



PSCR Portfolio Overviews

Pecha Kucha Presentations



DISCLAIMER

Certain commercial entities, equipment, or materials may be identified in this document in order to describe an experimental procedure or concept adequately.

Such identification is not intended to imply recommendation or endorsement by the National Institute of Standards and Technology, nor is it intended to imply that the entities, materials, or equipment are necessarily the best available for the purpose.

***Please note, unless mentioned in reference to a NIST Publication, all information and data presented is preliminary/in-progress and subject to change**

Pecha Kucha Format



OUR OUTREACH

Funding Opportunities

PSCRC not only conducts internal research but also puts substantial resources into promoting the development of these technologies externally through grants, cooperative agreements, and open Innovation Prize Challenges. These efforts give NIST access to experts and innovators from around the world, and greatly expand the number of researchers focused on key public safety communications issues. To date, PSCRC has awarded over \$45M in grants to over 40 recipients, and more is on the way.

Stakeholder Engagement

Effective two-way communication between PSCRC and public safety practitioners is critical to the success of the program. PSCRC regularly hosts events to gather insights and input from this essential community. In 2018, more than 300 first responders participated in PSCRC events, including roundtables and workshops. In addition, PSCRC performs regular outreach via email.

Research Outcomes

Moreover, PSCRC holds an Annual Public Safety Roadband Stakeholder Meeting to share the latest in research outcomes and impacts with the first responder community. In 2018, PSCRC brought over 30 sessions and 40 demonstrations of internal and external projects to more than



500 public safety stakeholders. The filmed sessions and slide presentations, as well as additional PSCRC tools and resources, can be found online at PSCRC.gov.

NIST

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Boulder, CO 80505-1337
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NIST's mission is to promote U.S. innovation by advancing measurement science, standards, and technology to ways that enhance economic security and improve our quality of life.

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www.nist.gov



THIS IS PSCRC

Public Safety Communications Research



06:40

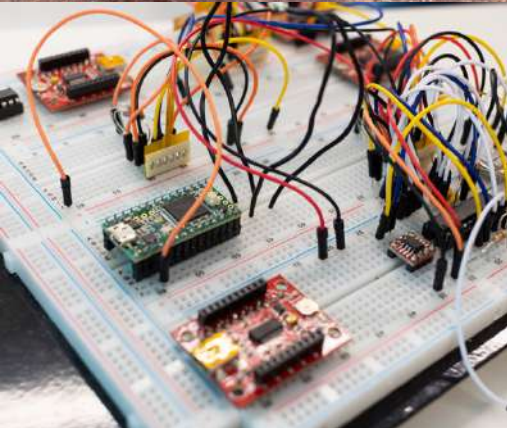
When Timer Ends

Radar >

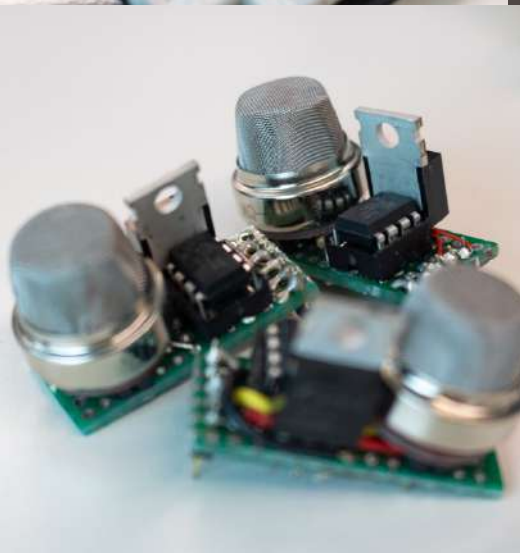
Cancel

Pause





20x20





Attend the sessions,

view the demos!



**ENHANCED
USER INTERFACE
USER EXPERIENCE**



**PSCR MISSION
CRITICAL VOICE**



**PSCR
SECURITY**



**PSCR
ANALYTICS**

LBS

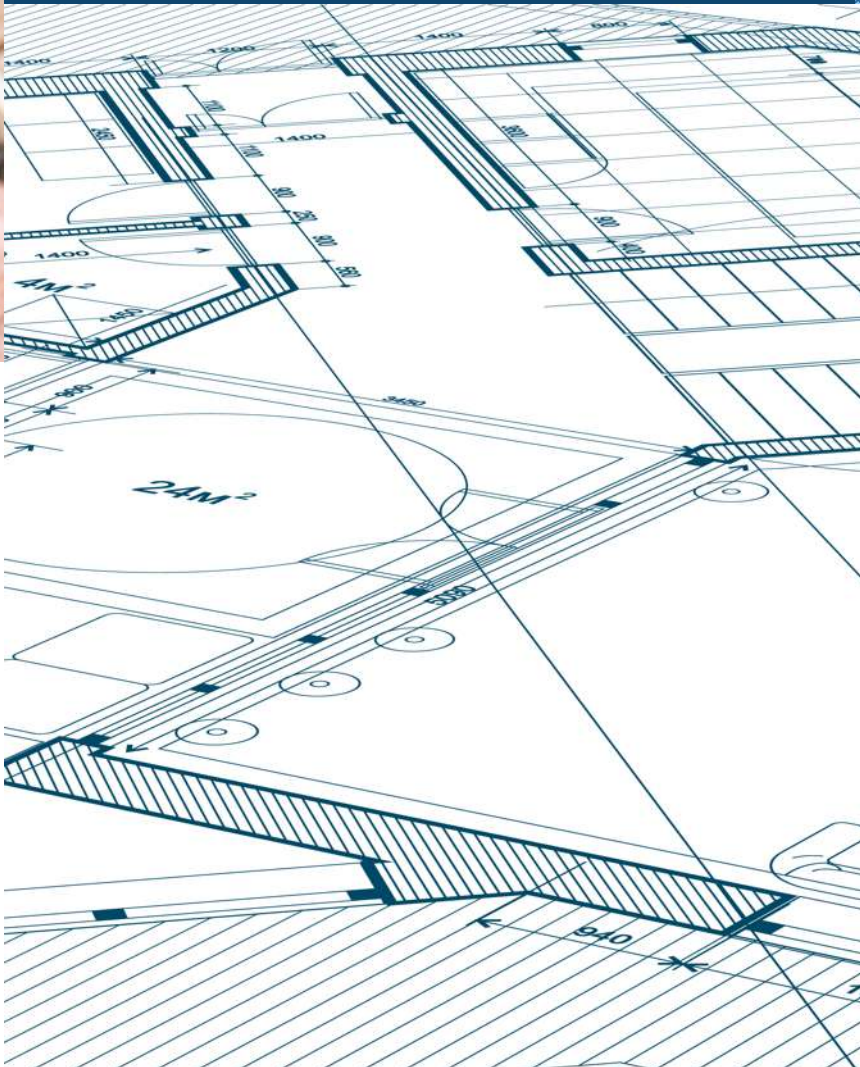


PSCR LOCATION-BASED
SERVICES



**RESILIENT
SYSTEMS**





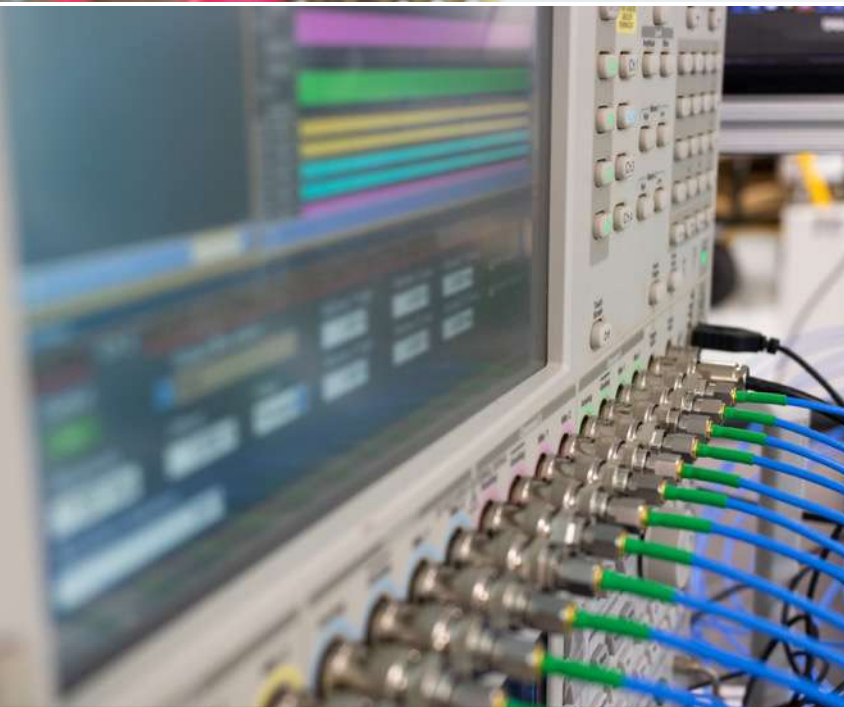
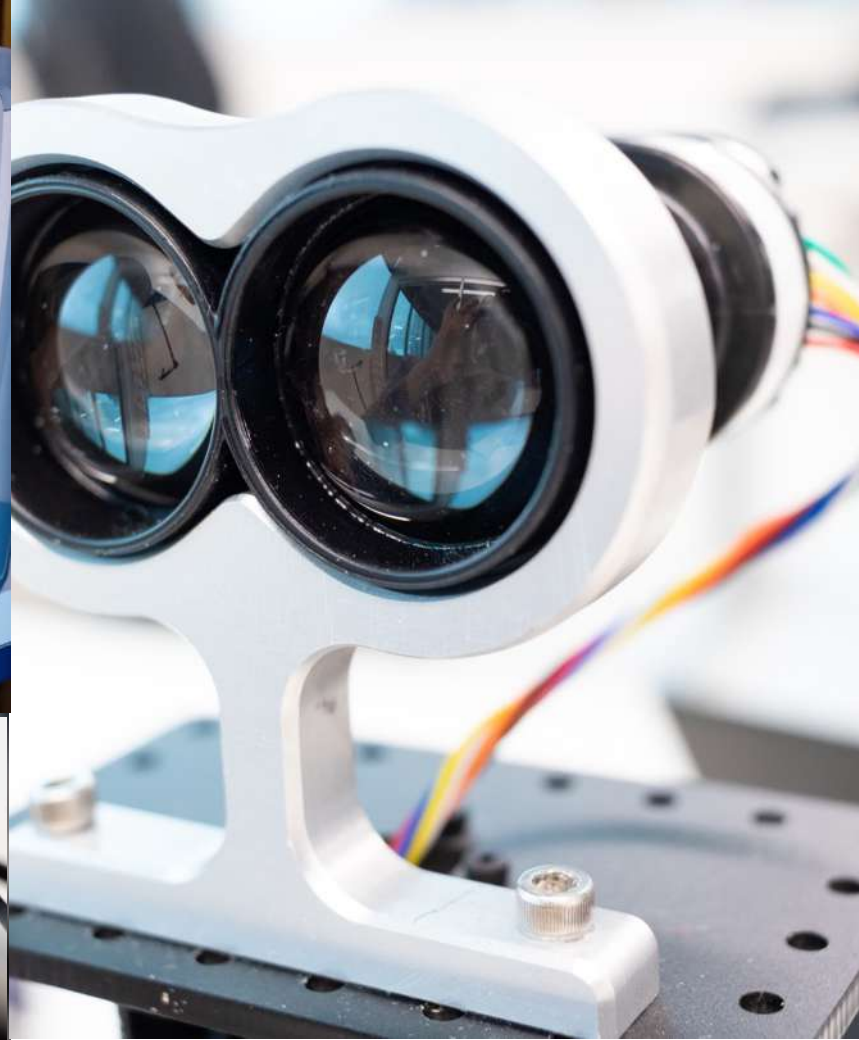
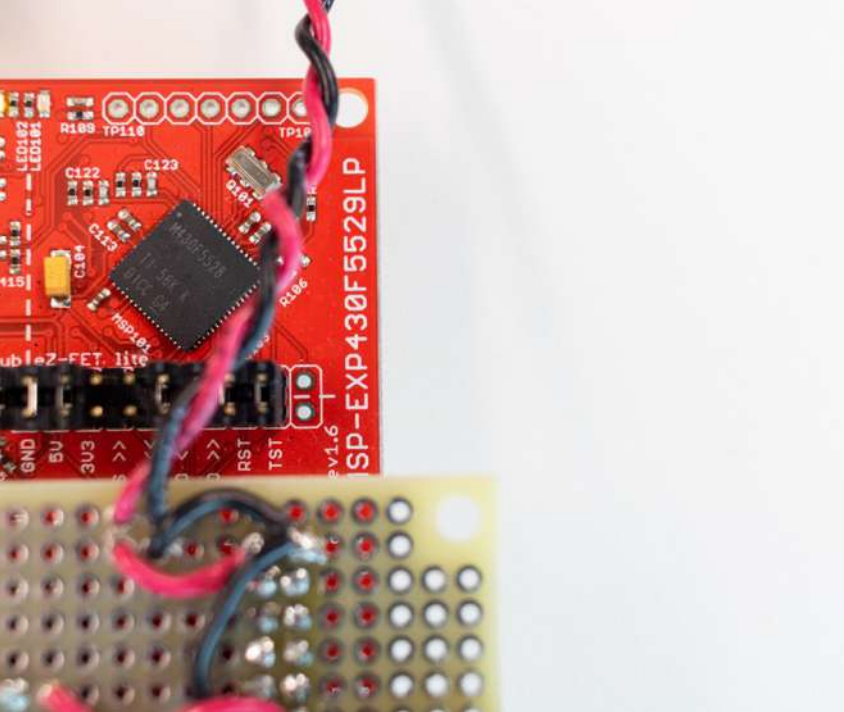
**PUBLIC
SAFETY
INTERNET
OF THINGS**



**HIGHLY MOBILE
DEPLOYED
NETWORKS**







Track Overviews

Mission Critical Voice Overview

Location-Based Services Overview

Public Safety Analytics Overview

User Interface / User Experience Program Overview

Security Overview

Resilient Systems Overview

Search



Benson, Jeb



Coward, Brian

Intern
NIST PSCR

My Messages



Inbox



No messages yet

Find someone to message on
the Attendee List.

Stakeholder Meeting Resource Center

2019 Session Videos **COMING SUMMER 2019**



PSCR Video Gallery - Pulling the Future Forward



**PUBLIC SAFETY
COMMUNICATIONS
PSCR RESEARCH**





Thank You

Next Up

Don

Bradshaw

MCV



Mission Critical Voice

Portfolio Overview

What does it mean to have Mission Critical Voice?

