

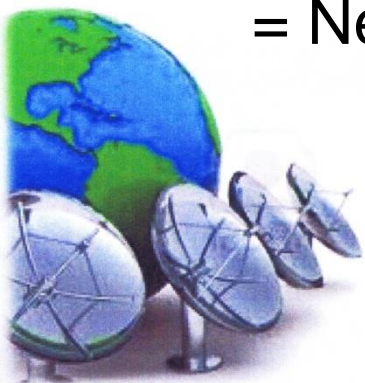


# Ground Station Network

Tokai university  
Kou Minowada

# About Ground Station Network (GSN)

- An Working Group in the UNISEC
- Main idea:
  - “Construct a network-based ground station system for satellites operation”
  - Extend communication time with satellites
  - Communication system redundancy
  - Isolating the cause of a problem
  - Sharing information  
= Network of People



# GSN Stations in Japan



Participating stations: 17universiy

- Ground stations in overseas countries
- Lulea Univ. of Technology & Umea Univ. (Sweden)
  - California Polytechnic State Univ. (CA, USA)
  - National Cheng Kung Univ. (Taiwan)
  - Univ. of Wurzburg (Germany)

Kyushu Institute of Technology  
Kyushu University

Sugadaira Space Radio Observatory

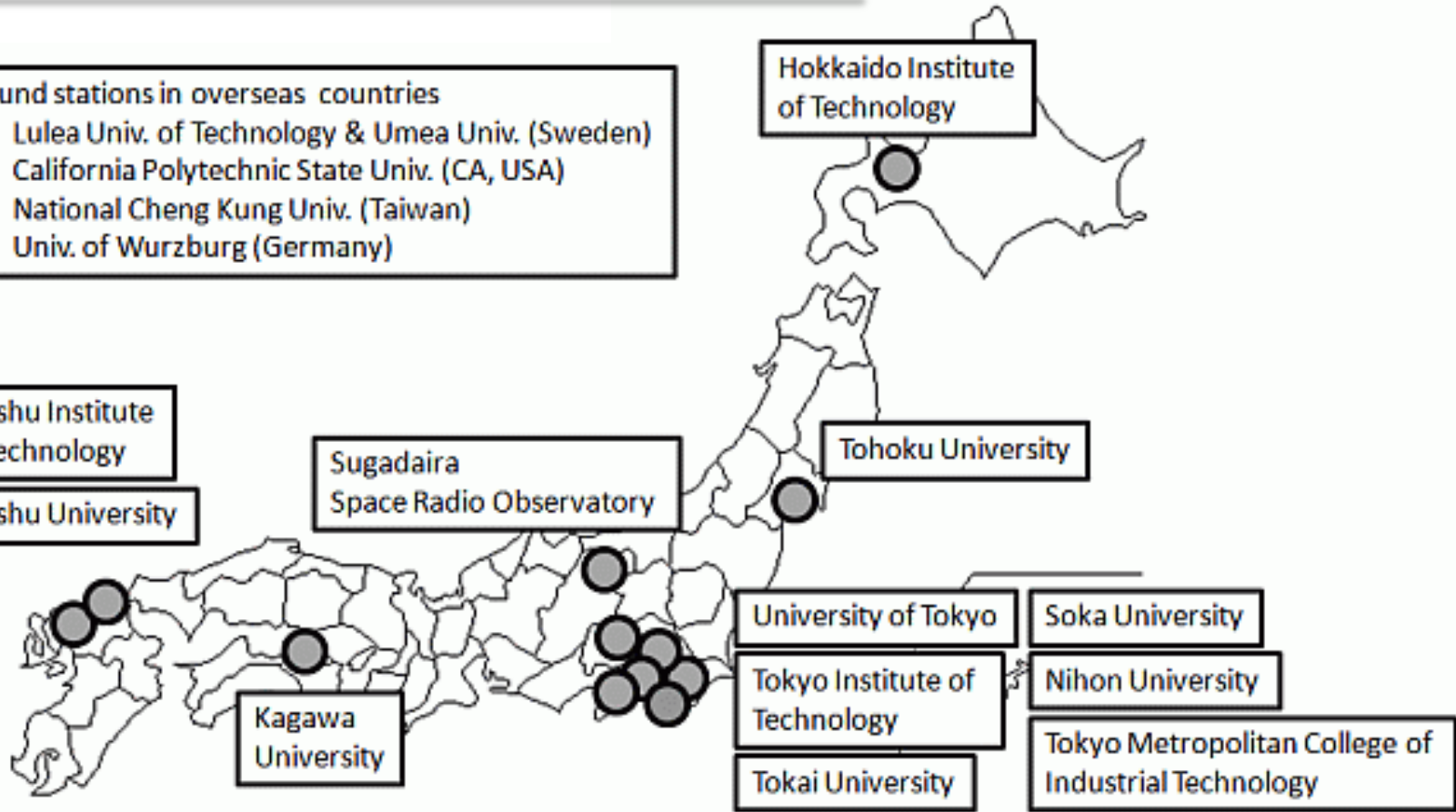
Kagawa University

