PENGEMBANGAN APLIKASI BERGERAK UNTUK MENDETEKSI TINGKAT KEMACETAN LALU LINTAS DAN CUACA DI YOGYAKARTA MEMANFAATKAN GOOGLE MAPS API, OPENWEATHERMAP API, DAN GPS

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AGENDA

- Latar belakang
- Tinjauan pustaka
- Konsep
- Implementasi
- Pengujian dan analisis
- Kesimpulan

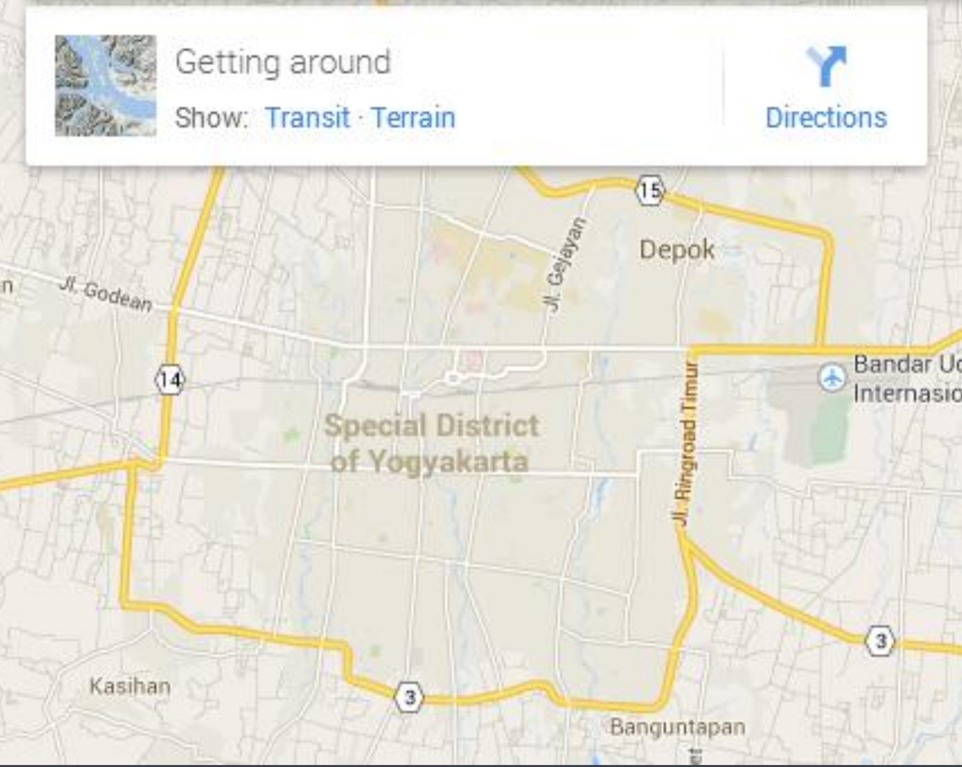
TAHUN **2012**

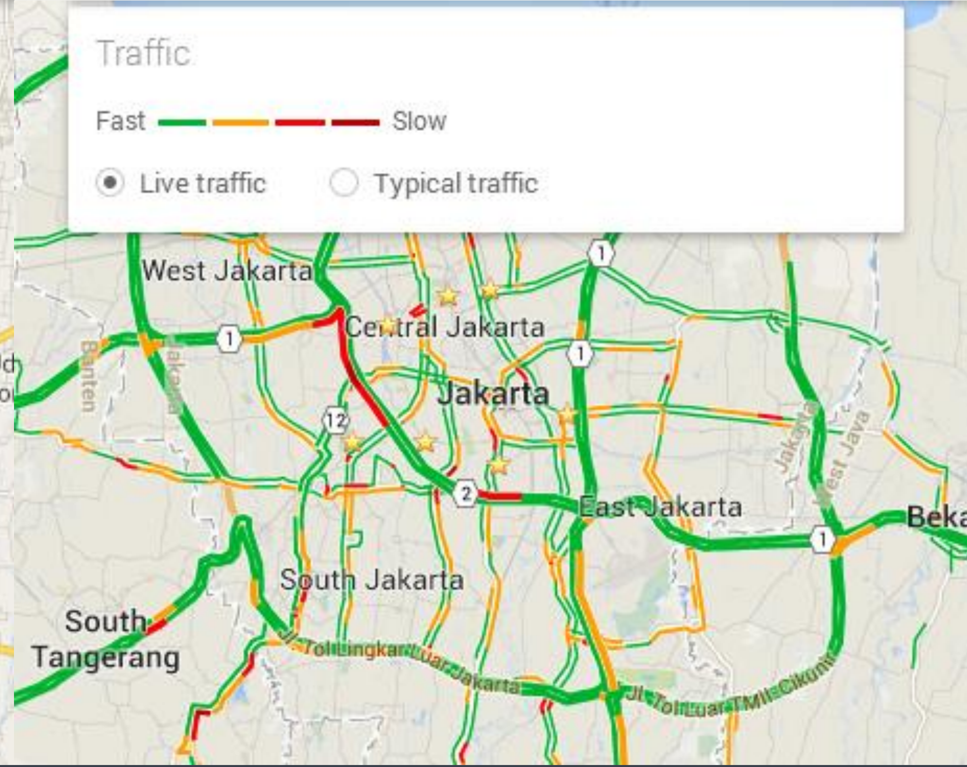
94,373,324

- BADAN PUSAT STATISTIK -

peningkatan jumlah kendaraan > perluasan ruas jalan

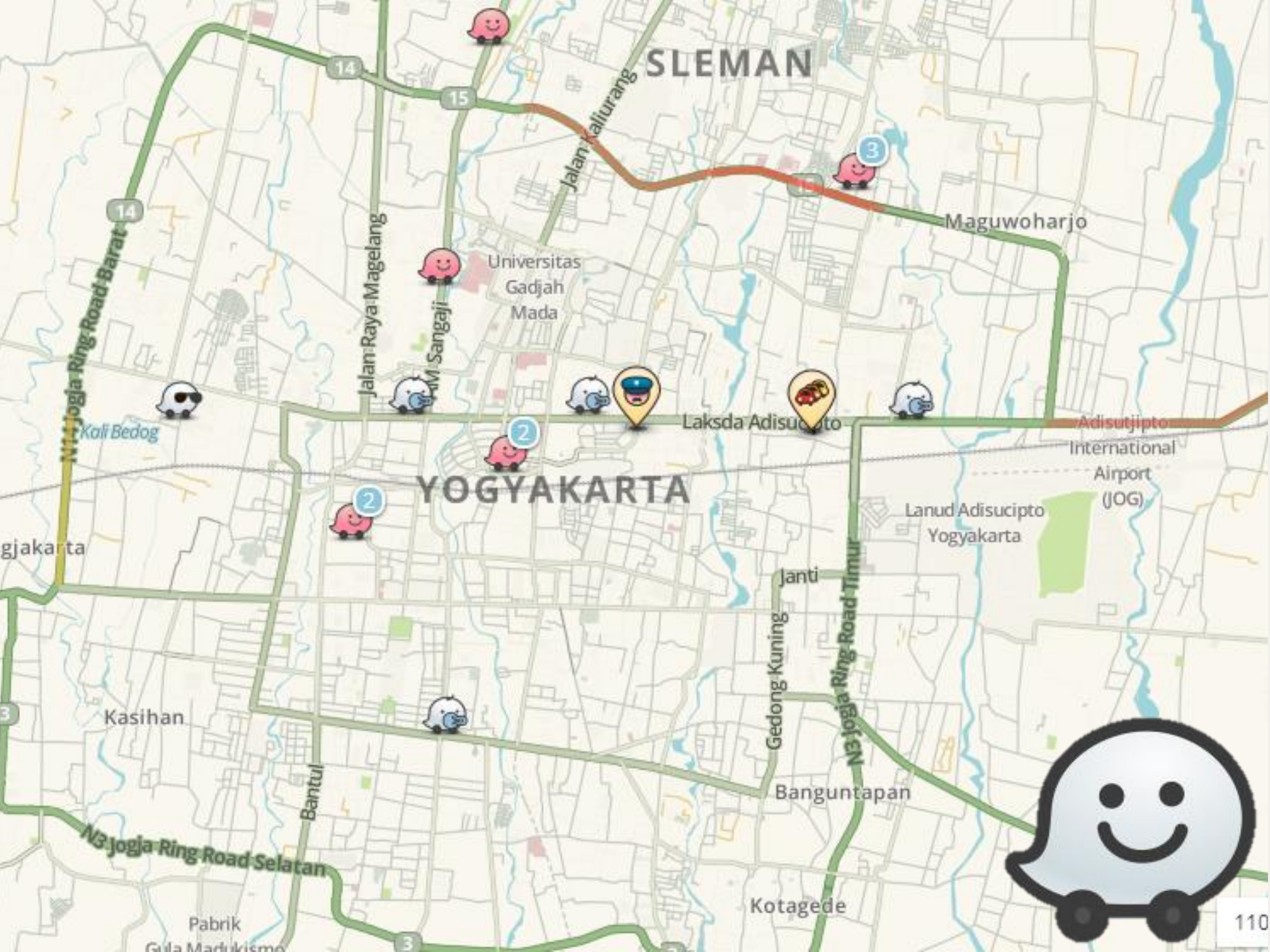
merambat ke **Yogyakarta**


Getting around
Show: Transit · Terrain
Directions
Depok
Jl. Godean
Jl. Gejayan
Bandar Ud
Internasio
Special District
of Yogyakarta
Jl. Ringroad Timur
Kasihan
Banguntapan


Traffic
Fast
Slow
Live traffic
Typical traffic
West Jakarta
Central Jakarta
Jakarta
East Jakarta
South Jakarta
South
Tangerang
Banten

Google Maps


North Jakarta
West Jakarta
Central Jakarta
Jakarta
South Jakarta
South Tangerang
Bekasi
Babelan
Lingkar Luar Timur
Jakarta-Cikampek Toll Road
Jl. Tol Lingkar Luar Jakarta
West Java
Jakarta