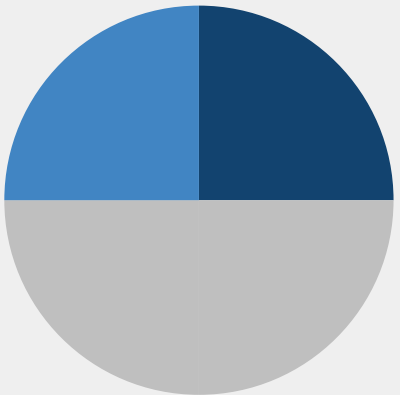




Mission Critical Push to Talk

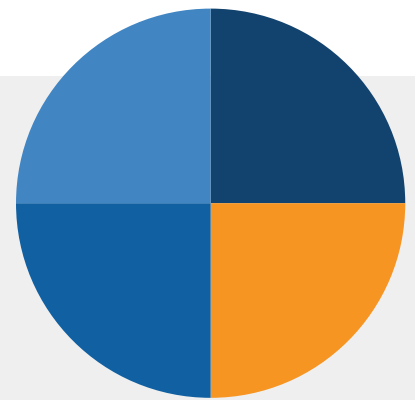


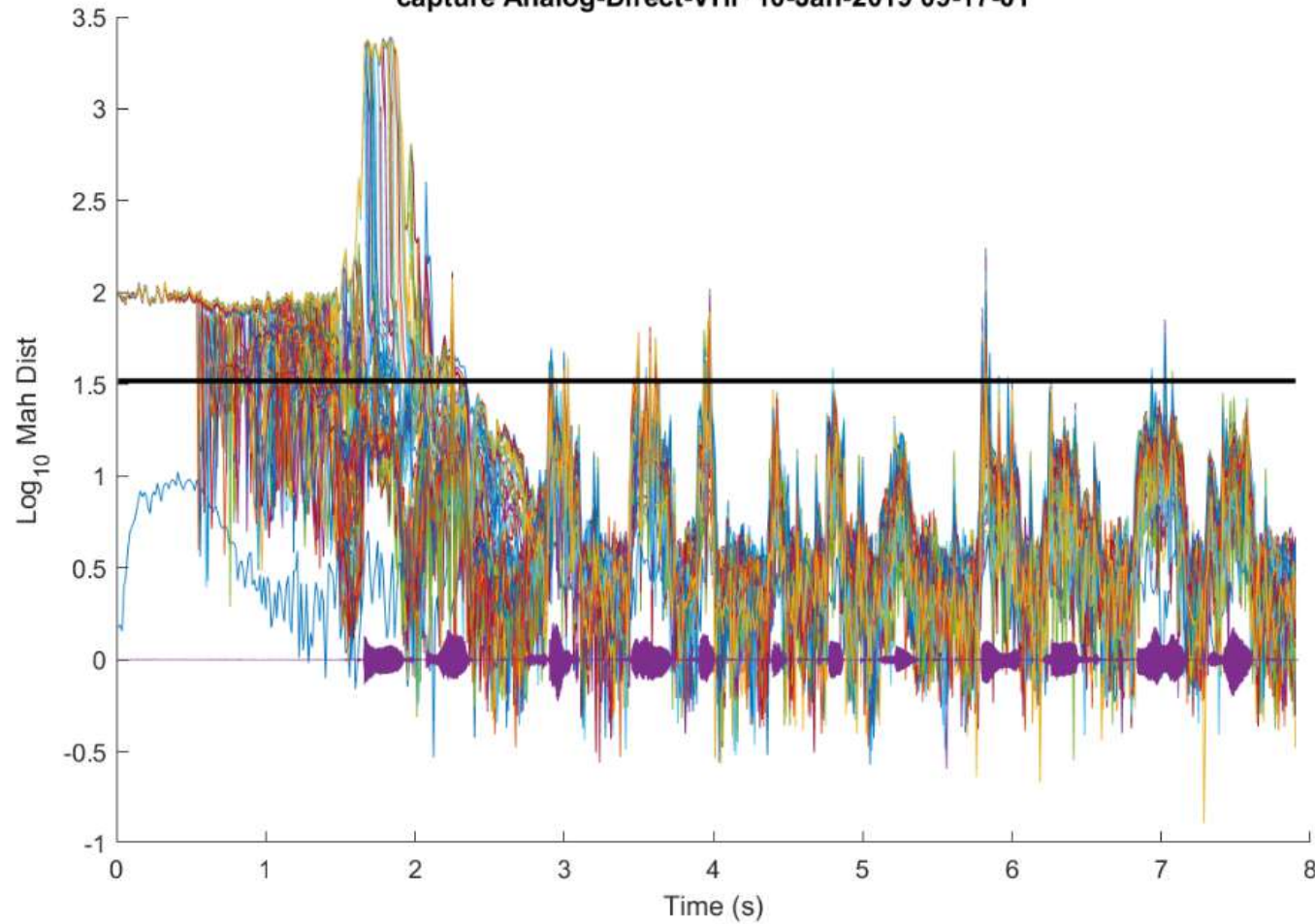
Direct Mode Operations



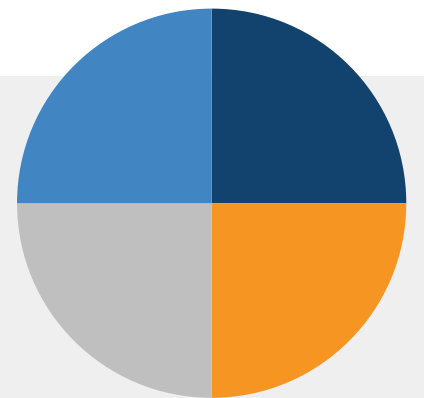


Land Mobile Radio to LTE





Quality of Experience of Mission Critical Voice



Recent Awards

 COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

Georgia Tech  Research
Institute



2017 PSIAP



Universidad del País Vasco Euskal Herriko Unibertsitatea

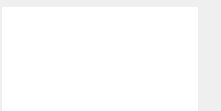
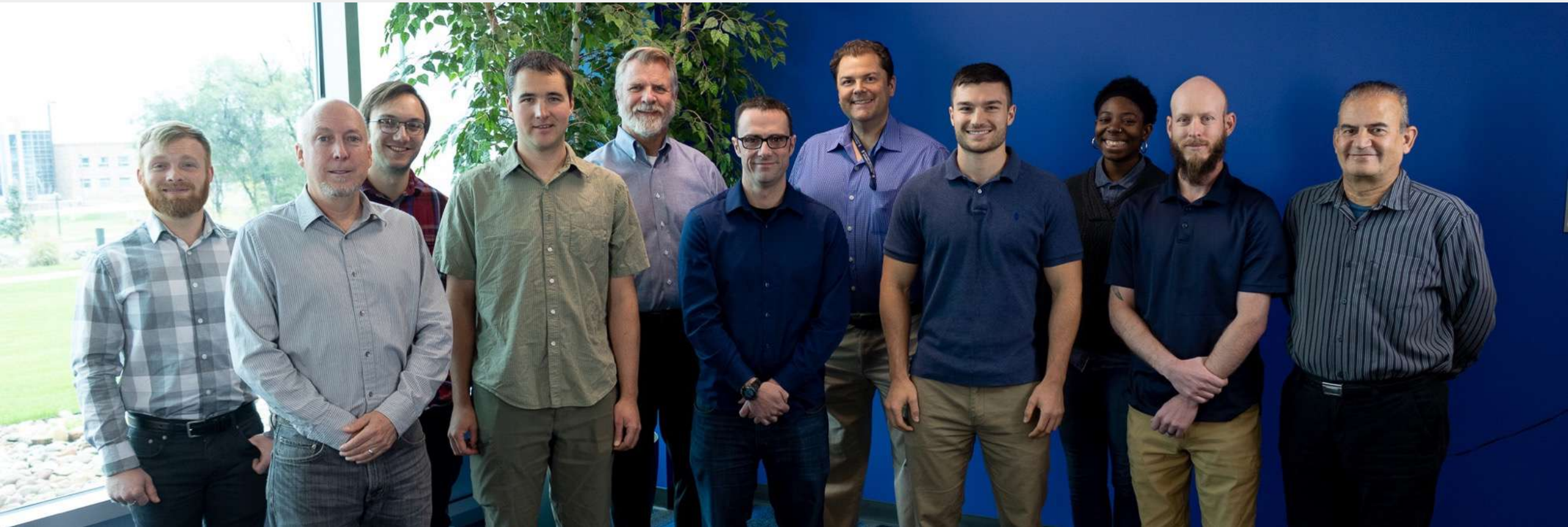


Test Equipment

Funding Opportunity



Meet the Team

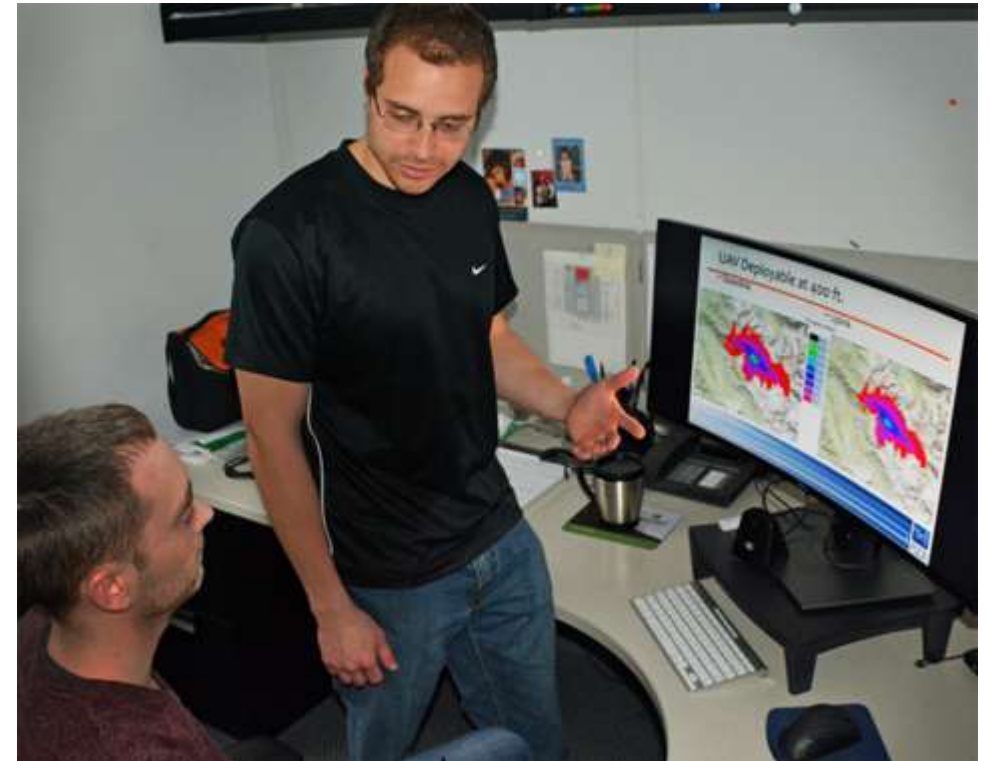
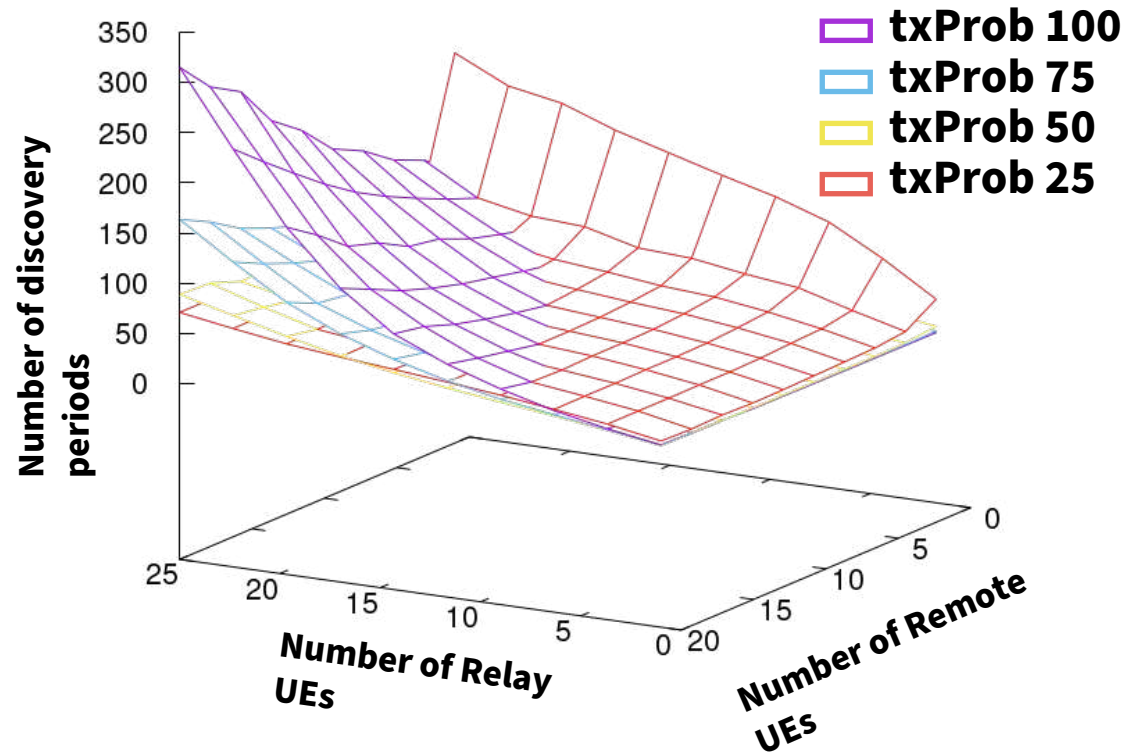




DSCR

Wireless Networks Division

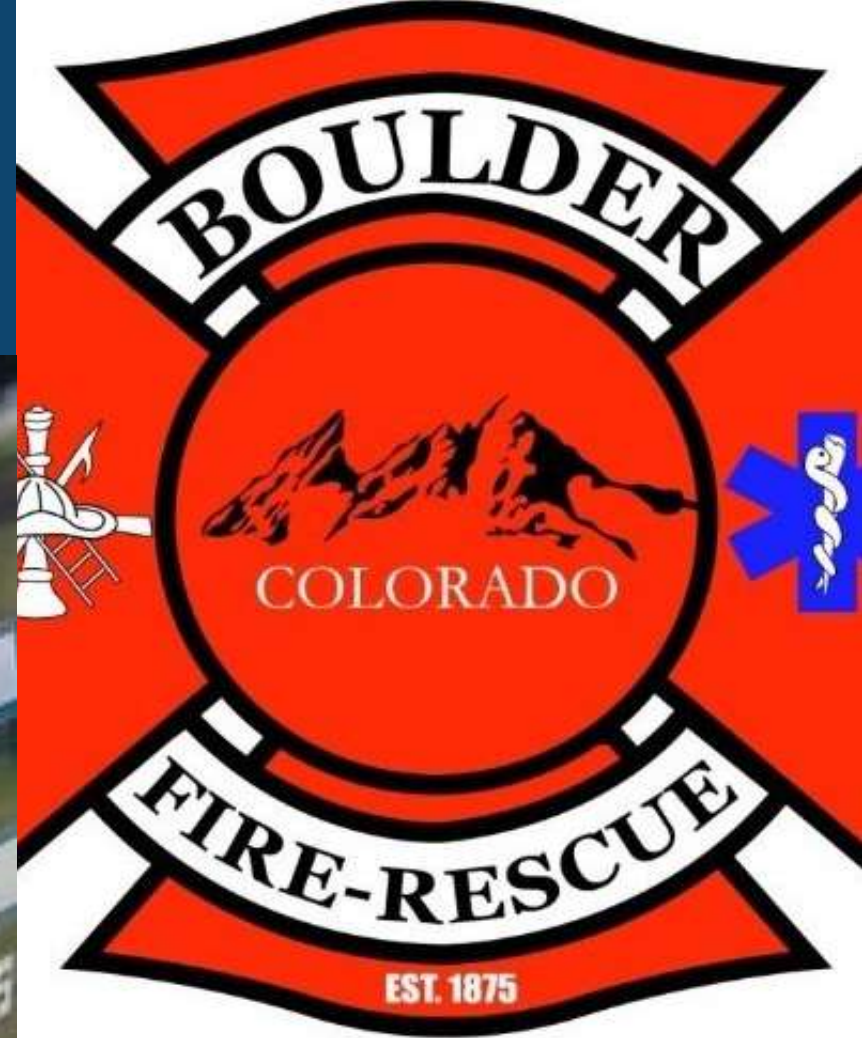
Performance of UE-to-Network Relay Discovery





**What does the future
of MCV look like?**

Collaboration & Partnerships



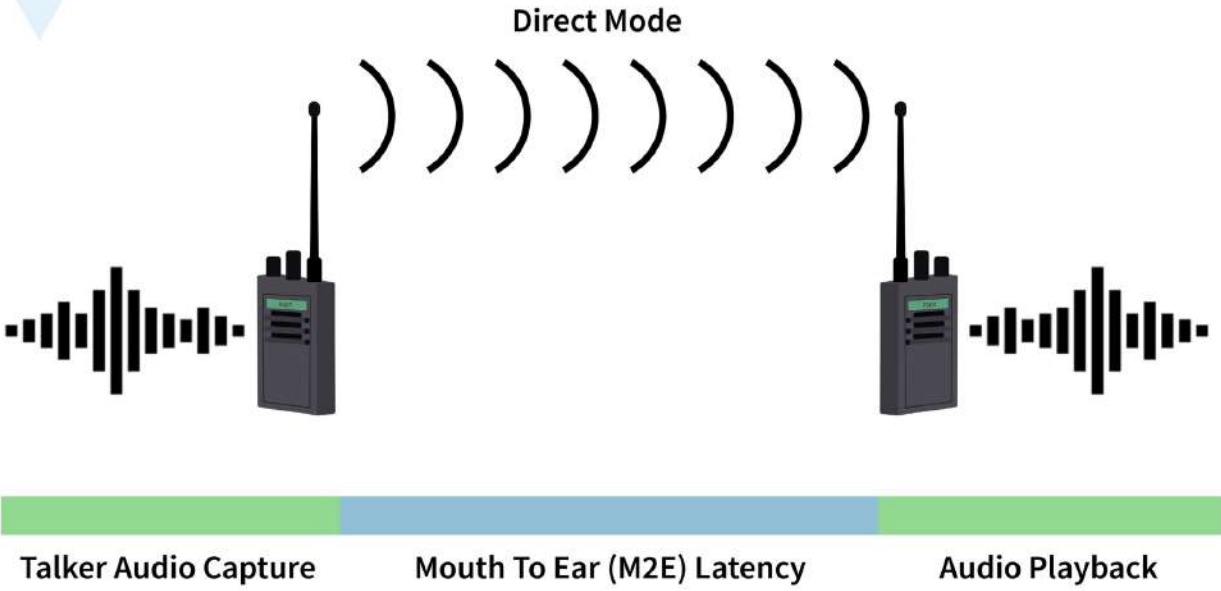


So what are the largest challenges facing MCV?

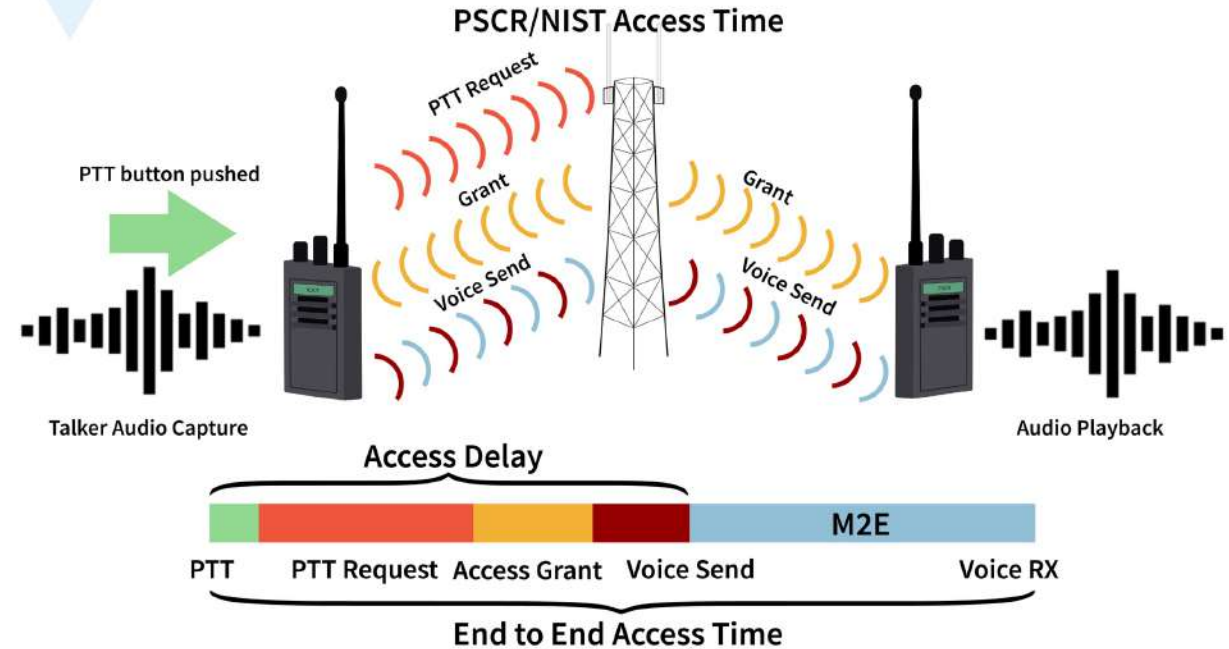
Why is MCV so important?



