PROBLEM STATEMENT

We need an automated solution that helps in managing the complete activities of a garage. This Car WorkShop (**CWS**) management software is required for vehicle management, spare part management, job card creation, accounting etc. A good CWS management software should have all these features in it.

USES OF CAR WORKSHOP MANAGEMENT

Vehicle Management

When a client takes a car into the workshop for servicing for the first time, the **foreman must enter customer and vehicle information into the system**.

Work Scheduler

The foreman **must also** inspect the vehicle, create a new **work order detailing the jobs to do,** and assign the work to a **mechanic**.

The **mechanic** checks **assigned work orders**. Later, he inspects the car in depth, decides **interventions** to do, and carries them out.

Once all interventions are done, the mechanic **marks** the **work order** as **finished**, write down a general description of the job done and, for each **intervention**, he records the **time** it took and the **spare parts** used, if any.

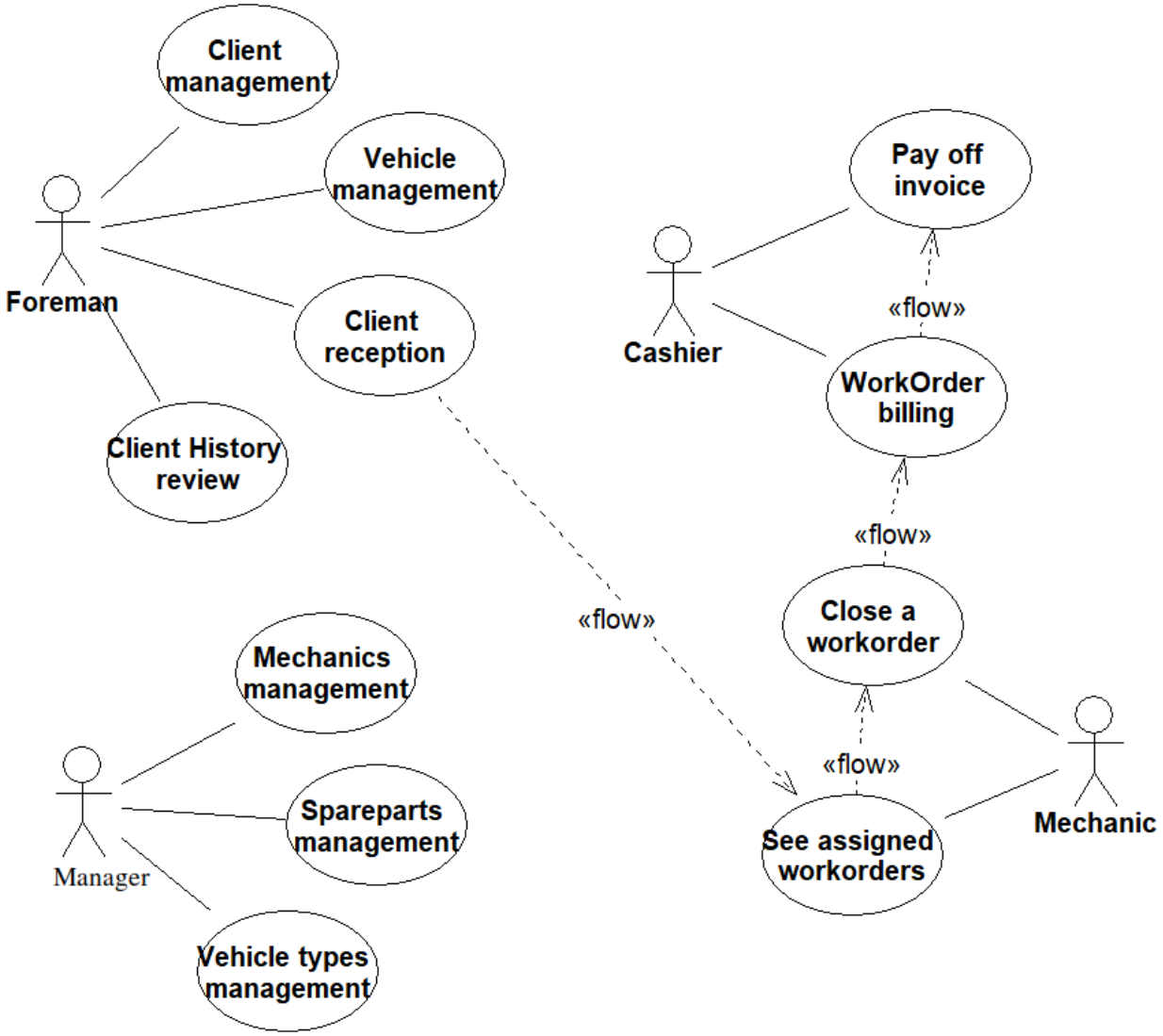
Invoice Management

The cashier creates invoices from a single order or more than one. All them must be finished and not billed work orders. This can happen at any moment after the mechanic handling the work order marks it as finished and before the car can be handed over to the client.

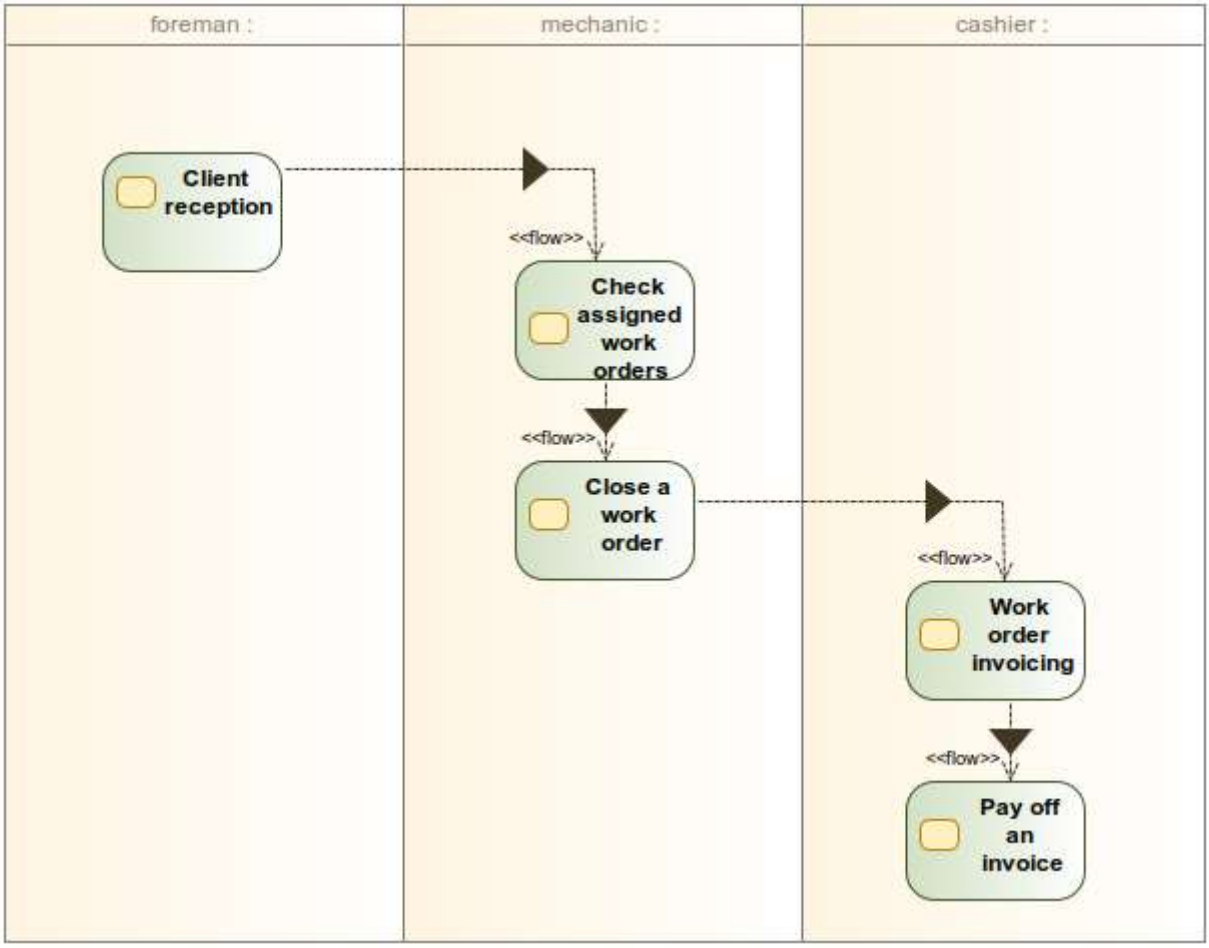
When the client comes to the workshop to pick their vehicle up, he must **pay the invoice**. Accepted **payment methods** include **cash**, **credit cards** and **discount vouchers** issued by the workshop