Hokkaido Institute of Technology

Tohoku University

University of Tokyo  
Tokyo Institute of Technology  
Tokai University

Soka University  
Nihon University  
Tokyo Metropolitan College of Industrial Technology



# History of GSN Japan

- 1998 At the University Space System Symposium (USSS)  
Concept “An international network of  
ground stations via the Internet”
- 1999 “Cubesat” was proposed in the 2<sup>nd</sup> USSS
- 2001 UNISAT
- 2002 UNISEC established

GSN was proposed in the USSS.

The main idea was inherited through the UNISAT and the UNISEC after the activity was extended to Japan.

# Activity

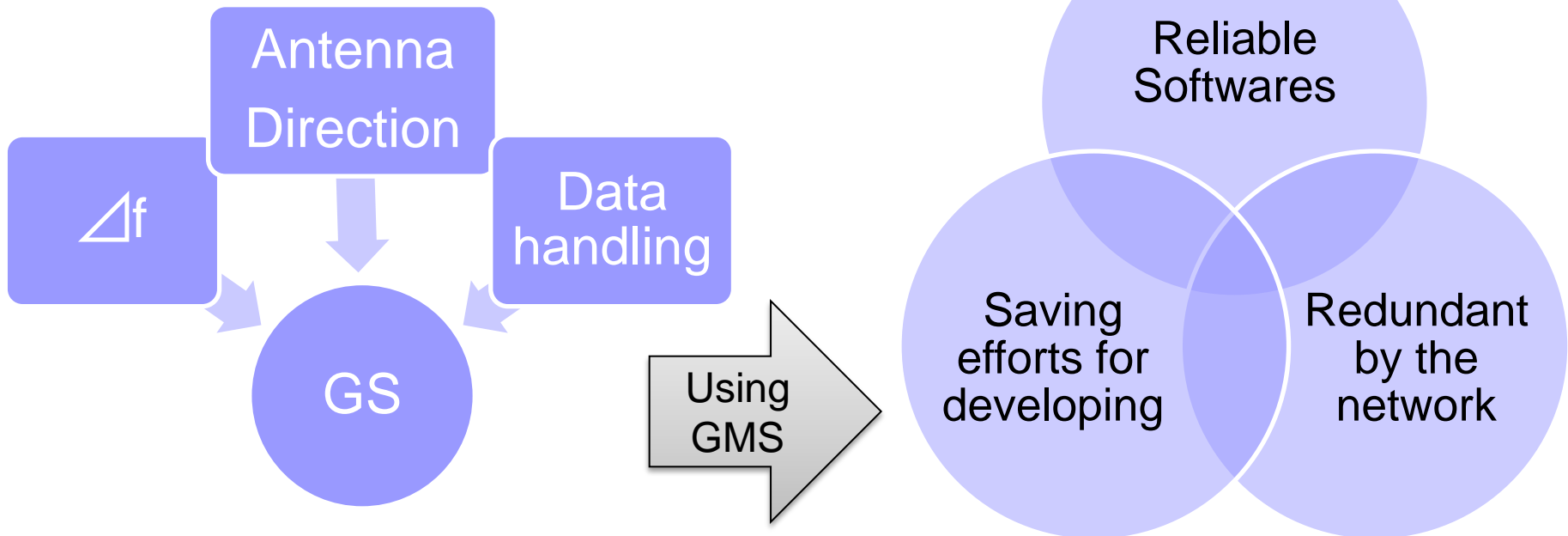
1. GSN standard software (GMS)
2. Collaborated receiving  
Especially in the first critical phase
3. Information sharing  
Web/Local meeting,
4. Outreach  
Receive signal in a school, teaching



