Dwight Look College of
ENGINEERING
TEXAS A&M UNIVERSITY

Team 28: Gas Monitoring System
Bi-Weekly Update 3

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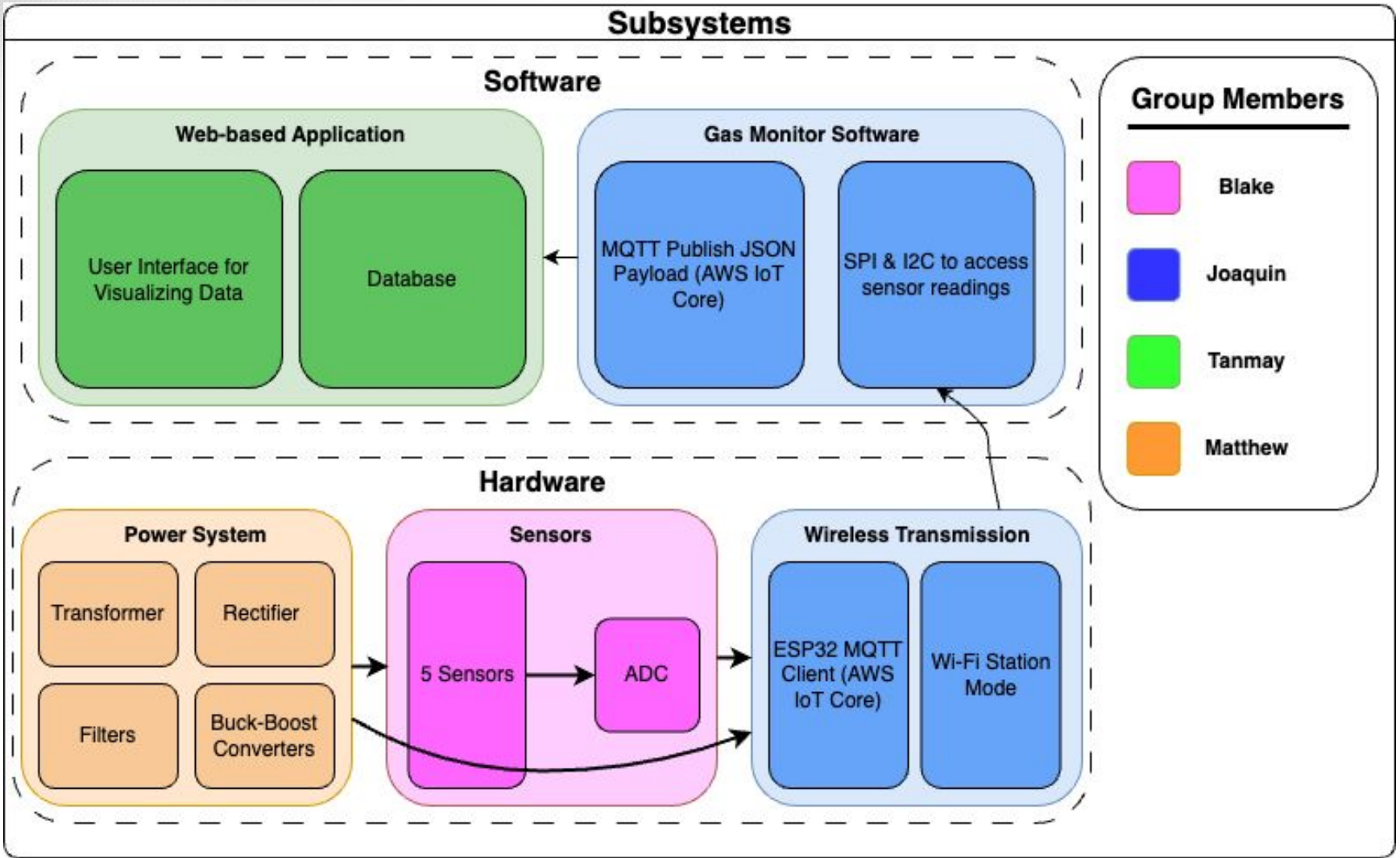
Project Summary

- Monitoring environmental conditions in animal farms.
- To design and implement a durable, real-time gas monitoring system that can track harmful gases in animal farms.

