AdvanCTi

SMART TRAFFIC PROPOSAL

Made in Malaysia, for Malaysians

MySTI

OUR HISTORY

2000 — LED Vision was established

2002 — LED Display division established

2004

2006 — Traffic light division established

2008

2001

2003

2005

2007

OUR HISTORY

AdvanCTi

LED Vision 10 years' anniversary opening ceremony by Tan Sri Haji Ali Rustam (Former Chief Minister Melaka)

KL Sogo Relamp 1st Phase

MRT Underground Station

2009 2010 2011 2012 2013 2014 2015 2016 2017

Lighting division was established

Lighting division was established

SME CORP MALAYSIA

KL Sogo Relamp Final Phase

OUR HISTORY

AdvanCTi

2018

IoT Solution division was established

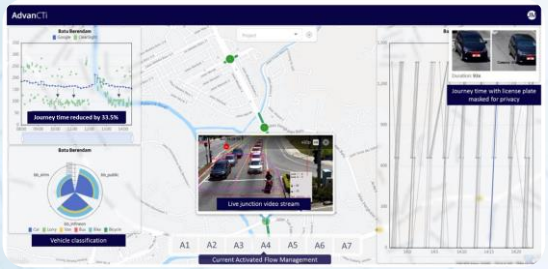
AdvanCTi

2019

Successful installation of P3 LED at Gamuda Cove

2020

Matching Grant with UTeM-Ai Traffic Melaka



2021

Majlis Bandaraya Ipoh Smart Traffic Success (1 way Optimization)

Sandbox 1 fund (MTDC) - Smart AI ready Traffic Controller

2022

Majlis Bandaraya Pasir Gudang Success (2 Way Optimization)

intel partner Gold IoT Solutions

Appointed by intel as Gold IOT Solution Partner

PRESENT

OUR PROFILE

AdvanCTi

LED VISION

AdvanLED

- LED StreetLight/ Traffic Light

- LED Display

- LED Lighting

AdvanCTi

- IoT Solutions

Smart Traffic Solution

AdvanCTi Smart City Solutions

CTiTraffic

CTiData

CTiLight

Current Achievements

IP Filing: PI2021000730 (A METHOD FOR TRACKING AND CHARACTERIZING VEHILE FOR TRAFFIC PREDICTION)

Patents Form No. 1 PATENTS ACT 1983 REQUEST FOR GRANT OF PATENT (Regulations 7(1)) To : The Registrar of Patents Patents Registration Office Kuala Lumpur, Malaysia	For Official Use Application No : PI2021000730 Filing Date : Request received on : 09 FEBRUARY 2021 Fee received on : 09 FEBRUARY 2021 Amount : RM 260 *Cheque / Postal Order / Money Order / Draft Cash No. : IPOL2021000000007655
Please submit this Form in duplicate together with the prescribed fee	Applicant's file reference : 2020/PT/R4.41/OP

THE APPLICANT(S) REQUEST(S) THE GRANT OF A PATENT IN RESPECT OF THE FOLLOWING PARTICULARS :

I. Title Of Invention : A METHOD FOR TRACKING AND CHARACTERIZING VEHICLES FOR TRAFFIC PREDICTION

II. APPLICANT(S) (the data concerning each applicant must appear in this box or, if the space insufficient, in the space below :

Name: **Universiti Teknikal Malaysia Melaka**
Address: **Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya**
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Malaysia

Name: **LED VISION SDN. BHD.**
Address: **NO 109, JALAN PM 1, TAMAN PERINDUSTRIAN MERDEKA,**
BATU BERENDAM,
75350 Melaka Melaka
Malaysia

Address for service in Malaysia : C/O TEE IP SDN. BHD., SUITE 32-2, JALAN DWITASIK, DATARAN DWITASIK, BANDAR SRI PERMAISURI 56000 KUALA LUMPUR, 56000 Cheras Kuala Lumpur, Malaysia

Nationality : Malaysia,Not Specified

*Permanent residence or principal place of business :
C/O TEE IP SDN. BHD., SUITE 32-2, JALAN DWITASIK, DATARAN DWITASIK, BANDAR SRI PERMAISURI 56000 KUALA LUMPUR, 56000 Cheras Kuala Lumpur, Malaysia

Telephone Number (if any) | Fax Number (if any)

Additional Information (if any)

A METHOD FOR TRACKING AND CHARACTERIZING VEHICLES FOR TRAFFIC PREDICTION

TECHNICAL FIELD

The present invention relates to a method for tracking and characterizing vehicles for traffic prediction, more particularly, calculating accurate journey time measurement for traffic junction analytic.

BACKGROUND ART

The existing point check traffic cameras in the market make use of automatic license plate recognition for point to point journey time which is not suitable to be used directly for traffic prediction where waiting time at the traffic junction is not included.

There have been several solutions provided for a method for tracking and characterizing vehicles for traffic prediction, and few of them have been discussed below:

US6249725B1 discloses a method of controlling at least one station display, where a vehicle transmits its actual location to a central control station which calculates the estimated waiting time (tw) until the vehicle reaches the station, and controls the station display to visually signal this waiting time (tw) to improve the accuracy of the indicated waiting time (tw), it is provided that the waiting time (tw) of a number (n) of immediately preceding vehicles (3, 4, . . .) is calculated as a function of the trend line of the actual travel times (t1, t2, . . . tm, tm+1. . . tn).

US9235988B2 discloses a method for tracking and characterizing a plurality of vehicles simultaneously in a traffic control environment, providing a three-dimensional (3D) optical emitter, providing a 3D optical receiver with a wide and deep field of view; driving the 3D optical emitter into emitting short light pulses; receiving a reflection/backscatter of the emitted light, thereby acquiring an individual digital full-waveform LIDAR trace for each detection channel of the 3D optical receiver; using the

Current Achievements

IP Filing: PI2022002279 (A METHOD FOR CONTROLLING A PLURALITY OF TRAFFIC INTERSECTIONS)

ACKNOWLEDGE RECEIPT

Patents Form No. 1 PATENTS ACT 1983 AND PATENTS REGULATIONS 1986 REQUEST FOR GRANT OF PATENT [Sections 23, 24 and 26B(1)] [Regulation 7(1)] To: The Registrar of Patents Patent Registration Office Malaysia	For Official Use APPLICATION NO.: ..... Filing Date: ..... Request received on: ..... Fee received on: ..... Amount: ..... *Cheque/Postal Order/Bank Draft/Local Order/Credit Card/ Debit Card No.: .....
Please submit this Form together with the prescribed fee.	~~Applicant's or~~ Agent's file reference: 2022/PT/I5.02/OP

THE APPLICANT(S) REQUEST(S) THE GRANT OF A PATENT IN RESPECT OF THE FOLLOWING:

I. TITLE OF INVENTION:

A METHOD FOR CONTROLLING A PLURALITY OF TRAFFIC INTERSECTIONS

II. APPLICANT(S) (the data concerning each applicant must appear in this box or, if the space insufficient, in the space below):

Name	:	LED VISION SDN BHD
I.C./Passport No.	:	-
Address	:	NO 109, JALAN PM 1, TAMAN PERINDUSTRIAN MERDEKA, BATU BERENDAM, 75350 MELAKA, MALAYSIA.
Address for service in Malaysia	:	C/O TEE IP SDN BHD (CO. NO.: 903530-X) A-23-01, PENTHOUSE OFFICE, EKOCHERAS OFFICE SUITES 693, JALAN CHERAS, BATU 5, KUALA LUMPUR, 56000, MALAYSIA.
Nationality	:	MALAYSIAN
*Permanent residence or principal place of business	:	NO 109, JALAN PM 1, TAMAN PERINDUSTRIAN MERDEKA, BATU BERENDAM, 75350 MELAKA, MALAYSIA.
Telephone Number *(required)*	:	603- 91343113
Email address *(required)*	:	info@teeip.com

Additional Information (if any):

☐ Yes ☑ No

III. INVENTOR

Applicant is the inventor ☐ Yes ☑ No

If the applicant is not the inventor:

DITERIMA 29 APR 2022

1

A METHOD FOR CONTROLLING A PLURALITY OF TRAFFIC INTERSECTIONS

TECHNICAL FIELD

This invention relates generally to traffic control methods. More particularly, the present invention pertains to a method for controlling a plurality of traffic intersections.

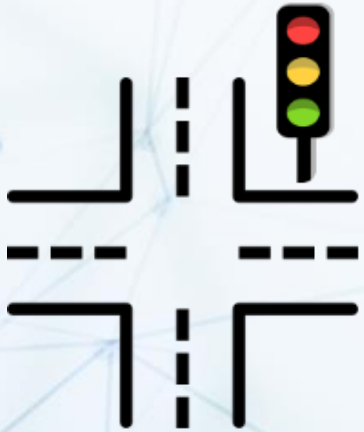
BACKGROUND ART

A traffic intersection is a location where vehicular traffic going in different directions. The traffic intersection can be designed to allow traffic to proceed in a controlled manner to minimize accidents. Intersections with heavy traffic or fast traffic are usually controlled by traffic signals. Most of the traffic signals nowadays can be divided into two categories including fixed time signals and vehicle actuated (VA) signals.

Fixed time signals are set to regularly repeat a cycle of red, amber or yellow, and green lights. Depending upon the traffic intensities at different times of the day, the timings of each phase of the cycle are predetermined. Those predetermined timings that are set to activate according to a schedule are known as multiplan. By design, multiplan serves only the average peak traffic flow at different time frames based on historical traffic flow volumes. The cycle of red, yellow, and green goes on irrespective of the traffic condition on the road. It may lead to a situation where the traffic in the heavy stream has to stop at the end of the phase and green time is wasted serving roads with low traffic.

