Case Study
Identifying Mobility Pattern in Public Transport

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Bus Rapid Transit

eTicketing with electronic money integration as part of **sustainable transport system, and developing effective, accountable and transparent transport operators.**. Features including Fleet Management Mobile Apps for Passenger, Display Info System on-Bus and in-Shelter

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

11 SUSTAINABLE CITIES AND COMMUNITIES

Smart Transportation

Transportasi

Trans Jogja

- 600K Monthly Transactions
- 4 e-Money Issuers
  - 2 Native Card
  - 2 Concession Card
- 112 Gate on Shelter
  - 74 Tap on Bus Validator

Trans Jakarta

- **10M** Monthly Transactions
- **6** e-Money Issuers
- **224** Shelters
  292 Access Gate
  12 Lanes

Batik Solo Trans

Trans Pakuan Bogor

Trans Sarbagita

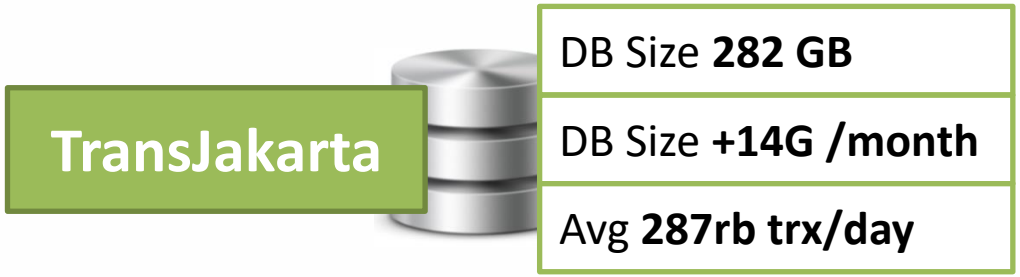
Trans Kendari

820 Payment Device Terminals

24% of national e-Money Transaction Share

The Problem

- Earlier days, evaluating the performance of busway corridors were done manually, one of them were using surveys to the passengers
- Processing each pairing transactions to produce origin/destination matrix were also done manually
- Limited analysis due to the large transaction data and manual processing



** Data as of April 2016*

The Needs

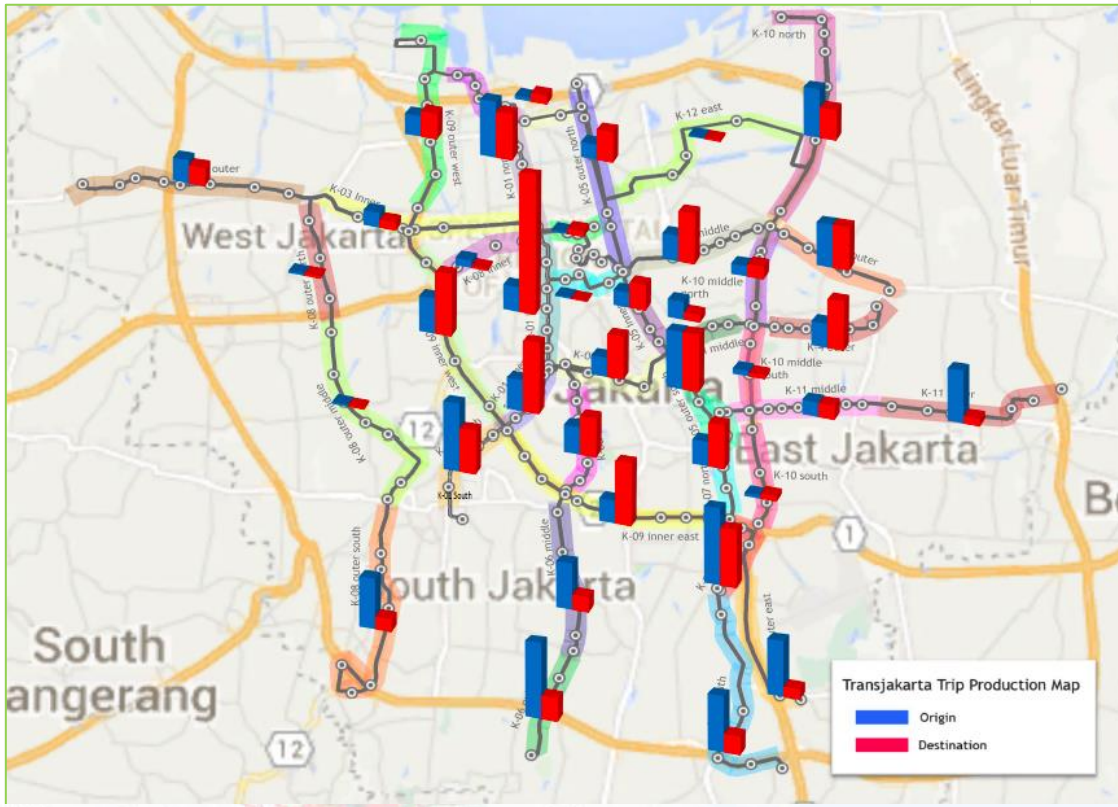
- *Origin/Destination (O/D) Matrix*, a two dimensional table summarizing pairing transaction, transaction at the origin and at the destination.

