



University Hands-On Space Education - Japanese Case -

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History

- 1990 Necessity of hands-on education recognized by academic societies
- 1992 **Satellite Design Contest**, to provide a venue for university students to work and compete
- 1998 **USSS** (Univ. Space Systems Symp) started under JUSTSAP
 Joint projects between Japanese and US universities
 Proposal of CanSat, CubeSat, Ground Station Network
- 2001 UNISAT (University Satellite Consortium)
- 2003 **NPO UNISEC** (Univ. Space Eng'ng Consortium)
- 2003~ Launches of CubeSat's
 Cooperation with local Industries
- 2008~ JAXA launches of small satellites

Satellite Design Contest

Promotion of Student Space Activities
Through Small Satellite Design Based on Student Initiative
Categories: Design=Piggyback, Idea=No Limitation

- **Initiative of Academic Societies (1992~)**
JSME, JSASS, IEICE
later Joined by NASDA, ISAS, JSF
- **Providing a Trigger to University Space Activity**
A Sep Further from “Theory”
Accessible Space
- **Well Received by Society**
Increase in Participation
Encouragement from General Public & Journalism
Expectation toward Piggyback Launches
- **Accumulate Student Expertise**
1st University Satellite (WEOS by Chiba Inst. Tech)
Desires toward Next Step

Student Satellite Designs

Satellite Design Contest (1993~)

1993



Whale Observation
Chiba Ins. Tech.

1998



Lunar 2001
Kyushu U



Jumping Turtle
Tohoku U

2002



PETSAT
Tokyo U



Microscopic Newtonian Gravity
MIT

2003



Infrared Astronomy
Tokyo U



Jupiter Probe
Tokyo Inst. Tech.



Orbital Elevator
Kyushu U

JUSTSAP/USSS

Japan US Science Technology and Space Applications Program
University Space Systems Symposium

- JUSTSAP:
Pursuit of Joint Projects (Japan/US),
Meetings in Hawaii Annually
- USSS:
Students from 6-10 universities, Japan/US
Define Joint Small Satellite Projects
through Discussions among Students
- Well Defined Project Proposals Adopted &
Implemented
CanSat, CubeSat, Ground Stations,
Satellite Concurrent Designs

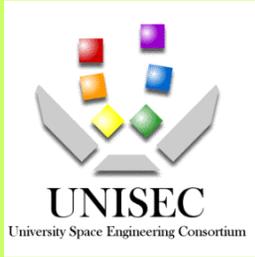
USSS in Action



2-Day Discussion in Hawaii



CanSat Lunch in Nevada, US



UNISEC

University Space Engineering Consortium

**NPO Established in 2003, succeeding JSASS
Sub-Group Activities**

**Support university satellite and rocket projects
for technology development, space education
and international cooperation**

- **Working Items**

- 1) Fund raising and financial support to student projects
- 2) students' usage of agency/companies test facilities
- 3) Acquisition of radio frequencies
- 4) information exchange, workshop among universities
- 5) Promotion of regional and university/industry cooperation

