Conceptualizing the Design and Use of Augmented Reality Within a Common Operating Picture for Incident Command Systems

Final Presentation

May 3rd, 2022

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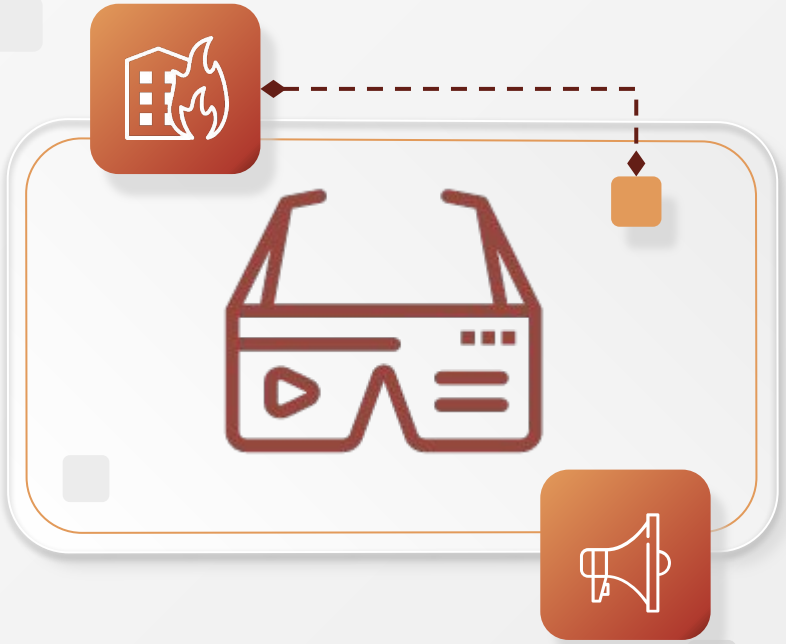

OVERVIEW

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The project definition & introduction

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01

THE PROJECT

The Indiana University Crisis Technologies Innovation Lab (IU CTIL) is exploring the design of an augmented reality system that will help both incident commanders and other first responders.

Our team was tasked to investigate and research past, present, and future design systems that may influence user experience and expectations in a command and control application during times of crisis.

RESEARCH GOALS

Define the value of real-time location tracking and asset management during emergency incidents

Discover how AR can improve **situational awareness** and decision making

Provide future product **feature requirements** and design recommendations that can achieve success in the short and long term

02

KEY FINDINGS

RESEARCH METHODS

Conduct interviews with subject matter experts (SMEs)

These SMEs had a background in incident command and AR technology.

Site visit at IMPD Command Center

Real-world example of current Incident Command workflows and communication patterns.

Affinity Mapping

Highlighted themes about ICs personalities, work habits, needs, values, and goals

Empathy Mapping

Created to focus our comprehension of future user concerns

RESEARCH METHODS

Persona Development

Developing the personas of potential ICs helped us better understand their needs and goals

Scenario and Storyboard Development

Helped to better visualize use cases for the AR IC technology

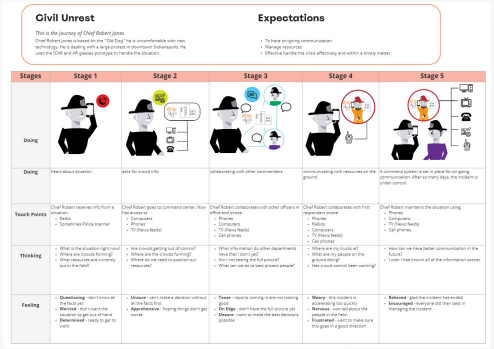
3D Prototype

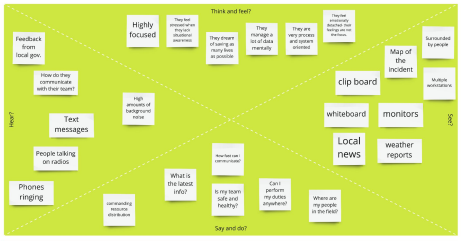
Conceptualized a design system for AR based on the cumulative research

