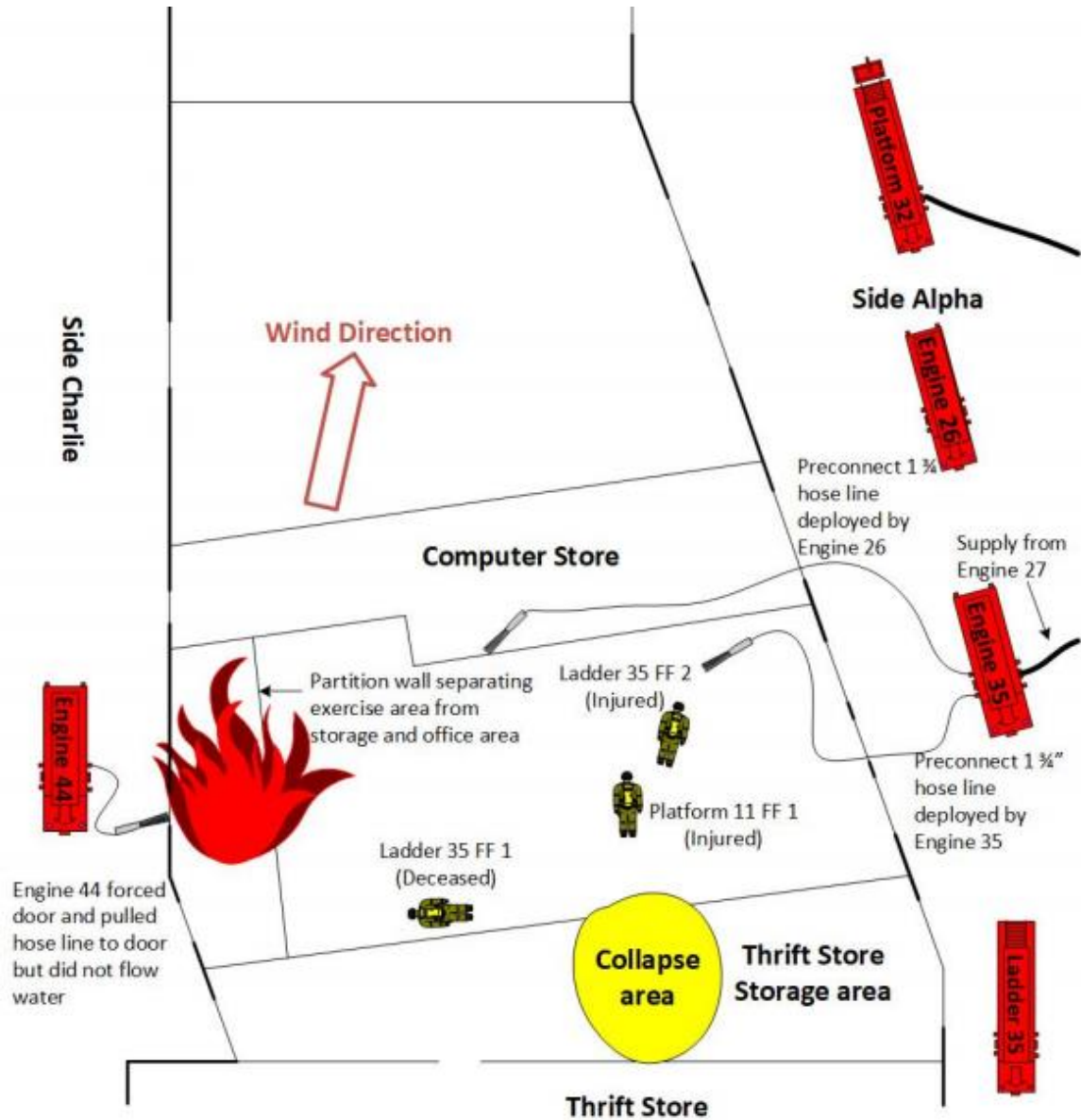


# PSCR Location-based Services Overview

# Motivation

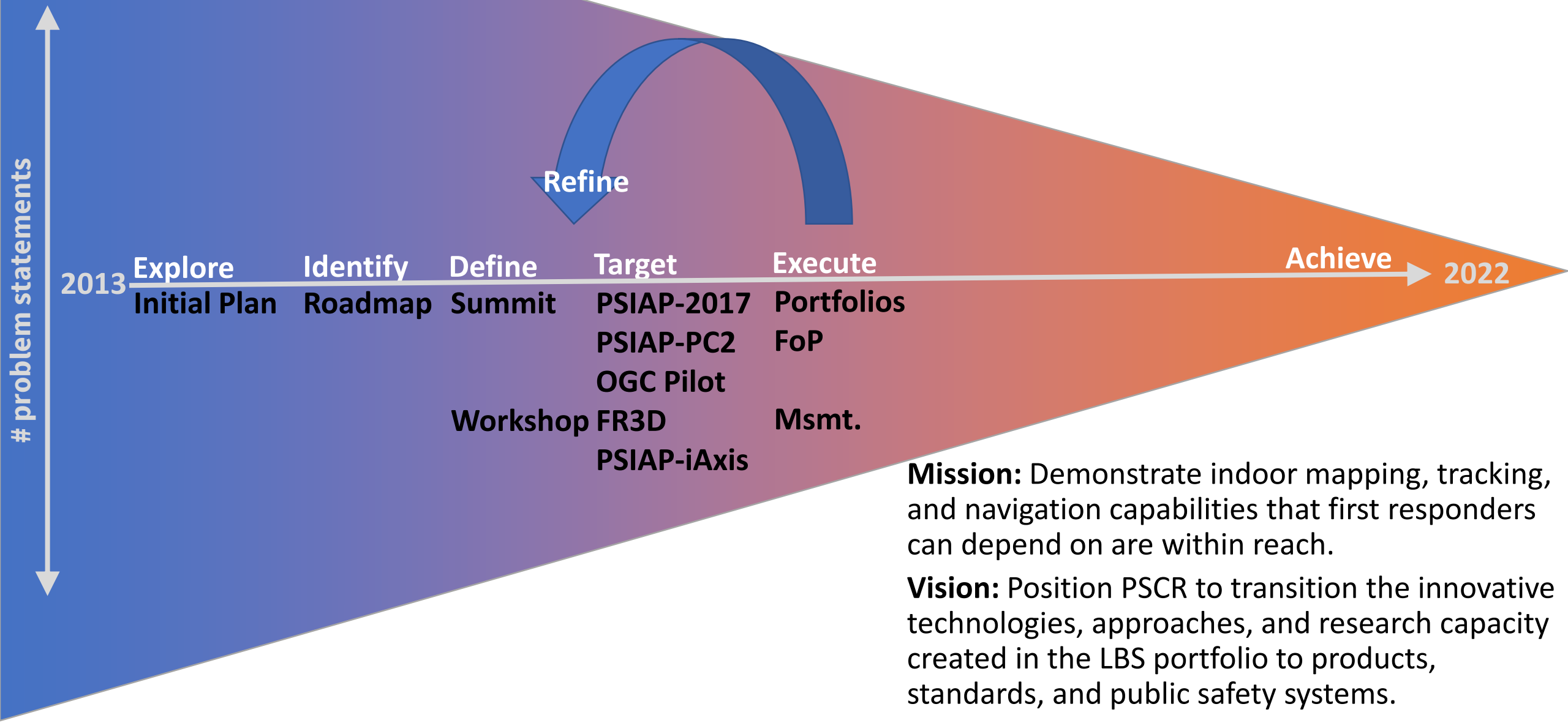


# Motivation

NIST



# Plan to Execution



**Mission:** Demonstrate indoor mapping, tracking, and navigation capabilities that first responders can depend on are within reach.

**Vision:** Position PSCR to transition the innovative technologies, approaches, and research capacity created in the LBS portfolio to products, standards, and public safety systems.