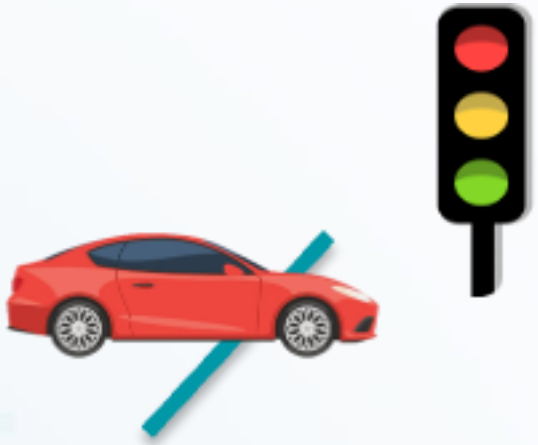
In conventional VA signals, in-ground loop detectors are placed at each lane for vehicle detection. The timings of the phase and cycle are changed according to traffic demand. While this system reduces the loss of green time by ending the cycle early when the demand is low and extends the green time to serve more traffic in the heavy stream, its range of detection is limited and its

The Current Challange



5000+ nos

There are approximately 5000 traffic light junctions in Malaysia



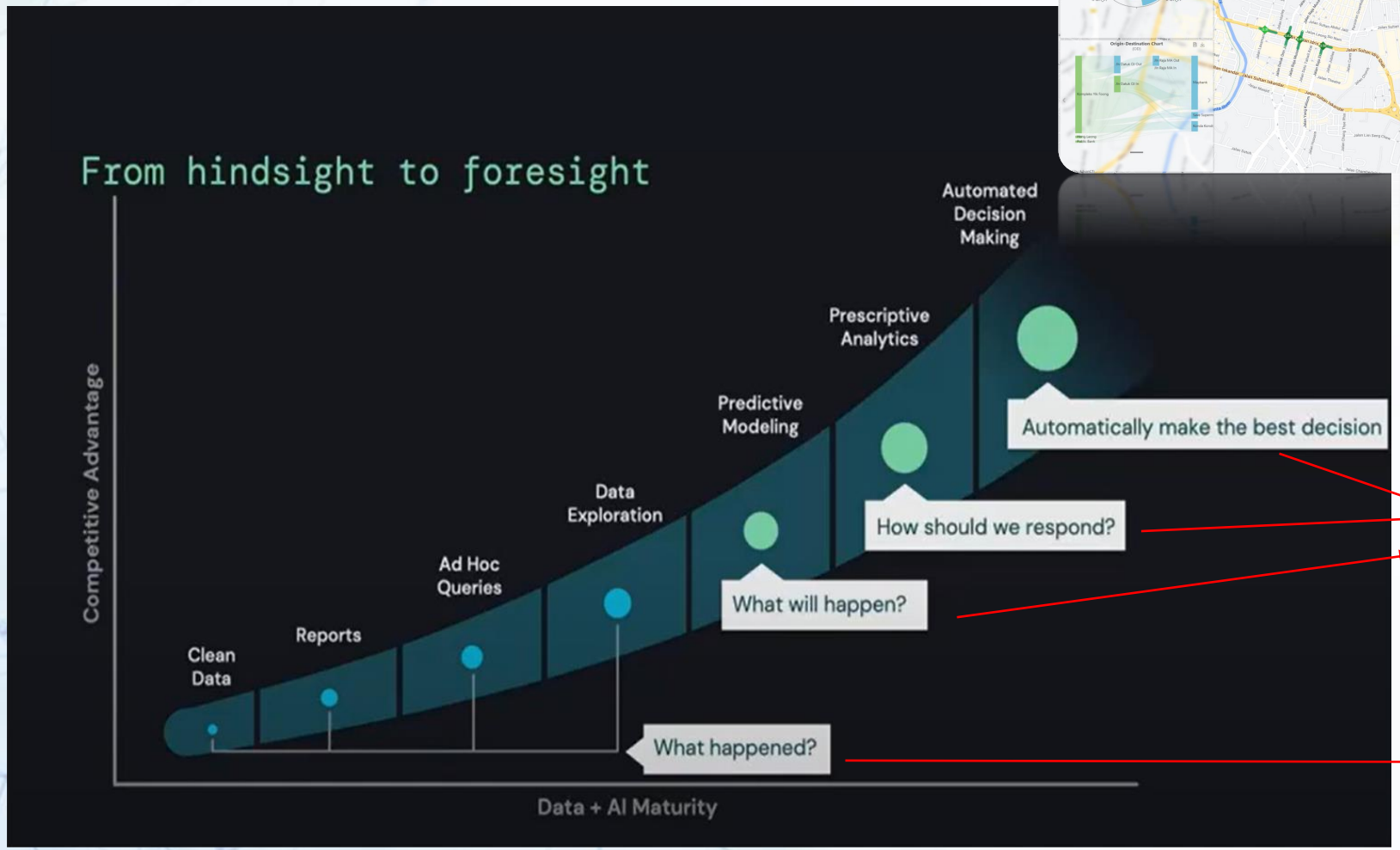
Control Strategies

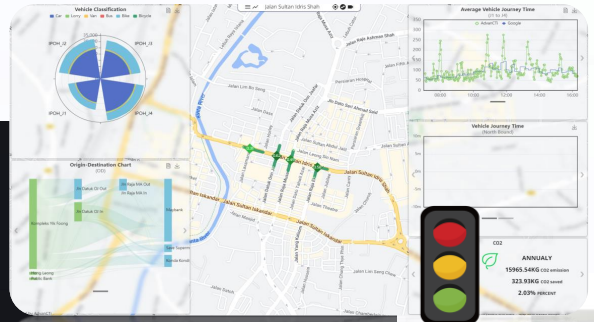
A significant number of traffic congestion are caused by poor timing of traffic lights and the non synconization between traffic controllers.

Synchronization Technology

Although there are connected traffic lights such as SCATS, the synchronization & coordination of the traffic controllers still have room for improvement

AdvanCTI Smart Traffic Solution





4 Smart City Dashboard

Dashboard for macro cityview visibility with feedable open data

3 Traffic Signal Controller

Optimized traffic plan is synchronized and executed in each traffic signal controller

2 AI Traffic Optimizer

sascoo.ai traffic optimizer to adapt with real time information from AI CCTV

1 AI CCTVs (Sensors)

Data Analytics with AI CCTV at the traffic junctions

V2X On Board Units (OBU)

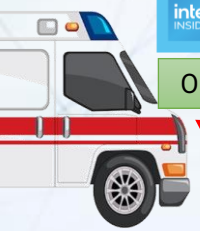
Multi Junction Hardware AI Solution Architecture

Electrical Vehicles / Smart Emergency Vehicles / Autonomous Special Purpose Vehicles

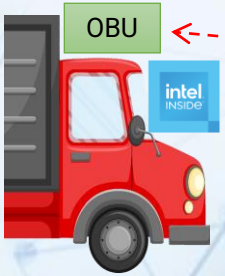
OBU

IPC : Intel Celeron 6305E

1. V2X SAEJ2735 messages



OBU



OBU

5.9Ghz
(within 200m)

Dashboard
SASCOO.AI
Advancti.com

Internet

4G/5G

AI Edge Box & RSU 1

IPC : Intel Celeron 6305E

1. Journey Time Calculation
2. Waiting Time Calculation
3. License Plate Recognition
4. Origin – Destination Matrix
5. WebRTC Stream Conversation

CAT6

J1

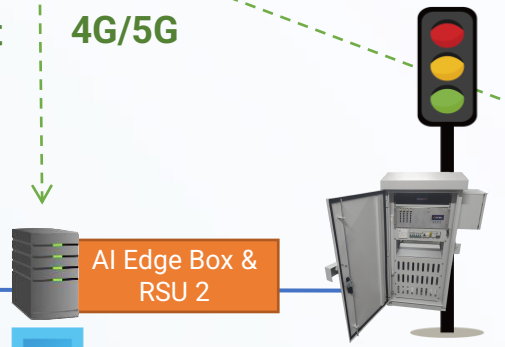
CAM1-4

VPU: Intel Movidus MA2485

1. Vehicle Classification
2. Vehicle Directional Counting
3. Event Identifying

Mounting Height: 6M

Location:
Junction 1



AI Edge Box & RSU 2

IPC : Intel Celeron 6305E

1. Journey Time Calculation
2. Waiting Time Calculation
3. License Plate Recognition
4. Origin – Destination Matrix
5. WebRTC Stream Conversation

CAT6

J1

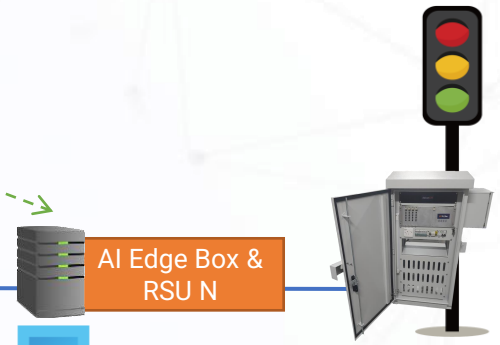
CAM5-8

VPU: Intel Movidus MA2485

1. Vehicle Classification
2. Vehicle Directional Counting
3. Event Identifying

Mounting Height: 6M

Location:
Junction 2



AI Edge Box & RSU N

IPC : Intel Celeron 6305E

1. Journey Time Calculation
2. Waiting Time Calculation
3. License Plate Recognition
4. Origin – Destination Matrix
5. WebRTC Stream Conversation

CAT6

J1

CAMN-4N

VPU: Intel Movidus MA2485

1. Vehicle Classification
2. Vehicle Directional Counting
3. Event Identifying

Mounting Height: 6M

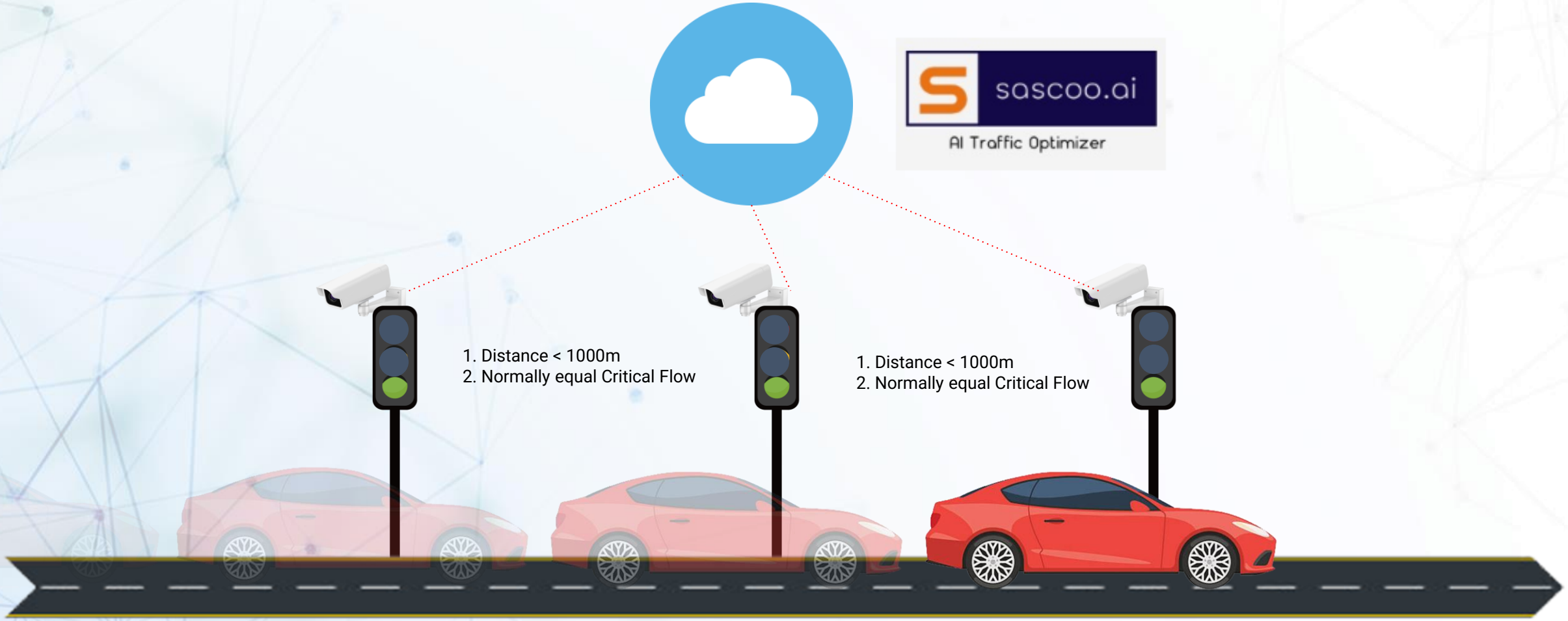
Location:
Junction N

SASCOO.AI Architecture

AdvanCTi

SASCOO.AI (How does it work?)

