Database Compatibility for Oracle® Developers Reference Guide

EDB Postgres™ Advanced Server 12

July 29, 2019
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1 Introduction

Database Compatibility for Oracle means that an application runs in an Oracle environment as well as in the EDB Postgres Advanced Server (Advanced Server) environment with minimal or no changes to the application code.

This guide provides reference material about the compatibility features offered by Advanced Server:

- SQL Language syntax support
- Compatible Data Types
- SQL Commands
- Catalog Views
- System Catalog Tables

Developing an application that is compatible with Oracle databases in the Advanced Server requires special attention to which features are used in the construction of the application. For example, developing a compatible application means selecting:

- Data types to define the application’s database tables that are compatible with Oracle databases
- SQL statements that are compatible with Oracle SQL
- System and built-in functions for use in SQL statements and procedural logic that are compatible with Oracle databases
- Stored Procedure Language (SPL) to create database server-side application logic for stored procedures, functions, triggers, and packages
- System catalog views that are compatible with Oracle’s data dictionary

For detailed information about Advanced Server's compatibility features and extended functionality, please see the complete library of Advanced Server documentation, available at:

https://www.enterprisedb.com/resources/product-documentation
1.1 What’s New

The following database compatibility for Oracle features have been added to Advanced Server 11 to create Advanced Server 12:

- Advanced Server introduces **COMPOUND TRIGGERS**, which are stored as a PL block that executes in response to a specified triggering event. For information, see the *Database Compatibility for Oracle Developer’s Guide*. For affected SPL programs, see Section 2.3.35.

- Advanced Server now supports **new VIEWS** that provide information that is compatible with the Oracle data dictionary views. For information, see Sections 3.4, 3.6, 0, 3.34, 3.37, 3.57, 3.67, 3.69, and 3.85.

- Advanced Server has added the **LISTAGG** function to support string aggregation that concatenates data from multiple rows into a single row in an ordered manner. For information, see Section 2.4.11.1.

- Advanced Server now supports **CAST (MULTISET)** function, allowing subquery output to be **CAST** to a nested table type. For information, see Section 2.1.3.3.

- Advanced Server has added the **MEDIAN** function to calculate a median value from the set of provided values. For information, see Section 2.4.11.2.

- Advanced Server has added the **SYS_GUID** function to generate and return a globally unique identifier in the form of 16-bytes of **RAW** data. For information, see Section 2.4.4.2.

- Advanced Server now supports an Oracle-compatible **SELECT UNIQUE** clause in addition to an existing **SELECT DISTINCT** clause. For information, see Section 2.3.71.11.

- Advanced Server has re-implemented **default_with_rowids** to create a table that includes a **ROWID** column in the newly created table. For information, see the *EDB Postgres Advanced Server Guide*.

1.2 Typographical Conventions Used in this Guide

Certain typographical conventions are used in this manual to clarify the meaning and usage of various commands, statements, programs, examples, etc. This section provides a summary of these conventions.
In the following descriptions a term refers to any word or group of words which may be language keywords, user-supplied values, literals, etc. A term’s exact meaning depends upon the context in which it is used.

- **Italic font** introduces a new term, typically, in the sentence that defines it for the first time.
- **Fixed-width (mono-spaced) font** is used for terms that must be given literally such as SQL commands, specific table and column names used in the examples, programming language keywords, etc. For example, `SELECT * FROM emp;`
- **Italic fixed-width font** is used for terms for which the user must substitute values in actual usage. For example, `DELETE FROM table_name;`
- A vertical pipe | denotes a choice between the terms on either side of the pipe. A vertical pipe is used to separate two or more alternative terms within square brackets (optional choices) or braces (one mandatory choice).
- Square brackets [ ] denote that one or none of the enclosed term(s) may be substituted. For example, `[ a | b ]`, means choose one of “a” or “b” or neither of the two.
- Braces {} denote that exactly one of the enclosed alternatives must be specified. For example, `{ a | b }`, means exactly one of “a” or “b” must be specified.
- Ellipses ... denote that the proceeding term may be repeated. For example, `[ a | b ] ...` means that you may have the sequence, “b a a b a”.
2 The SQL Language

The following sections describe the subset of the Advanced Server SQL language compatible with Oracle databases. The following SQL syntax, commands, data types, and functions work in both EDB Postgres Advanced Server and Oracle.

The Advanced Server documentation set includes syntax and commands for extended functionality (functionality that does not provide database compatibility for Oracle or support Oracle-styled applications) that is not included in this guide.

This section is organized into the following sections:

- General discussion of Advanced Server SQL syntax and language elements
- Data types
- Summary of SQL commands
- Built-in functions

2.1 SQL Syntax

This section describes the general syntax of SQL. It forms the foundation for understanding the following chapters that include detail about how the SQL commands are applied to define and modify data.
2.1.1 Lexical Structure

SQL input consists of a sequence of commands. A command is composed of a sequence of tokens, terminated by a semicolon (;). The end of the input stream also terminates a command. Which tokens are valid depends on the syntax of the particular command.

A token can be a keyword, an identifier, a quoted identifier, a literal (or constant), or a special character symbol. Tokens are normally separated by whitespace (space, tab, newline), but need not be if there is no ambiguity (which is generally only the case if a special character is adjacent to some other token type).

Additionally, comments can occur in SQL input. They are not tokens - they are effectively equivalent to whitespace.

For example, the following is (syntactically) valid SQL input:

```
SELECT * FROM MY_TABLE;
UPDATE MY_TABLE SET A = 5;
INSERT INTO MY_TABLE VALUES (3, 'hi there');
```

This is a sequence of three commands, one per line (although this is not required; more than one command can be on a line, and commands can usually be split across lines).

The SQL syntax is not very consistent regarding what tokens identify commands and which are operands or parameters. The first few tokens are generally the command name, so in the above example we would usually speak of a SELECT, an UPDATE, and an INSERT command. But for instance the UPDATE command always requires a SET token to appear in a certain position, and this particular variation of INSERT also requires a VALUES token in order to be complete. The precise syntax rules for each command are described in Section 2.3.
2.1.2 Identifiers and Key Words

Tokens such as `SELECT`, `UPDATE`, or `VALUES` in the example above are examples of *key words*, that is, words that have a fixed meaning in the SQL language. The tokens `MY_TABLE` and `A` are examples of *identifiers*. They identify names of tables, columns, or other database objects, depending on the command they are used in. Therefore they are sometimes simply called, “*names*”. Key words and identifiers have the same *lexical structure*, meaning that one cannot know whether a token is an identifier or a key word without knowing the language.

SQL identifiers and key words must begin with a letter (`a-z` or `A-Z`). Subsequent characters in an identifier or key word can be letters, underscores, digits (`0-9`), dollar signs (`$`), or number signs (`#`).

Identifier and key word names are case insensitive. Therefore

```
UPDATE MY_TABLE SET A = 5;
```

can equivalently be written as:

```
update my_table set a = 5;
```

A convention often used is to write key words in upper case and names in lower case, e.g.,

```
UPDATE my_table SET a = 5;
```

There is a second kind of identifier: the *delimited identifier* or *quoted identifier*. It is formed by enclosing an arbitrary sequence of characters in double quotes ("`). A delimited identifier is always an identifier, never a key word. So "`select`" could be used to refer to a column or table named "`select`", whereas an unquoted select would be taken as a key word and would therefore provoke a parse error when used where a table or column name is expected. The example can be written with quoted identifiers like this:

```
UPDATE "my_table" SET "a" = 5;
```

Quoted identifiers can contain any character, except the character with the numeric code zero.

To include a double quote, use two double quotes. This allows you to construct table or column names that would otherwise not be possible (such as ones containing spaces or ampersands). The length limitation still applies.
Quoting an identifier also makes it case-sensitive, whereas unquoted names are always folded to lower case. For example, the identifiers `FOO`, `foo`, and "foo" are considered the same by Advanced Server, but "Foo" and "FOO" are different from these three and each other. The folding of unquoted names to lower case is not compatible with Oracle databases. In Oracle syntax, unquoted names are folded to upper case: for example, `foo` is equivalent to "FOO" not "foo". If you want to write portable applications you are advised to always quote a particular name or never quote it.
2.1.3 Constants

The kinds of implicitly-typed constants in Advanced Server are strings and numbers. Constants can also be specified with explicit types, which can enable more accurate representation and more efficient handling by the system. These alternatives are discussed in the following subsections.

2.1.3.1 String Constants

A string constant in SQL is an arbitrary sequence of characters bounded by single quotes ('), for example 'This is a string'. To include a single-quote character within a string constant, write two adjacent single quotes, e.g. 'Dianne''s horse'. Note that this is not the same as a double-quote character (").

2.1.3.2 Numeric Constants

Numeric constants are accepted in these general forms:

```
digits
digits. [digits] [e[+]digits]
[digits]. digits[e[+]digits]
digitse[+]digits
```

where digits is one or more decimal digits (0 through 9). At least one digit must be before or after the decimal point, if one is used. At least one digit must follow the exponent marker (e), if one is present. There may not be any spaces or other characters embedded in the constant. Note that any leading plus or minus sign is not actually considered part of the constant; it is an operator applied to the constant.

These are some examples of valid numeric constants:

```
42
3.5
4.
.001
5e2
1.925e-3
```

A numeric constant that contains neither a decimal point nor an exponent is initially presumed to be type INTEGER if its value fits in type INTEGER (32 bits); otherwise it is presumed to be type BIGINT if its value fits in type BIGINT (64 bits); otherwise it is taken to be type NUMBER. Constants that contain decimal points and/or exponents are always initially presumed to be type NUMBER.
The initially assigned data type of a numeric constant is just a starting point for the type resolution algorithms. In most cases the constant will be automatically coerced to the most appropriate type depending on context. When necessary, you can force a numeric value to be interpreted as a specific data type by casting it as described in the following section.

### 2.1.3.3 Constants of Other Types

**CAST**

A constant of an arbitrary type can be entered using the following notation:

\[
\text{CAST('string' AS type)}
\]

The string constant’s text is passed to the input conversion routine for the type called `type`. The result is a constant of the indicated type. The explicit type cast may be omitted if there is no ambiguity as to the type the constant must be (for example, when it is assigned directly to a table column), in which case it is automatically coerced.

**CAST** can also be used to specify runtime type conversions of arbitrary expressions.

**CAST (MULTISET)**

MULTISET is an extension to **CAST** that converts subquery results into a nested table type. The synopsis is:

\[
\text{CAST (MULTISET (subquery) AS datatype)}
\]

Where `subquery` is a query returning one or more rows and `datatype` is a nested table type.

**CAST (MULTISET)** is used to store a collection of data in a table.

**Example**

The following example demonstrates using **MULTISET**:

```sql
edb=# CREATE OR REPLACE TYPE project_table_t AS TABLE OF VARCHAR2(25);
CREATE TYPE
edb=# CREATE TABLE projects (person_id NUMBER(10), project_name VARCHAR2(20));
CREATE TABLE
edb=# CREATE TABLE pers_short (person_id NUMBER(10), last_name VARCHAR2(25));
CREATE TABLE

edb=# INSERT INTO projects VALUES (1, 'Teach');
INSERT 0 1
edb=# INSERT INTO projects VALUES (1, 'Code');
INSERT 0 1
```
edb=# INSERT INTO projects VALUES (2, 'Code');
INSERT 0 1
edb=# INSERT INTO pers_short VALUES (1, 'Morgan');
INSERT 0 1
edb=# INSERT INTO pers_short VALUES (2, 'Kolk');
INSERT 0 1
edb=# INSERT INTO pers_short VALUES (3, 'Scott');
INSERT 0 1
edb=# COMMIT;
COMMIT

edb=# SELECT e.last_name, CAST(MULTISET(
    SELECT p.project_name
    FROM projects p
    WHERE p.person_id = e.person_id
    ORDER BY p.project_name) AS project_table_t)
FROM pers_short e;

+-----------------+------------------+
| last_name | project_table_t |
|-----------+------------------|
| Morgan    | {Code,Teach}     |
| Kolk      | {Code}           |
| Scott     | {}               |
(3 rows)
2.1.4 Comments

A comment is an arbitrary sequence of characters beginning with double dashes and extending to the end of the line, e.g.:

```
-- This is a standard SQL comment
```

Alternatively, C-style block comments can be used:

```
/* multiline comment
 * block
 */
```

where the comment begins with /* and extends to the matching occurrence of */.
2.2 Data Types

The following table shows the built-in general-purpose data types.

<table>
<thead>
<tr>
<th>Table 2-1 Data Types</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
</tr>
<tr>
<td>BLOB</td>
</tr>
<tr>
<td><strong>BOOLEAN</strong></td>
</tr>
<tr>
<td>CHAR [ (n) ]</td>
</tr>
<tr>
<td>CLOB</td>
</tr>
<tr>
<td><strong>DATE</strong></td>
</tr>
<tr>
<td><strong>DOUBLE PRECISION</strong></td>
</tr>
<tr>
<td><strong>INTEGER</strong></td>
</tr>
<tr>
<td><strong>NUMBER</strong></td>
</tr>
<tr>
<td><strong>NUMBER(p [, s])</strong></td>
</tr>
<tr>
<td><strong>REAL</strong></td>
</tr>
<tr>
<td><strong>TIMESTAMP</strong> [ (p) ]</td>
</tr>
<tr>
<td><strong>TIMESTAMP</strong> [ (p) ] WITH TIME ZONE</td>
</tr>
<tr>
<td>VARCHAR2(n)</td>
</tr>
<tr>
<td><strong>XMLTYPE</strong></td>
</tr>
</tbody>
</table>
2.2.1 Numeric Types

Numeric types consist of four-byte integers, four-byte and eight-byte floating-point numbers, and fixed-precision decimals. The following table lists the available types.

Table 2-2 Numeric Types

<table>
<thead>
<tr>
<th>Name</th>
<th>Storage Size</th>
<th>Description</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>BINARY_INTEGER</td>
<td>4 bytes</td>
<td>Signed integer, Alias for INTEGER</td>
<td>-2,147,483,648 to +2,147,483,647</td>
</tr>
<tr>
<td>DOUBLE PRECISION</td>
<td>8 bytes</td>
<td>Variable-precision, inexact</td>
<td>15 decimal digits precision</td>
</tr>
<tr>
<td>INTEGER</td>
<td>4 bytes</td>
<td>Usual choice for integer</td>
<td>-2,147,483,648 to +2,147,483,647</td>
</tr>
<tr>
<td>NUMBER</td>
<td>Variable</td>
<td>User-specified precision, exact</td>
<td>Up to 1000 digits of precision</td>
</tr>
<tr>
<td>NUMBER(p [, s ] )</td>
<td>Variable</td>
<td>Exact numeric of maximum precision, p, and optional scale, s</td>
<td>Up to 1000 digits of precision</td>
</tr>
<tr>
<td>PLS_INTEGER</td>
<td>4 bytes</td>
<td>Signed integer, Alias for INTEGER</td>
<td>-2,147,483,648 to +2,147,483,647</td>
</tr>
<tr>
<td>REAL</td>
<td>4 bytes</td>
<td>Variable-precision, inexact</td>
<td>6 decimal digits precision</td>
</tr>
<tr>
<td>ROWID</td>
<td>8 bytes</td>
<td>Signed 8 bit integer.</td>
<td>-9223372036854775808 to 9223372036854775807</td>
</tr>
</tbody>
</table>

The following sections describe the types in detail.

2.2.1.1 Integer Types

The BINARY_INTEGER, INTEGER, PLS_INTEGER, and ROWID types store whole numbers (without fractional components) as specified in Table 2-2 Numeric Types. Attempts to store values outside of the allowed range will result in an error.

2.2.1.2 Arbitrary Precision Numbers

The type, NUMBER, can store practically an unlimited number of digits of precision and perform calculations exactly. It is especially recommended for storing monetary amounts and other quantities where exactness is required. However, the NUMBER type is very slow compared to the floating-point types described in the next section.

In what follows we use these terms: The scale of a NUMBER is the count of decimal digits in the fractional part, to the right of the decimal point. The precision of a NUMBER is the total count of significant digits in the whole number, that is, the number of digits to both
sides of the decimal point. So the number 23.5141 has a precision of 6 and a scale of 4. Integers can be considered to have a scale of zero.

Both the precision and the scale of the \texttt{NUMBER} type can be configured. To declare a column of type \texttt{NUMBER} use the syntax

\begin{verbatim}
   \texttt{NUMBER}\texttt{(precision, scale)}
\end{verbatim}

The precision must be positive, the scale zero or positive. Alternatively,

\begin{verbatim}
   \texttt{NUMBER}\texttt{(precision)}
\end{verbatim}

selects a scale of 0. Specifying \texttt{NUMBER} without any precision or scale creates a column in which numeric values of any precision and scale can be stored, up to the implementation limit on precision. A column of this kind will not coerce input values to any particular scale, whereas \texttt{NUMBER} columns with a declared scale will coerce input values to that scale. (The SQL standard requires a default scale of 0, i.e., coercion to integer precision. For maximum portability, it is best to specify the precision and scale explicitly.)

If the precision or scale of a value is greater than the declared precision or scale of a column, the system will attempt to round the value. If the value cannot be rounded so as to satisfy the declared limits, an error is raised.

\subsection*{2.2.1.3 Floating-Point Types}

The data types \texttt{REAL} and \texttt{DOUBLE PRECISION} are \textit{inexact}, variable-precision numeric types. In practice, these types are usually implementations of IEEE Standard 754 for Binary Floating-Point Arithmetic (single and double precision, respectively), to the extent that the underlying processor, operating system, and compiler support it.

Inexact means that some values cannot be converted exactly to the internal format and are stored as approximations, so that storing and printing back out a value may show slight discrepancies. Managing these errors and how they propagate through calculations is the subject of an entire branch of mathematics and computer science and will not be discussed further here, except for the following points:

If you require exact storage and calculations (such as for monetary amounts), use the \texttt{NUMBER} type instead.

If you want to do complicated calculations with these types for anything important, especially if you rely on certain behavior in boundary cases (infinity, underflow), you should evaluate the implementation carefully.

Comparing two floating-point values for equality may or may not work as expected.
On most platforms, the `REAL` type has a range of at least 1E-37 to 1E+37 with a precision of at least 6 decimal digits. The `DOUBLE PRECISION` type typically has a range of around 1E-307 to 1E+308 with a precision of at least 15 digits. Values that are too large or too small will cause an error. Rounding may take place if the precision of an input number is too high. Numbers too close to zero that are not representable as distinct from zero will cause an underflow error.

Advanced Server also supports the SQL standard notations `FLOAT` and `FLOAT(p)` for specifying inexact numeric types. Here, `p` specifies the minimum acceptable precision in binary digits. Advanced Server accepts `FLOAT(1)` to `FLOAT(24)` as selecting the `REAL` type, while `FLOAT(25)` to `FLOAT(53)` as selecting `DOUBLE PRECISION`. Values of `p` outside the allowed range draw an error. `FLOAT` with no precision specified is taken to mean `DOUBLE PRECISION`.

### 2.2.2 Character Types

The following table lists the general-purpose character types available in Advanced Server.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAR{ (n) }</td>
<td>Fixed-length character string, blank-padded to the size specified by n</td>
</tr>
<tr>
<td>CLOB</td>
<td>Large variable-length up to 1 GB</td>
</tr>
<tr>
<td>LONG</td>
<td>Variable unlimited length.</td>
</tr>
<tr>
<td>NVARCHAR(n)</td>
<td>Variable-length national character string, with limit.</td>
</tr>
<tr>
<td>NVARCHAR2(n)</td>
<td>Variable-length national character string, with limit.</td>
</tr>
<tr>
<td>STRING</td>
<td>Alias for VARCHAR2.</td>
</tr>
<tr>
<td>VARCHAR(n)</td>
<td>Variable-length character string, with limit (considered deprecated, but supported for compatibility)</td>
</tr>
<tr>
<td>VARCHAR2(n)</td>
<td>Variable-length character string, with limit</td>
</tr>
</tbody>
</table>

Where `n` is a positive integer; these types can store strings up to `n` characters in length. An attempt to assign a value that exceeds the length of `n` will result in an error, unless the excess characters are all spaces, in which case the string will be truncated to the maximum length.

The storage requirement for data of these types is the actual string plus 1 byte if the string is less than 127 bytes, or 4 bytes if the string is 127 bytes or greater. In the case of `CHAR`, the padding also requires storage. Long strings are compressed by the system automatically, so the physical requirement on disk may be less. Long values are stored in background tables so they do not interfere with rapid access to the shorter column values.

The database character set determines the character set used to store textual values.
If you do not specify a value for $n$, $n$ will default to 1. If the string to be assigned is shorter than $n$, values of type `CHAR` will be space-padded to the specified width ($n$), and will be stored and displayed that way.

Padding spaces are treated as semantically insignificant. That is, trailing spaces are disregarded when comparing two values of type `CHAR`, and they will be removed when converting a `CHAR` value to one of the other string types.

If you explicitly cast an over-length value to a `CHAR(n)` type, the value will be truncated to $n$ characters without raising an error (as specified by the SQL standard).

`VARCHAR`, `VARCHAR2`, `NVARCHAR` and `NVARCHAR2`

If the string to be assigned is shorter than $n$, values of type `VARCHAR`, `VARCHAR2`, `NVARCHAR` and `NVARCHAR2` will store the shorter string without padding.

Note that trailing spaces are semantically significant in `VARCHAR` values.

If you explicitly cast a value to a `VARCHAR` type, an over-length value will be truncated to $n$ characters without raising an error (as specified by the SQL standard).

`CLOB`

You can store a large character string in a `CLOB` type. `CLOB` is semantically equivalent to `VARCHAR2` except no length limit is specified. Generally, you should use a `CLOB` type if the maximum string length is not known.

The longest possible character string that can be stored in a `CLOB` type is about 1 GB.

**Note:** The `CLOB` data type is actually a `DOMAIN` based on the PostgreSQL `TEXT` data type. For information on a `DOMAIN`, see the PostgreSQL core documentation at:

https://www.postgresql.org/docs/12/static/sql-createdomain.html

Thus, usage of the `CLOB` type is limited by what can be done for `TEXT` such as a maximum size of approximately 1 GB.

For usage of larger amounts of data, instead of using the `CLOB` data type, use the PostgreSQL `Large Objects` feature that relies on the `pg_largeobject` system catalog. For information on large objects, see the PostgreSQL core documentation at:

https://www.postgresql.org/docs/12/static/largeobjects.html
2.2.3 Binary Data

The following data types allows storage of binary strings.

<table>
<thead>
<tr>
<th>Name</th>
<th>Storage Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BINARY</td>
<td>The length of the binary string.</td>
<td>Fixed-length binary string, with a length between 1 and 8300.</td>
</tr>
<tr>
<td>BLOB</td>
<td>The actual binary string plus 1 byte if the binary string is less than 127 bytes, or 4 bytes if the binary string is 127 bytes or greater.</td>
<td>Variable-length binary string, with a maximum size of 1 GB.</td>
</tr>
<tr>
<td>VARBINARY</td>
<td>The length of the binary string</td>
<td>Variable-length binary string, with a length between 1 and 8300.</td>
</tr>
</tbody>
</table>

A binary string is a sequence of octets (or bytes). Binary strings are distinguished from characters strings by two characteristics: First, binary strings specifically allow storing octets of value zero and other "non-printable" octets (defined as octets outside the range 32 to 126). Second, operations on binary strings process the actual bytes, whereas the encoding and processing of character strings depends on locale settings.
2.2.4 Date/Time Types

The following discussion of the date/time types assumes that the configuration parameter, `edb_redwood_date`, has been set to `TRUE` whenever a table is created or altered.

Advanced Server supports the date/time types shown in the following table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Storage Size</th>
<th>Description</th>
<th>Low Value</th>
<th>High Value</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td>8 bytes</td>
<td>Date and time</td>
<td>4713 BC</td>
<td>5874897 AD</td>
<td>1 second</td>
</tr>
<tr>
<td>INTERVAL DAY TO SECOND[(p)]</td>
<td>12 bytes</td>
<td>Period of time -178000000 years</td>
<td>178000000 years</td>
<td>1 microsecond / 14 digits</td>
<td></td>
</tr>
<tr>
<td>INTERVAL YEAR TO MONTH</td>
<td>12 bytes</td>
<td>Period of time -178000000 years</td>
<td>178000000 years</td>
<td>1 microsecond / 14 digits</td>
<td></td>
</tr>
<tr>
<td>TIMESTAMP [(p)]</td>
<td>8 bytes</td>
<td>Date and time</td>
<td>4713 BC</td>
<td>5874897 AD</td>
<td>1 microsecond</td>
</tr>
<tr>
<td>TIMESTAMP [(p)] WITH TIME ZONE</td>
<td>8 bytes</td>
<td>Date and time with time zone</td>
<td>4713 BC</td>
<td>5874897 AD</td>
<td>1 microsecond</td>
</tr>
</tbody>
</table>

When `DATE` appears as the data type of a column in the data definition language (DDL) commands, `CREATE TABLE` or `ALTER TABLE`, it is translated to `TIMESTAMP` at the time the table definition is stored in the database. Thus, a time component will also be stored in the column along with the date.

When `DATE` appears as a data type of a variable in an SPL declaration section, or the data type of a formal parameter in an SPL procedure or an SPL function, or the return type of an SPL function, it is always translated to `TIMESTAMP` and thus can handle a time component if present.

`TIMESTAMP` accepts an optional precision value `p` which specifies the number of fractional digits retained in the seconds field. The allowed range of `p` is from 0 to 6 with the default being 6.

When `TIMESTAMP` values are stored as double precision floating-point numbers (currently the default), the effective limit of precision may be less than 6. `TIMESTAMP` values are stored as seconds before or after midnight 2000-01-01. Microsecond precision is achieved for dates within a few years of 2000-01-01, but the precision degrades for dates further away. When `TIMESTAMP` values are stored as eight-byte integers (a compile-time option), microsecond precision is available over the full range of values. However eight-byte integer timestamps have a more limited range of dates than shown above: from 4713 BC up to 294276 AD.

`TIMESTAMP (p) WITH TIME ZONE` is similar to `TIMESTAMP (p)`, but includes the time zone as well.
2.2.4.1 INTERVAL Types

INTERVAL values specify a period of time. Values of INTERVAL type are composed of fields that describe the value of the data. The following table lists the fields allowed in an INTERVAL type:

<table>
<thead>
<tr>
<th>Field Name</th>
<th>INTERVAL Values Allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR</td>
<td>Integer value (positive or negative)</td>
</tr>
<tr>
<td>MONTH</td>
<td>0 through 11</td>
</tr>
<tr>
<td>DAY</td>
<td>Integer value (positive or negative)</td>
</tr>
<tr>
<td>HOUR</td>
<td>0 through 23</td>
</tr>
<tr>
<td>MINUTE</td>
<td>0 through 59</td>
</tr>
<tr>
<td>SECOND</td>
<td>0 through 59.9(p) where 9(p) is the precision of fractional seconds</td>
</tr>
</tbody>
</table>

The fields must be presented in descending order – from YEARS to MONTHS, and from DAYS to HOURS, MINUTES and then SECONDS.

Advanced Server supports two INTERVAL types compatible with Oracle databases.

The first variation supported by Advanced Server is INTERVAL DAY TO SECOND [(p)]. INTERVAL DAY TO SECOND [(p)] stores a time interval in days, hours, minutes and seconds.

\( p \) specifies the precision of the second field.

Advanced Server interprets the value:

\[
\text{INTERVAL '1 2:34:5.678' DAY TO SECOND(3)}
\]

as 1 day, 2 hours, 34 minutes, 5 seconds and 678 thousandths of a second.

Advanced Server interprets the value:

\[
\text{INTERVAL '1 23' DAY TO HOUR}
\]

as 1 day and 23 hours.

Advanced Server interprets the value:

\[
\text{INTERVAL '2:34' HOUR TO MINUTE}
\]

as 2 hours and 34 minutes.

Advanced Server interprets the value:
as 2 hours, 34 minutes, 56 seconds and 13 thousandths of a second. Note that the fractional second is rounded up to 13 because of the specified precision.

The second variation supported by Advanced Server that is compatible with Oracle databases is `INTERVAL YEAR TO MONTH`. This variation stores a time interval in years and months.

Advanced Server interprets the value:

```
INTERVAL '12-3' YEAR TO MONTH
```

as 12 years and 3 months.

Advanced Server interprets the value:

```
INTERVAL '456' YEAR(2)
```

as 12 years and 3 months.

Advanced Server interprets the value:

```
INTERVAL '300' MONTH
```

as 25 years.

2.2.4.2 Date/Time Input

Date and time input is accepted in ISO 8601 SQL-compatible format, the Oracle default `dd-MON-yy` format, as well as a number of other formats provided that there is no ambiguity as to which component is the year, month, and day. However, use of the `TO_DATE` function is strongly recommended to avoid ambiguities.

Any date or time literal input needs to be enclosed in single quotes, like text strings. The following SQL standard syntax is also accepted:

```
type 'value'
```

`type` is either `DATE` or `TIMESTAMP`.

`value` is a date/time text string.
### 2.2.4.2.1 Dates

The following table shows some possible input formats for dates, all of which equate to January 8, 1999.

<table>
<thead>
<tr>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 8, 1999</td>
</tr>
<tr>
<td>1999-01-08</td>
</tr>
<tr>
<td>1999-Jan-08</td>
</tr>
<tr>
<td>Jan-08-1999</td>
</tr>
<tr>
<td>08-Jan-1999</td>
</tr>
<tr>
<td>08-Jan-99</td>
</tr>
<tr>
<td>Jan-08-99</td>
</tr>
<tr>
<td>990108</td>
</tr>
<tr>
<td>080108</td>
</tr>
</tbody>
</table>

The date values can be assigned to a `DATE` or `TIMESTAMP` column or variable. The hour, minute, and seconds fields will be set to zero if the date value is not appended with a time value.

### 2.2.4.2.2 Times

Some examples of the time component of a date or time stamp are shown in the following table.

<table>
<thead>
<tr>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>04:05:06.789</td>
<td>ISO 8601</td>
</tr>
<tr>
<td>04:05:06</td>
<td>ISO 8601</td>
</tr>
<tr>
<td>04:05</td>
<td>ISO 8601</td>
</tr>
<tr>
<td>040506</td>
<td>ISO 8601</td>
</tr>
<tr>
<td>04:05 AM</td>
<td>Same as 04:05; AM does not affect value</td>
</tr>
<tr>
<td>04:05 PM</td>
<td>Same as 16:05; input hour must be &lt;= 12</td>
</tr>
</tbody>
</table>

### 2.2.4.2.3 Time Stamps

Valid input for time stamps consists of a concatenation of a date and a time. The date portion of the time stamp can be formatted according to any of the examples shown in Table 2-7. The time portion of the time stamp can be formatted according to any of examples shown in Table 2-8.

The following is an example of a time stamp which follows the Oracle default format.

```
08-JAN-99 04:05:06
```

The following is an example of a time stamp which follows the ISO 8601 standard.
2.2.4.3 Date/Time Output

The default output format of the date/time types will be either (dd-MON-yy) referred to as the Redwood date style, compatible with Oracle databases, or (yyyy-mm-dd) referred to as the ISO 8601 format, depending upon the application interface to the database. Applications that use JDBC such as SQL Interactive always present the date in ISO 8601 form. Other applications such as PSQL present the date in Redwood form.

The following table shows examples of the output formats for the two styles, Redwood and ISO 8601.

<table>
<thead>
<tr>
<th>Table 2-9 Date/Time Output Styles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Redwood style</td>
</tr>
<tr>
<td>ISO 8601/SQL standard</td>
</tr>
</tbody>
</table>

2.2.4.4 Internals

Advanced Server uses Julian dates for all date/time calculations. Julian dates correctly predict or calculate any date after 4713 BC based on the assumption that the length of the year is 365.2425 days.
2.2.5 Boolean Type

Advanced Server provides the standard SQL type `BOOLEAN`. `BOOLEAN` can have one of only two states: `TRUE` or `FALSE`. A third state, `UNKNOWN`, is represented by the SQL `NULL` value.

Table 2-10 Boolean Type

<table>
<thead>
<tr>
<th>Name</th>
<th>Storage Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOOLEAN</td>
<td>1 byte</td>
<td>Logical Boolean (true/false)</td>
</tr>
</tbody>
</table>

The valid literal value for representing the true state is `TRUE`. The valid literal for representing the false state is `FALSE`. 
2.2.6 XML Type

The **XMLTYPE** data type is used to store XML data. Its advantage over storing XML data in a character field is that it checks the input values for well-formedness, and there are support functions to perform type-safe operations on it.

The XML type can store well-formed “documents”, as defined by the XML standard, as well as “content” fragments, which are defined by the production `XMLDecl? content` in the XML standard. Roughly, this means that content fragments can have more than one top-level element or character node.

**Note:** Oracle does not support the storage of content fragments in **XMLTYPE** columns.

The following example shows the creation and insertion of a row into a table with an **XMLTYPE** column.

```sql
CREATE TABLE books (
    content XMLTYPE
);

INSERT INTO books VALUES (XMLPARSE (DOCUMENT '<?xml version="1.0"?>
<title>Manual</title><chapter>...</chapter></book>'));

SELECT * FROM books;
```

```
<table>
<thead>
<tr>
<th>content</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;book&gt;&lt;title&gt;Manual&lt;/title&gt;&lt;chapter&gt;...&lt;/chapter&gt;&lt;/book&gt;</td>
</tr>
</tbody>
</table>
```

(1 row)
2.3 SQL Commands

This section provides a summary of the SQL commands compatible with Oracle databases that are supported by Advanced Server. The SQL commands in this section will work on both an Oracle database and an Advanced Server database.

Note the following points:

- Advanced Server supports other commands that are not listed here. These commands may have no Oracle equivalent or they may provide the similar or same functionality as an Oracle SQL command, but with different syntax.
- The SQL commands in this section do not necessarily represent the full syntax, options, and functionality available for each command. In most cases, syntax, options, and functionality that are not compatible with Oracle databases have been omitted from the command description and syntax.
- The Advanced Server documentation set documents command functionality that may not be compatible with Oracle databases.
2.3.1 ALTER INDEX

Name

ALTER INDEX -- modify an existing index.

Synopsis

Advanced Server supports two variations of the ALTER INDEX command compatible with Oracle databases. Use the first variation to rename an index:

ALTER INDEX name RENAME TO new_name

Use the second variation of the ALTER INDEX command to rebuild an index:

ALTER INDEX name REBUILD

Description

ALTER INDEX changes the definition of an existing index. The RENAME clause changes the name of the index. The REBUILD clause reconstructs an index, replacing the old copy of the index with an updated version based on the index's table.

The REBUILD clause invokes the PostgreSQL REINDEX command; for more information about using the REBUILD clause, see the PostgreSQL core documentation at:

https://www.postgresql.org/docs/12/static/sql-reindex.html

ALTER INDEX has no effect on stored data.

Parameters

name

The name (possibly schema-qualified) of an existing index.

new_name

New name for the index.
Examples

To change the name of an index from `name_idx` to `empname_idx`:

```
ALTER INDEX name_idx RENAME TO empname_idx;
```

To rebuild an index named `empname_idx`:

```
ALTER INDEX empname_idx REBUILD;
```

See Also

CREATE INDEX, DROP INDEX
2.3.2 ALTER PROCEDURE

Name

ALTER PROCEDURE

Synopsis

ALTER PROCEDURE procedure_name options [RESTRICT]

Description

Use the ALTER PROCEDURE statement to specify that a procedure is a SECURITY INVOKER or SECURITY DEFINER.

Parameters

procedure_name

procedure_name specifies the (possibly schema-qualified) name of a stored procedure.

options may be:

[EXTERNAL] SECURITY DEFINER

Specify SECURITY DEFINER to instruct the server to execute the procedure with the privileges of the user that created the procedure. The EXTERNAL keyword is accepted for compatibility, but ignored.

[EXTERNAL] SECURITY INVOKER

Specify SECURITY INVOKER to instruct the server to execute the procedure with the privileges of the user that is invoking the procedure. The EXTERNAL keyword is accepted for compatibility, but ignored.

The RESTRICT keyword is accepted for compatibility, but ignored.

Examples

The following command specifies that the update_balance procedure should execute with the privileges of the user invoking the procedure:

```
ALTER PROCEDURE update_balance SECURITY INVOKER;
```
2.3.3 ALTER PROFILE

Name

ALTER PROFILE – alter an existing profile

Synopsis

ALTER PROFILE profile_name RENAME TO new_name;

ALTER PROFILE profile_name
  LIMIT {parameter value} [...] ;

Description

Use the ALTER PROFILE command to modify a user-defined profile; Advanced Server supports two forms of the command:

- Use ALTER PROFILE...RENAME TO to change the name of a profile.
- Use ALTER PROFILE...LIMIT to modify the limits associated with a profile.

Include the LIMIT clause and one or more space-delimited parameter/value pairs to specify the rules enforced by Advanced Server, or use ALTER PROFILE...RENAME TO to change the name of a profile.

Parameters

profile_name

The name of the profile.

new_name

new_name specifies the new name of the profile.

parameter

parameter specifies the attribute limited by the profile.

value

value specifies the parameter limit.

Advanced Server supports the value shown below for each parameter:
FAILED_LOGIN_ATTEMPTS specifies the number of failed login attempts that a user may make before the server locks the user out of their account for the length of time specified by PASSWORD_LOCK_TIME. Supported values are:

- An INTEGER value greater than 0.
- DEFAULT - the value of FAILED_LOGIN_ATTEMPTS specified in the DEFAULT profile.
- UNLIMITED – the connecting user may make an unlimited number of failed login attempts.

PASSWORD_LOCK_TIME specifies the length of time that must pass before the server unlocks an account that has been locked because of FAILED_LOGIN_ATTEMPTS. Supported values are:

- A NUMERIC value greater than or equal to 0. To specify a fractional portion of a day, specify a decimal value. For example, use the value 4.5 to specify 4 days, 12 hours.
- DEFAULT - the value of PASSWORD_LOCK_TIME specified in the DEFAULT profile.
- UNLIMITED – the account is locked until it is manually unlocked by a database superuser.

PASSWORD_LIFE_TIME specifies the number of days that the current password may be used before the user is prompted to provide a new password. Include the PASSWORD_GRACE_TIME clause when using the PASSWORD_LIFE_TIME clause to specify the number of days that will pass after the password expires before connections by the role are rejected. If PASSWORD_GRACE_TIME is not specified, the password will expire on the day specified by the default value of PASSWORD_GRACE_TIME, and the user will not be allowed to execute any command until a new password is provided. Supported values are:

- A NUMERIC value greater than or equal to 0. To specify a fractional portion of a day, specify a decimal value. For example, use the value 4.5 to specify 4 days, 12 hours.
- DEFAULT - the value of PASSWORD_LIFE_TIME specified in the DEFAULT profile.
- UNLIMITED – The password does not have an expiration date.

PASSWORD_GRACE_TIME specifies the length of the grace period after a password expires until the user is forced to change their password. When the grace period expires, a user will be allowed to connect, but will not be allowed to execute any command until they update their expired password. Supported values are:
• A NUMERIC value greater than or equal to 0. To specify a fractional portion of a day, specify a decimal value. For example, use the value 4.5 to specify 4 days, 12 hours.
• DEFAULT - the value of PASSWORD_GRACE_TIME specified in the DEFAULT profile.
• UNLIMITED – The grace period is infinite.

PASSWORD_REUSE_TIME specifies the number of days a user must wait before reusing a password. The PASSWORD_REUSE_TIME and PASSWORD_REUSE_MAX parameters are intended to be used together. If you specify a finite value for one of these parameters while the other is UNLIMITED, old passwords can never be reused. If both parameters are set to UNLIMITED there are no restrictions on password reuse. Supported values are:

• A NUMERIC value greater than or equal to 0. To specify a fractional portion of a day, specify a decimal value. For example, use the value 4.5 to specify 4 days, 12 hours.
• DEFAULT - the value of PASSWORD_REUSE_TIME specified in the DEFAULT profile.
• UNLIMITED – The password can be re-used without restrictions.

PASSWORD_REUSE_MAX specifies the number of password changes that must occur before a password can be reused. The PASSWORD_REUSE_TIME and PASSWORD_REUSE_MAX parameters are intended to be used together. If you specify a finite value for one of these parameters while the other is UNLIMITED, old passwords can never be reused. If both parameters are set to UNLIMITED there are no restrictions on password reuse. Supported values are:

• An INTEGER value greater than or equal to 0.
• DEFAULT - the value of PASSWORD_REUSE_MAX specified in the DEFAULT profile.
• UNLIMITED – The password can be re-used without restrictions.

PASSWORD_VERIFY_FUNCTION specifies password complexity. Supported values are:

• The name of a PL/SQL function.
• DEFAULT - the value of PASSWORD_VERIFY_FUNCTION specified in the DEFAULT profile.
• NULL

PASSWORD_ALLOW_HASHED specifies whether an encrypted password to be allowed for use or not. If you specify the value as TRUE, the system allows a user to change the password by specifying a hash computed encrypted password on the client side.
However, if you specify the value as `FALSE`, then a password must be specified in a plain-text form in order to be validated effectively, else an error will be thrown if a server receives an encrypted password. Supported values are:

- A BOOLEAN value `TRUE/ON/YES/1` or `FALSE/OFF/NO/0`.
- DEFAULT – the value of `PASSWORD_ALLOW_HASHED` specified in the DEFAULT profile.

**Note:** The `PASSWORD_ALLOW_HASHED` is not an Oracle-compatible parameter.

**Examples**

The following example modifies a profile named `acctg_profile`:

```sql
ALTER PROFILE acctg_profile
    LIMIT FAILED_LOGIN_ATTEMPTS 3 PASSWORD_LOCK_TIME 1;
```

`acctg_profile` will count failed connection attempts when a login role attempts to connect to the server. The profile specifies that if a user has not authenticated with the correct password in three attempts, the account will be locked for one day.

The following example changes the name of `acctg_profile` to `payables_profile`:

```sql
ALTER PROFILE acctg_profile RENAME TO payables_profile;
```
2.3.4 ALTER QUEUE

Advanced Server includes extra syntax (not offered by Oracle) with the `ALTER QUEUE` SQL command. This syntax can be used in association with the `DBMS_AQADM` package.

Name

`ALTER QUEUE` -- allows a superuser or a user with the `aq_administrator_role` privilege to modify the attributes of a queue.

Synopsis

This command is available in four forms. The first form of this command changes the name of a queue.

```
ALTER QUEUE queue_name RENAME TO new_name
```

Parameters

`queue_name`

The name (optionally schema-qualified) of an existing queue.

`RENAME TO`

Include the `RENAME TO` clause and a new name for the queue to rename the queue.

`new_name`

New name for the queue.

The second form of the `ALTER QUEUE` command modifies the attributes of the queue:

```
ALTER QUEUE queue_name SET [ ( { option_name option_value } [,SET option_name] ]
```

Parameters

`queue_name`

The name (optionally schema-qualified) of an existing queue.
Include the `SET` clause and `option_name/option_value` pairs to modify the attributes of the queue:

```
option_name option_value
```

The name of the option or options to be associated with the new queue and the corresponding value of the option. If you provide duplicate option names, the server will return an error.

- If `option_name` is `retries`, provide an integer that represents the number of times a dequeue may be attempted.
- If `option_name` is `retrydelay`, provide a double-precision value that represents the delay in seconds.
- If `option_name` is `retention`, provide a double-precision value that represents the retention time in seconds.

Use the third form of the `ALTER QUEUE` command to enable or disable enqueuing and/or dequeuing on a particular queue:

```
ALTER QUEUE queue_name ACCESS { START | STOP } [ FOR { enqueue | dequeue } ] [ NOWAIT ]
```

**Parameters**

`queue_name`

The name (optionally schema-qualified) of an existing queue.

`ACCESS`

Include the `ACCESS` keyword to enable or disable enqueuing and/or dequeuing on a particular queue.

`START | STOP`

Use the `START` and `STOP` keywords to indicate the desired state of the queue.

`FOR enqueue|dequeue`

Use the `FOR` clause to indicate if you are specifying the state of enqueuing or dequeuing activity on the specified queue.

`NOWAIT`
Include the `NOWAIT` keyword to specify that the server should not wait for the completion of outstanding transactions before changing the state of the queue. The `NOWAIT` keyword can only be used when specifying an `ACCESS` value of `STOP`. The server will return an error if `NOWAIT` is specified with an `ACCESS` value of `START`.

Use the fourth form to `ADD` or `DROP` callback details for a particular queue.

```sql
ALTER QUEUE queue_name { ADD | DROP } CALL TO location_name
[ WITH callback_option ]
```

**Parameters**

- `queue_name`
  The name (optionally schema-qualified) of an existing queue.
- `ADD | DROP`
  Include the `ADD` or `DROP` keywords to enable add or remove callback details for a queue.
- `location_name`
  Specifies the name of the callback procedure.
- `callback_option`
  `callback_option` can be `context`; specify a `RAW` value when including this clause.

**Example**

The following example changes the name of a queue from `work_queue_east` to `work_order`:

```sql
ALTER QUEUE work_queue_east RENAME TO work_order;
```

The following example modifies a queue named `work_order`, setting the number of retries to 100, the delay between retries to 2 seconds, and the length of time that the queue will retain dequeued messages to 10 seconds:

```sql
ALTER QUEUE work_order SET (retries 100, retrydelay 2, retention 10);
```

The following commands enable enqueueing and dequeueing in a queue named `work_order`:
ALTER QUEUE work_order ACCESS START;
ALTER QUEUE work_order ACCESS START FOR enqueue;
ALTER QUEUE work_order ACCESS START FOR dequeue;

The following commands disable enqueueing and dequeueing in a queue named work_order:

ALTER QUEUE work_order ACCESS STOP NOWAIT;
ALTER QUEUE work_order ACCESS STOP FOR enqueue;
ALTER QUEUE work_order ACCESS STOP FOR dequeue;

See Also

CREATE QUEUE, DROP QUEUE
2.3.5 ALTER QUEUE TABLE

Advanced Server includes extra syntax (not offered by Oracle) with the ALTER QUEUE SQL command. This syntax can be used in association with the DBMS_AQADM package.

Name

AL TER QUEUE TABLE -- modify an existing queue table.

Synopsis

Use ALTER QUEUE TABLE to change the name of an existing queue table:

```
ALTER QUEUE TABLE name RENAME TO new_name
```

Description

ALTER QUEUE TABLE allows a superuser or a user with the aq_administrator_role privilege to change the name of an existing queue table.

Parameters

**name**

The name (optionally schema-qualified) of an existing queue table.

**new_name**

New name for the queue table.

Example

To change the name of a queue table from wo_table_east to work_order_table:

```
ALTER QUEUE TABLE wo_queue_east RENAME TO work_order_table;
```

See Also

CREATE QUEUE TABLE, DROP QUEUE TABLE
2.3.6 ALTER ROLE... IDENTIFIED BY

Name

ALTER ROLE - change the password associated with a database role

Synopsis

ALTER ROLE role_name IDENTIFIED BY password
[REPLACE prev_password]

Description

A role without the CREATEROLE privilege may use this command to change their own password. An unprivileged role must include the REPLACE clause and their previous password if PASSWORD VERIFY FUNCTION is not NULL in their profile. When the REPLACE clause is used by a non-superuser, the server will compare the password provided to the existing password and raise an error if the passwords do not match.

A database superuser can use this command to change the password associated with any role. If a superuser includes the REPLACE clause, the clause is ignored; a non-matching value for the previous password will not throw an error.

If the role for which the password is being changed has the SUPERUSER attribute, then a superuser must issue this command. A role with the CREATEROLE attribute can use this command to change the password associated with a role that is not a superuser.

Parameters

role_name

The name of the role whose password is to be altered.

password

The role’s new password.

prev_password

The role’s previous password.

Examples

To change a role’s password:
ALTER ROLE john IDENTIFIED BY xyRP35z REPLACE 23PJ74a;
2.3.7 ALTER ROLE - Managing Database Link and DBMS_RLS Privileges

Advanced Server includes extra syntax (not offered by Oracle) for the ALTER ROLE command. This syntax can be useful when assigning privileges related to creating and dropping database links compatible with Oracle databases, and fine-grained access control (using DBMS_RLS).

CREATE DATABASE LINK

A user who holds the CREATE DATABASE LINK privilege may create a private database link. The following ALTER ROLE command grants privileges to an Advanced Server role that allow the specified role to create a private database link:

```sql
ALTER ROLE role_name
   WITH [CREATEDBLINK | CREATE DATABASE LINK]
```

This command is the functional equivalent of:

```sql
GRANT CREATE DATABASE LINK to role_name
```

Use the following command to revoke the privilege:

```sql
ALTER ROLE role_name
   WITH [NOCREATEDBLINK | NO CREATE DATABASE LINK]
```

Please note: the CREATEDBLINK and NOCREATEDBLINK keywords should be considered deprecated syntax; we recommend using the CREATE DATABASE LINK and NO CREATE DATABASE LINK syntax options.

CREATE PUBLIC DATABASE LINK

A user who holds the CREATE PUBLIC DATABASE LINK privilege may create a public database link. The following ALTER ROLE command grants privileges to an Advanced Server role that allow the specified role to create a public database link:

```sql
ALTER ROLE role_name
   WITH [CREATEPUBLICDBLINK | CREATE PUBLIC DATABASE LINK]
```

This command is the functional equivalent of:

```sql
GRANT CREATE PUBLIC DATABASE LINK to role_name
```

Use the following command to revoke the privilege:
ALTER ROLE role_name
WITH [NOCREATEPUBLICDBLINK | NO CREATE PUBLIC DATABASE LINK]

Please note: the CREATEPUBLICDBLINK and NOCREATEPUBLICDBLINK keywords should be considered deprecated syntax; we recommend using the CREATE PUBLIC DATABASE LINK and NO CREATE PUBLIC DATABASE LINK syntax options.

**DROP PUBLIC DATABASE LINK**

A user who holds the DROP PUBLIC DATABASE LINK privilege may drop a public database link. The following ALTER ROLE command grants privileges to an Advanced Server role that allow the specified role to drop a public database link:

ALTER ROLE role_name
WITH [DROPPUBLICDBLINK | DROP PUBLIC DATABASE LINK]

This command is the functional equivalent of:

GRANT DROP PUBLIC DATABASE LINK to role_name

Use the following command to revoke the privilege:

ALTER ROLE role_name
WITH [NODROPPUBLICDBLINK | NO DROP PUBLIC DATABASE LINK]

Please note: the DROPPUBLICDBLINK and NO DROPPUBLICDBLINK keywords should be considered deprecated syntax; we recommend using the DROP PUBLIC DATABASE LINK and NO DROP PUBLIC DATABASE LINK syntax options.

**EXEMPT ACCESS POLICY**

A user who holds the EXEMPT ACCESS POLICY privilege is exempt from fine-grained access control (DBMS_RLS) policies. A user who holds these privileges will be able to view or modify any row in a table constrained by a DBMS_RLS policy. The following ALTER ROLE command grants privileges to an Advanced Server role that exempt the specified role from any defined DBMS_RLS policies:

ALTER ROLE role_name
WITH [POLICYEXEMPT | EXEMPT ACCESS POLICY]

This command is the functional equivalent of:

GRANT EXEMPT ACCESS POLICY TO role_name

Use the following command to revoke the privilege:
ALTER ROLE role_name
    WITH [NOPOLICYEXEMPT | NO EXEMPT ACCESS POLICY]

Please note: the POLICYEXEMPT and NOPOLICYEXEMPT keywords should be considered deprecated syntax; we recommend using the EXEMPT ACCESS POLICY and NO EXEMPT ACCESS POLICY syntax options.

See Also

CREATE ROLE, DROP ROLE, GRANT, REVOKE, SET ROLE
2.3.8 ALTER SEQUENCE

Name

ALTER SEQUENCE -- change the definition of a sequence generator

Synopsis

ALTER SEQUENCE name [ INCREMENT BY increment ]
    [ MINVALUE minvalue ] [ MAXVALUE maxvalue ]
    [ CACHE cache | NOCACHE ] [ CYCLE ]

Description

ALTER SEQUENCE changes the parameters of an existing sequence generator. Any parameter not specifically set in the ALTER SEQUENCE command retains its prior setting.

Parameters

name

The name (optionally schema-qualified) of a sequence to be altered.

increment

The clause INCREMENT BY increment is optional. A positive value will make an ascending sequence, a negative one a descending sequence. If unspecified, the old increment value will be maintained.

minvalue

The optional clause MINVALUE minvalue determines the minimum value a sequence can generate. If not specified, the current minimum value will be maintained. Note that the key words, NO MINVALUE, may be used to set this behavior back to the defaults of 1 and \(-2^{63}-1\) for ascending and descending sequences, respectively, however, this term is not compatible with Oracle databases.

maxvalue

The optional clause MAXVALUE maxvalue determines the maximum value for the sequence. If not specified, the current maximum value will be maintained. Note that the key words, NO MAXVALUE, may be used to set this behavior back to
the defaults of \(2^{63}-1\) and -1 for ascending and descending sequences, respectively, however, this term is not compatible with Oracle databases.

\textit{cache}

The optional clause \texttt{CACHE cache} specifies how many sequence numbers are to be preallocated and stored in memory for faster access. The minimum value is 1 (only one value can be generated at a time, i.e., \texttt{NOCACHE}). If unspecified, the old cache value will be maintained.

\textit{CYCLE}

The \texttt{CYCLE} option allows the sequence to wrap around when the \texttt{maxvalue} or \texttt{minvalue} has been reached by an ascending or descending sequence respectively. If the limit is reached, the next number generated will be the \texttt{minvalue} or \texttt{maxvalue}, respectively. If not specified, the old cycle behavior will be maintained. Note that the key words, \texttt{NO CYCLE}, may be used to alter the sequence so that it does not recycle, however, this term is not compatible with Oracle databases.

\textbf{Notes}

To avoid blocking of concurrent transactions that obtain numbers from the same sequence, \texttt{ALTER SEQUENCE} is never rolled back; the changes take effect immediately and are not reversible.

\texttt{ALTER SEQUENCE} will not immediately affect \texttt{NEXTVAL} results in backends, other than the current one, that have pre-allocated (cached) sequence values. They will use up all cached values prior to noticing the changed sequence parameters. The current backend will be affected immediately.

\textbf{Examples}

Change the increment and cache value of sequence, \texttt{serial}.

\begin{verbatim}
ALTER SEQUENCE serial INCREMENT BY 2 CACHE 5;
\end{verbatim}

\textbf{See Also}

\texttt{CREATE SEQUENCE}, \texttt{DROP SEQUENCE}
2.3.9 ALTER SESSION

Name

ALTER SESSION -- change a runtime parameter

Synopsis

ALTER SESSION SET name = value

Description

The ALTER SESSION command changes runtime configuration parameters. ALTER SESSION only affects the value used by the current session. Some of these parameters are provided solely for compatibility with Oracle syntax and have no effect whatsoever on the runtime behavior of Advanced Server. Others will alter a corresponding Advanced Server database server runtime configuration parameter.

Parameters

name

Name of a settable runtime parameter. Available parameters are listed below.

value

New value of parameter.

Configuration Parameters

The following configuration parameters can be modified using the ALTER SESSION command:

NLS_DATE_FORMAT (string)

Sets the display format for date and time values as well as the rules for interpreting ambiguous date input values. Has the same effect as setting the Advanced Server datestyle runtime configuration parameter.

NLS_LANGUAGE (string)

Sets the language in which messages are displayed. Has the same effect as setting the Advanced Server lc_messages runtime configuration parameter.
NLS_LENGTH_SEMANTICS (string)

Valid values are BYTE and CHAR. The default is BYTE. This parameter is provided for syntax compatibility only and has no effect in the Advanced Server.

OPTIMIZER_MODE (string)

Sets the default optimization mode for queries. Valid values are ALL_ROWS, CHOOSE, FIRST_ROWS, FIRST_ROWS_10, FIRST_ROWS_100, and FIRST_ROWS_1000. The default is CHOOSE. This parameter is implemented in Advanced Server.

QUERY_REWRITE_ENABLED (string)

Valid values are TRUE, FALSE, and FORCE. The default is FALSE. This parameter is provided for syntax compatibility only and has no effect in Advanced Server.

QUERY_REWRITE_INTEGRITY (string)

Valid values are ENFORCED, TRUSTED, and STALE_TOLERATED. The default is ENFORCED. This parameter is provided for syntax compatibility only and has no effect in Advanced Server.

Examples

Set the language to U.S. English in UTF-8 encoding. Note that in this example, the value, en_US.UTF-8, is in the format that must be specified for Advanced Server. This form is not compatible with Oracle databases.

```
ALTER SESSION SET NLS_LANGUAGE = 'en_US.UTF-8';
```

Set the date display format.

```
ALTER SESSION SET NLS_DATE_FORMAT = 'dd/mm/yyyy';
```
2.3.10 ALTER TABLE

Name

ALTER TABLE -- change the definition of a table

Synopsis

ALTER TABLE name
   action [, ...]
ALTER TABLE name
   RENAME COLUMN column TO new_column
ALTER TABLE name
   RENAME TO new_name

where action is one of:

   ADD column type [ column_constraint [ ... ] ]
   DROP COLUMN column
   ADD table_constraint
   DROP CONSTRAINT constraint_name [ CASCADE ]

Description

ALTER TABLE changes the definition of an existing table. There are several subforms:

ADD column type

   This form adds a new column to the table using the same syntax as CREATE TABLE.

DROP COLUMN

   This form drops a column from a table. Indexes and table constraints involving the column will be automatically dropped as well.

ADD table_constraint

   This form adds a new constraint to a table using the same syntax as CREATE TABLE.

DROP CONSTRAINT
This form drops constraints on a table. Currently, constraints on tables are not required to have unique names, so there may be more than one constraint matching the specified name. All matching constraints will be dropped.

**RENAME**

The **RENAME** form changes the name of a table (or an index, sequence, or view) or the name of an individual column in a table. There is no effect on the stored data.

You **must own the table to use** **ALTER TABLE**.

**Parameters**

*name*

The name (possibly schema-qualified) of an existing table to alter.

*column*

Name of a new or existing column.

*new_column*

New name for an existing column.

*new_name*

New name for the table.

*type*

Data type of the new column.

*table_constraint*

New table constraint for the table.

*constraint_name*

Name of an existing constraint to drop.

**CASCADE**

Automatically drop objects that depend on the dropped constraint.

**Notes**
When you invoke `ADD COLUMN`, all existing rows in the table are initialized with the column’s default value (null if no `DEFAULT` clause is specified). Adding a column with a non-null default will require the entire table to be rewritten. This may take a significant amount of time for a large table; and it will temporarily require double the disk space. Adding a `CHECK` or `NOT NULL` constraint requires scanning the table to verify that existing rows meet the constraint.

The `DROP COLUMN` form does not physically remove the column, but simply makes it invisible to SQL operations. Subsequent insert and update operations in the table will store a null value for the column. Thus, dropping a column is quick but it will not immediately reduce the on-disk size of your table, as the space occupied by the dropped column is not reclaimed. The space will be reclaimed over time as existing rows are updated.

Changing any part of a system catalog table is not permitted. Refer to `CREATE TABLE` for a further description of valid parameters.

**Examples**

To add a column of type `VARCHAR2` to a table:

```
ALTER TABLE emp ADD address VARCHAR2(30);
```

To drop a column from a table:

```
ALTER TABLE emp DROP COLUMN address;
```

To rename an existing column:

```
ALTER TABLE emp RENAME COLUMN address TO city;
```

To rename an existing table:

```
ALTER TABLE emp RENAME TO employee;
```

To add a check constraint to a table:

```
ALTER TABLE emp ADD CONSTRAINT sal_chk CHECK (sal > 500);
```

To remove a check constraint from a table:

```
ALTER TABLE emp DROP CONSTRAINT sal_chk;
```

**See Also**

`CREATE TABLE`, `DROP TABLE`
2.3.11 ALTER TABLESPACE

Name

ALTER TABLESPACE -- change the definition of a tablespace

Synopsis

ALTER TABLESPACE name RENAME TO newname

Description

ALTER TABLESPACE changes the definition of a tablespace.

Parameters

name

The name of an existing tablespace.

newname

The new name of the tablespace. The new name cannot begin with pg_, as such names are reserved for system tablespaces.

Examples

Rename tablespace empspace to employee_space:

ALTER TABLESPACE empspace RENAME TO employee_space;

See Also

DROP TABLESPACE
2.3.12 ALTER USER… IDENTIFIED BY

Name

ALTER USER -- change a database user account

Synopsis

ALTER USER role_name IDENTIFIED BY password REPLACE prev_password

Description

A role without the CREATEROLE privilege may use this command to change their own password. An unprivileged role must include the REPLACE clause and their previous password if PASSWORD_VERIFY_FUNCTION is not NULL in their profile. When the REPLACE clause is used by a non-superuser, the server will compare the password provided to the existing password and raise an error if the passwords do not match.

A database superuser can use this command to change the password associated with any role. If a superuser includes the REPLACE clause, the clause is ignored; a non-matching value for the previous password will not throw an error.

If the role for which the password is being changed has the SUPERUSER attribute, then a superuser must issue this command. A role with the CREATEROLE attribute can use this command to change the password associated with a role that is not a superuser.

Parameters

role_name

The name of the role whose password is to be altered.

password

The role’s new password.

prev_password

The role’s previous password.

Examples

Change a user password:
 See Also

CREATE USER, DROP USER
2.3.13 ALTER USER|ROLE... PROFILE MANAGEMENT CLAUSES

Name

ALTER USER|ROLE

Synopsis

ALTER USER|ROLE name [[WITH] option[...]]

where option can be the following compatible clauses:

- PROFILE profile_name
- ACCOUNT {LOCK|UNLOCK}
- PASSWORD EXPIRE [AT 'timestamp']

or option can be the following non-compatible clauses:

- PASSWORD SET AT 'timestamp'
- LOCK TIME 'timestamp'
- STORE PRIOR PASSWORD { 'password' 'timestamp' }, [...]

For information about the administrative clauses of the ALTER USER or ALTER ROLE command that are supported by Advanced Server, please see the PostgreSQL core documentation available at:

https://www.postgresql.org/docs/12/static/sql-commands.html

Only a database superuser can use the ALTER USER|ROLE clauses that enforce profile management. The clauses enforce the following behaviors:

Include the PROFILE clause and a profile_name to associate a pre-defined profile with a role, or to change which pre-defined profile is associated with a user.

Include the ACCOUNT clause and the LOCK or UNLOCK keyword to specify that the user account should be placed in a locked or unlocked state.