UNISEC Supported Activities



Workshop



Symposium



CanSat Projects



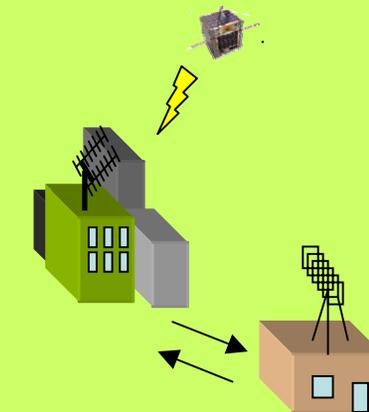
USSS



Hybrid Rocket Projects

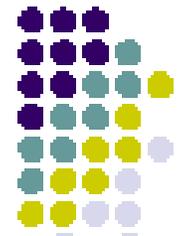


CubeSat Projects



Ground Station Network

Currently 35 universities, more than 300 students, 60 regular members involved

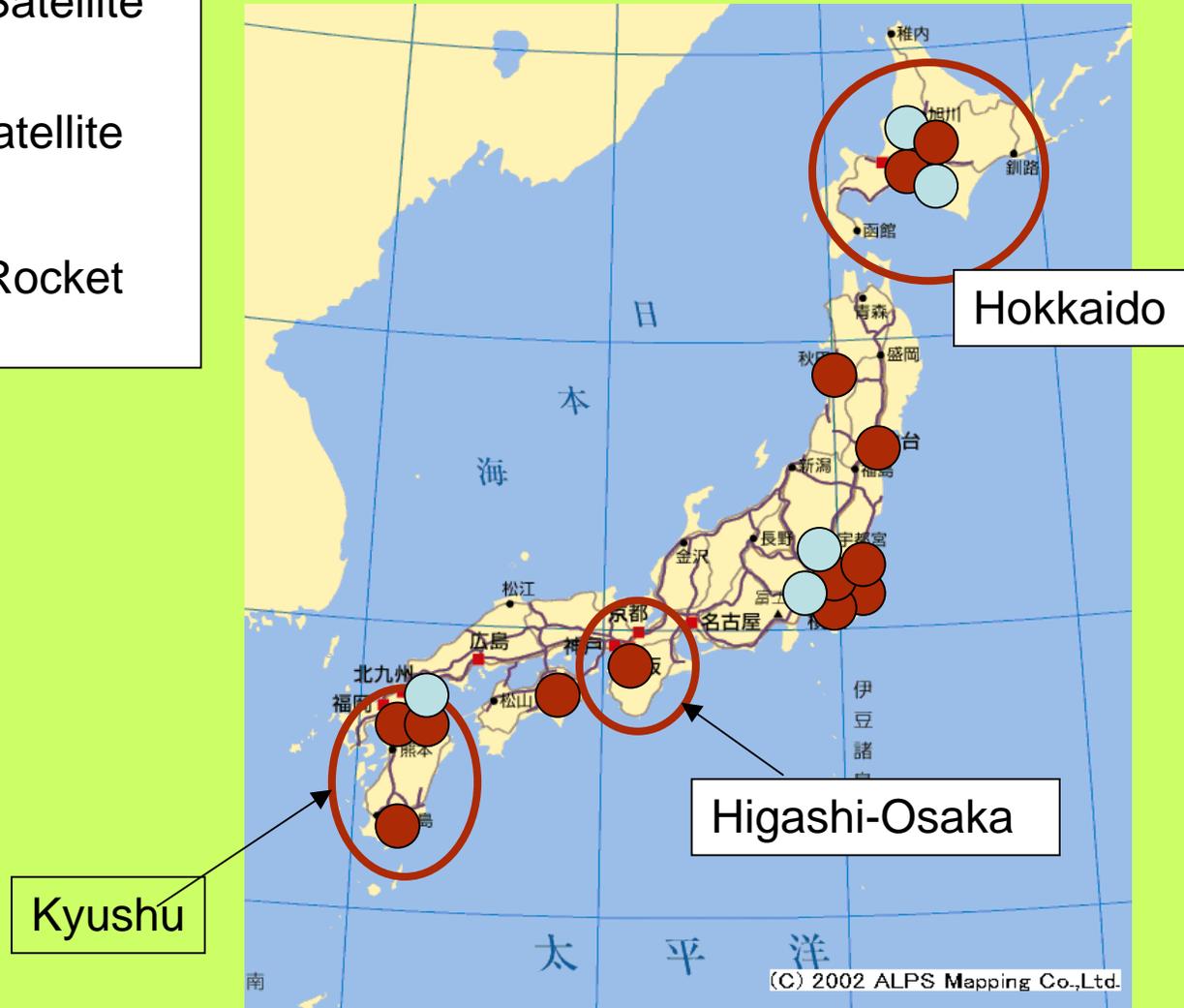
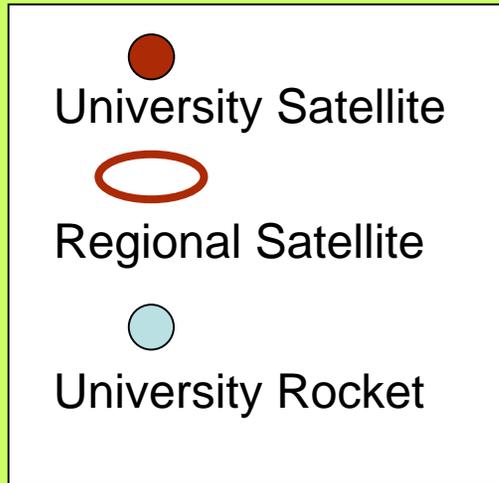


