XA | COBEO

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University of Vigo - INTA

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2008 Cubesat Summer Developer's Workshop

Project Presentation

GENERAL DESCRIPTION

University of Vigo: Leader Spanish university in R+D devoted resources 260 research groups, 50 European projects, 25 patents.

INTA: Public research organization specialized in aerospace research and technology development. Experience in aerospace with many national and international projects.

Both institutions have agreed to collaborate in the development of XATCOBEO.

Mission Description

XATCOBEO: design & development of a satellite as educational demonstrator based in OPTOS experience

XATCOBEO SYSTEM:
SPACE SEGMENT (Cubesat 1U) + GROUND SEGMENT + USER SEGMENT

University of Vigo's responsibilities:
   Educational matters
   Design and development of new technologies

INTA's responsibilities:
   Support in engineering and management
   AIV facilities and expertise

Educational satellite system with professional reliability

Mission Description

Standards:

    CubeSAT Design Specification (Rev 10)

    ESA ECSS standards:

        Space Project Management (ECSS-M-00)

        Space Project Engineering (ECSS-E-00)

Model Philosophy: PFM

Mission objectives:

    To contribute to the CubeSAT community with:

        Qualification of a new deployment mechanism

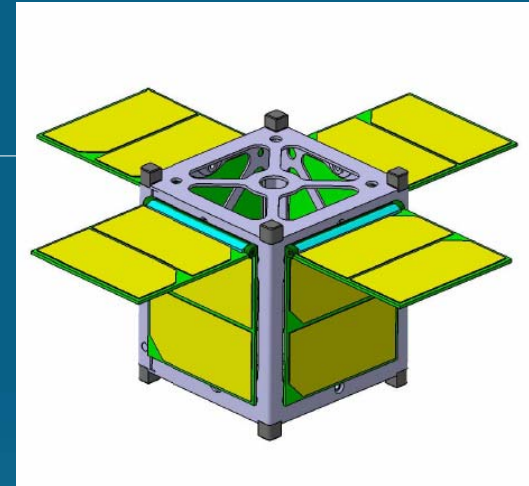   Qualification of a 2 payloads

    To integrate students in a CubeSAT development with high-end requirements

        Emphasis in working methodology
          (HOW is more important than WHAT)

XATCOBEO: Objectives

❑ Design and development of:
  - CubeSAT satellite 1U (10x10x10cm) Weight < 1kg
  - Ground segment (at the University of Vigo)
❑ To involve students in a space project
❑ To learn work methods based on ESA standards
❑ New technologies incorporated (SRAD, RDS, PDM)
❑ Launching with VEGA at the end of 2009

SPONSORS

☐ Xunta de Galicia/Retegal (DIESTE agreement)

☐ Department of Science and Investigation

☐ Raminovatech

PROJECT ORGANIZATION

•ORGANIZATION PROBLEMS

- Mixed teams INTA/UVIGO

- More than 40 people creating software, hardware and documents at the same time.