Include the LOCK TIME 'timestamp' clause and a date/time value to lock the role at the specified time, and unlock the role at the time indicated by the PASSWORD_LOCK_TIME parameter of the profile assigned to this role. If LOCK_TIME is used with the ACCOUNT LOCK clause, the role can only be unlocked by a database superuser with the ACCOUNT UNLOCK clause.
Include the `PASSWORD EXPIRE` clause with the `AT 'timestamp'` keywords to specify a date/time when the password associated with the role will expire. If you omit the `AT 'timestamp'` keywords, the password will expire immediately.

Include the `PASSWORD SET AT 'timestamp'` keywords to set the password modification date to the time specified.

Include the `STORE PRIOR PASSWORD { 'password' 'timestamp' } [, ...]` clause to modify the password history, adding the new password and the time the password was set.

Each login role may only have one profile. To discover the profile that is currently associated with a login role, query the `profile` column of the `DBA_USERS` view.

**Parameters**

*name*

The name of the role with which the specified profile will be associated.

*password*

The password associated with the role.

*profile_name*

The name of the profile that will be associated with the role.

*timestamp*

The date and time at which the clause will be enforced. When specifying a value for `timestamp`, enclose the value in single-quotes.

**Notes**

For information about the Postgres-compatible clauses of the `ALTER USER` or `ALTER ROLE` command, see the PostgreSQL core documentation available at:

https://www.postgresql.org/docs/12/static/sql-alterrole.html

**Examples**

The following command uses the `ALTER USER... PROFILE` command to associate a profile named `acctg` with a user named `john`:

```
ALTER USER john PROFILE acctg_profile;
```
The following command uses the `ALTER ROLE... PROFILE` command to associate a profile named `acctg` with a user named `john`:

```
ALTER ROLE john PROFILE acctg_profile;
```
2.3.14 CALL

Name

CALL

Synopsis

CALL procedure_name '([argument_list])'

Description

Use the CALL statement to invoke a procedure. To use the CALL statement, you must have EXECUTE privileges on the procedure that the CALL statement is invoking.

Parameters

procedure_name

    procedure_name is the (optionally schema-qualified) procedure name.

argument_list

    argument_list specifies a comma-separated list of arguments required by the procedure. Note that each member of argument_list corresponds to a formal argument expected by the procedure. Each formal argument may be an IN parameter, an OUT parameter, or an INOUT parameter.

Examples

The CALL statement may take one of several forms, depending on the arguments required by the procedure:

    CALL update_balance();
    CALL update_balance(1,2,3);
2.3.15 COMMENT

Name

COMMENT -- define or change the comment of an object

Synopsis

COMMENT ON
{
    TABLE table_name |
    COLUMN table_name.column_name
} IS 'text'

Description

COMMENT stores a comment about a database object. To modify a comment, issue a new
COMMENT command for the same object. Only one comment string is stored for each
object. To remove a comment, specify the empty string (two consecutive single quotes
with no intervening space) for text. Comments are automatically dropped when the
object is dropped.

Parameters

table_name

    The name of the table to be commented. The table name may be schema-
    qualified.

table_name.column_name

    The name of a column within table_name to be commented. The table name
    may be schema-qualified.

text

    The new comment.

Notes

There is presently no security mechanism for comments: any user connected to a
database can see all the comments for objects in that database (although only superusers
can change comments for objects that they don’t own). Do not put security-critical
information in a comment.
Examples

Attach a comment to the table `emp`:

```sql
COMMENT ON TABLE emp IS 'Current employee information';
```

Attach a comment to the `empno` column of the `emp` table:

```sql
COMMENT ON COLUMN emp.empno IS 'Employee identification number';
```

Remove these comments:

```sql
COMMENT ON TABLE emp IS '';
COMMENT ON COLUMN emp.empno IS '';
```
2.3.16 COMMIT

Name

COMMIT -- commit the current transaction

Synopsis

COMMIT [ WORK ]

Description

COMMIT commits the current transaction. All changes made by the transaction become visible to others and are guaranteed to be durable if a crash occurs.

Parameters

WORK

Optional key word - has no effect.

Notes

Use ROLLBACK to abort a transaction. Issuing COMMIT when not inside a transaction does no harm.

Please note: Executing a COMMIT in a plpgsql procedure will throw an error if there is an Oracle-style SPL procedure on the runtime stack.

Examples

To commit the current transaction and make all changes permanent:

```
COMMIT;
```

See Also

ROLLBACK, ROLLBACK TO SAVEPOINT
2.3.17 CREATE DATABASE

Name

CREATE DATABASE -- create a new database

Synopsis

CREATE DATABASE name

Description

CREATE DATABASE creates a new database.

To create a database, you must be a superuser or have the special CREATEDB privilege. Normally, the creator becomes the owner of the new database. Non-supersusers with CREATEDB privilege can only create databases owned by them.

The new database will be created by cloning the standard system database template1.

Parameters

name

The name of the database to be created.

Notes

CREATE DATABASE cannot be executed inside a transaction block.

Errors along the line of “could not initialize database directory” are most likely related to insufficient permissions on the data directory, a full disk, or other file system problems.

Examples

To create a new database:

```
CREATE DATABASE employees;
```
2.3.18 CREATE [PUBLIC] DATABASE LINK

Name

CREATE [PUBLIC] DATABASE LINK -- create a new database link.

Synopsis

CREATE [ PUBLIC ] DATABASE LINK name
  CONNECT TO { CURRENT_USER |
              username IDENTIFIED BY 'password'
           }
  USING { postgres_fdw 'fdw_connection_string' |
         [ oci ] 'oracle_connection_string' }

Description

CREATE DATABASE LINK creates a new database link. A database link is an object that allows a reference to a table or view in a remote database within a DELETE, INSERT, SELECT or UPDATE command. A database link is referenced by appending @dblink to the table or view name referenced in the SQL command where dblink is the name of the database link.

Database links can be public or private. A public database link is one that can be used by any user. A private database link can be used only by the database link’s owner. Specification of the PUBLIC option creates a public database link. If omitted, a private database link is created.

When the CREATE DATABASE LINK command is given, the database link name and the given connection attributes are stored in the Advanced Server system table named pg_catalog.edb_dblink. When using a given database link, the database containing the edb_dblink entry defining this database link is called the local database. The server and database whose connection attributes are defined within the edb_dblink entry is called the remote database.

A SQL command containing a reference to a database link must be issued while connected to the local database. When the SQL command is executed, the appropriate authentication and connection is made to the remote database to access the table or view to which the @dblink reference is appended.

Note: A database link cannot be used to access a remote database within a standby database server. Standby database servers are used for high availability, load balancing, and replication.
For information about high availability, load balancing, and replication for PostgreSQL database servers, see the PostgreSQL core documentation available at:

https://www.postgresql.org/docs/12/static/high-availability.html

**Note:** For Advanced Server 12, the `CREATE DATABASE LINK` command is tested against and certified for use with Oracle version 10g Release 2 (10.2), Oracle version 11g Release 2 (11.2), and Oracle version 12c Release 1 (12.1).

### Parameters

**PUBLIC**

Create a public database link that can be used by any user. If omitted, then the database link is private and can only be used by the database link’s owner.

**name**

The name of the database link.

**username**

The username to be used for connecting to the remote database.

**CURRENT_USER**

Include `CURRENT_USER` to specify that Advanced Server should use the user mapping associated with the role that is using the link when establishing a connection to the remote server.

**password**

The password for `username`.

**postgres_fdw**

Specifies foreign data wrapper `postgres_fdw` as the connection to a remote Advanced Server database. If `postgres_fdw` has not been installed on the database, use the `CREATE EXTENSION` command to install `postgres_fdw`. For more information, please see the `CREATE EXTENSION` command in the PostgreSQL Core documentation at:

https://www.postgresql.org/docs/12/static/sql-createextension.html

**fdw_connection_string**
Specify the connection information for the `postgres_fdw` foreign data wrapper.

**oci**

Specifies a connection to a remote Oracle database. This is Advanced Server’s default behavior.

**oracle_connection_string**

Specify the connection information for an oci connection.

**Notes**

To create a non-public database link you must have the `CREATE DATABASE LINK` privilege. To create a public database link you must have the `CREATE PUBLIC DATABASE LINK` privilege.

**Setting up an Oracle Instant Client for oci-dblink**

In order to use oci-dblink, an Oracle instant client must be downloaded and installed on the host running the Advanced Server database in which the database link is to be created.

An instant client can be downloaded from the following site:


**Oracle Instant Client for Linux**

The following instructions apply to Linux hosts running Advanced Server.

Be sure the `libaio` library (the Linux-native asynchronous I/O facility) has already been installed on the Linux host running Advanced Server.

The `libaio` library can be installed with the following command:

```sh
yum install libaio
```

If the Oracle instant client that you've downloaded does not include the file specifically named `libclntsh.so` without a version number suffix, you must create a symbolic link named `libclntsh.so` that points to the downloaded version of the library file. Navigate to the instant client directory and execute the following command:

```sh
ln -s libclntsh.so.version libclntsh.so
```

Where `version` is the version number of the `libclntsh.so` library. For example:
ln -s libclntsh.so.12.1 libclntsh.so

When you are executing a SQL command that references a database link to a remote Oracle database, Advanced Server must know where the Oracle instant client library resides on the Advanced Server host.

The LD_LIBRARY_PATH environment variable must include the path to the Oracle client installation directory containing the libclntsh.so file. For example, assuming the installation directory containing libclntsh.so is /tmp/instantclient:

    export LD_LIBRARY_PATH=/tmp/instantclient:$LD_LIBRARY_PATH

**Note:** This LD_LIBRARY_PATH environment variable setting must be in effect when the pg_ctl utility is executed to start or restart Advanced Server.

If you are running the current session as the user account (for example, enterprisedb) that will directly invoke pg_ctl to start or restart Advanced Server, then be sure to set LD_LIBRARY_PATH before invoking pg_ctl.

You can set LD_LIBRARY_PATH within the .bash_profile file under the home directory of the enterprisedb user account (that is, set LD_LIBRARY_PATH within file ~enterprisedb/.bash_profile). In this manner, LD_LIBRARY_PATH will be set when you log in as enterprisedb.

If however, you are using a Linux service script with the systemctl or service command to start or restart Advanced Server, LD_LIBRARY_PATH must be set within the service script so it is in effect when the script invokes the pg_ctl utility.

The particular script file that needs to be modified to include the LD_LIBRARY_PATH setting depends upon the Advanced Server version, the Linux system on which it was installed, and whether it was installed with the graphical installer or an RPM package.

See the appropriate version of the *EDB Postgres Advanced Server Installation Guide* to determine the service script that affects the startup environment. The installation guides can be found at the following location:

[https://www.enterprisedb.com/resources/product-documentation](https://www.enterprisedb.com/resources/product-documentation)

**Oracle Instant Client for Windows**

The following instructions apply to Windows hosts running Advanced Server.

When you are executing a SQL command that references a database link to a remote Oracle database, Advanced Server must know where the Oracle instant client library resides on the Advanced Server host.
Set the Windows **PATH** system environment variable to include the Oracle client installation directory that contains the **oci.dll** file.

As an alternative you can set the value of the **oracle_home** configuration parameter in the **postgresql.conf** file. The value specified in the **oracle_home** configuration parameter will override the Windows **PATH** environment variable.

To set the **oracle_home** configuration parameter in the **postgresql.conf** file, edit the file, adding the following line:

```bash
oracle_home = 'lib_directory'
```

Substitute the name of the Windows directory that contains **oci.dll** for **lib_directory**. For example:

```bash
oracle_home = 'C:/tmp/instantclient_10_2'
```

After setting the **PATH** environment variable or the **oracle_home** configuration parameter, you must restart the server for the changes to take effect. Restart the server from the Windows Services console.

**Note:** If **tnsnames.ora** is configured in failover mode, and a client:server failure occurs, the client connection will be established with a secondary server (usually a backup server). Later, when the primary server resumes, the client will retain their connection to a secondary server until a new session is established. The new client connections will automatically be established with the primary server. If the primary and secondary servers are out-of-sync, then there is a possibility that the clients that have established a connection to the secondary server and the clients which later connected to the primary server can see a different database view.

**Examples**

**Creating an oci-dblink Database Link**

The following example demonstrates using the **CREATE DATABASE LINK** command to create a database link (named **chicago**) that connects an instance of Advanced Server to an Oracle server via an oci-dblink connection. The connection information tells Advanced Server to log in to Oracle as user **admin**, whose password is **mypassword**. Including the **oci** option tells Advanced Server that this is an oci-dblink connection; the connection string, `''//127.0.0.1/acctg''` specifies the server address and name of the database.

```sql
CREATE DATABASE LINK chicago
  CONNECT TO admin IDENTIFIED BY 'mypassword'
  USING oci '//127.0.0.1/acctg';
```
Note: You can specify a hostname in the connection string (in place of an IP address).

Creating a postgres_fdw Database Link

The following example demonstrates using the `CREATE DATABASE LINK` command to create a database link (named `bedford`) that connects an instance of Advanced Server to another Advanced Server instance via a `postgres_fdw` foreign data wrapper connection. The connection information tells Advanced Server to log in as user `admin`, whose password is `mypassword`. Including the `postgres_fdw` option tells Advanced Server that this is a `postgres_fdw` connection; the connection string, `'host=127.0.0.1 port=5444 dbname=marketing'` specifies the server address and name of the database.

```
CREATE DATABASE LINK bedford
    CONNECT TO admin IDENTIFIED BY 'mypassword'
    USING postgres_fdw 'host=127.0.0.1 port=5444 dbname=marketing';
```

Note: You can specify a hostname in the connection string (in place of an IP address).

Using a Database Link

The following examples demonstrate using a database link with Advanced Server to connect to an Oracle database. The examples assume that a copy of the Advanced Server sample application’s `emp` table has been created in an Oracle database and a second Advanced Server database cluster with the sample application is accepting connections at port 5443.

Create a public database link named, `oralink`, to an Oracle database named, `xe`, located at 127.0.0.1 on port 1521. Connect to the Oracle database with username, `edb`, and password, `password`.

```
CREATE PUBLIC DATABASE LINK oralink CONNECT TO edb IDENTIFIED BY 'password'
    USING '//127.0.0.1:1521/xe';
```

Issue a `SELECT` command on the `emp` table in the Oracle database using database link, `oralink`.

```
SELECT * FROM emp@oralink;
```

<table>
<thead>
<tr>
<th>empno</th>
<th>ename</th>
<th>job</th>
<th>mgr</th>
<th>hiredate</th>
<th>sal</th>
<th>comm</th>
<th>deptno</th>
</tr>
</thead>
<tbody>
<tr>
<td>7369</td>
<td>SMITH</td>
<td>CLERK</td>
<td>7902</td>
<td>17-DEC-80</td>
<td>800</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>7499</td>
<td>ALLEN</td>
<td>SALESMAN</td>
<td>7698</td>
<td>20-FEB-81</td>
<td>1600</td>
<td>300</td>
<td>30</td>
</tr>
<tr>
<td>7521</td>
<td>WARD</td>
<td>SALESMAN</td>
<td>7698</td>
<td>22-FEB-81</td>
<td>1250</td>
<td>500</td>
<td>30</td>
</tr>
<tr>
<td>7566</td>
<td>JONES</td>
<td>MANAGER</td>
<td>7839</td>
<td>02-APR-81</td>
<td>2975</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>7654</td>
<td>MARTIN</td>
<td>SALESMAN</td>
<td>7698</td>
<td>28-SEP-81</td>
<td>1250</td>
<td>1400</td>
<td>30</td>
</tr>
<tr>
<td>7698</td>
<td>BLAKE</td>
<td>MANAGER</td>
<td>7839</td>
<td>01-MAY-81</td>
<td>2850</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>7782</td>
<td>CLARK</td>
<td>MANAGER</td>
<td>7839</td>
<td>09-JUN-81</td>
<td>2450</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>7788</td>
<td>SCOTT</td>
<td>ANALYST</td>
<td>7566</td>
<td>19-APR-87</td>
<td>3000</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>7839</td>
<td>KING</td>
<td>PRESIDENT</td>
<td>7839</td>
<td>17-NOV-81</td>
<td>5000</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>7844</td>
<td>TURNER</td>
<td>SALESMAN</td>
<td>7698</td>
<td>08-SEP-81</td>
<td>1500</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>7876</td>
<td>ADAMS</td>
<td>CLERK</td>
<td>7788</td>
<td>23-MAY-87</td>
<td>1100</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>
Create a private database link named, `fdwlink`, to the Advanced Server database named, `edb`, located on host `192.168.2.22` running on port `5444`. Connect to the Advanced Server database with username, `enterprisedb`, and password, `password`.

```
CREATE DATABASE LINK fdwlink CONNECT TO enterprisedb IDENTIFIED BY 'password' USING postgres_fdw 'host=192.168.2.22 port=5444 dbname=edb';
```

Display attributes of database links, `oralink` and `fdwlink`, from the local `edb_dblink` system table:

```
SELECT lnkname, lnkuser, lnkconnstr FROM pg_catalog.edb_dblink;
```

<table>
<thead>
<tr>
<th>lnkname</th>
<th>lnkuser</th>
<th>lnkconnstr</th>
</tr>
</thead>
<tbody>
<tr>
<td>oralink</td>
<td>edb</td>
<td>//127.0.0.1:1521/xe</td>
</tr>
<tr>
<td>fdwlink</td>
<td>enterprisedb</td>
<td></td>
</tr>
</tbody>
</table>

(2 rows)

Perform a join of the `emp` table from the Oracle database with the `dept` table from the Advanced Server database:

```
SELECT d.deptno, d.dname, e.empno, e.ename, e.job, e.sal, e.comm FROM emp@oralink e, dept@fdwlink d WHERE e.deptno = d.deptno ORDER BY 1, 3;
```

<table>
<thead>
<tr>
<th>deptno</th>
<th>dname</th>
<th>empno</th>
<th>ename</th>
<th>job</th>
<th>sal</th>
<th>comm</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>7782</td>
<td>CLARK</td>
<td>MANAGER</td>
<td>2450</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>7839</td>
<td>KING</td>
<td>PRESIDENT</td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>7934</td>
<td>MILLER</td>
<td>CLERK</td>
<td>1300</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7369</td>
<td>SMITH</td>
<td>CLERK</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7566</td>
<td>JONES</td>
<td>MANAGER</td>
<td>2975</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7788</td>
<td>SCOTT</td>
<td>ANALYST</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7876</td>
<td>ADAMS</td>
<td>CLERK</td>
<td>1100</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7902</td>
<td>FORD</td>
<td>ANALYST</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7499</td>
<td>ALLEN</td>
<td>SALESMAN</td>
<td>1600</td>
<td>300</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7521</td>
<td>WARD</td>
<td>SALESMAN</td>
<td>1250</td>
<td>500</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7654</td>
<td>MARTIN</td>
<td>SALESMAN</td>
<td>1250</td>
<td>1400</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7698</td>
<td>BLAKE</td>
<td>MANAGER</td>
<td>2850</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7844</td>
<td>TURNER</td>
<td>SALESMAN</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7900</td>
<td>JAMES</td>
<td>CLERK</td>
<td>950</td>
<td></td>
</tr>
</tbody>
</table>

(14 rows)

**Pushdown for an oci Database Link**

When the oci-dblink is used to execute SQL statements on a remote Oracle database, there are certain circumstances where pushdown of the processing occurs on the foreign server.

*Pushdown* refers to the occurrence of processing on the foreign (that is, the remote) server instead of the local client where the SQL statement was issued. Pushdown can
result in performance improvement since the data is processed on the remote server before being returned to the local client.

Pushdown applies to statements with the standard SQL join operations (inner join, left outer join, right outer join, and full outer join). Pushdown still occurs even when a sort is specified on the resulting data set.

In order for pushdown to occur, certain basic conditions must be met. The tables involved in the join operation must belong to the same foreign server and use the identical connection information to the foreign server (that is, the same database link defined with the CREATE DATABASE LINK command).

In order to determine if pushdown is to be used for a SQL statement, display the execution plan by using the EXPLAIN command.

For information about the EXPLAIN command, please see the PostgreSQL Core documentation at:

https://www.postgresql.org/docs/12/static/sql-explain.html

The following examples use the database link created as shown by the following:

CREATE PUBLIC DATABASE LINK oralink CONNECT TO edb IDENTIFIED BY 'password'
USING '//192.168.2.23:1521/xe';

The following example shows the execution plan of an inner join:

EXPLAIN (verbose,costs off) SELECT d.deptno, d.dname, e.empno, e.ename FROM dept@oralink d, emp@oralink e WHERE d.deptno = e.deptno ORDER BY 1, 3;

<table>
<thead>
<tr>
<th>deptno</th>
<th>dname</th>
<th>empno</th>
<th>ename</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>7782</td>
<td>CLARK</td>
</tr>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>7839</td>
<td>KING</td>
</tr>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>7934</td>
<td>MILLER</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7369</td>
<td>SMITH</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7566</td>
<td>JONES</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7788</td>
<td>SCOTT</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7876</td>
<td>ADAMS</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7902</td>
<td>FORD</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7499</td>
<td>ALLEN</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7521</td>
<td>WARD</td>
</tr>
</tbody>
</table>

Note that the INNER JOIN operation occurs under the Foreign Scan section. The output of this join is the following:
The following shows the execution plan of a left outer join:

```
EXPLAIN (verbose,costs off) SELECT d.deptno, d.dname, e.empno, e.ename FROM dept@oralink d LEFT OUTER JOIN emp@oralink e ON d.deptno = e.deptno ORDER BY 1, 3;

QUERY PLAN
-----------------------------------------------------
<table>
<thead>
<tr>
<th>Foreign Scan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output: d.deptno, d.dname, e.empno, e.ename</td>
</tr>
<tr>
<td>Relations: (_dblink_dept_1 d) LEFT JOIN (_dblink_emp_2 e)</td>
</tr>
<tr>
<td>Remote Query: SELECT r1.deptno, r1.dname, r2.empno, r2.ename FROM (dept r1 LEFT JOIN emp r2 ON ((r1.deptno = r2.deptno))) ORDER BY r1.deptno ASC NULLS LAST, r2.empno ASC NULLS LAST</td>
</tr>
<tr>
<td>(4 rows)</td>
</tr>
</tbody>
</table>
```

The output of this join is the following:

<table>
<thead>
<tr>
<th>deptno</th>
<th>dname</th>
<th>empno</th>
<th>ename</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>7782</td>
<td>CLARK</td>
</tr>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>7839</td>
<td>KING</td>
</tr>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>7934</td>
<td>MILLER</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7369</td>
<td>SMITH</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7566</td>
<td>JONES</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7788</td>
<td>SCOTT</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7876</td>
<td>ADAMS</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>7902</td>
<td>FORD</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7499</td>
<td>ALLEN</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7521</td>
<td>WARD</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7654</td>
<td>MARTIN</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7698</td>
<td>BLAKE</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7844</td>
<td>TURNER</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>7900</td>
<td>JAMES</td>
</tr>
<tr>
<td>40</td>
<td>OPERATIONS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
<td>--</td>
<td>---------</td>
</tr>
<tr>
<td>(15 rows)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following example shows a case where the entire processing is not pushed down because the emp joined table resides locally instead of on the same foreign server.

```
EXPLAIN (verbose,costs off) SELECT d.deptno, d.dname, e.empno, e.ename FROM dept@oralink d LEFT OUTER JOIN emp e ON d.deptno = e.deptno ORDER BY 1, 3;

QUERY PLAN
------------------------------------------------------------------
<table>
<thead>
<tr>
<th>Sort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output: d.deptno, d.dname, e.empno, e.ename</td>
</tr>
<tr>
<td>Sort Key: d.deptno, e.empno</td>
</tr>
<tr>
<td>-&gt; Hash Left Join</td>
</tr>
<tr>
<td>Output: d.deptno, d.dname, e.empno, e.ename</td>
</tr>
<tr>
<td>Hash Cond: (d.deptno = e.deptno)</td>
</tr>
<tr>
<td>-&gt; Foreign Scan on _dblink_dept_1 d</td>
</tr>
<tr>
<td>Output: d.deptno, d.dname, d.loc</td>
</tr>
<tr>
<td>Remote Query: SELECT deptno, dname, NULL FROM dept</td>
</tr>
<tr>
<td>-&gt; Hash</td>
</tr>
<tr>
<td>Output: e.empno, e.ename, e.deptno</td>
</tr>
<tr>
<td>-&gt; Seq Scan on public.emp e</td>
</tr>
<tr>
<td>Output: e.empno, e.ename, e.deptno</td>
</tr>
<tr>
<td>(13 rows)</td>
</tr>
</tbody>
</table>
```
The output of this join is the same as the previous left outer join example.

Creating a Foreign Table from a Database Link

Note: The procedure described in this section is not compatible with Oracle databases.

After you have created a database link, you can create a foreign table based upon this database link. The foreign table can then be used to access the remote table referencing it with the foreign table name instead of using the database link syntax. Using the database link requires appending @dlink to the table or view name referenced in the SQL command where dlink is the name of the database link.

This technique can be used for either an oci-dblink connection for remote Oracle access, or a postgres_fdw connection for remote Postgres access.

The following example shows the creation of a foreign table to access a remote Oracle table.

First, create a database link as previously described. The following is the creation of a database link named oralink for connecting to the Oracle database.

```
CREATE PUBLIC DATABASE LINK oralink CONNECT TO edb IDENTIFIED BY 'password'
USING '//127.0.0.1:1521/xe';
```

The following query shows the database link:

```
SELECT lnkname, lnkuser, lnkconnstr FROM pg_catalog.edb_dblink;
```

```
lnkname | lnkuser |     lnkconnstr
---------+---------+-----------------------------
oralink  | edb     | //127.0.0.1:1521/xe
(1 row)
```

When you create the database link, Advanced Server creates a corresponding foreign server. The following query displays the foreign server:

```
SELECT srvname, srvowner, srvfdw, srvtype, srvoptions FROM pg_foreign_server;
```

```
srvname | srvowner | srvfdw | srvtype | srvoptions
---------+---------+--------+---------+-----------------------------
oralink  |       10 | 14005  |         | {connstr=//127.0.0.1:1521/xe}
(1 row)
```

For more information about foreign servers, please see the CREATE SERVER command in the PostgreSQL Core documentation at:

https://www.postgresql.org/docs/12/static/sql-createserver.html

Create the foreign table as shown by the following:
CREATE FOREIGN TABLE emp_ora (  
  empno       NUMERIC(4),  
  ename       VARCHAR(10),  
  job         VARCHAR(9),  
  mgr         NUMERIC(4),  
  hiredate    TIMESTAMP WITHOUT TIME ZONE,  
  sal         NUMERIC(7,2),  
  comm        NUMERIC(7,2),  
  deptno      NUMERIC(2)  
)  
SERVER oralink  
OPTIONS (table_name 'emp', schema_name 'edb');

Note the following in the CREATE FOREIGN TABLE command:

- The name specified in the SERVER clause at the end of the CREATE FOREIGN TABLE command is the name of the foreign server, which is oralink in this example as displayed in the srvname column from the query on pg_foreign_server.
- The table name and schema name are specified in the OPTIONS clause by the table and schema options.
- The column names specified in the CREATE FOREIGN TABLE command must match the column names in the remote table.
- Generally, CONSTRAINT clauses may not be accepted or enforced on the foreign table as they are assumed to have been defined on the remote table.

For more information about the CREATE FOREIGN TABLE command, please see the PostgreSQL Core documentation at:

https://www.postgresql.org/docs/12/static/sql-createforeigntable.html

The following is a query on the foreign table:

```
SELECT * FROM emp_ora;
```

```
empno | ename | job     | mgr | hiredate        | sal   | comm   | deptno
-------+-------+---------+-----+-----------------+-------+-------+-------
7369   | SMITH | CLERK   | 7902| 17-DEC-80 00:00:00 | 800.00|       | 20
7499   | ALLEN | SALESMAN| 7698| 20-FEB-81 00:00:00 | 1600.00| 300.00| 30
7521   | WARD  | SALESMAN| 7698| 22-FEB-81 00:00:00 | 1250.00| 500.00| 30
7566   | JONES | MANAGER | 7839| 02-APR-81 00:00:00 | 2975.00|       | 20
7654   | MARTIN| SALESMAN| 7698| 28-SEP-81 00:00:00 | 1250.00| 1400.00| 30
7698   | BLAKE | MANAGER | 7839| 01-MAY-81 00:00:00 | 2850.00|       | 30
7782   | CLARK | MANAGER | 7839| 09-JUN-81 00:00:00 | 2450.00|       | 10
7788   | SCOTT | ANALYST | 7566| 19-APR-87 00:00:00 | 3000.00|       | 20
7839   | KING  | PRESIDENT| 7698| 17-NOV-81 00:00:00 | 5000.00|       | 10
7844   | TURNER| SALESMAN| 7698| 08-SEP-81 00:00:00 | 1500.00| 0.00  | 30
7876   | ADAMS | CLERK   | 7788| 23-MAY-87 00:00:00 | 1100.00|       | 20
7900   | JAMES | CLERK   | 7698| 03-DEC-81 00:00:00 | 950.00 |       | 30
7902   | FORD  | ANALYST | 7566| 03-DEC-81 00:00:00 | 3000.00|       | 20
7934   | MILLER| CLERK   | 7839| 23-JAN-82 00:00:00 | 1300.00|       | 10
(14 rows)
```
In contrast, the following is a query on the same remote table, but using the database link instead of the foreign table:

```sql
SELECT * FROM emp@oralink;
```

```
empno | ename  | job    | mgr  | hiredate            | sal  | comm | deptno
-------+--------+--------+------|---------------------+------|------|-------
7369   | SMITH  | CLERK  | 7902 | 17-DEC-80 00:00:00 | 800  |      | 20    
7499   | ALLEN  | SALESMAN | 7698 | 20-FEB-81 00:00:00 | 1600 | 300  | 30    
7521   | WARD   | SALESMAN | 7698 | 22-FEB-81 00:00:00 | 1250 | 500  | 30    
7566   | JONES  | MANAGER | 7839 | 02-APR-81 00:00:00 | 2975 |      | 20    
7654   | MARTIN | SALESMAN | 7698 | 28-SEP-81 00:00:00 | 1250 | 1400 | 30    
7698   | BLAKE  | MANAGER | 7839 | 01-MAY-81 00:00:00 | 2850 |      | 30    
7782   | CLARK  | MANAGER | 7839 | 09-JUN-81 00:00:00 | 2450 |      | 10    
7788   | SCOTT  | ANALYST | 7566 | 19-APR-87 00:00:00 | 3000 |      | 20    
7839   | KING   | PRESIDENT | 7698 | 17-NOV-81 00:00:00 | 5000 |      | 10    
7844   | TURNER | SALESMAN | 7698 | 08-SEP-81 00:00:00 | 1500 | 0    | 30    
7876   | ADAMS  | CLERK   | 7788 | 23-MAY-87 00:00:00 | 1100 |      | 20    
7900   | JAMES  | CLERK   | 7698 | 03-DEC-81 00:00:00 | 950  |      | 30    
7902   | FORD   | ANALYST | 7566 | 03-DEC-81 00:00:00 | 3000 |      | 20    
7934   | MILLER | CLERK   | 7782 | 23-JAN-82 00:00:00 | 1300 |      | 10    
```

(14 rows)

**Note:** For backward compatibility reasons, it is still possible to write `USING libpq` rather than `USING postgres_fdw`. However, the `libpq` connector is missing many important optimizations which are present in the `postgres_fdw` connector. Therefore, the `postgres_fdw` connector should be used whenever possible. The `libpq` option is deprecated and may be removed entirely in a future Advanced Server release.

**See Also**

`DROP DATABASE LINK`
2.3.19 CREATE DIRECTORY

Name

CREATE DIRECTORY -- create an alias for a file system directory path

Synopsis

CREATE DIRECTORY name AS 'pathname'

Description

The CREATE DIRECTORY command creates an alias for a file system directory pathname. You must be a database superuser to use this command.

When the alias is specified as the appropriate parameter to the programs of the UTL_FILE package, the operating system files are created in, or accessed from the directory corresponding to the given alias.

Parameters

name

The directory alias name.

pathname

The fully-qualified directory path represented by the alias name. The CREATE DIRECTORY command does not create the operating system directory. The physical directory must be created independently using the appropriate operating system commands.

Notes

The operating system user id, enterprisedb, must have the appropriate read and/or write privileges on the directory if the UTL_FILE package is to be used to create and/or read files using the directory.

The directory alias is stored in the pg_catalog.edb_dir system catalog table. Note that edb_dir is not a table compatible with Oracle databases.

The directory alias can also be viewed from the Oracle catalog views SYS.ALL_DIRECTORIES and SYS.DBA_DIRECTORIES, which are compatible with Oracle databases.
Use the `DROP DIRECTORY` command to delete the directory alias. When a directory alias is deleted, the corresponding physical file system directory is not affected. The file system directory must be deleted using the appropriate operating system commands.

In a Linux system, the directory name separator is a forward slash (`/`).

In a Windows system, the directory name separator can be specified as a forward slash (`/`) or two consecutive backslashes (`\\`).

### Examples

Create an alias named `empdir` for directory `/tmp/empdir` on Linux:

```
CREATE DIRECTORY empdir AS '/tmp/empdir';
```

Create an alias named `empdir` for directory `C:\TEMP\EMPDIR` on Windows:

```
CREATE DIRECTORY empdir AS 'C:/TEMP/EMPDIR';
```

View all of the directory aliases:

```
SELECT * FROM pg_catalog.edb_dir;
```

<table>
<thead>
<tr>
<th>dirname</th>
<th>dirowner</th>
<th>dirpath</th>
</tr>
</thead>
<tbody>
<tr>
<td>empdir</td>
<td>10</td>
<td>C:/TEMP/EMPDIR</td>
</tr>
</tbody>
</table>

View the directory aliases using a view compatible with Oracle databases:

```
SELECT * FROM SYS.ALL_DIRECTORIES;
```

<table>
<thead>
<tr>
<th>owner</th>
<th>directory_name</th>
<th>directory_path</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTERPRISEDB</td>
<td>EMPDIR</td>
<td>C:/TEMP/EMPDIR</td>
</tr>
</tbody>
</table>

### See Also

`DROP DIRECTORY`
2.3.20 CREATE FUNCTION

**Name**

CREATE FUNCTION -- define a new function

**Synopsis**

```
CREATE [ OR REPLACE ] FUNCTION name [ (parameters) ]
  RETURN data_type
  [ IMMTABLE | STABLE | VOLATILE | DETERMINISTIC |
  [ NOT ] LEAKPROOF | CALLED ON NULL INPUT |
  RETURNS NULL ON NULL INPUT |
  STRICT |
  [ EXTERNAL ] SECURITY INVOKER |
  [ EXTERNAL ] SECURITY DEFINER |
  AUTHID DEFINER |
  AUTHID CURRENT_USER |
  PARALLEL [ UNSAFE | RESTRICTED | SAFE ] |
  COST execution_cost |
  ROWS result_rows |
  SET configuration_parameter |
  [ TO value | = value | FROM CURRENT ]
{ IS | AS }
  [ PRAGMA AUTONOMOUS_TRANSACTION; ]
  [ declarations ]
BEGIN
  statements
END [ name ];
```

**Description**

CREATE FUNCTION defines a new function. CREATE OR REPLACE FUNCTION will either create a new function, or replace an existing definition.

If a schema name is included, then the function is created in the specified schema. Otherwise it is created in the current schema. The name of the new function must not match any existing function with the same input argument types in the same schema. However, functions of different input argument types may share a name (this is called
overloading). (Overloading of functions is an Advanced Server feature - overloading of stored, standalone functions is not compatible with Oracle databases.)

To update the definition of an existing function, use `CREATE OR REPLACE FUNCTION`. It is not possible to change the name or argument types of a function this way (if you tried, you would actually be creating a new, distinct function). Also, `CREATE OR REPLACE FUNCTION` will not let you change the return type of an existing function. To do that, you must drop and recreate the function. Also when using `OUT` parameters, you cannot change the types of any `OUT` parameters except by dropping the function.

The user that creates the function becomes the owner of the function.

**Parameters**

*name*

`name` is the identifier of the function.

*parameters*

`parameters` is a list of formal parameters.

*data_type*

`data_type` is the data type of the value returned by the function’s `RETURN` statement.

*declarations*

`declarations` are variable, cursor, type, or subprogram declarations. If subprogram declarations are included, they must be declared after all other variable, cursor, and type declarations.

*statements*

`statements` are SPL program statements (the `BEGIN-END` block may contain an `EXCEPTION` section).

**IMMUTABLE**

**STABLE**

**VOLATILE**

These attributes inform the query optimizer about the behavior of the function; you can specify only one choice. **VOLATILE** is the default behavior.
IMMUTABLE indicates that the function cannot modify the database and always reaches the same result when given the same argument values; it does not do database lookups or otherwise use information not directly present in its argument list. If you include this clause, any call of the function with all-constant arguments can be immediately replaced with the function value.

STABLE indicates that the function cannot modify the database, and that within a single table scan, it will consistently return the same result for the same argument values, but that its result could change across SQL statements. This is the appropriate selection for function that depend on database lookups, parameter variables (such as the current time zone), etc.

VOLATILE indicates that the function value can change even within a single table scan, so no optimizations can be made. Please note that any function that has side-effects must be classified volatile, even if its result is quite predictable, to prevent calls from being optimized away.

DETERMINISTIC

DETERMINISTIC is a synonym for IMMUTABLE. A DETERMINISTIC function cannot modify the database and always reaches the same result when given the same argument values; it does not do database lookups or otherwise use information not directly present in its argument list. If you include this clause, any call of the function with all-constant arguments can be immediately replaced with the function value.

[ NOT ] LEAKPROOF

A LEAKPROOF function has no side effects, and reveals no information about the values used to call the function.

CALLED ON NULL INPUT
RETURNS NULL ON NULL INPUT
STRICT

CALLED ON NULL INPUT (the default) indicates that the procedure will be called normally when some of its arguments are NULL. It is the author's responsibility to check for NULL values if necessary and respond appropriately.

RETURNS NULL ON NULL INPUT or STRICT indicates that the procedure always returns NULL whenever any of its arguments are NULL. If these clauses are specified, the procedure is not executed when there are NULL arguments; instead a NULL result is assumed automatically.

[ EXTERNAL ] SECURITY DEFINER
SECURITY DEFINER specifies that the function will execute with the privileges of the user that created it; this is the default. The key word EXTERNAL is allowed for SQL conformance, but is optional.

[ EXTERNAL ] SECURITY INVOKER

The SECURITY INVOKER clause indicates that the function will execute with the privileges of the user that calls it. The key word EXTERNAL is allowed for SQL conformance, but is optional.

AUTHID DEFINER

AUTHID CURRENT_USER

The AUTHID DEFINER clause is a synonym for [EXTERNAL] SECURITY DEFINER. If the AUTHID clause is omitted or if AUTHID DEFINER is specified, the rights of the function owner are used to determine access privileges to database objects.

The AUTHID CURRENT_USER clause is a synonym for [EXTERNAL] SECURITY INVOKER. If AUTHID CURRENT_USER is specified, the rights of the current user executing the function are used to determine access privileges.

PARALLEL { UNSAFE | RESTRICTED | SAFE }

The PARALLEL clause enables the use of parallel sequential scans (parallel mode). A parallel sequential scan uses multiple workers to scan a relation in parallel during a query in contrast to a serial sequential scan.

When set to UNSAFE, the function cannot be executed in parallel mode. The presence of such a function in a SQL statement forces a serial execution plan. This is the default setting if the PARALLEL clause is omitted.

When set to RESTRICTED, the function can be executed in parallel mode, but the execution is restricted to the parallel group leader. If the qualification for any particular relation has anything that is parallel restricted, that relation won't be chosen for parallelism.

When set to SAFE, the function can be executed in parallel mode with no restriction.

COST execution_cost

execution_cost is a positive number giving the estimated execution cost for the function, in units of cpu_operator_cost. If the function returns a set, this is the cost per returned row. Larger values cause the planner to try to avoid evaluating the function more often than necessary.
ROWS \texttt{result\_rows}

\texttt{result\_rows} is a positive number giving the estimated number of rows that the planner should expect the function to return. This is only allowed when the function is declared to return a set. The default assumption is 1000 rows.

\textbf{SET configuration\_parameter \{ TO value \| = value \| FROM CURRENT \}}

The \texttt{SET} clause causes the specified configuration parameter to be set to the specified value when the function is entered, and then restored to its prior value when the function exits. \texttt{SET FROM CURRENT} saves the session's current value of the parameter as the value to be applied when the function is entered.

If a \texttt{SET} clause is attached to a function, then the effects of a \texttt{SET LOCAL} command executed inside the function for the same variable are restricted to the function; the configuration parameter's prior value is restored at function exit. An ordinary \texttt{SET command} (without \texttt{LOCAL}) overrides the \texttt{SET} clause, much as it would do for a previous \texttt{SET LOCAL} command, with the effects of such a command persisting after procedure exit, unless the current transaction is rolled back.

\textbf{PRAGMA AUTONOMOUS\_TRANSACTION}

\texttt{PRAGMA AUTONOMOUS\_TRANSACTION} is the directive that sets the function as an autonomous transaction.

Please Note: The \texttt{STRICT, LEAKPROOF, PARALLEL, COST, ROWS} and \texttt{SET} keywords provide extended functionality for Advanced Server and are not supported by Oracle.

\textbf{Notes}

Advanced Server allows function overloading; that is, the same name can be used for several different functions so long as they have distinct input (\texttt{IN, IN OUT}) argument data types.

\textbf{Examples}

The function \texttt{emp\_comp} takes two numbers as input and returns a computed value. The \texttt{SELECT} command illustrates use of the function.

\begin{verbatim}
CREATE OR REPLACE FUNCTION emp_comp ( 
p_sal           NUMBER,
p_comm           NUMBER 
) RETURN NUMBER IS BEGIN RETURN (p_sal + NVL(p_comm, 0)) * 24;
END;
\end{verbatim}
Function `sal_range` returns a count of the number of employees whose salary falls in the specified range. The following anonymous block calls the function a number of times using the arguments’ default values for the first two calls.

```sql
CREATE OR REPLACE FUNCTION sal_range (    p_sal_min       NUMBER DEFAULT 0,
    p_sal_max       NUMBER DEFAULT 10000
) RETURN INTEGER
IS
    v_count         INTEGER;
BEGIN
    SELECT COUNT(*) INTO v_count FROM emp
        WHERE sal BETWEEN p_sal_min AND p_sal_max;
    RETURN v_count;
END;
BEGIN
    DBMS_OUTPUT.PUT_LINE('Number of employees with a salary: ' || sal_range);
    DBMS_OUTPUT.PUT_LINE('Number of employees with a salary of at least $2000.00: ' || sal_range(2000.00));
    DBMS_OUTPUT.PUT_LINE('Number of employees with a salary between $2000.00 and $3000.00: ' || sal_range(2000.00, 3000.00));
END;
```

Number of employees with a salary: 14
Number of employees with a salary of at least $2000.00: 6
Number of employees with a salary between $2000.00 and $3000.00: 5

The following example demonstrates using the `AUTHID CURRENT_USER` clause and `STRICT` keyword in a function declaration:

```sql
CREATE OR REPLACE FUNCTION dept_salaries(dept_id int) RETURN NUMBER
STRICT
AUTHID CURRENT_USER
BEGIN
```
RETURN QUERY (SELECT sum(salary) FROM emp WHERE deptno = id);
END;

Include the STRICT keyword to instruct the server to return NULL if any input parameter passed is NULL; if a NULL value is passed, the function will not execute.

The dept_salaries function executes with the privileges of the role that is calling the function. If the current user does not have sufficient privileges to perform the SELECT statement querying the emp table (to display employee salaries), the function will report an error. To instruct the server to use the privileges associated with the role that defined the function, replace the AUTHID CURRENT_USER clause with the AUTHID DEFINER clause.

Other Pragmas (declared within a package specification)

PRAGMA RESTRICT_REFERENCES

Advanced Server accepts but ignores syntax referencing PRAGMA RESTRICT_REFERENCES.

See Also

DROP FUNCTION
2.3.21 CREATE INDEX

Name

CREATE INDEX -- define a new index

Synopsis

CREATE [ UNIQUE ] INDEX name ON table
   ( { column | ( expression ) } )
   [ TABLESPACE tablespace ]

Description

CREATE INDEX constructs an index, name, on the specified table. Indexes are primarily used to enhance database performance (though inappropriate use will result in slower performance).

The key field(s) for the index are specified as column names, or alternatively as expressions written in parentheses. Multiple fields can be specified to create multicolunm indexes.

An index field can be an expression computed from the values of one or more columns of the table row. This feature can be used to obtain fast access to data based on some transformation of the basic data. For example, an index computed on `UPPER(col)` would allow the clause `WHERE UPPER(col) = 'JIM'` to use an index.

Advanced Server provides the B-tree index method. The B-tree index method is an implementation of Lehman-Yao high-concurrency B-trees.

Indexes are not used for `IS NULL` clauses by default.

All functions and operators used in an index definition must be "immutable", that is, their results must depend only on their arguments and never on any outside influence (such as the contents of another table or the current time). This restriction ensures that the behavior of the index is well-defined. To use a user-defined function in an index expression remember to mark the function immutable when you create it.

If you create an index on a partitioned table, the CREATE INDEX command does propagate indexes to the table’s subpartitions.

Parameters

UNIQUE
Causes the system to check for duplicate values in the table when the index is created (if data already exist) and each time data is added. Attempts to insert or update data which would result in duplicate entries will generate an error.

name

The name of the index to be created. No schema name can be included here; the index is always created in the same schema as its parent table.

table

The name (possibly schema-qualified) of the table to be indexed.

column

The name of a column in the table.

expression

An expression based on one or more columns of the table. The expression usually must be written with surrounding parentheses, as shown in the syntax. However, the parentheses may be omitted if the expression has the form of a function call.

tablespace

The tablespace in which to create the index. If not specified, default_tablespace is used, or the database’s default tablespace if default_tablespace is an empty string.

Notes

Up to 32 fields may be specified in a multicolomn index.

Examples

To create a B-tree index on the column, ename, in the table, emp:

```
CREATE INDEX name_idx ON emp (ename);
```

To create the same index as above, but have it reside in the index_tblspc tablespace:

```
CREATE INDEX name_idx ON emp (ename) TABLESPACE index_tblspc;
```

See Also

DROP INDEX, ALTER INDEX
2.3.22 CREATE MATERIALIZED VIEW

Name

CREATE MATERIALIZED VIEW -- define a new materialized view

Synopsis

CREATE MATERIALIZED VIEW name
    [build_clause][create_mv_refresh] AS subquery

Where build_clause is:

    BUILD {IMMEDIATE | DEFERRED}

Where create_mv_refresh is:

    REFRESH [COMPLETE] [ON DEMAND]

Description

CREATE MATERIALIZED VIEW defines a view of a query that is not updated each time the view is referenced in a query. By default, the view is populated when the view is created; you can include the BUILD DEFERRED keywords to delay the population of the view.

A materialized view may be schema-qualified; if you specify a schema name when invoking the CREATE MATERIALIZED VIEW command, the view will be created in the specified schema. The view name must be distinct from the name of any other view, table, sequence, or index in the same schema.

Parameters

name

    The name (optionally schema-qualified) of a view to be created.

subquery

    A SELECT statement that specifies the contents of the view. Refer to SELECT for more information about valid queries.

build_clause
Include a `build_clause` to specify when the view should be populated. Specify `BUILD IMMEDIATE`, or `BUILD DEFERRED`:

- **BUILD IMMEDIATE** instructs the server to populate the view immediately. This is the default behavior.
- **BUILD DEFERRED** instructs the server to populate the view at a later time (during a `REFRESH` operation).

`create_mv_refresh`

Include the `create_mv_refresh` clause to specify when the contents of a materialized view should be updated. The clause contains the `REFRESH` keyword followed by `COMPLETE` and/or `ON DEMAND`, where:

- **COMPLETE** instructs the server to discard the current content and reload the materialized view by executing the view's defining query when the materialized view is refreshed.
- **ON DEMAND** instructs the server to refresh the materialized view on demand by calling the `DBMS_MVIEW` package or by calling the Postgres `REFRESH MATERIALIZED VIEW` statement. This is the default behavior.

**Notes**

Materialized views are read only - the server will not allow an `INSERT`, `UPDATE`, or `DELETE` on a view.

Access to tables referenced in the view is determined by permissions of the view owner; the user of a view must have permissions to call all functions used by the view.

For more information about the Postgres `REFRESH MATERIALIZED VIEW` command, please see the PostgreSQL Core Documentation available at:

https://www.postgresql.org/docs/12/static/sql-refreshmaterializedview.html

**Examples**

The following statement creates a materialized view named `dept_30`:

```sql
CREATE MATERIALIZED VIEW dept_30 BUILD IMMEDIATE AS SELECT * FROM emp WHERE deptno = 30;
```

The view contains information retrieved from the `emp` table about any employee that works in department 30.
2.3.23 CREATE PACKAGE

Name

CREATE PACKAGE -- define a new package specification

Synopsis

CREATE [ OR REPLACE ] PACKAGE name
{ AUTHID { DEFINER | CURRENT_USER } }
{ IS | AS }
[ declaration; ] [, ...]
{ PROCEDURE proc_name
  [ (argname [ IN | IN OUT | OUT ] argtype [ DEFAULT value ]
     [, ...]) ];
  [ PRAGMA RESTRICT_REFERENCES(name,
     { RNDS | RNPS | TRUST | WNDS | WNPS } [, ...] ); ]
|
FUNCTION func_name
  [ (argname [ IN | IN OUT | OUT ] argtype [ DEFAULT value ]
     [, ...]) ]
RETURN rettype [ DETERMINISTIC ];
  [ PRAGMA RESTRICT_REFERENCES(name,
     { RNDS | RNPS | TRUST | WNDS | WNPS } [, ...] ); ]
} [, ...]
END [ name ]

Description

CREATE PACKAGE defines a new package specification. CREATE OR REPLACE PACKAGE will either create a new package specification, or replace an existing specification.

If a schema name is included, then the package is created in the specified schema. Otherwise it is created in the current schema. The name of the new package must not match any existing package in the same schema unless the intent is to update the definition of an existing package, in which case use CREATE OR REPLACE PACKAGE.

The user that creates the procedure becomes the owner of the package.

Parameters

name

The name (optionally schema-qualified) of the package to create.
DEFINER | CURRENT_USER

Specifies whether the privileges of the package owner (DEFINER) or the privileges of the current user executing a program in the package (CURRENT_USER) are to be used to determine whether or not access is allowed to database objects referenced in the package. DEFINER is the default.

declaration

A public variable, type, cursor, or REF CURSOR declaration.

proc_name

The name of a public procedure.

argname

The name of an argument.

IN | IN OUT | OUT

The argument mode.

argtype

The data type(s) of the program's arguments.

DEFAULT value

Default value of an input argument.

func_name

The name of a public function.

rettype

The return data type.

DETERMINISTIC

DETERMINISTIC is a synonym for IMMUTABLE. A DETERMINISTIC procedure cannot modify the database and always reaches the same result when given the same argument values; it does not do database lookups or otherwise use information not directly present in its argument list. If you include this clause, any call of the procedure with all-constant arguments can be immediately replaced with the procedure value.
The keywords are accepted for compatibility and ignored.

Examples

The package specification, `empinfo`, contains three public components - a public variable, a public procedure, and a public function.

```sql
CREATE OR REPLACE PACKAGE empinfo
IS
    emp_name    VARCHAR2(10);
    PROCEDURE get_name (p_empno NUMBER);
    FUNCTION display_counter
        RETURN INTEGER;
END;
```

See Also

DROP PACKAGE
2.3.24 CREATE PACKAGE BODY

Name

CREATE BODY PACKAGE -- define a new package body

Synopsis

CREATE [ OR REPLACE ] PACKAGE BODY name
{ IS | AS }

[ PROCEDURE proc_name
[ { (argname [ IN | IN OUT | OUT ] argtype [ DEFAULT value ]
[ [, ...]) ]
[ STRICT ]
[ LEAKPROOF ]
[ PARALLEL { UNSAFE | RESTRICTED | SAFE } ]
[ COST execution_cost ]
[ ROWS result_rows ]
[ SET config_param { TO value | = value | FROM CURRENT } ]
{ IS | AS }
program_body
END [ proc_name ];
|]

FUNCTION func_name
[ { (argname [ IN | IN OUT | OUT ] argtype [ DEFAULT value ]
[ [, ...]) ]
RETURN rettype [ DETERMINISTIC ]
{ STRICT ]
[ LEAKPROOF ]
[ PARALLEL { UNSAFE | RESTRICTED | SAFE } ]
[ COST execution_cost ]
[ ROWS result_rows ]
[ SET config_param { TO value | = value | FROM CURRENT } ]
{ IS | AS }
program_body
END [ func_name ];
]
]
[ BEGIN
statement; [, ...] ]
END [ name ]

Description

CREATE PACKAGE BODY defines a new package body. CREATE OR REPLACE
PACKAGE BODY will either create a new package body, or replace an existing body.
If a schema name is included, then the package body is created in the specified schema. Otherwise it is created in the current schema. The name of the new package body must match an existing package specification in the same schema. The new package body name must not match any existing package body in the same schema unless the intent is to update the definition of an existing package body, in which case use `CREATE OR REPLACE PACKAGE BODY`.

### Parameters

**name**

The name (optionally schema-qualified) of the package body to create.

**declaration**

A private variable, type, cursor, or `REF CURSOR` declaration.

**proc_name**

The name of a public or private procedure. If `proc_name` exists in the package specification with an identical signature, then it is public, otherwise it is private.

**argname**

The name of an argument.

**IN | IN OUT | OUT**

The argument mode.

**argtype**

The data type(s) of the program's arguments.

**DEFAULT value**

Default value of an input argument.

**STRICT**

The `STRICT` keyword specifies that the function will not be executed if called with a `NULL` argument; instead the function will return `NULL`.

**LEAKPROOF**
The LEAKPROOF keyword specifies that the function will not reveal any information about arguments, other than through a return value.

PARALLEL { UNSAFE | RESTRICTED | SAFE }

The PARALLEL clause enables the use of parallel sequential scans (parallel mode). A parallel sequential scan uses multiple workers to scan a relation in parallel during a query in contrast to a serial sequential scan.

When set to UNSAFE, the procedure or function cannot be executed in parallel mode. The presence of such a procedure or function forces a serial execution plan. This is the default setting if the PARALLEL clause is omitted.

When set to RESTRICTED, the procedure or function can be executed in parallel mode, but the execution is restricted to the parallel group leader. If the qualification for any particular relation has anything that is parallel restricted, that relation won't be chosen for parallelism.

When set to SAFE, the procedure or function can be executed in parallel mode with no restriction.

execution_cost

execution_cost specifies a positive number giving the estimated execution cost for the function, in units of cpu_operator_cost. If the function returns a set, this is the cost per returned row. The default is 0.0025.

result_rows

result_rows is the estimated number of rows that the query planner should expect the function to return. The default is 1000.

SET

Use the SET clause to specify a parameter value for the duration of the function:

config_param specifies the parameter name.

value specifies the parameter value.

FROM CURRENT guarantees that the parameter value is restored when the function ends.
The pragma, declarations, and SPL statements that comprise the body of the function or procedure.

The pragma may be `PRAGMA AUTONOMOUS_TRANSACTION` to set the function or procedure as an autonomous transaction.

The declarations may include variable, type, `REF CURSOR`, or subprogram declarations. If subprogram declarations are included, they must be declared after all other variable, type, and `REF CURSOR` declarations.

`func_name`

The name of a public or private function. If `func_name` exists in the package specification with an identical signature, then it is public, otherwise it is private.

`rettype`

The return data type.

`DETERMINISTIC`

Include `DETERMINISTIC` to specify that the function will always return the same result when given the same argument values. A `DETERMINISTIC` function must not modify the database.

Note: The `DETERMINISTIC` keyword is equivalent to the PostgreSQL `IMMUTABLE` option.

Note: If `DETERMINISTIC` is specified for a public function in the package body, it must also be specified for the function declaration in the package specification. For private functions, there is no function declaration in the package specification.

`statement`

An SPL program statement. Statements in the package initialization section are executed once per session the first time the package is referenced.

Please Note: The `STRICT`, `LEAKPROOF`, `PARALLEL`, `COST`, `ROWS` and `SET` keywords provide extended functionality for Advanced Server and are not supported by Oracle.

**Examples**

The following is the package body for the `empinfo` package.

```sql
CREATE OR REPLACE PACKAGE BODY empinfo IS
  v_counter       INTEGER;
```
PROCEDURE get_name (  
    p_empno     NUMBER  
)  
IS  
BEGIN  
    SELECT ename INTO emp_name FROM emp WHERE empno = p_empno;  
    v_counter := v_counter + 1;  
END;  
FUNCTION display_counter  
RETURN INTEGER  
IS  
BEGIN  
    RETURN v_counter;  
END;  
BEGIN  
    v_counter := 0;  
    DBMS_OUTPUT.PUT_LINE('Initialized counter');  
END;  

The following two anonymous blocks execute the procedure and function in the empinfo package and display the public variable.

BEGIN  
empinfo.get_name(7369);  
DBMS_OUTPUT.PUT_LINE('Employee Name    : ' || empinfo.emp_name);  
DBMS_OUTPUT.PUT_LINE('Number of queries: ' || empinfo.display_counter);  
END;  

Employee Name    : SMITH  
Number of queries: 1

BEGIN  
empinfo.get_name(7900);  
DBMS_OUTPUT.PUT_LINE('Employee Name    : ' || empinfo.emp_name);  
DBMS_OUTPUT.PUT_LINE('Number of queries: ' || empinfo.display_counter);  
END;  

Employee Name    : JAMES  
Number of queries: 2

See Also

CREATE PACKAGE, DROP PACKAGE
## 2.3.25 CREATE PROCEDURE

### Name

**CREATE PROCEDURE** -- define a new stored procedure

### Synopsis

```sql
CREATE [ OR REPLACE ] PROCEDURE name [ (parameters) ]

[ IMMUTABLE ]
[ STABLE ]
[ VOLATILE ]
[ DETERMINISTIC ]
[ NOT ] LEAKPROOF
[ CALLED ON NULL INPUT ]
[ RETURNS NULL ON NULL INPUT ]
[ STRICT ]
[ EXTERNAL ] SECURITY INVOKER
[ EXTERNAL ] SECURITY DEFINER
[ AUTHID DEFINER ]
[ AUTHID CURRENT_USER ]
[ PARALLEL { UNSAFE | RESTRICTED | SAFE } ]
[ COST execution_cost ]
[ ROWS result_rows ]
[ SET configuration_parameter ]

{ TO value | = value | FROM CURRENT }

...]

{ IS | AS }

[ PRAGMA AUTONOMOUS_TRANSACTION; ]

[ declarations ]

BEGIN

statements

END [ name ];
```

### Description

**CREATE PROCEDURE** defines a new stored procedure. **CREATE OR REPLACE PROCEDURE** will either create a new procedure, or replace an existing definition.

If a schema name is included, then the procedure is created in the specified schema. Otherwise it is created in the current schema. The name of the new procedure must not match any existing procedure with the same input argument types in the same schema. However, procedures of different input argument types may share a name (this is called overloading). (Overloading of procedures is an Advanced Server feature - overloading of stored, standalone procedures is not compatible with Oracle databases.)
To update the definition of an existing procedure, use \texttt{CREATE OR REPLACE PROCEDURE}. It is not possible to change the name or argument types of a procedure this way (if you tried, you would actually be creating a new, distinct procedure). When using \texttt{OUT} parameters, you cannot change the types of any \texttt{OUT} parameters except by dropping the procedure.

**Parameters**

\textit{name}

\textit{name} is the identifier of the procedure.

\textit{parameters}

\textit{parameters} is a list of formal parameters.

\textit{declarations}

\textit{declarations} are variable, cursor, type, or subprogram declarations. If subprogram declarations are included, they must be declared after all other variable, cursor, and type declarations.

\textit{statements}

\textit{statements} are SPL program statements (the \texttt{BEGIN-END} block may contain an \texttt{EXCEPTION} section).

\textbf{IMMUTABLE}

\textbf{STABLE}

\textbf{VOLATILE}

These attributes inform the query optimizer about the behavior of the procedure; you can specify only one choice. \textbf{VOLATILE} is the default behavior.

\textbf{IMMUTABLE} indicates that the procedure cannot modify the database and always reaches the same result when given the same argument values; it does not do database lookups or otherwise use information not directly present in its argument list. If you include this clause, any call of the procedure with all-constant arguments can be immediately replaced with the procedure value.

\textbf{STABLE} indicates that the procedure cannot modify the database, and that within a single table scan, it will consistently return the same result for the same argument values, but that its result could change across SQL statements. This is the appropriate selection for procedures that depend on database lookups, parameter variables (such as the current time zone), etc.
VOLATILE indicates that the procedure value can change even within a single table scan, so no optimizations can be made. Please note that any function that has side-effects must be classified volatile, even if its result is quite predictable, to prevent calls from being optimized away.

DETERMINISTIC

DETERMINISTIC is a synonym for IMMUTABLE. A DETERMINISTIC procedure cannot modify the database and always reaches the same result when given the same argument values; it does not do database lookups or otherwise use information not directly present in its argument list. If you include this clause, any call of the procedure with all-constant arguments can be immediately replaced with the procedure value.

[ NOT ] LEAKPROOF

A LEAKPROOF procedure has no side effects, and reveals no information about the values used to call the procedure.

CALLED ON NULL INPUT
RETURNS NULL ON NULL INPUT
STRICT

CALLED ON NULL INPUT (the default) indicates that the procedure will be called normally when some of its arguments are NULL. It is the author's responsibility to check for NULL values if necessary and respond appropriately.

RETURNS NULL ON NULL INPUT or STRICT indicates that the procedure always returns NULL whenever any of its arguments are NULL. If these clauses are specified, the procedure is not executed when there are NULL arguments; instead a NULL result is assumed automatically.

[ EXTERNAL ] SECURITY DEFINER

SECURITY DEFINER specifies that the procedure will execute with the privileges of the user that created it; this is the default. The key word EXTERNAL is allowed for SQL conformance, but is optional.

[ EXTERNAL ] SECURITY INVOKER

The SECURITY INVOKER clause indicates that the procedure will execute with the privileges of the user that calls it. The key word EXTERNAL is allowed for SQL conformance, but is optional.
The `AUTHID DEFINER` clause is a synonym for `[EXTERNAL] SECURITY DEFINER`. If the `AUTHID` clause is omitted or if `AUTHID DEFINER` is specified, the rights of the procedure owner are used to determine access privileges to database objects.

The `AUTHID CURRENT_USER` clause is a synonym for `[EXTERNAL] SECURITY INVOKER`. If `AUTHID CURRENT_USER` is specified, the rights of the current user executing the procedure are used to determine access privileges.

