Zetron: Internet of Life Saving Things (IoLST)

ELECTRICAL & COMPUTER ENGINEERING

ZETRON®

Team: Hong Zhang, Shen Yao, Tianning Li
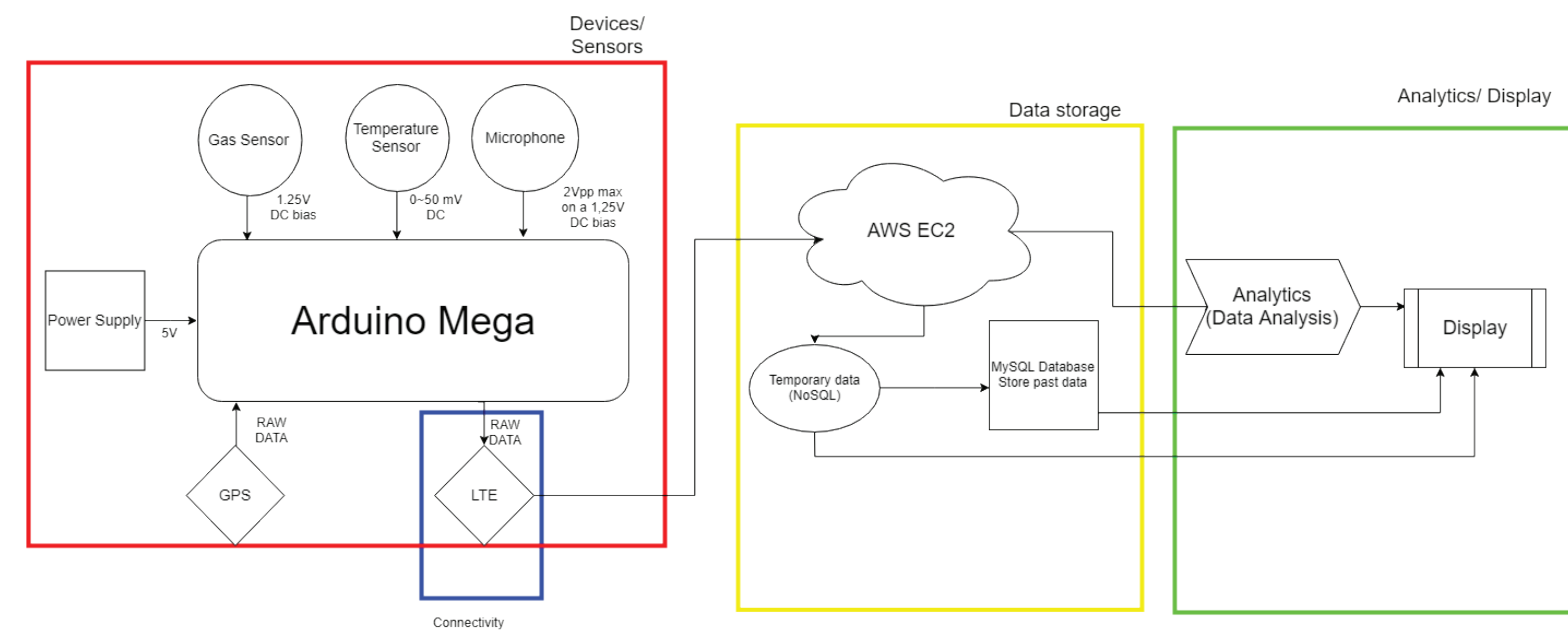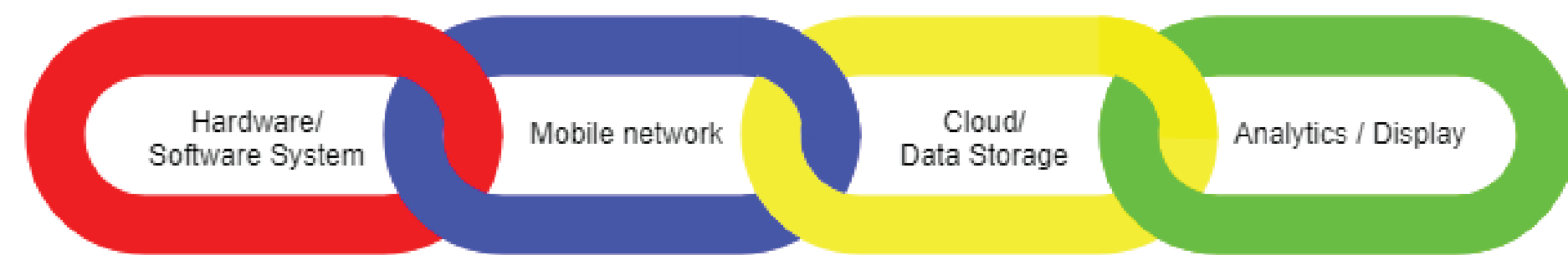Industry Mentor: Len Cayetano
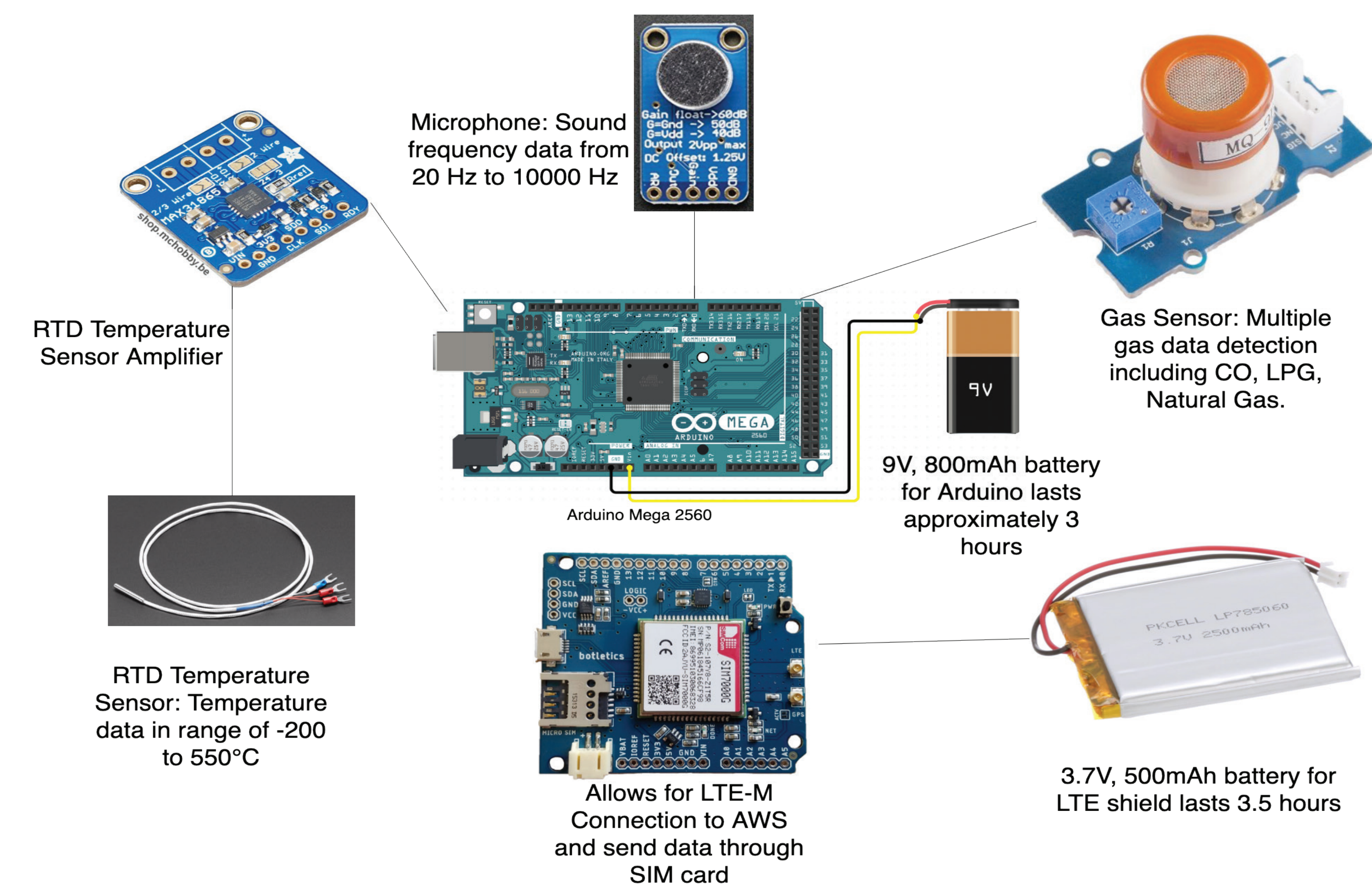Faculty Mentor: Jim Peckol

