

Uni DB1 Syntax Details

Syntax details for the DB1 (databases) course at HdM Stuttgart

Felicitas Pojtinger

2022-02-01

“so basically i am monkey” - monke, monkeeee

Acknowledgements

Most of the following is based on the Oracle Tutorial.

Reset Everything

Reset Everything

Run the following to get the commands to drop all tables and their constraints:

begin

```
for i in (select index_name from user_indexes where index_n  
    execute immediate 'drop_index_' || i.index_name;  
end loop;
```

```
for i in (select trigger_name from user_triggers) loop  
    execute immediate 'drop_trigger_' || i.trigger_name;  
end loop;
```

```
for i in (select view_name from user_views) loop  
    execute immediate 'drop_view_' || i.view_name;  
end loop;
```

SQL

Operators

Operator	Description
=	Equality
!=,<>	Inequality
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
IN	Equal to any value in a list of values
ANY/ SOME/ ALL	Compare a value to a list or subquery. It must be preceded by another operator such as =, >, <.
NOT IN	Not equal to any value in a list of values
[NOT]	Equivalent to [Not] >= n and <= y.
BETWEEN n and m	
[NOT] EXISTS	Return true if subquery returns at least one row

Joins

- An **inner join** matches stuff in both tables:

```
select a.id as id_a, a.color as color_a, b.id as id_b, b
```

- A **left (outer) join** matches everything in the left tables plus what matches in the right table:

```
select a.id as id_a, a.color as color_a, b.id as id_b, b
```

- This **left (outer) join** matches everything that is in the left table and not in the right table:

```
select a.id as id_a, a.color as color_a, b.id as id_b, b
```

- A **right (outer) join** matches everything in the right join plus what matches in the left table:

```
select a.id as id_a, a.color as color_a, b.id as id_b, b
```

- You can alias long column names with
select mylongname as name from contacts or just
select mylongname name from contacts. The as keyword is optional.
Full-text column names are supported by enclosing in “”. as can also
format strings:
select first_name || ' ' || last_name as "Name" from employees;
yields Alice, Bob and System.
- You can also create a table alias (using from employees e), but you
CAN'T USE the as keyword.

Limits and Pagination

- The Oracle equivalent of filter is fetch n next rows only:
`select * from products order by list_price desc fetch next 5 rows only;`

- You may also use the fetch next n percent rows only:

```
select * from inventories order by quantity desc fetch next 5 percent rows only;
```

- Filtering by for example a quantity, and you only want the first 10 “condition matches”? Use fetch n next rows with ties:

```
select * from inventories order by quantity desc fetch next 10 rows with ties;
```

- Need Pagination? Use offset:

```
select * from products order by standard_cost desc offset 10 rows;
```

Dates and Intervals

- Want to extract a year from a date? Use `extract`:

```
select * from orders where status = 'Shipped' and extract
```

- Want to get the current date? Use `current_date`:

```
select current_date from dual;
```

- The `to_char` function can convert dates (and timestamps) to chars:

```
select to_char(sysdate, 'YYYY-MM-DD') from dual;
```

- The `to_date` function can convert chars to dates:

```
select to_date('2021-01-12', 'YYYY-MM-DD') from dual;
```

- Alternatively, the date literal uses the `YYYY-MM-DD` format and does not require format specs:

```
select date '1969-04-20' from dual;
```

Expressions

- Only single quotes are supported.
- Comparisons are done with =, NOT ==.
- It also supports full expression evaluation:

```
select product_name as "Product_Name", list_price - standard
```

- You can use () in where clauses to prioritize:

```
select * from orders where (  
status = 'Canceled' or status = 'Pending' ) and customer  
order by order_date;
```

- The in keyword is a useful tool for sub collections and subqueries:

-

```
select * from orders where salesman_id in (54, 55, 56) order by order_id;
```

-

```
select * from orders where salesman_id not in (54, 55, 56) order by order_id10;
```

Grouping and Ordering

- You can use functions like upper and dates when ordering.