Informal Evaluation of 3D Prototype

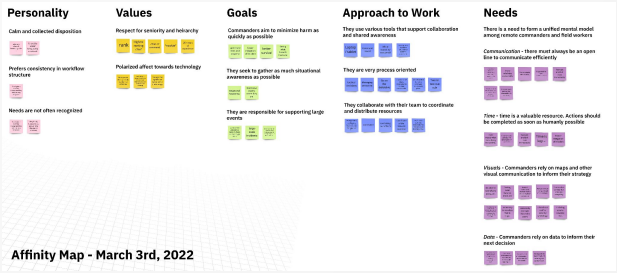
Demoed the prototype with a working Incident Commander to gather feedback on the current progress

RESEARCH ARTIFACTS

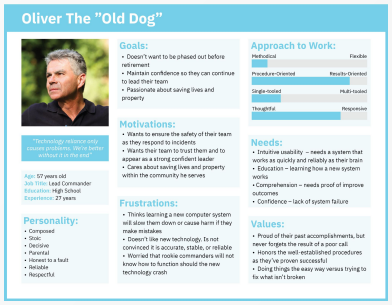


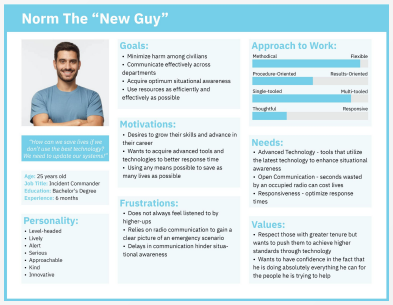


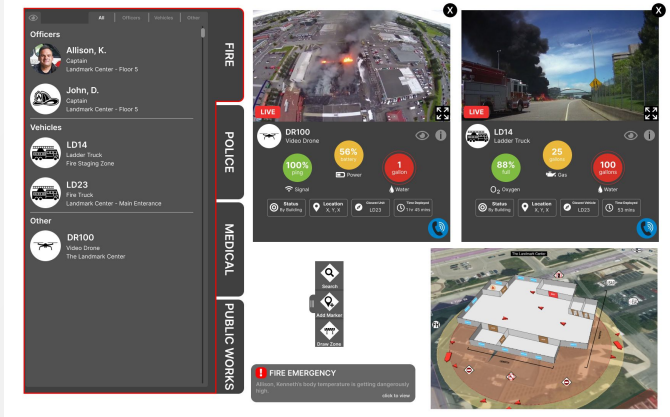
Empathy Map - March 10th, 2022



Affinity Map - March 3rd, 2022







Conceptualizing the Design and Use of Augmented Reality Within a Common Operating Picture for Incident Command Systems

Define the value of real-time location tracking and asset management during emergency incidents

- Allows for commanders to remain aware of situational data that often changes **rapidly**
- Current reliance upon audio data for asset management is **inefficient**
- Knowing **resource and responder proximity** to incident enables commanders to create efficient and **comprehensive strategy**

Discover how AR can improve situational awareness and decision-making

- AR can enable incident commanders to see where resources and responders are on an **X, Y, and Z axis**
- Operations don’t always go according to plan as incidents can include **unexpected variables**
- AR could support remote collaboration, enabling commanders to form a **common operating picture remotely**