SYSTEM ACTORS AND USE CASES

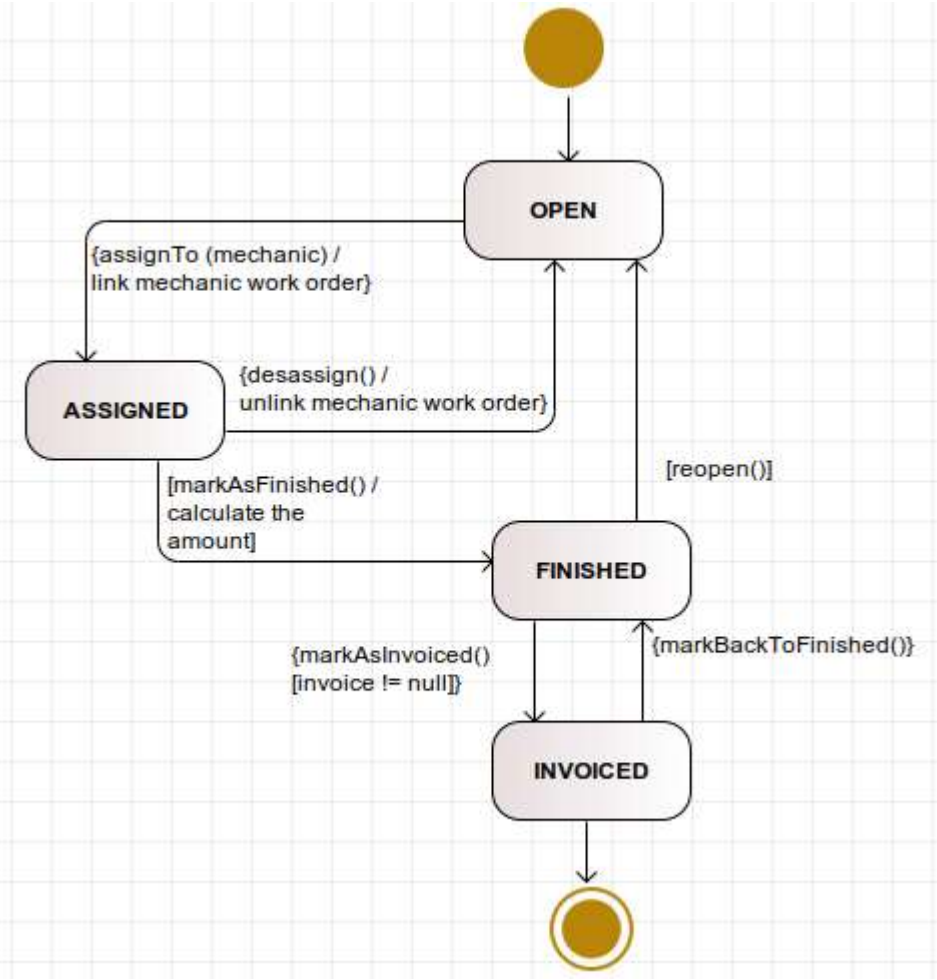
Foreman	- Client management - Vehicle management - Client reception - Client history review
Mechanic	- See assigned work orders - Close a work order
Cashier	- Work order billing - Pay off an invoice
Manager	- Mechanics management - Spare parts management - Vehicle types management


