



Whitepaper

# Optimizing Residential Car Parks

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Safe and Efficient  
Parking Access Control

# Challenges Faced in Residential Access Control

Residential car parks in Malaysia vary depending on the location and the type of property. Gated car parks usually require access cards and have guards monitoring vehicle traffic. While CCTV cameras and security guards may also be present, managing them can be challenging due to technological advancements affecting security, effectiveness, cost, and convenience. Some of the challenges includes :



## **WEAK SECURITY**

Access cards created can be passed around from one person to another very easily which creates fear and anxiousness amongst residents.



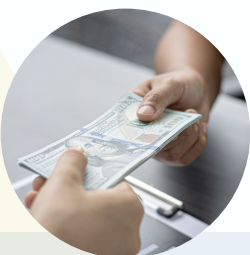
## **LACK OF EFFICIENCY**

Difficulty in identifying unregistered vehicles by security guards, and inefficiencies to manually register visitor for entry and exit, resulting in reduced efficiency and longer wait times.



## **INCREASED TRAFFIC DURING PEAK HOURS**

The manual recording and registration of vehicles entering and leaving the residential area results in a considerable amount of time.



## **ADDITIONAL COST**

The additional costs that needs to be paid by residents or management for access control including expenses for RFID, fobs, and security personnel, may cause dissatisfaction as these costs are expected to continue rising over time.

# Access Control Solutions Available in the Market Today

Actions were taken and solutions were created to help overcome the challenges faced by the residential management. The solutions that can be seen available nowadays includes:



RFID



Access Card / Fobs



Manually by Security

## RFID

To enable vehicle entry and exit in residential parking areas, RFID scanners and tags are employed to recognize registered vehicles. However, RFID's limited range and expensive cost make it an unsuitable option despite its popularity.

## ACCESS CARDS AND FOBS

Access cards and fobs are commonly used to enter and exit residential car parks but they are not very efficient or secure. Tapping the card to a reader takes time, and they can be easily passed around and stolen, compromising security.

## MANUAL SCANNING CHECK BY SECURITY GUARDS

Security guards manually screening and registering vehicles in residential car parks is a typical method for monitoring access, but it is not efficient as it is time-consuming and prone to errors due to manual labor.

# AI-Based Access Control



Computer vision is a field of artificial intelligence and computer science that focuses on enabling machines to interpret and understand visual data including images and videos. With the help of computer vision, ongoing access control issues can now be resolved to improve vehicle management, security and efficiency. The application behind this is Automated Number Plate Recognition (ANPR).

## Automated Number Plate Recognition

An ANPR system uses cameras mounted at specific points along a road or at the entry and exit points of a car park to capture images of registration plates as they pass. These images are then processed by an AI software that reads the plate numbers and compares them to a database of vehicles. If a match is found, the system will indicate that the vehicle has been found and provide information such as the time and date that the image was taken, the vehicle's registration number, and the location. Upon cross referencing with the relevant parking/visitor management system the system then triggers the barrier gate open to allow the vehicle to pass through.

This useful technology has a wide array of applications, everything from security enforcement to car park management, enabling a more seamless experience. ANPR allows the operator to monitor the cars coming in and out of their parking facility. This type of monitoring is not only useful for ensuring that no unauthorized vehicles are entering or leaving the site but it can also be used to retrospectively issue parking charge notices for those who are abusing the parking facility. The system can capture images of registration plates as vehicles enter and leave, record them, match them against an access database, and send an alarm if there's a mismatch.



# Components

ANPR is connected to barriers to control vehicle access and pre-authorize residents vehicles, visitors, or pre-paid parking. The system relies on key components that work together to perform specific functions, mainly :



## CAMERAS

Cameras next to barriers quickly capture number plate information to grant or deny area access. The camera acts as the eye/vision which captures the image to be sent to the server to do the inferencing.



## SERVER

ANPR systems use a server with AI software to process camera images and store metadata in the cloud. The database stores number plate information for user control and management, including entry/exit times and pre-authorization limits for certain vehicles.



## BARRIER

Barriers physically deter vehicles and provide controlled access and exit points. They usually have at least one entrance and exit, with cameras pointing outward from the direction of travel



## DISPLAY

Before every entrance and exit, there will be a personalized display for each vehicle displaying the plates of the vehicle.

# Integration

ANPR uses the license plate as a unique identifier to access vehicles, eliminating the need for RFID cards. It manages vehicle registration, prevents unauthorized access, and allows for easy management of multiple vehicles and traffic monitoring on a single dashboard, useful for security management.