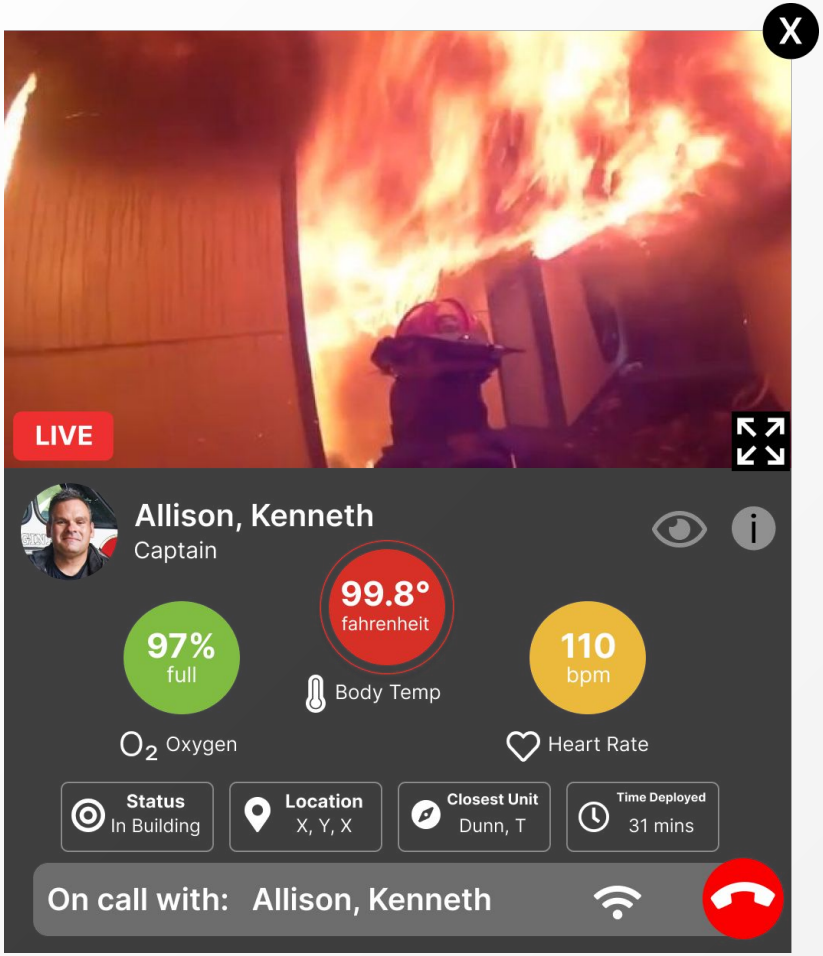
03

PROTOTYPE

Our research findings and understanding of current pain points led us to develop a dynamic prototype.

This hi-fidelity prototype helps conceptualize our proposed design system and the features necessary to help incident commanders accomplish their goals in a timely manner.

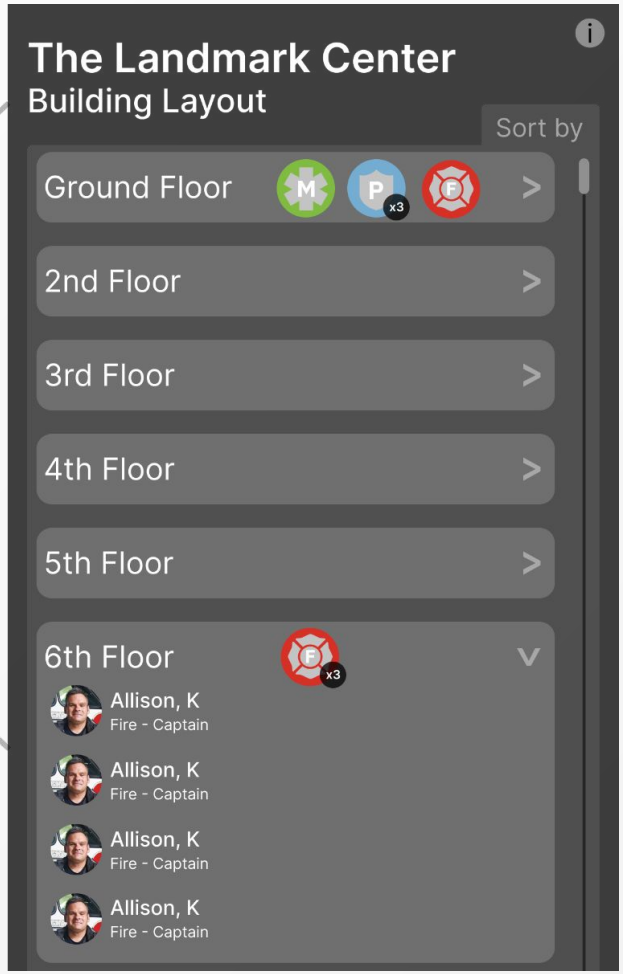
THE CONCEPT ART



Unit Pop-up

- Live video feed from unit to help commanders see through their responders eyes
- Responsive biometric data which draws attention to key information
- Detailed status and location information
- Capabilities which facilitate communication