**PSCR** LOCATION-BASED SERVICES

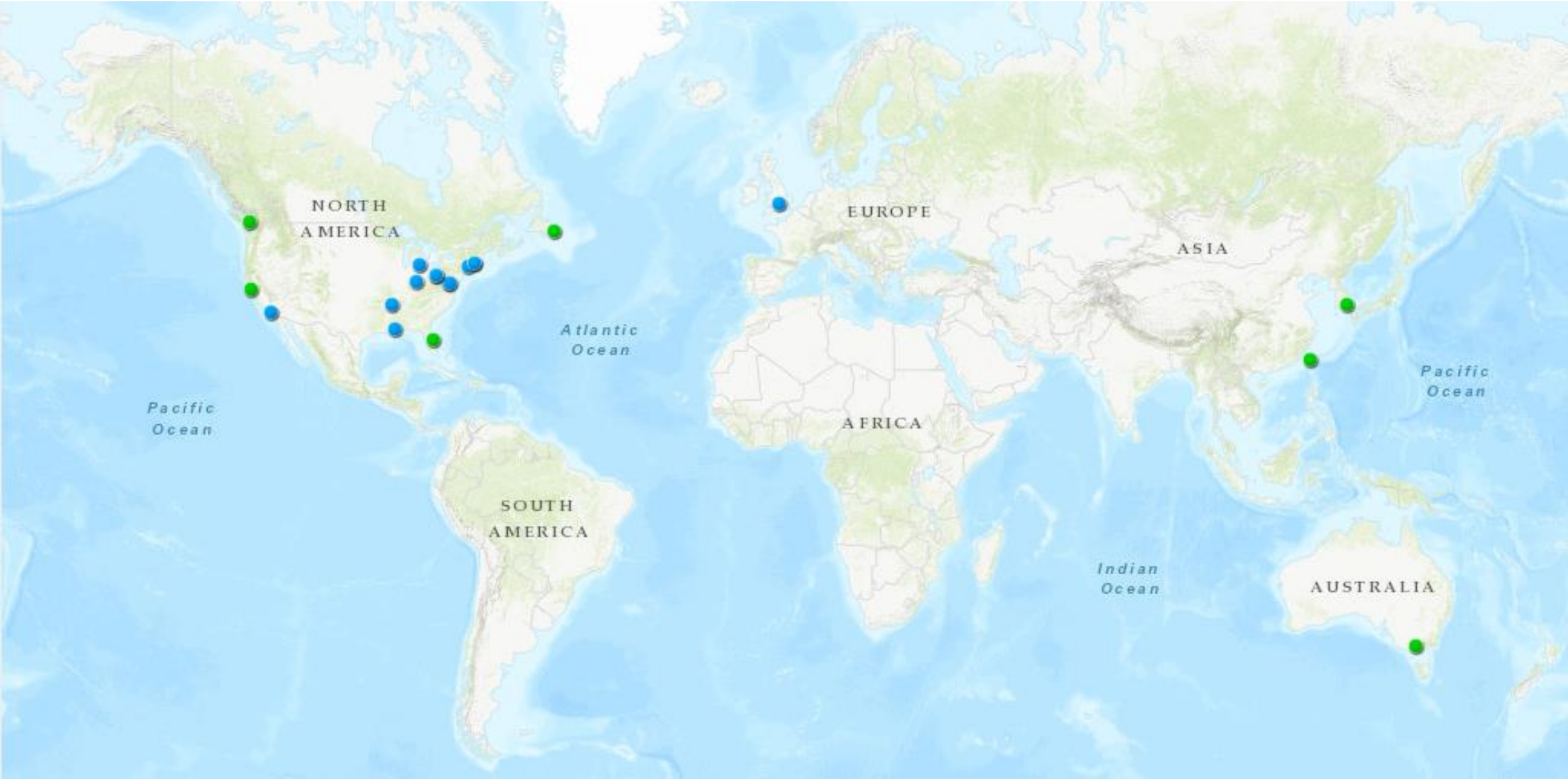
Mapping

Navigation

Opera...

