地上局ネットワーク

(Ground Station Network)

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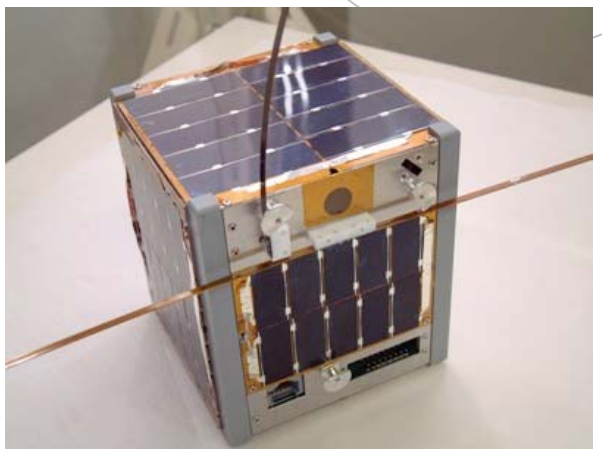
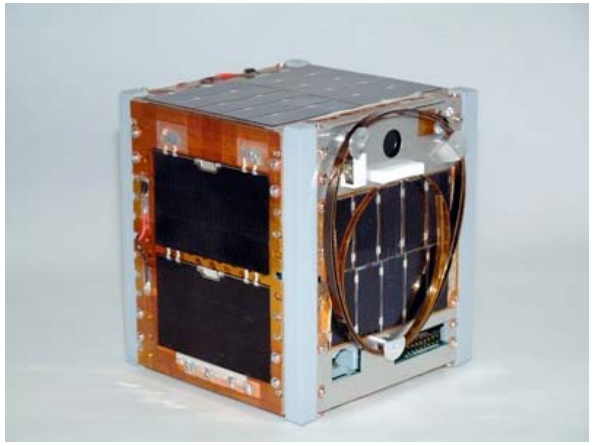
University of Tokyo's CubeSat "XI"

- U of Tokyo has launched 2 CubeSats until now
  - XI-IV [sai-four]
    - Date: June 30, 2003
    - Launch Vehicle: Rockot
    - Site: Plesetsk Cosmodrome, Russia
    - Working for approx. 3 years in orbit

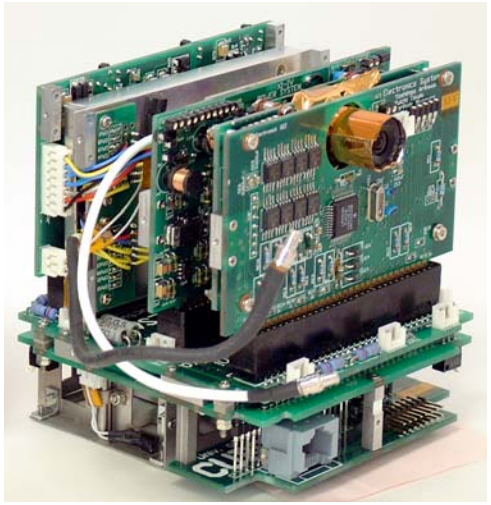


  - XI-V [sai-five]
    - Date: October 27, 2005
    - Launch Vehicle: Cosmos
    - Site: Plesetsk Cosmodrome, Russia
    - Working for just half a year in orbit



