Smart City Car Parking System

BD2 Project

20L

04.04.2020

Michał Smutkiewicz (283538)

Khanh Do Van (308946)

Przemek Kacprowicz (267976)

Artur Nasiadko (308805)

0. Contents

1. Project Overview

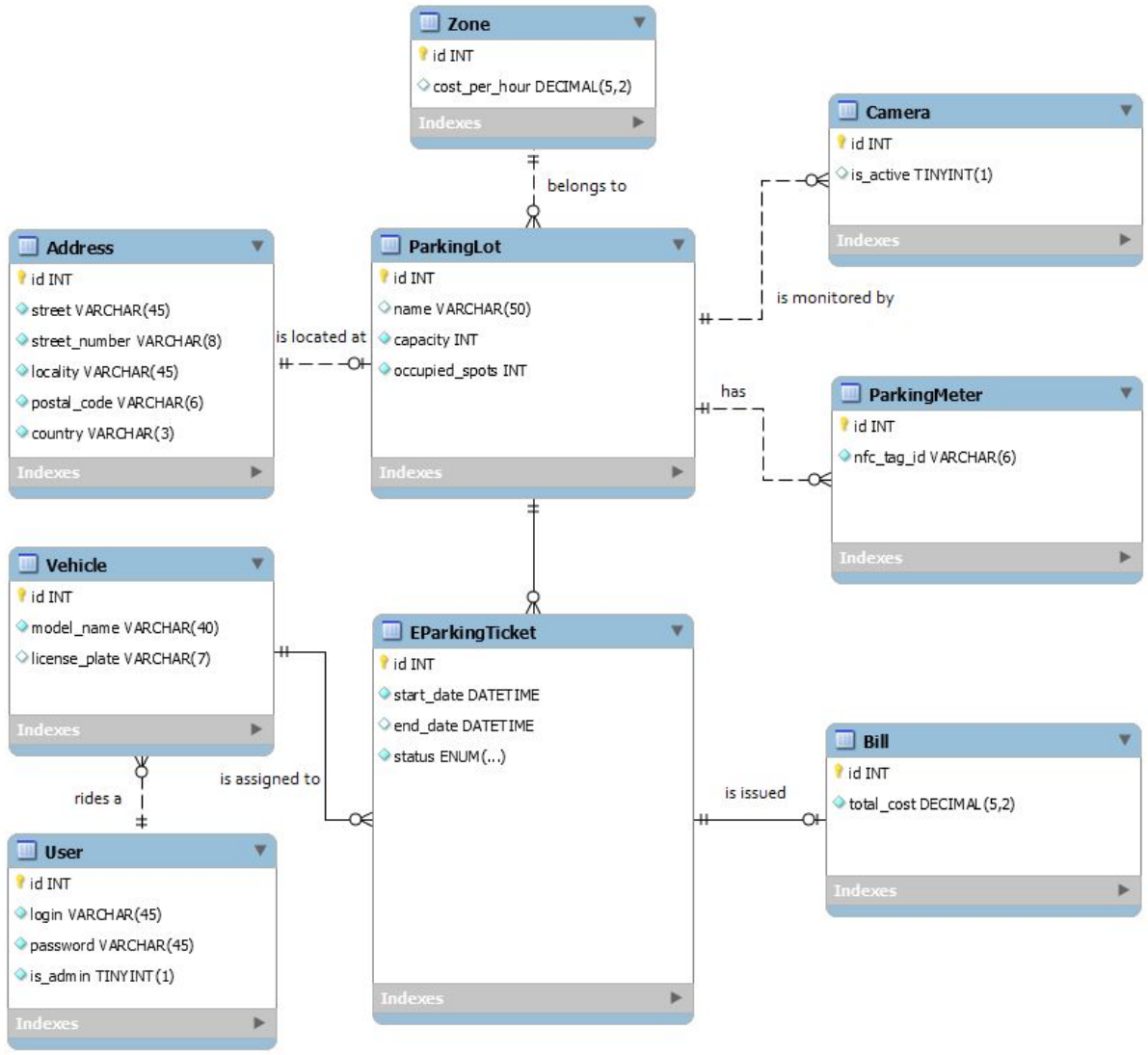
The aim of the project is to make a system which will **make it easier to park in the city** by eliminating the need to manually get a ticket from a parking meter. What is more, our system will take advantage of database containing up-to-date information about current state of local parking lots to save drivers' time wasted every day on seeking parking spots.