- The group by keyword can be used to find unique data:

```
select status from orders group by status;
```

- By combining group by with count you can count the amount of unique data:

```
select status, count (*) from orders group by status;
```

- group by can also be used with the where keyword:

```
select name, count(*) as "Shipped_Orders" from orders in
```

- where can NOT APPEAR AFTER group by; use the having keyword instead.

- The having keyword enables you to filter like with where, but after

- You can count the amount of rows with the count() function:

```
select count(*) from products
```

- The sum function can be used to calculate a total:

```
select sum(unit_price * quantity) from order_items;
```

- It can also be used to calculate a total per row (the group by order_id part is required; group by order_value does not work):

```
select order_id , sum(unit_price * quantity) as order_value
```

Inserting

- It is a good idea to always specify the columns when inserting:

```
insert into discounts(discount_name, amount, start_date,
```

- You can also “insert from select” using insert into:

```
insert into sales(customer_id, product_id, order_date, t
```

- It's even possible to “create a table from select” using create table x as, basically coping its schema (where 1 = 0 skips copying the rows):

```
create table sales_2017 as select * from sales where 1 =
```

- Using insert all, it is possible to insert multiple rows at once (note the lack of commas between the into keywords. Here, the subquery is ignored/a placeholder.):

```
insert all into fruits (fruit_name, color) values ('Apple'13
```


- Using case it is possible to create if/else constructs:

```
select product_name, list_price, case category_id when 1
```

- case is also useful for conditional grouping:

```
select * from locations order by country_id, case country
```

- case also evaluates to an expression, so you can use it for conditional updates:

```
update products set list_price = case when list_price < 2
```

Helper Functions

- You can extract substrings with substr:
`select substr('Alex', 1, 1) from dual;`
- Stuff like `select upper('uwu') from dual` can come in handy.
- Using `round` it is possible to round numbers (returns 5.23):
`select round(5.234234234234, 2) from dual;`
- You can use `replace` to replace strings:
`update accounts set phone = replace(phone, '+1-', '');`
- You can use the `floor`, `round` and `ceil` functions to get rounded values.

- generated by default as identity is quite useful for auto-incrementing columns such as PKs:

```
create table persons ( person_id number generated by default
```

- generated always as identity is the same but does not allow setting it manually.

Modifying Columns

- You can use `desc mytable` to show the schema for a table.

- `alter table` can be used to add columns using `add`:

```
alter table persons add birthdate date not null;
```

- You can also add multiples at once (note that there is no column keyword):

```
alter table persons add ( phone varchar2(20), email varchar2(255) not null);
```

- `modify` can change the column type (note that there is no column keyword):

```
alter table persons modify birthdate date null;
```

- `drop column` can be used to remove a column

```
alter table persons drop column birthdate;
```

- You can create virtual columns in regular tables without using views with `alter table x add ... as` (note the required `(` after the `as` keyword):

```
alter table parts add (capacity_description as ( case wh
```

- The size of a `varchar2` is adjustable afterwards (note that this checks if any current `varchar2`s are larger than the new size and fails if they are.):

```
alter table persons modify first_name varchar2(255);
```

Modifying Tables

- You can drop a table with drop table:

```
drop table people;
```

- Appending purge clears the recycle bin; appending cascade constraints drop all related constraints.

- You can clear a table using truncate table:

```
truncate table customers_copy;
```

- The same limitations as with drop table concerning constraints apply, so appending cascade (WITHOUT constraints) drops all related ones.
- You can clear the recycle bin with:

```
purge recyclebin;
```

Constraints

- It is possible to add constraints (any constraints, a primary key in this example) after creating a table with add constraint:

```
alter table purchase_orders add constraint purchase_order
```

- You may remove a constraint with drop constraint:

```
alter table purchase_orders drop constraint purchase_ord
```

- Instead of removing it, you can also use disable constraint:

```
alter table purchase_orders disable constraint purchase_
```

- And re-enable it with enable constraint:

```
alter table purchase_orders enable constraint purchase_o
```

- You can also add foreign key constraints:

```
alter table suppliers add constraint suppliers_supplier_g20
```

