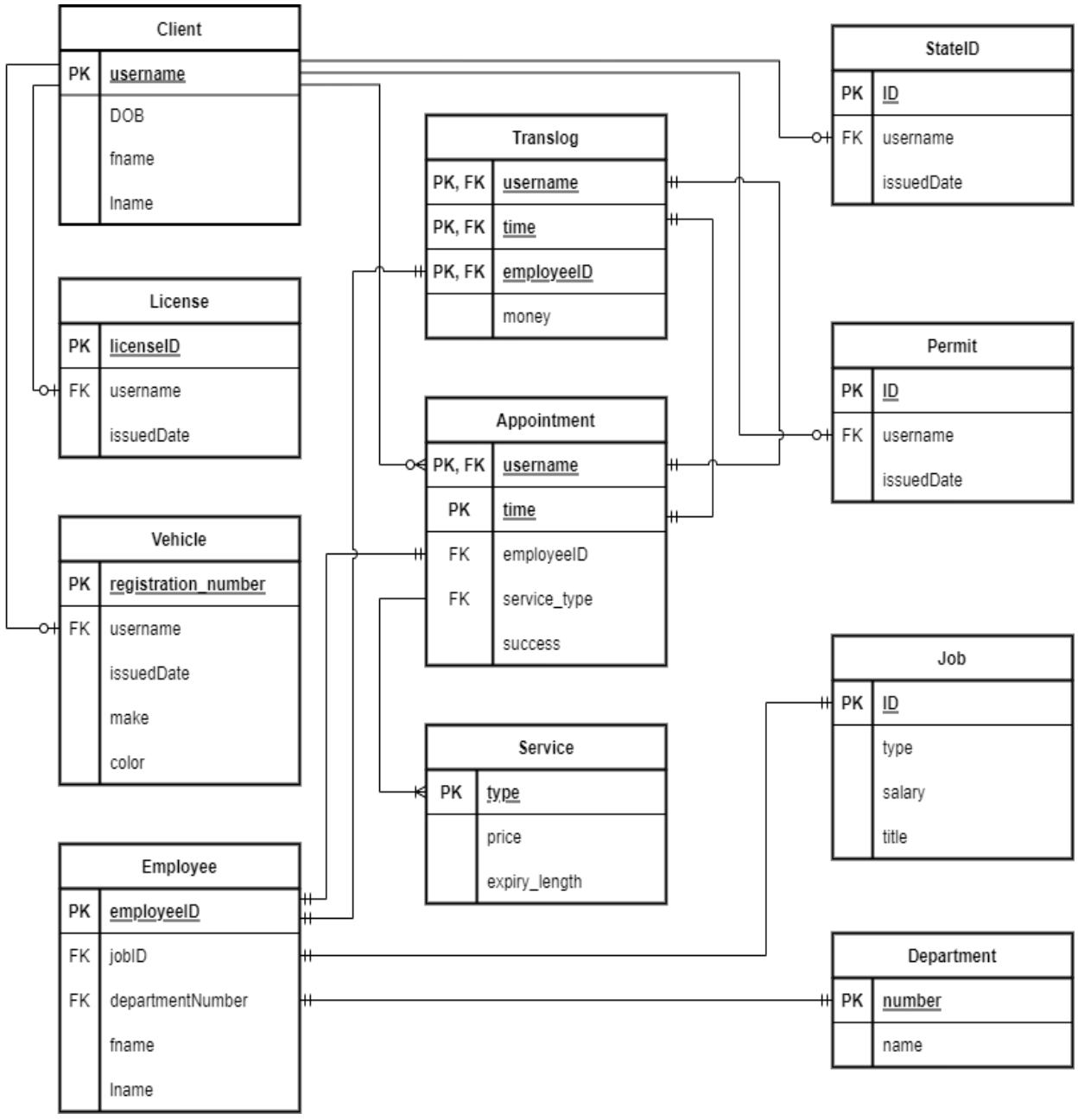
DESIGN DOCUMENTATION

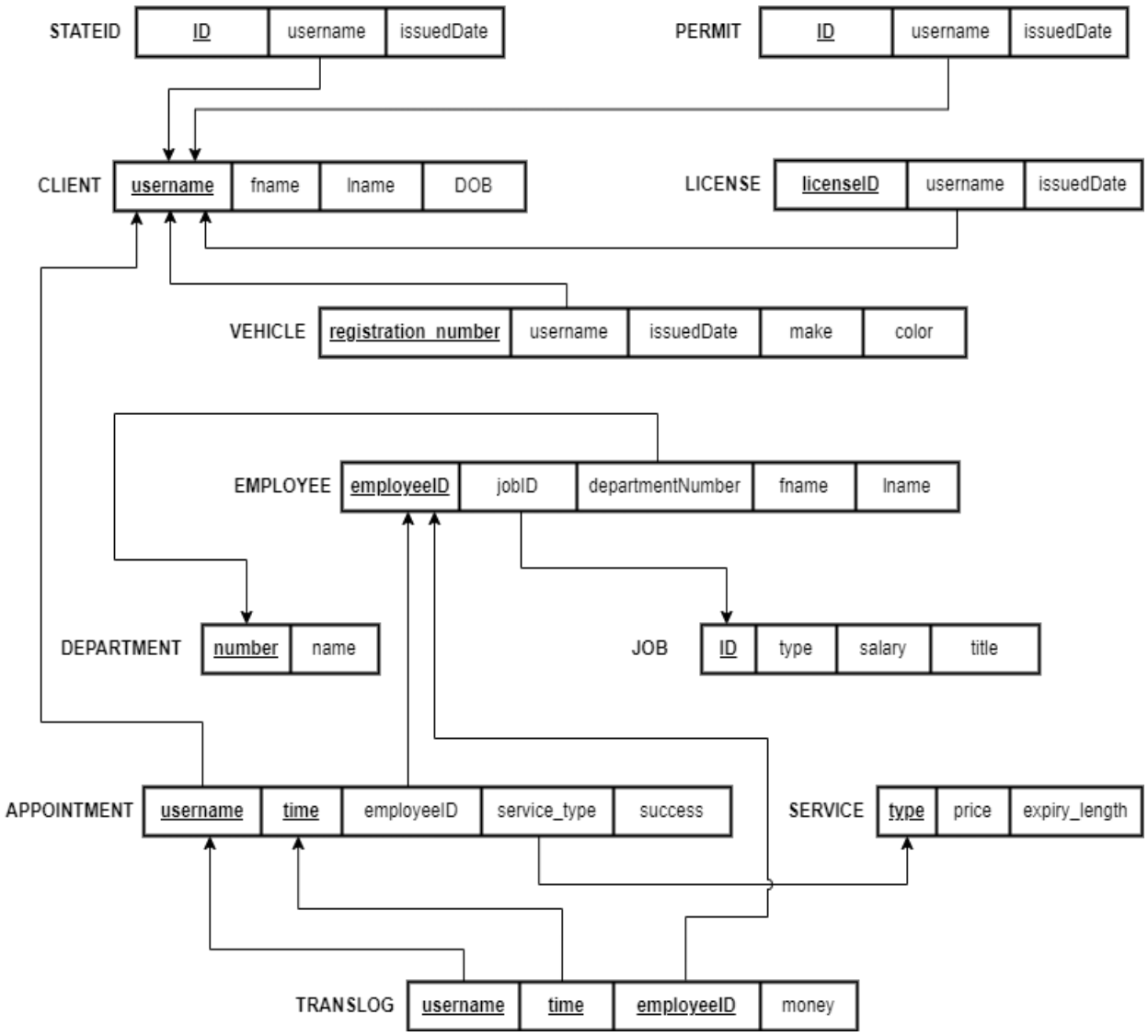
I. Conceptual Database Design

ER Diagram



II. Logical database design

Relational Database Schema



III. Normalization analysis

1. **Client**
    - FDs:
        - username -> fname
        - username -> lname
        - username -> DOB
    - All attribute are not set-values (1st normal form)

- Non-prime attributes of Client (fname, lname, DOB) are fully functionally dependent upon the candidate key of R (username) (2nd normal form)
- All of the FDs satisfy (a) x (username) is a superkey of R (Client) (3rd normal form)

