

1) Large objects (photos, videos, CAD files, etc.) are stored as a large object:

- blob: binary large object -- object is a large collection of uninterpreted binary
- clob: character large object -- object is a large collection of character data

When a query returns a large object, a pointer is returned rather than the large object itself.

2) Privileges control the ability to run SQL statements. A role is group of privileges. Users are the ones who really use and take the benefits of the database.

```
create role accountant;
create role administrator;
create role support;

grant all on accounts, customers, transactions to administrator;
grant all on accounts, transactions to accountant;
grant select on customers to support;
-----
create user User1;
create user User2;
create user User3;

grant administrator to User1;
grant accountant to User2;
grant support to User3;
-----
alter user User2 createrole;
-----
revoke delete on accounts, transactions from User2;

3) add not null constraints
alter table transactions alter column date set not null;
alter table customers alter column name set not null;
alter table accounts alter column currency set not null;

5)
--index so that each customer can only have one account of one currency
create index cus_cur on accounts(customer_id, currency);
--index for searching transactions by currency and balance
create index cur_bal on accounts(currency, balance);

6)
DO $$
BEGIN
UPDATE accounts SET balance = balance -transactions.amount FROM transactions
WHERE account_id=transactions.src_account AND transactions.status='init';
IF 0 < (select count() FROM accounts WHERE balance<accounts.limit)THEN
UPDATE accounts SET balance = balance + transactions.amount FROM transactions
WHERE account_id=transactions.src_account AND transactions.status='init';
UPDATE transactions
SET
transactions.status='rollback'
FROM accounts
WHERE account_id=transactions.src_account AND transactions.status='init';
ELSE
UPDATE accounts SET balance = balance + transactions.amount FROM transactions
WHERE account_id=transactions.dst_account AND transactions.status='init';
UPDATE transactions
```

```
SET status='commit'  
FROM accounts  
WHERE account_id=transactions.dst_account AND transactions.status='init';  
END IF;  
END  
$$
```