Human Computer Interaction Graduate Program

Emergency Response Design System

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Meet the Team

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Mission Statement

Create an augmented reality design system that assists both Incident Command and First Responders in successful, more efficient emergency scenario resolution.

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Create an **augmented reality design system** that assists both Incident Command and First Responders in successful, more efficient emergency scenario resolution.

Augmented Reality Design System

We're designing a set of symbols that can be used on any Augmented Reality product (ex: Microsoft Hololens, Magic Leap, Oculus, etc.).

Our system includes patterns for both projected augmented reality and head-worn displays.

Mission Statement

Create an augmented reality design system that assists both **Incident Command and First Responders** in successful, more efficient emergency scenario resolution.

Incident Command and First Responders

Incident Command is a group of agencies working together to solve an emergency scenario. It's usually composed of higher-ranking non-field agents located off-site that are coordinating their first responder resources. Sometimes Incident Commanders can be in the field.

First Responders are the field agents that physically respond to a scenario, like a firefighter to a building fire or water rescue.

Mission Statement

Create an augmented reality design system that assists both Incident Command and First Responders in successful, **more efficient emergency scenario resolution**.

We create efficiency through...

- Creating repeatable patterns and symbols that are easy to learn and effortless to recall

- Producing a system that scales to any scenario and can include any public agency

- Leveraging existing brain trust in NIMS symbology

What's out there

Current Landscape

Current Landscape

Existing work is focused on the first responder's heads up display while in the field.

- C-THRU (in the market)
  - Gear was lightweight
  - Reduced resolution time
  - Was easy to use - no buttons required

- "The Future of Firefighting" (concept)
  - Explores how firefighters might interact with a heads up display
  - Shows potential features needed in the field

C-THRU THERMAL IMAGING CAMERA

PROJECTIONS

SMOKE REDUCES VISIBILITY

REGULAR VISION   C-THRU

Current Landscape

There's not much available in augmented reality for Incident Command use. Partnerships with military branches have been announced, but nothing has been published.

Current incident response coordination systems depend on many people from different teams monitoring multiple screens that run independent software with a range of older-to-newer interfaces.


Indiana EOC

Sample Map Scenarios

Heads Up Display

This design system is built for a heads-up augmented reality system like the Microsoft Hololens, but all major elements can translate to a 2D display, like a computer screen, phone, or tablet.

