Design of the On-Board Computer of the Belgian OUFTI-1 CubeSat

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1. OUFTI-1
2. Two OBCs for OUFTI-1
3. Real Time Operating System
4. Software architecture
5. Conclusion
OUFTI-1

CubeSat standard

1 kg

Three payloads

liter

watt

Subsystems developed by students

University of Liege

Haute Ecole de Li`ge

ISIL

UCL
Outline

1. OUFTI-1
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Two OBCs for OUFTI-1

Backup OBC

Default OBC
Two OBCs for OUFTI-1
Two OBCs for OUFTI-1

- Redundancy management through I²C bus.
Outline

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Real-Time Operating System

- Multi-tasking

![Diagram showing multi-tasking with two tasks: Task 2 with high priority and Task 1 with low priority.](image-url)
Real-Time Operating System

- Deterministic
Real-Time Operating System

• Why FreeRTOS?
  – Free
  – Open Source
  – Lightweight
  – Known to be reliable
  – MSP430 compatibility

☞ www.freertos.org
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Software architecture
Software architecture

• COM Rx task:

AX.25 bits reception → BUFFER Rx → COM Rx → SCHEDULER
Waiting for AX.25 frame → Commands interpretation → Recording of the received commands
Decoding of AX.25 frames → DEMOD configuration → DEMOD
Software architecture

- Sequencer task:
  - Doppler Correction
  - Change subsystems status
  - Log & Meas. retrieval
  - Modification of meas. configuration
  - Measurement & sampling frequencies
Software architecture

• Measurement task:
Software architecture

• Measurement task:
Software architecture

Monitor:
- Redundancy management & waiting for a FAULT or a status change

Subsystems:
- Subsystem or payload ON/OFF
- Subsystem or payload reset
- Antennas Deployment

Event to log
Software architecture

• Monitor task:
Software architecture

• Log task:
Software architecture

- COM Tx task:
Conclusion

• Two is better than one…

• Task distribution and priority definition have to be carefully chosen
Thank you for your attention!