Hierarchical organization

+

• SOLUTION
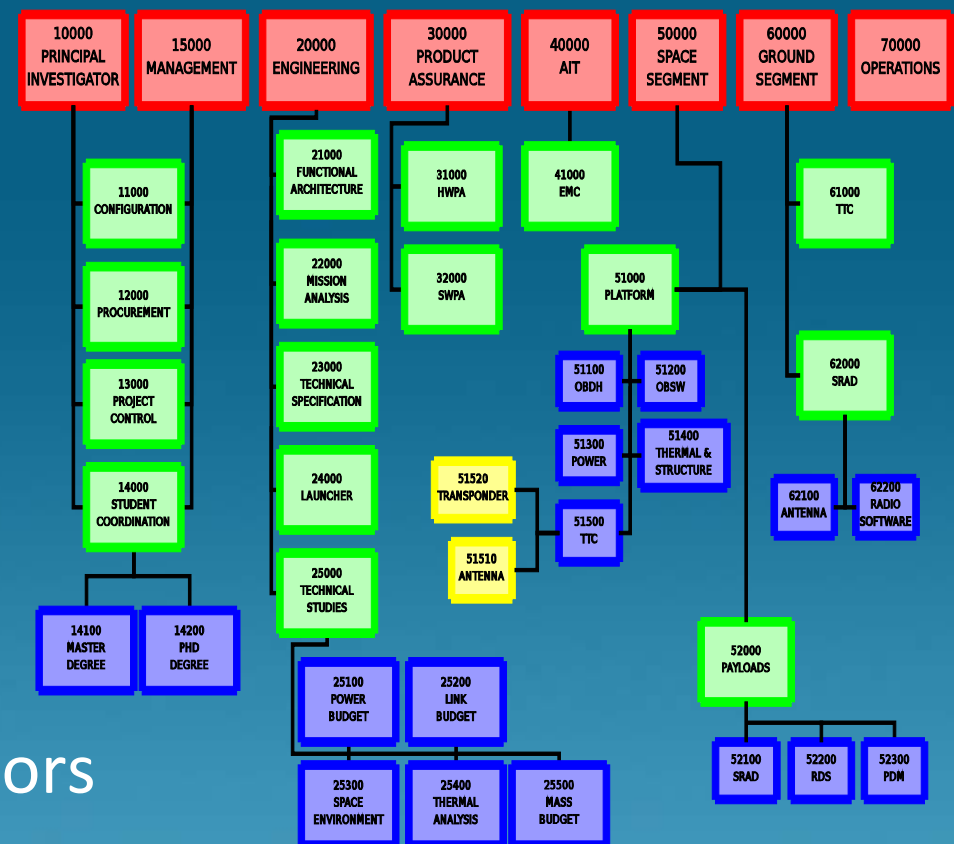
Electronic Management
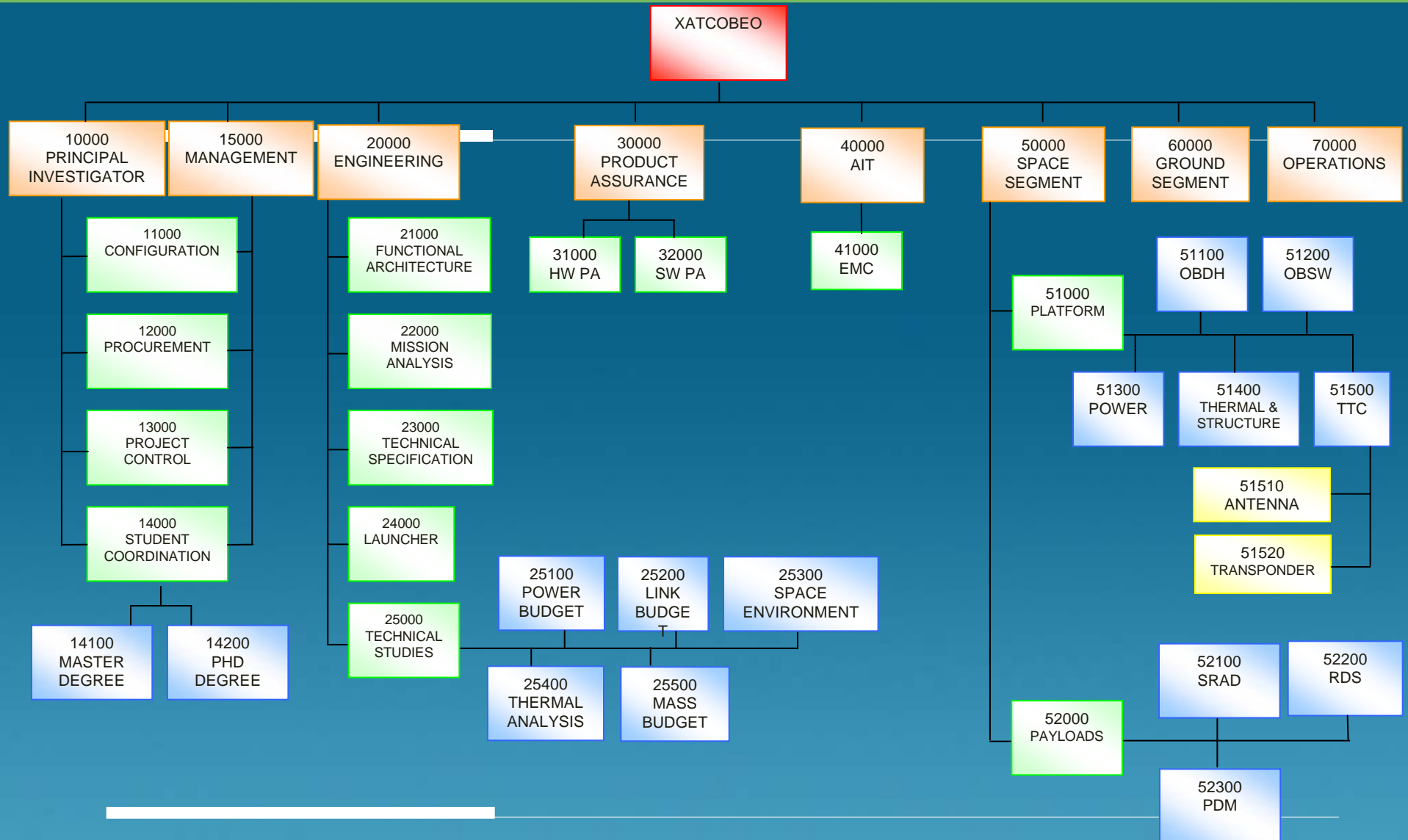
• HIERARCHY

