Dwight Look College of
ENGINEERING
TEXAS A&M UNIVERSITY

Team 28: Gas Monitoring System
Bi-Weekly Update 5

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TA: Vishwam Raval

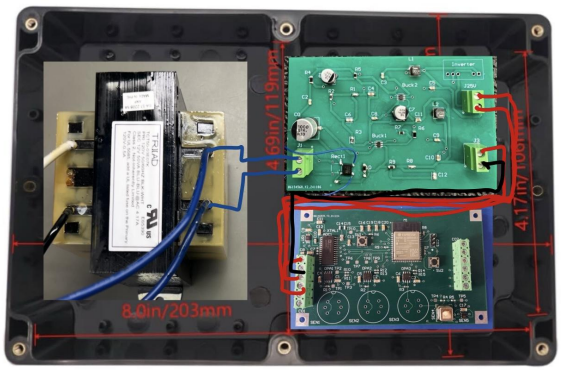
Project Summary

- 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.

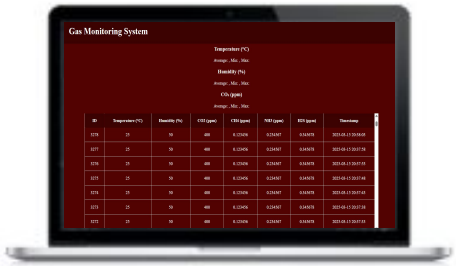
Integrated System Diagram

AWS IoT

Gas Monitor



User Interface



Database

Web Server uses Database to populate graphs and view historical data

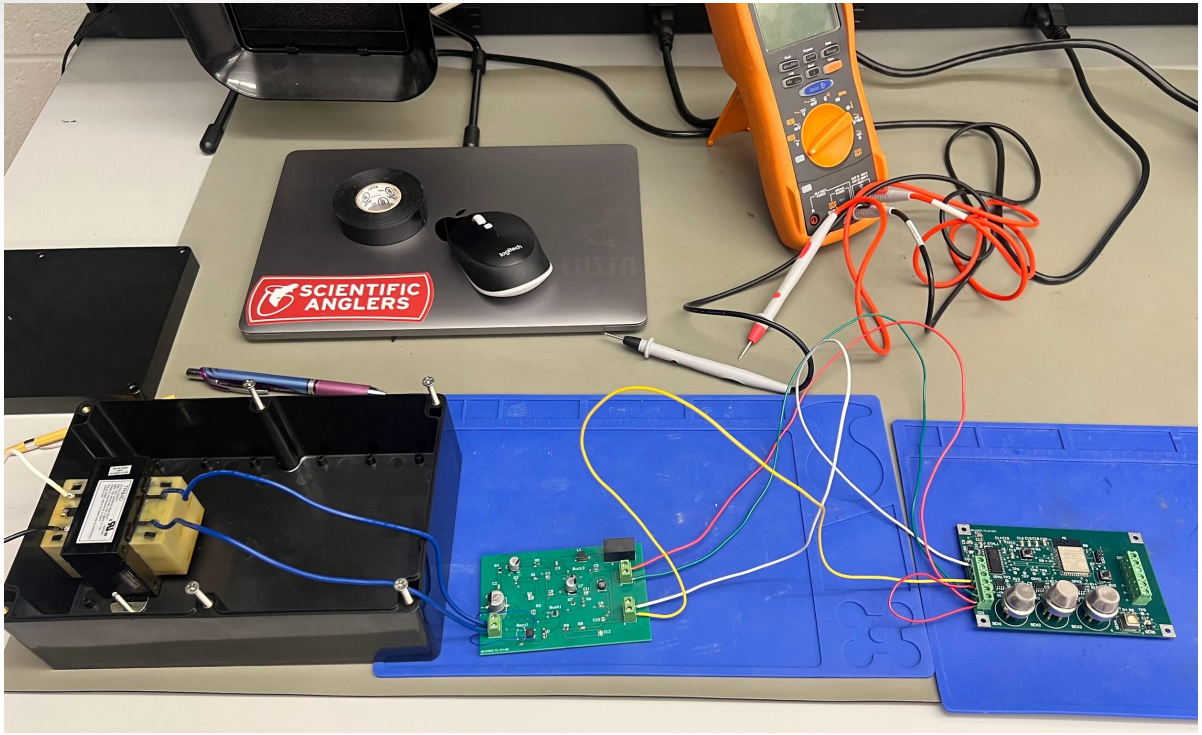
Project Timeline (45 seconds)