Project/Subsystem Overview



Project Timeline

Troubleshoot/ Debug Individual Subsystems (completed 1/27)	Integration of Power and Sensor Subsystems (to complete by 2/14)	Integration of MCU and Database (to complete by 3/3)	Integration of MCU and Sensor Subsystems (to complete by 3/3)	Complete Integration, Design Housing (to complete by 3/17)	Testing / Validation (to complete by 3/31)	Demo and Report and Engineering Showcase (to complete by 4/7)

Matthew

Accomplishments since last update 14 hrs of effort	Ongoing progress/problems and plans until the next presentation
-Integrated sensor and power subsystem except for negative voltage -Partial integration test between all 4 subsystems -Diagnosed inverting voltage issues and ordered/received necessary parts to fix	-Full power and Sensor integration will be complete by next review -Inverting voltage will be fully functional -Make progress on housing unit

Sensor-Power integration

Blake

Accomplishments since last update 12 hrs of effort	Ongoing progress/problems and plans until the next presentation
-Mostly integrated with microcontroller subsystem. Temperature/humidity and CO2 read. Ain1 read. -Fully integrated test between all 4 subsystems.	-Fully integrate with microcontroller. Cycle through all analog inputs. -Solder one of the analog sensors on to make sure it reads correctly. -Resolder a few parts. -Test all inputs together with power board.

Joaquin

Accomplishments since last update 15 hrs of effort	Ongoing progress/problems and plans until the next presentation
- Completed integration of MCU with Database - Completed integration of MCU with I2C sensors - Tested ADC code (AIN1 test on next slide)	- Ongoing integration of MCU with Analog Sensors (need to find register addresses of AIN2 and AIN3) - Improving Error/Initializing Handling - AWS connection fails in lab room. - AWS timeout after 5 minutes

Fixed:
Wi-Fi timeout
Power saving feature weakened Wi-Fi strength
Removed replica MQTT transmissions by waiting for new sensor data and sending only one packet of data

Sensors + MCU Integration

Testing Analog to Digital Converter

Joaquin, Blake (02/20/25)

- **Error increases at lower voltage**

Input Voltage (V)	ADC Hex Code	Converted Voltage (V)	Error (%)
0.25	9207711	0.27193	8.7
0.5	10026842	0.515789	3.1
1.0	11663025	1.003691	0.37
1.5	13300455	1.491746	0.55

Testing I2C, SPI, Database Integration

Entire team (02/20/25)

TEMP - 25.68°C = 78°F

HUM - 26.89%

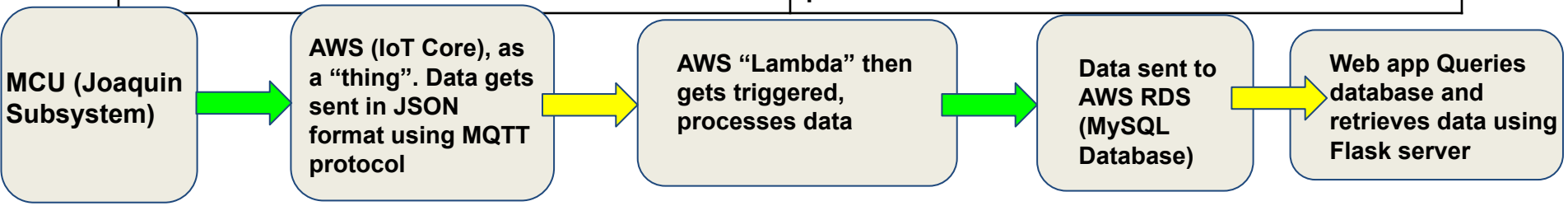
CO2 - 1277 ppm

```
I (77527) SCD41: CO2: 1277 ppm, Temperature: 25.68°C, Humidity:
 26.89%
I (77977) AD7718: Data Ready - Reading ADC Value...
I (77977) AD7718: Raw ADC Data: 11663017
I (77977) AD7718: Raw ADC Data: 0x00B1F6A9
I (77977) AD7718: ADC Decimal Value: 11663017
I (77987) AD7718: Converted Voltage: 1.003668 V
I (78527) gasmonitor: Publishing: {"temperature_hdc1000":0.00,
"humidity_hdc1000":0.00, "temperature_scd41":25.68, "humidity_s
cd41":26.89, "co2_scd41":1277}
```