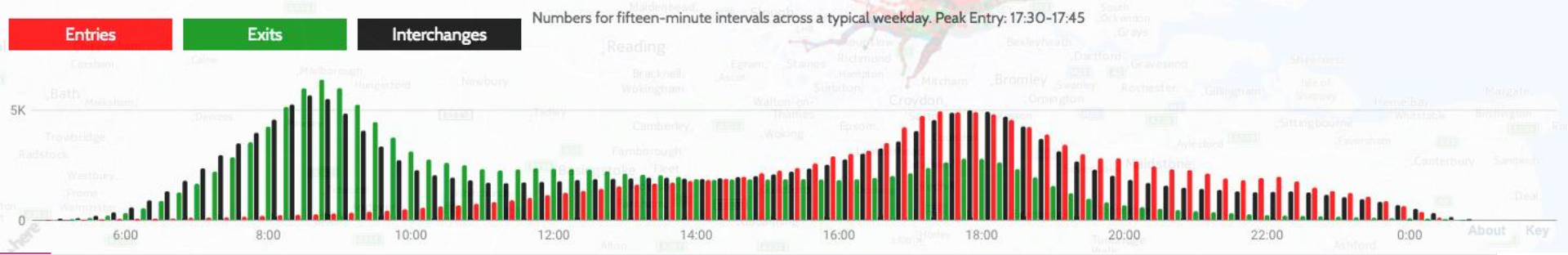
TUJUAN / ASAL	KOR_1	KOR_2	KOR_3	KOR_4	KOR_5	KOR_6	KOR_7	KOR_8	KOR_9	KOR_10
1	27,238	3,074	4,859	3,259	2,299	3,394	1,315	3,169	3,472	763
2	2,971	3,200	3,108	273	1,427	359	470	1,526	632	798
3	5,075	2,547	7,528	429	1,375	688	664	3,089	2,012	409
4	3,447	254	383	5,729	1,289	2,643	616	497	878	1,000
5	2,111	1,293	1,317	1,198	6,780	665	2,973	905	1,116	683
6	4,049	474	660	2,004	746	10,911	524	1,349	2,960	254
7	1,833	704	772	789	3,565	807	2,731	981	3,682	2,590
8	2,689	1,126	2,840	392	864	1,172	665	8,356	3,003	237
9	3,789	645	2,019	796	1,361	2,310	2,472	3,669	15,124	1,337
10	1,010	839	435	1,167	808	274	1,545	302	1,423	4,731
11	388	183	179	181	1,519	95	842	154	335	704
12	883	125	249	102	514	112	160	208	294	370
13	299	107	91	73	203	567	262	117	730	366

The Needs

- **Spatial Trip Generation**, vizualize the volume of *production* dan *attraction* in the map for each location (shelter, sub-corridors, corridors).

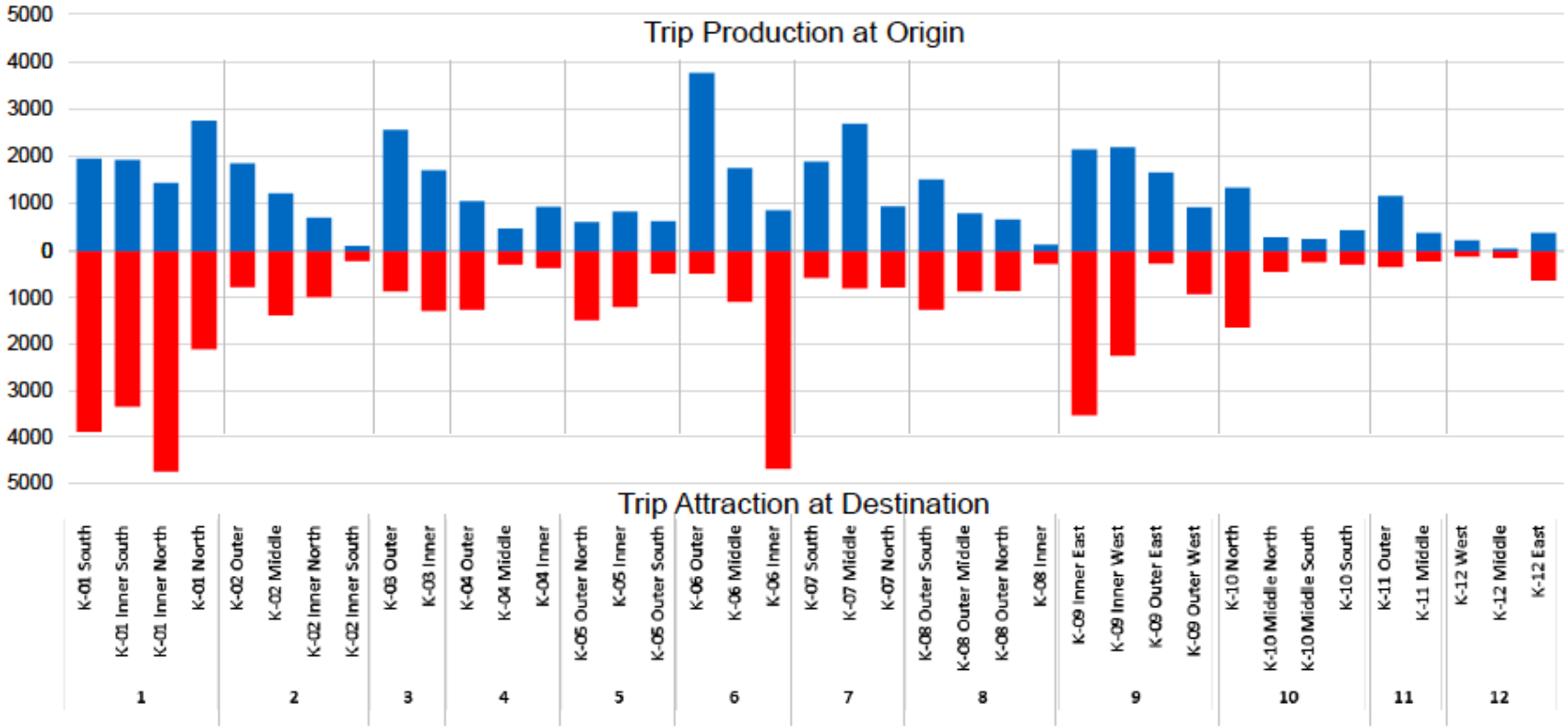
- The activity pulse (entry and exit) in each locations (shelter)





