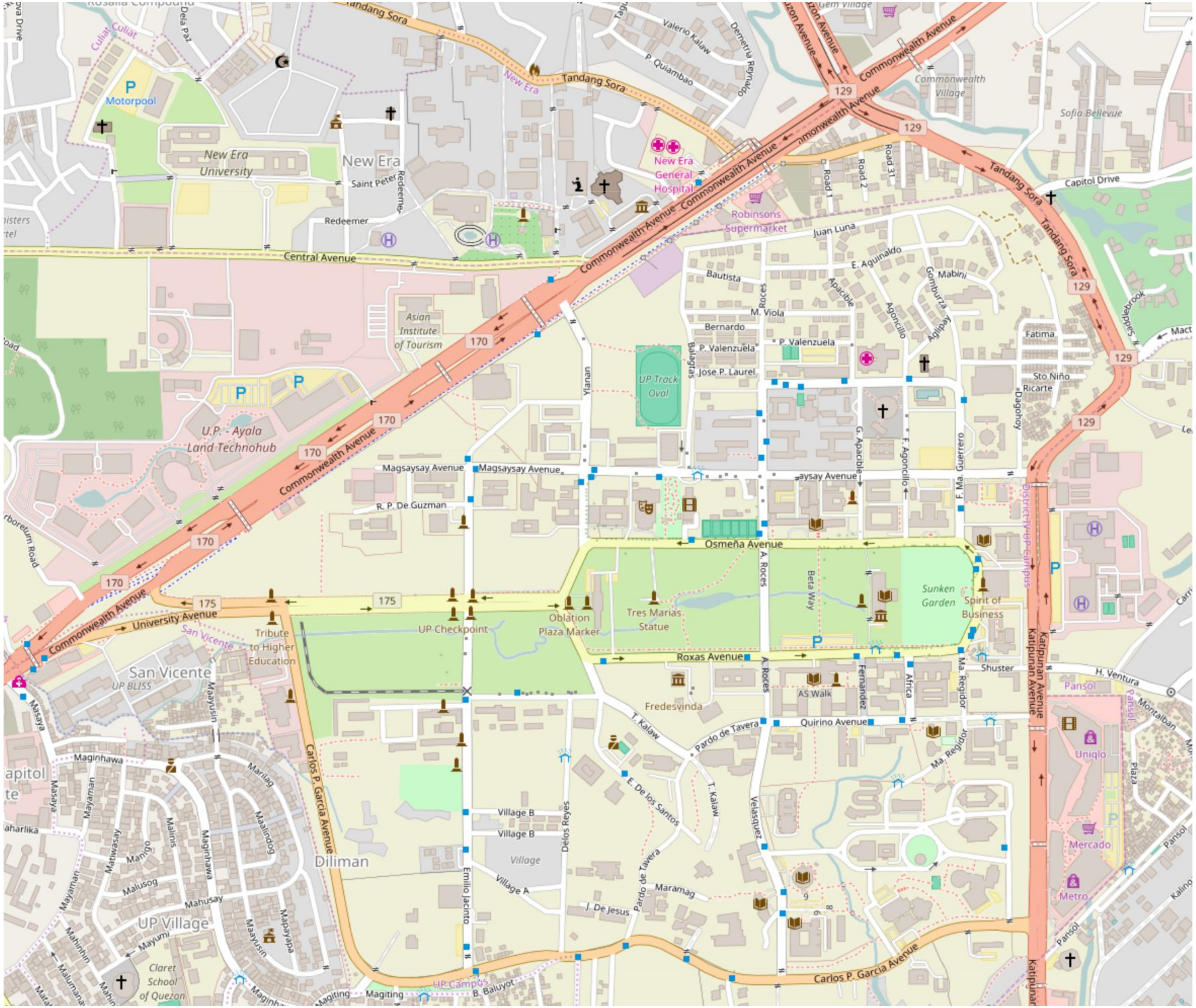
University of the Philippines Diliman

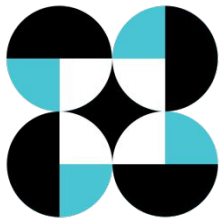
Unibersidad ng Pilipinas Diliman

Motto	Honor and Excellence
Type	National university, research university
Established	February 12, 1949
Affiliation	Association of Pacific Rim Universities, Association of Southeast Asian Institutions of Higher Learning, ASEAN European Academic University Network, ASEAN University Network
Chancellor	Michael Tan
President	Alfredo E. Pascual
Academic staff	2,192 (2013)[1]
Students	27,340 (2013)[1]
Undergraduates	17,951 (2013)[1]
Postgraduates	8,133 (2013)[1]
Doctoral students	1,189 (2014)[2]
Other students	1,256 (basic level) (2013)[1]
Location	Quezon City, Philippines
Campus	Suburb
Colors	UP Maroon and UP Forest Green
Nickname	Fighting Maroons
Sporting affiliations	University Athletic Association of the Philippines
Website	upd.edu.ph

UNIVERSITY OF THE PHILIPPINES



Development of Philippine Earth Observation Microsatellite Program



- To implement data access, utilization, processing mechanisms for the microsatellite data

- To perform calibration and validation of the payload sensors to be carried by the microsatellite

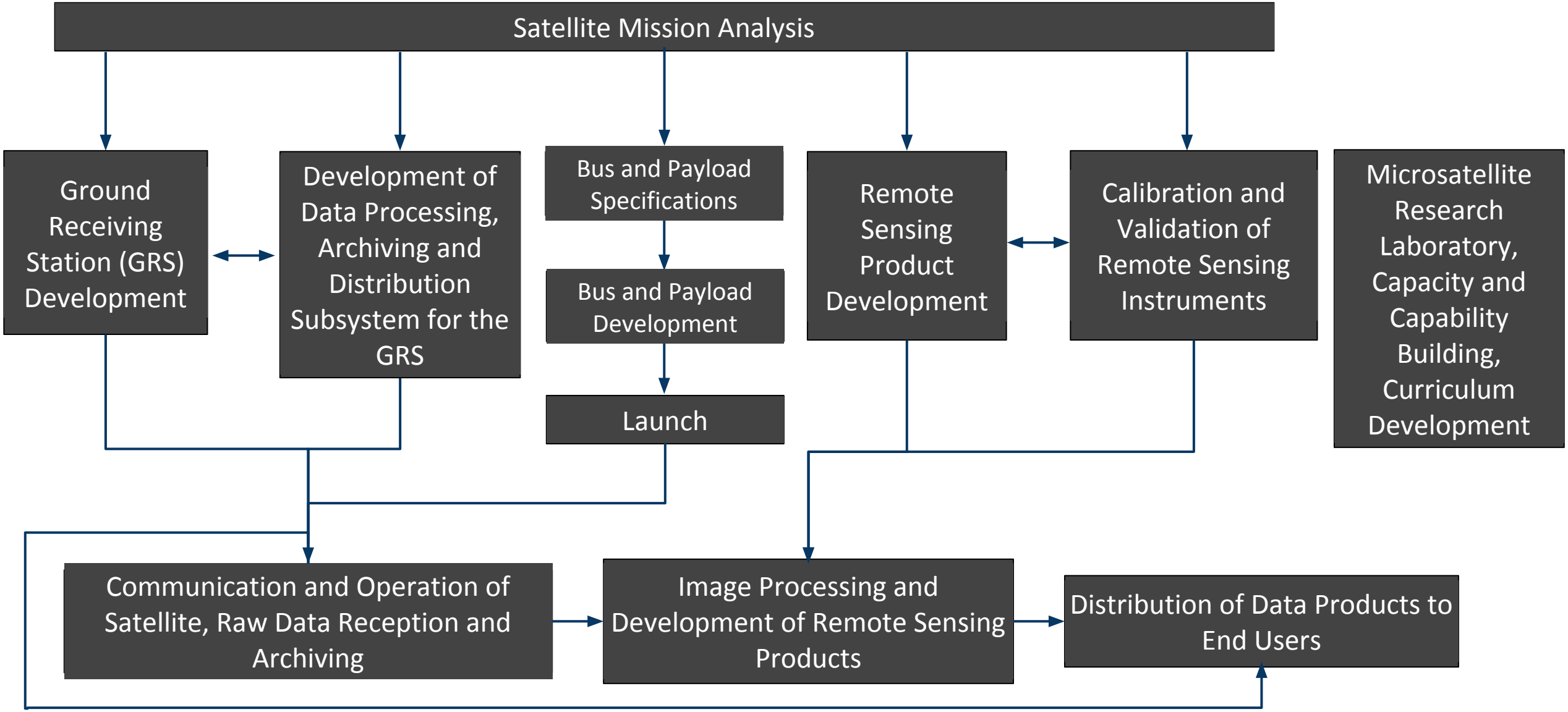
- To develop higher level remote sensing products from the raw microsatellite data

- To build and launch a multi-spectral high-resolution Earth Observation Microsatellite with high precision telescope and other relevant payload through Filipino engineers and scientists working with Japanese counterparts

- To investigate and implement design enhancements on the electronic and computing systems and payload of the microsatellite through the local Microsatellite Research Facility

- To establish the ground receiving station (GRS) of the microsatellite

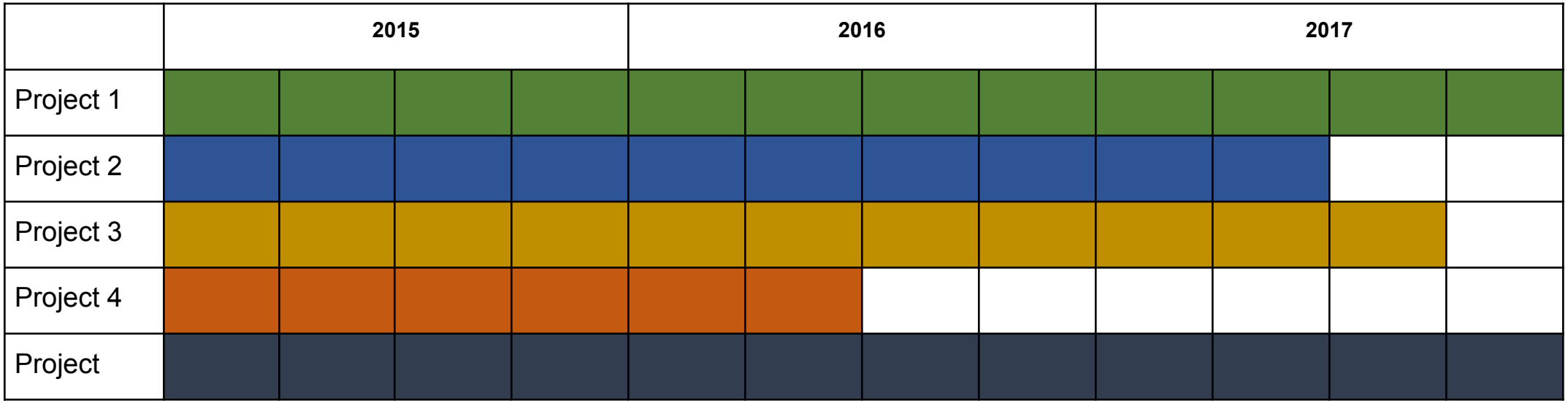
PHL-Microsat Program Overview



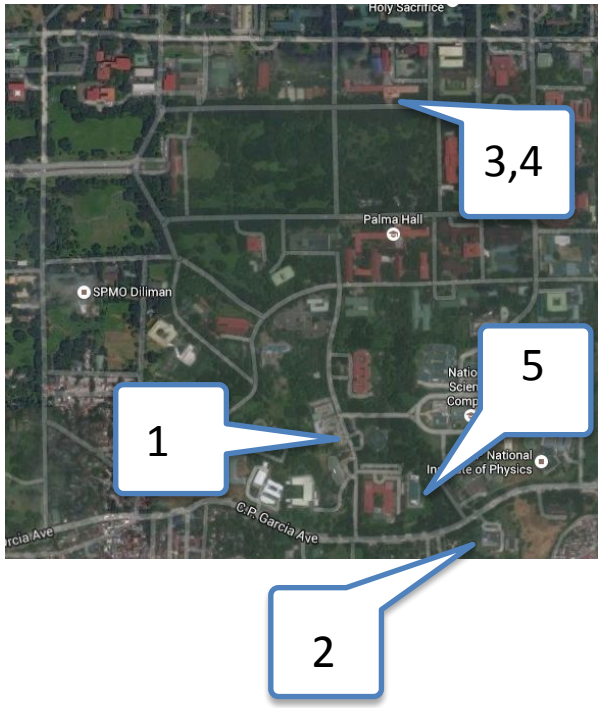
PHL-Microsat Component Projects

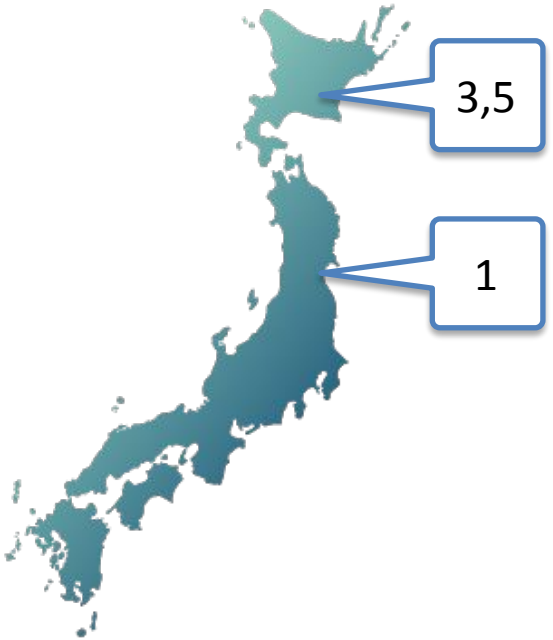
PROJECT 1: Microsatellite BUS Development (UPD-EEEI, Tohoku and Hokkaido Universities)
PROJECT 2: Ground Receiving Station for the Philippine Microsatellite Program (DOST-ASTI)
PROJECT 3: Development of a Data Processing, Archiving, and Distribution Sub-system for the Ground Receiving Station of the Philippine Scientific Earth Observation Microsatellite (UPD-TCAGP)
PROJECT 4: Calibration and Validation of Remote Sensing Instruments for PHL-MICROSAT (UPD-TCAGP)
PROJECT 5: Remote Sensing Product Development (UPD-IESM and Hokkaido University)

