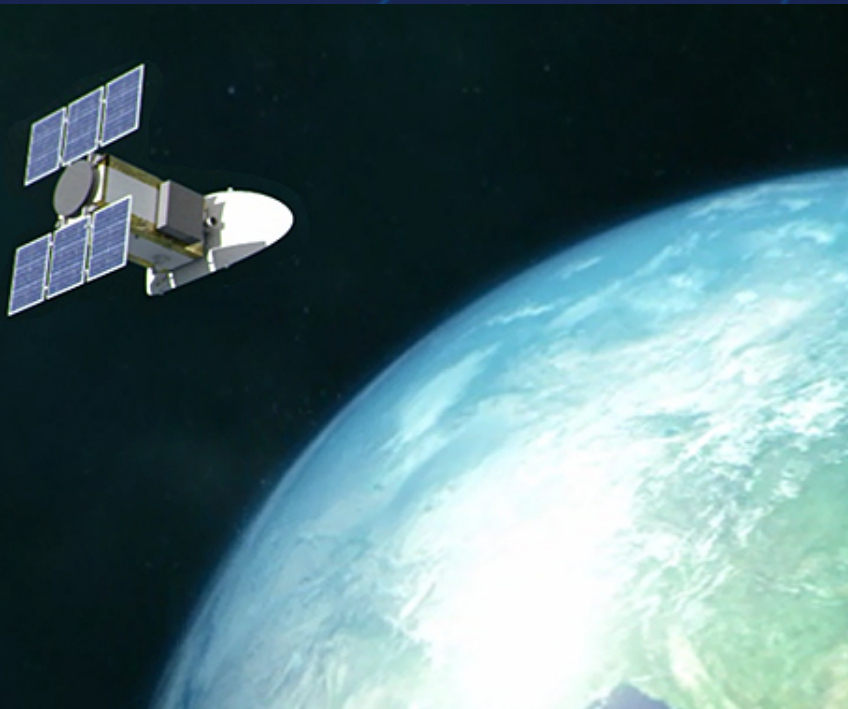




VIETNAM ACADEMY OF SCIENCE AND TECHNOLOGY  
VIETNAM NATIONAL SATELLITE CENTER



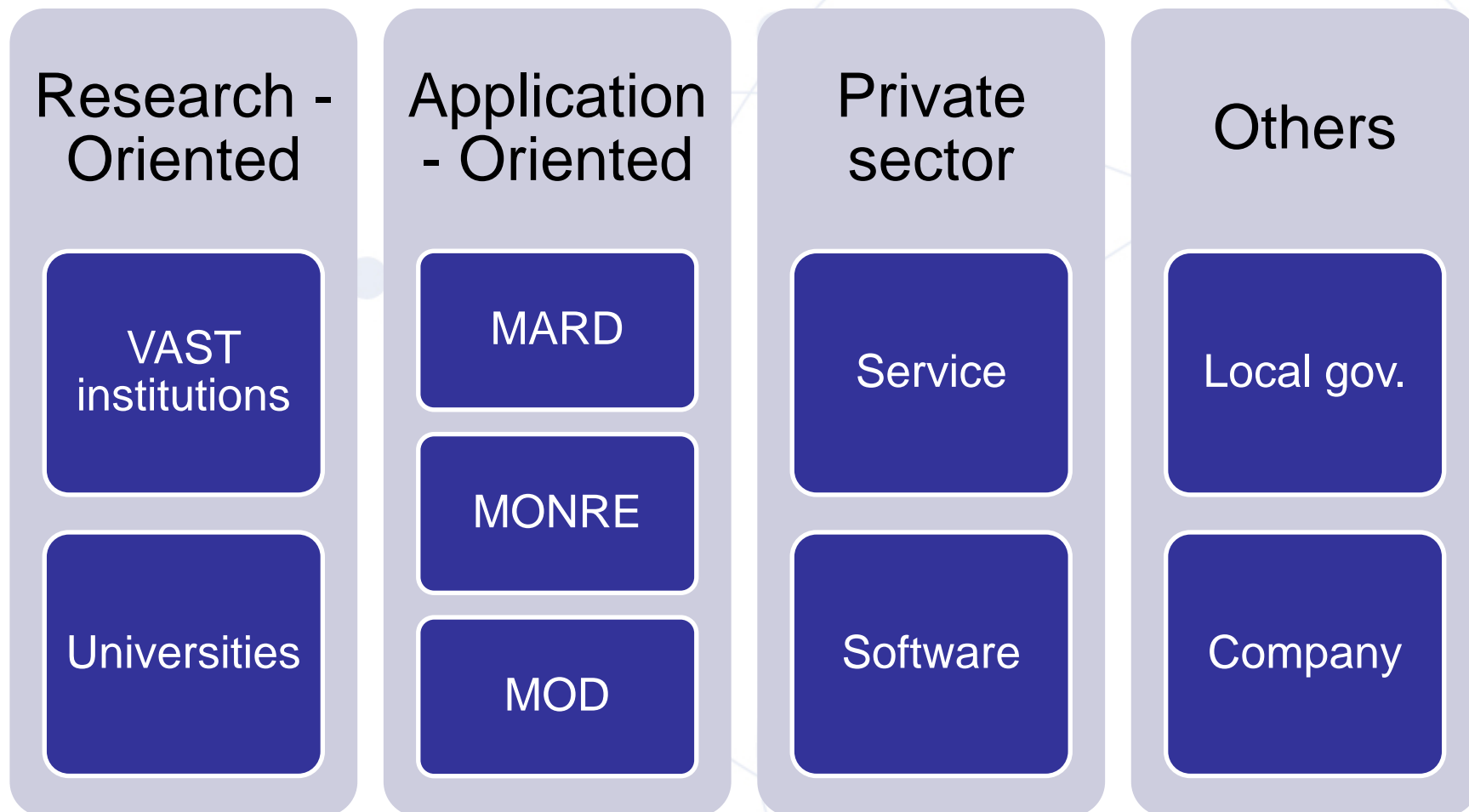
# EO Satellites and Remote sensing applications in Vietnam

