Group 2

Open Source Virtual Satellite

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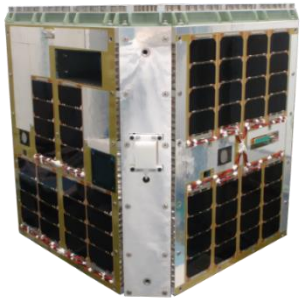
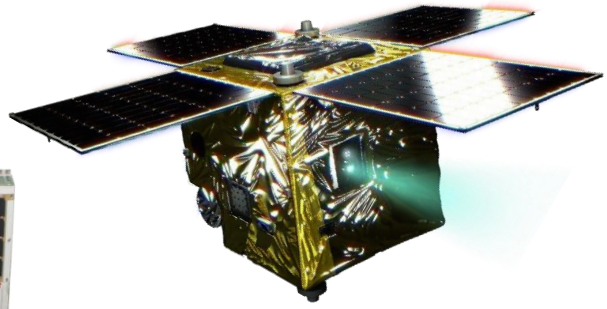
Self-introduction

- Assistant professor of Prof. Nakasuka's lab.
- Several experiments on micro-spacecraft development and operation
  - Attitude control, C&DH, Science instruments…
  - Software development for spacecraft

PRISM (**2009**): 8kg
Remote Sensing



Nano-JASMINE: 33kg
Astrometry



PROCYON(**2014**): 65kg
DeepSpace Exploration

EQUULEUS(**2019**): 14kg
Lunar Exploration

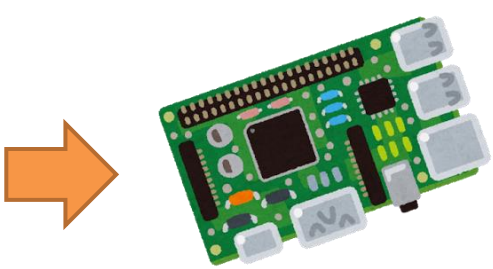
Issues on current nano-satellite development

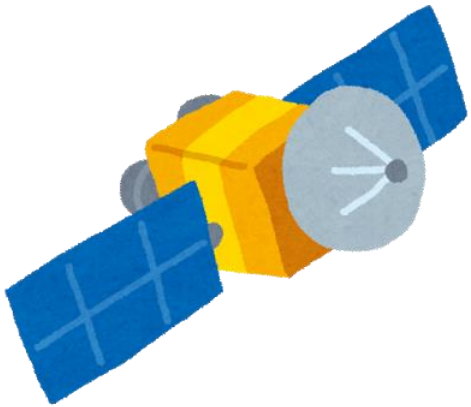
- Hardware First
- Many **standardized** and **modularized** H/W components, but no S/W components.
- Many software bugs
  - We need more evaluation or hands-on training opportunities on S/W development
- Real H/W components are still expensive
  - Opportunity to access space is still limited

We have to more focus on
S/W development, standardization,
modularization, education, and reliability

