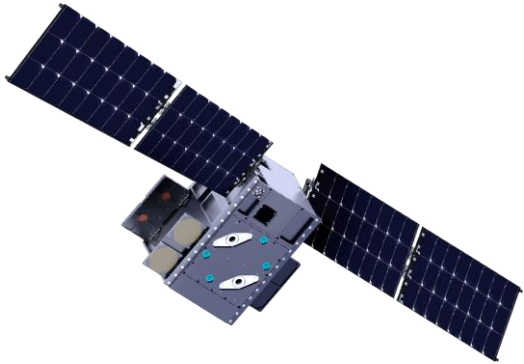


Jomo Kenyatta University of Agriculture and Technology-Kenya Space Agency Research Chair 2020/2021



Project Mission:

Developing a CubeSat mission for Natural Resource Management and Disaster Mitigations

A Multidisciplinary Approach of JKUAT Students from CoETCH: Conceptualize, Design & Launch

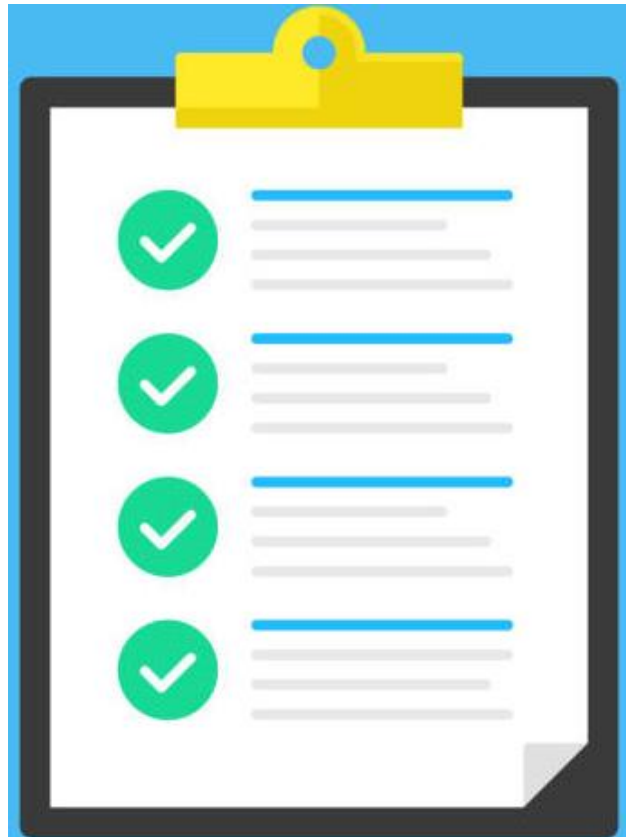
Presenter: Okello, Jacob Okomo B.Sc. GIS 4th Year



GIS DAY Wednesday, 17TH November 2021



Overview



- Team
- Mission Background
- Problem Statement
- Overall Architecture and Subsystems

Multidisciplinary Team

COETEC

EEE



Kelvin Mwaniki (4)
Amos Gichaga (4)

ECE



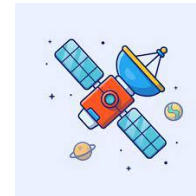
Sackey Freshia (5)
Moses Mulwa (4)
Timothy Ndichu (4)

TIE



Sylvia Jepkemoi (4)

GEGIS



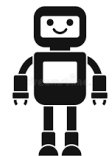
Jacob Okomo (4)

MechE



Kenneth Kabugu (5)
Allan Otworu (4)

MeCHT

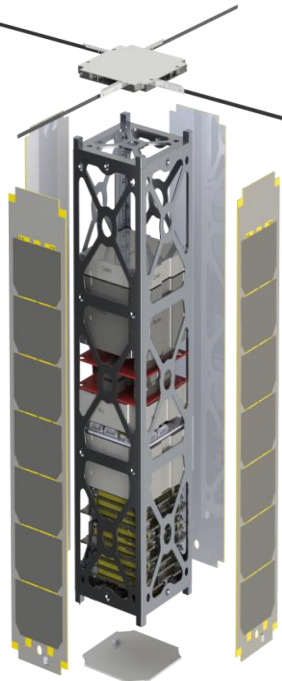
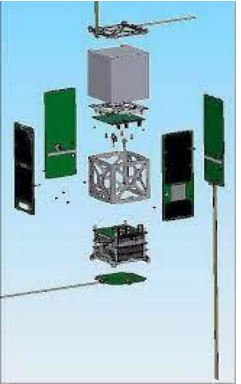


Staff (PhD)



MISSION Background

- African countries have lately appreciated the niche in space business and Satellite technologies, Kenya not being an exception as was seen in the UoN 1KUNS-PF in April 2018.
- KSA in patronship with the Department of Defence (DoD) and Ministry of Education has lately made significant efforts to further appropriate for such avenues by harvesting multidisciplinary knowledge accrued in Kenyan Universities.
- JKUAT being an aggressive one, took part in the initiating a current active phase in September 2020 with aim to develop a CubeSat transceiver and a corresponding Ground Station for use in disaster management and mitigation.



