# Cognicity

http://cognicity.info/cognicity/

A geosocial Intelligence framework for urban data

# About Cognicity

- ➔ Peta Jakarta  is the pilot project of Cognicity
- ➔ Objective: Report locations of flood events using twitter for:
  - ◆ 1) Cross validate formal reports of flooding  from traditional data sources
  - ◆ 2) Civic Co-management of disasters

https://youtu.be/6v7BO8_rhWI

Open source framework for urban data, which harnesses the power of social media by gathering, sorting and displaying real-time situational reports from urgent infrastructure issues such as flooding

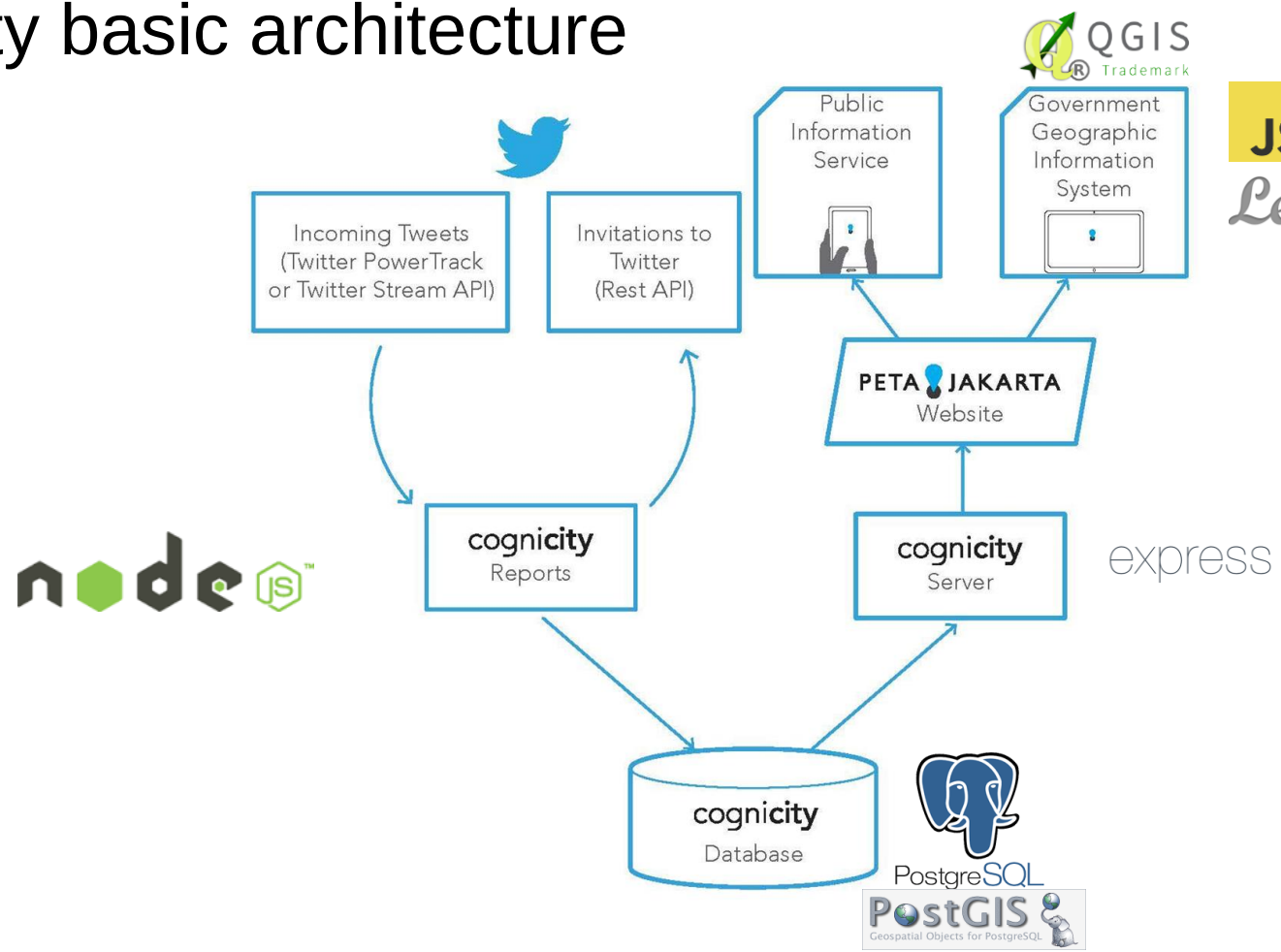
# The Geosocial Intelligence Framework Principles