Tracking

# Global





**PSCR** LOCATION-BASED  
SERVICES

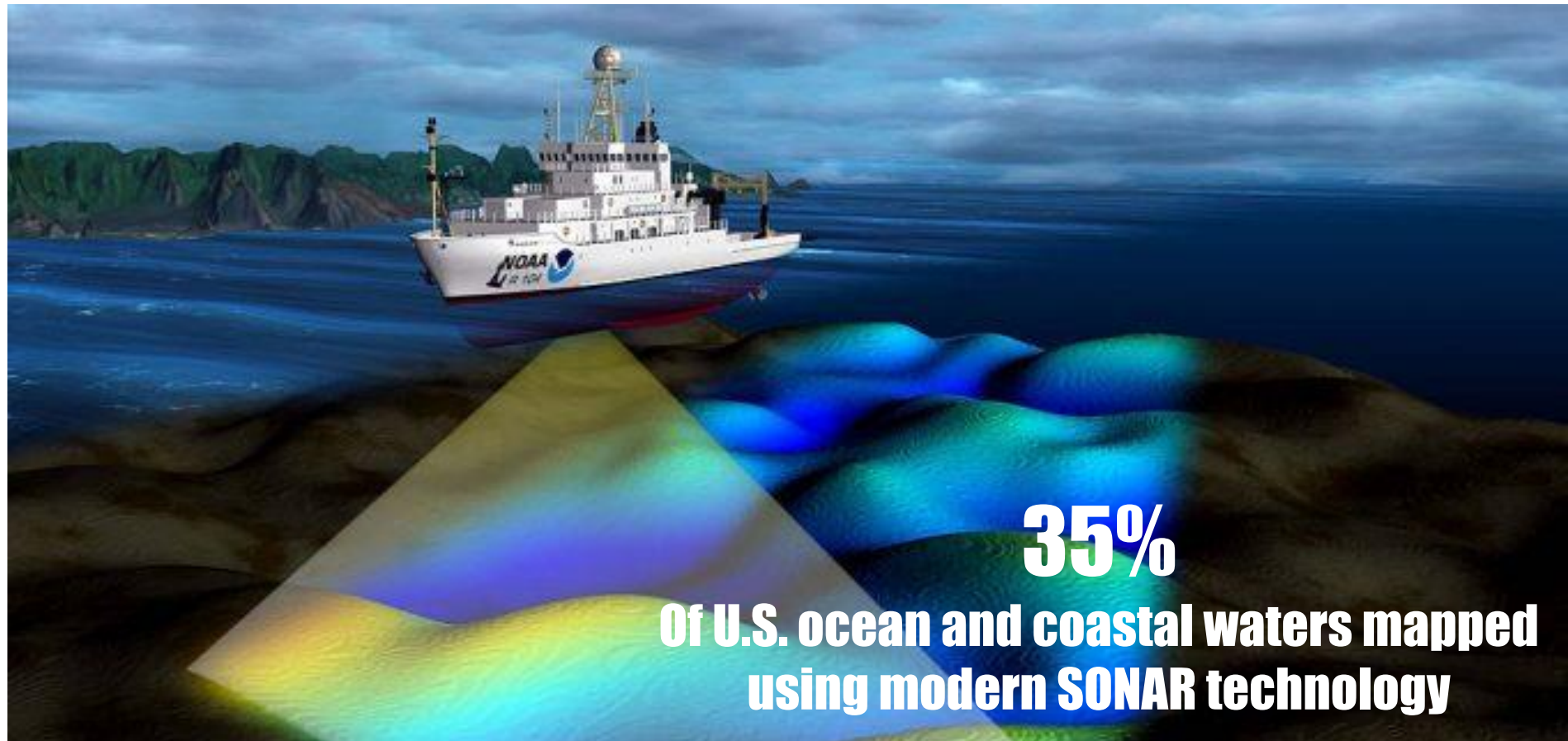
Mapping

Navigation

# The Last Frontier

NIST