Vu Anh Tuan [vatuan@vnsc.org.vn](mailto:vatuan@vnsc.org.vn)

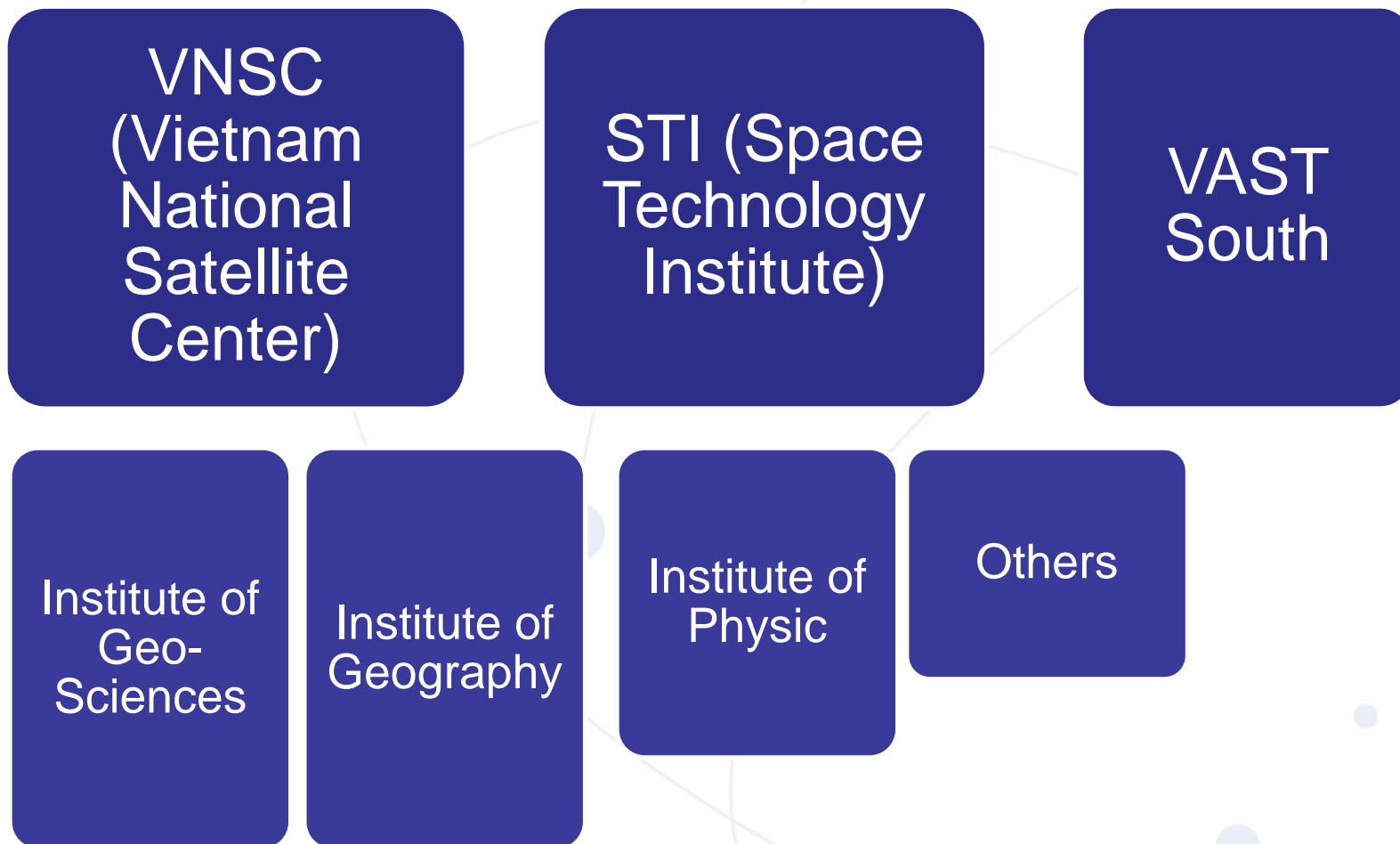
# Overview

- Remote sensing organizations in Vietnam
- Space projects in Vietnam
  - VNREDSat-1
  - Vietnam Space Center project
  - LOTUSat specification
- Remote Sensing applications
- Looking forward
- Summary

# Organizations



# Organizations



# Organizations

MARD

MONRE

FIPI (Forest  
inventory and  
planning  
institute)

NIAP  
(National  
Institute of  
Agricultural  
Planning and  
Projection)

DMC  
(Disaster  
management  
center)

Directorate of  
remote  
sensing

Other

# Space project



VINASAT-1

- Launch date: 18 April 2008
- Manufacturer: Lockheed Martin
- Lifetime: >15 years
- Mass: 2,637 kg



VINASAT-2

- Launch date: 15 May 2012
- Manufacturer: Lockheed Martin
- Lifetime: >15 years
- Mass: 2,969 kg