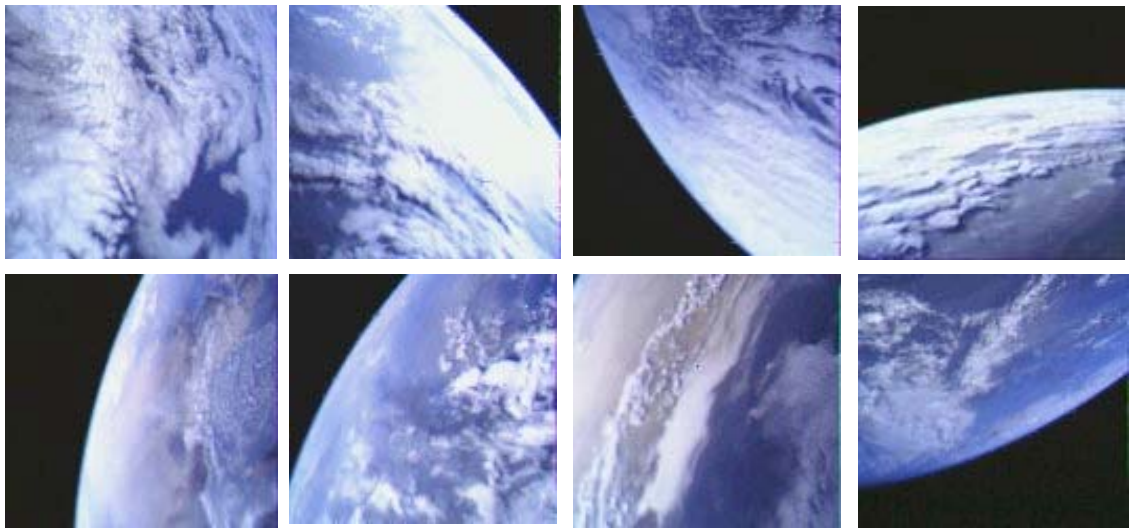
XI's achievements

- Established bus system suitable for nano-satellites with COTS and verified its space survivability
- Acquired a large amount of engineering data and beautiful Earth pictures (though resolution is low)
- Honored to receive OSCAR numbers from AMSAT-NA; XI-IV is officially known as CO-57 and XI-V as CO-58 now



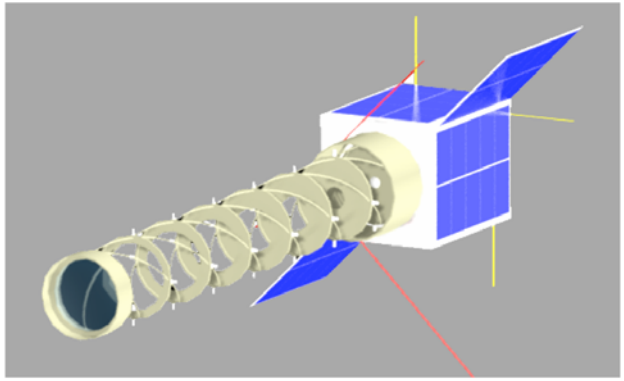
Internal structure of XI-V

Earth pictures taken by XI



U of Tokyo's Challenge to Space

- Take a visit at the website of University of Tokyo's nano-satellite projects!
  - CubeSat Project: **http://www.space.t.u-tokyo.ac.jp/cubesat/**
  - XI MAIL STATION: **http://www.space.t.u-tokyo.ac.jp/ximail/**
    - We are distributing Earth images taken by XI free of charge!
  - PRISM Project: **http://www.space.t.u-tokyo.ac.jp/prism/**
    - U of Tokyo's 2nd generation nano-satellite project (not a CubeSat)
  - S-310 Project: **http://www.space.t.u-tokyo.ac.jp/s310/**
  - Ground Station: **http://www.space.t.u-tokyo.ac.jp/gs/**



PRISM (Launch will be in 2007)

S-310 Sounding Rocket Experiment (Jan. 22)

U of Tokyo & Cal Poly Experiments

- Ground Station Network experiments
  - Track and send / receive data from XI-IV
  - Establish inter-university relationships
  - Test Ground Station Network feasibilities
  - Learn from each other
- Cal Poly has gained
  - Experience tracking, sending, and receiving packet data
  - Downlink: 1200 baud, AFSK, 437 MHz (UHF)
  - Fully able to test our ground station (before our launch)