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 (to complete by 3/17)	Testing / Validation, Housing unit completed (to complete by 3/31)	Demo and Report and Engineering Showcase (to complete by 4/7)

Matthew Owen

Accomplishments since last update 25 hrs of effort	Ongoing progress/problems and plans until the next presentation
-Identified and fixed load issues that were preventing full functionality of all sensors -Validated full system operation under full load with all sensors attached -Mounted transformer and testfit/drilled holes for pcb mounting	-Improve reliability while running the system over long periods of time - Get bolts/nuts from hardware store this week and finish mounting all parts into housing enclosure -Field testing this thursday

Gas Monitor Housing



Test fit all boards and got the transformer mounted.

Drilled remaining holes for pcb mounting with all sensors oriented correctly.

Blake

Accomplishments since last update 20 hrs of effort	Ongoing progress/problems and plans until the next presentation
• Fixed problem of power pcb not powering full load of analog sensors • Applied equation to convert voltage to ppm • Ran fully integrated test with sensors in lab. Validated: 1.) Power pcb powering the sensor pcb 2.) Microcontroller receiving all data from digital and analog sensors and transmitting it to website	• Run a test on a farm and record data for final demo • Temperature sensor detecting heat on board • Make voltage to ppm equations more accurate (24 hour calibration time? Not sure if this can be done before demo) • Fix reliability issues (not all sensors were powered sometimes)

Sensor Outputs

Temp with sensors (F)	Temp without sensors (F)
88.71	75.77
89.11	75.73
86.37	75.74
86.63	75.69
86.85	75.68
87.06	75.71
87.28	75.72

Heat causing temperature detection to be higher.

NH3 (ppm)	H2S (ppm)	CH4 (ppm)
27.5278	0.1324	0.336903
37.7256	0.135651	0.330812
602.433	0.113883	0.255422
37.541	0.172677	0.462406
37.6081	0.169129	0.382718
27.3617	0.104913	0.492009
28.5659	0.113744	0.398275

NH3 abnormally high, outlier is when sensor is exhaled on. Wrong equation.

H2S should be higher (voltage levels higher as it is not close to being calibrated).

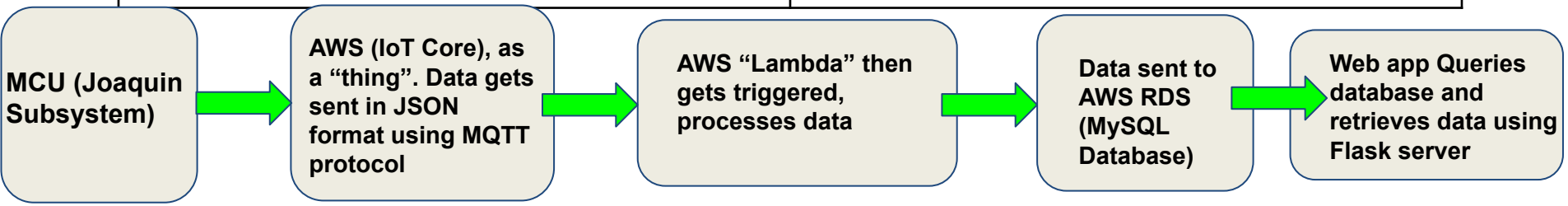
CH4 is reasonable value.