2D Scenario: Building Fire

This mock map shows a building fire in Indianapolis. The following slide shows the exact same scene, but in 3D.
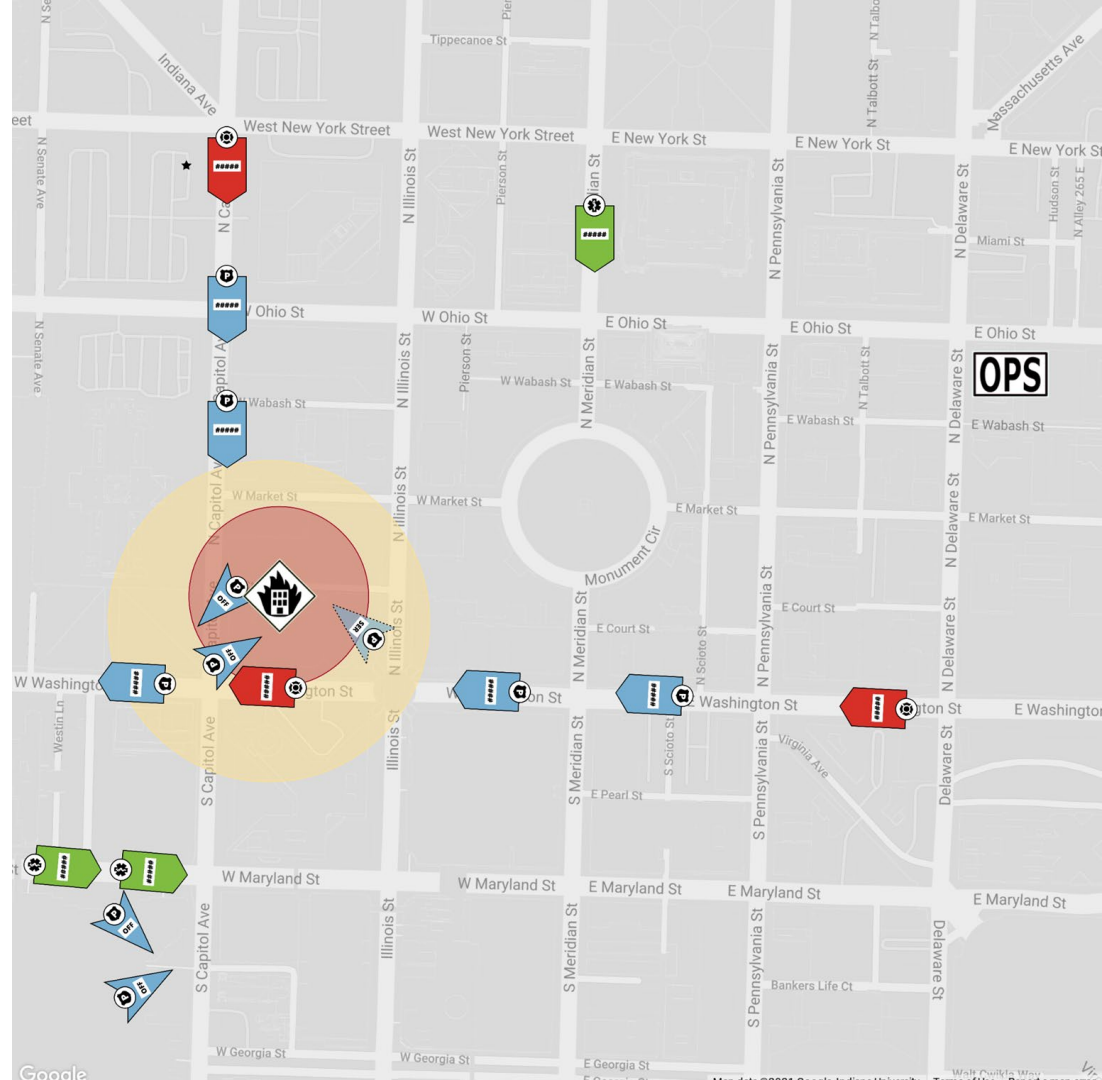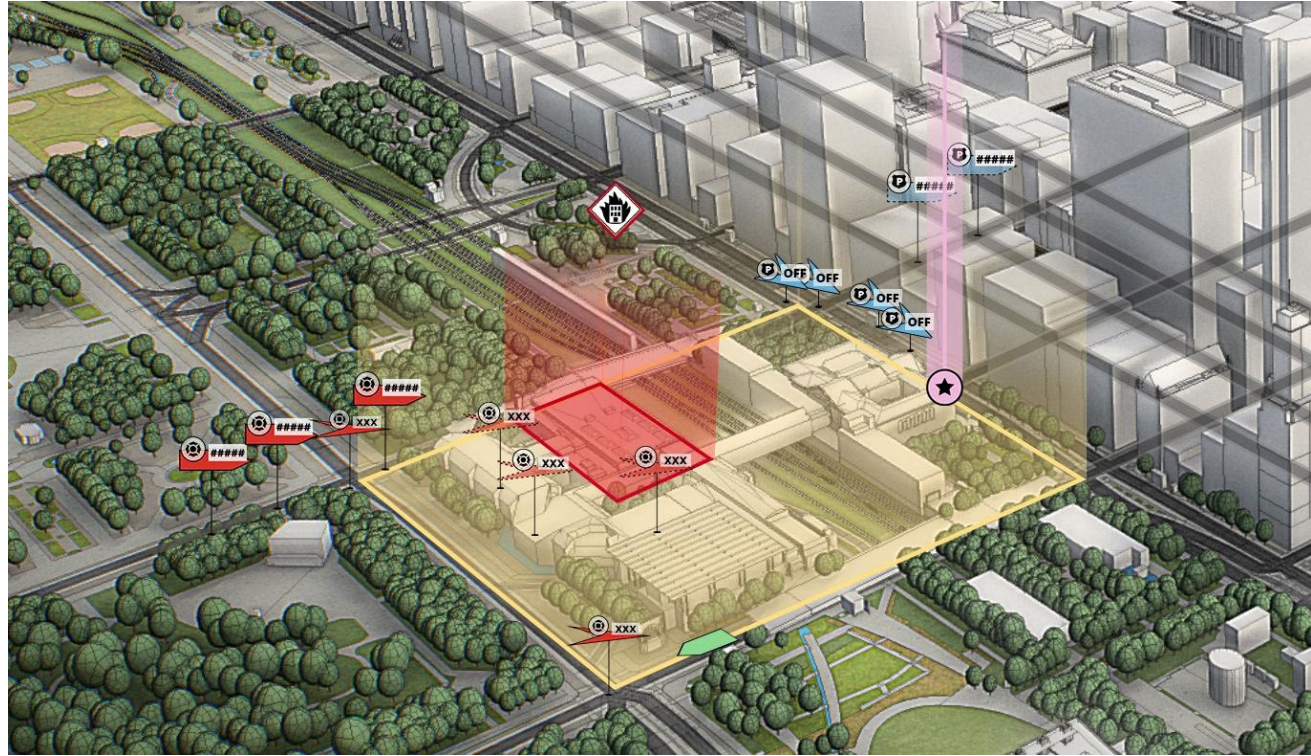
3D Scenario:
Building Fire
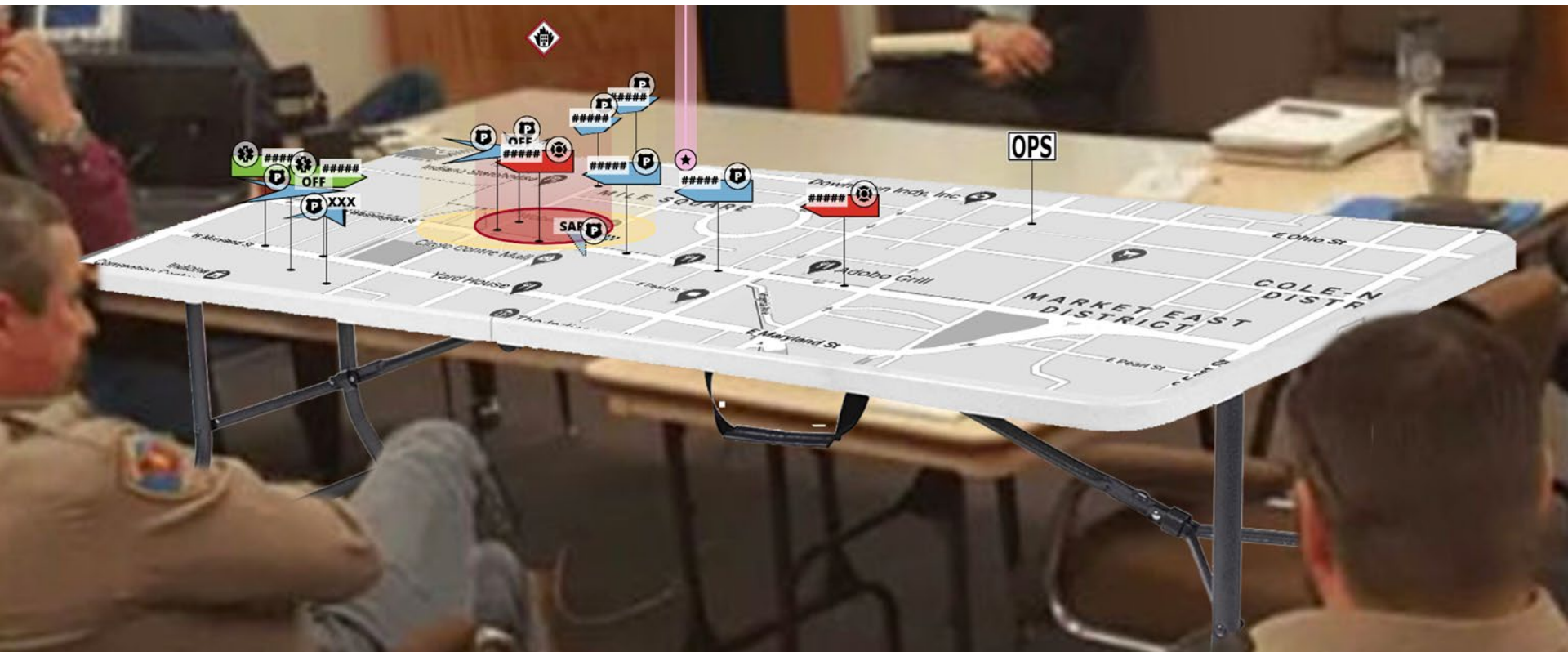
3D Scenario: Terrain Data

This mock map shows how the design system works when we have more terrain data, like buildings, hills, mountains, etc.

Note that streets are always visible at a semi-transparency.

3D Scenario: At a Distance

This mock map shows how the design system works when a scenario is farther away from the user or not in the viewable area.
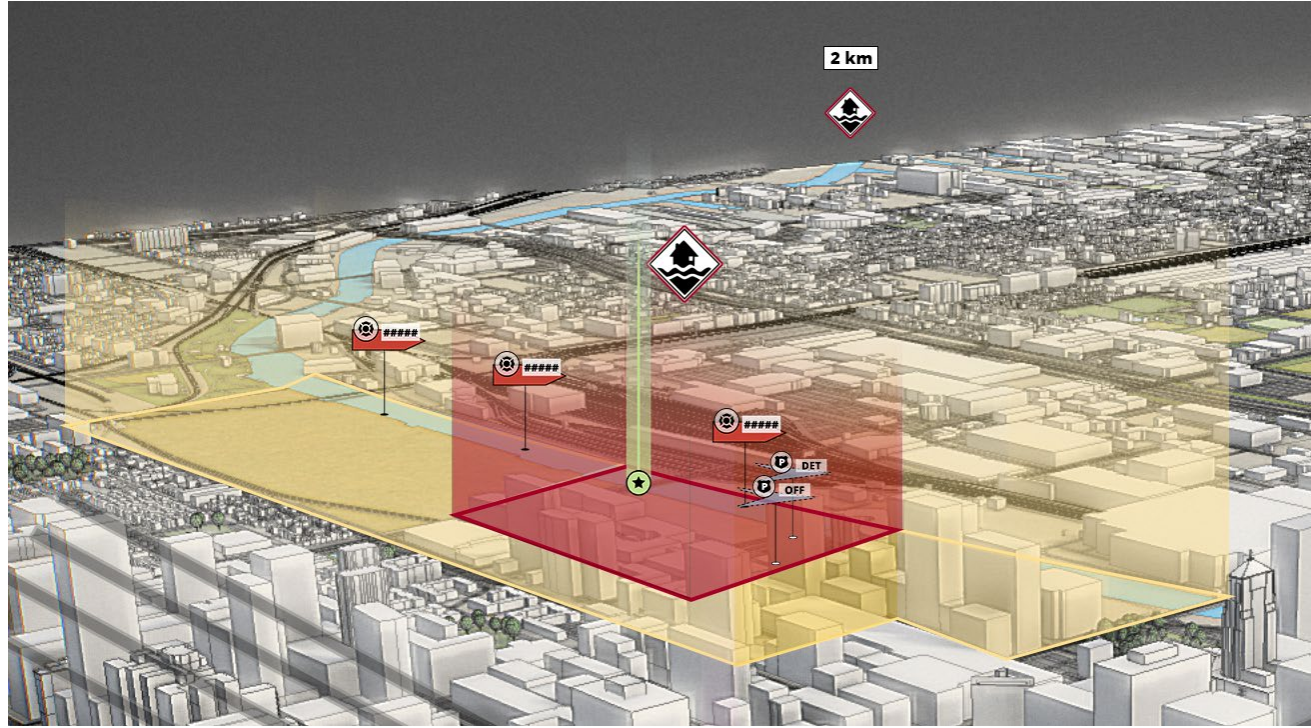
Selecting an Asset: Cards