Client management
Vehicle management
Foreman
Client reception
Client History review
Pay off invoice
Cashier
«flow»
WorkOrder billing
«flow»
Close a workorder
«flow»
Mechanics management
Spareparts management
Manager
Vehicle types management
«flow»
See assigned workorders
Mechanic

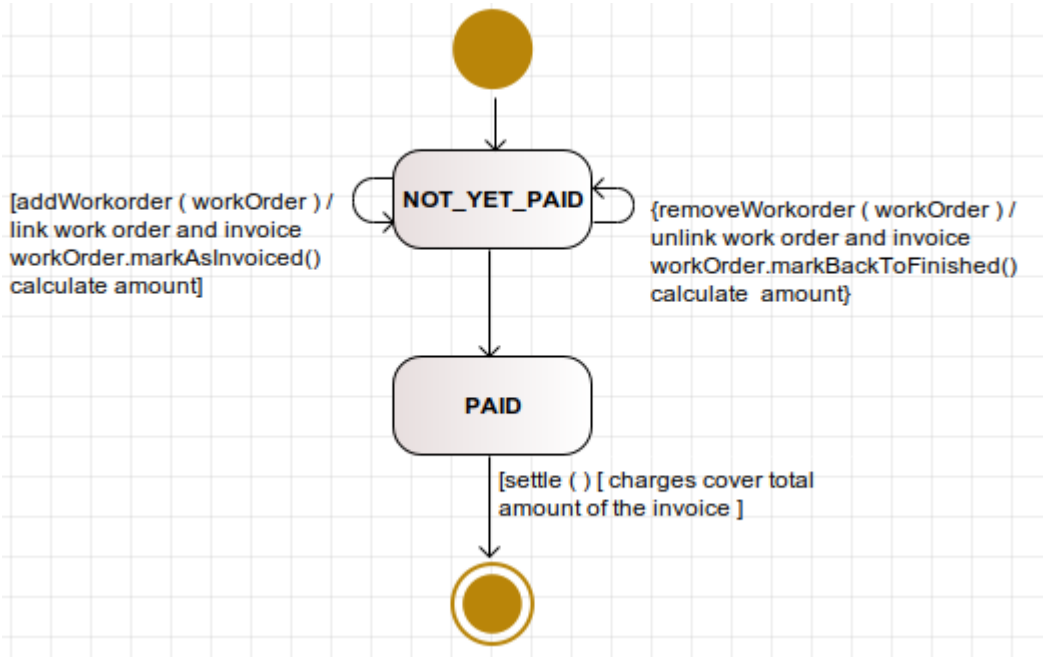
Use case: Workflow for a work order



State diagram for a work order



State diagram for an invoice



USE CASE DESCRIPTION

Foreman. Check in a vehicle

Each time a vehicle enters the workshop for the first time, the foreman registers it in the system first (see "Vehicles management").

Then, regardless it is a new car or a regular client, the foreman will identify the vehicle (by plate number), will inspect the car and will **open a new work order**, entering information on vehicle failure and describing the work to be done.

A newly created work order is in **OPEN state** and changes to **ASSIGNED** as soon as the foreman **assigns it to a mechanic**.

The foreman is also responsible for the following actions:

- Modify or delete work orders
- Display work order details
- Review vehicle's work order history
- Display client's vehicles
- Search a vehicle by client's NIF, by plate number or by brand and model.

Foreman. Vehicles management

The first time a vehicle comes to the workshop, the foreman will **register it in the system**. He will enter **relevant information** as plate number, vehicle's brand and model, type of vehicle and **owner**. When the owner is also a new client, his information also needs to be added to the system (see "Clients management").

The foreman can modify data later at any time. But a vehicle can only be deleted from the system if there is no work order recorded for it (regardless the state).

