Oracle 11g – PL SQL

Working on Composite Data Types

About Composite Data type

Working on various Composite Data types and their Usage:

- Defined PL/SQL records
- Creating a PL/SQL Record
- Advantage of using `%ROWTYPE` attribute
- Create an `INDEX BY` table
- Create an `INDEX BY` table of records
- Describe the difference between records, tables, and tables of records

Composite Data Types

- Are of two types:
  - PL/SQL `RECORD`s
  - PL/SQL Collections
    - `INDEX BY` Table

PL/SQL Records

- Must contain one or more components of any scalar, `RECORD`, or `INDEX BY` table data type, called fields
- Are similar in structure to records in a third generation language (3GL)
- Are not the same as rows in a database table
- Treat a collection of fields as a logical unit
- Are convenient for fetching a row of data from a table for processing

Creating a PL/SQL Record

Syntax:

```
TYPE type_name IS RECORD
      (field_declaration[, field_declaration]…);
identifier    type_name;
```

Where *field_declaration* is:

```
field_name {field_type | variable%TYPE
            | table.column%TYPE | table%ROWTYPE}
            [[NOT NULL] {:= | DEFAULT} expr]
```

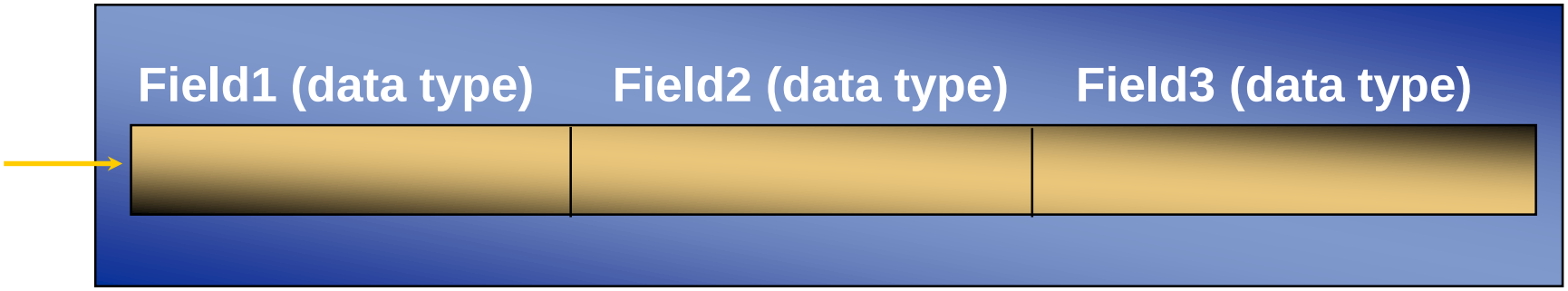
Creating a PL/SQL Record

Declare variables to store the name, job, and salary of a new employee.

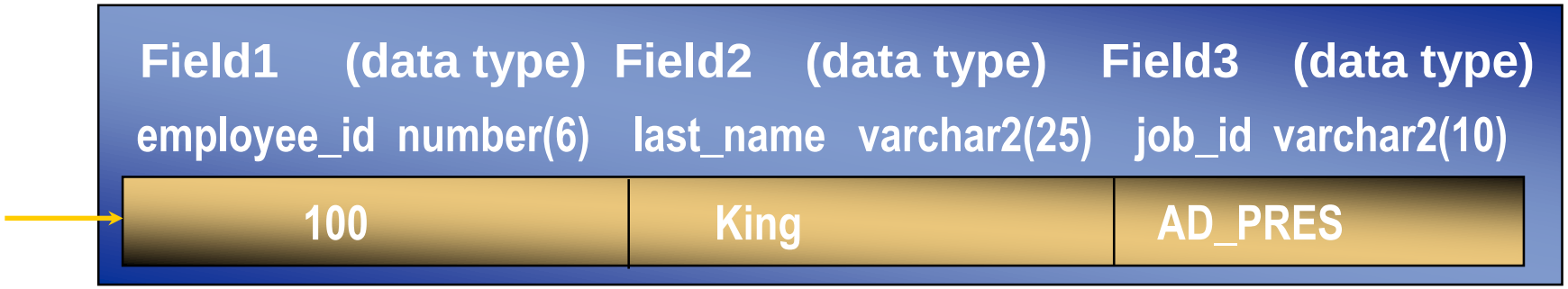
Example:

```
...
  TYPE emp_record_type IS RECORD
    (last_name   VARCHAR2(25),
     job_id      VARCHAR2(10),
     salary      NUMBER(8,2));
  emp_record     emp_record_type;
...
```

PL/SQL Record Structure



Example:



The %ROWTYPE Attribute

- Declare a variable according to a collection of columns in a database table or view.
- Prefix %ROWTYPE with the database table.
- Fields in the record take their names and data types from the columns of the table or view.

Advantages of Using %ROWTYPE

- The number and data types of the underlying database columns need not be known.
- The number and data types of the underlying database column may change at run time.
- The attribute is useful when retrieving a row with the `SELECT *` statement.