Current
State

Gap

Future
State

Problem statement

In Kenya, there exists limited local resources to monitor common calamities e.g., the extent of damage of forest fires, drought severity and flooding in near-real time. This limits efficient recovery and threatens food security.

General Mission:

Acquisition, on-board storage and transmission to ground of low spatial resolution, panchromatic images of Kenya terrestrial expanse.

Primary mission

Disaster Mitigation : Monitoring Forest fires, Drought.

Secondary mission

Natural resources management: Crop health monitoring

Mission Architecture/Subsystems.

Payloads

- Low Resolution VIS Panchromatic Camera (450 – 650nm)
- Thermal Infrared Camera (9,000 to 12,000nm)

Attitude Determination & Control Subsystem (ADCS)

- Orientation of the Space Vehicle and therefore the Payloads

Telemetry, Communication and Tracking (TCT)/ CDH

- Remote control and communication

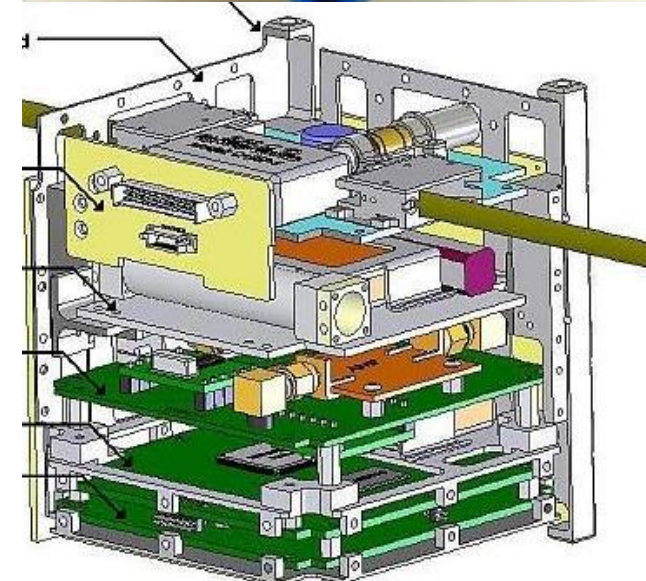
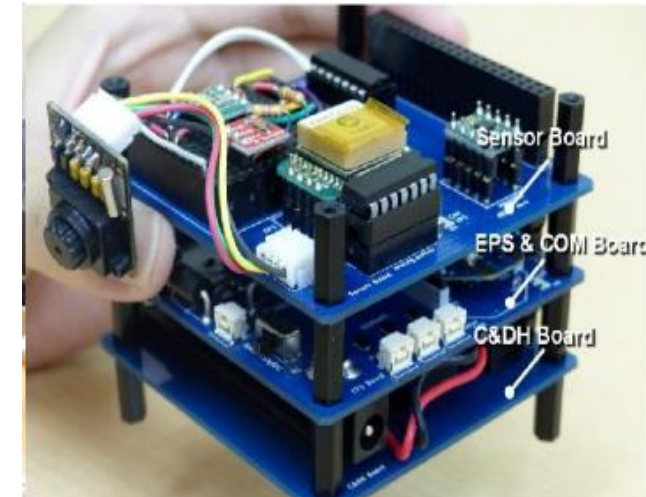
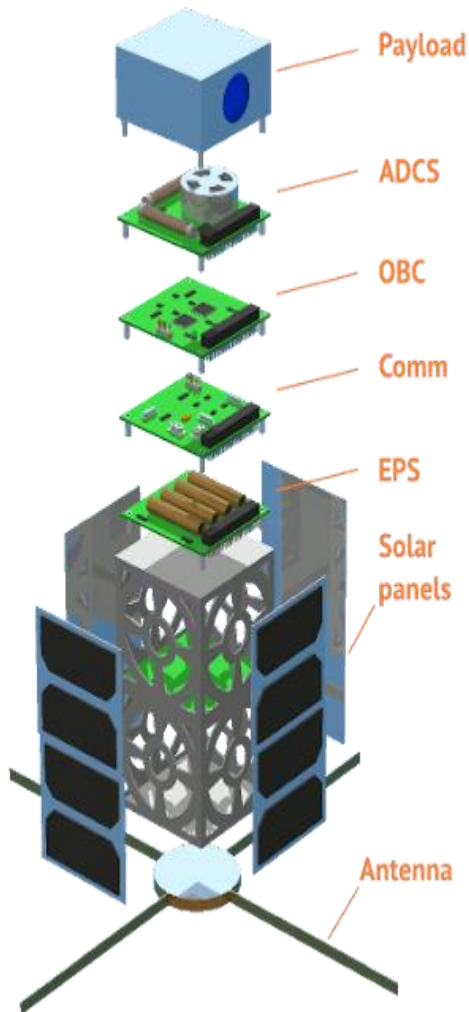
Electric and Power Subsystem (EPS)