To achieve this, we'll need to provide mechanisms to detect free spots on our parking lots. There will be two ways to detect a car being parked in the system:

- Every parking lot will have several **smart parking meters** with NFC tags. Scanning a tag with a mobile application and then registering for parking will replace normal ticket printing in parking meters, making the process quicker and more friendly for the environment.
- Every parking lot will have **smart cameras**. When a car will park at a parking spot within the observation range of one of them, this parking spot will be reported as occupied and other drivers looking for a free parking spot will see updated amount of free spots it in their mobile applications.

When a car leaves the area the time it spent on the parking lot is counted and the owner of the car is billed for an appropriate amount. Parking lots are assigned to zones which define price information. The system won't track which individual spots are taken, only how many spots are occupied per parking lot.

2. Conceptual Model - ER Diagram



3. Conceptual Model - Description

ParkingLot

Represents a large area where drivers can park their vehicles for a period of time.

Attribute name	Domain	Required	Description
🔑 id	Int	Yes	Identification of the parking lot.
name	Varchar(50)	No	Additional field, representing parking lot name if there is one.
capacity	Int	Yes	Maximum number of spots can serves.
occupied_spots	Int	Yes	Number of spots are taken currently.

EParkingTicket

Represents virtual reservation - a kind of ticket from classic parking meter. It is always created whenever a driver wants to start counting the period of parking. This is also the entity on which future bills are based on.

Attribute name	Domain	Required	Description
🔑 id	Int	Yes	Identification of the EParkingTicket.
start_date	datetime	Yes	The time when a car starts being parked.
end_date	datetime	No	The time when a car leaves.
status	Status { 'STARTED', 'ENDED', 'PAID', 'CANCELLED' }	Yes	Indicates the status of EParkingTicket (started, ended, paid, cancelled).

Camera

Every parking lot can have several smart cameras that can detect occupation of parking spots and signal it to the main system.

Attribute name	Domain	Required	Description
id	Int	Yes	Identification of the camera.
is_active	Tinyint(1)	Yes	The status of the camera (working, not working).

Zone

Zone represents the pay rate in the particular area. There may be several parking lots in one Zone.

Attribute name	Domain	Required	Description
id	Int	Yes	Identification of the zone.
cost_per_hour	Decimal(5,2)	Yes	The amount of money paid per hour.

ParkingMeter

Represents a small post or plate with NFC tag which can be scanned to occupy a spot on the parking lot.

Attribute name	Domain	Required	Description
id	Int	Yes	Identification of the parking meter
nfc_tag_ID	Varchar(6)	Yes	A tag of the parking meter

Bill

Represents payment for only one specific EParkingTicket.

Attribute name	Domain	Required	Description
id	Int	Yes	Identification of the bill.

total_cost	Decimal(5,2)	Yes	Total amount of the bill.

User

Represents a user who might own car(s) on the system. He/she is supposed to make use of the parking service of the system.

Attribute name	Domain	Required	Description
id	Int	Yes	Identification of the user.
login	Varchar(45)	Yes	The login name of the user for logging into the system.
password	Varchar(45)	Yes	The hashed string of the password of the user account.
is_admin	Tinyint(1)	Yes	Whether or not the user is a system administrator.

Vehicle

Represents a vehicle on the system. Users can register zero or many vehicles.

Attribute name	Domain	Required	Description
id	Int	Yes	Identification of the vehicle.
model_name	Varchar(40)	Yes	The model name of the vehicle.
license_plate	Varchar(7)	Yes	The license plate numbers of the vehicle.

Address

Representation of addresses where all parking lots are located in. These addresses recorded in this table are kind of conceptual addresses for parking lots.

Attribute name	Domain	Required	Description
id	Int	Yes	Identification of the Address.
street	Varchar(45)	Yes	The name of street.
street_number	Varchar(8)	Yes	The street number.
locality	Varchar(45)	Yes	The locality where the address belongs to.

postal_code	Varchar(6)	Yes	The postal code of this address.
country	Varchar(3)	Yes	ISO country code of this address.