STAMINA4Space: Disruption and Value Creation from Space Technology through Data, Industry and People

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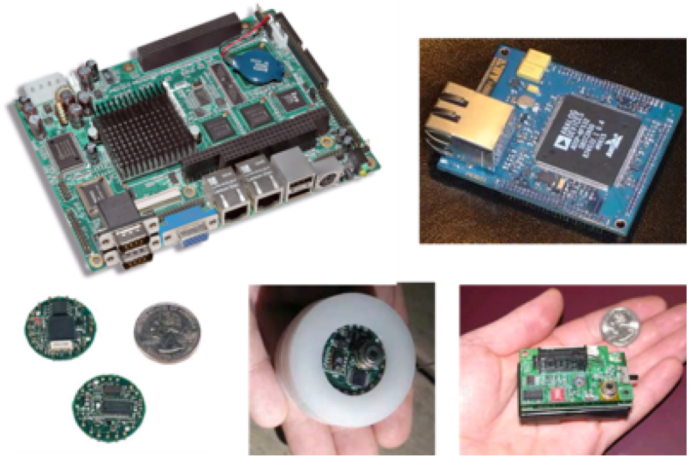
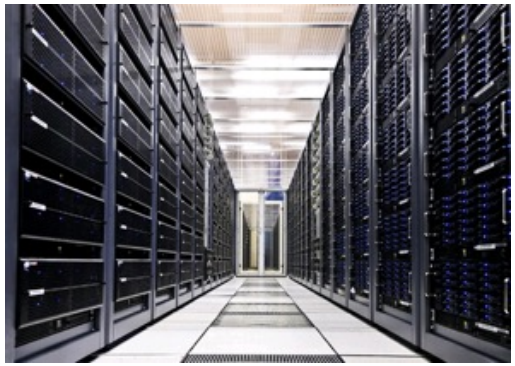
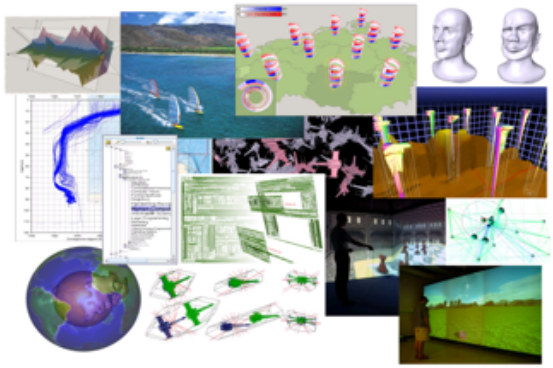
2018 Philippine APEC Study Center Network
Disruptive Technologies: Opportunities, Challenges and Risks
Henry Sy, Jr. Hall, UP BGC
08 October 2018