Problem Statement

During a fire, a firemen's priority is to save lives and recently firemen's safety has been an increasing priority. We are creating a system that helps firemen/first responders better respond to these dangers and improve their ability to save lives.

System Requirements

• Hardware/Software System to collect life-saving data
• Ability to operate on mobile network
• Cloud to store data
• Analytics to display information
• Security to provide reliability

Hardware/Device

RTD Temperature Sensor Amplifier

Microphone: Sound frequency data from 20 Hz to 10000 Hz

Gas Sensor: Multiple gas data detection including CO, LPG, Natural Gas.

9V, 800mAh battery for Arduino lasts approximately 3 hours

Arduino Mega 2560

RTD Temperature Sensor: Temperature data in range of -200 to 550°C

Allows for LTE-M Connection to AWS and send data through SIM card

3.7V, 500mAh battery for LTE shield lasts 3.5 hours

Discussion/Future Work

As we wrap up the project, there are many considerations and things we have thought about for the future. One of the main things is going to be trying to downsize the prototype to a more portable form. The number of sensors/data we can use can be expanded as well. Developing a better support structure for multi-device analytics and support should be considered. There is potential for feature/usage expansion.

Connectivity

Selected LTE-M over LTE
  • Low powered network connectivity
  • Longer battery life for the device
  • Costs less because of lower data rate
Hologram Sim Card to Enable LTE-M Connectivity
  • Good coverage/performance through multi-carrier support
  • Developer Tools
Interaction with Amazon EC2 Service
  • HTTP Protocol: Request Message ("Get" Method)
    • Method for sending information to EC2 Service
    • Direct method to send data (Once per second)
    • Does not require routing through Hologram platform

LTE-M   Hologram   Amazon EC2

Dashboard Interface/Analytics

Security
  • Login system for data/interface access
  • Page access is per role/user profile
  • Session expires after a certain amount of time
  • Database secured by AWS, only developer have access
Back-End
 • Keep track of user activity, data transfer and receiving
Front-End
  • Responsive web design: adapt to different window size
  • Display website and information
  • Javascript: handle data update
  • D3.js library: data visualization
Information
  • Multi-device data display
  • Real-time & archive data display (Charts & Graphs)
Analytics
  • Highlight Hazard Levels
    • Temperature: Extreme temperatures
    • Gas Data: Toxic, flammable, or explosive gasses
  • Mapping Data with GPS Longitude + Latitude Coordinates
    • Temperature/Gas: Source detection
    • Microphone: Picking up SOS frequency + Distance