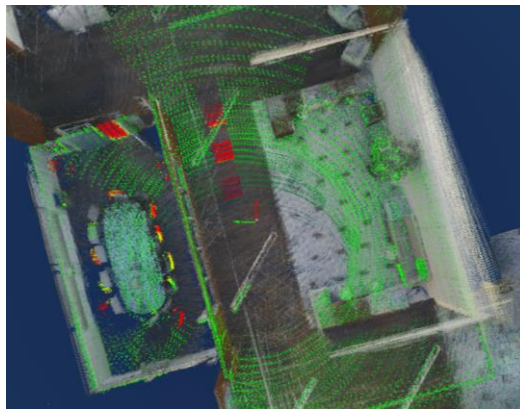
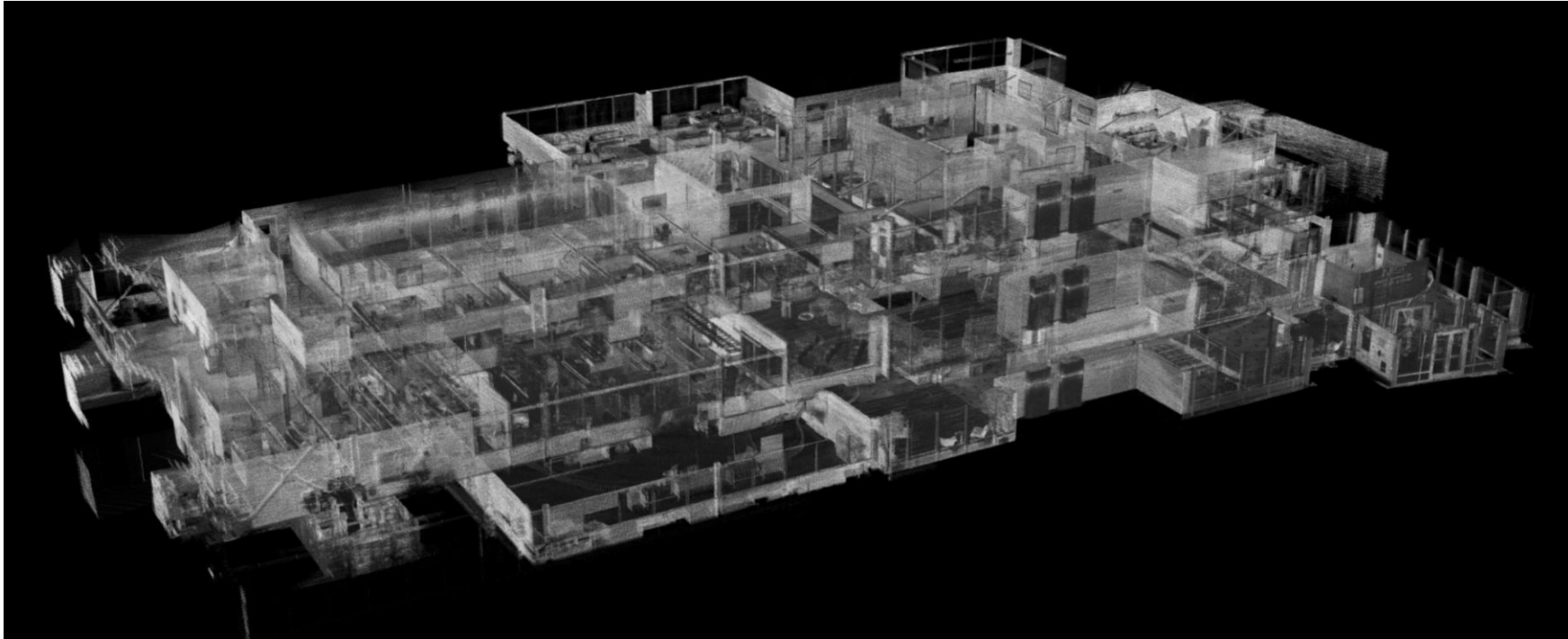
**270,000,000,000 sq. ft**  
**U.S. commercial + residential real estate**



