Wabash Capstone Project Notes 06

By: John Danison

What Did I Say I Would Do This Week?

Refine Data Acquisition Strategy | Specifically, How Data Will Be Formatted
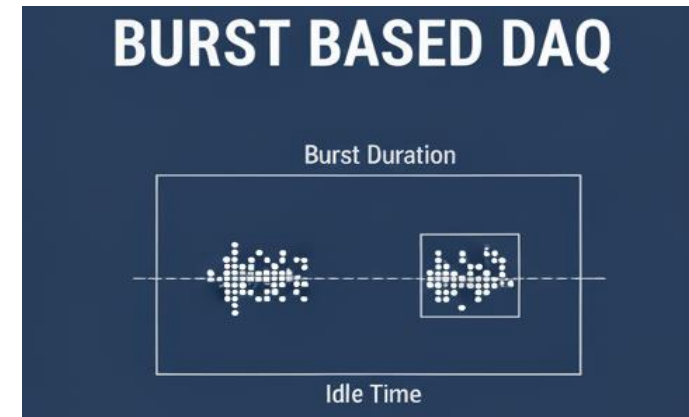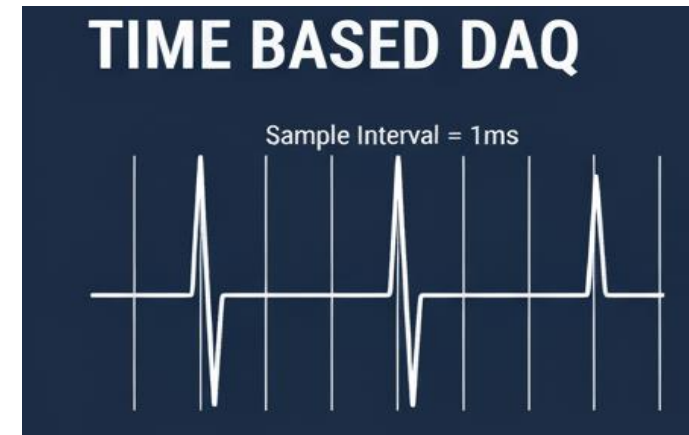
Have Sensors Picked & Documentation For Reasons Complete

What I Have Done This Week Pt1.

Compared Data Acquisition Strategies

Parameter	Time-Based Acquisition	Burst-Based Acquisition
Sampling Trigger	Fixed interval (e.g., timer)	Event or condition-based
Data Rate	Uniform	Variable, bursty
Power Efficiency	Moderate to low	High (system sleeps most of the time)
Suitability	Slowly changing signals (Temp, RH)	Fast or transient signals (Accel, Strain)
Implementation Complexity	Low	Higher (requires event detection logic)
Data Volume	Constant	Reduced, but burst-heavy when active

TIME BASED DAQ

Sample Interval = 1ms

BURST BASED DAQ

Burst Duration

Idle Time

What I Have Done This Week Pt2.

It appears that a Burst-Based DAQ strategy is most applicable for this application.
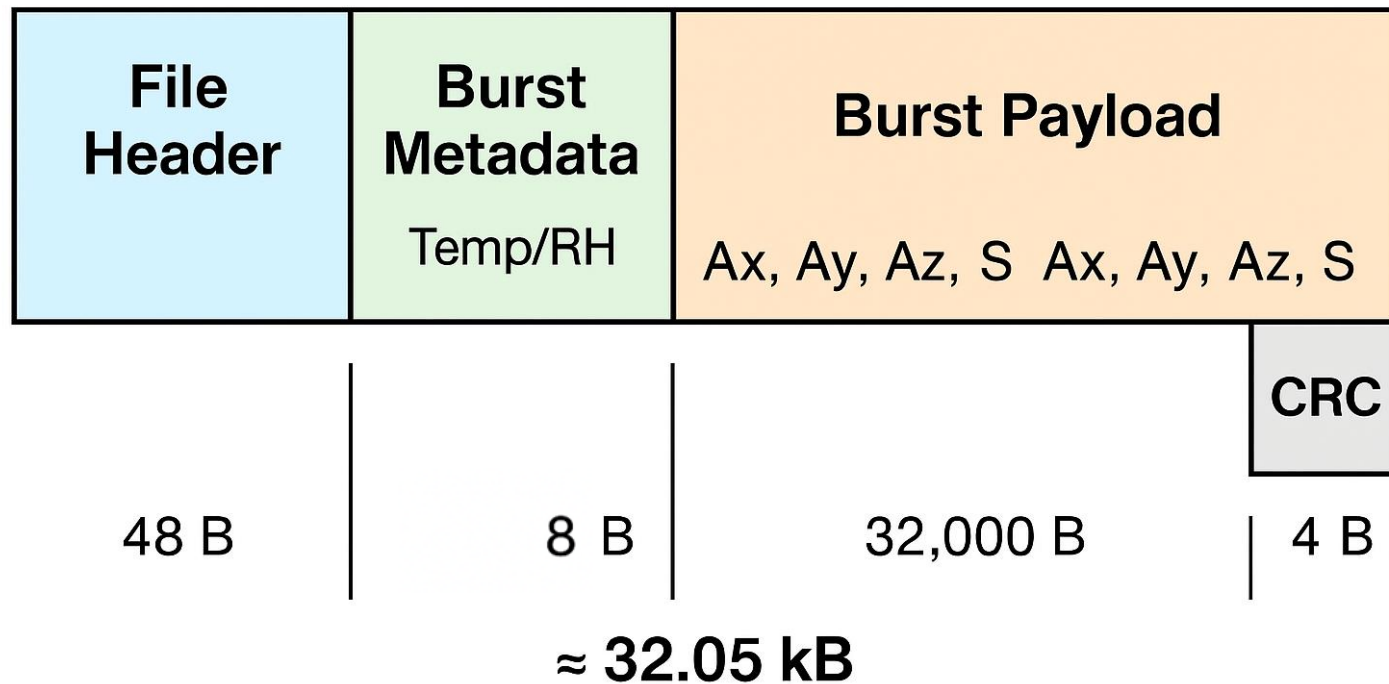
Most importantly, we have the space available to attempt this.