`PARALLEL` { UNSAFE | RESTRICTED | SAFE }

The `PARALLEL` clause enables the use of parallel sequential scans (parallel mode). A parallel sequential scan uses multiple workers to scan a relation in parallel during a query in contrast to a serial sequential scan.

When set to `UNSAFE`, the procedure cannot be executed in parallel mode. The presence of such a procedure forces a serial execution plan. This is the default setting if the `PARALLEL` clause is omitted.

When set to `RESTRICTED`, the procedure can be executed in parallel mode, but the execution is restricted to the parallel group leader. If the qualification for any particular relation has anything that is parallel restricted, that relation won't be chosen for parallelism.

When set to `SAFE`, the procedure can be executed in parallel mode with no restriction.

`COST` execution_cost

`execution_cost` is a positive number giving the estimated execution cost for the procedure, in units of `cpu_operator_cost`. If the procedure returns a set, this is the cost per returned row. Larger values cause the planner to try to avoid evaluating the function more often than necessary.

`ROWS` result_rows

`result_rows` is a positive number giving the estimated number of rows that the planner should expect the procedure to return. This is only allowed when the procedure is declared to return a set. The default assumption is 1000 rows.

`SET configuration_parameter` { TO value | = value | FROM CURRENT }

The `SET` clause causes the specified configuration parameter to be set to the specified value when the procedure is entered, and then restored to its prior value when the procedure exits. `SET FROM CURRENT` saves the session's current value of the parameter as the value to be applied when the procedure is entered.
If a `SET` clause is attached to a procedure, then the effects of a `SET LOCAL` command executed inside the procedure for the same variable are restricted to the procedure; the configuration parameter's prior value is restored at procedure exit. An ordinary `SET` command (without `LOCAL`) overrides the `SET` clause, much as it would do for a previous `SET LOCAL` command, with the effects of such a command persisting after procedure exit, unless the current transaction is rolled back.

**PRAGMA AUTONOMOUS_TRANSACTION**

`PRAGMA AUTONOMOUS_TRANSACTION` is the directive that sets the procedure as an autonomous transaction.

**Note:** The `STRICT`, `LEAKPROOF`, `PARALLEL`, `COST`, `ROWS` and `SET` keywords provide extended functionality for Advanced Server and are not supported by Oracle.

**Note:** The `IMMUTABLE`, `STABLE`, `STRICT`, `LEAKPROOF`, `COST`, `ROWS` and `PARALLEL {UNSAFE | RESTRICTED | SAFE}` attributes are only supported for EDB SPL procedures.

**Note:** By default, stored procedures are created as `SECURITY DEFINERS`; stored procedures defined in `plpgsql` are created as `SECURITY INVOKERS`.

**Examples**

The following procedure lists the employees in the `emp` table:

```sql
CREATE OR REPLACE PROCEDURE list_emp
IS
    v_empno NUMBER(4);
    v_ename VARCHAR2(10);
    CURSOR emp_cur IS
        SELECT empno, ename FROM emp ORDER BY empno;
BEGIN
    OPEN emp_cur;
    DBMS_OUTPUT.PUT_LINE('EMPNO    ENAME');
    DBMS_OUTPUT.PUT_LINE('-----    -------');
    LOOP
        FETCH emp_cur INTO v_empno, v_ename;
        EXIT WHEN emp_cur%NOTFOUND;
        DBMS_OUTPUT.PUT_LINE(v_empno || '     ' || v_ename);
    END LOOP;
    CLOSE emp_cur;
END;
EXEC list_emp;
EMPNO    ENAME
-----    -------
7369     SMITH
7499     ALLEN
7521     WARD
```
The following procedure uses `IN OUT` and `OUT` arguments to return an employee’s number, name, and job based upon a search using first, the given employee number, and if that is not found, then using the given name. An anonymous block calls the procedure.

```sql
CREATE OR REPLACE PROCEDURE emp_job (
    p_empno         IN OUT emp.empno%TYPE,
    p_ename         IN OUT emp.ename%TYPE,
    p_job           OUT    emp.job%TYPE
) IS
    v_empno         emp.empno%TYPE;
    v_ename         emp.ename%TYPE;
    v_job           emp.job%TYPE;
BEGIN
    SELECT ename, job INTO v_ename, v_job FROM emp WHERE empno = p_empno;
    p_ename := v_ename;
    p_job   := v_job;
    DBMS_OUTPUT.PUT_LINE('Found employee # ' || p_empno);
EXCEPTION
    WHEN NO_DATA_FOUND THEN
    BEGIN
        SELECT empno, job INTO v_empno, v_job FROM emp
            WHERE ename = p_ename;
        p_empno := v_empno;
        p_job   := v_job;
        DBMS_OUTPUT.PUT_LINE('Found employee ' || p_ename);
    EXCEPTION
        WHEN NO_DATA_FOUND THEN
            DBMS_OUTPUT.PUT_LINE('Could not find an employee with ' ||
                'number, ' || p_empno || ' nor name, ' || p_ename);
        p_empno := NULL;
        p_ename := NULL;
        p_job   := NULL;
    END;
END;

DECLARE
    v_empno      emp.empno%TYPE;
    v_ename      emp.ename%TYPE;
    v_job        emp.job%TYPE;
BEGIN
    v_empno := 0;
    v_ename := 'CLARK';
    emp_job(v_empno, v_ename, v_job);
    DBMS_OUTPUT.PUT_LINE('Employee No: ' || v_empno);
    DBMS_OUTPUT.PUT_LINE('Name       : ' || v_ename);
    DBMS_OUTPUT.PUT_LINE('Job        : ' || v_job);
END;
```
The following example demonstrates using the `AUTHID DEFINER` and `SET` clauses in a procedure declaration. The `update_salary` procedure conveys the privileges of the role that defined the procedure to the role that is calling the procedure (while the procedure executes):

```sql
CREATE OR REPLACE PROCEDURE update_salary(id INT, new_salary NUMBER)
    SET SEARCH_PATH = 'public' SET WORK_MEM = '1MB'
    AUTHID DEFINER IS
BEGIN
    UPDATE emp SET salary = new_salary WHERE emp_id = id;
END;
```

Include the `SET` clause to set the procedure's search path to `public` and the work memory to `1MB`. Other procedures, functions and objects will not be affected by these settings.

In this example, the `AUTHID DEFINER` clause temporarily grants privileges to a role that might otherwise not be allowed to execute the statements within the procedure. To instruct the server to use the privileges associated with the role invoking the procedure, replace the `AUTHID DEFINER` clause with the `AUTHID CURRENT_USER` clause.

**See Also**

`DROP PROCEDURE`
2.3.26 CREATE PROFILE

Name

CREATE PROFILE – create a new profile

Synopsis

CREATE PROFILE profile_name
    [LIMIT {parameter value} ... ];

Description

CREATE PROFILE creates a new profile. Include the LIMIT clause and one or more space-delimited parameter/value pairs to specify the rules enforced by Advanced Server.

Advanced Server creates a default profile named DEFAULT. When you use the CREATE ROLE command to create a new role, the new role is automatically associated with the DEFAULT profile. If you upgrade from a previous version of Advanced Server to Advanced Server 10, the upgrade process will automatically create the roles in the upgraded version to the DEFAULT profile.

You must be a superuser to use CREATE PROFILE.

Include the LIMIT clause and one or more space-delimited parameter/value pairs to specify the rules enforced by Advanced Server.

Parameters

profile_name

The name of the profile.

parameter

The password attribute that will be monitored by the rule.

value

The value the parameter must reach before an action is taken by the server.

Advanced Server supports the value shown below for each parameter:
FAILED_LOGIN_ATTEMPTS specifies the number of failed login attempts that a user may make before the server locks the user out of their account for the length of time specified by PASSWORD_LOCK_TIME. Supported values are:

- An INTEGER value greater than 0.
- DEFAULT - the value of FAILED_LOGIN_ATTEMPTS specified in the DEFAULT profile.
- UNLIMITED – the connecting user may make an unlimited number of failed login attempts.

PASSWORD_LOCK_TIME specifies the length of time that must pass before the server unlocks an account that has been locked because of FAILED_LOGIN_ATTEMPTS. Supported values are:

- A NUMERIC value greater than or equal to 0. To specify a fractional portion of a day, specify a decimal value. For example, use the value 4.5 to specify 4 days, 12 hours.
- DEFAULT - the value of PASSWORD_LOCK_TIME specified in the DEFAULT profile.
- UNLIMITED – the account is locked until it is manually unlocked by a database superuser.

PASSWORD_LIFE_TIME specifies the number of days that the current password may be used before the user is prompted to provide a new password. Include the PASSWORD_GRACE_TIME clause when using the PASSWORD_LIFE_TIME clause to specify the number of days that will pass after the password expires before connections by the role are rejected. If PASSWORD_GRACE_TIME is not specified, the password will expire on the day specified by the default value of PASSWORD_GRACE_TIME, and the user will not be allowed to execute any command until a new password is provided. Supported values are:

- A NUMERIC value greater than or equal to 0. To specify a fractional portion of a day, specify a decimal value. For example, use the value 4.5 to specify 4 days, 12 hours.
- DEFAULT - the value of PASSWORD_LIFE_TIME specified in the DEFAULT profile.
- UNLIMITED – The password does not have an expiration date.

PASSWORD_GRACE_TIME specifies the length of the grace period after a password expires until the user is forced to change their password. When the grace period expires, a user will be allowed to connect, but will not be allowed to execute any command until they update their expired password. Supported values are:
- A **NUMERIC** value greater than or equal to 0. To specify a fractional portion of a day, specify a decimal value. For example, use the value **4.5** to specify 4 days, 12 hours.
- **DEFAULT** - the value of **PASSWORD_GRACE_TIME** specified in the **DEFAULT** profile.
- **UNLIMITED** – The grace period is infinite.

**PASSWORD_REUSE_TIME** specifies the number of days a user must wait before reusing a password. The **PASSWORD_REUSE_TIME** and **PASSWORD_REUSE_MAX** parameters are intended to be used together. If you specify a finite value for one of these parameters while the other is **UNLIMITED**, old passwords can never be reused. If both parameters are set to **UNLIMITED** there are no restrictions on password reuse. Supported values are:

- A **NUMERIC** value greater than or equal to 0. To specify a fractional portion of a day, specify a decimal value. For example, use the value **4.5** to specify 4 days, 12 hours.
- **DEFAULT** - the value of **PASSWORD_REUSE_TIME** specified in the **DEFAULT** profile.
- **UNLIMITED** – The password can be re-used without restrictions.

**PASSWORD_REUSE_MAX** specifies the number of password changes that must occur before a password can be reused. The **PASSWORD_REUSE_TIME** and **PASSWORD_REUSE_MAX** parameters are intended to be used together. If you specify a finite value for one of these parameters while the other is **UNLIMITED**, old passwords can never be reused. If both parameters are set to **UNLIMITED** there are no restrictions on password reuse. Supported values are:

- An **INTEGER** value greater than or equal to 0.
- **DEFAULT** - the value of **PASSWORD_REUSE_MAX** specified in the **DEFAULT** profile.
- **UNLIMITED** – The password can be re-used without restrictions.

**PASSWORD_VERIFY_FUNCTION** specifies password complexity. Supported values are:

- The name of a PL/SQL function.
- **DEFAULT** - the value of **PASSWORD_VERIFY_FUNCTION** specified in the **DEFAULT** profile.
- **NULL**

**PASSWORD_ALLOW_HASHED** specifies whether an encrypted password to be allowed for use or not. If you specify the value as **TRUE**, the system allows a user to change the password by specifying a hash computed encrypted password on the client side.
However, if you specify the value as `FALSE`, then a password must be specified in a plain-text form in order to be validated effectively, else an error will be thrown if a server receives an encrypted password. Supported values are:

- A **BOOLEAN** value `TRUE/ON/YES/1` or `FALSE/OFF/NO/0`.
- **DEFAULT** – the value of `PASSWORD_ALLOW_HASHED` specified in the **DEFAULT** profile.

**Note:** The `PASSWORD_ALLOW_HASHED` is not an Oracle-compatible parameter.

**Notes**

Use **DROP PROFILE** command to remove the profile.

**Examples**

The following command creates a profile named `acctg`. The profile specifies that if a user has not authenticated with the correct password in five attempts, the account will be locked for one day:

```
CREATE PROFILE acctg LIMIT
   FAILED_LOGIN_ATTEMPTS 5
   PASSWORD_LOCK_TIME 1;
```

The following command creates a profile named `sales`. The profile specifies that a user must change their password every 90 days:

```
CREATE PROFILE sales LIMIT
   PASSWORD_LIFE_TIME 90
   PASSWORD_GRACE_TIME 3;
```

If the user has not changed their password before the 90 days specified in the profile has passed, they will be issued a warning at login. After a grace period of 3 days, their account will not be allowed to invoke any commands until they change their password.

The following command creates a profile named `accts`. The profile specifies that a user cannot re-use a password within 180 days of the last use of the password, and must change their password at least 5 times before re-using the password:

```
CREATE PROFILE accts LIMIT
   PASSWORD_REUSE_TIME 180
   PASSWORD_REUSE_MAX 5;
```

The following command creates a profile named `resources`; the profile calls a user-defined function named `password_rules` that will verify that the password provided meets their standards for complexity:
CREATE PROFILE resources LIMIT
  PASSWORD_VERIFY_FUNCTION password_rules;
2.3.27 CREATE QUEUE

Advanced Server includes extra syntax (not offered by Oracle) with the CREATE QUEUE SQL command. This syntax can be used in association with DBMS_AQADM.

Name

CREATE QUEUE – create a queue.

Synopsis

Use CREATE QUEUE to define a new queue:

```
CREATE QUEUE name QUEUE TABLE queue_table_name [( { option_name option_value } [, ... ] ) ]
```

where option_name and the corresponding option_value can be:

- TYPE [normal_queue | exception_queue]
- RETRIES [INTEGER]
- RETRYDELAY [DOUBLE PRECISION]
- RETENTION [DOUBLE PRECISION]

Description

The CREATE QUEUE command allows a database superuser or any user with the system-defined aq_administrator_role privilege to create a new queue in the current database.

If the name of the queue is schema-qualified, the queue is created in the specified schema. If a schema is not included in the CREATE QUEUE command, the queue is created in the current schema. A queue may only be created in the schema in which the queue table resides. The name of the queue must be unique from the name of any other queue in the same schema.

Use DROP QUEUE to remove a queue.

Parameters

name
The name (optionally schema-qualified) of the queue to be created.

\[ \text{queue\_table\_name} \]

The name of the queue table with which this queue is associated.

\[ \text{option\_name option\_value} \]

The name of any options that will be associated with the new queue, and the corresponding value for the option. If the call to `CREATE QUEUE` includes duplicate option names, the server will return an error. The following values are supported:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
<td>Specify <code>normal_queue</code> to indicate that the queue is a normal queue, or <code>exception_queue</code> to indicate that the queue is an exception queue. An exception queue will only accept dequeue operations.</td>
</tr>
<tr>
<td>RETRIES</td>
<td>An INTEGER value that specifies the maximum number of attempts to remove a message from a queue.</td>
</tr>
<tr>
<td>RETRYDELAY</td>
<td>A DOUBLE PRECISION value that specifies the number of seconds after a ROLLBACK that the server will wait before retrying a message.</td>
</tr>
<tr>
<td>RETENTION</td>
<td>A DOUBLE PRECISION value that specifies the number of seconds that a message will be saved in the queue table after dequeueing.</td>
</tr>
</tbody>
</table>

**Example**

The following command creates a queue named `work_order` that is associated with a queue table named `work_order_table`:

```
CREATE QUEUE work_order QUEUE TABLE work_order_table (RETRIES 5, RETRYDELAY 2);
```

The server will allow 5 attempts to remove a message from the queue, and enforce a retry delay of 2 seconds between attempts.

**See Also**

`ALTER QUEUE`, `DROP QUEUE`
2.3.28 CREATE QUEUE TABLE

Advanced Server includes extra syntax (not offered by Oracle) with the `CREATE QUEUE TABLE` SQL command. This syntax can be used in association with `DBMS_AQADM`.

Name

`CREATE QUEUE TABLE` -- create a new queue table.

Synopsis

Use `CREATE QUEUE TABLE` to define a new queue table:

```
CREATE QUEUE TABLE name OF type_name [ ( { option_name = option_value } [, ... ] ) ]
```

where `option_name` and the corresponding `option_value` can be:

<table>
<thead>
<tr>
<th><code>option_name</code></th>
<th><code>option_value</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>SORT_LIST</td>
<td>priority, enq_time</td>
</tr>
<tr>
<td>MULTIPLE_CONSUMERS</td>
<td>FALSE, TRUE</td>
</tr>
<tr>
<td>MESSAGE_GROUPING</td>
<td>NONE, TRANSACTIONAL</td>
</tr>
<tr>
<td>STORAGE_CLAUSE</td>
<td>TABLESPACE <code>tablespace_name</code>, PCTFREE integer, PCTUSED integer, INITRANS integer, MAXTRANS integer, STORAGE storage_option</td>
</tr>
</tbody>
</table>

Where `storage_option` is one or more of the following:

- MINEXTENTS integer, MAXEXTENTS integer,
- PCTINCREASE integer, INITIAL `size_clause`, NEXT,
- FREELIST integer, OPTIMAL `size_clause`,
- BUFFER_POOL {KEEP|RECYCLE|DEFAULT}.

Please note that only the `TABLESPACE` option is enforced; all others are accepted for compatibility and ignored. Use the `TABLESPACE` clause to specify the name of a tablespace in which the table will be created.

Description

`CREATE QUEUE TABLE` allows a superuser or a user with the `aq_administrator_role` privilege to create a new queue table.

If the call to `CREATE QUEUE TABLE` includes a schema name, the queue table is created in the specified schema. If no schema name is provided, the new queue table is created in the current schema.

The name of the queue table must be unique from the name of any other queue table in the same schema.
Parameters

**name**

The name (optionally schema-qualified) of the new queue table.

**type_name**

The name of an existing type that describes the payload of each entry in the queue table. For information about defining a type, see `CREATE TYPE`.

**option_name** option_value

The name of any options that will be associated with the new queue table, and the corresponding value for the option. If the call to `CREATE QUEUE TABLE` includes duplicate option names, the server will return an error. The following values are accepted:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SORT_LIST</strong></td>
<td>Use the <code>SORT_LIST</code> option to control the dequeneing order of the queue; specify the names of the column(s) that will be used to sort the queue (in ascending order). The currently accepted values are the following combinations of <code>enq_time</code> and <code>priority</code>: enq_time, priority priority, enq_time priority, enq_time Any other value will return an ERROR.</td>
</tr>
<tr>
<td><strong>MULTIPLE_CONSUMERS</strong></td>
<td>A BOOLEAN value that indicates if a message can have more than one consumer (TRUE), or are limited to one consumer per message (FALSE).</td>
</tr>
<tr>
<td><strong>MESSAGE_GROUPING</strong></td>
<td>Specify <code>none</code> to indicate that each message should be dequeued individually, or <code>transactional</code> to indicate that messages that are added to the queue as a result of one transaction should be dequeued as a group.</td>
</tr>
<tr>
<td><strong>STORAGE_CLAUSE</strong></td>
<td>Use <code>STORAGE_CLAUSE</code> to specify table attributes. <code>STORAGE_CLAUSE</code> may be <code>TABLESPACE</code> <code>tablespace_name</code>, <code>PCTFREE</code> integer, <code>PCTUSED</code> integer, <code>INITRANS</code> integer, <code>MAXTRANS</code> integer, <code>STORAGE</code> <code>storage_option</code> Where <code>storage_option</code> is one or more of the following: <code>MINEXTENTS</code> integer, <code>MAXEXTENTS</code> integer, <code>PCTINCREASE</code> integer, <code>INITIAL size_clause</code>, <code>NEXT</code>, <code>FREELISTS</code> integer, <code>OPTIMAL size_clause</code>, <code>BUFFER_POOL</code> `{KEEP</td>
</tr>
</tbody>
</table>
Example

You must create a user-defined type before creating a queue table; the type describes the columns and data types within the table. The following command creates a type named `work_order`:

```
CREATE TYPE work_order AS (name VARCHAR2, project TEXT, completed BOOLEAN);
```

The following command uses the `work_order` type to create a queue table named `work_order_table`:

```
CREATE QUEUE TABLE work_order_table OF work_order (sort_list (enq_time, priority));
```

See Also

`ALTER QUEUE TABLE`, `DROP QUEUE TABLE`
2.3.29 CREATE ROLE

Name

CREATE ROLE -- define a new database role

Synopsis

CREATE ROLE name [IDENTIFIED BY password [REPLACE old_password]]

Description

CREATE ROLE adds a new role to the Advanced Server database cluster. A role is an entity that can own database objects and have database privileges; a role can be considered a “user”, a “group”, or both depending on how it is used. The newly created role does not have the LOGIN attribute, so it cannot be used to start a session. Use the ALTER ROLE command to give the role LOGIN rights. You must have CREATEROLE privilege or be a database superuser to use the CREATE ROLE command.

If the IDENTIFIED BY clause is specified, the CREATE ROLE command also creates a schema owned by, and with the same name as the newly created role.

Note that roles are defined at the database cluster level, and so are valid in all databases in the cluster.

Parameters

name

The name of the new role.

IDENTIFIED BY password

Sets the role’s password. (A password is only of use for roles having the LOGIN attribute, but you can nonetheless define one for roles without it.) If you do not plan to use password authentication you can omit this option.

Notes

Use ALTER ROLE to change the attributes of a role, and DROP ROLE to remove a role. The attributes specified by CREATE ROLE can be modified by later ALTER ROLE commands.
Use `GRANT` and `REVOKE` to add and remove members of roles that are being used as groups.

The maximum length limit for role name and password is 63 characters.

**Examples**

Create a role (and a schema) named, `admins`, with a password:

```
CREATE ROLE admins IDENTIFIED BY Rt498zb;
```

**See Also**

`ALTER ROLE`, `DROP ROLE`, `GRANT`, `REVOKE`, `SET ROLE`
2.3.30 CREATE SCHEMA

Name

CREATE SCHEMA -- define a new schema

Synopsis

CREATE SCHEMA AUTHORIZATION username schema_element [ ... ]

Description

This variation of the CREATE SCHEMA command creates a new schema owned by username and populated with one or more objects. The creation of the schema and objects occur within a single transaction so either all objects are created or none of them including the schema. (Please note: if you are using an Oracle database, no new schema is created – username, and therefore the schema, must pre-exist.)

A schema is essentially a namespace: it contains named objects (tables, views, etc.) whose names may duplicate those of other objects existing in other schemas. Named objects are accessed either by “qualifying” their names with the schema name as a prefix, or by setting a search path that includes the desired schema(s). Unqualified objects are created in the current schema (the one at the front of the search path, which can be determined with the function CURRENT_SCHEMA). (The search path concept and the CURRENT_SCHEMA function are not compatible with Oracle databases.)

CREATE SCHEMA includes subcommands to create objects within the schema. The subcommands are treated essentially the same as separate commands issued after creating the schema. All the created objects will be owned by the specified user.

Parameters

username

The name of the user who will own the new schema. The schema will be named the same as username. Only superusers may create schemas owned by users other than themselves. (Please note: In Advanced Server the role, username, must already exist, but the schema must not exist. In Oracle, the user (equivalently, the schema) must exist.)

schema_element

An SQL statement defining an object to be created within the schema. CREATE TABLE, CREATE VIEW, and GRANT are accepted as clauses within CREATE
SCHEMA. Other kinds of objects may be created in separate commands after the schema is created.

Notes

To create a schema, the invoking user must have the CREATE privilege for the current database. (Of course, superusers bypass this check.)

In Advanced Server, there are other forms of the CREATE SCHEMA command that are not compatible with Oracle databases.

Examples

```sql
CREATE SCHEMA AUTHORIZATION enterprisedb
CREATE TABLE empjobs (ename VARCHAR2(10), job VARCHAR2(9))
CREATE VIEW managers AS SELECT ename FROM empjobs WHERE job = 'MANAGER'
GRANT SELECT ON managers TO PUBLIC;
```
### 2.3.31 CREATE SEQUENCE

**Name**

CREATE SEQUENCE -- define a new sequence generator

**Synopsis**

```
CREATE SEQUENCE name [ INCREMENT BY increment ]
[ { NOMINVALUE | MINVALUE minvalue } ]
[ { NOMAXVALUE | MAXVALUE maxvalue } ]
[ START WITH start ] [ CACHE cache | NOCACHE ] [ CYCLE ]
```

**Description**

CREATE SEQUENCE creates a new sequence number generator. This involves creating and initializing a new special single-row table with the name, `name`. The generator will be owned by the user issuing the command.

If a schema name is given then the sequence is created in the specified schema, otherwise it is created in the current schema. The sequence name must be distinct from the name of any other sequence, table, index, or view in the same schema.

After a sequence is created, use the functions `NEXTVAL` and `CURRVAL` to operate on the sequence. These functions are documented in Section 2.4.9.

**Parameters**

- **name**

  The name (optionally schema-qualified) of the sequence to be created.

- **increment**

  The optional clause `INCREMENT BY increment` specifies the value to add to the current sequence value to create a new value. A positive value will make an ascending sequence, a negative one a descending sequence. The default value is 1.

- **NOMINVALUE | MINVALUE minvalue**

  The optional clause `MINVALUE minvalue` determines the minimum value a sequence can generate. If this clause is not supplied, then defaults will be used. The defaults are 1 and $-2^{63}-1$ for ascending and descending sequences,
respectively. Note that the key words, NONMINVALUE, may be used to set this behavior to the default.

NOMAXVALUE | MAXVALUE maxvalue

The optional clause MAXVALUE maxvalue determines the maximum value for the sequence. If this clause is not supplied, then default values will be used. The defaults are $2^{63} - 1$ for ascending and descending sequences, respectively. Note that the key words, NOMAXVALUE, may be used to set this behavior to the default.

start

The optional clause START WITH start allows the sequence to begin anywhere. The default starting value is minvalue for ascending sequences and maxvalue for descending ones.

cache

The optional clause CACHE cache specifies how many sequence numbers are to be preallocated and stored in memory for faster access. The minimum value is 1 (only one value can be generated at a time, i.e., NOCACHE), and this is also the default.

CYCLE

The CYCLE option allows the sequence to wrap around when the maxvalue or minvalue has been reached by an ascending or descending sequence respectively. If the limit is reached, the next number generated will be the minvalue or maxvalue, respectively.

If CYCLE is omitted (the default), any calls to NEXTVAL after the sequence has reached its maximum value will return an error. Note that the key words, NO CYCLE, may be used to obtain the default behavior, however, this term is not compatible with Oracle databases.

Notes

Sequences are based on big integer arithmetic, so the range cannot exceed the range of an eight-byte integer (-9223372036854775808 to 9223372036854775807). On some older platforms, there may be no compiler support for eight-byte integers, in which case sequences use regular INTEGER arithmetic (range -2147483648 to +2147483647).

Unexpected results may be obtained if a cache setting greater than one is used for a sequence object that will be used concurrently by multiple sessions. Each session will allocate and cache successive sequence values during one access to the sequence object.
and increase the sequence object’s last value accordingly. Then, the next _cache_ uses of _NEXTVAL_ within that session simply return the preallocated values without touching the sequence object. So, any numbers allocated but not used within a session will be lost when that session ends, resulting in "holes" in the sequence.

Furthermore, although multiple sessions are guaranteed to allocate distinct sequence values, the values may be generated out of sequence when all the sessions are considered. For example, with a _cache_ setting of 10, session A might reserve values 1..10 and return _NEXTVAL_=1, then session B might reserve values 11..20 and return _NEXTVAL_=11 before session A has generated _NEXTVAL_=2. Thus, with a _cache_ setting of one it is safe to assume that _NEXTVAL_ values are generated sequentially; with a _cache_ setting greater than one you should only assume that the _NEXTVAL_ values are all distinct, not that they are generated purely sequentially. Also, the last value will reflect the latest value reserved by any session, whether or not it has yet been returned by _NEXTVAL_.

**Examples**

Create an ascending sequence called _serial_, starting at 101:

```
CREATE SEQUENCE serial START WITH 101;
```

Select the next number from this sequence:

```
SELECT serial.NEXTVAL FROM DUAL;
```

```nextval
---------
101
(1 row)
```

Create a sequence called _supplier_seq_ with the _NOCACHE_ option:

```
CREATE SEQUENCE supplier_seq
    MINVALUE 1
    START WITH 1
    INCREMENT BY 1
    NOCACHE;
```

Select the next number from this sequence:

```
SELECT supplier_seq.NEXTVAL FROM DUAL;
```

```nextval
---------
1
(1 row)
```

**See Also**

_ALTER SEQUENCE_, _DROP SEQUENCE_
### 2.3.32 CREATE SYNONYM

#### Name

**CREATE SYNONYM** -- define a new synonym

#### Synopsis

```sql
CREATE [OR REPLACE] [PUBLIC] SYNONYM [schema.]syn_name
FOR object_schema.object_name[@dblink_name];
```

#### Description

**CREATE SYNONYM** defines a synonym for certain types of database objects. Advanced Server supports synonyms for:

- tables
- views
- materialized views
- sequences
- stored procedures
- stored functions
- types
- objects that are accessible through a database link
- other synonyms

#### Parameters:

- **syn_name**

  *syn_name* is the name of the synonym. A synonym name must be unique within a schema.

- **schema**

  *schema* specifies the name of the schema that the synonym resides in. If you do not specify a schema name, the synonym is created in the first existing schema in your search path.

- **object_name**

  *object_name* specifies the name of the object.

- **object_schema**
object_schema specifies the name of the schema that the referenced object resides in.

dblink_name

dblink_name specifies the name of the database link through which an object is accessed.

Include the REPLACE clause to replace an existing synonym definition with a new synonym definition.

Include the PUBLIC clause to create the synonym in the public schema. The CREATE PUBLIC SYNONYM command, compatible with Oracle databases, creates a synonym that resides in the public schema:

```
CREATE [OR REPLACE] PUBLIC SYNONYM syn_name FOR object_schema.object_name;
```

This just a shorthand way to write:

```
CREATE [OR REPLACE] SYNONYM public.syn_name FOR object_schema.object_name;
```

Notes

Access to the object referenced by the synonym is determined by the permissions of the current user of the synonym; the synonym user must have the appropriate permissions on the underlying database object.

Examples

Create a synonym for the emp table in a schema named, enterprisedb:

```
CREATE SYNONYM personnel FOR enterprisedb.emp;
```

See Also

DROP SYNONYM
2.3.33 CREATE TABLE

Name

CREATE TABLE -- define a new table

Synopsis

CREATE [ GLOBAL TEMPORARY ] TABLE table_name ( 
  { column_name data_type [ DEFAULT default_expr ]
  [ column_constraint [ ... ] ] | table_constraint } [, ...]
  )
  [ WITH ( ROWIDS [= value ] ) ]
  [ ON COMMIT { PRESERVE ROWS | DELETE ROWS } ]
  [ TABLESPACE tablespace ]

where column_constraint is:

[ CONSTRAINT constraint_name ]
{ NOT NULL | NULL | UNIQUE [ USING INDEX TABLESPACE tablespace ] | PRIMARY KEY [ USING INDEX TABLESPACE tablespace ] | CHECK (expression) | REFERENCES ref_table [ ( refcolumn ) ] [ ON DELETE action ] ]
[ DEFERRABLE | NOT DEFERRABLE ] [ INITIALLY DEFERRED | INITIALLY IMMEDIATE ]

and table_constraint is:

[ CONSTRAINT constraint_name ]
{ UNIQUE ( column_name [, ...] )
  [ USING INDEX TABLESPACE tablespace ] | PRIMARY KEY ( column_name [, ...] )
  [ USING INDEX TABLESPACE tablespace ] | CHECK ( expression ) | FOREIGN KEY ( column_name [, ...] )
  REFERENCES ref_table [ ( refcolumn [, ...] ) ] [ ON DELETE action ] ]
[ DEFERRABLE | NOT DEFERRABLE ]
[ INITIALLY DEFERRED | INITIALLY IMMEDIATE ]

Description

CREATE TABLE will create a new, initially empty table in the current database. The table will be owned by the user issuing the command.
If a schema name is given (for example, `CREATE TABLE myschema.mytable ...`) then the table is created in the specified schema. Otherwise it is created in the current schema. Temporary tables exist in a special schema, so a schema name may not be given when creating a temporary table. The table name must be distinct from the name of any other table, sequence, index, or view in the same schema.

`CREATE TABLE` also automatically creates a data type that represents the composite type corresponding to one row of the table. Therefore, tables cannot have the same name as any existing data type in the same schema.

A table cannot have more than 1600 columns. (In practice, the effective limit is lower because of tuple-length constraints).

The optional constraint clauses specify constraints (or tests) that new or updated rows must satisfy for an insert or update operation to succeed. A constraint is an SQL object that helps define the set of valid values in the table in various ways.

There are two ways to define constraints: table constraints and column constraints. A column constraint is defined as part of a column definition. A table constraint definition is not tied to a particular column, and it can encompass more than one column. Every column constraint can also be written as a table constraint; a column constraint is only a notational convenience if the constraint only affects one column.

**Parameters**

GLOBAL TEMPORARY

If specified, the table is created as a temporary table. Temporary tables are automatically dropped at the end of a session, or optionally at the end of the current transaction (see `ON COMMIT` below). Existing permanent tables with the same name are not visible to the current session while the temporary table exists, unless they are referenced with schema-qualified names. In addition, temporary tables are not visible outside the session in which it was created. (This aspect of global temporary tables is not compatible with Oracle databases.) Any indexes created on a temporary table are automatically temporary as well.

`table_name`

The name (optionally schema-qualified) of the table to be created.

`column_name`

The name of a column to be created in the new table.
**data_type**

The data type of the column. This may include array specifiers. For more information on the data types included with Advanced Server, refer to Section 2.2.

**DEFAULT default_expr**

The **DEFAULT** clause assigns a default data value for the column whose column definition it appears within. The value is any variable-free expression (subqueries and cross-references to other columns in the current table are not allowed). The data type of the default expression must match the data type of the column.

The default expression will be used in any insert operation that does not specify a value for the column. If there is no default for a column, then the default is null.

**CONSTRAINT constraint_name**

An optional name for a column or table constraint. If not specified, the system generates a name.

**NOT NULL**

The column is not allowed to contain null values.

**NULL**

The column is allowed to contain null values. This is the default.

This clause is only available for compatibility with non-standard SQL databases. Its use is discouraged in new applications.

**UNIQUE - column constraint**

UNIQUE (column_name [, ...]) - table constraint

The **UNIQUE** constraint specifies that a group of one or more distinct columns of a table may contain only unique values. The behavior of the unique table constraint is the same as that for column constraints, with the additional capability to span multiple columns.

For the purpose of a unique constraint, null values are not considered equal.

Each unique table constraint must name a set of columns that is different from the set of columns named by any other unique or primary key constraint defined for the table. (Otherwise it would just be the same constraint listed twice.)
PRIMARY KEY - column constraint

The primary key constraint specifies that a column or columns of a table may contain only unique (non-duplicate), non-null values. Technically, PRIMARY KEY is merely a combination of UNIQUE and NOT NULL, but identifying a set of columns as primary key also provides metadata about the design of the schema, as a primary key implies that other tables may rely on this set of columns as a unique identifier for rows.

Only one primary key can be specified for a table, whether as a column constraint or a table constraint.

The primary key constraint should name a set of columns that is different from other sets of columns named by any unique constraint defined for the same table.

CHECK (expression)

The CHECK clause specifies an expression producing a Boolean result which new or updated rows must satisfy for an insert or update operation to succeed. Expressions evaluating to TRUE or “unknown” succeed. Should any row of an insert or update operation produce a FALSE result an error exception is raised and the insert or update does not alter the database. A check constraint specified as a column constraint should reference that column’s value only, while an expression appearing in a table constraint may reference multiple columns.

Currently, CHECK expressions cannot contain subqueries nor refer to variables other than columns of the current row.

REFERENCES reftable [(refcolumn)] [ON DELETE action] - column constraint
FOREIGN KEY (column [, ...]) REFERENCES reftable [(refcolumn [, ...])] [ON DELETE action] - table constraint

These clauses specify a foreign key constraint, which requires that a group of one or more columns of the new table must only contain values that match values in the referenced column(s) of some row of the referenced table. If refcolumn is omitted, the primary key of the reftable is used. The referenced columns must be the columns of a unique or primary key constraint in the referenced table.

In addition, when the data in the referenced columns is changed, certain actions are performed on the data in this table’s columns. The ON DELETE clause specifies the action to perform when a referenced row in the referenced table is being deleted. Referential actions cannot be deferred even if the constraint is deferrable. Here are the following possible actions for each clause:

CASCADE
Delete any rows referencing the deleted row, or update the value of the referencing column to the new value of the referenced column, respectively.

**SET NULL**

Set the referencing column(s) to NULL.

If the referenced column(s) are changed frequently, it may be wise to add an index to the foreign key column so that referential actions associated with the foreign key column can be performed more efficiently.

**DEFERRABLE**

**NOT DEFERRABLE**

This controls whether the constraint can be deferred. A constraint that is not deferrable will be checked immediately after every command. Checking of constraints that are deferrable may be postponed until the end of the transaction (using the **SET CONSTRAINTS** command). **NOT DEFERRABLE** is the default. Only foreign key constraints currently accept this clause. All other constraint types are not deferrable.

**INITIALLY IMMEDIATE**

**INITIALLY DEFERRED**

If a constraint is deferrable, this clause specifies the default time to check the constraint. If the constraint is **INITIALLY IMMEDIATE**, it is checked after each statement. This is the default. If the constraint is **INITIALLY DEFERRED**, it is checked only at the end of the transaction. The constraint check time can be altered with the **SET CONSTRAINTS** command.

**WITH ( ROWIDS [ = value ] )**

The **ROWIDS** option for a table include **value equals to TRUE/ON/1 or FALSE/OFF/0**. When set to **TRUE/ON/1**, a **ROWID** column is created in the new table. **ROWID** is an auto-incrementing value based on a sequence that starts with 1 and assigned to each row of a table. If a **value** is not specified then the default value is always **TRUE**.

By default, a unique index is created on a **ROWID** column. The **ALTER** and **DROP** operations are restricted on a **ROWID** column.

**ON COMMIT**

The behavior of temporary tables at the end of a transaction block can be controlled using **ON COMMIT**. The two options are:
PRESERVE ROWS

No special action is taken at the ends of transactions. This is the default behavior. (Note that this aspect is not compatible with Oracle databases. The Oracle default is DELETE ROWS.)

DELETE ROWS

All rows in the temporary table will be deleted at the end of each transaction block. Essentially, an automatic TRUNCATE is done at each commit.

TABLESPACE tablespace

The tablespace is the name of the tablespace in which the new table is to be created. If not specified, default tablespace is used, or the database’s default tablespace if default_tablespace is an empty string.

USING INDEX TABLESPACE tablespace

This clause allows selection of the tablespace in which the index associated with a UNIQUE or PRIMARY KEY constraint will be created. If not specified, default tablespace is used, or the database’s default tablespace if default_tablespace is an empty string.

Notes

Advanced Server automatically creates an index for each unique constraint and primary key constraint to enforce the uniqueness. Thus, it is not necessary to create an explicit index for primary key columns. (See CREATE INDEX for more information.)

Examples

Create table dept and table emp:

```sql
CREATE TABLE dept (  deptno NUMBER(2) NOT NULL CONSTRAINT dept_pk PRIMARY KEY,  dname VARCHAR2(14),  loc VARCHAR2(13));
CREATE TABLE emp (  empno NUMBER(4) NOT NULL CONSTRAINT emp_pk PRIMARY KEY,  ename VARCHAR2(10),  job VARCHAR2(9),  mgr NUMBER(4),  hiredate DATE,  sal NUMBER(7,2),  comm NUMBER(7,2),  deptno NUMBER(2) CONSTRAINT emp_ref_dept_fk REFERENCES dept(deptno))
```
Define a unique table constraint for the table `dept`. Unique table constraints can be defined on one or more columns of the table.

```sql
CREATE TABLE dept (
    deptno          NUMBER(2) NOT NULL CONSTRAINT dept_pk PRIMARY KEY,
    dname           VARCHAR2(14) CONSTRAINT dept_dname_uq UNIQUE,
    loc             VARCHAR2(13)
); 
```

Define a check column constraint:

```sql
CREATE TABLE emp (  
    empno           NUMBER(4) NOT NULL CONSTRAINT emp_pk PRIMARY KEY,  
    ename           VARCHAR2(10),  
    job             VARCHAR2(9),  
    mgr             NUMBER(4),  
    hiredate        DATE,  
    sal             NUMBER(7,2) CONSTRAINT emp_sal_ck CHECK (sal > 0),  
    comm            NUMBER(7,2),  
    deptno          NUMBER(2) CONSTRAINT emp_ref_dept_fk  
        REFERENCES dept(deptno) 
); 
```

Define a check table constraint:

```sql
CREATE TABLE emp (  
    empno           NUMBER(4) NOT NULL CONSTRAINT emp_pk PRIMARY KEY,  
    ename           VARCHAR2(10),  
    job             VARCHAR2(9),  
    mgr             NUMBER(4),  
    hiredate        DATE,  
    sal             NUMBER(7,2),  
    comm            NUMBER(7,2),  
    deptno          NUMBER(2) CONSTRAINT emp_ref_dept_fk  
        REFERENCES dept(deptno),  
    CONSTRAINT new_emp_ck CHECK (ename IS NOT NULL AND empno > 7000) 
); 
```

Define a primary key table constraint for the table `jobhist`. Primary key table constraints can be defined on one or more columns of the table.

```sql
CREATE TABLE jobhist (  
    empno           NUMBER(4) NOT NULL,  
    startdate       DATE NOT NULL,  
    enddate         DATE,  
    job             VARCHAR2(9),  
    sal             NUMBER(7,2),  
    comm            NUMBER(7,2),  
    deptno          NUMBER(2),  
    chgdesc         VARCHAR2(80),  
    CONSTRAINT jobhist_pk PRIMARY KEY (empno, startdate) 
); 
```
This assigns a literal constant default value for the column, job and makes the default value of hiredate be the date at which the row is inserted.

```
CREATE TABLE emp (  
    empno       NUMBER(4) NOT NULL CONSTRAINT emp_pk PRIMARY KEY,  
    ename       VARCHAR2(10),  
    job         VARCHAR2(9) DEFAULT 'SALESMAN',  
    mgr         NUMBER(4),  
    hiredate    DATE DEFAULT SYSDATE,  
    sal         NUMBER(7,2),  
    comm        NUMBER(7,2),  
    deptno      NUMBER(2) CONSTRAINT emp_ref_dept_fk  
               REFERENCES dept(deptno)  
);  
```

Create table dept in tablespace diskvol1:

```
CREATE TABLE dept (  
    deptno     NUMBER(2) NOT NULL CONSTRAINT dept_pk PRIMARY KEY,  
    dname      VARCHAR2(14),  
    loc        VARCHAR2(13)  
) TABLESPACE diskvol1;  
```

See Also

ALTER TABLE, DROP TABLE
2.3.34 CREATE TABLE AS

Name

CREATE TABLE AS -- define a new table from the results of a query

Synopsis

CREATE [ GLOBAL TEMPORARY ] TABLE table_name
  [ (column_name [, ...] ) ]
  [ ON COMMIT { PRESERVE ROWS | DELETE ROWS } ]
  [ TABLESPACE tablespace ]
AS query

Description

CREATE TABLE AS creates a table and fills it with data computed by a SELECT command. The table columns have the names and data types associated with the output columns of the SELECT (except that you can override the column names by giving an explicit list of new column names).

CREATE TABLE AS bears some resemblance to creating a view, but it is really quite different: it creates a new table and evaluates the query just once to fill the new table initially. The new table will not track subsequent changes to the source tables of the query. In contrast, a view re-evaluates its defining SELECT statement whenever it is queried.

Parameters

GLOBAL TEMPORARY

If specified, the table is created as a temporary table. Refer to CREATE TABLE for details.

table_name

The name (optionally schema-qualified) of the table to be created.

column_name

The name of a column in the new table. If column names are not provided, they are taken from the output column names of the query.
A query statement (a `SELECT` command). Refer to `SELECT` for a description of the allowed syntax.
2.3.35 CREATE TRIGGER

Name

CREATE TRIGGER -- define a simple trigger

Synopsis

CREATE [ OR REPLACE ] TRIGGER name
   { BEFORE | AFTER | INSTEAD OF }
   { INSERT | UPDATE | DELETE | TRUNCATE }
   [ OR { INSERT | UPDATE | DELETE | TRUNCATE } ] [, ...]
   ON table
   [ REFERENCING { OLD AS old | NEW AS new } ...]
   [ FOR EACH ROW ]
   [ WHEN condition ]
   [ DECLARE ]
   [ PRAGMA AUTONOMOUS_TRANSACTION; ]
   declaration; [, ...] ]
   BEGIN
   statement; [, ...]
   [ EXCEPTION ]
   [ WHEN exception [ OR exception ] [...] THEN
   statement; [, ...] ] [, ...]
   ]
   END

Name

CREATE TRIGGER -- define a compound trigger

Synopsis

CREATE [ OR REPLACE ] TRIGGER name
   FOR { INSERT | UPDATE | DELETE | TRUNCATE }
   [ OR { INSERT | UPDATE | DELETE | TRUNCATE } ] [, ...]
   ON table
   [ REFERENCING { OLD AS old | NEW AS new } ...]
   [ WHEN condition ]
   COMPOUND TRIGGER
   [ private_declaration; ] ...
   [ procedure_or_function_definition ] ...
   compound_trigger_definition
   END
Where *private_declaration* is an identifier of a private variable that can be accessed by any procedure or function. There can be zero, one, or more private variables. *private_declaration* can be any of the following:

- Variable Declaration
- Record Declaration
- Collection Declaration
- REF CURSOR and Cursor Variable Declaration
- TYPE Definitions for Records, Collections, and REF CURSORS
- Exception
- Object Variable Declaration

Where *procedure_or_function_definition* :=

```
procedure_definition | function_definition
```

Where *procedure_definition* :=

```
PROCEDURE proc_name [ argument_list ]
[ options_list ]
[ IS | AS ]
procedure_body
END [ proc_name ];
```

Where *procedure_body* :=

```
[ declaration; ] [, ...]
BEGIN
  statement; [...]
[ EXCEPTION
    { WHEN exception [OR exception] [...]] THEN statement; }
    [...]
]
```

Where *function_definition* :=

```
FUNCTION func_name [ argument_list ]
RETURN rettype [ DETERMINISTIC ]
[ options_list ]
[ IS | AS ]
function_body
END [ func_name ];
```

Where *function_body* :=

```
[ declaration; ] [, ...]
BEGIN
```
statement; [...] 
[ EXCEPTION 
  { WHEN exception [ OR exception ] [...] THEN statement; } [...] ]

Where compound_trigger_definition is:

{ compound_trigger_event } { IS | AS }
  compound_trigger_body
END [ compound_trigger_event ] [...] }

Where compound_trigger_event :=

[ BEFORE STATEMENT | BEFORE EACH ROW | AFTER EACH ROW | 
  AFTER STATEMENT | INSTEAD OF EACH ROW ]

Where compound_trigger_body :=

[ declaration; ] [, ...] 
BEGIN 
  statement; [...] 
[ EXCEPTION 
  { WHEN exception [ OR exception ] [...] THEN statement; } [...] ]

Description

CREATE TRIGGER defines a new trigger. CREATE OR REPLACE TRIGGER will either 
create a new trigger, or replace an existing definition.

If you are using the CREATE TRIGGER keywords to create a new trigger, the name of the 
new trigger must not match any existing trigger defined on the same table. New triggers 
will be created in the same schema as the table on which the triggering event is defined.

If you are updating the definition of an existing trigger, use the CREATE OR REPLACE 
TRIGGER keywords.

When you use syntax that is compatible with Oracle to create a trigger, the trigger runs as 
a SECURITY DEFINER function.

Parameters

name

The name of the trigger to create.
BEFORE | AFTER

Determines whether the trigger is fired before or after the triggering event.

INSTEAD OF

INSTEAD OF trigger modifies an updatable view; the trigger will execute to update the underlying table(s) appropriately. The INSTEAD OF trigger is executed for each row of the view that is updated or modified.

INSERT | UPDATE | DELETE | TRUNCATE

Defines the triggering event.

table

The name of the table or view on which the triggering event occurs.

condition

condition is a Boolean expression that determines if the trigger will actually be executed; if condition evaluates to TRUE, the trigger will fire.

If the trigger definition includes the FOR EACH ROW keywords, the WHEN clause can refer to columns of the old and/or new row values by writing OLD.column_name or NEW.column_name respectively. INSERT triggers cannot refer to OLD and DELETE triggers cannot refer to NEW.

If the trigger includes the INSTEAD OF keywords, it may not include a WHEN clause. A WHEN clause cannot contain subqueries.

REFERENCING { OLD AS old | NEW AS new } ...

REFERENCING clause to reference old rows and new rows, but restricted in that old may only be replaced by an identifier named old or any equivalent that is saved in all lowercase (for example, REFERENCING OLD AS old, REFERENCING OLD AS OLD, or REFERENCING OLD AS "old"). Also, new may only be replaced by an identifier named new or any equivalent that is saved in all lowercase (for example, REFERENCING NEW AS new, REFERENCING NEW AS NEW, or REFERENCING NEW AS "new").

Either one, or both phrases OLD AS old and NEW AS new may be specified in the REFERENCING clause (for example, REFERENCING NEW AS New OLD AS Old).
This clause is not compatible with Oracle databases in that identifiers other than old or new may not be used.

FOR EACH ROW

Determines whether the trigger should be fired once for every row affected by the triggering event, or just once per SQL statement. If specified, the trigger is fired once for every affected row (row-level trigger), otherwise the trigger is a statement-level trigger.

PRAGMA AUTONOMOUS_TRANSACTION

PRAGMA AUTONOMOUS_TRANSACTION is the directive that sets the trigger as an autonomous transaction.

declaration

A variable, type, REF CURSOR, or subprogram declaration. If subprogram declarations are included, they must be declared after all other variable, type, and REF CURSOR declarations.

statement

An SPL program statement. Note that a DECLARE - BEGIN - END block is considered an SPL statement unto itself. Thus, the trigger body may contain nested blocks.

exception

An exception condition name such as NO_DATA_FOUND, OTHERS, etc.

Examples

The following is a statement-level trigger that fires after the triggering statement (insert, update, or delete on table emp) is executed.

```
CREATE OR REPLACE TRIGGER user_audit_trig
AFTER INSERT OR UPDATE OR DELETE ON emp
DECLARE
  v_action        VARCHAR2(24);
BEGIN
  IF INSERTING THEN
    v_action := ' added employee(s) on ';
  ELSIF UPDATING THEN
    v_action := ' updated employee(s) on ';
  ELSIF DELETING THEN
    v_action := ' deleted employee(s) on ';
  END IF;
  DBMS_OUTPUT.PUT_LINE('User ' || USER || v_action ||
                      TO_CHAR(SYSDATE,'YYYY-MM-DD'));
```
The following is a row-level trigger that fires before each row is either inserted, updated, or deleted on table `emp`.

```sql
CREATE OR REPLACE TRIGGER emp_sal_trig
    BEFORE DELETE OR INSERT OR UPDATE ON emp
    FOR EACH ROW
DECLARE
    sal_diff NUMBER;
BEGIN
    IF INSERTING THEN
        DBMS_OUTPUT.PUT_LINE('Inserting employee ' || :NEW.empno);
        DBMS_OUTPUT.PUT_LINE('..New salary: ' || :NEW.sal);
    END IF;
    IF UPDATING THEN
        sal_diff := :NEW.sal - :OLD.sal;
        DBMS_OUTPUT.PUT_LINE('Updating employee ' || :OLD.empno);
        DBMS_OUTPUT.PUT_LINE('..Old salary: ' || :OLD.sal);
        DBMS_OUTPUT.PUT_LINE('..New salary: ' || :NEW.sal);
        DBMS_OUTPUT.PUT_LINE('..Raise     : ' || sal_diff);
    END IF;
    IF DELETING THEN
        DBMS_OUTPUT.PUT_LINE('Deleting employee ' || :OLD.empno);
        DBMS_OUTPUT.PUT_LINE('..Old salary: ' || :OLD.sal);
    END IF;
END;
```

The following is an example of a compound trigger that records a change to the employee salary by defining a compound trigger `HR_TRIGGER` on table `EMP`.

First, create a table named `EMP`:

```sql
CREATE TABLE EMP(EMPNO INT, ENAME TEXT, SAL INT, DEPTNO INT);
CREATE TABLE
```

Then, create a compound trigger named `HR_TRIGGER`. The trigger utilizes each of the four timing points to modify the salary with an `INSERT`, `UPDATE`, or `DELETE` statement. In the global declaration section, the initial salary is declared as 10,000:

```sql
CREATE OR REPLACE TRIGGER HR_TRIGGER
    FOR INSERT OR UPDATE OR DELETE ON EMP
    COMPOUND TRIGGER
    -- Global declaration.
    var_sal NUMBER := 10000;

    BEFORE STATEMENT IS
    BEGIN
        var_sal := var_sal + 1000;
        DBMS_OUTPUT.PUT_LINE('Before Statement: ' || var_sal);
    END BEFORE STATEMENT;

    BEFORE EACH ROW IS
    BEGIN
        var_sal := var_sal + 1000;
        DBMS_OUTPUT.PUT_LINE('Before Each Row: ' || var_sal);
    END BEFORE EACH ROW;
```
AFTER EACH ROW IS
BEGIN
  var_sal := var_sal + 1000;
  DBMS_OUTPUT.PUT_LINE('After Each Row: ' || var_sal);
END AFTER EACH ROW;

AFTER STATEMENT IS
BEGIN
  var_sal := var_sal + 1000;
  DBMS_OUTPUT.PUT_LINE('After Statement: ' || var_sal);
END AFTER STATEMENT;
END HR_TRIGGER;

Output: Trigger created.

**INSERT** the record into table **EMP**.

```
INSERT INTO EMP(EMPNO, ENAME, SAL, DEPTNO) VALUES(1111,'SMITH', 10000, 20);
```

The **INSERT** statement produces the following output:

```
Before Statement: 11000
Before each row: 12000
After each row: 13000
After statement: 14000
INSERT 0 1
```

The **UPDATE** statement will update the employee salary record, setting the salary to 15000 for a specific employee number.

```
UPDATE EMP SET SAL = 15000 where EMPNO = 1111;
```

The **UPDATE** statement produces the following output:

```
Before Statement: 11000
Before each row: 12000
After each row: 13000
After statement: 14000
UPDATE 1
```

```
SELECT * from EMP;
EMPNO | ENAME | SAL  | DEPTNO
-------+-------+------|-------
1111   | SMITH | 15000| 20
(1 row)
```

The **DELETE** statement deletes the employee salary record.

```
DELETE from EMP where EMPNO = 1111;
```

The **DELETE** statement produces the following output:

```
Before Statement: 11000
```
Before each row: 12000
After each row: 13000
After statement: 14000
DELETE 1

SELECT * from EMP;
EMPNO | ENAME | SAL | DEPTNO
------- | ------ | --- | -------
-------+-------+----+-------
(0 rows)

The TRUNCATE statement removes all the records from the EMP table.

CREATE OR REPLACE TRIGGER HR_TRIGGER
    FOR TRUNCATE ON EMP
    COMPOUND TRIGGER
    -- Global declaration.
    var_sal NUMBER := 10000;
    BEFORE STATEMENT IS
    BEGIN
        var_sal := var_sal + 1000;
        DBMS_OUTPUT.PUT_LINE('Before Statement: ' || var_sal);
    END BEFORE STATEMENT;

    AFTER STATEMENT IS
    BEGIN
        var_sal := var_sal + 1000;
        DBMS_OUTPUT.PUT_LINE('After Statement: ' || var_sal);
    END AFTER STATEMENT;

END HR_TRIGGER;

Output: Trigger created.

The TRUNCATE statement produces the following output:

TRUNCATE EMP;
Before Statement: 11000
After statement: 12000
TRUNCATE TABLE

Note: The TRUNCATE statement may be used only at a BEFORE STATEMENT or AFTER STATEMENT timing-point.

See Also

DROP TRIGGER
2.3.36 CREATE TYPE

Name

CREATE TYPE -- define a new user-defined type, which can be an object type, a collection type (a nested table type or a varray type), or a composite type.

Synopsis

Object Type

CREATE [ OR REPLACE ] TYPE name [
    [ AUTHID { DEFINER | CURRENT_USER } ]
    { IS | AS } OBJECT
    ( { attribute { datatype | objtype | collecttype } } 
    [, ...] 
    [ method_spec ] [, ...] 
) 
[ [ NOT ] { FINAL | INSTANTIABLE } ] ... 

where method_spec is:

[ [ NOT ] { FINAL | INSTANTIABLE } ] ...
[ OVERRIDEING ]
subprogram_spec

and subprogram_spec is:

{ MEMBER | STATIC }
{ PROCEDURE proc_name
    [ ( [ SELF [ IN | IN OUT ] name ] 
    [, argname [ IN | IN OUT | OUT ] argtype
    [ DEFAULT value ]
    ) ...]
    
    | FUNCTION func_name
    [ ( [ SELF [ IN | IN OUT ] name ] 
    [, argname [ IN | IN OUT | OUT ] argtype
    [ DEFAULT value ]
    ) ...]
    RETURN rettype
}

Nested Table Type
CREATE [ OR REPLACE ] TYPE name { IS | AS } TABLE OF
{ datatype | objtype | collecttype }

Varray Type

CREATE [ OR REPLACE ] TYPE name { IS | AS }
{ VARRAY | VARYING ARRAY } (maxsize) OF { datatype | objtype }

Composite Type

CREATE [ OR REPLACE ] TYPE name { IS | AS }
( [ attribute datatype ][, ...] )

Description

CREATE TYPE defines a new, user-defined data type. The types that can be created are an object type, a nested table type, a varray type, or a composite type. Nested table and varray types belong to the category of types known as collections.

Composite types are not compatible with Oracle databases. However, composite types can be accessed by SPL programs as with other types described in this section.

Note: For packages only, a composite type can be included in a user-defined record type declared with the TYPE IS RECORD statement within the package specification or package body. Such nested structure is not permitted in other SPL programs such as functions, procedures, triggers, etc.

In the CREATE TYPE command, if a schema name is included, then the type is created in the specified schema, otherwise it is created in the current schema. The name of the new type must not match any existing type in the same schema unless the intent is to update the definition of an existing type, in which case use CREATE OR REPLACE TYPE.

Note: The OR REPLACE option cannot be currently used to add, delete, or modify the attributes of an existing object type. Use the DROP TYPE command to first delete the existing object type. The OR REPLACE option can be used to add, delete, or modify the methods in an existing object type.

Note: The PostgreSQL form of the ALTER TYPE ALTER ATTRIBUTE command can be used to change the data type of an attribute in an existing object type. However, the ALTER TYPE command cannot add or delete attributes in the object type.

The user that creates the type becomes the owner of the type.
Parameters

name

The name (optionally schema-qualified) of the type to create.

DEFINER | CURRENT_USER

Specifies whether the privileges of the object type owner (DEFINER) or the privileges of the current user executing a method in the object type (CURRENT_USER) are to be used to determine whether or not access is allowed to database objects referenced in the object type. DEFINER is the default.

attribute

The name of an attribute in the object type or composite type.

datatype

The data type that defines an attribute of the object type or composite type, or the elements of the collection type that is being created.

objtype

The name of an object type that defines an attribute of the object type or the elements of the collection type that is being created.

collecttype

The name of a collection type that defines an attribute of the object type or the elements of the collection type that is being created.

FINAL
NOT FINAL

For an object type, specifies whether or not a subtype can be derived from the object type. FINAL (subtype cannot be derived from the object type) is the default.

For method_spec, specifies whether or not the method may be overridden in a subtype. NOT FINAL (method may be overridden in a subtype) is the default.

INSTANTIABLE
NOT INSTANTIABLE

For an object type, specifies whether or not an object instance can be created of this object type. INSTANTIABLE (an instance of this object type can be created) is
the default. If NOT INSTANTIABLE is specified, then NOT FINAL must be specified as well. If method_spec for any method in the object type contains the NOT INSTANTIABLE qualifier, then the object type, itself, must be defined with NOT INSTANTIABLE and NOT FINAL following the closing parenthesis of the object type specification.

For method_spec, specifies whether or not the object type definition provides an implementation for the method. INSTANTIABLE (the CREATE TYPE BODY command for the object type provides the implementation of the method) is the default. If NOT INSTANTIABLE is specified, then the CREATE TYPE BODY command for the object type must not contain the implementation of the method.

OVERRIDING

If OVERRIDING is specified, method_spec overrides an identically named method with the same number of identically named method arguments with the same data types, in the same order, and the same return type (if the method is a function) as defined in a supertype.

MEMBER  
STATIC

Specify MEMBER if the subprogram operates on an object instance. Specify STATIC if the subprogram operates independently of any particular object instance.

proc_name

The name of the procedure to create.

SELF [ IN | IN OUT ] name

For a member method there is an implicit, built-in parameter named SELF whose data type is that of the object type being defined. SELF refers to the object instance that is currently invoking the method. SELF can be explicitly declared as an IN or IN OUT parameter in the parameter list. If explicitly declared, SELF must be the first parameter in the parameter list. If SELF is not explicitly declared, its parameter mode defaults to IN OUT for member procedures and IN for member functions.

argname

The name of an argument. The argument is referenced by this name within the method body.

argtype
The data type(s) of the method’s arguments. The argument types may be a base data type or a user-defined type such as a nested table or an object type. A length must not be specified for any base type - for example, specify VARCHAR2, not VARCHAR2(10).

**DEFAULT value**

Supplies a default value for an input argument if one is not supplied in the method call. DEFAULT may not be specified for arguments with modes IN OUT or OUT.

**func_name**

The name of the function to create.

**rettype**

The return data type, which may be any of the types listed for argtype. As for argtype, a length must not be specified for rettype.

**maxsize**

The maximum number of elements permitted in the varray.

**Examples**

**Creating an Object Type**

Create object type `addr_obj_typ`.

```sql
CREATE OR REPLACE TYPE addr_obj_typ AS OBJECT (
  street          VARCHAR2(30),
  city            VARCHAR2(20),
  state           CHAR(2),
  zip             NUMBER(5)
);
```

Create object type `emp_obj_typ` that includes a member method `display_emp`.

```sql
CREATE OR REPLACE TYPE emp_obj_typ AS OBJECT (
  empno           NUMBER(4),
  ename           VARCHAR2(20),
  addr            ADDR_OBJ_TYP,
  MEMBER PROCEDURE display_emp (SELF IN OUT emp_obj_typ)
);
```

Create object type `dept_obj_typ` that includes a static method `get_dname`.

```sql
CREATE OR REPLACE TYPE dept_obj_typ AS OBJECT (
  deptno          NUMBER(2),
  STATIC FUNCTION get_dname (p_deptno IN NUMBER) RETURN VARCHAR2,
```
Creating a Collection Type

Create a nested table type, `budget_tbl_typ`, of data type, `NUMBER(8,2)`.

```
CREATE OR REPLACE TYPE budget_tbl_typ IS TABLE OF NUMBER(8,2);
```

Creating and Using a Composite Type

The following example shows the usage of a composite type accessed from an anonymous block.