SLEMAN
14
15
Jalan Kaliurang
3
14
Maguwoharjo
Universitas
Gadjah
Mada
N14 Jogja Ring Road Barat
Jalan Raya Magelang
JI. M. Sangaji
Kali Bedog
2
Laksda Adisucipto
Adisutjipto
International
Airport
(JOG)
YOGYAKARTA
2
Lanud Adisucipto
Yogyakarta
gjakarta
Janti
Gedong Kuning
N3 Jogja Ring Road Timur
Kasihan
3
Banguntapan
Bantul
N3 Jogja Ring Road Selatan
Kotagede
Pabrik
Gula Madukismo
3

~~buta peta~~

~~cuaca~~

DIBUTUHKAN APLIKASI YANG

algoritma

friendly

cuaca

GPS

Batasan Masalah

YOGYAKARTA

PERSIMPANGAN

~~PERENCANAAN RUTE~~

TINJAUAN PUSTAKA

Google Maps
Waze
LewatMana

REPRESENTASI

tingkat kemacetan dengan

WARNA

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Development of Traffic sensor system with Virtual Detection Zone

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***Abstract*— There are a number of ways to monitor traffic and help people to navigate through or avoid traffic jams. A prospective way is to use smart phones with GPS enabled device as traffic sensors, which complement existing sensors. This paper attempts to highlight a number of progressive steps in the effort to build an integrated ITS, which harnesses smart phones as intelligent agent. However, a number of questions should be addressed first: How smart phones can avoid map mismatching phenomenon which is a common problem in navigation devices ? What if there are compromised agents which attempt to invalidate the gathered data ? and how to place detectors in such a system. Consequently, there are three possible solutions discussed in this paper: the use of non-overlapping zones in Virtual Detection Zone (VDZ), filtering algorithm to ignore compromised agents and the use of macroscopic simulation to aid the placement of VDZ in selected roads.**

I. INTRODUCTION

Vehicle traffic must be monitored or data must be collected before an Urban Mobility Simulator can be designed. Although inductive loop or magnetic loop detector, is a traditional device, it is one of the most accurate count-detectors. Another advantage is its ability to measure car speed per lane and in specific zones accurately. Unlike a video camera it can give a more accurate measurement. In [1], it gave an error rate of 0.1-3% for counting vehicles in a one-hour period on the freeway.

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However, as technology progressed, the corresponding speed difference between the loop data and probe vehicle (using Global Positioning System/GPS enabled phones) data was 1.2 - 3.3%. In fact, experimental field tests have shown acoustic sensors (part of wireless sensor networks) can give an error rate of 1-3%, which is comparable to that of inductive loop detector. Because of the highly intrusive characteristic of inductive loop detectors, the quest for researching a reliable and cost-effective alternative system, which can provide traffic data at the same accuracy level as inductive loop systems, while minimizing the disruption during installation and maintenance, has been underway for some time. The motivation of developing wireless sensor networks based surveillance system is to provide a direct replacement for the inductive loop systems, and extend the coverage of Intelligent Transport System (ITS) applications. For interested readers, references for the theoretical background of both intrusive and non-intrusive technologies can mainly be obtained from [1]-[7].

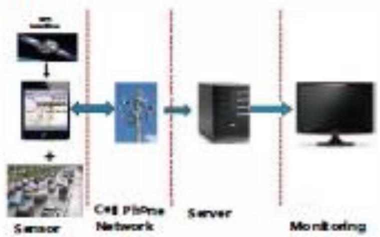

Fig. 1. Sensors in smart phones as part of an integrated intelligent transport system [7].

Fig. 1, shows a proposed integrated ITS [7]-[10], which has been progressively researched and currently is being build. This system enables smart phone carriers, as non-intrusive device, to act like traffic sensor, by having an agent or application which gathers and filters GPS data. This paper will attempt to address three aspects which help in building such a system. They are: Virtual Detection Zone (VDZ) algorithm, filtering algorithm to ignore compromised

"GPS** dapat menghasilkan hasil yang **LEBIH AKURAT."

dengan ERROR RATE sebesar 0.1-3%

Granular Quantifying Traffic States Using Mobile Probes

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***Abstract*— This paper proposes a novel method for detecting traffic congestions, qualifying and quantifying congestion levels using mobile phones as traffic probes. The system provides a robust mechanism for granularly comparing the seriousness of different congested areas. Congested areas are detected in a detailed manner by which exact congested positions are reported. Moreover, congestions can be detected even though no complete traffic trace due to the traffic jam is collected. This feature is quite different from, and makes the system more robust compared to the previous ones. This project also consists of a reasonable vehicle classification method based on only GPS data. This mechanism improves not only the effectiveness and the accuracy but also the scalability, thus the system is flexibly applicable for any traffic system structure, especially in developing countries where a lot of motorbikes are travelling on the roads. The evaluation reveals that the proposed ideas are novel which are not discussed in the existing work.**

Keywords-traffic estimation; mobile phone probes; vehicle classification; quantifying traffic state, real-time traffic data; GPS.

I. Introduction

Traffic jam is a serious social issue in almost every country. It causes economic loss, air pollution as well as other social-related issues. Obviously, this issue becomes more serious in developing countries where the traffic infrastructure has not caught up the transportation demands. Recent years, several researches on Vehicular Technology Systems (VTS) and Intelligent Transportation Systems (ITS) are dedicated for finding suitable solutions aiming at reducing the traffic congestion to be occurred. These studies majorly focus on estimating traffic states, disseminating discovered information to drivers thus help them to avoid from entering congested areas.

Traditional systems relied on road-side fixed sensors to record the times when transponders cross sensors' locations. The sensors might be loop detectors [1], [2], RFID readers [3], [4], etc. The essential drawbacks of these systems are their coverage limitation and their sensitiveness to errors and malfunctioning. To solve these drawbacks, on-board devices should be utilized. One may employ ad-hoc networks which includes wireless sensors equipped on vehicles [5], or utilize GPS receivers equipped on navigation systems [6], [7], [8], [9], [10]. However, these systems required costly devices equipped on each vehicle and ad-hoc networks may not work properly when the density of vehicles is inadequate.

Nowadays, with the advance of the mobile technology, mobile phones are investigated to be utilized as traffic probes recording real-time traffic data for the traffic estimation [11], [12], [13], [14]. This approach might help to solve the issues such as the coverage limitation, the real-time effect, the installation and maintenance cost, tec., since mobile phones are available everywhere. Nevertheless, several issues emerging from this technology are not thoroughly solved in the existing work. This paper aims to propose solutions for following essential issues: *1) the issues on vehicle classification (e.g. motorbike, car, bus, truck,...) to improve the effectiveness and the accuracy of the traffic estimation; 2) the issues on granularly detecting congestion areas without waiting for the traffic trace data; and 3) the issues on quantifying traffic states for evaluating congestion levels*. As our best knowledge, no reliable method utilizing GPS data to quantify the traffic states in a detailed level was proposed. This work proposes a robust mechanism for granularly quantifying traffic states into continuous values, hence even the slightly different traffic states can also be recognized and granularly comparable.

The remaining of the paper is organized as follows: Section 2 overviews the related work. An overviewed architecture of the proposed system is described in section 3. Section 4 summaries the challenges in traffic estimation using mobile probes and briefly discusses the proposed solutions. Section 5 describes the novel model for qualifying and quantifying traffic states. The evaluation is presented in section 6, and section 7 concludes this work.

II. Related Work

VICS (Vehicle Information and Communication System) [15] is one of the well-known systems in Japan that provides real-time road traffic information. This system collects traffic data based on a huge number of fixed sensors of infrared ray, quasi-micro and FM wave techniques. A server at the VICS center processes data to estimate traffic states and distribute the information to the car navigation devices or to the Internet. This system works well but it requires a huge cost for the installation and maintenance. Moreover, it also suffers from the coverage limitation. This work is different, it focuses on utilizing on-board, mobile sensors to improve the coverage of the system and reduce the cost.

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- ✓ KECEPATAN RATA-RATA kendaraan
- ✓ JUMLAH kendaraan