The Changing Face of Computing



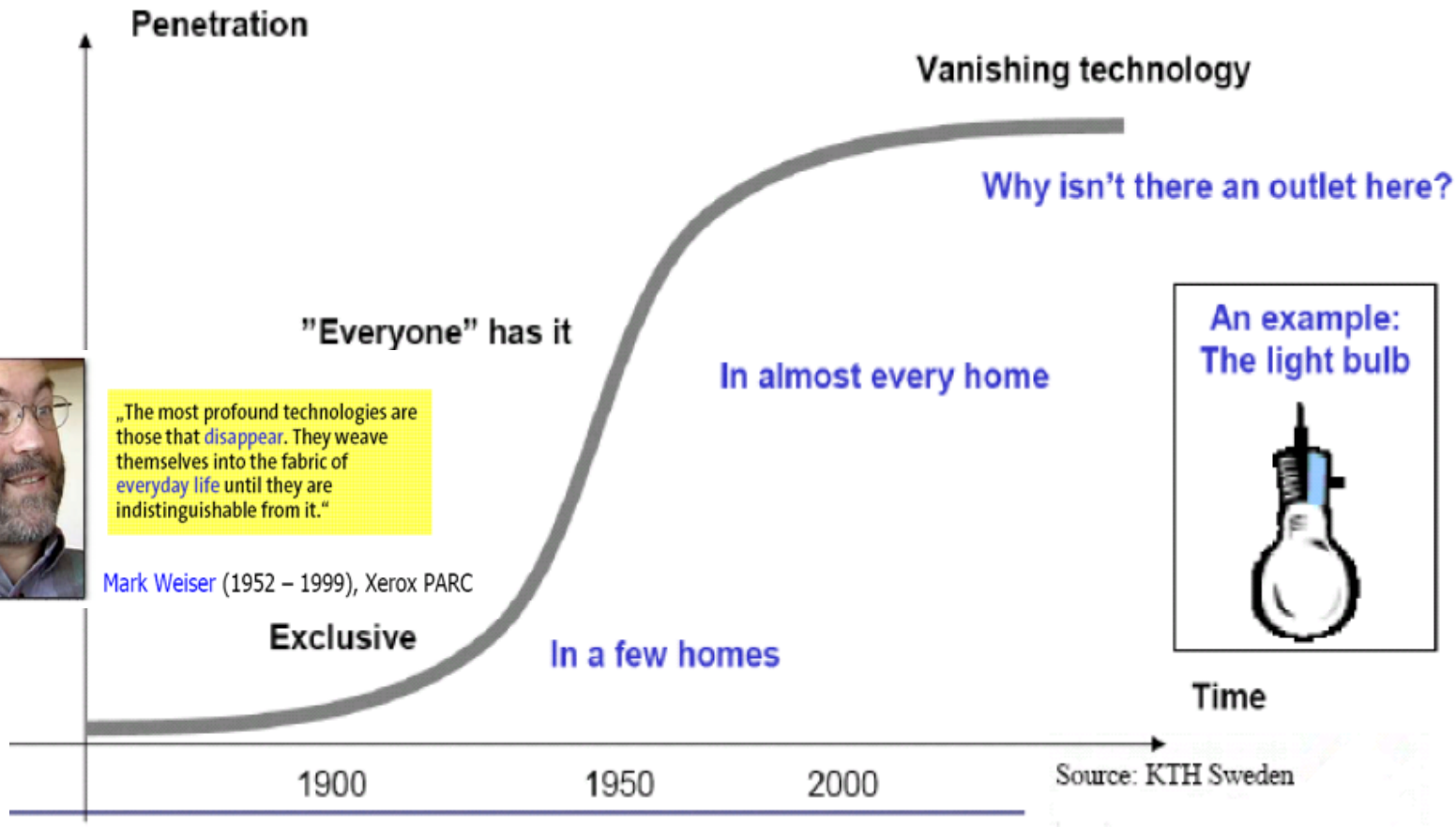


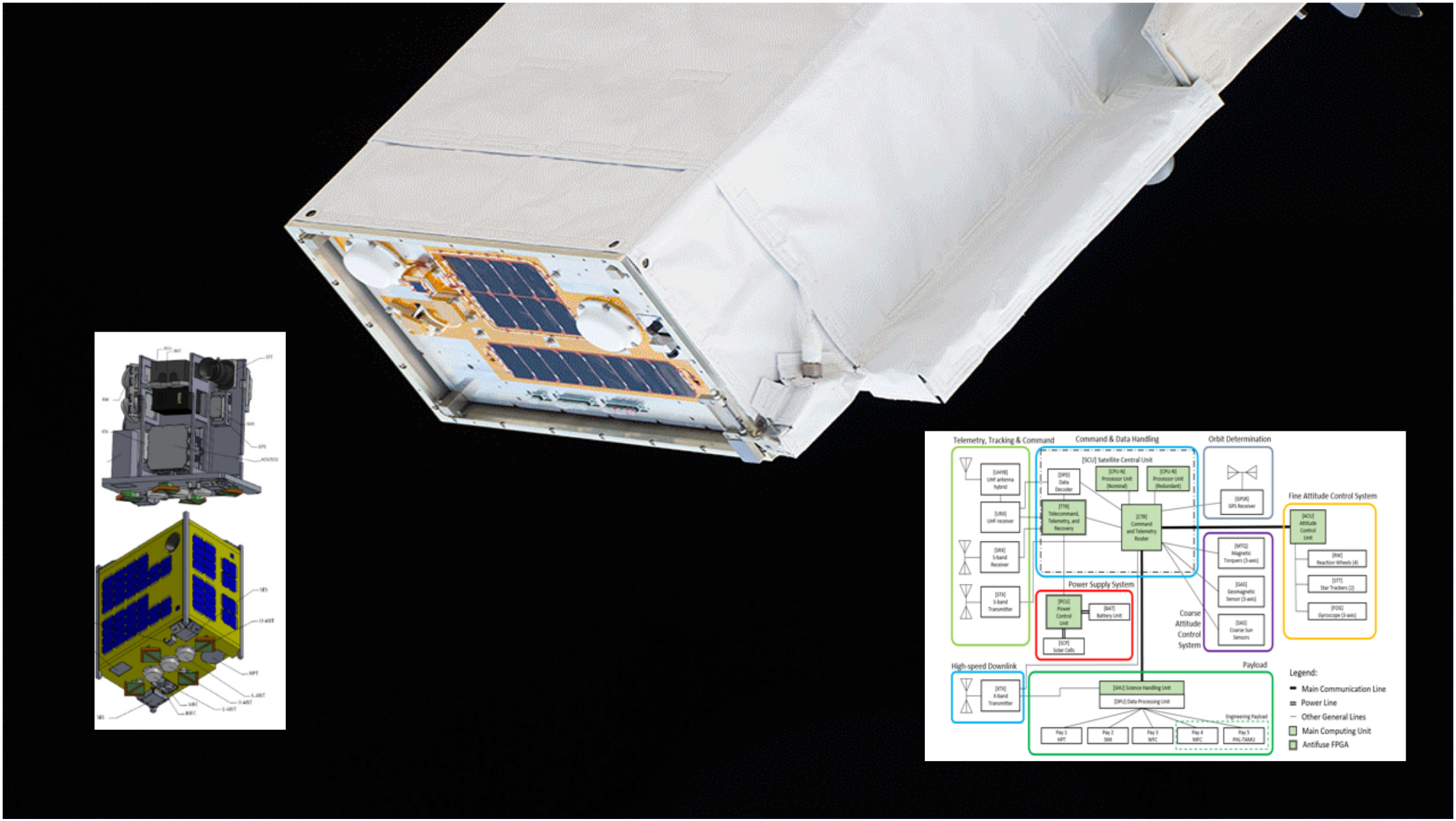


Going the Way of the Light Bulb

„The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it."

Mark Weiser (1952 – 1999), Xerox PARC





Telemetry, Tracking & Command
Command & Data Handling
Orbit Determination
[SCU] Satellite Central Unit
[UHYA] UHF antenna hybrid
[URX] UHF receiver
[SRX] S-band Receiver
[STX] S-band Transmitter
[DPD] Data Decoder
[CPU-N] Processor Unit (Nominal)
[CPU-R] Processor Unit (Redundant)
[TTR] Telecommand, Telemetry, and Recovery
[CTR] Command and Telemetry Router
[GPSR] GPS Receiver
Fine Attitude Control System
[ACU] Attitude Control Unit
[RW] Reaction Wheels (4)
[STT] Star Trackers (2)
[FOG] Gyroscope (3-axis)
Power Supply System
[PCU] Power Control Unit
