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Introduction of JICA-JST SATREPS "ANZEN" Project

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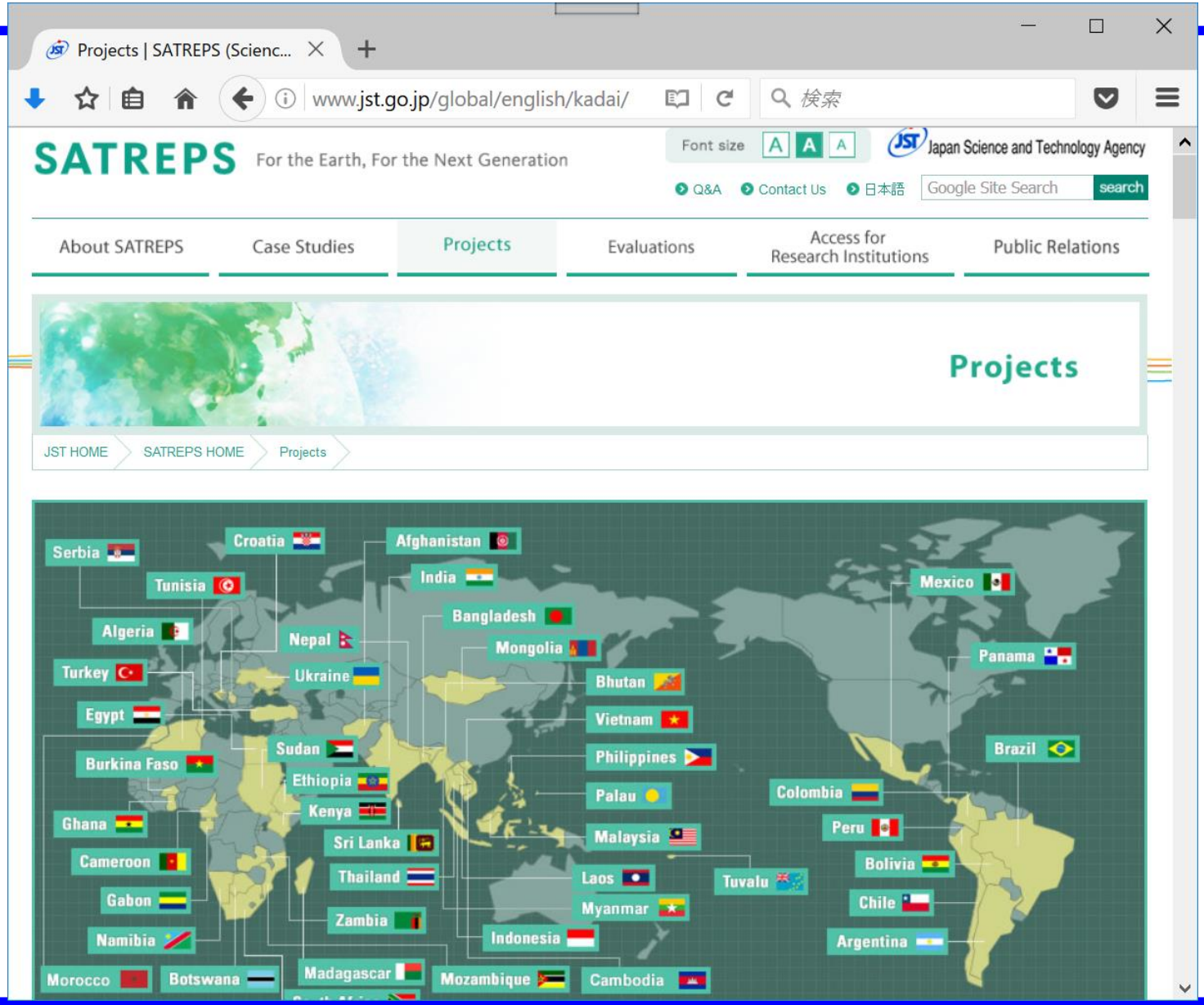
SATREPS

What is SATREPS ??