PROJECT COMPONENT DURATION



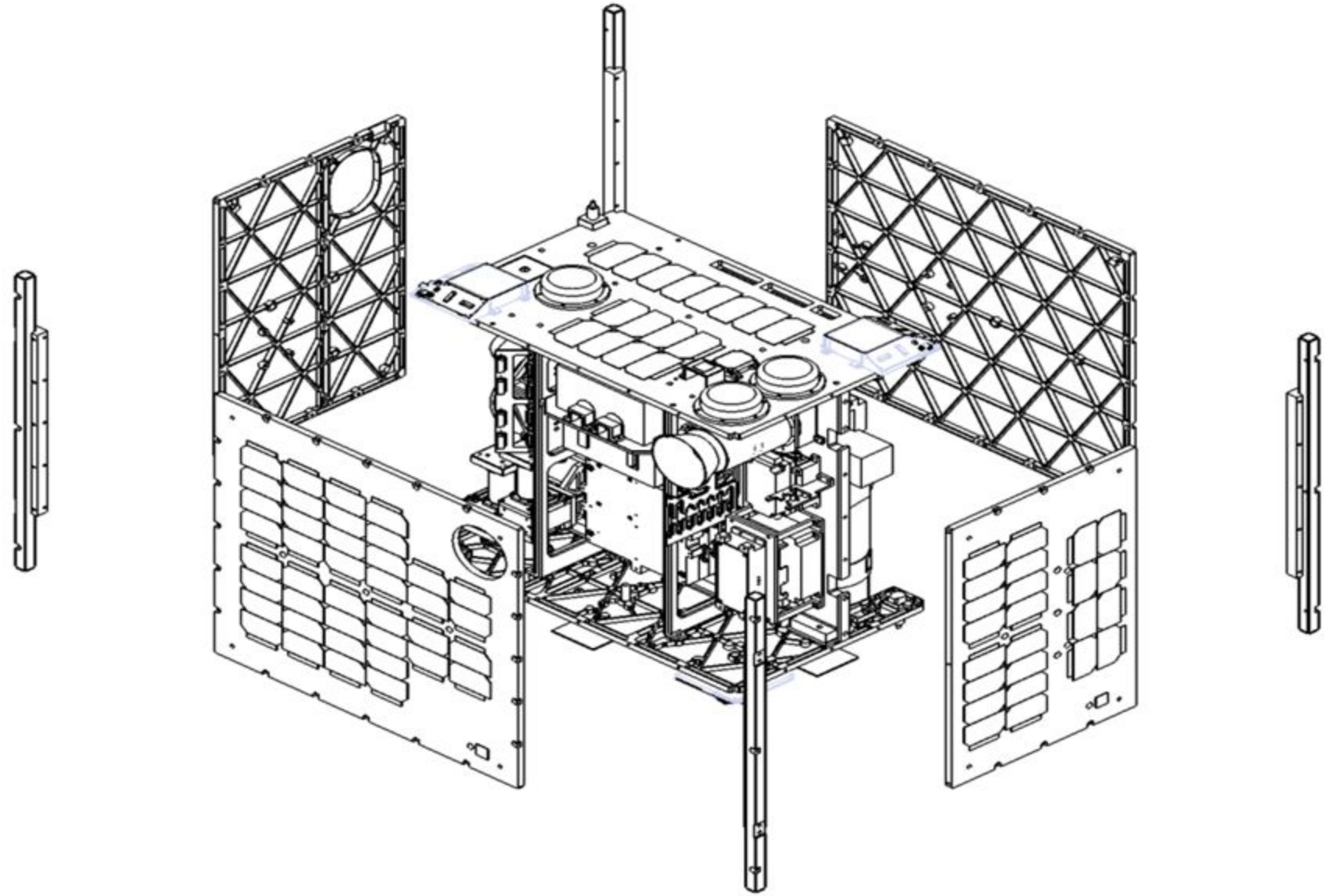
PHL-Microsat Component Projects



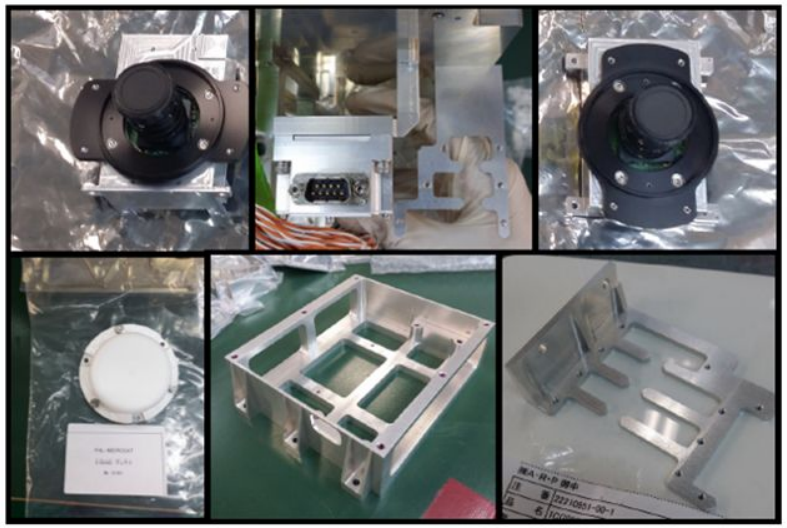


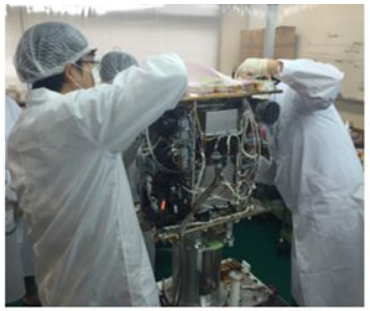
PROJECT 1	PROJECT 4
PROJECT 2	PROJECT 5
PROJECT 3	