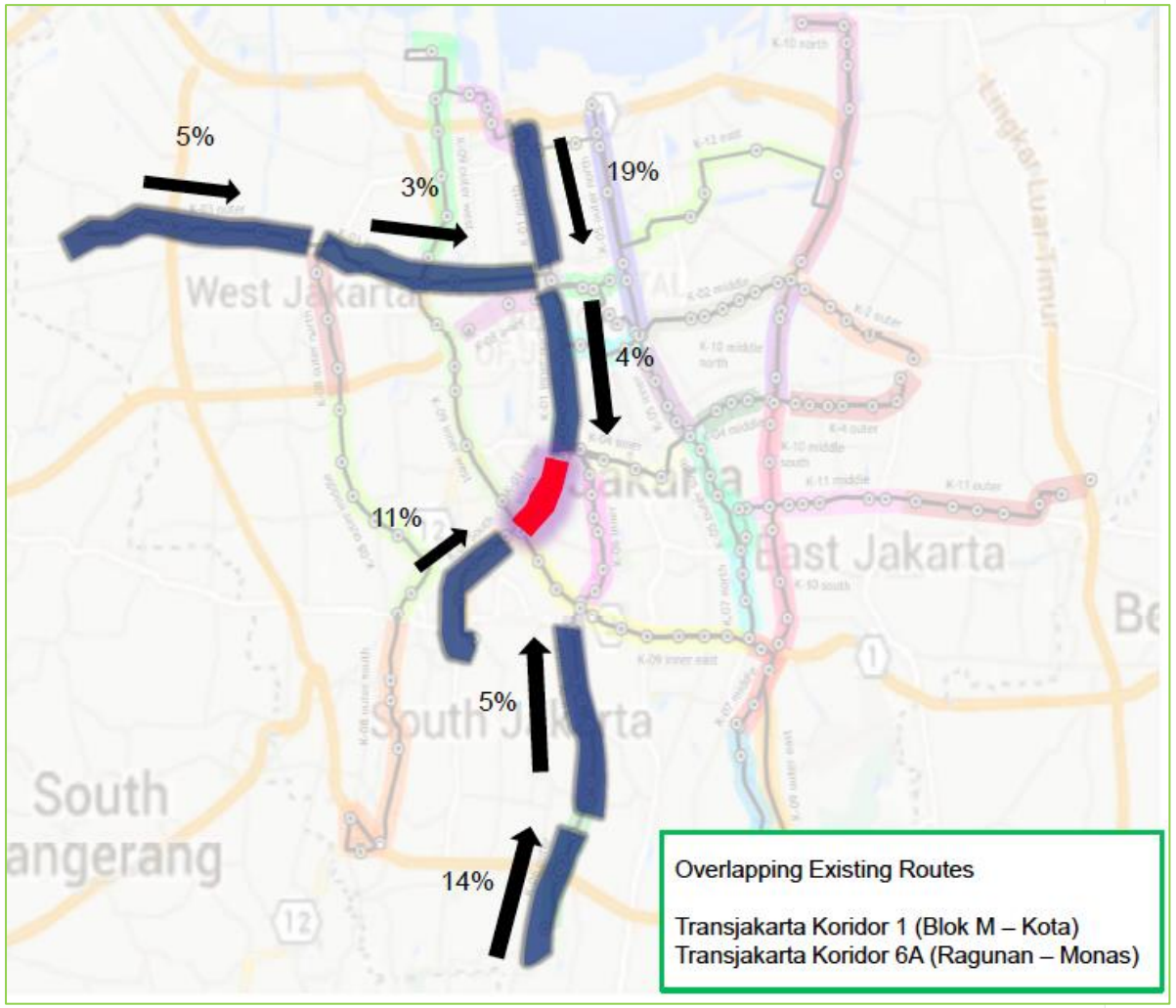
The Needs

- **Trip Generation Summary**, showing the summary of jumlah *production* dan *attraction* in each location on certain time periods.