# 1. GSN Standard Software

- Ground station Management Service (GMS)

Standard functions



- GMS developing project was a member of the **GENSO** project

## 2. Cooperated receiving

Uncertainness of  
estimated TLE

Lack of experience

Cooperation

Fast understanding  
of communication  
situation

Experience

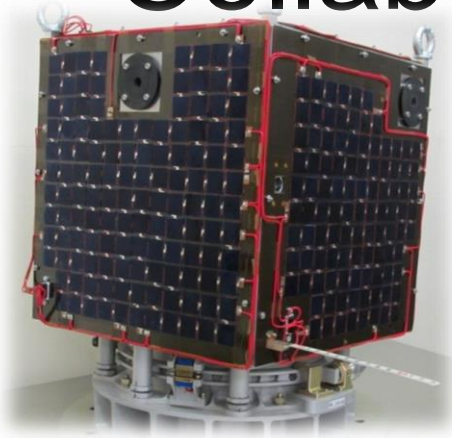
Division of roles (using  
different estimated TLE,  
freq. offset...

Extending visible  
time





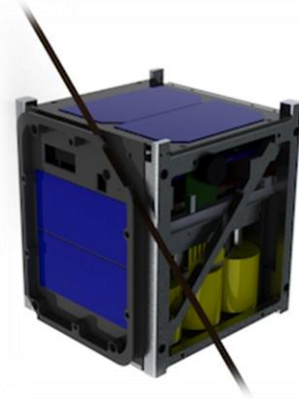
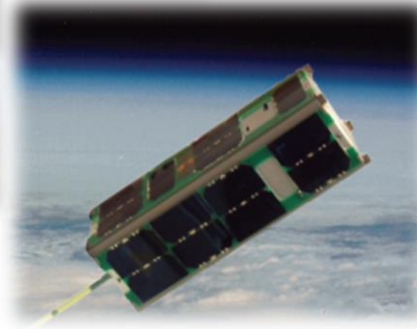
# Collaborated tracking activity



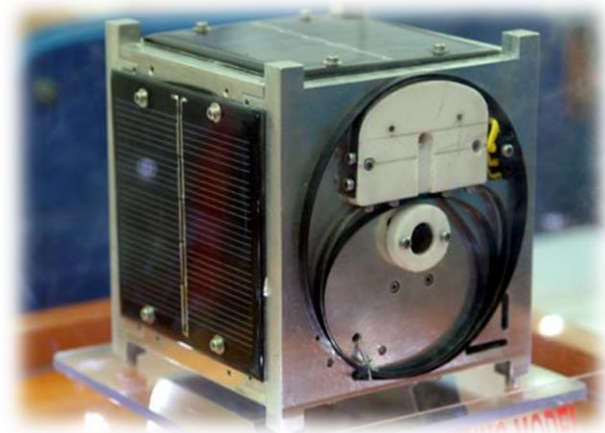
OUTSAT



PROITERES  
2012/9/9



PhoneSat 2013/04/22



PicoDragon 2013/11/19



# Tracking Cooperation History

- 2009/9/23 PSLV-C14 (Germany, Swiss, Turkey)  
➤ UWE-2, ITUpSAT, SwissCube, BeeSat
- 2009/1/21 GOSAT piggyback satellites (Japan)  
➤ PRISM, STARS, KKS-1, SOHLA-1, KAGAYAKI, SPRITE
- 2010/5/21 PLANET-C piggyback satellites (Japan)  
➤ Negai☆“, WASEDA-SAT2, UNITEC-1
- 2011/2/23 ELaNa (USA)
- 2011/10/28 ELaNa-III (USA)
- 2012/5/18 Horyu-2 (Japan)
- 2012/9/9 PROITERES (Japan)
- 2012/9/14 OUTSat (USA)  
➤ Aeneas, CSSWE, CP5, CXBN
- 2012/10/5 ISS deployed sats  
➤ FITSAT-1, F-1



# Future

We want to discuss with GSN from other country,

- To extend the best network over the world,
- To share our experience,
- To evolve together,
- To start more interesting activities!

Let's get together in the UNISEC Global GSN discussion group!