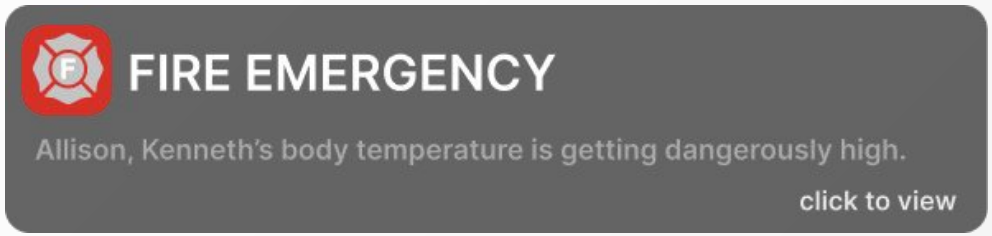
THE CONCEPT ART

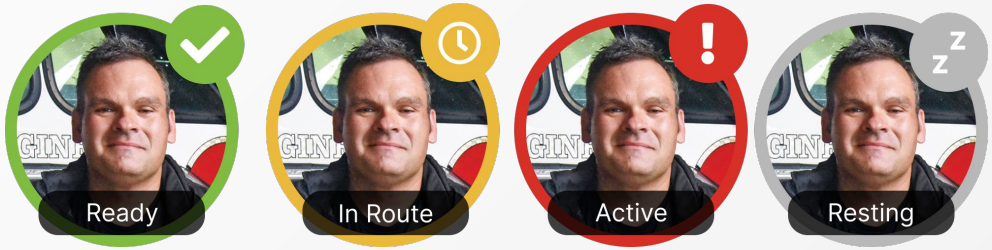


Building Layout

- Unit Locations
- Individual Floor View
- Dropdown Menu Unit Details
- Additional Building Details

THE CONCEPT ART





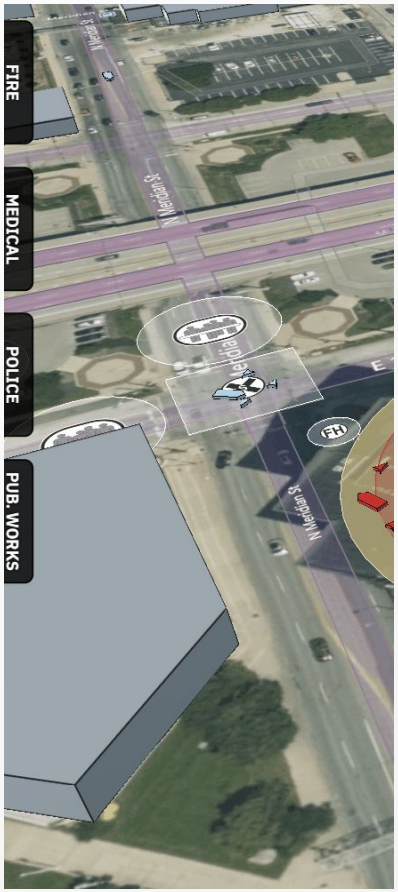
Notifications

- Emergency Data Popup
- Responsive Department Icons
- Short Issue Descriptions
- Click to Focus