ZETRON UW

Login
Username:
Password:
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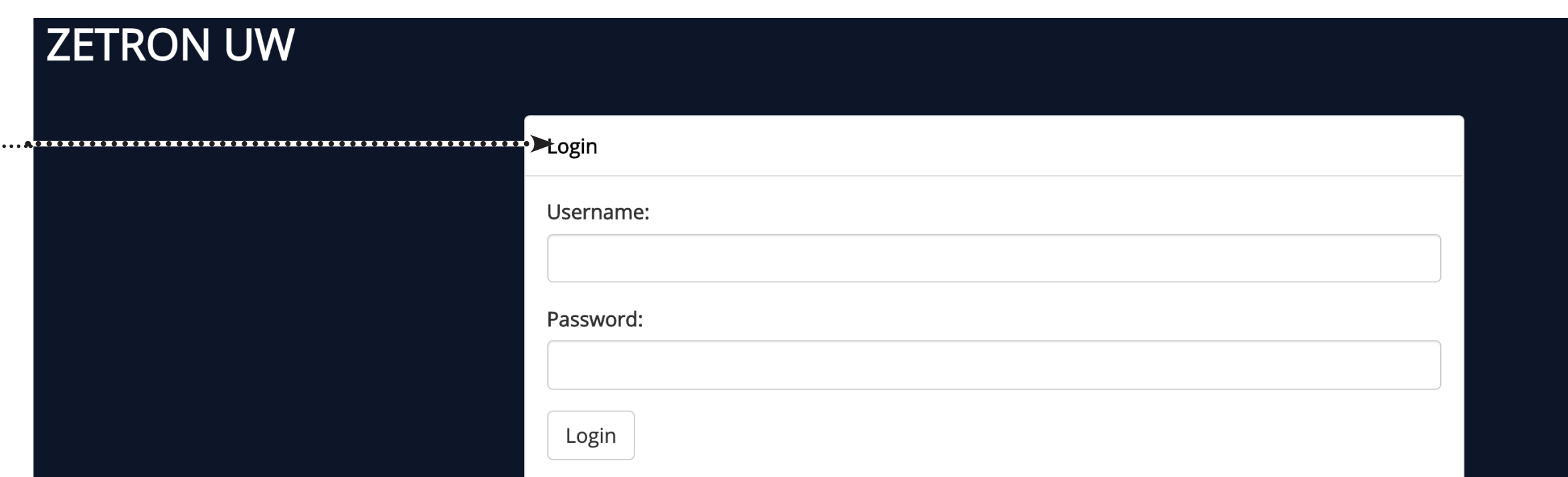