The Needs

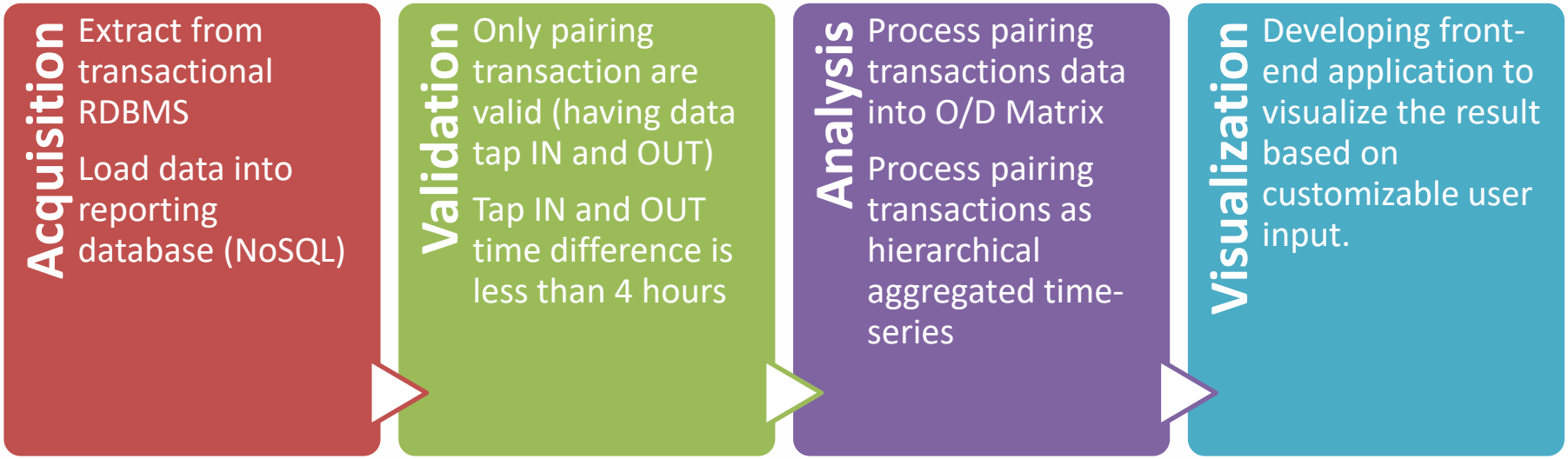
- **Passenger Flow**, showing the percentage of passenger's origin heading to certain destination.



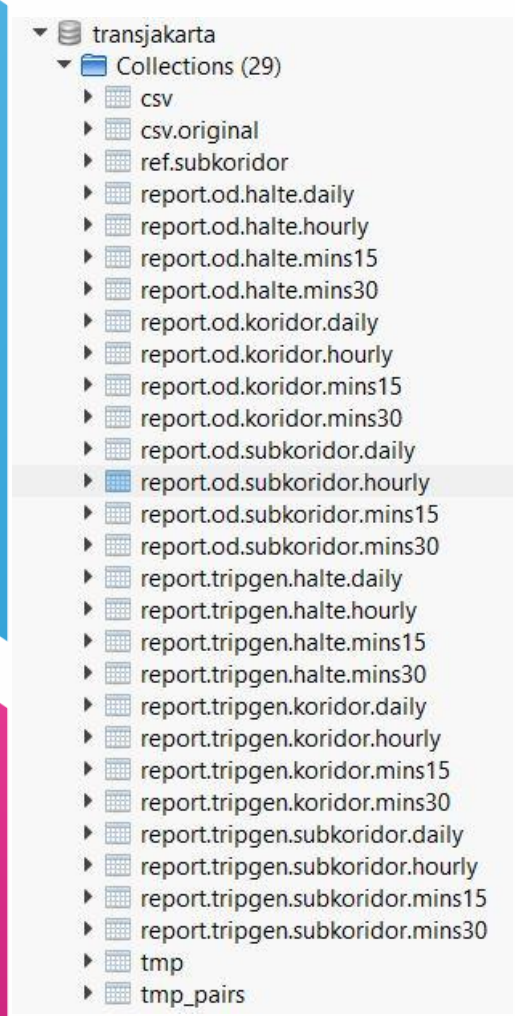
Transaction Data

- Tap IN: timestamp and location
- Tap OUT: timestamp and location

The Steps


Acquisition
Extract from transactional RDBMS
Load data into reporting database (NoSQL)
Validation
Only pairing transaction are valid (having data tap IN and OUT)
Tap IN and OUT time difference is less than 4 hours
Analysis
Process pairing transactions data into O/D Matrix
Process pairing transactions as hierarchical aggregated time-series
Visualization
Developing front-end application to visualize the result based on customizable user input.

