41.3. Declarations

All variables used in a block must be declared in the declarations section of the block. (The only exceptions are that the loop variable of a FOR loop iterating over a range of integer values is automatically declared as an integer variable, and likewise the loop variable of a FOR loop iterating over a cursor's result is automatically declared as a record variable.)

PL/pgSQL variables can have any SQL data type, such as integer, varchar, and char.

Here are some examples of variable declarations:

```
user_id integer;
quantity numeric(5);
url varchar;
myrow tablename%ROWTYPE;
myfield tablename.columnname%TYPE;
arow RECORD;
```

The general syntax of a variable declaration is:

```
name [ CONSTANT ] type [ COLLATE collation_name ] [ NOT NULL ] [ { DEFAULT | := | = } expression ];
```

The DEFAULT clause, if given, specifies the initial value assigned to the variable when the block is entered. If the DEFAULT clause is not given then the variable is initialized to the SQL null value. The CONSTANT option prevents the variable from being assigned to after initialization, so that its value will remain constant for the duration of the block. The COLLATE option specifies a collation to use for the variable (see Section 41.3.6). If NOT NULL is specified, an assignment of a null value results in a run-time error. All variables declared as NOT NULL must have a nonnull default value specified. Equal (=) can be used instead of PL/SQL-compliant :=.

A variable's default value is evaluated and assigned to the variable each time the block is entered (not just once per function call). So, for example, assigning now() to a variable of type timestamp causes the variable to have the time of the current function call, not the time when the function was precompiled.

Examples:

```
quantity integer DEFAULT 32;
url varchar := 'http://mysite.com';
user_id CONSTANT integer := 10;
```

41.3.1. Declaring Function Parameters

Parameters passed to functions are named with the identifiers $1, $2, etc. Optionally, aliases can be declared for $n parameter names for increased readability. Either the alias or the numeric identifier can then be used to refer to the parameter value.

There are two ways to create an alias. The preferred way is to give a name to the parameter in the CREATE FUNCTION command, for example:

```
CREATE FUNCTION sales_tax(subtotal real) RETURNS real AS $$
BEGIN
    RETURN subtotal * 0.06;
END;
$$ LANGUAGE plpgsql;
```

The other way is to explicitly declare an alias, using the declaration syntax

```
name ALIAS FOR $n;
```

The same example in this style looks like:

```
CREATE FUNCTION sales_tax(real) RETURNS real AS $$
DECLARE
    subtotal ALIAS FOR $1;
BEGIN
    RETURN subtotal * 0.06;
END;
$$ LANGUAGE plpgsql;
```

> **Note:** These two examples are not perfectly equivalent. In the first case, subtotal could be referenced as sales_tax.subtotal, but in the second case it could not. (Had we attached a label to the inner block, subtotal could be qualified with that label, instead.)

Some more examples:

```
CREATE FUNCTION instr(varchar, integer) RETURNS integer AS $$
DECLARE
    v_string ALIAS FOR $1;
    index ALIAS FOR $2;
BEGIN
    -- some computations using v_string and index here
END;
$$ LANGUAGE plpgsql;


CREATE FUNCTION concat_selected_fields(in_t sometablename) RETURNS text AS $$
BEGIN
    RETURN in_t.f1 || in_t.f3 || in_t.f5 || in_t.f7;
END;
$$ LANGUAGE plpgsql;
```

When a PL/pgSQL function is declared with output parameters, the output parameters are given $n names and optional aliases in just the same way as the normal input parameters. An output parameter is effectively a variable that starts out NULL; it should be assigned to during the execution of the function. The final value of the parameter is what is returned. For instance, the sales-tax example could also be done this way:

```
CREATE FUNCTION sales_tax(subtotal real, OUT tax real) AS $$
BEGIN
    tax := subtotal * 0.06;
END;
$$ LANGUAGE plpgsql;
```

Notice that we omitted RETURNS real — we could have included it, but it would be redundant.