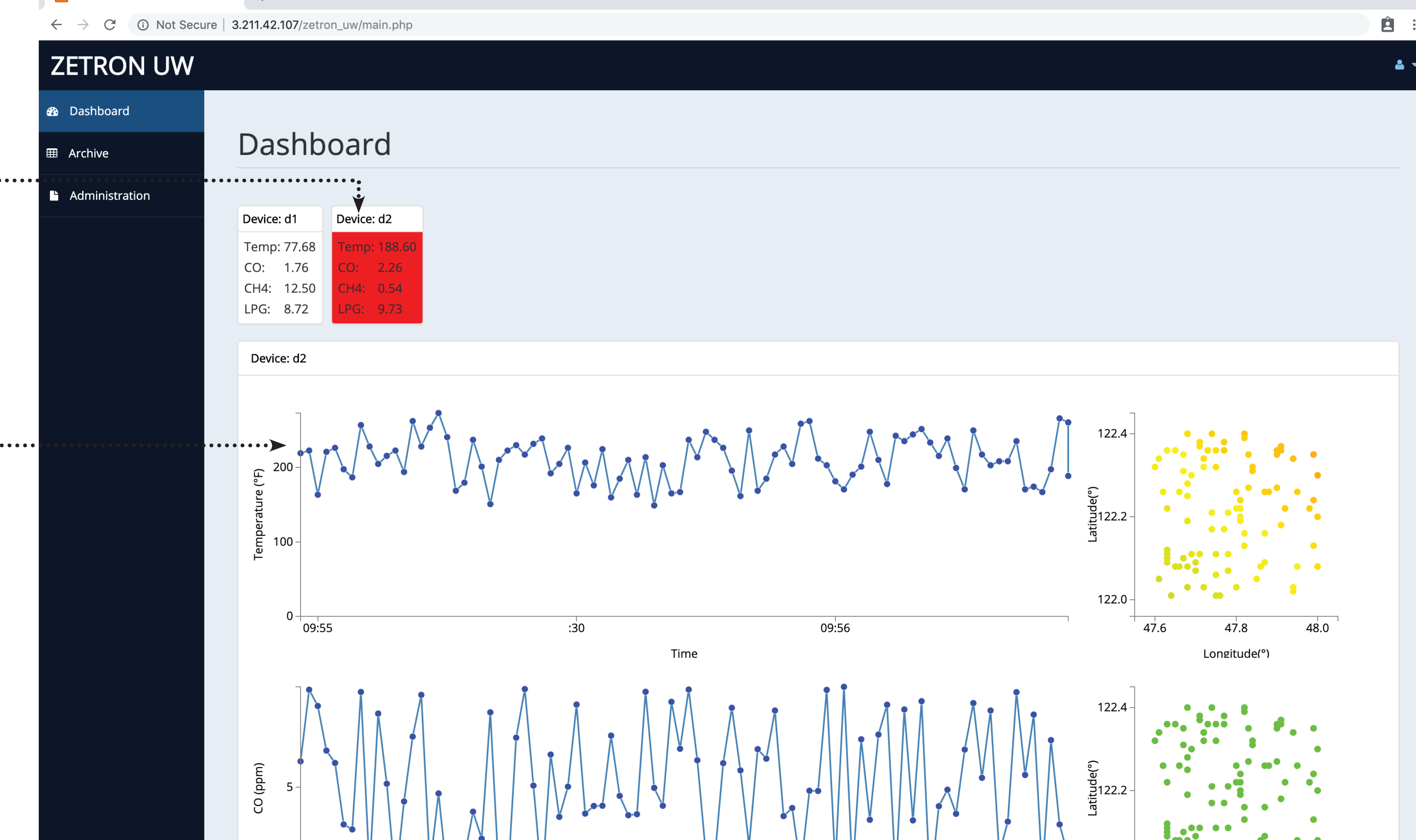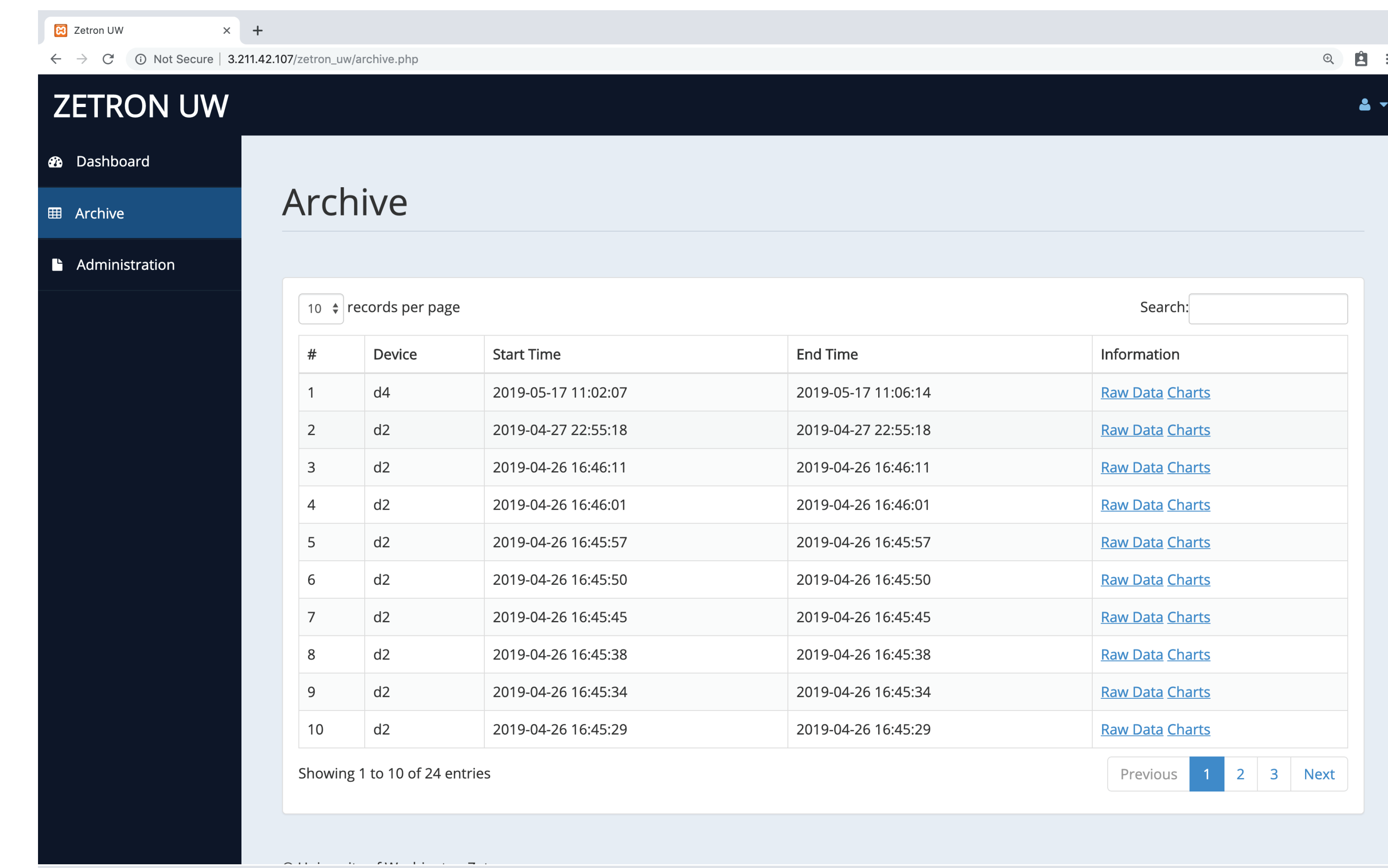© University of Washington Zetron group