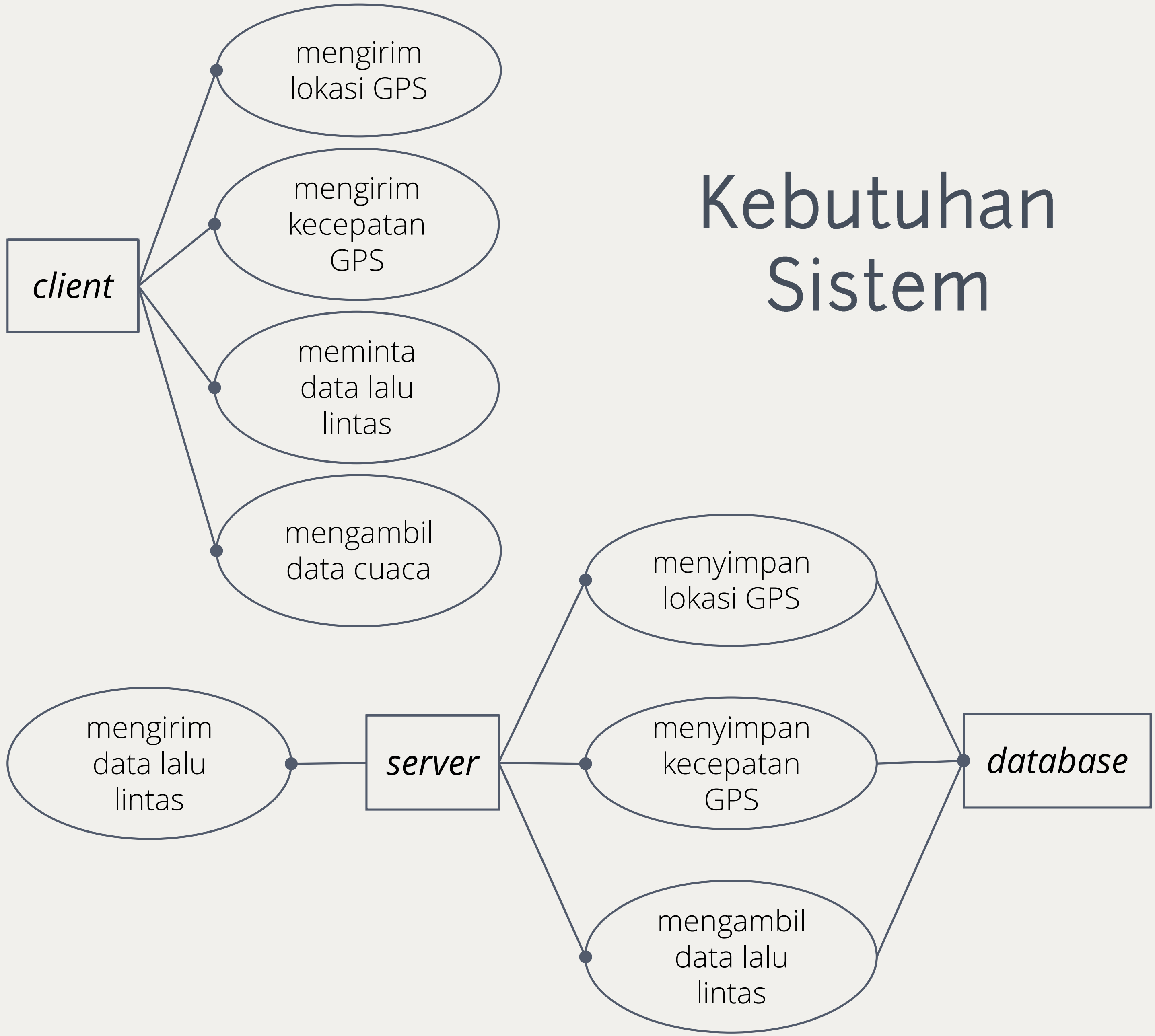
Konsep

crowdsourcing

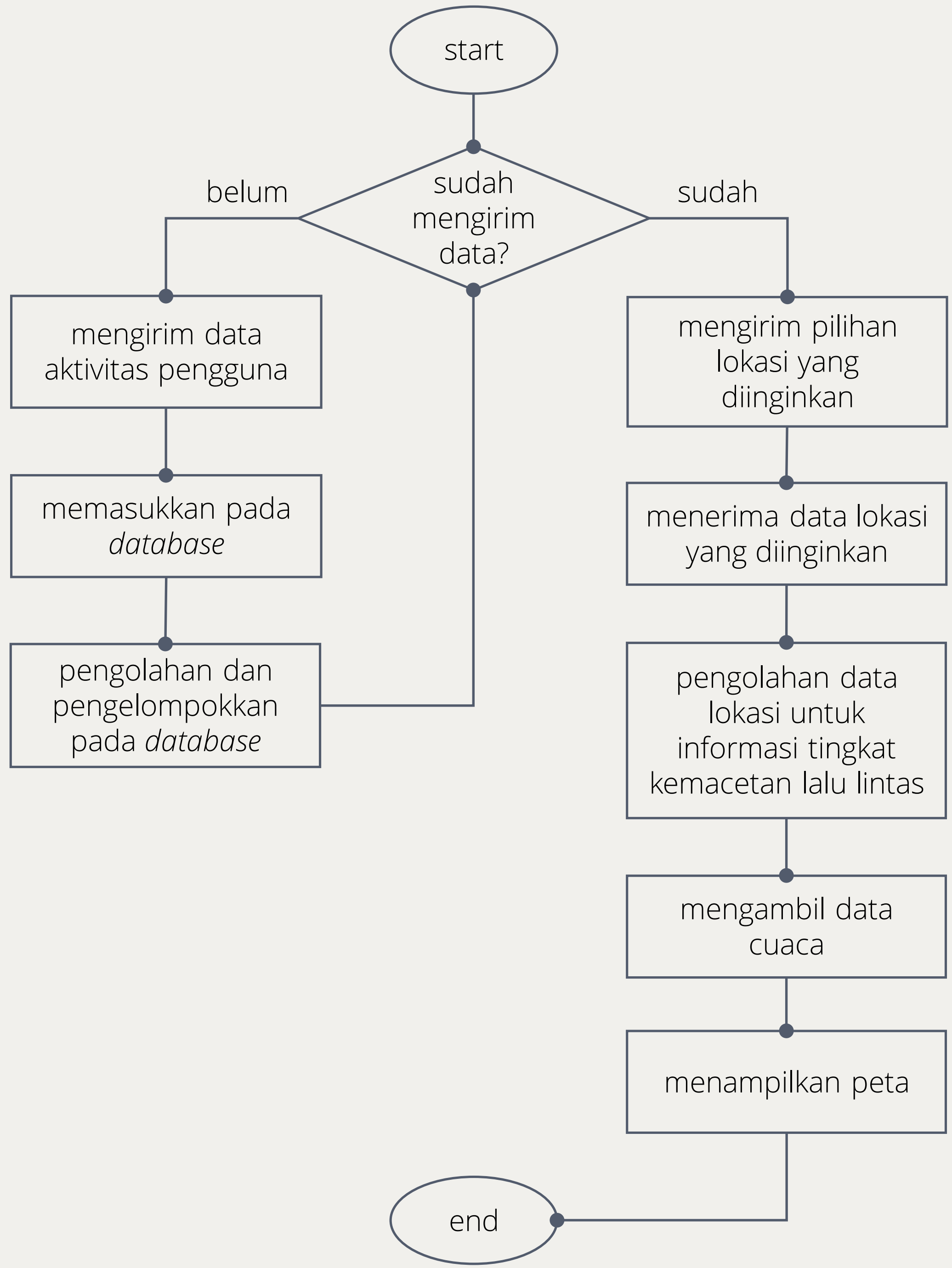
crowd

outsourcing

Kebutuhan Sistem



Perancangan Aplikasi



Implementasi

INISIASI

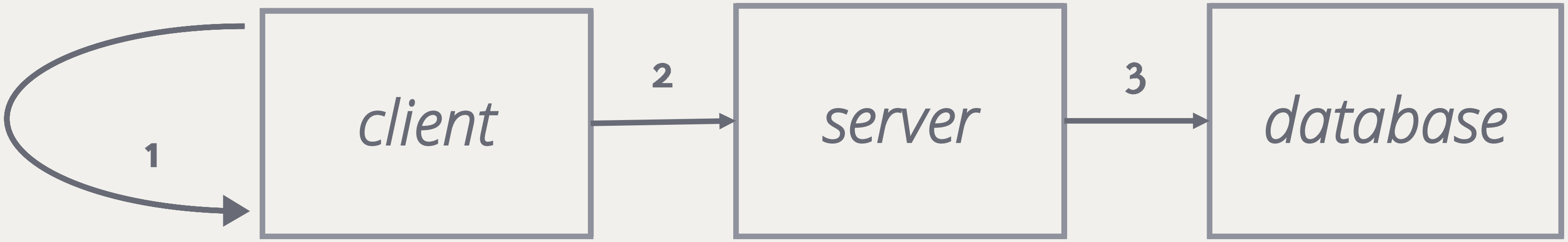
PENGIRIMAN

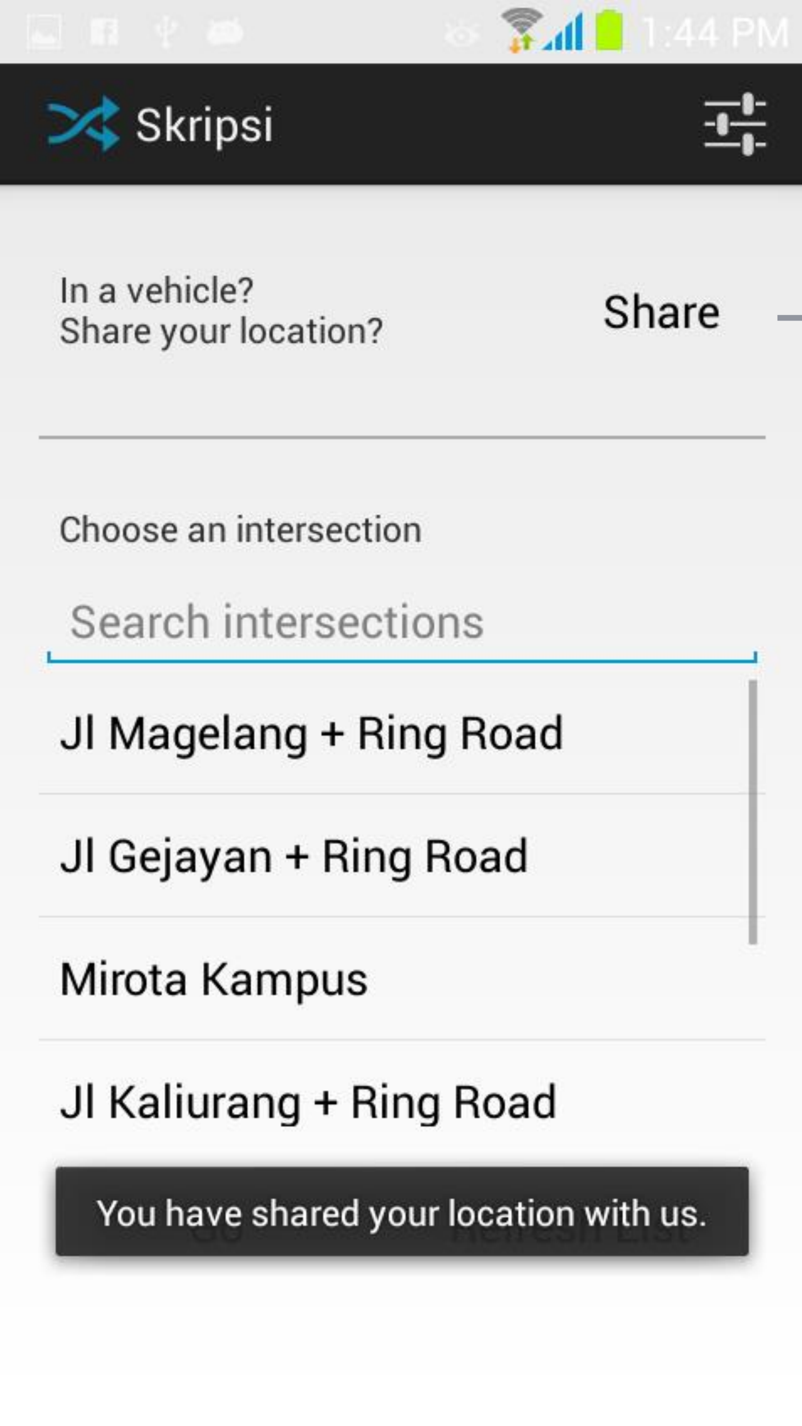
PENGAMBILAN

ANDROID
DEVELOPER
TOOLS

eclipse

PENGIRIMAN DATA GPS PIRANTI BERGERAK





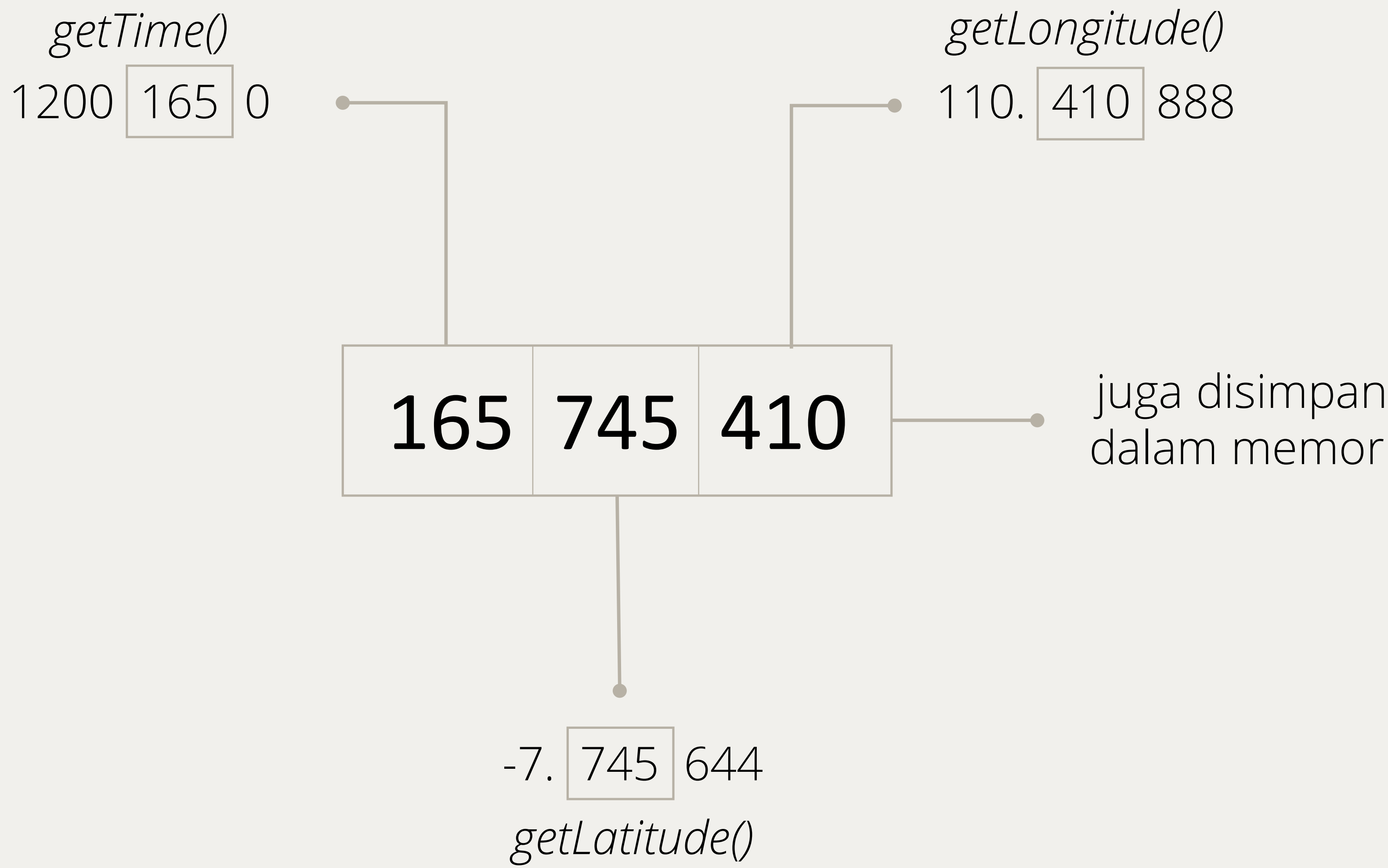