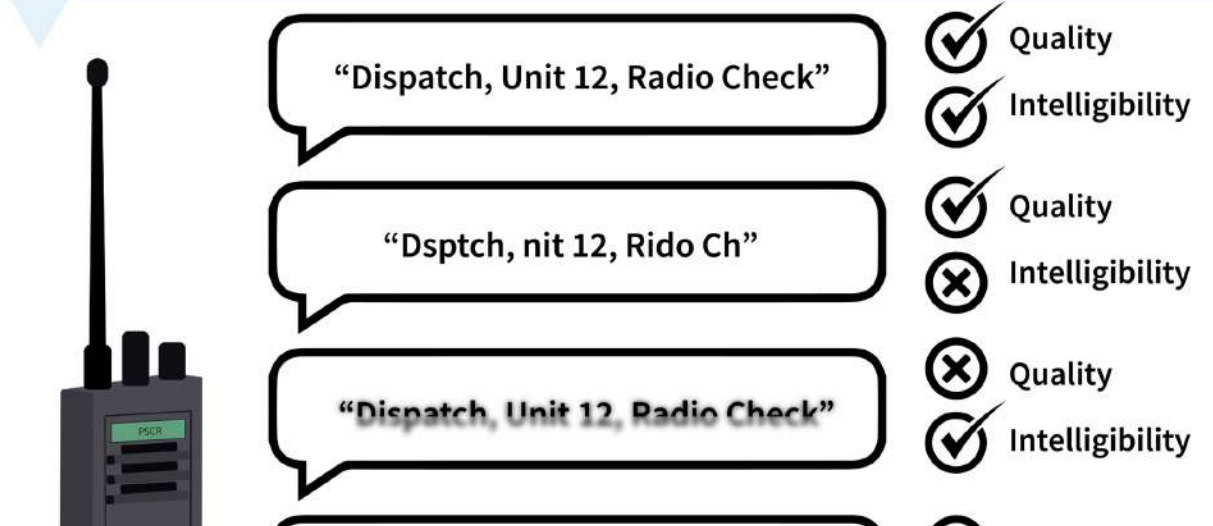
MOUTH TO EAR LATENCY



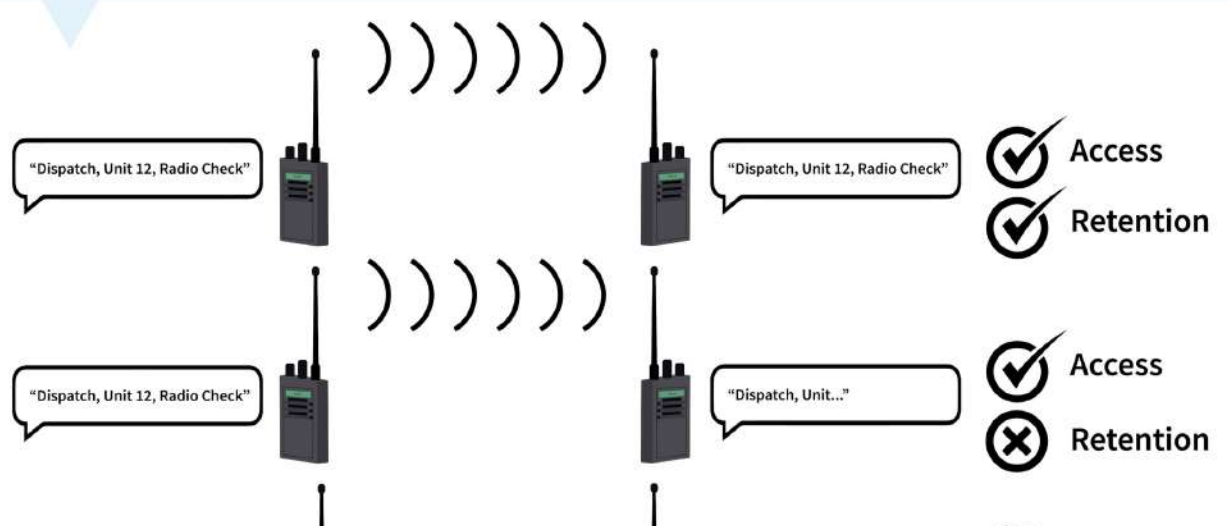
END TO END ACCESS TIME



VOICE QUALITY & INTELLIGIBILITY



PROBABILITY OF ACCESS & RETENTION





 **PSCR MISSION
CRITICAL VOICE**



NIST



Thank You

Next Up

Scott

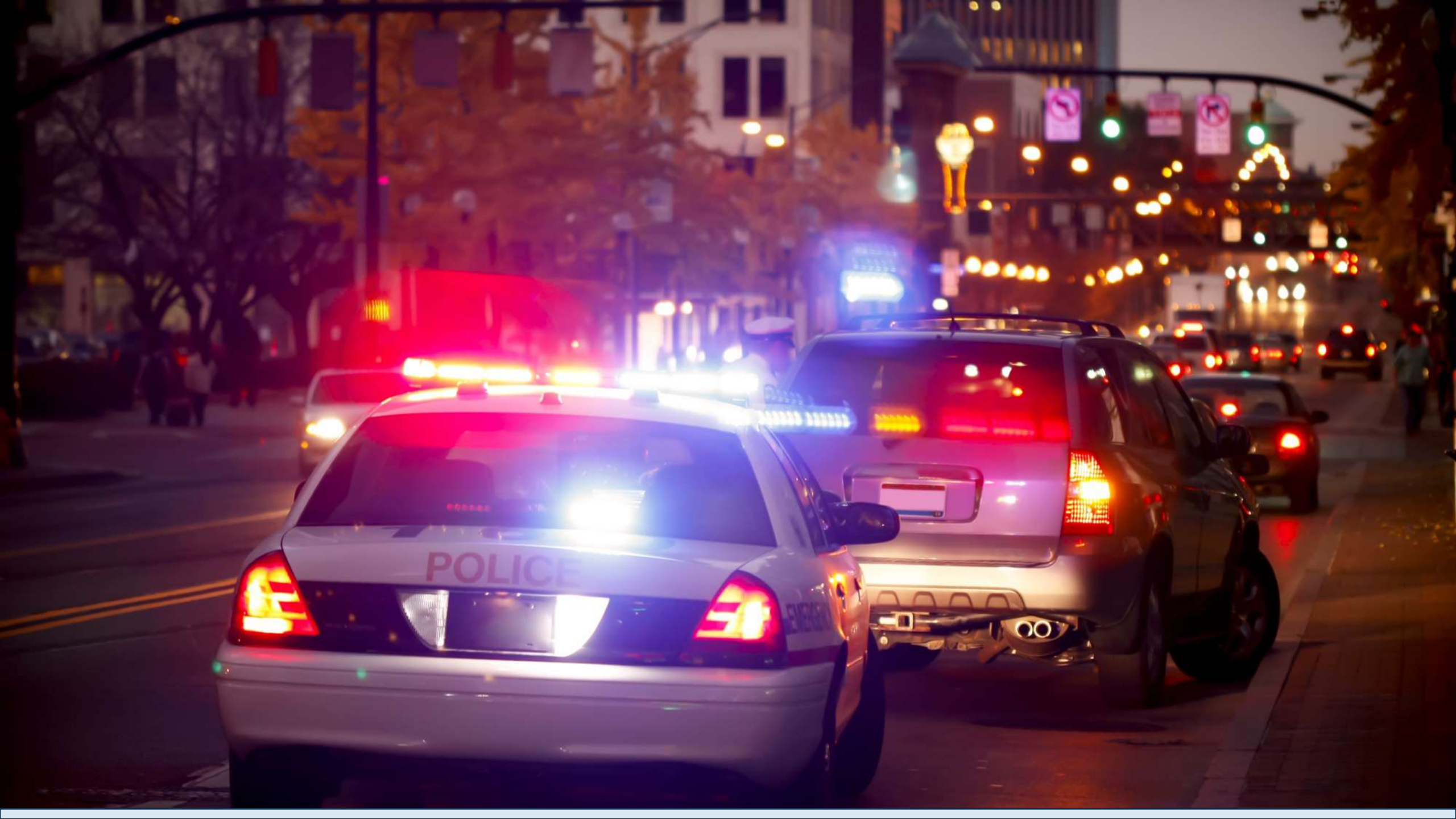
Ledgerwood

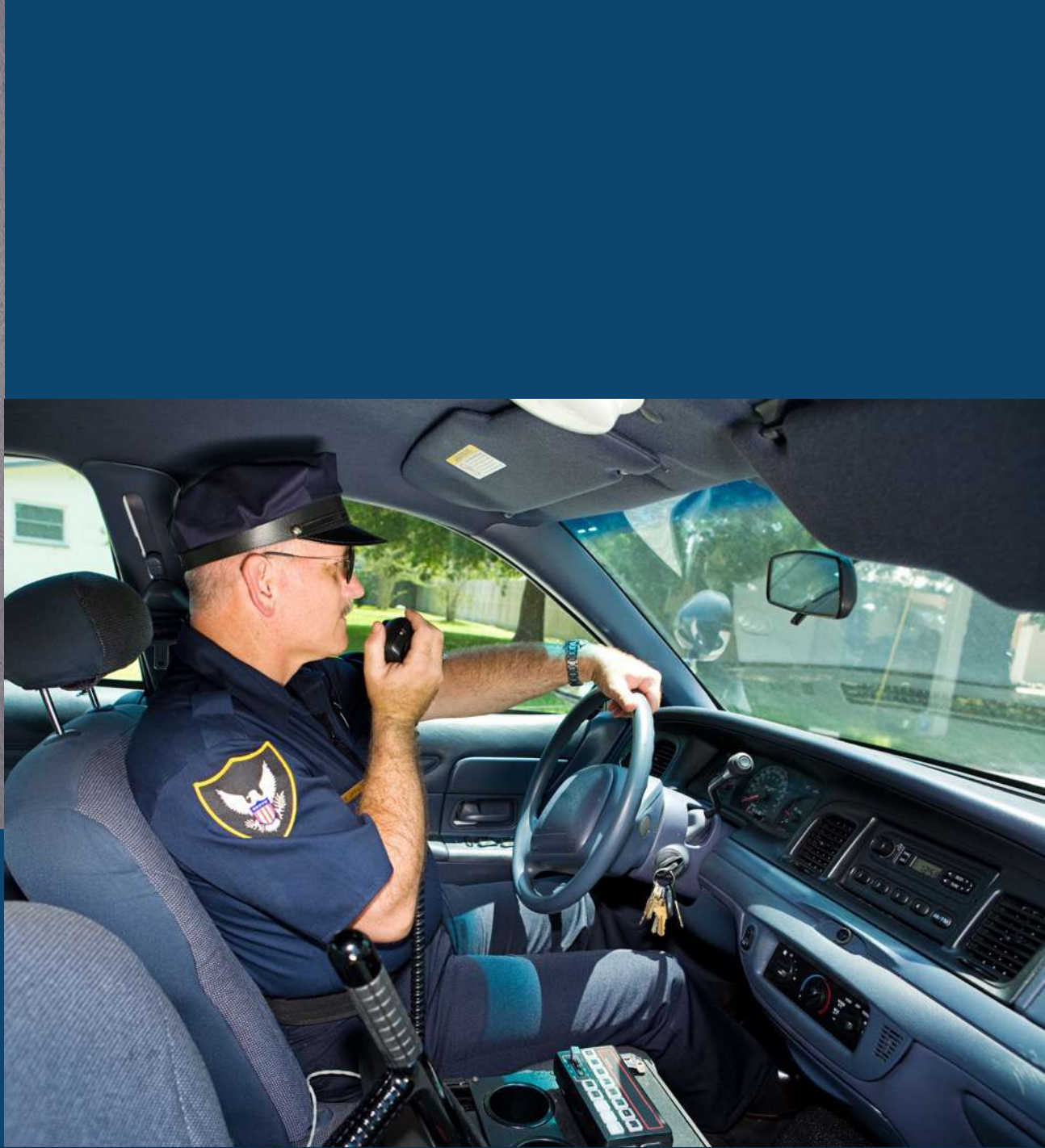
UI/UX

2019 Public Safety Broadband Stakeholder Meeting



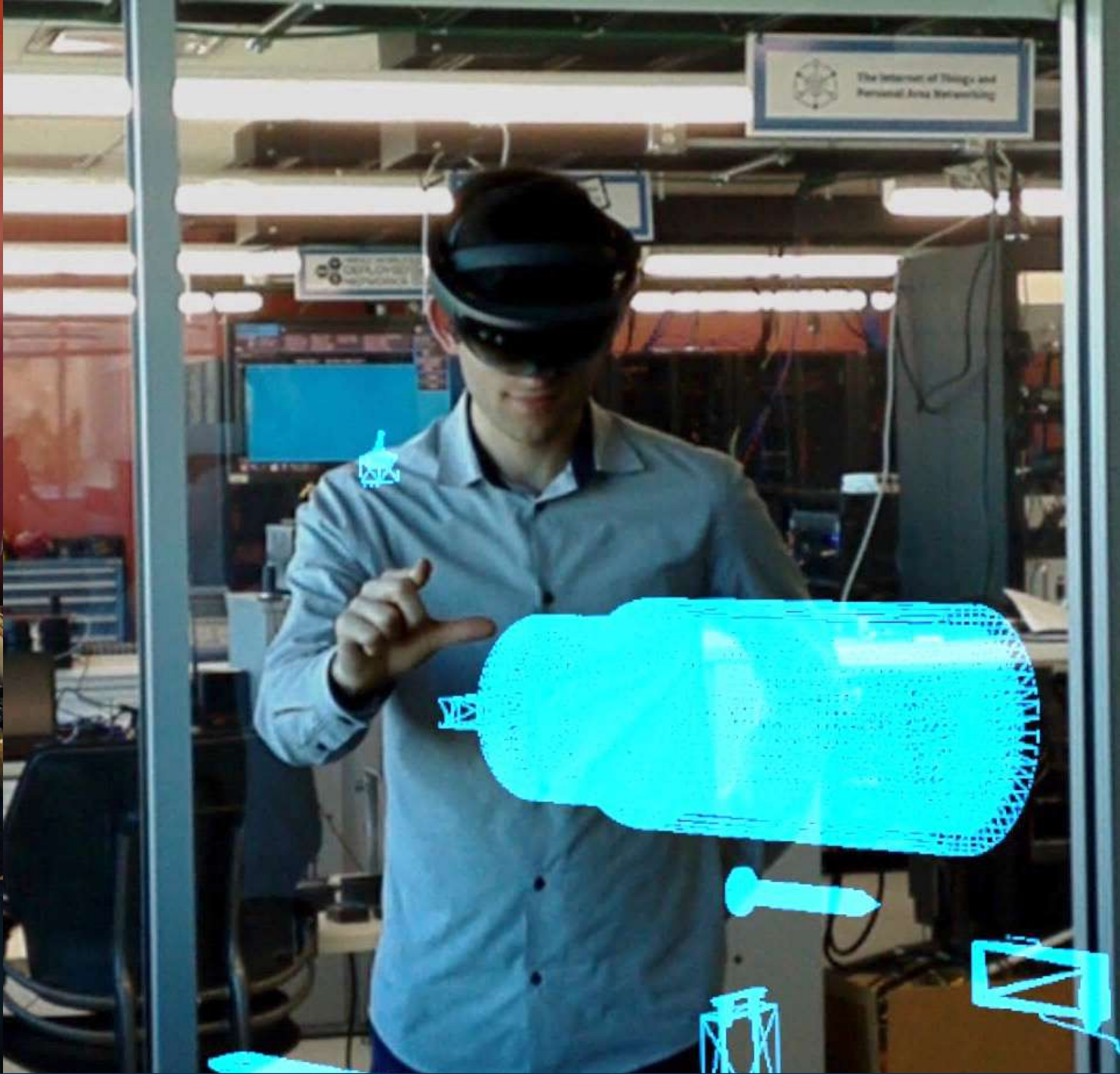
Enhanced User Interface and User Experience Portfolio

