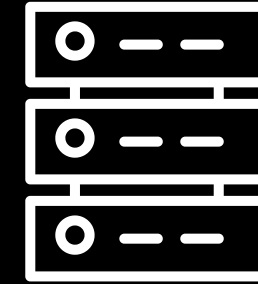
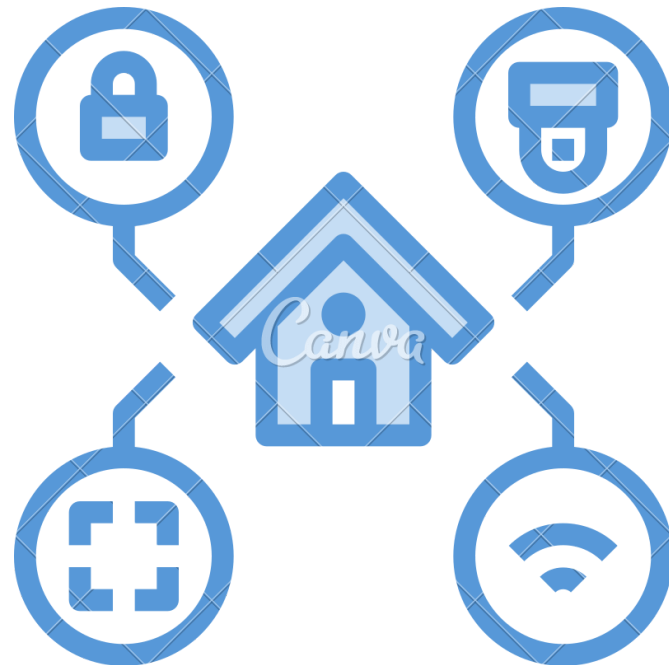


Lab SERVER



HackMait 4.0



A.T.O.M

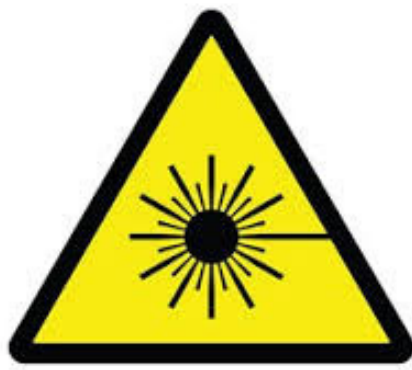
Ayan Goel

Ayush Kandari

Hriday Aggarwal (Team Leader)

Manan Singh Sethi

Problem Statement



Dealing with HAZARDS



1. Research facilities pose a significant risk to the well-being of researchers and laboratory personnel due to the presence of hazardous chemicals and conditions.
2. The emergency response processes currently used in research institutions are often reactive and rely on manual alarms, causing delays and inefficiencies. Therefore, it is necessary to develop an intelligent system that can quickly and effectively recognize emergencies and respond to them.
3. This system should be capable of identifying hazardous situations such as chemical spills, gas leaks, and fires in real-time and initiating appropriate actions. It should integrate with existing safety and security measures, such as environmental sensors and camera surveillance systems.



Proposed Solution

Smart Automation for Facility and Environment safety (S.A.F.E.)

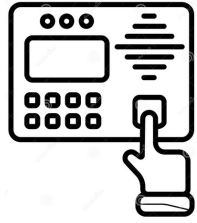


1. An effective solution to improve emergency response for hazardous conditions in research facilities is to create an intelligent system network using the Internet of Things (IoT).
2. This system consists of interconnected devices, such as environmental sensors, smart cameras, and access control systems, which can detect and communicate hazardous conditions in real-time.

Example - For instance, when an environmental sensor detects a chemical spill or gas leak, the intelligent system can immediately alert laboratory personnel and trigger automatic responses such as closing doors and windows to prevent the spread of hazardous material.