1) **FOSS** technologies: for developing complementary tools
2) Go from passive spatial and temporal data mining to **“big crowdsourcing”**
3) Ethic **co-management of citizens**
4) **Open data**

# Cognicity Modules

| Module Name | Source Code | Documentation |
|---|---|---|
| CogniCity Server | https://github.com/smart-facility/cognicity-server/tree/v1.0.3 | http://cognicity.info/cognicity/api-docs/cognicity-server/ |
| CogniCity Reports | https://github.com/smart-facility/cognicity-reports-powertrack/tree/v1.0.3 | http://cognicity.info/cognicity/api-docs/cognicity-reports-powertrack/ |
| CogniCity Database | https://github.com/smart-facility/cognicity-schema | https://github.com/smart-facility/cognicity-schema/blob/master/README.md |
| PetaJakarta.org | https://github.com/smart-facility/petajakarta-web | https://github.com/smart-facility/petajakarta-web/blob/master/README.md |

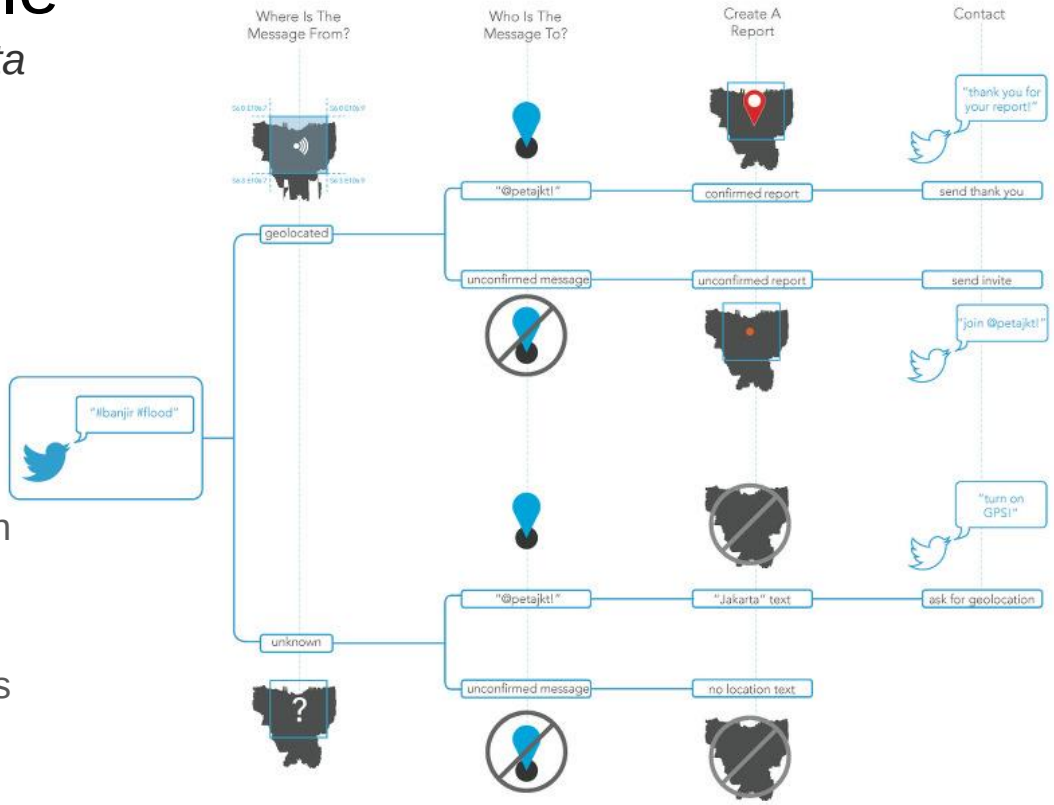
# Cognicity basic architecture



# CogniCity Report Module

*NodeJS app to collect crowd-sourced data via social media*

- ➔ The reports collected are separated from their users
- ➔ The text content of tweets is only stored when the report is confirmed: when user sends a tweet to the @petajkt account
- ➔ It depends on *ntwitter* from npm
- ➔ The cognicity-reports depends just on *ntwitter* npm package
- ➔ The cognicity-reports-powertrack depends on *ntwitter* and *gnip* npm packages




#banjir @petajkt

# Other validation processes

➔Areas were reports are concentrated

➔Monitoring official twitter accounts

➔by monitoring TV, news..