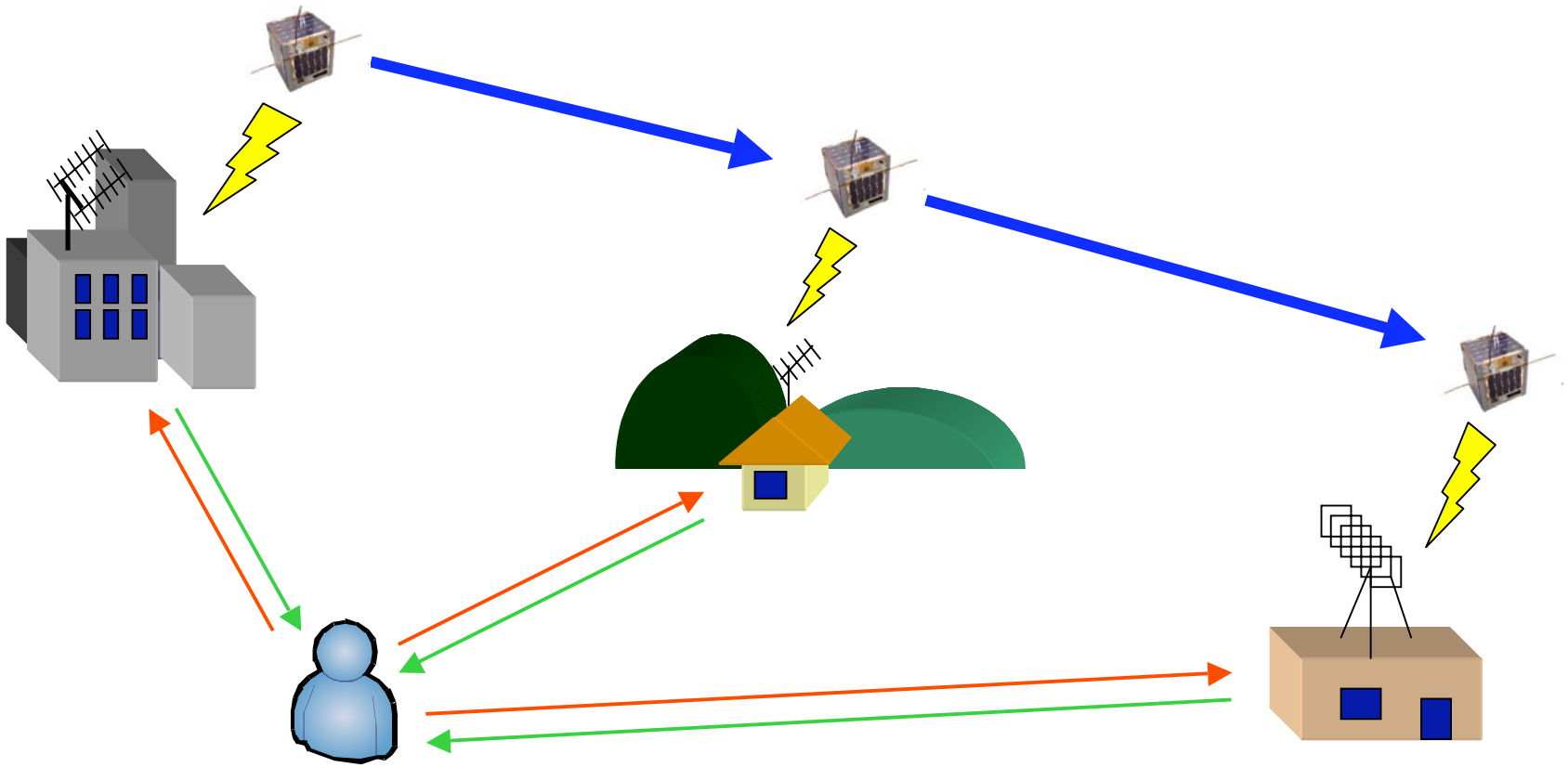
Initial Experiment

- See how fast the two ground stations can download a picture from XI-IV
  - Normally takes about 2 days from just U of Tokyo
  - Cal Poly and U of Tokyo took only 7 hours!
  - This experiment both ground stations had operators present
  - Raw picture size was 32 KB
  - 128x120 pixels

