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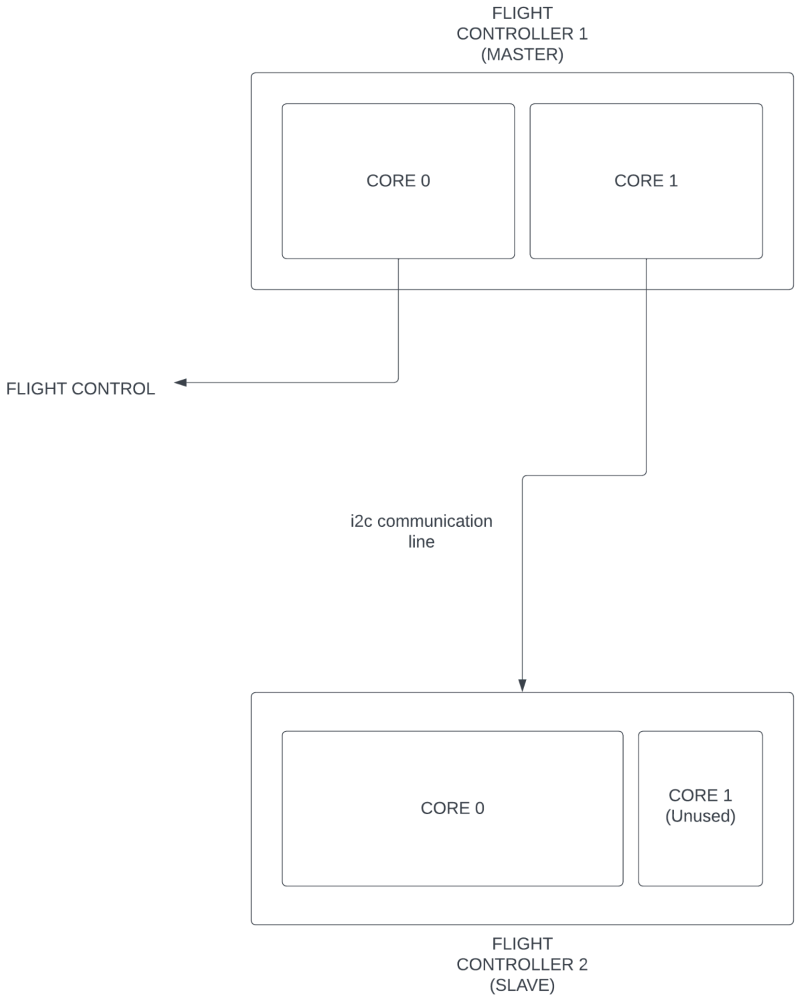
System Bridge Description

The HIVE-2 vehicle contains two controllers onboard; the main control board and the secondary board. The main board handles all flight tasks, flight control hardware and provides an external operator interface. The secondary board handles the thermal and standard camera, the computation associated with the visual and camera systems and it also contains extra interfaces for LoRa, servo and power.



Two flight controllers communicate with each other over I2C protocol. The master flight controller sends commands to the slave flight controller, which then executes the commands. The master flight controller also receives data from the slave flight controller, which is used to monitor the status of the system.

The I2C protocol is a serial communication protocol that uses two wires to communicate between devices. The master flight controller is the device that initiates the communication, and the slave flight controller is the device that responds to the master flight controller's commands.

The master flight controller sends a start bit to the slave flight controller, which is followed by the slave flight controller's address. The master flight controller then sends the command to the slave

flight controller, which is followed by a stop bit. The slave flight controller then responds to the command by sending the data back to the master flight controller.

Process Explained

As the master flight controller handles all flight tasks and flight control hardware on process core 0, all communication between the secondary flight controller is handled on process core 1. Each core is able to run up to 240 Mhz.We separate the tasks on each core using the RTOS. When the master controller initiates communication with the slave controller to retrieve data, a request is sent. Each request will be formatted using the in house logger format. (Example shown aside):

```
LOG_SEL:
        {
                ID: UAV-SEL-TEST-HARD-FAIL
                TIME: 21
                MACHINE-STATE: 0
                EXCEPTION-TYPE: 1
                INFO: Submodule Down
        }
```

New event logs will be used to structure the data communication between the two controllers; Shown below is an example

Data request sent by master flight controller:

```
LOG_P2_REQUEST:
                {
                        ID: UAV-P2-GET-CAMERAFRAME
                        TIME: 23
                        MACHINE-STATE: 0
                }
```

Data request sent in response by secondary flight controller:

```
LOG_P1_RESPONSE:
                {
                        ID: UAV-P1-RETURN-CAMERAFRAME
                        TIME: 23
                        DATA: <CAMERA DATA HERE>
                }
```

The secondary flight controller firmware will run continuously waiting for an i2c interrupt (indicating a request made by the primary flight controller) and when an interrupt is received it will carry out tasks such as reading a camera frame from the main / thermal camera.