➔Active users that frequently tweet reliable info

# CogniCity Database

| Table Name | Description |
|---|---|
| tweet_reports | Confirmed tweet reports of flooding |
| tweet_reports_unconfirmed | Unconfirmed tweet reports of flooding |
| nonspatial_tweet_reports | Confirmed tweet reports of flooding missing geolocation metadata |
| all_users | Encrypted hash of all related Twitter usernames |
| tweet_users | Encrypted hash of user names who have submitted confirmed reports |
| tweet_invitees | Encrypted hash of users have been been sent an invitation |
| nonspatial_tweet_users | Encrypted hash of users who have submitted confirmed reports missing geolocation metadata |
| jkt_city_boundary | Boundaries of Jakarta's five municipalities |
| jkt_subdistrict_boundary | Boundaries of Jakarta's municipal sub-districts ('Kecamatan') |
| jkt_village_boundary | Boundaries of Jakarta's municipal villages ('Kelurahan') |
| jkt_rw_boundary | Municipal boundaries of Jakarta's municipal RW districts ('Rukun- |

# Database Tables

| | |
|---|---|
| jkt_village_boundary | Boundaries of Jakarta's municipal villages ('Kelurahan') |
| jkt_rw_boundary | Municipal boundaries of Jakarta's municipal RW districts ('Rukun-Warga') |
| pumps | Locations of water pumps in Jakarta |
| floodgates | Locations of floodgates in Jakarta |
| waterways | Locations of waterways in Jakarta |

# CogniCity Server Module

*NodeJS server for CogniCity data and web files*

- ➔ How many tweets are within a specific municipal district? spatial SQL query (ST_Within) to aggregate and count tweets in the report tables
- ➔ Provide access to 3 groups of data, across 9 API points:
  - ◆ Reports endpoints (real time)
  - ◆ Aggregates endpoints count of the sum of confirmed and unconfirmed data reports
  - ◆ Infrastructure endpoints: location of waterways pumps, floodgates…
- ➔ Data is given in periods of :
  - ◆ 1 hr
  - ◆ 3hr
  - ◆ 6hr
  - ◆ 24hr
- ➔ Data is given in three municipal scales:
  - ◆ Village
  - ◆ Subdistrict
  - ◆ City

# API endpoints

| CogniCity API Endpoint | Description | Data | Temporal Extent | Spatial Extent |
|---|---|---|---|---|
| reports/confirmed | Real-time listing of confirmed flood reports | Point geometries + message | 1 hour | Jakarta + surrounds |
| reports/unconfirmed | Real-time listing of unconfirmed flood reports | Point geometries | 1 hour | Jakarta + surrounds |
| reports/count | Real-time sum count of all reports | Count | 1, 3, 6, or 24 hours | n/a |
| reports/timeseries | Real-time sum count of all reports at hourly intervals | Timestamps + count | 24 hours | n/a |

# API endpoints

| CogniCity API Endpoint | Description | Data | Temporal Extent | Spatial Extent |
|---|---|---|---|---|
| aggregates/live | Real-time count of all reports by municipal area | Polygon geometries + count | 1, 3, 6, or 24 hours | Jakarta |
| aggregates/archive | Archive of previous counts of all reports by municipal area | Polygon geometries + timestamp + count | Archive extents in 1 hour blocks | Jakarta |
| infrastructure/waterways | Waterways in Jakarta | Linestring geometry + name | n/a | Jakarta + surrounds |
| infrastructure/pumps | Water pumps in Jakarta | Point geometry + name | n/a | Jakarta + surrounds |
| infrastructure/floodgates | Floodgates in Jakarta | Point geometry + name | n/a | Jakarta + surrounds |