“Greenwave” with synchronization of traffic controllers



SASCOO.AI (How does it work?)

Donate “Green Time” or Skip phases that is not in use

SASCOO.AI (How does it work?)

"Adaptive" To Real Time Situation

"Will not Open the Lane as it will cause the traffic situation to be worse" *(Bottleneck Control)*

sascoo.ai
AI Traffic Optimizer

"Timing plan will change to make it earlier to clear the residual"

Advantages # 1

SMART CITY

AdvanCTi

Reduction of Journey Time as much as 51% by being adaptive

* Information base on Ipoh Project

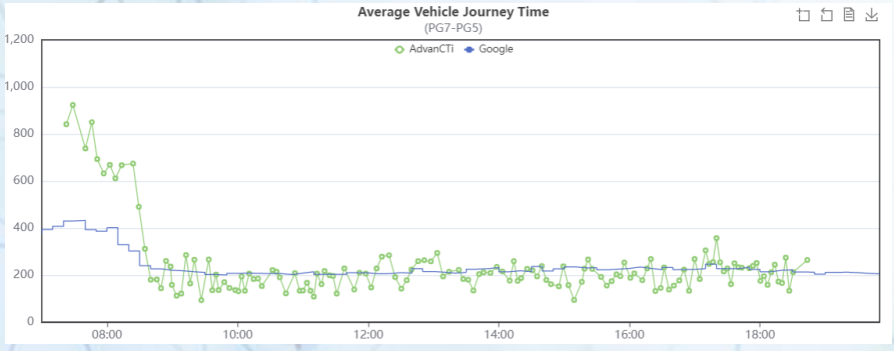
Advantages # 2

SMART CITY

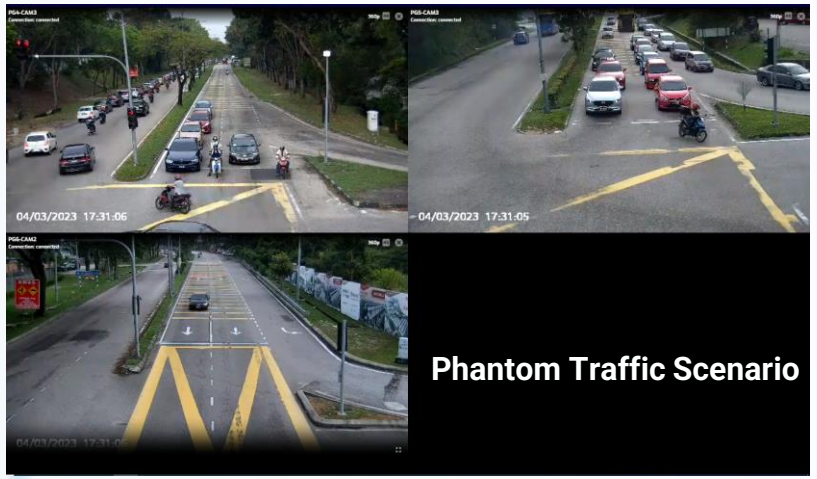
Provides Insights to City Planner

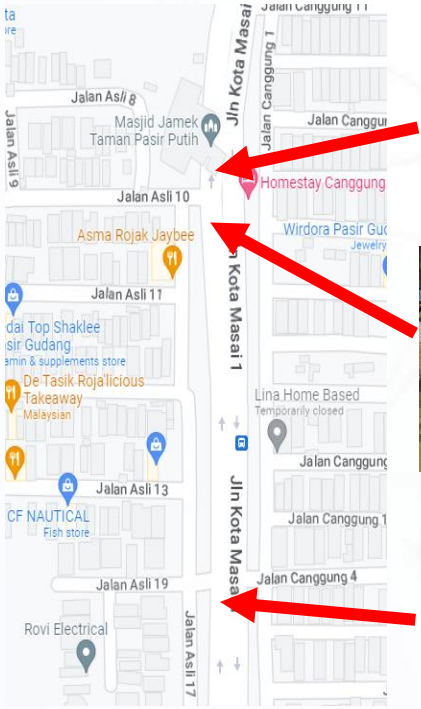
Origin – Destination Matrix Data