# Space Project

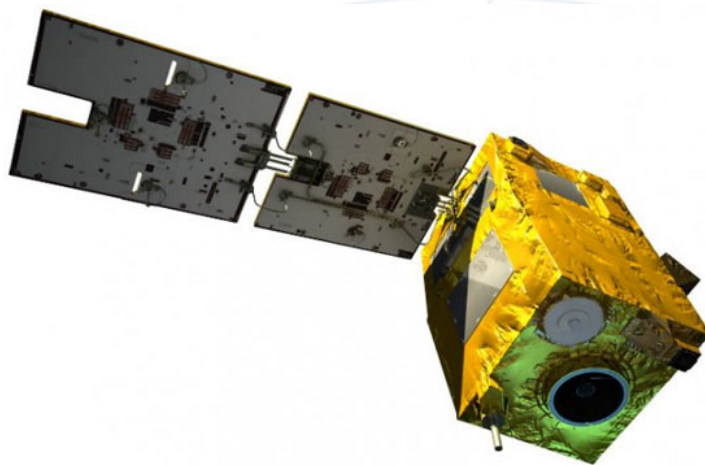
- 2007: Ground station of SPOT (Hanoi) – MONRE
- 2011-2013: VNREDSat-1
  - Launch: 2013
  - 120 kg
  - 680 km
- 2012-2012: Vietnam Space Center
  - LOTUSat 1 and 2





# Space Project

VNREDSat-1



- Funded by French ODA
- Mass: 120 kg
- Mission lifetime: 5 years
- Launched in May 2013

- ✓ Nearly 40,000 images taken by VNREDSat-1
- ✓ Disaster image data provided to other member countries of Sentinel Asia

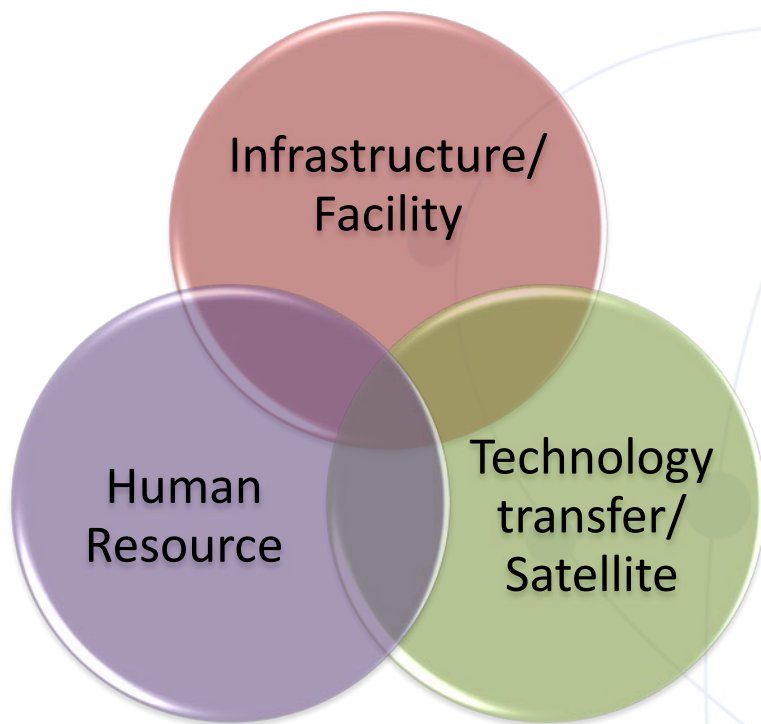


# VNSC Project

- ❑ Location: Hoa Lac Hi-Tech Park, Hanoi
- ❑ Duration: 2012 - 2020
- ❑ Total investment: 54,4 billion Jap. Yen (ODA Fund)
- ❑ Executing Agency: VNSC



# VNSC Project



Management Center and S/C Control Center



Public Education Center



# VNSC Project

## ❖ **Human resource development**

- Small satellite development
- Remote sensing technology

## ❖ **Construction of infrastructure**

- Assembling, integration & test facility of small satellite
- Data image receiving and processing facility
- Research and education facility