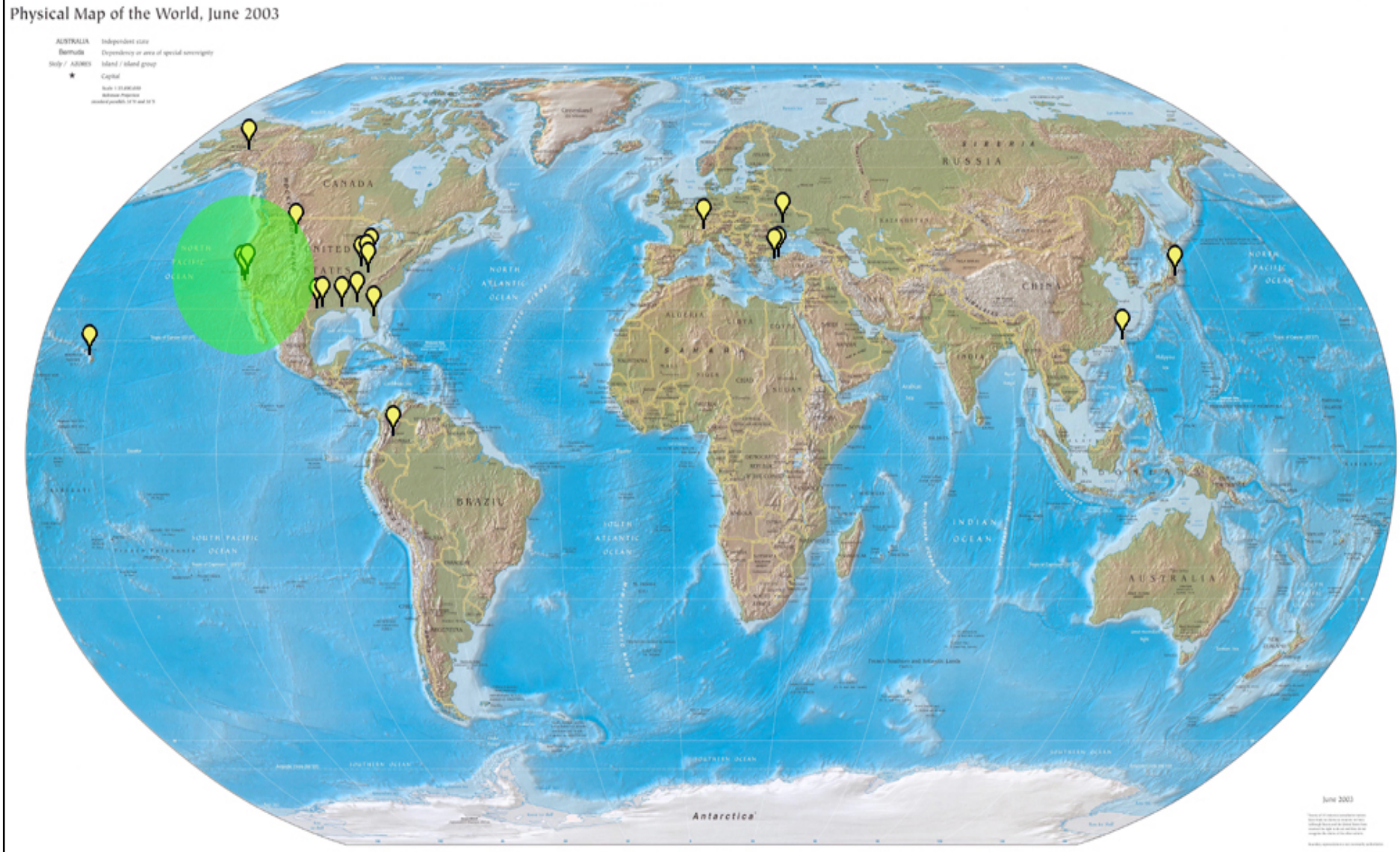
- Future experiments planned
  - More autonomous control
  - Testing of GSN software
  - Will release to community