2. **License**
    - FDs:
        - licenseID -> username
        - licenseID -> issuedDate
    - All attribute are not set-values (1st normal form)
    - Non-prime attributes of License (username, issuedDate) are fully functionally dependent upon the candidate key of R (licensedID) (2nd normal form)
    - All of the FDs satisfy (a) x (licensedID) is a superkey of R (License) (3rd normal form)
3. **Vehicle**
    - FDs:
        - registration_number -> username
        - registration_number -> issuedDate
        - registration_number -> make
        - registration_number -> color
    - All attributes are not set-values (1st normal form)
    - Non-prime attributes of Vehicle (username, issuedDate, color, make) are fully functionally dependent upon the candidate key of R (registration_number) (2nd normal form)
    - All of the FDs satisfy (a) X (registration_number) is a superkey of R (Vehicle) (3rd normal form)
4. **Employee**
    - FDs:
        - employeeID -> jobID
        - employeeID -> departmentNumber
        - employeeID -> fname
        - employeeID -> lname
    - All attributes are not set-values (1st normal form)
    - Non-prime attributes of User (jobID, departmentNumber, fname, lname) are fully functionally dependent upon the candidate key of R (employeeID) (2nd normal form)

- All of the FDs satisfy (a) x (employeeID) is a superkey of R (Employee) (3rd normal form)

5. **Appointment**
    - FDs:
        - {username, time} -> employeeID
        - {username, time} -> service_type
        - {username, time} -> success
    - All attributes are not set-values (1st normal form)
    - Non-prime attributes of appointment (employeeID, service_type, success) are fully functionally dependent upon the candidate key of R () (2nd normal form)
    - All of the FDs satisfy (a) x ({username, time}) is a superkey of R (Appointment) (3rd normal form)
6. **Service**
    - FDs:
        - type -> price
        - type -> expiry_length
    - All attributes are not set-values (1st normal form)
    - Non-prime attributes of Service (price, expiry_length) are fully functionally dependent upon the candidate key of R (type) (2nd normal form)
    - All of the FDs satisfy (a) x (type) is a superkey of R (Service) (3rd normal form)
7. **StateID**
    - FDs:
        - ID -> username
        - ID -> issuedDate
    - All attributes are not set-values (1st normal form)
    - Non-prime attributes of StateID (username, issuedDate) are fully functionally dependent upon the candidate key of R (ID) (2nd normal form)
    - All of the FDs satisfy (a) x (ID) is a superkey of R (StateID) (3rd normal form)
8. **Permit**
    - FDs:
        - ID -> username
        - ID -> issuedDate

- All attributes are not set-values (1st normal form)
- Non-prime attributes of permit (username, issuedDate) are fully functionally dependent upon the candidate key of R (ID) (2nd normal form)
- All of the FDs satisfy (a) x (ID) is a superkey of R (Permit) (3rd normal form)

9. Job

- FDs:
  - ID -> type
  - ID -> salary
  - ID -> title
- All attributes are not set-values (1st normal form)
- Non-prime attributes of a job (type, salary, title) are fully functionally dependent upon the candidate key of R (ID) (2nd normal form)
- All of the FDs satisfy (a) x (ID) is a superkey of R (Job) (3rd normal form)

10. Department

- FDs:
  - number -> name
- All attributes are not set-values (1st normal form)
- Non-prime attributes of Department (name) are fully functionally dependent upon the candidate key of R (number) (2nd normal form)
- All of the FDs satisfy (a) x (number) is a superkey of R (Department) (3rd normal form)

11. Translog

- FDs:
  - {username, time, employeeID) -> money
- All attributes are not set-values (1st normal form)
- Non-prime attributes of Department (money) are fully functionally dependent upon the candidate key of R (2nd normal form)
- All of the FDs satisfy (a) x is a superkey of R (3rd normal form)

IV. Query description

Query question: Given a registration number, find the information of the corresponding vehicle, owner, and license.

Utility: This query will be useful in accidents where tracing information of casualty is needed or when a stolen vehicle is found and the police need to find the owner information.