## ❖ **Technology transfer**

- Small earth observation satellite
- Satellite image data utilization

# VNSC Project

- 2009: 1<sup>st</sup> project of EOS: VNREDSat 1
- 2011: VNSC project

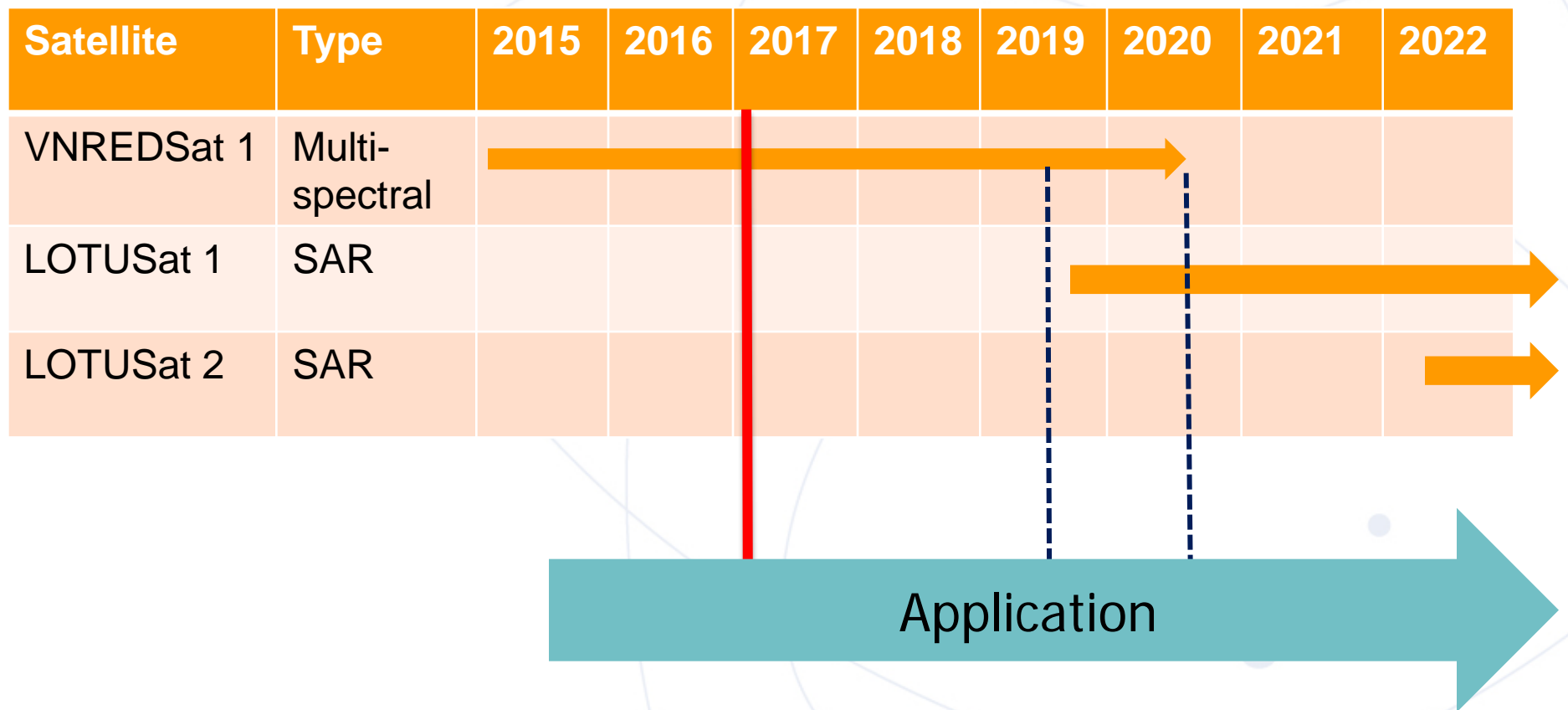
**2013:**  
VNREDSat 1

**2019:**  
LOTUSat 1

**2022:**  
LOTUSat 2



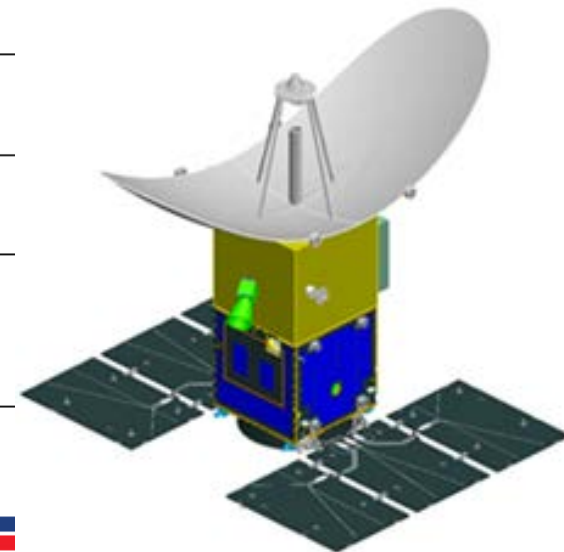
# VNSC Project



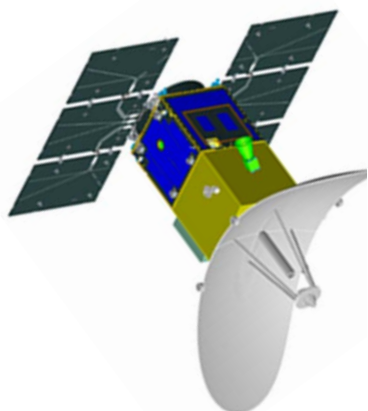


# LOTUSat Spec.

Launch Date	July 2017 and Dec. 2020
Operational Orbit	SSO and Dawn-Dusk orbit around 500km Example -1 (ASNARO constellation case) Altitude: 504km SSO (Dawn-dusk Orbit) Revisit cycle: 5 days Example -2 Altitude: 511km SSO (Dawn-dusk Orbit)) Revisit cycle: 11 days
Mission Life	longer than 5 years
Satellite Mass	about 550kg
Size (launch phase)	<u>apprx.</u> 1.5m X 1.5m X 3m(h)