Types

- You can create a number within a range: `number(1,0)`.
- The number type is used for all types of numbers by specifying precision and scale: `number(6)` (or `number(6,0)`) is a signed integer fitting 6 digits, `number(6,2)` is a float with two digits precision. The DB doesn't just cut off numbers, it rounds them.
- The float type can be emulated by the number type, i.e. `float(2)` is equal to `number(38,2)`. The argument is in bits instead of digits though.
- The `lengthdb` function can be used to get the length of field in bytes.
- The char type has a fixed length: `name char(10)` or `name char(10 bytes)`, meaning that a char always takes up the amount of bytes set. `nchar` is the same but UTF-8 or UTF-16 any doesn't take bytes.
- The `varchar2` type also takes an argument for the length in bytes, which in ASCII corresponds to the amount of characters. `nvarchar2` is

Views

- You can create a view with `create view x as select ...` :

```
create view employees_years_of_service as select employee
```

- If used with `create` or `replace view`, upserts are possible.
- By appending with `read only`, you can prevent data modifications:

```
create or replace view employees_years_of_service as sel
```

- `drop view x` removes the view.
- Deletions and updates on views are usually fine, but inserts can often be not that useful due to fields being excluded from the view; see instead of triggers later on for a solution;
- Subqueries can be used in selects:

```
select * from ( select * from products ) where list_price
```

- You can create an index with create index:

```
create index members_last_name on members(last_name);
```

- You can also create an index spanning multiple columns:

```
create index members_full_name on members(first_name , last_name);
```

- You can drop an index with drop index:

```
drop index members_full_name;
```

PL/SQL

- Block structure:

```
declare
-- declarations
begin
-- your logic
exception
-- exception handling
end;
```

- The most simple example is as follows:

```
begin
    dbms_output.put_line( 'Hello_World! ' );
end;
```

- Use put_line from the dbms_output package to print to stdout.

Variables

- PL/SQL extends SQL by adding a boolean type (which can have the values true, false and null).
- Variables need not be given a value at declaration if they are nullable:

```
declare
    total_sales  number(15,2);
    credit_limit number(10,0);
    contact_name varchar2(255);
begin
    null;
end;
```

- You can use default as an alternative to the := operator when assigning variables in the declaration section. DO NOT use = when assignment, even re-assignment also uses :=.

Fetching Data

- Use `select ... into` to fetch data into variables; `%TYPE` infers the type of a column:

```
declare
```

```
    customer_name customers.name%TYPE;
```

```
    customer_credit_limit customers.credit_limit%TYPE;
```

```
begin
```

```
    select
```

```
        name, credit_limit
```

```
    into
```

```
        customer_name, customer_credit_limit
```

```
    from customers where customer_id = 38;
```

```
        dbms_output.put_line(customer_name || ' :␣' || customer_credit_limit);
```

```
end;
```

Branches and Expressions

- `if ... then ... end if` can be used for branching:

```
declare
```

```
    sales number := 20000;
```

```
begin
```

```
    if sales > 10000 then
```

```
        dbms_output.put_line('Lots of sales!');
```

```
    end if;
```

```
end;
```

- Inline expressions are also supported:

```
large_sales := sales > 10000
```

- Booleans need not be compared with `my_bool = true`, a simple `if my_bool` then is fine.

- `elseif ... then` is NOT valid syntax: `elsif ... then` is valid syntax.

Switches

- You may use the case keyword for switch cases:

```
declare
```

```
    grade char(1);
```

```
    message varchar2(255);
```

```
begin
```

```
    grade := 'A';
```

```
    case grade
```

```
        when 'A' then
```

```
            message := 'Excellent';
```

```
        when 'B' then
```

```
            message := 'Great';
```

```
        when 'C' then
```

```
            message := 'Good';
```

```
        when 'D' then
```


- A label/goto equivalent is also available:

begin

goto do_work;

goto goodbye;

<<do_work>>

dbms_output.put_line('mawahaha');

<<goodbye>>

dbms_output.put_line('Goodbye!');

end;

Loops

- The equivalent of the while loop is the loop. exit/continue prevents an infinite loop:

```
declare
```

```
    i number := 0;
```

```
begin
```

```
    loop
```

```
        i := i + 1;
```

```
        dbms_output.put_line('Iterator:␣' || i);
```

```
        if i >= 10 then
```

```
            exit;
```

```
        end if;
```

```
    end loop;
```