Ground Station Network

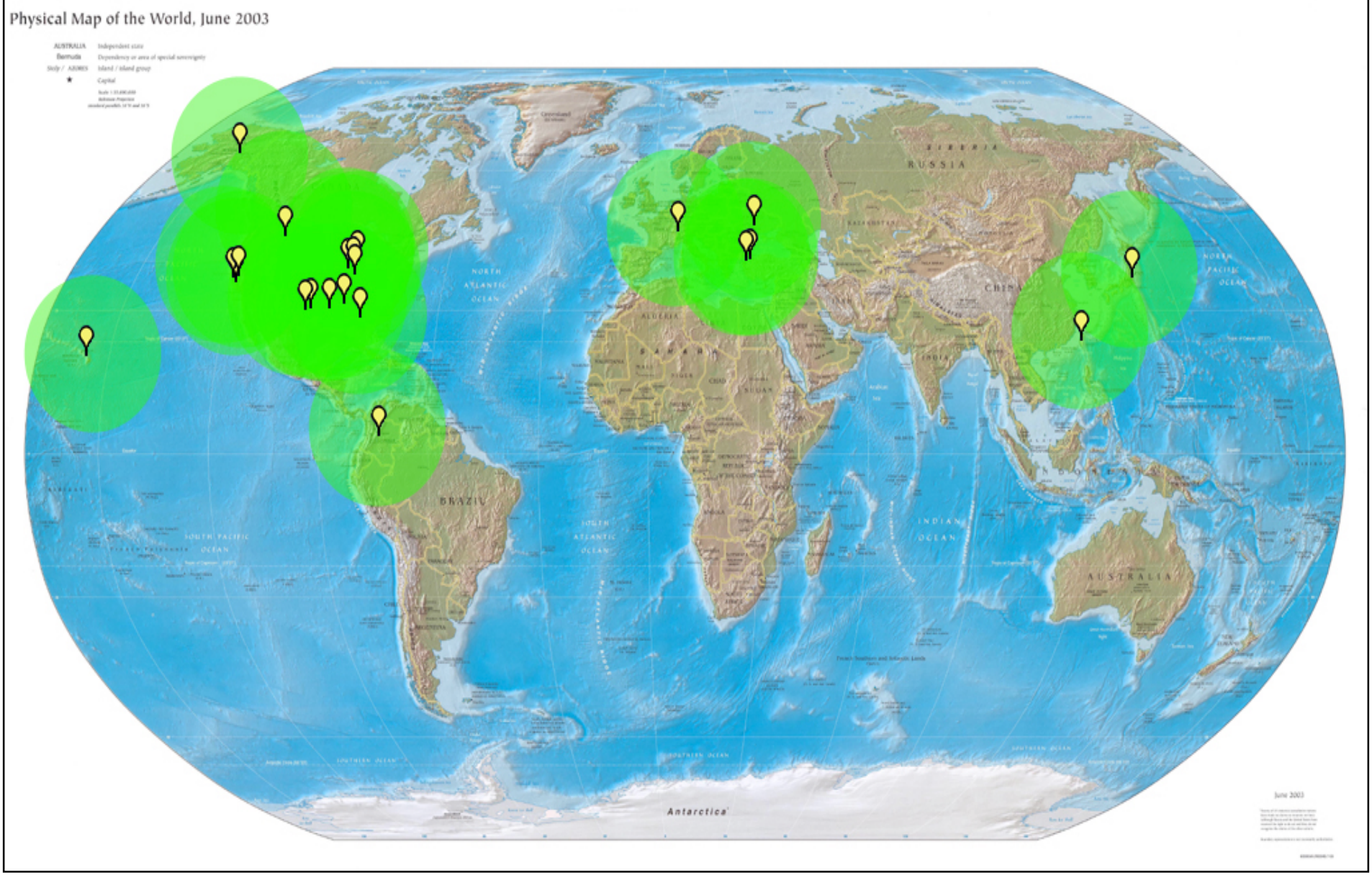
- Connects ground stations all over the world with the Internet
- Can improve total data downloaded from CubeSats