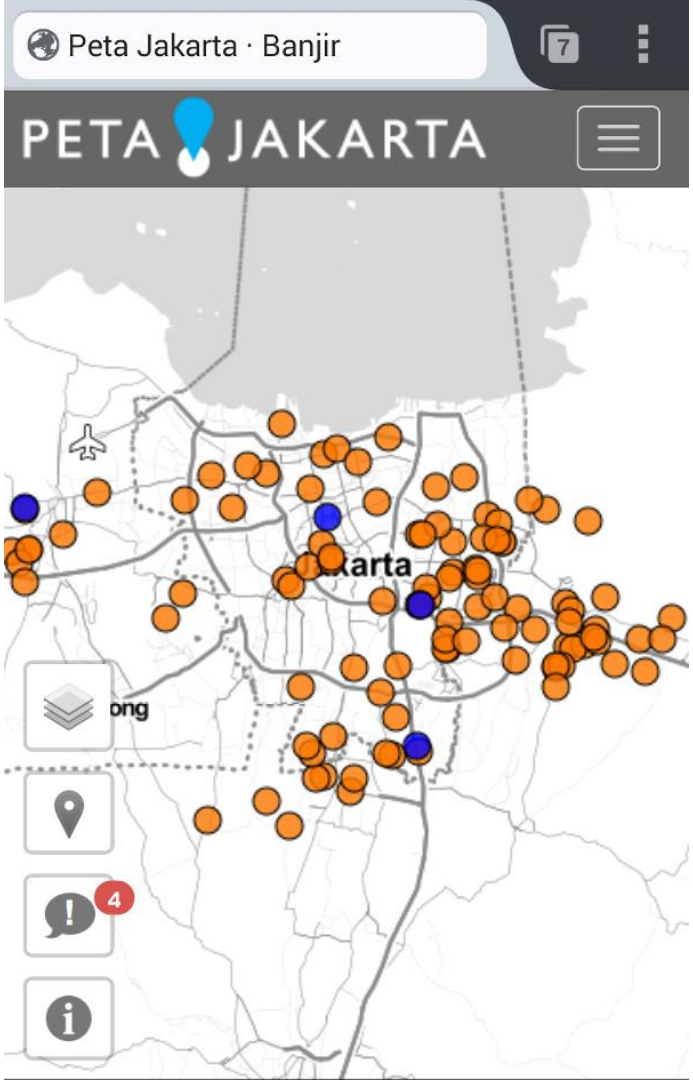
CogniCity PetaJakarta.org Module

*Front-end JavaScript & HTML5 for mobile web application*

Real time multi-stable cartographic interface


User Interface:
Geolocation
+
Nearby Reports


Institutional Interface:
Overview
+
Report Scaling


Peta Jakarta · Banjir
7
PETA JAKARTA