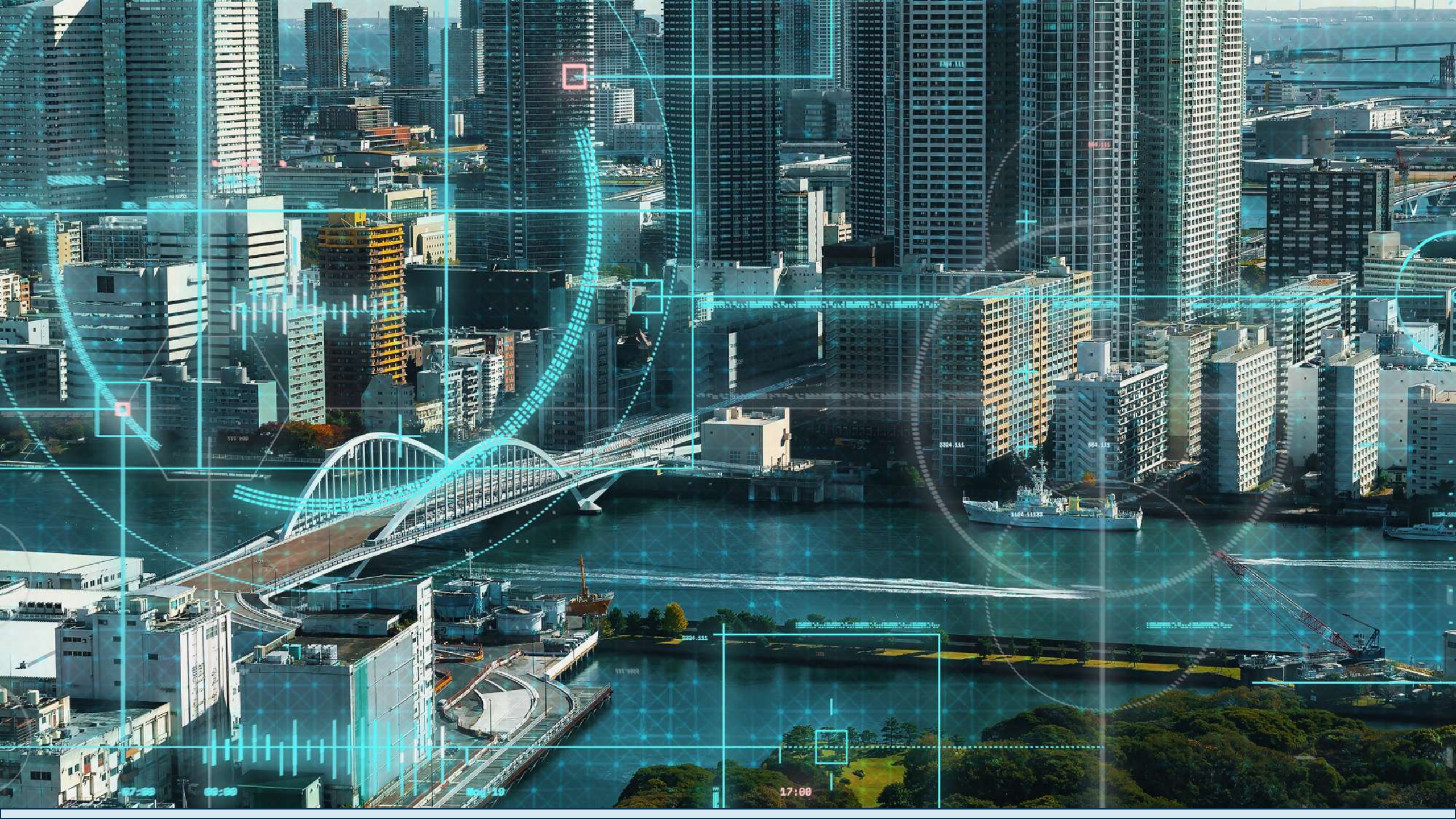










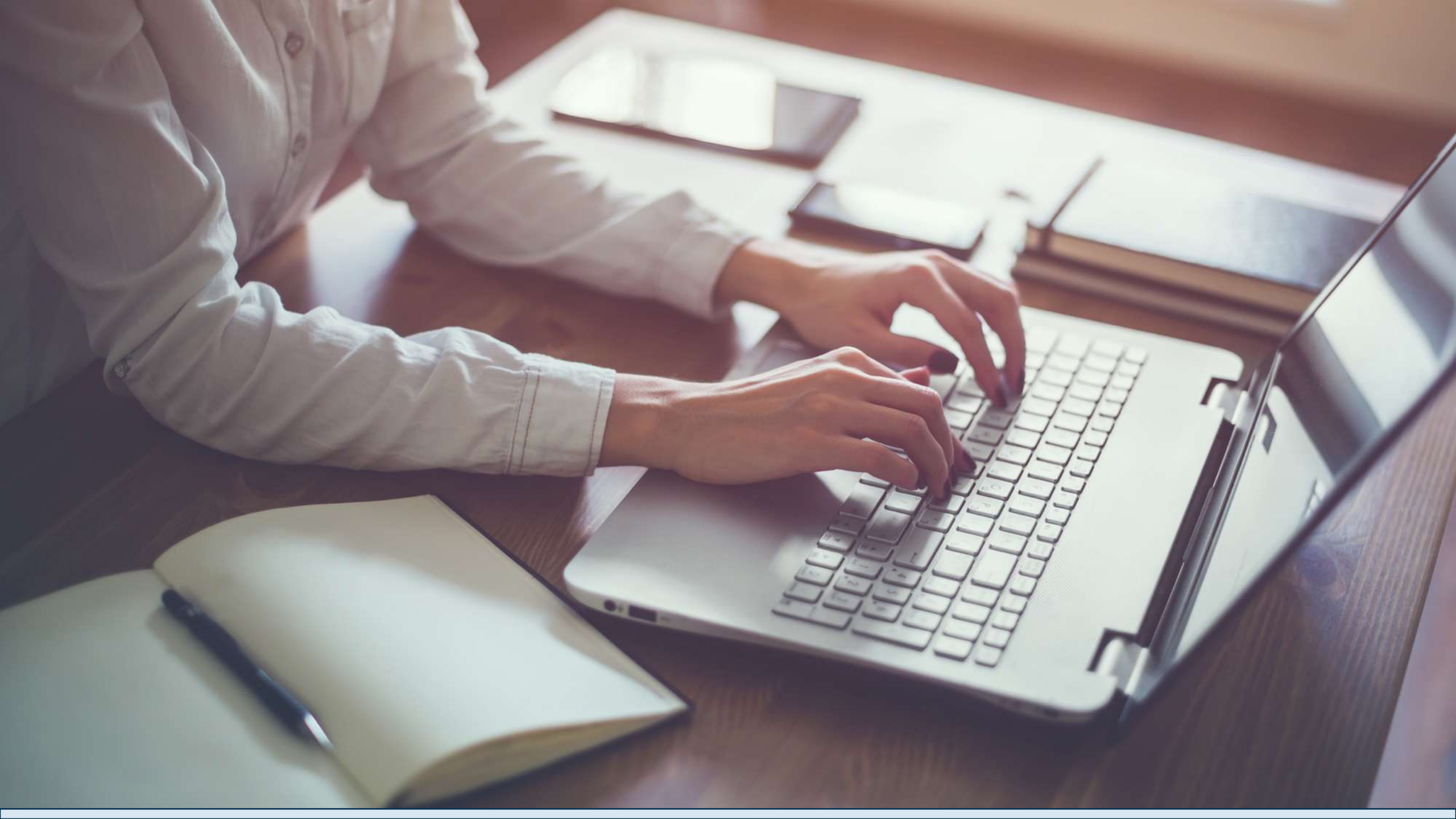


17:00

17:00

17:10

17:00



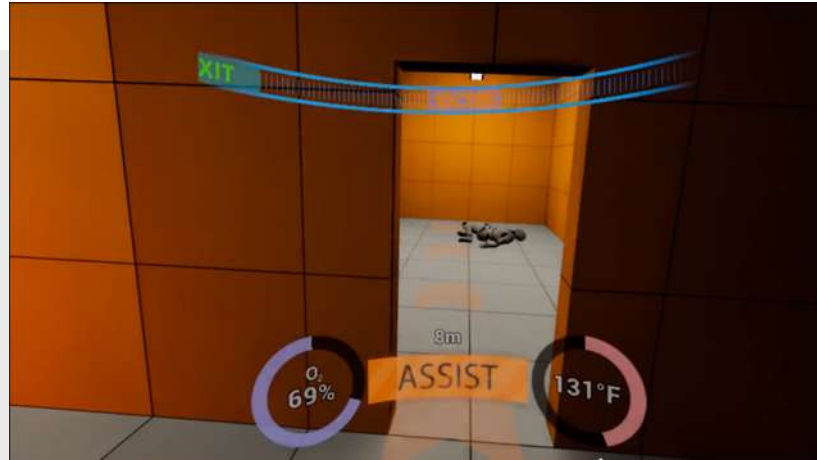
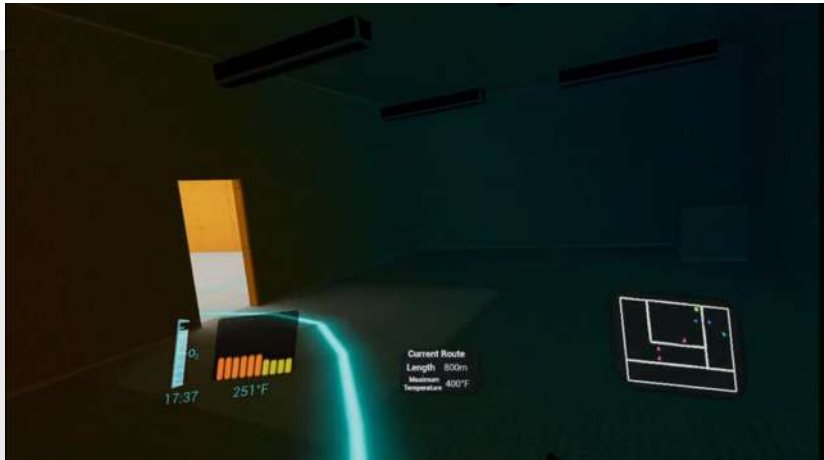
The image shows a close-up of a survey form with a grid layout. The columns are labeled 'Somewhat Agree', 'Strongly Agree', and 'Agree Completely'. A yellow pencil is pointing to a radio button in the 'Strongly Agree' column. There are several other radio buttons in the 'Somewhat Agree' and 'Agree Completely' columns, but they are not selected. The form is on a white background with a grid of lines.

	Somewhat Agree	Strongly Agree	Agree Completely
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Over 7,000
public
safety
members
shared
their
opinions!**



2018 - Heads-up Display Navigation Challenge Finalists







Haptic Interfaces for Public Safety Challenge

Help first responders by developing haptic interfaces, prototyped in virtual reality and embedded in firefighter equipment for a live competition

Haptic Providers:

- Engineering Acoustics, Inc.
- Contact Control Interfaces
- Janus Research Group, Inc.

Haptic Development Teams:

- Brilliant Sole, Inc.
- Carnegie Mellon University
- Engineering Dynamics LLC
- IFTech Inventing Future Technology Inc.
- Team ASA-VR; Team DSGN
- Team Haply
- Team WEAR Lab.



First Responder
Network Authority®

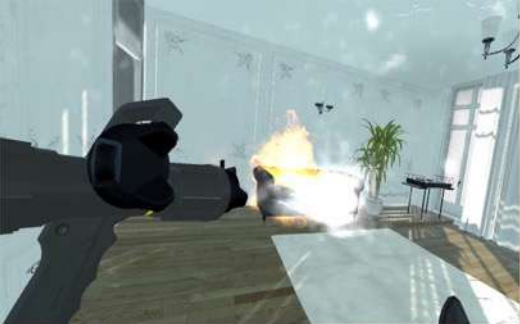


West Metro
Fire Rescue



PSIAP-UI Grant Awardees and Cooperative Agreements

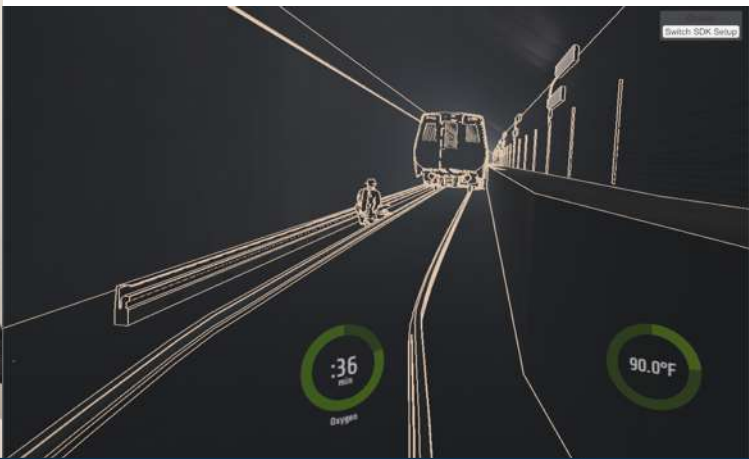




**HOSE NOZZLE
CONTROLLER
PROTOTYPE**



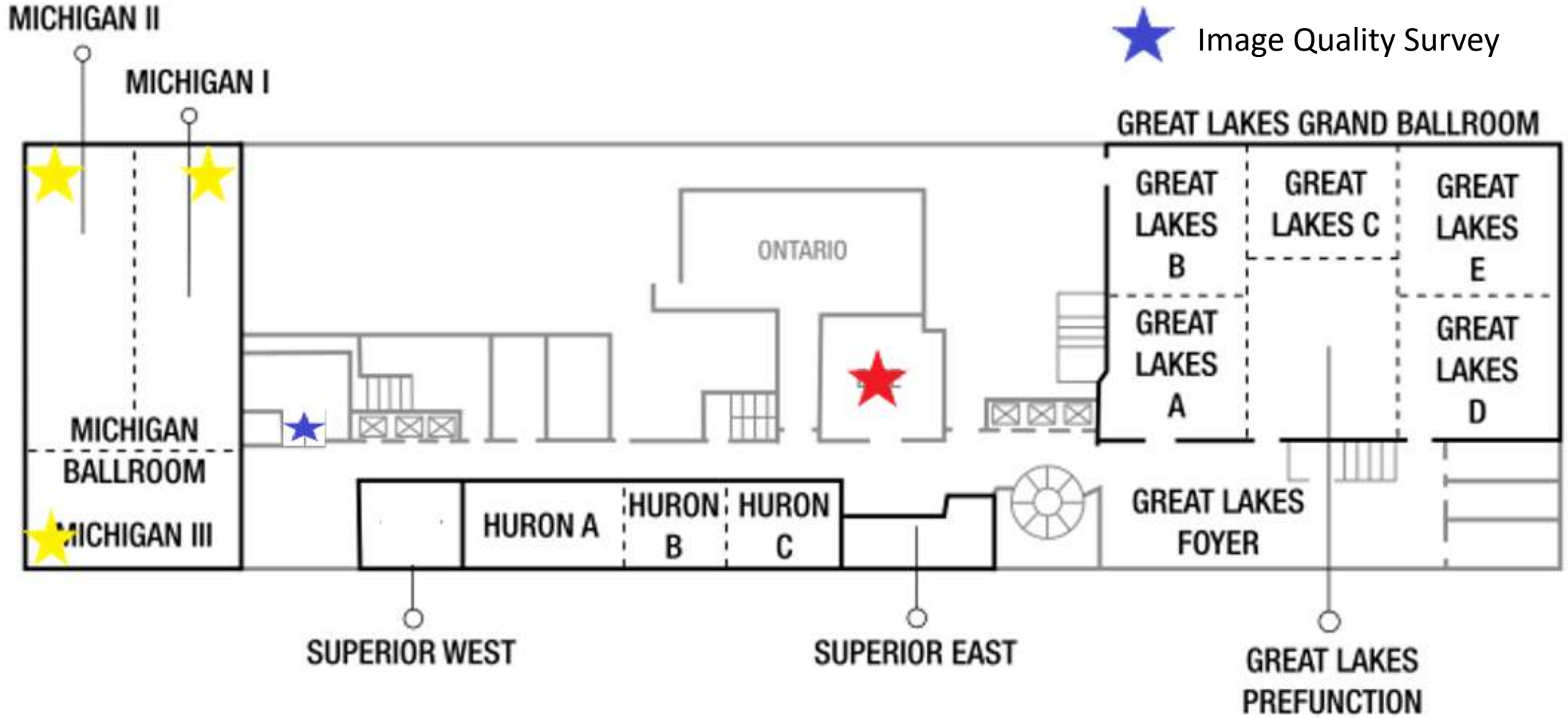
 **ENHANCED
USER INTERFACE
USER EXPERIENCE**