Traffic Flow Profile



Visual Pattern



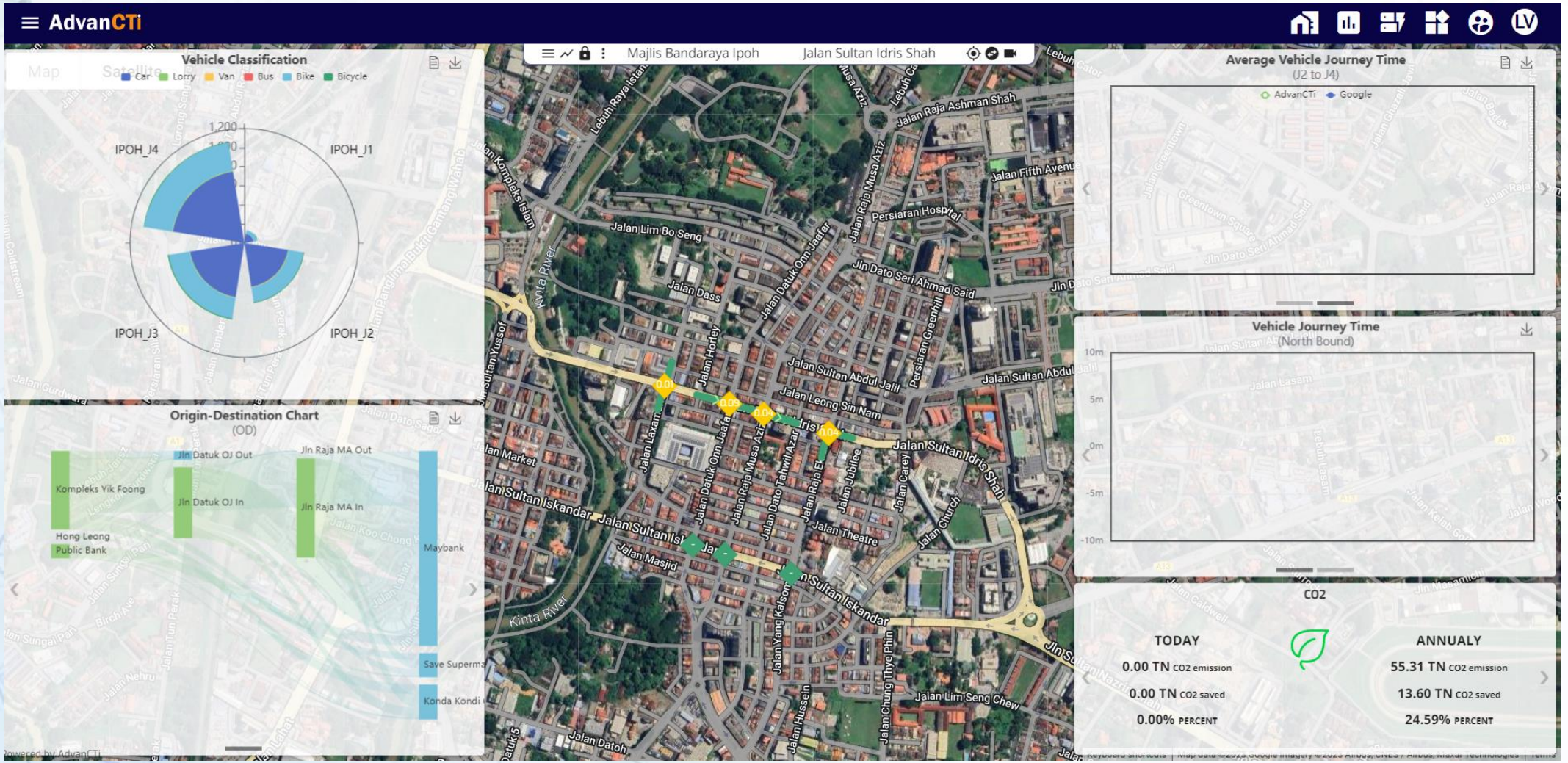


Advantages # 3

SMART CITY

AdvanCTi

Integrates with 3rd Party Data such as Google/ Waze / Other Smart City Systems

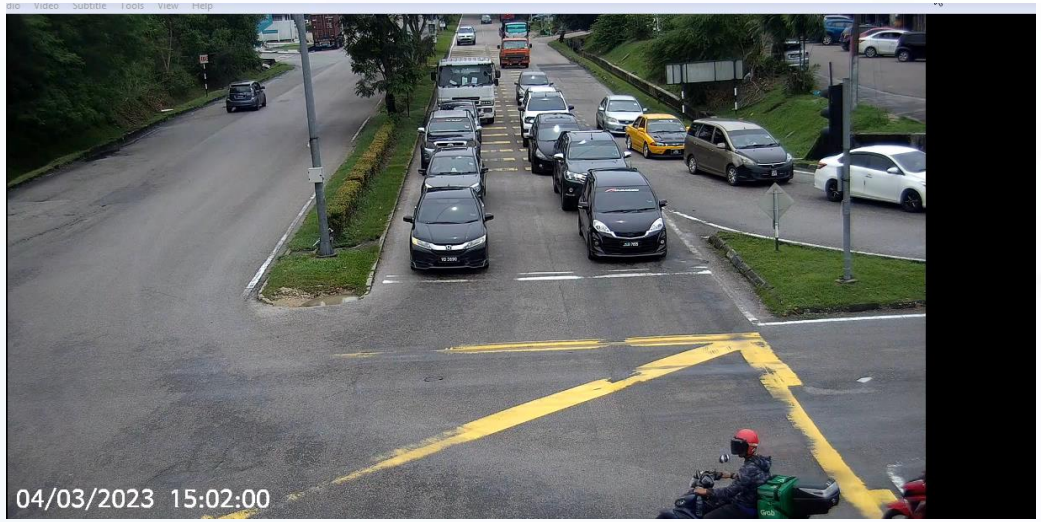


Advantages # 4

SAFE CITY

AdvanCTi

Smart AI Detection for Unusual Events

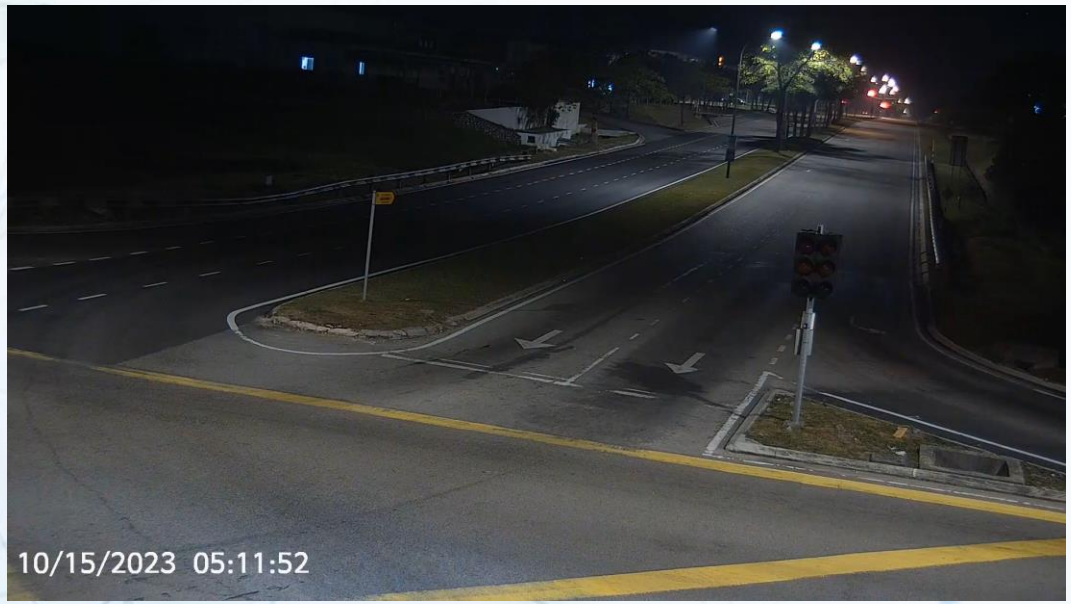


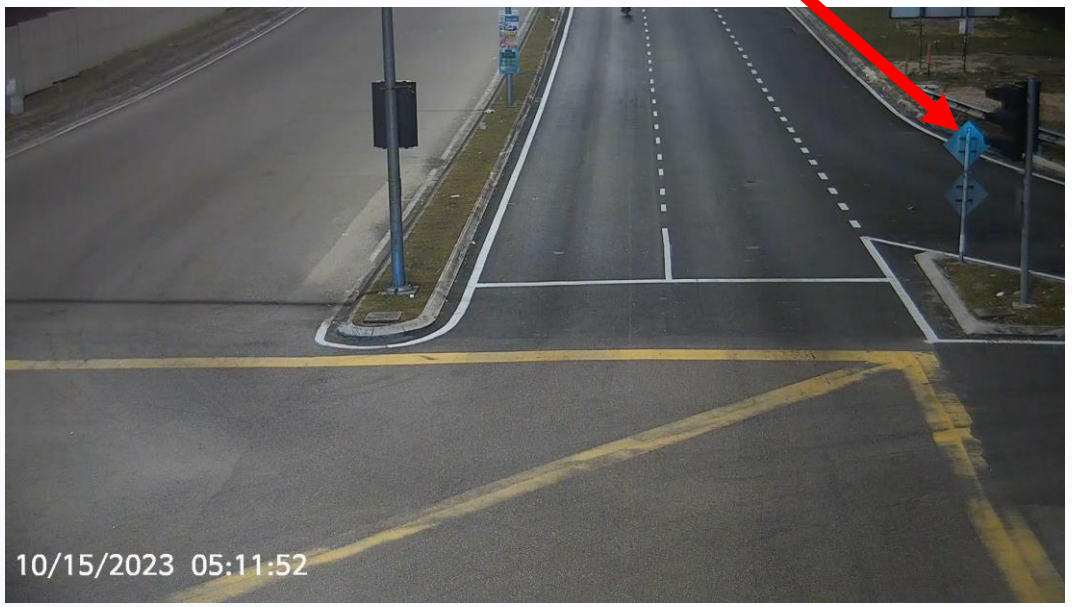
Advantages # 5

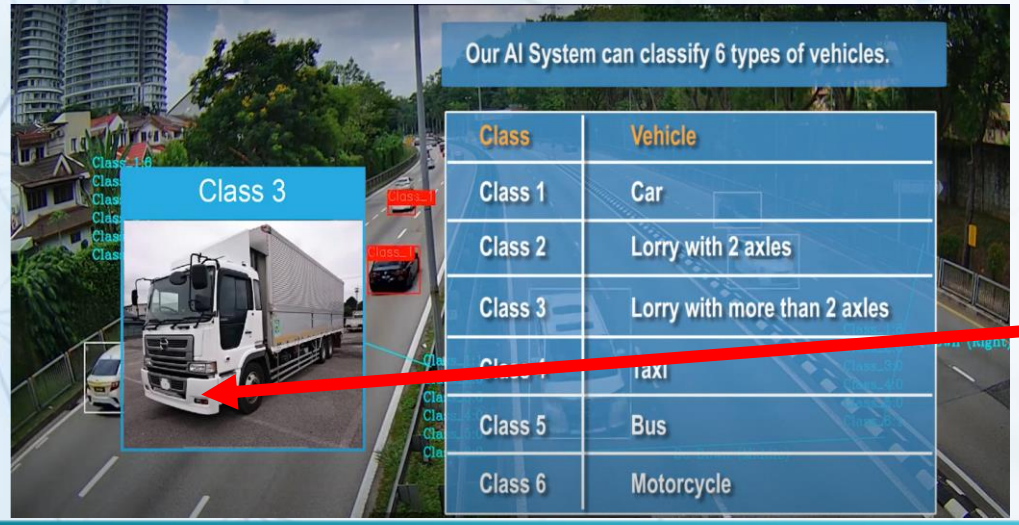
SAFE CITY

Enforcement of Traffic Violations

Green Light!!



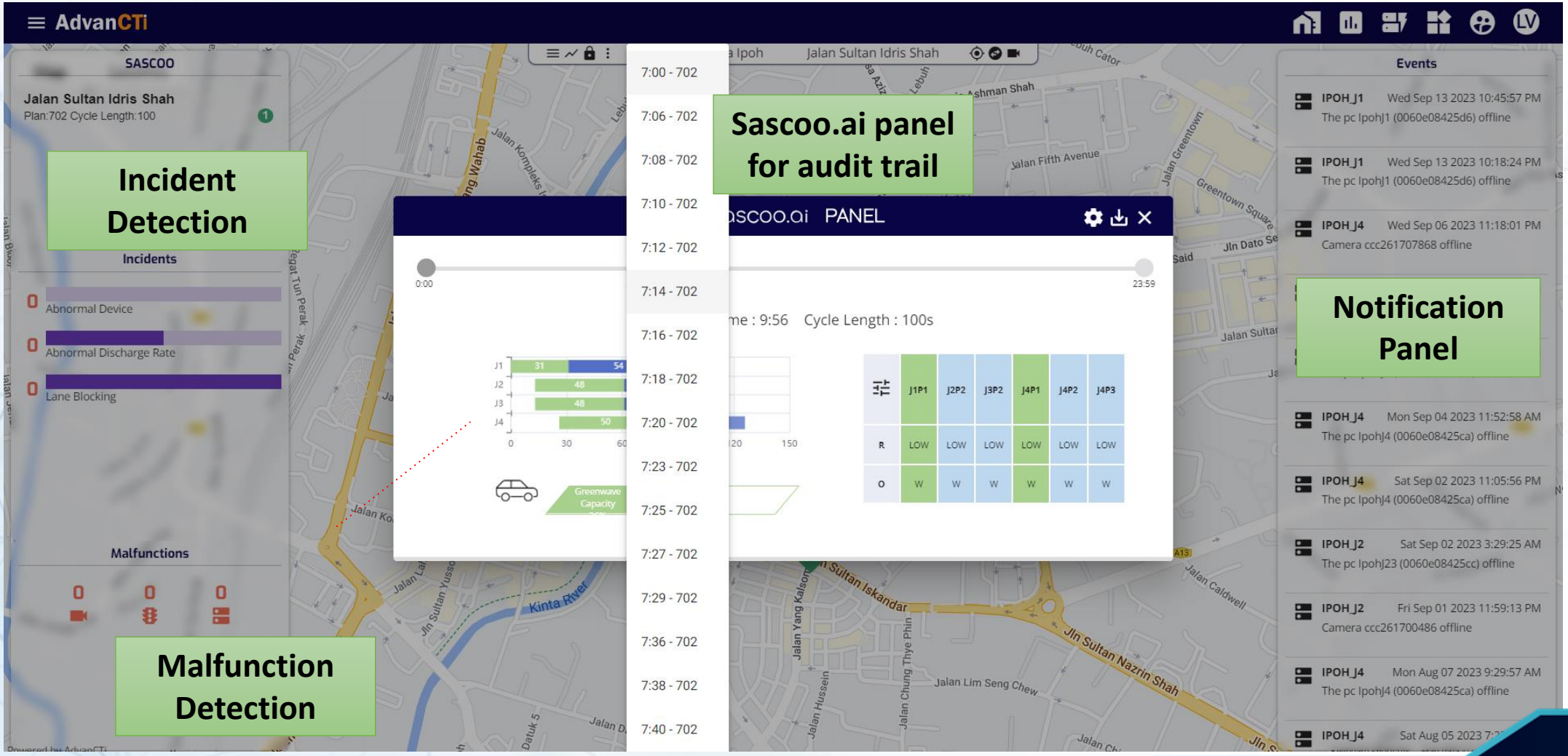




Advantages # 6

SAFE CITY

Auditable Trails Records & Notifications



Advantages # 7

GREEN CITY

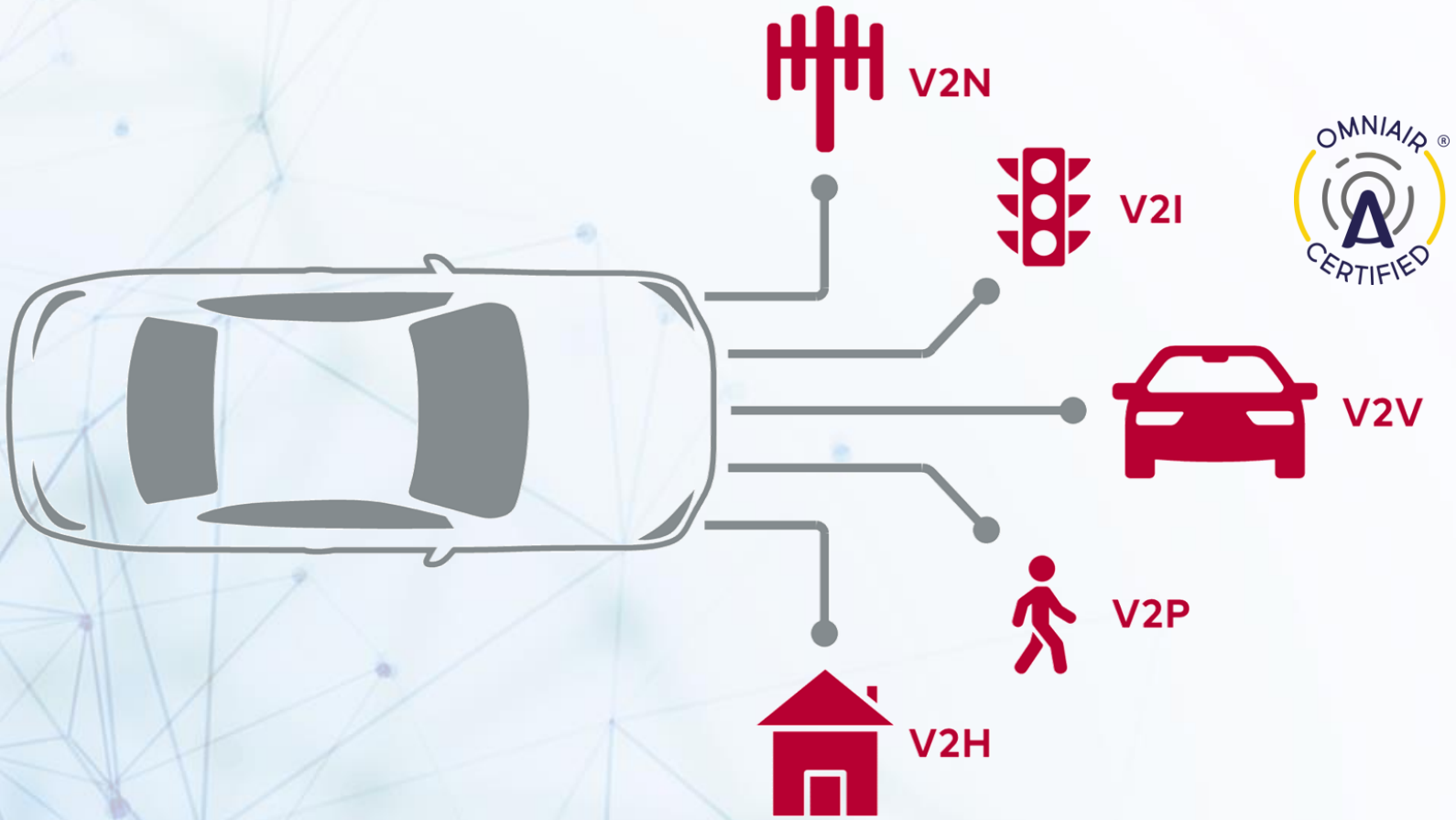
Carbon Emission Reduction with proven formula