<Example of Activities>



- UT & Titech : CubeSat succeeded
- Nihon Univ. : CubeSat launch in June 2006
- Soka Univ. : CubeSat under development
- Kyushu Univ : Tether experiment satellite development
- Hokkaido Tech: Remote sensing satellite for agriculture
- Hokkaido Univ., Tokyo MIT: Hybrid rocket experiment
- Tokai Univ. : Hybrid rocket launch in Alaska
- Collaboration with local private sectors begin:
Hokkaido, Tokyo, Osaka, Kyushu <http://www.unisec.jp>

UNISEC Activities And associated regional projects





CanSat

An Ideal tool for entry education
Building and operating satellites



CanSat

Sub-Orbital Flights

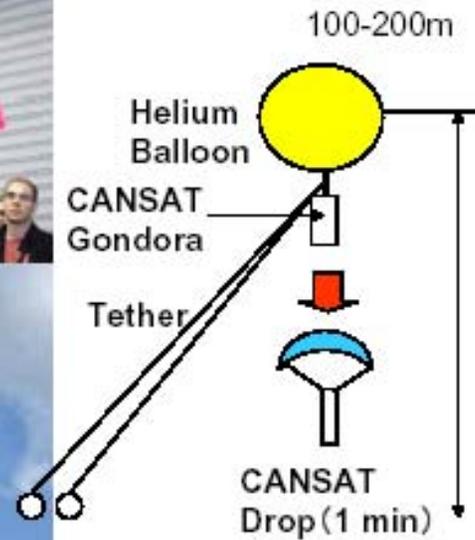




CanSat Balloon Flights

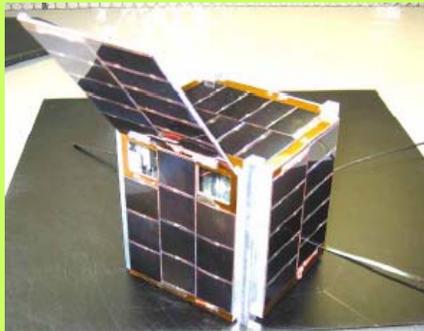


**IAC 06, Fukuoka
International competition**



CubeSat

- Now International Standard -



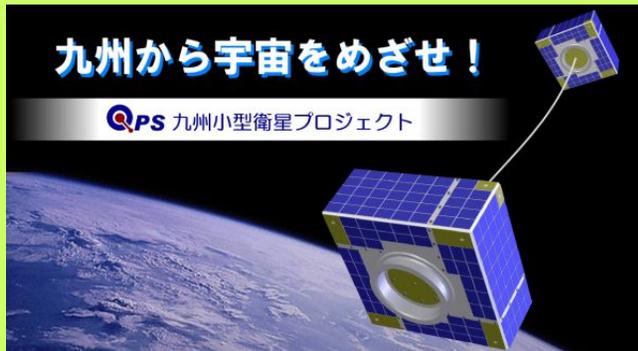
Cute, Tokyo Ins. Tech



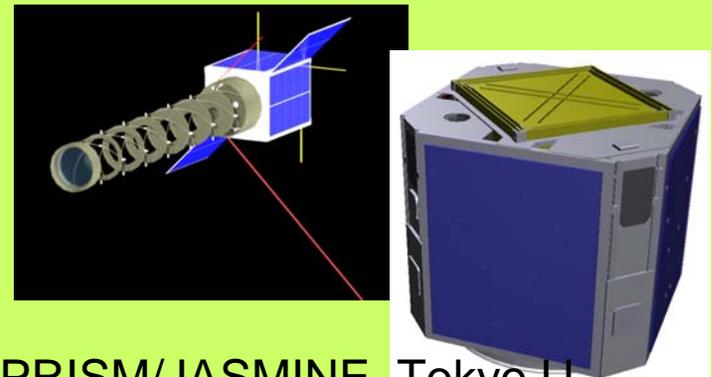
Xi, Tokyo U

followed by