[BAT] Battery Unit
[SCP] Solar Cells
[MTQ] Magnetic Torquers (3-axis)
[GAS] Geomagnetic Sensor (3-axis)
[SAS] Coarse Sun Sensors
Coarse Attitude Control System
High-speed Downlink
[XTX] X-band Transmitter
Payload
[SHU] Science Handling Unit
[DPU] Data Processing Unit
Engineering Payload
Pay 1 HPT
Pay 2 SMR
Pay 3 WFC
Pay 4 MFC
Pay 5 PNS-TAMU
Legend:
Main Communication Line
Power Line
Other General Lines
Main Computing Unit
Antifuse FPGA

Diwata-1 Microsatellite Payload

CLASS: 50 kg Microsatellite

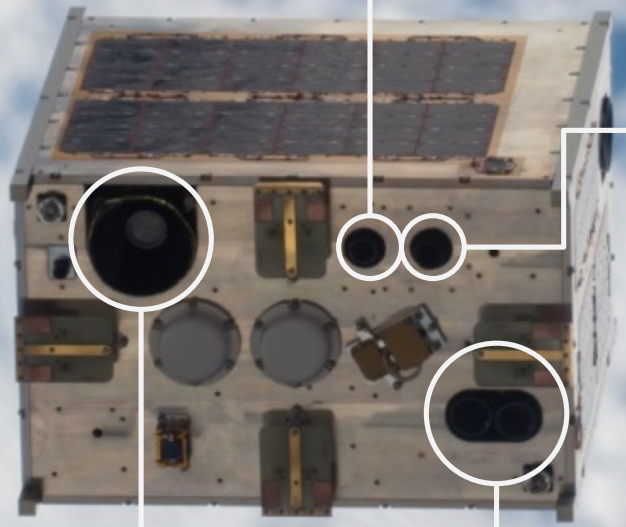
DIMENSION: 55 x 55 x 35 cm

INCLINATION: 51.6 degrees

ALTITUDE: ~420km

LAUNCH: 23 March 2016

RELEASE: 27 April 2016



WIDE FIELD CAMERA (WFC)

MIDDLE FIELD CAMERA (MFC)

SPACE-BORNE MULTISPECTRAL IMAGER WITH LIQUID CRYSTAL TUNABLE FILTER (SMI-LCTF)

HIGH PRECISION TELESCOPE (HPT)