The composite type is created by the following:

```
CREATE OR REPLACE TYPE emphist_typ AS (
    empno           NUMBER(4),
    ename           VARCHAR2(10),
    hiredate        DATE,
    job             VARCHAR2(9),
    sal             NUMBER(7,2)
);
```

The following is the anonymous block that accesses the composite type:

```
DECLARE
    v_emphist EMPHIST_TYP;
BEGIN
    v_emphist.empno := 9001;
    v_emphist.ename := 'SMITH';
    v_emphist.hiredate := '01-AUG-17';
    v_emphist.job := 'SALESMAN';
    v_emphist.sal := 8000.00;
    DBMS_OUTPUT.PUT_LINE('   EMPNO: ' || v_emphist.empno);
    DBMS_OUTPUT.PUT_LINE('   ENAME: ' || v_emphist.ename);
    DBMS_OUTPUT.PUT_LINE('HIREDATE: ' || v_emphist.hiredate);
    DBMS_OUTPUT.PUT_LINE('     JOB: ' || v_emphist.job);
    DBMS_OUTPUT.PUT_LINE('     SAL: ' || v_emphist.sal);
END;
```

The following example shows the usage of a composite type accessed from a user-defined record type, declared within a package body.

The composite type is created by the following:

```
CREATE OR REPLACE TYPE salhist_typ AS (
    startdate DATE,
    job       VARCHAR2(9),
);
The package specification is defined by the following:

```sql
CREATE OR REPLACE PACKAGE emp_salhist
IS
  PROCEDURE fetch_emp (
    p_empno     IN NUMBER
  );
END;
```

The package body is defined by the following:

```sql
CREATE OR REPLACE PACKAGE BODY emp_salhist
IS
  TYPE emprec_typ IS RECORD (
    empno       NUMBER(4),
    ename       VARCHAR(10),
    salhist     SALHIST_TYP
  );
  TYPE emp_arr_typ IS TABLE OF emprec_typ INDEX BY BINARY_INTEGER;
  emp_arr         emp_arr_typ;

  PROCEDURE fetch_emp (
    p_empno     IN NUMBER
  )
  IS
    CURSOR emp_cur IS SELECT e.empno, e.ename, h.startdate, h.job, h.sal
    FROM emp e, jobhist h
    WHERE e.empno = p_empno
    AND e.empno = h.empno;
    i           INTEGER := 0;

  BEGIN
    DBMS_OUTPUT.PUT_LINE('EMPNO  ENAME    STARTDATE  JOB         ' ||
      'SAL        ');
    DBMS_OUTPUT.PUT_LINE('  -----  -------  ---------  ---------  --------- ');

    FOR r_emp IN emp_cur LOOP
      i := i + 1;
      emp_arr(i) := (r_emp.empno, r_emp.ename,
        (r_emp.startdate, r_emp.job, r_emp.sal));
    END LOOP;

    FOR i IN 1 .. emp_arr.COUNT LOOP
      DBMS_OUTPUT.PUT_LINE(emp_arr(i).empno || '   ' ||
        RPAD(emp_arr(i).ename,8) || '   ' ||
        TO_CHAR(emp_arr(i).salhist.startdate,'DD-MON-YY') || '   ' ||
        RPAD(emp_arr(i).salhist.job,10) || '   ' ||
        TO_CHAR(emp_arr(i).salhist.sal,'99,999.99'));
    END LOOP;

  END;
END;
```

Note that in the declaration of the `TYPE emprec_typ IS RECORD` data structure in the package body, the `salhist` field is defined with the `SALHIST_TYP` composite type as created by the `CREATE TYPE salhist_typ` statement.
The associative array definition `TYPE emp_arr_typ IS TABLE OF emprec_typ` references the record type data structure `emprec_typ` that includes the field `salhist` that is defined with the `SALHIST_TYP` composite type.

Invocation of the package procedure that loads the array from a join of the `emp` and `jobhist` tables, then displays the array content is shown by the following:

```sql
EXEC emp_salhist.fetch_emp(7788);
```

<table>
<thead>
<tr>
<th>EMPNO</th>
<th>ENAME</th>
<th>STARTDATE</th>
<th>JOB</th>
<th>SAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>7788</td>
<td>SCOTT</td>
<td>19-APR-87</td>
<td>CLERK</td>
<td>1,000.00</td>
</tr>
<tr>
<td>7788</td>
<td>SCOTT</td>
<td>13-APR-88</td>
<td>CLERK</td>
<td>1,040.00</td>
</tr>
<tr>
<td>7788</td>
<td>SCOTT</td>
<td>05-MAY-90</td>
<td>ANALYST</td>
<td>3,000.00</td>
</tr>
</tbody>
</table>

EDB-SPL Procedure successfully completed

See Also

CREATE TYPE BODY, DROP TYPE
2.3.37 CREATE TYPE BODY

Name

CREATE TYPE BODY -- define a new object type body

Synopsis

CREATE [ OR REPLACE ] TYPE BODY name
  { IS | AS }
  method_spec [ ... ]
END

where method_spec is:

  subprogram_spec

and subprogram_spec is:

  { MEMBER | STATIC }
  { PROCEDURE proc_name
    [ ( [ SELF [ IN | IN OUT ] name ]
      [, argname [ IN | IN OUT | OUT ] argtype
        [ DEFAULT value ]
      ] ... )
    ]
  }
  { IS | AS }
  program_body
END;

| FUNCTION func_name
  [ ( [ SELF [ IN | IN OUT ] name ]
    [, argname [ IN | IN OUT | OUT ] argtype
      [ DEFAULT value ]
    ] ... )
  ]
  RETURN rettype
  { IS | AS }
  program_body
END;

Description

CREATE TYPE BODY defines a new object type body. CREATE OR REPLACE TYPE BODY will either create a new object type body, or replace an existing body.
If a schema name is included, then the object type body is created in the specified schema. Otherwise it is created in the current schema. The name of the new object type body must match an existing object type specification in the same schema. The new object type body name must not match any existing object type body in the same schema unless the intent is to update the definition of an existing object type body, in which case use `CREATE OR REPLACE TYPE BODY`.

**Parameters**

`name`

The name (optionally schema-qualified) of the object type for which a body is to be created.

`MEMBER`  
`STATIC`

Specify `MEMBER` if the subprogram operates on an object instance. Specify `STATIC` if the subprogram operates independently of any particular object instance.

`proc_name`

The name of the procedure to create.

`SELF [ IN | IN OUT ] name`

For a member method there is an implicit, built-in parameter named `SELF` whose data type is that of the object type being defined. `SELF` refers to the object instance that is currently invoking the method. `SELF` can be explicitly declared as an `IN` or `IN OUT` parameter in the parameter list. If explicitly declared, `SELF` must be the first parameter in the parameter list. If `SELF` is not explicitly declared, its parameter mode defaults to `IN OUT` for member procedures and `IN` for member functions.

`argname`

The name of an argument. The argument is referenced by this name within the method body.

`argtype`

The data type(s) of the method’s arguments. The argument types may be a base data type or a user-defined type such as a nested table or an object type. A length must not be specified for any base type - for example, specify `VARCHAR2`, not `VARCHAR2 (10)`. 
DEFAULT value

Supplies a default value for an input argument if one is not supplied in the method call. DEFAULT may not be specified for arguments with modes IN OUT or OUT.

program_body

The pragma, declarations, and SPL statements that comprise the body of the function or procedure. The pragma may be `PRAGMA AUTONOMOUS_TRANSACTION` to set the function or procedure as an autonomous transaction.

func_name

The name of the function to create.

rettype

The return data type, which may be any of the types listed for `argtype`. As for `argtype`, a length must not be specified for `rettype`.

Examples

Create the object type body for object type `emp_obj_typ` given in the example for the `CREATE TYPE` command.

```
CREATE OR REPLACE TYPE BODY emp_obj_typ AS
  MEMBER PROCEDURE display_emp (SELF IN OUT emp_obj_typ) IS
    BEGIN
      DBMS_OUTPUT.PUT_LINE('Employee No: ' || empno);
      DBMS_OUTPUT.PUT_LINE('Name: ' || ename);
      DBMS_OUTPUT.PUT_LINE('Street: ' || addr.street);
      DBMS_OUTPUT.PUT_LINE('City/State/Zip: ' || addr.city || ', ' || addr.state || ' ' || LPAD(addr.zip,5,'0'));
    END;
END;
```

Create the object type body for object type `dept_obj_typ` given in the example for the `CREATE TYPE` command.

```
CREATE OR REPLACE TYPE BODY dept_obj_typ AS
  STATIC FUNCTION get_dname (p_deptno IN NUMBER) RETURN VARCHAR2 IS
    v_dname VARCHAR2(14);
    BEGIN
      CASE p_deptno
        WHEN 10 THEN v_dname := 'ACCOUNTING';
        WHEN 20 THEN v_dname := 'RESEARCH';
        WHEN 30 THEN v_dname := 'SALES';
        WHEN 40 THEN v_dname := 'OPERATIONS';
        ELSE v_dname := 'UNKNOWN';
      END CASE;
    END;
END;
```
END CASE;
RETURN v_dname;
END;

MEMBER PROCEDURE display_dept
IS
BEGIN
    DBMS_OUTPUT.PUT_LINE('Dept No : ' || SELF.deptno);
    DBMS_OUTPUT.PUT_LINE('Dept Name : ' || dept_obj_typ.get_dname(SELF.deptno));
END;

See Also

CREATE TYPE, DROP TYPE
2.3.38 CREATE USER

Name

CREATE USER -- define a new database user account

Synopsis

CREATE USER name [IDENTIFIED BY password]

Description

CREATE USER adds a new user to an Advanced Server database cluster. You must be a database superuser to use this command.

When the CREATE USER command is given, a schema will also be created with the same name as the new user and owned by the new user. Objects with unqualified names created by this user will be created in this schema.

Parameters

name

The name of the user.

password

The user's password. The password can be changed later using ALTER USER.

Notes

The maximum length allowed for the user name and password is 63 characters.

Examples

Create a user named, john.

CREATE USER john IDENTIFIED BY abc;

See Also

DROP USER
2.3.39 CREATE USER|ROLE... PROFILE MANAGEMENT CLAUSES

Name

CREATE USER|ROLE

Synopsis

CREATE USER|ROLE name [[WITH] option [...]]

where option can be the following compatible clauses:

PROFILE profile_name
| ACCOUNT {LOCK|UNLOCK}
| PASSWORD EXPIRE [AT 'timestamp']

or option can be the following non-compatible clauses:

| LOCK TIME 'timestamp'

For information about the administrative clauses of the CREATE USER or CREATE ROLE command that are supported by Advanced Server, please see the PostgreSQL core documentation available at:

https://www.postgresql.org/docs/12/static/sql-commands.html

Description

CREATE ROLE|USER... PROFILE adds a new role with an associated profile to an Advanced Server database cluster.

Roles created with the CREATE USER command are (by default) login roles. Roles created with the CREATE ROLE command are (by default) not login roles. To create a login account with the CREATE ROLE command, you must include the LOGIN keyword.

Only a database superuser can use the CREATE USER|ROLE clauses that enforce profile management; these clauses enforce the following behaviors:

Include the PROFILE clause and a profile_name to associate a pre-defined profile with a role, or to change which pre-defined profile is associated with a user.
Include the `ACCOUNT` clause and the `LOCK` or `UNLOCK` keyword to specify that the user account should be placed in a locked or unlocked state.

Include the `LOCK TIME 'timestamp'` clause and a date/time value to lock the role at the specified time, and unlock the role at the time indicated by the `PASSWORD_LOCK_TIME` parameter of the profile assigned to this role. If `LOCK TIME` is used with the `ACCOUNT LOCK` clause, the role can only be unlocked by a database superuser with the `ACCOUNT UNLOCK` clause.

Include the `PASSWORD_EXPIRE` clause with the optional `AT 'timestamp'` keywords to specify a date/time when the password associated with the role will expire. If you omit the `AT 'timestamp'` keywords, the password will expire immediately.

Each login role may only have one profile. To discover the profile that is currently associated with a login role, query the `profile` column of the `DBA_USERS` view.

**Parameters**

**name**

The name of the role.

**profile_name**

The name of the profile associated with the role.

**timestamp**

The date and time at which the clause will be enforced. When specifying a value for `timestamp`, enclose the value in single-quotes.

**Examples**

The following example uses `CREATE USER` to create a login role named `john` who is associated with the `acctg_profile` profile:

```
CREATE USER john PROFILE acctg_profile IDENTIFIED BY "1safepwd";
```

`john` can log in to the server, using the password `1safepwd`.

The following example uses `CREATE ROLE` to create a login role named `john` who is associated with the `acctg_profile` profile:

```
CREATE ROLE john PROFILE acctg_profile LOGIN PASSWORD "1safepwd";
```
john can log in to the server, using the password lsafepwd.
2.3.40 CREATE VIEW

Name

CREATE VIEW -- define a new view

Synopsis

CREATE [ OR REPLACE ] VIEW name [ ( column_name [, ...] ) ]
AS query

Description

CREATE VIEW defines a view of a query. The view is not physically materialized. Instead, the query is run every time the view is referenced in a query.

CREATE OR REPLACE VIEW is similar, but if a view of the same name already exists, it is replaced.

If a schema name is given (for example, CREATE VIEW myschema.myview ...) then the view is created in the specified schema. Otherwise it is created in the current schema. The view name must be distinct from the name of any other view, table, sequence, or index in the same schema.

Parameters

name

The name (optionally schema-qualified) of a view to be created.

column_name

An optional list of names to be used for columns of the view. If not given, the column names are deduced from the query.

query

A query (that is, a SELECT statement) which will provide the columns and rows of the view.

Refer to SELECT for more information about valid queries.
Notes

Currently, views are read only - the system will not allow an insert, update, or delete on a view. You can get the effect of an updatable view by creating rules that rewrite inserts, etc. on the view into appropriate actions on other tables.

Access to tables referenced in the view is determined by permissions of the view owner. However, functions called in the view are treated the same as if they had been called directly from the query using the view. Therefore the user of a view must have permissions to call all functions used by the view.

Examples

Create a view consisting of all employees in department 30:

```
CREATE VIEW dept_30 AS SELECT * FROM emp WHERE deptno = 30;
```

See Also

DROP VIEW
2.3.41 DELETE

Name

DELETE -- delete rows of a table

Synopses

DELETE [ optimizer_hint ] FROM table[@dblink ]
[ WHERE condition ]
[ RETURNING return_expression [, ...]
{ INTO { record | variable [, ...] }
| BULK COLLECT INTO collection [, ...] } ]

Description

DELETE deletes rows that satisfy the WHERE clause from the specified table. If the WHERE clause is absent, the effect is to delete all rows in the table. The result is a valid, but empty table.

Note: The TRUNCATE command provides a faster mechanism to remove all rows from a table.

The RETURNING INTO { record | variable [, ...] } clause may only be specified if the DELETE command is used within an SPL program. In addition the result set of the DELETE command must not include more than one row, otherwise an exception is thrown. If the result set is empty, then the contents of the target record or variables are set to null.

The RETURNING BULK COLLECT INTO collection [, ...] clause may only be specified if the DELETE command is used within an SPL program. If more than one collection is specified as the target of the BULK COLLECT INTO clause, then each collection must consist of a single, scalar field -- i.e., collection must not be a record. The result set of the DELETE command may contain none, one, or more rows. return_expression evaluated for each row of the result set, becomes an element in collection starting with the first element. Any existing rows in collection are deleted. If the result set is empty, then collection will be empty.

You must have the DELETE privilege on the table to delete from it, as well as the SELECT privilege for any table whose values are read in the condition.
Parameters

optimizer_hint

Comment-embedded hints to the optimizer for selection of an execution plan.

table

The name (optionally schema-qualified) of an existing table.

dblink

Database link name identifying a remote database. See the CREATE DATABASE LINK command for information on database links.

condition

A value expression that returns a value of type BOOLEAN that determines the rows which are to be deleted.

return_expression

An expression that may include one or more columns from table. If a column name from table is specified in return_expression, the value substituted for the column when return_expression is evaluated is the value from the deleted row.

record

A record whose field the evaluated return_expression is to be assigned. The first return_expression is assigned to the first field in record, the second return_expression is assigned to the second field in record, etc. The number of fields in record must exactly match the number of expressions and the fields must be type-compatible with their assigned expressions.

variable

A variable to which the evaluated return_expression is to be assigned. If more than one return_expression and variable are specified, the first return_expression is assigned to the first variable, the second return_expression is assigned to the second variable, etc. The number of variables specified following the INTO keyword must exactly match the number of expressions following the RETURNING keyword and the variables must be type-compatible with their assigned expressions.

collection
A collection in which an element is created from the evaluated `return_expression`. There can be either a single collection which may be a collection of a single field or a collection of a record type, or there may be more than one collection in which case each collection must consist of a single field. The number of return expressions must match in number and order the number of fields in all specified collections. Each corresponding `return_expression` and `collection` field must be type-compatible.

**Examples**

Delete all rows for employee 7900 from the `jobhist` table:

```
DELETE FROM jobhist WHERE empno = 7900;
```

Clear the table `jobhist`:

```
DELETE FROM jobhist;
```

**See Also**

TRUNCATE
### DROP DATABASE LINK

#### Name

**DROP DATABASE LINK** -- remove a database link

#### Synopsis

DROP [ PUBLIC ] DATABASE LINK name

#### Description

**DROP DATABASE LINK** drops existing database links. To execute this command you must be a superuser or the owner of the database link.

#### Parameters

**name**

The name of a database link to be removed.

**PUBLIC**

Indicates that name is a public database link.

#### Examples

Remove the public database link named, `oralink`:

```sql
DROP PUBLIC DATABASE LINK oralink;
```

Remove the private database link named, `edblink`:

```sql
DROP DATABASE LINK edblink;
```

#### See Also

**CREATE DATABASE LINK**
2.3.43 DROP DIRECTORY

Name

DROP DIRECTORY -- remove a directory alias for a file system directory path

Synopsis

DROP DIRECTORY name

Description

DROP DIRECTORY drops an existing alias for a file system directory path that was created with the CREATE DIRECTORY command. To execute this command you must be a superuser.

When a directory alias is deleted, the corresponding physical file system directory is not affected. The file system directory must be deleted using the appropriate operating system commands.

Parameters

name

The name of a directory alias to be removed.

Examples

Remove the directory alias named empdir:

    DROP DIRECTORY empdir;

See Also

CREATE DIRECTORY
2.3.44 DROP FUNCTION

Name

DROP FUNCTION -- remove a function

Synopsis

DROP FUNCTION [ IF EXISTS ] name

[ ([ argmode ] [ argname ] argtype ) [, ...]) ]

[ CASCADE | RESTRICT ]

Description

DROP FUNCTION removes the definition of an existing function. To execute this command you must be a superuser or the owner of the function. All input (IN, IN OUT) argument data types to the function must be specified if this is an overloaded function. (This requirement is not compatible with Oracle databases. In Oracle, only the function name is specified. Advanced Server allows overloading of function names, so the function signature given by the input argument data types is required in the Advanced Server DROP FUNCTION command of an overloaded function.)

Usage of IF EXISTS, CASCADE, or RESTRICT is not compatible with Oracle databases and is used only by Advanced Server.

Parameters

IF EXISTS

Do not throw an error if the function does not exist. A notice is issued in this case.

name

The name (optionally schema-qualified) of an existing function.

argmode

The mode of an argument: IN, IN OUT, or OUT. If omitted, the default is IN. Note that DROP FUNCTION does not actually pay any attention to OUT arguments, since only the input arguments are needed to determine the function’s identity. So it is sufficient to list only the IN and IN OUT arguments. (Specification of argmode is not compatible with Oracle databases and applies only to Advanced Server.)

argname
The name of an argument. Note that `DROP FUNCTION` does not actually pay any attention to argument names, since only the argument data types are needed to determine the function’s identity. (Specification of `argname` is not compatible with Oracle databases and applies only to Advanced Server.)

`argtype`

The data type of an argument of the function. (Specification of `argtype` is not compatible with Oracle databases and applies only to Advanced Server.)

`CASCADE`

Automatically drop objects that depend on the function (such as operators or triggers), and in turn all objects that depend on those objects.

`RESTRICT`

Refuse to drop the function if any objects depend on it. This is the default.

**Examples**

The following command removes the `emp_comp` function.

```sql
DROP FUNCTION emp_comp(NUMBER, NUMBER);
```

**See Also**

`CREATE FUNCTION`
2.3.45  DROP INDEX

Name

DROP INDEX -- remove an index

Synopsis

DROP INDEX name

Description

DROP INDEX drops an existing index from the database system. To execute this command you must be a superuser or the owner of the index. If any objects depend on the index, an error will be given and the index will not be dropped.

Parameters

name

The name (optionally schema-qualified) of an index to remove.

Examples

This command will remove the index name_idx:

    DROP INDEX name_idx;

See Also

ALTER INDEX, CREATE INDEX
2.3.46 DROP PACKAGE

Name

DROP PACKAGE -- remove a package

Synopsis

DROP PACKAGE [ BODY ] name

Description

DROP PACKAGE drops an existing package. To execute this command you must be a superuser or the owner of the package. If BODY is specified, only the package body is removed – the package specification is not dropped. If BODY is omitted, both the package specification and body are removed.

Parameters

name

The name (optionally schema-qualified) of a package to remove.

Examples

This command will remove the emp_admin package:

```
DROP PACKAGE emp_admin;
```

See Also

CREATE PACKAGE, CREATE PACKAGE BODY
2.3.47 DROP PROCEDURE

Name

DROP PROCEDURE -- remove a procedure

Synopsis

DROP PROCEDURE [ IF EXISTS ] name
  [ ([ argmode ] [ argname ] argtype ) [, ...])] ]
  [ CASCADE | RESTRICT ]

Description

DROP PROCEDURE removes the definition of an existing procedure. To execute this command you must be a superuser or the owner of the procedure. All input (IN, IN OUT) argument data types to the procedure must be specified if this is an overloaded procedure. (This requirement is not compatible with Oracle databases. In Oracle, only the procedure name is specified. Advanced Server allows overloading of procedure names, so the procedure signature given by the input argument data types is required in the Advanced Server DROP PROCEDURE command of an overloaded procedure.)

Usage of IF EXISTS, CASCADE, or RESTRICT is not compatible with Oracle databases and is used only by Advanced Server.

Parameters

IF EXISTS

Do not throw an error if the procedure does not exist. A notice is issued in this case.

name

The name (optionally schema-qualified) of an existing procedure.

argmode

The mode of an argument: IN, IN OUT, or OUT. If omitted, the default is IN. Note that DROP PROCEDURE does not actually pay any attention to OUT arguments, since only the input arguments are needed to determine the procedure’s identity. So it is sufficient to list only the IN and IN OUT arguments. (Specification of argmode is not compatible with Oracle databases and applies only to Advanced Server.)
argname

The name of an argument. Note that DROP PROCEDURE does not actually pay any attention to argument names, since only the argument data types are needed to determine the procedure’s identity. (Specification of argname is not compatible with Oracle databases and applies only to Advanced Server.)

argtype

The data type of an argument of the procedure. (Specification of argtype is not compatible with Oracle databases and applies only to Advanced Server.)

CASCADEx

Automatically drop objects that depend on the procedure, and in turn all objects that depend on those objects.

RESTRICT

Refuse to drop the procedure if any objects depend on it. This is the default.

Examples

The following command removes the select_emp procedure.

```
DROP PROCEDURE select_emp;
```

See Also

CREATE PROCEDURE
2.3.48 DROP PROFILE

Name

DROP PROFILE – drop a user-defined profile

Synopsis

DROP PROFILE [IF EXISTS] profile_name [CASCADE | RESTRICT];

Description

Include the IF EXISTS clause to instruct the server to not throw an error if the specified profile does not exist. The server will issue a notice if the profile does not exist.

Include the optional CASCADE clause to reassign any users that are currently associated with the profile to the default profile, and then drop the profile. Include the optional RESTRICT clause to instruct the server to not drop any profile that is associated with a role. This is the default behavior.

Parameters

profile_name

The name of the profile being dropped.

Example

The following example drops a profile named acctg_profile:

```
DROP PROFILE acctg_profile CASCADE;
```

The command first re-associates any roles associated with the acctg_profile profile with the default profile, and then drops the acctg_profile profile.

The following example drops a profile named acctg_profile:

```
DROP PROFILE acctg_profile RESTRICT;
```

The RESTRICT clause in the command instructs the server to not drop acctg_profile if there are any roles associated with the profile.
2.3.49 DROP QUEUE

Advanced Server includes extra syntax (not offered by Oracle) with the DROP QUEUE SQL command. This syntax can be used in association with DBMS_AQADM.

Name

DROP QUEUE -- drop an existing queue.

Synopsis

Use DROP QUEUE to drop an existing queue:

```
DROP QUEUE [IF EXISTS] name
```

Description

DROP QUEUE allows a superuser or a user with the aq_administrator_role privilege to drop an existing queue.

Parameters

name

The name (possibly schema-qualified) of the queue that is being dropped.

IF EXISTS

Include the IF EXISTS clause to instruct the server to not return an error if the queue does not exist. The server will issue a notice.

Examples

The following example drops a queue named work_order:

```
DROP QUEUE work_order;
```

See Also

CREATE QUEUE, ALTER QUEUE
2.3.50 DROP QUEUE TABLE

Advanced Server includes extra syntax (not offered by Oracle) with the DROP QUEUE TABLE SQL command. This syntax can be used in association with DBMS_AQADM.

Name

DROP QUEUE TABLE -- drop a queue table.

Synopsis

Use DROP QUEUE TABLE to delete a queue table:

   DROP QUEUE TABLE [ IF EXISTS ] name [, ... ]
   [CASCADE | RESTRICT]

Description

DROP QUEUE TABLE allows a superuser or a user with the aq_administrator_role privilege to delete a queue table.

Parameters

name

   The name (possibly schema-qualified) of the queue table that will be deleted.

IF EXISTS

   Include the IF EXISTS clause to instruct the server to not return an error if the queue table does not exist. The server will issue a notice.

CASCADE

   Include the CASCADE keyword to automatically delete any objects that depend on the queue table.

RESTRICT

   Include the RESTRICT keyword to instruct the server to refuse to delete the queue table if any objects depend on it. This is the default.
Example

The following example deletes a queue table named `work_order_table` and any objects that depend on it:

```
DROP QUEUE TABLE work_order_table CASCADE;
```

See Also

CREATE QUEUE TABLE, ALTER QUEUE TABLE
2.3.51 DROP SYNONYM

Name

DROP SYNONYM -- remove a synonym

Synopsis

DROP [PUBLIC] SYNONYM [schema.]syn_name

Description

DROP SYNONYM deletes existing synonyms. To execute this command you must be a superuser or the owner of the synonym, and have USAGE privileges on the schema in which the synonym resides.

Parameters:

syn_name

syn_name is the name of the synonym. A synonym name must be unique within a schema.

schema

schema specifies the name of the schema that the synonym resides in.

Like any other object that can be schema-qualified, you may have two synonyms with the same name in your search path. To disambiguate the name of the synonym that you are dropping, include a schema name. Unless a synonym is schema qualified in the DROP SYNONYM command, Advanced Server deletes the first instance of the synonym it finds in your search path.

You can optionally include the PUBLIC clause to drop a synonym that resides in the public schema. The DROP PUBLIC SYNONYM command, compatible with Oracle databases, drops a synonym that resides in the public schema:

DROP PUBLIC SYNONYM syn_name;

The following example drops the synonym, personnel:

DROP SYNONYM personnel;
2.3.52 DROP ROLE

Name

DROP ROLE -- remove a database role

Synopsis

DROP ROLE name [ CASCADE ]

Description

DROP ROLE removes the specified role. To drop a superuser role, you must be a superuser yourself; to drop non-superuser roles, you must have CREATE ROLE privilege.

A role cannot be removed if it is still referenced in any database of the cluster; an error will be raised if so. Before dropping the role, you must drop all the objects it owns (or reassign their ownership) and revoke any privileges the role has been granted.

It is not necessary to remove role memberships involving the role; DROP ROLE automatically revokes any memberships of the target role in other roles, and of other roles in the target role. The other roles are not dropped nor otherwise affected.

Alternatively, if the only objects owned by the role belong within a schema that is owned by the role and has the same name as the role, the CASCADE option can be specified. In this case the issuer of the DROP ROLE name CASCADE command must be a superuser and the named role, the schema, and all objects within the schema will be deleted.

Parameters

name

The name of the role to remove.

CASCADE

If specified, also drops the schema owned by, and with the same name as the role (and all objects owned by the role belonging to the schema) as long as no other dependencies on the role or the schema exist.
Examples

To drop a role:

```
DROP ROLE admins;
```

See Also

CREATE ROLE, SET ROLE, GRANT, REVOKE
## 2.3.53 DROP SEQUENCE

### Name

DROP SEQUENCE -- remove a sequence

### Synopsis

```
DROP SEQUENCE name [, ...]
```

### Description

`DROP SEQUENCE` removes sequence number generators. To execute this command you must be a superuser or the owner of the sequence.

### Parameters

- `name`
  The name (optionally schema-qualified) of a sequence.

### Examples

To remove the sequence, `serial`:

```
DROP SEQUENCE serial;
```

### See Also

- `ALTER SEQUENCE`, `CREATE SEQUENCE`
2.3.54 DROP TABLE

Name

DROP TABLE -- remove a table

Synopsis

DROP TABLE name [CASCADE | RESTRICT | CASCADE CONSTRAINTS]

Description

DROP TABLE removes tables from the database. Only its owner may destroy a table. To empty a table of rows, without destroying the table, use DELETE. DROP TABLE always removes any indexes, rules, triggers, and constraints that exist for the target table.

Parameters

name

The name (optionally schema-qualified) of the table to drop.

Include the RESTRICT keyword to specify that the server should refuse to drop the table if any objects depend on it. This is the default behavior; the DROP TABLE command will report an error if any objects depend on the table.

Include the CASCADE clause to drop any objects that depend on the table.

Include the CASCADE CONSTRAINTS clause to specify that Advanced Server should drop any dependent constraints (excluding other object types) on the specified table.

Examples

The following command drops a table named emp that has no dependencies:

```
DROP TABLE emp;
```

The outcome of a DROP TABLE command will vary depending on whether the table has any dependencies - you can control the outcome by specifying a drop behavior. For example, if you create two tables, orders and items, where the items table is dependent on the orders table:

```
CREATE TABLE orders 
order_id int PRIMARY KEY, order_date date, ...);
```
CREATE TABLE items
  (order_id REFERENCES orders, quantity INT, ...);

Advanced Server will perform one of the following actions when dropping the `orders` table, depending on the drop behavior that you specify:

- If you specify `DROP TABLE orders RESTRICT`, Advanced Server will report an error.
- If you specify `DROP TABLE orders CASCADE`, Advanced Server will drop the `orders` table and the `items` table.
- If you specify `DROP TABLE orders CASCADE CONSTRAINTS`, Advanced Server will drop the `orders` table and remove the foreign key specification from the `items` table, but not drop the `items` table.

See Also

`ALTER TABLE`, `CREATE TABLE`
2.3.55 DROP TABLESPACE

Name

DROP TABLESPACE -- remove a tablespace

Synopsis

DROP TABLESPACE tablespacename

Description

DROP TABLESPACE removes a tablespace from the system.

A tablespace can only be dropped by its owner or a superuser. The tablespace must be empty of all database objects before it can be dropped. It is possible that objects in other databases may still reside in the tablespace even if no objects in the current database are using the tablespace.

Parameters

tablespacename

The name of a tablespace.

Examples

To remove tablespace employee_space from the system:

DROP TABLESPACE employee_space;

See Also

ALTER TABLESPACE
**2.3.56 DROP TRIGGER**

**Name**

DROP TRIGGER -- remove a trigger

**Synopsis**

DROP TRIGGER *name*

**Description**

DROP TRIGGER removes a trigger from its associated table. The command must be run by a superuser or the owner of the table on which the trigger is defined.

**Parameters**

name

The name of a trigger to remove.

**Examples**

Remove trigger `emp_sal_trig`:

```
DROP TRIGGER emp_sal_trig;
```

**See Also**

CREATE TRIGGER
2.3.57  DROP TYPE

Name

DROP TYPE -- remove a type definition

Synopsis

DROP TYPE [ BODY ] name

Description

DROP TYPE removes the type definition. To execute this command you must be a
superuser or the owner of the type.

The optional BODY qualifier applies only to object type definitions, not to collection types
nor to composite types. If BODY is specified, only the object type body is removed – the
object type specification is not dropped. If BODY is omitted, both the object type
specification and body are removed.

The type will not be deleted if there are other database objects dependent upon the named
type.

Parameters

name

The name of a type definition to remove.

Examples

Drop object type addr_obj_typ.

DROP TYPE addr_obj_typ;

Drop nested table type budget_tbl_typ.

DROP TYPE budget_tbl_typ;

See Also

CREATE TYPE, CREATE TYPE BODY
2.3.58 DROP USER

Name

DROP USER -- remove a database user account

Synopsis

DROP USER name [ CASCADE ]

Description

DROP USER removes the specified user. To drop a superuser, you must be a superuser yourself; to drop non-superusers, you must have CREATEROLE privilege.

A user cannot be removed if it is still referenced in any database of the cluster; an error will be raised if so. Before dropping the user, you must drop all the objects it owns (or reassign their ownership) and revoke any privileges the user has been granted.

However, it is not necessary to remove role memberships involving the user; DROP USER automatically revokes any memberships of the target user in other roles, and of other roles in the target user. The other roles are not dropped nor otherwise affected.

Alternatively, if the only objects owned by the user belong within a schema that is owned by the user and has the same name as the user, the CASCADE option can be specified. In this case the issuer of the DROP USER name CASCADE command must be a superuser and the named user, the schema, and all objects within the schema will be deleted.

Parameters

name

The name of the user to remove.

CASCADE

If specified, also drops the schema owned by, and with the same name as the user (and all objects owned by the user belonging to the schema) as long as no other dependencies on the user or the schema exist.
Examples

To drop a user account who owns no objects nor has been granted any privileges on other objects:

```
DROP USER john;
```

To drop user account, john, who has not been granted any privileges on any objects, and does not own any objects outside of a schema named, john, that is owned by user, john:

```
DROP USER john CASCADE;
```

See Also

CREATE USER, ALTER USER
2.3.59 DROP VIEW

Name

DROP VIEW -- remove a view

Synopsis

DROP VIEW name

Description

DROP VIEW drops an existing view. To execute this command you must be a database superuser or the owner of the view. The named view will not be deleted if other objects are dependent upon this view (such as a view of a view).

The form of the DROP VIEW command compatible with Oracle does not support a CASCADE clause; to drop a view and it's dependencies, use the PostgreSQL-compatible form of the DROP VIEW command. For more information, see the PostgreSQL core documentation at:

https://www.postgresql.org/docs/12/static/sql-dropview.html

Parameters

name

The name (optionally schema-qualified) of the view to remove.

Examples

This command will remove the view called dept_30:

```
DROP VIEW dept_30;
```

See Also

CREATE VIEW
### EXEC

**Name**

EXEC

**Synopsis**

EXEC function_name ['(['argument_list']')]'

**Description**

EXECUTE.

**Parameters**

procedure_name

- `procedure_name` is the (optionally schema-qualified) function name.

argument_list

- `argument_list` specifies a comma-separated list of arguments required by the function. Note that each member of `argument_list` corresponds to a formal argument expected by the function. Each formal argument may be an IN parameter, an OUT parameter, or an INOUT parameter.

**Examples**

The EXEC statement may take one of several forms, depending on the arguments required by the function:

- EXEC update_balance;
- EXEC update_balance();
- EXEC update_balance(1,2,3);
2.3.61  GRANT

Name

GRANT -- define access privileges

Synopsis

GRANT { { SELECT | INSERT | UPDATE | DELETE | REFERENCES } 

[,...] | ALL [ PRIVILEGES ] } 

ON tablename

TO { username | groupname | PUBLIC } [, ...] 

[ WITH GRANT OPTION ]

GRANT { { INSERT | UPDATE | REFERENCES } (column [, ...]) } 

[, ...] 

ON tablename

TO { username | groupname | PUBLIC } [, ...] 

[ WITH GRANT OPTION ]

GRANT { SELECT | ALL [ PRIVILEGES ] } 

ON sequencename

TO { username | groupname | PUBLIC } [, ...] 

[ WITH GRANT OPTION ]

GRANT { EXECUTE | ALL [ PRIVILEGES ] } 

ON FUNCTION progname

( [ [ argmode ] [ argname ] argtype ] [, ...] ) 

TO { username | groupname | PUBLIC } [, ...] 

[ WITH GRANT OPTION ]

GRANT { EXECUTE | ALL [ PRIVILEGES ] } 

ON PROCEDURE progname

[ ( [ [ argmode ] [ argname ] argtype ] [, ...] ) ] 

TO { username | groupname | PUBLIC } [, ...] 

[ WITH GRANT OPTION ]

GRANT { EXECUTE | ALL [ PRIVILEGES ] } 

ON PACKAGE packagename

TO { username | groupname | PUBLIC } [, ...] 

[ WITH GRANT OPTION ]

GRANT role [, ...]

TO { username | groupname | PUBLIC } [, ...] 

[ WITH ADMIN OPTION ]

GRANT { CONNECT | RESOURCE | DBA } [, ...]

TO { username | groupname } [, ...]
[ WITH ADMIN OPTION ]

GRANT CREATE [ PUBLIC ] DATABASE LINK TO { username | groupname }

GRANT DROP PUBLIC DATABASE LINK TO { username | groupname }

GRANT EXEMPT ACCESS POLICY TO { username | groupname }

Description

The `GRANT` command has three basic variants: one that grants privileges on a database object (table, view, sequence, or program), one that grants membership in a role, and one that grants system privileges. These variants are similar in many ways, but they are different enough to be described separately.

In Advanced Server, the concept of users and groups has been unified into a single type of entity called a `role`. In this context, a `user` is a role that has the `LOGIN` attribute – the role may be used to create a session and connect to an application. A `group` is a role that does not have the `LOGIN` attribute – the role may not be used to create a session or connect to an application.

A role may be a member of one or more other roles, so the traditional concept of users belonging to groups is still valid. However, with the generalization of users and groups, users may “belong” to users, groups may “belong” to groups, and groups may “belong” to users, forming a general multi-level hierarchy of roles. User names and group names share the same namespace therefore it is not necessary to distinguish whether a grantee is a user or a group in the `GRANT` command.
2.3.62 GRANT on Database Objects

This variant of the `GRANT` command gives specific privileges on a database object to a role. These privileges are added to those already granted, if any.

The key word `PUBLIC` indicates that the privileges are to be granted to all roles, including those that may be created later. `PUBLIC` may be thought of as an implicitly defined group that always includes all roles. Any particular role will have the sum of privileges granted directly to it, privileges granted to any role it is presently a member of, and privileges granted to `PUBLIC`.

If the `WITH GRANT OPTION` is specified, the recipient of the privilege may in turn grant it to others. Without a grant option, the recipient cannot do that. Grant options cannot be granted to `PUBLIC`.

There is no need to grant privileges to the owner of an object (usually the user that created it), as the owner has all privileges by default. (The owner could, however, choose to revoke some of his own privileges for safety.) The right to drop an object or to alter its definition in any way is not described by a grantable privilege; it is inherent in the owner, and cannot be granted or revoked. The owner implicitly has all grant options for the object as well.

Depending on the type of object, the initial default privileges may include granting some privileges to `PUBLIC`. The default is no public access for tables and `EXECUTE` privilege for functions, procedures, and packages. The object owner may of course revoke these privileges. (For maximum security, issue the `REVOKE` in the same transaction that creates the object; then there is no window in which another user may use the object.)

The possible privileges are:

```sql
SELECT
  Allows SELECT from any column of the specified table, view, or sequence. For sequences, this privilege also allows the use of the `currval` function.

INSERT
  Allows INSERT of a new row into the specified table.

UPDATE
  Allows UPDATE of a column of the specified table. `SELECT . . . FOR UPDATE` also requires this privilege (besides the `SELECT` privilege).
```
DELETE

Allows **DELETE** of a row from the specified table.

REFERENCES

To create a foreign key constraint, it is necessary to have this privilege on both the referencing and referenced tables.

EXECUTE

Allows the use of the specified package, procedure, or function. When applied to a package, allows the use of all of the package’s public procedures, public functions, public variables, records, cursors and other public objects and object types. This is the only type of privilege that is applicable to functions, procedures, and packages.

The Advanced Server syntax for granting the **EXECUTE** privilege is not fully compatible with Oracle databases. Advanced Server requires qualification of the program name by one of the keywords, `FUNCTION`, `PROCEDURE`, or `PACKAGE` whereas these keywords must be omitted in Oracle. For functions, Advanced Server requires all input (IN, IN OUT) argument data types after the function name (including an empty parenthesis if there are no function arguments). For procedures, all input argument data types must be specified if the procedure has one or more input arguments. In Oracle, function and procedure signatures must be omitted. This is due to the fact that all programs share the same namespace in Oracle, whereas functions, procedures, and packages have their own individual namespace in Advanced Server to allow program name overloading to a certain extent.

ALL PRIVILEGES

Grant all of the available privileges at once.

The privileges required by other commands are listed on the reference page of the respective command.
2.3.63 GRANT on Roles

This variant of the GRANT command grants membership in a role to one or more other roles. Membership in a role is significant because it conveys the privileges granted to a role to each of its members.

If the WITH ADMIN OPTION is specified, the member may in turn grant membership in the role to others, and revoke membership in the role as well. Without the admin option, ordinary users cannot do that.

Database superusers can grant or revoke membership in any role to anyone. Roles having the CREATEROLE privilege can grant or revoke membership in any role that is not a superuser.

There are three pre-defined roles that have the following meanings:

CONNECT

Granting the CONNECT role is equivalent to giving the grantee the LOGIN privilege. The grantor must have the CREATEROLE privilege.

RESOURCE

Granting the RESOURCE role is equivalent to granting the CREATE and USAGE privileges on a schema that has the same name as the grantee. This schema must exist before the grant is given. The grantor must have the privilege to grant CREATE or USAGE privileges on this schema to the grantee.

DBA

Granting the DBA role is equivalent to making the grantee a superuser. The grantor must be a superuser.

Notes

The REVOKE command is used to revoke access privileges.

When a non-owner of an object attempts to GRANT privileges on the object, the command will fail outright if the user has no privileges whatsoever on the object. As long as a privilege is available, the command will proceed, but it will grant only those privileges for which the user has grant options. The GRANT ALL PRIVILEGES forms will issue a warning message if no grant options are held, while the other forms will issue a warning if grant options for any of the privileges specifically named in the command are not held.
(In principle these statements apply to the object owner as well, but since the owner is always treated as holding all grant options, the cases can never occur.)

It should be noted that database superusers can access all objects regardless of object privilege settings. This is comparable to the rights of root in a Unix system. As with root, it’s unwise to operate as a superuser except when absolutely necessary.

If a superuser chooses to issue a `GRANT` or `REVOKE` command, the command is performed as though it were issued by the owner of the affected object. In particular, privileges granted via such a command will appear to have been granted by the object owner. (For role membership, the membership appears to have been granted by the containing role itself.)

`GRANT` and `REVOKE` can also be done by a role that is not the owner of the affected object, but is a member of the role that owns the object, or is a member of a role that holds privileges `WITH GRANT OPTION` on the object. In this case the privileges will be recorded as having been granted by the role that actually owns the object or holds the privileges `WITH GRANT OPTION`.

For example, if table `t1` is owned by role `g1`, of which role `u1` is a member, then `u1` can grant privileges on `t1` to `u2`, but those privileges will appear to have been granted directly by `g1`. Any other member of role `g1` could revoke them later.

If the role executing `GRANT` holds the required privileges indirectly via more than one role membership path, it is unspecified which containing role will be recorded as having done the grant. In such cases it is best practice to use `SET ROLE` to become the specific role you want to do the `GRANT` as.

Currently, Advanced Server does not support granting or revoking privileges for individual columns of a table. One possible workaround is to create a view having just the desired columns and then grant privileges to that view.

**Examples**

Grant insert privilege to all users on table `emp`:

```
GRANT INSERT ON emp TO PUBLIC;
```

Grant all available privileges to user `mary` on view `salesemp`:

```
GRANT ALL PRIVILEGES ON salesemp TO mary;
```

Note that while the above will indeed grant all privileges if executed by a superuser or the owner of `emp`, when executed by someone else it will only grant those permissions for which the someone else has grant options.
Grant membership in role **admins** to user **joe**:

```
GRANT admins TO joe;
```

Grant **CONNECT** privilege to user **joe**:

```
GRANT CONNECT TO joe;
```

**See Also**

**REVOKE**, **SET ROLE**
2.3.64 GRANT on System Privileges

This variant of the GRANT command gives a role the ability to perform certain system operations within a database. System privileges relate to the ability to create or delete certain database objects that are not necessarily within the confines of one schema. Only database superusers can grant system privileges.

CREATE [PUBLIC] DATABASE LINK

The CREATE [PUBLIC] DATABASE LINK privilege allows the specified role to create a database link. Include the PUBLIC keyword to allow the role to create public database links; omit the PUBLIC keyword to allow the specified role to create private database links.

DROP PUBLIC DATABASE LINK

The DROP PUBLIC DATABASE LINK privilege allows a role to drop a public database link. System privileges are not required to drop a private database link. A private database link may be dropped by the link owner or a database superuser.

EXEMPT ACCESS POLICY

The EXEMPT ACCESS POLICY privilege allows a role to execute a SQL command without invoking any policy function that may be associated with the target database object. That is, the role is exempt from all security policies in the database.

The EXEMPT ACCESS POLICY privilege is not inheritable by membership to a role that has the EXEMPT ACCESS POLICY privilege. For example, the following sequence of GRANT commands does not result in user joe obtaining the EXEMPT ACCESS POLICY privilege even though joe is granted membership to the enterprisedb role, which has been granted the EXEMPT ACCESS POLICY privilege:

```
GRANT EXEMPT ACCESS POLICY TO enterprisedb;
GRANT enterprisedb TO joe;
```

The rolpolicyexempt column of the system catalog table pg_authid is set to true if a role has the EXEMPT ACCESS POLICY privilege.

Examples

Grant CREATE PUBLIC DATABASE LINK privilege to user joe:

```
GRANT CREATE PUBLIC DATABASE LINK TO joe;
```
Grant DROP PUBLIC DATABASE LINK privilege to user joe:

```
GRANT DROP PUBLIC DATABASE LINK TO joe;
```

Grant the EXEMPT ACCESS POLICY privilege to user joe:

```
GRANT EXEMPT ACCESS POLICY TO joe;
```

Using the ALTER ROLE Command to Assign System Privileges

The Advanced Server ALTER ROLE command also supports syntax that you can use to assign:

- the privilege required to create a public or private database link.
- the privilege required to drop a public database link.
- the EXEMPT ACCESS POLICY privilege.

The ALTER ROLE syntax is functionally equivalent to the respective commands compatible with Oracle databases.

See Also

REVOKE, ALTER ROLE
2.3.65 INSERT

Name

INSERT -- create new rows in a table

Synopsis

```
INSERT INTO table[@dblink ] [ ( column [, ...] ) ]
 { VALUES ( { expression | DEFAULT } [, ...] )
 [ RETURNING return_expression [, ...]
 { INTO { record | variable [, ...] }
 | BULK COLLECT INTO collection [, ...] } ]
 | query }
```

Description

INSERT allows you to insert new rows into a table. You can insert a single row at a time or several rows as a result of a query.

The columns in the target list may be listed in any order. Each column not present in the target list will be inserted using a default value, either its declared default value or null.

If the expression for each column is not of the correct data type, automatic type conversion will be attempted.

The `RETURNING INTO { record | variable [, ...] }` clause may only be specified when the `INSERT` command is used within an SPL program and only when the `VALUES` clause is used.

The `RETURNING BULK COLLECT INTO collection [, ...]` clause may only be specified if the `INSERT` command is used within an SPL program. If more than one `collection` is specified as the target of the `BULK COLLECT INTO` clause, then each `collection` must consist of a single, scalar field – i.e., `collection` must not be a record. `return_expression` evaluated for each inserted row, becomes an element in `collection` starting with the first element. Any existing rows in `collection` are deleted. If the result set is empty, then `collection` will be empty.

You must have `INSERT` privilege to a table in order to insert into it. If you use the `query` clause to insert rows from a query, you also need to have `SELECT` privilege on any table used in the query.
Parameters

table

The name (optionally schema-qualified) of an existing table.

dblink

Database link name identifying a remote database. See the CREATE DATABASE LINK command for information on database links.

column

The name of a column in table.

expression

An expression or value to assign to column.

DEFAULT

This column will be filled with its default value.

query

A query (SELECT statement) that supplies the rows to be inserted. Refer to the SELECT command for a description of the syntax.

return_expression

An expression that may include one or more columns from table. If a column name from table is specified in return_expression, the value substituted for the column when return_expression is evaluated is determined as follows:

If the column specified in return_expression is assigned a value in the INSERT command, then the assigned value is used in the evaluation of return_expression.

If the column specified in return_expression is not assigned a value in the INSERT command and there is no default value for the column in the table’s column definition, then null is used in the evaluation of return_expression.

If the column specified in return_expression is not assigned a value in the INSERT command and there is a default value for the column in the
table’s column definition, then the default value is used in the evaluation of return_expression.

record

A record whose field the evaluated return_expression is to be assigned. The first return_expression is assigned to the first field in record, the second return_expression is assigned to the second field in record, etc. The number of fields in record must exactly match the number of expressions and the fields must be type-compatible with their assigned expressions.

variable

A variable to which the evaluated return_expression is to be assigned. If more than one return_expression and variable are specified, the first return_expression is assigned to the first variable, the second return_expression is assigned to the second variable, etc. The number of variables specified following the INTO keyword must exactly match the number of expressions following the RETURNING keyword and the variables must be type-compatible with their assigned expressions.

collection

A collection in which an element is created from the evaluated return_expression. There can be either a single collection which may be a collection of a single field or a collection of a record type, or there may be more than one collection in which case each collection must consist of a single field. The number of return expressions must match in number and order the number of fields in all specified collections. Each corresponding return_expression and collection field must be type-compatible.

Examples

Insert a single row into table emp:

```sql
INSERT INTO emp VALUES (8021,'JOHN','SALESMAN',7698,'22-FEB-07',1250,500,30);
```

In this second example, the column, comm, is omitted and therefore it will have the default value of null:

```sql
INSERT INTO emp (empno, ename, job, mgr, hiredate, sal, deptno) VALUES (8022,'PETERS','CLERK',7698,'03-DEC-06',950,30);
```

The third example uses the DEFAULT clause for the hiredate and comm columns rather than specifying a value:

```sql
INSERT INTO emp VALUES (8023,'FORD','ANALYST',7566,NULL,3000,NULL,20);
```
This example creates a table for the department names and then inserts into the table by selecting from the `dname` column of the `dept` table:

```sql
CREATE TABLE deptnames (  
    deptname VARCHAR2(14)  
);  
INSERT INTO deptnames SELECT dname FROM dept;
```
2.3.66 LOCK

Name

LOCK -- lock a table

Synopsis

LOCK TABLE name [, ...] IN lockmode MODE [ NOWAIT ]

where lockmode is one of:

ROW SHARE | ROW EXCLUSIVE | SHARE | SHARE ROW EXCLUSIVE | EXCLUSIVE

Description

LOCK TABLE obtains a table-level lock, waiting if necessary for any conflicting locks to be released. If NOWAIT is specified, LOCK TABLE does not wait to acquire the desired lock: if it cannot be acquired immediately, the command is aborted and an error is emitted. Once obtained, the lock is held for the remainder of the current transaction. (There is no UNLOCK TABLE command; locks are always released at transaction end.)

When acquiring locks automatically for commands that reference tables, Advanced Server always uses the least restrictive lock mode possible. LOCK TABLE provides for cases when you might need more restrictive locking. For example, suppose an application runs a transaction at the isolation level read committed and needs to ensure that data in a table remains stable for the duration of the transaction. To achieve this you could obtain SHARE lock mode over the table before querying. This will prevent concurrent data changes and ensure subsequent reads of the table see a stable view of committed data, because SHARE lock mode conflicts with the ROW EXCLUSIVE lock acquired by writers, and your LOCK TABLE name IN SHARE MODE statement will wait until any concurrent holders of ROW EXCLUSIVE mode locks commit or roll back. Thus, once you obtain the lock, there are no uncommitted writes outstanding; furthermore none can begin until you release the lock.

To achieve a similar effect when running a transaction at the isolation level serializable, you have to execute the LOCK TABLE statement before executing any data modification statement. A serializable transaction’s view of data will be frozen when its first data modification statement begins. A later LOCK TABLE will still prevent concurrent writes - but it won’t ensure that what the transaction reads corresponds to the latest committed values.
If a transaction of this sort is going to change the data in the table, then it should use **SHARE ROW EXCLUSIVE** lock mode instead of **SHARE** mode.

This ensures that only one transaction of this type runs at a time. Without this, a deadlock is possible: two transactions might both acquire **SHARE** mode, and then be unable to also acquire **ROW EXCLUSIVE** mode to actually perform their updates. (Note that a transaction’s own locks never conflict, so a transaction can acquire **ROW EXCLUSIVE** mode when it holds **SHARE** mode - but not if anyone else holds **SHARE** mode.) To avoid deadlocks, make sure all transactions acquire locks on the same objects in the same order, and if multiple lock modes are involved for a single object, then transactions should always acquire the most restrictive mode first.

**Parameters**

**name**

The name (optionally schema-qualified) of an existing table to lock.

The command `LOCK TABLE a, b;` is equivalent to `LOCK TABLE a; LOCK TABLE b`. The tables are locked one-by-one in the order specified in the `LOCK TABLE` command.

**lockmode**

The lock mode specifies which locks this lock conflicts with.

If no lock mode is specified, then the server uses the most restrictive mode, **ACCESS EXCLUSIVE**. (**ACCESS EXCLUSIVE** is not compatible with Oracle databases. In Advanced Server, this configuration mode ensures that no other transaction can access the locked table in any manner.)

**NOWAIT**

Specifies that `LOCK TABLE` should not wait for any conflicting locks to be released: if the specified lock cannot be immediately acquired without waiting, the transaction is aborted.

**Notes**

All forms of `LOCK` require **UPDATE** and/or **DELETE** privileges.

`LOCK TABLE` is useful only inside a transaction block since the lock is dropped as soon as the transaction ends. A `LOCK TABLE` command appearing outside any transaction block forms a self-contained transaction, so the lock will be dropped as soon as it is obtained.
LOCK TABLE only deals with table-level locks, and so the mode names involving ROW are all misnomers. These mode names should generally be read as indicating the intention of the user to acquire row-level locks within the locked table. Also, ROW EXCLUSIVE mode is a sharable table lock. Keep in mind that all the lock modes have identical semantics so far as LOCK TABLE is concerned, differing only in the rules about which modes conflict with which.
2.3.67  REVOKE

Name

REVOKE -- remove access privileges

Synopsis

REVOKE { { SELECT | INSERT | UPDATE | DELETE | REFERENCES } }
    [, ...] | ALL [ PRIVILEGES ] }
ON tablename
    FROM { username | groupname | PUBLIC } [, ...]
    [ CASCADE | RESTRICT ]

REVOKE { SELECT | ALL [ PRIVILEGES ] }
ON sequencename
    FROM { username | groupname | PUBLIC } [, ...]
    [ CASCADE | RESTRICT ]

REVOKE { EXECUTE | ALL [ PRIVILEGES ] }
ON FUNCTION progname
    ( [ [ argmode ] [ argname ] argtype ] [, ...] )
    FROM { username | groupname | PUBLIC } [, ...]
    [ CASCADE | RESTRICT ]

REVOKE { EXECUTE | ALL [ PRIVILEGES ] }
ON PROCEDURE progname
    [ ( [ [ argmode ] [ argname ] argtype ] [, ...] ) ]
    FROM { username | groupname | PUBLIC } [, ...]
    [ CASCADE | RESTRICT ]

REVOKE { EXECUTE | ALL [ PRIVILEGES ] }
ON PACKAGE packagename
    FROM { username | groupname | PUBLIC } [, ...]
    [ CASCADE | RESTRICT ]

REVOKE role [, ...] FROM { username | groupname | PUBLIC }
    [, ...]
    [ CASCADE | RESTRICT ]

REVOKE { CONNECT | RESOURCE | DBA } [, ...]
    FROM { username | groupname } [, ...]

REVOKE CREATE [ PUBLIC ] DATABASE LINK
    FROM { username | groupname }

REVOKE DROP PUBLIC DATABASE LINK
    FROM { username | groupname }
REVOKE EXEMPT ACCESS POLICY
   FROM { username | groupname }

Description

The REVOKE command revokes previously granted privileges from one or more roles. The key word PUBLIC refers to the implicitly defined group of all roles.

See the description of the GRANT command for the meaning of the privilege types.

Note that any particular role will have the sum of privileges granted directly to it, privileges granted to any role it is presently a member of, and privileges granted to PUBLIC. Thus, for example, revoking SELECT privilege from PUBLIC does not necessarily mean that all roles have lost SELECT privilege on the object: those who have it granted directly or via another role will still have it.

If the privilege had been granted with the grant option, the grant option for the privilege is revoked as well as the privilege, itself.

If a user holds a privilege with grant option and has granted it to other users then the privileges held by those other users are called dependent privileges. If the privilege or the grant option held by the first user is being revoked and dependent privileges exist, those dependent privileges are also revoked if CASCADE is specified, else the revoke action will fail. This recursive revocation only affects privileges that were granted through a chain of users that is traceable to the user that is the subject of this REVOKE command. Thus, the affected users may effectively keep the privilege if it was also granted through other users.

Note: CASCADE is not an option compatible with Oracle databases. By default Oracle always cascades dependent privileges, but Advanced Server requires the CASCADE keyword to be explicitly given, otherwise the REVOKE command will fail.

When revoking membership in a role, GRANT OPTION is instead called ADMIN OPTION, but the behavior is similar.

Notes

A user can only revoke privileges that were granted directly by that user. If, for example, user A has granted a privilege with grant option to user B, and user B has in turn granted it to user C, then user A cannot revoke the privilege directly from C. Instead, user A could revoke the grant option from user B and use the CASCADE option so that the privilege is in turn revoked from user C. For another example, if both A and B have granted the same privilege to C, A can revoke his own grant but not B’s grant, so C will still effectively have the privilege.
When a non-owner of an object attempts to `REVOKE` privileges on the object, the command will fail outright if the user has no privileges whatsoever on the object. As long as some privilege is available, the command will proceed, but it will revoke only those privileges for which the user has grant options. The `REVOKE ALL PRIVILEGES` forms will issue a warning message if no grant options are held, while the other forms will issue a warning if grant options for any of the privileges specifically named in the command are not held. (In principle these statements apply to the object owner as well, but since the owner is always treated as holding all grant options, the cases can never occur.)

If a superuser chooses to issue a `GRANT` or `REVOKE` command, the command is performed as though it were issued by the owner of the affected object. Since all privileges ultimately come from the object owner (possibly indirectly via chains of grant options), it is possible for a superuser to revoke all privileges, but this may require use of `CASCADE` as stated above.

`REVOKE` can also be done by a role that is not the owner of the affected object, but is a member of the role that owns the object, or is a member of a role that holds privileges `WITH GRANT OPTION` on the object. In this case the command is performed as though it were issued by the containing role that actually owns the object or holds the privileges `WITH GRANT OPTION`. For example, if table `t1` is owned by role `g1`, of which role `u1` is a member, then `u1` can revoke privileges on `t1` that are recorded as being granted by `g1`. This would include grants made by `u1` as well as by other members of role `g1`.

If the role executing `REVOKE` holds privileges indirectly via more than one role membership path, it is unspecified which containing role will be used to perform the command. In such cases it is best practice to use `SET ROLE` to become the specific role you want to do the `REVOKE` as. Failure to do so may lead to revoking privileges other than the ones you intended, or not revoking anything at all.

Please Note: The Advanced Server `ALTER ROLE` command also supports syntax that revokes the system privileges required to create a public or private database link, or exemptions from fine-grained access control policies (`DBMS_RLS`). The `ALTER ROLE` syntax is functionally equivalent to the respective `REVOKE` command, compatible with Oracle databases.

**Examples**

Revoke insert privilege for the public on table `emp`:

```sql
REVOKE INSERT ON emp FROM PUBLIC;
```

Revoke all privileges from user `mary` on view `salesemp`:

```sql
REVOKE ALL PRIVILEGES ON salesemp FROM mary;
```

Note that this actually means “revoke all privileges that I granted”.

---

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Revoke membership in role `admins` from user `joe`:

```
REVOKE admins FROM joe;
```

Revoke `CONNECT` privilege from user `joe`:

```
REVOKE CONNECT FROM joe;
```

Revoke `CREATE DATABASE LINK` privilege from user `joe`:

```
REVOKE CREATE DATABASE LINK FROM joe;
```

Revoke `EXEMPT ACCESS POLICY` privilege from user `joe`:

