAME,
           AC.CONSTRAINT_CATALOG, AC.CONSTRAINT_SCHEMA, AC.CONSTRAINT_NAME
    FROM ( ( SELECT CTU.TABLE_CATALOG, CTU.TABLE_SCHEMA, CTU.TABLE_NAME,
                    CTU.CONSTRAINT_CATALOG, CTU.CONSTRAINT_SCHEMA, CTU.CONSTRAINT_NAME
             FROM DEFINITION_SCHEMA.CHECK_TABLE_USAGE AS CTU )
           UNION
           ( SELECT TC.TABLE_CATALOG, TC.TABLE_SCHEMA, TC.TABLE_NAME,
                    RC.CONSTRAINT_CATALOG, RC.CONSTRAINT_SCHEMA, RC.CONSTRAINT_NAME
             FROM DEFINITION_SCHEMA.REFERENTIAL_CONSTRAINTS AS RC
               JOIN
                  DEFINITION_SCHEMA.TABLE_CONSTRAINTS AS TC
                 ON ( RC.UNIQUE_CONSTRAINT_CATALOG, RC.UNIQUE_CONSTRAINT_SCHEMA,
                      RC.UNIQUE_CONSTRAINT_NAME )
                  = ( TC.CONSTRAINT_CATALOG, TC.CONSTRAINT_SCHEMA,
                      TC.CONSTRAINT_NAME ) )
           UNION
           ( SELECT TC.TABLE_CATALOG, TC.TABLE_SCHEMA, TC.TABLE_NAME,
                    TC.CONSTRAINT_CATALOG, TC.CONSTRAINT_SCHEMA, TC.CONSTRAINT_NAME
             FROM DEFINITION_SCHEMA.TABLE_CONSTRAINTS AS TC
             WHERE TC.CONSTRAINT_TYPE IN
                   ( 'UNIQUE', 'PRIMARY KEY' ) ) ) AS AC (TABLE_CATALOG, TABLE_SCHEMA,
                                                          TABLE_NAME, CONSTRAINT_CATALOG,
                                                          CONSTRAINT_SCHEMA,
                                                          CONSTRAINT_NAME)
       JOIN
         DEFINITION_SCHEMA.SCHEMATA AS S
         ON ( ( AC.TABLE_CATALOG, AC.TABLE_SCHEMA )
            = ( S.CATALOG_NAME, S.SCHEMA_NAME ) )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
          OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND CONSTRAINT_CATALOG
        = ( SELECT ISCN.CATALOG_NAME
            FROM INFORMATION_SCHEMA_CATALOG_NAME AS ISCN );

GRANT SELECT ON TABLE CONSTRAINT_TABLE_USAGE
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F341, “Usage tables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.CONSTRAINT_TABLE_USAGE.

2) Without Feature F391, “Long identifiers”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.CONSTRAINT_TABLE_USAGE.

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6.26 DATA_TYPE_PRIVILEGES view

Function

Identify those schema objects whose included data type descriptors are accessible to a given user or role.

Definition

```
CREATE VIEW DATA_TYPE_PRIVILEGES
    ( OBJECT_CATALOG, OBJECT_SCHEMA, OBJECT_NAME,
      OBJECT_TYPE, DTD_IDENTIFIER ) AS
      SELECT UDT_CATALOG, UDT_SCHEMA, UDT_NAME,
             'USER-DEFINED TYPE', DTD_IDENTIFIER
      FROM ATTRIBUTES
    UNION
      SELECT TABLE_CATALOG, TABLE_SCHEMA, TABLE_NAME,
             'TABLE', DTD_IDENTIFIER
        FROM COLUMNS
    UNION
      SELECT DOMAIN_CATALOG, DOMAIN_SCHEMA, DOMAIN_NAME,
             'DOMAIN', DTD_IDENTIFIER
      FROM DOMAINS
    UNION
      SELECT UDT_CATALOG, UDT_SCHEMA, UDT_NAME,
             'USER-DEFINED TYPE', DTD_IDENTIFIER
      FROM METHOD_SPECIFICATIONS
    UNION
      SELECT PARAMETER_UDT_CATALOG, PARAMETER_UDT_SCHEMA, PARAMETER_UDT_NAME,
             'USER-DEFINED TYPE', DTD_IDENTIFIER
      FROM METHOD_SPECIFICATION_PARAMETERS
    UNION
      SELECT SPECIFIC_CATALOG, SPECIFIC_SCHEMA, SPECIFIC_NAME,
             'ROUTINE', DTD_IDENTIFIER
      FROM PARAMETERS
    UNION
      SELECT SPECIFIC_CATALOG, SPECIFIC_SCHEMA, SPECIFIC_NAME,
             'ROUTINE', DTD_IDENTIFIER
      FROM ROUTINES
      WHERE DTD_IDENTIFIER IS NOT NULL
    UNION
      SELECT USER_DEFINED_TYPE_CATALOG, USER_DEFINED_TYPE_SCHEMA,
             USER_DEFINED_TYPE_NAME, 'USER-DEFINED TYPE', SOURCE_DTD_IDENTIFIER
      FROM USER_DEFINED_TYPES
      WHERE SOURCE_DTD_IDENTIFIER IS NOT NULL
    UNION
      SELECT USER_DEFINED_TYPE_CATALOG, USER_DEFINED_TYPE_SCHEMA,
             USER_DEFINED_TYPE_NAME, 'USER-DEFINED TYPE', REF_DTD_IDENTIFIER
      FROM USER_DEFINED_TYPES
      WHERE REF_DTD_IDENTIFIER IS NOT NULL;

GRANT SELECT ON TABLE DATA_TYPE_PRIVILEGES
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature F231, “Privilege tables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.DATA_TYPE_PRIVILEGES.

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6.27 DIRECT_SUPERTABLES view

Function

Identify the direct supertables related to a table that are defined in this catalog and owned by a given user or role.

Definition

```
CREATE VIEW DIRECT_SUPERTABLES AS
    SELECT DS.TABLE_CATALOG, DS.TABLE_SCHEMA, DS.TABLE_NAME, DS.SUPERTABLE_NAME
    FROM DEFINITION_SCHEMA.DIRECT_SUPERTABLES AS DS
      JOIN
         DEFINITION_SCHEMA.SCHEMATA AS S
        ON ( ( DS.TABLE_CATALOG, DS.TABLE_SCHEMA )
           = ( S.CATALOG_NAME, S.SCHEMA_NAME ) )
    WHERE ( S.SCHEMA_OWNER = CURRENT_USER
          OR
            S.SCHEMA_OWNER IN
            ( SELECT ER.ROLE_NAME
              FROM ENABLED_ROLES AS ER ) )
      AND
         DS.TABLE_CATALOG
       = ( SELECT ISCN.CATALOG_NAME
           FROM INFORMATION_SCHEMA_CATALOG_NAME AS ISCN );

GRANT SELECT ON TABLE DIRECT_SUPERTABLES
    TO PUBLIC WITH GRANT OPTION;
```

Conformance Rules

1) Without Feature S081, “Subtables”, conforming SQL language shall not reference the view INFORMATION_SCHEMA.DIRECT_SUPERTABLES.

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