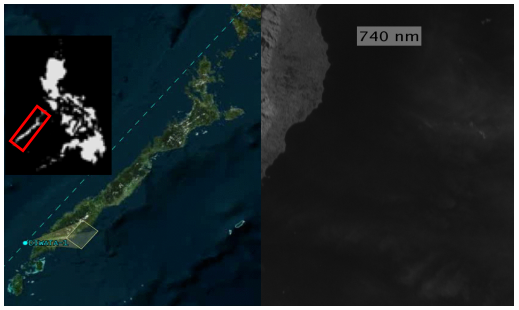
The Philippines is not really launching satellites …

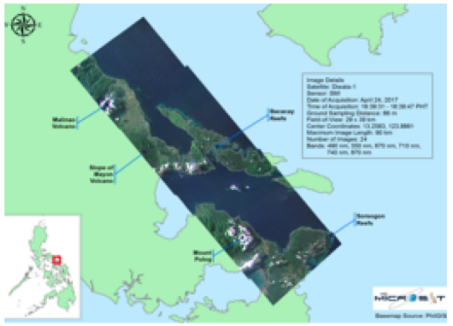
We are *putting computers in orbit.*

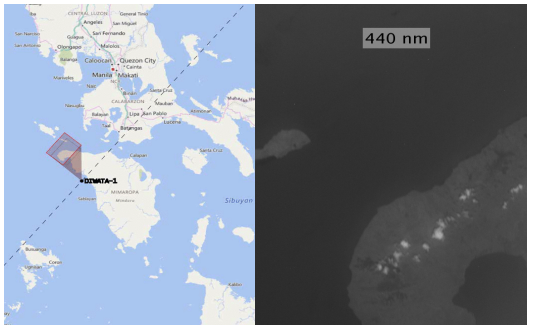
What on earth for?

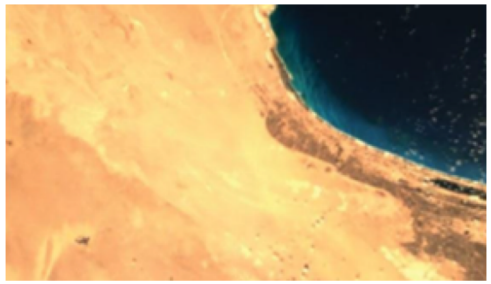
Data for enabling science-based policies and interventions.
Data for enhancing productivity and inclusive innovation.
Data as fuel for the 4th industrial revolution.