LEVEL TWO

- ★ Haptic Challenge
- ★ PSIAP-UI VR Demos
- ★ Image Quality Survey





THANK YOU

NIST



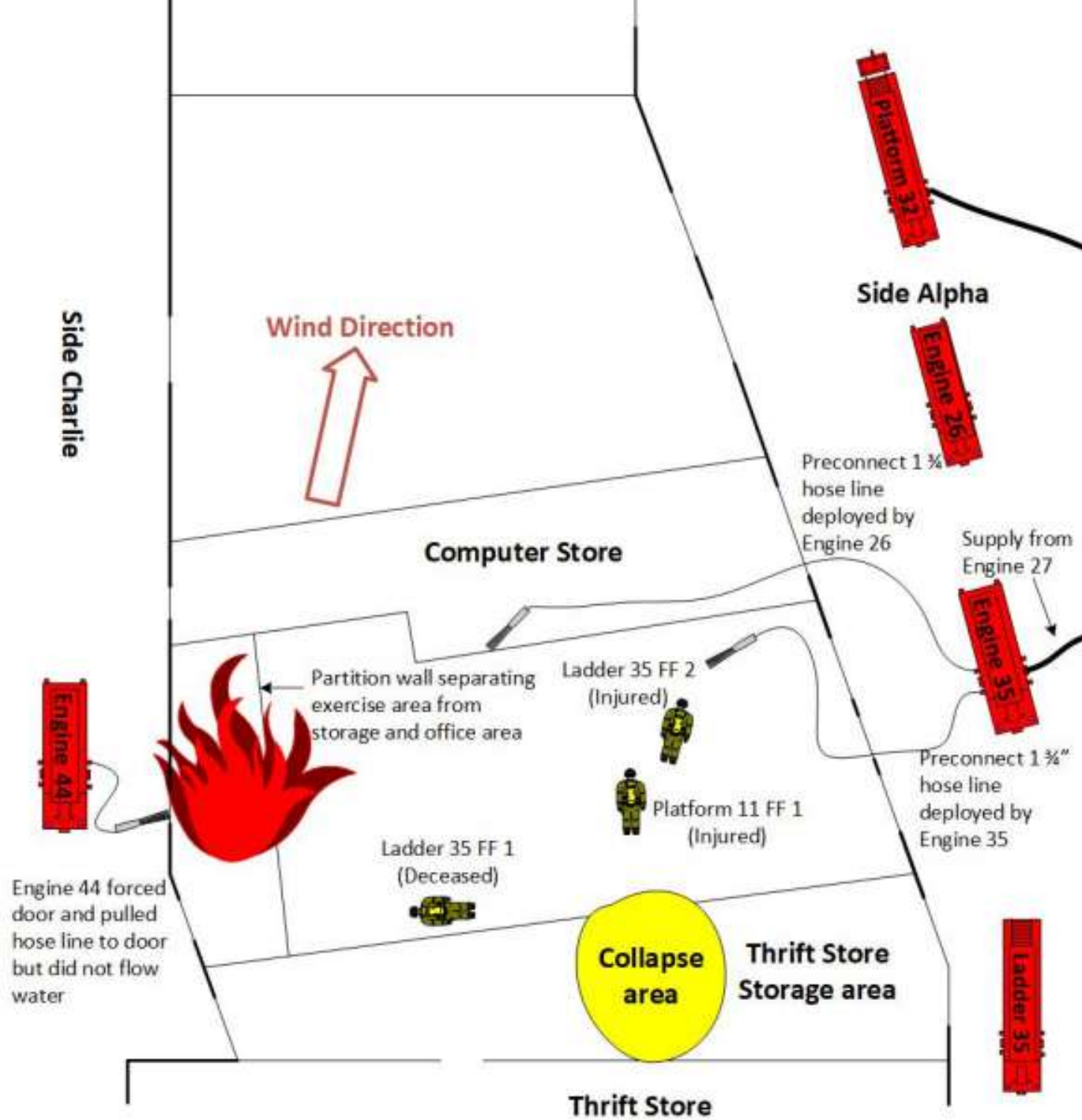
Next Up
Jeb
Benson
LBS

NIST

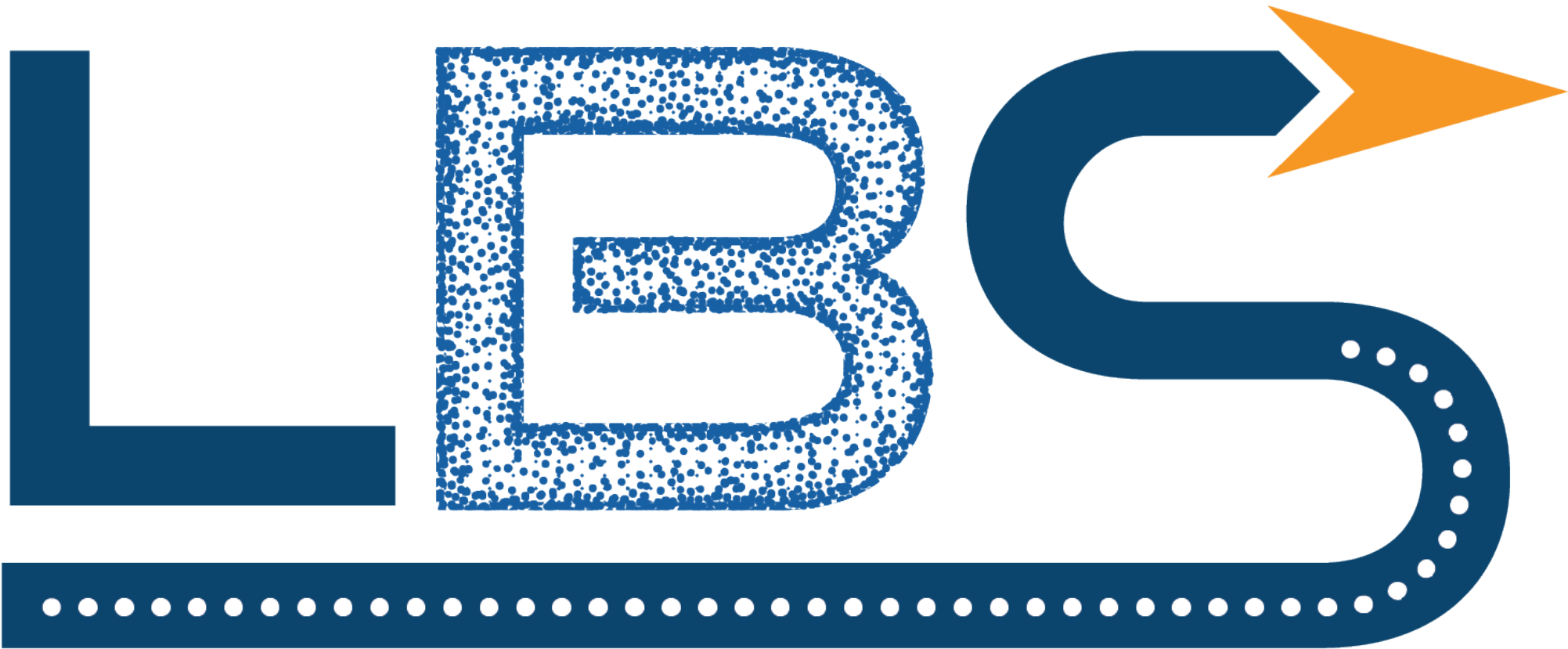


2019 Stakeholder Meeting

LBS Portfolio Overview







PSCR

**LOCATION-BASED
SERVICES**

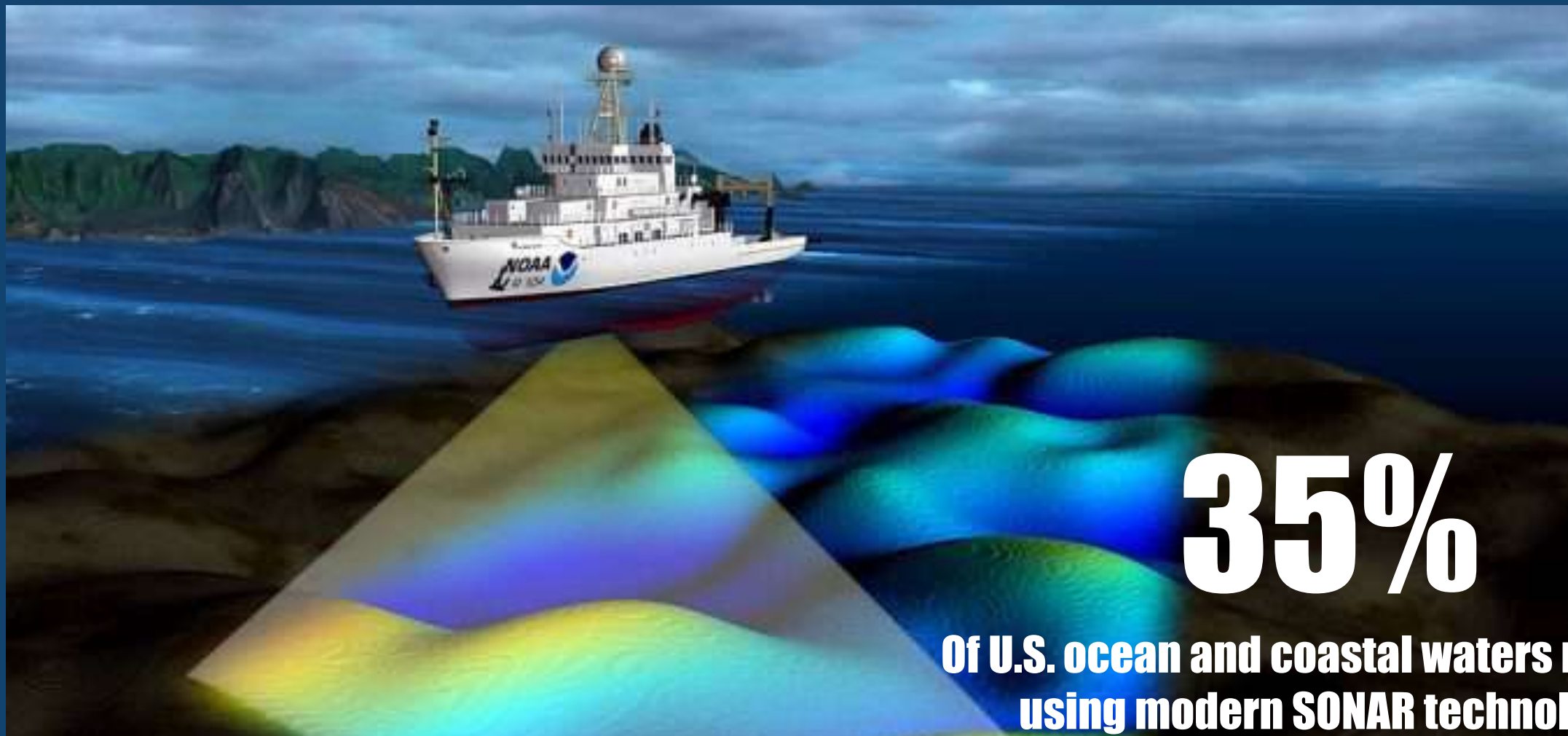


PSCR

POLICE

270,000,000,000 sq. ft

U.S. commercial + residential real estate



35%

Of U.S. ocean and coastal waters mapped
using modern SONAR technology



Sq. ft. of real estate in U.S

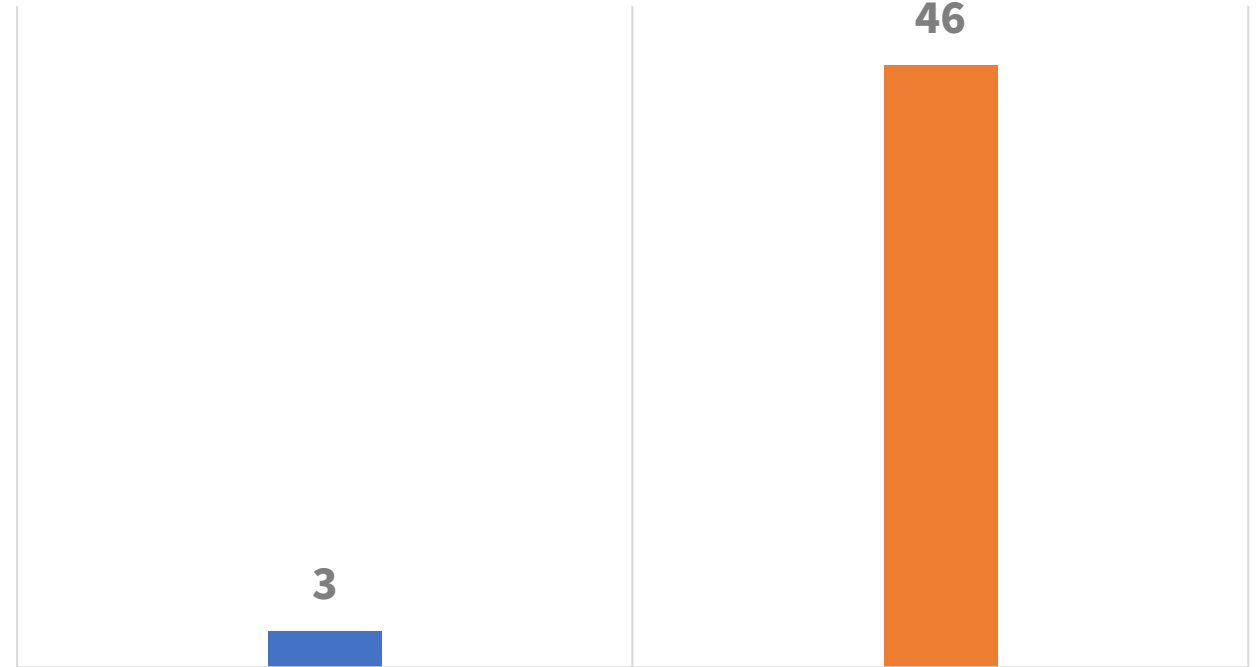
181.5B

87.4B

2X

2008 – 2017

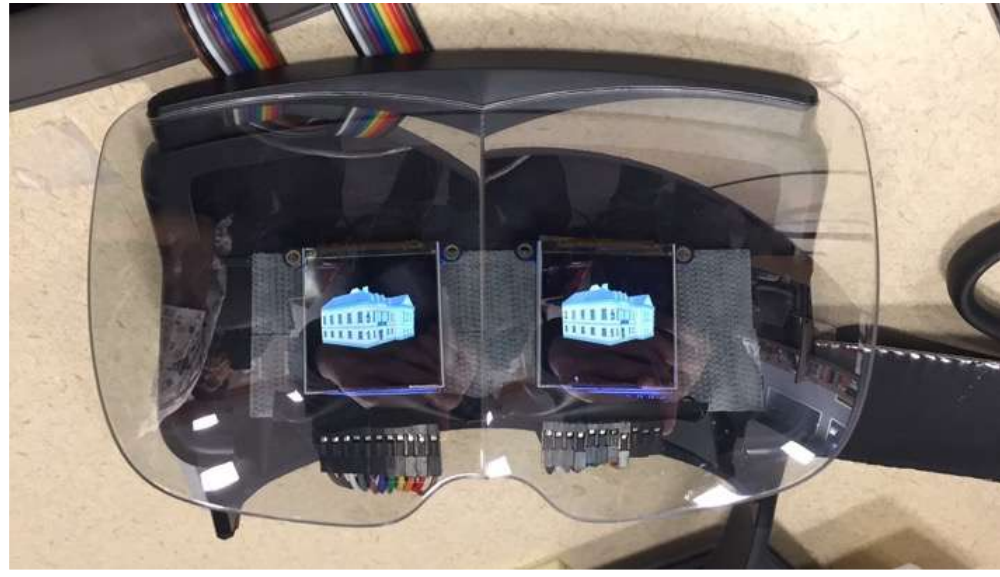
FIREFIGHTER FIRE GROUND DEATHS PER 100,000 FIRES



RESIDENTIAL

NON-RESIDENTIAL

15X



door: 100%



fire suppression systems - extinguisher: 100%



3 Cities
29 Buildings
4,500,000 sq. ft.

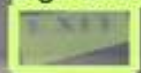
table: 100%



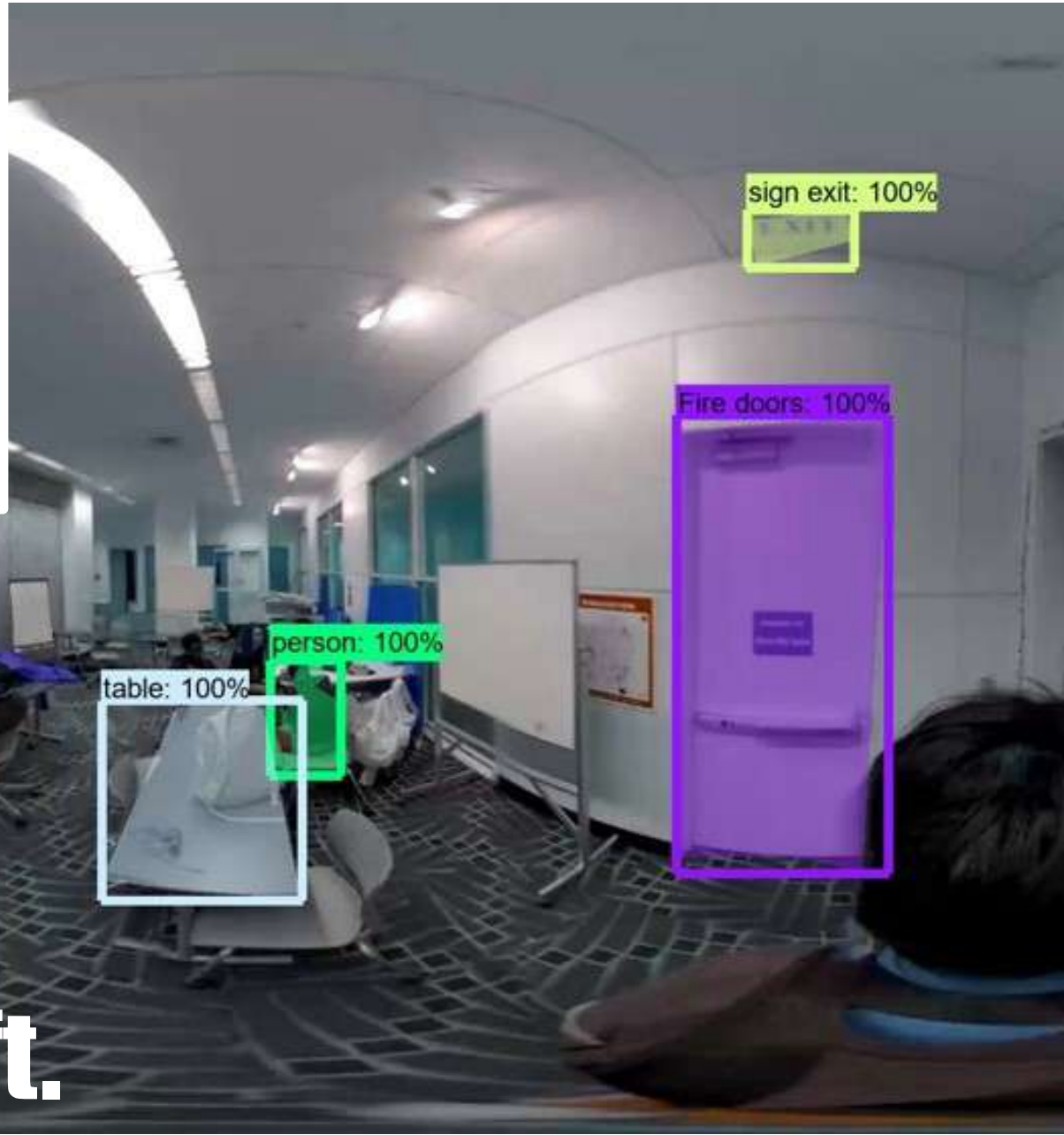
person: 100%



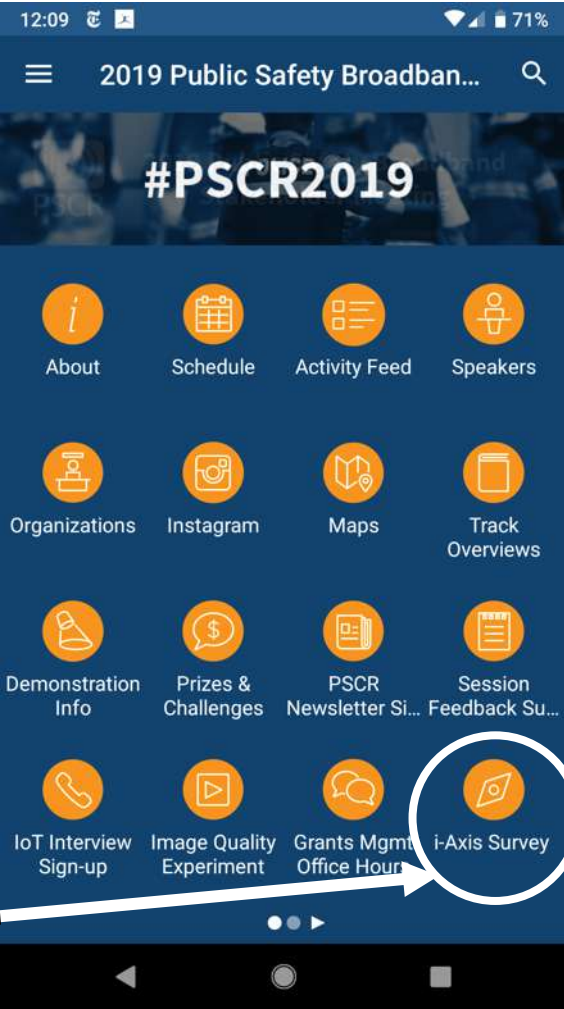
sign exit: 100%



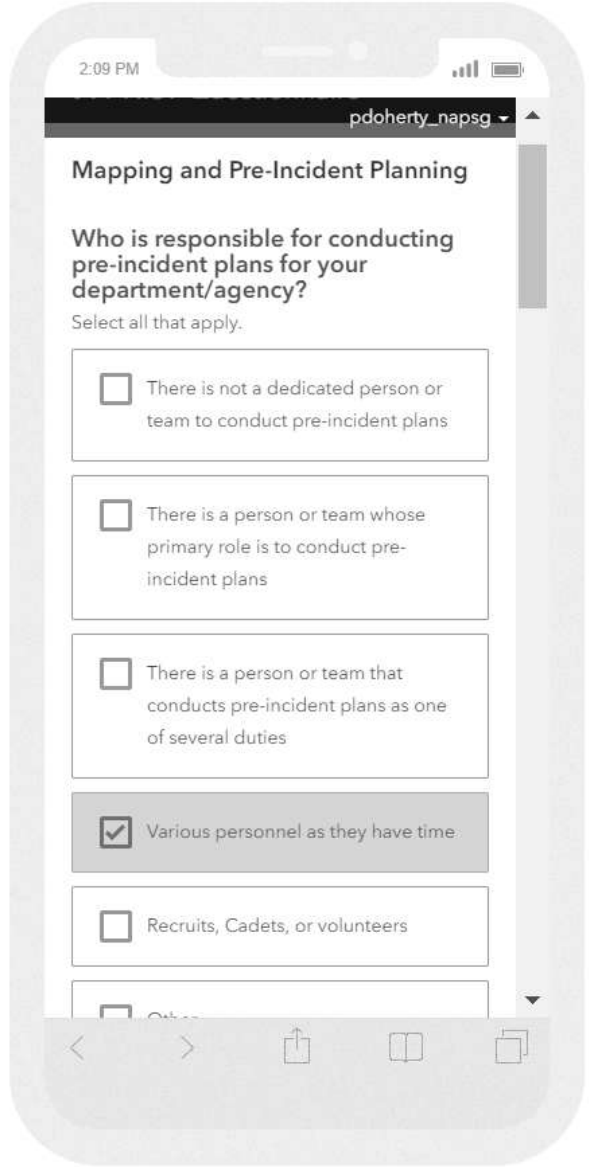
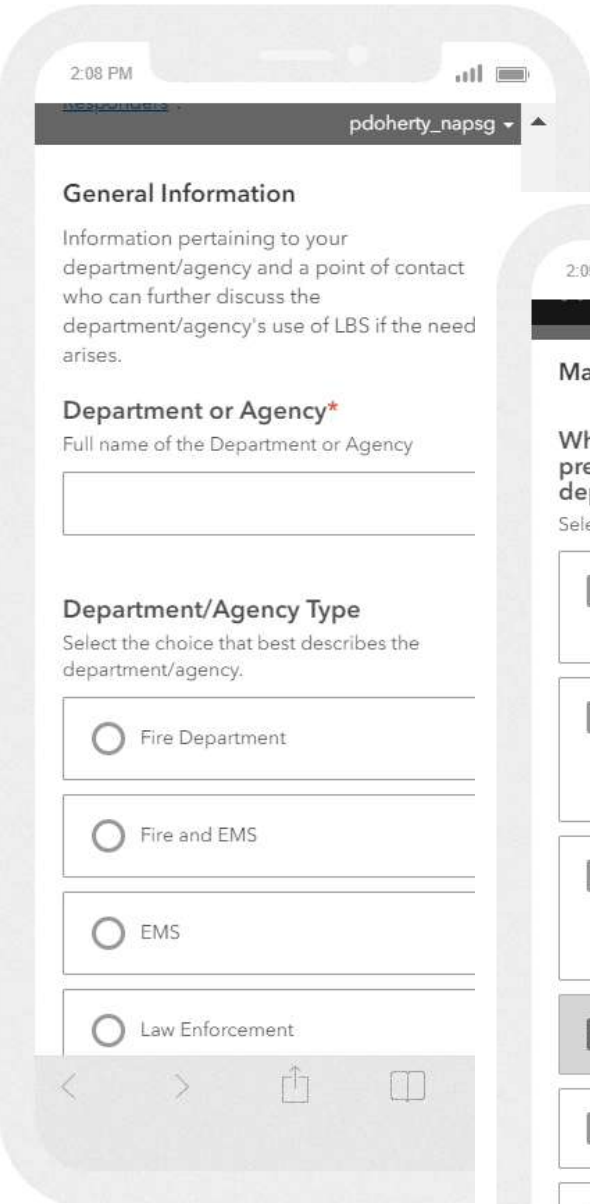
Fire doors: 100%



**Open Camera.
Point at QR Code.
Click the link.**

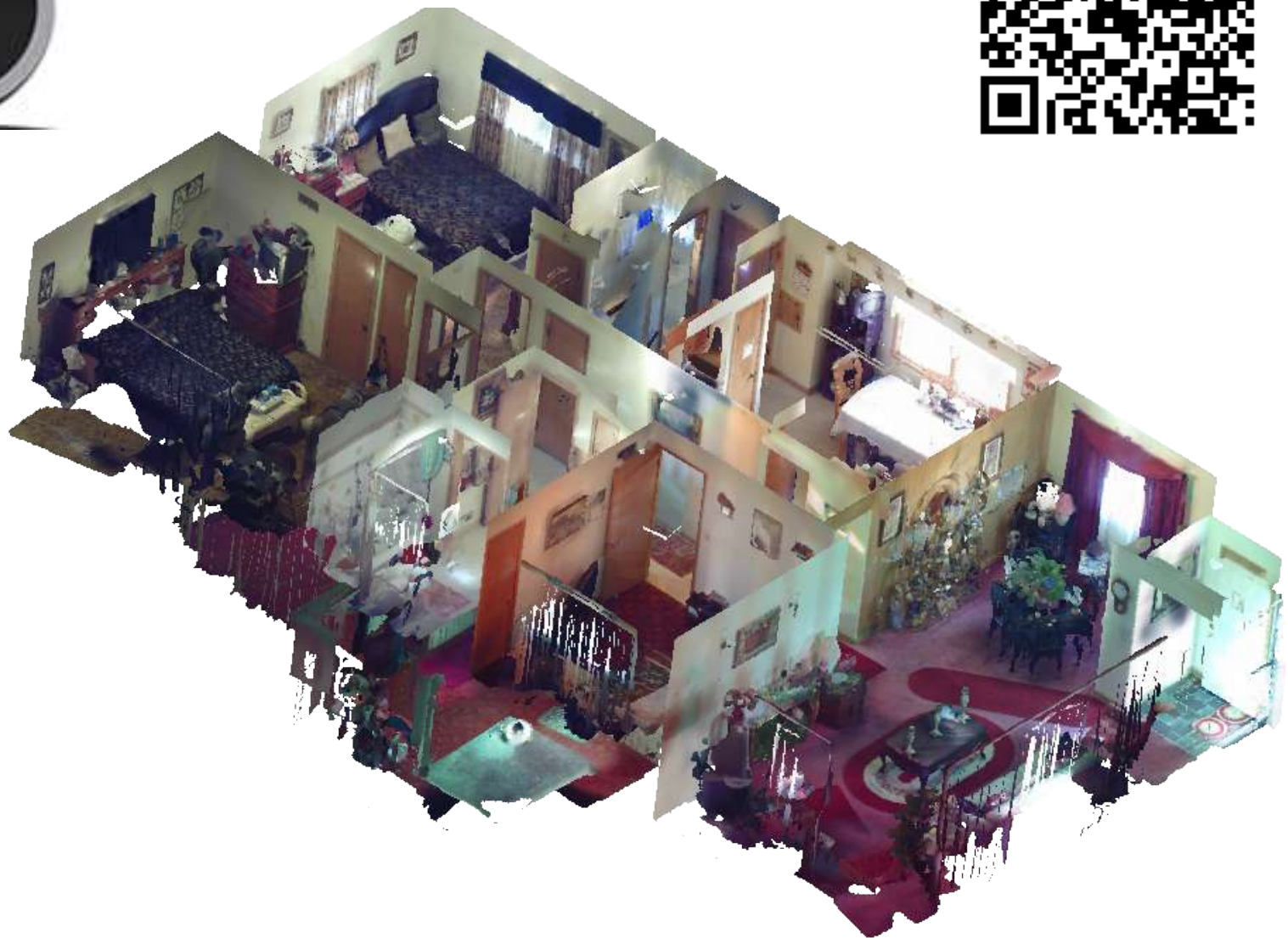


Or use the app.