Hierarchical Aggregated Time Series



db.getCollection('pairs').fi...

My Mongo localhost:27017 transjakarta

```
db.getCollection('pairs').find({})
```

pairs 0.002 sec.

	_id	pan	in_jam	in_koridor	in_halte	out_jam	ou
1	ObjectId("58...	145000100055884	2016-11-16T11:41:05Z	2.0	Juanda	2016-11-16T12:36:25Z	
2	ObjectId("58...	145000100062781	2016-11-16T06:04:54Z	10.0	Penas Kalim...	2016-11-16T06:44:57Z	
3	ObjectId("58...	145000100062781	2016-11-16T19:25:13Z	4.0	Pemuda Rw....	2016-11-16T20:36:43Z	
4	ObjectId("58...	145000100067319	2016-11-16T06:04:13Z	4.0	Sunan Giri	2016-11-16T07:05:03Z	
5	ObjectId("58...	145000100072558	2016-11-16T07:06:14Z	1.0	Masjid Agun...	2016-11-16T07:58:39Z	
6	ObjectId("58...	145000100072558	2016-11-16T17:43:13Z	1.0	Harmoni	2016-11-16T18:41:12Z	
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8	ObjectId("58...	145000100080122	2016-11-16T19:53:38Z	1.0	Tosari	2016-11-16T20:42:07Z	
9	ObjectId("58...	145000100094628	2016-11-16T17:40:03Z	6.0	Kuningan M...	2016-11-16T18:48:00Z	
10	ObjectId("58...	145000100096375	2016-11-16T20:05:59Z	8.0	Central Park ...	2016-11-16T20:31:56Z	
11	ObjectId("58...	145000100103601	2016-11-16T15:29:55Z	3.0	Grogol 1	2016-11-16T16:09:40Z	
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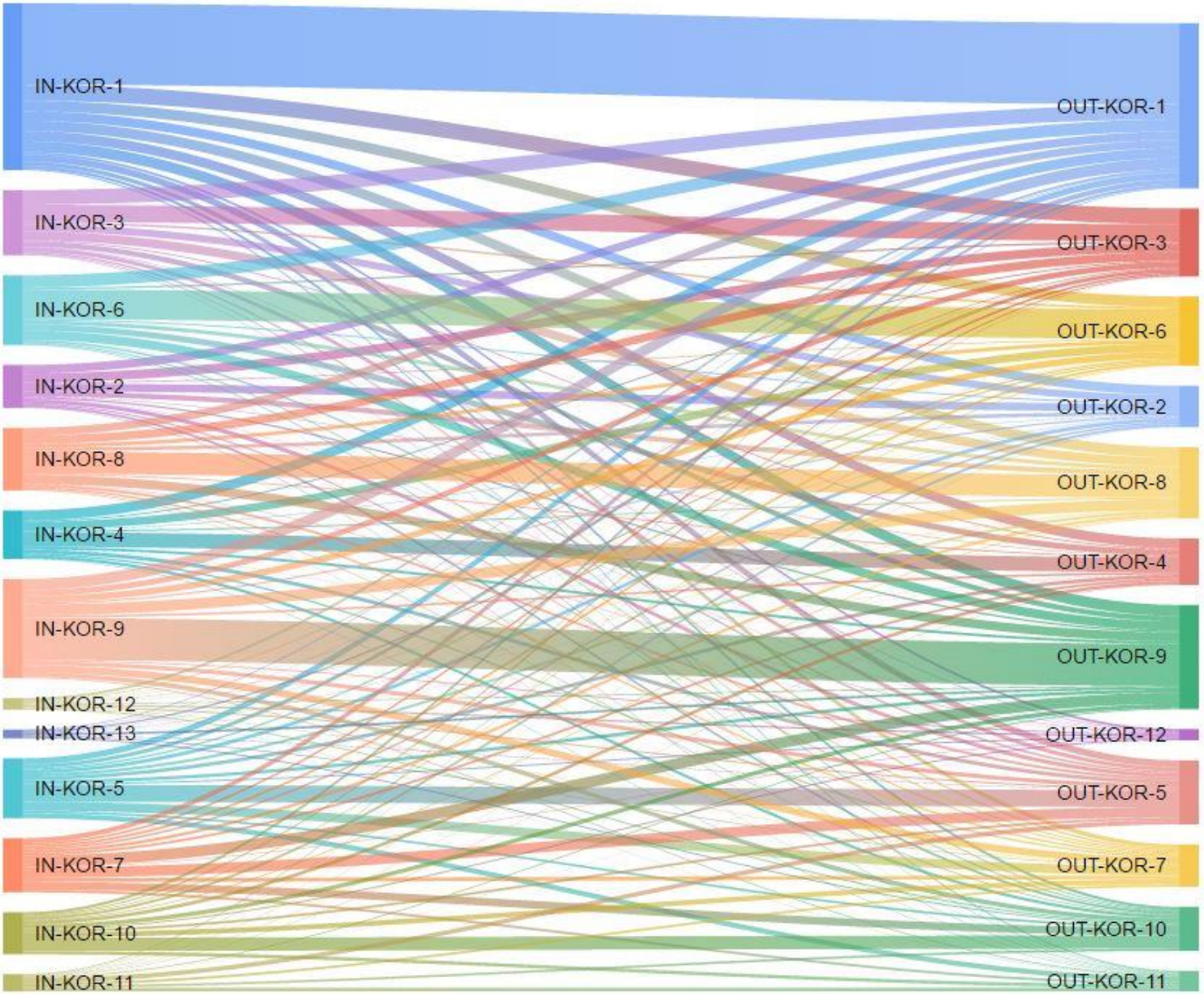
15	ObjectId("58...	145000100151220	2016-11-16T07:21:27Z	2.0	Bermis	2016-11-16T08:22:55Z	
16	ObjectId("58...	145000100151220	2016-11-16T18:56:38Z	1.0	Sarinah	2016-11-16T20:20:24Z	