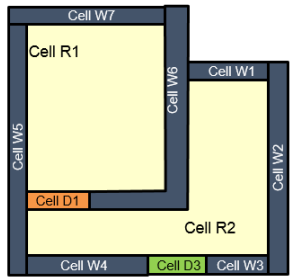


# Future of Pre-incident Planning

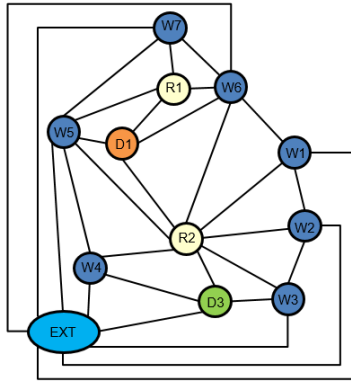
NIST



# Indoor Map & Nav Pilot

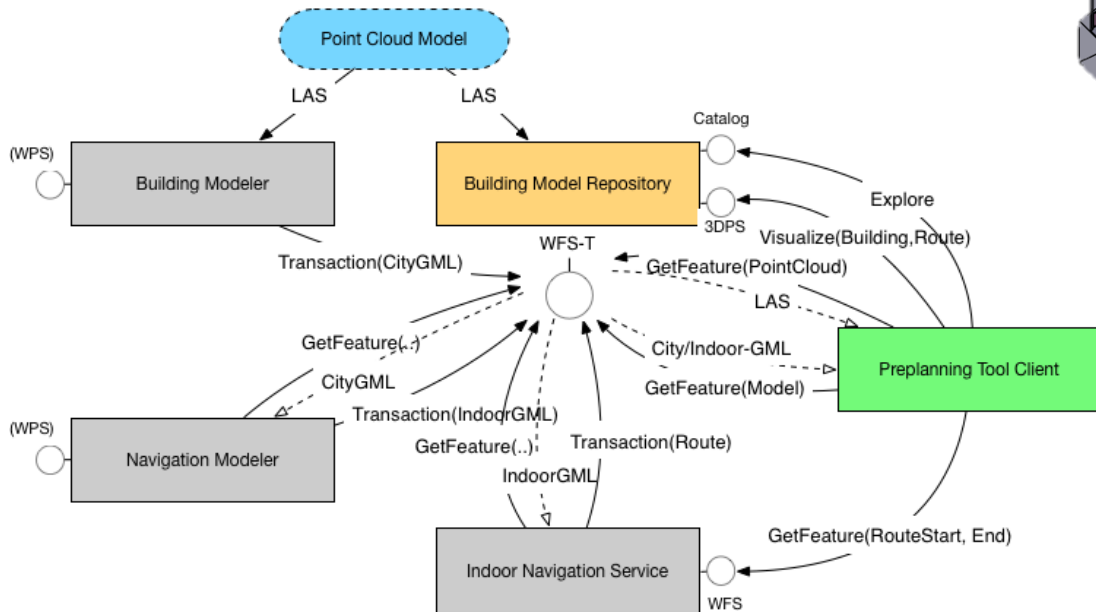
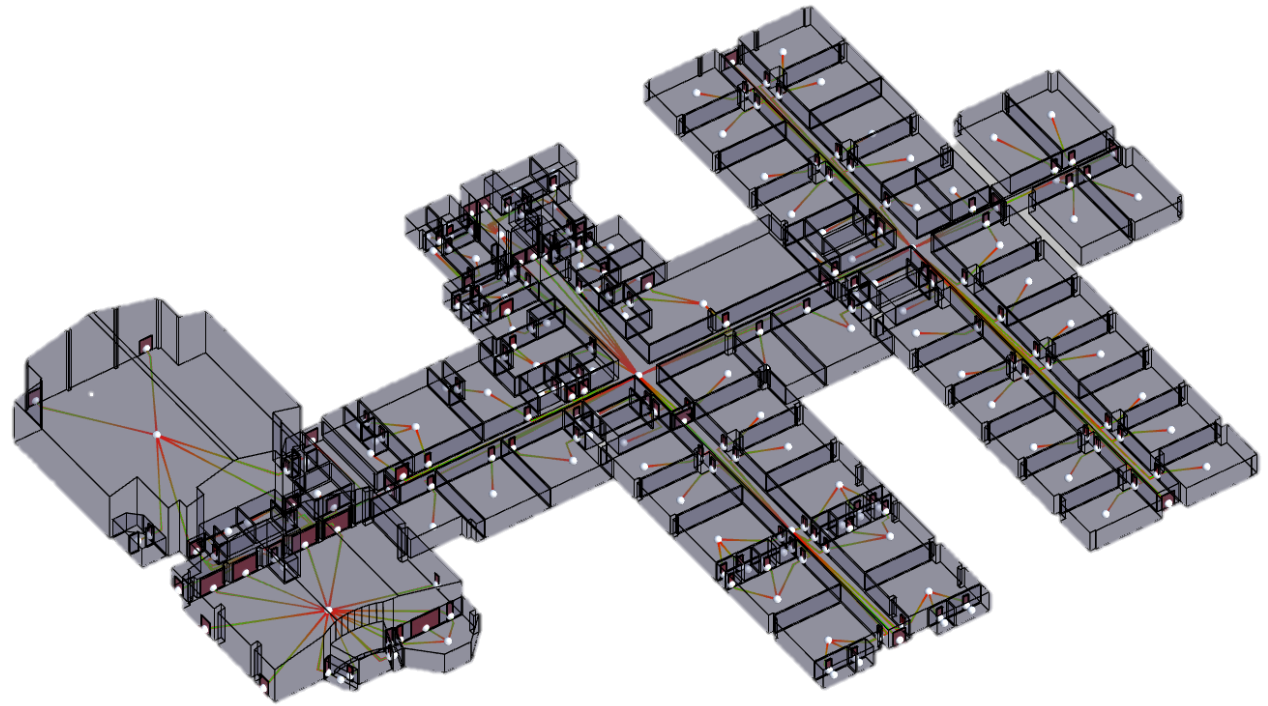


Original Space



Adjacency Relationship of Transformed Graph

- Non-Navigable Space (wall)
- Navigable Space (room)
- Connection Space (door)
- Anchor Space (gate)



