

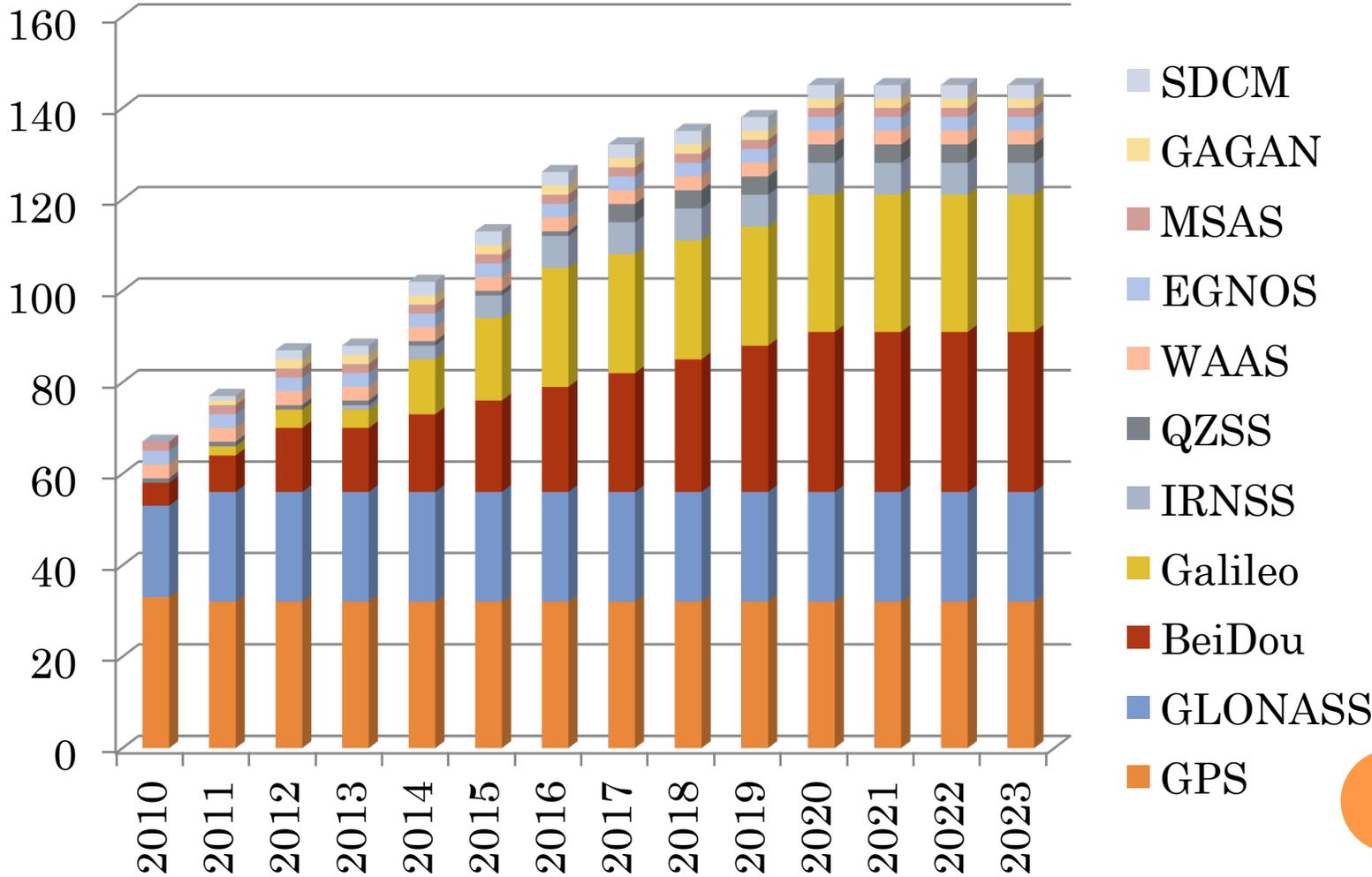
# **REPORT ON A MULTI-GNSS DEMONSTRATION PROJECT IN THE ASIA/OCEANIA REGION**

**SUMMARY OF 6<sup>th</sup> ASIA OCEANIA REGIONAL WORKSHOP ON GNSS**

1

**Hiroaki Tateshita  
Multi-GNSS Asia Secretariat  
9<sup>th</sup> November, 2014  
Prague, Czech Republic**

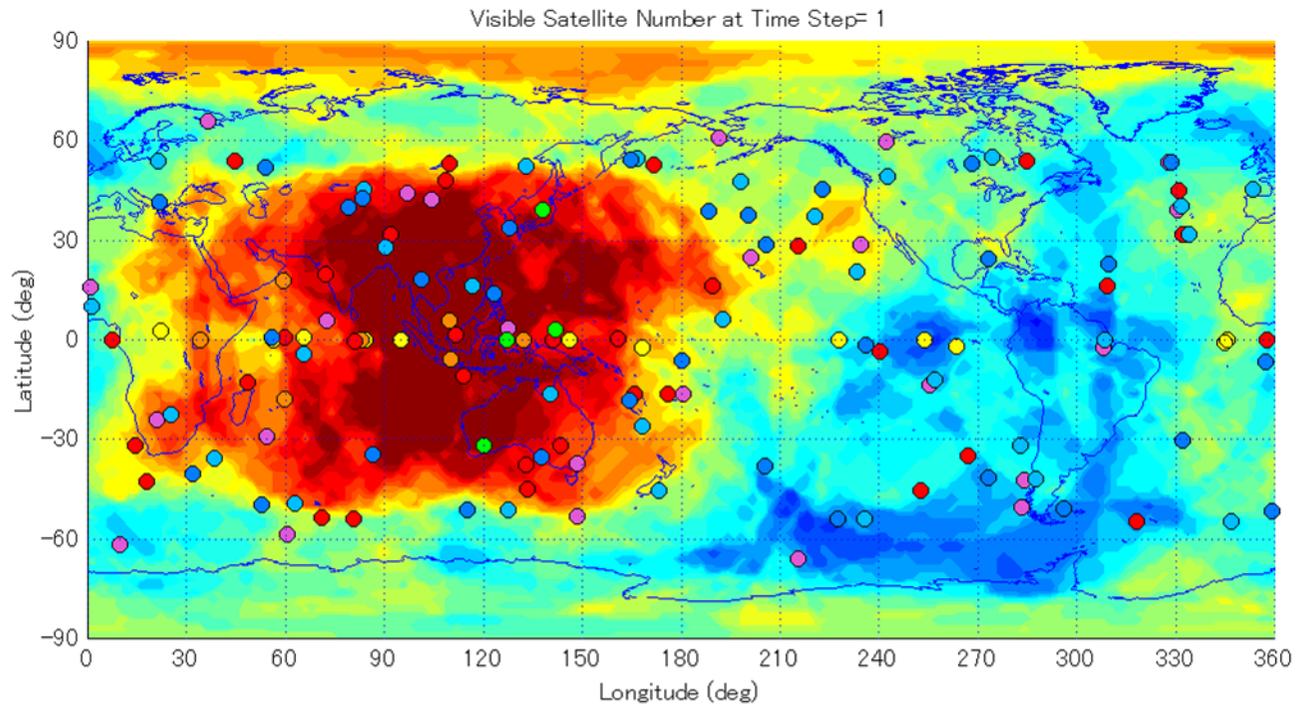
# SATELLITE NUMBERS IN MULTIPLE CONSTELLATIONS





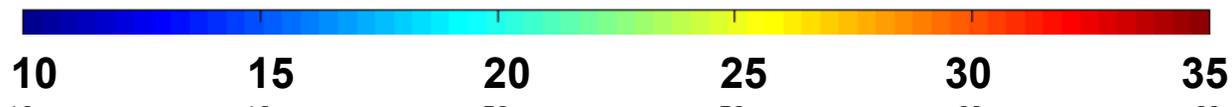
# ASIA OCEANIA REGION IS SHOWCASE OF MULTI-GNSS APPLICATION

Visible satellite number (mask angle 30 degrees)



**2020:**

- GPS(32)+
- Glonass(24)+
- Galileo(30)+
- BeiDou(35)+
- QZSS(4)+
- IRNSS(7)+
- SBAS(13)



# ASIA OCEANIA MULTI-GNSS DEMONSTRATION CAMPAIGN “THREE MAJOR PILLARS”



- Campaign consists of three main activities:

## Multi-GNSS Monitoring NW



## Application Demonstration

### Disaster Mitigation



### Precise Positioning



### ITS



### LBS



Others (iono/tropospheric, observation etc)

## Regional Workshop



5<sup>th</sup> Workshop, Dec. 2013,  
@Hanoi, Viet Nam

4<sup>th</sup> Workshop, Dec. 2012  
@ Kuala Lumpur, Malaysia

3<sup>rd</sup> Workshop, Nov. 2011  
@ Jeju, Korea:

2<sup>nd</sup> Workshop, Nov. 2010  
@ Melbourne, Australia

1<sup>st</sup> Workshop, Jan. 2010,  
@ Bangkok, Thailand

# Multi-GNSS Demonstration Campaign



## ORGANIZATION: WHAT IS MGA?

- “Multi GNSS Asia (MGA)” is an international organization to promote and support activities of the “Asia Oceania Multi-GNSS Demonstration Campaign”
- MGA was established in September 4<sup>th</sup>, 2011 in Tokyo