Unit Status

- Responsive Colors and Icons
- Popup Labels

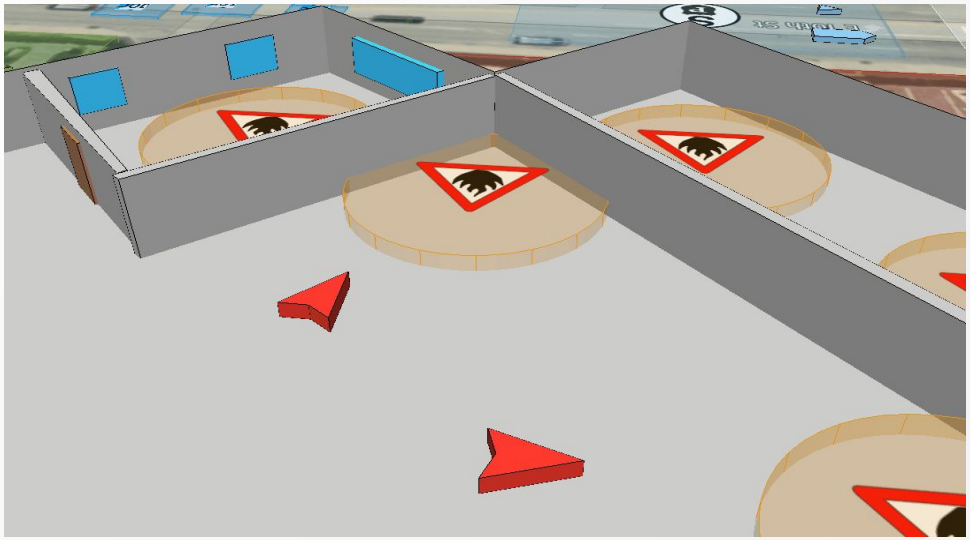
THE FEATURES



Resource Collection Area

- View all available resources within a common operating picture in one place
- Resources are categorized into organizations and then type
- Each resource has a status indicator to help the operator identify and act upon any troubles with certain personnel, vehicles, or areas

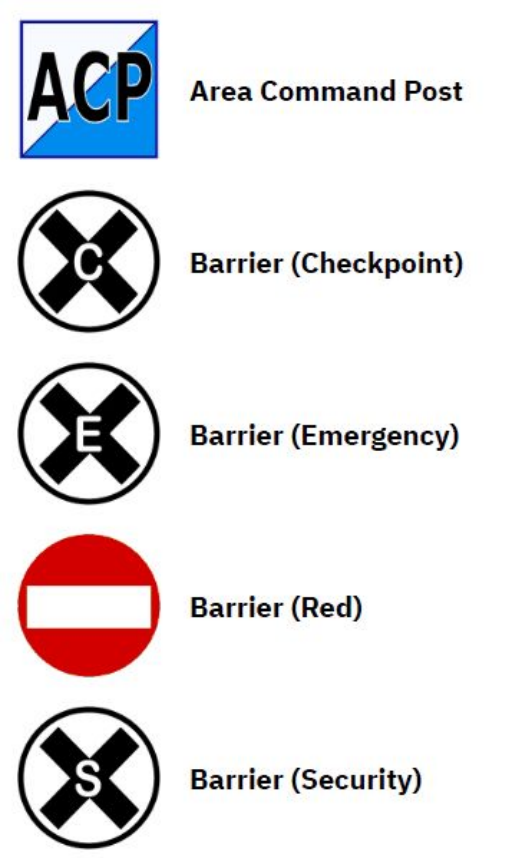
THE FEATURES



3D Representations of Resources, Areas, and Structures

- Embrace the “digital twin” concept to give a better picture and overall situational awareness to incident commanders
- Both personnel and vehicles’ models utilize pointer systems to include their current heading and possibly provide the commander with an idea of where they are facing in real time
- Structures and areas of interest can be seen by those making decisions with the usage of accurate models from publicly provided data that is accurate and up-to-date