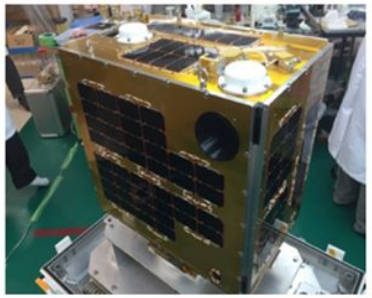
PROJECT 1	PROJECT 3
	PROJECT 5

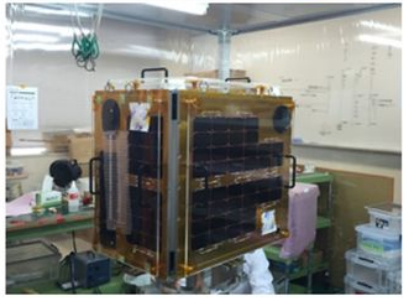


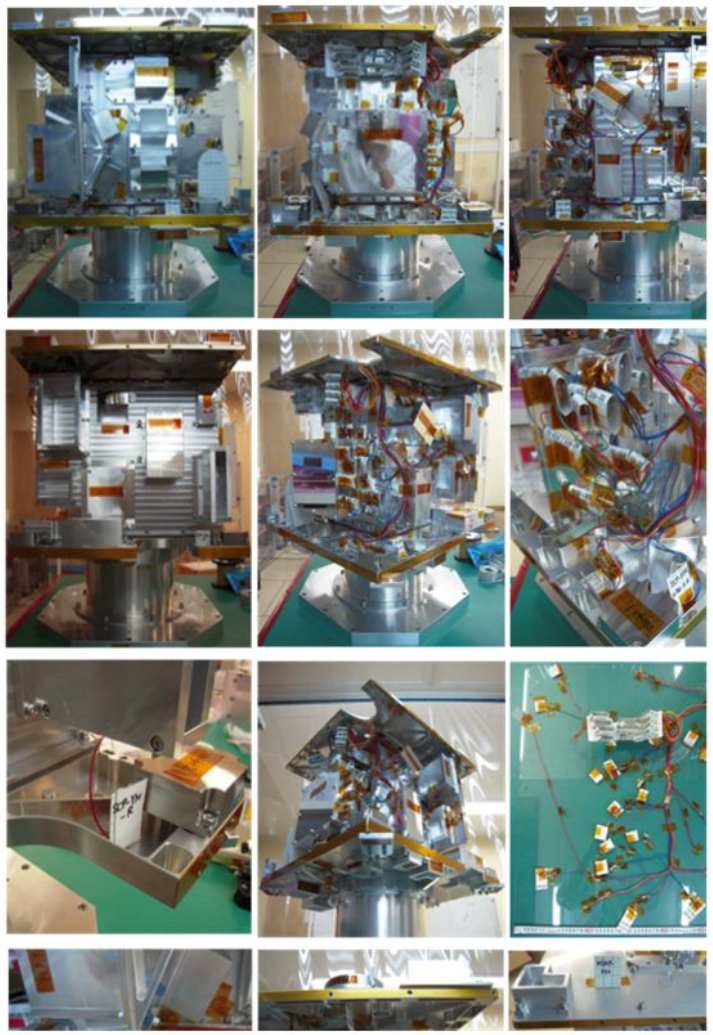
Diwata-1



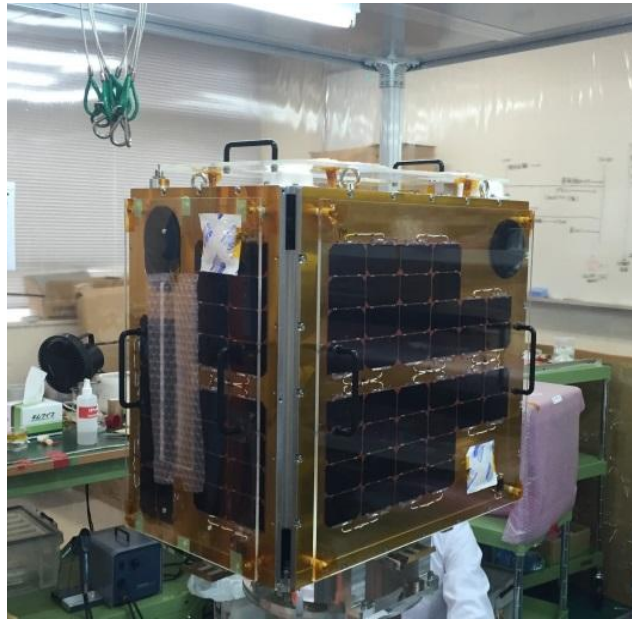




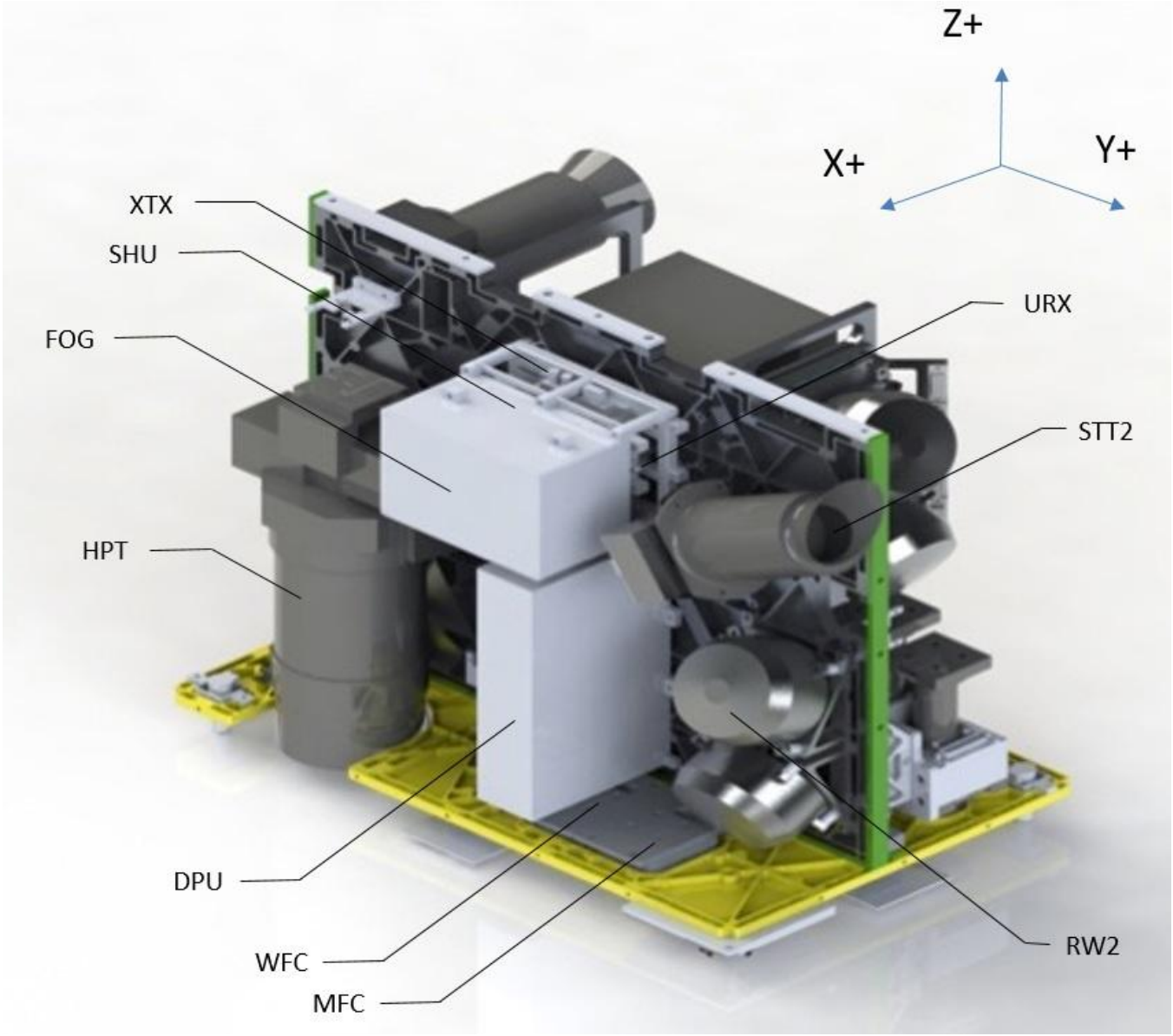


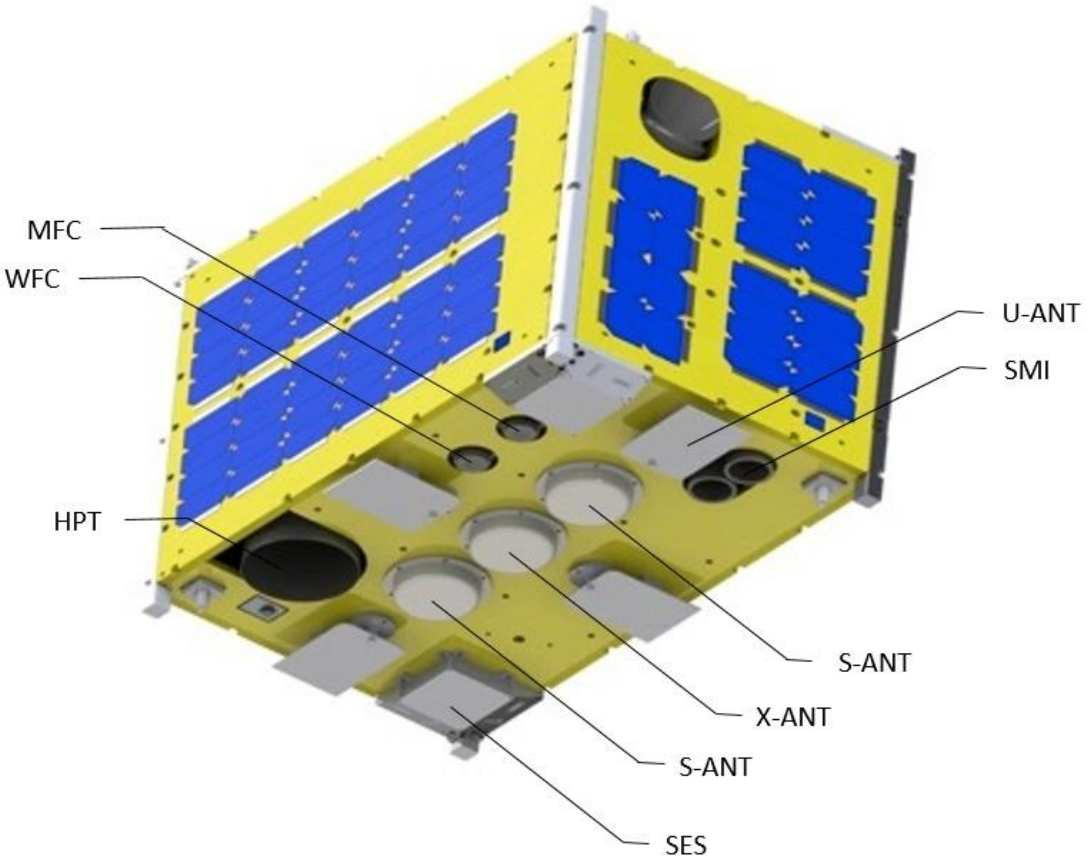


- Class: 50kg Microsatellite
- Dimensions: 55x55x35cm
- Inclination: 51.6 deg
- Altitude: ~420km
- Launch: 23 Mar 2016
- Release: 27 Apr 2016



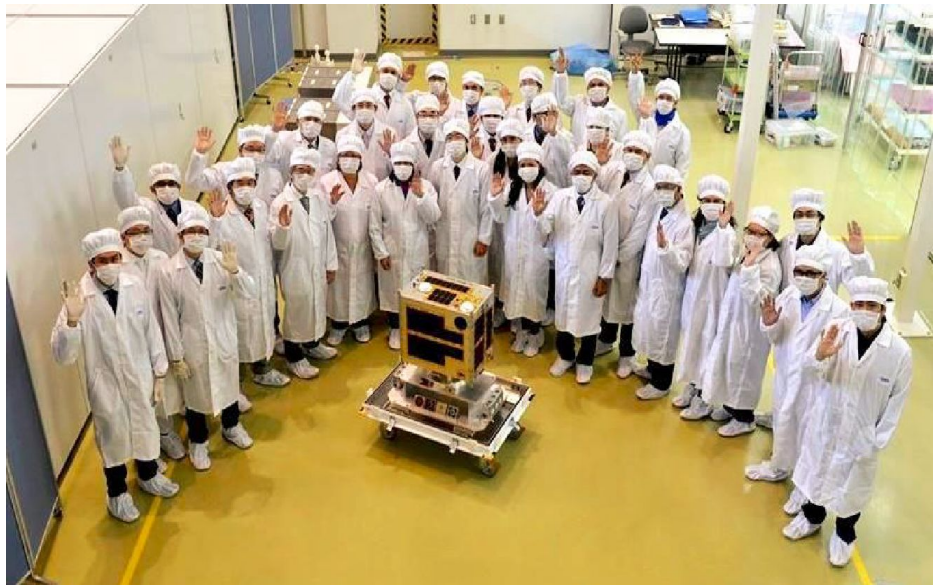
Diwata-1 Modules



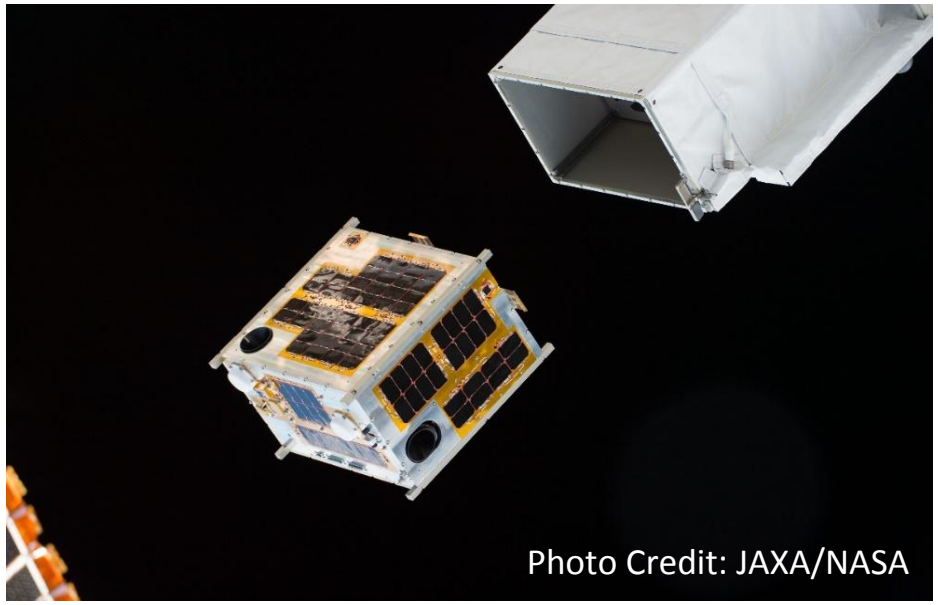


Diwata-1: Road to Space

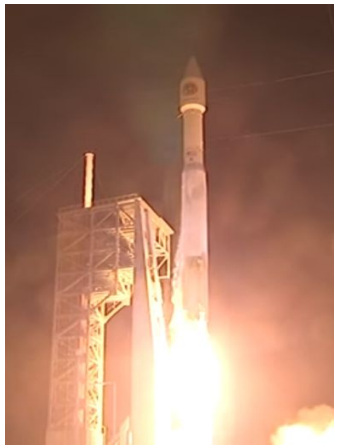
Diwata-1 with PHL-Microsat Team during the handover ceremony at JAXA facility
Tsukuba, Japan, January 13, 2016

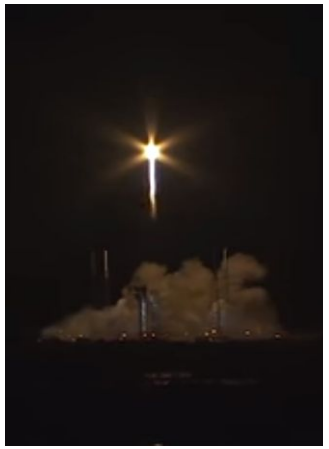


Diwata-1 release from ISS
Diwata-1 was successfully deployed into low-earth orbit from the Japanese Experiment Module 'Kibo', April 27, 2016



Diwata-1 launch to space - March 23, 2016 - Cape Canaveral, Florida

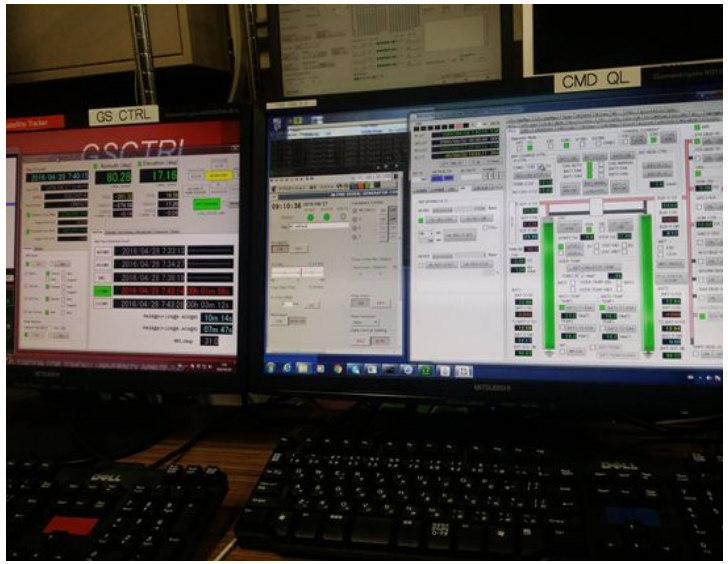




PH-JP team members watching the release in JAXA

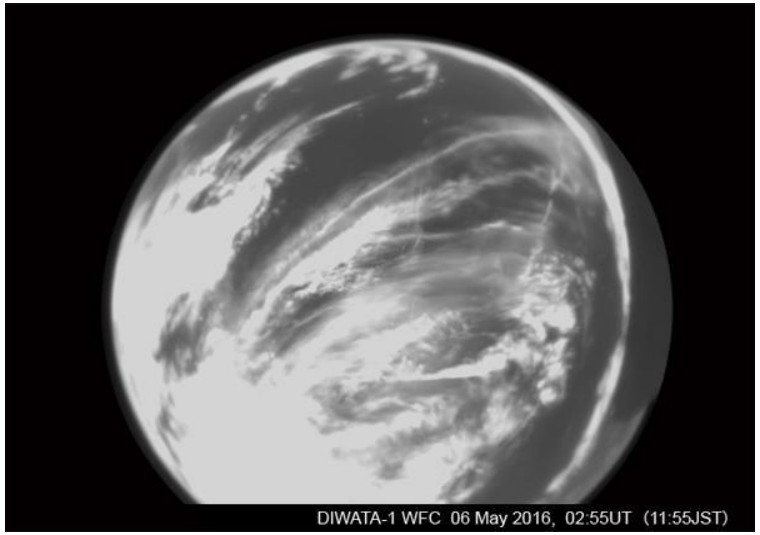
Diwata-1: First Received Signal and Images

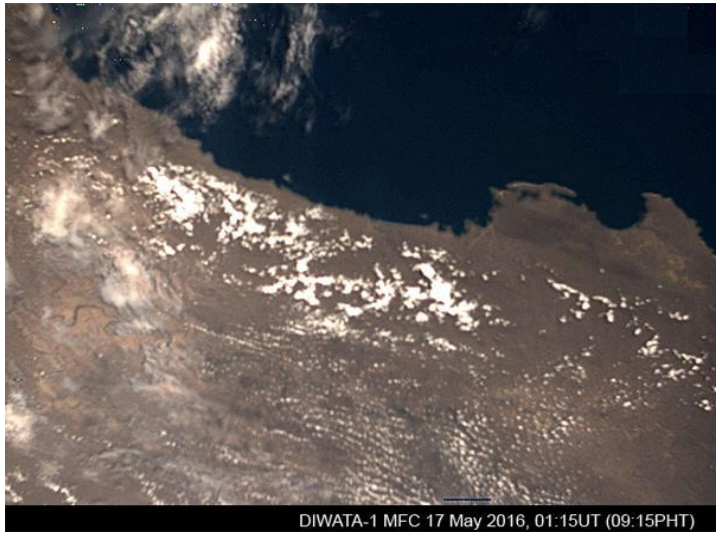
First received signal from Diwata-1:
28 APR 16, 07:33:07 JST