1<sup>st</sup> meeting of MGA Steering Committee



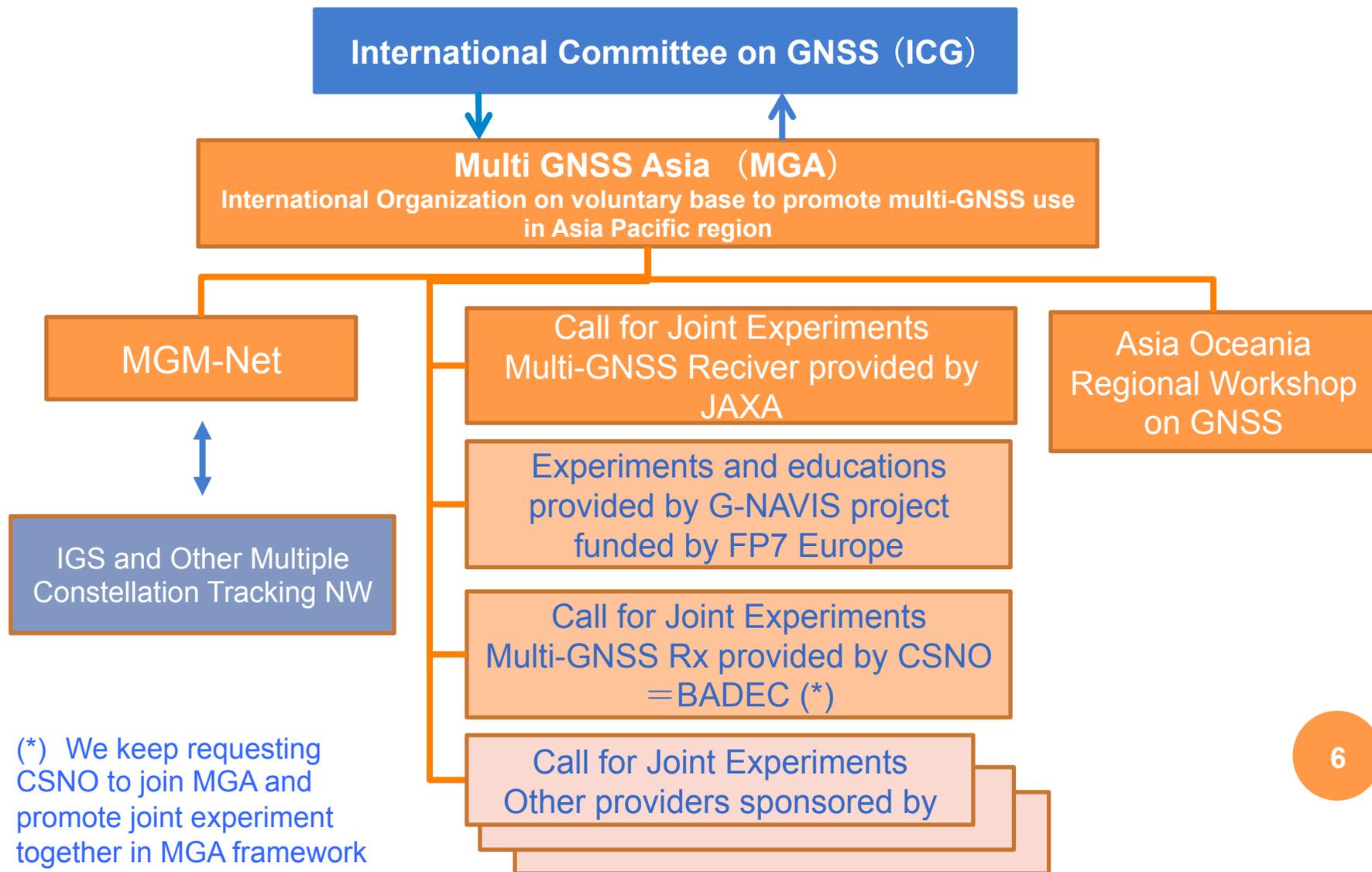
public website: [www.multignss.asia](http://www.multignss.asia)