1. Tasks are split into WorkPackages (WP).

2. Each WP is assigned to a different team.

3. Each team is formed by:

- 1 supervisor

- 1 student responsible

- N members and cooperators

WP Distribution

```
                                    XATCOBEO

  10000          15000         20000          30000         40000      50000       60000      70000
  PRINCIPAL      MANAGEMENT    ENGINEERING    PRODUCT       AIT        SPACE       GROUND     OPERATIONS
  INVESTIGATOR                                ASSURANCE                SEGMENT     SEGMENT

    11000           21000         31000      32000        41000                      51100      51200
    CONFIGURATION   FUNCTIONAL    HW PA      SW PA         EMC                        OBDH       OBSW
                    ARCHITECTURE                                        51000
    12000           22000                                               PLATFORM
    PROCUREMENT     MISSION                                                         51300    51400        51500
                    ANALYSIS                                                        POWER    THERMAL &    TTC
    13000           23000                                                                    STRUCTURE
    PROJECT         TECHNICAL                                                                      51510
    CONTROL         SPECIFICATION                                                                  ANTENNA
    14000           24000                                                                          51520
    STUDENT         LAUNCHER                                                                        TRANSPONDER
    COORDINATION
                                   25100      25200       25300
    14100    14200    25000        POWER      LINK        SPACE                                52100    52200
    MASTER   PHD      TECHNICAL    BUDGET     BUDGET      ENVIRONMENT                          SRAD     RDS
    DEGREE   DEGREE   STUDIES                 T
                                   25400      25500                              52000
                                   THERMAL    MASS                               PAYLOADS
                                   ANALYSIS   BUDGET                                             52300
                                                                                                PDM
```

- ELECTRONIC MANAGEMENT

AGENDA

E- GroupWare v14

KnowledgeTree™
Document Management Made Simple

DOCUMENTS

BIBUS

LIBRARY

SUBVERSION

DE

SPACE
SEGMENT

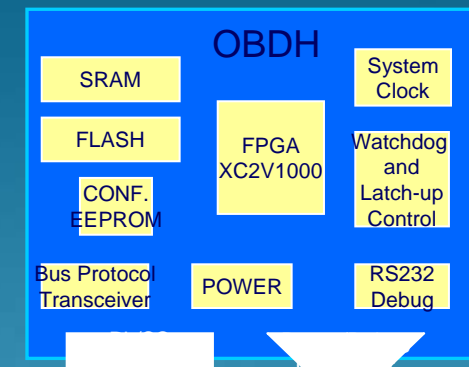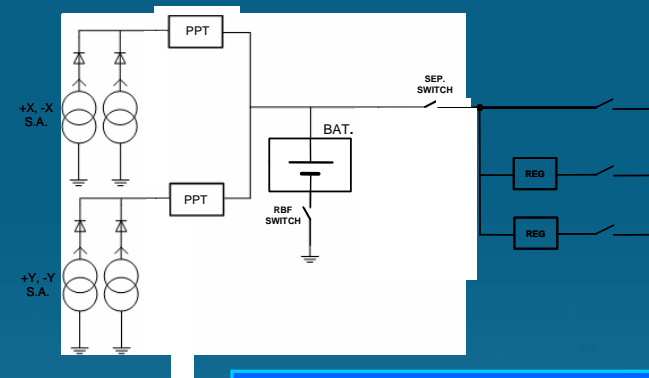## XATCOBEO: Subsystems (I)

☐ **Power:**

- ▪ Lithium battery
- ▪ Solar panels: 2 cells on each side

☐ **Software:**

- ▪ C code
- ▪ Modes: Start-Normal-Communications-Safe

☐ **Computer:**

- ▪ Microprocessor embedded in programmable logic device (FPGA)

XATCOBEO: Subsystems (II)

❑ **Communications:**

- 4 antennas (TBC), omnidirectional radiation diagram
- Uplink for telecommands, downlink for telemetry, in ham radio frequencies

❑ **Thermic:**

- Passive thermic control
- Paints and insulating materials
- Conductive materials depending on cases

❑ **Structure and mechanisms:**

- Structure: CubeSAT 1U
- Mechanism of deployment of antennas

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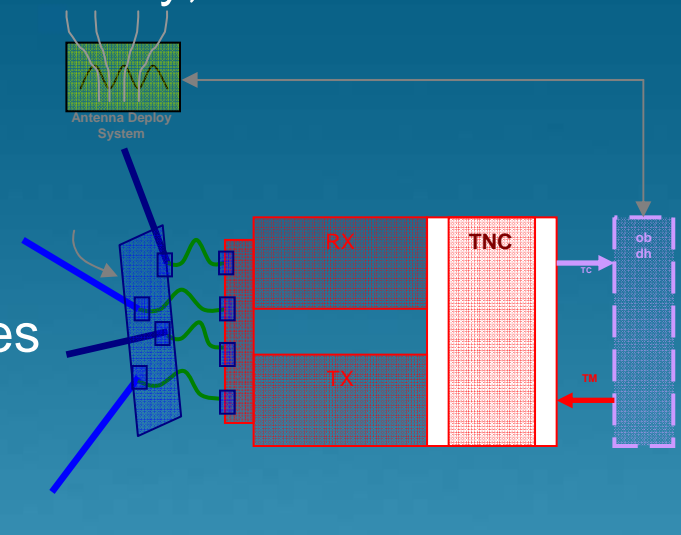
XATCOBEO: Experiments