Use Case

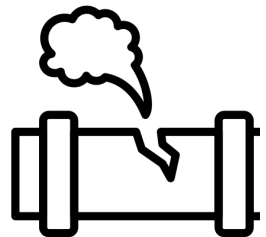
1. **Access control:** The intelligent system can monitor access to restricted areas of the facility and alert security personnel if someone tries to gain unauthorized entry.



2. **Fire detection:** The system can use heat and smoke detectors to identify fires, triggering an automatic response such as activating fire suppression systems, closing doors and windows, and alerting emergency services.



3. **Gas leak detection:** Environmental sensors can detect the presence of dangerous gases such as carbon monoxide, and the intelligent system can automatically shut down gas lines to prevent .



4. **Equipment monitoring:** The system can monitor the status of critical equipment and notify maintenance staff if any malfunctions are detected, reducing the risk of equipment failure and potential hazards.



5. **Hazardous material monitoring:** Environmental sensors can monitor storage areas for hazardous materials, alerting laboratory staff if the humidity or temperature levels exceed safe thresholds.



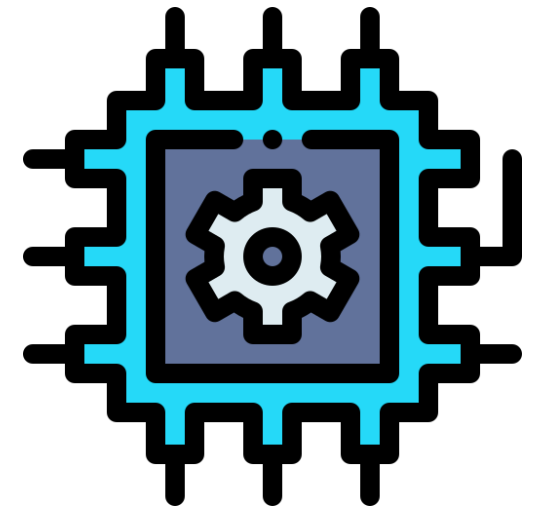
Tech-stack

S.A.F.E. Hardware

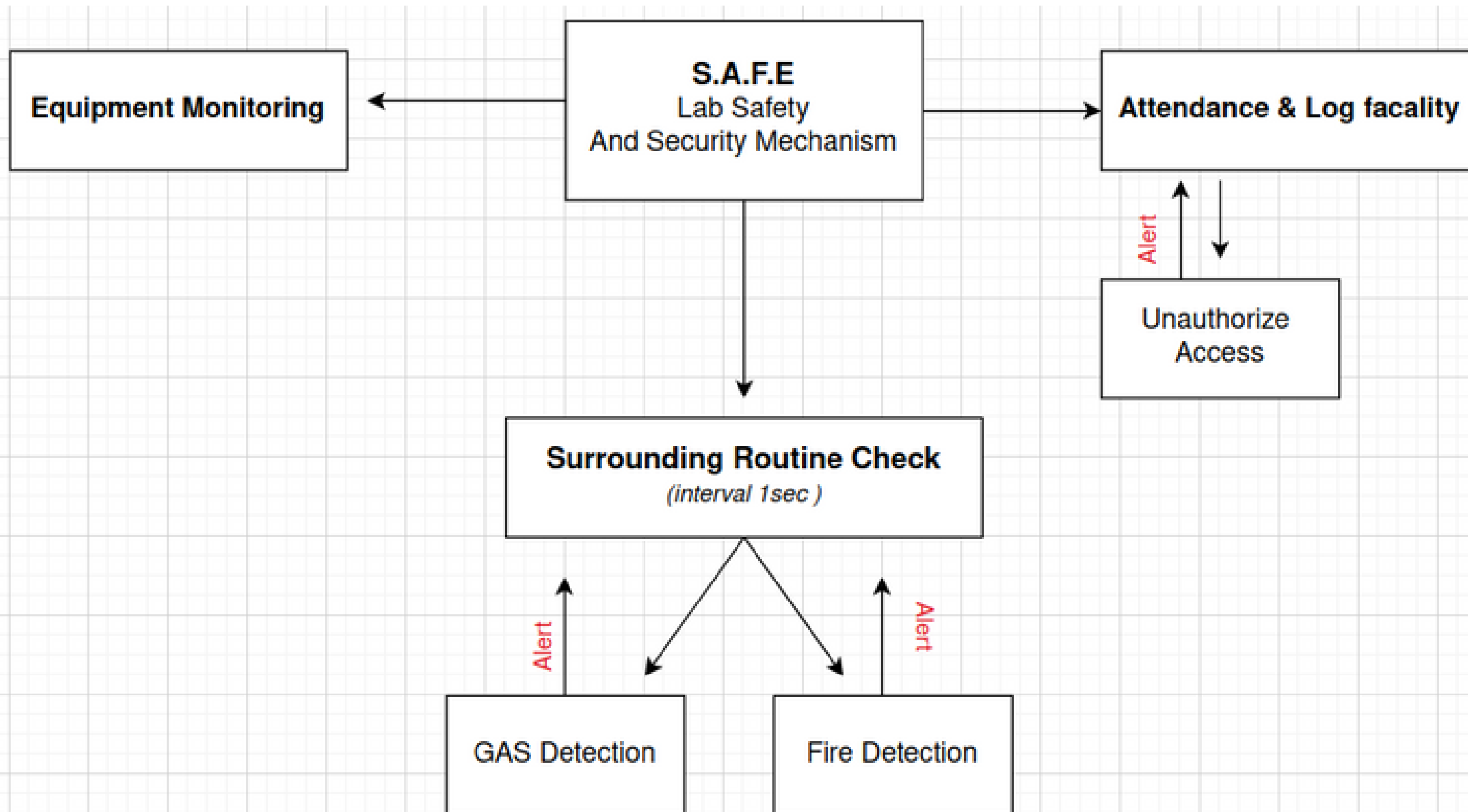
1. **Host machine** - *For the deployment of the S.A.F.E. system*
2. **ESP(Microcontroller)** - *Acts as the brain for communication between RFID and Application*
3. **Sensors** - *Fire and Gas detection sensors*
4. **Servo motors**

S.A.F.E. Software

1. **Docker** - *For the deployment of the S.A.F.E. on the host machine*
2. **Python** - *For making the GUI for issuing RFID cards to the employees*
3. **Arduino IDE** - *Programming environment for giving instructions to ESP*
4. **CSS, HTML** - *JavaScript and Flask- Developing a website for displaying all the stored Data*
5. **MongoDb** - *Database used to store all attendance data*



Data Flow Diagram



USP and Scalability of S.A.F.E.