site for members only



# WORK STRUCTURE FOR MGA



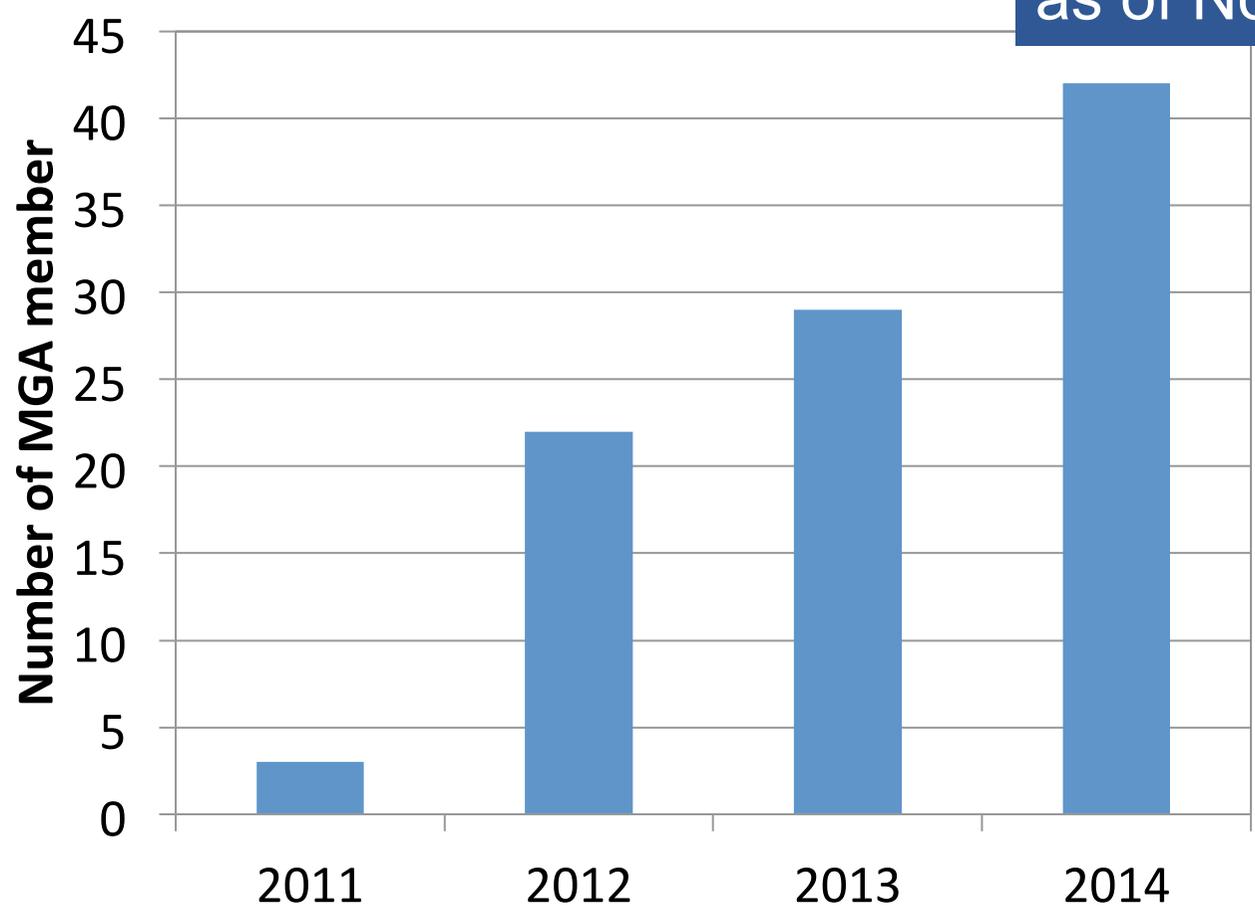
(\*) We keep requesting CSNO to join MGA and promote joint experiment together in MGA framework

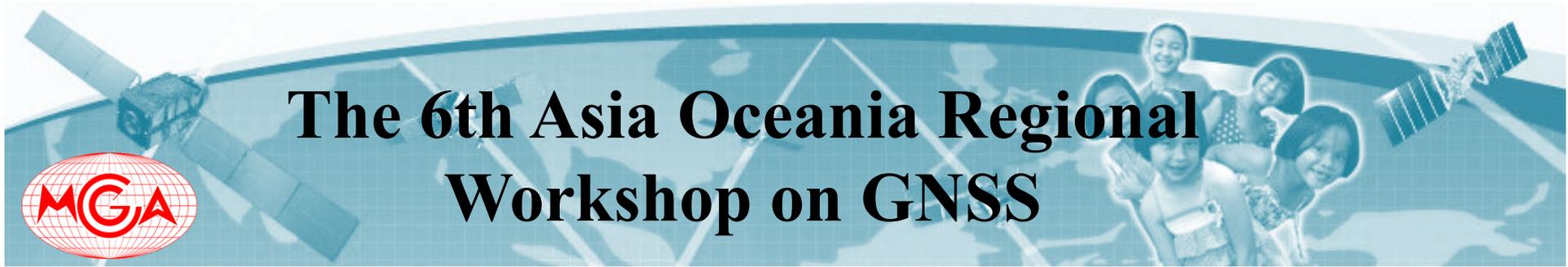
# MGA PARTICIPATING ORGANIZATIONS



No	Organizations	Countries/Regions
1	Beach Building & Civil Group (BBCG)	Australia
2	RMIT University (RMIT)	Australia
3	Japan Aerospace Exploration Agency (JAXA)	Japan
4	University Putra Malaysia (UPM)	Malaysia
5	National Cheng Kung University (NCKU)	Taiwan
6	Asian Institute of Technology (AIT)	Thailand
7	Chungnam National University (CNU)	Korea
8	SINGAPORE LAND AUTHORITY (SLA)	Singapore
9	T	
10	T	
11	N	
12	M	
13	N	
14	E	
15	R	
16	T	
17	N	
18	H	
19	G	
20	M	
21	U	
22	K	
23	B	
24	E	
25	S	
26	Ir	
27	G	
28	K	
29	C	
30	S	
31	R	
32	S	
33	T	
34	F	
35	K	
36	K	
37	N	
38	P	
39	G	
40	N	
41	C	
42	Kangwon National University (KNU)	Korea

42 organizations from 15 countries/regions as of Nov. 4, 2014





**6<sup>th</sup> Asia Oceania Regional Workshop on GNSS was held very successfully on October 9-11, 2014 at Phuket, Thailand**





- about 100 participants from many organizations including universities, institutes, government agencies, International organizations and companies gathered from 14 countries.

