

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

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  
         execute immediate 'drop_index_' || i.index_name  
end loop;
```

```
for i in (select trigger_name from user_triggers)  
         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	

Joins

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

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

- 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
```

- 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
```

- 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
```

- 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
```

- 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
```

- Need Pagination? Use offset:

```
select * from products order by standard_cost de
```

Dates and Intervals

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

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

- 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
```

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

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 -
```

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

```
select * from orders where (  
    status = 'Canceled' or status = 'Pending' ) and  
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 o
```

## 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 where status = 'shipped';
```

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

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

## Counting and Sums

- 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 c
```

# Inserting

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

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

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

```
insert into sales(customer_id, product_id, order,
```

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

```
create table sales_2017 as select * from sales v
```

- 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) value
```



# Switches

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

```
select product_name , list_price , case category_id
```

- case is also useful for conditional grouping:

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

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

```
update products set list_price = case when list_
```

## 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.

## Auto-Generated Primary Keys

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

```
create table persons (person_id number generate
```

- 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), en
```

- `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; 17
```

## Virtual Columns

- 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 (
```

- 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(2
```

## 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 purch
```

- You may remove a constraint with drop constraint :

```
alter table purchase_orders drop constraint purc
```

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

```
alter table purchase_orders disable constraint p
```

- And re-enable it with enable constraint :

```
alter table purchase_orders enable constraint pu
```

- You can also add foreign key constraints:

```
alter table suppliers add constraint suppliers_s
```

# 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.



# Views

- You can create a view with `create view x as select ... :`  
**create view** employees\_years\_of\_service **as select**
- 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
- `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:

- 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

- 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

# 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.

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

# 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
```



# Labels and Goto

- 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

 dbms_output.put_line(customer.name || '/' ||
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 , -2)
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 , -2)
```

# Cursors

- 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 cus
begin
 for customer_record in customers_cursor loop
 update customers set credit_limit = 0 wh
 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 v

 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
 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_
```

```
 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) := 'Cancelled'

 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

- 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(255);
```

```
 names names_type := names_type('Albert', 'John');
```

```
begin
```

```
 dbms_output.put_line('Length before append: ' ||
```

```
 names.extend;
```

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

```
 dbms_output.put_line('Length after append: ' ||
```

```
 names.trim;
```