❑ **Payloads**:

- ▪ Software RADio board for communications (**SRAD**):
  - ✓ Software radio that can be configured on board
- ▪ Radiation Dose Sensor (**RDS**):
  - ✓ Sensor to measure radiation
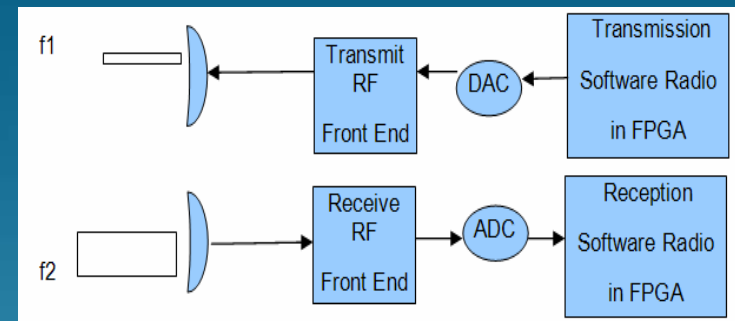
❑ **Panel Deployer Mechanism (PDM):**

- ▪ Try out on board a mechanism of deployment

RDS Overview
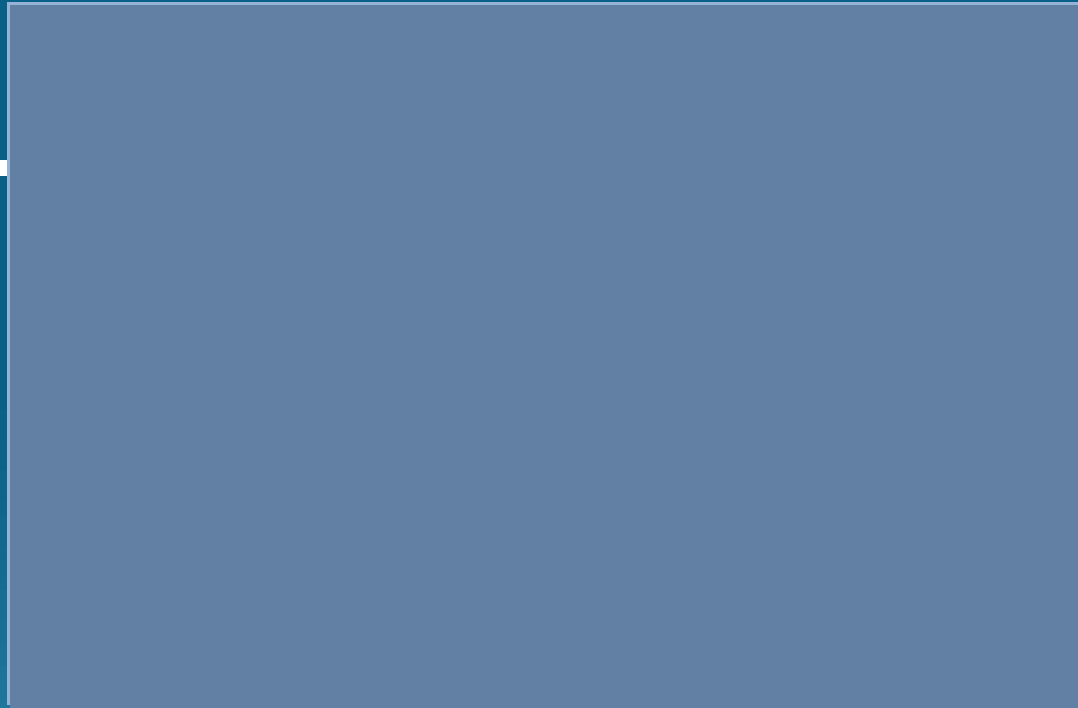
- Sensor to measure the total accumulated radiation dose.
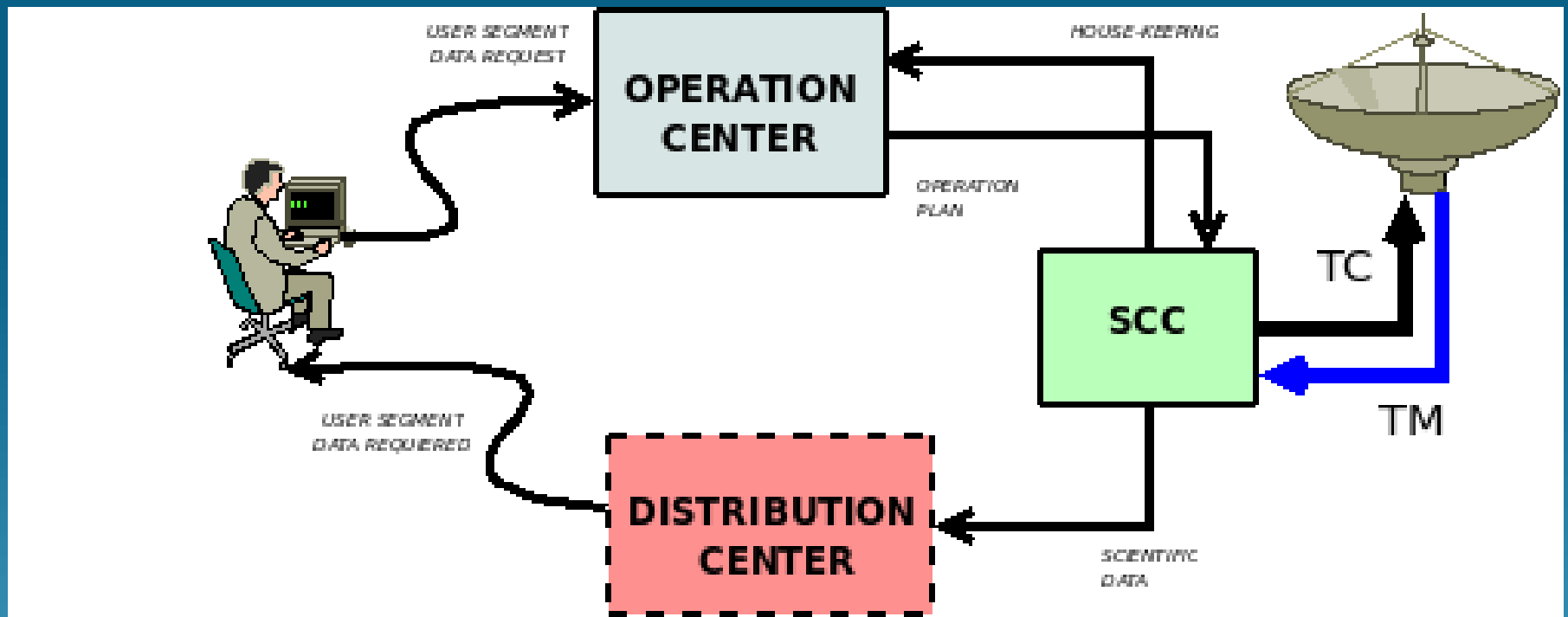