Joaquin

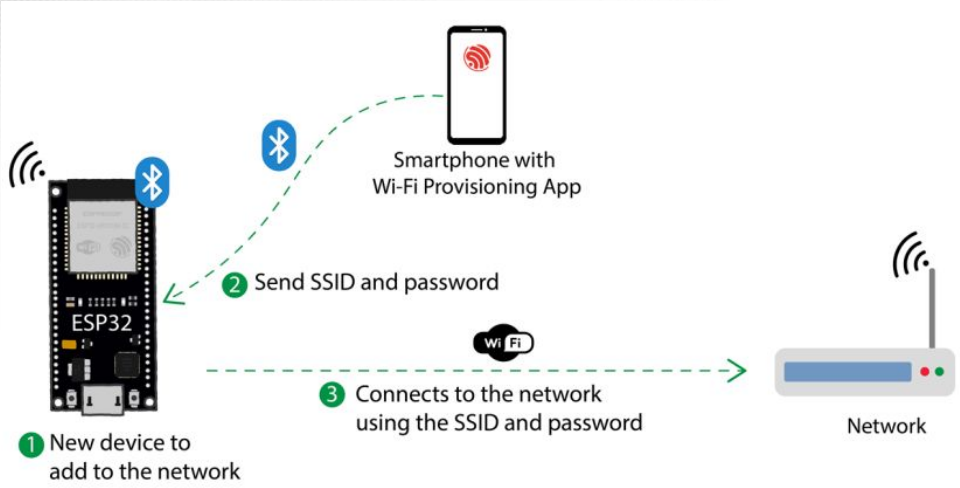
Accomplishments since last update 10 hrs of effort	Ongoing progress/problems and plans until the next presentation
• Tested Wi-Fi provisioning at home and lab • Monitored wifi and data transmission stays on for up to 3 hours (Validation passed) • Writing User/Troubleshooting errors	• Run real world test on animal farm • April 3rd on Farm • Add troubleshooting to User manual

Tanmay Sarkar

Accomplishments since last update 15 hours of effort	Ongoing progress/problems and plans until the next presentation
Full flow of data is now working with real data (Over spring break, had to use test data). Data is updating faster with no visual glitches. Integration with MCU fully complete	Continue testing to ensure that system continues to work long-term. (As more and more data gets added) Tweak certain aspects of the web application (Data statistics, graphs) Deploy website using AWS EC2 for Backend, AWS Elastic Beanstalk for frontend



User Experience



Wi-Fi Provisioning allows connection to any Wi-Fi network.

ID	Temperature (°C)	Humidity (%)	CO2 (ppm)	NH3 (ppm)	H2S (ppm)	CH4 (ppm)	Timestamp
15219	88.71	72.02	986	27.5278	0.1324	0.336903	2025-03-27 17:19:59
15218	89.11	70.97	795	37.7256	0.135651	0.330812	2025-03-27 17:19:54
15217	86.37	78.6	1226	602.433	0.113883	0.255422	2025-03-27 17:19:29
15216	86.63	77.91	1224	37.541	0.172677	0.462406	2025-03-27 17:19:23
15215	86.85	77.27	1223	37.6081	0.169129	0.382718	2025-03-27 17:19:18
15214	87.06	76.55	1234	27.3617	0.104913	0.492009	2025-03-27 17:19:12
15213	87.28	75.7	1210	28.5659	0.113744	0.398275	2025-03-27 17:19:08

User Experience

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Livestock Gas Monitor

User Manual and Wi-Fi Provisioning Setup Instructions

Welcome to the Livestock Gas Monitor. Follow these simple steps to connect your device to Wi-Fi and get it up and running:

Step 1: Download the Provisioning App

1. Go to your smartphone's app store.
2. Search for and download the ESP SoftAP Prov app.

Step 2: Configure the App Settings

1. Open the ESP SoftAP Prov app.
2. Tap the settings icon (⚙️) at the top left corner.
3. Configure the following settings:

- Supported Device Types: Select "Soft AP"
- Encrypted Communication: Set to ON
- Set Username: Enter wifiprov

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	YES	Tanmay
Deploy web application	Web application stays online 24/7	YES	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)	YES	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.	YES	Blake
Correct Output Voltages	Specified voltages of 5,-5,3.3 V are supplied	YES	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 !