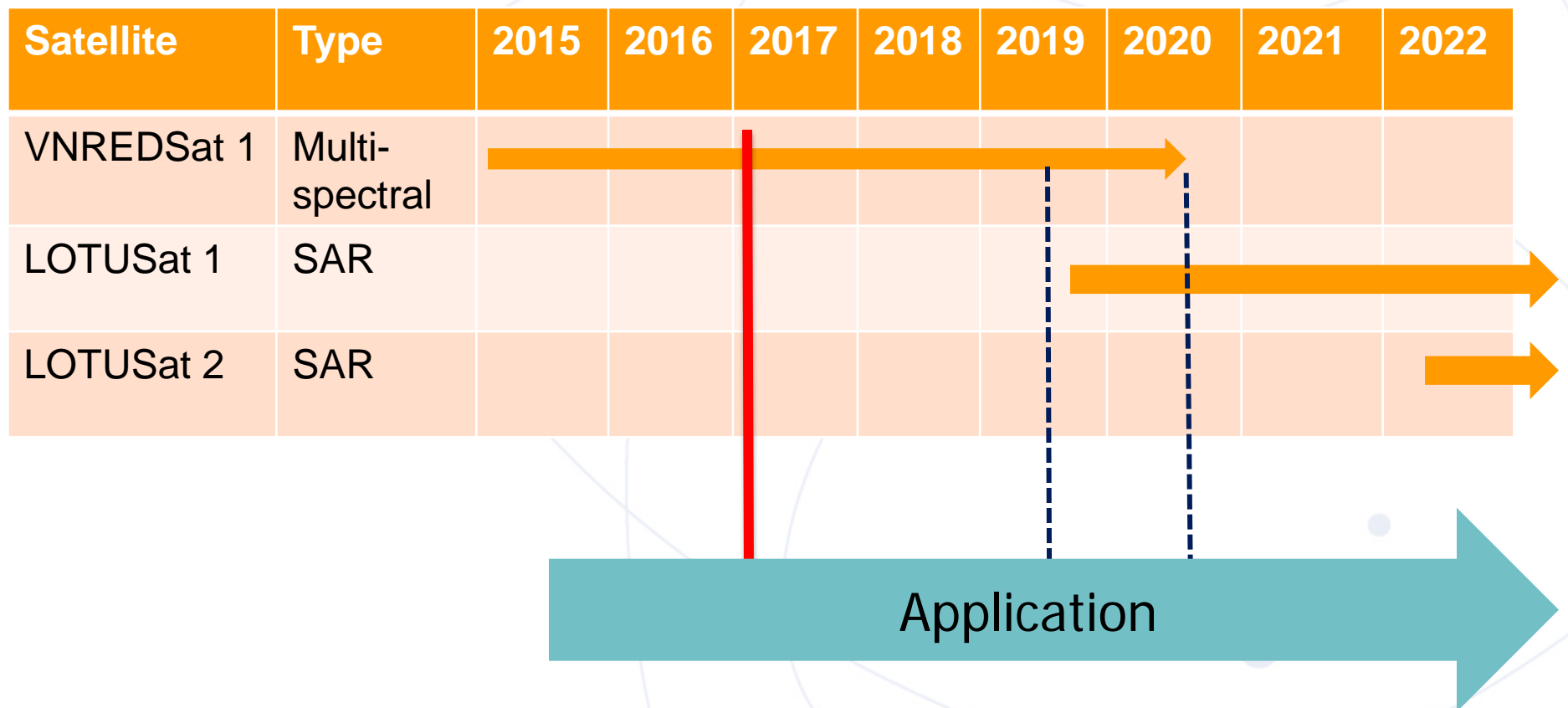
# LOTUSat Spec.



SAR Frequency	X - band
Resolution - Spotlight mode	1m x 1m (10km x 10km)
Resolution - Stripmap mode	2m x 2m (12km x 800km)
Resolution - Scan mode	16m x 16m (50km x 800km)
Polarization	HH or VV (switchable)
Look direction	Left or Right
Incidence angle	15°~ 45°
Data downlink	X-band / RHCP 16QAM(832Mbps)/QPSK(416Mbps)

