

# Background

## 100+ Years Of Safety

MSA is a manufacturer of safety products with a strong track record of delivering premium products. Cutting-edge technology has always been at the heart of MSA products, from the sensors used in gas detectors to voice amplification for firefighters, and has been key in ensuring that MSA stays ahead of the curve when it comes to keeping its customers safe. See [msasafety.com](https://msasafety.com) for additional details.

## From Hardware To Software And Beyond

With the proliferation of Internet of Things, data analytics and cloud computing, players in the safety space are venturing into uncharted territories with their safety products and services.

More companies are making the move from a hardware to software. Products such as portable gas detectors used by field workers to track gas levels on-site are now collecting data about workers and their environment using gas sensors, accelerometers and GPS. Safety officers can use this data to visualize worker locations, detect when workers fall, and view trends in gas levels across sites, but this is only the beginning.

The Industrial IoT market is expected to be worth over \$1.4 billion by 2021 as IoT-enabled safety devices, cloud computing, and data analytics become mainstream.

## Challenge Statements:

Pick **one** category.

### 1. Predictive Analytics

Worker safety is of utmost important amongst companies in the safety space. The ability to reduce fatalities, injuries and even near-miss incidents can save lives and cut costs. Use data provided and/or any other data sources you see fit. See available data at the end of this document.

- How can data and analytics reduce safety-related incidents to increase safety amongst field-workers?
- How can predictive analytics be used to proactively anticipate gas-related safety hazards ahead of time?

- How can insights from data be communicated to safety officers and senior management to provide them with meaningful insights that are easy to understand and act on?

## 2. Safety Culture

Field workers in oil, gas, and petrochemical plants have demanding jobs. As a result, enforcing safety regulations and maintaining a positive safety culture can be challenging.

- How can companies build a strong culture that puts employees' safety at the core?
- How might approaches, like gamification, be introduced to encourage safe habits and positive behavior change?

## 3. Business and Marketing Strategy

Transitioning from traditionally hardware businesses to building software is a daunting challenge for companies. It is a sharp turn from pure gas detection hardware selling business model to a data analytics and service driven business model.

- Considering the internal and external inertia of the industry, how would you build the business model and do the marketing/pricing for this cloud-connected portable gas detection product? Such aspects may include data collection and analytics SaaS platform collecting and analyzing data from distributed gas detectors.
- As the wave of industrial IoT makes its impact, the next generation of critical industrial technology is on the horizon. Describe your vision for this next generation of technology after IoT, discuss its impacts, and how businesses can begin to prepare today to score a competitive advantage.

## 4. Other Great Ideas

Feel like you've stumbled upon another great opportunity for the next-generation of safety that is not already covered above? We would love to see it.

## Logistics

- While this is a "hackathon," rest assured that you do not need prior coding experience. The challenge statements are crafted so that there is something in it for everyone.
- This is a virtual hackathon which means that you can work on your solutions remotely and submit your work online. There is no formal meeting, event location, or opening/closing ceremony.

- You can work individually or in teams.
- Challenge statements will be released at 10 am on Friday, April 27 and submissions will close at 6pm on Sunday, April 29. (See Submission section for more details)
- Prizes will be awarded to winning teams on May 2.
- Teams will be awarded \$650, \$400 and \$200 for 1st, 2nd, and 3rd place respectively.
- Event website: <http://www.cs.cmu.edu/~dq/hackSafety/>

## Submission

[Use this link to submit your results.](#)

- **Source code / literature:**
  - Software solutions: submit your source code to GitHub and provide the link for submission. Make sure your source code includes a README.md file with instructions to run your code.
  - Literature: please submit a final .PDF file to google drive and provide the link during submission. It is recommended to use LaTeX to compose your paper if it is in the form of scientific literature. But please feel free to use other kind of software/tools to compose your literature, as long as it is converted to a .PDF document finally.
- **Introduction video**: submit an introduction video to YouTube, Google Drive or any video host
  - Video length: 2 - 10 minutes, as long as you could concisely introduce your key idea, and briefly introduce your implementation;
  - Presentation: You may record your screen with slides, or let a team member give an introduction talk, etc. The presentation format is **flexible** as long as it clearly communicates your idea.
  - Be sure to label files appropriately so that we know which team you belong to and the order in which to view the files.
- **Supplemental materials**: If you made presentation slides, please make sure you upload them to a google drive folder and submit a shared link to that folder. And you could also include other supplemental materials, such as extra data you found and used, a poster for your work, cover letter for your solution, etc. But these are optional.

For all types of projects, please provide sufficient information to fully communicate the work your team has done. If you have questions about submission, please reach out to the event hosts as necessary.

## Judging Criteria

- Submissions will be evaluated based on:
  - **Solution To The Problem (30%):** How well the solution address the challenges faced by the intended target audience?
  - **Feasibility (20%):** How logistically and technically feasible is the solution to implement this solution?
  - **Innovativeness (30%):** How creative is the solution in its approach to the problem or its execution?
  - **Quality Of Prototype (20%):** How developed was the prototype/proposed solution?

## Available Data

Limited data is available for use. However, its contents are not easily readable and will require considerable effort to parse. No further information describing the data is available , beyond what is listed here.

Data: <https://msa-poc.sharefile.com/share/view/scf5ffba91df4e1cb>

There are 2 sets of data present:

1. Periodic Data Details, which lists the instruments as their gas readings.
2. Session Alarm Details, which lists any gas events that occurred and also includes the gas readings if they were captured.

MSA has changed the instrument serial numbers and removed any configured user name, department, and company from the instruments themselves. The periodic readings are embedded with the alarms if they are in place. Also, the serial numbers are changed, but they match up (if there are any overlaps in the pulled data). Gas sensor readings are processed readings over a fix duration. Every sample by the instrument itself is not logged, so readings data are not continuous.

## Further Questions

Join [the slack channel for the hackathon](#) - feel free to post questions, comments, or concerns directly into the channel and event hosts will respond as soon as possible. For private matters or other concerns, email Henry Yelin at [hyelin@andrew.cmu.edu](mailto:hyelin@andrew.cmu.edu) and an event host will respond shortly.