When you select an asset, an informational card will float in the air.

The kind of information will change depending on what is selected - i.e., a Firefighter or Police officer, or a vehicle vs. a group.
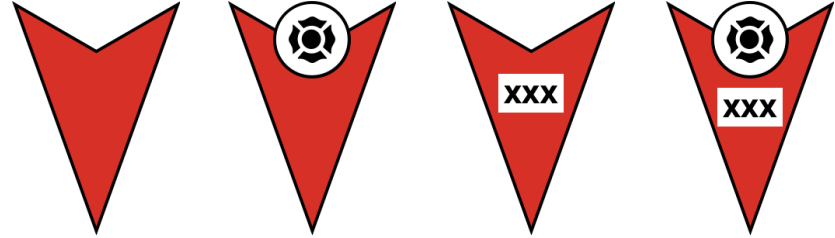

Options for communication or live feeds

Symbols & Patterns

Individual Personnel

This symbols stands for a single member of personnel. The arrow points in the direction the person is traveling.

The icon and color changes according on the team affiliation.

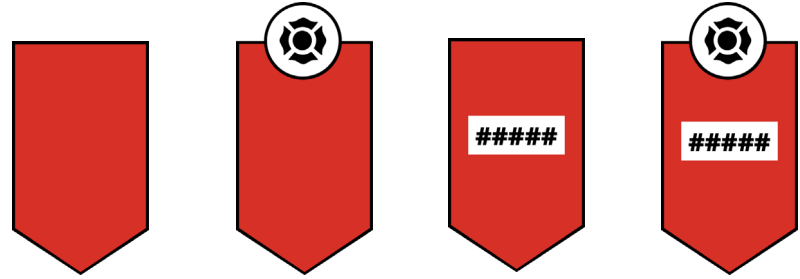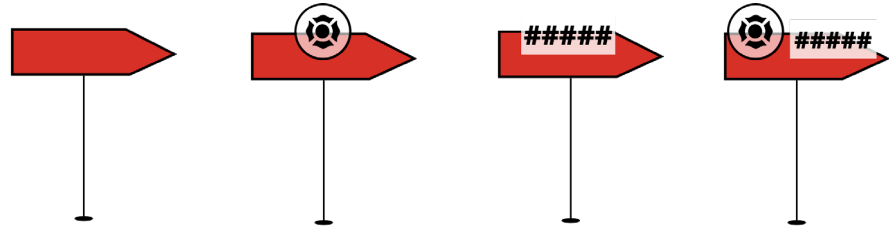XXX is a placeholder for the person's rank.
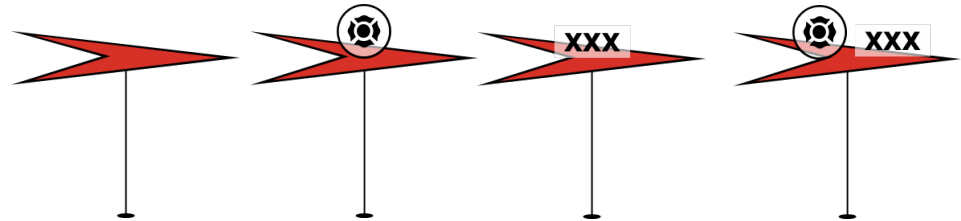
Vehicles & Apparatus

This symbols stands for a vehicle or apparatus. The arrow points in the direction the vehicle is traveling.

The icon and color changes according on the team affiliation.

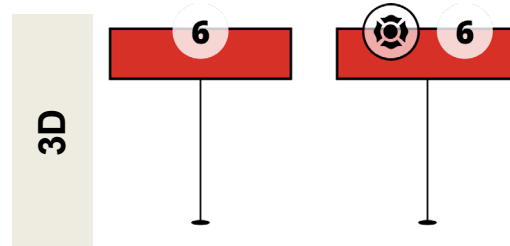##### is a placeholder for the vehicle's identification code.
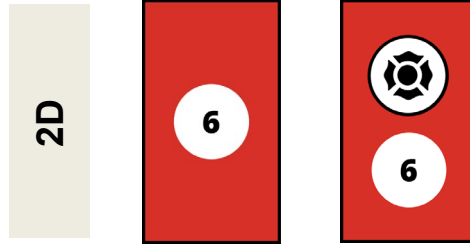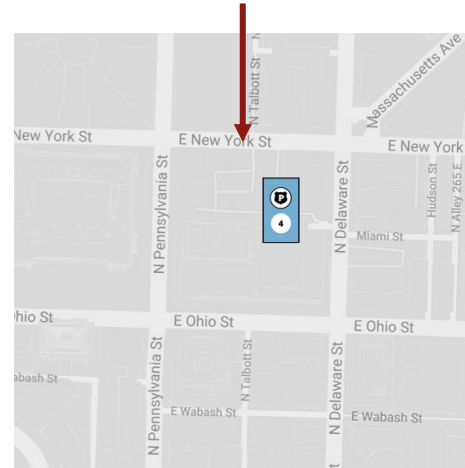

2D

3D

General Groups

This symbols stands for a group of personnel. It should be used when they are not moving in the same, single direction.

The icon and color changes according on the team affiliation.

The number is a placeholder for how many people are in the group.

2D

3D

Zoomed in, can see each individual officer

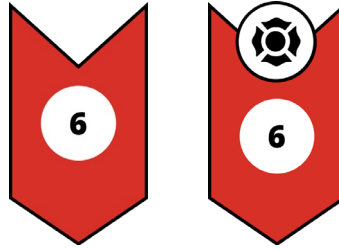Zoomed out, these officers become a general group

Directional Groups

This symbols stands for a group of personnel. It should be used when they are not moving in the same, single direction.
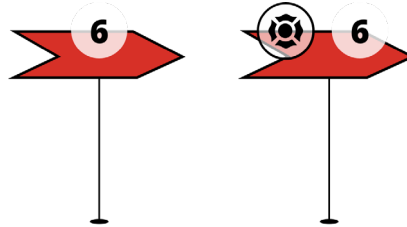
The icon and color changes according on the team affiliation.