LocationManager.GPS_PROVIDER

getLastKnownLocation( )

getLatitude()
getLongitude()
getSpeed()
getTime()

Perolehan Data GPS

Pembentukan ID



Pengiriman Data GPS

latitude

longitude

speed

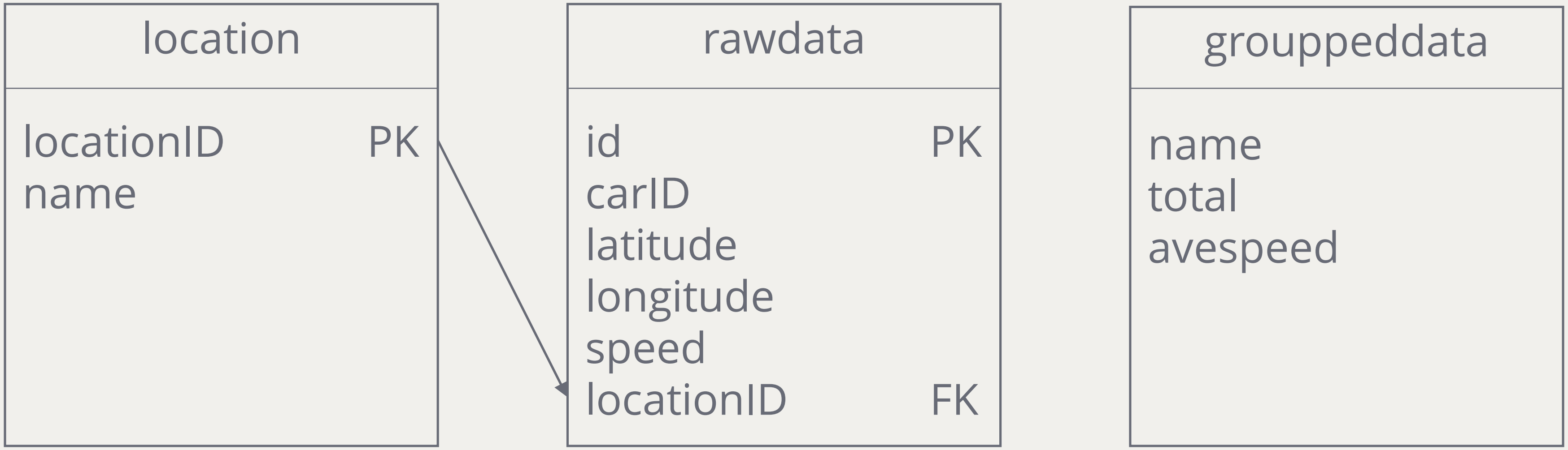
carID

carID lama

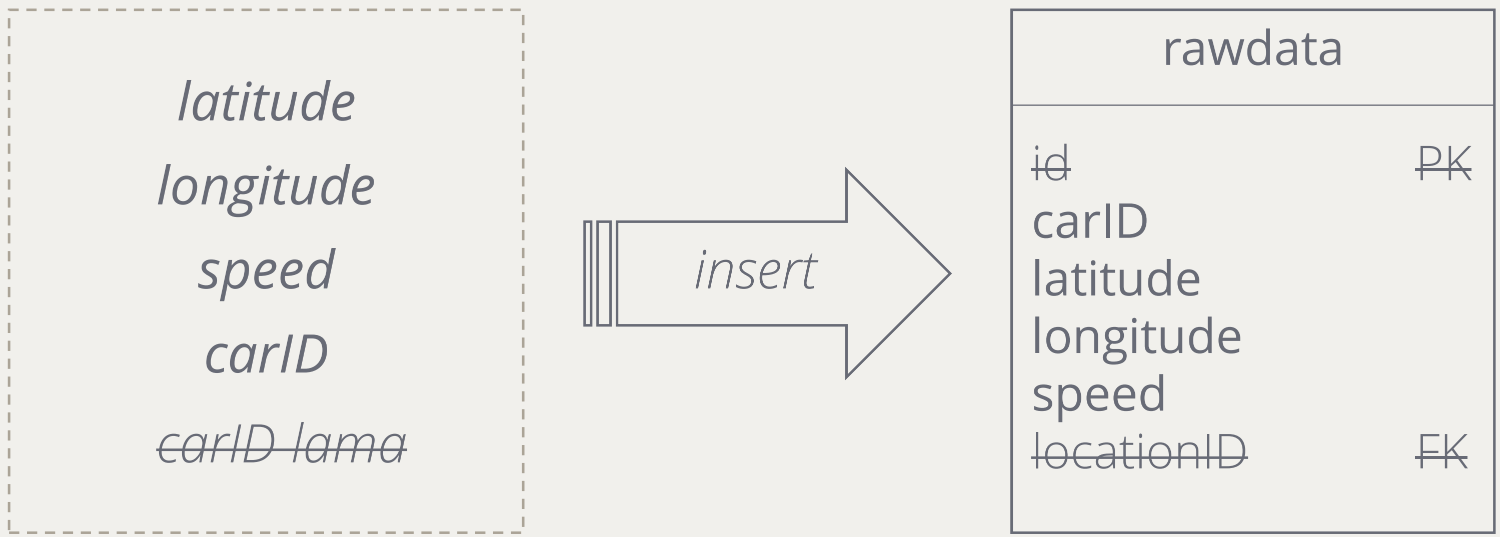
Penyimpanan Data GPS

- ✓ menyimpan data baru
- ✓ menghapus data lama
- ✓ update locationID
- ✓ update view

