# INFS2044 Assignment 1 Case Study: Parking Monitoring System

In this assignment you will be developing a design for a Parking Monitoring System (PMS), similar to the one the University uses for monitoring the casual visitor car parks at Mawson Lakes.

*There may be systems available commercially or open-source alternatives that provide much or all of the functionality described in this document. For purposes of the assignment, it is not acceptable to use these systems as part of your design.*

The PMS employs vehicles that regularly patrol the designated car parks to detect if any parked vehicles have been parked without a valid paid temporary permit. The system relies on license plate recognition (LPR) camera technology that is mounted on the rooftops of the vehicles ("PMS Vehicles"), as well as GPS technology to track the position of the PMS vehicle and identify the car park being patrolled. The recognised license numbers are compared against a database of parking permits, vehicles without a valid permit are identified, and expiation notices issued to these vehicles.

## Use Cases

Some of the Use Cases for this system are outlined below.

- UC01 Driver Registers Vehicle: Driver registers a vehicle's license plate, identifies the car park in which it is parked and for what period of time, and pays for parking using a credit card. This use case can be carried out using a phone app or via one of a number of dedicated PMS kiosks located near the monitored car parks.
- UC02 Monitor Vehicles: PMS vehicles visit the car parks on a regular schedule, monitoring the vehicles parked in each car park via LPR camera technology mounted on the vehicle, and logs the recognised license plates, time, and location information.
- UC03 Issue Expiation Notice: PMS system detects that no permit associated with a vehicle's license plate has been registered and alerts the driver of the PMS vehicle. The parking inspector, who drives the PMS vehicle, confirms that the license plate has been recognised correctly and issues an expiation notice. The system logs the expiation notice along with time stamp, location, the inspector's details, and an image showing the parked vehicle at the location. The inspector prints a paper ticket showing the expiation notice details and attaches it to the offending vehicle's windscreen.
- UC04 View KPIs: The PMS operators view hourly statistics about parked vehicles, expiation notices issued, and PMS vehicles' movements (live) on a dashboard, broken down by location and by client. The information shown on the dashboard shall be updated no less than once within any 5-minutes-long time period.

## Other Requirements

Usability:
- UR01: The user interface for the parking inspector shall be usable on a standard tablet device by a normal sighted person in an outdoor environment.

Performance:
- PR01: The system shall recognise an unobstructed license plate of a parked vehicle at a distance of no more than 5 meters in no more than 0.5 seconds, provided that the PMS vehicle's speed does not exceed 10kph.

Scalability:
- SR01: The system shall be able to store no less than 100,000 expiation notices and associated images of vehicles.
- SR02: The system shall support no less than 100 PMS monitoring vehicles at any point in time.

Business Rules:

- BR01: Evidence photos of vehicles that have received expiation notices, along with GPS location and time stamp, must be stored for no less than 5 years (due to potential of disputes and litigation).
- BR02: For each parked vehicle, a permit must be acquired no later than 10 minutes after the vehicle entered the monitored car park. Vehicles exceeding this grace period may be subject to expiation notices.

Assumptions:

- A01: LPR Camera technology has been improving steadily. Multiple vendors of mature LPR technology offer dedicated camera and machine vision hardware packaged in a single device. Many LPR cameras are now available on the market, and new ones appear regularly.

Future Evolutions:

- FE01: The company has been considering adopting fixed wall-mounted camera systems at the entry and exit of car parks. These camera systems have better detection capabilities than the mobile ones mounted on cars, but some require a permanent high-bandwidth network connection, since they rely on cloud-based providers of LPR algorithm implementations.

## Scope

In Scope:
- Software systems for PMS staff and PMS vehicles

Out of Scope:
- End user (driver) applications, kiosk application software
- User interface design
- Database schema design
- Reporting format design
- Detailed security mechanisms
- Network design
- Hardware design
- Cloud plan pricing
- Detailed component interface and implementation design

## Completeness and Assumptions

These aforementioned use cases and requirements are most certainly incomplete. You may need to make additional assumptions to elicit volatilities and create your design. Ensure that you discuss relevant assumptions in your assignment submission document.

## Level of Detail

The level of detail expected for this assignment is aligned with that given in the Week 2 Workshop materials, supported by written discussion/justification.