* Currently in process of getting Accreditation

Advantages # 8

SMART CITY

Vechicle to Everything (V2X) ready



Ready to use Applications for Priority Passage:

1. Smart Ambulance
2. Smart Bomba
3. BRT (Bus Rapid Transit)
4. VIP Vehicles

Ready to use Applications for Smart Driving:

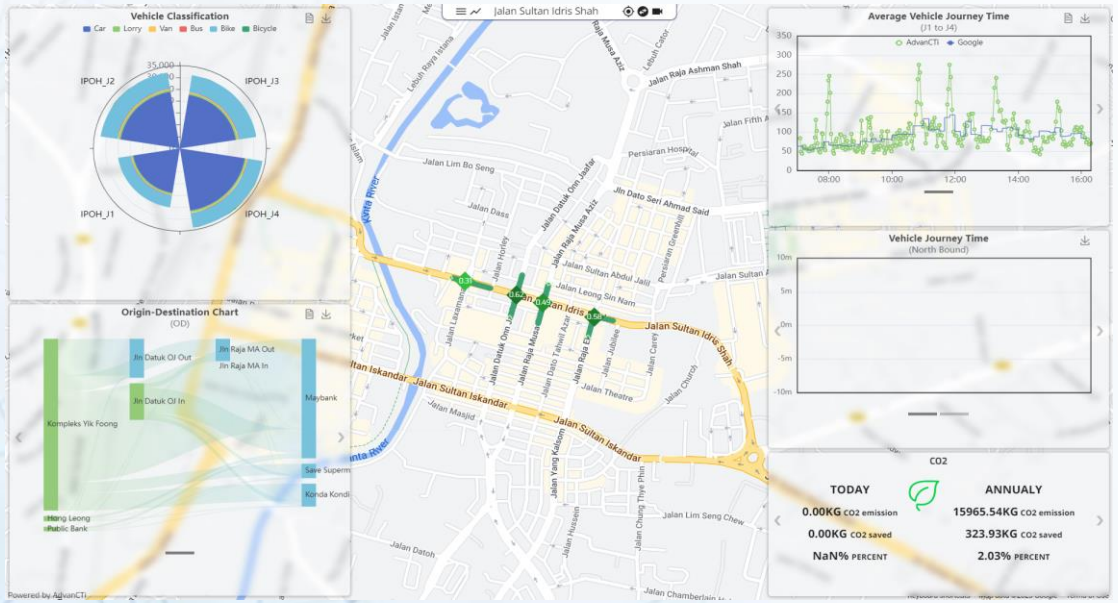
1. Speed feedback to enjoy GreenWave
2. Heads up on traffic signal timing
3. Alternative routes for congestion

Ready to use Applications for Autonomous Vehicles:

1. Autonomous Delivery Packages
2. Autonomous Public Transport

Success Case Study

Majlis Bandaraya Ipoh (MBI) – 4 junctions



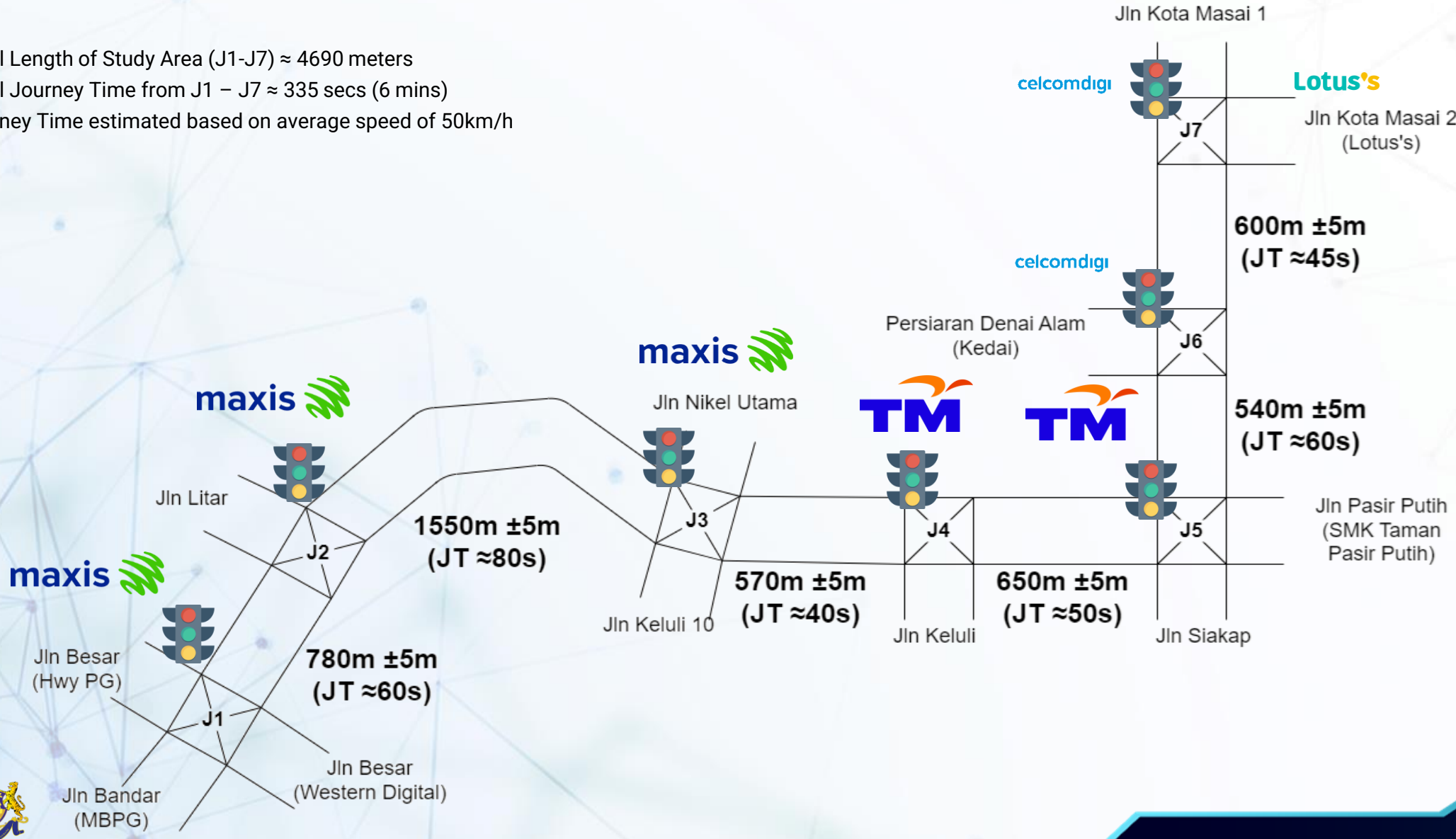
Results: Peak period journey time reduction of **33%,**
Normal Period journey time reduction of **51%**

Majlis Bandaraya Pasir Gudang (MBPG) – 7 junctions

Results: Peak period journey time reduction of **40%,**
Normal Period journey time reduction of **25%**

Success Case Study (Majlis Bandaraya Pasir Gudang)

Total Length of Study Area (J1-J7) ≈ 4690 meters
Total Journey Time from J1 – J7 ≈ 335 secs (6 mins)
Journey Time estimated based on average speed of 50km/h



Scope Of Works

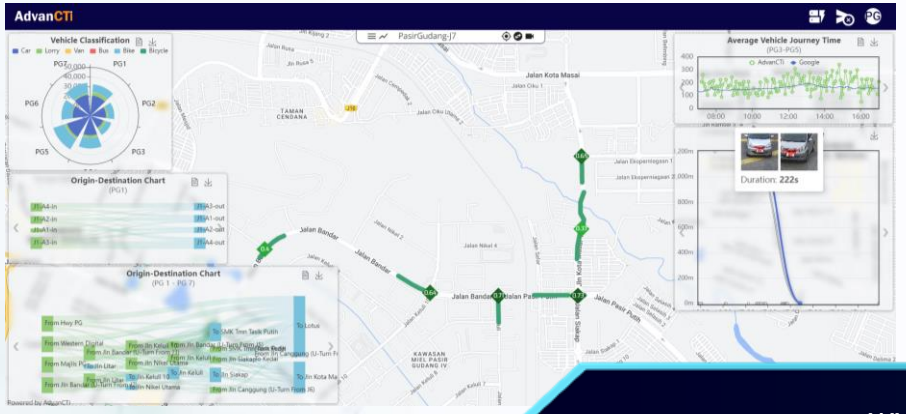
1. Install **24** new AI CCTV



2. Replace **7** new Traffic Controller



3. Provide **1** Traffic Dashboard & SASCOO AI Traffic Optimizer



Case Study for Majlis Bandaraya Pasir Gudang

AdvanCTi

Goals of the Project

1. Smoothens traffic flow with fewer stops to create a green wave
2. Improve traffic condition through the junctions with reduction of minimum 20% of journey time.
3. Provide advanced traffic control
4. Improve traffic movements such as stops, throughput and congestion
5. Adapt to unusual events
6. Enhance movement of public transport vehicles
7. Provide MBPG real-time view of operation, better awareness of ground situation including route awareness of critical vehicles used for emergencies and day-to-day operation
8. Provide MBPG and operational decision makers with data to analyse past trends for planning and decision making purposes.