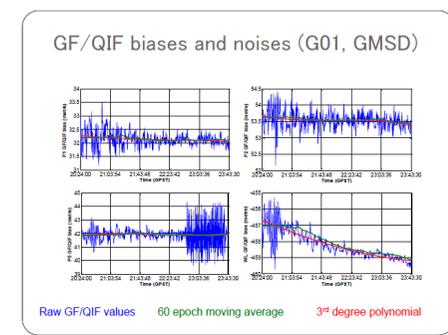
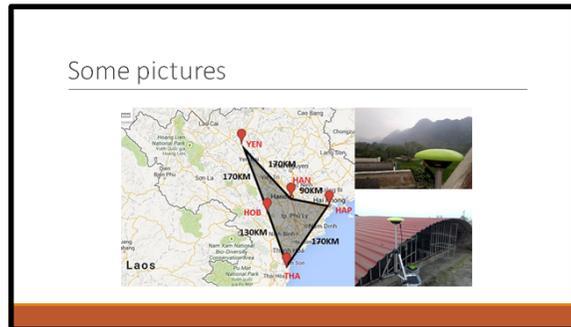




- Oct. 9th
  - GNSS Tutorial Session by G-NAVIS and GSI and JAXA
- Oct. 10th
  - Welcome and Keynote Speech
  - What's New about GNSS
  - Status Report of the Multi-GNSS Joint Experiments
  - GNSS Applications /Network Session
- Oct. 11th
  - Discussion Session
  - Demonstration Session
  - Closing Session



3 Final results of Joint Experiment 2012 including improvement of positioning by Multi-GNSS were shared



A preliminary results and next steps of joint experiments 2013 were shared. Final results of these experiments are expected to be reported in next workshop.





# Proposed Multi-GNSS Joint Experiments

- MGA Steering Committee endorsed the implementation of the following 2 proposed experiments
  1. **“Development of a Precise Positioning System in Urban Canyon using Multi-GNSS”**, National Geographic Information Institute, South Korea *[PP]*
  2. **“Proposal for Vehicle Safety Monitoring System with Furuno's Receiver”**, National Electronic & Computer Technology Center, Chulalongkorn University ,Thailand *[ITS]*



## CHALLENGES AND NEXT STEPS

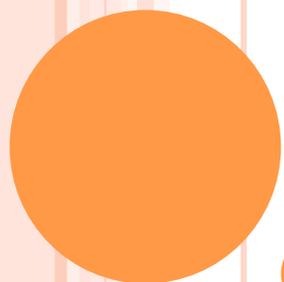
- More Experimental Opportunities of Multi-GNSS utilization from MGA participating organizations
- Encourage not only academia but also industrial participation for vitalization.
- More Collaborations with GNSS providers such as China and India.
- Transparency and Openness of MGA
  - “Membership Forum” has been created as a meeting for MGA participating organizations.
  - Steering Committee membership can be incremented up to 11, currently 8, in order to add more diversity.
- New additional Working Group: Capacity Building WG



## SUMMARY

- Multi-GNSS Asia (MGA) was introduced. The Active Participation in MGA be highly welcomed!!
- As results of the 6<sup>th</sup> Asia Oceania Regional Workshop on GNSS, Two proposed Multi-GNSS Joint Experiments were endorsed to be implemented.
- Next steps and challenges of MGA were introduced

Thank you for your kind attention!