Foreman. Client management

All the CRUD operations must be implemented on the client entity as well.

The foreman creates a client when he comes to the workshop for the first time and records NIF, name, surname, postal address, telephone, and email. Later, he could update this information.

However, if there is any vehicle registered to a client, it is not allowed to delete it at all.

Foreman. Client history review

Foreman can display all vehicles registered to a client as well as all work orders registered to a vehicle.

He can also search for clients in the system using incomplete information or through their vehicles.

Mechanic. See assigned work orders

Every mechanic can go over his list of assigned work orders, update its status to FINISHED or look at the work order details, including interventions done and spare parts used while repairing. The mechanic can also check the vehicle's history.

Mechanic. Close a work order

When a mechanic completes a work order, he marks it as FINISHED, recording, for each intervention done, labour time and which and how many spare parts where used in the job.

He will have options to look for spare parts by description, brand, model, or code.

Cashier. Work order invoicing

The person in charge of the cash will be responsible for **generating the invoice**.

Several **repairs** for the same client **can be invoiced together** in the same invoice. So, to generate an invoice, **cashier searches client outstanding work orders by NIF**. Then, he generates invoice for them all and marks them as **INVOICED**.

Invoicing must comply with certain restrictions:

- Only **FINISHED** work orders can be invoiced.
- Several outstanding work orders may be charged in the same invoice. To do this, the cashier is asked to enter work orders' ids to be charged in this invoice and the **total amount** is calculated by adding partial cost for any of the work order invoiced **plus taxes**.
- The cost of an individual work order is computed as the **sum of each intervention recorded in the work order** which, in turn, will be the sum of the **labour cost and replacements' cost**.
    - Labour cost depends on the actual time spent (in minutes) and the vehicle rate (cost of one labour hour). Although price is set by hours, **calculation is done by minutes**.
    - Replacement cost results multiplying the price of each spare part by the quantity used in that replacement.
- When all the work orders to be included in the invoice are processed, an invoice is created
    - New invoices are in ***NOT_YET_PAID*** state and **work orders become INVOICED**.
    - Total amount will be the addition of all work order amounts plus VAT. VAT depends on the date when the invoice was generated: if it is before 1/7/2012, 18% will apply, thereafter 21%
    - The final amount of the invoice must be rounded to 2 decimals.
    - Due date will be today's date; no time precision is needed.
    - Every invoice is identified by an invoice number, a unique and sequential number that is automatically assigned to invoices. Legally, an invoice number sequence should never contain repeats or gaps (for an invoice with number 1012 to exist, there must exist an invoice numbered 1011).

Cashier. Pay off an invoice

Before picking the vehicle up, the client must **pay the repair invoice**. Several means of payment are accepted: cash, credit card or vouchers.

The cashier will look for the client's invoice number and the system will display **payment means available to that client**.

When more than one is available, client can **split payment** among them. Every payment made is a **charge**.

Regarding the payment means, some constrains must be considered:

- Cash payment is always available for every client.
- Clients with a credit card registered in the system can use it if it is not expired.
- If a client has a voucher(s), it can be used to pay without exceeding total amount in the voucher(s).
- Additionally, the system keeps track of the total amount paid through different payment means.

Once total amount of the invoice has been paid, by one or several charges with the available payment means, the invoice will change to **PAID** status.

Manager. Mechanics management

Manager will register new mechanics in the system, update their info, or delete mechanics. However, the last is quite unusual operation and it is allowed if there is no information about the mechanic recorded in the system, other than his personal record.

Manager. Spare parts inventory management

The manager will also manage a spare parts inventory. He can add, update, and delete spare parts. He can also check spare parts by code, brand, model, or description. The result will list how many have been used by part and profit obtained from each one.

Price updates will affect only future invoices.

Manager. Vehicle types management

The manager can add, update, and remove vehicle types that can be serviced in this car workshop. However, the most important modification will be vehicle's rate updates (price per labour hour for type of vehicle). This modification will affect any future invoices.

Domain model