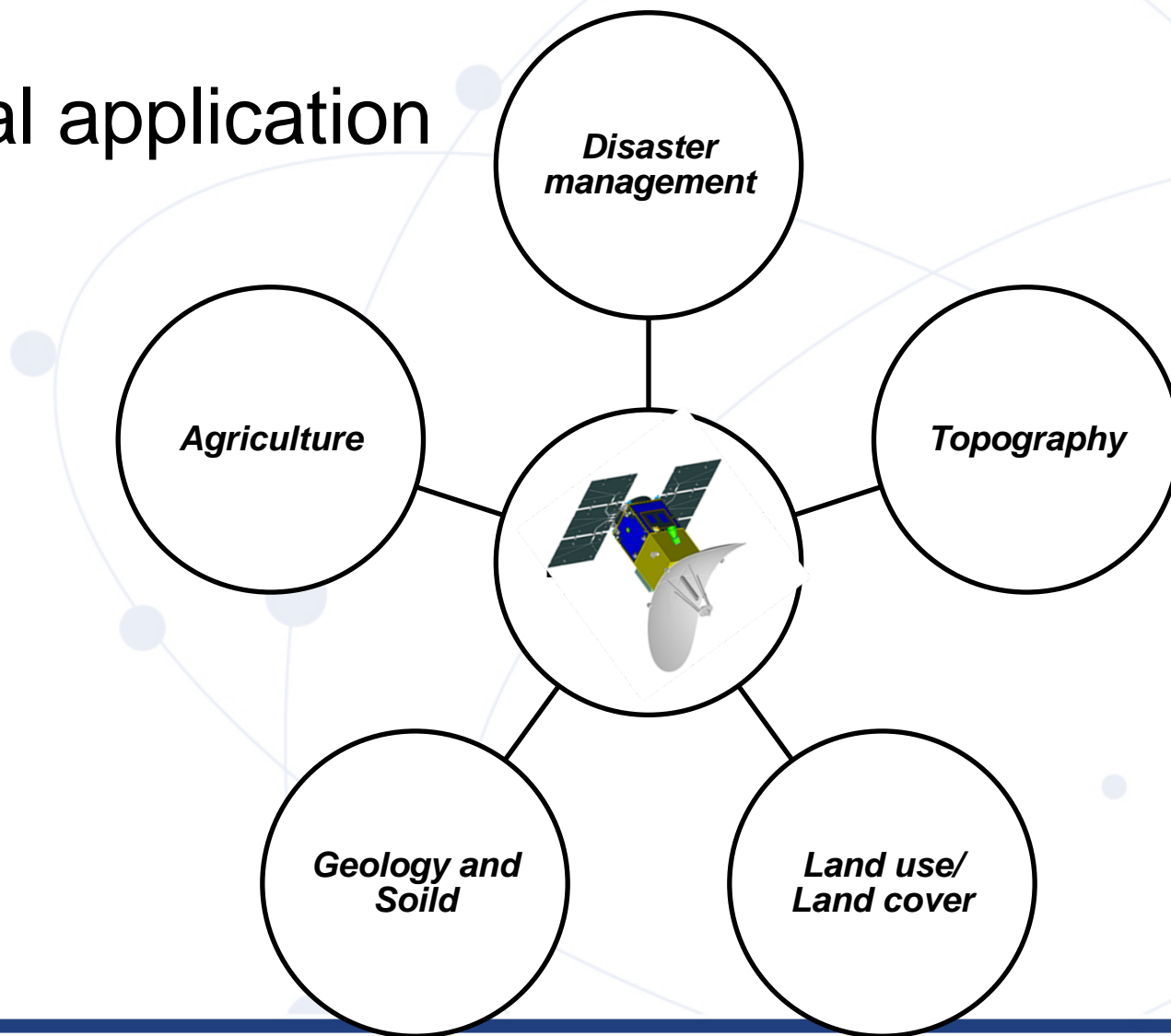


# Application



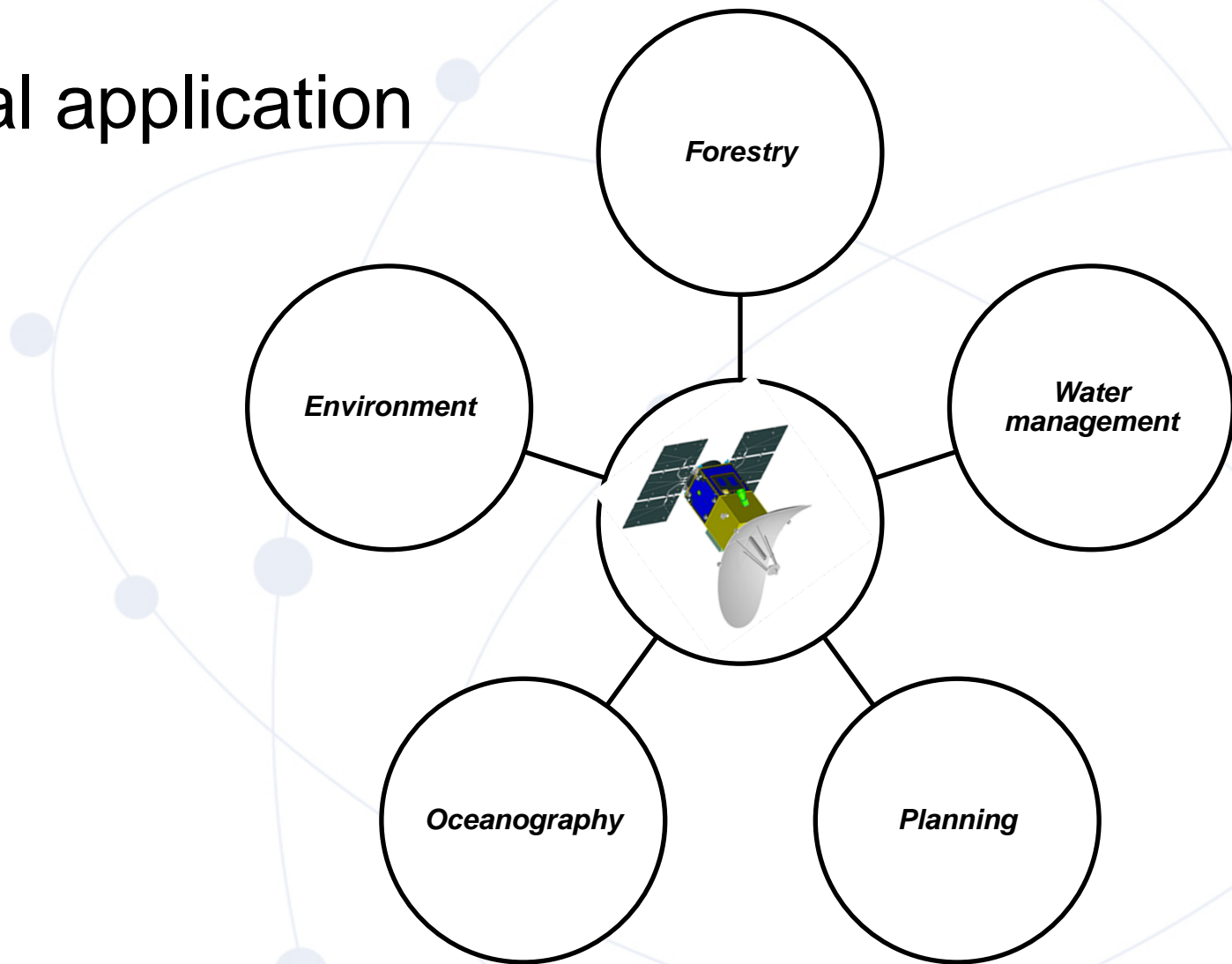
# Application

- Potential application



# Application

- Potential application



# Application at VNSC

- Natural resource management, supporting territory planning:
  - Forestry (forest mapping, forest change, biomass)
  - Land and water management
  - Ocean resource and environment studies, coastal zone management
  - Urban management; Agriculture
- Satellite Image processing algorithm and software development
- Training activities in remote sensing and GIS