- 1. Innovative Technology-** Usually the alternatives present in the market are either too bulky or inefficient in terms of resources and energy required for deploying them on the Machine. On the contrary, S.A.F.E. is integrated with Docker which lets us deploy the entire Automated system on the host machine with the help of containers without worrying about various dependencies and configurations.
- 2. Scalability and Flexibility-** Docker enables easy scaling of the S.A.F.E. system by allowing multiple instances of the system to run in separate containers, which can be deployed on different machines or even across multiple servers. This makes it highly scalable to accommodate varying attendance requirements of different organizations, from small businesses to large enterprises.
- 3. Cost-effective-** Docker's containerization approach allows for efficient utilization of resources, as multiple containers can run on a single host machine, reducing the need for additional hardware. This makes the S.A.F.E system cost-effective in terms of hardware requirements.

4. Security- Docker provides container isolation, which means each container runs independently with its own file system, processes, and resources, thereby providing an additional layer of security. This ensures that the attendance system remains isolated from the host system and other containers, reducing the risk of data breaches and unauthorized access.

5. Subscription and Service based- The projected market to the S.A.F.E. system is small organizations and medium scale businesses with a few employees working under them. Subscription based business model is advantageous for both them and for us. They don't require a huge upfront investment for purchasing the S.A.F.E., just a yearly subscription fee makes our product one of the most attractive, viable and unique option in the market.



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