

TALLINN UNIVERSITY OF TECHNOLOGY  
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ICD0024 Homework

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## Smart Parking System

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## Author's declaration of originality.

I hereby certify that I am the sole author of this report. All the used materials, references to the literature and the work of others have been referred to.

Author: Vladimir Puz 25.02.2024

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# 1. Introduction

Urban areas are facing increasing challenges in managing parking spaces efficiently. The Smart Parking System (SPS) is designed to address this issue by optimizing the use of parking spaces, improving the experience for drivers, and reducing congestion. This proposal outlines the SPS's architecture and the functionalities it offers to different user roles.

## 2. System Description

The Smart Parking System is an integrated information system for urban mobility and smart city solutions. It leverages real-time data to facilitate the management of parking lots, ensuring optimal utilization of parking spaces. The system includes features such as spot detection, driver guidance, payment processing, and parking analytics.

### 3. Database Schema Overview

The system's backbone is a robust database with the following entities:

**ParkingLot:** Manages details of parking lots.

**ParkingSpot:** Tracks individual spots within lots.

**Reservation:** Handles booking of parking spaces.

**Vehicle:** Stores information about user vehicles.

**Payment:** Processes payments for parking services.

**ParkingAnalytics:** Analyzes parking data for insights.

## 4. User Roles and Functionalities

- a. Parking Administrator
  - Oversee parking lot registrations and setup.
  - Monitor real-time availability of parking spots.
  - Access parking analytics for decision-making.
  - Adjust parking rates and policies based on data.
- b. Driver (Registered User)
  - View available parking spots in real-time.
  - Reserve parking spots in advance.
  - Manage vehicle information.
  - Make payments and view payment history.
  - Receive guidance to the reserved parking spot.
- c. Guest User
  - View available parking spots without registering.
  - Obtain directions to parking lots.
  - Access general information about parking facilities.
- d. Traffic Analyst
  - Access parking analytics data.
  - Analyze peak and low occupancy times.
  - Generate reports on parking usage and trends.
  - Provide recommendations for traffic management.

## 5. Conclusion

The Smart Parking System is designed to be a comprehensive solution for urban parking challenges. By enabling efficient parking spot utilization, offering easy reservation and payment options, and providing valuable analytics, the SPS aims to enhance urban mobility and contribute to the smart city ecosystem.



Smart Parking System Proposal ERD

ParkingAnalytics		
PK	AnalyticsId	TKey
FK	ParkingLotId	TKey
	Date	datetime
	Hour	int
	AverageOccupancy	int
	PeakOccupancyTime	datetime
	LowOccupancyTime	datetime
	TotalParkingSessions	int
	AverageParkingDuration	int

ParkingLot		
PK	ParkingLotId	TKey
	Name	string(256)
	Location	string(256)
	TotalSpots	int
	AvailableSpots	int
	Latitude	string(20)
	Longitude	string(20)

ParkingSpot		
PK	ParkingSpotId	TKey
FK	ParkingLotId	TKey
	SpotNumber	string(256)
	IsOccupied	boolean
	SpotType	enum

Reservation		
PK	ReservationId	TKey
FK	ParkingSpotId	TKey
	StartTime	datetime
	EndTime	datetime
FK	VehicleId	TKey
	ReservationStatus	enum

UserVehicle		
PK/FK	UserId	TKey
PK/FK	VehicleId	TKey

Vehicle		
PK	VehicleId	TKey
	LicensePlate	string(50)
	VehicleType	enum
	OwnerContact	string(256)

Payment		
PK	PaymentId	TKey
FK	ReservationId	TKey
	Amount	int
	PaymentMethod	enum
	PaymentStatus	enum

User		
PK	Id	TKey
	UserName	string(256)
	NormalizedUserName	string(256)
uniq	Email	string(256)
idx	NormalizedEmail	string(256)
	EmailConfirmed	boolean
	PasswordHash	string
	SecurityStamp	string
	ConcurrencyStamp	string
	PhoneNumber	string
	PhoneNumberConfirmed	boolean
	TwoFactorEnable	boolean
	LockoutEnd	datetime
	LockoutEnabled	boolean
	AccessFailedCount	int
	FirstName	string(128)
	LastName	string(128)

UserRole		
PK/FK	UserId	TKey
PK/FK	RoleId	TKey

Role		
PK	Id	TKey
	Name	string(256)
uniq	NormalizedName	string(256)
	ConcurrencyStamp	string(256)
	DisplayName	string(256)

RoleClaim		
FK	Id	TKey
FK	RoleId	TKey
	ClaimType	string
	ClaimValue	string

UserLogin		
PK	LoginProvider	string(128)
PK	ProviderKey	string(128)
FK	ProviderDisplayName	string
FK	UserId	TKey

UserToken		
PK/FK	UserId	TKey
PK	LoginProvider	string(128)
PK	Name	string(128)
PK	Value	string

UserClaim		
PK	Id	TKey
FK	UserId	TKey
	ClaimType	string
	ClaimValue	string

SpotType	
Standart	
Handicapped	
UAU	

ReservationStatus	
Reserved	
Active	
Completed	
Canceled	

VehicleType	
Car	
Motocycle	
Truck	

PaymentMethod	
CreditCard	
PayPal	
Cash	

PaymentStatus	
Pending	
Completed	
Refunded	