```
REVOKE EXEMPT ACCESS POLICY FROM joe;
```

See Also

`GRANT`, `SET ROLE`
2.3.68 ROLLBACK

Name

ROLLBACK -- abort the current transaction

Synopsis

ROLLBACK [ WORK ]

Description

ROLLBACK rolls back the current transaction and causes all the updates made by the transaction to be discarded.

Parameters

WORK

Optional key word - has no effect.

Notes

Use COMMIT to successfully terminate a transaction.

Issuing ROLLBACK when not inside a transaction does no harm.

Please note: Executing a ROLLBACK in a plpgsql procedure will throw an error if there is an Oracle-style SPL procedure on the runtime stack.

Examples

To abort all changes:

ROLLBACK;

See Also

COMMIT, ROLLBACK TO SAVEPOINT, SAVEPOINT
2.3.69   ROLLBACK TO SAVEPOINT

Name

ROLLBACK TO SAVEPOINT -- roll back to a savepoint

Synopsis

ROLLBACK [ WORK ] TO [ SAVEPOINT ] savepoint_name

Description

Roll back all commands that were executed after the savepoint was established. The
savepoint remains valid and can be rolled back to again later, if needed.

ROLLBACK TO SAVEPOINT implicitly destroys all savepoints that were established after
the named savepoint.

Parameters

savepoint_name

The savepoint to which to roll back.

Notes

Specifying a savepoint name that has not been established is an error.

ROLLBACK TO SAVEPOINT is not supported within SPL programs.

Examples

To undo the effects of the commands executed savepoint depts was established:

\set AUTOCOMMIT off
INSERT INTO dept VALUES (50, 'HR', 'NEW YORK');
SAVEPOINT depts;
INSERT INTO emp (empno, ename, deptno) VALUES (9001, 'JONES', 50);
INSERT INTO emp (empno, ename, deptno) VALUES (9002, 'ALICE', 50);
ROLLBACK TO SAVEPOINT depts;

See Also

COMMIT, ROLLBACK, SAVEPOINT
2.3.70 SAVEPOINT

Name

SAVEPOINT -- define a new savepoint within the current transaction

Synopsis

SAVEPOINT savepoint_name

Description

SAVEPOINT establishes a new savepoint within the current transaction.

A savepoint is a special mark inside a transaction that allows all commands that are executed after it was established to be rolled back, restoring the transaction state to what it was at the time of the savepoint.

Parameters

savepoint_name

The name to be given to the savepoint.

Notes

Use ROLLBACK TO SAVEPOINT to roll back to a savepoint.

Savepoints can only be established when inside a transaction block. There can be multiple savepoints defined within a transaction.

When another savepoint is established with the same name as a previous savepoint, the old savepoint is kept, though only the more recent one will be used when rolling back.

SAVEPOINT is not supported within SPL programs.

Examples

To establish a savepoint and later undo the effects of all commands executed after it was established:

```sql
\set AUTOCOMMIT off
INSERT INTO dept VALUES (50, 'HR', 'NEW YORK');
SAVEPOINT depts;
INSERT INTO emp (empno, ename, deptno) VALUES (9001, 'JONES', 50);
```
The above transaction will commit a row into the dept table, but the inserts into the emp and jobhist tables are rolled back.

See Also

COMMIT, ROLLBACK, ROLLBACK TO SAVEPOINT
2.3.71 SELECT

Name

SELECT -- retrieve rows from a table or view

Synopsis

SELECT [ optimizer_hint ] [ ALL | DISTINCT | UNIQUE ]
* | expression [ AS output_name ] [, ...]
FROM from_item [, ...]
[ WHERE condition ]
[ [ START WITH start_expression ]
CONNECT BY { PRIOR parent_expr = child_expr |
child_expr = PRIOR parent_expr }
[ ORDER SIBLINGS BY expression [ ASC | DESC ] [, ...] ] ]
[ GROUP BY { expression | ROLLUP ( expr_list ) |
CUBE ( expr_list ) | GROUPING SETS ( expr_list ) } [, ...]
[ LEVEL ] ]
[ HAVING condition [, ...] ]
[ { UNION [ ALL ] | INTERSECT | MINUS } select ]
[ ORDER BY expression [ ASC | DESC ] [, ...] ]
[ FOR UPDATE [ WAIT n | NOWAIT | SKIP LOCKED ]]

where from_item can be one of:

  table_name[@dblink ] [ alias ]
  ( select ) alias
  from_item [ NATURAL ] join_type from_item
  [ ON join_condition | USING ( join_column [, ...] ) ]

Description

SELECT retrieves rows from one or more tables. The general processing of SELECT is as follows:

1. All elements in the FROM list are computed. (Each element in the FROM list is a real or virtual table.) If more than one element is specified in the FROM list, they are cross-joined together. (See FROM clause, below.)
2. If the WHERE clause is specified, all rows that do not satisfy the condition are eliminated from the output. (See WHERE clause, below.)
3. If the GROUP BY clause is specified, the output is divided into groups of rows that match on one or more values. If the HAVING clause is present, it eliminates groups that do not satisfy the given condition. (See GROUP BY clause and HAVING clause below.)
4. Using the operators \texttt{UNION}, \texttt{INTERSECT}, and \texttt{MINUS}, the output of more than one \texttt{SELECT} statement can be combined to form a single result set. The \texttt{UNION} operator returns all rows that are in one or both of the result sets. The \texttt{INTERSECT} operator returns all rows that are strictly in both result sets. The \texttt{MINUS} operator returns the rows that are in the first result set but not in the second. In all three cases, duplicate rows are eliminated. In the case of the \texttt{UNION} operator, if \texttt{ALL} is specified then duplicates are not eliminated. (See \texttt{UNION} clause, \texttt{INTERSECT} clause, and \texttt{MINUS} clause below.)

5. The actual output rows are computed using the \texttt{SELECT} output expressions for each selected row. (See \texttt{SELECT} list below.)

6. The \texttt{CONNECT BY} clause is used to select data that has a hierarchical relationship. Such data has a parent-child relationship between rows. (See \texttt{CONNECT BY} clause.)

7. If the \texttt{ORDER BY} clause is specified, the returned rows are sorted in the specified order. If \texttt{ORDER BY} is not given, the rows are returned in whatever order the system finds fastest to produce. (See \texttt{ORDER BY} clause below.)

8. \texttt{DISTINCT} | \texttt{UNIQUE} eliminates duplicate rows from the result. \texttt{ALL} (the default) will return all candidate rows, including duplicates. (See \texttt{DISTINCT} | \texttt{UNIQUE} clause below.)

9. The \texttt{FOR UPDATE} clause causes the \texttt{SELECT} statement to lock the selected rows against concurrent updates. (See \texttt{FOR UPDATE} clause below.)

You must have \texttt{SELECT} privilege on a table to read its values. The use of \texttt{FOR UPDATE} requires \texttt{UPDATE} privilege as well.

Parameters

\texttt{optimizer\_hint}

Comment-embedded hints to the optimizer for selection of an execution plan. See Section 2.4 for information about optimizer hints.

2.3.71.1 FROM Clause

The \texttt{FROM} clause specifies one or more source tables for a \texttt{SELECT} statement. The syntax is:

\begin{verbatim}
FROM source [, ...]
\end{verbatim}

Where \texttt{source} can be one of following elements:

\begin{verbatim}
table\_name[@dblink ]
\end{verbatim}
The name (optionally schema-qualified) of an existing table or view. \textit{dblink} is a
database link name identifying a remote database. See the \texttt{CREATE DATABASE}
LINK command for information on database links.

\textbf{alias}

A substitute name for the \texttt{FROM} item containing the alias. An alias is used for
brevity or to eliminate ambiguity for self-joins (where the same table is scanned
multiple times). When an alias is provided, it completely hides the actual name of
the table or function; for example given \texttt{FROM foo AS f}, the remainder of the
\texttt{SELECT} must refer to this \texttt{FROM} item as \texttt{f} not \texttt{foo}.

\textbf{select}

A sub-\texttt{SELECT} can appear in the \texttt{FROM} clause. This acts as though its output were
created as a temporary table for the duration of this single \texttt{SELECT} command.
Note that the sub-\texttt{SELECT} must be surrounded by parentheses, and an alias must
be provided for it.

\textbf{join\_type}

One of the following:

\begin{verbatim}
[ INNER ] JOIN
LEFT [ OUTER ] JOIN
RIGHT [ OUTER ] JOIN
FULL [ OUTER ] JOIN
CROSS JOIN
\end{verbatim}

For the \texttt{INNER} and \texttt{OUTER} join types, a join condition must be specified, namely
\textbf{exactly one of} \texttt{NATURAL}, \texttt{ON} \texttt{join\_condition}, or \texttt{USING} \texttt{(join\_column [,}
\texttt{ . . . ] )}. See below for the meaning. For \texttt{CROSS JOIN}, none of these clauses
may appear.

A \texttt{JOIN} clause combines two \texttt{FROM} items. Use parentheses if necessary to
determine the order of nesting. In the absence of parentheses, \texttt{JOINS} nest left-to-
right. In any case \texttt{JOIN} binds more tightly than the commas separating \texttt{FROM}
items.

\texttt{CROSS JOIN} and \texttt{INNER JOIN} produce a simple Cartesian product, the same
result as you get from listing the two items at the top level of \texttt{FROM}, but restricted
by the join condition (if any). \texttt{CROSS JOIN} is equivalent to \texttt{INNER JOIN ON}
(\texttt{TRUE}), that is, no rows are removed by qualification. These join types are just a
notational convenience, since they do nothing you couldn’t do with plain \texttt{FROM}
and \texttt{WHERE}.
LEFT OUTER JOIN returns all rows in the qualified Cartesian product (i.e., all combined rows that pass its join condition), plus one copy of each row in the left-hand table for which there was no right-hand row that passed the join condition. This left-hand row is extended to the full width of the joined table by inserting null values for the right-hand columns. Note that only the JOIN clause’s own condition is considered while deciding which rows have matches. Outer conditions are applied afterwards.

Conversely, RIGHT OUTER JOIN returns all the joined rows, plus one row for each unmatched right-hand row (extended with nulls on the left). This is just a notational convenience, since you could convert it to a LEFT OUTER JOIN by switching the left and right inputs.

FULL OUTER JOIN returns all the joined rows, plus one row for each unmatched left-hand row (extended with nulls on the right), plus one row for each unmatched right-hand row (extended with nulls on the left).

ON join_condition

join_condition is an expression resulting in a value of type BOOLEAN (similar to a WHERE clause) that specifies which rows in a join are considered to match.

USING (join_column [, ...] )

A clause of the form USING (a, b, ...) is shorthand for ON left_table.a = right_table.a AND left_table.b = right_table.b.... Also, USING implies that only one of each pair of equivalent columns will be included in the join output, not both.

NATURAL

NATURAL is shorthand for a USING list that mentions all columns in the two tables that have the same names.

If multiple sources are specified, the result is the Cartesian product (cross join) of all the sources. Usually qualification conditions are added to restrict the returned rows to a small subset of the Cartesian product.

Example

The following example selects all of the entries from the dept table:

```
SELECT * FROM dept;
```

<table>
<thead>
<tr>
<th>deptno</th>
<th>dname</th>
<th>loc</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>NEW YORK</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>DALLAS</td>
</tr>
</tbody>
</table>
```
2.3.71.2 WHERE Clause

The optional WHERE clause has the form:

WHERE condition

where condition is any expression that evaluates to a result of type BOOLEAN. Any row that does not satisfy this condition will be eliminated from the output. A row satisfies the condition if it returns TRUE when the actual row values are substituted for any variable references.

Example

The following example joins the contents of the emp and dept tables, WHERE the value of the deptno column in the emp table is equal to the value of the deptno column in the dept table:

```
SELECT d.deptno, d.dname, e.empno, e.ename, e.mgr, e.hiredate
FROM emp e, dept d
WHERE d.deptno = e.deptno;
```

```
deptno |   dname   | empno | ename  | mgr  | hiredate
--------|-----------|-------|--------|------|------------------
10      | ACCOUNTING | 7934  | MILLER | 7782 | 23-JAN-82 00:00:00
10      | ACCOUNTING | 7782  | CLARK  | 7839 | 09-JUN-81 00:00:00
10      | ACCOUNTING | 7839  | KING   |      | 17-NOV-81 00:00:00
20      | RESEARCH   | 7788  | SCOTT  | 7566 | 19-APR-87 00:00:00
20      | RESEARCH   | 7566  | JONES  | 7839 | 02-APR-81 00:00:00
20      | RESEARCH   | 7369  | SMITH  | 7902 | 17-DEC-80 00:00:00
20      | RESEARCH   | 7876  | ADAMS  | 7788 | 23-MAY-87 00:00:00
20      | RESEARCH   | 7902  | FORD   | 7566 | 03-DEC-81 00:00:00
30      | SALES      | 7521  | WARD   | 7698 | 22-FEB-81 00:00:00
30      | SALES      | 7844  | TURNER | 7698 | 08-SEP-81 00:00:00
30      | SALES      | 7499  | ALLEN  | 7698 | 20-FEB-81 00:00:00
30      | SALES      | 7698  | BLAKE  | 7839 | 01-MAY-81 00:00:00
30      | SALES      | 7654  | MARTIN | 7698 | 28-SEP-81 00:00:00
30      | SALES      | 7900  | JAMES  | 7698 | 03-DEC-81 00:00:00
(14 rows)
```
GROUP BY will condense into a single row all selected rows that share the same values for the grouped expressions. expression can be an input column name, or the name or ordinal number of an output column (SELECT list item), or an arbitrary expression formed from input-column values. In case of ambiguity, a GROUP BY name will be interpreted as an input-column name rather than an output column name.

ROLLUP, CUBE, and GROUPING SETS are extensions to the GROUP BY clause for supporting multidimensional analysis. See Section 2.3.71.3 for information on using these extensions.

Aggregate functions, if any are used, are computed across all rows making up each group, producing a separate value for each group (whereas without GROUP BY, an aggregate produces a single value computed across all the selected rows). When GROUP BY is present, it is not valid for the SELECT list expressions to refer to ungrouped columns except within aggregate functions, since there would be more than one possible value to return for an ungrouped column.

Example

The following example computes the sum of the sal column in the emp table, grouping the results by department number:

```sql
SELECT deptno, SUM(sal) AS total
FROM emp
GROUP BY deptno;
```

<table>
<thead>
<tr>
<th>deptno</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>8750.00</td>
</tr>
<tr>
<td>20</td>
<td>10875.00</td>
</tr>
<tr>
<td>30</td>
<td>9400.00</td>
</tr>
</tbody>
</table>

(3 rows)

2.3.71.4 HAVING Clause

The optional HAVING clause has the form:

```
HAVING condition
```

where condition is the same as specified for the WHERE clause.

HAVING eliminates group rows that do not satisfy the specified condition. HAVING is different from WHERE; WHERE filters individual rows before the application of GROUP BY, while HAVING filters group rows created by GROUP BY. Each column referenced in
condition must unambiguously reference a grouping column, unless the reference appears within an aggregate function.

Example

To sum the column, sal of all employees, group the results by department number and show those group totals that are less than 10000:

```
SELECT deptno, SUM(sal) AS total
FROM emp
GROUP BY deptno
HAVING SUM(sal) < 10000;
```

<table>
<thead>
<tr>
<th>deptno</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>8750.00</td>
</tr>
<tr>
<td>30</td>
<td>9400.00</td>
</tr>
</tbody>
</table>

(2 rows)

2.3.71.5 SELECT List

The `SELECT` list (between the key words `SELECT` and `FROM`) specifies expressions that form the output rows of the `SELECT` statement. The expressions can (and usually do) refer to columns computed in the `FROM` clause. Using the clause `AS output_name`, another name can be specified for an output column. This name is primarily used to label the column for display. It can also be used to refer to the column’s value in `ORDER BY` and `GROUP BY` clauses, but not in the `WHERE` or `HAVING` clauses; there you must write out the expression instead.

Instead of an expression, * can be written in the output list as a shorthand for all the columns of the selected rows.

Example

The `SELECT` list in the following example specifies that the result set should include the `empno` column, the `ename` column, the `mgr` column and the `hiredate` column:

```
SELECT empno, ename, mgr, hiredate FROM emp;
```

<table>
<thead>
<tr>
<th>empno</th>
<th>ename</th>
<th>mgr</th>
<th>hiredate</th>
</tr>
</thead>
<tbody>
<tr>
<td>7934</td>
<td>MILLER</td>
<td>7782</td>
<td>23-JAN-82 00:00:00</td>
</tr>
<tr>
<td>7782</td>
<td>CLARK</td>
<td>7839</td>
<td>09-JUN-81 00:00:00</td>
</tr>
<tr>
<td>7839</td>
<td>KING</td>
<td></td>
<td>17-NOV-81 00:00:00</td>
</tr>
<tr>
<td>7788</td>
<td>SCOTT</td>
<td>7566</td>
<td>19-APR-81 00:00:00</td>
</tr>
<tr>
<td>7566</td>
<td>JONES</td>
<td>7839</td>
<td>02-APR-81 00:00:00</td>
</tr>
<tr>
<td>7369</td>
<td>SMITH</td>
<td>7902</td>
<td>17-DEC-80 00:00:00</td>
</tr>
<tr>
<td>7876</td>
<td>ADAMS</td>
<td>7788</td>
<td>23-MAY-81 00:00:00</td>
</tr>
<tr>
<td>7902</td>
<td>FORD</td>
<td>7566</td>
<td>03-DEC-81 00:00:00</td>
</tr>
<tr>
<td>7521</td>
<td>WARD</td>
<td>7698</td>
<td>22-FEB-81 00:00:00</td>
</tr>
<tr>
<td>7844</td>
<td>TURNER</td>
<td>7698</td>
<td>08-SEP-81 00:00:00</td>
</tr>
<tr>
<td>7499</td>
<td>ALLEN</td>
<td>7698</td>
<td>20-FEB-81 00:00:00</td>
</tr>
</tbody>
</table>
2.3.71.6 UNION Clause

The **UNION** clause has the form:

```
select_statement UNION [ ALL ] select_statement
```

`select_statement` is any **SELECT** statement without an **ORDER BY** or **FOR UPDATE** clause. (**ORDER BY** can be attached to a sub-expression if it is enclosed in parentheses. Without parentheses, these clauses will be taken to apply to the result of the **UNION**, not to its right-hand input expression.)

The **UNION** operator computes the set union of the rows returned by the involved **SELECT** statements. A row is in the set union of two result sets if it appears in at least one of the result sets. The two **SELECT** statements that represent the direct operands of the **UNION** must produce the same number of columns, and corresponding columns must be of compatible data types.

The result of **UNION** does not contain any duplicate rows unless the **ALL** option is specified. **ALL** prevents elimination of duplicates.

Multiple **UNION** operators in the same **SELECT** statement are evaluated left to right, unless otherwise indicated by parentheses.

Currently, **FOR UPDATE** may not be specified either for a **UNION** result or for any input of a **UNION**.

2.3.71.7 INTERSECT Clause

The **INTERSECT** clause has the form:

```
select_statement INTERSECT select_statement
```

`select_statement` is any **SELECT** statement without an **ORDER BY** or **FOR UPDATE** clause.
The `INTERSECT` operator computes the set intersection of the rows returned by the involved `SELECT` statements. A row is in the intersection of two result sets if it appears in both result sets.

The result of `INTERSECT` does not contain any duplicate rows.

Multiple `INTERSECT` operators in the same `SELECT` statement are evaluated left to right, unless parentheses dictate otherwise. `INTERSECT` binds more tightly than `UNION`. That is, `A UNION B INTERSECT C` will be read as `A UNION (B INTERSECT C)`.

### 2.3.71.8 MINUS Clause

The `MINUS` clause has this general form:

```
select_statement MINUS select_statement
```

`select_statement` is any `SELECT` statement without an `ORDER BY` or `FOR UPDATE` clause.

The `MINUS` operator computes the set of rows that are in the result of the left `SELECT` statement but not in the result of the right one.

The result of `MINUS` does not contain any duplicate rows.

Multiple `MINUS` operators in the same `SELECT` statement are evaluated left to right, unless parentheses dictate otherwise. `MINUS` binds at the same level as `UNION`.

### 2.3.71.9 CONNECT BY Clause

The `CONNECT BY` clause determines the parent-child relationship of rows when performing a hierarchical query. It has the general form:

```
CONNECT BY { PRIOR parent_expr = child_expr | child_expr = PRIOR parent_expr }
```

`parent_expr` is evaluated on a candidate parent row. If `parent_expr = child_expr` results in `TRUE` for a row returned by the `FROM` clause, then this row is considered a child of the parent.

The following optional clauses may be specified in conjunction with the `CONNECT BY` clause:
START WITH start_expression

The rows returned by the FROM clause on which start_expression evaluates to TRUE become the root nodes of the hierarchy.

ORDER SIBLINGS BY expression [ ASC | DESC ] [, ...]

Sibling rows of the hierarchy are ordered by expression in the result set.

Note: Advanced Server does not support the use of AND (or other operators) in the CONNECT BY clause.

2.3.71.10 ORDER BY Clause

The optional ORDER BY clause has the form:

ORDER BY expression [ ASC | DESC ] [, ...]

expression can be the name or ordinal number of an output column (SELECT list item), or it can be an arbitrary expression formed from input-column values.

The ORDER BY clause causes the result rows to be sorted according to the specified expressions. If two rows are equal according to the leftmost expression, they are compared according to the next expression and so on. If they are equal according to all specified expressions, they are returned in an implementation-dependent order.

The ordinal number refers to the ordinal (left-to-right) position of the result column. This feature makes it possible to define an ordering on the basis of a column that does not have a unique name. This is never absolutely necessary because it is always possible to assign a name to a result column using the AS clause.

It is also possible to use arbitrary expressions in the ORDER BY clause, including columns that do not appear in the SELECT result list. Thus the following statement is valid:

SELECT ename FROM emp ORDER BY empno;

A limitation of this feature is that an ORDER BY clause applying to the result of a UNION, INTERSECT, or MINUS clause may only specify an output column name or number, not an expression.

If an ORDER BY expression is a simple name that matches both a result column name and an input column name, ORDER BY will interpret it as the result column name. This is the opposite of the choice that GROUP BY will make in the same situation. This inconsistency is made to be compatible with the SQL standard.
Optionally one may add the key word **ASC** (ascending) or **DESC** (descending) after any expression in the **ORDER BY** clause. If not specified, **ASC** is assumed by default.

The null value sorts higher than any other value. In other words, with ascending sort order, null values sort at the end, and with descending sort order, null values sort at the beginning.

Character-string data is sorted according to the locale-specific collation order that was established when the database cluster was initialized.

**Examples**

The following two examples are identical ways of sorting the individual results according to the contents of the second column (**dname**):

```sql
SELECT * FROM dept ORDER BY dname;

<table>
<thead>
<tr>
<th>deptno</th>
<th>dname</th>
<th>loc</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>NEW YORK</td>
</tr>
<tr>
<td>40</td>
<td>OPERATIONS</td>
<td>BOSTON</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>DALLAS</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>CHICAGO</td>
</tr>
</tbody>
</table>
(4 rows)

SELECT * FROM dept ORDER BY 2;

<table>
<thead>
<tr>
<th>deptno</th>
<th>dname</th>
<th>loc</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>ACCOUNTING</td>
<td>NEW YORK</td>
</tr>
<tr>
<td>40</td>
<td>OPERATIONS</td>
<td>BOSTON</td>
</tr>
<tr>
<td>20</td>
<td>RESEARCH</td>
<td>DALLAS</td>
</tr>
<tr>
<td>30</td>
<td>SALES</td>
<td>CHICAGO</td>
</tr>
</tbody>
</table>
(4 rows)
```

**2.3.71.11 DISTINCT | UNIQUE Clause**

If a **SELECT statement** specifies **DISTINCT** or **UNIQUE**, all duplicate rows are removed from the result set (one row is kept from each group of duplicates). The **DISTINCT** or **UNIQUE** clause are synonymous when used with a **SELECT statement**. The **ALL** keyword specifies the opposite: all rows are kept; that is the default.

Error messages resulting from the improper use of a **SELECT statement** that includes the **DISTINCT** or **UNIQUE** keywords will include both the **DISTINCT | UNIQUE** keywords as shown below:

```
psql: ERROR:  FOR UPDATE is not allowed with DISTINCT/UNIQUE clause
```
2.3.71.12 FOR UPDATE Clause

The `FOR UPDATE` clause takes the form:

```
FOR UPDATE [WAIT n|NOWAIT|SKIP LOCKED]
```

`FOR UPDATE` causes the rows retrieved by the `SELECT` statement to be locked as though for update. This prevents a row from being modified or deleted by other transactions until the current transaction ends; any transaction that attempts to `UPDATE`, `DELETE`, or `SELECT FOR UPDATE` a selected row will be blocked until the current transaction ends. If an `UPDATE`, `DELETE`, or `SELECT FOR UPDATE` from another transaction has already locked a selected row or rows, `SELECT FOR UPDATE` will wait for the first transaction to complete, and will then lock and return the updated row (or no row, if the row was deleted).

`FOR UPDATE` cannot be used in contexts where returned rows cannot be clearly identified with individual table rows (for example, with aggregation).

Use `FOR UPDATE` options to specify locking preferences:

- Include the `WAIT n` keywords to specify the number of seconds (or fractional seconds) that the `SELECT` statement will wait for a row locked by another session. Use a decimal form to specify fractional seconds; for example, `WAIT 1.5` instructs the server to wait one and a half seconds. Specify up to 4 digits to the right of the decimal.

- Include the `NOWAIT` keyword to report an error immediately if a row cannot be locked by the current session.

- Include `SKIP LOCKED` to instruct the server to lock rows if possible, and skip rows that are already locked by another session.
2.3.72 SET CONSTRAINTS

Name

SET CONSTRAINTS -- set constraint checking modes for the current transaction

Synopsis

SET CONSTRAINTS { ALL | name [, ...] } { DEFERRED | IMMEDIATE }

Description

SET CONSTRAINTS sets the behavior of constraint checking within the current transaction. IMMEDIATE constraints are checked at the end of each statement. DEFERRED constraints are not checked until transaction commit. Each constraint has its own IMMEDIATE or DEFERRED mode.

Upon creation, a constraint is given one of three characteristics: DEFERRABLE INITIALLY DEFERRED, DEFERRABLE INITIALLY IMMEDIATE, or NOT DEFERRABLE. The third class is always IMMEDIATE and is not affected by the SET CONSTRAINTS command. The first two classes start every transaction in the indicated mode, but their behavior can be changed within a transaction by SET CONSTRAINTS.

SET CONSTRAINTS with a list of constraint names changes the mode of just those constraints (which must all be deferrable). If there are multiple constraints matching any given name, all are affected. SET CONSTRAINTS ALL changes the mode of all deferrable constraints.

When SET CONSTRAINTS changes the mode of a constraint from DEFERRED to IMMEDIATE, the new mode takes effect retroactively: any outstanding data modifications that would have been checked at the end of the transaction are instead checked during the execution of the SET CONSTRAINTS command. If any such constraint is violated, the SET CONSTRAINTS fails (and does not change the constraint mode). Thus, SET CONSTRAINTS can be used to force checking of constraints to occur at a specific point in a transaction.

Currently, only foreign key constraints are affected by this setting. Check and unique constraints are always effectively not deferrable.
Notes

This command only alters the behavior of constraints within the current transaction. Thus, if you execute this command outside of a transaction block it will not appear to have any effect.
2.3.73 SET ROLE

Name

SET ROLE -- set the current user identifier of the current session

Synopsis

SET ROLE { rolename | NONE }

Description

This command sets the current user identifier of the current SQL session context to be rolename. After SET ROLE, permissions checking for SQL commands is carried out as though the named role were the one that had logged in originally.

The specified rolename must be a role that the current session user is a member of. (If the session user is a superuser, any role can be selected.)

NONE resets the current user identifier to be the current session user identifier. These forms may be executed by any user.

Notes

Using this command, it is possible to either add privileges or restrict one’s privileges. If the session user role has the INHERITS attribute, then it automatically has all the privileges of every role that it could SET ROLE to; in this case SET ROLE effectively drops all the privileges assigned directly to the session user and to the other roles it is a member of, leaving only the privileges available to the named role. On the other hand, if the session user role has the NOINHERITS attribute, SET ROLE drops the privileges assigned directly to the session user and instead acquires the privileges available to the named role. In particular, when a superuser chooses to SET ROLE to a non-superuser role, she loses her superuser privileges.

Examples

User mary takes on the identity of role admins:

```
SET ROLE admins;
```

User mary reverts back to her own identity:

```
SET ROLE NONE;
```
2.3.74  SET TRANSACTION

Name

SET TRANSACTION -- set the characteristics of the current transaction

Synopsis

SET TRANSACTION transaction_mode

where transaction_mode is one of:

   ISOLATION LEVEL { SERIALIZABLE | READ COMMITTED }  
   READ WRITE | READ ONLY

Description

The SET TRANSACTION command sets the characteristics of the current transaction. It has no effect on any subsequent transactions. The available transaction characteristics are the transaction isolation level and the transaction access mode (read/write or read-only). The isolation level of a transaction determines what data the transaction can see when other transactions are running concurrently:

READ COMMITTED

   A statement can only see rows committed before it began. This is the default.

SERIALIZABLE

   All statements of the current transaction can only see rows committed before the first query or data-modification statement was executed in this transaction.

The transaction isolation level cannot be changed after the first query or data-modification statement (SELECT, INSERT, DELETE, UPDATE, or FETCH) of a transaction has been executed. The transaction access mode determines whether the transaction is read/write or read-only. Read/write is the default.

When a transaction is read-only, the following SQL commands are disallowed: INSERT, UPDATE, and DELETE if the table they would write to is not a temporary table; all CREATE, ALTER, and DROP commands; COMMENT, GRANT, REVOKE, TRUNCATE; and EXECUTE if the command it would execute is among those listed. This is a high-level notion of read-only that does not prevent all writes to disk.
2.3.75 TRUNCATE

Name

TRUNCATE -- empty a table

Synopsis

TRUNCATE TABLE name [DROP STORAGE]

Description

TRUNCATE quickly removes all rows from a table. It has the same effect as an unqualified DELETE, but since it does not actually scan the table, it is faster. This is most useful on large tables.

The DROP STORAGE clause is accepted for compatibility, but is ignored.

Parameters

name

The name (optionally schema-qualified) of the table to be truncated.

Notes

TRUNCATE cannot be used if there are foreign-key references to the table from other tables. Checking validity in such cases would require table scans, and the whole point is not to do one.

TRUNCATE will not run any user-defined ON DELETE triggers that might exist for the table.

Examples

Truncate the table bigtable:

TRUNCATE TABLE bigtable;

See Also

DROP VIEW, DELETE
2.3.76 UPDATE

Name
UPDATE -- updaterows of a table

Synopsis
UPDATE [ optimizer_hint ] table[@dblink ]
  SET column = { expression | DEFAULT } [, ...]
  [ WHERE condition ]
  [ RETURNING return_expression [, ...]
    { INTO { record | variable [, ...] } |
      BULK COLLECT INTO collection [, ...] } ]

Description
UPDATE changes the values of the specified columns in all rows that satisfy the condition. Only the columns to be modified need be mentioned in the SET clause; columns not explicitly modified retain their previous values.

The RETURNING INTO { record | variable [, ...] } clause may only be specified within an SPL program. In addition the result set of the UPDATE command must not return more than one row, otherwise an exception is thrown. If the result set is empty, then the contents of the target record or variables are set to null.

The RETURNING BULK COLLECT INTO collection [, ...] clause may only be specified if the UPDATE command is used within an SPL program. If more than one collection is specified as the target of the BULK COLLECT INTO clause, then each collection must consist of a single, scalar field – i.e., collection must not be a record. The result set of the UPDATE command may contain none, one, or more rows. return_expression evaluated for each row of the result set, becomes an element in collection starting with the first element. Any existing rows in collection are deleted. If the result set is empty, then collection will be empty.

You must have the UPDATE privilege on the table to update it, as well as the SELECT privilege to any table whose values are read in expression or condition.

Parameters
optimizer_hint
Comment-embedded hints to the optimizer for selection of an execution plan.
table

The name (optionally schema-qualified) of the table to update.

dblink

Database link name identifying a remote database. See the CREATE DATABASE LINK command for information on database links.

column

The name of a column in table.

expression

An expression to assign to the column. The expression may use the old values of this and other columns in the table.

DEFAULT

Set the column to its default value (which will be null if no specific default expression has been assigned to it).

condition

An expression that returns a value of type BOOLEAN. Only rows for which this expression returns true will be updated.

return_expression

An expression that may include one or more columns from table. If a column name from table is specified in return_expression, the value substituted for the column when return_expression is evaluated is determined as follows:

If the column specified in return_expression is assigned a value in the UPDATE command, then the assigned value is used in the evaluation of return_expression.

If the column specified in return_expression is not assigned a value in the UPDATE command, then the column’s current value in the affected row is used in the evaluation of return_expression.

record

A record whose field the evaluated return_expression is to be assigned. The first return_expression is assigned to the first field in record, the second
return_expression is assigned to the second field in record, etc. The number of fields in record must exactly match the number of expressions and the fields must be type-compatible with their assigned expressions.

variable

A variable to which the evaluated return_expression is to be assigned. If more than one return_expression and variable are specified, the first return_expression is assigned to the first variable, the second return_expression is assigned to the second variable, etc. The number of variables specified following the INTO keyword must exactly match the number of expressions following the RETURNING keyword and the variables must be type-compatible with their assigned expressions.

collection

A collection in which an element is created from the evaluated return_expression. There can be either a single collection which may be a collection of a single field or a collection of a record type, or there may be more than one collection in which case each collection must consist of a single field. The number of return expressions must match in number and order the number of fields in all specified collections. Each corresponding return_expression and collection field must be type-compatible.

Examples

Change the location to AUSTIN for department 20 in the dept table:

```
UPDATE dept SET loc = 'AUSTIN' WHERE deptno = 20;
```

For all employees with job = SALESMAN in the emp table, update the salary by 10% and increase the commission by 500.

```
UPDATE emp SET sal = sal * 1.1, comm = comm + 500 WHERE job = 'SALESMAN';
```
2.4 Functions and Operators

Advanced Server provides a large number of functions and operators for the built-in data types.

2.4.1 Logical Operators

The usual logical operators are available: AND, OR, NOT

SQL uses a three-valued Boolean logic where the null value represents "unknown". Observe the following truth tables:

Table 2-11 AND/OR Truth Table

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>a AND b</th>
<th>a OR b</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td>True</td>
<td>Null</td>
<td>Null</td>
<td>True</td>
</tr>
<tr>
<td>False</td>
<td>False</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>False</td>
<td>Null</td>
<td>False</td>
<td>Null</td>
</tr>
<tr>
<td>Null</td>
<td>Null</td>
<td>Null</td>
<td>Null</td>
</tr>
</tbody>
</table>

Table 2-12 NOT Truth Table

<table>
<thead>
<tr>
<th>a</th>
<th>NOT a</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td>Null</td>
<td>Null</td>
</tr>
</tbody>
</table>

The operators AND and OR are commutative, that is, you can switch the left and right operand without affecting the result.
2.4.2 Comparison Operators

The usual comparison operators are shown in the following table.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;</td>
<td>Less than</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater than</td>
</tr>
<tr>
<td>&lt;=</td>
<td>Less than or equal to</td>
</tr>
<tr>
<td>&gt;=</td>
<td>Greater than or equal to</td>
</tr>
<tr>
<td>=</td>
<td>Equal</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>Not equal</td>
</tr>
<tr>
<td>!=</td>
<td>Not equal</td>
</tr>
</tbody>
</table>

Comparison operators are available for all data types where this makes sense. All comparison operators are binary operators that return values of type `BOOLEAN`; expressions like `1 < 2 < 3` are not valid (because there is no `<` operator to compare a Boolean value with 3).

In addition to the comparison operators, the special `BETWEEN` construct is available.

```
a BETWEEN x AND y
```

is equivalent to

```
a >= x AND a <= y
```

Similarly,

```
a NOT BETWEEN x AND y
```

is equivalent to

```
a < x OR a > y
```

There is no difference between the two respective forms apart from the CPU cycles required to rewrite the first one into the second one internally.

To check whether a value is or is not null, use the constructs

```
extpression IS NULL
expression IS NOT NULL
```
Do not write `expression = NULL` because NULL is not "equal to" NULL. (The null value represents an unknown value, and it is not known whether two unknown values are equal.) This behavior conforms to the SQL standard.

Some applications may expect that `expression = NULL` returns true if `expression` evaluates to the null value. It is highly recommended that these applications be modified to comply with the SQL standard.
2.4.3 Mathematical Functions and Operators

Mathematical operators are provided for many Advanced Server types. For types without common mathematical conventions for all possible permutations (e.g., date/time types) the actual behavior is described in subsequent sections.

The following table shows the available mathematical operators.

Table 2-14 Mathematical Operators

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
<th>Example</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Addition</td>
<td>2 + 3</td>
<td>5</td>
</tr>
<tr>
<td>-</td>
<td>Subtraction</td>
<td>2 - 3</td>
<td>-1</td>
</tr>
<tr>
<td>*</td>
<td>Multiplication</td>
<td>2 * 3</td>
<td>6</td>
</tr>
<tr>
<td>/</td>
<td>Division (See the following note.)</td>
<td>4 / 2</td>
<td>2</td>
</tr>
<tr>
<td>**</td>
<td>Exponentiation Operator</td>
<td>2 ** 3</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: If the `db_dialect` configuration parameter in the `postgresql.conf` file is set to `redwood`, then division of a pair of `INTEGER` data types does not result in a truncated value. Any fractional result is retained as shown by the following example:

```
edb=# SET db_dialect TO redwood;
SET
edb=# SHOW db_dialect;
db_dialect
-------
  redwood
(1 row)
edb=# SELECT CAST('10' AS INTEGER) / CAST('3' AS INTEGER) FROM dual;
?column?
-----------
 3.3333333333333333
(1 row)
```

This behavior is compatible with Oracle databases where there is no native `INTEGER` data type, and any `INTEGER` datatype specification is internally converted to `NUMBER(38)`, which results in retaining any fractional result.

If the `db_dialect` configuration parameter is set to `postgres`, then division of a pair of `INTEGER` data types results in a truncated value as shown by the following example:

```
edb=# SET db_dialect TO postgres;
SET
edb=# SHOW db_dialect;
db_dialect
-------
   postgres
(1 row)
edb=# SELECT CAST('10' AS INTEGER) / CAST('3' AS INTEGER) FROM dual;
?column?
--------
 3
(1 row)
```
This behavior is compatible with PostgreSQL databases where division involving any pair of INTEGER, SMALLINT, or BIGINT data types results in truncation of the result. The same truncated result is returned by Advanced Server when `db_dialect` is set to `postgres` as shown in the previous example.

Note however, that even when `db_dialect` is set to `redwood`, only division with a pair of INTEGER data types results in no truncation of the result. Division that includes only SMALLINT or BIGINT data types, with or without an INTEGER data type, does result in truncation in the PostgreSQL fashion without retaining the fractional portion as shown by the following where INTEGER and SMALLINT are involved in the division:

```
edb=# SHOW db_dialect;
db_dialect
-------
redwood
(1 row)
edb=# SELECT CAST('10' AS INTEGER) / CAST('3' AS SMALLINT) FROM dual;
?column?
---------
3
(1 row)
```

The following table shows the available mathematical functions. Many of these functions are provided in multiple forms with different argument types. Except where noted, any given form of a function returns the same data type as its argument. The functions working with DOUBLE PRECISION data are mostly implemented on top of the host system’s C library; accuracy and behavior in boundary cases may therefore vary depending on the host system.

**Table 2-15 Mathematical Functions**

<table>
<thead>
<tr>
<th>Function</th>
<th>Return Type</th>
<th>Description</th>
<th>Example</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS(x)</td>
<td>Same as x</td>
<td>Absolute value</td>
<td>ABS(-17.4)</td>
<td>17.4</td>
</tr>
<tr>
<td>CEIL(DOUBLE PRECISION or NUMBER)</td>
<td>Same as input</td>
<td>Smallest integer not less than argument</td>
<td>CEIL(-42.8)</td>
<td>-42</td>
</tr>
<tr>
<td>EXP(DOUBLE PRECISION or NUMBER)</td>
<td>Same as input</td>
<td>Exponential</td>
<td>EXP(1.0)</td>
<td>2.7182818284590452</td>
</tr>
<tr>
<td>FLOOR(DOUBLE PRECISION or NUMBER)</td>
<td>Same as input</td>
<td>Largest integer not greater than argument</td>
<td>FLOOR(-42.8)</td>
<td>43</td>
</tr>
<tr>
<td>LN(DOUBLE PRECISION or NUMBER)</td>
<td>Same as input</td>
<td>Natural logarithm</td>
<td>LN(2.0)</td>
<td>0.6931471805599453</td>
</tr>
<tr>
<td>LOG(b NUMBER, x)</td>
<td>NUMBER</td>
<td>Logarithm to base b</td>
<td>LOG(2.0, 64.0)</td>
<td>6.000000000000000 00</td>
</tr>
<tr>
<td>MOD(y, x)</td>
<td>Same as argument types</td>
<td>Remainder of y/x</td>
<td>MOD(9, 4)</td>
<td>1</td>
</tr>
<tr>
<td>NVL(x, y)</td>
<td>Same as argument types; where both arguments are of</td>
<td>If x is null, then NVL returns y</td>
<td>NVL(9, 0)</td>
<td>9</td>
</tr>
</tbody>
</table>
### Trigonometric Functions

The following table shows the available trigonometric functions. All trigonometric functions take arguments and return values of type `DOUBLE PRECISION`.

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACOS(x)</td>
<td>Inverse cosine</td>
</tr>
<tr>
<td>ASIN(x)</td>
<td>Inverse sine</td>
</tr>
<tr>
<td>ATAN(x)</td>
<td>Inverse tangent</td>
</tr>
<tr>
<td>ATAN2(x, y)</td>
<td>Inverse tangent of x/y</td>
</tr>
<tr>
<td>COS(x)</td>
<td>Cosine</td>
</tr>
<tr>
<td>SIN(x)</td>
<td>Sine</td>
</tr>
<tr>
<td>TAN(x)</td>
<td>Tangent</td>
</tr>
</tbody>
</table>
2.4.4 String Functions and Operators

This section describes functions and operators for examining and manipulating string values. Strings in this context include values of the types `CHAR`, `VARCHAR2`, and `CLOB`. Unless otherwise noted, all of the functions listed below work on all of these types, but be wary of potential effects of automatic padding when using the `CHAR` type. Generally, the functions described here also work on data of non-string types by converting that data to a string representation first.

<table>
<thead>
<tr>
<th>Function</th>
<th>Return Type</th>
<th>Description</th>
<th>Example</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>`string</td>
<td></td>
<td>string`</td>
<td>CLOB</td>
<td>String concatenation</td>
</tr>
<tr>
<td><code>CONCAT(string, string)</code></td>
<td>CLOB</td>
<td>String concatenation</td>
<td>'a'</td>
<td></td>
</tr>
<tr>
<td><code>HEXTORAW(varchar2)</code></td>
<td>RAW</td>
<td>Converts a <code>VARCHAR2</code> value to a <code>RAW</code> value</td>
<td>HEXTORAW('303132')</td>
<td>'012'</td>
</tr>
<tr>
<td><code>RAWTOHEX(raw)</code></td>
<td>VARCHAR2</td>
<td>Converts a <code>RAW</code> value to a <code>HEXADECIMAL</code> value</td>
<td>RAWTOHEX('012')</td>
<td>'303132'</td>
</tr>
<tr>
<td><code>INSTR(string, set, [start [, occurrence ]])</code></td>
<td>INTEGER</td>
<td>Finds the location of a set of characters in a string, starting at position <code>start</code> in the string, <code>string</code>, and looking for the first, second, third and so on occurrences of the set. Returns 0 if the set is not found.</td>
<td>INSTR('PETER PIPER PICKED a PECK of PICKLED PEPPERS','PI',1,3)</td>
<td>30</td>
</tr>
<tr>
<td><code>INSTRB(string, set)</code></td>
<td>INTEGER</td>
<td>Returns the position of the set within the string.</td>
<td>INSTRB('PETER PIPER PICKED a PECK of PICKLED PEPPERS','PICK')</td>
<td>13</td>
</tr>
<tr>
<td><code>INSTRB(string, set, start)</code></td>
<td>INTEGER</td>
<td>Returns the position of the set within the string, beginning at <code>start</code>. Returns 0 if <code>set</code> is not found.</td>
<td>INSTRB('PETER PIPER PICKED a PECK of PICKLED PEPPERS','PICK',14)</td>
<td>30</td>
</tr>
<tr>
<td><code>INSTRB(string, set, start, occurrence)</code></td>
<td>INTEGER</td>
<td>Returns the position of the specified occurrence of <code>set</code> within the string, beginning at <code>start</code>. Returns 0 if <code>set</code> is not found.</td>
<td>INSTRB('PETER PIPER PICKED a PECK of PICKLED PEPPERS','PICK',1,2)</td>
<td>30</td>
</tr>
<tr>
<td><code>LOWER(string)</code></td>
<td>CLOB</td>
<td>Convert <code>string</code> to lower case</td>
<td>LOWER('TOM')</td>
<td>tom</td>
</tr>
<tr>
<td><code>SUBSTR(string, start [, count ])</code></td>
<td>CLOB</td>
<td>Extract substring starting from <code>start</code> and going for <code>count</code> characters. If <code>count</code> is not specified, the string is clipped from the start till the end.</td>
<td>SUBSTR('This is a test',6,2)</td>
<td>is</td>
</tr>
<tr>
<td><code>SUBSTRB(string, start [, count ])</code></td>
<td>CLOB</td>
<td>Same as <code>SUBSTR</code> except <code>start</code> and <code>count</code> are in double-byte characters.</td>
<td>SUBSTRB('abc',3) (assuming a double-byte)</td>
<td>c</td>
</tr>
</tbody>
</table>

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Additional string manipulation functions are available and are listed in the following table. Some of them are used internally to implement the SQL-standard string functions listed in Table 2-17.

Table 2-18 Other String Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Return Type</th>
<th>Description</th>
<th>Example</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCII(string)</td>
<td>INTEGER</td>
<td>ASCII code of the first byte of the argument</td>
<td>ASCII('x')</td>
<td>120</td>
</tr>
<tr>
<td>CHR(INTEGER)</td>
<td>CLOB</td>
<td>Character with the given ASCII code</td>
<td>CHR(65)</td>
<td>A</td>
</tr>
<tr>
<td>DECODE(expr, expr1a, expr1b [, expr2a, expr2b ]... [ , default ] )</td>
<td>Same as argument types of expr1a, expr1b, expr2b,..., default</td>
<td>Finds first match of expr with expr1a, expr2a, etc. When match found, returns corresponding parameter pair, expr1b, expr2b, etc. If no match found, returns default. If no match found</td>
<td>DECODE(3, 1,'One', 2,'Two', 3,'Three', 'Not found')</td>
<td>Three</td>
</tr>
<tr>
<td>Function</td>
<td>Return Type</td>
<td>Description</td>
<td>Example</td>
<td>Result</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------</td>
<td>-----------</td>
</tr>
<tr>
<td>INITCAP(string)</td>
<td>CLOB</td>
<td>Convert the first letter of each word to uppercase and the rest to lowercase. Words are sequences of alphanumeric characters separated by non-alphanumeric characters.</td>
<td>INITCAP('hi THOMAS')</td>
<td>Hi Thomas</td>
</tr>
<tr>
<td>LENGTH</td>
<td>INTEGER</td>
<td>Returns the number of characters in a string value.</td>
<td>LENGTH('Côte d’Azur')</td>
<td>11</td>
</tr>
<tr>
<td>LENGTHC</td>
<td>INTEGER</td>
<td>This function is identical in functionality to LENGTH; the function name is supported for compatibility.</td>
<td>LENGTHC('Côte d’Azur')</td>
<td>11</td>
</tr>
<tr>
<td>LENGTH2</td>
<td>INTEGER</td>
<td>This function is identical in functionality to LENGTH; the function name is supported for compatibility.</td>
<td>LENGTH2('Côte d’Azur')</td>
<td>11</td>
</tr>
<tr>
<td>LENGTH4</td>
<td>INTEGER</td>
<td>This function is identical in functionality to LENGTH; the function name is supported for compatibility.</td>
<td>LENGTH4('Côte d’Azur')</td>
<td>11</td>
</tr>
<tr>
<td>LENGTHB</td>
<td>INTEGER</td>
<td>Returns the number of bytes required to hold the given value.</td>
<td>LENGTHB('Côte d’Azur')</td>
<td>12</td>
</tr>
<tr>
<td>LPAD(string, length INTEGER [, fill ])</td>
<td>CLOB</td>
<td>Fill up string to size, length by prepending the characters, fill (a space by default). If string is already longer than length then it is truncated (on the right).</td>
<td>LPAD('hi', 5, 'xy')</td>
<td>xyxhi</td>
</tr>
<tr>
<td>REPLACE(string, search_string [, , replace_string ] )</td>
<td>CLOB</td>
<td>Replaces one value in a string with another. If you do not specify a value for replace_string, the search_string value when found, is removed.</td>
<td>REPLACE ('GEORGE', 'GE', 'EG')</td>
<td>EGOREG</td>
</tr>
<tr>
<td>RPAD(string, length INTEGER [, fill ])</td>
<td>CLOB</td>
<td>Fill up string to size, length by appending the characters, fill (a space by default). If string is already longer than length then it is truncated.</td>
<td>RPAD('hi', 5, 'xy')</td>
<td>hixyx</td>
</tr>
<tr>
<td>TRANSLATE(string, from, to)</td>
<td>CLOB</td>
<td>Any character in string that matches a character in the from set is replaced by the corresponding character in the to set.</td>
<td>TRANSLATE('12345', '14', 'ax')</td>
<td>a23x5</td>
</tr>
</tbody>
</table>
2.4.4.1 Truncation of String Text Resulting from Concatenation with NULL

**Note:** This section describes a functionality that is not compatible with Oracle databases, which may lead to some inconsistency when converting data from Oracle to Advanced Server.

For Advanced Server, when a column value is **NULL**, the concatenation of the column with a text string may result in either of the following:

- Return of the text string
- Disappearance of the text string (that is, a null result)

The result is dependent upon the data type of the **NULL** column and the way in which the concatenation is done.

If one uses the string concatenation operator `||`, then the types that have implicit coercion to text as listed in Table 2-19 will not truncate the string if one of the input parameters is **NULL**, whereas for other types it will truncate the string unless the explicit type cast is used (that is, `::text`). Also, to see the consistent behavior in the presence of nulls, one can use the `CONCAT` function.

The following query lists the data types that have implicit coercion to text:

```sql
SELECT castsource::regtype, casttarget::regtype, castfunc::regproc, 
    CASE castcontext 
        WHEN 'e' THEN 'explicit' 
        WHEN 'a' THEN 'implicit in assignment' 
        WHEN 'i' THEN 'implicit in expressions' 
    END as castcontext, 
    CASE castmethod 
        WHEN 'f' THEN 'function' 
        WHEN 'i' THEN 'input/output function' 
        WHEN 'b' THEN 'binary-coercible' 
    END as castmethod 
FROM pg_cast 
WHERE casttarget::regtype::text = 'text' 
    AND castcontext='i';
```

The result of the query is listed in the following table:

<table>
<thead>
<tr>
<th>castsource</th>
<th>casttarget</th>
<th>castfunc</th>
<th>castcontext</th>
<th>castmethod</th>
</tr>
</thead>
<tbody>
<tr>
<td>character</td>
<td>text</td>
<td>pg_catalog.text</td>
<td>implicit in expressions</td>
<td>function</td>
</tr>
<tr>
<td>character varying</td>
<td>text</td>
<td>-</td>
<td>implicit in expressions</td>
<td>binary-coercible</td>
</tr>
<tr>
<td>&quot;char&quot;</td>
<td>text</td>
<td>pg_catalog.text</td>
<td>implicit in expressions</td>
<td>function</td>
</tr>
</tbody>
</table>
For information on the column output, see the \texttt{pg\_cast} system catalog in the PostgreSQL core documentation available at:

\url{https://www.postgresql.org/docs/12/static/catalog-pg-cast.html}

So for example, data type \texttt{UUID} is not in this list and therefore does not have the implicit coercion to \texttt{text}. As a result, certain concatenation attempts with a \texttt{NULL UUID} column results in a truncated text result.

The following table is created for this example with a single row with all \texttt{NULL} column values.

```sql
CREATE TABLE null_concat_types (
    boolean_type    BOOLEAN,
    uuid_type       UUID,
    char_type       CHARACTER
);
INSERT INTO null_concat_types VALUES (NULL, NULL, NULL);
```
Columns `boolean_type` and `char_type` have the implicit coercion to text while column `uuid_type` does not.

Thus, string concatenation with the concatenation operator `||` against columns `boolean_type` or `char_type` results in the following:

```sql
SELECT 'x=' || boolean_type || 'y' FROM null_concat_types;
```

<table>
<thead>
<tr>
<th>?column?</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>x=y</td>
</tr>
<tr>
<td>(1 row)</td>
</tr>
</tbody>
</table>

```sql
SELECT 'x=' || char_type || 'y' FROM null_concat_types;
```

<table>
<thead>
<tr>
<th>?column?</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>x=y</td>
</tr>
<tr>
<td>(1 row)</td>
</tr>
</tbody>
</table>

But concatenation with column `uuid_type` results in the loss of the `x=` string:

```sql
SELECT 'x=' || uuid_type || 'y' FROM null_concat_types;
```

<table>
<thead>
<tr>
<th>?column?</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>y</td>
</tr>
<tr>
<td>(1 row)</td>
</tr>
</tbody>
</table>

However, using explicit casting with `::text` prevents the loss of the `x=` string:

```sql
SELECT 'x=' || uuid_type::text || 'y' FROM null_concat_types;
```

<table>
<thead>
<tr>
<th>?column?</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>x=y</td>
</tr>
<tr>
<td>(1 row)</td>
</tr>
</tbody>
</table>

Using the `CONCAT` function also preserves the `x=` string:

```sql
SELECT CONCAT('x=' ,uuid_type) || 'y' FROM null_concat_types;
```

<table>
<thead>
<tr>
<th>?column?</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>x=y</td>
</tr>
<tr>
<td>(1 row)</td>
</tr>
</tbody>
</table>

Thus, depending upon the data type of a NULL column, explicit casting or the `CONCAT` function should be used to avoid loss of some text string.
2.4.4.2 SYS_GUID

The SYS_GUID function generates and returns a globally unique identifier; the identifier takes the form of 16 bytes of RAW data. The SYS_GUID function is based on the uuid-ossp module to generate universally unique identifiers. The synopsis is:

SYS_GUID()

Example

The following example adds a column to the table EMP, inserts a unique identifier, and returns a 16-byte RAW value:

```sql
edb=# CREATE TABLE EMP(C1 RAW (16) DEFAULT SYS_GUID() PRIMARY KEY, C2 INT);
CREATE TABLE
edb=# INSERT INTO EMP(C2) VALUES (1);
INSERT 0 1
edb=# SELECT * FROM EMP;
c1                    | c2
-------------------------------+----
\xb944970d3a1b42a7a2119265c49cbb7f | 1
(1 row)
```
2.4.5 Pattern Matching String Functions

Advanced Server offers support for the `REGEXP_COUNT`, `REGEXP_INSTR` and `REGEXP_SUBSTR` functions. These functions search a string for a pattern specified by a regular expression, and return information about occurrences of the pattern within the string. The pattern should be a POSIX-style regular expression; for more information about forming a POSIX-style regular expression, please refer to the core documentation at:

https://www.postgresql.org/docs/12/static/functions-matching.html

2.4.5.1 REGEXP_COUNT

`REGEXP_COUNT` searches a string for a regular expression, and returns a count of the times that the regular expression occurs. The signature is:

```
INTEGER REGEXP_COUNT
(
  srcstr TEXT,
  pattern TEXT,
  position DEFAULT 1
  modifier DEFAULT NULL
)
```

Parameters

```
srcstr
```

`srcstr` specifies the string to search.

```
pattern
```

`pattern` specifies the regular expression for which `REGEXP_COUNT` will search.

```
position
```

`position` is an integer value that indicates the position in the source string at which `REGEXP_COUNT` will begin searching. The default value is 1.
modifier

*modifier* specifies values that control the pattern matching behavior. The default value is NULL. For a complete list of the modifiers supported by Advanced Server, see the PostgreSQL core documentation available at:

https://www.postgresql.org/docs/12/static/functions-matching.html

**Example**

In the following simple example, `REGEXP_COUNT` returns a count of the number of times the letter *i* is used in the character string 'reinitializing':

```
edb=# SELECT REGEXP_COUNT('reinitializing', 'i', 1) FROM DUAL;
  regexp_count
--------------
     5
(1 row)
```

In the first example, the command instructs `REGEXP_COUNT` begins counting in the first position; if we modify the command to start the count on the 6th position:

```
edb=# SELECT REGEXP_COUNT('reinitializing', 'i', 6) FROM DUAL;
  regexp_count
--------------
     3
(1 row)
```

`REGEXP_COUNT` returns 3; the count now excludes any occurrences of the letter *i* that occur before the 6th position.

### 2.4.5.2 REGEXP_INSTR

`REGEXP_INSTR` searches a string for a POSIX-style regular expression. This function returns the position within the string where the match was located. The signature is:

```
INTEGER REGEXP_INSTR
  (
    srcstr TEXT,
    pattern TEXT,
    position INT DEFAULT 1,
    occurrence INT DEFAULT 1,
    returnparam INT DEFAULT 0,
    modifier TEXT DEFAULT NULL,
    subexpression INT DEFAULT 0,
  )
```
Parameters:

srcstr

srcstr specifies the string to search.

pattern

pattern specifies the regular expression for which REGEXP_INSTR will search.

position

position specifies an integer value that indicates the start position in a source string. The default value is 1.

occurrence

occurrence specifies which match is returned if more than one occurrence of the pattern occurs in the string that is searched. The default value is 1.

returnparam

returnparam is an integer value that specifies the location within the string that REGEXP_INSTR should return. The default value is 0. Specify:

0 to return the location within the string of the first character that matches pattern.

A value greater than 0 to return the position of the first character following the end of the pattern.

modifier

modifier specifies values that control the pattern matching behavior. The default value is NULL. For a complete list of the modifiers supported by Advanced Server, see the PostgreSQL core documentation available at:

https://www.postgresql.org/docs/12/static/functions-matching.html

subexpression

subexpression is an integer value that identifies the portion of the pattern that will be returned by REGEXP_INSTR. The default value of subexpression is 0.
If you specify a value for subexpression, you must include one (or more) set of parentheses in the pattern that isolate a portion of the value being searched for. The value specified by subexpression indicates which set of parentheses should be returned; for example, if subexpression is 2, REGEXP_INSTR will return the position of the second set of parentheses.

Example

In the following simple example, REGEXP_INSTR searches a string that contains the phone number for the first occurrence of a pattern that contains three consecutive digits:

```
edb=# SELECT REGEXP_INSTR('800-555-1212', '[0-9][0-9][0-9]', 1, 1) FROM DUAL;
regexp_instr
-----------
1
(1 row)
```

The command instructs REGEXP_INSTR to return the position of the first occurrence. If we modify the command to return the start of the second occurrence of three consecutive digits:

```
edb=# SELECT REGEXP_INSTR('800-555-1212', '[0-9][0-9][0-9]', 1, 2) FROM DUAL;
regexp_instr
-----------
5
(1 row)
```

REGEXP_INSTR returns 5; the second occurrence of three consecutive digits begins in the 5th position.

### 2.4.5.3 REGEXP_SUBSTR

The REGEXP_SUBSTR function searches a string for a pattern specified by a POSIX compliant regular expression. REGEXP_SUBSTR returns the string that matches the pattern specified in the call to the function. The signature of the function is:

```
TEXT REGEXP_SUBSTR
(
    srcstr TEXT,
    pattern TEXT,
    position INT DEFAULT 1,
    occurrence INT DEFAULT 1,
    modifier TEXT DEFAULT NULL,
    subexpression INT DEFAULT 0
)
```
Parameters:

srcstr

srcstr specifies the string to search.

pattern

pattern specifies the regular expression for which REGEXP_SUBSTR will search.

position

position specifies an integer value that indicates the start position in a source string. The default value is 1.

occurrence

occurrence specifies which match is returned if more than one occurrence of the pattern occurs in the string that is searched. The default value is 1.

modifier

modifier specifies values that control the pattern matching behavior. The default value is NULL. For a complete list of the modifiers supported by Advanced Server, see the PostgreSQL core documentation available at:

https://www.postgresql.org/docs/12/static/functions-matching.html

subexpression

subexpression is an integer value that identifies the portion of the pattern that will be returned by REGEXP_SUBSTR. The default value of subexpression is 0.

If you specify a value for subexpression, you must include one (or more) set of parentheses in the pattern that isolate a portion of the value being searched for. The value specified by subexpression indicates which set of parentheses should be returned; for example, if subexpression is 2, REGEXP_SUBSTR will return the value contained within the second set of parentheses.

Example

In the following simple example, REGEXP_SUBSTR searches a string that contains a phone number for the first set of three consecutive digits:
It locates the first occurrence of three digits and returns the string (800); if we modify the command to check for the second occurrence of three consecutive digits:

```
edb=# SELECT REGEXP_SUBSTR('800-555-1212', '[0-9][0-9][0-9]', 1, 2) FROM DUAL;
regexp_substr
------------
555
(1 row)
```

REGEXP_SUBSTR returns 555, the contents of the second substring.
2.4.6 Pattern Matching Using the LIKE Operator

Advanced Server provides pattern matching using the traditional SQL LIKE operator. The syntax for the LIKE operator is as follows.

```
string LIKE pattern [ ESCAPE escape-character ]
string NOT LIKE pattern [ ESCAPE escape-character ]
```

Every pattern defines a set of strings. The LIKE expression returns TRUE if string is contained in the set of strings represented by pattern. As expected, the NOT LIKE expression returns FALSE if LIKE returns TRUE, and vice versa. An equivalent expression is NOT (string LIKE pattern).

If pattern does not contain percent signs or underscore, then the pattern only represents the string itself; in that case LIKE acts like the equals operator. An underscore (\_\_) in pattern stands for (matches) any single character; a percent sign (\%) matches any string of zero or more characters.

Some examples:

```
'abc' LIKE 'abc'    true
'abc' LIKE 'a%'     true
'abc' LIKE '_b_'    true
'abc' LIKE 'c'      false
```

LIKE pattern matches always cover the entire string. To match a pattern anywhere within a string, the pattern must therefore start and end with a percent sign.

To match a literal underscore or percent sign without matching other characters, the respective character in pattern must be preceded by the escape character. The default escape character is the backslash but a different one may be selected by using the ESCAPE clause. To match the escape character itself, write two escape characters.

Note that the backslash already has a special meaning in string literals, so to write a pattern constant that contains a backslash you must write two backslashes in an SQL statement. Thus, writing a pattern that actually matches a literal backslash means writing four backslashes in the statement. You can avoid this by selecting a different escape character with ESCAPE; then a backslash is not special to LIKE anymore. (But it is still special to the string literal parser, so you still need two of them.)

It’s also possible to select no escape character by writing ESCAPE ''. This effectively disables the escape mechanism, which makes it impossible to turn off the special meaning of underscore and percent signs in the pattern.
2.4.7 Data Type Formatting Functions

The Advanced Server formatting functions described in the following table provide a powerful set of tools for converting various data types (date/time, integer, floating point, numeric) to formatted strings and for converting from formatted strings to specific data types. These functions all follow a common calling convention: the first argument is the value to be formatted and the second argument is a string template that defines the output or input format.