DEVELOP TERRITORY  
MONITORING SYSTEM

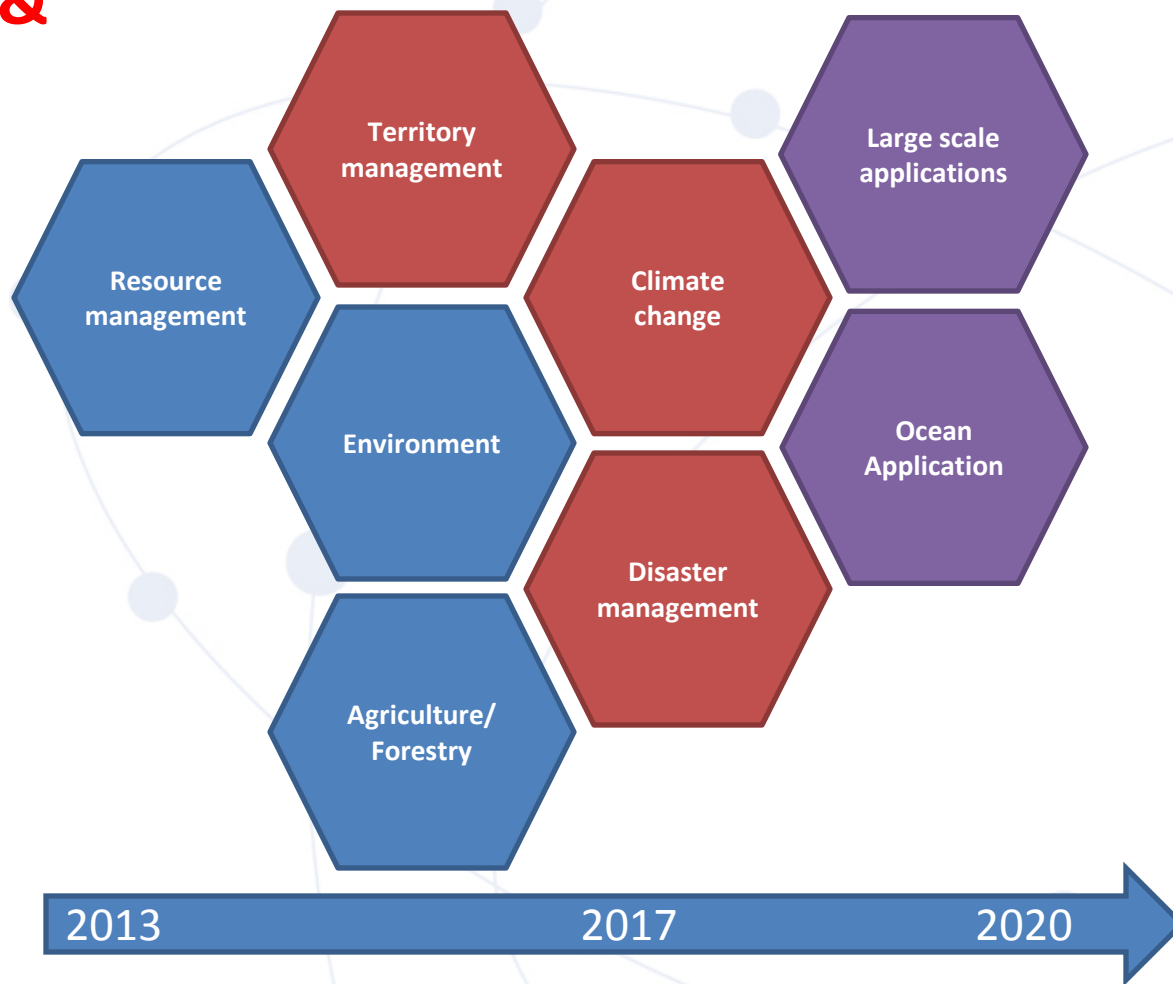
DEVELOP TERRITORY  
MANAGEMENT  
INFORMATION SYSTEM

DEVELOP AND  
TRANSFER  
SOFTWARES

DEVELOP  
SPECIFIC  
APPLICATIONS

# Application at VNSC

## Application & Research



# Looking forward

- The need: Potential application need to be come real application
- The challenges:
  - Human resources
  - Finance
  - Technology