Types and Objects

- You can also use %ROWTYPE to infer the type of a row and select an entire row at once:

```
declare
```

```
    customer customers%ROWTYPE;
```

```
begin
```

```
    select * into customer from customers where customer
```

```
        dbms_output.put_line(customer.name || '/' || customer
```

```
end;
```

- It is also possible to use OOP-style object/row creation thanks to %ROWTYPE:

```
declare
```

```
    person persons%ROWTYPE;
```

Exceptions

- You can create custom exceptions:

```
declare
    e_credit_too_high exception;
    pragma exception_init(e_credit_too_high, -20001);
begin
    if 10000 > 1000 then
        raise e_credit_too_high;
    end if;
end;
```

- If you want to raise a custom exception, use raise_application_error:

```
declare
    e_credit_too_high exception;
    pragma exception_init(e_credit_too_high, -20001);
begin
```

- Using cursors, you can procedurally process data:

```
declare
```

```
    cursor sales_cursor is select * from sales;
```

```
    sales_record sales_cursor%ROWTYPE;
```

```
begin
```

```
    update customers set credit_limit = 0;
```

```
    open sales_cursor;
```

```
    loop
```

```
        fetch sales_cursor into sales_record;
```

```
        exit when sales_cursor%NOTFOUND;
```

```
    update
```

```
        customers
```

- The DB can also lock fields for safe multiple access:

```
declare
    cursor customers_cursor is select * from customers for
begin
    for customer_record in customers_cursor loop
        update customers set credit_limit = 0 where customer_id = customer_record.customer_id;
    end loop;
end;
```

Procedures

- You can create procedures, which are comparable to functions:

```
create or replace procedure
    print_contact(customer_id_arg number)
is
    contact_record contacts%rowtype;
begin
    select * into contact_record from contacts where cust

    dbms_output.put_line(contact_record.first_name || '
end;
```

- These procedures can then be executed:

```
begin
    print_contact(50);
end;
```

Functions

- Functions are similar, but require returning a value:

```
create or replace function
```

```
    get_total_sales_for_year(year_arg integer)
```

```
return number
```

```
is
```

```
    total_sales number := 0;
```

```
begin
```

```
    select sum(unit_price * quantity) into total_sales  
    from order_items
```

```
    inner join orders using (order_id)
```

```
    where status = 'Shipped'
```

```
    group by extract(year from order_date)
```

```
    having extract(year from order_date) = year_arg;
```

```
    return total_sales;
```


Packages

- Packages can be used to group function “interfaces” and variables:

```
create or replace package order_management
as
    shipped_status constant varchar(10) := 'Shipped';
    pending_status constant varchar(10) := 'Pending';
    cancelled_status constant varchar(10) := 'Canceled';

    function get_total_transactions return number;
end order_management;
```

- You can now access the variables in the package with .:

```
begin
    dbms_output.put_line(order_management.shipped_status
end;
```

Triggers

- Triggers follow a similar structure as procedures:

```
declare
-- declarations
begin
-- your logic
exception
-- exception handling
end;
```

- Using triggers, you can for example create a manual log after operations with after update or delete on ... :

```
create or replace trigger customers_audit_trigger
  after update or delete
  on customers
  for each row
```

- Maps are also possible in PL/SQL using table of:

```
declare
    type country_capitals_type
        is table of varchar2(100)
        index by varchar2(50);

    country_capitals country_capitals_type;
begin
    country_capitals('China') := 'Beijing';
    country_capitals('EU') := 'Brussels';
    country_capitals('USA') := 'Washington';
end;
```

- You can use mymap.first and mymap.next to iterate:

```
declare
```

Arrays

- Using varray, it is also possible to create arrays:

```
declare
```

```
    type names_type is varray(255) of varchar2(20) not null;
```

```
    names names_type := names_type('Albert', 'Jonathan',
```

```
begin
```

```
    dbms_output.put_line('Length_before_append:_' || names_type.count);
```

```
    names.extend;
```

```
    names(names.last) := 'Alice';
```

```
    dbms_output.put_line('Length_after_append:_' || names_type.count);
```

```
    names.trim;
```