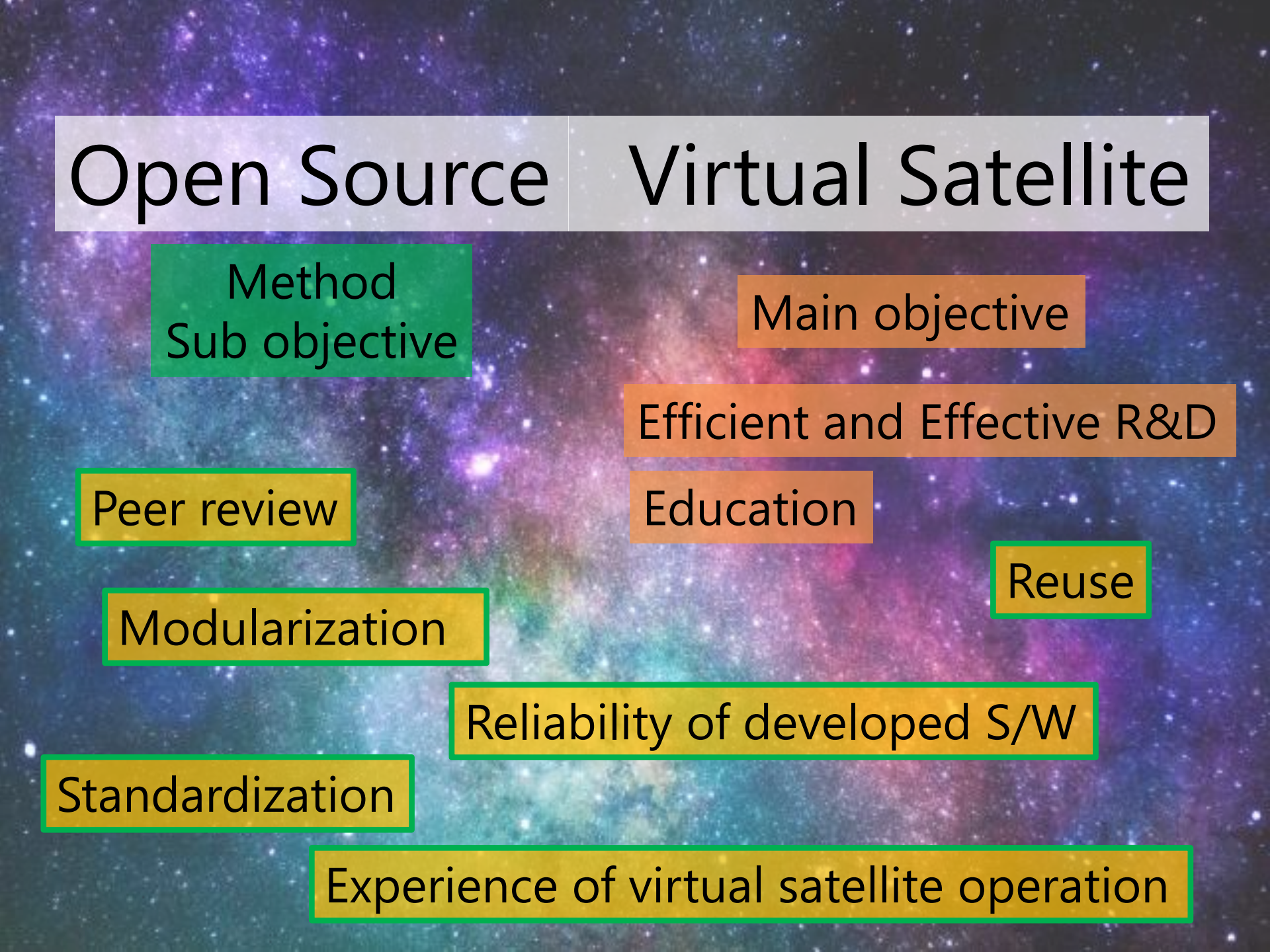
My dream

- I want to develop, evaluate, and demonstrate
  every S/W related to space activity
  in a virtual space in PC
  - Every S/W: On-board C&DH, ADCS, Thermal, Power etc…
    On-ground C&DH, image processing, etc…
- The virtual space **must seamlessly connect with real** hardware components





Seamless Connection

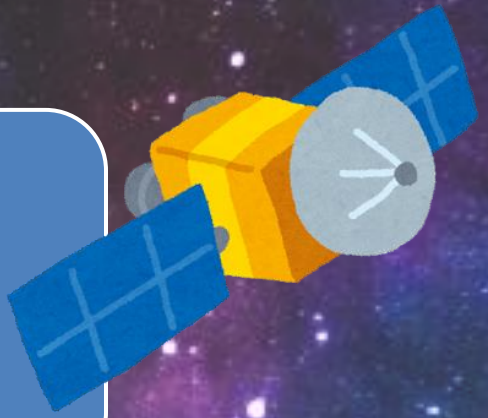

Open Source
Virtual Satellite
Method
Sub objective
Main objective
Efficient and Effective R&D
Peer review
Education
Reuse
Modularization
Reliability of developed S/W
Standardization
Experience of virtual satellite operation

My Dream: Virtual Satellite

Spacecraft

Algorithms

Components Emulator



Simulator

Space Environment

RF & Antenna Emulator

Algorithms

Ground Station

Why Open Source? Why in UNISEC?