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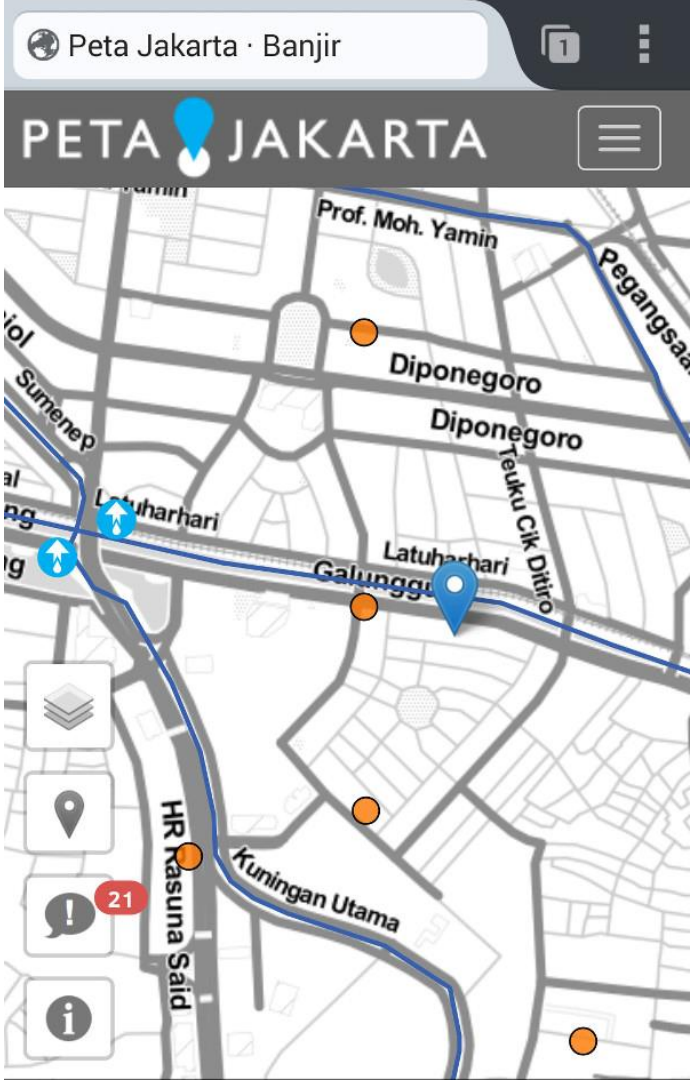
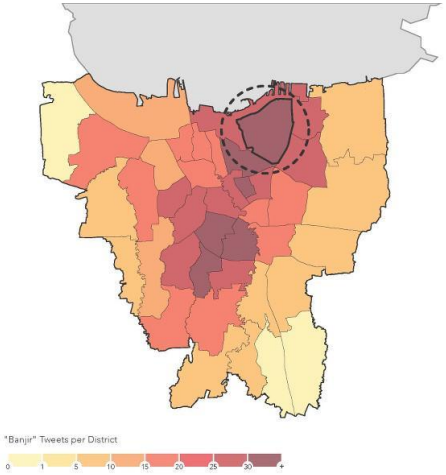
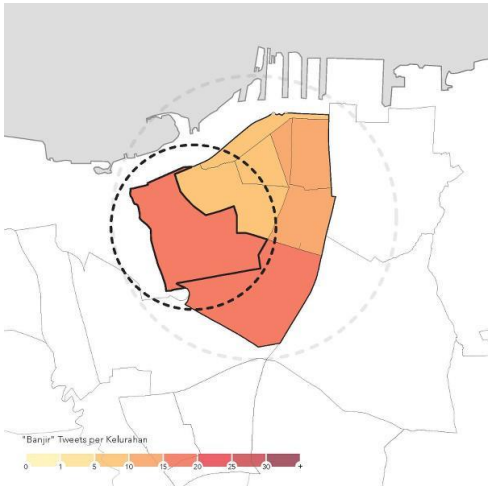
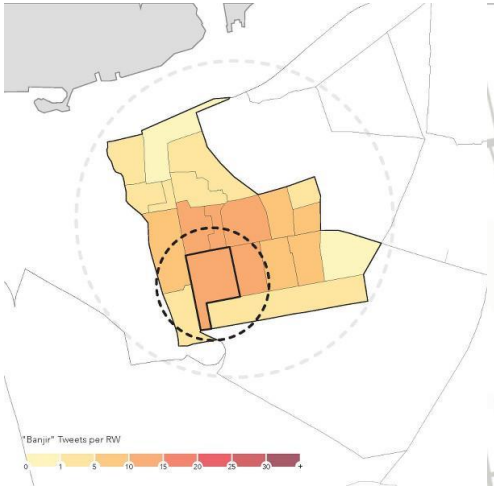

Peta Jakarta · Banjir
1
PETA JAKARTA
Prof. Moh. Yamin
Diponegoro
Diponegoro
Sumenep
Teuku Cik Ditiro
Latuharhari
Latuharhari
HR Rasuna Said
Kuningan Utama
21