Table 2-20 Formatting Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Return Type</th>
<th>Description</th>
<th>Example</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO_CHAR(DATE [, format])</td>
<td>VARCHAR2</td>
<td>Convert a date/time to a string with output, format. If omitted default format is DD-MON-YY.</td>
<td>TO_CHAR(SYSDATE, 'MM/DD/YYYY HH12:MI:SS AM')</td>
<td>07/25/2007 09:43:02 AM</td>
</tr>
<tr>
<td>TO_CHAR(TIMESTAMP [, format])</td>
<td>VARCHAR2</td>
<td>Convert a timestamp to a string with output, format. If omitted default format is DD-MON-YY.</td>
<td>TO_CHAR(CURRENT_TIMESTAMP, 'MM/DD/YYYY HH12:MI:SS AM')</td>
<td>08/13/2015 08:55:22 PM</td>
</tr>
<tr>
<td>TO_CHAR(INTEGER [, format])</td>
<td>VARCHAR2</td>
<td>Convert an integer to a string with output, format</td>
<td>TO_CHAR(2412, '999,999S')</td>
<td>2,412+</td>
</tr>
<tr>
<td>TO_CHAR(NUMBER [, format])</td>
<td>VARCHAR2</td>
<td>Convert a decimal number to a string with output, format</td>
<td>TO_CHAR(10125.35, '999,999.99')</td>
<td>10,125.35</td>
</tr>
<tr>
<td>TO_CHAR(DOUBLE PRECISION, format)</td>
<td>VARCHAR2</td>
<td>Convert a floating-point number to a string with output, format</td>
<td>TO_CHAR(CAST(123.5282 AS REAL), '999.99')</td>
<td>123.53</td>
</tr>
<tr>
<td>TO_DATE(string [, format])</td>
<td>DATE</td>
<td>Convert a date formatted string to a DATE data type</td>
<td>TO_DATE('2007-07-04 13:39:10', 'YYYY-MM-DD HH24:MI:SS')</td>
<td>04-JUL-07 13:39:10</td>
</tr>
<tr>
<td>TO_NUMBER(string [, format])</td>
<td>NUMBER</td>
<td>Convert a number formatted string to a NUMBER data type</td>
<td>TO_NUMBER('2,412-', '999,999S')</td>
<td>-2412</td>
</tr>
<tr>
<td>TO_TIMESTAMP(string, format)</td>
<td>TIMESTAMP TZ</td>
<td>Convert a timestamp formatted string to a TIMESTAMPTZ data type</td>
<td>TO_TIMESTAMP('05 Dec 2000 08:30:25 pm', 'DD Mon YYYY hh12:mi:ss pm')</td>
<td>05-DEC-00 20:30:25 +05:30</td>
</tr>
</tbody>
</table>

In an output template string (for TO_CHAR), there are certain patterns that are recognized and replaced with appropriately-formatted data from the value to be formatted. Any text that is not a template pattern is simply copied verbatim. Similarly, in an input template...
string (for anything but \texttt{TO\_CHAR}), template patterns identify the parts of the input data string to be looked at and the values to be found there.

If you do not specify a date, month, or year when calling \texttt{TO\_TIMESTAMP} or \texttt{TO\_DATE}, then by default the output format considers the first date of a current month or current year respectively. In the following example, date, month, and year is not specified in the input string; \texttt{TO\_TIMESTAMP} and \texttt{TO\_DATE} returns a default value of the first date of a current month and current year.

\begin{verbatim}
edb=# select to_timestamp('12', 'HH');
    to_timestamp
    ---------------------------
    01-JUL-19 12:00:00 +05:30
    (1 row)

deb=# select to_date('12', 'HH');
    to_date
    -----------------
    01-JUL-19 12:00:00
    (1 row)
\end{verbatim}

The following table shows the template patterns available for formatting date values using the \texttt{TO\_CHAR}, \texttt{TO\_DATE}, and \texttt{TO\_TIMESTAMP} functions.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH</td>
<td>Hour of day (01-12)</td>
</tr>
<tr>
<td>HH12</td>
<td>Hour of day (01-12)</td>
</tr>
<tr>
<td>HH24</td>
<td>Hour of day (00-23)</td>
</tr>
<tr>
<td>MI</td>
<td>Minute (00-59)</td>
</tr>
<tr>
<td>SS</td>
<td>Second (00-59)</td>
</tr>
<tr>
<td>SSSSS</td>
<td>Seconds past midnight (0-86399)</td>
</tr>
<tr>
<td>FF\textit{n}</td>
<td>Fractional seconds where \textit{n} is an optional integer from 1 to 9 for the number of digits to return. If omitted, the default is 6.</td>
</tr>
<tr>
<td>AM or A.M. or PM or P.M.</td>
<td>Meridian indicator (uppercase)</td>
</tr>
<tr>
<td>am or a.m. or pm or p.m.</td>
<td>Meridian indicator (lowercase)</td>
</tr>
<tr>
<td>YYYY\textit{Y}</td>
<td>Year (4 and more digits) with comma</td>
</tr>
<tr>
<td>YEAR</td>
<td>Year (spelled out)</td>
</tr>
<tr>
<td>SYEAR</td>
<td>Year (spelled out) (BC dates prefixed by a minus sign)</td>
</tr>
<tr>
<td>YYYY</td>
<td>Year (4 and more digits)</td>
</tr>
<tr>
<td>YYYYY</td>
<td>Year (4 and more digits) (BC dates prefixed by a minus sign)</td>
</tr>
<tr>
<td>YYY</td>
<td>Last 3 digits of year</td>
</tr>
<tr>
<td>YY</td>
<td>Last 2 digits of year</td>
</tr>
<tr>
<td>Y</td>
<td>Last digit of year</td>
</tr>
<tr>
<td>YYYY</td>
<td>ISO year (4 and more digits)</td>
</tr>
<tr>
<td>YYYY</td>
<td>Last 3 digits of ISO year</td>
</tr>
<tr>
<td>YY</td>
<td>Last 2 digits of ISO year</td>
</tr>
<tr>
<td>Y</td>
<td>Last 1 digit of ISO year</td>
</tr>
</tbody>
</table>
### Pattern Description

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC or B.C. or A.D.</td>
<td>Era indicator (uppercase)</td>
</tr>
<tr>
<td>BC or B.C. or AD or a.d.</td>
<td>Era indicator (lowercase)</td>
</tr>
<tr>
<td>MONTH</td>
<td>Full uppercase month name</td>
</tr>
<tr>
<td>Month</td>
<td>Full mixed-case month name</td>
</tr>
<tr>
<td>month</td>
<td>Full lowercase month name</td>
</tr>
<tr>
<td>MON</td>
<td>Abbreviated uppercase month name (3 characters in English, localized lengths vary)</td>
</tr>
<tr>
<td>Mon</td>
<td>Abbreviated mixed-case month name (3 characters in English, localized lengths vary)</td>
</tr>
<tr>
<td>mon</td>
<td>Abbreviated lowercase month name (3 characters in English, localized lengths vary)</td>
</tr>
<tr>
<td>RR</td>
<td>Month number (01-12)</td>
</tr>
<tr>
<td>DAY</td>
<td>Full uppercase day name</td>
</tr>
<tr>
<td>Day</td>
<td>Full mixed-case day name</td>
</tr>
<tr>
<td>day</td>
<td>Full lowercase day name</td>
</tr>
<tr>
<td>DY</td>
<td>Abbreviated uppercase day name (3 characters in English, localized lengths vary)</td>
</tr>
<tr>
<td>Dy</td>
<td>Abbreviated mixed-case day name (3 characters in English, localized lengths vary)</td>
</tr>
<tr>
<td>dy</td>
<td>Abbreviated lowercase day name (3 characters in English, localized lengths vary)</td>
</tr>
<tr>
<td>DDD</td>
<td>Day of year (001-366)</td>
</tr>
<tr>
<td>DD</td>
<td>Day of month (01-31)</td>
</tr>
<tr>
<td>D</td>
<td>Day of week (1-7; Sunday is 1)</td>
</tr>
<tr>
<td>N</td>
<td>Week of month (1-5) (The first week starts on the first day of the month)</td>
</tr>
<tr>
<td>NW</td>
<td>Week number of year (1-53) (The first week starts on the first day of the year)</td>
</tr>
<tr>
<td>IW</td>
<td>ISO week number of year; the first Thursday of the new year is in week 1</td>
</tr>
<tr>
<td>CC</td>
<td>Century (2 digits); the 21st century starts on 2001-01-01</td>
</tr>
<tr>
<td>SCC</td>
<td>Same as CC except BC dates are prefixed by a minus sign</td>
</tr>
<tr>
<td>J</td>
<td>Julian Day (days since January 1, 4712 BC)</td>
</tr>
<tr>
<td>Q</td>
<td>Quarter</td>
</tr>
<tr>
<td>mm</td>
<td>Month in Roman numerals (i-xii; i=January) (lowercase)</td>
</tr>
<tr>
<td>RR</td>
<td>First 2 digits of the year when given only the last 2 digits of the year. Result is based upon an algorithm using the current year and the given 2-digit year. The first 2 digits of the given 2-digit year will be the same as the first 2 digits of the current year with the following exceptions:</td>
</tr>
<tr>
<td>RRRR</td>
<td>Only affects TO_DATE function. Allows specification of 2-digit or 4-digit year. If 2-digit year given, then returns first 2 digits of year like RR format. If 4-digit year given, returns the given 4-digit year.</td>
</tr>
</tbody>
</table>

Certain modifiers may be applied to any template pattern to alter its behavior. For example, FMMonth is the Month pattern with the FM modifier. The following table shows the modifier patterns for date/time formatting.
Table 2-22 Template Pattern Modifiers for Date/Time Formatting

<table>
<thead>
<tr>
<th>Modifier</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM prefix</td>
<td>Fill mode (suppress padding blanks and zeros)</td>
<td>FMMonth</td>
</tr>
<tr>
<td>TH suffix</td>
<td>Uppercase ordinal number suffix</td>
<td>EDTH</td>
</tr>
<tr>
<td>TH suffix</td>
<td>Lowercase ordinal number suffix</td>
<td>DDth</td>
</tr>
<tr>
<td>FX prefix</td>
<td>Fixed format global option (see usage notes)</td>
<td>FX Month DD Day</td>
</tr>
<tr>
<td>SP suffix</td>
<td>Spell mode</td>
<td>DDSP</td>
</tr>
</tbody>
</table>

Usage notes for date/time formatting:

- **FM** suppresses leading zeroes and trailing blanks that would otherwise be added to make the output of a pattern fixed-width.
- **TO_TIMESTAMP** and **TO_DATE** skip multiple blank spaces in the input string if the **FX** option is not used. **FX** must be specified as the first item in the template. For example **TO_TIMESTAMP('2000 JUN','YYYY MON')** is correct, but **TO_TIMESTAMP('2000  JUN', 'FXYYYY MON')** returns an error, because **TO_TIMESTAMP** expects one space only.
- Ordinary text is allowed in **TO_CHAR** templates and will be output literally.
- In conversions from string to **timestamp** or **date**, the **CC** field is ignored if there is a **YYY**, **YYYY** or **Y,YYY** field. If **CC** is used with **YY** or **Y** then the year is computed as \((CC-1)*100+YY\).

The following table shows the template patterns available for formatting numeric values.

Table 2-23 Template Patterns for Numeric Formatting

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Value with the specified number of digits</td>
</tr>
<tr>
<td>0</td>
<td>Value with leading zeroes</td>
</tr>
<tr>
<td>.</td>
<td>Decimal point</td>
</tr>
<tr>
<td>,</td>
<td>Group (thousand) separator</td>
</tr>
<tr>
<td>$</td>
<td>Dollar sign</td>
</tr>
<tr>
<td>FR</td>
<td>Negative value in angle brackets</td>
</tr>
<tr>
<td>$S</td>
<td>Sign anchored to number (uses locale)</td>
</tr>
<tr>
<td>L</td>
<td>Currency symbol (uses locale)</td>
</tr>
<tr>
<td>D</td>
<td>Decimal point (uses locale)</td>
</tr>
<tr>
<td>S</td>
<td>Group separator (uses locale)</td>
</tr>
<tr>
<td>MI</td>
<td>Minus sign specified in right-most position (if number &lt; 0)</td>
</tr>
<tr>
<td>Rn or rn</td>
<td>Roman numeral (input between 1 and 3999)</td>
</tr>
<tr>
<td>V</td>
<td>Shift specified number of digits (see notes)</td>
</tr>
</tbody>
</table>

Usage notes for numeric formatting:

- 9 results in a value with the same number of digits as there are 9s. If a digit is not available it outputs a space.
TH does not convert values less than zero and does not convert fractional numbers.

\( V \) effectively multiplies the input values by \( 10^n \), where \( n \) is the number of digits following \( V \). \( \text{TO_CHAR} \) does not support the use of \( V \) combined with a decimal point. (E.g., 99.9V99 is not allowed.)

The following table shows some examples of the use of the \( \text{TO_CHAR} \) and \( \text{TO_DATE} \) functions.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{TO_CHAR}(\text{CURRENT_TIMESTAMP}, \text{&quot;Day, DD HH12:MI:SS&quot;}) )</td>
<td>&quot;Tuesday, 06 05:39:18&quot;</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(\text{CURRENT_TIMESTAMP}, \text{&quot;FMDay, FMDD HH12:MI:SS&quot;}) )</td>
<td>&quot;Tuesday, 6 05:39:18&quot;</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(-0.1, \text{&quot;99.99&quot;}) )</td>
<td>-.10</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(-0.1, \text{&quot;FM9.99&quot;}) )</td>
<td>-.1</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(0.1, \text{&quot;0.9&quot;}) )</td>
<td>0.1</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(12, \text{&quot;9990999.9&quot;}) )</td>
<td>0012.0</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(12, \text{&quot;FM9990999.9&quot;}) )</td>
<td>0012.</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(485, \text{&quot;999&quot;}) )</td>
<td>485</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(-485, \text{&quot;999&quot;}) )</td>
<td>-485</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(1485, \text{&quot;9,999&quot;}) )</td>
<td>1,485</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(1485, \text{&quot;9G999&quot;}) )</td>
<td>1,485</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(148.5, \text{&quot;999.999&quot;}) )</td>
<td>148.500</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(148, \text{&quot;FM999.999&quot;}) )</td>
<td>148.5</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(148, \text{&quot;99999.999&quot;}) )</td>
<td>148.500</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(148, \text{&quot;9999D999&quot;}) )</td>
<td>148.500</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(3148.5, \text{&quot;9G999D999&quot;}) )</td>
<td>3,148.500</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(-485, \text{&quot;999S&quot;}) )</td>
<td>-485-</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(-485, \text{&quot;999MI&quot;}) )</td>
<td>-485-</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(485, \text{&quot;999MI&quot;}) )</td>
<td>485-</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(-485, \text{&quot;999PR&quot;}) )</td>
<td>&lt;485&gt;</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(485, \text{&quot;L999&quot;}) )</td>
<td>$ 485</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(485, \text{&quot;RN&quot;}) )</td>
<td>CDLXXXV</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(485, \text{&quot;FMRN&quot;}) )</td>
<td>CDLXXXV</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(5.2, \text{&quot;FMRN&quot;}) )</td>
<td>V</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(12, \text{&quot;999999&quot;}) )</td>
<td>12000</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(12.4, \text{&quot;999999&quot;}) )</td>
<td>12400</td>
</tr>
<tr>
<td>( \text{TO_CHAR}(12.45, \text{&quot;99V9&quot;}) )</td>
<td>125</td>
</tr>
</tbody>
</table>

### 2.4.7.1 IMMUTABLE TO_CHAR(TIMESTAMP, format) Function

There are certain cases of the \( \text{TO_CHAR} \) function that can result in usage of an \texttt{IMMUTABLE} form of the function. Basically, a function is \texttt{IMMUTABLE} if the function does not modify the database, and the function returns the same, consistent value.
dependent upon only its input parameters. That is, the settings of configuration parameters, the locale, the content of the database, etc. do not affect the results returned by the function.

For more information about function volatility categories VOLATILE, STABLE, and IMMUTABLE, please see the PostgreSQL Core documentation at:

https://www.postgresql.org/docs/12/static/xfunc-volatility.html

A particular advantage of an IMMUTABLE function is that it can be used in the CREATE INDEX command to create an index based on that function.

In order for the TO_CHAR function to use the IMMUTABLE form the following conditions must be satisfied:

- The first parameter of the TO_CHAR function must be of data type TIMESTAMP.
- The format specified in the second parameter of the TO_CHAR function must not affect the return value of the function based on factors such as language, locale, etc. For example a format of 'YYYY-MM-DD HH24:MI:SS' can be used for an IMMUTABLE form of the function since, regardless of locale settings, the result of the function is the date and time expressed solely in numeric form. However, a format of 'DD-MON-YYYY' cannot be used for an IMMUTABLE form of the function because the 3-character abbreviation of the month may return different results depending upon the locale setting.

Format patterns that result in a non-immutable function include any variations of spelled out or abbreviated months (MONTH, MON), days (DAY, DY), median indicators (AM, PM), or era indicators (BC, AD).

For the following example, a table with a TIMESTAMP column is created.

```
CREATE TABLE ts_tbl (ts_col TIMESTAMP);
```

The following shows the successful creation of an index with the IMMUTABLE form of the TO_CHAR function.

```
edb=# CREATE INDEX ts_idx ON ts_tbl (TO_CHAR(ts_col,'YYYY-MM-DD HH24:MI:SS'));
CREATE INDEX
edb=# \\ds ts_idx
```

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>to_char</td>
<td>character varying</td>
<td>to_char(ts_col, 'YYYY-MM-DD HH24:MI:SS'::character varying)</td>
</tr>
<tr>
<td>btree, for table &quot;public.ts_tbl&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following results in an error because the format specified in the `TO_CHAR` function prevents the use of the `IMMUTABLE` form since the 3-character month abbreviation, `MON`, may result in different return values based on the locale setting.

```sql
edb=# CREATE INDEX ts_idx_2 ON ts_tbl (TO_CHAR(ts_col, 'DD-MON-YYYY'));
ERROR: functions in index expression must be marked IMMUTABLE
```
2.4.8 Date/Time Functions and Operators

Table 2-26 shows the available functions for date/time value processing, with details appearing in the following subsections. The following table illustrates the behaviors of the basic arithmetic operators (+, -). For formatting functions, refer to Section 2.4.7. You should be familiar with the background information on date/time data types from Section 2.2.4.

Table 2-25 Date/Time Operators

<table>
<thead>
<tr>
<th>Operator</th>
<th>Example</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>DATE '2001-09-28' + 7</td>
<td>05-OCT-01 00:00:00</td>
</tr>
<tr>
<td>+</td>
<td>TIMESTAMP '2001-09-28 13:30:00' + 3</td>
<td>01-OCT-01 13:30:00</td>
</tr>
<tr>
<td>-</td>
<td>DATE '2001-10-01' - 7</td>
<td>24-SEP-01 00:00:00</td>
</tr>
<tr>
<td>-</td>
<td>TIMESTAMP '2001-09-28 13:30:00' - 3</td>
<td>25-SEP-01 13:30:00</td>
</tr>
<tr>
<td>-</td>
<td>TIMESTAMP '2001-09-29 03:00:00' -</td>
<td>0 1 day 15 hours</td>
</tr>
</tbody>
</table>

In the date/time functions of the following table the use of the DATE and TIMESTAMP data types are interchangeable.

Table 2-26 Date/Time Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Return Type</th>
<th>Description</th>
<th>Example</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADD_MONTHS(DATE, NUMBER)</td>
<td>DATE</td>
<td>Add months to a date; see Section 2.4.8.1</td>
<td>ADD_MONTHS('14-APR-98', 3)</td>
<td>31-MAY-97 00:00:00</td>
</tr>
<tr>
<td>CURRENT_DATE</td>
<td>DATE</td>
<td>Current date; see Section 2.4.8.8</td>
<td>CURRENT_DATE</td>
<td>04-JUL-07</td>
</tr>
<tr>
<td>CURRENT_TIMESTAMP</td>
<td>TIMESTAMP</td>
<td>Returns the current date and time; see Section 2.4.8.8</td>
<td>CURRENT_TIMESTAMP</td>
<td>04-JUL-07 15:33:23.484</td>
</tr>
<tr>
<td>EXTRACT(hour FROM TIMESTAMP)</td>
<td>DOUBLE PRECISION</td>
<td>Get subfield; see Section 2.4.8.2</td>
<td>EXTRACT(hour FROM TIMESTAMP '2001-02-16 20:38:40')</td>
<td>20</td>
</tr>
<tr>
<td>LAST_DAY(DATE)</td>
<td>DATE</td>
<td>Returns the last day of the month represented by the given date. If the given date contains a time portion, it is carried forward to the result unchanged.</td>
<td>LAST_DAY('16-APR-97')</td>
<td>30-APR-98 00:00:00</td>
</tr>
<tr>
<td>LOCALTIMESTAMP [ (precision) ]</td>
<td>TIMESTAMP</td>
<td>Current date and time (start of current transaction); see Section 2.4.8.8</td>
<td>LOCALTIMESTAMP</td>
<td>04-JUL-07 15:33:23.484</td>
</tr>
<tr>
<td>MONTHS_BETWEEN(DATE, DATE)</td>
<td>NUMBER</td>
<td>Number of months between two dates; see Section 2.4.8.3</td>
<td>MONTHS_BETWEEN('28-FEB-07', '30-NOV-06')</td>
<td>3</td>
</tr>
<tr>
<td>NEXT_DAY(DATE, DATE)</td>
<td>DATE</td>
<td>Date falling on</td>
<td>NEXT_DAY('16-APR-98')</td>
<td>17-APR-98</td>
</tr>
</tbody>
</table>

...
<table>
<thead>
<tr>
<th>Function</th>
<th>Return Type</th>
<th>Description</th>
<th>Example</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>dayofweek(day)</code></td>
<td></td>
<td><code>dayofweek</code> following specified date; see Section 2.4.8.4</td>
<td><code>NEW_TIME(</code>TO_DATE <code>'2005/05/29 01:45', 'AST', 'PST')</code></td>
<td>2005/05/29 21:45:00</td>
</tr>
<tr>
<td><code>NEW_TIME(DATE, VARCHAR, VARCHAR)</code></td>
<td>DATE</td>
<td>Converts a date and time to an alternate time zone</td>
<td><code>NEW_TIME(TO_DATE '2005/05/29 01:45', 'AST', 'PST')</code></td>
<td>2005/05/29 21:45:00</td>
</tr>
<tr>
<td><code>NUMTODSINTERVAL(NUMBER, INTERVAL)</code></td>
<td>INTERVAL</td>
<td>Converts a number to a specified day or second interval; see Section 2.4.8.9</td>
<td><code>SELECT numtodsinterval(100, 'hour')</code></td>
<td>4 days 04:00:00</td>
</tr>
<tr>
<td><code>NUMTOYMINTERVAL(NUMBER, INTERVAL)</code></td>
<td>INTERVAL</td>
<td>Converts a number to a specified year or month interval; see Section 2.4.8.10</td>
<td><code>SELECT numtoyminterval(100, 'month')</code></td>
<td>8 years 4 mons</td>
</tr>
<tr>
<td><code>ROUND(DATE [, format])</code></td>
<td>DATE</td>
<td>Date rounded according to format; see Section 2.4.8.6</td>
<td><code>ROUND(TO_DATE('29-MAY-05'), 'MON')</code></td>
<td>01-JUN-05 00:00:00</td>
</tr>
<tr>
<td><code>SYS_EXTRACT.UTC(TIME STAMP WITH TIME ZONE)</code></td>
<td>TIMESTAMP</td>
<td>Returns Coordinated Universal Time</td>
<td><code>SYS_EXTRACT.UTC(CAST('24-MAR-11 12:30:00PM - 04:00' AS TIMESTAMP WITH TIME ZONE))</code></td>
<td>24-MAR-11 16:30:00</td>
</tr>
<tr>
<td><code>SYSDATE()</code></td>
<td>DATE</td>
<td>Returns current date and time</td>
<td><code>SYSDATE</code></td>
<td>01-AUG-12 11:12:34</td>
</tr>
<tr>
<td><code>SYSTIMESTAMP()</code></td>
<td>TIMESTAMP</td>
<td>Returns current date and time</td>
<td><code>SYSTIMESTAMP</code></td>
<td>01-AUG-12 11:11:23.665</td>
</tr>
<tr>
<td><code>TRUNC(DATE [, format])</code></td>
<td>DATE</td>
<td>Truncate according to format; see Section 2.4.8.7</td>
<td><code>TRUNC(TO_DATE('29-MAY-05'), 'MON')</code></td>
<td>01-MAY-05 00:00:00</td>
</tr>
</tbody>
</table>

### 2.4.8.1 ADD_MONTHS

The **ADD_MONTHS** function adds (or subtracts if the second parameter is negative) the specified number of months to the given date. The resulting day of the month is the same as the day of the month of the given date except when the day is the last day of the month in which case the resulting date always falls on the last day of the month.

Any fractional portion of the number of months parameter is truncated before performing the calculation.

If the given date contains a time portion, it is carried forward to the result unchanged.

The following are examples of the **ADD_MONTHS** function.

```sql
SELECT ADD_MONTHS('13-JUN-07', 4) FROM DUAL;
```

```
add_months
--------------
13-OCT-07 00:00:00
```
### 2.4.8.2 EXTRACT

The `EXTRACT` function retrieves subfields such as year or hour from date/time values. The `EXTRACT` function returns values of type `DOUBLE PRECISION`. The following are valid field names:

#### YEAR

- The year field

```
SELECT EXTRACT(YEAR FROM TIMESTAMP '2001-02-16 20:38:40') FROM DUAL;
```

```
date_part
----------
2001
(1 row)
```

#### MONTH

- The number of the month within the year (1 - 12)

```
SELECT EXTRACT(MONTH FROM TIMESTAMP '2001-02-16 20:38:40') FROM DUAL;
```

```
date_part
----------
2
(1 row)
```

#### DAY

- The day (of the month) field (1 - 31)

```
SELECT EXTRACT(DAY FROM TIMESTAMP '2001-02-16 20:38:40') FROM DUAL;
```

```
date_part
----------
16
(1 row)
```
HOUR

The hour field (0 - 23)

```
SELECT EXTRACT(HOUR FROM TIMESTAMP '2001-02-16 20:38:40') FROM DUAL;
```

date_part
---------
20
(1 row)

MINUTE

The minutes field (0 - 59)

```
SELECT EXTRACT(MINUTE FROM TIMESTAMP '2001-02-16 20:38:40') FROM DUAL;
```

date_part
---------
38
(1 row)

SECOND

The seconds field, including fractional parts (0 - 59)

```
SELECT EXTRACT(SECOND FROM TIMESTAMP '2001-02-16 20:38:40') FROM DUAL;
```

date_part
---------
40
(1 row)

2.4.8.3 MONTHS_BETWEEN

The `MONTHS_BETWEEN` function returns the number of months between two dates. The result is a numeric value which is positive if the first date is greater than the second date or negative if the first date is less than the second date.

The result is always a whole number of months if the day of the month of both date parameters is the same, or both date parameters fall on the last day of their respective months.

The following are some examples of the `MONTHS_BETWEEN` function.

```
SELECT MONTHS_BETWEEN('15-DEC-06','15-OCT-06') FROM DUAL;
```

months_between
----------------
2
(1 row)
2.4.8.4 NEXT_DAY

The NEXT_DAY function returns the first occurrence of the given weekday strictly greater than the given date. At least the first three letters of the weekday must be specified - e.g., SAT. If the given date contains a time portion, it is carried forward to the result unchanged.

The following are examples of the NEXT_DAY function.

```sql
SELECT NEXT_DAY(TO_DATE('13-AUG-07', 'DD-MON-YY'), 'SUNDAY') FROM DUAL;
next_day
-------------------
19-AUG-07 00:00:00
(1 row)

SELECT NEXT_DAY(TO_DATE('13-AUG-07', 'DD-MON-YY'), 'MON') FROM DUAL;
next_day
-------------------
20-AUG-07 00:00:00
(1 row)
```

2.4.8.5 NEW_TIME

The NEW_TIME function converts a date and time from one time zone to another. NEW_TIME returns a value of type DATE. The syntax:

```sql
NEW_TIME(DATE, time_zone1, time_zone2)
```
$time_{zone1}$ and $time_{zone2}$ must be string values from the Time Zone column of the following table:

### Table 2-27 Time Zones

<table>
<thead>
<tr>
<th>Time Zone</th>
<th>Offset from UTC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AST</td>
<td>UTC+4</td>
<td>Atlantic Standard Time</td>
</tr>
<tr>
<td>ADT</td>
<td>UTC+3</td>
<td>Atlantic Daylight Time</td>
</tr>
<tr>
<td>BST</td>
<td>UTC+11</td>
<td>Bering Standard Time</td>
</tr>
<tr>
<td>BDT</td>
<td>UTC+10</td>
<td>Bering Daylight Time</td>
</tr>
<tr>
<td>CST</td>
<td>UTC+10</td>
<td>Central Standard Time</td>
</tr>
<tr>
<td>CDT</td>
<td>UTC+6</td>
<td>Central Daylight Time</td>
</tr>
<tr>
<td>EST</td>
<td>UTC+5</td>
<td>Eastern Standard Time</td>
</tr>
<tr>
<td>EDT</td>
<td>UTC+4</td>
<td>Eastern Daylight Time</td>
</tr>
<tr>
<td>GMT</td>
<td>UTC</td>
<td>Greenwich Mean Time</td>
</tr>
<tr>
<td>HST</td>
<td>UTC+10</td>
<td>Alaska-Hawaii Standard Time</td>
</tr>
<tr>
<td>HDT</td>
<td>UTC+9</td>
<td>Alaska-Hawaii Daylight Time</td>
</tr>
<tr>
<td>MST</td>
<td>UTC+7</td>
<td>Mountain Standard Time</td>
</tr>
<tr>
<td>MDT</td>
<td>UTC+6</td>
<td>Mountain Daylight Time</td>
</tr>
<tr>
<td>NST</td>
<td>UTC+3:30</td>
<td>Newfoundland Standard Time</td>
</tr>
<tr>
<td>PST</td>
<td>UTC+8</td>
<td>Pacific Standard Time</td>
</tr>
<tr>
<td>PDT</td>
<td>UTC+7</td>
<td>Pacific Daylight Time</td>
</tr>
<tr>
<td>YST</td>
<td>UTC+9</td>
<td>Yukon Standard Time</td>
</tr>
<tr>
<td>YDT</td>
<td>UTC+8</td>
<td>Yukon Daylight Time</td>
</tr>
</tbody>
</table>

Following is an example of the `NEW_TIME` function.

```sql
```

<table>
<thead>
<tr>
<th>Pacific Standard Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-AUG-07 06:35:15</td>
</tr>
</tbody>
</table>

(1 row)

### 2.4.8.6 ROUND

The `ROUND` function returns a date rounded according to a specified template pattern. If the template pattern is omitted, the date is rounded to the nearest day. The following table shows the template patterns for the `ROUND` function.

### Table 2-28 Template Date Patterns for the ROUND Function

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$CC$, $SCC$</td>
<td>Returns January 1, $cc$01 where $cc$ is first 2 digits of the given year if last 2 digits $\leq$ 50, or 1 greater than the first 2 digits of the given year if last 2 digits &gt; 50; (for AD years)</td>
</tr>
<tr>
<td>$YYYY$, $YYYY$, $YEAR$, $SYEAR$,</td>
<td>Returns January 1, $yyyy$ where $yyyy$ is rounded to the nearest year; rounds down on June 30, rounds up on July 1</td>
</tr>
<tr>
<td>Pattern</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>YYYY, YY, Y</td>
<td>Rounds to the beginning of the ISO year which is determined by rounding down if the month and day is on or before June 30th, or by rounding up if the month and day is July 1st or later</td>
</tr>
<tr>
<td>IYYY, IYY, IY, I</td>
<td>Returns the first day of the quarter determined by rounding down if the month and day is on or before the 15th of the second month of the quarter, or by rounding up if the month and day is on the 16th of the second month or later of the quarter</td>
</tr>
<tr>
<td>MONTH, MON, MM, MM</td>
<td>Returns the first day of the specified month if the day of the month is on or prior to the 15th; returns the first day of the following month if the day of the month is on the 16th or later</td>
</tr>
<tr>
<td>NW</td>
<td>Round to the nearest date that corresponds to the same day of the week as the first day of the year</td>
</tr>
<tr>
<td>IW</td>
<td>Round to the nearest date that corresponds to the same day of the week as the first day of the ISO year</td>
</tr>
<tr>
<td>N</td>
<td>Round to the nearest date that corresponds to the same day of the week as the first day of the month</td>
</tr>
<tr>
<td>DDD, DD, J</td>
<td>Rounds to the start of the nearest day; 11:59:59 AM or earlier rounds to the start of the same day; 12:00:00 PM or later rounds to the start of the next day</td>
</tr>
<tr>
<td>DAY, DY, D</td>
<td>Rounds to the nearest Sunday</td>
</tr>
<tr>
<td>HH, HH12, HH24</td>
<td>Round to the nearest hour</td>
</tr>
<tr>
<td>MI</td>
<td>Round to the nearest minute</td>
</tr>
</tbody>
</table>

Following are examples of usage of the ROUND function.

The following examples round to the nearest hundred years.

```sql
SELECT TO_CHAR(ROUND(TO_DATE('1950','YYYY'),'CC'),'DD-MON-YYYY') "Century" FROM DUAL;

    Century
-------------
   01-JAN-1901
(1 row)

SELECT TO_CHAR(ROUND(TO_DATE('1951','YYYY'),'CC'),'DD-MON-YYYY') "Century" FROM DUAL;

    Century
-------------
   01-JAN-2001
(1 row)
```

The following examples round to the nearest year.

```sql
SELECT TO_CHAR(ROUND(TO_DATE('30-JUN-1999','DD-MON-YYYY'),'Y'),'DD-MON-YYYY') "Year" FROM DUAL;

    Year
-------------
   01-JAN-1999
(1 row)

SELECT TO_CHAR(ROUND(TO_DATE('01-JUL-1999','DD-MON-YYYY'),'Y'),'DD-MON-YYYY') "Year" FROM DUAL;
```
The following examples round to the nearest ISO year. The first example rounds to 2004 and the ISO year for 2004 begins on December 29th of 2003. The second example rounds to 2005 and the ISO year for 2005 begins on January 3rd of that same year.

(An ISO year begins on the first Monday from which a 7 day span, Monday thru Sunday, contains at least 4 days of the new year. Thus, it is possible for the beginning of an ISO year to start in December of the prior year.)

```
SELECT TO_CHAR(ROUND(TO_DATE('30-JUN-2004','DD-MON-YYYY'), 'IYYY'), 'DD-MON-YYYY') "ISO Year" FROM DUAL;
ISO Year
--------
29-DEC-2003
(1 row)
```

```
SELECT TO_CHAR(ROUND(TO_DATE('01-JUL-2004','DD-MON-YYYY'), 'IYYY'), 'DD-MON-YYYY') "ISO Year" FROM DUAL;
ISO Year
--------
03-JAN-2005
(1 row)
```

The following examples round to the nearest quarter.

```
SELECT ROUND(TO_DATE('15-FEB-07','DD-MON-YY'),'Q') "Quarter" FROM DUAL;
Quarter
--------
01-JAN-07 00:00:00
(1 row)
```

```
SELECT ROUND(TO_DATE('16-FEB-07','DD-MON-YY'),'Q') "Quarter" FROM DUAL;
Quarter
--------
01-APR-07 00:00:00
(1 row)
```

The following examples round to the nearest month.

```
SELECT ROUND(TO_DATE('15-DEC-07','DD-MON-YY'),'MONTH') "Month" FROM DUAL;
Month
-------
01-DEC-07 00:00:00
(1 row)
```

```
SELECT ROUND(TO_DATE('16-DEC-07','DD-MON-YY'),'MONTH') "Month" FROM DUAL;
```
The following examples round to the nearest week. The first day of 2007 lands on a Monday so in the first example, January 18th is closest to the Monday that lands on January 15th. In the second example, January 19th is closer to the Monday that falls on January 22nd.

```
SELECT ROUND(TO_DATE('18-JAN-07', 'DD-MON-YY'), 'WW') "Week" FROM DUAL;
```

```
Week
--------------------
15-JAN-07 00:00:00
(l row)
```

```
SELECT ROUND(TO_DATE('19-JAN-07', 'DD-MON-YY'), 'WW') "Week" FROM DUAL;
```

```
Week
--------------------
22-JAN-07 00:00:00
(l row)
```

The following examples round to the nearest ISO week. An ISO week begins on a Monday. In the first example, January 1, 2004 is closest to the Monday that lands on December 29, 2003. In the second example, January 2, 2004 is closer to the Monday that lands on January 5, 2004.

```
SELECT ROUND(TO_DATE('01-JAN-04', 'DD-MON-YY'), 'IW') "ISO Week" FROM DUAL;
```

```
ISO Week
--------------------
29-DEC-03 00:00:00
(l row)
```

```
SELECT ROUND(TO_DATE('02-JAN-04', 'DD-MON-YY'), 'IW') "ISO Week" FROM DUAL;
```

```
ISO Week
--------------------
05-JAN-04 00:00:00
(l row)
```

The following examples round to the nearest week where a week is considered to start on the same day as the first day of the month.

```
SELECT ROUND(TO_DATE('05-MAR-07', 'DD-MON-YY'), 'W') "Week" FROM DUAL;
```

```
Week
--------------------
08-MAR-07 00:00:00
(l row)
```

```
SELECT ROUND(TO_DATE('04-MAR-07', 'DD-MON-YY'), 'W') "Week" FROM DUAL;
```

```
Week
--------------------
```
The following examples round to the nearest day.

```sql
SELECT ROUND(TO_DATE('04-AUG-07 11:59:59 AM','DD-MON-YY HH:MI:SS AM'),'J') "Day" FROM DUAL;
```

<table>
<thead>
<tr>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>04-AUG-07 00:00:00</td>
</tr>
</tbody>
</table>

```sql
SELECT ROUND(TO_DATE('04-AUG-07 12:00:00 PM','DD-MON-YY HH:MI:SS AM'),'J') "Day" FROM DUAL;
```

<table>
<thead>
<tr>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>05-AUG-07 00:00:00</td>
</tr>
</tbody>
</table>

The following examples round to the start of the nearest day of the week (Sunday).

```sql
SELECT ROUND(TO_DATE('08-AUG-07','DD-MON-YY'),'DAY') "Day of Week" FROM DUAL;
```

<table>
<thead>
<tr>
<th>Day of Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>05-AUG-07 00:00:00</td>
</tr>
</tbody>
</table>

```sql
SELECT ROUND(TO_DATE('09-AUG-07','DD-MON-YY'),'DAY') "Day of Week" FROM DUAL;
```

<table>
<thead>
<tr>
<th>Day of Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-AUG-07 00:00:00</td>
</tr>
</tbody>
</table>

The following examples round to the nearest hour.

```sql
SELECT TO_CHAR(ROUND(TO_DATE('09-AUG-07 08:29','DD-MON-YY HH:MI'),'HH'),'DD-MON-YY HH24:MI:SS') "Hour" FROM DUAL;
```

<table>
<thead>
<tr>
<th>Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>09-AUG-07 08:00:00</td>
</tr>
</tbody>
</table>

```sql
SELECT TO_CHAR(ROUND(TO_DATE('09-AUG-07 08:30','DD-MON-YY HH:MI'),'HH'),'DD-MON-YY HH24:MI:SS') "Hour" FROM DUAL;
```

<table>
<thead>
<tr>
<th>Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>09-AUG-07 09:00:00</td>
</tr>
</tbody>
</table>

The following examples round to the nearest minute.
2.4.8.7 TRUNC

The TRUNC function returns a date truncated according to a specified template pattern. If the template pattern is omitted, the date is truncated to the nearest day. The following table shows the template patterns for the TRUNC function.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC, SCC</td>
<td>Returns January 1, cc01 where cc is first 2 digits of the given year</td>
</tr>
<tr>
<td>YYYY, YY, YEAR, SYEAR, YY, Y</td>
<td>Returns January 1, yyyy where yyyy is the given year</td>
</tr>
<tr>
<td>YYYY, YY, Y</td>
<td>Returns the start date of the ISO year containing the given date</td>
</tr>
<tr>
<td>Q</td>
<td>Returns the first day of the quarter containing the given date</td>
</tr>
<tr>
<td>MONTH, MON, MM, RM</td>
<td>Returns the first day of the specified month</td>
</tr>
<tr>
<td>WW</td>
<td>Returns the largest date just prior to, or the same as the given date that corresponds to the same day of the week as the first day of the year</td>
</tr>
<tr>
<td>LW</td>
<td>Returns the start of the ISO week containing the given date</td>
</tr>
<tr>
<td>N</td>
<td>Returns the largest date just prior to, or the same as the given date that corresponds to the same day of the week as the first day of the month</td>
</tr>
<tr>
<td>DDD, DD, J</td>
<td>Returns the start of the day for the given date</td>
</tr>
<tr>
<td>DAY, DY, D</td>
<td>Returns the start of the week (Sunday) containing the given date</td>
</tr>
<tr>
<td>HH, HH12, HH24</td>
<td>Returns the start of the hour</td>
</tr>
<tr>
<td>MI</td>
<td>Returns the start of the minute</td>
</tr>
</tbody>
</table>

Following are examples of usage of the TRUNC function.

The following example truncates down to the hundred years unit.
The following example truncates down to the year.

```sql
SELECT TO_CHAR(TRUNC(TO_DATE('01-JUL-1999','DD-MON-YYYY'),'Y'),'DD-MON-YYYY')
"Year" FROM DUAL;
```

```
Year
-------
01-JAN-1999
```

(1 row)

The following example truncates down to the beginning of the ISO year.

```sql
SELECT TO_CHAR(TRUNC(TO_DATE('01-JUL-2004','DD-MON-YYYY'),'IYYY'),'DD-MON-YYYY')
"ISO Year" FROM DUAL;
```

```
ISO Year
---------
29-DEC-2003
```

(1 row)

The following example truncates down to the start date of the quarter.

```sql
SELECT TRUNC(TO_DATE('16-FEB-07','DD-MON-YY'),'Q') "Quarter" FROM DUAL;
```

```
Quarter
--------
01-JAN-07 00:00:00
```

(1 row)

The following example truncates to the start of the month.

```sql
SELECT TRUNC(TO_DATE('16-DEC-07','DD-MON-YYYY'),'MONTH') "Month" FROM DUAL;
```

```
Month
-------
01-DEC-07 00:00:00
```

(1 row)

The following example truncates down to the start of the week determined by the first day of the year. The first day of 2007 lands on a Monday so the Monday just prior to January 19th is January 15th.

```sql
SELECT TRUNC(TO_DATE('19-JAN-07','DD-MON-YYYY'),'WW') "Week" FROM DUAL;
```

```
Week
-------
15-JAN-07 00:00:00
```

(1 row)

The following example truncates to the start of the week where a week is considered to start on the same day as the first day of the month.

```
SELECT TRUNC(TO_DATE('21-MAR-07','DD-MON-YY'),'W') "Week" FROM DUAL;
```

```
Week
-------------------
15-MAR-07 00:00:00
(1 row)
```

The following example truncates to the start of the day.

```
SELECT TRUNC(TO_DATE('04-AUG-07 12:00:00 PM','DD-MON-YY HH:MI:SS AM'),'J') "Day" FROM DUAL;
```

```
Day
-------------------
04-AUG-07 00:00:00
(1 row)
```

The following example truncates to the start of the week (Sunday).

```
SELECT TRUNC(TO_DATE('09-AUG-07','DD-MON-YY'),'DAY') "Day of Week" FROM DUAL;
```

```
Day of Week
-------------------
05-AUG-07 00:00:00
(1 row)
```

The following example truncates to the start of the hour.

```
SELECT TO_CHAR(TRUNC(TO_DATE('09-AUG-07 08:30','DD-MON-YY HH:MI:SS'),'HH'),'DD-MON-YY HH24:MI:SS') "Hour" FROM DUAL;
```

```
Hour
-------------------
09-AUG-07 08:00:00
(1 row)
```

The following example truncates to the minute.

```
SELECT TO_CHAR(TRUNC(TO_DATE('09-AUG-07 08:30:30','DD-MON-YY HH:MI:SS'),'MI'),'DD-MON-YY HH24:MI:SS') "Minute" FROM DUAL;
```

```
Minute
-------------------
09-AUG-07 08:30:00
(1 row)
```
2.4.8.8 CURRENT DATE/TIME

Advanced Server provides a number of functions that return values related to the current date and time. These functions all return values based on the start time of the current transaction.

- CURRENT_DATE
- CURRENT_TIMESTAMP
- LOCALTIMESTAMP
- LOCALTIMESTAMP(precision)

CURRENT_DATE returns the current date and time based on the start time of the current transaction. The value of CURRENT_DATE will not change if called multiple times within a transaction.

```
SELECT CURRENT_DATE FROM DUAL;
```

```
date
-----------
06-AUG-07
```

CURRENT_TIMESTAMP returns the current date and time. When called from a single SQL statement, it will return the same value for each occurrence within the statement. If called from multiple statements within a transaction, it may return different values for each occurrence. If called from a function, it may return a different value than the value returned by CURRENT_TIMESTAMP in the caller.

```
SELECT CURRENT_TIMESTAMP, CURRENT_TIMESTAMP FROM DUAL;
```

```
current_timestamp | current_timestamp
---------------------+---------------------
02-SEP-13 17:52:29.261473 +05:00 | 02-SEP-13 17:52:29.261474 +05:00
```

LOCALTIMESTAMP can optionally be given a precision parameter which causes the result to be rounded to that many fractional digits in the seconds field. Without a precision parameter, the result is given to the full available precision.

```
SELECT LOCALTIMESTAMP FROM DUAL;
```

```
timestamp
------------------------
06-AUG-07 16:11:35.973
```

```
SELECT LOCALTIMESTAMP(2) FROM DUAL;
```

```
timestamp
-----------------------
06-AUG-07 16:11:44.58
```

Since these functions return the start time of the current transaction, their values do not change during the transaction. This is considered a feature: the intent is to allow a single transaction to have a consistent notion of the “current” time, so that multiple modifications within the same transaction bear the same time stamp. Other database systems may advance these values more frequently.

### 2.4.8.9 NUMTODSINTERVAL

The `NUMTODSINTERVAL` function converts a numeric value to a time interval that includes day through second interval units. When calling the function, specify the smallest fractional interval type to be included in the result set. The valid interval types are `DAY`, `HOUR`, `MINUTE`, and `SECOND`.

The following example converts a numeric value to a time interval that includes days and hours:

```sql
SELECT numtodsinterval(100, 'hour');
numtodsinterval
------------
4 days 04:00:00
(1 row)
```

The following example converts a numeric value to a time interval that includes minutes and seconds:

```sql
SELECT numtodsinterval(100, 'second');
numtodsinterval
------------
1 min 40 secs
(1 row)
```

### 2.4.8.10 NUMTOYMINTERVAL

The `NUMTOYMINTERVAL` function converts a numeric value to a time interval that includes year through month interval units. When calling the function, specify the smallest fractional interval type to be included in the result set. The valid interval types are `YEAR` and `MONTH`.

The following example converts a numeric value to a time interval that includes years and months:

```sql
SELECT numtoyminterval(100, 'month');
numtoyminterval
---------------
8 years 4 mons
(1 row)
```
The following example converts a numeric value to a time interval that includes years only:

```sql
SELECT numtoyminterval(100, 'year');
numtoyminterval
----------
100 years
(1 row)
```
2.4.9 Sequence Manipulation Functions

This section describes Advanced Server’s functions for operating on sequence objects. Sequence objects (also called sequence generators or just sequences) are special single-row tables created with the CREATE SEQUENCE command. A sequence object is usually used to generate unique identifiers for rows of a table. The sequence functions, listed below, provide simple, multiuser-safe methods for obtaining successive sequence values from sequence objects.

```
sequence.NEXTVAL
sequence.CURRVAL
```

`sequence` is the identifier assigned to the sequence in the CREATE SEQUENCE command. The following describes the usage of these functions.

**NEXTVAL**

Advance the sequence object to its next value and return that value. This is done atomically: even if multiple sessions execute NEXTVAL concurrently, each will safely receive a distinct sequence value.

**CURRVAL**

Return the value most recently obtained by NEXTVAL for this sequence in the current session. (An error is reported if NEXTVAL has never been called for this sequence in this session.) Notice that because this is returning a session-local value, it gives a predictable answer whether or not other sessions have executed NEXTVAL since the current session did.

If a sequence object has been created with default parameters, NEXTVAL calls on it will return successive values beginning with 1. Other behaviors can be obtained by using special parameters in the CREATE SEQUENCE command.

**Important**: To avoid blocking of concurrent transactions that obtain numbers from the same sequence, a NEXTVAL operation is never rolled back; that is, once a value has been fetched it is considered used, even if the transaction that did the NEXTVAL later aborts. This means that aborted transactions may leave unused "holes" in the sequence of assigned values.
2.4.10  Conditional Expressions

The following section describes the SQL-compliant conditional expressions available in Advanced Server.

2.4.10.1  CASE

The SQL \texttt{CASE} expression is a generic conditional expression, similar to if/else statements in other languages:

\begin{verbatim}
CASE WHEN condition THEN result \\
    [ WHEN ... ] \\
    [ ELSE result ]
END
\end{verbatim}

\texttt{CASE} clauses can be used wherever an expression is valid. \textit{condition} is an expression that returns a \texttt{BOOLEAN} result. If the result is \texttt{TRUE} then the value of the \texttt{CASE} expression is the \textit{result} that follows the condition. If the result is \texttt{FALSE} any subsequent \texttt{WHEN} clauses are searched in the same manner. If no \texttt{WHEN condition} is \texttt{TRUE} then the value of the \texttt{CASE} expression is the \textit{result} in the \texttt{ELSE} clause. If the \texttt{ELSE} clause is omitted and no condition matches, the result is \texttt{NULL}.

An example:

\begin{verbatim}
SELECT * FROM test;
\end{verbatim}
\begin{verbatim}
a
---
1
2
3
(3 rows)
\end{verbatim}

\begin{verbatim}
SELECT a, 
    CASE WHEN a=1 THEN 'one' 
       WHEN a=2 THEN 'two' 
       ELSE 'other' 
    END
FROM test;
\end{verbatim}
\begin{verbatim}
a | case  
---|------
1 | one  
2 | two  
3 | other 
(3 rows)
\end{verbatim}

The data types of all the \textit{result} expressions must be convertible to a single output type.
The following “simple” `CASE` expression is a specialized variant of the general form above:

```
CASE expression
  WHEN value THEN result
  [ WHEN ... ]
  [ ELSE result ]
END
```

The expression is computed and compared to all the value specifications in the WHEN clauses until one is found that is equal. If no match is found, the result in the ELSE clause (or a null value) is returned.

The example above can be written using the simple `CASE` syntax:

```
SELECT a,
  CASE a WHEN 1 THEN 'one'
    WHEN 2 THEN 'two'
    ELSE 'other'
  END
FROM test;
```

<table>
<thead>
<tr>
<th>a</th>
<th>case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>one</td>
</tr>
<tr>
<td>2</td>
<td>two</td>
</tr>
<tr>
<td>3</td>
<td>other</td>
</tr>
</tbody>
</table>

(3 rows)

A `CASE` expression does not evaluate any subexpressions that are not needed to determine the result. For example, this is a possible way of avoiding a division-by-zero failure:

```
SELECT ... WHERE CASE WHEN x <> 0 THEN y/x > 1.5 ELSE false END;
```

### 2.4.10.2 COALESCE

The `COALESCE` function returns the first of its arguments that is not null. Null is returned only if all arguments are null.

```
COALESCE(value [, value2 ] ...)
```

It is often used to substitute a default value for null values when data is retrieved for display or further computation. For example:

```
SELECT COALESCE(description, short_description, '(none)') ...
```

Like a `CASE` expression, `COALESCE` will not evaluate arguments that are not needed to determine the result; that is, arguments to the right of the first non-null argument are not evaluated. This SQL-standard function provides capabilities similar to `NVL` and `IFNULL`, which are used in some other database systems.
2.4.10.3  NULLIF

The NULLIF function returns a null value if value1 and value2 are equal; otherwise it returns value1.

\[
\text{NULLIF(value1, value2)}
\]

This can be used to perform the inverse operation of the COALESCE example given above:

\[
\text{SELECT NULLIF(value1, '(none)')} ...
\]

If value1 is (none), return a null, otherwise return value1.

2.4.10.4  NVL

The NVL function returns the first of its arguments that is not null. NVL evaluates the first expression; if that expression evaluates to NULL, NVL returns the second expression.

\[
\text{NVL(expr1, expr2)}
\]

The return type is the same as the argument types; all arguments must have the same data type (or be coercible to a common type). NVL returns NULL if all arguments are NULL.

The following example computes a bonus for non-commissioned employees. If an employee is a commissioned employee, this expression returns the employees commission; if the employee is not a commissioned employee (that is, his commission is NULL), this expression returns a bonus that is 10% of his salary.

\[
\text{bonus} = \text{NVL(emp.commission, emp.salary * .10)}
\]

2.4.10.5  NVL2

NVL2 evaluates an expression, and returns either the second or third expression, depending on the value of the first expression. If the first expression is not NULL, NVL2 returns the value in expr2; if the first expression is NULL, NVL2 returns the value in expr3.

\[
\text{NVL2(expr1, expr2, expr3)}
\]

The return type is the same as the argument types; all arguments must have the same data type (or be coercible to a common type).

The following example computes a bonus for commissioned employees - if a given employee is a commissioned employee, this expression returns an amount equal to 110%
of his commission; if the employee is not a commissioned employee (that is, his commission is NULL), this expression returns 0.

\[
\text{bonus} = \text{NVL2} (\text{emp.commission}, \text{emp.commission} \times 1.1, 0)
\]

### 2.4.10.6 GREATEST and LEAST

The `GREATEST` and `LEAST` functions select the largest or smallest value from a list of any number of expressions.

\[
\text{GREATEST} (\text{value}, \text{value2} \ldots) \\
\text{LEAST} (\text{value}, \text{value2} \ldots)
\]

The expressions must all be convertible to a common data type, which will be the type of the result. Null values in the list are ignored. The result will be null only if all the expressions evaluate to null.

Note that `GREATEST` and `LEAST` are not in the SQL standard, but are a common extension.
2.4.11 Aggregate Functions

Aggregate functions compute a single result value from a set of input values. The built-in aggregate functions are listed in the following tables.

Table 2-30 General-Purpose Aggregate Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Argument Type</th>
<th>Return Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG(expression)</td>
<td>INTEGER, REAL, DOUBLE PRECISION, NUMBER</td>
<td>NUMBER for any integer type, DOUBLE PRECISION for a floating-point argument, otherwise the same as the argument data type</td>
<td>The average (arithmetic mean) of all input values</td>
</tr>
<tr>
<td>COUNT(*)</td>
<td></td>
<td>BIGINT</td>
<td>Number of input rows</td>
</tr>
<tr>
<td>COUNT(expression)</td>
<td>Any</td>
<td>BIGINT</td>
<td>Number of input rows for which the value of expression is not null</td>
</tr>
<tr>
<td>MAX(expression)</td>
<td>Any numeric, string, date/time, or bytea type</td>
<td>Same as argument type</td>
<td>Maximum value of expression across all input values</td>
</tr>
<tr>
<td>MIN(expression)</td>
<td>Any numeric, string, date/time, or bytea type</td>
<td>Same as argument type</td>
<td>Minimum value of expression across all input values</td>
</tr>
<tr>
<td>SUM(expression)</td>
<td>INTEGER, REAL, DOUBLE PRECISION, NUMBER</td>
<td>BIGINT for SMALLINT or INTEGER arguments, NUMBER for BIGINT arguments, DOUBLE PRECISION for floating-point arguments, otherwise the same as the argument data type</td>
<td>Sum of expression across all input values</td>
</tr>
</tbody>
</table>

It should be noted that except for COUNT, these functions return a null value when no rows are selected. In particular, SUM of no rows returns null, not zero as one might expect. The COALESCE function may be used to substitute zero for null when necessary.

The following table shows the aggregate functions typically used in statistical analysis. (These are separated out merely to avoid cluttering the listing of more commonly used aggregates.) Where the description mentions \( N \), it means the number of input rows for which all the input expressions are non-null. In all cases, null is returned if the computation is meaningless, for example when \( N \) is zero.

Table 2-31 Aggregate Functions for Statistics

<table>
<thead>
<tr>
<th>Function</th>
<th>Argument Type</th>
<th>Return Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORR((Y, X))</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>Correlation coefficient</td>
</tr>
<tr>
<td>COVAR_POP((Y, X))</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>Population covariance</td>
</tr>
<tr>
<td>COVAR_SAMP((Y, X))</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>Sample covariance</td>
</tr>
<tr>
<td>REGR_AVGX((Y, X))</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>Average of the independent variable ((\text{sum}(X) / N))</td>
</tr>
<tr>
<td>Function</td>
<td>Argument Type</td>
<td>Return Type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>REGR_AVGY(Y, X)</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>Average of the dependent variable (( \frac{\text{sum}(Y)}{N} ))</td>
</tr>
<tr>
<td>REGR_COUNT(Y, X)</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>Number of input rows in which both expressions are nonnull</td>
</tr>
<tr>
<td>REGR_INTERCEPT(Y, X)</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>y-intercept of the least-squares-fit linear equation determined by the ((X, Y)) pairs</td>
</tr>
<tr>
<td>REGR_R2(Y, X)</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>Square of the correlation coefficient</td>
</tr>
<tr>
<td>REGR_SLOPE(Y, X)</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>Slope of the least-squares-fit linear equation determined by the ((X, Y)) pairs</td>
</tr>
<tr>
<td>REGR_SXX(Y, X)</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>( \text{sum}(X^2) - \frac{\text{sum}(X)^2}{N} ) (&quot;sum of squares&quot; of the independent variable)</td>
</tr>
<tr>
<td>REGR_SXY(Y, X)</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>( \text{sum}(X*Y) - \frac{\text{sum}(X) \cdot \text{sum}(Y)}{N} ) (&quot;sum of products&quot; of independent times dependent variable)</td>
</tr>
<tr>
<td>REGR_SYX(Y, X)</td>
<td>DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
<td>( \text{sum}(Y^2) - \frac{\text{sum}(Y)^2}{N} ) (&quot;sum of squares&quot; of the dependent variable)</td>
</tr>
<tr>
<td>STDDEV(expression)</td>
<td>INTEGER, REAL, DOUBLE PRECISION, NUMBER</td>
<td>DOUBLE PRECISION</td>
<td>Historic alias for STDDEV_SAMP</td>
</tr>
<tr>
<td>STDDEV_POP(expression)</td>
<td>INTEGER, REAL, DOUBLE PRECISION, NUMBER</td>
<td>DOUBLE PRECISION</td>
<td>Population standard deviation of the input values</td>
</tr>
<tr>
<td>STDDEV_SAMP(expression)</td>
<td>INTEGER, REAL, DOUBLE PRECISION, NUMBER</td>
<td>DOUBLE PRECISION</td>
<td>Sample standard deviation of the input values</td>
</tr>
<tr>
<td>VARIANCE(expression)</td>
<td>INTEGER, REAL, DOUBLE PRECISION, NUMBER</td>
<td>DOUBLE PRECISION</td>
<td>Historical alias for VAR_SAMP</td>
</tr>
<tr>
<td>VAR_POP(expression)</td>
<td>INTEGER, REAL, DOUBLE PRECISION, NUMBER</td>
<td>DOUBLE PRECISION</td>
<td>Population variance of the input values (square of the population standard deviation)</td>
</tr>
<tr>
<td>VAR_SAMP(expression)</td>
<td>INTEGER, REAL, DOUBLE PRECISION, NUMBER</td>
<td>DOUBLE PRECISION</td>
<td>Sample variance of the input values (square of the sample standard deviation)</td>
</tr>
</tbody>
</table>
2.4.11.1 LISTAGG

Advanced Server has added the LISTAGG function to support string aggregation. 
LISTAGG is an aggregate function that concatenates data from multiple rows into a single row in an ordered manner. You can optionally include a custom delimiter for your data.

The LISTAGG function mandates the use of an ORDER BY clause under a WITHIN GROUP clause to concatenate values of the measure column, and then generate the ordered aggregated data.

Purpose

- LISTAGG can be used without any grouping. In this case, the LISTAGG function operates on all rows in a table and returns a single row.

- LISTAGG can be used with the GROUP BY clause. In this case, the LISTAGG function operates on each group and returns an aggregated output for each group.

- LISTAGG can be used with the OVER clause. In this case, the LISTAGG function partitions a query result set into groups based on the expression in the query_partition_by_clause and then aggregates data in each group.

Synopsis

LISTAGG(measure_expr [, delimiter ]) WITHIN GROUP(order_by_clause) [ OVER query_partition_by_clause ]

Parameters

measure_expr

measure_expr (mandatory) specifies the column or expression that assigns a value to aggregate. NULL values are ignored.

delimiter

delimiter (optional) specifies a string that separates the concatenated values in the result row. The delimiter can be a NULL value, string, character literal, column name, or constant expression. If ignored, the LISTAGG function uses a NULL value by default.

order_by_clause
order_by_clause (mandatory) determines the sort order in which the concatenated values are returned.

query_partition_by_clause

query_partition_by_clause (optional) allows LISTAGG function to be used as an analytic function and sets the range of records for each group in the OVER clause.

Return Type

The LISTAGG function returns a string value.

Examples

The following example concatenates the values in the EMP table and lists all the employees separated by a delimiter comma.