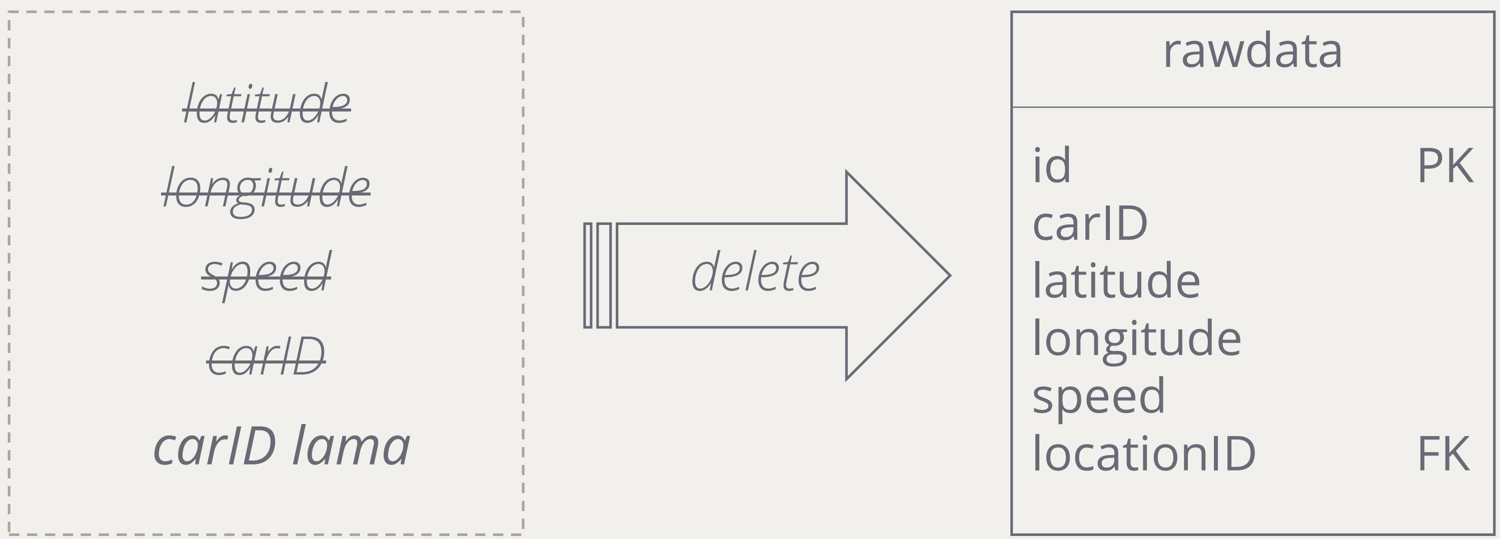
RELATIONAL DIAGRAM



✓ MENYIMPAN DATA BARU



✓ MENGHAPUS DATA LAMA



✓ UPDATE LOCATIONID

rawdata	
id	PK
carID	
latitude	
longitude	
speed	
locationID	**FK**

pengalokasian locationID

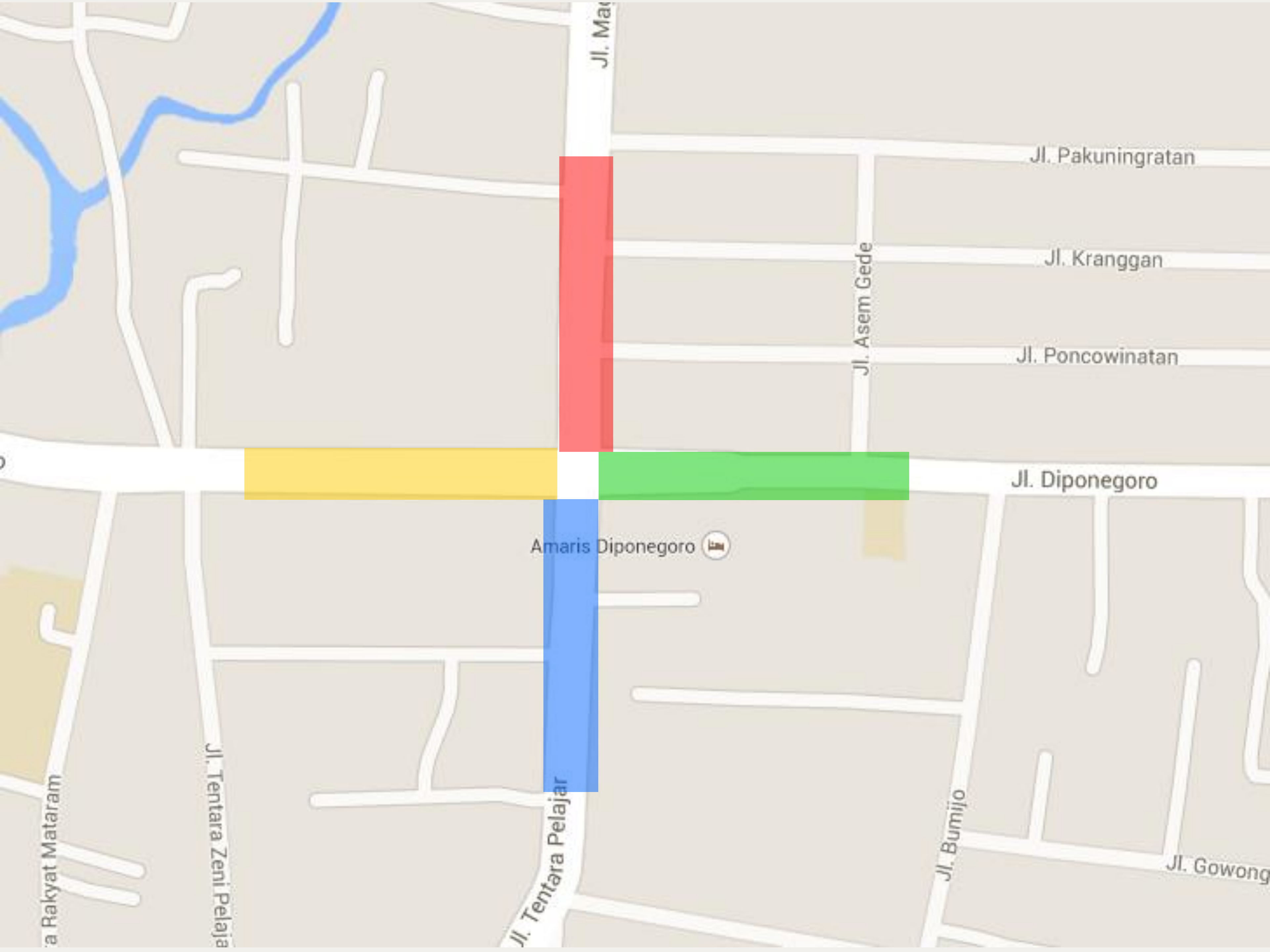
berdasarkan tabel location

TABEL LOCATION

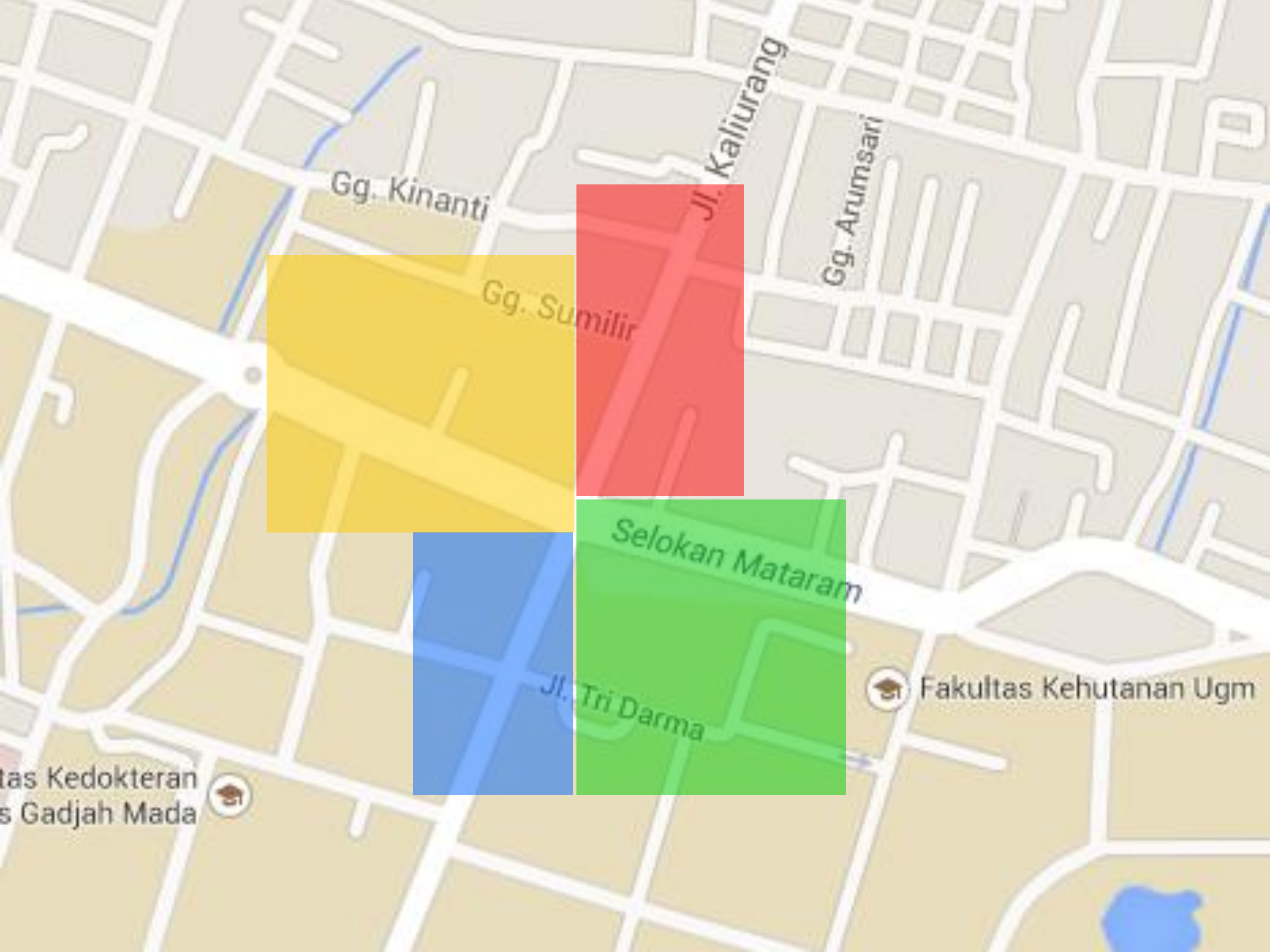
location	
locationID	PK
name	

pengelompokkan berdasarkan

latitude dan *longitude*



Jl. Pakuningratan
Jl. Kranggan
Jl. Poncowinatan
Jl. Asem Gede
Jl. Diponegoro
Amaris Diponegoro
Jl. Tentara Pelajar
Jl. Tentara Zeni Pelajar
Jl. Bumijo