- Power supply

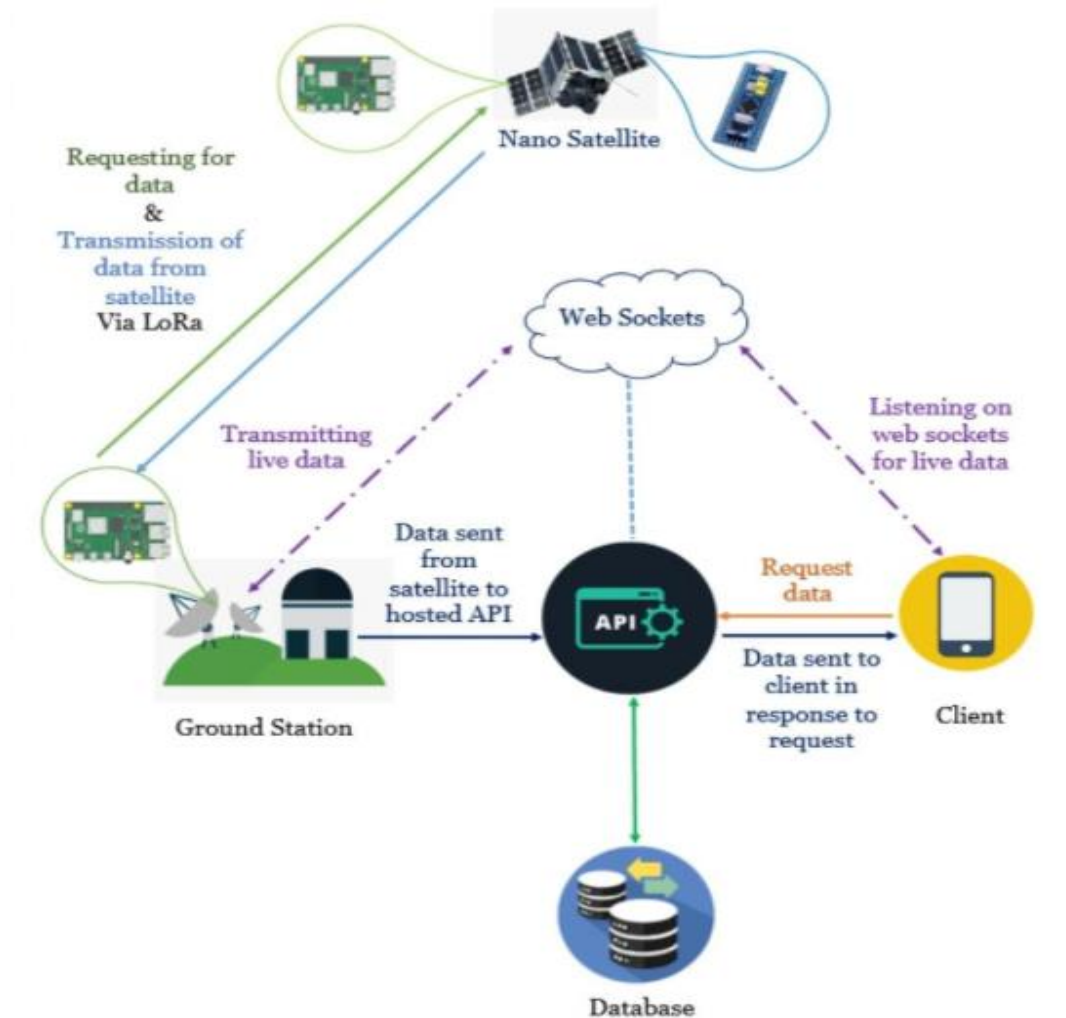
Mechanical and Thermal Control Subsystem