First, create a table named EMP and then insert records into the EMP table.

```sql
edb=# CREATE TABLE EMP
edb-# (EMPNO NUMBER(4) NOT NULL,
edb-# ENAME VARCHAR2(10),
edb-# JOB VARCHAR2(9),
edb-# MGR NUMBER(4),
edb-# HIREDATE DATE,
edb-# SAL NUMBER(7, 2),
edb-# COMM NUMBER(7, 2),
edb-# DEPTNO NUMBER(2));
CREATE TABLE

edb=# INSERT INTO EMP VALUES
edb-# (7499, 'ALLEN', 'SALESMAN', 7698,
edb-# TO_DATE('20-FEB-1981', 'DD-MON-YYYY'), 1600, 300, 30); INSERT 0 1
edb=# INSERT INTO EMP VALUES
edb-# (7521, 'WARD', 'SALESMAN', 7698,
edb-# TO_DATE('22-FEB-1981', 'DD-MON-YYYY'), 1250, 500, 30); INSERT 0 1
edb=# INSERT INTO EMP VALUES
edb-# (7566, 'JONES', 'MANAGER', 7839,
edb-# TO_DATE('2-APR-1981', 'DD-MON-YYYY'), 2975, NULL, 20); INSERT 0 1
edb=# INSERT INTO EMP VALUES
edb-# (7654, 'MARTIN', 'SALESMAN', 7698,
edb-# TO_DATE('28-SEP-1981', 'DD-MON-YYYY'), 1250, 1400, 30); INSERT 0 1
edb=# INSERT INTO EMP VALUES
edb-# (7698, 'BLAKE', 'MANAGER', 7839,
edb-# TO_DATE('1-MAY-1981', 'DD-MON-YYYY'), 2850, NULL, 30); INSERT 0 1
edb=# SELECT LISTAGG(ENAME, ',') WITHIN GROUP (ORDER BY ENAME) FROM EMP;
```
The following example uses PARTITION BY clause with LISTAGG in EMP table and generates output based on a partition by DEPTNO that applies to each partition and not on the entire table.

```
edb=# SELECT DISTINCT DEPTNO, LISTAGG(ENAME, ',') WITHIN GROUP (ORDER BY ENAME) OVER(PARTITION BY DEPTNO) FROM EMP;

depthno |         listagg
--------+-------------------------
      30 | ALLEN,BLAKE,MARTIN,WARD
      20 | JONES
```

The following example is identical to the previous example, except it includes the GROUP BY clause.

```
edb=# SELECT DEPTNO, LISTAGG(ENAME, ',') WITHIN GROUP (ORDER BY ENAME) FROM EMP GROUP BY DEPTNO;

depthno |         listagg
--------+-------------------------
      20 | JONES
      30 | ALLEN,BLAKE,MARTIN,WARD
```

The following example uses PARTITION BY clause with LISTAGG in EMP table and generates output based on a partition by DEPTNO that applies to each partition and not on the entire table.
2.4.11.2 MEDIAN

The MEDIAN function that calculates the middle value of an expression from a given range of values; NULL values are ignored. The MEDIAN function returns an error if a query does not reference the user-defined table.

Purpose

- MEDIAN can be used without any grouping. In this case, the MEDIAN function operates on all rows in a table and returns a single row.

- MEDIAN can be used with the OVER clause. In this case, the MEDIAN function partitions a query result set into groups based on the expression specified in the PARTITION BY clause and then aggregates data in each group.

Synopsis

MEDIAN( median_expression ) [ OVER ( [ PARTITION BY... ] ) ]

Parameters

median_expression

median_expression (mandatory) is a target column or expression that the MEDIAN function operates on and returns a median value. It can be a numeric, datetime, or interval data type.

PARTITION BY

PARTITION BY clause (optional) allows a MEDIAN function to be used as an analytic function and sets the range of records for each group in the OVER clause.

Return Types

The return type is determined by the input data type of expression. The following table illustrates the return type for each input type.

Table 2-32 Input Types

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Return Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMERIC</td>
<td>NUMERIC</td>
</tr>
<tr>
<td>FLOAT, DOUBLE PRECISION</td>
<td>DOUBLE PRECISION</td>
</tr>
<tr>
<td>REAL</td>
<td>REAL</td>
</tr>
<tr>
<td>INTERVAL</td>
<td>INTERVAL</td>
</tr>
<tr>
<td>DATE</td>
<td>DATE</td>
</tr>
<tr>
<td>TIMESTAMP</td>
<td>TIMESTAMP</td>
</tr>
<tr>
<td>TIMESTAMPTZ</td>
<td>TIMESTAMPTZ</td>
</tr>
</tbody>
</table>
Examples

In the following example, a query returns the median salary for each department in the EMP table:

```sql
edb=# SELECT *
FROM EMP;
empno | ename  | job   | mgr  | hiredate         | sal   | comm | deptno
-------+--------+-------+-------+------------------+-------+-------+-------
7369  | SMITH  | CLERK | 7902 | 17-DEC-80 00:00:00 | 800.00 |       | 20    
7499  | ALLEN  | SALESMAN | 7698 | 20-FEB-81 00:00:00 | 1600.00 | 300.00 | 30    
7521  | WARD   | SALESMAN | 7698 | 22-FEB-81 00:00:00 | 1250.00 |       | 30    
7566  | JONES  | MANAGER | 7839 | 02-APR-81 00:00:00 | 2975.00 |       | 20    
7654  | MARTIN | SALESMAN | 7698 | 28-SEP-81 00:00:00 | 1250.00 | 1400.00 | 30    
(5 rows)
```

```sql
edb=# SELECT MEDIAN (SAL) FROM EMP;
median
--------
  1250
(1 row)
```

The following example uses PARTITION BY clause with MEDIAN in EMP table and returns the median salary based on a partition by DEPTNO:

```sql
edb=# SELECT EMPNO, ENAME, DEPTNO, MEDIAN (SAL) OVER (PARTITION BY DEPTNO)
FROM EMP;
empno | ename  | deptno | median
-------+--------+--------+-------
7369  | SMITH  | 20     | 1887.5
7566  | JONES  | 20     | 1887.5
7499  | ALLEN  | 30     | 1250
7521  | WARD   | 30     | 1250
7654  | MARTIN | 30     | 1250
(5 rows)
```

The MEDIAN function can be compared with PERCENTILE_CONT. In the following example, MEDIAN generates the same result as PERCENTILE_CONT:

```sql
edb=# SELECT MEDIAN (SAL), PERCENTILE_CONT(0.5) WITHIN GROUP(ORDER BY SAL)
FROM EMP;
median | percentile_cont
--------+---------------------
  1250  |            1250
(1 row)
```
2.4.12 Subquery Expressions

This section describes the SQL-compliant subquery expressions available in Advanced Server. All of the expression forms documented in this section return Boolean (TRUE/FALSE) results.

2.4.12.1 EXISTS

The argument of EXISTS is an arbitrary SELECT statement, or subquery. The subquery is evaluated to determine whether it returns any rows. If it returns at least one row, the result of EXISTS is TRUE; if the subquery returns no rows, the result of EXISTS is FALSE.

```
EXISTS(subquery)
```

The subquery can refer to variables from the surrounding query, which will act as constants during any one evaluation of the subquery.

The subquery will generally only be executed far enough to determine whether at least one row is returned, not all the way to completion. It is unwise to write a subquery that has any side effects (such as calling sequence functions); whether the side effects occur or not may be difficult to predict.

Since the result depends only on whether any rows are returned, and not on the contents of those rows, the output list of the subquery is normally uninteresting. A common coding convention is to write all EXISTS tests in the form EXISTS(SELECT 1 WHERE . . . ). There are exceptions to this rule however, such as subqueries that use INTERSECT.

This simple example is like an inner join on deptno, but it produces at most one output row for each dept row, even though there are multiple matching emp rows:

```
SELECT dname FROM dept WHERE EXISTS (SELECT 1 FROM emp WHERE emp.deptno = dept.deptno);
```

```
dname
---------
ACCOUNTING
RESEARCH
SALES
(3 rows)
```

2.4.12.2 IN

The right-hand side is a parenthesized subquery, which must return exactly one column. The left-hand expression is evaluated and compared to each row of the subquery result.
The result of \texttt{IN} is \texttt{TRUE} if any equal subquery row is found. The result is \texttt{FALSE} if no equal row is found (including the special case where the subquery returns no rows).

\texttt{expression \ IN \ (subquery)}

Note that if the left-hand expression yields \texttt{NULL}, or if there are no equal right-hand values and at least one right-hand row yields \texttt{NULL}, the result of the \texttt{IN} construct will be \texttt{NULL}, not \texttt{FALSE}. This is in accordance with SQL’s normal rules for Boolean combinations of null values.

As with \texttt{EXISTS}, it’s unwise to assume that the subquery will be evaluated completely.

\textbf{2.4.12.3 \ NOT IN}

The right-hand side is a parenthesized subquery, which must return exactly one column. The left-hand expression is evaluated and compared to each row of the subquery result. The result of \texttt{NOT IN} is \texttt{TRUE} if only unequal subquery rows are found (including the special case where the subquery returns no rows). The result is \texttt{FALSE} if any equal row is found.

\texttt{expression \ NOT \ IN \ (subquery)}

Note that if the left-hand expression yields \texttt{NULL}, or if there are no equal right-hand values and at least one right-hand row yields \texttt{NULL}, the result of the \texttt{NOT IN} construct will be \texttt{NULL}, not \texttt{TRUE}. This is in accordance with SQL’s normal rules for Boolean combinations of null values.

As with \texttt{EXISTS}, it’s unwise to assume that the subquery will be evaluated completely.

\textbf{2.4.12.4 \ ANY/SOME}

The right-hand side is a parenthesized subquery, which must return exactly one column. The left-hand expression is evaluated and compared to each row of the subquery result using the given operator, which must yield a Boolean result. The result of \texttt{ANY} is \texttt{TRUE} if any true result is obtained. The result is \texttt{FALSE} if no true result is found (including the special case where the subquery returns no rows).

\texttt{expression \ operator \ ANY \ (subquery)}
\texttt{expression \ operator \ SOME \ (subquery)}

\texttt{SOME} is a synonym for \texttt{ANY}. \texttt{IN} is equivalent to \texttt{= ANY}.
Note that if there are no successes and at least one right-hand row yields NULL for the operator’s result, the result of the ANY construct will be NULL, not FALSE. This is in accordance with SQL’s normal rules for Boolean combinations of null values.

As with EXISTS, it’s unwise to assume that the subquery will be evaluated completely.

2.4.12.5 ALL

The right-hand side is a parenthesized subquery, which must return exactly one column. The left-hand expression is evaluated and compared to each row of the subquery result using the given operator, which must yield a Boolean result. The result of ALL is TRUE if all rows yield true (including the special case where the subquery returns no rows). The result is FALSE if any false result is found. The result is NULL if the comparison does not return FALSE for any row, and it returns NULL for at least one row.

```
expression operator ALL (subquery)
```

NOT IN is equivalent to <> ALL. As with EXISTS, it’s unwise to assume that the subquery will be evaluated completely.
3 Oracle Catalog Views

The Oracle Catalog Views provide information about database objects in a manner compatible with the Oracle data dictionary views.

3.1 ALL_ALL_TABLES

The **ALL_ALL_TABLES** view provides information about the tables accessible by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the table’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the table belongs.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>Name of the tablespace in which the table resides if other than the default tablespace.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER VARYING (5)</td>
<td>Included for compatibility only; always set to VALID.</td>
</tr>
<tr>
<td>temporary</td>
<td>TEXT</td>
<td>Y if the table is temporary, N if the table is permanent.</td>
</tr>
</tbody>
</table>

3.2 ALL_CONS_COLUMNS

The **ALL_CONS_COLUMNS** view provides information about the columns specified in constraints placed on tables accessible by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the constraint’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the constraint belongs.</td>
</tr>
<tr>
<td>constraint_name</td>
<td>TEXT</td>
<td>The name of the constraint.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table to which the constraint belongs.</td>
</tr>
<tr>
<td>column_name</td>
<td>TEXT</td>
<td>The name of the column referenced in the constraint.</td>
</tr>
<tr>
<td>position</td>
<td>SMALLINT</td>
<td>The position of the column within the object definition.</td>
</tr>
<tr>
<td>constraint_def</td>
<td>TEXT</td>
<td>The definition of the constraint.</td>
</tr>
</tbody>
</table>

3.3 ALL_CONSTRAINTS

The **ALL_CONSTRAINTS** view provides information about the constraints placed on tables accessible by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the constraint’s owner.</td>
</tr>
</tbody>
</table>
### Table Compatibility for Oracle Developers

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the constraint belongs.</td>
</tr>
<tr>
<td>constraint_name</td>
<td>TEXT</td>
<td>The name of the constraint.</td>
</tr>
<tr>
<td>constraint_type</td>
<td>TEXT</td>
<td>The constraint type. Possible values are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C - check constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F - foreign key constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P - primary key constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U - unique key constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R - referential integrity constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V - constraint on a view</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O - with read-only, on a view</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table to which the constraint belongs.</td>
</tr>
<tr>
<td>search_condition</td>
<td>TEXT</td>
<td>Search condition that applies to a check constraint.</td>
</tr>
<tr>
<td>r_owner</td>
<td>TEXT</td>
<td>Owner of a table referenced by a referential constraint.</td>
</tr>
<tr>
<td>r_constraint_name</td>
<td>TEXT</td>
<td>Name of the constraint definition for a referenced table.</td>
</tr>
<tr>
<td>delete_rule</td>
<td>TEXT</td>
<td>The delete rule for a referential constraint. Possible values are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C - cascade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R - restrict</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N - no action</td>
</tr>
<tr>
<td>deferrable</td>
<td>BOOLEAN</td>
<td>Specified if the constraint is deferrable (T or F).</td>
</tr>
<tr>
<td>deferred</td>
<td>BOOLEAN</td>
<td>Specifies if the constraint has been deferred (T or F).</td>
</tr>
<tr>
<td>index_owner</td>
<td>TEXT</td>
<td>User name of the index owner.</td>
</tr>
<tr>
<td>index_name</td>
<td>TEXT</td>
<td>The name of the index.</td>
</tr>
<tr>
<td>constraint_def</td>
<td>TEXT</td>
<td>The definition of the constraint.</td>
</tr>
</tbody>
</table>

### 3.4 **ALL_COL_PRIVS**

The **ALL_COL_PRIVS** view provides the following types of privileges:

- **Column object privileges** for which a current user is either an object owner, grantor, or grantee.

- **Column object privileges** for which **PUBLIC** is the grantee.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>grantor</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the user who granted the privilege.</td>
</tr>
<tr>
<td>grantee</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the user with the privilege.</td>
</tr>
<tr>
<td>table_schema</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the user who owns the object.</td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the schema in which the object resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Object name.</td>
</tr>
<tr>
<td>column_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Column name.</td>
</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>privilege</td>
<td>CHARACTER VARYING(40)</td>
<td>Privilege on the column.</td>
</tr>
<tr>
<td>grantable</td>
<td>CHARACTER VARYING(3)</td>
<td>Indicates whether the privilege was granted with the grant option YES or NO. YES indicates that the GRANTEE (recipient of the privilege) can in turn grant the privilege to others. The value may be YES if the grantee has the administrator privileges.</td>
</tr>
<tr>
<td>common</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO.</td>
</tr>
<tr>
<td>inherited</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO.</td>
</tr>
</tbody>
</table>

### 3.5 ALL_DB_LINKS

The ALL_DB_LINKS view provides information about the database links accessible by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>TEXT</td>
<td>User name of the database link's owner.</td>
</tr>
<tr>
<td>db_link</td>
<td>TEXT</td>
<td>The name of the database link.</td>
</tr>
<tr>
<td>Type</td>
<td>CHARACTER VARYING</td>
<td>Type of remote server. Value will be either REDWOOD or EDB</td>
</tr>
<tr>
<td>username</td>
<td>TEXT</td>
<td>User name of the user logging in.</td>
</tr>
<tr>
<td>Host</td>
<td>TEXT</td>
<td>Name or IP address of the remote server.</td>
</tr>
</tbody>
</table>

### 3.6 ALL_DEPENDENCIES

The ALL_DEPENDENCIES view provides information about the dependencies between database objects that the current user can access (except for synonyms).

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>CHARACTER VARYING(128)</td>
<td>Owner of dependent object.</td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the schema in which the dependent object resides.</td>
</tr>
<tr>
<td>name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the dependent object.</td>
</tr>
<tr>
<td>type</td>
<td>CHARACTER VARYING(18)</td>
<td>Type of the dependent object.</td>
</tr>
<tr>
<td>referenced_owner</td>
<td>CHARACTER VARYING(128)</td>
<td>Owner of the referenced object.</td>
</tr>
<tr>
<td>referenced_schema_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the schema in which the referenced object resides.</td>
</tr>
<tr>
<td>referenced_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the referenced object.</td>
</tr>
<tr>
<td>referenced_type</td>
<td>CHARACTER VARYING(128)</td>
<td>Type of the referenced object.</td>
</tr>
</tbody>
</table>
### 3.7 ALL_DIRECTORIES

The `ALL_DIRECTORIES` view provides information about all directories created with the `CREATE DIRECTORY` command.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>referenced_link_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Included for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>dependency_type</td>
<td>CHARACTER VARYING(4)</td>
<td>Included for compatibility only. Always set to HARD.</td>
</tr>
</tbody>
</table>

### 3.8 ALL_IND_COLUMNS

The `ALL_IND_COLUMNS` view provides information about columns included in indexes on the tables accessible by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>index_owner</td>
<td>TEXT</td>
<td>User name of the index's owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the index belongs.</td>
</tr>
<tr>
<td>index_name</td>
<td>TEXT</td>
<td>The name of the index.</td>
</tr>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>User name of the table owner.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table to which the index belongs.</td>
</tr>
<tr>
<td>column_name</td>
<td>TEXT</td>
<td>The name of the column.</td>
</tr>
<tr>
<td>column_position</td>
<td>SMALLINT</td>
<td>The position of the column within the index.</td>
</tr>
<tr>
<td>column_length</td>
<td>SMALLINT</td>
<td>The length of the column (in bytes).</td>
</tr>
<tr>
<td>char_length</td>
<td>NUMERIC</td>
<td>The length of the column (in characters).</td>
</tr>
<tr>
<td>descend</td>
<td>CHARACTER(1)</td>
<td>Always set to Y (descending); included for compatibility only.</td>
</tr>
</tbody>
</table>

### 3.9 ALL_INDEXES

The `ALL_INDEXES` view provides information about the indexes on tables that may be accessed by the current user.
### 3.10 ALL_JOBS

The **ALL_JOBS** view provides information about all jobs that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>job</td>
<td>INTEGER</td>
<td>The identifier of the job (Job ID).</td>
</tr>
<tr>
<td>log_user</td>
<td>TEXT</td>
<td>The name of the user that submitted the job.</td>
</tr>
<tr>
<td>priv_user</td>
<td>TEXT</td>
<td>Same as log_user. Included for compatibility only.</td>
</tr>
<tr>
<td>schema_user</td>
<td>TEXT</td>
<td>The name of the schema used to parse the job.</td>
</tr>
<tr>
<td>last_date</td>
<td>TIMESTAMP WITH TIME ZONE</td>
<td>The last date that this job executed successfully.</td>
</tr>
<tr>
<td>last_sec</td>
<td>TEXT</td>
<td>Same as last_date.</td>
</tr>
<tr>
<td>this_date</td>
<td>TIMESTAMP WITH TIME ZONE</td>
<td>The date that the job began executing.</td>
</tr>
<tr>
<td>this_sec</td>
<td>TEXT</td>
<td>Same as this_date.</td>
</tr>
<tr>
<td>next_date</td>
<td>TIMESTAMP WITH TIME ZONE</td>
<td>The next date that this job will be executed.</td>
</tr>
<tr>
<td>next_sec</td>
<td>TEXT</td>
<td>Same as next_date.</td>
</tr>
<tr>
<td>total_time</td>
<td>INTERVAL</td>
<td>The execution time of this job (in seconds).</td>
</tr>
<tr>
<td>broken</td>
<td>TEXT</td>
<td>If Y, no attempt will be made to run this job. If N, this job will attempt to execute.</td>
</tr>
<tr>
<td>interval</td>
<td>TEXT</td>
<td>Determines how often the job will repeat.</td>
</tr>
</tbody>
</table>
3.11 ALL_OBJECTS

The **ALL_OBJECTS** view provides information about all objects that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the object’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the object belongs.</td>
</tr>
<tr>
<td>object_name</td>
<td>TEXT</td>
<td>Name of the object.</td>
</tr>
<tr>
<td>object_type</td>
<td>TEXT</td>
<td>Type of the object – possible values are: INDEX, FUNCTION, PACKAGE, PACKAGE BODY, PROCEDURE, SEQUENCE, SYNONYM, TABLE, TRIGGER, and VIEW.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER VARYING</td>
<td>Whether or not the state of the object is valid. Currently, included for compatibility only; always set to VALID.</td>
</tr>
<tr>
<td>temporary</td>
<td>TEXT</td>
<td>Y if a temporary object; N if this is a permanent object.</td>
</tr>
</tbody>
</table>

3.12 ALL_PART_KEY_COLUMNS

The **ALL_PART_KEY_COLUMNS** view provides information about the key columns of the partitioned tables that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>The owner of the table.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>name</td>
<td>TEXT</td>
<td>The name of the table in which the column resides.</td>
</tr>
<tr>
<td>object_type</td>
<td>CHARACTER(5)</td>
<td>For compatibility only; always TABLE.</td>
</tr>
<tr>
<td>column_name</td>
<td>TEXT</td>
<td>The name of the column on which the key is defined.</td>
</tr>
<tr>
<td>column_position</td>
<td>INTEGER</td>
<td>1 for the first column; 2 for the second column, etc.</td>
</tr>
</tbody>
</table>
### 3.13 ALL_PART_TABLES

The `ALL_PART_TABLES` view provides information about all of the partitioned tables that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>The owner of the partitioned table.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table.</td>
</tr>
<tr>
<td>partitioning_type</td>
<td>TEXT</td>
<td>The partitioning type used to define table partitions.</td>
</tr>
<tr>
<td>subpartitioning_type</td>
<td>TEXT</td>
<td>The subpartitioning type used to define table subpartitions.</td>
</tr>
<tr>
<td>partition_count</td>
<td>BIGINT</td>
<td>The number of partitions in the table.</td>
</tr>
<tr>
<td>def_subpartition_count</td>
<td>INTEGER</td>
<td>The number of subpartitions in the table.</td>
</tr>
<tr>
<td>partitioning_key_count</td>
<td>INTEGER</td>
<td>The number of partitioning keys specified.</td>
</tr>
<tr>
<td>subpartitioning_key_count</td>
<td>INTEGER</td>
<td>The number of subpartitioning keys specified.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER VARYING(8)</td>
<td>Provided for compatibility only. Always VALID.</td>
</tr>
<tr>
<td>def_tablespace_name</td>
<td>CHARACTER VARYING(30)</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_pct_free</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_pct_used</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_ini_trans</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_max_trans</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_initial_extent</td>
<td>CHARACTER VARYING(40)</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_next_extent</td>
<td>CHARACTER VARYING(40)</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_min_extents</td>
<td>CHARACTER VARYING(40)</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_max_extents</td>
<td>CHARACTER VARYING(40)</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_pct_increase</td>
<td>CHARACTER VARYING(40)</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_freeists</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_freeist_groups</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_logging</td>
<td>CHARACTER VARYING(7)</td>
<td>Provided for compatibility only. Always YES.</td>
</tr>
<tr>
<td>def_compression</td>
<td>CHARACTER VARYING(8)</td>
<td>Provided for compatibility only. Always NONE.</td>
</tr>
<tr>
<td>def_buffer_pool</td>
<td>CHARACTER VARYING(7)</td>
<td>Provided for compatibility only. Always DEFAULT.</td>
</tr>
<tr>
<td>ref_ptn_constraint_name</td>
<td>CHARACTER VARYING(30)</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>interval</td>
<td>CHARACTER VARYING(1000)</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
</tbody>
</table>
### 3.14 ALL_POLICIES

The `ALL_POLICIES` view provides information on all policies in the database. This view is accessible only to superusers.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>object_owner</td>
<td>TEXT</td>
<td>Name of the owner of the object.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the object belongs.</td>
</tr>
<tr>
<td>object_name</td>
<td>TEXT</td>
<td>Name of the object on which the policy applies.</td>
</tr>
<tr>
<td>policy_group</td>
<td>TEXT</td>
<td>Included for compatibility only; always set to an empty string.</td>
</tr>
<tr>
<td>policy_name</td>
<td>TEXT</td>
<td>Name of the policy.</td>
</tr>
<tr>
<td>pf_owner</td>
<td>TEXT</td>
<td>Name of the schema containing the policy function, or the schema containing the package that contains the policy function.</td>
</tr>
<tr>
<td>package</td>
<td>TEXT</td>
<td>Name of the package containing the policy function (if the function belongs to a package).</td>
</tr>
<tr>
<td>function</td>
<td>TEXT</td>
<td>Name of the policy function.</td>
</tr>
<tr>
<td>sel</td>
<td>TEXT</td>
<td>Whether or not the policy applies to <code>SELECT</code> commands. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>ins</td>
<td>TEXT</td>
<td>Whether or not the policy applies to <code>INSERT</code> commands. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>upd</td>
<td>TEXT</td>
<td>Whether or not the policy applies to <code>UPDATE</code> commands. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>del</td>
<td>TEXT</td>
<td>Whether or not the policy applies to <code>DELETE</code> commands. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>idx</td>
<td>TEXT</td>
<td>Whether or not the policy applies to index maintenance. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>chk_option</td>
<td>TEXT</td>
<td>Whether or not the check option is in force for <code>INSERT</code> and <code>UPDATE</code> commands. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>enable</td>
<td>TEXT</td>
<td>Whether or not the policy is enabled on the object. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>static_policy</td>
<td>TEXT</td>
<td>Included for compatibility only; always set to <code>NO</code>.</td>
</tr>
<tr>
<td>policy_type</td>
<td>TEXT</td>
<td>Included for compatibility only; always set to <code>UNKNOWN</code>.</td>
</tr>
<tr>
<td>long_predicate</td>
<td>TEXT</td>
<td>Included for compatibility only; always set to <code>YES</code>.</td>
</tr>
</tbody>
</table>

### 3.15 ALL_QUEUES

The `ALL_QUEUES` view provides information about any currently defined queues.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the queue owner.</td>
</tr>
<tr>
<td>name</td>
<td>TEXT</td>
<td>The name of the queue.</td>
</tr>
<tr>
<td>queue_table</td>
<td>TEXT</td>
<td>The name of the queue table in which the queue resides.</td>
</tr>
<tr>
<td>qid</td>
<td>OID</td>
<td>The system-assigned object ID of the queue.</td>
</tr>
</tbody>
</table>
### 3.16 ALL_QUEUE_TABLES

The **ALL_QUEUE_TABLES** view provides information about all of the queue tables in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>Role name of the owner of the queue table.</td>
</tr>
<tr>
<td>queue_table</td>
<td>TEXT</td>
<td>The user-specified name of the queue table.</td>
</tr>
<tr>
<td>type</td>
<td>CHARACTER VARYING</td>
<td>The type of data stored in the queue table.</td>
</tr>
<tr>
<td>object_type</td>
<td>TEXT</td>
<td>The user-defined payload type.</td>
</tr>
<tr>
<td>sort_order</td>
<td>CHARACTER VARYING</td>
<td>The order in which the queue table is sorted.</td>
</tr>
<tr>
<td>recipients</td>
<td>CHARACTER VARYING</td>
<td>Always SINGLE.</td>
</tr>
<tr>
<td>message_grouping</td>
<td>CHARACTER VARYING</td>
<td>Always NONE.</td>
</tr>
<tr>
<td>compatible</td>
<td>CHARACTER VARYING</td>
<td>The release number of the Advanced Server release with which this queue table is compatible.</td>
</tr>
<tr>
<td>primary_instance</td>
<td>NUMERIC</td>
<td>Always 0.</td>
</tr>
<tr>
<td>secondary_instance</td>
<td>NUMERIC</td>
<td>Always 0.</td>
</tr>
<tr>
<td>owner_instance</td>
<td>NUMERIC</td>
<td>The instance number of the instance that owns the queue table.</td>
</tr>
<tr>
<td>user_comment</td>
<td>CHARACTER VARYING</td>
<td>The user comment provided when the table was created.</td>
</tr>
<tr>
<td>secure</td>
<td>CHARACTER VARYING</td>
<td>YES indicates that the queue table is secure; NO indicates that it is not.</td>
</tr>
</tbody>
</table>
### 3.17 ALL_SEQUENCES

The `ALL_SEQUENCES` view provides information about all user-defined sequences on which the user has `SELECT`, or `UPDATE` privileges.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sequence_owner</td>
<td>TEXT</td>
<td>User name of the sequence's owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the sequence resides.</td>
</tr>
<tr>
<td>sequence_name</td>
<td>TEXT</td>
<td>Name of the sequence.</td>
</tr>
<tr>
<td>min_value</td>
<td>NUMERIC</td>
<td>The lowest value that the server will assign to the sequence.</td>
</tr>
<tr>
<td>max_value</td>
<td>NUMERIC</td>
<td>The highest value that the server will assign to the sequence.</td>
</tr>
<tr>
<td>increment_by</td>
<td>NUMERIC</td>
<td>The value added to the current sequence number to create the next sequent number.</td>
</tr>
<tr>
<td>cycle_flag</td>
<td>CHARACTER VARYING</td>
<td>Specifies if the sequence should wrap when it reaches min_value or max_value.</td>
</tr>
<tr>
<td>order_flag</td>
<td>CHARACTER VARYING</td>
<td>Will always return Y.</td>
</tr>
<tr>
<td>cache_size</td>
<td>NUMERIC</td>
<td>The number of pre-allocated sequence numbers stored in memory.</td>
</tr>
<tr>
<td>last_number</td>
<td>NUMERIC</td>
<td>The value of the last sequence number saved to disk.</td>
</tr>
</tbody>
</table>

### 3.18 ALL_SOURCE

The `ALL_SOURCE` view provides a source code listing of the following program types: functions, procedures, triggers, package specifications, and package bodies.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the program’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the program belongs.</td>
</tr>
<tr>
<td>name</td>
<td>TEXT</td>
<td>Name of the program.</td>
</tr>
<tr>
<td>type</td>
<td>TEXT</td>
<td>Type of program – possible values are: FUNCTION, PACKAGE, PACKAGE BODY, PROCEDURE, and TRIGGER.</td>
</tr>
<tr>
<td>line</td>
<td>INTEGER</td>
<td>Source code line number relative to a given program.</td>
</tr>
<tr>
<td>text</td>
<td>TEXT</td>
<td>Line of source code text.</td>
</tr>
</tbody>
</table>

### 3.19 ALL_SUBPART_KEY_COLUMNS

The `ALL_SUBPART_KEY_COLUMNS` view provides information about the key columns of those partitioned tables which are subpartitioned that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>The owner of the table.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the</td>
</tr>
</tbody>
</table>
### 3.20 ALL_SYNONYMS

The **ALL_SYNONYMS** view provides information on all synonyms that may be referenced by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the synonym’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the synonym resides.</td>
</tr>
<tr>
<td>synonym_name</td>
<td>TEXT</td>
<td>Name of the synonym.</td>
</tr>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>User name of the object’s owner.</td>
</tr>
<tr>
<td>table_schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the object that the synonym refers to.</td>
</tr>
<tr>
<td>db_link</td>
<td>TEXT</td>
<td>The name of any associated database link.</td>
</tr>
</tbody>
</table>

### 3.21 ALL_TAB_COLUMNS

The **ALL_TAB_COLUMNS** view provides information on all columns in all user-defined tables and views.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>CHARACTER VARYING</td>
<td>User name of the owner of the table or view in which the column resides.</td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the schema in which the table or view resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the table or view.</td>
</tr>
<tr>
<td>column_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the column.</td>
</tr>
<tr>
<td>data_type</td>
<td>CHARACTER VARYING</td>
<td>Data type of the column.</td>
</tr>
<tr>
<td>data_length</td>
<td>NUMERIC</td>
<td>Length of text columns.</td>
</tr>
<tr>
<td>data_precision</td>
<td>NUMERIC</td>
<td>Precision (number of digits) for NUMBER columns.</td>
</tr>
<tr>
<td>data_scale</td>
<td>NUMERIC</td>
<td>Scale of NUMBER columns.</td>
</tr>
<tr>
<td>nullable</td>
<td>CHARACTER(1)</td>
<td>Whether or not the column is nullable. Possible values are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Y – column is nullable; N – column does not allow null.</td>
</tr>
<tr>
<td>column_id</td>
<td>NUMERIC</td>
<td>Relative position of the column within the table or view.</td>
</tr>
<tr>
<td>data_default</td>
<td>CHARACTER VARYING</td>
<td>Default value assigned to the column.</td>
</tr>
</tbody>
</table>
### 3.22 ALL_TAB_PARTITIONS

The **ALL_TAB_PARTITIONS** view provides information about all of the partitions that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>The owner of the table in which the partition resides.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table.</td>
</tr>
<tr>
<td>composite</td>
<td>TEXT</td>
<td>YES if the table is subpartitioned; NO if the table is not subpartitioned.</td>
</tr>
<tr>
<td>partition_name</td>
<td>TEXT</td>
<td>The name of the partition.</td>
</tr>
<tr>
<td>subpartition_count</td>
<td>BIGINT</td>
<td>The number of subpartitions in the partition.</td>
</tr>
<tr>
<td>high_value</td>
<td>TEXT</td>
<td>The high partitioning value specified in the <code>CREATE TABLE</code> statement.</td>
</tr>
<tr>
<td>high_value_length</td>
<td>INTEGER</td>
<td>The length of high partitioning value.</td>
</tr>
<tr>
<td>partition_position</td>
<td>INTEGER</td>
<td>The ordinal position of this partition.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>The name of the tablespace in which the partition resides.</td>
</tr>
<tr>
<td>pct_free</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0.</td>
</tr>
<tr>
<td>pct_used</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0.</td>
</tr>
<tr>
<td>ini_trans</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0.</td>
</tr>
<tr>
<td>max_trans</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0.</td>
</tr>
<tr>
<td>init_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>next_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>min_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0.</td>
</tr>
<tr>
<td>max_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0.</td>
</tr>
<tr>
<td>pct_increase</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0.</td>
</tr>
<tr>
<td>freelists</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>freelists_groups</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>logging</td>
<td>CHARACTER VARYING(7)</td>
<td>Included for compatibility only; always YES.</td>
</tr>
<tr>
<td>compression</td>
<td>CHARACTER VARYING(8)</td>
<td>Included for compatibility only; always NONE.</td>
</tr>
<tr>
<td>num_rows</td>
<td>NUMERIC</td>
<td>Same as <code>pg_class.reltuples</code>.</td>
</tr>
<tr>
<td>blocks</td>
<td>INTEGER</td>
<td>Same as <code>pg_class.relpages</code>.</td>
</tr>
<tr>
<td>empty_blocks</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>avg_space</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>chain_cnt</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>avg_row_len</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>sample_size</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>last_analyzed</td>
<td>TIMESTAMP</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>buffer_pool</td>
<td>CHARACTER VARYING(7)</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
<tr>
<td>global_stats</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always YES.</td>
</tr>
<tr>
<td>user_stats</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO.</td>
</tr>
<tr>
<td>backing_table</td>
<td>REGCLASS</td>
<td>Name of the partition backing table.</td>
</tr>
</tbody>
</table>
3.23 **ALL_TAB_SUBPARTITIONS**

The **ALL_TAB_SUBPARTITIONS** view provides information about all of the subpartitions that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>The owner of the table in which the subpartition resides.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table.</td>
</tr>
<tr>
<td>partition_name</td>
<td>TEXT</td>
<td>The name of the partition.</td>
</tr>
<tr>
<td>subpartition_name</td>
<td>TEXT</td>
<td>The name of the subpartition.</td>
</tr>
<tr>
<td>high_value</td>
<td>TEXT</td>
<td>The high subpartitioning value specified in the <strong>CREATE TABLE</strong> statement.</td>
</tr>
<tr>
<td>high_value_length</td>
<td>INTEGER</td>
<td>The length of high partitioning value.</td>
</tr>
<tr>
<td>subpartition_position</td>
<td>INTEGER</td>
<td>The ordinal position of this subpartition.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>The name of the tablespace in which the subpartition resides.</td>
</tr>
<tr>
<td>pct_free</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>pct_used</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>ini_trans</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>max_trans</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>initial_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>next_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>min_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>max_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>pct_increase</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>freelists</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>freelist_groups</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>logging</td>
<td>CHARACTER VARYING(7)</td>
<td>Included for compatibility only; always YES</td>
</tr>
<tr>
<td>compression</td>
<td>CHARACTER VARYING(8)</td>
<td>Included for compatibility only; always NONE</td>
</tr>
<tr>
<td>num_rows</td>
<td>NUMERIC</td>
<td>Same as <strong>pg_class.reltuples</strong>.</td>
</tr>
<tr>
<td>blocks</td>
<td>INTEGER</td>
<td>Same as <strong>pg_class.relpages</strong>.</td>
</tr>
<tr>
<td>empty_blocks</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>avg_space</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>chain_cnt</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>avg_row_len</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>sample_size</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>last_analyzed</td>
<td>TIMESTAMP WITHOUT TIME ZONE</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>buffer_pool</td>
<td>CHARACTER VARYING(7)</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>global_stats</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always YES</td>
</tr>
<tr>
<td>user_stats</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO</td>
</tr>
<tr>
<td>backing_table</td>
<td>REGCLASS</td>
<td>Name of the subpartition backing table.</td>
</tr>
</tbody>
</table>
3.24 ALL_TAB_PRIVS

The **ALL_TAB_PRIVS** view provides the following types of privileges:

- Object privileges for which a current user is either an object owner, grantor, or grantee.

- Object privileges for which the **PUBLIC** is the grantee.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>grantor</td>
<td>CHARACTER VARYING (128)</td>
<td>Name of the user who granted the privilege.</td>
</tr>
<tr>
<td>grantee</td>
<td>CHARACTER VARYING (128)</td>
<td>Name of the user with the privilege.</td>
</tr>
<tr>
<td>table_schema</td>
<td>CHARACTER VARYING (128)</td>
<td>Name of the user who owns the object.</td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING (128)</td>
<td>Name of the schema in which the object resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>CHARACTER VARYING (128)</td>
<td>Object name.</td>
</tr>
<tr>
<td>privilege</td>
<td>CHARACTER VARYING (40)</td>
<td>Privilege name.</td>
</tr>
<tr>
<td>grantable</td>
<td>CHARACTER VARYING (3)</td>
<td>Indicates whether the privilege was granted with the grant option YES or NO.</td>
</tr>
<tr>
<td>hierarchy</td>
<td>CHARACTER VARYING (3)</td>
<td>The value can be YES or NO. The value may be YES if the privilege is SELECT else NO.</td>
</tr>
<tr>
<td>common</td>
<td>CHARACTER VARYING (3)</td>
<td>Included for compatibility only; always NO.</td>
</tr>
<tr>
<td>type</td>
<td>CHARACTER VARYING (24)</td>
<td>Type of object.</td>
</tr>
<tr>
<td>inherited</td>
<td>CHARACTER VARYING (3)</td>
<td>Included for compatibility only; always NO.</td>
</tr>
</tbody>
</table>

3.25 ALL_TABLES

The **ALL_TABLES** view provides information on all user-defined tables.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the table’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the table belongs.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>Name of the tablespace in which the table resides if other than the default tablespace.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER VARYING (5)</td>
<td>Whether or not the state of the table is valid. Currently, included for compatibility only; always set to VALID.</td>
</tr>
</tbody>
</table>
### 3.26 ALL_TRIGGERS

The `ALL_TRIGGERS` view provides information about the triggers on tables that may be accessed by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the trigger’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the trigger resides.</td>
</tr>
<tr>
<td>trigger_name</td>
<td>TEXT</td>
<td>The name of the trigger.</td>
</tr>
<tr>
<td>trigger_type</td>
<td>TEXT</td>
<td>The type of the trigger. Possible values are: BEFORE ROW, BEFORE STATEMENT, AFTER ROW, AFTER STATEMENT</td>
</tr>
<tr>
<td>triggering_event</td>
<td>TEXT</td>
<td>The event that fires the trigger.</td>
</tr>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>The user name of the owner of the table on which the trigger is defined.</td>
</tr>
<tr>
<td>base_object_type</td>
<td>TEXT</td>
<td>Included for compatibility only. Value will always be TABLE.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table on which the trigger is defined.</td>
</tr>
<tr>
<td>referencing_name</td>
<td>TEXT</td>
<td>Included for compatibility only. Value will always be REFERENCING NEW AS NEW OLD AS OLD.</td>
</tr>
<tr>
<td>status</td>
<td>TEXT</td>
<td>Status indicates if the trigger is enabled (VALID) or disabled (NOTVALID).</td>
</tr>
<tr>
<td>description</td>
<td>TEXT</td>
<td>Included for compatibility only.</td>
</tr>
<tr>
<td>trigger_body</td>
<td>TEXT</td>
<td>The body of the trigger.</td>
</tr>
<tr>
<td>action_statement</td>
<td>TEXT</td>
<td>The SQL command that executes when the trigger fires.</td>
</tr>
</tbody>
</table>

### 3.27 ALL_TYPES

The `ALL_TYPES` view provides information about the object types available to the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>The owner of the object type.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the type is defined.</td>
</tr>
<tr>
<td>type_name</td>
<td>TEXT</td>
<td>The name of the type.</td>
</tr>
<tr>
<td>type_oid</td>
<td>OID</td>
<td>The object identifier (OID) of the type.</td>
</tr>
<tr>
<td>typecode</td>
<td>TEXT</td>
<td>The typecode of the type. Possible values are: OBJECT, COLLECTION, OTHER</td>
</tr>
</tbody>
</table>
### 3.28 ALL_USERS

The **ALL_USERS** view provides information on all user names.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>username</td>
<td>TEXT</td>
<td>Name of the user.</td>
</tr>
<tr>
<td>user_id</td>
<td>OID</td>
<td>Numeric user id assigned to the user.</td>
</tr>
<tr>
<td>created</td>
<td>TIMESTAMP WITHOUT TIME ZONE</td>
<td>Included for compatibility only; always NULL.</td>
</tr>
</tbody>
</table>

### 3.29 ALL_VIEW_COLUMNS

The **ALL_VIEW_COLUMNS** view provides information on all columns in all user-defined views.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>CHARACTER VARYING</td>
<td>User name of the view’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the schema in which the view belongs.</td>
</tr>
<tr>
<td>view_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the view.</td>
</tr>
<tr>
<td>column_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the column.</td>
</tr>
<tr>
<td>data_type</td>
<td>CHARACTER VARYING</td>
<td>Data type of the column.</td>
</tr>
<tr>
<td>data_length</td>
<td>NUMERIC</td>
<td>Length of text columns.</td>
</tr>
<tr>
<td>data_precision</td>
<td>NUMERIC</td>
<td>Precision (number of digits) for NUMBER columns.</td>
</tr>
<tr>
<td>data_scale</td>
<td>NUMERIC</td>
<td>Scale of NUMBER columns.</td>
</tr>
<tr>
<td>nullable</td>
<td>CHARACTER(1)</td>
<td>Whether or not the column is nullable – possible values are: Y – column is nullable; N – column does not allow null.</td>
</tr>
<tr>
<td>column_id</td>
<td>NUMERIC</td>
<td>Relative position of the column within the view.</td>
</tr>
<tr>
<td>data_default</td>
<td>CHARACTER VARYING</td>
<td>Default value assigned to the column.</td>
</tr>
</tbody>
</table>
3.30 ALL_VIEWS

The **ALL_VIEWS** view provides information about all user-defined views.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the view’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the view belongs.</td>
</tr>
<tr>
<td>view_name</td>
<td>TEXT</td>
<td>Name of the view.</td>
</tr>
<tr>
<td>text</td>
<td>TEXT</td>
<td>The SELECT statement that defines the view.</td>
</tr>
</tbody>
</table>

3.31 DBA_ALL_TABLES

The **DBA_ALL_TABLES** view provides information about all tables in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the table’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the table belongs.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>Name of the tablespace in which the table resides if other than the default tablespace.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER VARYING(5)</td>
<td>Included for compatibility only; always set to <strong>VALID</strong>.</td>
</tr>
<tr>
<td>temporary</td>
<td>TEXT</td>
<td>Y if the table is temporary; N if the table is permanent.</td>
</tr>
</tbody>
</table>

3.32 DBA_CONS_COLUMNS

The **DBA_CONS_COLUMNS** view provides information about all columns that are included in constraints that are specified in on all tables in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the constraint’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the constraint belongs.</td>
</tr>
<tr>
<td>constraint_name</td>
<td>TEXT</td>
<td>The name of the constraint.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table to which the constraint belongs.</td>
</tr>
<tr>
<td>column_name</td>
<td>TEXT</td>
<td>The name of the column referenced in the constraint.</td>
</tr>
<tr>
<td>position</td>
<td>SMALLINT</td>
<td>The position of the column within the object definition.</td>
</tr>
<tr>
<td>constraint_def</td>
<td>TEXT</td>
<td>The definition of the constraint.</td>
</tr>
</tbody>
</table>
3.33 DBA_CONSTRAINTS

The DBA_CONSTRAINTS view provides information about all constraints on tables in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the constraint’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the constraint belongs.</td>
</tr>
<tr>
<td>constraint_name</td>
<td>TEXT</td>
<td>The name of the constraint.</td>
</tr>
<tr>
<td>constraint_type</td>
<td>TEXT</td>
<td>The constraint type. Possible values are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C – check constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F – foreign key constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P – primary key constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U – unique key constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R – referential integrity constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V – constraint on a view</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O – with read-only, on a view</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table to which the constraint belongs.</td>
</tr>
<tr>
<td>search_condition</td>
<td>TEXT</td>
<td>Search condition that applies to a check constraint.</td>
</tr>
<tr>
<td>r_owner</td>
<td>TEXT</td>
<td>Owner of a table referenced by a referential constraint.</td>
</tr>
<tr>
<td>r_constraint_name</td>
<td>TEXT</td>
<td>Name of the constraint definition for a referenced table.</td>
</tr>
<tr>
<td>delete_rule</td>
<td>TEXT</td>
<td>The delete rule for a referential constraint. Possible values are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C – cascade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R – restrict</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N – no action</td>
</tr>
<tr>
<td>deferrable</td>
<td>BOOLEAN</td>
<td>Specified if the constraint is deferrable (T or F).</td>
</tr>
<tr>
<td>deferred</td>
<td>BOOLEAN</td>
<td>Specifies if the constraint has been deferred (T or F).</td>
</tr>
<tr>
<td>index_owner</td>
<td>TEXT</td>
<td>User name of the index owner.</td>
</tr>
<tr>
<td>index_name</td>
<td>TEXT</td>
<td>The name of the index.</td>
</tr>
<tr>
<td>constraint_def</td>
<td>TEXT</td>
<td>The definition of the constraint.</td>
</tr>
</tbody>
</table>

3.34 DBA_COL_PRIVS

The DBA_COL_PRIVS view provides a listing of the object privileges granted on columns for all the database users.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>grantee</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the user with the privilege.</td>
</tr>
<tr>
<td>owner</td>
<td>CHARACTER VARYING(128)</td>
<td>Object owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the schema in which the object resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Object name.</td>
</tr>
<tr>
<td>column_name</td>
<td>CHARACTER</td>
<td>Column name.</td>
</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>grantor</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the user who granted the privilege.</td>
</tr>
<tr>
<td>privilege</td>
<td>CHARACTER VARYING(40)</td>
<td>Privilege on the column.</td>
</tr>
<tr>
<td>grantable</td>
<td>CHARACTER VARYING(3)</td>
<td>Indicates whether the privilege was granted with the grant option YES or NO.</td>
</tr>
<tr>
<td>common</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO.</td>
</tr>
<tr>
<td>inherited</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO.</td>
</tr>
</tbody>
</table>

### 3.35 DBA_DB_LINKS

The DBA_DB_LINKS view provides information about all database links in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the database link’s owner.</td>
</tr>
<tr>
<td>db_link</td>
<td>TEXT</td>
<td>The name of the database link.</td>
</tr>
<tr>
<td>type</td>
<td>CHARACTER VARYING</td>
<td>Type of remote server. Value will be either REDWOOD or EDB</td>
</tr>
<tr>
<td>username</td>
<td>TEXT</td>
<td>User name of the user logging in.</td>
</tr>
<tr>
<td>host</td>
<td>TEXT</td>
<td>Name or IP address of the remote server.</td>
</tr>
</tbody>
</table>

### 3.36 DBA_DIRECTORIES

The DBA_DIRECTORIES view provides information about all directories created with the CREATE DIRECTORY command.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>CHARACTER VARYING(30)</td>
<td>User name of the directory’s owner.</td>
</tr>
<tr>
<td>directory_name</td>
<td>CHARACTER VARYING(30)</td>
<td>The alias name assigned to the directory.</td>
</tr>
<tr>
<td>directory_path</td>
<td>CHARACTER VARYING(4000)</td>
<td>The path to the directory.</td>
</tr>
</tbody>
</table>
### 3.37 DBA_DEPENDENCIES

The `DBA_DEPENDENCIES` view provides information about the dependencies between all objects in the database (except for synonyms).

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>CHARACTER VARYING(128)</td>
<td>Owner of the dependent object.</td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the schema in which the dependent object resides.</td>
</tr>
<tr>
<td>name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the dependent object.</td>
</tr>
<tr>
<td>type</td>
<td>CHARACTER VARYING(18)</td>
<td>Type of the dependent object.</td>
</tr>
<tr>
<td>referenced_owner</td>
<td>CHARACTER VARYING(128)</td>
<td>Owner of the referenced object.</td>
</tr>
<tr>
<td>referenced_schema_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the schema in which the referenced object resides.</td>
</tr>
<tr>
<td>referenced_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the referenced object.</td>
</tr>
<tr>
<td>referenced_type</td>
<td>CHARACTER VARYING(18)</td>
<td>Type of the referenced object.</td>
</tr>
<tr>
<td>referenced_link_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Included for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>dependency_type</td>
<td>CHARACTER VARYING(4)</td>
<td>Included for compatibility only. Always set to HARD.</td>
</tr>
</tbody>
</table>

### 3.38 DBA_IND_COLUMNS

The `DBA_IND_COLUMNS` view provides information about all columns included in indexes, on all tables in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>index_owner</td>
<td>TEXT</td>
<td>User name of the index’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the index belongs.</td>
</tr>
<tr>
<td>index_name</td>
<td>TEXT</td>
<td>Name of the index.</td>
</tr>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>User name of the table’s owner.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table in which the index belongs.</td>
</tr>
<tr>
<td>column_name</td>
<td>TEXT</td>
<td>Name of column or attribute of object column.</td>
</tr>
<tr>
<td>column_position</td>
<td>SMALLINT</td>
<td>The position of the column in the index.</td>
</tr>
<tr>
<td>column_length</td>
<td>SMALLINT</td>
<td>The length of the column (in bytes).</td>
</tr>
<tr>
<td>char_length</td>
<td>NUMERIC</td>
<td>The length of the column (in characters).</td>
</tr>
<tr>
<td>descend</td>
<td>CHARACTER(1)</td>
<td>Always set to Y (descending); included for compatibility only.</td>
</tr>
</tbody>
</table>
### 3.39 DBA_INDEXES

The **DBA_INDEXES** view provides information about all indexes in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the index’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the index resides.</td>
</tr>
<tr>
<td>index_name</td>
<td>TEXT</td>
<td>The name of the index.</td>
</tr>
<tr>
<td>index_type</td>
<td>TEXT</td>
<td>The index type is always BTREE. Included for compatibility only.</td>
</tr>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>User name of the owner of the indexed table.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the indexed table.</td>
</tr>
<tr>
<td>table_type</td>
<td>TEXT</td>
<td>Included for compatibility only. Always set to TABLE.</td>
</tr>
<tr>
<td>uniqueness</td>
<td>TEXT</td>
<td>Indicates if the index is UNIQUE or NONUNIQUE.</td>
</tr>
<tr>
<td>compression</td>
<td>CHARACTER(1)</td>
<td>Always set to N (not compressed). Included for compatibility only.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>Name of the tablespace in which the table resides if other than the default tablespace.</td>
</tr>
<tr>
<td>logging</td>
<td>TEXT</td>
<td>Included for compatibility only. Always set to LOGGING.</td>
</tr>
<tr>
<td>status</td>
<td>TEXT</td>
<td>Whether or not the state of the object is valid. (VALID or INVALID).</td>
</tr>
<tr>
<td>partitioned</td>
<td>CHARACTER(3)</td>
<td>Indicates that the index is partitioned. Always set to NO.</td>
</tr>
<tr>
<td>temporary</td>
<td>CHARACTER(1)</td>
<td>Indicates that an index is on a temporary table. Always set to N.</td>
</tr>
<tr>
<td>secondary</td>
<td>CHARACTER(1)</td>
<td>Included for compatibility only. Always set to N.</td>
</tr>
<tr>
<td>join_index</td>
<td>CHARACTER(3)</td>
<td>Included for compatibility only. Always set to NO.</td>
</tr>
<tr>
<td>dropped</td>
<td>CHARACTER(3)</td>
<td>Included for compatibility only. Always set to NO.</td>
</tr>
</tbody>
</table>

### 3.40 DBA_JOBS

The **DBA_JOBS** view provides information about all jobs in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>job</td>
<td>INTEGER</td>
<td>The identifier of the job (Job ID).</td>
</tr>
<tr>
<td>log_user</td>
<td>TEXT</td>
<td>The name of the user that submitted the job.</td>
</tr>
<tr>
<td>priv_user</td>
<td>TEXT</td>
<td>Same as log_user. Included for compatibility only.</td>
</tr>
<tr>
<td>schema_user</td>
<td>TEXT</td>
<td>The name of the schema used to parse the job.</td>
</tr>
<tr>
<td>last_date</td>
<td>TIMESTAMP WITH TIME ZONE</td>
<td>The last date that this job executed successfully.</td>
</tr>
<tr>
<td>last_sec</td>
<td>TEXT</td>
<td>Same as last_date.</td>
</tr>
<tr>
<td>this_date</td>
<td>TIMESTAMP WITH TIME ZONE</td>
<td>The date that the job began executing.</td>
</tr>
<tr>
<td>this_sec</td>
<td>TEXT</td>
<td>Same as this_date</td>
</tr>
<tr>
<td>next_date</td>
<td>TIMESTAMP WITH TIME ZONE</td>
<td>The next date that this job will be executed.</td>
</tr>
<tr>
<td>next_sec</td>
<td>TEXT</td>
<td>Same as next_date</td>
</tr>
</tbody>
</table>
### Name Types Description

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>total_time</td>
<td>INTERVAL</td>
<td>The execution time of this job (in seconds).</td>
</tr>
<tr>
<td>broken</td>
<td>TEXT</td>
<td>If Y, no attempt will be made to run this job. If N, this job will attempt to execute.</td>
</tr>
<tr>
<td>interval</td>
<td>TEXT</td>
<td>Determines how often the job will repeat.</td>
</tr>
<tr>
<td>failures</td>
<td>BIGINT</td>
<td>The number of times that the job has failed to complete since it’s last successful execution.</td>
</tr>
<tr>
<td>what</td>
<td>TEXT</td>
<td>The job definition (PL/SQL code block) that runs when the job executes.</td>
</tr>
<tr>
<td>nls_env</td>
<td>CHARACTER VARYING(4000)</td>
<td>Always NULL. Provided for compatibility only.</td>
</tr>
<tr>
<td>misc_env</td>
<td>BYTEA</td>
<td>Always NULL. Provided for compatibility only.</td>
</tr>
<tr>
<td>instance</td>
<td>NUMERIC</td>
<td>Always 0. Provided for compatibility only.</td>
</tr>
</tbody>
</table>

### 3.41 DBA_OBJECTS

The `DBA_OBJECTS` view provides information about all objects in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the object’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the object belongs.</td>
</tr>
<tr>
<td>object_name</td>
<td>TEXT</td>
<td>Name of the object.</td>
</tr>
<tr>
<td>object_type</td>
<td>TEXT</td>
<td>Type of the object – possible values are: INDEX, FUNCTION, PACKAGE, PACKAGE BODY, PROCEDURE, SEQUENCE, SYNONYM, TABLE, TRIGGER, and VIEW.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER VARYING</td>
<td>Included for compatibility only; always set to VALID.</td>
</tr>
<tr>
<td>temporary</td>
<td>TEXT</td>
<td>Y if the table is temporary; N if the table is permanent.</td>
</tr>
</tbody>
</table>

### 3.42 DBA_PART_KEY_COLUMNS

The `DBA_PART_KEY_COLUMNS` view provides information about the key columns of the partitioned tables that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>The owner of the table.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>name</td>
<td>TEXT</td>
<td>The name of the table in which the column resides.</td>
</tr>
<tr>
<td>object_type</td>
<td>CHARACTER(5)</td>
<td>For compatibility only; always TABLE.</td>
</tr>
<tr>
<td>column_name</td>
<td>TEXT</td>
<td>The name of the column on which the key is defined.</td>
</tr>
<tr>
<td>column_position</td>
<td>INTEGER</td>
<td>1 for the first column; 2 for the second column, etc.</td>
</tr>
</tbody>
</table>
### 3.4.3 DBA_PART_TABLES

The **DBA_PART_TABLES** view provides information about all of the partitioned tables in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>The owner of the partitioned table.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The schema in which the table resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table.</td>
</tr>
<tr>
<td>partitioning_type</td>
<td>TEXT</td>
<td>The type used to define table partitions.</td>
</tr>
<tr>
<td>subpartitioning_type</td>
<td>TEXT</td>
<td>The subpartitioning type used to define table subpartitions.</td>
</tr>
<tr>
<td>partition_count</td>
<td>BIGINT</td>
<td>The number of partitions in the table.</td>
</tr>
<tr>
<td>def_subpartition_count</td>
<td>INTEGER</td>
<td>The number of subpartitions in the table.</td>
</tr>
<tr>
<td>partitioning_key_count</td>
<td>INTEGER</td>
<td>The number of partitioning keys specified.</td>
</tr>
<tr>
<td>subpartitioning_key_count</td>
<td>INTEGER</td>
<td>The number of subpartitioning keys specified.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always valid.</td>
</tr>
<tr>
<td>def_tablespace_name</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_pct_free</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_pct_used</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_ini_trans</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_max_trans</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_initial_extent</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_next_extent</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_min_extents</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_max_extents</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_pct_increase</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_freelists</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_freelist_groups</td>
<td>NUMERIC</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>def_logging</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always YES.</td>
</tr>
<tr>
<td>def_compression</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always NONE.</td>
</tr>
<tr>
<td>def_buffer_pool</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always DEFAULT</td>
</tr>
<tr>
<td>ref_ptn_constraint_name</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>interval</td>
<td>CHARACTER</td>
<td>Provided for compatibility only. Always NULL.</td>
</tr>
</tbody>
</table>
3.44 DBA_POLICIES

The `DBA_POLICIES` view provides information on all policies in the database. This view is accessible only to superusers.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>object_owner</td>
<td>TEXT</td>
<td>Name of the owner of the object.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the object resides.</td>
</tr>
<tr>
<td>object_name</td>
<td>TEXT</td>
<td>Name of the object to which the policy applies.</td>
</tr>
<tr>
<td>policy_group</td>
<td>TEXT</td>
<td>Name of the policy group. Included for compatibility only; always set to an empty string.</td>
</tr>
<tr>
<td>policy_name</td>
<td>TEXT</td>
<td>Name of the policy.</td>
</tr>
<tr>
<td>pf_owner</td>
<td>TEXT</td>
<td>Name of the schema containing the policy function, or the schema containing the package that contains the policy function.</td>
</tr>
<tr>
<td>package</td>
<td>TEXT</td>
<td>Name of the package containing the policy function (if the function belongs to a package).</td>
</tr>
<tr>
<td>function</td>
<td>TEXT</td>
<td>Name of the policy function.</td>
</tr>
<tr>
<td>sel</td>
<td>TEXT</td>
<td>Whether or not the policy applies to <code>SELECT</code> commands. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>ins</td>
<td>TEXT</td>
<td>Whether or not the policy applies to <code>INSERT</code> commands. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>upd</td>
<td>TEXT</td>
<td>Whether or not the policy applies to <code>UPDATE</code> commands. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>del</td>
<td>TEXT</td>
<td>Whether or not the policy applies to <code>DELETE</code> commands. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>idx</td>
<td>TEXT</td>
<td>Whether or not the policy applies to index maintenance. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>chk_option</td>
<td>TEXT</td>
<td>Whether or not the check option is in force for <code>INSERT</code> and <code>UPDATE</code> commands. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>Enable</td>
<td>TEXT</td>
<td>Whether or not the policy is enabled on the object. Possible values are <code>YES</code> or <code>NO</code>.</td>
</tr>
<tr>
<td>static_policy</td>
<td>TEXT</td>
<td>Included for compatibility only; always set to <code>NO</code>.</td>
</tr>
<tr>
<td>policy_type</td>
<td>TEXT</td>
<td>Included for compatibility only; always set to <code>UNKNOWN</code>.</td>
</tr>
<tr>
<td>long_predicate</td>
<td>TEXT</td>
<td>Included for compatibility only; always set to <code>YES</code>.</td>
</tr>
</tbody>
</table>

3.45 DBA_PROFILES

The `DBA_PROFILES` view provides information about existing profiles. The table includes a row for each profile/resource combination.
3.46 DBA_QUEUES

The DBA_QUEUES view provides information about any currently defined queues.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the queue owner.</td>
</tr>
<tr>
<td>name</td>
<td>TEXT</td>
<td>The name of the queue.</td>
</tr>
<tr>
<td>queue_table</td>
<td>TEXT</td>
<td>The name of the queue table in which the queue resides.</td>
</tr>
<tr>
<td>qid</td>
<td>OID</td>
<td>The system-assigned object ID of the queue.</td>
</tr>
<tr>
<td>queue_type</td>
<td>CHARACTER VARYING</td>
<td>The queue type; may be EXCEPTION_QUEUE, NON_PERSISTENT_QUEUE, or NORMAL_QUEUE.</td>
</tr>
<tr>
<td>max_retries</td>
<td>NUMERIC</td>
<td>The maximum number of dequeue attempts.</td>
</tr>
<tr>
<td>retry_delay</td>
<td>NUMERIC</td>
<td>The maximum time allowed between retries.</td>
</tr>
<tr>
<td>enqueue_enabled</td>
<td>CHARACTER VARYING</td>
<td>YES if the queue allows enqueuing; NO if the queue does not.</td>
</tr>
<tr>
<td>dequeue_enabled</td>
<td>CHARACTER VARYING</td>
<td>YES if the queue allows dequeuing; NO if the queue does not.</td>
</tr>
<tr>
<td>retention</td>
<td>CHARACTER VARYING</td>
<td>The number of seconds that a processed message is retained in the queue.</td>
</tr>
<tr>
<td>user_comment</td>
<td>CHARACTER VARYING</td>
<td>A user-specified comment.</td>
</tr>
<tr>
<td>network_name</td>
<td>CHARACTER VARYING</td>
<td>The name of the network on which the queue resides.</td>
</tr>
<tr>
<td>sharded</td>
<td>CHARACTER VARYING</td>
<td>YES if the queue resides on a sharded network; NO if the queue does not.</td>
</tr>
</tbody>
</table>

3.47 DBA_QUEUE_TABLES

The DBA_QUEUE_TABLES view provides information about all of the queue tables in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>Role name of the owner of the queue table.</td>
</tr>
<tr>
<td>queue_table</td>
<td>TEXT</td>
<td>The user-specified name of the queue table.</td>
</tr>
</tbody>
</table>
### 3.48 DBA_ROLE_PRIVS

The `DBA_ROLE_PRIVS` view provides information on all roles that have been granted to users. A row is created for each role to which a user has been granted.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>grantee</td>
<td>TEXT</td>
<td>User name to whom the role was granted.</td>
</tr>
<tr>
<td>granted_role</td>
<td>TEXT</td>
<td>Name of the role granted to the grantee.</td>
</tr>
<tr>
<td>admin_option</td>
<td>TEXT</td>
<td>YES if the role was granted with the admin option, NO otherwise.</td>
</tr>
<tr>
<td>default_role</td>
<td>TEXT</td>
<td>YES if the role is enabled when the grantee creates a session.</td>
</tr>
</tbody>
</table>

### 3.49 DBA_ROLES

The `DBA_ROLES` view provides information on all roles with the `NOLOGIN` attribute (groups).