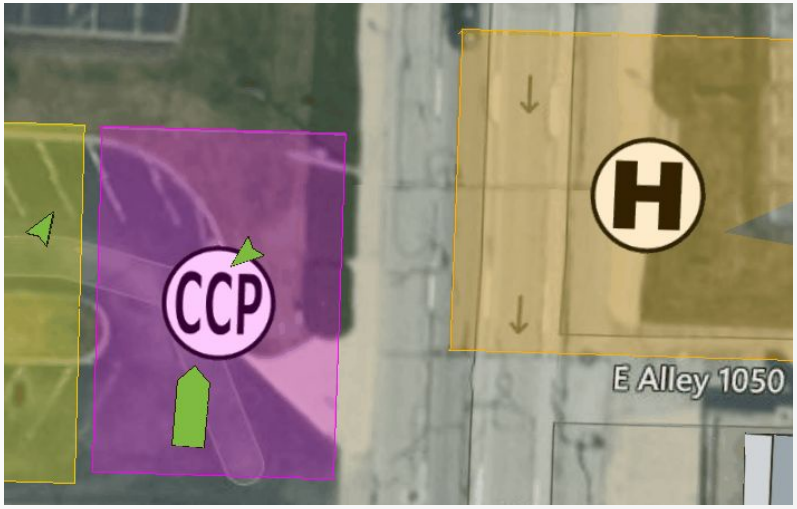
THE FEATURES



Standardized Symbology and Iconography

- Some incidents require a larger hierarchy of leadership and organizations across multiple jurisdictions
- Using a standardized and accepted icon library to rely on for symbols can provide a shared mental model that is accepted and understood by all who interface with this system
- This concept was taken from the military's use of standard symbols when planning and viewing geographical maneuvers, especially in an international effort

THE FEATURES

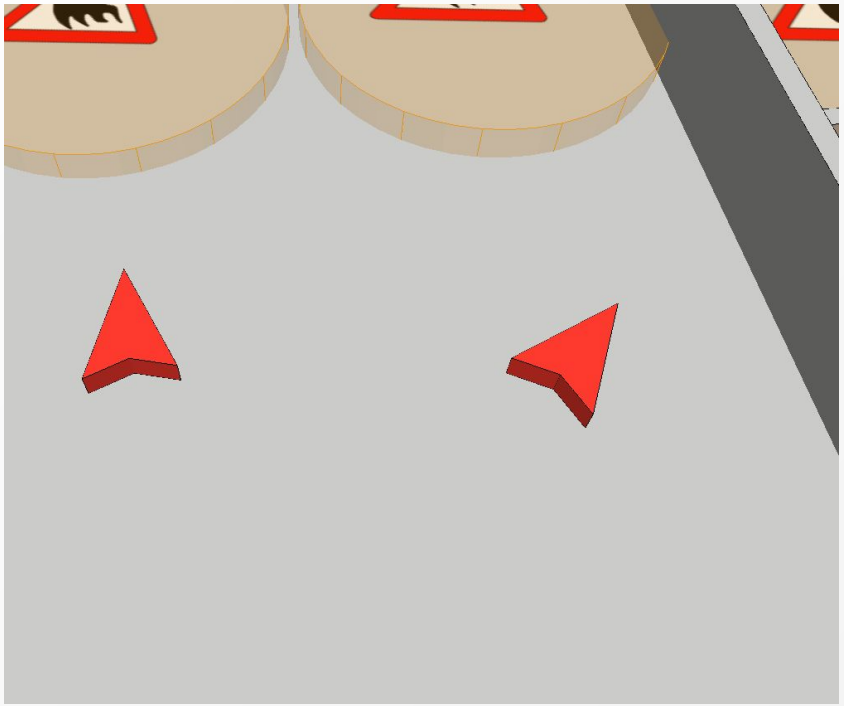


Operator Creation of Areas and Graphics

- Giving operators the ability to create areas and graphics on the fly can provide them with easily setting up areas for staging, breaching, or other incident specific collection points

- These graphics can then be customized per their function and be assigned to a specific organization or resource

THE FEATURES



Individual Resource Details & Information

- Condensed bites of data from resources can be fed to the incident commander to help make decisions
- This data can come in the form of biometrics, sensors, and even live streaming video of what the resource is seeing
- The details window can also provide some means of communication with the commander, whether through chat messages or calling the resource directly
- From this window, the operator can understand the resource's situation and base future actions off what is going on

THE FEATURES

Incoming Alerts and Notifications

- Feeding the incident commander alerts and notifications can help them direct their attention to things that matter
- Simply clicking on these notifications or alerts will give the commander instant access to the resource or item that needs attention
- This functionality will be crucial to commanders who are passively viewing an incident and will need notified of important updates as they come in

CHECK IT OUT!