Output parameters are most useful when returning multiple values. A trivial example is:

```
CREATE FUNCTION sum_n_product(x int, y int, OUT sum int, OUT prod int) AS $$
BEGIN
    sum := x + y;
    prod := x * y;
END;
$$ LANGUAGE plpgsql;
```

As discussed in Section 36.4.4, this effectively creates an anonymous record type for the function's results. If a RETURNS clause is given, it must say RETURNS record.

Another way to declare a PL/pgSQL function is with RETURNS TABLE, for example:

```
CREATE FUNCTION extended_sales(p_itemno int)
RETURNS TABLE(quantity int, total numeric) AS $$
BEGIN
    RETURN QUERY SELECT s.quantity, s.quantity * s.price FROM sales AS s
                 WHERE s.itemno = p_itemno;
END;
$$ LANGUAGE plpgsql;
```

This is exactly equivalent to declaring one or more OUT parameters and specifying RETURNS SETOF *sometype*.

When the return type of a PL/pgSQL function is declared as a polymorphic type (anyelement, anyarray, anynonarray, anyenum, or anyrange), a special parameter $0 is created. Its data type is the actual return type of the function, as deduced from the actual input types (see Section 36.2.5). This allows the function to access its actual return type as shown in Section 41.3.3. $0 is initialized to null and can be modified by the function, so it can be used to hold the return value if desired, though that is not required. $0 can also be given an alias. For example, this function works on any data type that has a + operator:

```
CREATE FUNCTION add_three_values(v1 anyelement, v2 anyelement, v3 anyelement)
RETURNS anyelement AS $$
DECLARE
    result ALIAS FOR $0;
BEGIN
    result := v1 + v2 + v3;
    RETURN result;
END;
$$ LANGUAGE plpgsql;
```

The same effect can be obtained by declaring one or more output parameters as polymorphic types. In this case the special $0 parameter is not used; the output parameters themselves serve the same purpose. For example:

```
CREATE FUNCTION add_three_values(v1 anyelement, v2 anyelement, v3 anyelement,
                                 OUT sum anyelement)
AS $$
BEGIN
    sum := v1 + v2 + v3;
END;
$$ LANGUAGE plpgsql;
```

41.3.2. ALIAS

```
newname ALIAS FOR oldname;
```

The ALIAS syntax is more general than is suggested in the previous section: you can declare an alias for any variable, not just function parameters. The main practical use for this is to assign a different name for variables with predetermined names, such as NEW or OLD within a trigger procedure.

Examples:

```
DECLARE
  prior ALIAS FOR old;
  updated ALIAS FOR new;
```

Since ALIAS creates two different ways to name the same object, unrestricted use can be confusing. It's best to use it only for the purpose of overriding predetermined names.

41.3.3. Copying Types

```
variable%TYPE
```

%TYPE provides the data type of a variable or table column. You can use this to declare variables that will hold database values. For example, let's say you have a column named user_id in your users table. To declare a variable with the same data type as users.user_id you write:

```
user_id users.user_id%TYPE;
```

By using %TYPE you don't need to know the data type of the structure you are referencing, and most importantly, if the data type of the referenced item changes in the future (for instance: you change the type of user_id from integer to real), you might not need to change your function definition.

%TYPE is particularly valuable in polymorphic functions, since the data types needed for internal variables can change from one call to the next. Appropriate variables can be created by applying %TYPE to the function's arguments or result placeholders.

41.3.4. Row Types

```
name table_name%ROWTYPE;
name composite_type_name;
```

A variable of a composite type is called a *row* variable (or *row-type* variable). Such a variable can hold a whole row of a SELECT or FOR query result, so long as that query's column set matches the declared type of the variable. The individual fields of the row value are accessed using the usual dot notation, for example rowvar.field.