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>role</td>
<td>TEXT</td>
<td>Name of a role having the <code>NOLOGIN</code> attribute – i.e., a group.</td>
</tr>
<tr>
<td>password_required</td>
<td>TEXT</td>
<td>Included for compatibility only; always N.</td>
</tr>
</tbody>
</table>
3.50 DBA_SEQUENCES

The DBA_SEQUENCES view provides information about all user-defined sequences.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sequence_owner</td>
<td>TEXT</td>
<td>User name of the sequence's owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the sequence resides.</td>
</tr>
<tr>
<td>sequence_name</td>
<td>TEXT</td>
<td>Name of the sequence.</td>
</tr>
<tr>
<td>min_value</td>
<td>NUMERIC</td>
<td>The lowest value that the server will assign to the sequence.</td>
</tr>
<tr>
<td>max_value</td>
<td>NUMERIC</td>
<td>The highest value that the server will assign to the sequence.</td>
</tr>
<tr>
<td>increment_by</td>
<td>NUMERIC</td>
<td>The value added to the current sequence number to create the next sequen</td>
</tr>
<tr>
<td>cycle_flag</td>
<td>CHARACTER VARYING</td>
<td>Specifies if the sequence should wrap when it reaches min_value or max_value.</td>
</tr>
<tr>
<td>order_flag</td>
<td>CHARACTER VARYING</td>
<td>Will always return Y.</td>
</tr>
<tr>
<td>cache_size</td>
<td>NUMERIC</td>
<td>The number of pre-allocated sequence numbers stored in memory.</td>
</tr>
<tr>
<td>last_number</td>
<td>NUMERIC</td>
<td>The value of the last sequence number saved to disk.</td>
</tr>
</tbody>
</table>

3.51 DBA_SOURCE

The DBA_SOURCE view provides the source code listing of all objects in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the program’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the program belongs.</td>
</tr>
<tr>
<td>name</td>
<td>TEXT</td>
<td>Name of the program.</td>
</tr>
<tr>
<td>type</td>
<td>TEXT</td>
<td>Type of program - possible values are: FUNCTION, PACKAGE, PACKAGE BODY, PROCEDURE, and TRIGGER.</td>
</tr>
<tr>
<td>line</td>
<td>INTEGER</td>
<td>Source code line number relative to a given program.</td>
</tr>
<tr>
<td>text</td>
<td>TEXT</td>
<td>Line of source code text.</td>
</tr>
</tbody>
</table>

3.52 DBA_SUBPART_KEY_COLUMNS

The DBA_SUBPART_KEY_COLUMNS view provides information about the key columns of those partitioned tables which are subpartitioned that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>The owner of the table.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>name</td>
<td>TEXT</td>
<td>The name of the table in which the column resides.</td>
</tr>
</tbody>
</table>
### 3.53 DBA_SYNONYMS

The DBA_SYNONYM view provides information about all synonyms in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the synonym’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the synonym belongs.</td>
</tr>
<tr>
<td>synonym_name</td>
<td>TEXT</td>
<td>Name of the synonym.</td>
</tr>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>User name of the table’s owner on which the synonym is defined.</td>
</tr>
<tr>
<td>table_schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table on which the synonym is defined.</td>
</tr>
<tr>
<td>db_link</td>
<td>TEXT</td>
<td>Name of any associated database link.</td>
</tr>
</tbody>
</table>

### 3.54 DBA_TAB_COLUMNS

The DBA_TAB_COLUMNS view provides information about all columns in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>CHARACTER VARYING</td>
<td>User name of the owner of the table or view in which the column resides.</td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the schema in which the table or view resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the table or view in which the column resides.</td>
</tr>
<tr>
<td>column_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the column.</td>
</tr>
<tr>
<td>data_type</td>
<td>CHARACTER VARYING</td>
<td>Data type of the column.</td>
</tr>
<tr>
<td>data_length</td>
<td>NUMERIC</td>
<td>Length of text columns.</td>
</tr>
<tr>
<td>data_precision</td>
<td>NUMERIC</td>
<td>Precision (number of digits) for NUMBER columns.</td>
</tr>
<tr>
<td>data_scale</td>
<td>NUMERIC</td>
<td>Scale of NUMBER columns.</td>
</tr>
<tr>
<td>nullable</td>
<td>CHARACTER(1)</td>
<td>Whether or not the column is nullable – possible values are: Y – column is nullable; N – column does not allow null.</td>
</tr>
<tr>
<td>column_id</td>
<td>NUMERIC</td>
<td>Relative position of the column within the table or view.</td>
</tr>
<tr>
<td>data_default</td>
<td>CHARACTER VARYING</td>
<td>Default value assigned to the column.</td>
</tr>
</tbody>
</table>
### 3.55 DBA_TAB_PARTITIONS

The `DBA_TAB_PARTITIONS` view provides information about all of the partitions that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>The owner of the table in which the partition resides.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table.</td>
</tr>
<tr>
<td>composite</td>
<td>TEXT</td>
<td>YES if the table is subpartitioned; NO if the table is not subpartitioned.</td>
</tr>
<tr>
<td>partition_name</td>
<td>TEXT</td>
<td>The name of the partition.</td>
</tr>
<tr>
<td>subpartition_count</td>
<td>BIGINT</td>
<td>The number of subpartitions in the partition.</td>
</tr>
<tr>
<td>high_value</td>
<td>TEXT</td>
<td>The high partitioning value specified in the <code>CREATE TABLE</code> statement.</td>
</tr>
<tr>
<td>high_value_length</td>
<td>INTEGER</td>
<td>The length of high partitioning value.</td>
</tr>
<tr>
<td>partition_position</td>
<td>INTEGER</td>
<td>The ordinal position of this partition.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>The name of the tablespace in which the partition resides.</td>
</tr>
<tr>
<td>pct_free</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>pct_used</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>init_trans</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>max_trans</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>initial_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>next_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>min_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>max_extent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>pct_increase</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>freelists</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>freelist_groups</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>logging</td>
<td>CHARACTER VARYING(7)</td>
<td>Included for compatibility only; always YES</td>
</tr>
<tr>
<td>compression</td>
<td>CHARACTER VARYING(8)</td>
<td>Included for compatibility only; always NONE</td>
</tr>
<tr>
<td>num_rows</td>
<td>NUMERIC</td>
<td>Same as <code>pg_class.reltuples</code>.</td>
</tr>
<tr>
<td>blocks</td>
<td>INTEGER</td>
<td>Same as <code>pg_class.relpages</code>.</td>
</tr>
<tr>
<td>empty_blocks</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>avg_space</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>chain_ent</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>avg_row_len</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>sample_size</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>last_analyzed</td>
<td>TIMESTAMP WITHOUT TIME ZONE</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>buffer_pool</td>
<td>CHARACTER VARYING(7)</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td>global_stats</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always YES</td>
</tr>
<tr>
<td>user_stats</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO</td>
</tr>
<tr>
<td>backing_table</td>
<td>REGCLASS</td>
<td>Name of the partition backing table.</td>
</tr>
</tbody>
</table>
### 3.56 `DBA_TAB_SUBPARTITIONS`

The `DBA_TAB_SUBPARTITIONS` view provides information about all of the subpartitions that reside in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>table_owner</code></td>
<td>TEXT</td>
<td>The owner of the table in which the subpartition resides.</td>
</tr>
<tr>
<td><code>schema_name</code></td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td><code>table_name</code></td>
<td>TEXT</td>
<td>The name of the table.</td>
</tr>
<tr>
<td><code>partition_name</code></td>
<td>TEXT</td>
<td>The name of the partition.</td>
</tr>
<tr>
<td><code>subpartition_name</code></td>
<td>TEXT</td>
<td>The name of the subpartition.</td>
</tr>
<tr>
<td><code>high_value</code></td>
<td>TEXT</td>
<td>The high subpartitioning value specified in the <code>CREATE TABLE</code> statement.</td>
</tr>
<tr>
<td><code>high_value_length</code></td>
<td>INTEGER</td>
<td>The length of high partitioning value.</td>
</tr>
<tr>
<td><code>subpartition_position</code></td>
<td>INTEGER</td>
<td>The ordinal position of this subpartition.</td>
</tr>
<tr>
<td><code>tablespace_name</code></td>
<td>TEXT</td>
<td>The name of the tablespace in which the subpartition resides.</td>
</tr>
<tr>
<td><code>pct_free</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td><code>pct_used</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td><code>init_trans</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td><code>max_trans</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td><code>initial_extent</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>next_extent</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>min_extent</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td><code>max_extent</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td><code>pct_increase</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td><code>freelists</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>freelist_groups</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>logging</code></td>
<td>CHARACTER VARYING(7)</td>
<td>Included for compatibility only; always YES</td>
</tr>
<tr>
<td><code>compression</code></td>
<td>CHARACTER VARYING(8)</td>
<td>Included for compatibility only; always NONE</td>
</tr>
<tr>
<td><code>num_rows</code></td>
<td>NUMERIC</td>
<td>Same as <code>pg_class.reltuples</code>.</td>
</tr>
<tr>
<td><code>blocks</code></td>
<td>INTEGER</td>
<td>Same as <code>pg_class.relpages</code>.</td>
</tr>
<tr>
<td><code>empty_blocks</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>avg_space</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>chain_cnt</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>avg_row_len</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>sample_size</code></td>
<td>NUMERIC</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>last_analyzed</code></td>
<td>TIMESTAMP WITHOUT TIME ZONE</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>buffer_pool</code></td>
<td>CHARACTER VARYING(7)</td>
<td>Included for compatibility only; always NULL</td>
</tr>
<tr>
<td><code>global_stats</code></td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always YES</td>
</tr>
<tr>
<td><code>user_stats</code></td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO</td>
</tr>
<tr>
<td><code>backing_table</code></td>
<td>REGCLASS</td>
<td>Name of the subpartition backing table.</td>
</tr>
</tbody>
</table>
3.57 DBA_TAB_PRIVS

The **DBA_TAB_PRIVS** view provides a listing of the access privileges granted to database users and to **PUBLIC**.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>grantee</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the user with the privilege.</td>
</tr>
<tr>
<td>owner</td>
<td>CHARACTER VARYING(128)</td>
<td>Object owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the schema in which the object resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Object name.</td>
</tr>
<tr>
<td>grantor</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the user who granted the privilege.</td>
</tr>
<tr>
<td>privilege</td>
<td>CHARACTER VARYING(40)</td>
<td>Privilege name.</td>
</tr>
<tr>
<td>grantable</td>
<td>CHARACTER VARYING(3)</td>
<td>Indicates whether the privilege was granted with the grant option YES or NO.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YES indicates that the GRANTEE (recipient of the privilege) can in turn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>grant the privilege to others. The value may be YES if the grantee has the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>administrator privileges.</td>
</tr>
<tr>
<td>hierarchy</td>
<td>CHARACTER VARYING(3)</td>
<td>The value can be YES or NO. The value may be YES if the privilege is SELECT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>else NO.</td>
</tr>
<tr>
<td>common</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO.</td>
</tr>
<tr>
<td>type</td>
<td>CHARACTER VARYING(24)</td>
<td>Type of object.</td>
</tr>
<tr>
<td>inherited</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO.</td>
</tr>
</tbody>
</table>

3.58 DBA_TABLES

The **DBA_TABLES** view provides information about all tables in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the table’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the table belongs.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>Name of the tablespace in which the table resides if other than the default</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tablespace.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER VARYING(5)</td>
<td>Included for compatibility only; always set to VALID.</td>
</tr>
<tr>
<td>temporary</td>
<td>CHARACTER(1)</td>
<td>Y if the table is temporary; N if the table is permanent.</td>
</tr>
</tbody>
</table>
## 3.59 DBA_TRIGGERS

The **DBA_TRIGGERS** view provides information about all triggers in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the trigger's owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the trigger resides.</td>
</tr>
<tr>
<td>trigger_name</td>
<td>TEXT</td>
<td>The name of the trigger.</td>
</tr>
<tr>
<td>trigger_type</td>
<td>TEXT</td>
<td>The type of the trigger. Possible values are: BEFORE ROW, BEFORE STATEMENT, AFTER ROW, AFTER STATEMENT</td>
</tr>
<tr>
<td>triggering_event</td>
<td>TEXT</td>
<td>The event that fires the trigger.</td>
</tr>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>The user name of the owner of the table on which the trigger is defined.</td>
</tr>
<tr>
<td>base_object_type</td>
<td>TEXT</td>
<td>Included for compatibility only. Value will always be TABLE.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table on which the trigger is defined.</td>
</tr>
<tr>
<td>referencing_names</td>
<td>TEXT</td>
<td>Included for compatibility only. Value will always be REFERENCING, NEW AS NEW, OLD AS OLD.</td>
</tr>
<tr>
<td>status</td>
<td>TEXT</td>
<td>Status indicates if the trigger is enabled (VALID) or disabled (NOTVALID).</td>
</tr>
<tr>
<td>description</td>
<td>TEXT</td>
<td>Included for compatibility only.</td>
</tr>
<tr>
<td>trigger_body</td>
<td>TEXT</td>
<td>The body of the trigger.</td>
</tr>
<tr>
<td>action_statement</td>
<td>TEXT</td>
<td>The SQL command that executes when the trigger fires.</td>
</tr>
</tbody>
</table>

## 3.60 DBA_TYPES

The **DBA_TYPES** view provides information about all object types in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>The owner of the object type.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the type is defined.</td>
</tr>
<tr>
<td>type_name</td>
<td>TEXT</td>
<td>The name of the type.</td>
</tr>
<tr>
<td>type_oid</td>
<td>OID</td>
<td>The object identifier (OID) of the type.</td>
</tr>
<tr>
<td>typecode</td>
<td>TEXT</td>
<td>The typecode of the type. Possible values are: OBJECT, COLLECTION, OTHER.</td>
</tr>
<tr>
<td>attributes</td>
<td>INTEGER</td>
<td>The number of attributes in the type.</td>
</tr>
</tbody>
</table>
3.61 DBA_USERS

The DBA_USERS view provides information about all users of the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>username</td>
<td>TEXT</td>
<td>User name of the user.</td>
</tr>
<tr>
<td>user_id</td>
<td>OID</td>
<td>ID number of the user.</td>
</tr>
<tr>
<td>password</td>
<td>CHARACTER</td>
<td>The password (encrypted) of the user.</td>
</tr>
<tr>
<td>account_status</td>
<td>CHARACTER</td>
<td>The current status of the account. Possible values are: OPEN, EXPIRED, EXPIRED(GRACE), EXPIRED &amp; LOCKED, EXPIRED &amp; LOCKED(TIMED), EXPIRED(GRACE) &amp; LOCKED, EXPIRED(GRACE) &amp; LOCKED(TIMED), LOCKED, LOCKED(TIMED)</td>
</tr>
<tr>
<td></td>
<td>VARYING(32)</td>
<td></td>
</tr>
<tr>
<td>lock_date</td>
<td>TIMESTAMP</td>
<td>If the account status is LOCKED, lock_date displays the date and time the account was locked.</td>
</tr>
<tr>
<td>expiry_date</td>
<td>TIMESTAMP</td>
<td>The expiration date of the password. Use the edb_get_password_expiry_date(role_id) function to get the current password expiration date.</td>
</tr>
<tr>
<td></td>
<td>WITHOUT TIME</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ZONE</td>
<td></td>
</tr>
<tr>
<td>default_tablespace</td>
<td>TEXT</td>
<td>The default tablespace associated with the account.</td>
</tr>
<tr>
<td>temporary_tablespace</td>
<td>CHARACTER VARYING(30)</td>
<td>Included for compatibility only. The value will always be &quot; (an empty string).</td>
</tr>
<tr>
<td>created</td>
<td>TIMESTAMP</td>
<td>Included for compatibility only. The value is always NULL.</td>
</tr>
<tr>
<td></td>
<td>WITHOUT TIME</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ZONE</td>
<td></td>
</tr>
<tr>
<td>profile</td>
<td>CHARACTER</td>
<td>The profile associated with the user.</td>
</tr>
<tr>
<td></td>
<td>VARYING(30)</td>
<td></td>
</tr>
<tr>
<td>initial_rsrc_consumer_group</td>
<td>CHARACTER VARYING(30)</td>
<td>Included for compatibility only. The value is always NULL.</td>
</tr>
<tr>
<td>external_name</td>
<td>CHARACTER</td>
<td>Included for compatibility only. The value is always NULL.</td>
</tr>
<tr>
<td></td>
<td>VARYING(4000)</td>
<td></td>
</tr>
</tbody>
</table>

3.62 DBA_VIEW_COLUMNS

The DBA_VIEW_COLUMNS view provides information on all columns in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>CHARACTER</td>
<td>User name of the view’s owner.</td>
</tr>
<tr>
<td></td>
<td>VARYING</td>
<td></td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER</td>
<td>Name of the schema in which the view belongs.</td>
</tr>
<tr>
<td></td>
<td>VARYING</td>
<td></td>
</tr>
</tbody>
</table>
3.63 DBA_VIEWS

The DBA_VIEWS view provides information about all views in the database.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the view’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the view belongs.</td>
</tr>
<tr>
<td>view_name</td>
<td>TEXT</td>
<td>Name of the view.</td>
</tr>
<tr>
<td>text</td>
<td>TEXT</td>
<td>The text of the SELECT statement that defines the view.</td>
</tr>
</tbody>
</table>

3.64 USER_ALL_TABLES

The USER_ALL_TABLES view provides information about all tables owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the table belongs.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>Name of the tablespace in which the table resides if other than the default tablespace.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER VARYING (5)</td>
<td>Included for compatibility only; always set to VALID.</td>
</tr>
<tr>
<td>temporary</td>
<td>TEXT</td>
<td>Y if the table is temporary; N if the table is permanent.</td>
</tr>
</tbody>
</table>
3.65 USER_CONS_COLUMNS

The `USER_CONS_COLUMNS` view provides information about all columns that are included in constraints in tables that are owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>User name of the constraint’s owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the constraint belongs.</td>
</tr>
<tr>
<td>constraint_name</td>
<td>TEXT</td>
<td>The name of the constraint.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table to which the constraint belongs.</td>
</tr>
<tr>
<td>column_name</td>
<td>TEXT</td>
<td>The name of the column referenced in the constraint.</td>
</tr>
<tr>
<td>position</td>
<td>SMALLINT</td>
<td>The position of the column within the object definition.</td>
</tr>
<tr>
<td>constraint_def</td>
<td>TEXT</td>
<td>The definition of the constraint.</td>
</tr>
</tbody>
</table>

3.66 USER_CONSTRAINTS

The `USER_CONSTRAINTS` view provides information about all constraints placed on tables that are owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>The name of the owner of the constraint.</td>
</tr>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the constraint belongs.</td>
</tr>
<tr>
<td>constraint_name</td>
<td>TEXT</td>
<td>The name of the constraint.</td>
</tr>
<tr>
<td>constraint_type</td>
<td>TEXT</td>
<td>The constraint type. Possible values are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C – check constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F – foreign key constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P – primary key constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U – unique key constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R – referential integrity constraint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V – constraint on a view</td>
</tr>
<tr>
<td></td>
<td></td>
<td>O – with read-only, on a view</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table to which the constraint belongs.</td>
</tr>
<tr>
<td>search_condition</td>
<td>TEXT</td>
<td>Search condition that applies to a check constraint.</td>
</tr>
<tr>
<td>r_owner</td>
<td>TEXT</td>
<td>Owner of a table referenced by a referential constraint.</td>
</tr>
<tr>
<td>r_constraint_name</td>
<td>TEXT</td>
<td>Name of the constraint definition for a referenced table.</td>
</tr>
<tr>
<td>delete_rule</td>
<td>TEXT</td>
<td>The delete rule for a referential constraint. Possible values are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C – cascade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R – restrict</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N – no action</td>
</tr>
<tr>
<td>deferrable</td>
<td>BOOLEAN</td>
<td>Specified if the constraint is deferrable (T or F).</td>
</tr>
<tr>
<td>deferred</td>
<td>BOOLEAN</td>
<td>Specifies if the constraint has been deferred (T or F).</td>
</tr>
<tr>
<td>index_owner</td>
<td>TEXT</td>
<td>User name of the index.</td>
</tr>
<tr>
<td>index_name</td>
<td>TEXT</td>
<td>The name of the index.</td>
</tr>
<tr>
<td>constraint_def</td>
<td>TEXT</td>
<td>The definition of the constraint.</td>
</tr>
</tbody>
</table>
3.67 USER_COL_PRIVS

The USER_COL_PRIVS view provides a listing of the object privileges granted on a column for which a current user is either an object owner, grantor, or grantee.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>grantee</td>
<td>Name of the user with the privilege.</td>
</tr>
<tr>
<td>owner</td>
<td>Object owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>Name of the schema in which the object resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>Object name.</td>
</tr>
<tr>
<td>column_name</td>
<td>Column name.</td>
</tr>
<tr>
<td>grantor</td>
<td>Name of the user who granted the privilege.</td>
</tr>
<tr>
<td>privilege</td>
<td>Privilege on the column.</td>
</tr>
<tr>
<td>grantable</td>
<td>Indicates whether the privilege was granted with the grant option YES or NO. YES indicates that the GRANTEE (recipient of the privilege) can in turn grant the privilege to others. The value may be YES if the grantee has the administrator privileges.</td>
</tr>
<tr>
<td>common</td>
<td>Included for compatibility only; always NO.</td>
</tr>
<tr>
<td>inherited</td>
<td>Included for compatibility only; always NO.</td>
</tr>
</tbody>
</table>

3.68 USER_DB_LINKS

The USER_DB_LINKS view provides information about all database links that are owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>db_link</td>
<td>The name of the database link.</td>
</tr>
<tr>
<td>type</td>
<td>Type of remote server. Value will be either REDWOOD or EDB</td>
</tr>
<tr>
<td>username</td>
<td>User name of the user logging in.</td>
</tr>
<tr>
<td>password</td>
<td>Password used to authenticate on the remote server.</td>
</tr>
<tr>
<td>host</td>
<td>Name or IP address of the remote server.</td>
</tr>
</tbody>
</table>
3.69 USER_DEPENDENCIES

The `USER_DEPENDENCIES` view provides information about dependencies between objects owned by a current user (with the exception of synonyms).

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the schema in which the dependent object resides.</td>
</tr>
<tr>
<td>name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the dependent object.</td>
</tr>
<tr>
<td>type</td>
<td>CHARACTER VARYING(18)</td>
<td>Type of the dependent object.</td>
</tr>
<tr>
<td>referenced_owner</td>
<td>CHARACTER VARYING(128)</td>
<td>Owner of the referenced object.</td>
</tr>
<tr>
<td>referenced_schema_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the schema in which the referenced object resides.</td>
</tr>
<tr>
<td>referenced_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Name of the referenced object.</td>
</tr>
<tr>
<td>referenced_type</td>
<td>CHARACTER VARYING(18)</td>
<td>Type of the referenced object.</td>
</tr>
<tr>
<td>referenced_link_name</td>
<td>CHARACTER VARYING(128)</td>
<td>Included for compatibility only. Always NULL.</td>
</tr>
<tr>
<td>schemaid</td>
<td>NUMERIC</td>
<td>ID of the current schema.</td>
</tr>
<tr>
<td>dependency_type</td>
<td>CHARACTER VARYING(4)</td>
<td>Included for compatibility only. Always set to HARD.</td>
</tr>
</tbody>
</table>

3.70 USER_INDEXES

The `USER_INDEXES` view provides information about all indexes on tables that are owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the index belongs.</td>
</tr>
<tr>
<td>index_name</td>
<td>TEXT</td>
<td>The name of the index.</td>
</tr>
<tr>
<td>index_type</td>
<td>TEXT</td>
<td>Included for compatibility only. Always set to BTREE.</td>
</tr>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>User name of the owner of the indexed table.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the indexed table.</td>
</tr>
<tr>
<td>table_type</td>
<td>TEXT</td>
<td>Included for compatibility only. Always set to TABLE.</td>
</tr>
<tr>
<td>uniqueness</td>
<td>TEXT</td>
<td>Indicates if the index is UNIQUE or NONUNIQUE.</td>
</tr>
<tr>
<td>compression</td>
<td>CHARACTER(1)</td>
<td>Included for compatibility only. Always set to N (not compressed).</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>Name of the tablespace in which the table resides if other than the default tablespace.</td>
</tr>
<tr>
<td>logging</td>
<td>TEXT</td>
<td>Included for compatibility only. Always set to LOGGING.</td>
</tr>
<tr>
<td>status</td>
<td>TEXT</td>
<td>Whether or not the state of the object is valid. (VALID or INVALID).</td>
</tr>
<tr>
<td>partitioned</td>
<td>CHARACTER(3)</td>
<td>Included for compatibility only. Always set to NO.</td>
</tr>
</tbody>
</table>
### 3.71 USER_JOBS

The `USER_JOBS` view provides information about all jobs owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>job</td>
<td>INTEGER</td>
<td>The identifier of the job (Job ID).</td>
</tr>
<tr>
<td>log_user</td>
<td>TEXT</td>
<td>The name of the user that submitted the job.</td>
</tr>
<tr>
<td>priv_user</td>
<td>TEXT</td>
<td>Same as log_user. Included for compatibility only.</td>
</tr>
<tr>
<td>schema_user</td>
<td>TEXT</td>
<td>The name of the schema used to parse the job.</td>
</tr>
<tr>
<td>last_date</td>
<td>TIMESTAMP WITH TIME ZONE</td>
<td>The last date that this job executed successfully.</td>
</tr>
<tr>
<td>last_sec</td>
<td>TEXT</td>
<td>Same as last_date.</td>
</tr>
<tr>
<td>this_date</td>
<td>TIMESTAMP WITH TIME ZONE</td>
<td>The date that the job began executing.</td>
</tr>
<tr>
<td>this_sec</td>
<td>TEXT</td>
<td>Same as this_date.</td>
</tr>
<tr>
<td>next_date</td>
<td>TIMESTAMP WITH TIME ZONE</td>
<td>The next date that this job will be executed.</td>
</tr>
<tr>
<td>next_sec</td>
<td>TEXT</td>
<td>Same as next_date.</td>
</tr>
<tr>
<td>total_time</td>
<td>INTERVAL</td>
<td>The execution time of this job (in seconds).</td>
</tr>
<tr>
<td>broken</td>
<td>TEXT</td>
<td>If Y, no attempt will be made to run this job. If N, this job will attempt to execute.</td>
</tr>
<tr>
<td>interval</td>
<td>TEXT</td>
<td>Determines how often the job will repeat.</td>
</tr>
<tr>
<td>failures</td>
<td>BIGINT</td>
<td>The number of times that the job has failed to complete since it’s last successful execution.</td>
</tr>
<tr>
<td>what</td>
<td>TEXT</td>
<td>The job definition (PL/SQL code block) that runs when the job executes.</td>
</tr>
<tr>
<td>nls_env</td>
<td>CHARACTER VARYING(4000)</td>
<td>Always NULL. Provided for compatibility only.</td>
</tr>
<tr>
<td>misc_env</td>
<td>BYTEA</td>
<td>Always NULL. Provided for compatibility only.</td>
</tr>
<tr>
<td>instance</td>
<td>NUMERIC</td>
<td>Always 0. Provided for compatibility only.</td>
</tr>
</tbody>
</table>

### 3.72 USER_OBJECTS

The `USER_OBJECTS` view provides information about all objects that are owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the object belongs.</td>
</tr>
</tbody>
</table>
### Name | Type | Description
--- | --- | ---
object_name | TEXT | Name of the object.
object_type | TEXT | Type of the object – possible values are: INDEX, FUNCTION, PACKAGE, PACKAGE BODY, PROCEDURE, SEQUENCE, SYNONYM, TABLE, TRIGGER, and VIEW.
status | CHARACTER VARYING | Included for compatibility only; always set to VALID.
temporary | TEXT | Y if the object is temporary; N if the object is not temporary.

### USER_PART_TABLES

The USER_PART_TABLES view provides information about all of the partitioned tables in the database that are owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
</table>
schema_name | TEXT | The name of the schema in which the table resides.
table_name | TEXT | The name of the table.
partitioning_type | TEXT | The partitioning type used to define table partitions.
subpartitioning_type | TEXT | The subpartitioning type used to define table subpartitions.
partition_count | BIGINT | The number of partitions in the table.
def_subpartition_count | INTEGER | The number of subpartitions in the table.
partitioning_key_count | INTEGER | The number of partitioning keys specified.
def_tablespace_name | CHARACTER VARYING(30) | Provided for compatibility only. Always NULL.
def_pct_free | NUMERIC | Provided for compatibility only. Always NULL.
def_pct_used | NUMERIC | Provided for compatibility only. Always NULL.
def_init_trans | NUMERIC | Provided for compatibility only. Always NULL.
def_max_trans | NUMERIC | Provided for compatibility only. Always NULL.
def_initial_extent | CHARACTER VARYING(40) | Provided for compatibility only. Always NULL.
def_min_extents | CHARACTER VARYING(40) | Provided for compatibility only. Always NULL.
def_max_extents | CHARACTER VARYING(40) | Provided for compatibility only. Always NULL.
def_pct_increase | CHARACTER VARYING(40) | Provided for compatibility only. Always NULL.
def_freelists | NUMERIC | Provided for compatibility only. Always NULL.
def_freelist_groups | NUMERIC | Provided for compatibility only. Always NULL.
3.74 USER_POLICIES

The USER_POLICIES view provides information on policies where the schema containing the object on which the policy applies has the same name as the current session user. This view is accessible only to superusers.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the object resides.</td>
</tr>
<tr>
<td>object_name</td>
<td>TEXT</td>
<td>Name of the object on which the policy applies.</td>
</tr>
<tr>
<td>policy_group</td>
<td>TEXT</td>
<td>Name of the policy group. Included for compatibility only; always set to an empty string.</td>
</tr>
<tr>
<td>policy_name</td>
<td>TEXT</td>
<td>Name of the policy.</td>
</tr>
<tr>
<td>owner</td>
<td>TEXT</td>
<td>Name of the schema containing the policy function, or the schema containing the package that contains the policy function.</td>
</tr>
<tr>
<td>package</td>
<td>TEXT</td>
<td>Name of the package containing the policy function (if the function belongs to a package).</td>
</tr>
<tr>
<td>function</td>
<td>TEXT</td>
<td>Name of the policy function.</td>
</tr>
<tr>
<td>sel</td>
<td>TEXT</td>
<td>Whether or not the policy applies to SELECT commands. Possible values are YES or NO.</td>
</tr>
<tr>
<td>ins</td>
<td>TEXT</td>
<td>Whether or not the policy applies to INSERT commands. Possible values are YES or NO.</td>
</tr>
<tr>
<td>upd</td>
<td>TEXT</td>
<td>Whether or not the policy applies to UPDATE commands. Possible values are YES or NO.</td>
</tr>
<tr>
<td>del</td>
<td>TEXT</td>
<td>Whether or not the policy applies to DELETE commands. Possible values are YES or NO.</td>
</tr>
<tr>
<td>idx</td>
<td>TEXT</td>
<td>Whether or not the policy applies to index maintenance. Possible values are YES or NO.</td>
</tr>
<tr>
<td>chk_option</td>
<td>TEXT</td>
<td>Whether or not the check option is in force for INSERT and UPDATE commands. Possible values are YES or NO.</td>
</tr>
<tr>
<td>enable</td>
<td>TEXT</td>
<td>Whether or not the policy is enabled on the object. Possible values are YES or NO.</td>
</tr>
<tr>
<td>static_policy</td>
<td>TEXT</td>
<td>Whether or not the policy is static. Included for compatibility only; always set to NO.</td>
</tr>
<tr>
<td>policy_type</td>
<td>TEXT</td>
<td>Policy type. Included for compatibility only; always set to UNKNOWN.</td>
</tr>
</tbody>
</table>
### 3.75 USER_QUEUES

The `USER_QUEUES` view provides information about any queue on which the current user has usage privileges.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>long_predicate</td>
<td>TEXT</td>
<td>Included for compatibility only; always set to YES.</td>
</tr>
</tbody>
</table>

#### Name

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>TEXT</td>
<td>The name of the queue.</td>
</tr>
<tr>
<td>queue_table</td>
<td>TEXT</td>
<td>The name of the queue table in which the queue resides.</td>
</tr>
<tr>
<td>gid</td>
<td>OID</td>
<td>The system-assigned object ID of the queue.</td>
</tr>
<tr>
<td>queue_type</td>
<td>CHARACTER VARYING</td>
<td>The queue type; may be EXCEPTION_QUEUE, NON_PERSISTENT_QUEUE, or NORMAL_QUEUE.</td>
</tr>
<tr>
<td>max_retries</td>
<td>NUMERIC</td>
<td>The maximum number of dequeue attempts.</td>
</tr>
<tr>
<td>retrydelay</td>
<td>NUMERIC</td>
<td>The maximum time allowed between retries.</td>
</tr>
<tr>
<td>enqueue_enabled</td>
<td>CHARACTER VARYING</td>
<td>YES if the queue allows enqueuing; NO if the queue does not.</td>
</tr>
<tr>
<td>dequeue_enabled</td>
<td>CHARACTER VARYING</td>
<td>YES if the queue allows dequeuing; NO if the queue does not.</td>
</tr>
<tr>
<td>retention</td>
<td>CHARACTER VARYING</td>
<td>The number of seconds that a processed message is retained in the queue.</td>
</tr>
<tr>
<td>user_comment</td>
<td>CHARACTER VARYING</td>
<td>A user-specified comment.</td>
</tr>
<tr>
<td>network_name</td>
<td>CHARACTER VARYING</td>
<td>The name of the network on which the queue resides.</td>
</tr>
<tr>
<td>sharded</td>
<td>CHARACTER VARYING</td>
<td>YES if the queue resides on a sharded network; NO if the queue does not.</td>
</tr>
</tbody>
</table>

#### 3.76 USER_QUEUE_TABLES

The `USER_QUEUE_TABLES` view provides information about all of the queue tables accessible by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>queue_table</td>
<td>TEXT</td>
<td>The user-specified name of the queue table.</td>
</tr>
<tr>
<td>type</td>
<td>CHARACTER VARYING</td>
<td>The type of data stored in the queue table.</td>
</tr>
<tr>
<td>object_type</td>
<td>TEXT</td>
<td>The user-defined payload type.</td>
</tr>
<tr>
<td>sort_order</td>
<td>CHARACTER VARYING</td>
<td>The order in which the queue table is sorted.</td>
</tr>
<tr>
<td>recipients</td>
<td>CHARACTER VARYING</td>
<td>Always SINGLE.</td>
</tr>
<tr>
<td>message_grouping</td>
<td>CHARACTER VARYING</td>
<td>Always NONE.</td>
</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>compatible</td>
<td>CHARACTER VARYING</td>
<td>The release number of the Advanced Server release with which this queue table is compatible.</td>
</tr>
<tr>
<td>primary_instance</td>
<td>NUMERIC</td>
<td>Always 0.</td>
</tr>
<tr>
<td>secondary_instance</td>
<td>NUMERIC</td>
<td>Always 0.</td>
</tr>
<tr>
<td>owner_instance</td>
<td>NUMERIC</td>
<td>The instance number of the instance that owns the queue table.</td>
</tr>
<tr>
<td>user_comment</td>
<td>CHARACTER VARYING</td>
<td>The user comment provided when the table was created.</td>
</tr>
<tr>
<td>secure</td>
<td>CHARACTER VARYING</td>
<td>YES indicates that the queue table is secure; NO indicates that it is not.</td>
</tr>
</tbody>
</table>

### 3.77 USER_ROLE_PRIVS

The `USER_ROLE_PRIVS` view provides information about the privileges that have been granted to the current user. A row is created for each role to which a user has been granted.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>username</td>
<td>TEXT</td>
<td>The name of the user to which the role was granted.</td>
</tr>
<tr>
<td>granted_role</td>
<td>TEXT</td>
<td>Name of the role granted to the grantee.</td>
</tr>
<tr>
<td>admin_option</td>
<td>TEXT</td>
<td>YES if the role was granted with the admin option, NO otherwise.</td>
</tr>
<tr>
<td>default_role</td>
<td>TEXT</td>
<td>YES if the role is enabled when the grantee creates a session.</td>
</tr>
<tr>
<td>os_granted</td>
<td>CHARACTER VARYING(3)</td>
<td>Included for compatibility only; always NO.</td>
</tr>
</tbody>
</table>

### 3.78 USER_SEQUENCES

The `USER_SEQUENCES` view provides information about all user-defined sequences that belong to the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the sequence resides.</td>
</tr>
<tr>
<td>sequence_name</td>
<td>TEXT</td>
<td>Name of the sequence.</td>
</tr>
<tr>
<td>min_value</td>
<td>NUMERIC</td>
<td>The lowest value that the server will assign to the sequence.</td>
</tr>
<tr>
<td>max_value</td>
<td>NUMERIC</td>
<td>The highest value that the server will assign to the sequence.</td>
</tr>
<tr>
<td>increment_by</td>
<td>NUMERIC</td>
<td>The value added to the current sequence number to create the next sequent number.</td>
</tr>
<tr>
<td>cycle_flag</td>
<td>CHARACTER VARYING</td>
<td>Specifies if the sequence should wrap when it reaches min_value or max_value.</td>
</tr>
<tr>
<td>order_flag</td>
<td>CHARACTER VARYING</td>
<td>Included for compatibility only; always Y.</td>
</tr>
</tbody>
</table>
### 3.79 USER_SOURCE

The **USER_SOURCE** view provides information about all programs owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the program belongs.</td>
</tr>
<tr>
<td>name</td>
<td>TEXT</td>
<td>Name of the program.</td>
</tr>
<tr>
<td>type</td>
<td>TEXT</td>
<td>Type of program – possible values are: FUNCTION, PACKAGE, PACKAGE_BODY, PROCEDURE, and TRIGGER.</td>
</tr>
<tr>
<td>line</td>
<td>INTEGER</td>
<td>Source code line number relative to a given program.</td>
</tr>
<tr>
<td>text</td>
<td>TEXT</td>
<td>Line of source code text.</td>
</tr>
</tbody>
</table>

### 3.80 USER_SUBPART_KEY_COLUMNS

The **USER_SUBPART_KEY_COLUMNS** view provides information about the key columns of those partitioned tables which are subpartitioned that belong to the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>name</td>
<td>TEXT</td>
<td>The name of the table in which the column resides.</td>
</tr>
<tr>
<td>object_type</td>
<td>CHARACTER(5)</td>
<td>For compatibility only; always TABLE.</td>
</tr>
<tr>
<td>column_name</td>
<td>TEXT</td>
<td>The name of the column on which the key is defined.</td>
</tr>
<tr>
<td>column_position</td>
<td>INTEGER</td>
<td>1 for the first column; 2 for the second column, etc.</td>
</tr>
</tbody>
</table>

### 3.81 USER_SYNONYMS

The **USER_SYNONYMS** view provides information about all synonyms owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the synonym resides.</td>
</tr>
<tr>
<td>synonym_name</td>
<td>TEXT</td>
<td>Name of the synonym.</td>
</tr>
<tr>
<td>table_owner</td>
<td>TEXT</td>
<td>User name of the table’s owner on which the synonym is defined.</td>
</tr>
<tr>
<td>table_schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table on which the synonym is defined.</td>
</tr>
</tbody>
</table>
### 3.82 USER_TAB_COLUMNS

The `USER_TAB_COLUMNS` view displays information about all columns in tables and views owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the schema in which the table or view resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the table or view in which the column resides.</td>
</tr>
<tr>
<td>column_name</td>
<td>CHARACTER VARYING</td>
<td>Name of the column.</td>
</tr>
<tr>
<td>data_type</td>
<td>CHARACTER VARYING</td>
<td>Data type of the column.</td>
</tr>
<tr>
<td>data_length</td>
<td>NUMERIC</td>
<td>Length of text columns.</td>
</tr>
<tr>
<td>data_precision</td>
<td>NUMERIC</td>
<td>Precision (number of digits) for NUMBER columns.</td>
</tr>
<tr>
<td>data_scale</td>
<td>NUMERIC</td>
<td>Scale of NUMBER columns.</td>
</tr>
<tr>
<td>nullable</td>
<td>CHARACTER(1)</td>
<td>Whether or not the column is nullable – possible values are: Y, N.</td>
</tr>
<tr>
<td>column_id</td>
<td>NUMERIC</td>
<td>Relative position of the column within the table.</td>
</tr>
<tr>
<td>data_default</td>
<td>CHARACTER VARYING</td>
<td>Default value assigned to the column.</td>
</tr>
</tbody>
</table>

### 3.83 USER_TAB_PARTITIONS

The `USER_TAB_PARTITIONS` view provides information about all of the partitions that are owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table.</td>
</tr>
<tr>
<td>composite</td>
<td>TEXT</td>
<td>YES if the table is subpartitioned; NO if the table is not subpartitioned.</td>
</tr>
<tr>
<td>partition_name</td>
<td>TEXT</td>
<td>The name of the partition.</td>
</tr>
<tr>
<td>subpartition_count</td>
<td>BIGINT</td>
<td>The number of subpartitions in the partition.</td>
</tr>
<tr>
<td>high_value</td>
<td>TEXT</td>
<td>The high partitioning value specified in the <code>CREATE TABLE</code> statement.</td>
</tr>
<tr>
<td>high_value_length</td>
<td>INTEGER</td>
<td>The length of high partitioning value.</td>
</tr>
<tr>
<td>partition_position</td>
<td>INTEGER</td>
<td>The ordinal position of this partition.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>The name of the tablespace in which the partition resides.</td>
</tr>
<tr>
<td>pct_free</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0.</td>
</tr>
<tr>
<td>pct_used</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0.</td>
</tr>
</tbody>
</table>
### 3.84 USER_TAB_SUBPARTITIONS

The **USER_TAB_SUBPARTITIONS** view provides information about all of the subpartitions owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the table resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>The name of the table.</td>
</tr>
<tr>
<td>partition_name</td>
<td>TEXT</td>
<td>The name of the partition.</td>
</tr>
<tr>
<td>subpartition_name</td>
<td>TEXT</td>
<td>The name of the subpartition.</td>
</tr>
<tr>
<td>high_value</td>
<td>TEXT</td>
<td>The high subpartitioning value specified in the <strong>CREATE TABLE</strong> statement.</td>
</tr>
<tr>
<td>high_value_length</td>
<td>INTEGER</td>
<td>The length of high partitioning value.</td>
</tr>
<tr>
<td>subpartition_position</td>
<td>INTEGER</td>
<td>The ordinal position of this subpartition.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>The name of the tablespace in which the subpartition resides.</td>
</tr>
<tr>
<td>pct_free</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>pct_used</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
<tr>
<td>ini_trans</td>
<td>NUMERIC</td>
<td>Included for compatibility only; always 0</td>
</tr>
</tbody>
</table>

The **USER_TAB_SUBPARTITIONS** view provides information about all of the subpartitions owned by the current user.
max_trans | NUMERIC | Included for compatibility only; always 0
initial_extent | NUMERIC | Included for compatibility only; always NULL
next_extent | NUMERIC | Included for compatibility only; always NULL
min_extent | NUMERIC | Included for compatibility only; always NULL
max_extent | NUMERIC | Included for compatibility only; always 0
pct_increase | NUMERIC | Included for compatibility only; always 0
freelists | NUMERIC | Included for compatibility only; always NULL
free_list_groups | NUMERIC | Included for compatibility only; always NULL
logging | CHARACTER VARYING (7) | Included for compatibility only; always YES
compression | CHARACTER VARYING (8) | Included for compatibility only; always NONE
num_rows | NUMERIC | Same as pg_class.reltuples.
blocks | INTEGER | Same as pg_class.relpages.
empty_blocks | NUMERIC | Included for compatibility only; always NULL
avg_space | NUMERIC | Included for compatibility only; always NULL
chain_cnt | NUMERIC | Included for compatibility only; always NULL
avg_row_len | NUMERIC | Included for compatibility only; always NULL
sample_size | NUMERIC | Included for compatibility only; always NULL
last_analyzed | TIMESTAMP WITHOUT TIME ZONE | Included for compatibility only; always NULL
buffer_pool | CHARACTER VARYING (7) | Included for compatibility only; always NULL
global_stats | CHARACTER VARYING (3) | Included for compatibility only; always YES
user_stats | CHARACTER VARYING (3) | Included for compatibility only; always NO
backing_table | REGCLASS | Name of the partition backing table.

### 3.85 USER_TAB_PRIVS

The USER_TAB_PRIVS view provides a listing of the object privileges for which a current user is either an object owner, grantor, or grantee.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>grantee</td>
<td>CHARACTER VARYING (128)</td>
<td>Name of the user with the privilege.</td>
</tr>
<tr>
<td>owner</td>
<td>CHARACTER VARYING (128)</td>
<td>Object owner.</td>
</tr>
<tr>
<td>schema_name</td>
<td>CHARACTER VARYING (128)</td>
<td>Name of the schema in which the object resides.</td>
</tr>
<tr>
<td>table_name</td>
<td>CHARACTER VARYING (128)</td>
<td>Object name.</td>
</tr>
<tr>
<td>grantor</td>
<td>CHARACTER VARYING (128)</td>
<td>Name of the user who granted the privilege.</td>
</tr>
<tr>
<td>privilege</td>
<td>CHARACTER VARYING (40)</td>
<td>Privilege name.</td>
</tr>
<tr>
<td>grantable</td>
<td>CHARACTER VARYING (3)</td>
<td>Indicates whether the privilege was granted with the grant option YES or NO. YES indicates that the GRANTEE (recipient of the privilege) can in tum grant the privilege to others. The</td>
</tr>
</tbody>
</table>
### 3.86 USER_TABLES

The **USER_TABLES** view displays information about all tables owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the table belongs.</td>
</tr>
<tr>
<td>table_name</td>
<td>TEXT</td>
<td>Name of the table.</td>
</tr>
<tr>
<td>tablespace_name</td>
<td>TEXT</td>
<td>Name of the tablespace in which the table resides if other than the default tablespace.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER VARYING(5)</td>
<td>Included for compatibility only; always set to VALID.</td>
</tr>
<tr>
<td>temporary</td>
<td>CHARACTER(1)</td>
<td>Y if the table is temporary; N if the table is not temporary.</td>
</tr>
</tbody>
</table>

### 3.87 USER_TRIGGERS

The **USER_TRIGGERS** view displays information about all triggers on tables owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the trigger resides.</td>
</tr>
<tr>
<td>trigger_name</td>
<td>TEXT</td>
<td>The name of the trigger.</td>
</tr>
</tbody>
</table>
| trigger_type   | TEXT | The type of the trigger. Possible values are:
|                |      | BEFORE ROW
|                |      | BEFORE STATEMENT
|                |      | AFTER ROW
|                |      | AFTER STATEMENT
| triggering_event | TEXT | The event that fires the trigger.                                            |
| table_owner    | TEXT | The user name of the owner of the table on which the trigger is defined.     |
| base_object_type | TEXT | Included for compatibility only. Value will always be TABLE.               |
| table_name     | TEXT | The name of the table on which the trigger is defined.                       |
| referencing_names | TEXT | Included for compatibility only. Value will always be REFERENCING NEW AS NEW OLD AS OLD. |
### 3.88 USER_TYPES

The `USER_TYPES` view provides information about all object types owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>The name of the schema in which the type is defined.</td>
</tr>
<tr>
<td>type_name</td>
<td>TEXT</td>
<td>The name of the type.</td>
</tr>
<tr>
<td>type_oid</td>
<td>OID</td>
<td>The object identifier (OID) of the type.</td>
</tr>
<tr>
<td>typecode</td>
<td>TEXT</td>
<td>The typecode of the type. Possible values are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OBJECT, COLLECTION, OTHER</td>
</tr>
<tr>
<td>attributes</td>
<td>INTEGER</td>
<td>The number of attributes in the type.</td>
</tr>
</tbody>
</table>

### 3.89 USER_USERS

The `USER_USERS` view provides information about the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>username</td>
<td>TEXT</td>
<td>User name of the user.</td>
</tr>
<tr>
<td>user_id</td>
<td>OID</td>
<td>ID number of the user.</td>
</tr>
<tr>
<td>account_status</td>
<td>CHARACTER VARYING (32)</td>
<td>The current status of the account. Possible values are:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPEN, EXPIRED, EXPIRED(GRACE), EXPIRED &amp; LOCKED, EXPIRED &amp; LOCKED(TIMED),</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EXPIRED(GRACE) &amp; LOCKED, LOCKED, LOCKED(TIMED)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use the <code>edb_get_role_status(role_id)</code> function to get the current status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of the account.</td>
</tr>
<tr>
<td>lock_date</td>
<td>TIMESTAMP WITHOUT TIME ZONE</td>
<td>If the account status is LOCKED, lock_date displays the date and time the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>account was locked.</td>
</tr>
</tbody>
</table>
### 3.90 USER_VIEW_COLUMNS

The USER_VIEW_COLUMNS view provides information about all columns in views owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>expiry_date</td>
<td>TIMESTAMP WITHOUT TIME ZONE</td>
<td>The expiration date of the account.</td>
</tr>
<tr>
<td>default_tablespace</td>
<td>TEXT</td>
<td>The default tablespace associated with the account.</td>
</tr>
<tr>
<td>temporary_tablespace</td>
<td>CHARACTER VARYING(30)</td>
<td>Included for compatibility only. The value will always be &quot; (an empty string).</td>
</tr>
<tr>
<td>created</td>
<td>TIMESTAMP WITHOUT TIME ZONE</td>
<td>Included for compatibility only. The value will always be NULL.</td>
</tr>
<tr>
<td>initial_rsrc_consumer_group</td>
<td>CHARACTER VARYING(30)</td>
<td>Included for compatibility only. The value will always be NULL.</td>
</tr>
<tr>
<td>external_name</td>
<td>CHARACTER VARYING(4000)</td>
<td>Included for compatibility only; always set to NULL.</td>
</tr>
</tbody>
</table>

### 3.91 USER_VIEWS

The USER_VIEWS view provides information about all views owned by the current user.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>schema_name</td>
<td>TEXT</td>
<td>Name of the schema in which the view resides.</td>
</tr>
<tr>
<td>view_name</td>
<td>TEXT</td>
<td>Name of the view.</td>
</tr>
<tr>
<td>column_name</td>
<td>TEXT</td>
<td>Name of the column.</td>
</tr>
<tr>
<td>data_type</td>
<td>TEXT</td>
<td>Data type of the column.</td>
</tr>
<tr>
<td>data_length</td>
<td>NUMERIC</td>
<td>Length of text columns.</td>
</tr>
<tr>
<td>data_precision</td>
<td>NUMERIC</td>
<td>Precision (number of digits) for NUMBER columns.</td>
</tr>
<tr>
<td>data_scale</td>
<td>NUMERIC</td>
<td>Scale of NUMBER columns.</td>
</tr>
<tr>
<td>nullable</td>
<td>CHARACTER(1)</td>
<td>Whether or not the column is nullable – possible values are: Y – column is nullable; N – column does not allow null.</td>
</tr>
<tr>
<td>column_id</td>
<td>NUMERIC</td>
<td>Relative position of the column within the view.</td>
</tr>
<tr>
<td>data_default</td>
<td>TEXT</td>
<td>Default value assigned to the column.</td>
</tr>
</tbody>
</table>

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3.92 V$VERSION

The V$VERSION view provides information about product compatibility.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>banner</td>
<td>TEXT</td>
<td>Displays product compatibility information.</td>
</tr>
</tbody>
</table>

3.93 PRODUCT_COMPONENT_VERSION

The PRODUCT_COMPONENT_VERSION view provides version information about product version compatibility.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>product</td>
<td>CHARACTER VARYING(74)</td>
<td>The name of the product.</td>
</tr>
<tr>
<td>version</td>
<td>CHARACTER VARYING(74)</td>
<td>The version number of the product.</td>
</tr>
<tr>
<td>status</td>
<td>CHARACTER VARYING(74)</td>
<td>Included for compatibility; always Available.</td>
</tr>
</tbody>
</table>
4 System Catalog Tables

The following system catalog tables contain definitions of database objects. The layout of the system tables is subject to change; if you are writing an application that depends on information stored in the system tables, it would be prudent to use an existing catalog view, or create a catalog view to isolate the application from changes to the system table.

4.1 dual

dual is a single-row, single-column table that is provided for compatibility with Oracle databases only.

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Modifiers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dummy</td>
<td>VARCHAR2(1)</td>
<td></td>
<td>Provided for compatibility only.</td>
</tr>
</tbody>
</table>

4.2 edb_dir

The edb_dir table contains one row for each alias that points to a directory created with the CREATE DIRECTORY command. A directory is an alias for a pathname that allows a user limited access to the host file system.

You can use a directory to fence a user into a specific directory tree within the file system. For example, the UTL_FILE package offers functions that permit a user to read and write files and directories in the host file system, but only allows access to paths that the database administrator has granted access to via a CREATE DIRECTORY command.

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Modifiers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dirname</td>
<td>&quot;name&quot;</td>
<td>not null</td>
<td>The name of the alias</td>
</tr>
<tr>
<td>dirrowner</td>
<td>oid</td>
<td>not null</td>
<td>The OID of the user that owns the alias.</td>
</tr>
<tr>
<td>dirpath</td>
<td>text</td>
<td></td>
<td>The directory name to which access is granted.</td>
</tr>
<tr>
<td>diracl</td>
<td>aclitem[]</td>
<td></td>
<td>The access control list that determines which users may access the alias.</td>
</tr>
</tbody>
</table>

4.3 edb_password_history

The edb_password_history table contains one row for each password change. The table is shared across all databases within a cluster.

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>References</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>passhistroleid</td>
<td>oid</td>
<td>pg_authid.oid</td>
<td>The ID of a role.</td>
</tr>
<tr>
<td>passhistpassword</td>
<td>text</td>
<td></td>
<td>Role password in md5 encrypted form.</td>
</tr>
</tbody>
</table>
### 4.4 edb_policy

The `edb_policy` table contains one row for each policy.

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Modifiers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>policyname</td>
<td>name</td>
<td>not null</td>
<td>The policy name.</td>
</tr>
<tr>
<td>policygroup</td>
<td>oid</td>
<td>not null</td>
<td>Currently unused.</td>
</tr>
<tr>
<td>policyobject</td>
<td>oid</td>
<td>not null</td>
<td>The OID of the table secured by this policy (the object schema plus the object name).</td>
</tr>
<tr>
<td>policykind</td>
<td>char</td>
<td>not null</td>
<td>The kind of object secured by this policy: 'r' for a table, 'v' for a view, '=' for a synonym. Currently always 'r'.</td>
</tr>
<tr>
<td>policyproc</td>
<td>oid</td>
<td>not null</td>
<td>The OID of the policy function (function_schema plus policy_function).</td>
</tr>
<tr>
<td>policyinsert</td>
<td>boolean</td>
<td>not null</td>
<td>True if the policy is enforced by INSERT statements.</td>
</tr>
<tr>
<td>policyselect</td>
<td>boolean</td>
<td>not null</td>
<td>True if the policy is enforced by SELECT statements.</td>
</tr>
<tr>
<td>policydelete</td>
<td>boolean</td>
<td>not null</td>
<td>True if the policy is enforced by DELETE statements.</td>
</tr>
<tr>
<td>policyupdate</td>
<td>boolean</td>
<td>not null</td>
<td>True if the policy is enforced by UPDATE statements.</td>
</tr>
<tr>
<td>policyindex</td>
<td>boolean</td>
<td>not null</td>
<td>Currently unused.</td>
</tr>
<tr>
<td>policyenabled</td>
<td>boolean</td>
<td>not null</td>
<td>True if the policy is enabled.</td>
</tr>
<tr>
<td>policyupdatecheck</td>
<td>boolean</td>
<td>not null</td>
<td>True if rows updated by an UPDATE statement must satisfy the policy.</td>
</tr>
<tr>
<td>policystatic</td>
<td>boolean</td>
<td>not null</td>
<td>Currently unused.</td>
</tr>
<tr>
<td>policytype</td>
<td>integer</td>
<td>not null</td>
<td>Currently unused.</td>
</tr>
<tr>
<td>policyopts</td>
<td>integer</td>
<td>not null</td>
<td>Currently unused.</td>
</tr>
<tr>
<td>policyseccols</td>
<td>int2vector</td>
<td>not null</td>
<td>The column numbers for columns listed in sec_relevant_cols.</td>
</tr>
</tbody>
</table>

### 4.5 edb_profile

The `edb_profile` table stores information about the available profiles. `edb_profiles` is shared across all databases within a cluster.

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>References</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>oid</td>
<td>oid</td>
<td></td>
<td>Row identifier (hidden attribute; must be explicitly selected).</td>
</tr>
<tr>
<td>prfname</td>
<td>name</td>
<td></td>
<td>The name of the profile.</td>
</tr>
<tr>
<td>prffailedloginattempts</td>
<td>integer</td>
<td></td>
<td>The number of failed login attempts</td>
</tr>
<tr>
<td>Column</td>
<td>Type</td>
<td>References</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------</td>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>prfpasswordlocktime</td>
<td>integer</td>
<td></td>
<td>The password lock time associated with the profile (in seconds). -1 indicates that the value from the default profile should be used. -2 indicates no limit on failed login attempts.</td>
</tr>
<tr>
<td>prfpasswordlifetime</td>
<td>integer</td>
<td></td>
<td>The password lifetime associated with the profile (in seconds). -1 indicates that the value from the default profile should be used. -2 indicates that the account should be locked permanently.</td>
</tr>
<tr>
<td>prfpasswordgracetime</td>
<td>integer</td>
<td></td>
<td>The password grace time associated with the profile (in seconds). -1 indicates that the value from the default profile should be used. -2 indicates that the password never expires.</td>
</tr>
<tr>
<td>prfpasswordreusetime</td>
<td>integer</td>
<td></td>
<td>The number of seconds that a user must wait before reusing a password. -1 indicates that the value from the default profile should be used. -2 indicates that the old passwords can never be reused.</td>
</tr>
<tr>
<td>prfpasswordreuseax</td>
<td>integer</td>
<td></td>
<td>The number of password changes that have to occur before a password can be reused. -1 indicates that the value from the default profile should be used. -2 indicates that the old passwords can never be reused.</td>
</tr>
<tr>
<td>prfpasswordallowhashed</td>
<td>integer</td>
<td></td>
<td>The password allow hashed parameter specifies whether an encrypted password to be allowed for use or not. The possible values can be true/on/yes/1, false/off/no/0, and DEFAULT.</td>
</tr>
<tr>
<td>prfpasswordverifyfuncdb</td>
<td>oid</td>
<td>pg_database.oid</td>
<td>The OID of the database in which the password verify function exists.</td>
</tr>
<tr>
<td>prfpasswordverifyfunc</td>
<td>oid</td>
<td>pg_proc.oid</td>
<td>The OID of the password verify function associated with the profile.</td>
</tr>
</tbody>
</table>

### 4.6 `edb_variable`

The `edb_variable` table contains one row for each package level variable (each variable declared within a package).
<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Modifiers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>varname</td>
<td>&quot;name&quot;</td>
<td>not null</td>
<td>The name of the variable.</td>
</tr>
<tr>
<td>varpackage</td>
<td>oid</td>
<td>not null</td>
<td>The OID of the pg_namespace row that stores the package.</td>
</tr>
<tr>
<td>vartype</td>
<td>oid</td>
<td>not null</td>
<td>The OID of the pg_type row that defines the type of the variable.</td>
</tr>
<tr>
<td>varaccess</td>
<td>&quot;char&quot;</td>
<td>not null</td>
<td>+ if the variable is visible outside of the package. - if the variable is only visible within the package. Note: Public variables are declared within the package header; private variables are declared within the package body.</td>
</tr>
<tr>
<td>varscc</td>
<td>text</td>
<td></td>
<td>Contains the source of the variable declaration, including any default value expressions for the variable.</td>
</tr>
<tr>
<td>varseq</td>
<td>smallint</td>
<td>not null</td>
<td>The order in which the variable was declared in the package.</td>
</tr>
</tbody>
</table>

### 4.7 pg_synonym

The pg_synonym table contains one row for each synonym created with the CREATE SYNONYM command or CREATE PUBLIC SYNONYM command.

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Modifiers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>synname</td>
<td>&quot;name&quot;</td>
<td>not null</td>
<td>The name of the synonym.</td>
</tr>
<tr>
<td>synnamespace</td>
<td>oid</td>
<td>not null</td>
<td>Replaces synowner. Contains the OID of the pg_namespace row where the synonym is stored.</td>
</tr>
<tr>
<td>synowner</td>
<td>oid</td>
<td>not null</td>
<td>The OID of the user that owns the synonym.</td>
</tr>
<tr>
<td>synobjschema</td>
<td>&quot;name&quot;</td>
<td>not null</td>
<td>The schema in which the referenced object is defined.</td>
</tr>
<tr>
<td>synobjname</td>
<td>&quot;name&quot;</td>
<td>not null</td>
<td>The name of the referenced object.</td>
</tr>
<tr>
<td>synlink</td>
<td>text</td>
<td></td>
<td>The (optional) name of the database link in which the referenced object is defined.</td>
</tr>
</tbody>
</table>

### 4.8 product_component_version

The product_component_version table contains information about feature compatibility; an application can query this table at installation or runtime to verify that features used by the application are available with this deployment.

<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>product</td>
<td>character varying (74)</td>
<td>The name of the product.</td>
</tr>
<tr>
<td>version</td>
<td>character varying (74)</td>
<td>The version number of the product.</td>
</tr>
<tr>
<td>status</td>
<td>character varying (74)</td>
<td>The status of the release.</td>
</tr>
</tbody>
</table>
5 Acknowledgements

The PostgreSQL 8.3, 8.4, 9.0, 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 10, 11, and 12 Documentation provided the baseline for the portions of this guide that are common to PostgreSQL, and is hereby acknowledged:

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