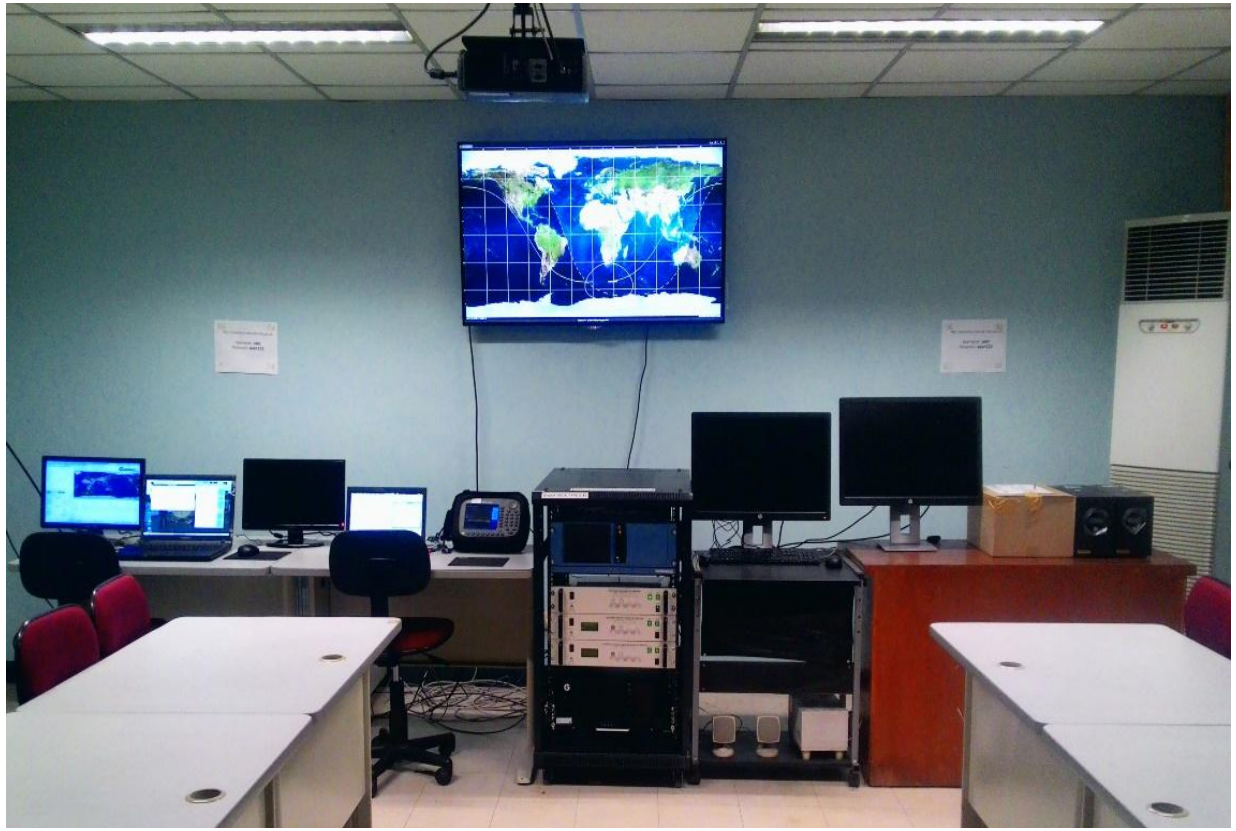
Team members at Tohoku Ground Station while checking the health of Diwata-1

Diwata-1 is in its initial testing phase and successfully captured and transmitted images





ASTI Ground Receiving Station can now download images using X-band

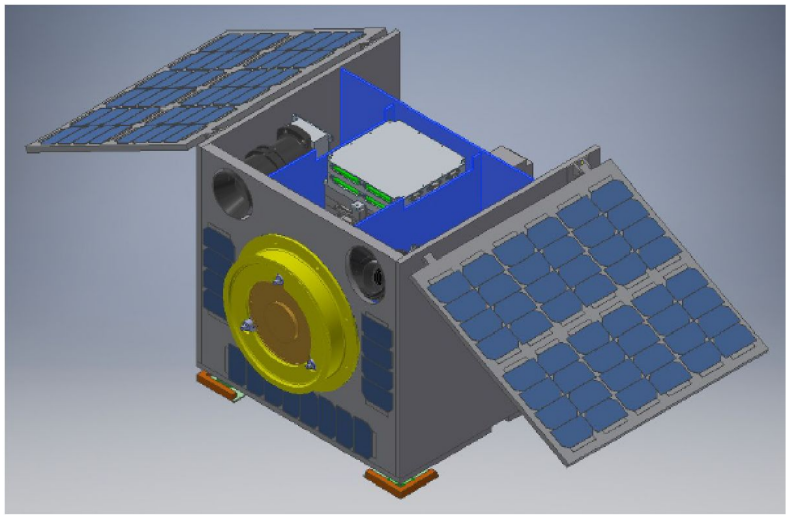


Microsatellite research and instructional facility (MRIF)

Ongoing construction of MRIF

Sustaining gains from first microsatellite development

- Developing instructional and educational materials for courses and short-term training to wider audience



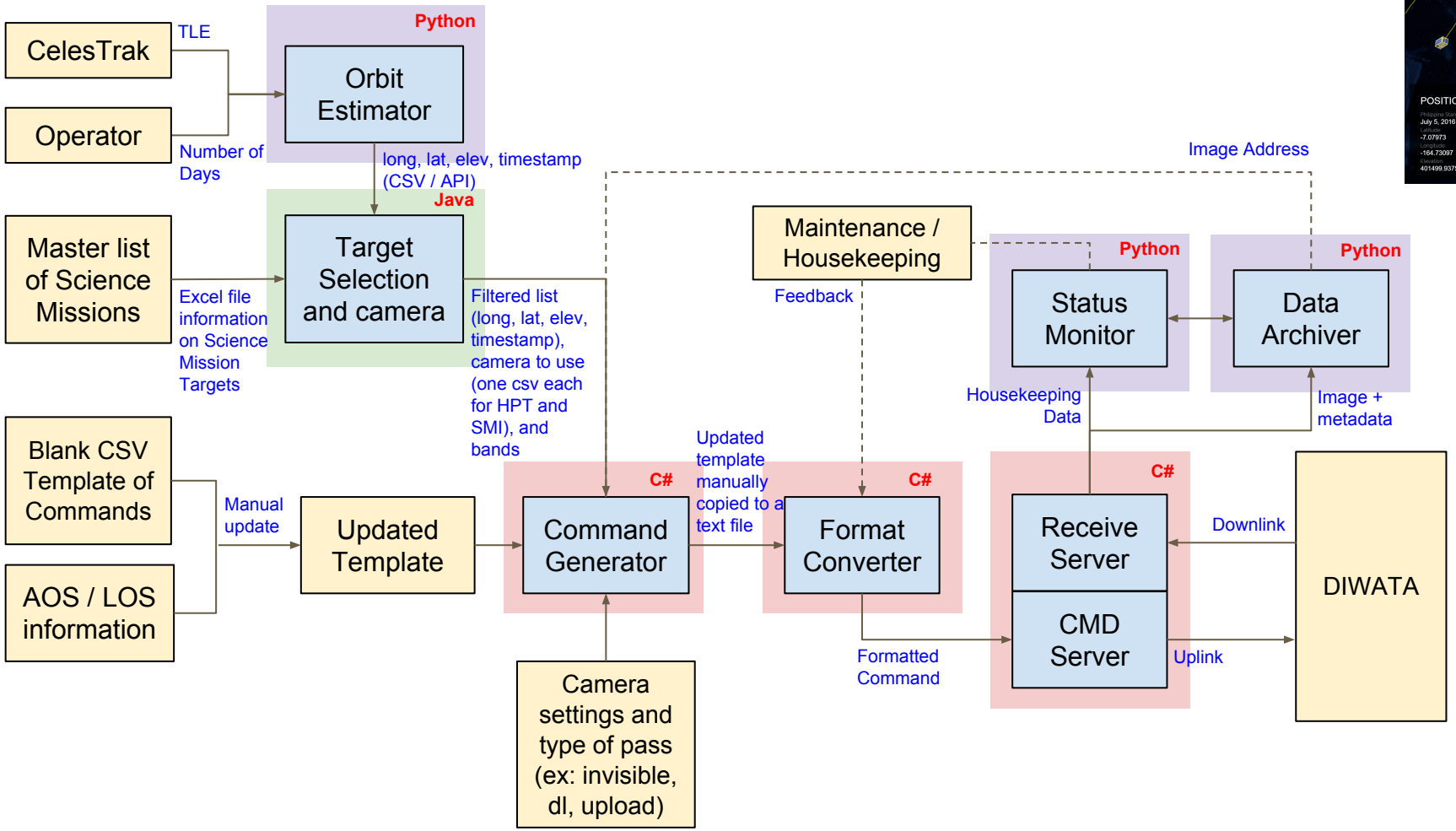
Diwata-2 design phase

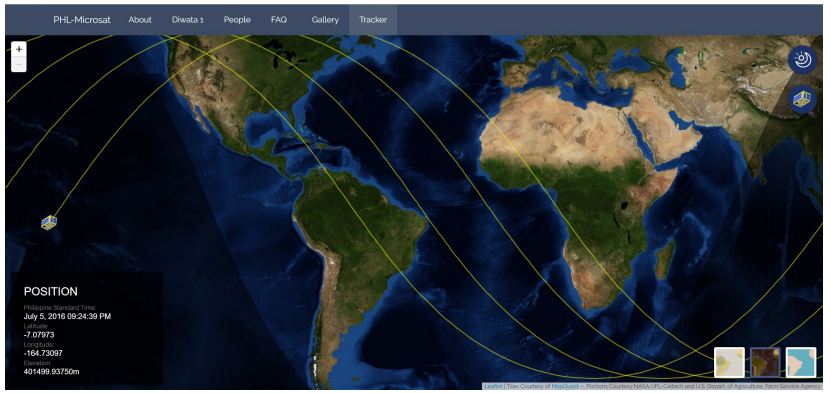
Design planning for the second microsatellite, Diwata-2 is ongoing. It is expected to be launched to orbit by 2018.

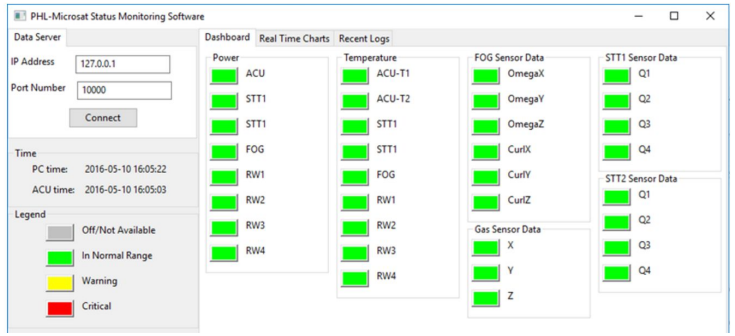
Construction site for MRIF

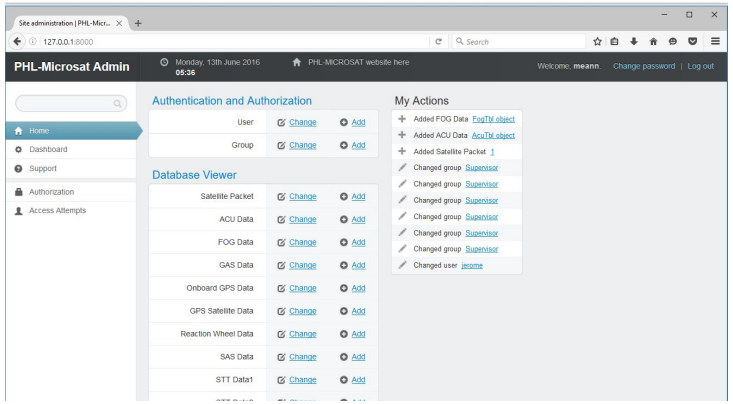
Anechoic Chamber Building

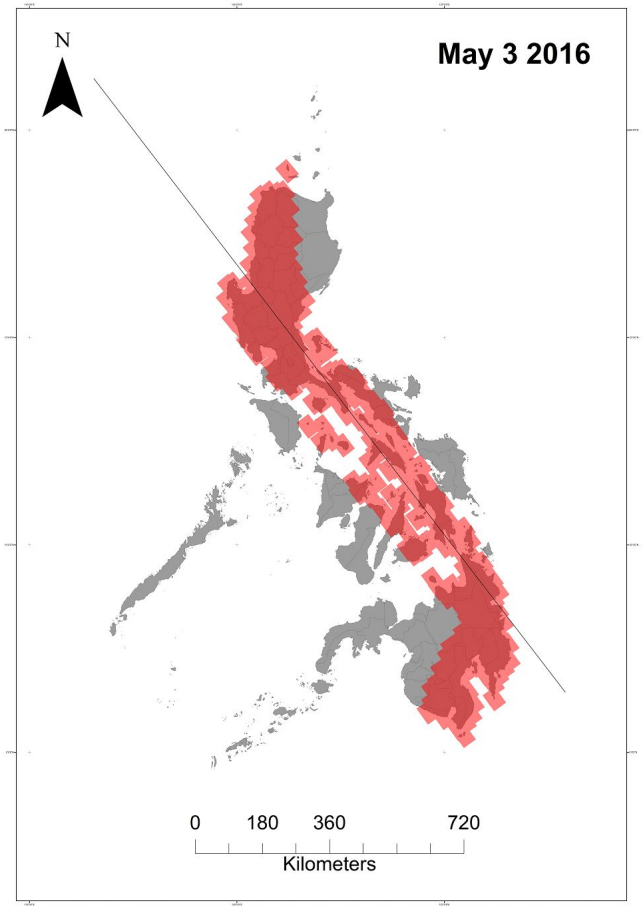
Ongoing development of a support system for operationalization of the satellite's ground receiving station