A row variable can be declared to have the same type as the rows of an existing table or view, by using the ***table_name***%ROWTYPE notation; or it can be declared by giving a composite type's name. (Since every table has an associated composite type of the same name, it actually does not matter in PostgreSQL whether you write %ROWTYPE or not. But the form with %ROWTYPE is more portable.)

Parameters to a function can be composite types (complete table rows). In that case, the corresponding identifier $***n*** will be a row variable, and fields can be selected from it, for example $1.user_id.

Only the user-defined columns of a table row are accessible in a row-type variable, not the OID or other system columns (because the row could be from a view). The fields of the row type inherit the table's field size or precision for data types such as char(***n***).

Here is an example of using composite types. table1 and table2 are existing tables having at least the mentioned fields:

```
CREATE FUNCTION merge_fields(t_row table1) RETURNS text AS $$
DECLARE
    t2_row table2%ROWTYPE;
BEGIN
    SELECT * INTO t2_row FROM table2 WHERE ... ;
    RETURN t_row.f1 || t2_row.f3 || t_row.f5 || t2_row.f7;
END;
$$ LANGUAGE plpgsql;

SELECT merge_fields(t.*) FROM table1 t WHERE ... ;
```

41.3.5. Record Types

```
name RECORD;
```

Record variables are similar to row-type variables, but they have no predefined structure. They take on the actual row structure of the row they are assigned during a SELECT or FOR command. The substructure of a record variable can change each time it is assigned to. A consequence of this is that until a record variable is first assigned to, it has no substructure, and any attempt to access a field in it will draw a run-time error.

Note that RECORD is not a true data type, only a placeholder. One should also realize that when a PL/pgSQL function is declared to return type record, this is not quite the same concept as a record variable, even though such a function might use a record variable to hold its result. In both cases the actual row structure is unknown when the function is written, but for a function returning record the actual structure is determined when the calling query is parsed, whereas a record variable can change its row structure on-the-fly.

41.3.6. Collation of PL/pgSQL Variables

When a PL/pgSQL function has one or more parameters of collatable data types, a collation is identified for each function call depending on the collations assigned to the actual arguments, as described in Section 23.2. If a collation is successfully identified (i.e., there are no conflicts of implicit collations among the arguments) then all the collatable parameters are treated as having that collation implicitly. This will affect the behavior of collation-sensitive operations within the function. For example, consider

```
CREATE FUNCTION less_than(a text, b text) RETURNS boolean AS $$
BEGIN
    RETURN a < b;
END;
$$ LANGUAGE plpgsql;

SELECT less_than(text_field_1, text_field_2) FROM table1;
SELECT less_than(text_field_1, text_field_2 COLLATE "C") FROM table1;
```

The first use of less_than will use the common collation of text_field_1 and text_field_2 for the comparison, while the second use will use C collation.

Furthermore, the identified collation is also assumed as the collation of any local variables that are of collatable types. Thus this function would not work any differently if it were written as

```
CREATE FUNCTION less_than(a text, b text) RETURNS boolean AS $$
DECLARE
    local_a text := a;
    local_b text := b;
BEGIN
    RETURN local_a < local_b;
END;
$$ LANGUAGE plpgsql;
```

If there are no parameters of collatable data types, or no common collation can be identified for them, then parameters and local variables use the default collation of their data type (which is usually the database's default collation, but could be different for variables of domain types).

A local variable of a collatable data type can have a different collation associated with it by including the COLLATE option in its declaration, for example

```
DECLARE
    local_a text COLLATE "en_US";
```

This option overrides the collation that would otherwise be given to the variable according to the rules above.

Also, of course explicit COLLATE clauses can be written inside a function if it is desired to force a particular collation to be used in a particular operation. For example,

```
CREATE FUNCTION less_than_c(a text, b text) RETURNS boolean AS $$
BEGIN
    RETURN a < b COLLATE "C";
END;
$$ LANGUAGE plpgsql;
```

This overrides the collations associated with the table columns, parameters, or local variables used in the expression, just as would happen in a plain SQL command.