Data Storage & Management

Real-time data
  • Stored in **NoSQL** Database
  • Faster access
  • Flexible (Database schema is the same when new sensors are added)
Archived data
  • Store in AWS Relational Database Service (RDS) **MySQL** Database
  • Each row stores a session which includes the start/end time and data
  • Database compatibility w/ Microsoft Azure and Google Cloud Storage

#	Device	Start Time	End Time	Information
1	d4	2019-05-17 11:02:07	2019-05-17 11:06:14	Raw Data Charts
2	d2	2019-04-27 22:55:18	2019-04-27 22:55:18	Raw Data Charts
3	d2	2019-04-26 16:46:11	2019-04-26 16:46:11	Raw Data Charts
4	d2	2019-04-26 16:46:01	2019-04-26 16:46:01	Raw Data Charts
5	d2	2019-04-26 16:45:57	2019-04-26 16:45:57	Raw Data Charts
6	d2	2019-04-26 16:45:50	2019-04-26 16:45:50	Raw Data Charts
7	d2	2019-04-26 16:45:45	2019-04-26 16:45:45	Raw Data Charts
8	d2	2019-04-26 16:45:38	2019-04-26 16:45:38	Raw Data Charts
9	d2	2019-04-26 16:45:34	2019-04-26 16:45:34	Raw Data Charts
10	d2	2019-04-26 16:45:29	2019-04-26 16:45:29	Raw Data Charts

Showing 1 to 10 of 24 entries   Previous 1 2 3 Next

Acknowledgements

References

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• https://www.educative.io/edpresso/what-is-amazon-ec2