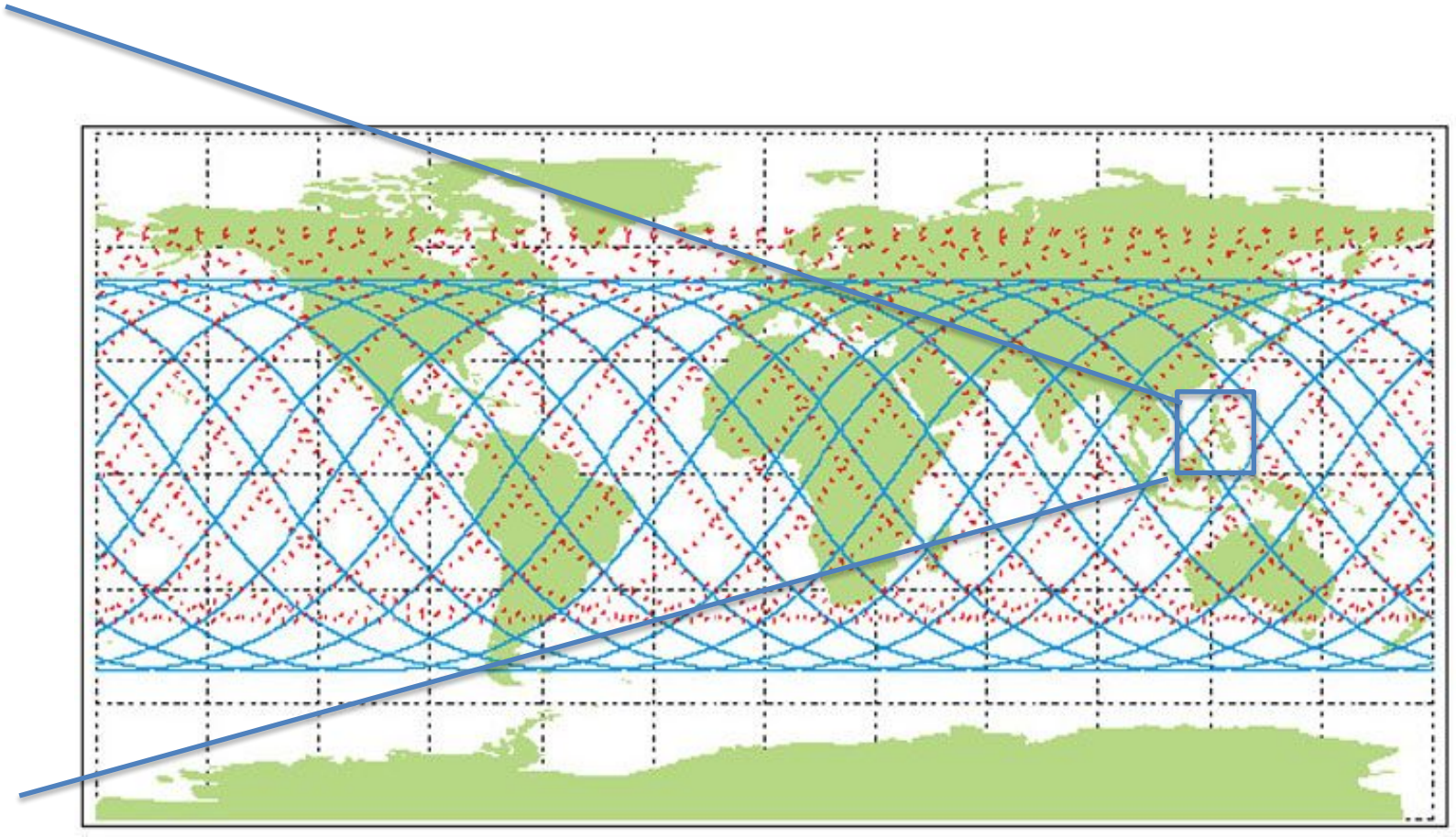












Due to the inclination, we can sweep through almost the whole country in one pass

http://iss.jaxa.jp/kibo/images/experiment/pict/smiles/smiles_e11.jpg

Diwata-1 Science Mission and Payload Sensors

High Precision Telescope

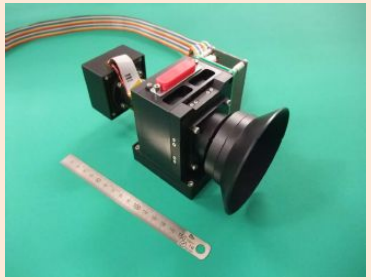
Spatial Resolution
3m

Field of View
1.9 x 1.4km

Possible Applications
Determine the extent of damages from disasters

Profiling and archiving of cultural and natural heritage sites

SMI with LCTF



Spatial Resolution
80m

Field of View
52 x 39km

Possible Applications
Assessment of the changes in Vegetation

Assessment of ocean productivity

Wide Field Camera

Spatial Resolution
7km

Field of View
180° x 134°

Possible Applications
Observation of cloud patterns and weather disturbances

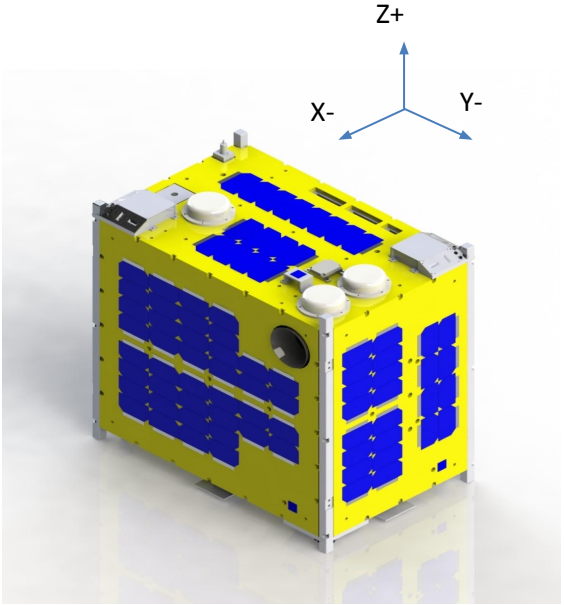
Middle Field Camera

Spatial Resolution
185 m

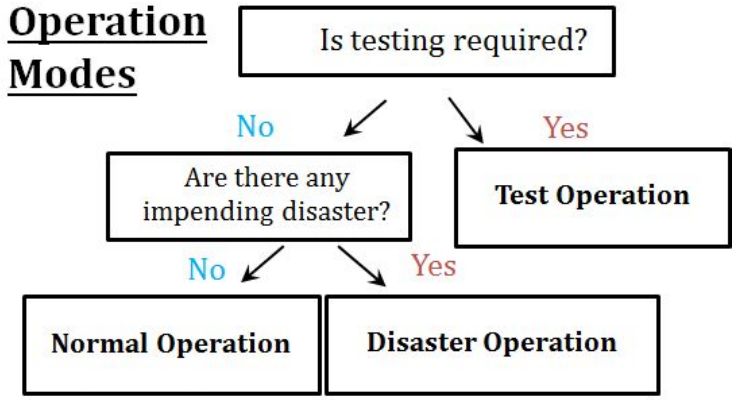
Field of View
121.9 X 91.4 km

Possible Applications
Assists in determining the locations of images captured using the HPT and SMI

Diwata-1 is expected to pass 4 times per day with an average duration of 9 minutes per pass



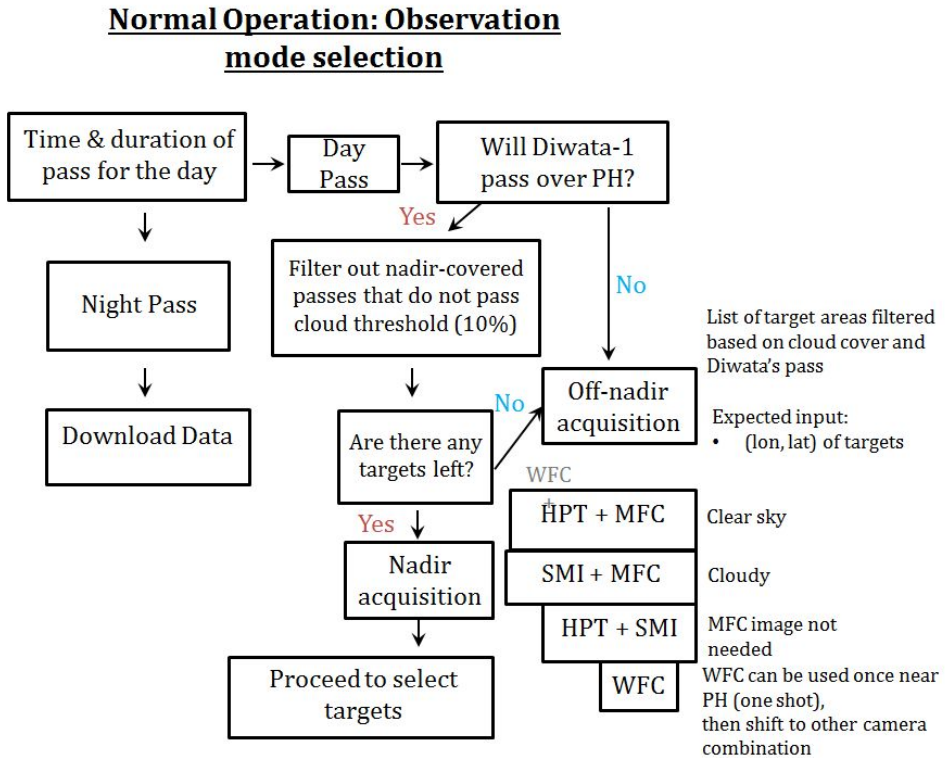
Observation Modes

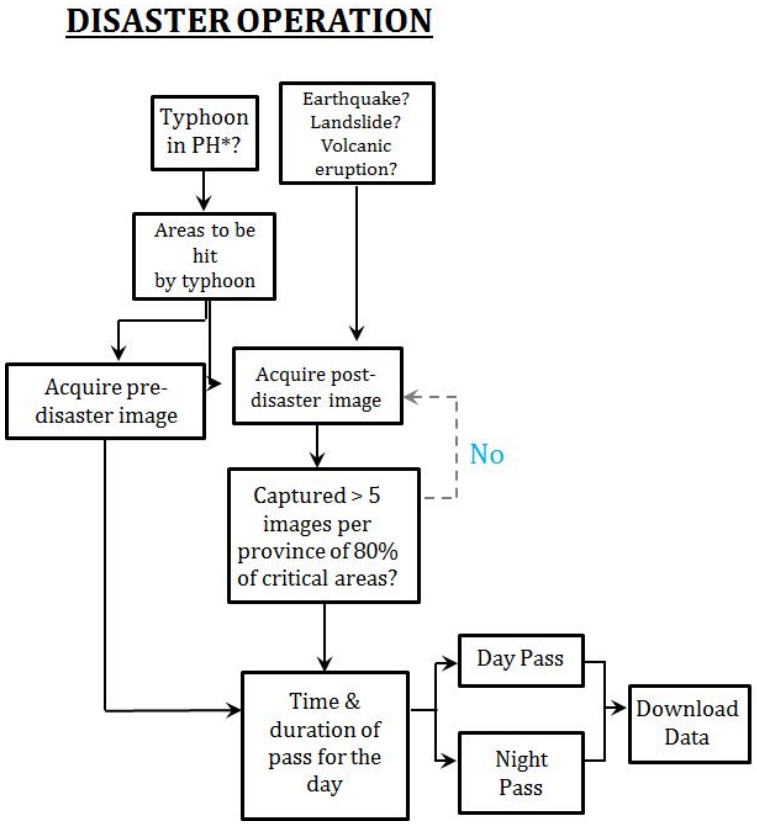


Normal Operation
- Diwata is healthy
- No disaster and impending disaster
- No request concerning national security

Disaster Operation
- Satellite is healthy
- *Impending disaster* and post disaster
- Request related to national security

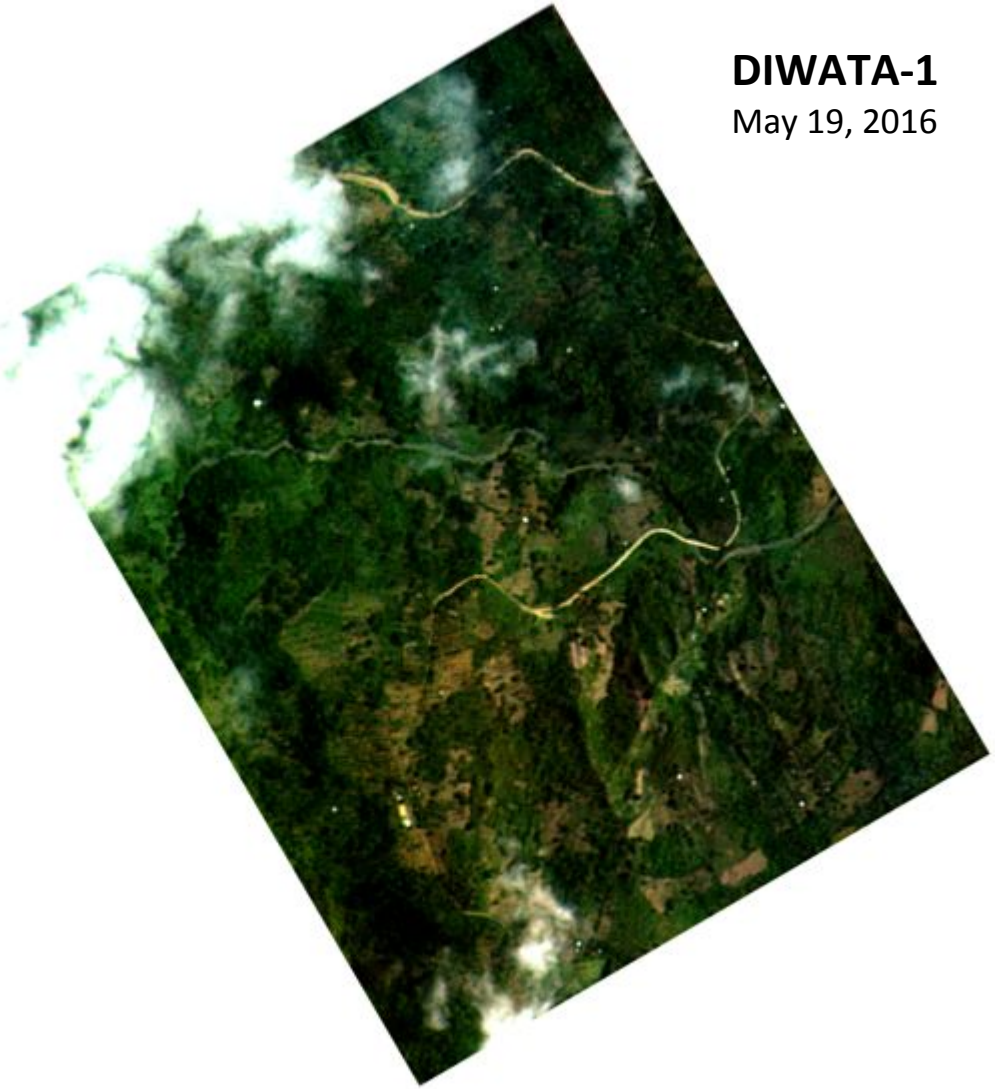
Test Operation
- Initial operations
- Diwata not healthy
- Cal-Val
- Requests from Projects 1-5 not covered in Normal and Disaster operation