Nihon U, Soka U,
Hokkaido Inst. Tech

And Further-On



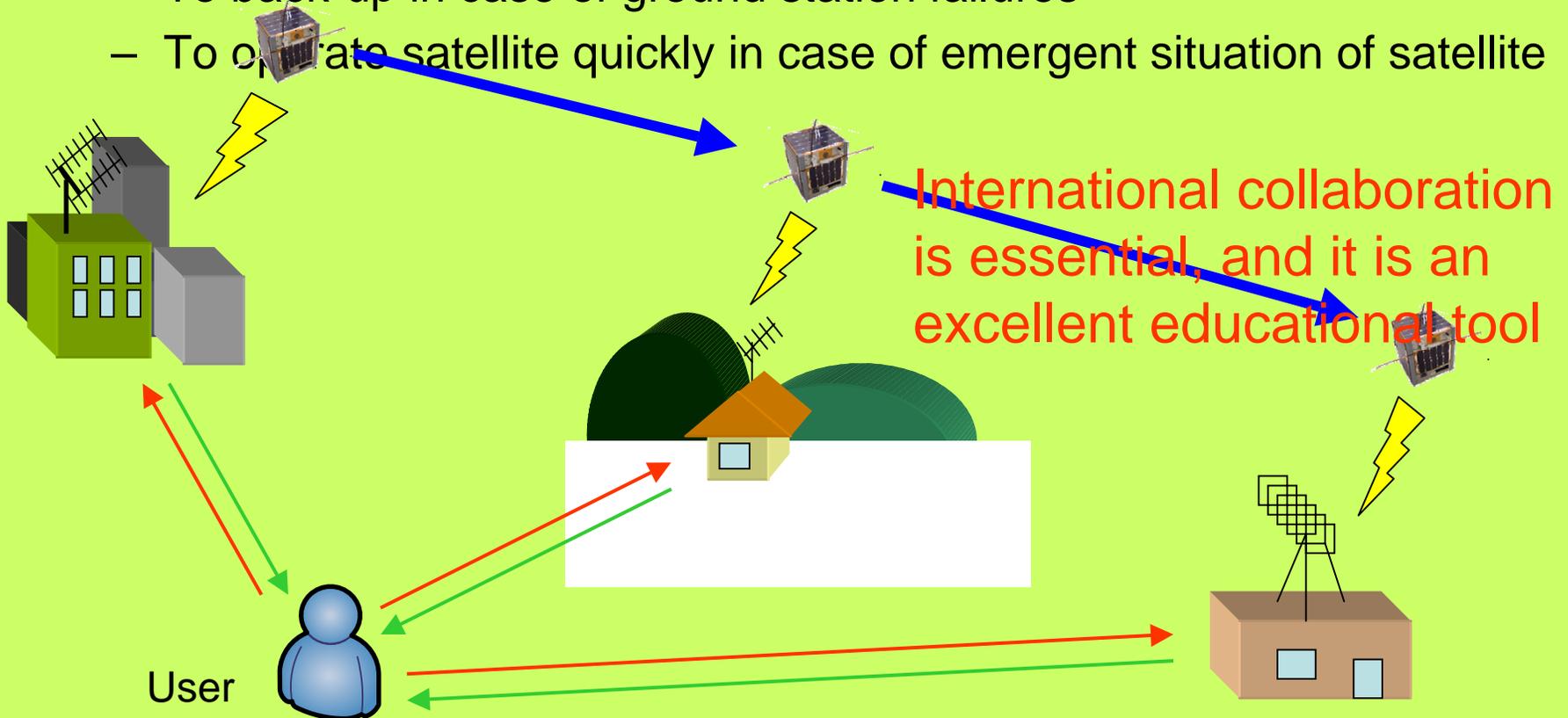
QTEX, Kyushu U



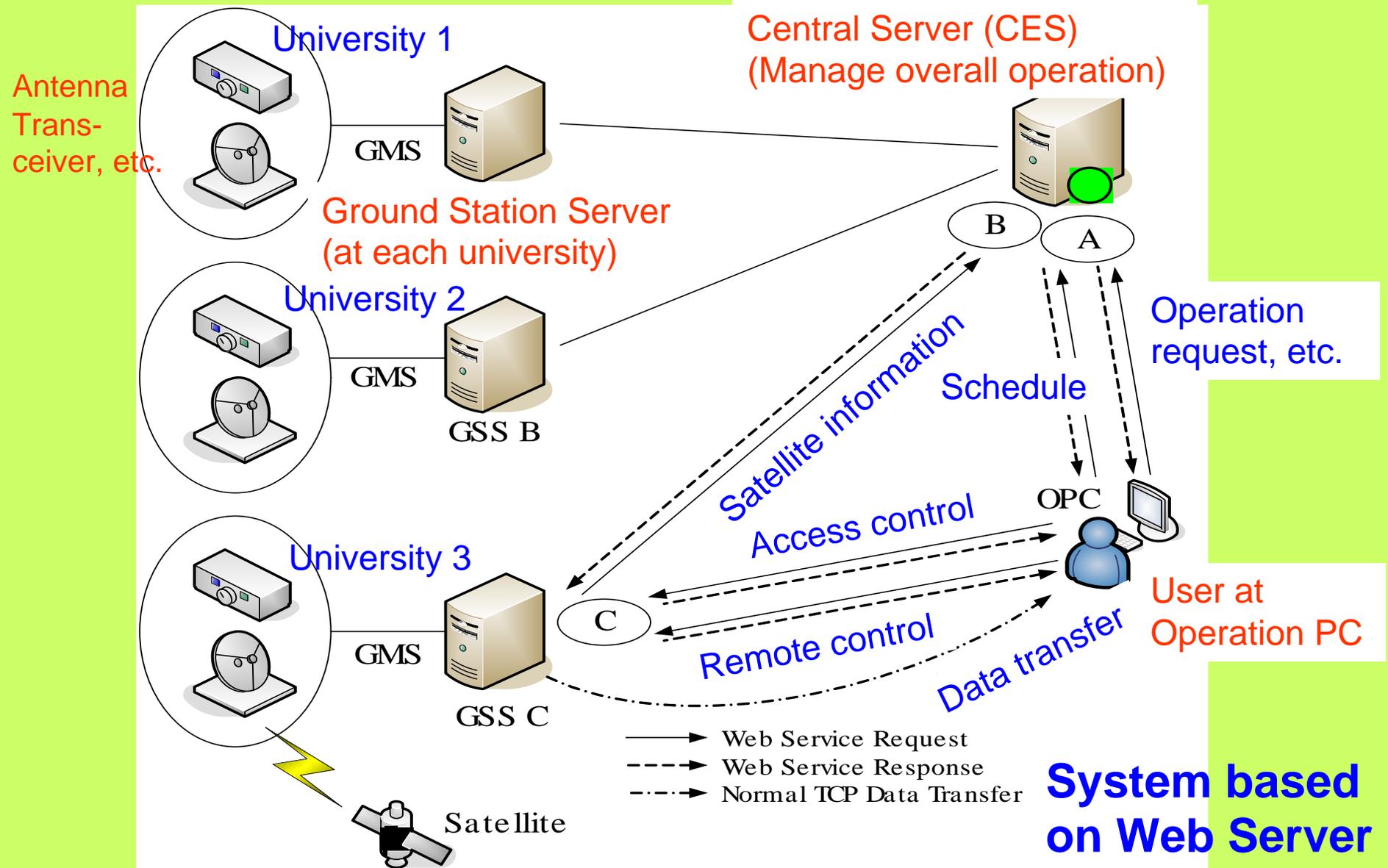
PRISM/JASMINE, Tokyo U

Ground Station Network

- Connect university ground stations all over the world via Internet, and remotely operate satellites
 - To enhance satellite operation opportunity and time
 - To back-up in case of ground station failures
 - To operate satellite quickly in case of emergent situation of satellite

