### **Ground Station Network**

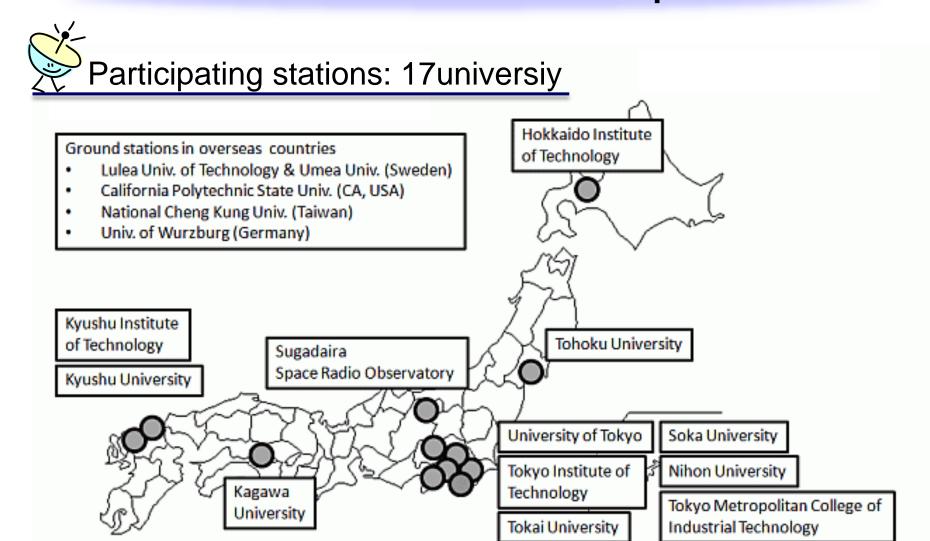
Tokai university Kou Minowada

#### 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**





## 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.

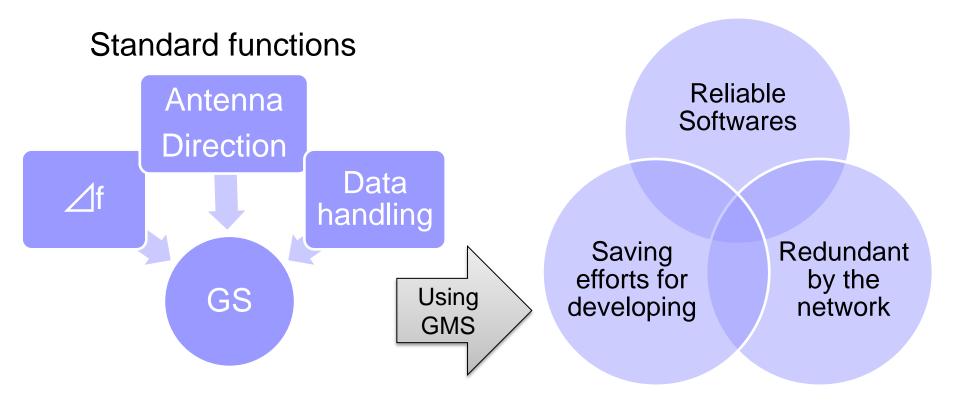
### **Activity**

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



#### 1. GSN Standard Software

Ground station Management Service (GMS)



GMS developing project was a member of the

**GENSO** project

# 2. Cooperated receiving

Uncertainness of estimated TLE

Lack of experience

Cooperation

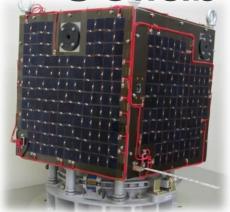
Fast understanding of communication situation

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

Experience

Extending visible time

## Collaborated tracking activity

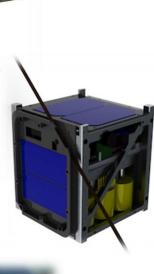


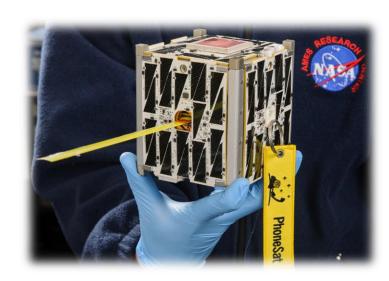
PROITERES 2012/9/9



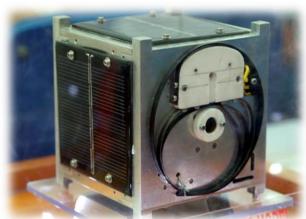












PicoDragon 2013/11/19

# Tracking Cooperation History

PSLV-C14 (Germany, Swiss, Turkey) 2009/9/23

UWE-2, ITUpSAT, SwissCube, BeeSat

GOSAT piggyback satellites (Japan) 2009/1/21

> PRISM, STARS, KKS-1, SOHLA-1, KAGAYAKI, SPRITE

PLANET-C piggyback satellites (Japan) 2010/5/21

Negai☆", WASEDA-SAT2, UNITEC-1

ELaNa (USA) 2011/2/23

ELaNa-III (USA) 2011/10/28

Horyu-2 (Japan) 2012/5/18

PROITERES (Japan) 2012/9/9

OUTSat (USA) 2012/9/14

Aeneas, CSSWE, CP5, CXBN



#### **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!