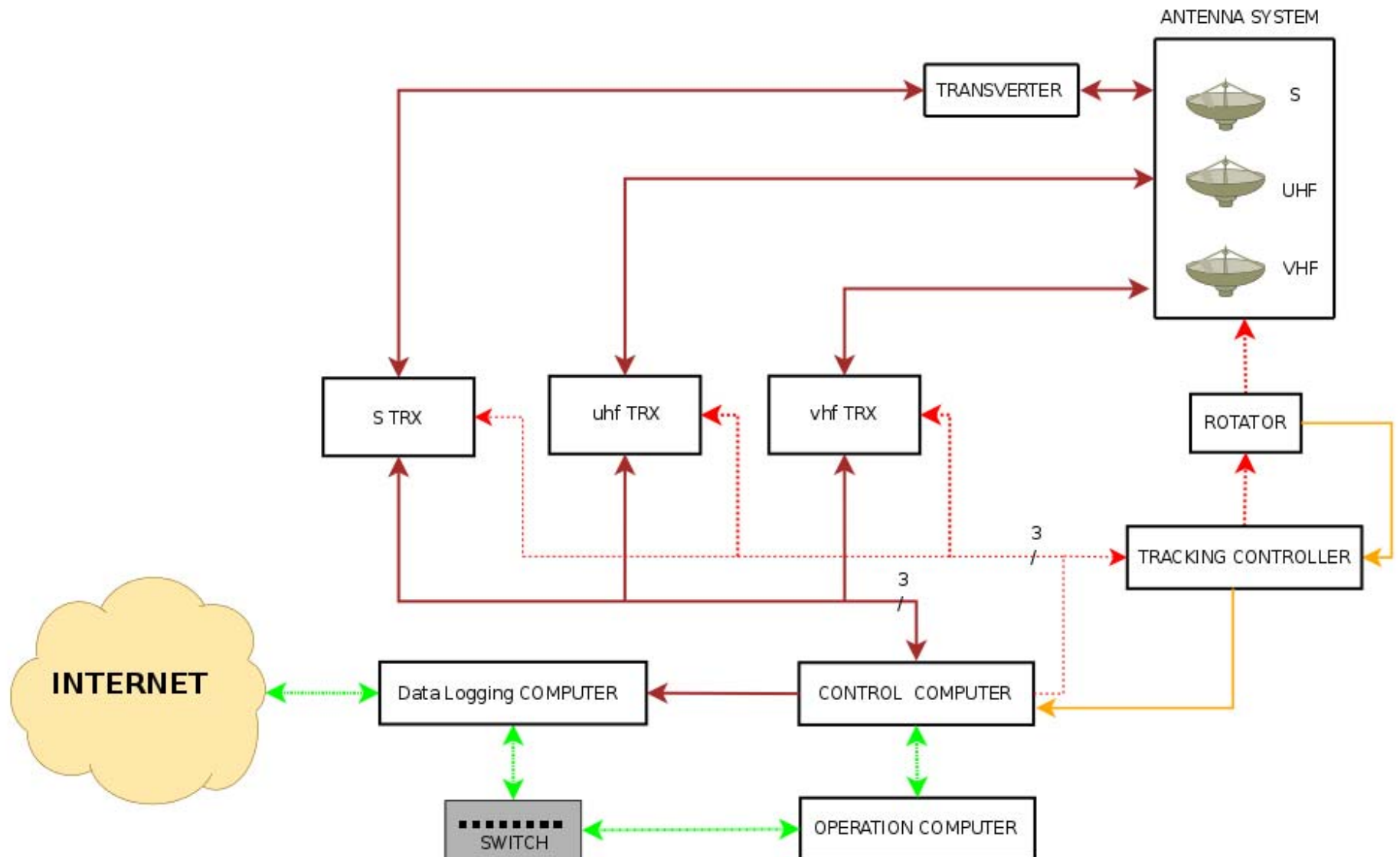
- It is based on commercial RADFET technology
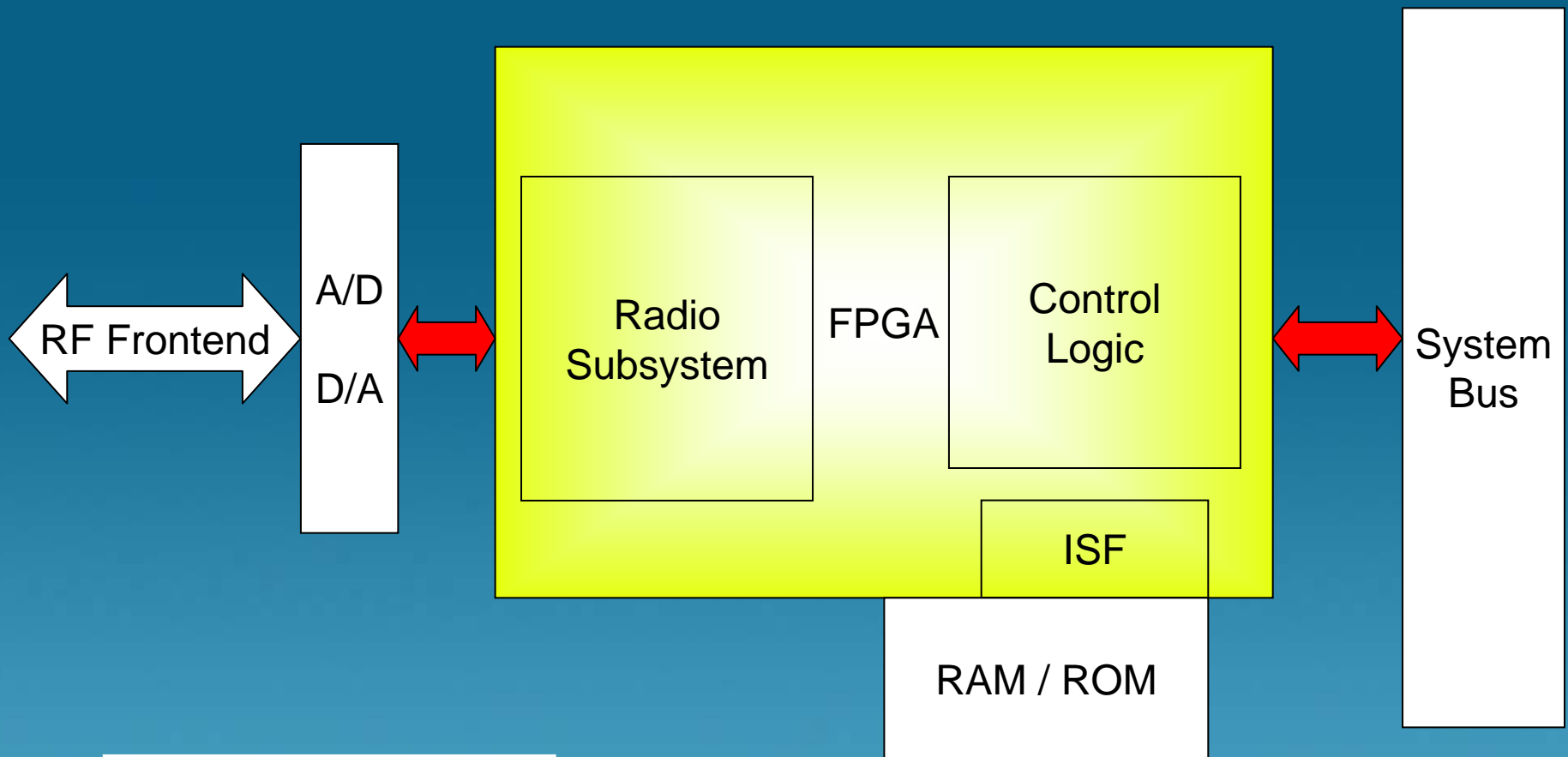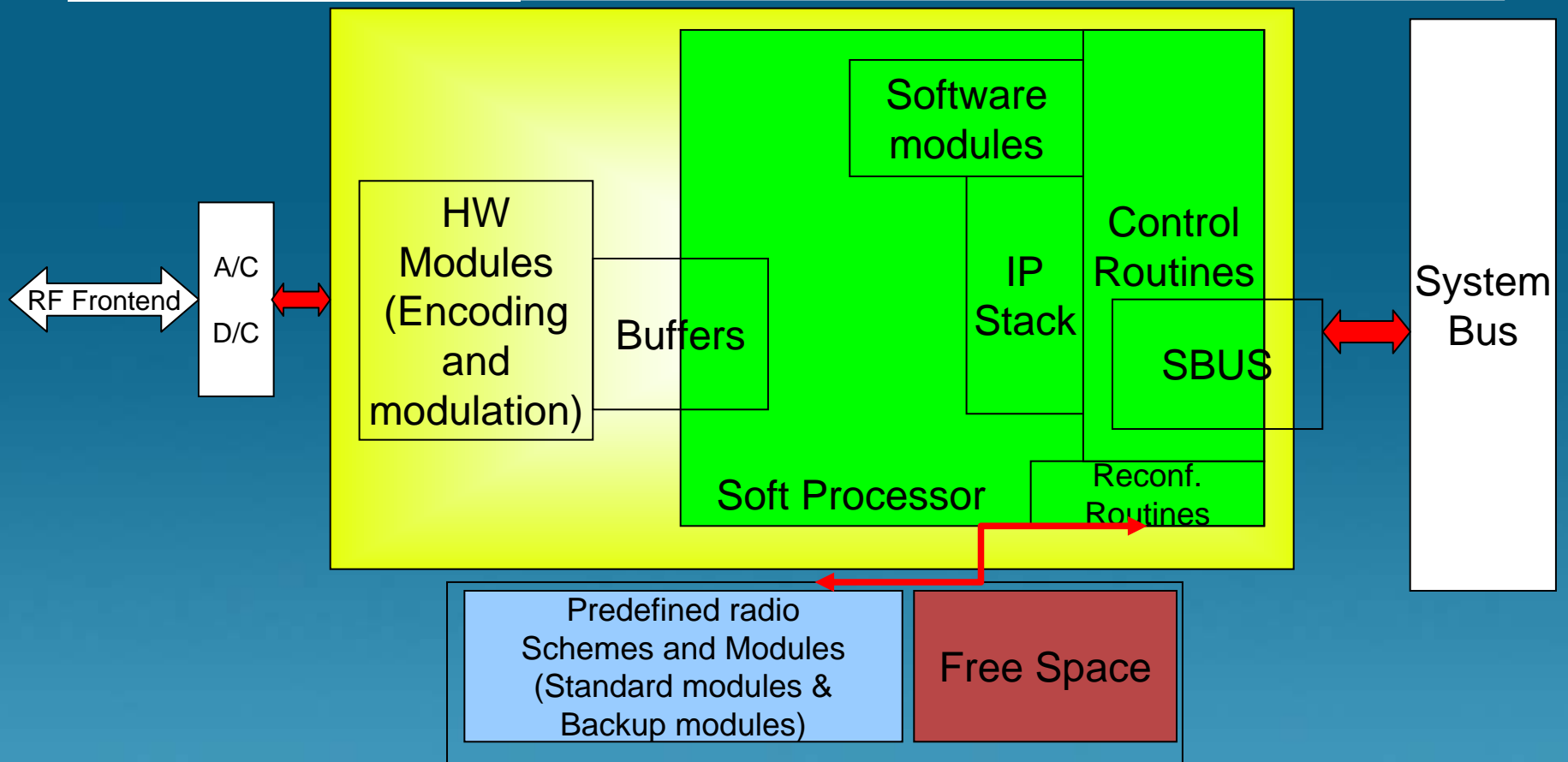
SRAD