# Scale & Risk

Sq. ft. of real estate in U.S

181.5B



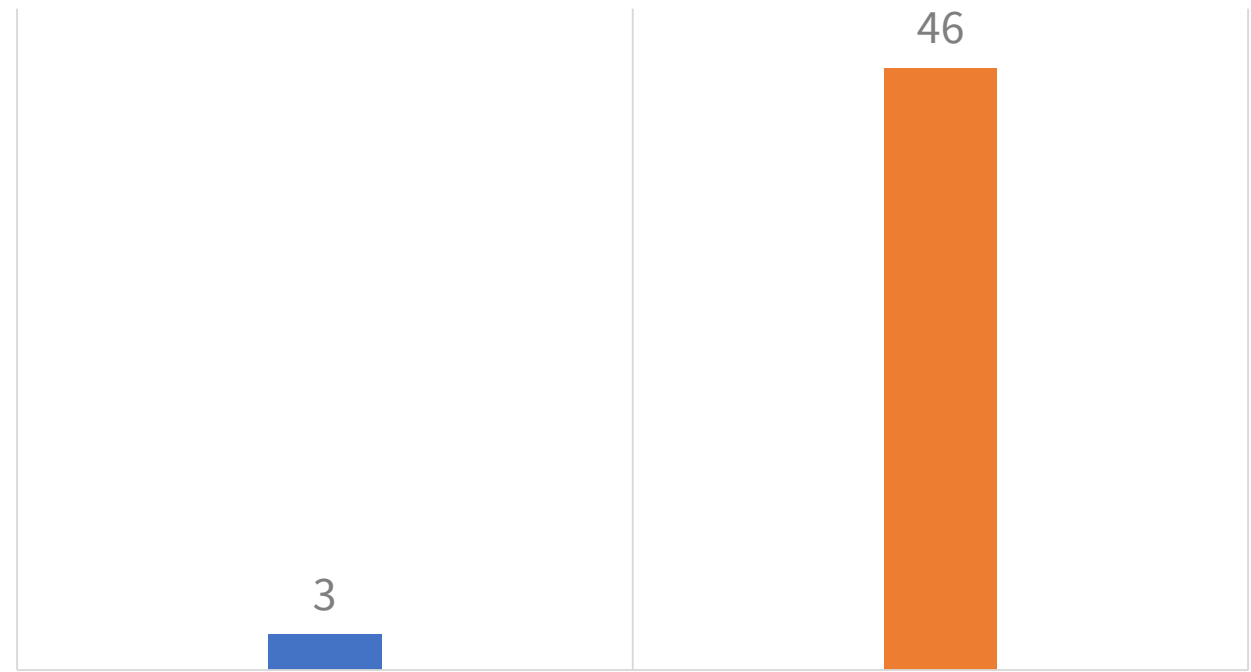
87.4B



2X

2008 – 2017

FIREFIGHTER FIRE GROUND DEATHS PER 100,000 FIRES



RESIDENTIAL

NON-RESIDENTIAL

15X

# Point Cloud City

NIST



**3 cities**  
**29 Buildings**  
**4,500,000 sq. ft.**



## **Tech To Protect Challenge: Fire Safety in 3D**

# **121M**

**Occupied housing units in U.S.**





**PSCR** LOCATION-BASED SERVICES



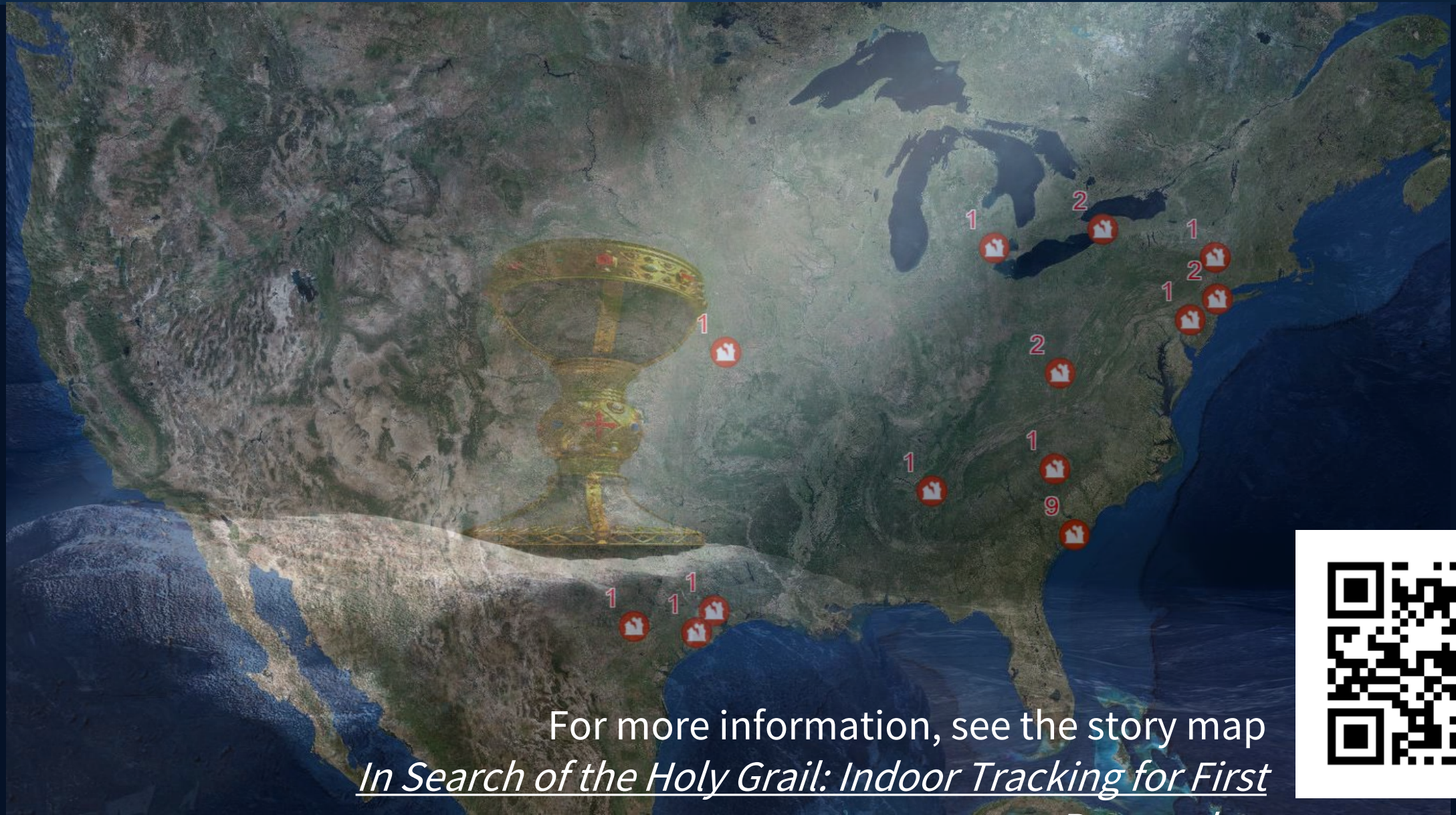