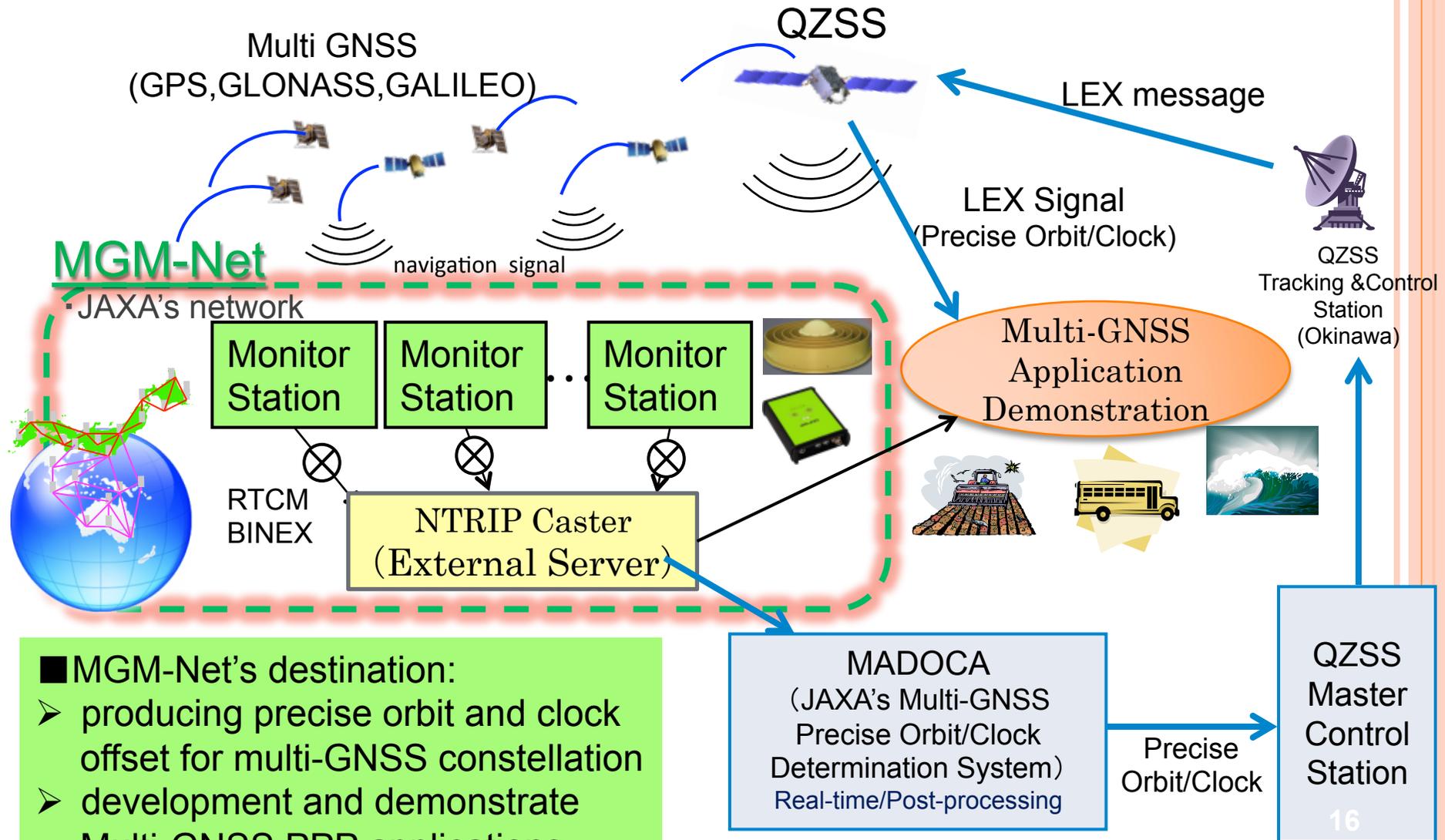


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以後、参考

# Activities 1 : Establishment of Multi-GNSS Monitoring Network



- MGM-Net's destination:
  - producing precise orbit and clock offset for multi-GNSS constellation
  - development and demonstrate Multi-GNSS PPP applications

LEX: QZSS's experimental signal including some information such as precise orbit /clock for PPP