GROUND SEGMENT

XATCOBEO: Ground Segment

SRAD
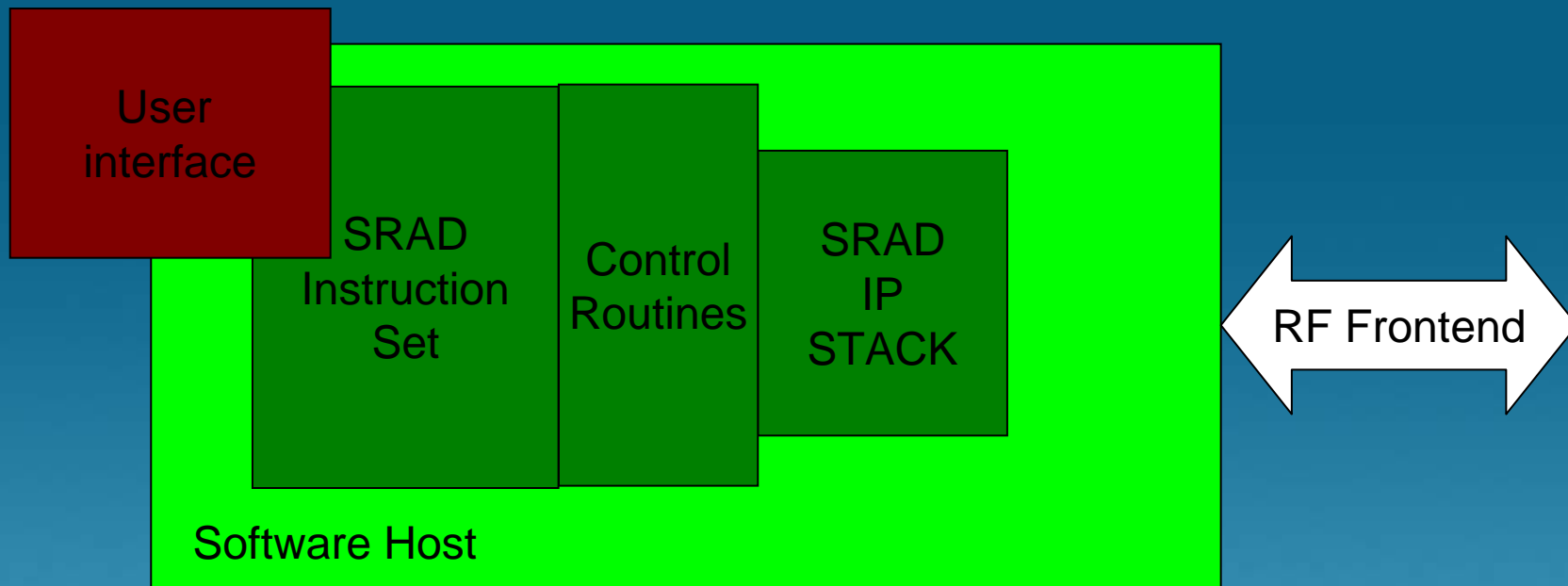
Ground Segment

Ground segment – SRAD

Conclusions

Educational development ➡ professional results:

Two different geographical teams: Managment
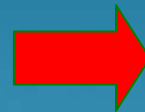
New technology qualification
   Improvement in power availability (SPAD)
   Developing a new TTC kit for CubeSatellites (SRAD)
   RDS: Radiation Dose Sensor.

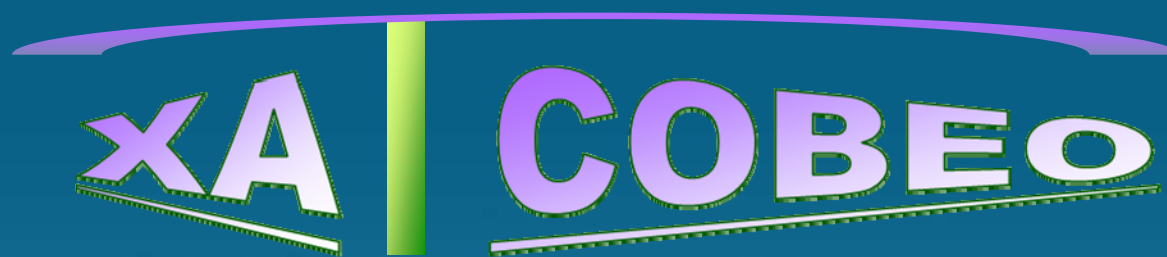Main Xatcobeo payload ➡ **TO TEACH STUDENTS A WORKING METHODOLOGY**

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