Web Application + Database Subsystem

Tanmay Sarkar

Accomplishments since last update 12 hours of effort	Ongoing progress/problems and plans until the next presentation
MCU can now communicate with AWS, AWS can communicate with Database Fixed Issue where data from sensor was not sending, previously only test messages worked	Ongoing: Making sure full system works. Next step is to ensure that database can fully communicate with web app. Issue with CO2 sensor should be fixed as well Deploy website onto internet using AWS EC2 Free Tier before next presentation



Microcontroller-Database Integration

AWS (Joaquin and Tanmay)

▼ sensor/reading — February 23, 2025, 23:49:33 (UTC-0600)


```
{
  "temperature_hdc1000": 23.35,
  "humidity_hdc1000": 59.22,
  "temperature_scd41": 22.77,
  "humidity_scd41": 61.96,
  "co2": 1105
}
```


▶ Properties

▼ sensor/reading — February 23, 2025, 23:49:08 (UTC-0600)


```
{
  "temperature_hdc1000": 23.35,
  "humidity_hdc1000": 59.62,
  "temperature_scd41": 22.77,
  "humidity_scd41": 61.96,
  "co2": 1105
}
```


```
1 •  SELECT * FROM sensor_readings ORDER BY timestamp DESC;
2
```

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

id	temperature_hdc1000	humidity_hdc1000	temperature_scd41	humidity_scd41	co2	timestamp
2865	23.35	59.22	22.77	61.96	1105	2025-02-24 05:49:33
2864	23.35	59.62	22.77	61.96	1105	2025-02-24 05:49:09

Result Grid

Execution Plan

	1/13/25	1/20/25	1/27/25	2/03/25	2/10/25	2/17/25	2/24/25	3/03/25	3/10/25	3/17/25	3/24/25	3/31/25	Key
Solder New Sensor PCB													Sensor
Revalidate Sensor Subsystem													Power
Integrate Power and Sensor Subsystems													Microntroller
													Database
Fix inverted voltage													Group
Fix load voltage issues													Completed
Integrate Power and Sensor Subsystems													In Progress
Design Housing Unit													Not Started
Integrate MCU and Database													Behind Schedule
I2C Integration w/ MCU													
Analog Sensor Integration w/ MCU													
Test MCU according to Validation Plan													
Add security measures to database													
Integrate MCU and Database													
Debugging MCU w/ Database													
Validating MCU w/ Database													
Total Integration													
Housing Unit, final touches													
Full-system Validation													
Final Presentation	April 9th												
Final Demo	April 21st												
Final Report	April 28th												

Validation

Make database/web app more secure	Password/2FA security		Tanmay
Integrate MCU w/ database	Successful data transmission < 5 seconds		Tanmay
Deploy web application	Web application stays online 24/7		Tanmay
Read Analog Sensor Data	Successfully convert analog data through the ADC by testing different voltage inputs.	YES	Joaquin
Read Digital Sensor Data	Successfully collect accurate and consistent data from I2C sensors.	YES	Joaquin
Transmit Sensor Data	Transmit sensor data wirelessly over a Wi-Fi network to AWS.	YES	Joaquin
Wi-Fi Range and Stability	Maintain stable transmission over extended time periods (30 min, 1 hr, 2 hrs, 3 hrs)		Joaquin
I2C Communications	Code can read CO2 and temperature/humidity sensor.	YES	Blake
SPI Communications	Code can read analog input from analog to digital converter.	YES	Blake
Microcontroller Flash	Microcontroller can upload code.	YES	Blake
Voltage Divider and Op Amp	Voltage divider cuts voltage in half. Unity gain op amp does not change the voltage. Works from range of .25 - 5V.		Blake
Correct Output Voltages	Specified voltages of 5,-5,3.3 V are supplied		Matthew
Load Requirements Met	Power subsystem can adequately provides 0.5-1A of current	YES	Matthew
Entire project is safely housed	Successfully designed a housing unit that will protect the sensors, pcbs, transformers.		Matthew

Thank you !