Diwata-1: RGB Composite

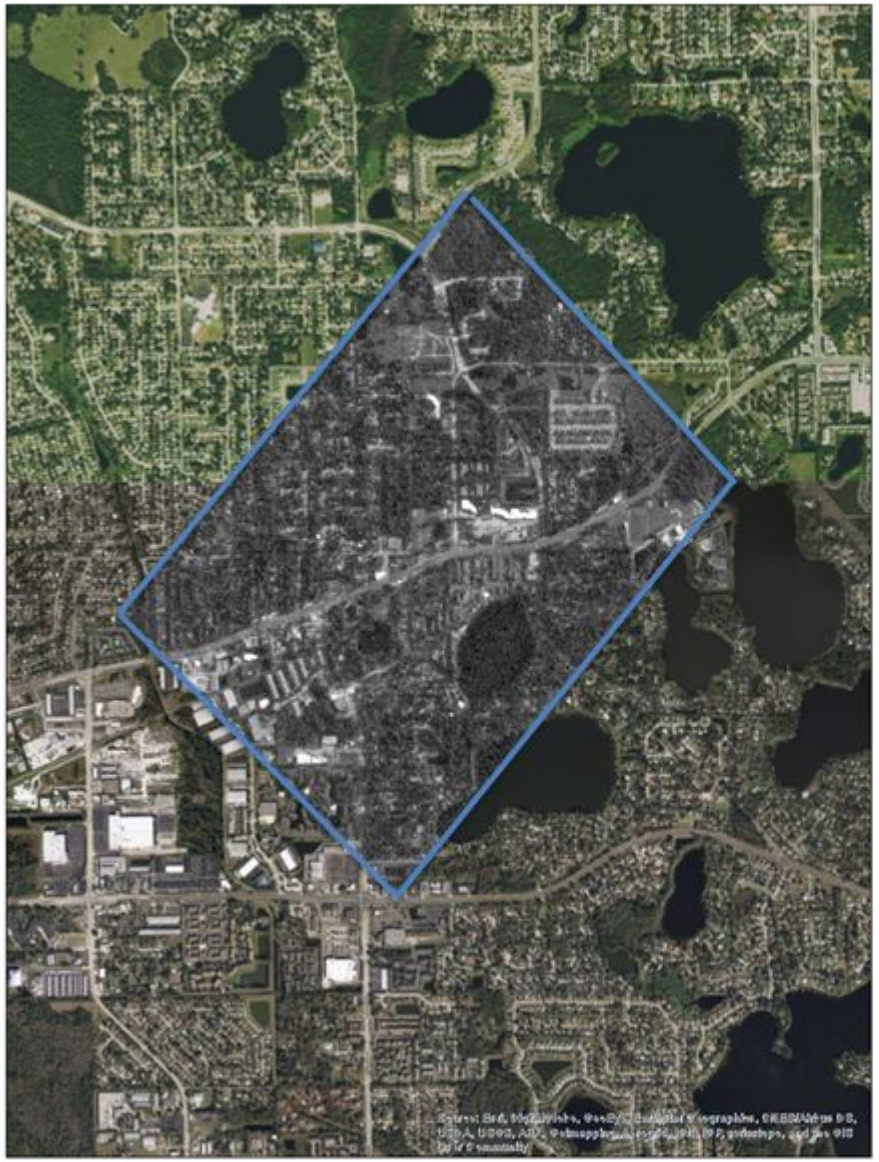
LANDSAT 8
May 14, 2016
8°07'04.2"N, 123°17'36.2"E
15 m GSD (Pan Sharpened)
RGB Image



DIWATA-1
May 19, 2016

Diwata-1: Georeferenced Images

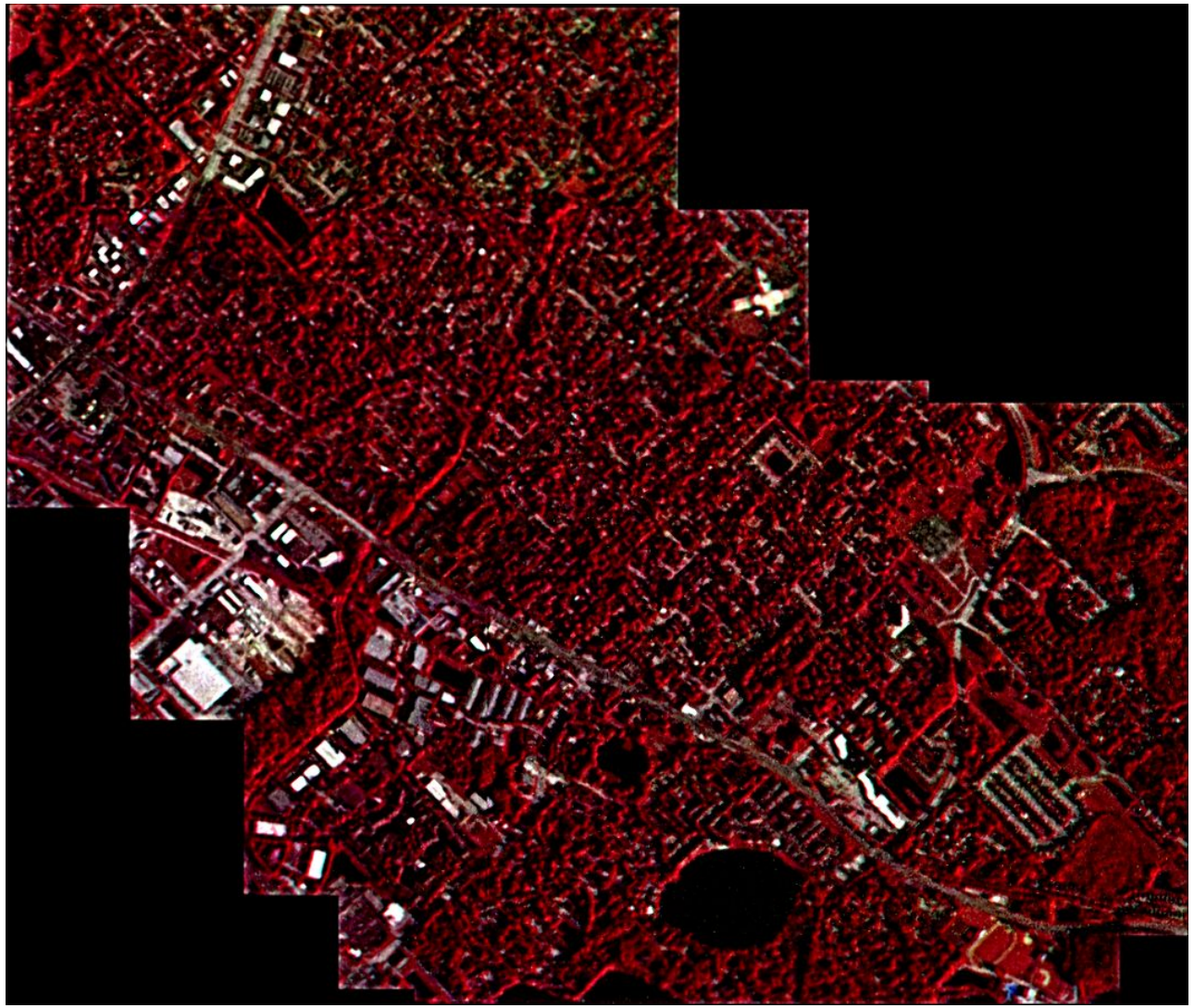
MFC



HPT

Location:
Orlando, Florida
Date acquired:
30 June 2016

Diwata-1: HPT multiple image capture



Location: Orlando, Florida

Date acquired: 30 June 2016

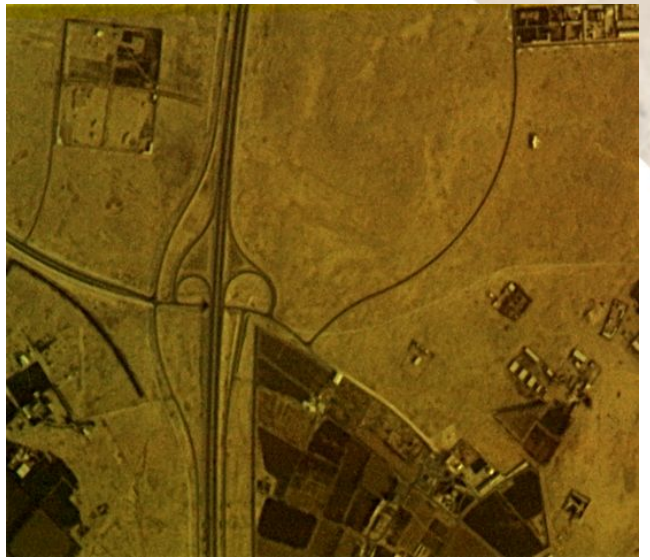
False Color Composite

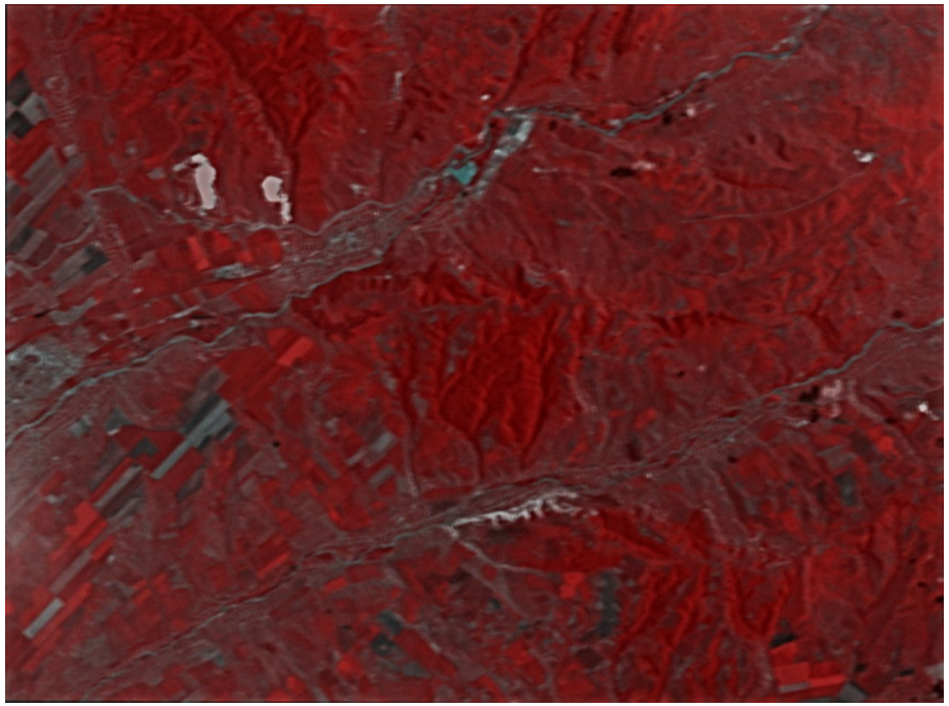
Diwata-1: HPT multiple image capture

Location: Simsimah, Qatar

Date acquired: 29 June 2016

Background image from Google Earth



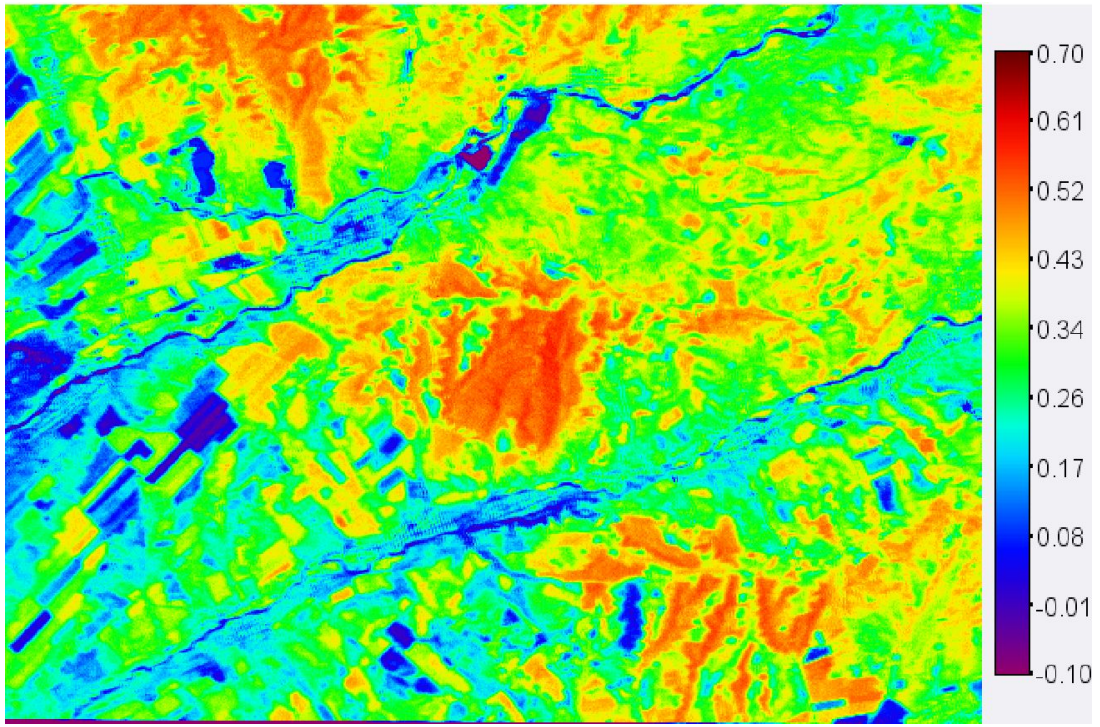


Location: Kubina, Russia

Date acquired: 16 August 2016

False Color Composite

NDVI



Location: Asuncion, Davao del Norte, PH

Date acquired: 16 August 2016

RGB (haze contaminated)