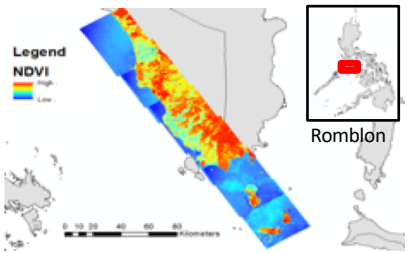
http://phl-microsat.upd.edu.ph/

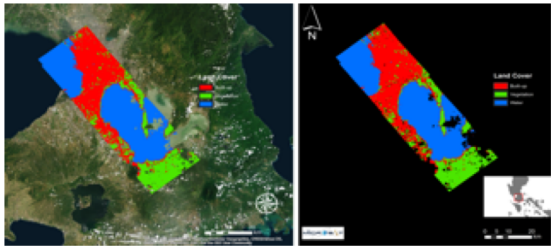


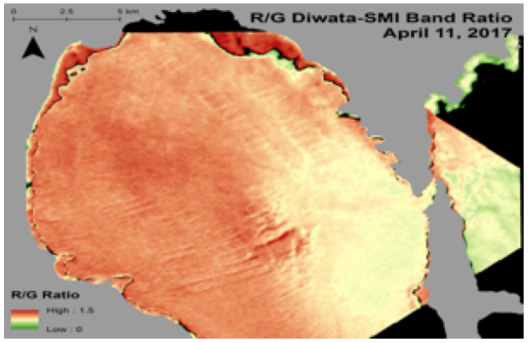


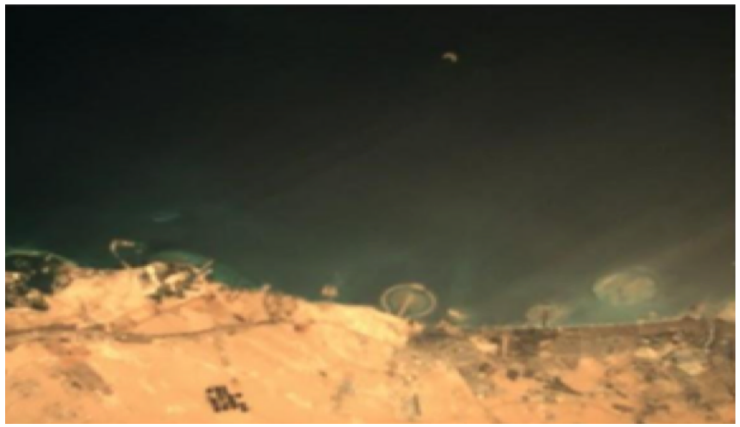


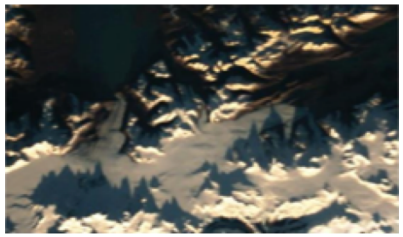


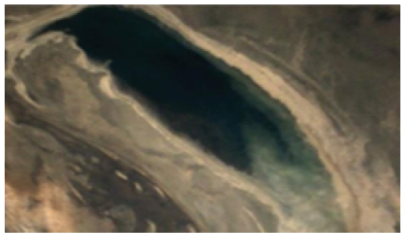


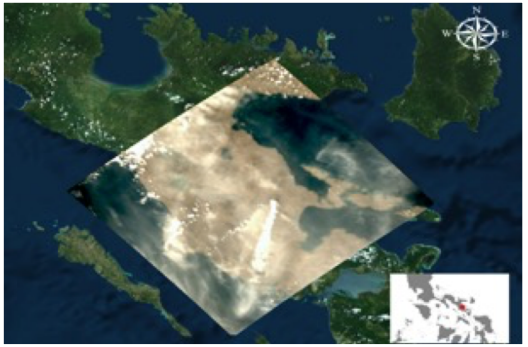












Bloomberg Businessweek

This Company Wants to Send You to the Stratosphere in a Balloon

Forgotten Photos From the Space Shuttle's Glory Days

How Space Movies Rule the Hollywood Box Office

July 26, 2018, 5:00 PM GMT+8 July 27, 2018, 6:14 AM GMT+8

All the Things Satellites Can Now See From Space

They're getting smaller, cheaper, and easier to launch. Here's what they're capturing.

By Andre Tartar, Jeff Kearns, Eric Roston, Jeremy Kahn, Shannon Sims, Karlis Salna, and Aaron Clark

Satellites are orbiting in record numbers. These are just some of the companies, government agencies, and NGOs putting them to use.

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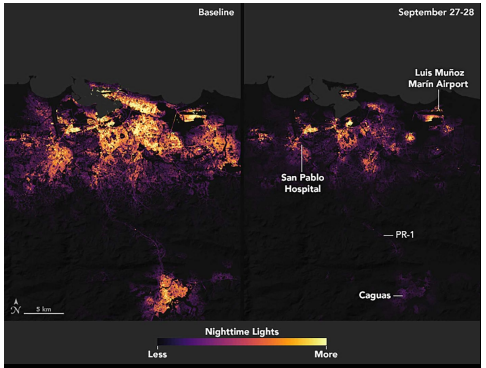
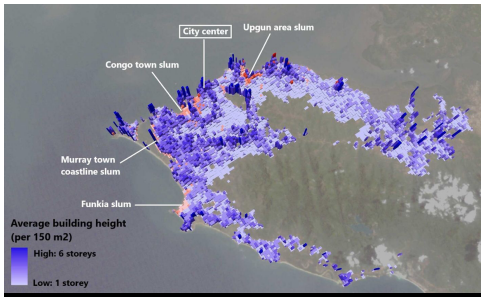


▲ These NASA satellite images show a comparison of Puerto Rico before and after Hurricane Maria hit the island. The before image on the left shows lighting around San Juan based on cloud-free conditions and low moonlight. The after image shows light detected on the nights of Sept. 27 and 28, 2017. SOURCE: NASA