One Ground Station



Ground Station Network

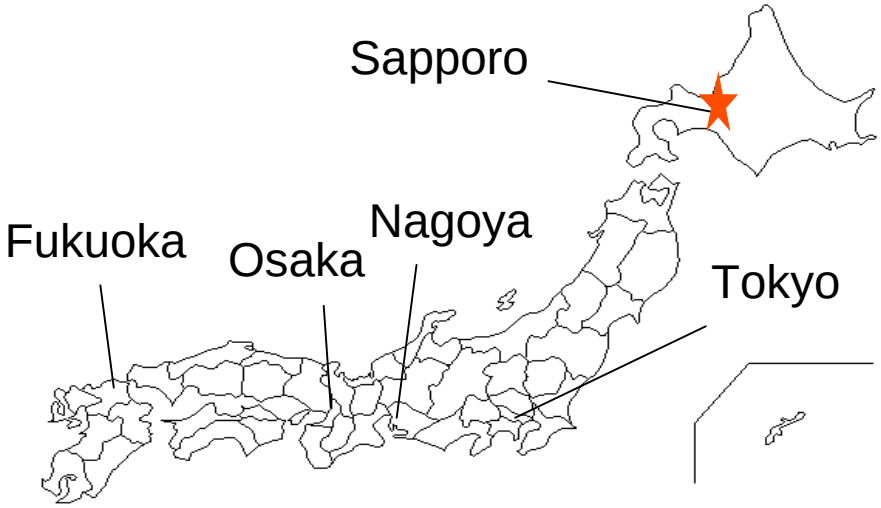


More Advantages of GSN

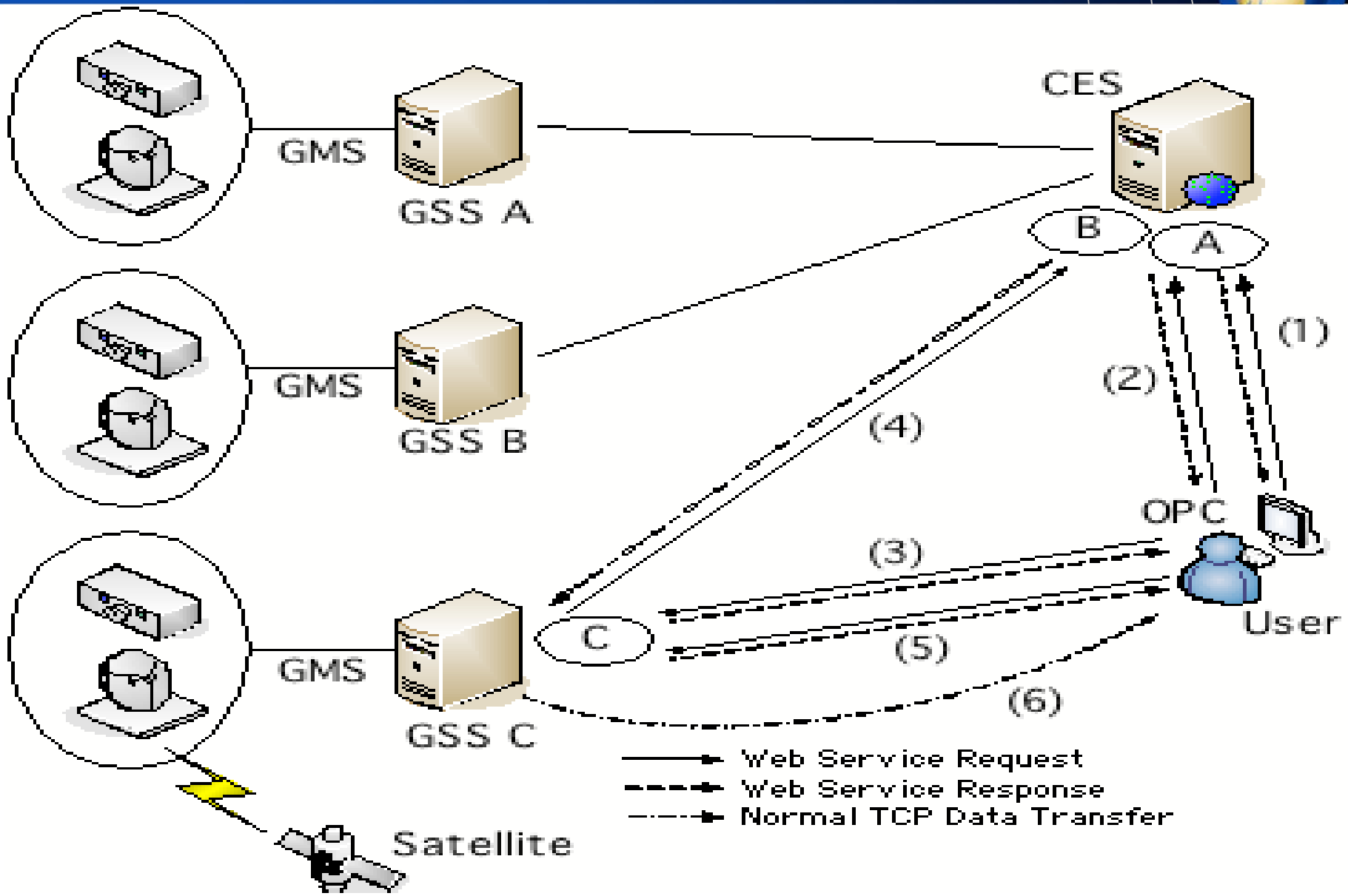
- With geographically close stations…
  - Even if your station equipment is out of order or under maintenance you can still operate your satellite.

    → Works as a backup station!

Destroyed ground antenna with heavy snow at Hokkaido Institute of Technology



GSN System Architecture



Demonstration

- Soon XI-IV will pass over Japan
  - AOS 13:18:59 → LOS 13:33:49 (PST)
- We will make a remote operation using GSN system
- Now it is very early morning in Japan, but some crazy guys are waiting for us at the University of Tokyo's ground station
  - Let's call them: http://ncam.space.t.u-tokyo.ac.jp/

Let's join us at Ground Station Network Project!

…And we will hold a 1st International Symposium on Ground Station Network in Tokyo! Keep updated with the latest information at **http://www.unisec.jp**