The %ROWTYPE Attribute

Examples:

Declare a variable to store the information about a department from the DEPARTMENTS table.

```
dept_record    departments%ROWTYPE;
```

Declare a variable to store the information about an employee from the EMPLOYEES table.

```
emp_record     employees%ROWTYPE;
```

INDEX BY Tables

- Are composed of two components:
  - Primary key of data type BINARY_INTEGER
  - Column of scalar or record data type
- Can increase in size dynamically because they are unconstrained

Creating an INDEX BY Table

Syntax:

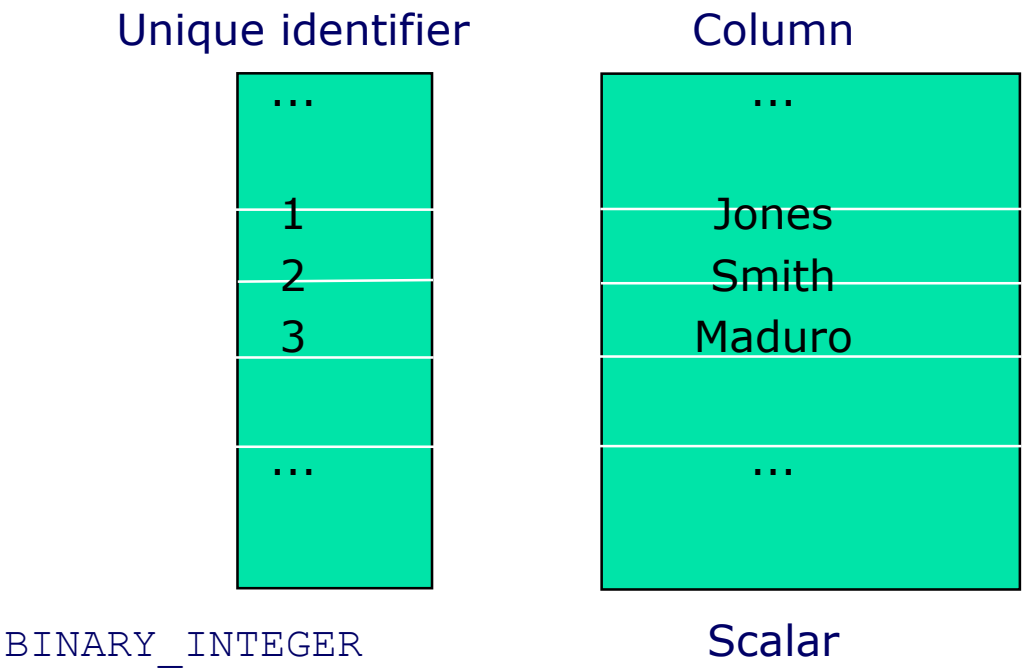
```
TYPE type_name IS TABLE OF
      {column_type | variable%TYPE
      | table.column%TYPE} [NOT NULL]
      | table.%ROWTYPE
      [INDEX BY BINARY_INTEGER];
identifier    type_name;
```

Declare an INDEX BY table to store names.

Example:

```
...
TYPE ename_table_type IS TABLE OF
                              employees.last_name%TYPE
  INDEX BY BINARY_INTEGER;
ename_table ename_table_type;
...
```

INDEX BY Table Structure



Creating an INDEX BY Table

```
DECLARE
  TYPE ename_table_type IS TABLE OF
       employees.last_name%TYPE
       INDEX BY BINARY_INTEGER;
  TYPE hiredate_table_type IS TABLE OF DATE
       INDEX BY BINARY_INTEGER;
  ename_table       ename_table_type;
  hiredate_table    hiredate_table_type;
BEGIN
  ename_table(1)    := 'CAMERON';
  hiredate_table(8) := SYSDATE + 7;
    IF ename_table.EXISTS(1) THEN
      INSERT INTO ...
    ...
END;
/
```

Using INDEX BY Table Methods

The following methods make INDEX BY tables easier to use:

- **EXISTS**
- **COUNT**
- **FIRST and LAST**
- **PRIOR**
- NEXT
- TRIM
- DELETE

INDEX BY Table of Records

- Define a TABLE variable with a permitted PL/SQL data type.
- Declare a PL/SQL variable to hold department information.

Example:

```
DECLARE
  TYPE dept_table_type IS TABLE OF
       departments%ROWTYPE
       INDEX BY BINARY_INTEGER;
  dept_table dept_table_type;
  -- Each element of dept_table is a record
```

Example of INDEX BY Table of Records

```
SET SERVEROUTPUT ON
DECLARE
   TYPE emp_table_type is table of
      employees%ROWTYPE INDEX BY BINARY_INTEGER;
   my_emp_table  emp_table_type;
   v_count       NUMBER(3):= 104;
BEGIN
  FOR i IN 100..v_count
  LOOP
        SELECT * INTO my_emp_table(i) FROM employees
        WHERE employee_id = i;
  END LOOP;
  FOR i IN my_emp_table.FIRST..my_emp_table.LAST
  LOOP
     DBMS_OUTPUT.PUT_LINE(my_emp_table(i).last_name);
  END LOOP;
END;
```