# 87%

**Percent time average person spends indoors**

# \$40.99B

**Projected global indoor  
location market by 2022**

# Holy Grail



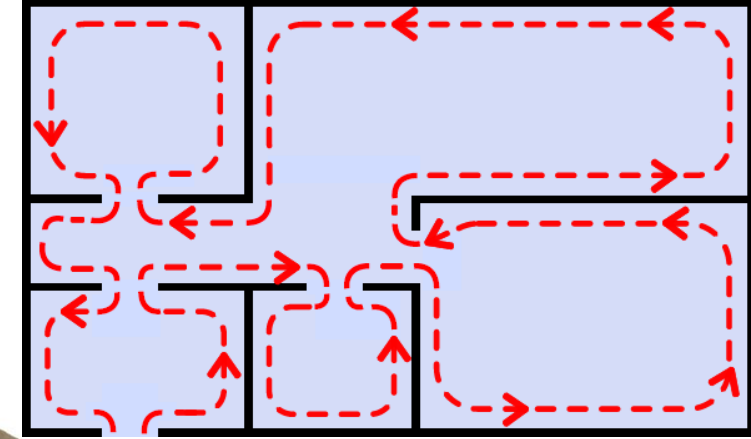
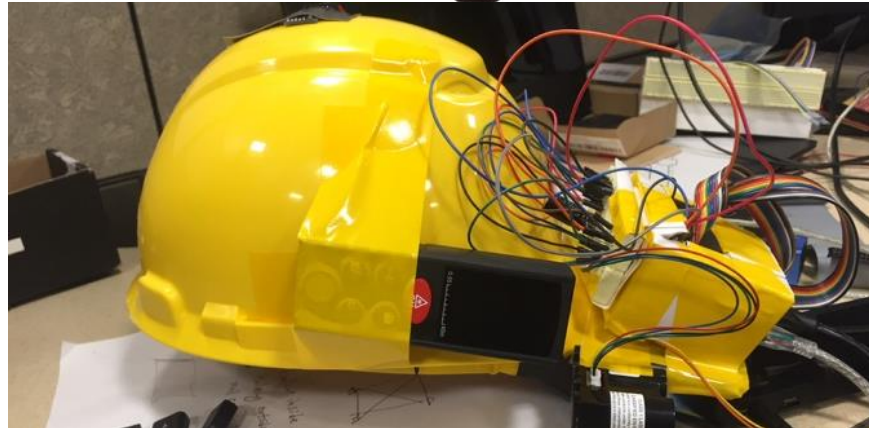
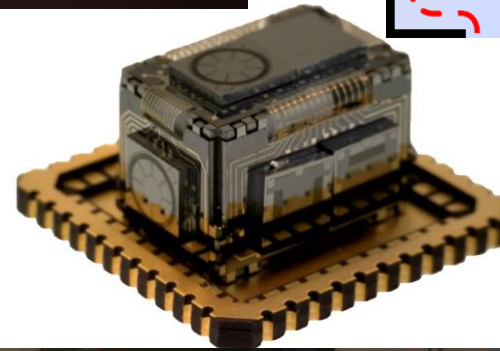
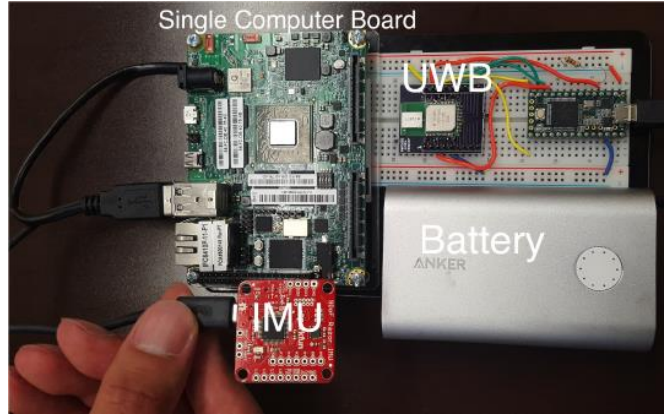
For more information, see the story map  
*[In Search of the Holy Grail: Indoor Tracking for First](#)*