What is “ANZEN” Project ??

“Development of a Comprehensive Disaster Resilience and Collaboration Platform in Myanmar”

Myanmar's challenges

Highly disaster-prone country:
Frequent occurrences of Earthquake, Cyclone, Flood, Landslide, and Fire.

Pressing challenge: Response to uncertainties

- Growing disaster risk due to large-scale land and urban development
- Occurrence of extreme storms and floods caused by global climate change

- Low capability of existing civil infrastructures for disaster mitigation
- Insufficiency of current techs, information system, and human resources; incapable of responding to the future of great uncertainty
- Strong institutional system sectioned vertically:
  → Major obstacle to built of comprehensive systems for disaster risk reduction
- Poor environment of research implementation and graduate education program in YTU, The highest educational institution

Research area: Main: Yangon and Bago River basin
Substitute : Dawei

G O A L

Contribute to Myanmar's steady economic growth by safe cities formation

- Develop integrated disaster resilience systems from the aspect of hardware, software, and human resources, for strengthening Myanmar's disaster response ability, to that end,
- Establish collaboration platform among government, academia and industry

- Conduct monitoring evaluation for urban development in responding to dynamic change in the country. Based on that, build scenario analysis system to predict changes in future disaster vulnerability continually
- Develop integrated disaster response system for strengthening disaster response ability based on the scenario analysis system
- Develop technology to secure civil infrastructures' disaster mitigation functions for achievement of disaster-resilient urban infrastructures
- Manage the collaborative consortium, promoting cooperation among gov't, academia and industry, to introduce and spread above technology and system into the Myanmar government and industrial sectors.

→ *Contribute to create business opportunities for Japanese industry by promoting international collaboration among gov't, academia and industry*

Research implementation framework (1)