Implementation Methodology

1. STEP 1: Gather Traffic Data & MBPG Data Validation
2. STEP 2: Identify Flow Profile & Peak Periods
3. STEP 3: Determine Control Strategy

Implementation Methodology

1. **STEP 1: Gather Traffic Data & MBPG Data Validation**
2. STEP 2: Identify Flow Profile & Peak Periods
3. STEP 3: Determine Control Strategy

AI CCTV – ClearSight CCTV

Main Features

Image	Features	Specifications
 	Image Sensor	1/2.8" progressive scan
	Max Resolution	1920 x 1080 (2MP) @ 60 FPS
	Focal Length	5.1 - 51mm±5%
	CPU	Multimedia SoC
	Flash	4Gb
	RAM	4Gb
	AI Engine	Intel® Movidius™ MA2485 VPU
	AI Features	1. Vehicle Classification 2. Vehicle Counting 3. Event Identification

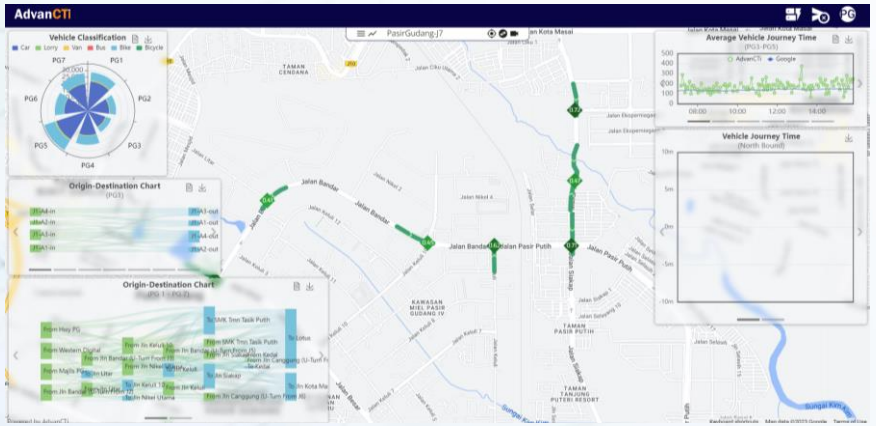
Traffic Controller – AdvanCTi Traffic Controller

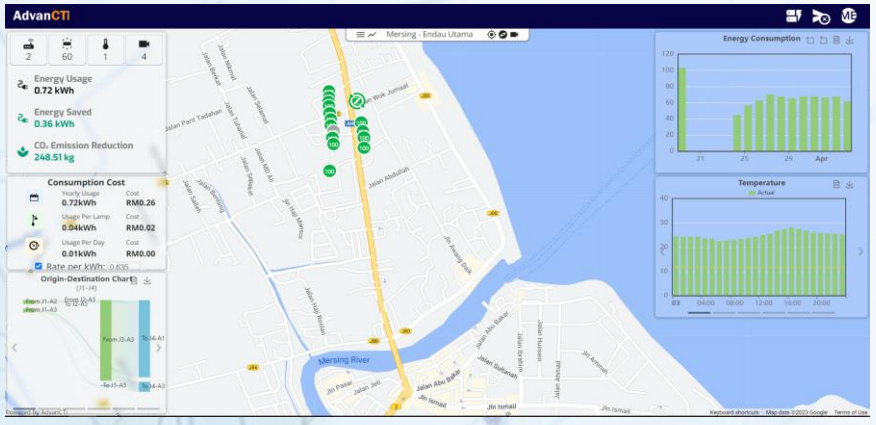
Image	Features	Specifications
	Certification	1. SIRIM 2. UL 3. ilac-MRA
	Sensors	AI CCTV (Virtual Loop)
	Features	1. Web Admin System Controller 2. Traffic Signal Pre-Emption 3. Remote Notification 4. Seamless SASCOO Ready 5. Hot Swap Signal Card 6. Independent Amber Flashing 7. Green Conflict Monitoring 8. Network Management System

VSENS – Virtual Loop Detection

Speed detection for better management for Heavy Vehicles

Smart City Dashboard & Optimizer – AdvanCTi





Modules	Available
Smart Traffic System	Full
Vehicle Classification & Counting Data	√
Origin To Destination Matrix	√
Journey Time Calculation	√
Video Recording	√
Traffic Light Phasing Information	√
SASCOO (AI Optimizer)	√
Carbon Emission Savings Module	√
Red Light & Incident Violation	√
Advanced Vehicle Classifier (heavy vehicle & ambulance)	√

Modules	Available
Smart Lighting System	Ready & Optional
Smart Environment Monitoring System	Ready & Optional

100% Malaysian Team, customization available

04/01/23 to 09/01/23 – Installing Jelly filled CAT6 Cable

MBPG

10/01/23 to 20/01/23 – Camera Installation Process

MBPG

10/01/23 to 20/01/23 – Camera Installation Process

MBPG

10/01/23 to 20/01/23 – Camera Installation Process

MBPG

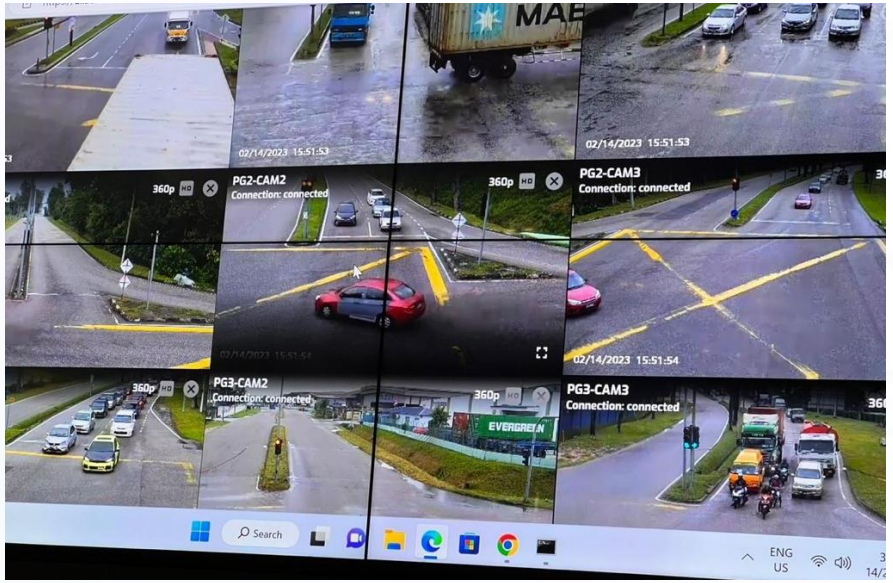
Wireless CPE, if manhole cannot be located/stuck

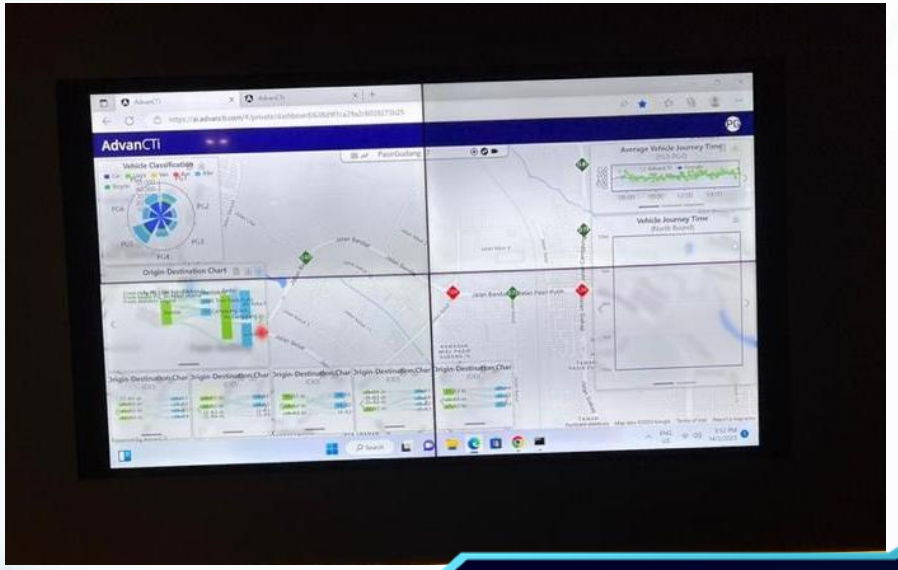
01/03/23 to 06/03/23 – Traffic Controller Installation

MBPG

Isolation Transformer

23/01/23 to 05/05/23 – Data Collection & Traffic Optimization Period





Implementation Methodology

1. STEP 1: Gather Traffic Data & MBPG Data Validation
2. **STEP 2: Identify Flow Profile & Peak Periods**
3. STEP 3: Determine Control Strategy

OD (Origin – Destination) Matrix

- Origin-Destination Matrix or OD describes vehicle movement in a certain area.
- The OD is depended on the Passenger Car Unit **(PCU)**
- Based on JKR Standards (Equivalent PCU Value) as below:

Passenger Car
1.00

Motorcycles
0.33

Van/Medium Lorries
1.75

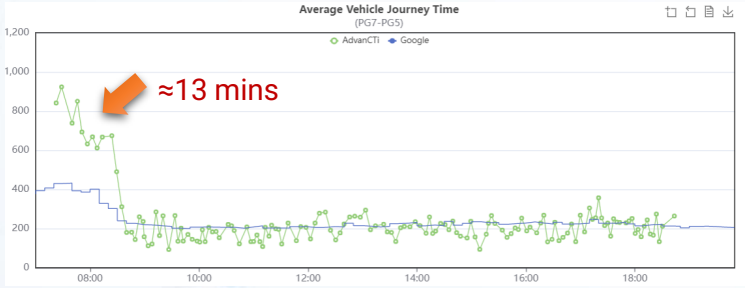
Buses
2.25

Heavy Lorries
2.25

OD Observation 1: There are 2 Peak Hours

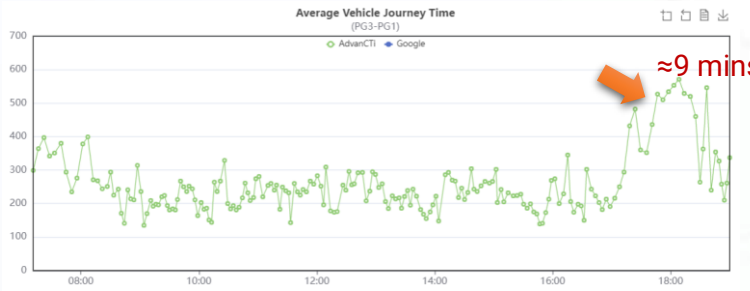
7AM – 8AM

Jalan Kota Masai 1
(South Bound From Kota Masai)

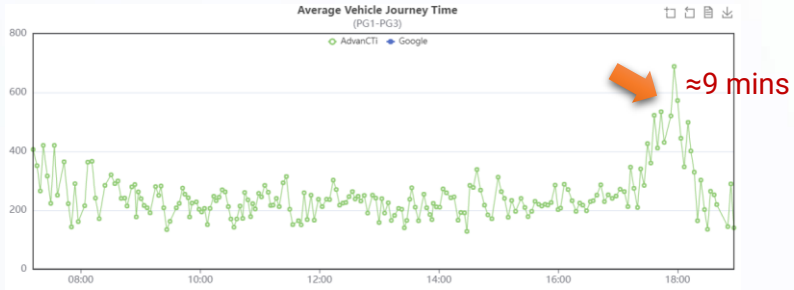


6PM – 7PM

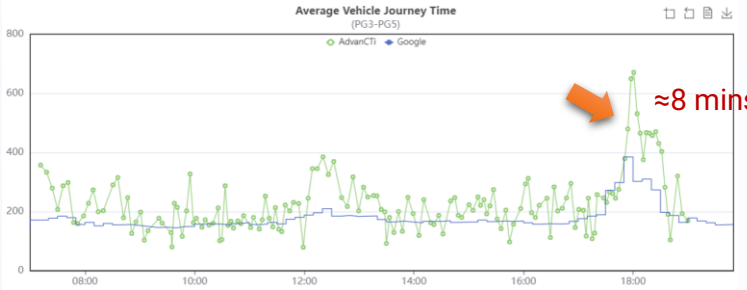
Jalan Bandar
(South Bound to MBPG)