Tech To Protect Challenge: Fire Safety in 3D



121M

Occupied housing units in U.S.

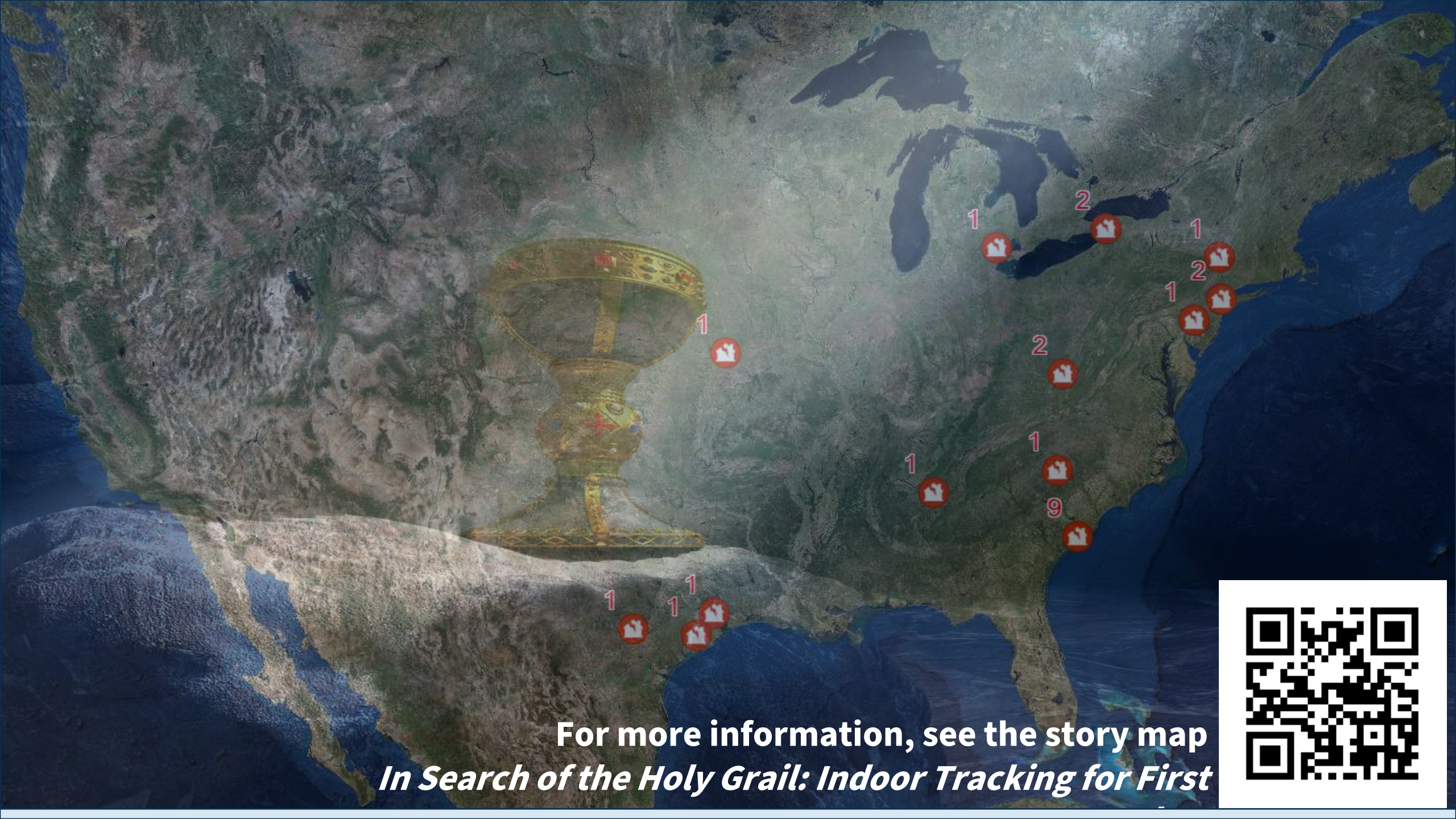


87%

Percent time average person spends indoors

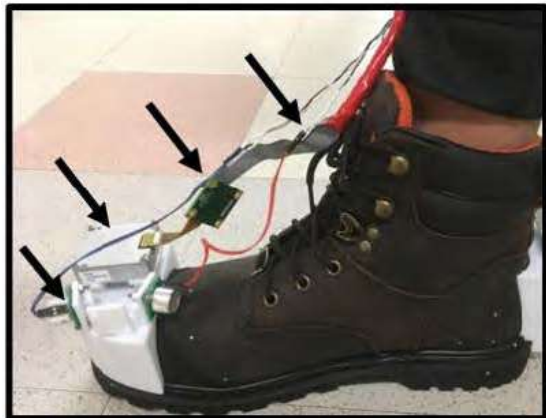
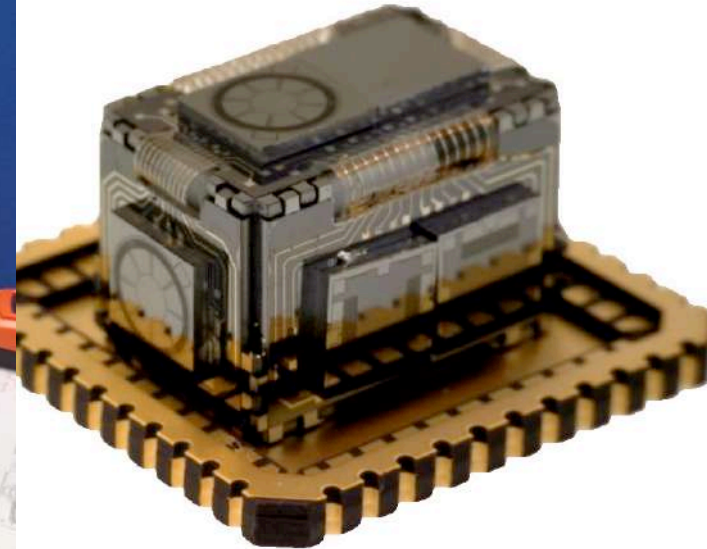
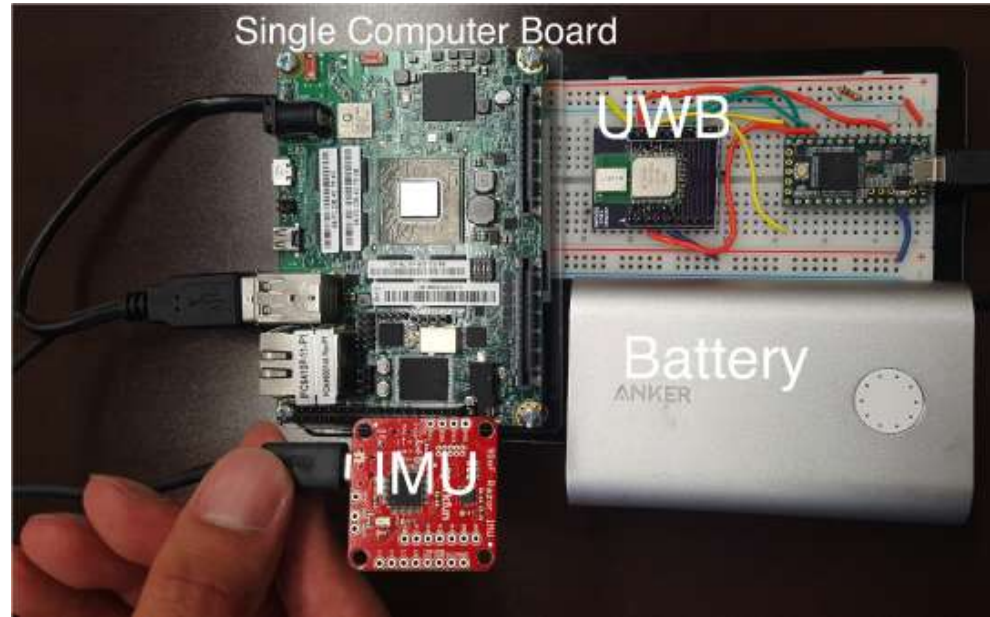
\$40.99B

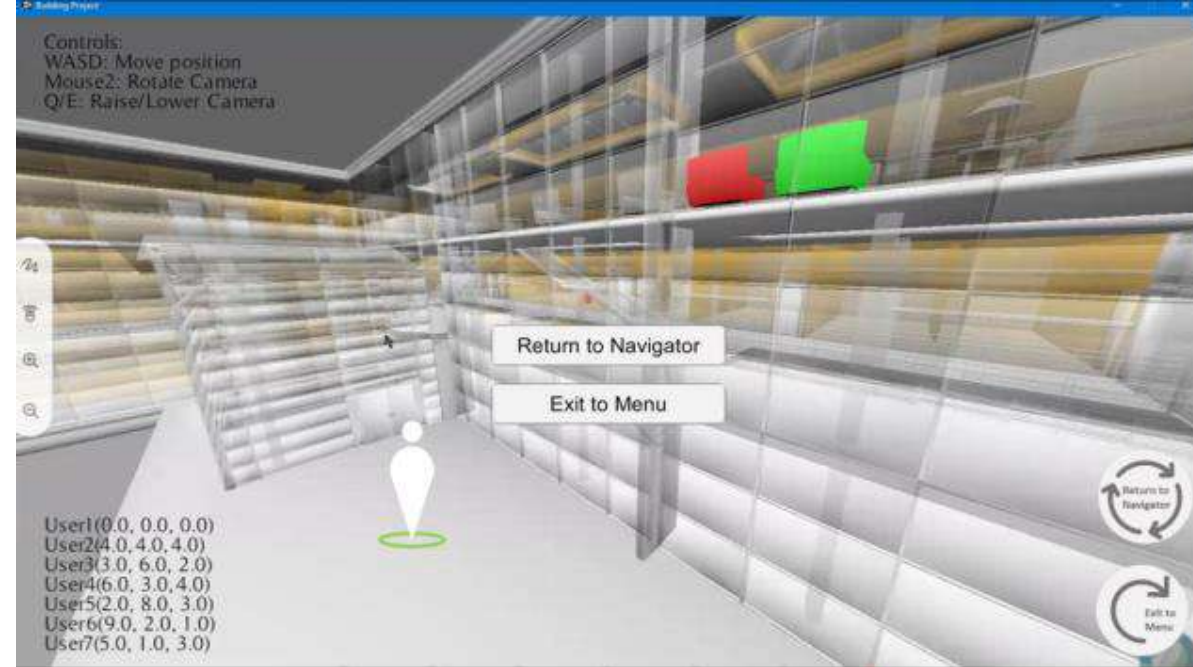
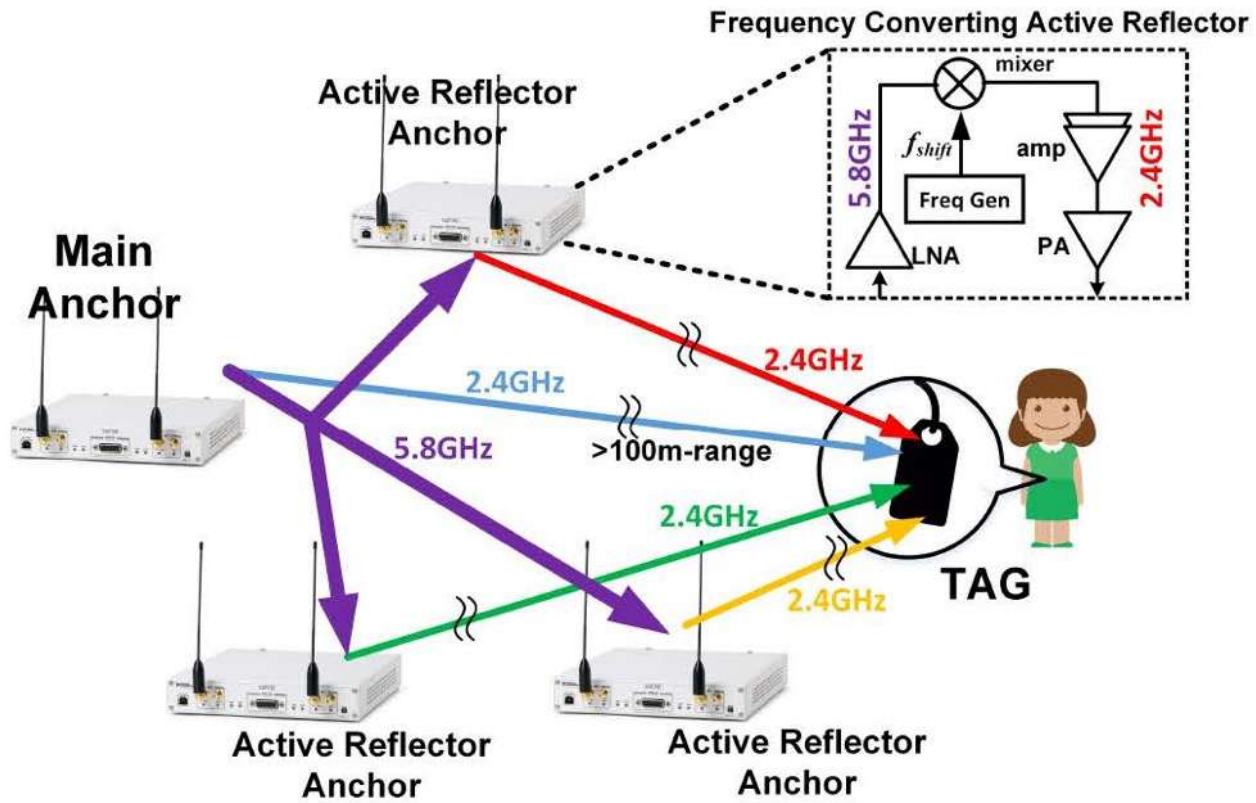
**Projected global indoor
location market by 2022**

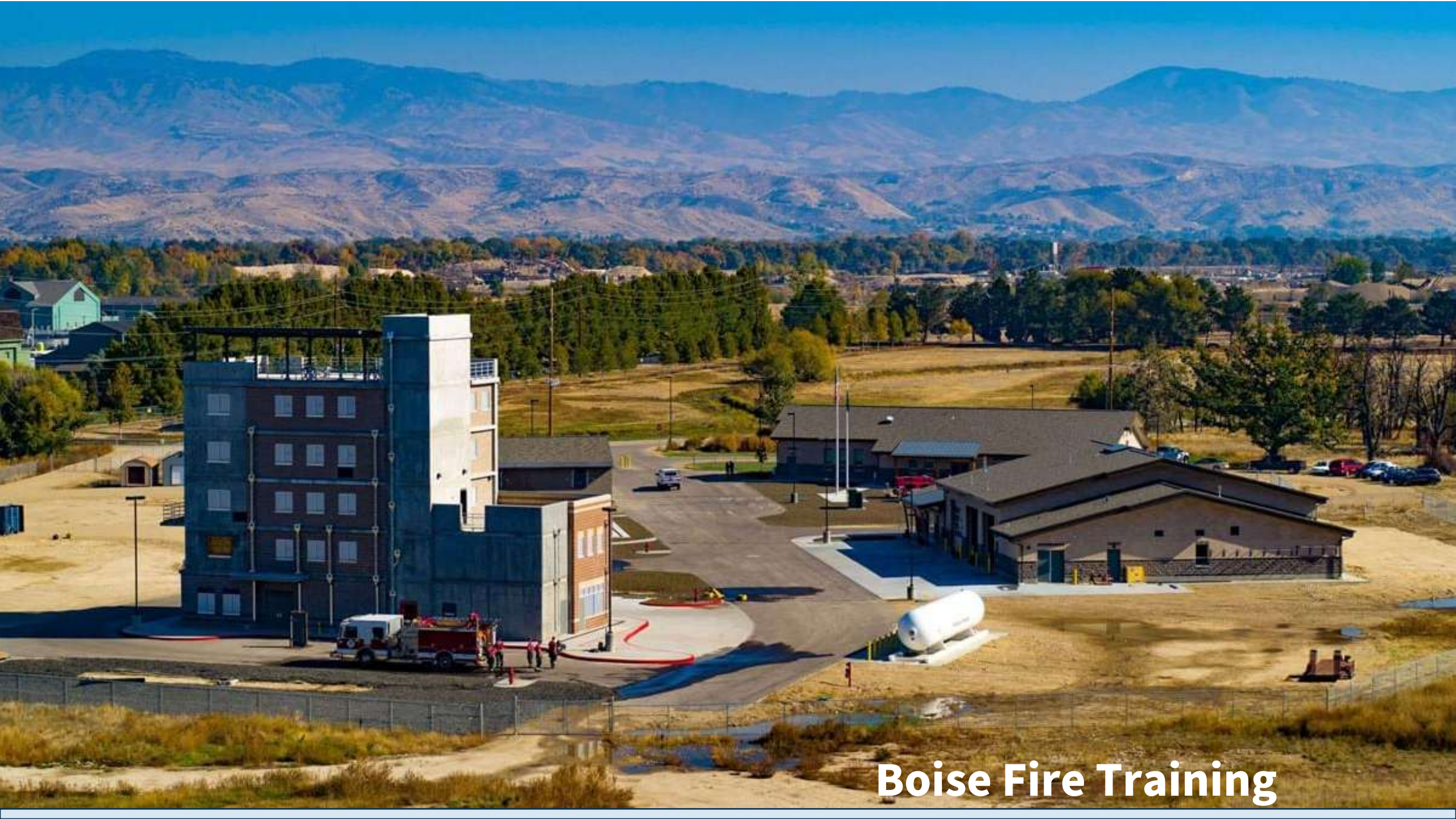


For more information, see the story map
In Search of the Holy Grail: Indoor Tracking for First









Boise Fire Training



140

R&D personnel & students

90%

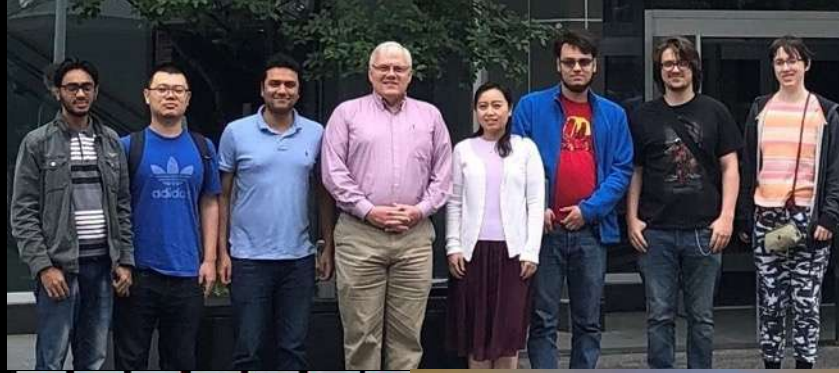
New to public safety

500 hrs.