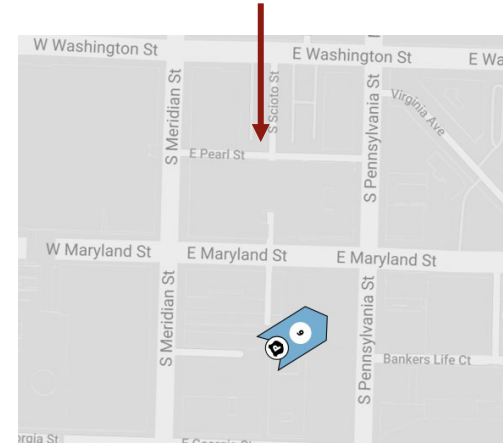The number is a placeholder for how many people are in the group.

2D

3D

Zoomed in, can see each individual officer, all moving in one direction

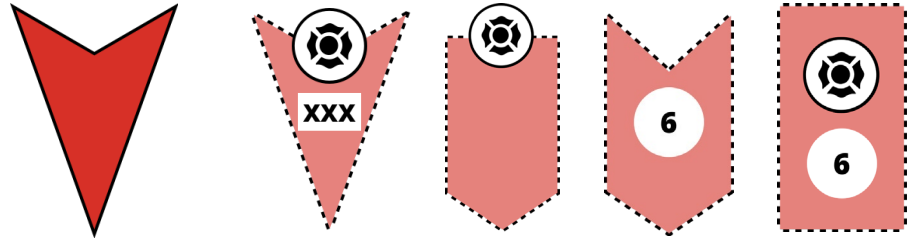Zoomed out, these officers become a directional group
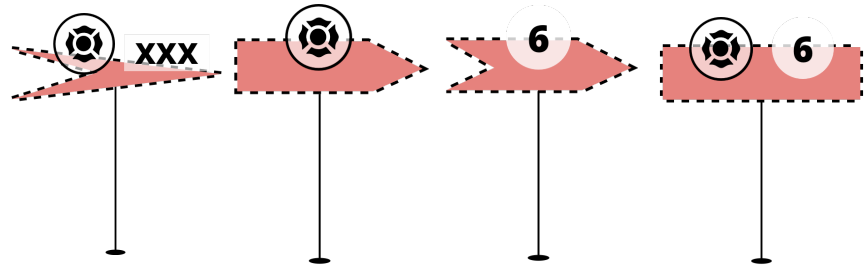
Occlusion, Elevation and Alerts

Occlusion

When the symbols are blocked by walls, buildings, the ground (if underground), or any other obstruction, they change in a few fundamental ways.

The fill color goes to 60% transparency.

The solid border turns into a dotted line.

2D Occlusion

An asset is occluded in 2D based on their elevation in relation to what is defined as surface level.

If you are looking at an above-ground scene, anyone underground would be occluded.

Conversely, if you're looking at an underground scene, anyone above ground, or further below ground than what is the user-relative surface level would be occluded.
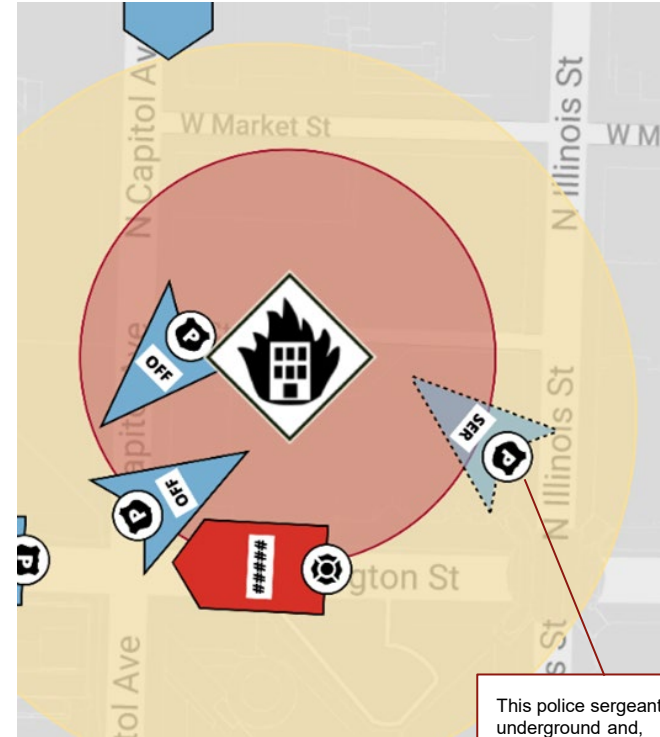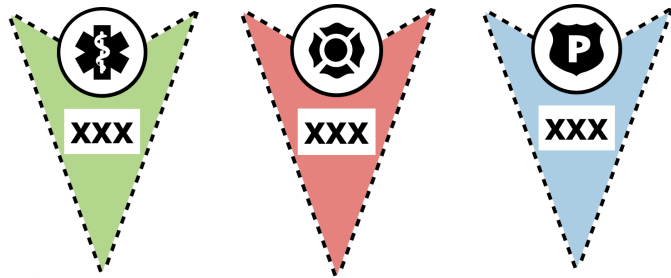
This police sergeant is underground and, therefore, occluded

3D Occlusion

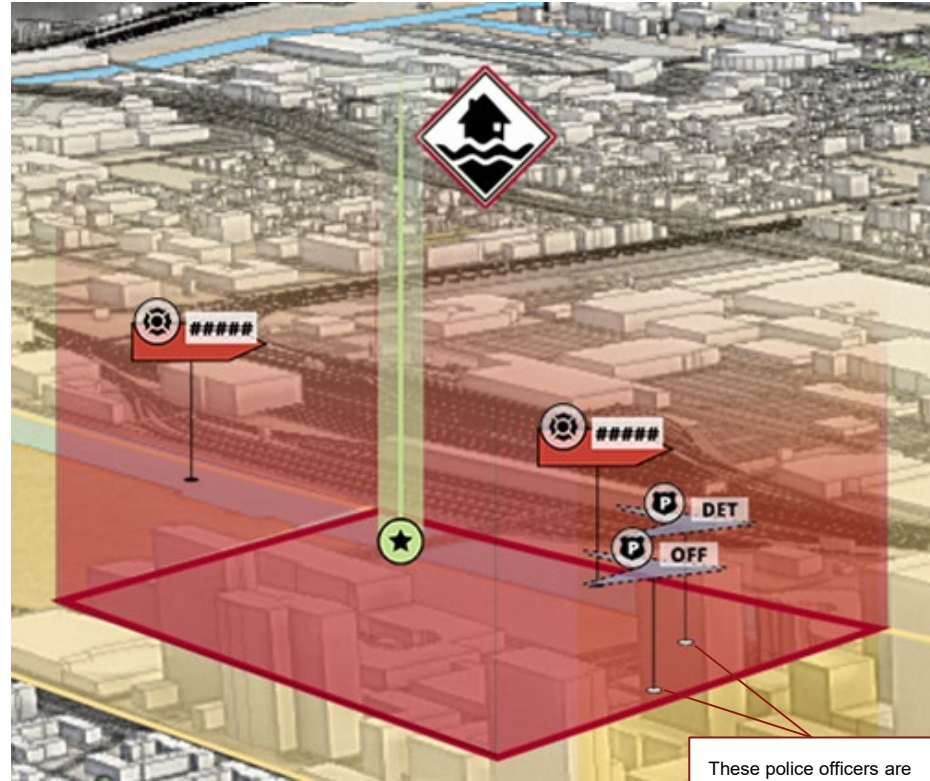With 3D, we have an extra dimension to keep in mind relative to occlusion– elevation.