- Structural integrity, thermal control and aesthetics

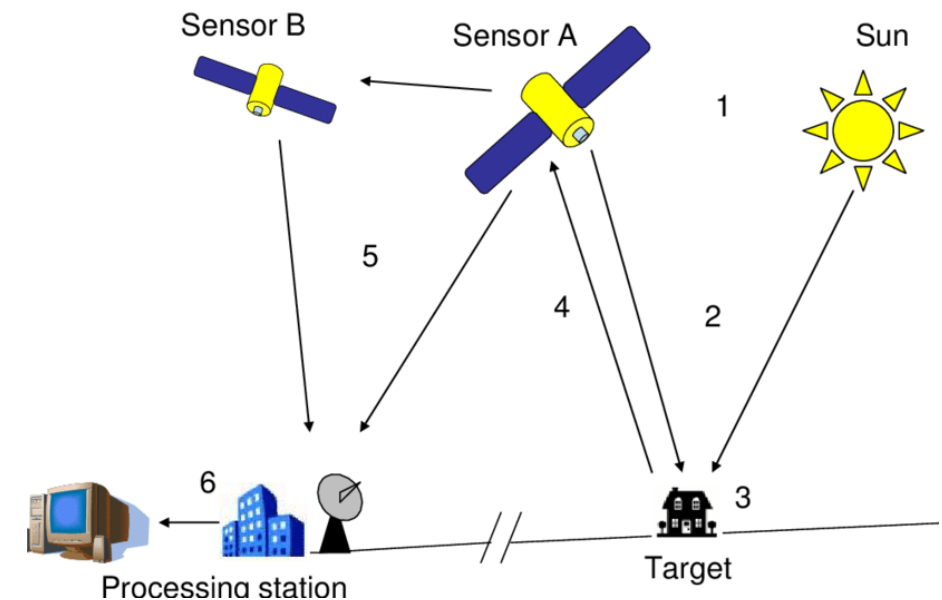
Ground Station



Mode Of Operation

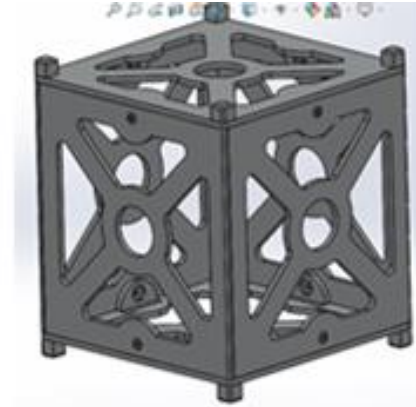


Nanosat Capture images (VIS & TIR) → CDH requests Data → Data to Ground Station → GS submit to Cloud WebSockets → Sockets to API and Client for use



Success Results

(a) Printed and functional CubeSat



CubeSat: Designed and constructed successfully consisting of

- Power, Communication and Mechanical Subsystems
- Ground station incorporated
- Payload included

Tests

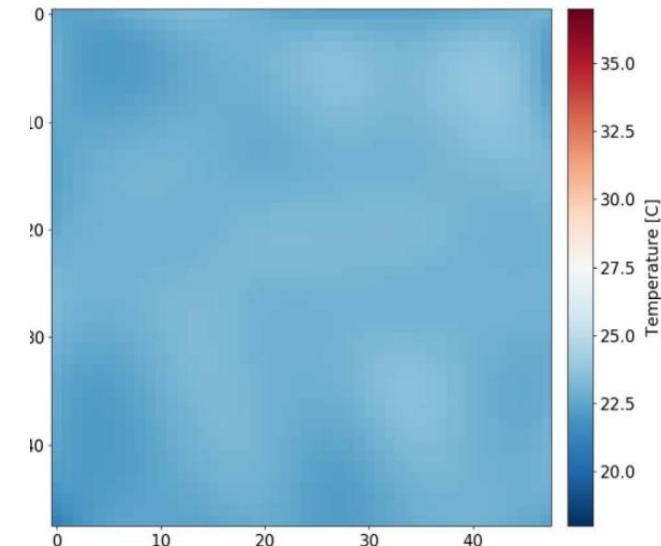
- System was tested on ground
- Systems found to be functional

Test at the orbit level pending

(b) Low resolution Image



(c) Thermal Infrared Image





- Merging theory and practice
- Exposure to new technology
- Interfaculty collaboration
- Problem solving skills in a team

- Equipping of laboratory
- Capacity building on space engineering and application
- Expansion into new research areas
- University Industry Collaboration - JKUAT and KSA





JKUAT Nanosatellite project, funded by Kenya Space Agency