▲ Oil storage monitored by Ursa. SOURCE: TERRASAR-X

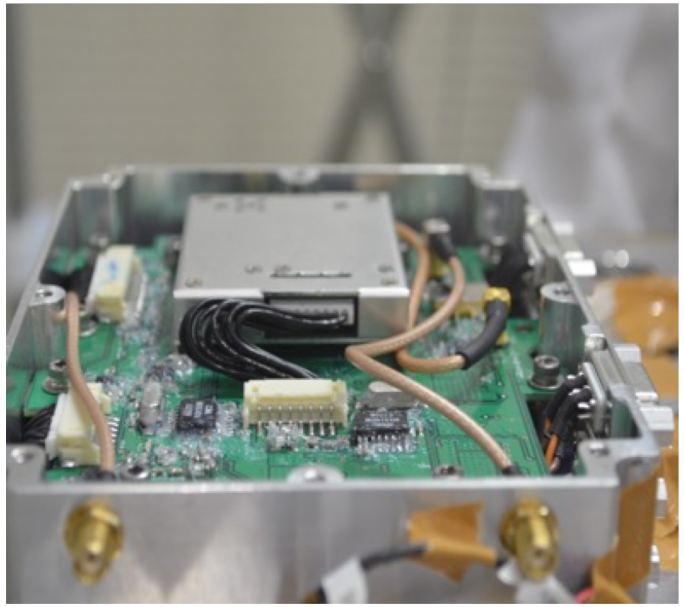


▲ Freetown's development is highly fragmented, and slum areas systematically display lower built-up heights. SOURCE: WORLD BANK

https://www.bloomberg.com/news/features/2018-07-26/all-the-things-satellites-can-now-see-from-space

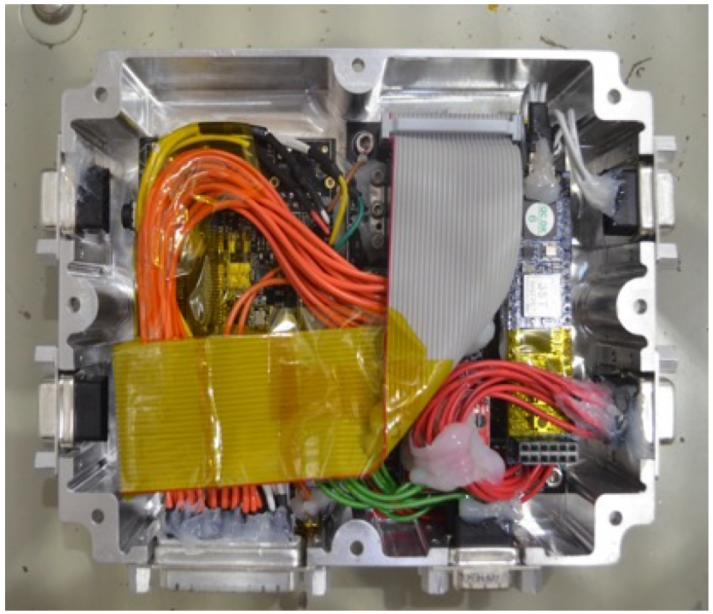
Not Just About the *Data*.
Developing a Local *Industrial Base*.

Locally-developed Experimental Modules to fly with Diwata-2



Amateur (“Ham”) Radio Payload

Aerospace and aeronautics sub-systems



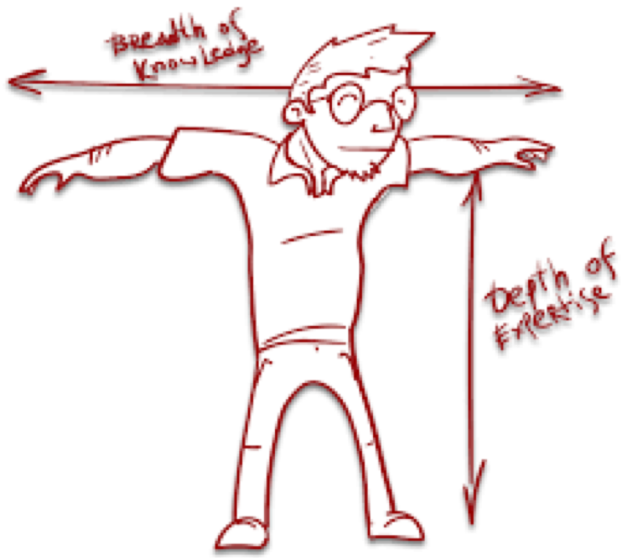
Attitude Control Unit (ACU-Ex)

Electronics and semiconductors

Sun Aspect Sensor (SAS-Z)

Space-grade materials

When we build satellites, we also build *People*.



T-shaped people have a principal skill that describes the vertical leg of the T — they're mechanical engineers or industrial designers. But they are so ***empathetic*** that they can branch out into other skills, such as anthropology, and do them as well."