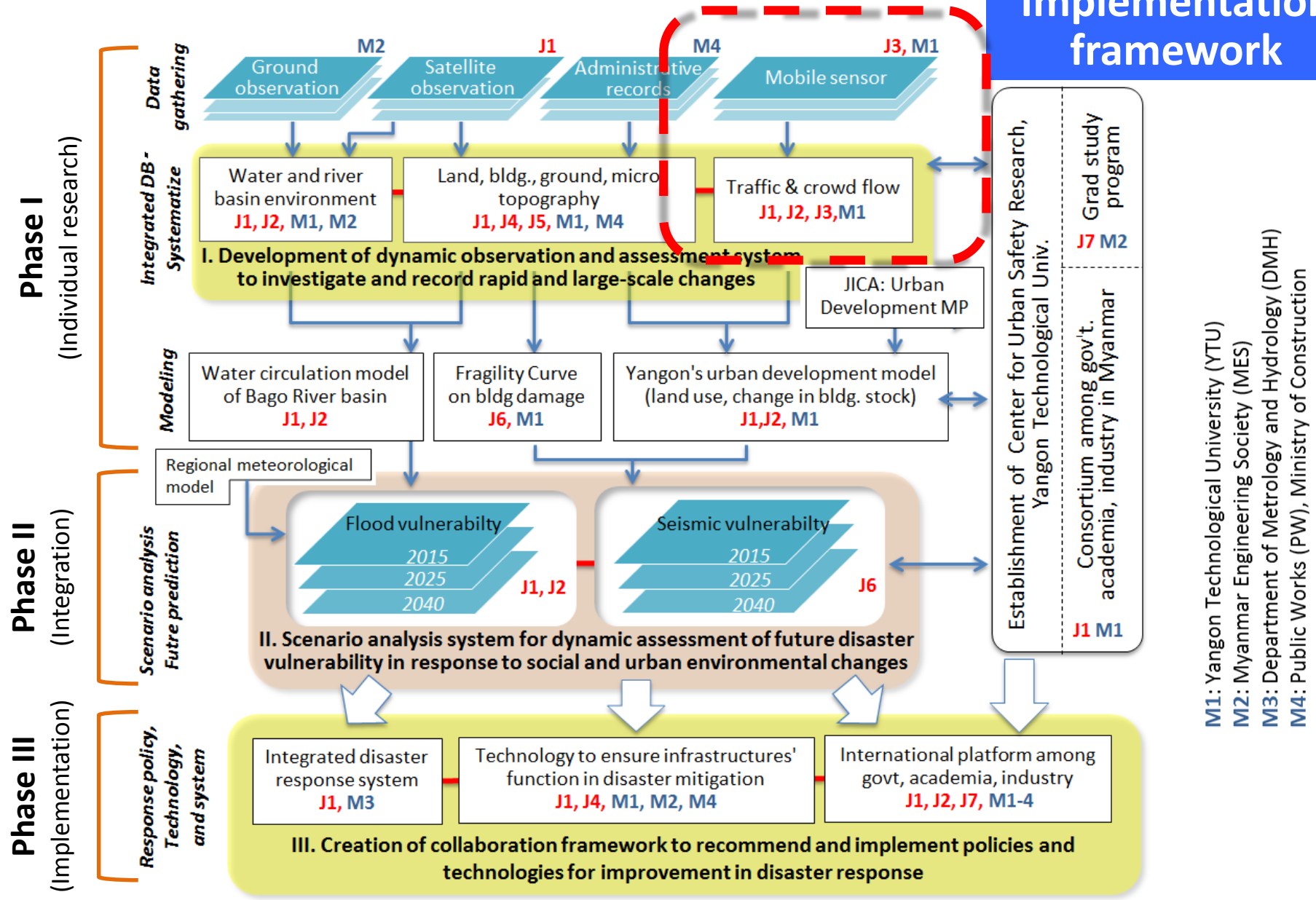
- **Research period:** From fiscal 2014 to 2018 (5years)
- **Domestic partners:** (4 universities)
  - **The University of Tokyo (Institute of Industrial Science**, School of Engineering, Graduate School of Interdisciplinary Information Studies)
  - Hokkaido University (School of Engineering)
  - Tohoku University (Graduate School of Environmental Studies, International Research Institute of Disaster Science)
  - Keio University (Graduate School of System Design and Management)
- **Counterpart in Myanmar:** (4 institutes)
  - **Yangon Technological University (YTU)**
  - Myanmar Engineering Society (MES)
  - Dept. of Metrology and Hydrology (DMH)
  - Public Works (PW), Ministry of Construction

Representative of counterpart
Vice-president, YTU
Prof. Khin Than Yu
(Dr. Eng., TU)

Myanmar government agencies (5 institutes, MOU signed)

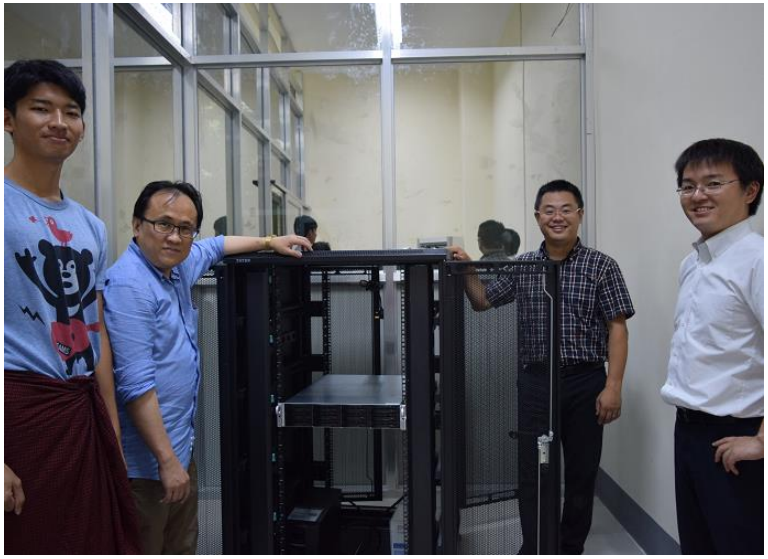
- Relief and Resettlement Department (RRD)
- Mandalay Technology University (MTU)
- Ministry of Agriculture and Irrigation
- Yangon City Development Committee (YCDC)