Gg. Kinanti
Jl. Kaliurang
Gg. Arumsari
Gg. Sumilir
Selokan Mataram
Jl. Tri Darma
Fakultas Kehutanan Ugm
tas Kedokteran
s Gadjah Mada

✓ UPDATE VIEW

join antara location dan rawdata

DIKELOMPOKKAN

berdasarkan name

JUMLAH data

pada tiap kelompok

groupeddata

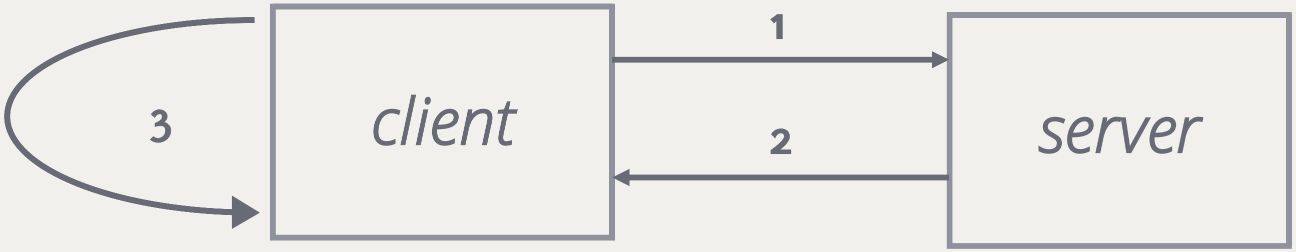
name
total
avespeed

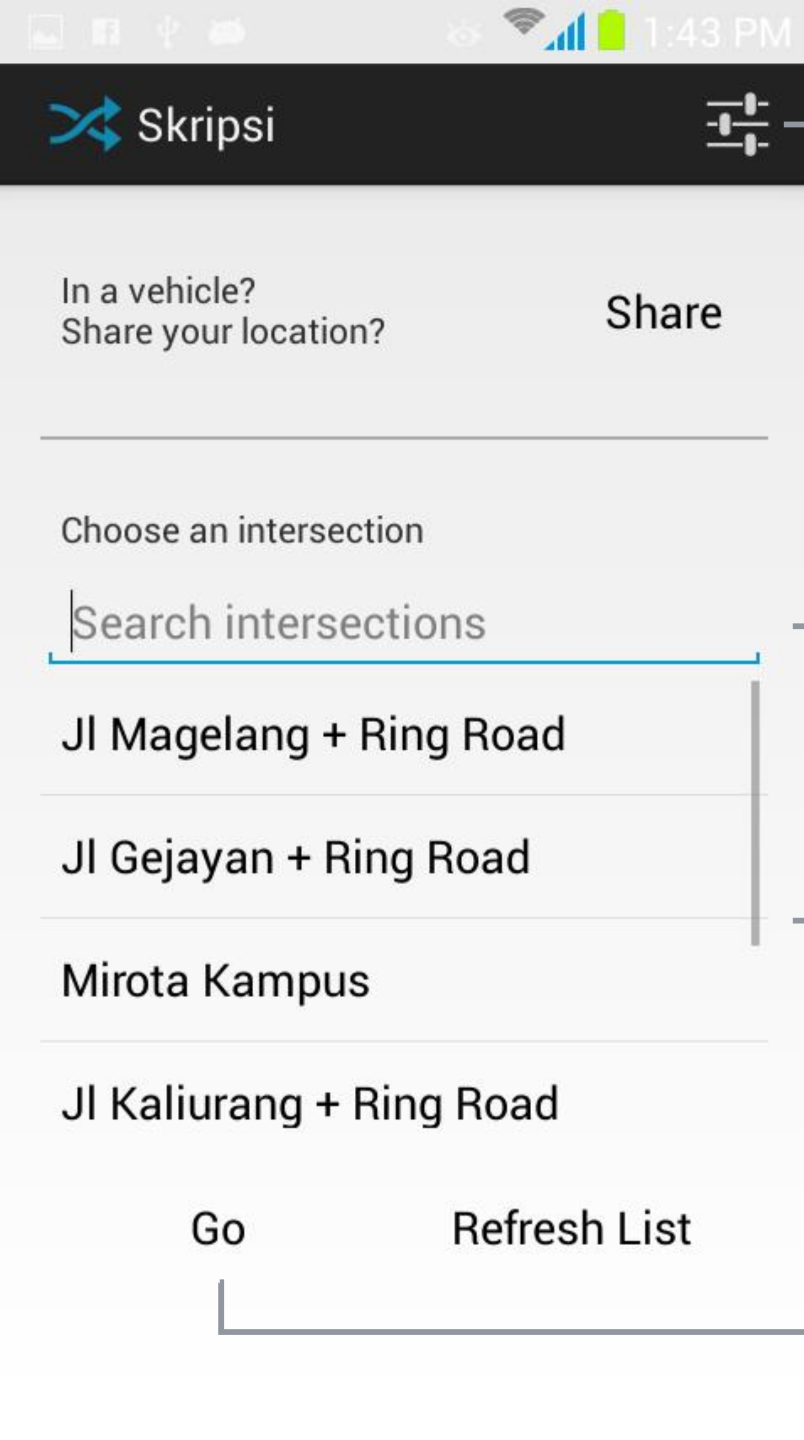
RATA-RATA

data kecepatan

pada tiap kelompok

PENGAMBILAN DATA GPS PIRANTI BERGERAK





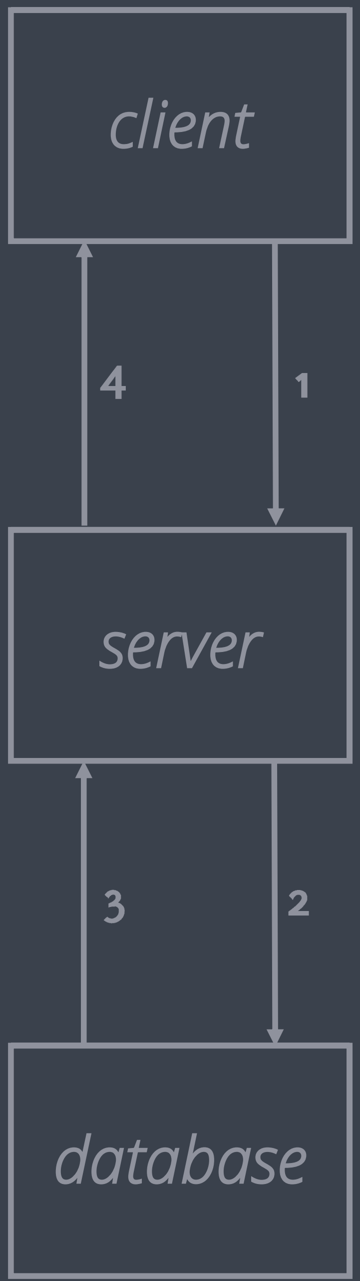
Pengiriman Request

fitur favorites

fitur search

pilihan disimpan