# Benefits of AI-based Access Control

Residential car parks can benefit from ANPR (Automatic Number Plate Recognition) and vehicle classification systems in a number of ways. Among these advantages are:



## IMPROVE SECURITY

ANPR is used for vehicle monitoring and access control in residential areas, preventing blacklisted cars from entering in real-time. It also logs the license plates of authorized vehicles to enhance security by preventing unauthorized entry to the parking lot.



## ENHANCED CONVENIENCE AND EFFICIENCY

ANPR automates access control to the car park by reading and recording license plates of vehicles, making entrance and exit quick and easy while eliminating manual labor. It also reduces wait times, improving convenience and effectiveness.



## COST SAVING

ANPR replaces costly conventional access control and parking management systems. They can integrate with existing security systems, resulting in lower installation costs and no need for extra hardware. Plus, residents don't have to pay for access cards or fobs.

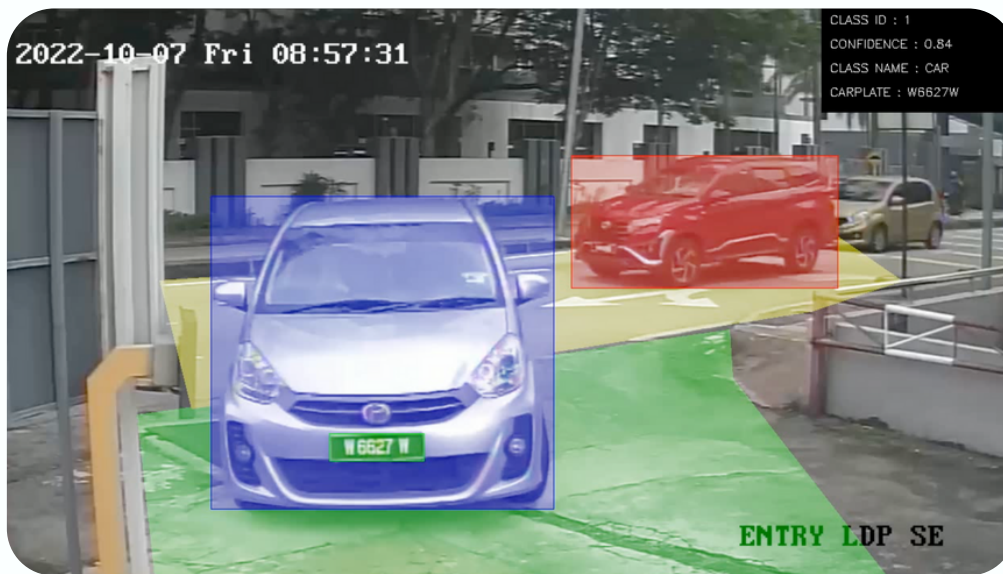


## BETTER PARKING MANAGEMENT

Improved parking management provides real-time parking availability by monitoring the number of vehicles and available spots. This reduces the time people spend searching for parking, leading to less congestion and increased efficiency.

# Tapway VehicleTrack

Tapway VehicleTrack identifies and recognises vehicles through a platform driven by deep learning technology. By incorporating the power of ANPR for vehicle identification and vehicle classification for grouping vehicles, our VehicleTrack is able to track cars coming in and out of car parks perfectly. Not only that, our solution goes beyond just being able to identify vehicles by their license plates, brand, and color but also class vehicles according to groups such as their brands.



In this current world, it is crucial to have a safe, convenient and efficient parking area for residents in order to maintain happiness and attract future customers. Tapway VehicleTrack focuses on bringing a powerful artificial intelligence-powered vehicle tracking system with :



## REAL TIME TRACKING

Information of the vehicle will be captured at the gate including the time of entry and exit



## CARDLESS & TOUCHLESS

Residents and visitors can easily drive in and out without having to tap any access cards or deal with security guards for registration purposes





## TWO FACTOR AUTHENTICATION

License plates of cars will be detected and identified together with car logo to improve accuracy and have more information



## CONTINUOUS AI MODEL IMPROVEMENT

Tapway will constantly work on improvements to the AI model and system to increase accuracy and have better performances



## REAL TIME ALERT

Authorities will be automatically alerted when blacklisted vehicles are identified according to the system/database of the area



## CUSTOMIZABLE GUEST DISPLAY

License plate will be displayed on a screen when a vehicle enter or leave the area making it more personal to individuals



## IMPROVED TRAFFIC FLOW

Seamless entry without manual registration or checking makes the traffic flow faster and avoid congestion especially during peak hours.