Implementation framework



J1: The Univ. of Tokyo, Institute of Industrial Science
J2: The Univ. of Tokyo, School of Engineering
J3: The Univ. of Tokyo, Center for Spatial Information Science
J4: Hokkido Univ., School of Engineering
J5: Tohoku Univ., Graduate School of Environmental Studies.
J6: Tohoku Univ., International Research Institute of Disaster Science
J7: Keio Univ. Graduate School of System Design and Management

Various activities



Traffic / People mobility Group

Daw Kyaing, Lecturer / YTU

Dr. Yoshihide Sekimoto, Associate Professor / UTokyo

SATREPS

Project team

Assoc. Prof. Sekimoto
IIS, UT

Lecturer. Daw Kyaing
Transportation, YTU

Dr. KoKo Lwin
Proj. Assist. Prof. IIS, UT

Prof. Kato
Civil Engineering, UT
(Advisor)

Mr. Fukushima
Researcher, IIS, UT

Prof. Shibasaki
CSIS, UT
(Advisor)

Assoc. Professor. Htay Win
Transportation, YTU

Ms. AyeHninHninNaing
Transportation, YTU

Aims and Scopes

- ✓To understand human mobility in Yangon City in order to improve public transportation system
- ✓To estimate traffic volume in Yangon City using mobile CDR (Call Detail Record) Data
- ✓To know public bus traffic congestion status to manage traffic flow in Yangon City

These information are essential for disaster management and emergency preparedness

Progress outline

1. Real-time people flow system
2. Bus location system

1. Real-time people flow system

- Got 1 week mobile phone CDR data from MPT this February.
- Can reconstruct trip and people movement data from CDR.

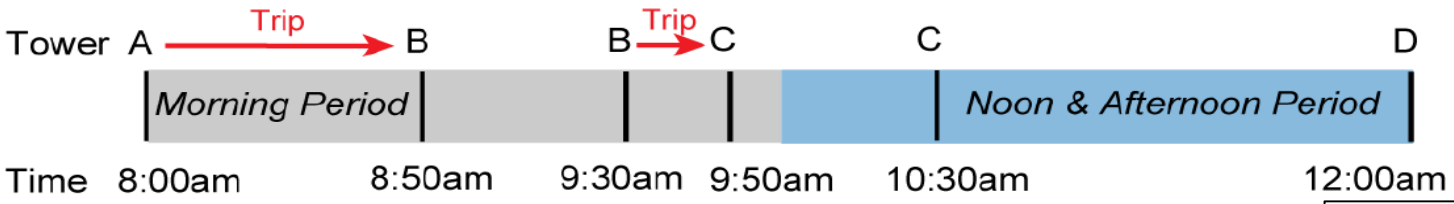
Property of CDR data

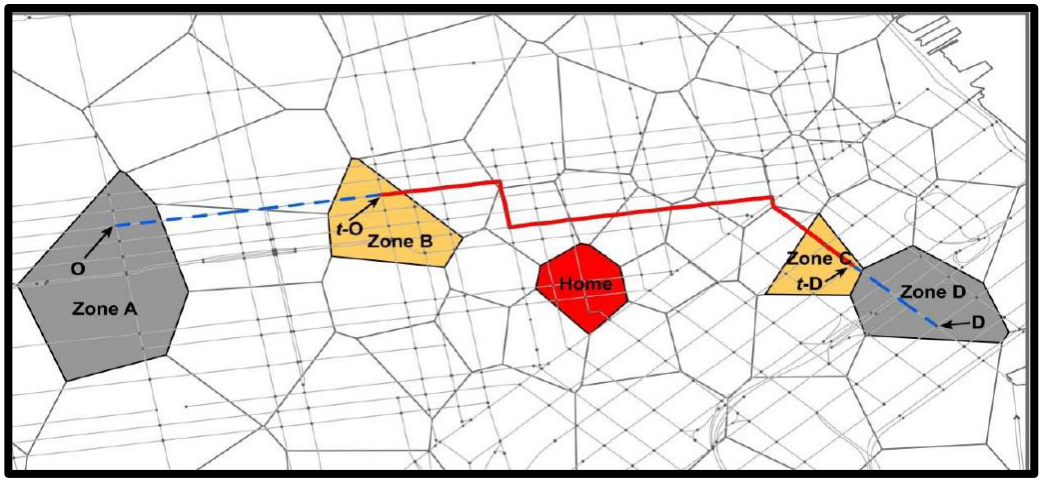
- CDR is call detail record of mobile phone