Rapid Post-Disaster Assessment

Provide near real-time access to satellite imagery

Provide critical information for fast disaster response and right resource allocation

Provide support in rehabilitation plans and recovery

High Precision Telescope

Environmental Monitoring

Provide satellite data to agriculture, fisheries, forestry and other sectors

Provide continuous data access that can meet ground resolution requirements on a comprehensive coverage

SMI with LCTF

Communications at times of disasters and emergencies

Provide means of communication for emergency responders, planners and affected communities when other regular infrastructure suffer debilitating damage or congestion

Amateur Radio

Diwata-2 design phase

Design planning for the second microsatellite, Diwata-2 is ongoing. It is expected to be launched to orbit by 2018.

Data Processing, Archiving, And Distribution Subsystem for the Ground Receiving Station of the Philippine Scientific Earth Observation Micro-Satellite

Mark Edwin Tupas, Ayin Tamondong, Romer Kristi Aranas,
Jerine Amado, McGuillis Kim Ramos, Benjamin Joseph Jiao,
Ian Panganiban, Charmyne Mamador, Julius Sempio
University of the Philippines - Diliman Training Center for Applied Geodesy and Photogrammetry
PHL-Microsat: Project 3

Objectives

(1) To design and develop data processing, archiving and distribution sub-systems for multiple sensor RS images.

(2) To gain proficiency in the upscaling and automating RS data calibration

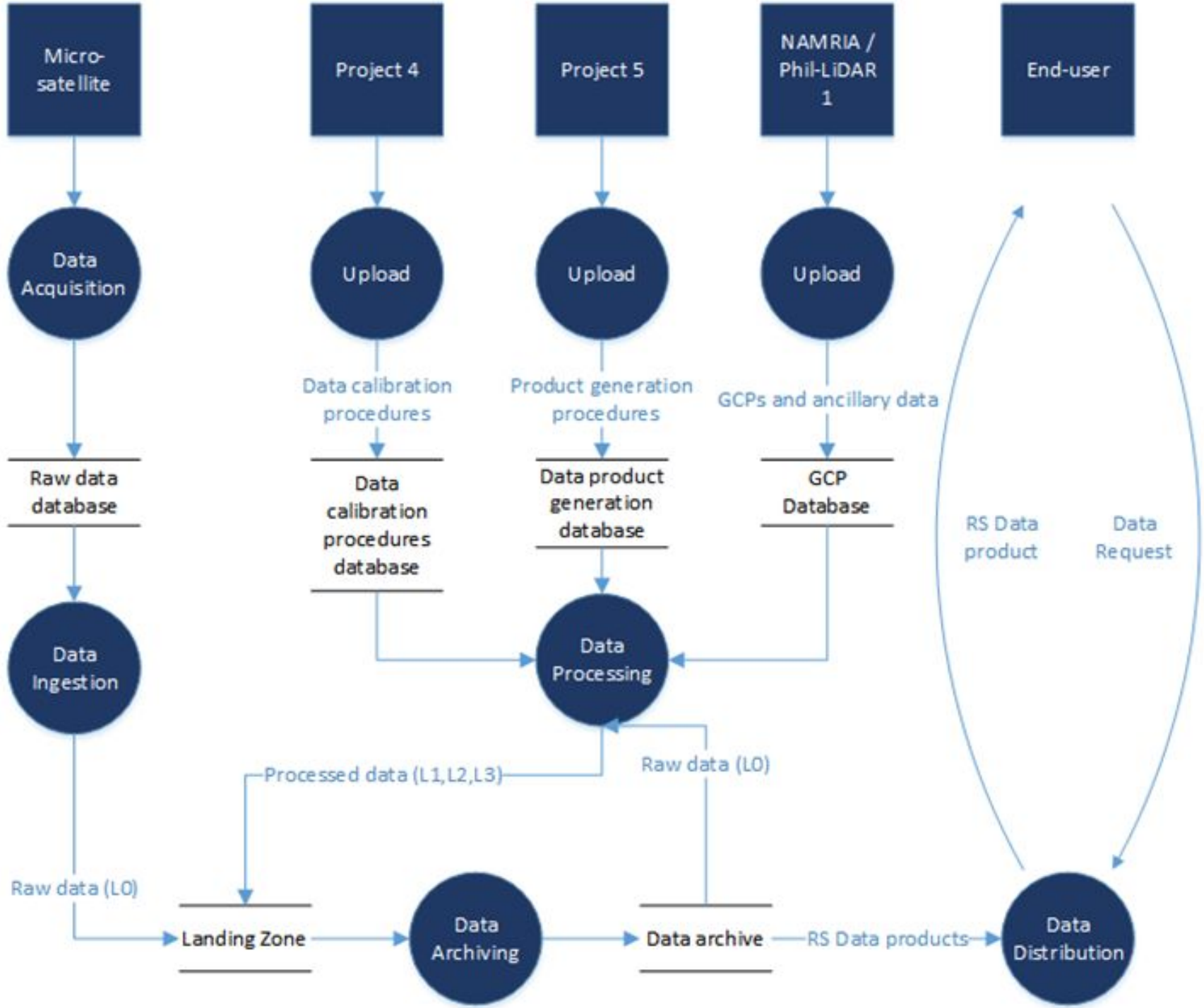
(3) To be able to disseminate different RS products (e.g. Land Cover, Resource Maps, etc.)

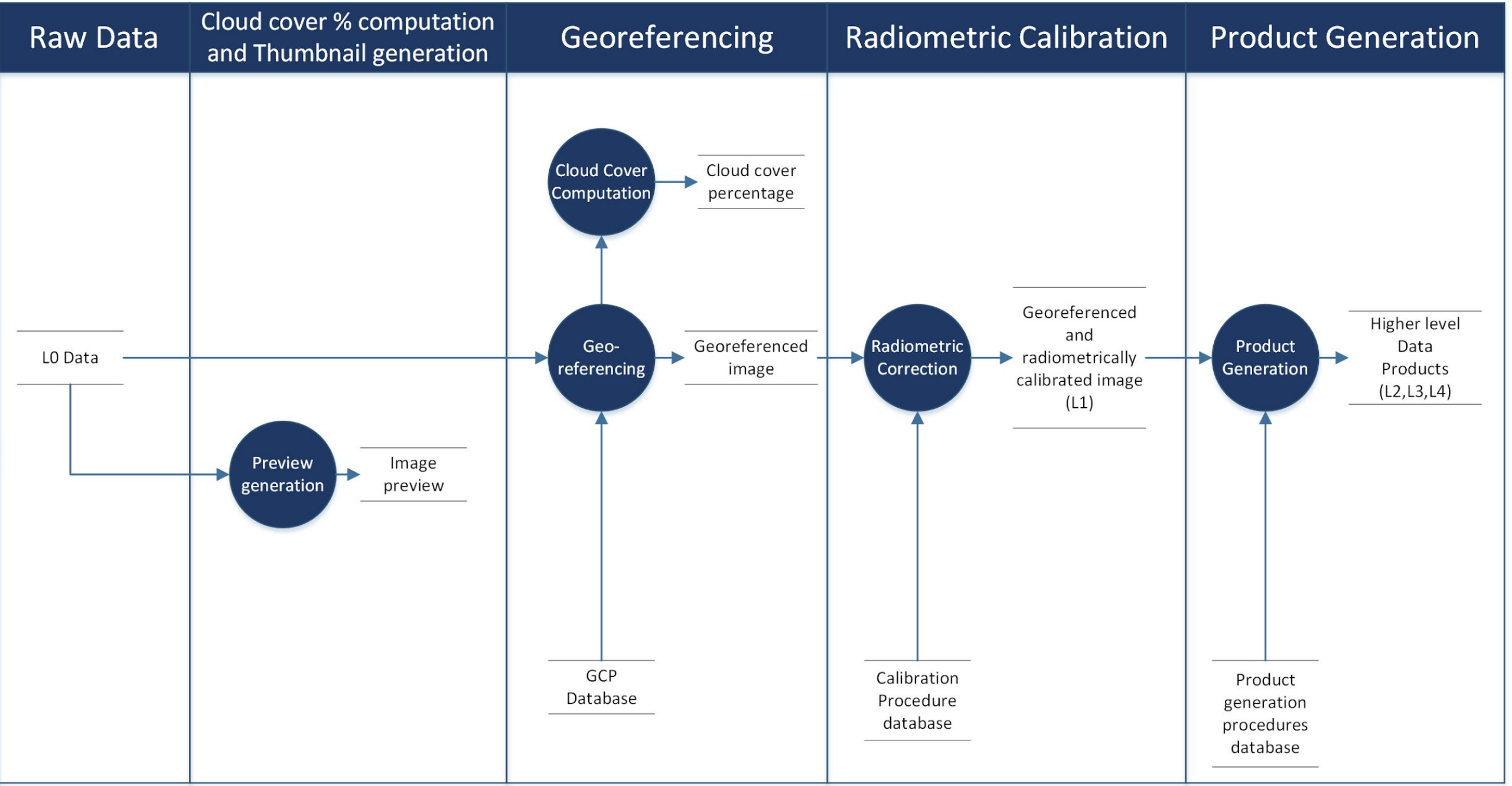
Why build instead of buy?

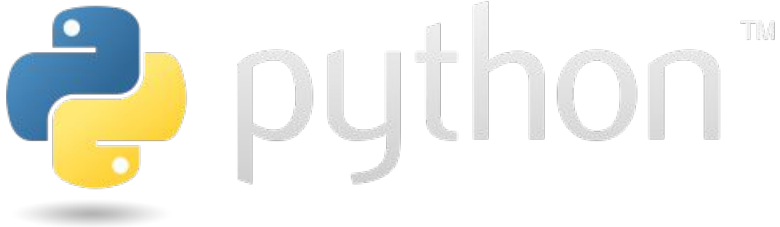
Capacity building

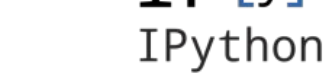
Fit for purpose

Minimize costs

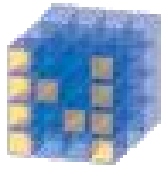

Micro-satellite
Project 4
Project 5
NAMRIA / Phil-LiDAR 1
End-user
Data Acquisition
Upload
Upload
Upload
Data calibration procedures
Product generation procedures
GCPs and ancillary data
Raw data database
Data calibration procedures database
Data product generation database
GCP Database
RS Data product
Data Request
Data Ingestion
Data Processing
Processed data (L1,L2,L3)
Raw data (L0)
Raw data (L0)
Landing Zone
Data Archiving
Data archive
RS Data products
Data Distribution