The different foots below show how you can tell if an assets is inside a building or on the user's relative surface level.

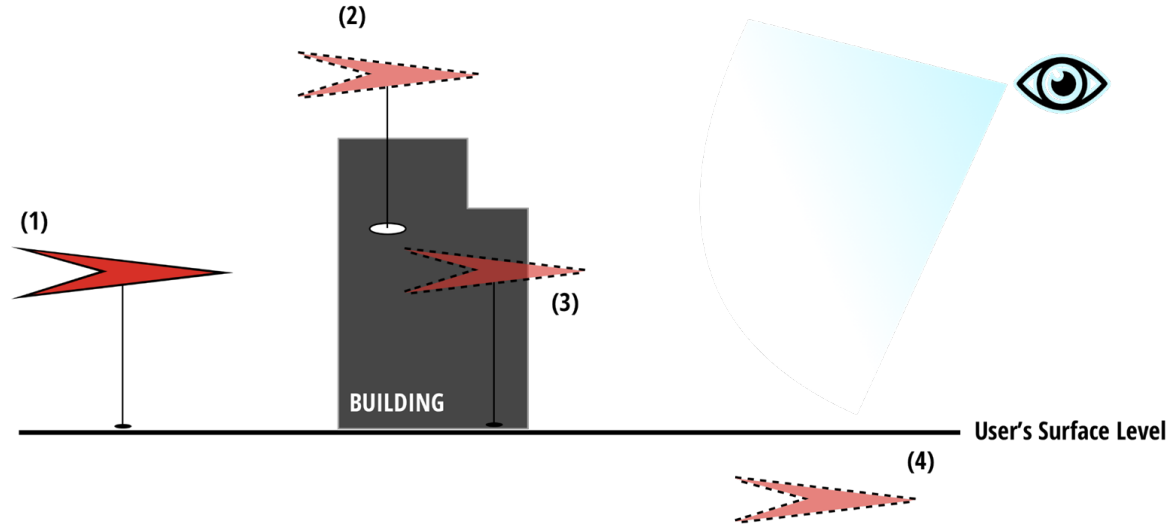

At the user's relative surface level

Elevated

These police officers are on different floors inside this building. Note the difference in the foot, and the dashed line and translucency that indicates occlusion.

Example 1

(1) Firefighter at the user's relative surface level

(2) Firefighter elevated and occluded by being inside the building

(3) Firefighter at the user's relative surface level, but occluded by the building

(4) Firefighter below the user's relative surface level and occluded by the surface

Example 2

(1) Firefighter at the user's relative surface level

(2) Firefighter elevated and occluded by being inside of a tunnel

(3) Firefighter at the user's relative surface level, but occluded by the train car

(4) Firefighter above the user's relative surface level and occluded by the the ground

(5) Firefighter below the user's relative surface level and occluded by the surface level
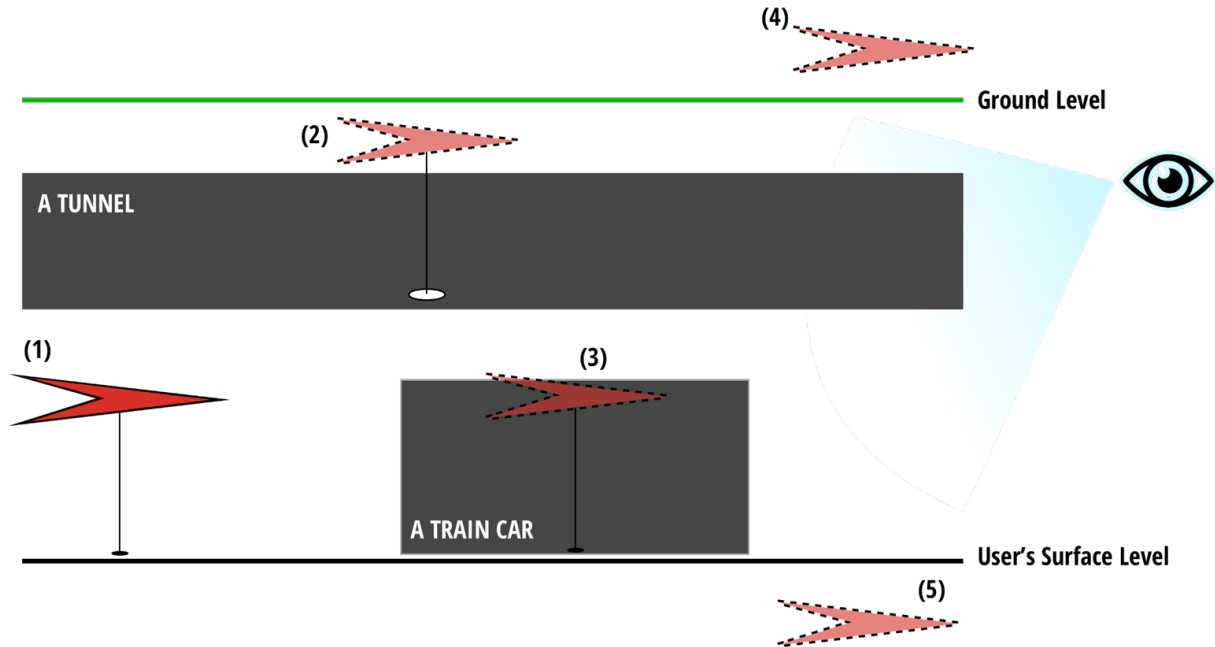
Alerts

Alerts are applied to people, groups, or vehicles when something

There are two levels of alerts:

Warning

Critical Danger

While the basic color and pattern is established, animation/kinetic design needs to be defined as well as interaction with occluded symbols.

NORMAL STATUS - NO ALERTS

A firefighter

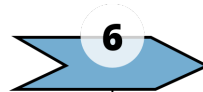A directional group of police

WARNING ALERT

A firefighter with a warning alert

A directional group of police with a warning alert

CRITICAL ALERT

A firefighter with a critical alert

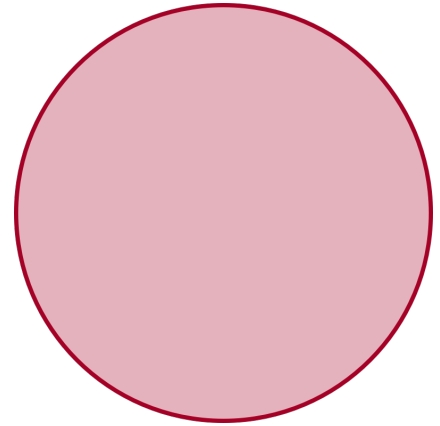A directional group of police with a critical alert
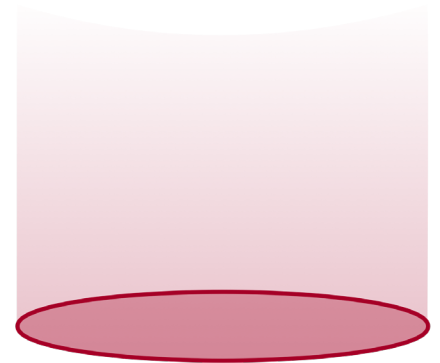
Zones and Beacons

Zones

Zones can take any shape, but they follow the same look and feel– a solid color border and a translucent fill color.