The prototype is publicly available @
https://h561project1.netlify.app

Recommend viewing on a
desktop or laptop computer and with
Google Chrome or Microsoft Edge

04

RECOMMENDATIONS

As the team started to finish the last project deliverables, we have developed some final recommendations based on information discovered throughout the project

Future product feature requirements and recommendations

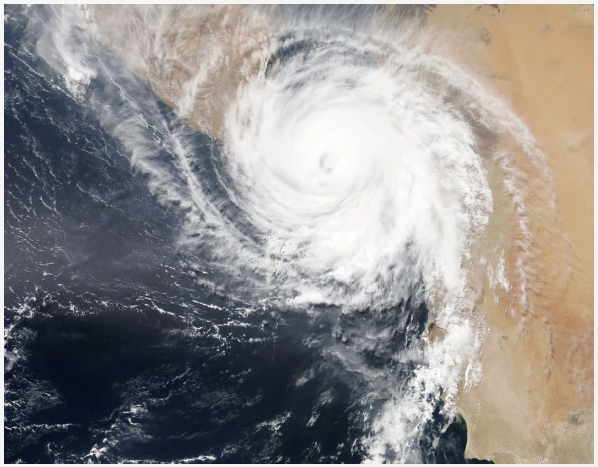
- Visually display a **3D map** of a common operating picture to demonstrate the distribution of threats, field workers, resources, and civilians.
  - This can include using the **X, Y, and Z-axis** in order to provide the operators with situational awareness of the incident

- Provide details about particular **resources**, such as individual **units**, **vehicles**, and even air assets like **helicopters** or **drones**

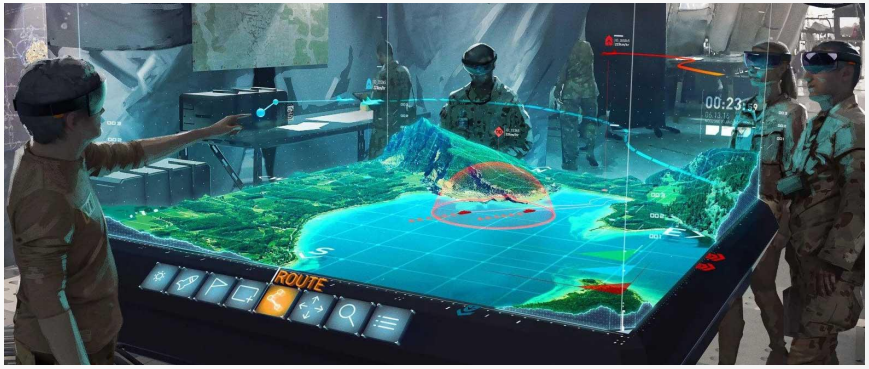
- If available, **live streaming video** attached to a unit can help the incident commanders place themselves at the scene

Future product feature requirements and recommendations

- Reflect updates in **real-time** from data gathered at the incident
- Provide the ability to visually show **thermal mapping**
- Display **weather data**
- Provide **indoor-location data**
  - Identify where resources and sensors are located
  - Identify dangerous areas or threats
- Enable **remote collaboration**
  - Multiple users can collaborate in the same environment without needing to be in the same room
  - Users must have the ability to see exactly what another user is seeing from their perspective to facilitate a **common operating picture**



Future product feature requirements and recommendations



- Support users in **mapping out plans** before executing
  - Placing staging areas, barricades, and tasks forces
  - Allow multiple users to collaborate on the same plan
  - Promote map drawing capabilities with lines, graphics, and simple polygons
- Provide **direct messaging** and **group messaging** to prevent overloading audio-based communications such as radios
- Support **benchmarking** during operation execution
  - **Visually signify** completed and pending benchmarks to help maintain a clutter-free, simple, and easy to read interface
  - **Filtering views** may be necessary to achieve this, so all data isn't visible at one time

THANKS FOR LISTENING!