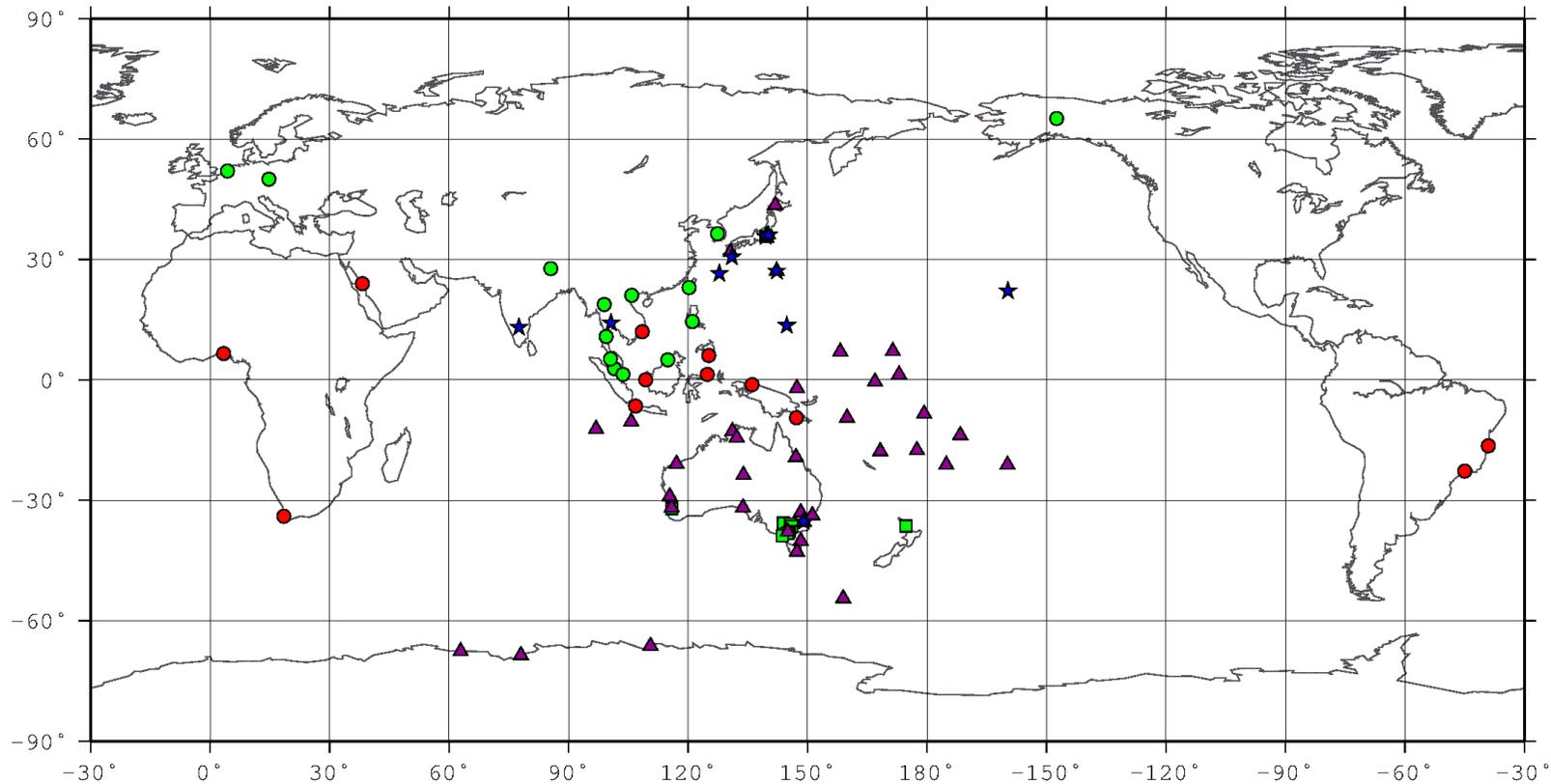


## ACTIVITY - 1

# MULTI GNSS MONITORING NETWORK (MGM-NET)

- Hosting Sites (In Operation) [14]
- Data Sharing Partner [9]
- ▲ Other Partner (Open to MGM-net) [40]
- Hosting Sites (Under Construction) [12]
- ★ JAXA Sites [10]