**Thank you!**





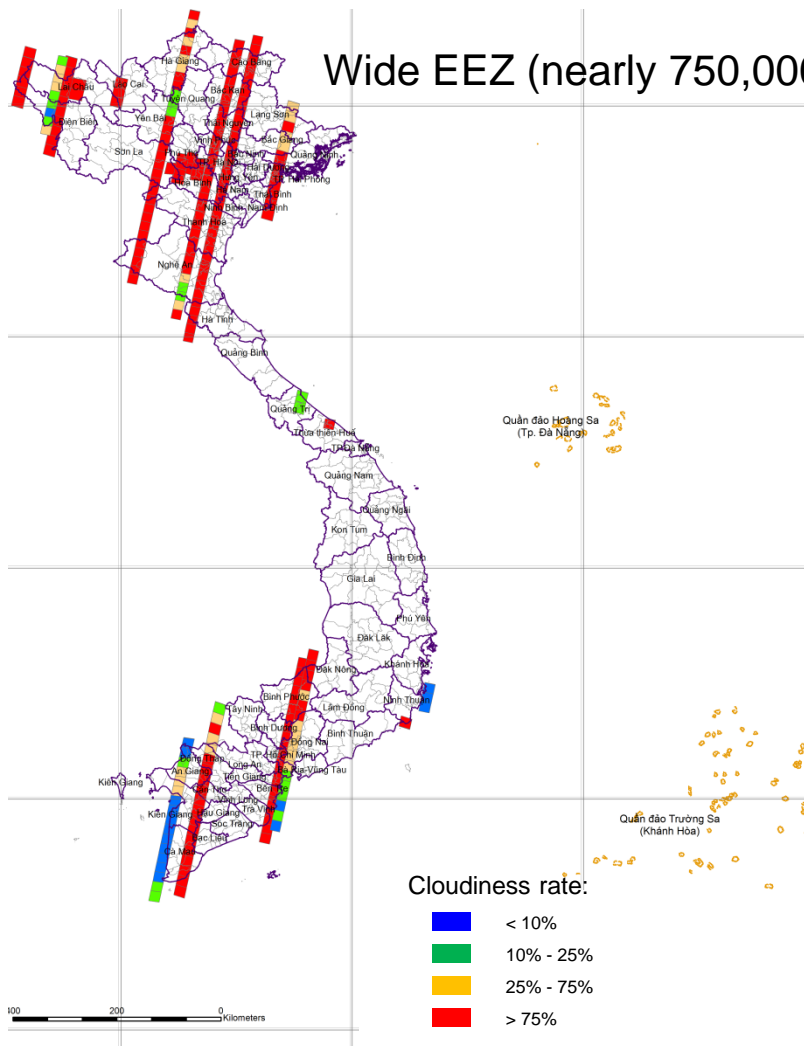


Image statistics by VNREDSat-1  
from 14 Aug. 2014 to 14 Sep. 2014

Wide EEZ (nearly 750,000 km<sup>2</sup>) needs to be monitored

Optical sensor satellites:

Unable to operate during night time and cloudiness

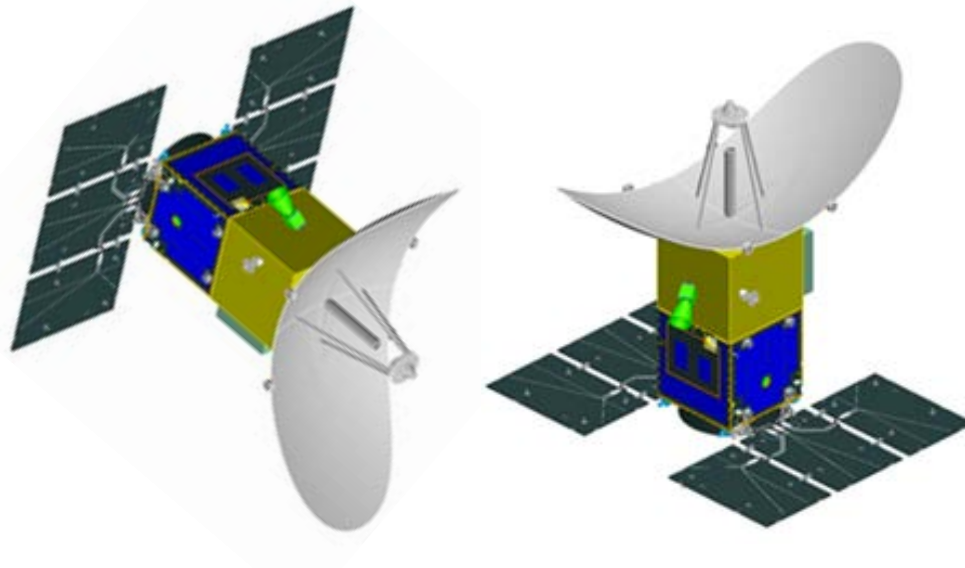
SAR sensor satellites:

Operate under all weather and night time



An image taken by VNREDSat-1

## LOTUSat-1&2 - SAR sensor satellites (VAST/VNSC)



**LOTUSat-1/2**

Mass: ~600kg

SSO Dawn-Dusk orbit ~ 500 km

Lifetime: >5 years

Size: Approx. 1.5m x 1.5m x 3m

Tentative launch date

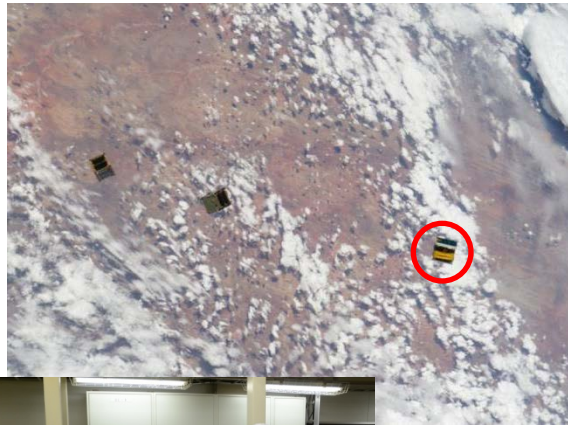
LOTUSat-1: 2018-2019

LOTUSat-2: 2021-2022

LOTUSat-1: AIT in Japan

LOTUSat-2: AIT in Vietnam

# “Made-in-Vietnam” Satellites (VAST/VNSC)



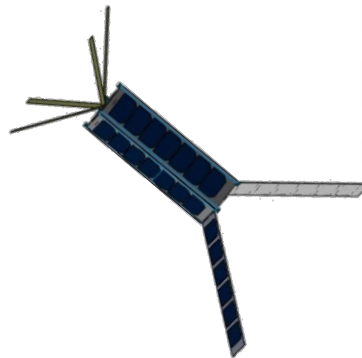
2011  
Start



PicoDragon

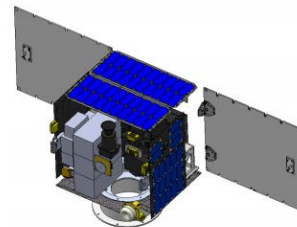
2013  
(1 kg)

2016-2017  
(6-10 kg)



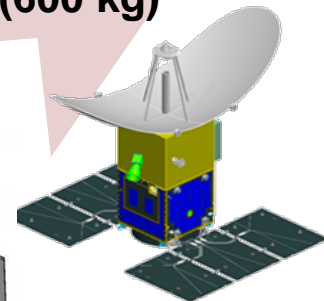
NanoDragon

2013-2017  
(50 kg)



MicroDragon

2018-2022  
(600 kg)



LOTUSat-2