"Banjir" Tweets per District
0
1
5
10
15
20
25
30
+


"Banjir" Tweets per Kelurahan
0
1
5
10
15
20
25
30
+

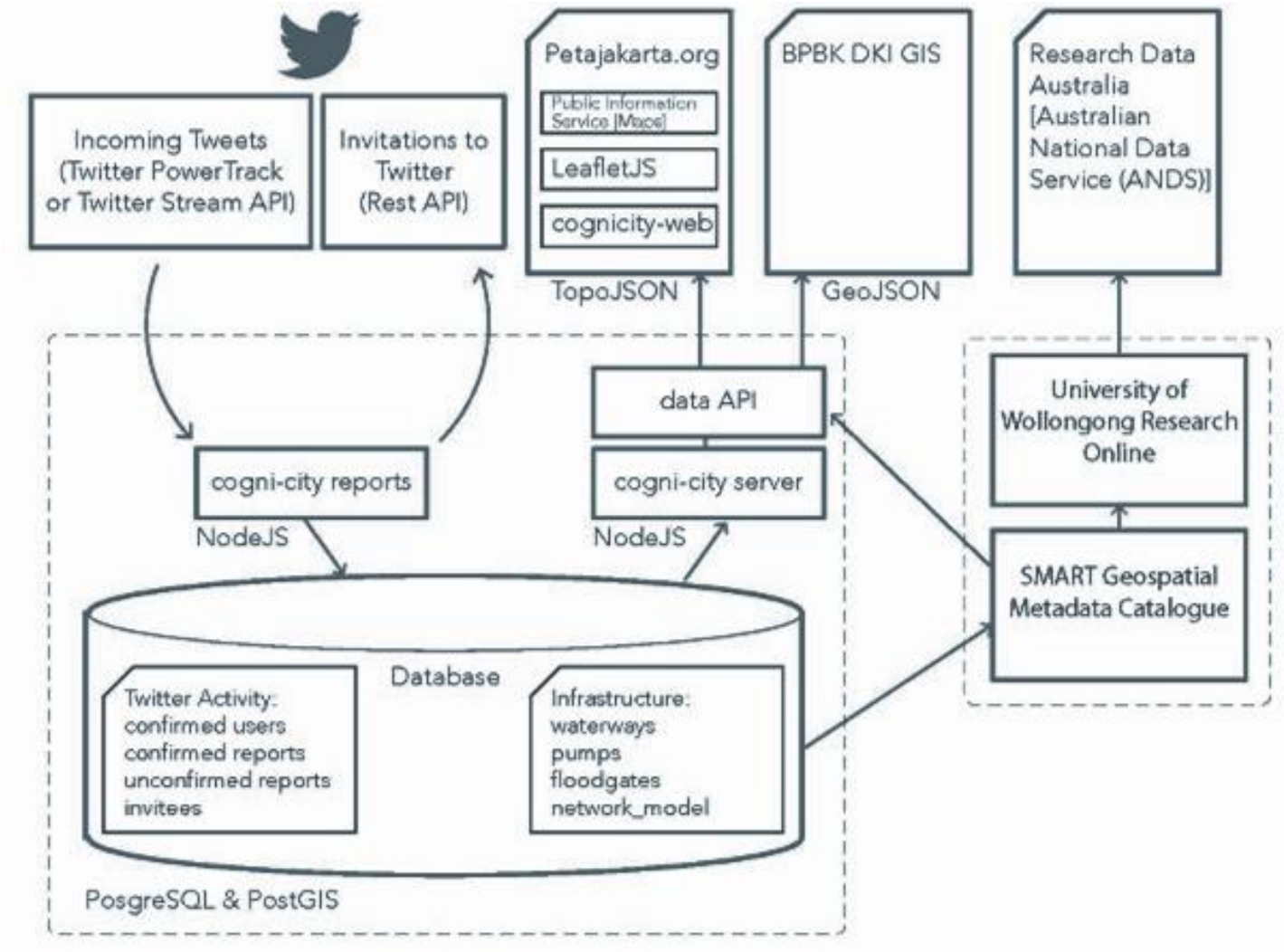

"Banjir" Tweets per RW
0
1
5
10
15
20
25
30
+

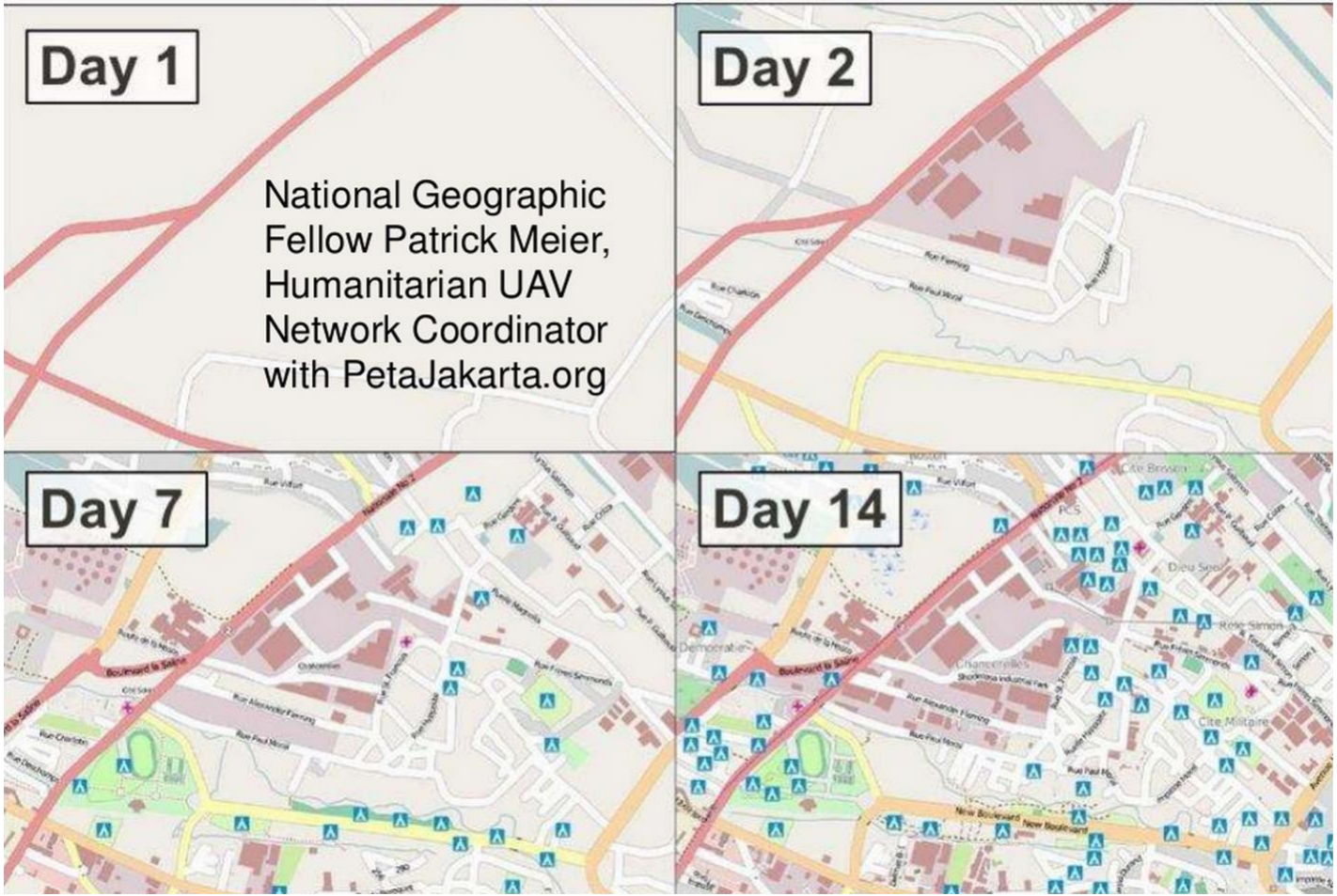

Individual Tweets at Street Level
Danau Sunter Utara
Griya Utama
Agung Baru 4
Agung Baru 5
Agung Baru 20
Agung Baru 8
Agung Baru 9
Agung Baru 1
Agung Baru 3
Agung Jaya 4
Agung Jaya 1
Agung Jaya 2
Agung Jaya 9
Danau Agung 2
Danau Agung 1
Danau Sunter Selatan
Sunter Jaya 1

# Flood Map

Showing 500 confirmed reports from the past hour

# Architecture




Day 1
National Geographic Fellow Patrick Meier, Humanitarian UAV Network Coordinator with PetaJakarta.org
Day 2
Day 7
Day 14

# Next steps

➔Embedded images on the map

➔Add date and time stamp on the map

➔Add a time slider bar

➔Add flood height information

➔Add 3d visualization using DTM

➔Add + API : InaSAFE, jakSAFE, AWARE platform

# GEOSPATIAL INTELLIGENCE FRAMEWORK

System Diagram for Jakarta Pilot Study on Urban Resilience & Climate Adaptation