Early Results



The Results

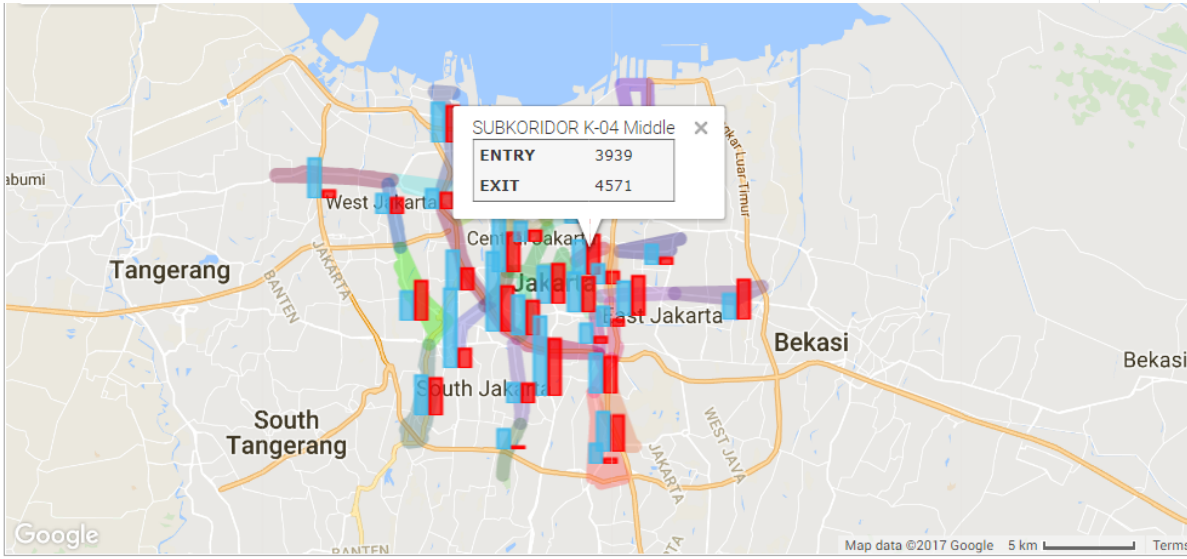
Date 10/10/2017 to 10/10/2017

Interval 15 menit

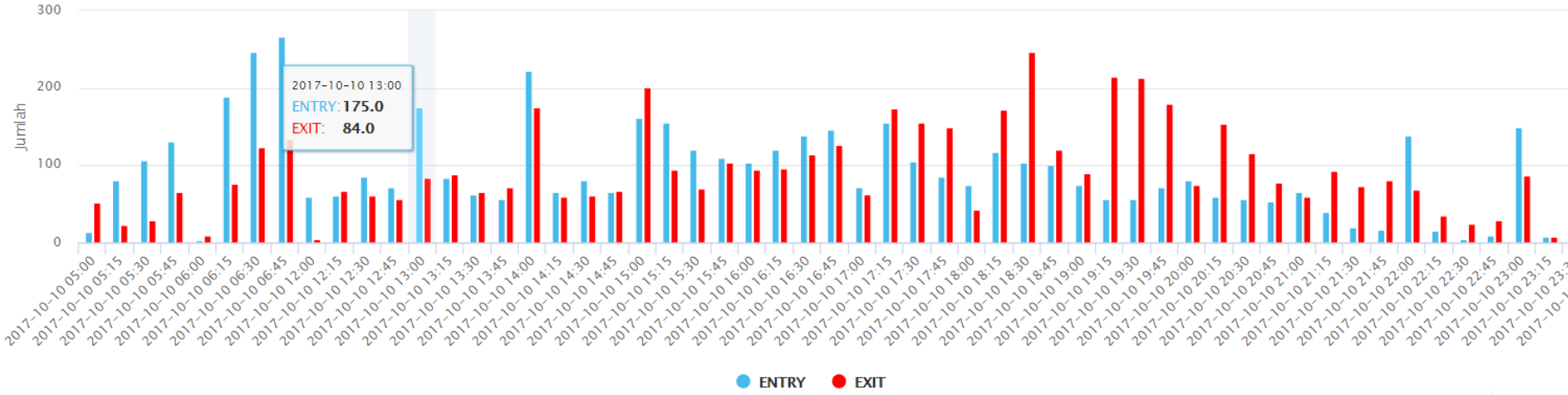
Periode Jam 05 23

Zoning Subkoridor

generate



SUBKORIDOR K-04 Middle



The Results

Flow Trip

Date 10/10/2017 to 10/10/2017

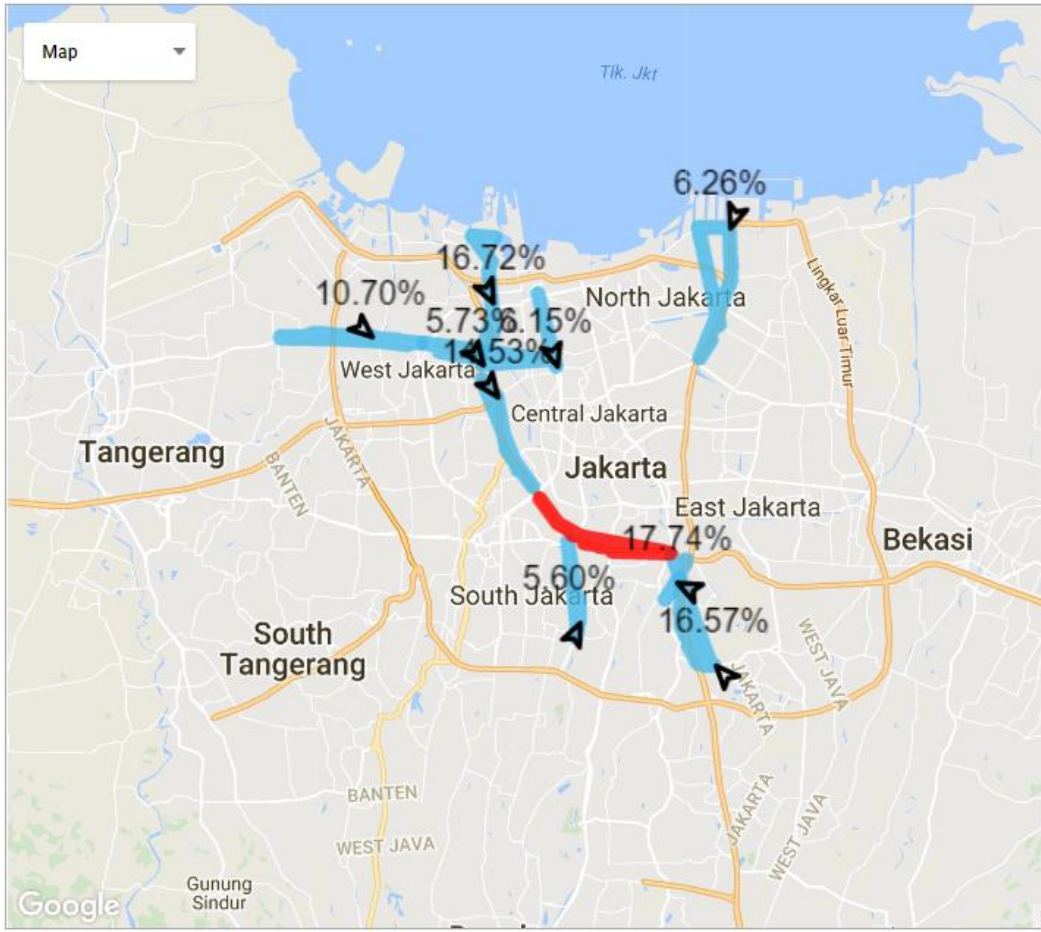
Interval daily

Zoning Subkoridor