## REPORTING & ADVANCED SEARCH FUNCTION

Vehicle entries and exits from earlier dates can be looked back using the search function in the system.

tapway **Reports: Event Search** 🔍

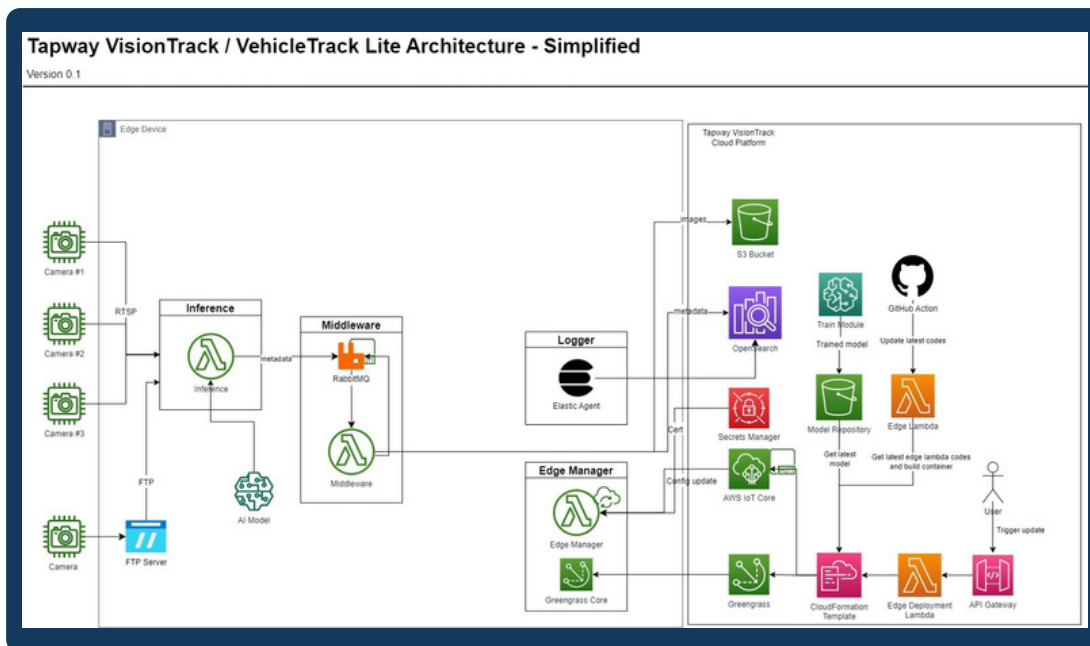
🔄 Export

Accuracy? ▾	Plate Number ▾	Plate Photo	Event Time	Camera ▾	Car Photo	Vanity Flag	Character Confidence
✓ ✗	VHF133		04/06/2023 8:02 AM	1164		0	1: 87% 82% 3: 91% 91% F: 92% H: 92% V: 92%
✓ ✗	BLM133		04/06/2023 8:02 AM	1164		0	1: 90% 90% 3: 90% 90% B: 91% L: 90% M: 92%
✓ ✗	ZA660C		04/06/2023 8:02 AM	1164		0	0: 88% 2: 85% 4: 65% 6: 90% 86% A: 80% C: 93%
✓ ✗	WC1179H		04/06/2023 8:01 AM	1164		0	1: 92% 89% 7: 90% 9: 95% C: 94% H: 93% W: 93%

Showing 1 to 25 of 160 entries 1 2 3 4 5 25 ▾

VehicleTrack event search report

## VehicleTrack on AWS



Tapway is using AWS IoT Greengrass to seamlessly manage all the edge servers while ensuring they have the capabilities of the cloud without the need for manual intervention. In addition, Tapway is also using AWS SageMaker for model training. AWS SageMaker helps to monitor training runs, troubleshooting logs and spawning parallel hyperparameter tuning jobs.

# About Tapway

Tapway leverages the power of computer vision technology to transform video feeds and images into intelligence and actionable insights.

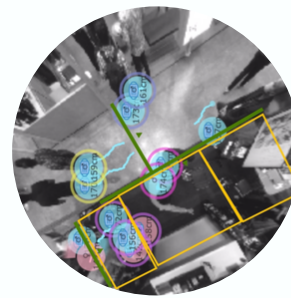
## Tapway Solutions



**VisionTrack**



**VehicleTrack**



**PeopleTrack**

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