For 3D zones, the border walls extend upwards with a gradient that fades from 25% at the bottom to 0% transparency at the top.
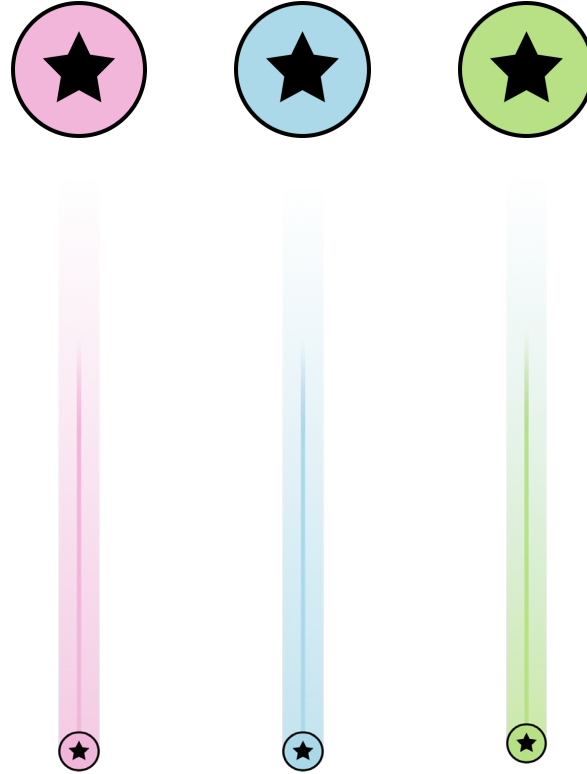
Warm Zone

Hot Zone

Beacons

Beacons can be used to indicate positions or points of interest.

The colors used are meant to contrast with the other colors of the system so that they always stand out.

Future design work: These beacons probably need labels and unique information cards. There are likely two states - labeled and unlabeled.

The System

Colors & Icons

Color Palette

Colors are divided into four categories:

Teams

Zones

Beacons

Alerts

Teams

FIRE

#D73027

POLICE

#74ADD1

EMS

#7FBC41

MILITARY

#DFC27D

Zones

WARM ZONE

#FEE090

HOT ZONE

#A50026

Beacons

ROSE BEACON

#F1B6DA

SKY BEACON

#ABD9E9

GRASS BEACON

#B8E186

Alerts

ALERT

#FDAE61

Icons

For now, we have three icons that represent the Fire department, Police department, and Emergency Medical Services.

The system is built to scale, so we will be able to add icons as needed– like military branches.
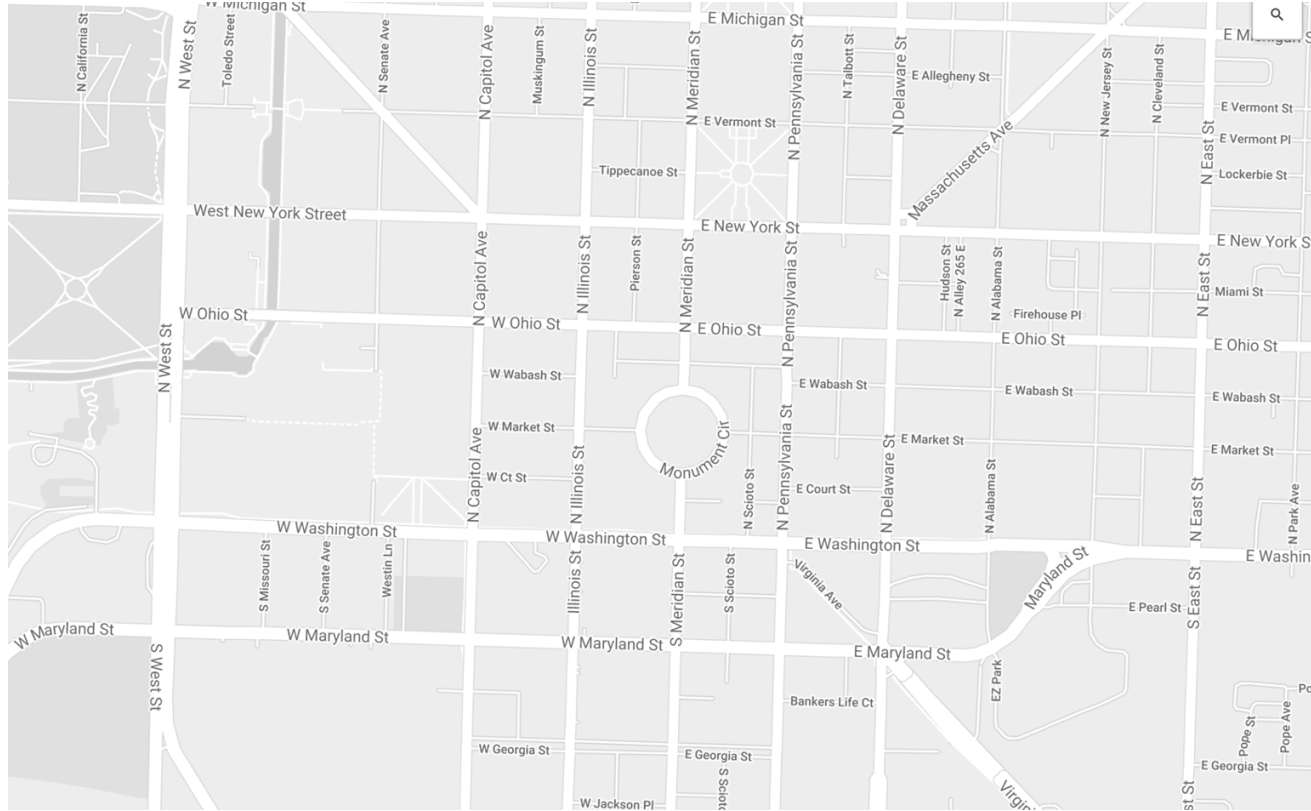
FIRE

POLICE

EMS

Maps

Google Maps can be styled to fit the use case (example).