We can record the temperature & relative humidity once at the beginning of the burst data from the acceleration and strain gauge sensors. This bundles data into one large "event" for Wabash to use.

Parameter	Value / Calculation	Result
Sensors	3-axis accel + 1 strain (high-rate) + Temp & RH (1 sample)	—
Sampling Rate (Accel/Strain)	2,000 samples/sec	—
Data Format	16-bit (2 bytes/sample)	—
Data Rate	2,000 × 4 × 2	16 kB/s
Burst Duration	—	2 s
Burst Size (Accel + Strain)	16 kB/s × 2 s	≈ 32 kB
Temp + RH Samples	2 sensors × 2 bytes each	+ 4 B
Total per Burst	32 kB + 4 B	≈ 32 kB
128 GB microSD Capacity	≈ 137,000 MB	—
Bursts Storable	137,000 MB ÷ 0.031 MB	≈ 4.3 million bursts

What I Have Done This Week Pt3.

Sample Data Packet / Entry:

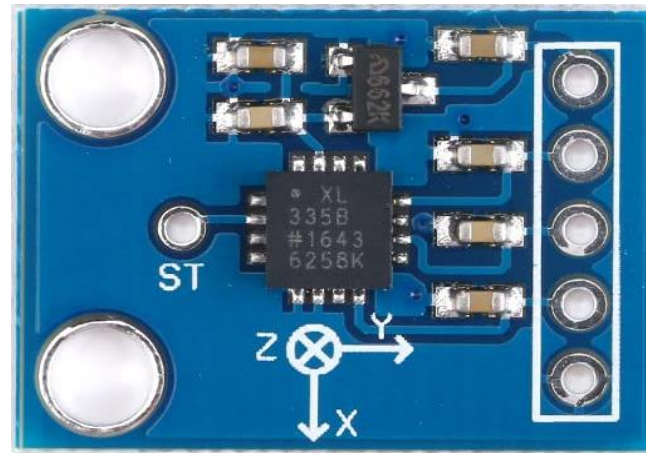| File Header	Burst Metadata Temp/RH	Burst Payload Ax, Ay, Az, S Ax, Ay, Az, S	CRC
48 B	8 B	32,000 B	4 B

≈ 32.05 kB

What I Have Done This Week Pt4.

Sensors Picked:

Temperature &
Relative Humidity:
SHT45
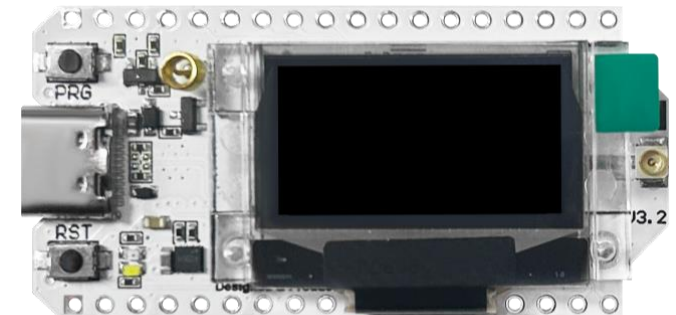
Acceleration / Vibration:

ADXL335

Microcontroller:

Heltec LoRa WiFi (V3)

Did I Do What I Say I Would Do?

I feel that I met my promises this past week. I have further brainstormed and laid out the storage packet and DAQ strategy.

I also created a BoM & sent it to Skylar for procurement.

I have attended every class.

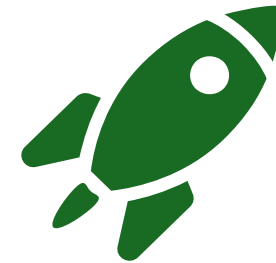I continue to lead the EE & DAQ of this project.

Plans For Upcoming Week

High Level

After the team goes on the manufacturing visit, we will pick the strain gauge the fits the physical requirements for the coupler.

Continue to research industry standard data acquisition methods and packet creation.

By EOW:

Find applicable strain gauge & ADC converter.

Create parts procurement to start prototyping process.

Attempt to setup a meeting with my internship mentor and ask about their data acquisition method for airplanes.