Period	Dec. 1-7, 2015
The number of CELL_ID	14,284
The number of subscriber's ID	4,435,321
The average number of daily records	16,161,366

MSISDN	EVENT ID	DATE&TIME	DURATION(Sec)	Upload(B)	Download(B)	CELL ID
3845230	1048	20151201155914	446	440	1394	00414010803330561
9903911	1048	20151201160658	0	0	0	0141401100240165
3938428	1048	20151201160554	64	194	610	0141401100240131
3938428	982	20151201160556	63	5624	11687	0141401100240131
0501317	1048	20151201090220	25478	30365	45173	0141401100090740
0501317	982	20151201090221	25478	566903	434232	0141401100090740
4016148	982	20151201160007	393	5873889	2136043	0141401100060682
4016148	1048	20151201160009	391	1301	3737	0141401100060682
9776353	1048	20151201153037	2164	51550	102593	00414010801320823
9776353	982	20151201153040	2160	1195309	8558137	00414010801320823
3587200	1048	20151201160457	104	2154	4916	00414010802312061
3908916	982	20151201160542	77	45462	956158	00414010030210102
5765675	982	20151201160406	174	106573	455079	01414010035112128
3961736	982	20151201155642	619	2951466	124273505	01414010335142151

Trips from raw CDR data

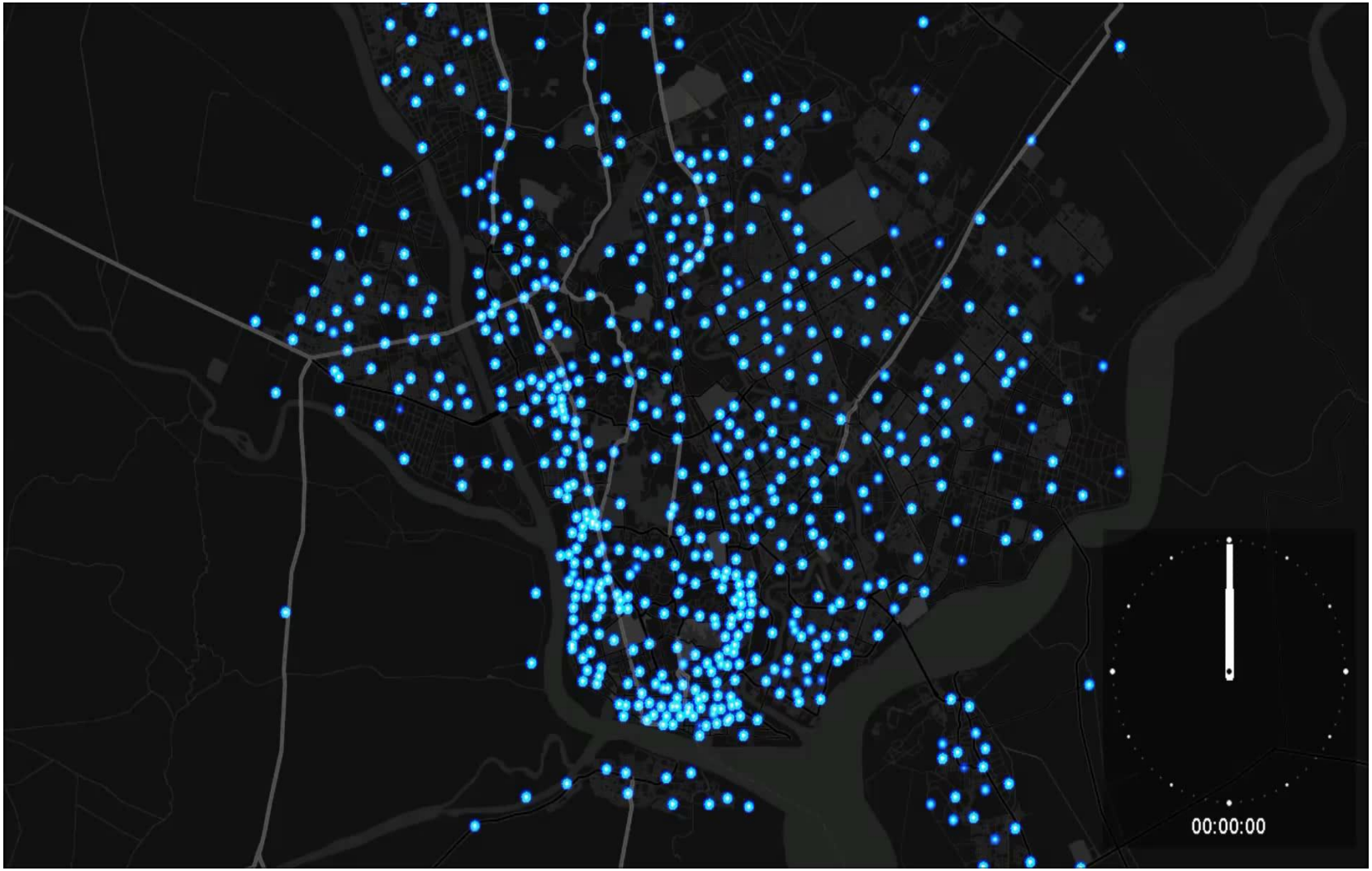




Cited from
P. Wang, T. Hunter, A. M. Bayen, K. Schechtner, and M. C. González, "Understanding road usage patterns in urban areas.," Science. Rep., vol. 2, p. 1001, Jan. 2012.

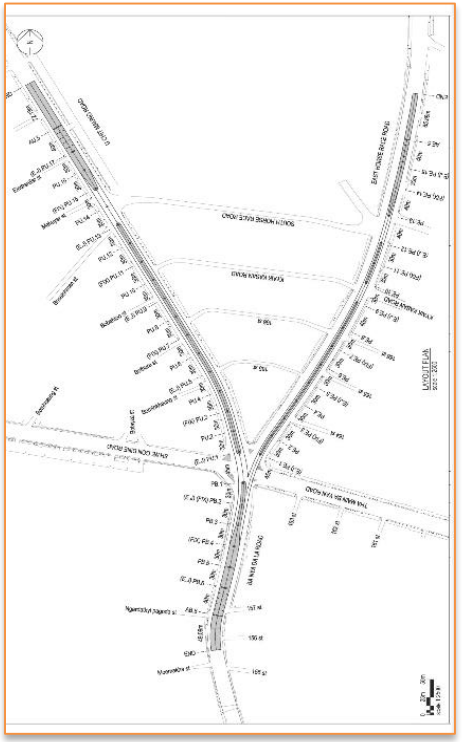
Date	Number of users	Number of records	Number of OD patterns	Number of ODs
Dec. 1, 2015	4049032		2637083	22478895
Dec. 2, 2015	3971440		2608754	21683774
Dec. 3, 2015	3940489		2568948	21393054
Dec. 4, 2015	3919829		2597189	21246083
Dec. 5, 2015	3958915		2570734	21271086
Dec. 6, 2015	3901516		2499722	20590517
Dec. 7, 2015	3869726		2575294	20557680