If a flat map is being pinned to a surface, we recommend a grayscale map so that it doesn't interfere with the colors present in the symbols.
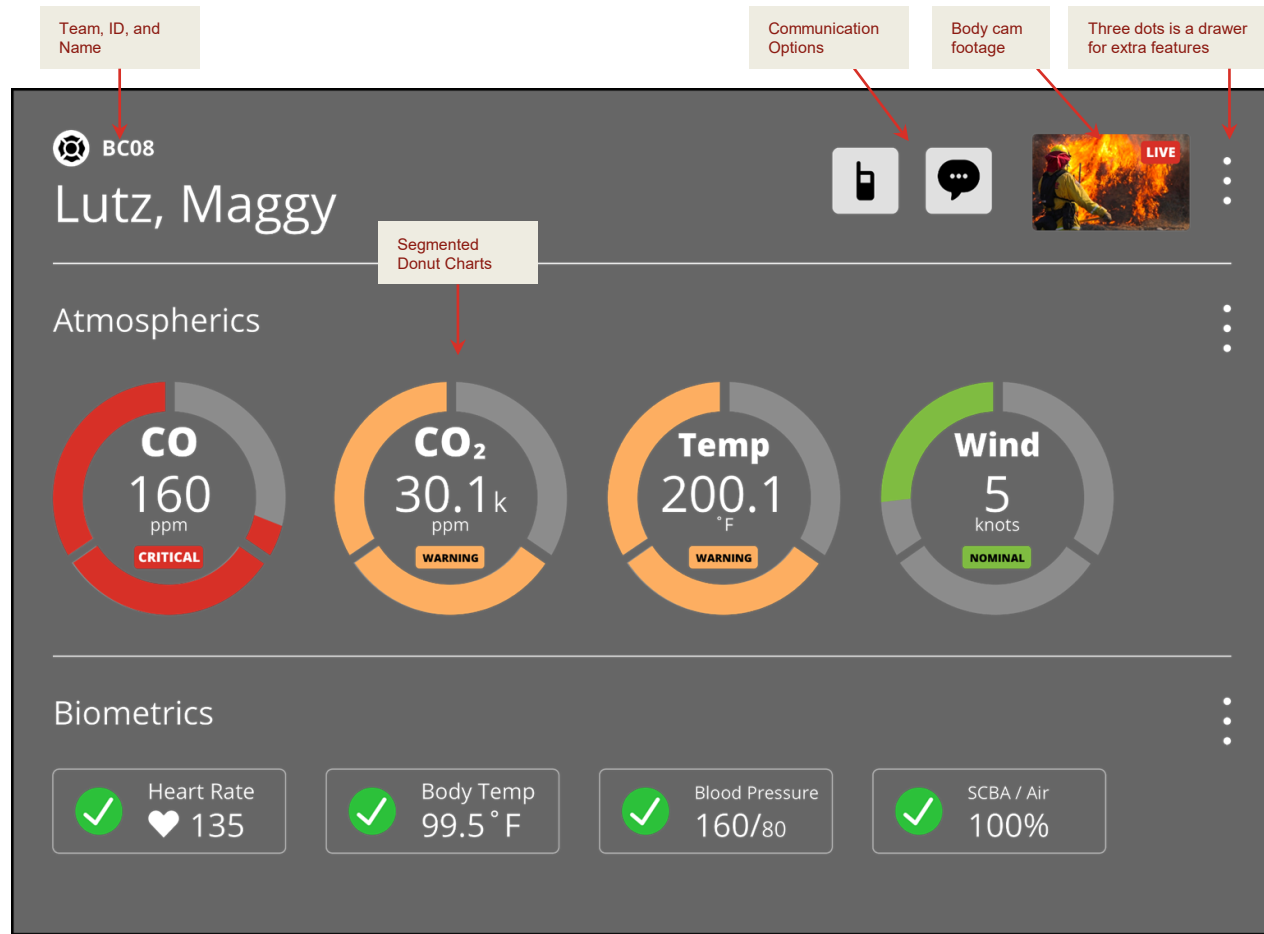
Sample Cards and HUD

Sample Card

Here an example a card displaying important information for an single individual.

The donut charts have three sections. The left quadrant fills first as values are nominal. The middle quadrant fills next as values approach warnings. The right quadrant fills last as the values are in a critical stage.

This design is not final. Features, information architecture and interaction design has yet to be defined.

Older explorations can be found in Figma, but they don't have the same typography or color standards as this system.

Team, ID, and Name

Communication Options

Body cam footage

Three dots is a drawer for extra features

Segmented Donut Charts

BC08

Lutz, Maggy

LIVE

Atmospherics

CO 160 ppm — CRITICAL

CO₂ 30.1k ppm — WARNING

Temp 200.1 °F — WARNING

Wind 5 knots — NOMINAL

Biometrics

Heart Rate ❤ 135

Body Temp 99.5°F

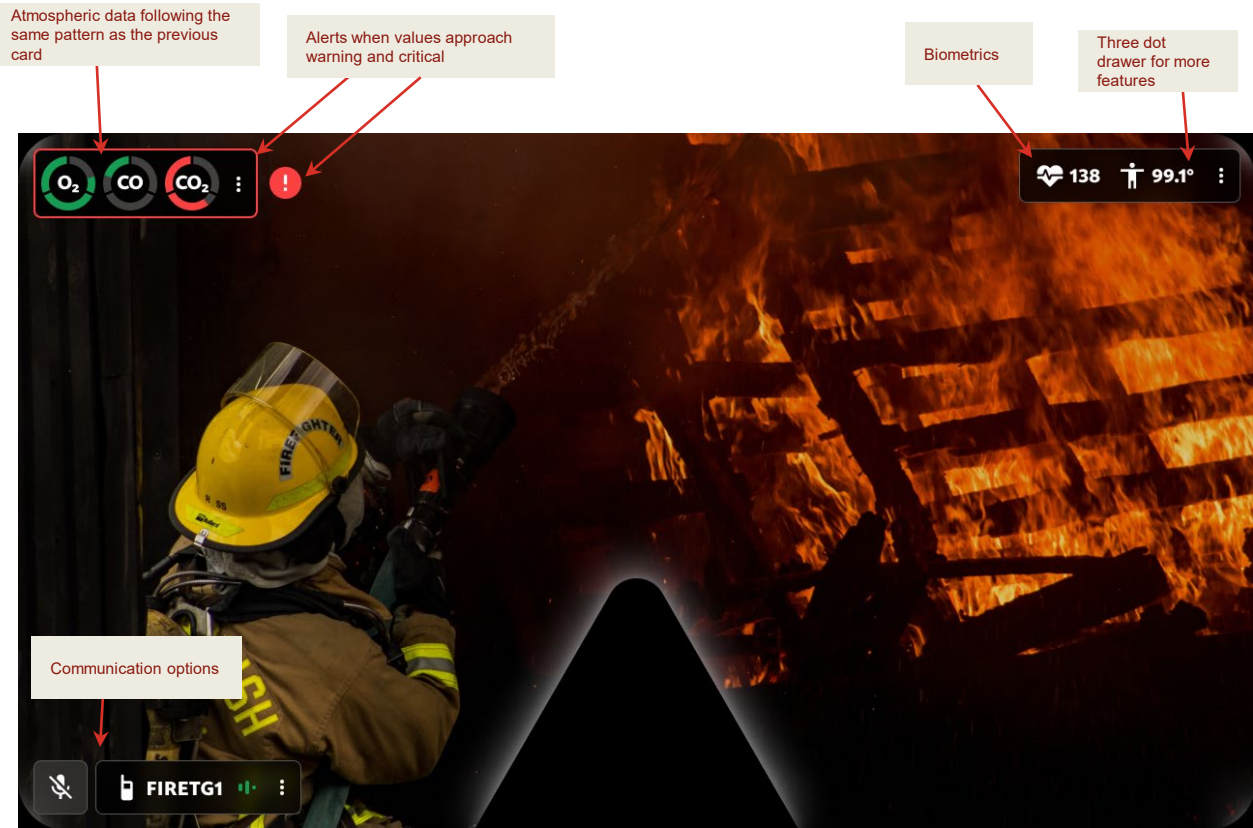Blood Pressure 160/80

SCBA / Air 100%

Sample HUD

This is an example of a fire fighter's HUD.