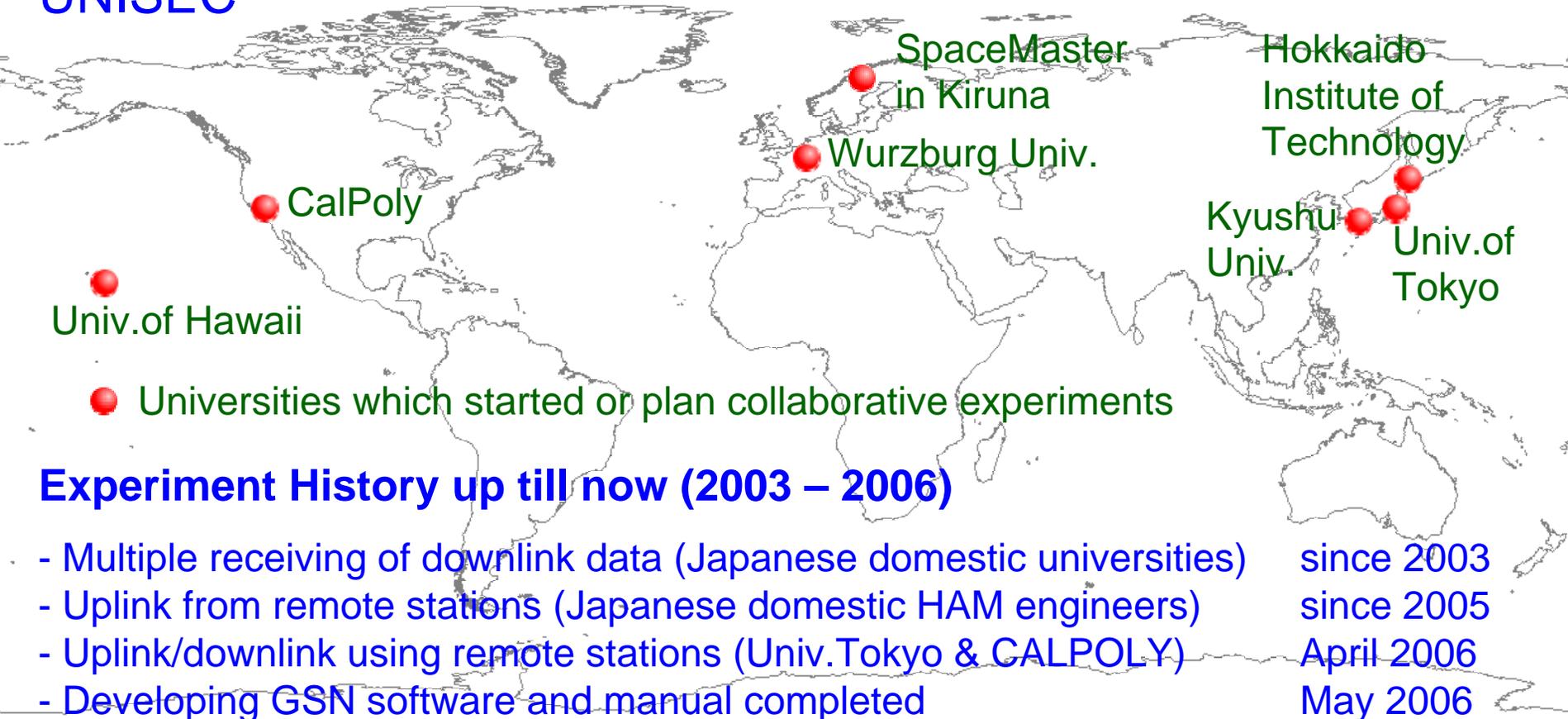


GSN System Architecture developed by UNISEC



GSN Current Status World-Wide

Experiments in collaboration with domestic and international universities have started using GSN software developed by UNISEC



Experiment History up till now (2003 – 2006)

1st International Ground Station Workshop in Univ of Tokyo

July 2006

UNISEC Rocket Groups

Hybrid rocket propulsion/launch experiment
Fly-back type rocket upper stage (winged)
International joint launch in Alaska, etc



Taiki-cho (Hokkaido)
Launch experiment

Summary of Hands-On Education in Japan

- **Accumulation of space system expertise** in universities, leading to a less expensive, more effective way of space system integration.
- Student's experiences on **complete cycle of projects**, from conception to operation, including design, fabrication, integration, testing and review.
- Cultivation of **international minds and understanding** through multi-national collaborative works.
- **Meeting social demands** to provide creative youths readily applicable not only to space development but also to any industrial and scientific practices.
- An excellent example of **effective educational process** to bring up challenging youths **within universities capacity** that could be applied to any nation.