Jalan Bandar
(North Bound from MBPG)



Jalan Pasir Putih
(North Bound from MBPG)



OD Observation 2:

7AM – 8AM

46.0 % of PCU to J1

22.6% of PCU to J4

6PM – 7PM

56.0% of PCU to J7

44.0% of PCU to J7

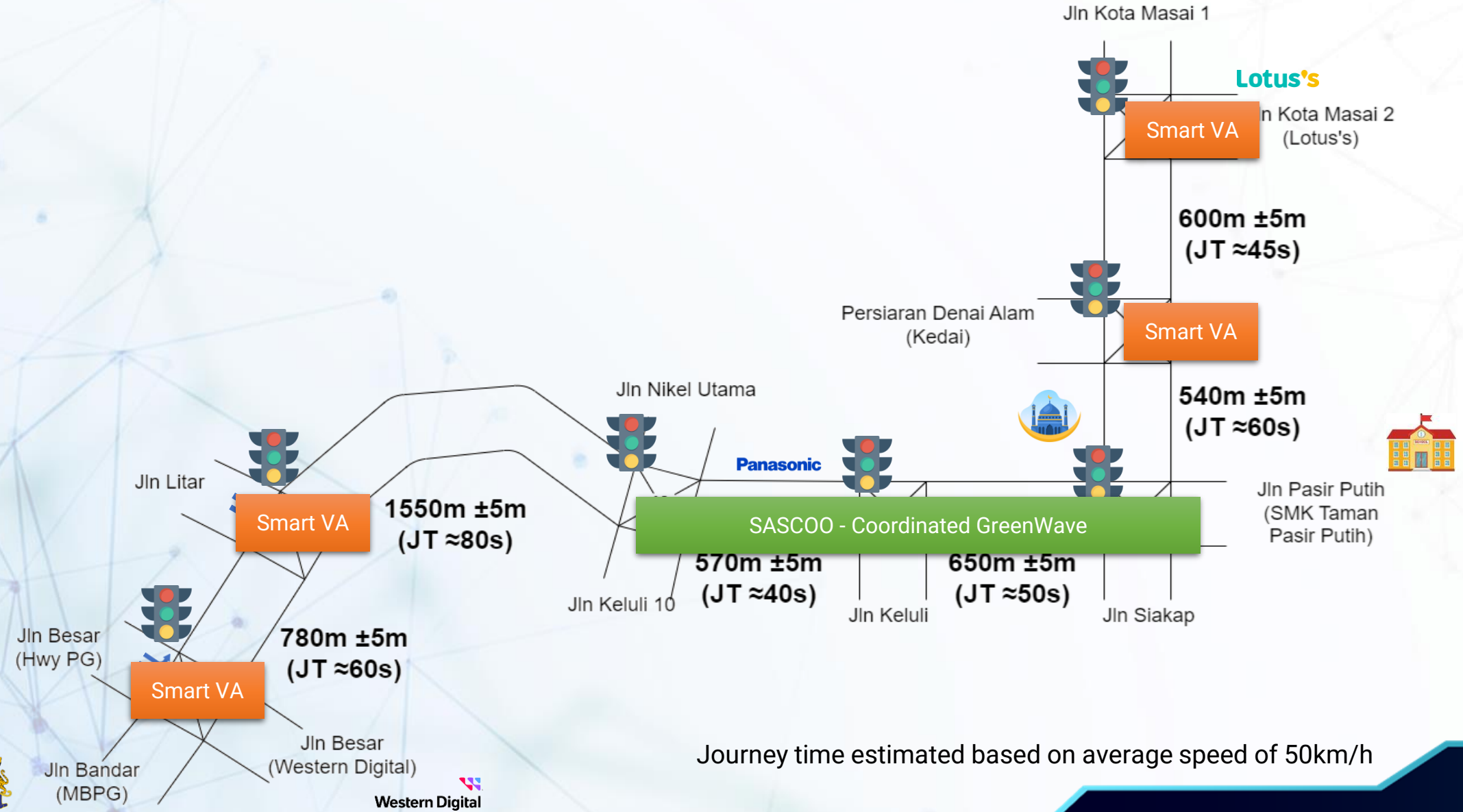
Other Items To be Determine:

1. Peak period of traffic congestions
2. Origin to Destination matrix
3. Identify GreenWave strategies
4. Identify phasing information for improvement **(Lead-Lag Possibilities)**

Implementation Methodology

1. STEP 1: Gather Traffic Data & MBPG Data Validation
2. STEP 2: Identify Flow Profile & Peak Periods
3. **STEP 3: Determine Control Strategy**

Control Strategy (MBPG Case Study)



Journey time estimated based on average speed of 50km/h

What we did…

7AM – 8AM

Southbound

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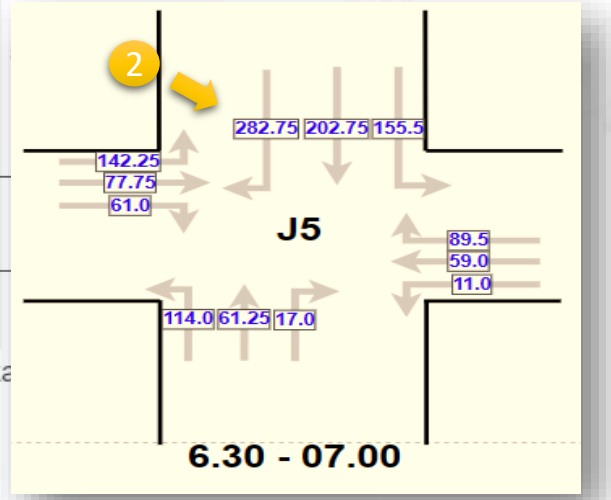
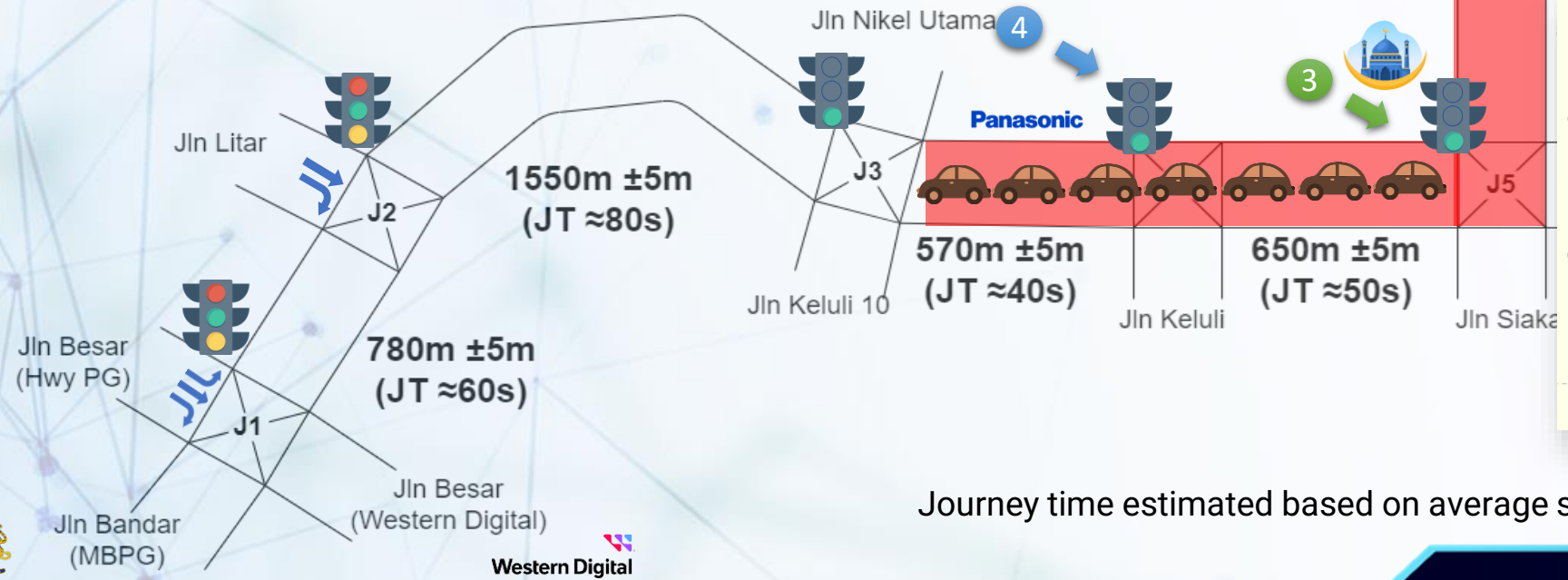
1. J7 – J3 has reached its maximum saturation during morning peak
2. 22% of the vehicles will turn right & 15% will go straight at J5 during morning peak
3. provide more green time at J5 (phase 4) 155 sec / max 300 sec cycle time.
   In the meantime, will monitor the residual at J5 not to cause a bottleneck situation
4. Implemented coordinated GreenWave during peak and normal time



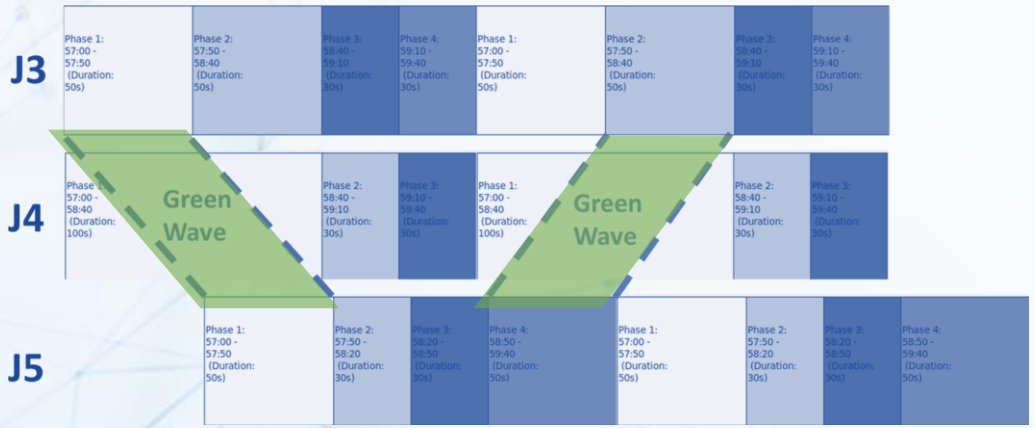


Journey time estimated based on average speed of 50km/h

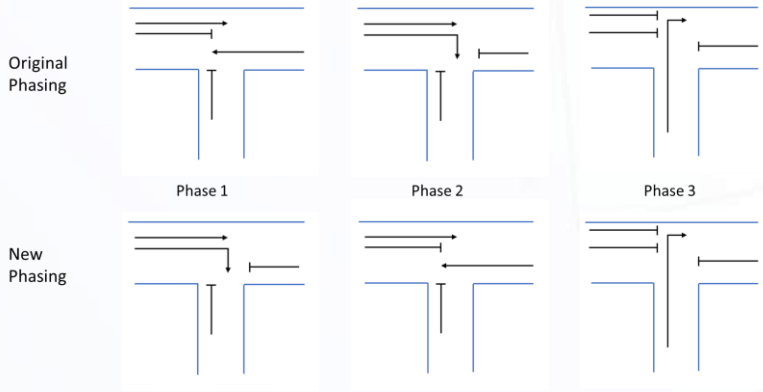
Changing Phase in J4

Changing to phase of Traffic Paths at J4 (can help improve journey time when implementing coordinate GreenWave)