The design is not final. Features and interactions still need to be defined.

Note that we recommend using translucent black backgrounds for in-the-field HUD to maximize legibility against all environments.

Older explorations can be found in Figma, but they don't have the same typography or color standards as this system.

Atmospheric data following the same pattern as the previous card

Alerts when values approach warning and critical

Biometrics

Three dot drawer for more features

Communication options

The System

Typography

Typography

Primary labels on symbols use Open Sans Condensed Extra Bold.

Normal information that's not a headline or alert in cards should utilize the Regular weight.

Font size is relative depending on the distance to the user. Use these guidelines for reference.

Open Sans Extra Bold

AaBbCcDdEeFfGgHhIiJjKkLlMmN nOoPpQqRrSsTtUuVvWwXxYyZz 1234567890!@#$%^&*()-+?<>[]{}

Open Sans Regular

AaBbCcDdEeFfGgHhIiJjKkLlMmNn OoPpQqRrSsTtUuVvWwXxYyZz 1234567890!@#$%^&*()-+?<>[]{}

Industry Experts

Feedback

Feedback Received

We've developed this system in conjunction with these industry experts:

- **Battalion Chief Dale Rolfson**, IT Manager, Indianapolis Fire Department
- **Tom Arkins**, Chief of IT and Informatics, Indianapolis EMS
- **Chief Jason Moore**, Bloomington Fire Department
- **Dr. David Wild**, Director of the Crisis Technologies Innovation Lab at IU Bloomington

With their help we've implemented several key features:

- Added vehicle/apparatus ID display on vehicle symbols
- Identified important zones
- Solidified occlusion, elevation, and related terminology
- Validated every symbol, color, and feature

Software and Files

Resources

Software and Files

[Design Files and Resources →](#)

This design system was made in [Sketch](#) and this application requires Mac OS. Educational discounts are available.

Older explorations of card and HUD elements are available [in Figma](#).

Future Considerations

Next Steps

Next Steps

While many aspects of this system have been tackled, there is more that the next design team needs to explore below.

1) Development and testing of this system
2) GUI and Information Architecture of the application for inputs and outputs
3) Designing preferences for different teams
4) Possibly enhancing beacons with labels, notes, and unique information cards
5) Animation/kinetic design of selections and alerts
6) Exploring additional uses for military branches (colors, icons, etc.)
7) Flesh out the card system (how can you expand, collapse, get access to more information, etc.)
8) Exploring how these map symbols may or may not work for the responder's HUD in while in the field
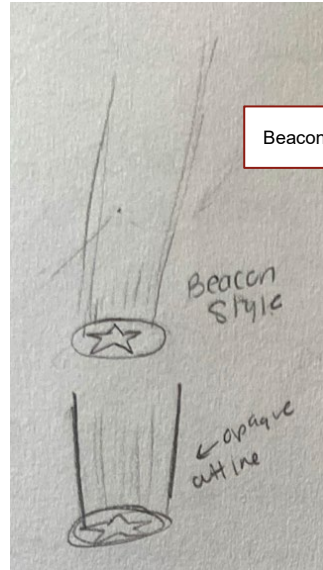
Thank You
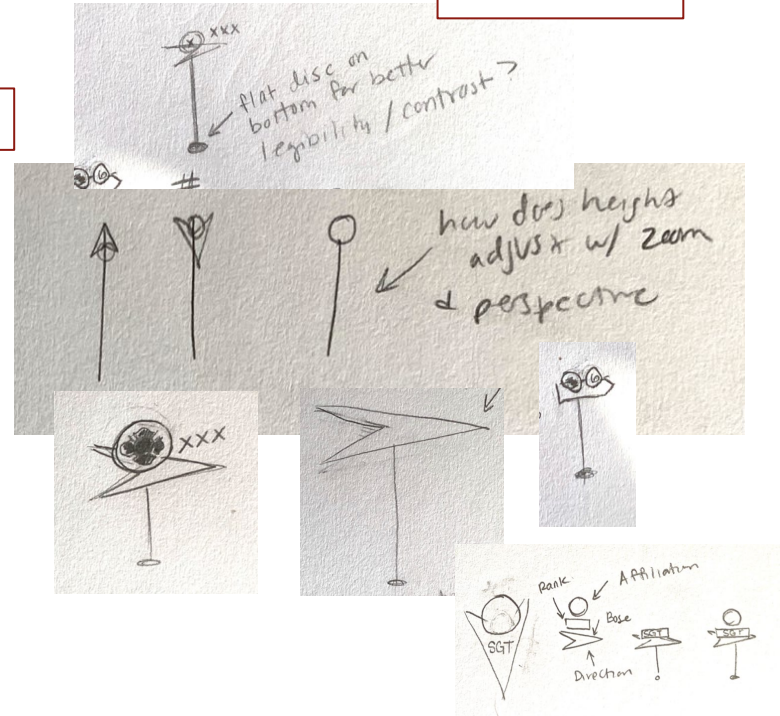
Sketches and Rough Drafts

Appendix

Sketch Appendix

The system didn't start in pretty design files. Check out how some of the work iterated, from pencil sketch to clean lines and vector files.
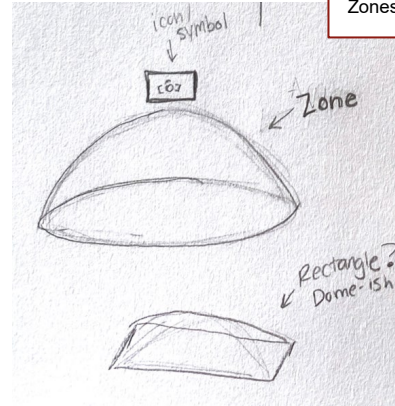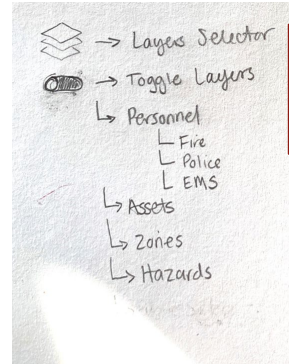

Beacons
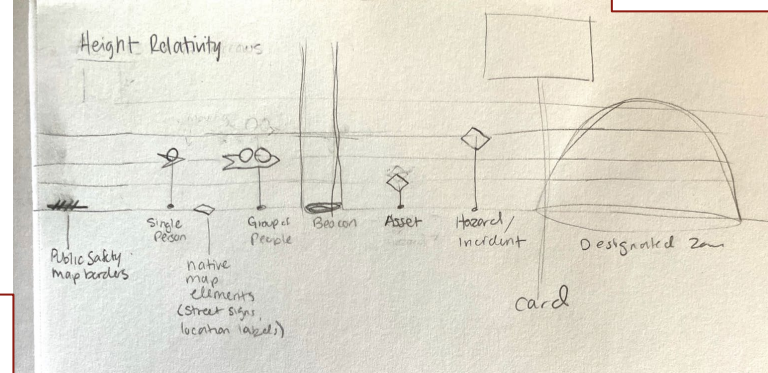
Early Symbol Concepts

Sketch Appendix

The system didn't start in pretty design files. Check out how some of the work iterated, from pencil sketch to clean lines and vector files.

Zones

Height Chart

Map Layers Information Architecture Brainstorm