Testing with public safety

32

Publications



**The First Responder 3D
(FR3D)
Indoor Tracking Prize**

**Watch [grants.gov](https://www.grants.gov) for
official announcement**



NIST



POLICE

Thank You



Next Up
John
Garofolo
Analytics

NIST



Analytics Portfolio

John Garofolo



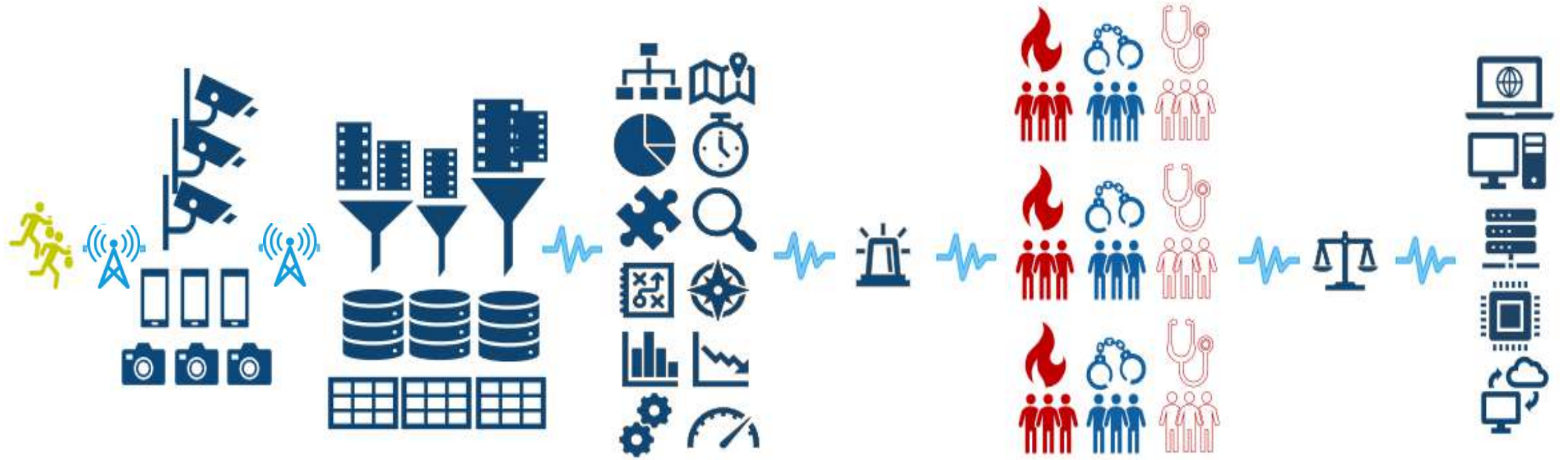
Mariposa Fire @MariposaFire · 18 Jun 2018
 Wheeler Fire (Mariposa County) - mariposafire.com/wheeler-fire-m...

Mariposa Fire @MariposaFire · 15 Jun 2018
 Vegetation Fire - Mariposa County -



Boyer Fire - Mariposa County - Mariposa Fire
 Boyer Fire Incident Information: Last Updated: June 15, 2018 7:14 pm
 Date/Time Started: June 15, 2018 1:37 pm Administrative Unit: CAL FIRE...
mariposafire.com







Our Focus: Increase automation to identify and analyze emergency events in real-time from a large number of data streams and provide first responders with actionable information.

R&D Thrusts





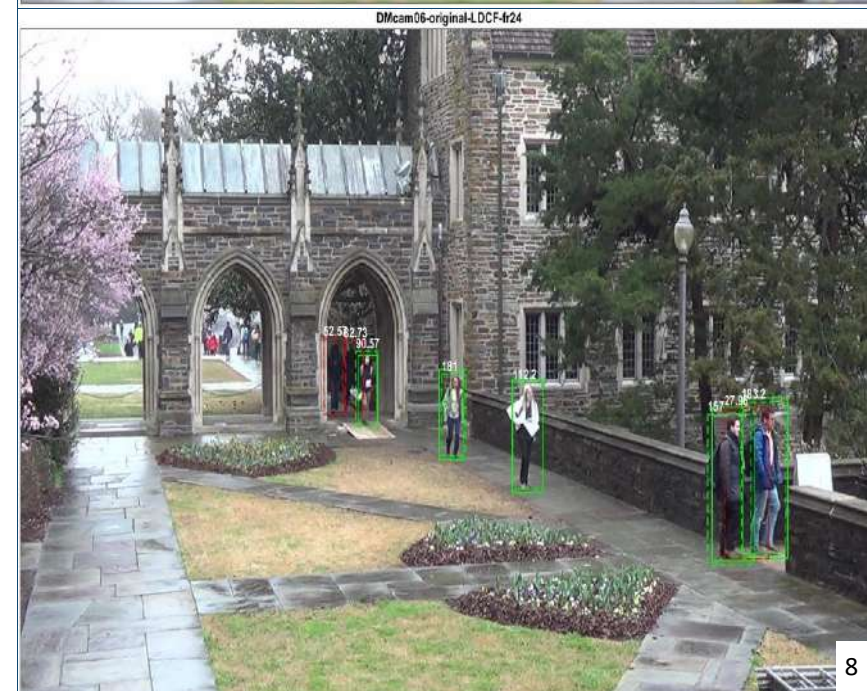


NIST

Data to Enable R&D

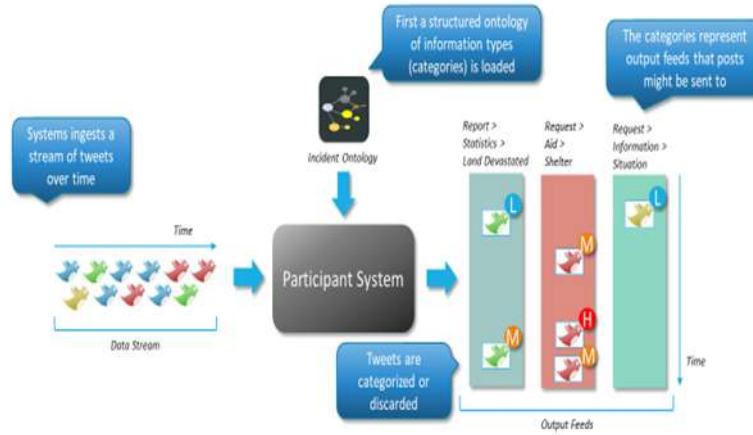


Enabling Research

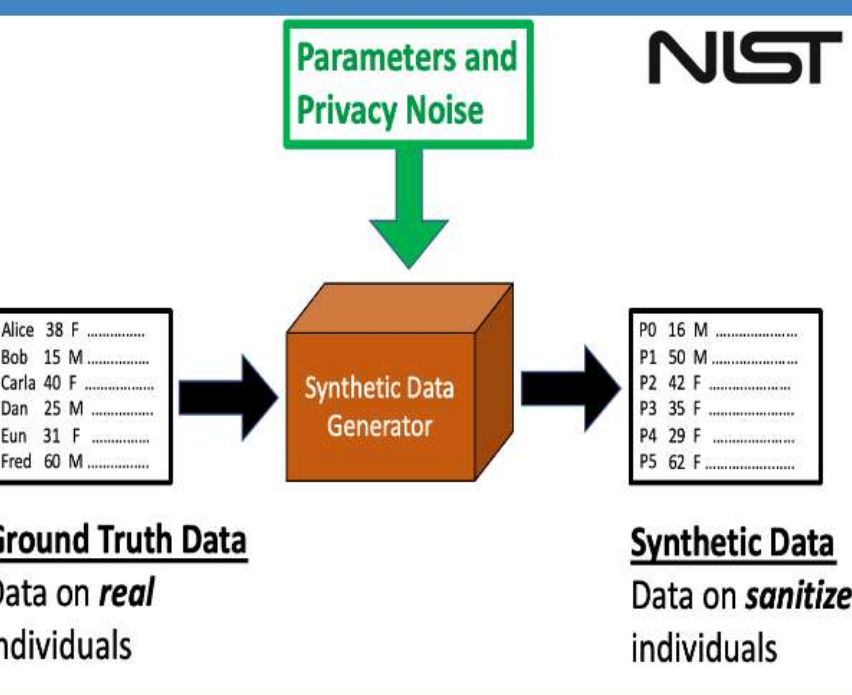




Task Visualisation

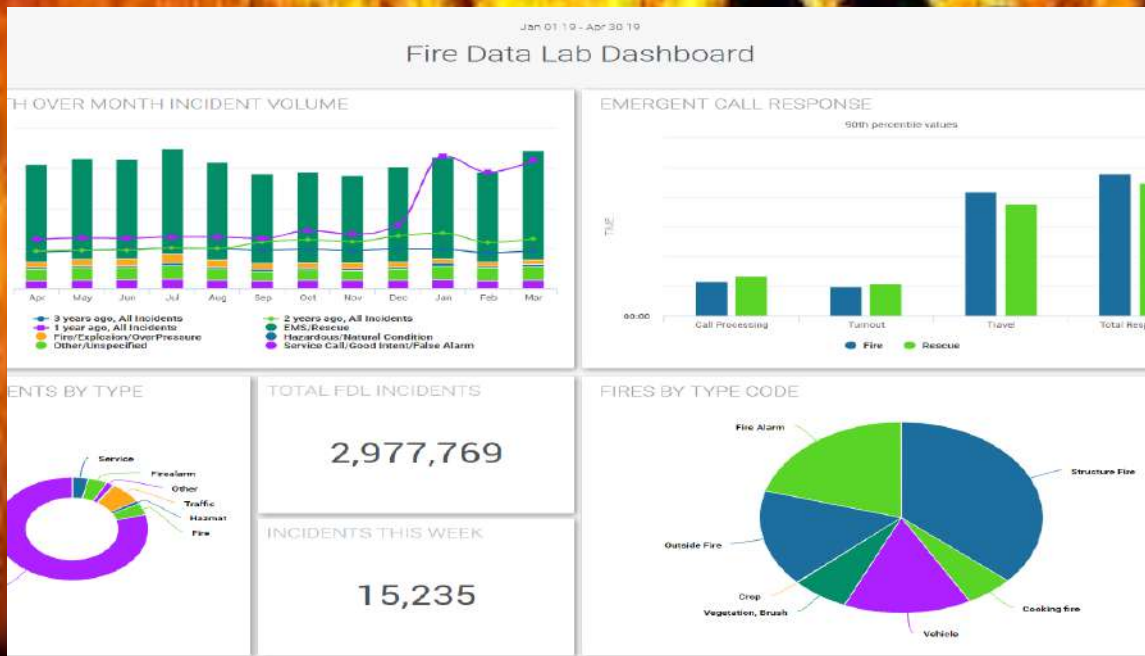


Challenge Projects to foster R&D





Frameworks



Rogers Fire Department Daily Report

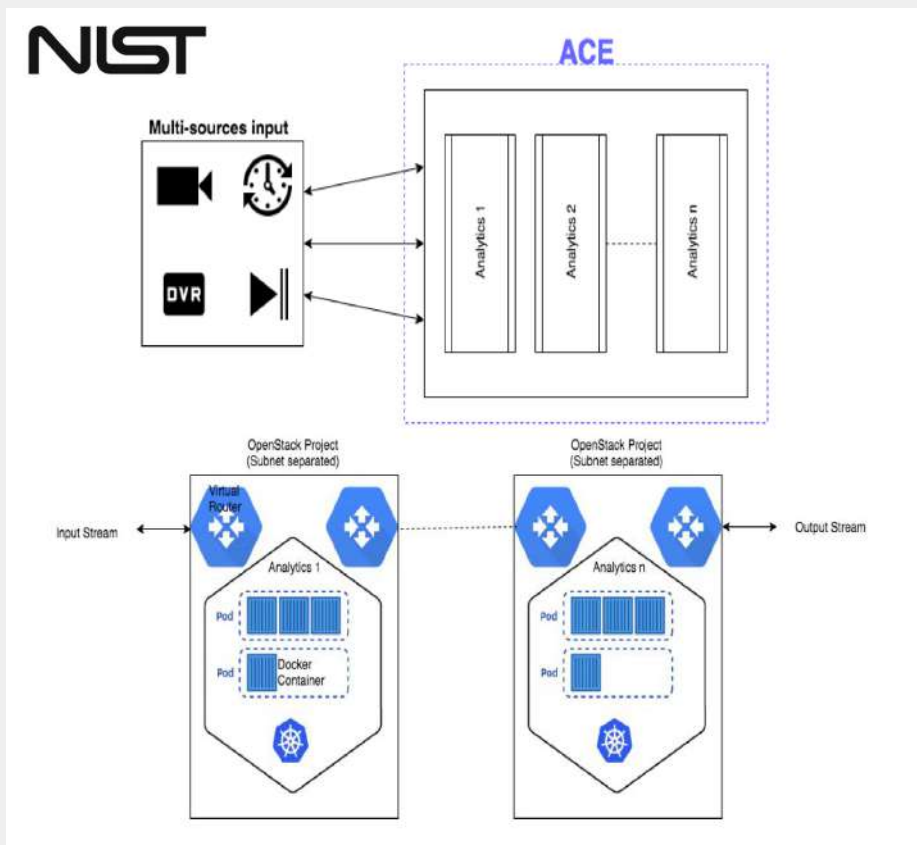
Apr 23, 2018 7:00 AM - Apr 24, 2018 7:00 AM
As of Apr 24, 2018 7:05 AM

[Dashboard](#)

Note: Metrics below may differ slightly from what you see on your dashboard

Incident Summary	
Metric	Value
Platoon	A
Total Incidents	14
EMS Incidents	10
Fire Incidents	4
Total Responses	29
Six Minute Response Percentage	84.84
90% Turnout Time (sec)	103.80
90% Event Duration (min)	72.51

Frameworks



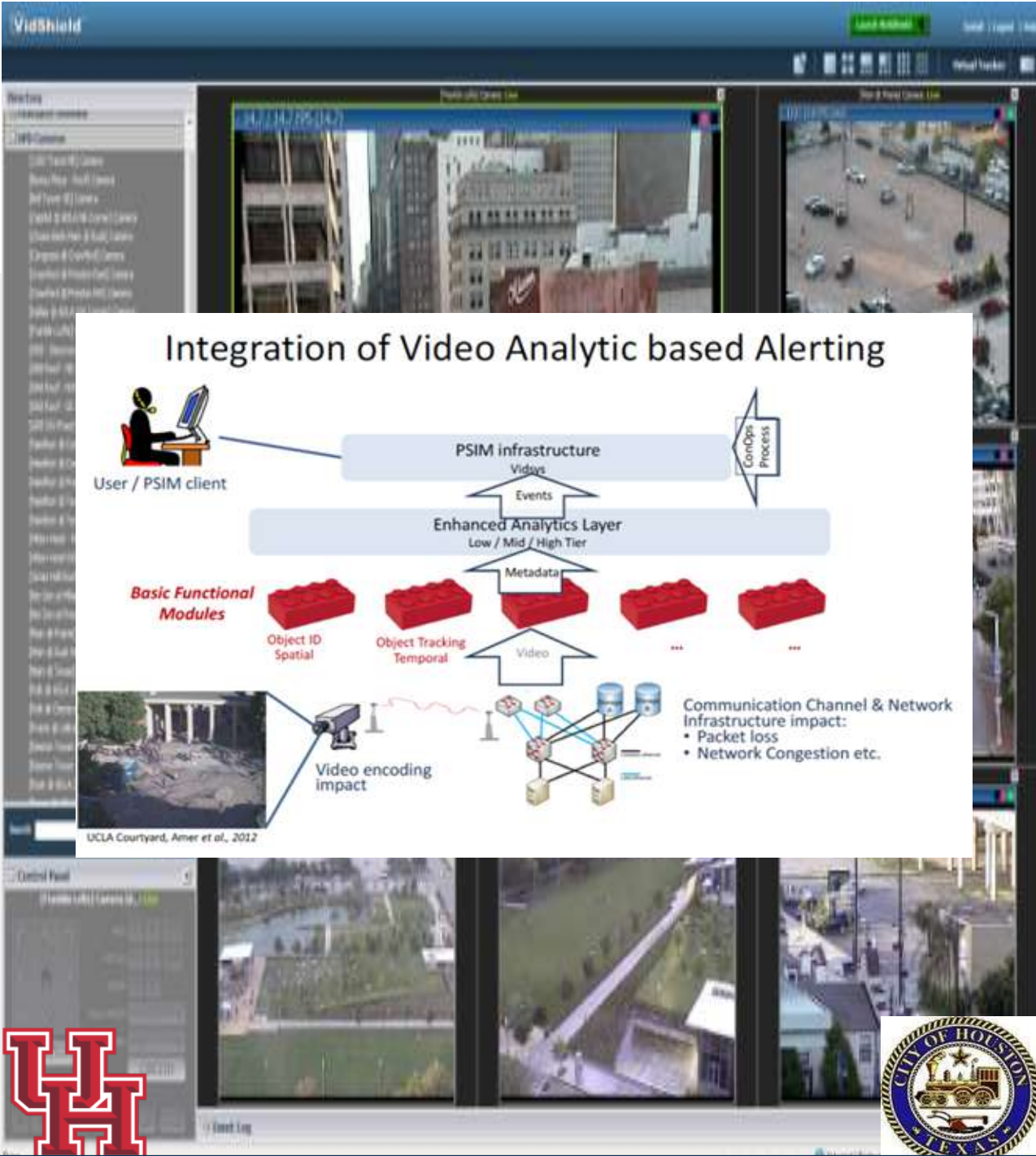
VOXEL51

ETA: Extensible Toolkit for Analytics
 NIST PSCR/PSIAP #60NANB17D159

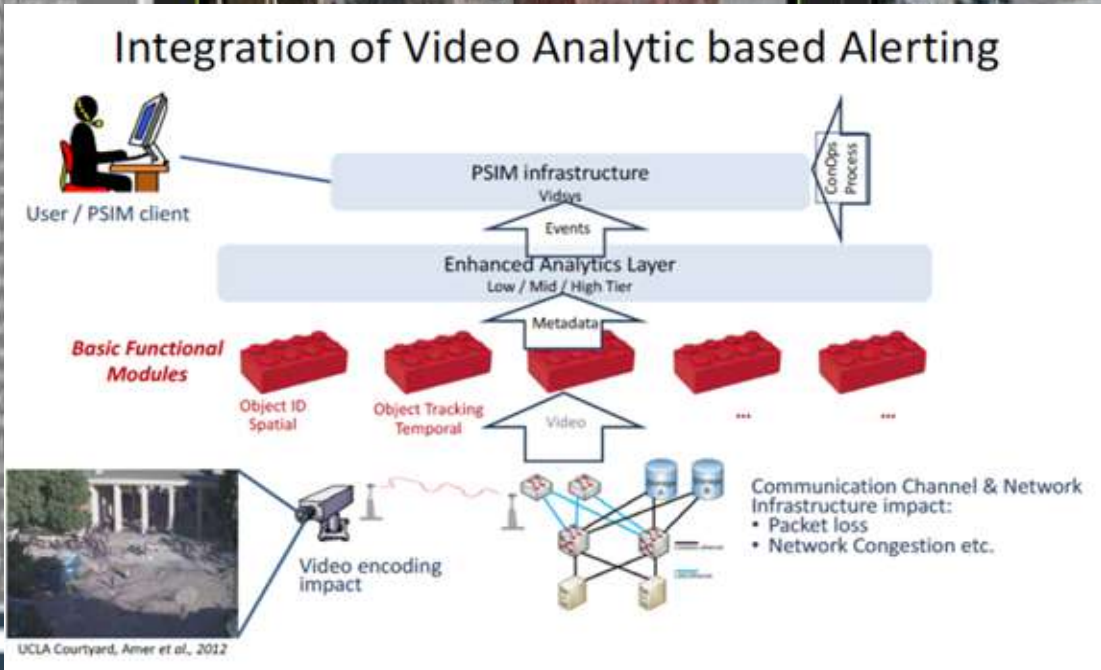
Our project lays the foundation of an open ecosystem of innovation centered around cutting edge technology for video analytics in public safety.