Tim Brown, CEO and president of IDEO

Electrical, electronics, mechanical engineers → **Systems Engineers**

Remote sensing scientists → **Data Scientists**





Diversity within the PHL-Microsat / STAMINA4Space team

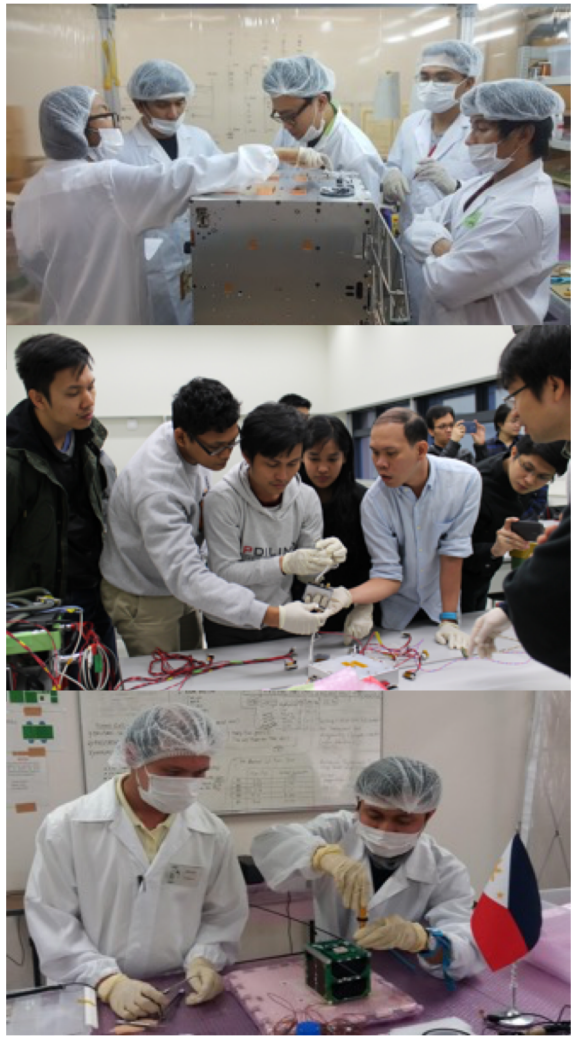
- Aerospace Engineering*
- Computer Science
- Cosmoscience*
- Electrical Engineering
- Electronics and Communication Engineering
- Energy Engineering
- Environmental Science
- Geodetic Engineering
- Geomatics Engineering
- Material Science and Engineering
- Mechanical Engineering
- Meteorology
- Physics
- Remote Sensing
- Space Engineering*

