FSW Subteam
Weekly Updates, Spring 2025

Week 1

Team Progress:
- Onboarded 4 new members onto the FSW team
- Feature and personnel planning for every subsystem for Spring 2025:
    - https://github.com/cmu-argus-2/FSW-mainboard/milestones
    - https://github.com/cmu-argus-2/FSW-mainboard/issues

Individual Updates:
Perrin Tong
- Updated IMU driver to output uncalibrated gyro + magnetometer readings
- Reduced IMU memory footprint from 9% to 2%
- FlatSat planning

Week 2

Team Progress:
- FlatSat development:
    - Fuel gauge IC now integrated on FlatSat and EPS task
    - Started interfacing with avionics for acquisition of FlatSat peripheral boards
        - Battery board, solar panels
    - Testing XY boards and preparing for ADCS testing and calibration
- Comms - CDH integration:
    - Implementing basic commands to be transmitted from GS and executed on SC with a response back to the GS

Individual Updates:
Perrin Tong
- Updated firmware to include adafruit register
- Completely removed middleware from emulator + FSW
- Gyro+Magnetometer noise data collection
- Assembling FlatSat + testing boards for ADCS
- Designing new time processing module to encapsulate built-in time module, RTC, GPS and CMD.

Ankita Chatterjee
- Copied in MAX17205 (fuel gauge) driver and added fuel gauge data logging to the EPS task / integrated it into FSW

Alexis Duong
- Implemented SWITCH_TO_STATE, FORCE_REBOOT and REQUEST_TM_HEARTBEAT Commands
- Updated the Command queue between comms and CDH to be a single element queue
- Added a Response queue that will allow Comms to get the status of a command that was executed by CDH

Michelle Heo
- Finalized flat sat layout and laser cut. Asked for longer flexible ribbon cables to accommodate for new design
- Converted RC Net to ONNX model, converting ONNX model to TensorRT model

Alena Lu
- Removed temp simulation directory from FSW mainboard repo, to restructure w/GNC sim backend
- Ran with current CMake version on sim interface branch, lowering CMake version for Ubuntu 20 still in progress

Week 3

Team Progress:
- Reallocated human resources to have a better division of labour.
- FlatSat:
  - Waiting for new boards, day in the life test is stalled by not having enough boards.

Individual Updates:
Ankita Chatterjee
- Added eps state flag to indicate when SOC reading warrants change in state (e.g. when to enter low power, when to exit experiment/payload, etc)
- Researched potential watchdog IC alternatives if the 1.6 s timeout of the MAX706 is too short, but decided on advice from Akshat & Neil to hold off on that until we actually test FSW with the MAX706 enabled. Also came up with a testing plan w/ Akshat & Neil since technically there's no way to enable the watchdog right now with the current board

Alena Lu
- Successfully ran GSW sim installation + emulator and simulator on Ubuntu 20.04, resolved CMake compatibility issue and fixed argus sim installation issues
- Initial block diagram + implementation of RTC and Python time module package for hal

Alexis Duong
- Implemented precondition checks before executions of the commands

- Familiarize myself with the Data Handler in order to write the code needed for remaining files g commands (REQUEST_FILE_METADATA, REQUEST_FILE_PKT)
- Set up PostgreSQL as the database that interacts with the command interface and later on Grafana. Also, mocked up data
- Created a React + Node.js based command interface that makes calls to PostgreSQL

Perrin Tong
- Redesigning HAL boot and designing reboot sequence and handling.
- Magnetorquer + Magnetometer testing on XY boards and IMU
- Script updates

Michelle Heo
- Worked with Varun and Neil on bringing up custom kernel on Jetson
- Worked with Varun and Neil on modifying the device tree overlay to support 4 cameras

Week 4

Team Progress:
- FlatSat mainboard showing weird behaviours, waiting for RP2040 + flash to arrive to try and fix the board
  - No idea what caused it, board is stuck in startup or throwing weird errors(module doesn't have attribute "sledp" when it's clearly sleep)
  - Running on main branch code, but the exact same code is fine on other boards