pilihan dikirimkan



Pelayanan Request

pilihan DITERIMA

query basis data DIEKSEKUSI

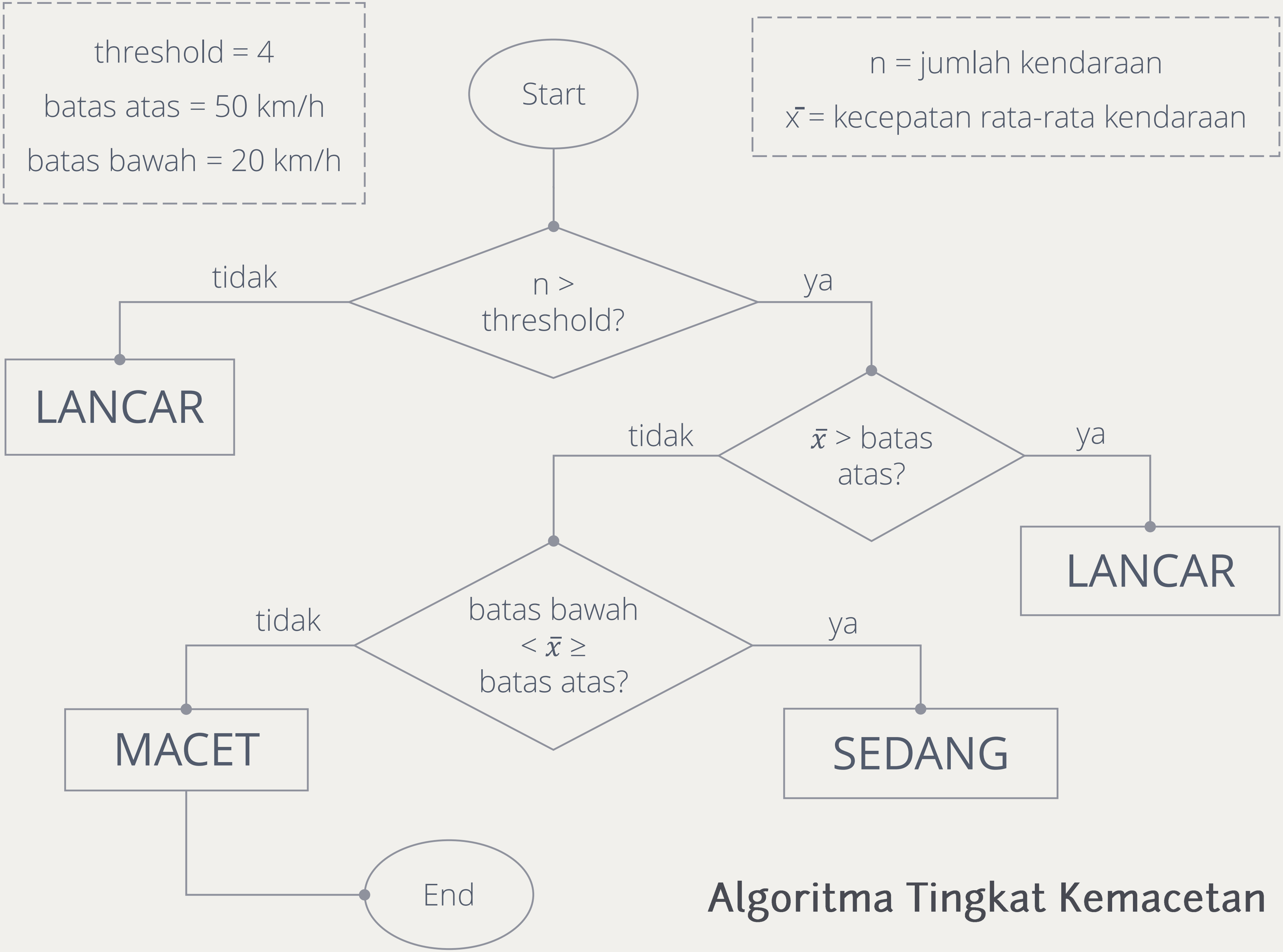
query ini mengambil data dengan nama lokasi yang sesuai dengan pilihan

hasil DISIMPAN pada server

DIKIRIM ke client

Penampilan pada Peta

1. algoritma tingkat kemacetan
2. pengambilan data cuaca
3. eksekusi peta

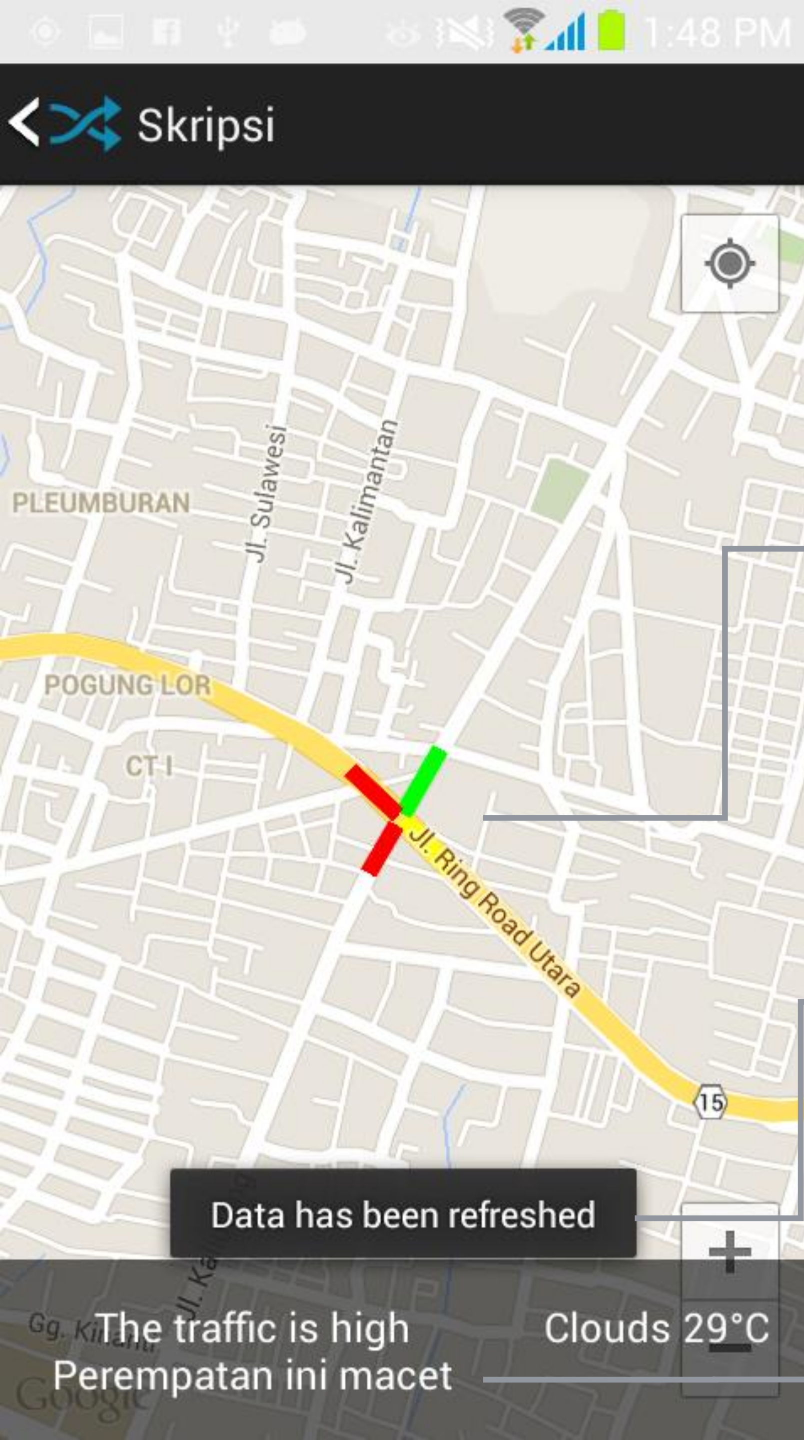


Algoritma Tingkat Kemacetan

Pengambilan Data Cuaca

- longitude dan latitude dari lokasi pilihan DIKIRIMKAN
- data DIPEROLEH
- keadaan cuaca dan suhu DISIMPAN