PFLOW from reconstructed trip data



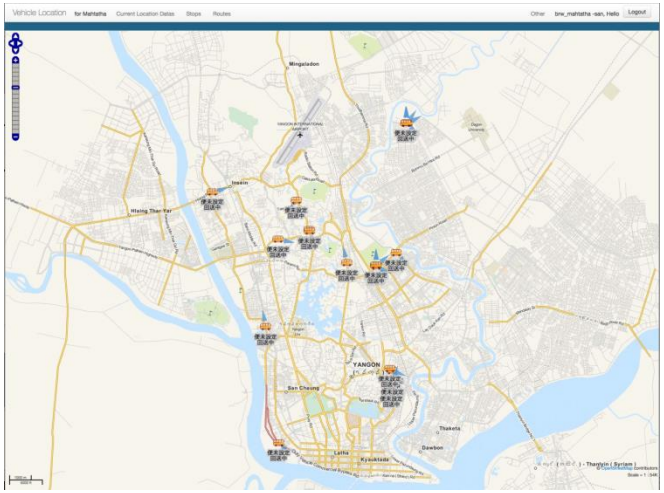
Comparison of PFLOW before/after flyover construction

- Now try to compare PFLOW before/after flyover construction
- Tamwe Flyover (Y- Shaped)
- Construction Starting Date → Sept. 2015
- Road Opening Date →16 July. 2016
- Location →At the five-leg junction of U Chit Maung Road, Banyar Dala Road, East Horse Race Course Road, Thamainbayan Road and Shwe Gone Daing Road .
- Target date plan of comparison for CDR data:
  Aug. 2015 & Aug. 2016
- Already send request to get CDR during several periods for comparison.



2. Progress of bus location system

- Trials with 3 buses on Sep., 2015
- Trials with 30 buses in Parami Lines, using smart phone from Feb., 2016
- Already develop the monitoring system



<Test site>
http://vl.bumprecorder.com/current_location_datas

Some Problems

- Several troubles occur with smartphones
  - Less electric current flow to smartphones
  - Some drivers take out to the office for security
- Will test again with 50 single GPS devices to solve some problems in January 2017

Single GPS device

Overview of bus location system

Smart Phone Application

This application sends the position to server every five seconds

The data size is 4MB per day

Bus

Location

Bus Location System

Location Data Manager

Synchronise

Japan Server

YTU Server

Test phase

Operation phase

Bus Location Service

... Bus traffic information

Arrival time, etc.

Bus situation, etc.