- The dream is **too huge** to achieve by one researcher, one laboratory, and one country
  - I need collaboration with many **motivated people** all over the world
- The virtual space is useful for all satellite developers especially for university researchers and students
  - Experts: Reliable and efficient development
  - Beginners: Low cost but effective training

The project is suitable for concept of UNISEC-Global

Open Source Virtual Satellite

Efficient and Effective R&D

Standardization

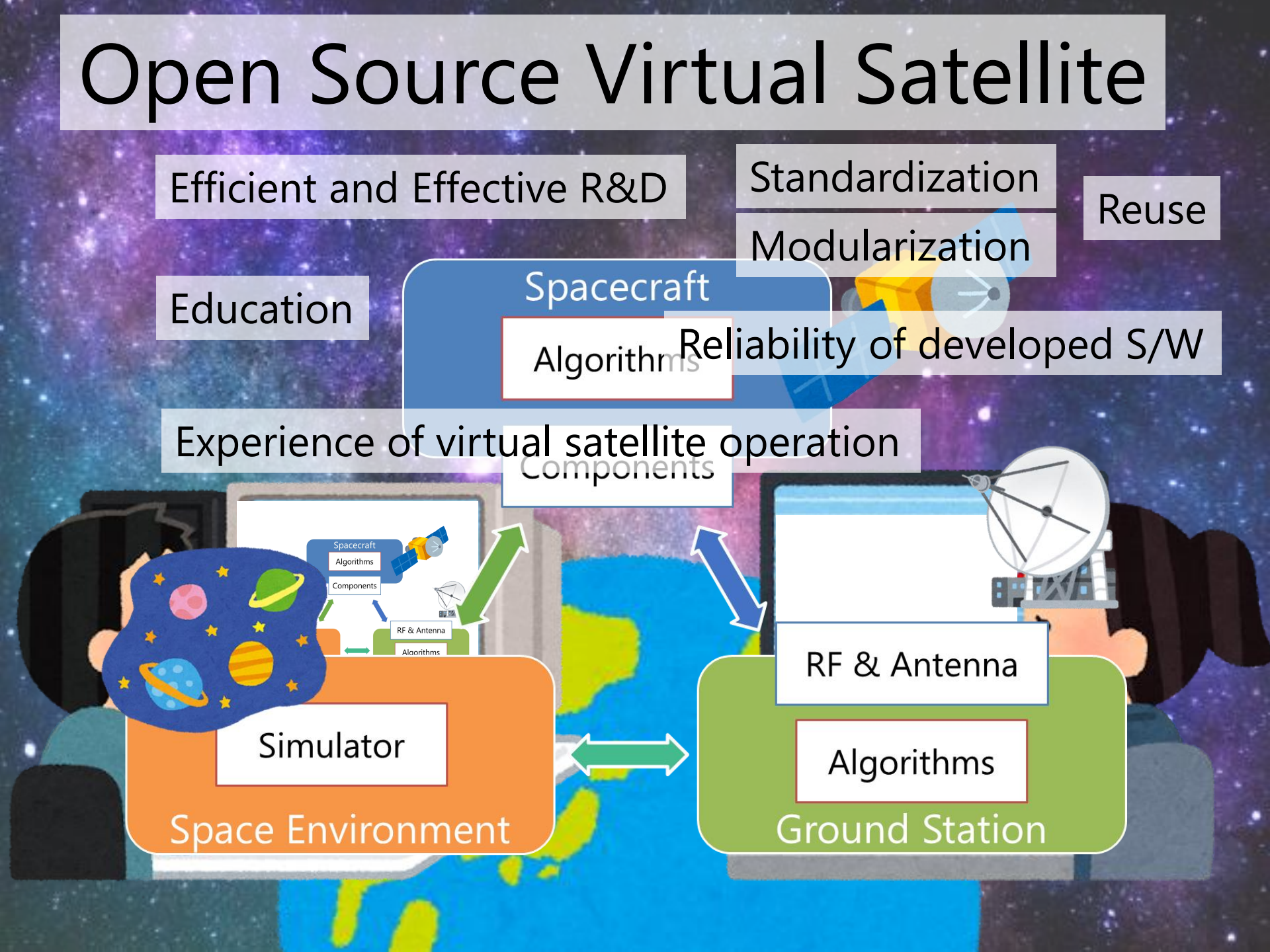
Reuse

Modularization

Education

Reliability of developed S/W

Experience of virtual satellite operation



Agenda of our group

- What kind of functions do we need?
  - For beginners, for experts,
  - For education, for reliability, and for efficiency
- How to build a team for this project?
  - What kind of team members and tools do we need?
- What can we do as a first step of this mighty project?