PI Jason Corso

jason@voxel51.com



Applied Analytics

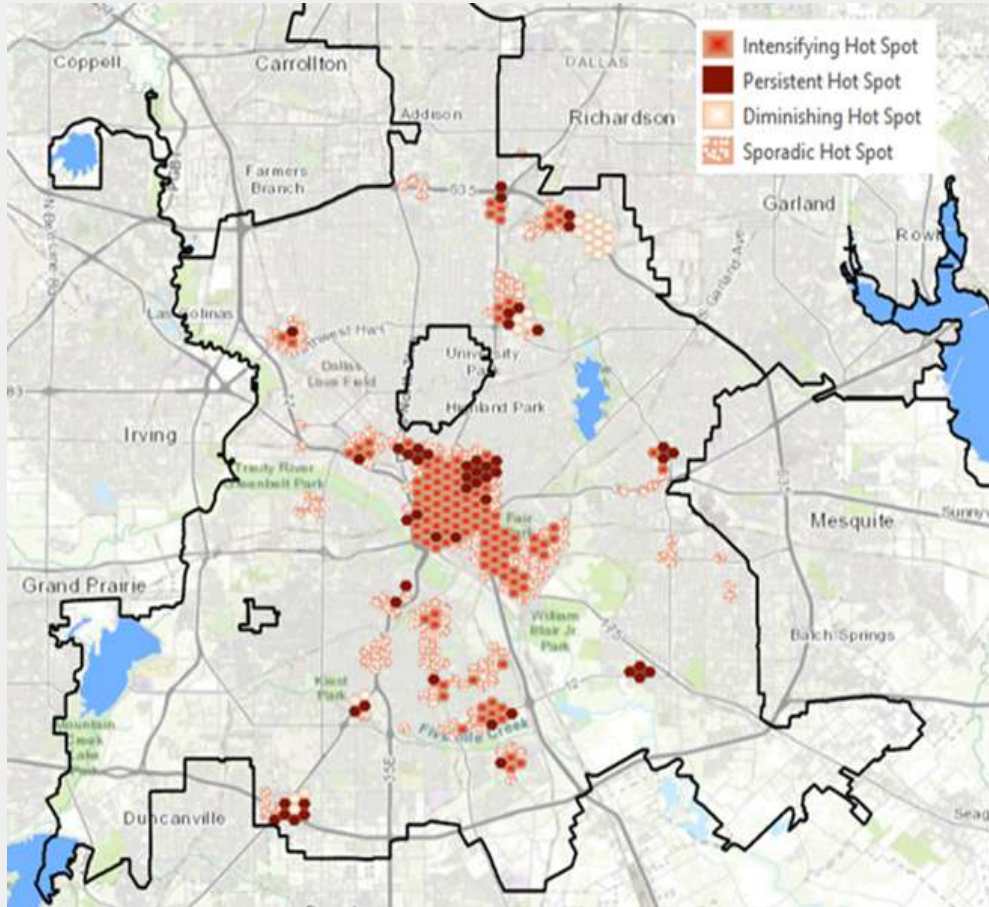


Unusual Motion

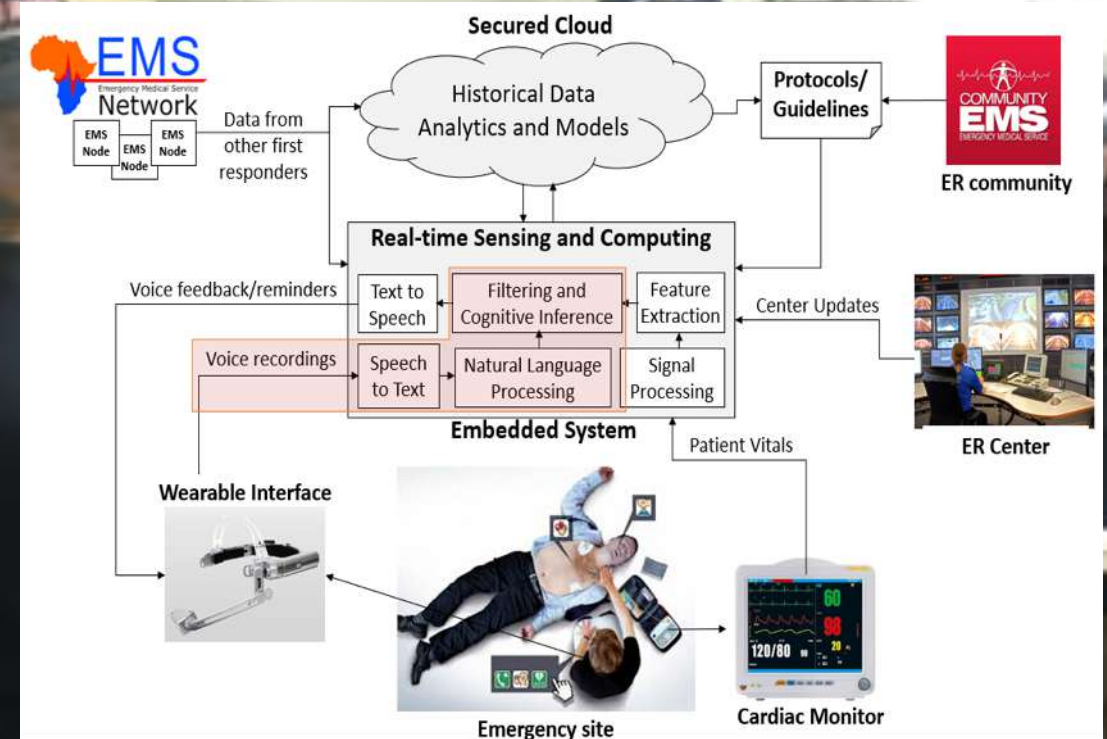
Stalled vehicle
Wrong direction
...



Applied Analytics



Applied Analytics



Applied Analytics

Gunshot Geo-Localization – Las Vegas Shooting

Satellite View

Mandalay Bay Hotel

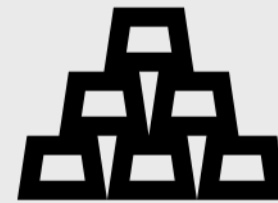
Pins: Camera locations
Possible shooter
location:

1. Donut area
2. Between green line and blue line



Collaboration Project with Baltimore CitiWatch

Demonstrate Agile Development/testing of Video Analytics with Public Safety Partners



Analyze the Infrastructure

*University of Houston/
Houston PS Video Program*

Understand the Analytic Needs

Baltimore CitiWatch

Curate the Analytic Modeling Data

*Baltimore CitiWatch/
Voxel51*

Build the Analytic Tools and Models

Voxel51

Refine and Test Models in the Lab

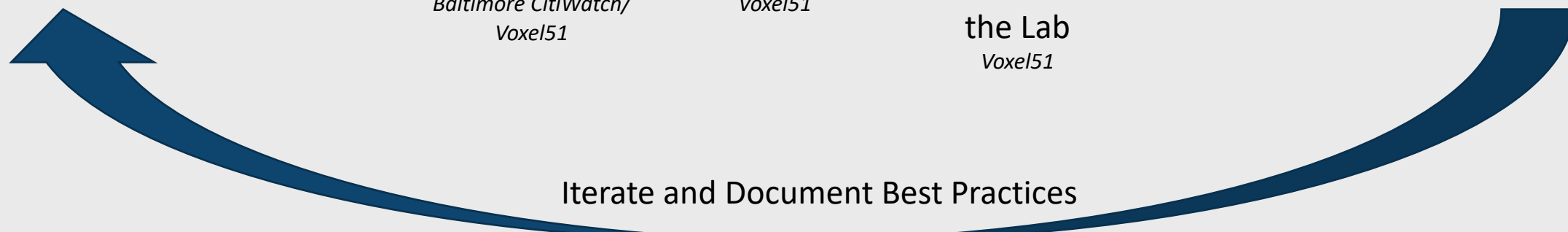
Voxel51

Integrate Within Measurement Framework

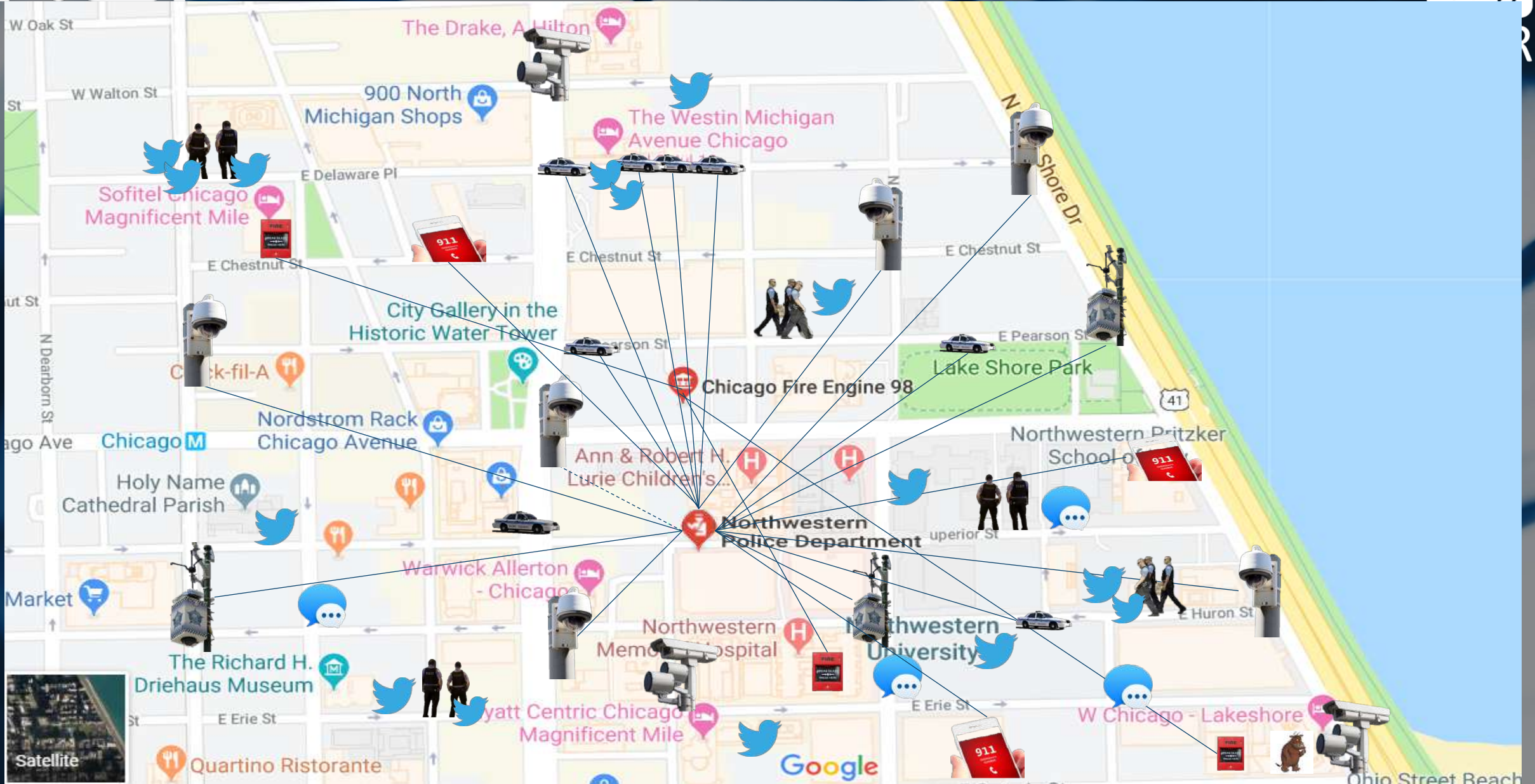
NIST ACE

Test with Public Safety Users

Baltimore CitiWatch



Iterate and Document Best Practices





First Responder's body worn camera shows multiple GSW victims, EMS crew receives location and images

911 call received at 0817 for medical emergency

Analytic detects multi-vehicle crash at 0759, nearby public safety center alerted

911 call received 0803

CPD camera shows smoke coming from 3rd Floor window of hotel

Fire Alarm on Erie & Lakeshore at 0820

Eyewitness tweets image of suspected shooter at cathedral

911 call reports active shooter 0812

CPD camera shows man with weapon leaving cathedral getting into tan sedan, vehicle description and photo is sent to all units

Gunshot Detector senses shots at 0811 and nearby public safety center alerted

ASAPS – City Scale Emergency Analysis with Actionable Information Delivery





Thank You

Next Up

John

Beltz

**Security &
Resilient
Systems**

PSCR Security Research Overview



5 Key Research Areas



LMR to LTE



User Interface User Experience
Mission Critical Voice



Location-Based Services
Public Safety Analytics



Security
Resilient Systems

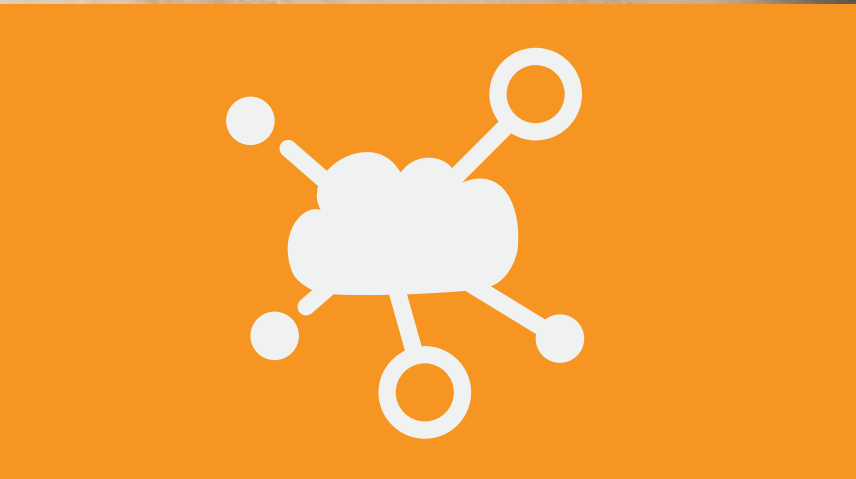


Cross Cutting
Research Areas

12 Billion



Cybersecurity



Access Controls

Mobile Application Security

Intrusion Detection

IoT/Wearables

Blockchain

LTE/5G Network Security

Encryption

Supply Chain

Identity Management

Privacy

Vulnerability Mitigation

Operating System

Over the air

Updates/patching

Forensics





Federation

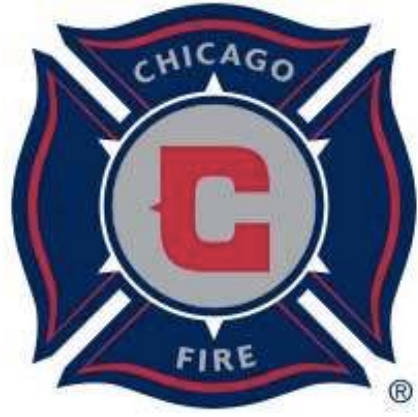


Database Login

Server Name:	<input type="text" value="DS"/>
Database:	<input type="text"/>
Login ID:	<input type="text"/>
Password:	<input type="password"/>

Use Integrated Security

Federation





NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

Texas Department of Public Safety

Department of Homeland Security

Kansas Bureau of Investigation

Houston Fire Department Safety

Washington State Patrol

MD DPSCS-CJIS AT&T NYPD

GTRI

ACE IJIS Institute FBI/CJIS

TN Bureau of Investigation Diverse Computing, NC. - CJIS

CommSys Inc

FBI CJIS FirstNet

LA-RICS

Motorola Solutions

DHS OEC

Division

Oasys International Corporation

Colorado Div. of Homeland Security and Emergency Management

Texas Department of Public

N.C. State Bureau of Investigation

NIST



LOGIN

PASSWORD



DRAFT

NIST SPECIAL PUBLICATION 1800-13A

Mobile Application Single Sign-On

Improving Authentication for Public Safety First Responders

Volume A:
Executive Summary

Paul Grassi
Applied Cybersecurity Division
Information Technology Laboratory

Bill Fisher
National Cybersecurity Center of Excellence
Information Technology Laboratory

Santosh Jha
William Kim
Taylor McCorkill
Joseph Pustiser
Mark Russell
Sudhi Umarji
The MITRE Corporation
McLean, VA

April 2018

DRAFT

This publication is available free of charge from:
<https://www.nccoe.nist.gov/projects/use-cases/mobile-ssn>



2 Factor Authentication



Enhanced Authenticators





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COMPUTER SECURITY

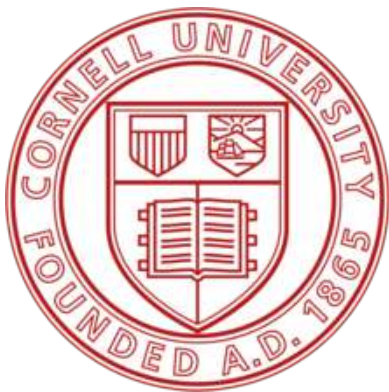
NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

NIST Special Publication 800-63-3
Digital Identity Guidelines





**RESILIENT
SYSTEMS**



NIST



POLICE

THANK YOU

NIST



Thank you