User Application

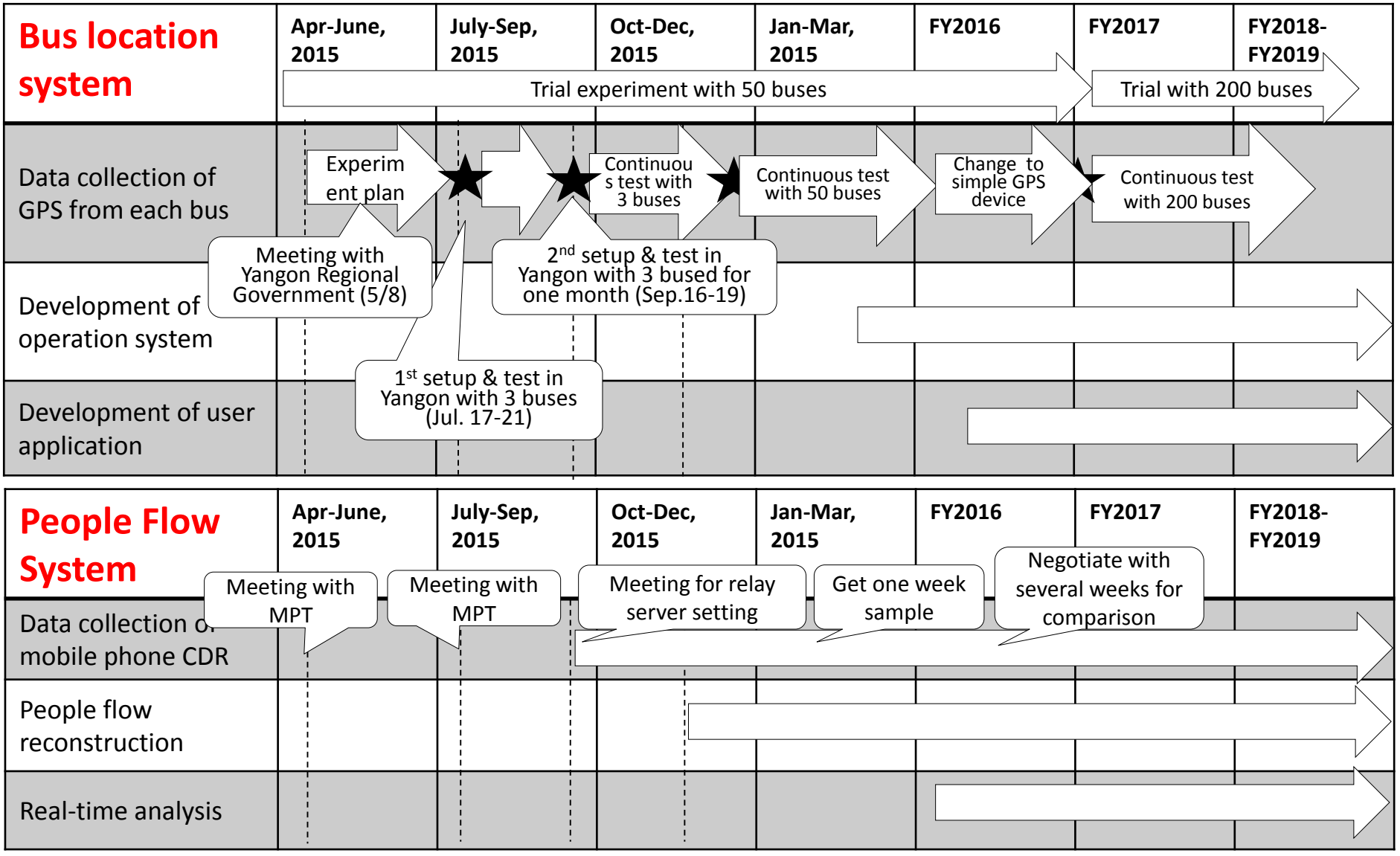
Route	Arrival time
Route A	12:00
Route B	12:30 5 minutes delay
Route C	13:00
....	....

Bus passenger

Operation System

Bus operator (Mahatha &YRG)

Plan


Bus location system
Apr-June, 2015
July-Sep, 2015
Oct-Dec, 2015
Jan-Mar, 2015
FY2016
FY2017
FY2018-FY2019
Trial experiment with 50 buses
Trial with 200 buses
Data collection of GPS from each bus
Experiment plan
Continuous test with 3 buses
Continuous test with 50 buses
Change to simple GPS device
Continuous test with 200 buses
Development of operation system
Development of user application
Meeting with Yangon Regional Government (5/8)
1st setup & test in Yangon with 3 buses (Jul. 17-21)
2nd setup & test in Yangon with 3 bused for one month (Sep.16-19)
People Flow System
Apr-June, 2015
July-Sep, 2015
Oct-Dec, 2015
Jan-Mar, 2015
FY2016
FY2017
FY2018-FY2019
Meeting with MPT
Meeting with MPT
Meeting for relay server setting
Get one week sample
Negotiate with several weeks for comparison
Data collection of mobile phone CDR
People flow reconstruction
Real-time analysis

Capacity building

- Invited YTU members to Tokyo this May, 2016 for mainly programming training and Big data handling
- Also see traffic control center of highway (NEXCO-Central).

Thanks !

Traffic/People mobility Group