Alexis Duong
- Revamped the command interface UI
- Got an E2E pipeline of command interface → TX database → GS → SC (Comms → CDH → Comms) → GS → RX database → command interface + Grafana
  - Able to receive and display all the heartbeats
  - Able to receive and display files
- Setting up cloud-based storage (integrating postgresql with google cloud)

Ankita Chatterjee
- Refactored EPS state flag logic and added unit tests (now merged)
- EPS documentation for deep dive
- Updating power budget (in progress/incomplete)

Perrin Tong
- Sick :/
- Divided up some work for Alena and Michelle
- Rewriting the new HAL boot and reboot implementation

- Updated boot script

Michelle Heo
- Was out sick for most of the week
- Reviewed HAL code (assigned by Perrin)

Alena Lu
- PR out for GNC SIL dependency updates
- More accurate timing analysis done on tasks using GPIO
- Started DRV8235 driver review

Week 5

Team Progress:
- Tested CP9 on existing mainboards
  - Only issue is slightly higher RAM use
  - Should be good to go ahead with new mainboards
- GPS is now finally merged into main
  - Primary bug fix was wrong baudrate
- ADCS FSW is merged and functional on main

Alexis Duong
- Filled out the rest of the commands (UPLINK_ORBIT/TIME) and filled in telemetry frames for TM_STORAGE by using functions from Data Handler
- Integrated postgresql into Google Cloud VM and have an IP that worked that I was able to connect a local website to and have Grafana connect to (until the whole crypto mining thing) - working on making it have better security
- Error handling for when a database is not connected to a ground station so that it does not interfere with other testing

Ankita Chatterjee
- Completed consumers for power budget (highlighted in red what might need to be determined empirically, put placeholder values in for now)
- Moved thermal task into eps task & added temp reading to MAX17205 driver (all untested though)
- Discussed EPS plans with Akshat & Ibrahima and outlined the goal for EPS for the semester

Michelle Heo
- Writing out code for mainboard + jetson communicating over UART
- Learned how to reflash jetson + configure IO pins

- Completed basic handshaking code, currently writing CRC5 generation + verification functions

Akshat Sahay
- Updated the comms message header to add source and destination of msg
- Integrated and tested GPS FSW, merged into main
- Tested and debugged ACS FSW a bit
- Profiled RAM use for all hardware and tasks in FSW

Perrin Tong
- Still working on hal revamp
- Testing CircuitPython 9 on HW

Alena Lu
- Wrote python script to run flight software and stop at a certain time
- Wrote a yml file to integrate SIL into Github workflow, needs to be tested.
- Serial log script for capturing error lines in progress

Week 6

Team Progress:
- Received new boards, currently testing most of them

Alexis Duong
- Help reorganize GS software structure (logic flow diagrams + designing a generic unpacker function)
- Tested integration with all types of commands
- Worked on testing a different method for computing total directory sizes of SD (DH functions)

Ankita Chatterjee
- Merged & tested PR from last week (moving thermal task to EPS and adding temp reading to MAX17205 driver)
- Fixed minor power monitor bug (where wrong sense resistor value was being used in ADM1176 driver)
- Producer stats for power budget (i.e. solar panel power generation) in progress, using efficiency determined from avionics testing last semester

Michelle Heo
- Tested updated UART code with CRC5 generation and verification
- Confirmed correct packet transmission by generating output image on the Jetson instead of dumping to the mainboard's SD card (waiting on functional mainboard)

- Implemented finalized handshaking code with ACKs/NACKs transmitted from the mainboard back to the Jetson
- Found an issue with timing constraints and latency from CRC5 generation/verification, currently looking into finding other error detection methods

Perrin Tong
- Testing + debugging new boards
- Unifying driver init interface, adding reset to devices
- Reworking error list
- Adding enable logic to all devices as V3 boards have enable lines