Eksekusi Peta

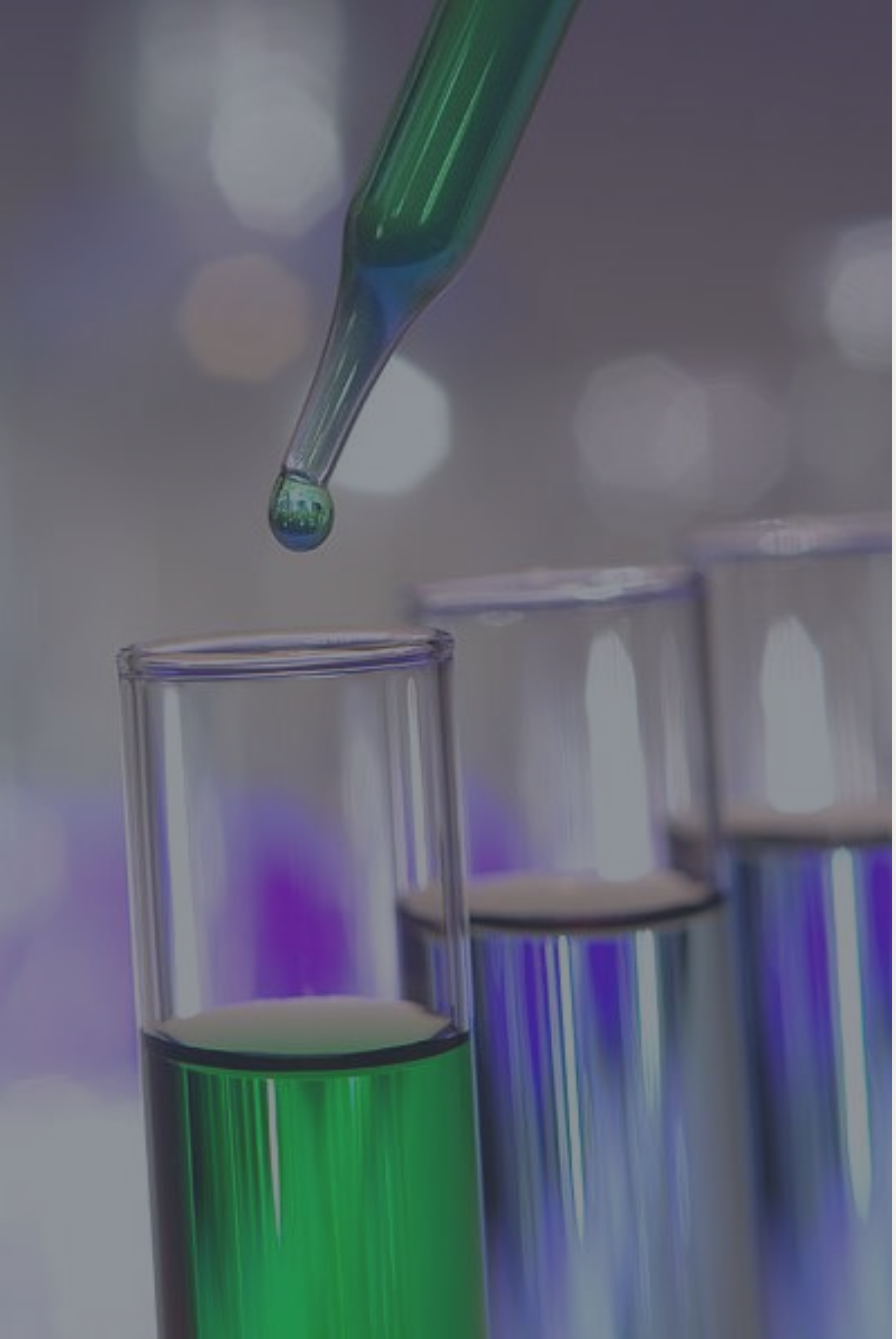


lancar = garis hijau
sedang = garis kuning
macet = garis merah

data telah diambil ulang

keadaan cuaca dan suhu

tingkat kemacetan



Pengujian Aplikasi

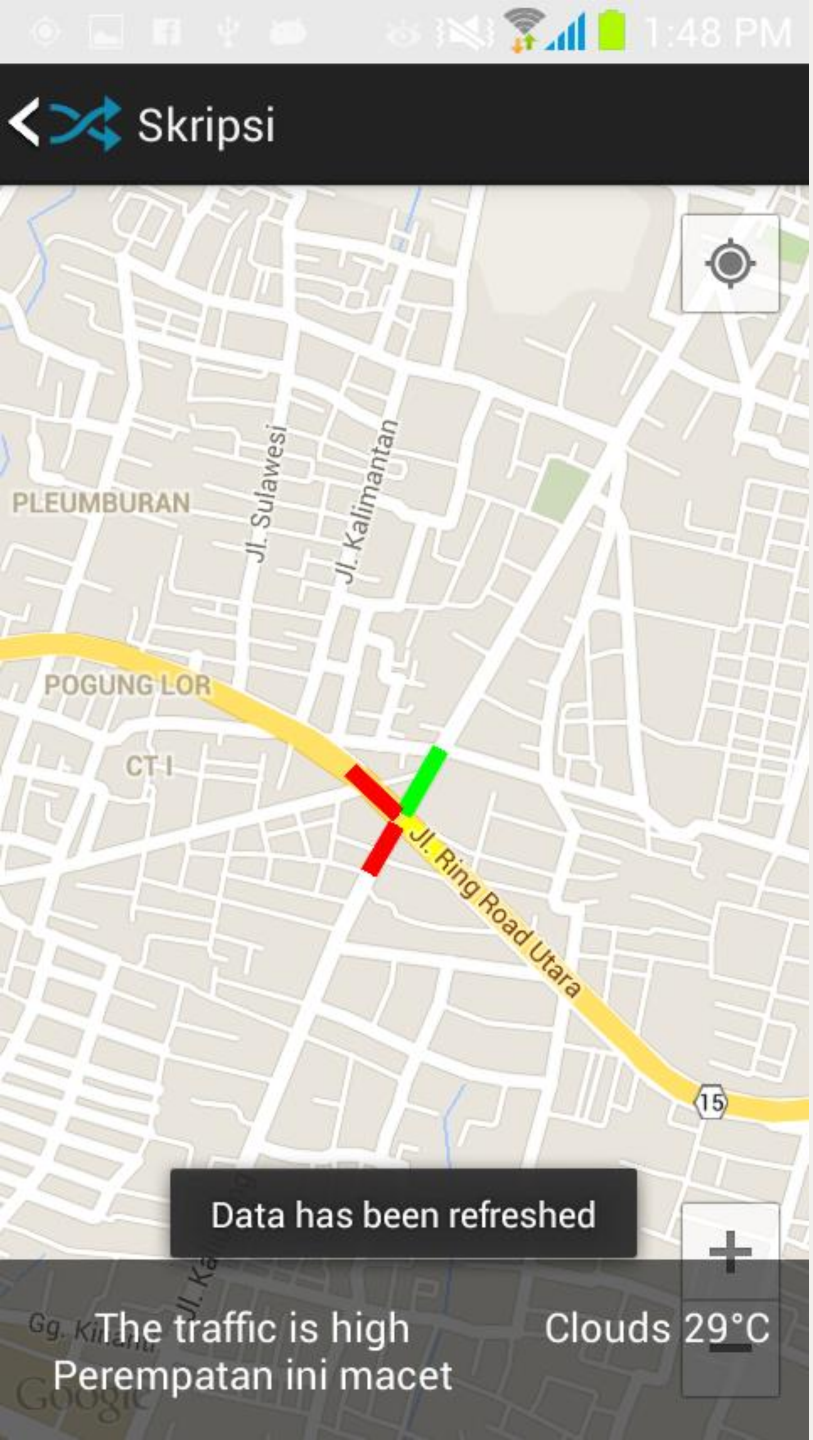
Pengiriman data GPS dari beberapa lokasi.

Pengaksesan data kemacetan lalu lintas di beberapa lokasi.

Pengiriman Data GPS dari Beberapa Lokasi

id	carId	latitude	longitude	speed	locationID
434474	123775374	-7.775824	110.374431	32.5	6
434475	102770377	-7.770519	110.377712	21.2	25
434476	165745410	-7.745644	110.410888	0	25

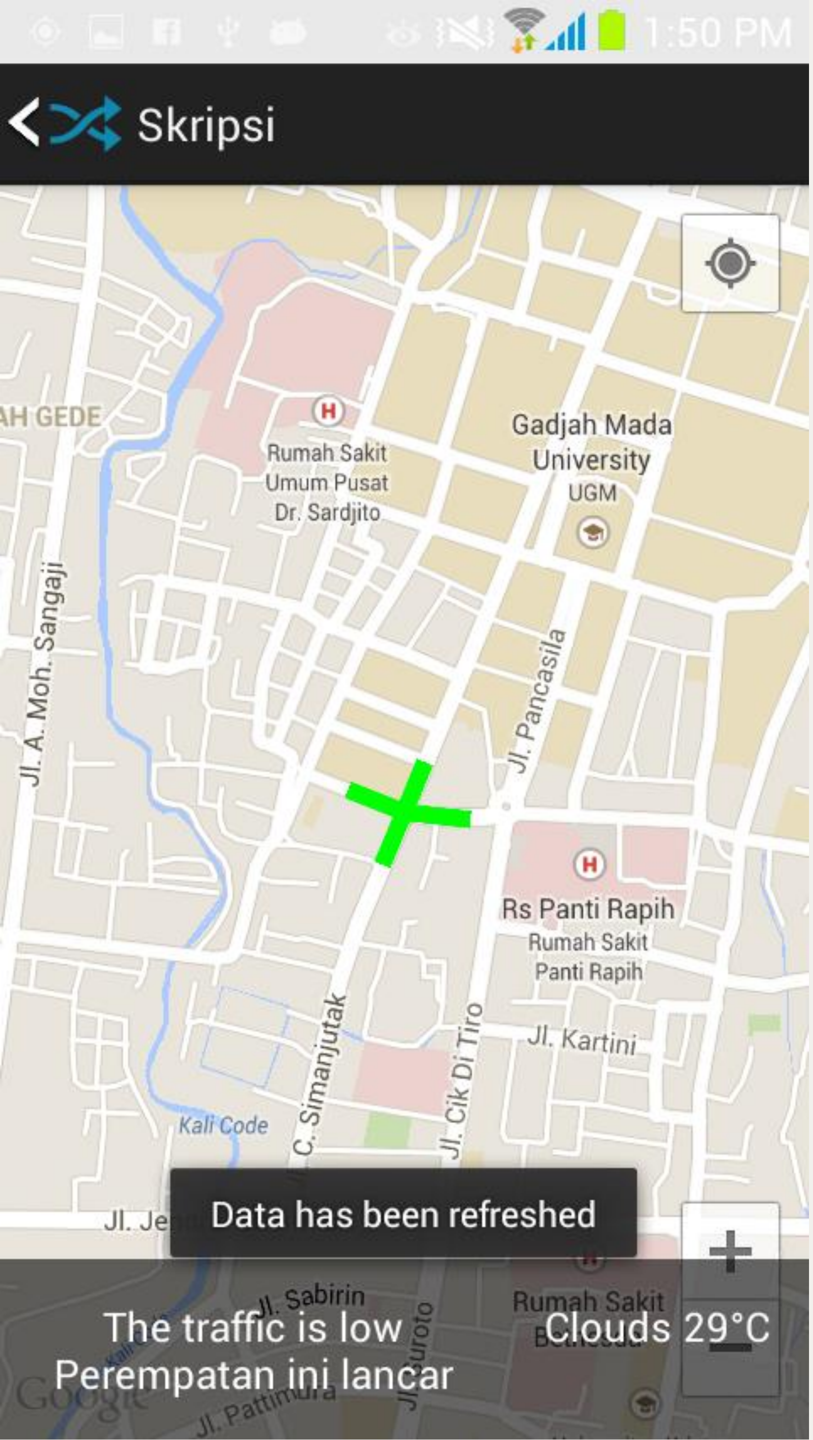
- persimpangan Mirota Kampus
- depan Perpustakaan Pusat UGM
- rumah peneliti (diam)



Pengaksesan Data Kemacetan Lalu Lintas di Beberapa Lokasi

persimpangan Jl. Kaliurang dan Ring Road

name	total	avespeed
jakalE	5	35
jakalN	2	42.5
jakalS	7	16.99285714285714
jakalW	5	15.6



Pengaksesan Data Kemacetan Lalu Lintas di Beberapa Lokasi

persimpangan Mirota Kampus

name	total	avespeed
mirotaE	3	26.833333333333332
mirotaN	1	60
mirotaS	4	15
mirotaW	2	37

Kelebihan

- Mengetahui tingkat kemacetan di Yogyakarta.
- Antisipasi pengguna buta peta.
- Ukuran file sebesar 2 MB.

Keterbatasan

- Daftar lalu lintas masih terbatas.
- Penambahan daftar lalu lintas masih *manual*.
- Masih menggunakan data *dummy*.
- Belum siap untuk *client* yang banyak.

Kesimpulan

- Algoritma dapat menentukan tingkat kemacetan.
- Dapat memanfaatkan Google Maps API.
- Dapat memanfaatkan OpenWeatherMap API.
- Dapat memanfaatkan GPS.

"Time is FREE, but it's PRICELESS.
Once you've lost it,
you can NEVER get it BACK."
— Harvey MacKay