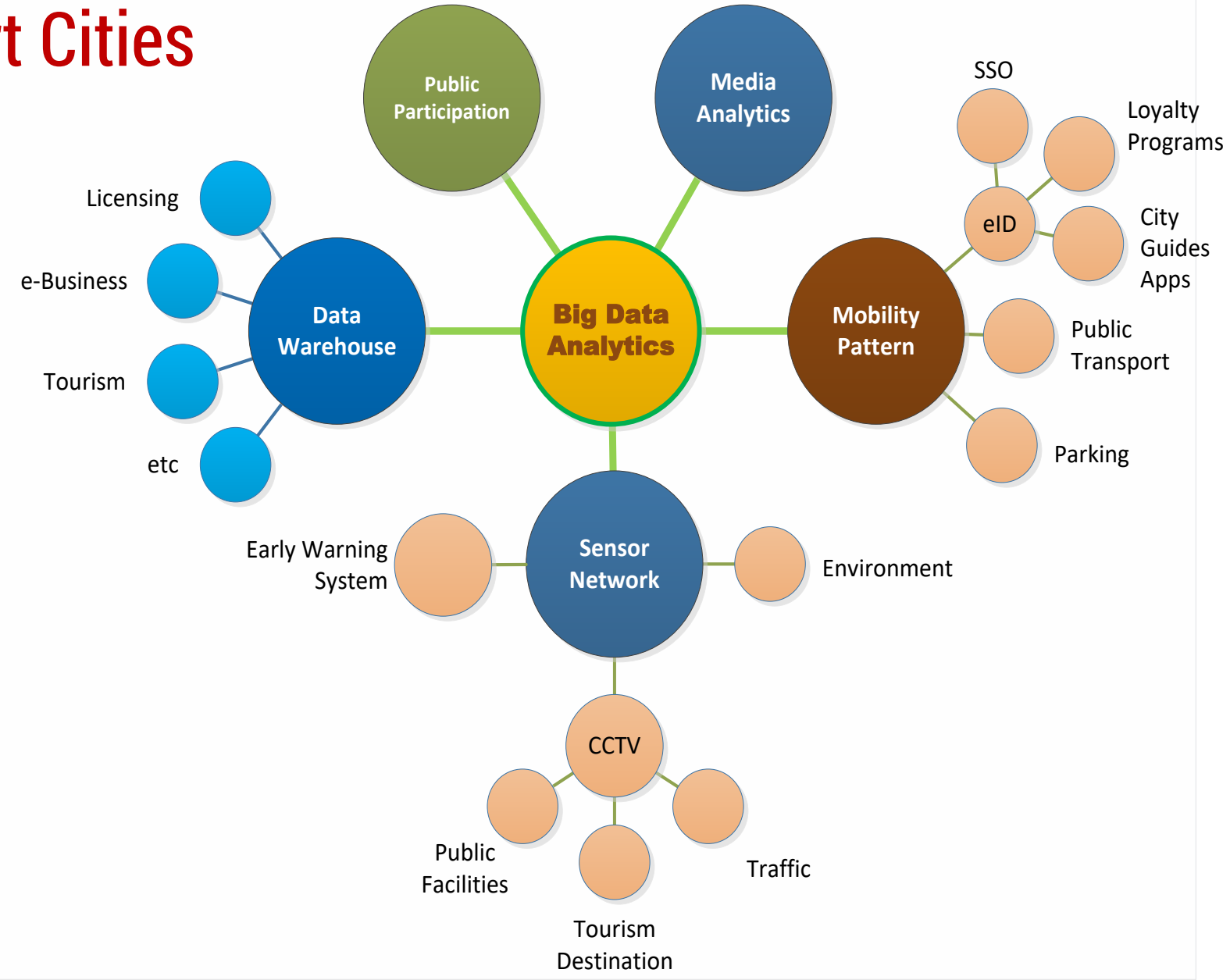
- ○ **Origin**
- ◉ **Destination**

K-09 Inner East

generate

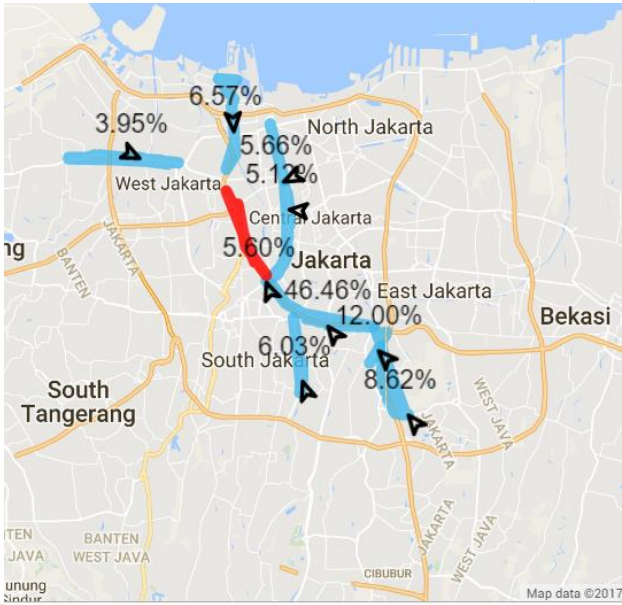


Big Data in Smart Cities



Mobility Pattern

Electronic Parking Terminals, not only increases the revenue from parking, but also serves as a sensor which provides the mobility pattern of privately owned vehicles



Electronic ticketing from TransJakarta provides the mobility pattern of public transport use

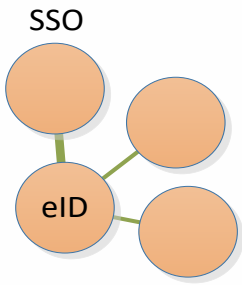
The Idea

Trans Jakarta

224 Shelters
292 Access Gate

Electronic Parking

312 Jakarta
485 Bandung



Loyalty Programs

City Guides Apps

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Your Data

Aha!

Let’s Collaborate