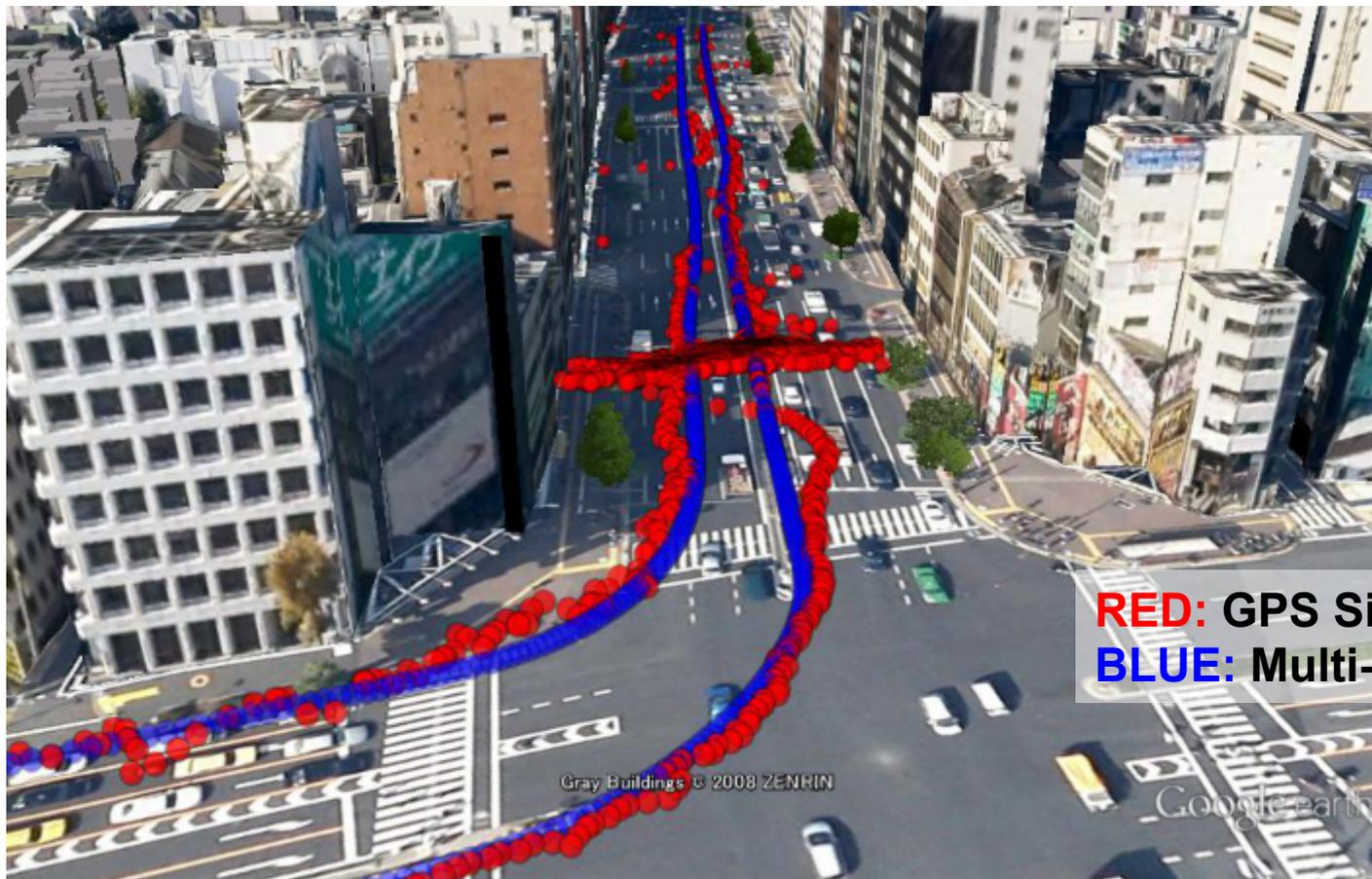
Oct, 2014



# IMPROVEMENT OF SATELLITE POSITIONING SERVICE (ACCURACY)

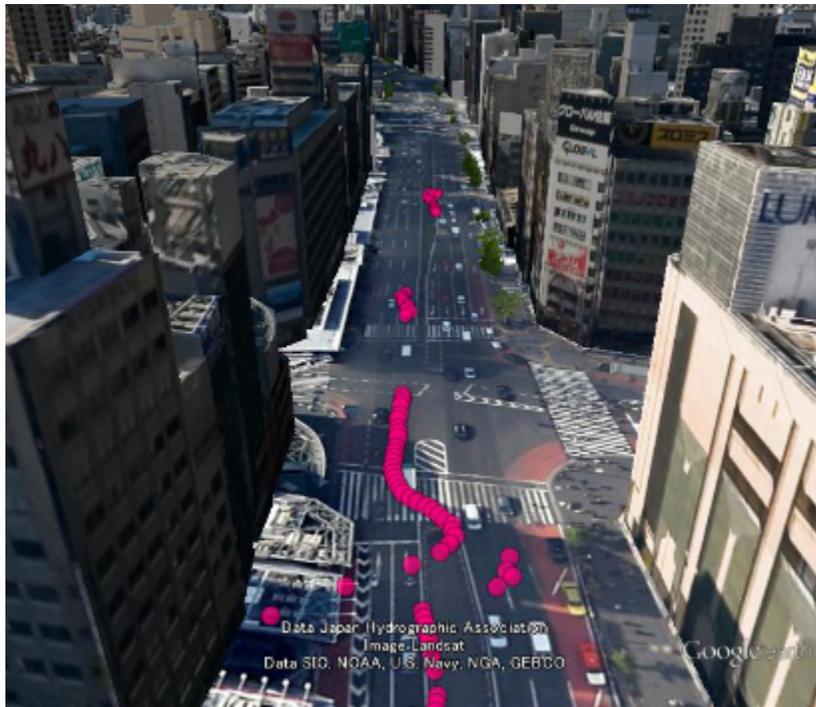


- GPS Single VS Multi-GNSS PPP (Post-processing)  
@ Yotsuya

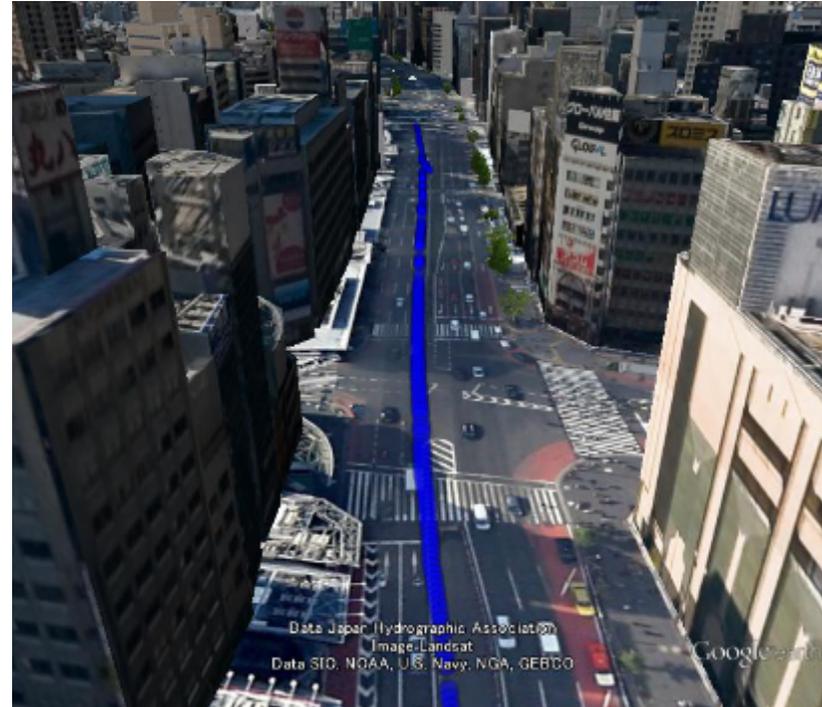


# POSITIONING PERFORMANCE IMPROVEMENT BY MULTI-GNSS

@Shinjuku, Japan



**RED: GPS PPP**



**BLUE: Multi-GNSS PPP**