Raw Data
Cloud cover % computation and Thumbnail generation
Georeferencing
Radiometric Calibration
Product Generation
L0 Data
Preview generation
Image preview
Cloud Cover Computation
Cloud cover percentage
Geo-referencing
Georeferenced image
GCP Database
Radiometric Correction
Georeferenced and radiometrically calibrated image (L1)
Calibration Procedure database
Product Generation
Higher level Data Products (L2,L3,L4)
Product generation procedures database


python

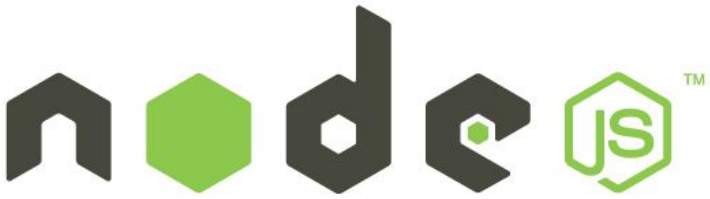

IP[y]:
IPython

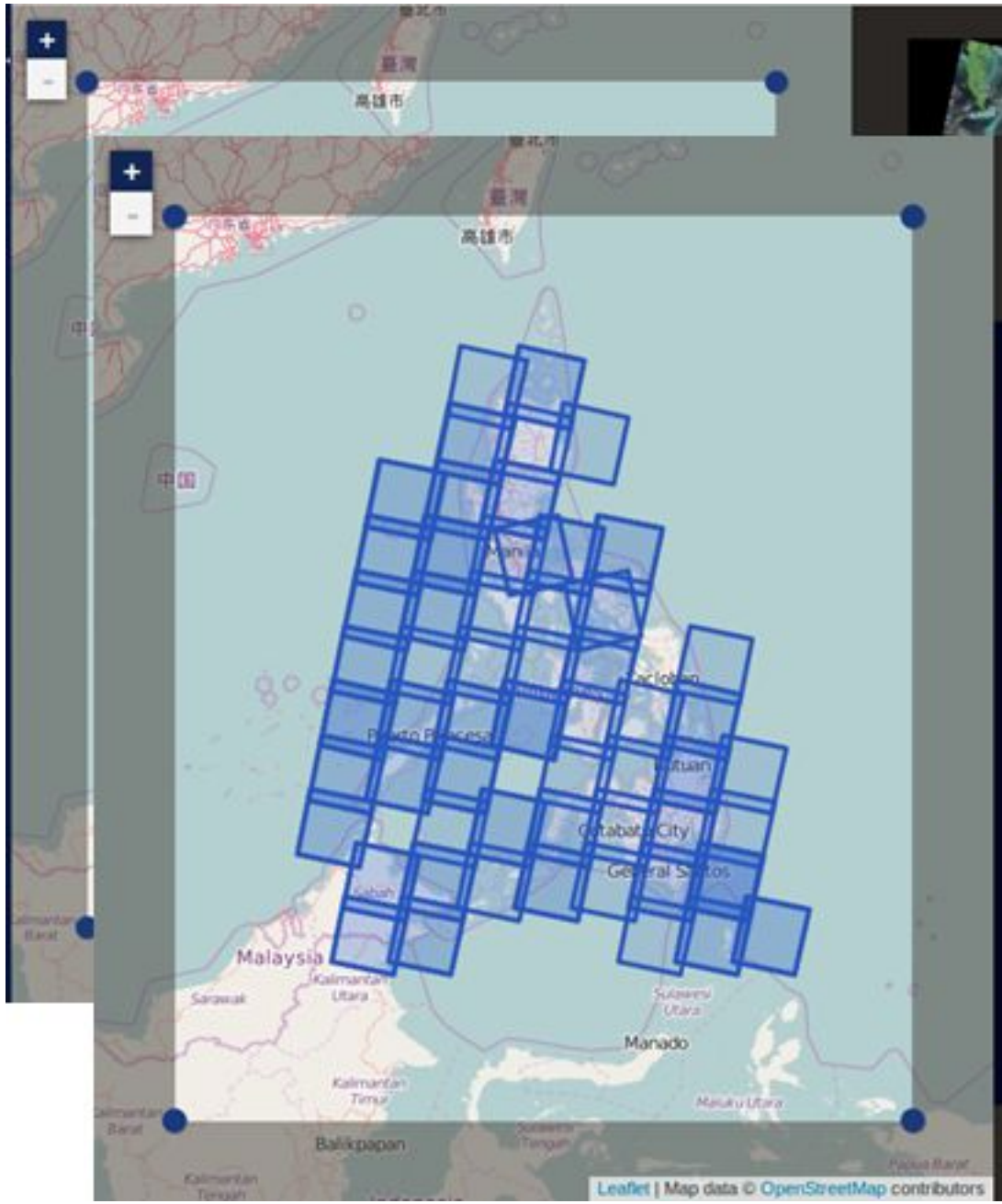

GDAL

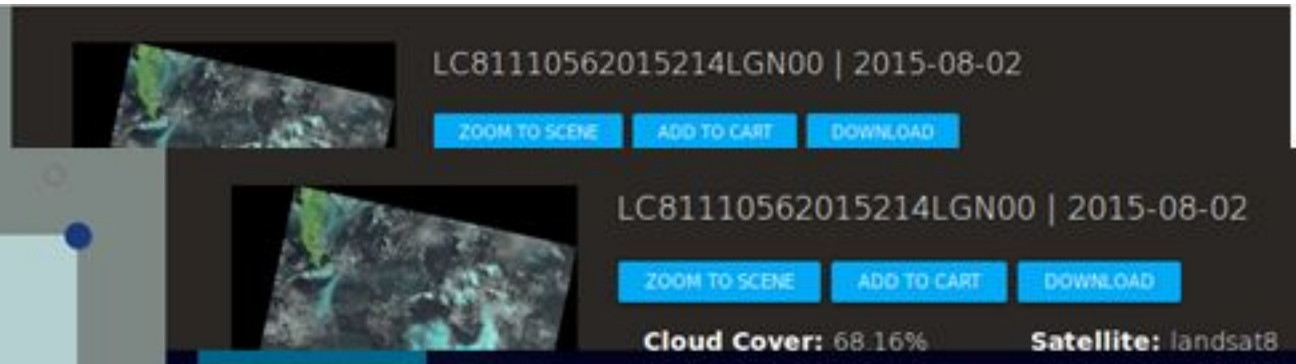


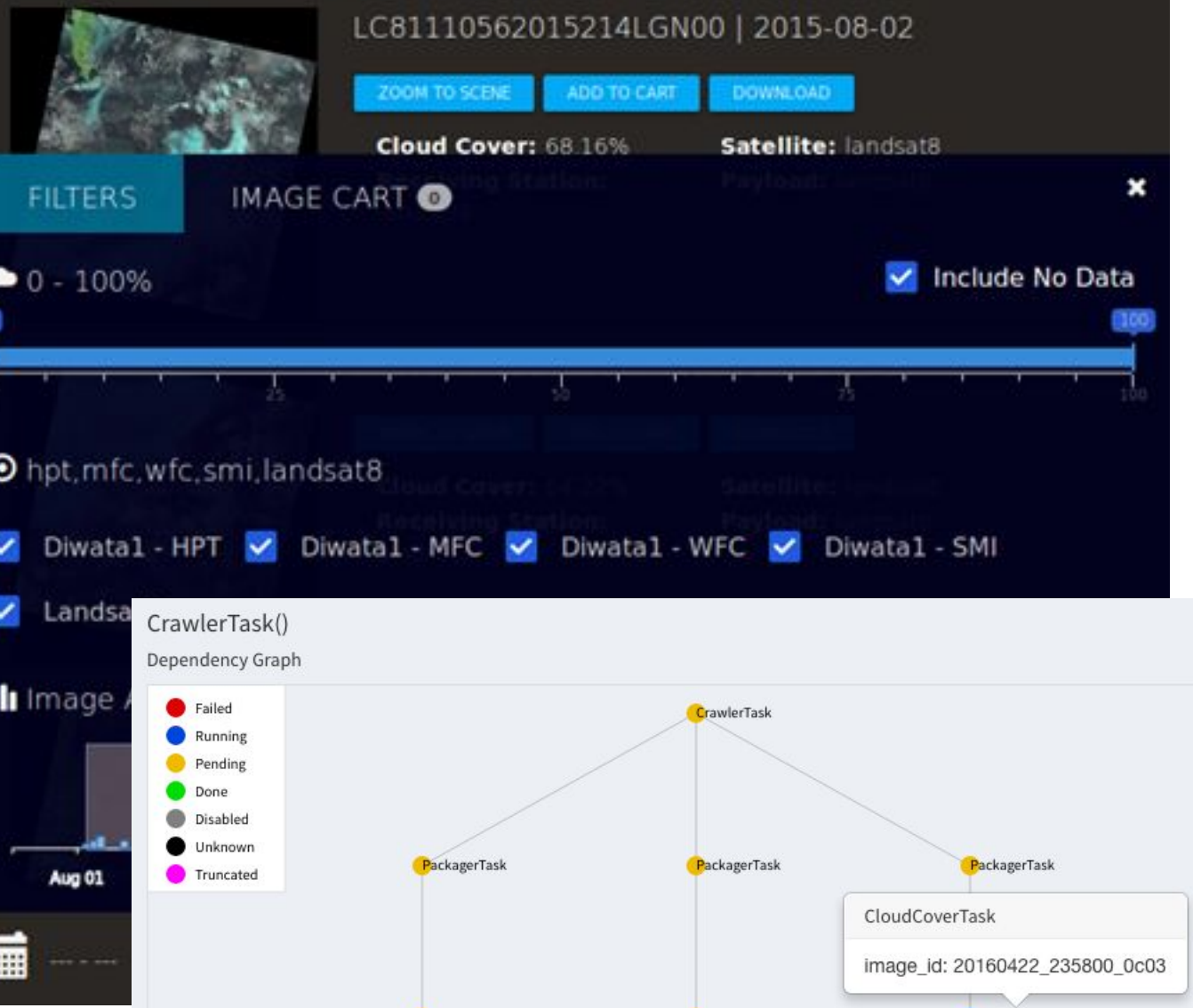

django


luigi

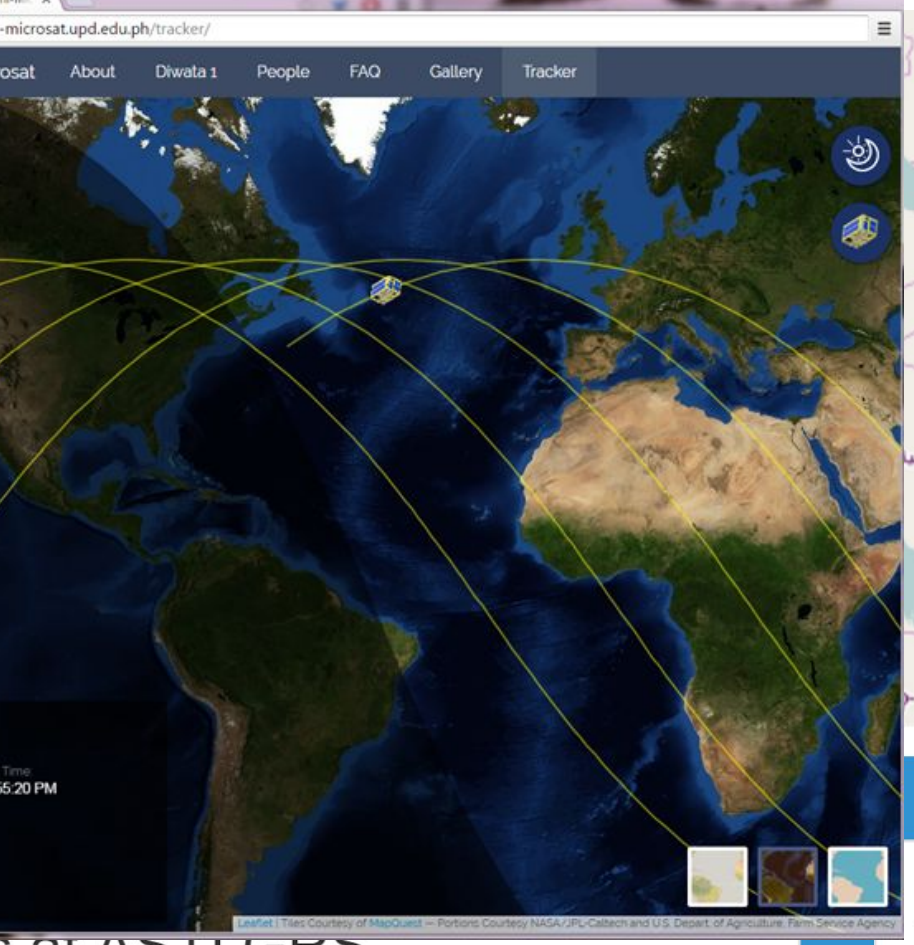

node
JS


Malaysia
Manado
Balikpapan
Leaflet | Map data © OpenStreetMap contributors


LC81110562015214LGN00 | 2015-08-02
ZOOM TO SCENE
ADD TO CART
DOWNLOAD


LC81110562015214LGN00 | 2015-08-02
ZOOM TO SCENE
ADD TO CART
DOWNLOAD
Cloud Cover: 68.16%
Satellite: landsat8
FILTERS
IMAGE CART 0
0 - 100%
Include No Data
hpt,mfc,wfc,smi,landsat8
Diwata1 - HPT
Diwata1 - MFC
Diwata1 - WFC
Diwata1 - SMI
Aug 01

CrawlerTask()
Dependency Graph
Failed
Running
Pending
Done
Disabled
Unknown
Truncated
CrawlerTask
PackagerTask
PackagerTask
PackagerTask
CloudCoverTask
image_id: 20160422_235800_0c03
CloudCoverTask
CloudCoverTask
CloudCoverTask



Pass at ASTI GRS

HOURS	MINUTES	SECONDS
0	5	57

Path

Pass at Tohoku GRS

HOURS	MINUTES	SECONDS
13	29	34

View Path

Current Position

Lat: 44.23039602712956

Long: 98.98806016916221

Elevation: 400965.34375m

Takeaways

1. Leveraging free and open source software allows us to gain the capacity to build a fit for purpose data processing, archiving, and distribution pipeline at minimal cost.
2. Some* assembly is required.
3. A lot of the time is spent reading documentation.

DPAD Challenges

1. Data Quality
    a. Pointing Accuracy
    b. SnR
2. Automation
    a. Georeferencing
    b. Workflow Management
3. Data Policy
    a. “Open Data Policy”
        i. DRR clause
        ii. non-commercial

DPAD - OSM

1. Applications
    a. Tracker
    b. Image Requests
    c. Image Browser
2. Automated Georeferencing
    a. Vector to Image Georeferencing
    b. Validation Points
3. (Hopefully) Image use

Questions?

Contact us at
project3@phl-microsat.xyz

PHL MICROSAT

Thank you!