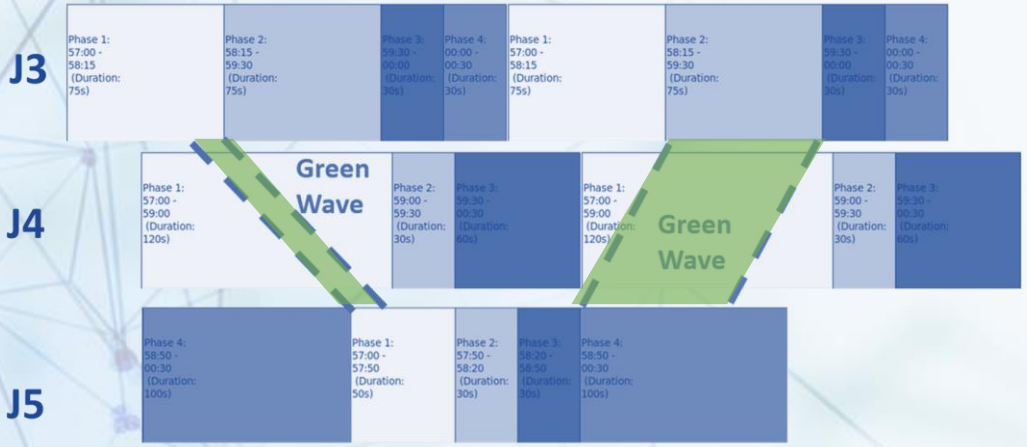
Ideal GreenWave



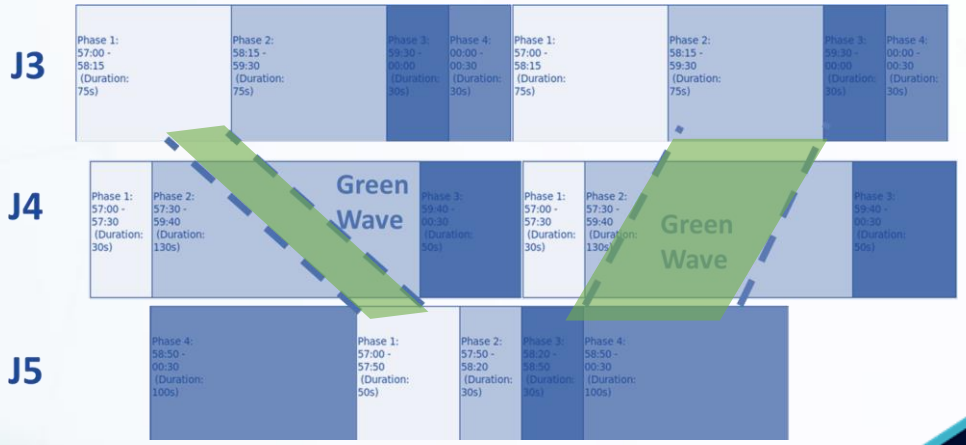
To change the phase of traffic path at J4



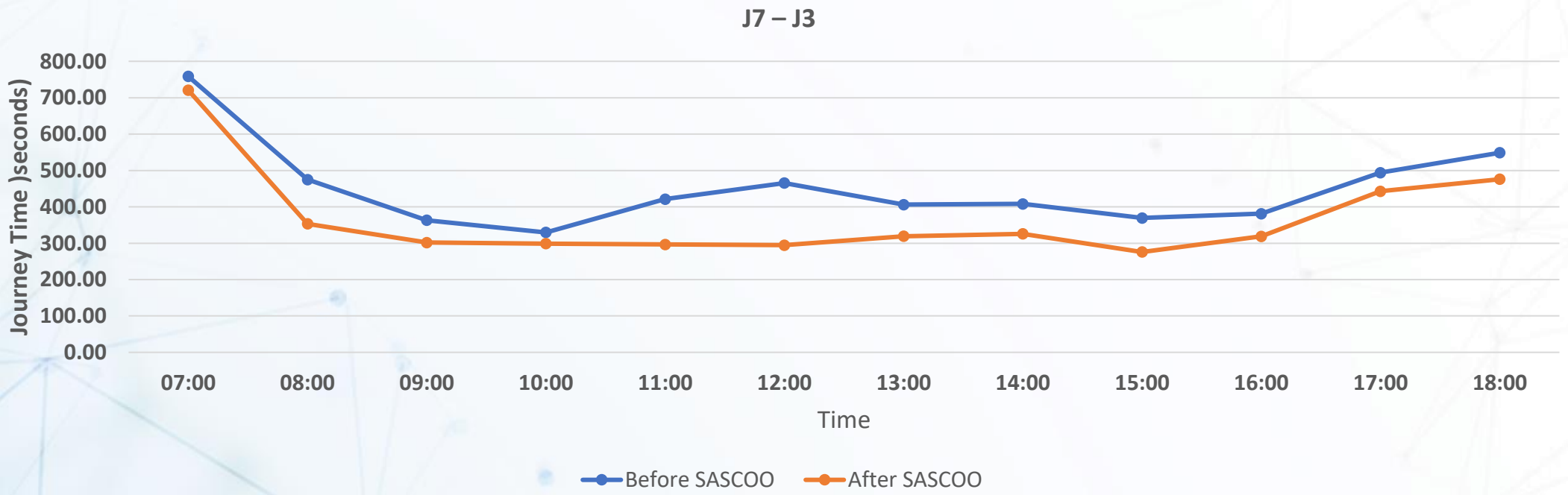
However, J5 Phase 4 need more green time due to heavy traffic, so can't achieve ideal GreenWave



Phase change achieved a better GreenWave Results



Results



TIME		7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00
BEFORE	LP (s)	758.50	474.85	363.09	329.75	421.34	465.37	406.25	408.09	369.28	381.34	494.12	548.72
AFTER	LP (s)	720.70	353.21	301.82	298.82	296.56	294.63	319.14	325.74	275.99	319.05	442.74	476.07
Saved (%)		5%	26%	17%	9%	30%	37%	21%	20%	25%	16%	10%	13%

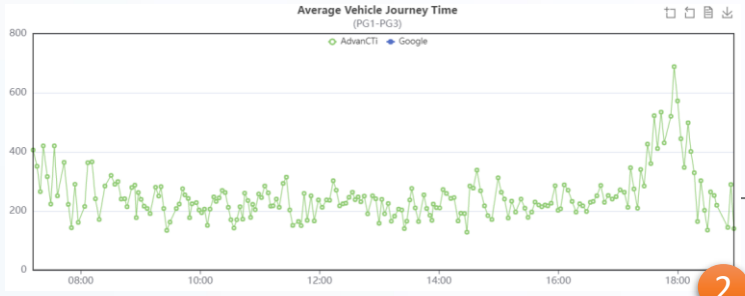
Not significant, due to maximum saturation

>15% journey time reduction at normal period

What we did…

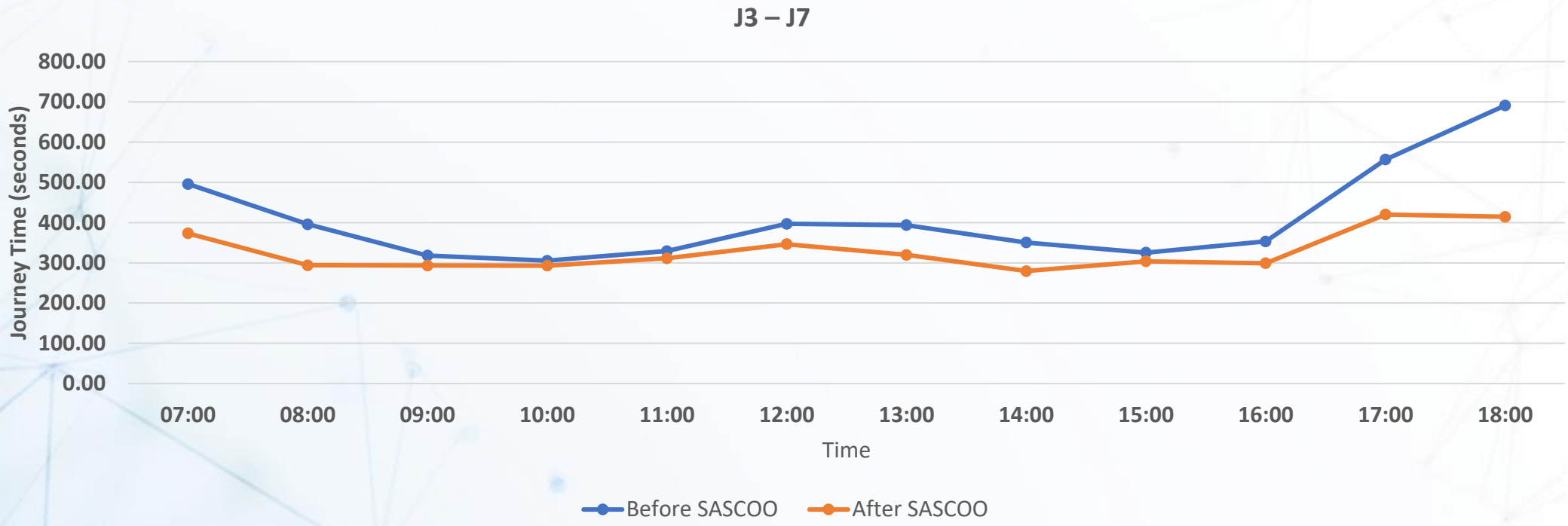
6PM – 7PM | Northbound

1. Implemented coordinated GreenWave during peak and normal time
2. However, there are a phantom traffic scenario between J5 & J6 that might be due to the speed bump



Journey time estimated based on average speed of 50km/h

Results



TIME		7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00
BEFORE	LP (s)	495.69	395.87	318.12	305.40	329.37	396.87	393.77	350.59	325.49	353.26	556.70	691.27
AFTER	LP (s)	373.38	293.96	293.15	292.94	311.29	346.34	319.71	279.44	303.86	298.94	419.90	414.26
Saved (%)		25%	26%	8%	4%	5%	13%	19%	20%	7%	15%	25%	40%

Average >15% journey time reduction at normal period

40% journey time reduction at peak period

More References

1. **Majlis Bandaraya Ipoh x 4 Junctions.** Completed since Jan 2022 (FULL Smart Traffic Solution)

2. **Majlis Bandaraya Mersing x 2 Junctions.** Completed since Mar 2022 (Traffic Data Collection)

3. **Litrak LDP Highway x 1 Junction.** Completed since May 2022 (Traffic Data Collection)

4. **Majlis Bandaraya Pontian x 1 Junction.** Completed since Nov 2022 (Traffic Data Collection)

5. **Majlis Bandaraya Pasir Gudang x 7 Junction.** Completed since Jan 2023 (FULL Smart Traffic Solution)

6. **LATAR Highway x 3 Junction.** To be completed by March 2023 (Traffic Data Collection)

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