PHL-Microsat

Trained 60 scientists and engineers

Deployed 16 graduate and research students in Japan

Offered local undergraduate elective course on space engineering



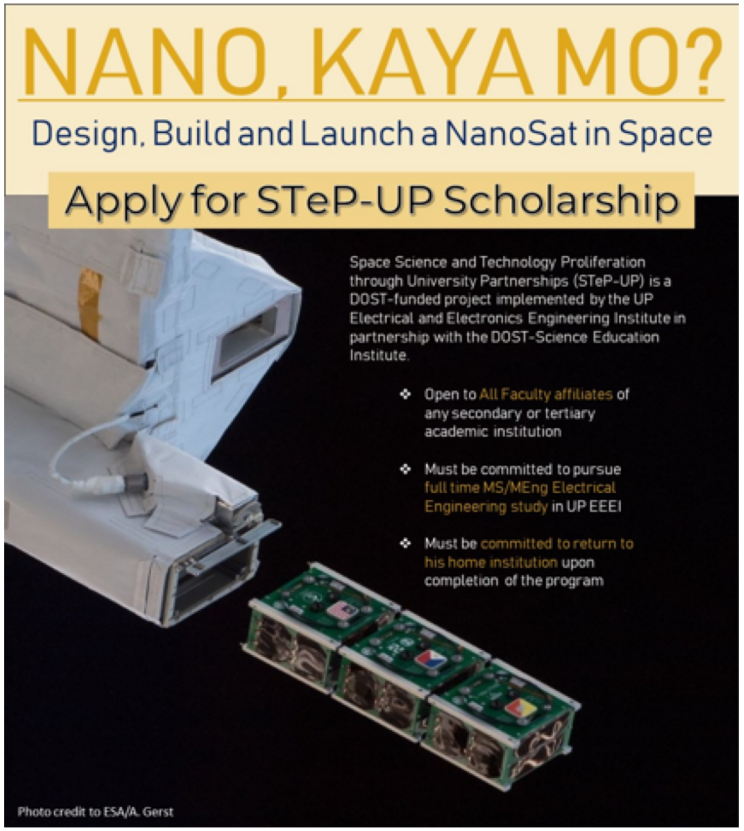
STAMINA_for_Space

Offering of local MS/MEng EE Program focused on nanosat track

Establishment of a University Consortium on Space Science and Engineering

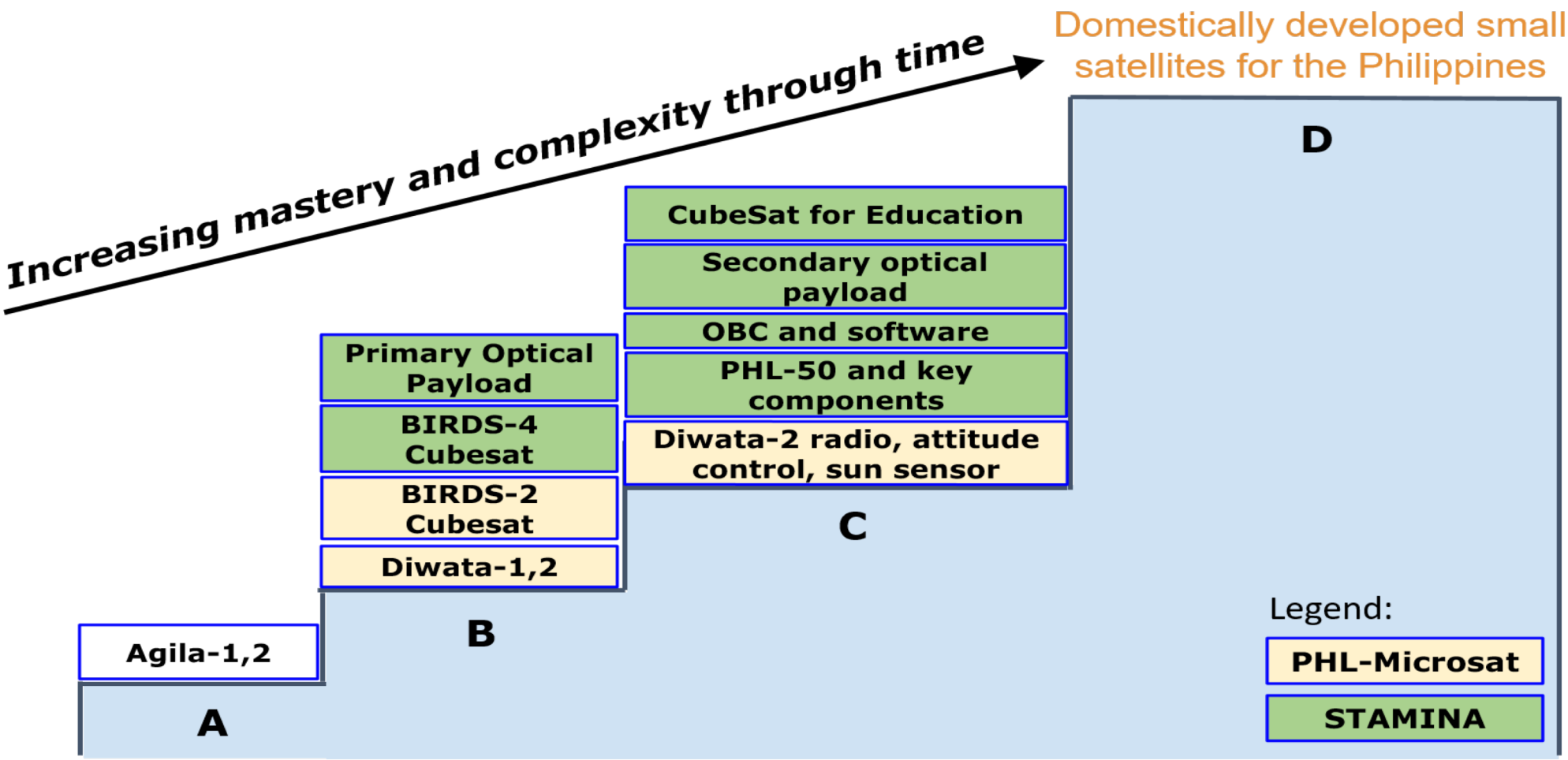
Pursuing optical payload development

Increasing mastery on satellite and systems engineering



STEP-UP scholarships
Deadline: 31 October 2018

Diwata-2 launch
29 October 2018



A – Buy satellite for operation in the country
B – Build a turnkey satellite system outside country and gain know-how on satellite technology development; Operation of the satellite in the country
C – Design and build of key components in-country to localize technology; integrate and test localized technology with flight-proven subsystems outside country; Operation of the satellite in the country
D – Design and build of satellite system, integrating flight-proven local and foreign satellite technologies in-country; Space environment testing selectively done outside country; Operation of the satellite in the country

Market-directed, design thinking mindset

+

T-shaped people and institutions

+

Enabling environment for inter-disciplinary work

Government Support

→ *Innovation and Value Creation*

Thank you.