EagleSat 2: On-Board Computer Subsystem
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Overview

• System-level description of satellite
• Computational needs for each subsystem
• On-board computer subsystem architecture
• In-depth look at payload prototypes
• Next Steps
System-Level Description

[Diagram of system-level components including CRP, Payload Computer, MDE, GPS, COMMS UHF Transceiver, ACS, C&DH Computer, AVR32, Zynq-7000, Memory, and interfaces like UART and SPI.]
Computational Needs – Bus Systems

- Communications – Command reception and data transmission
- EPS – Power monitoring
- ACS – Attitude telemetry and control
- GPS – Position telemetry
Computational Needs – Payloads

- Cosmic Ray Payload (CRP)
  - Interfacing with CMOS image sensor
  - Image processing to determine energy and trajectory of particle events observed

- Memory Degradation Experiment (MDE)
  - Interfacing with several SPI memory chips
  - Identifying and characterizing memory errors
OBC Subsystem Architecture

• Two separate computer systems

• Payload Computer
  • Interfaces to payload hardware and processes data
  • Will be designed and built in-house based on Zynq-7000 SoC

• Command and Data Handling Computer
  • Interfaces to other subsystems and status telemetry instruments
  • Commercial off the shelf GOMSpace Nanomind A3200
Payload Prototype – CRP

• Developed on Avnet Zedboard
  • Zynq-7000 contains both ARM processor system and FPGA programmable logic
  • Xillybus interface between processor and FPGA
  • Xillinux Linux distribution with application code on processor system
  • FPGA design integrated with Xillybus IP

• Uses CMV2000 CMOS image sensor
  • Breakout board designed in-house
  • Complete system design and testing is ongoing
Payload Prototype – MDE

- Developed on Texas Instruments TM4C123GXL
- Memory board developed in-house
- Testing ongoing since February
Next Steps

• Miniaturizing CRP prototype
• High altitude balloon test flight
• Payload prototypes on fully custom PCBs
• More capable flight hardware
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Questions?
Backup Slide

CRP Prototype Block Diagram

- LVDS Rx
- CMV2000
- DDR Shift Register
- Xillybus
- ARM Cortex-A (Linux)

Connections:
- Pixel Data from LVDS Rx to CMV2000
- GPIO from CMV2000 to ARM Cortex-A
- SPI from CMV2000 to ARM Cortex-A