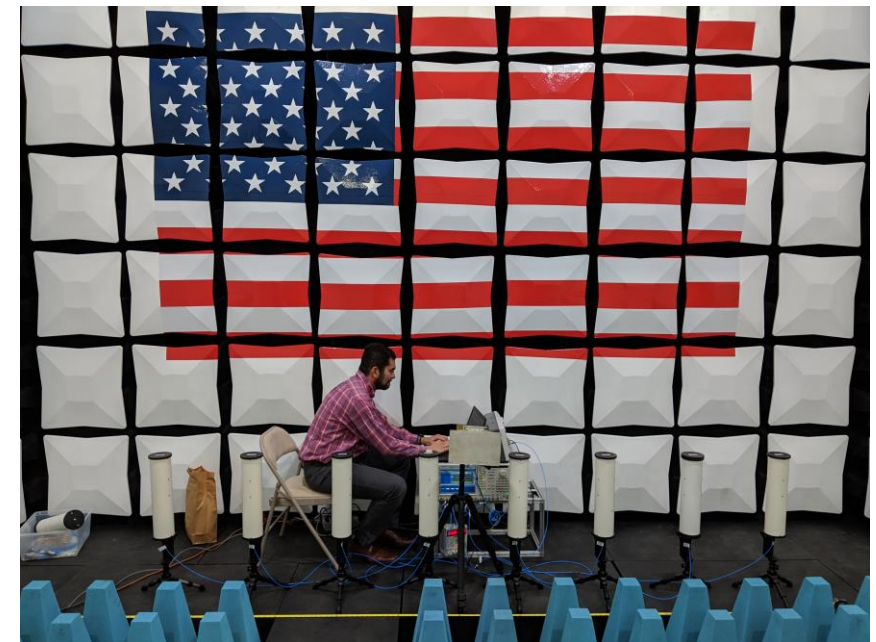
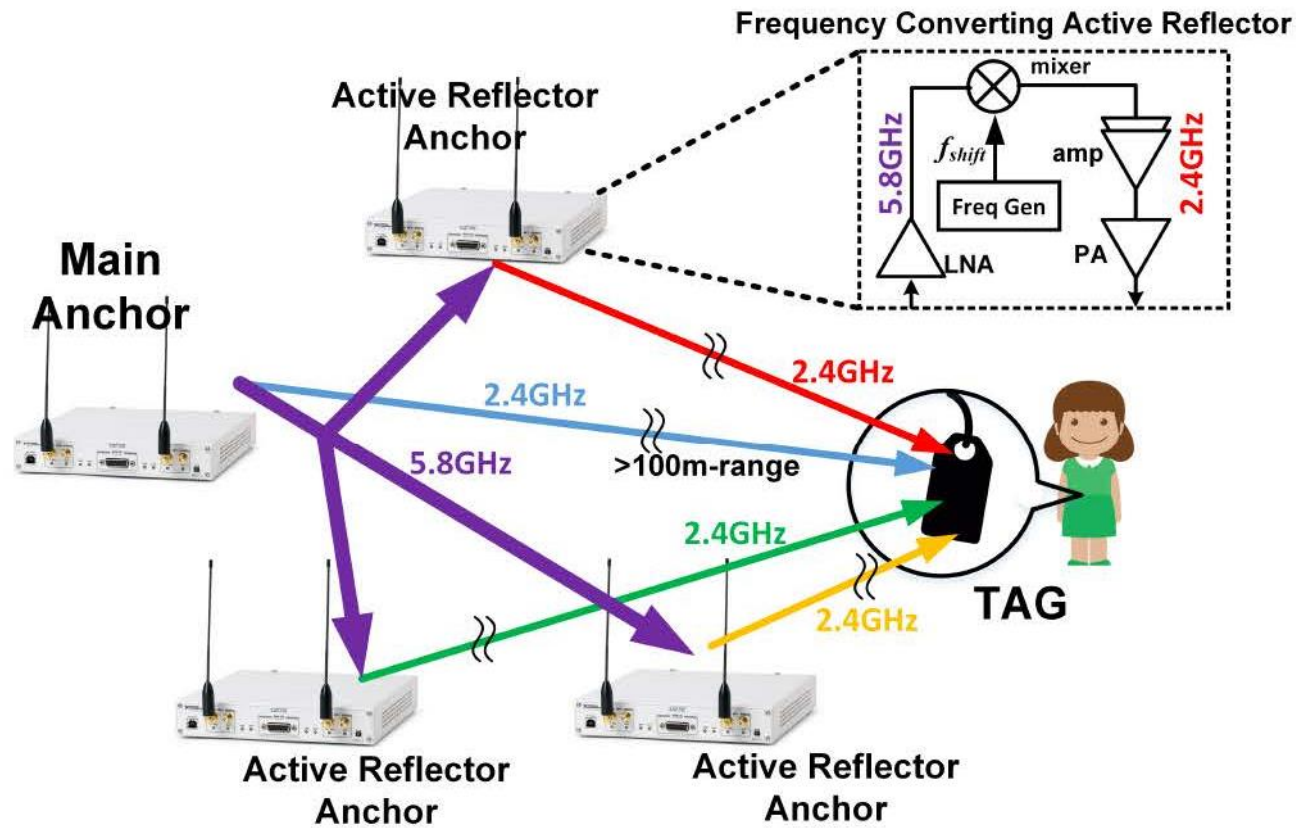


# Advanced R&D

- ✓ Inertial
- ✓ Magnetic
- ✓ Ultrasonic
- ✓ Pressure
- ✓ Thermal
- ✓ Visual
- ✓ LiDAR
- ✓ mmWave
- ✓ UWB
- ✓ BLE
- ✓ LTE-Downlink
- ✓ LTE-D2D
- ✓ Cooperative
- ✓ Map matching



# Advanced R&D





**Boise Fire Training Facility**



**PSCR** LOCATION-BASED  
SERVICES

# i-Axis & Outreach

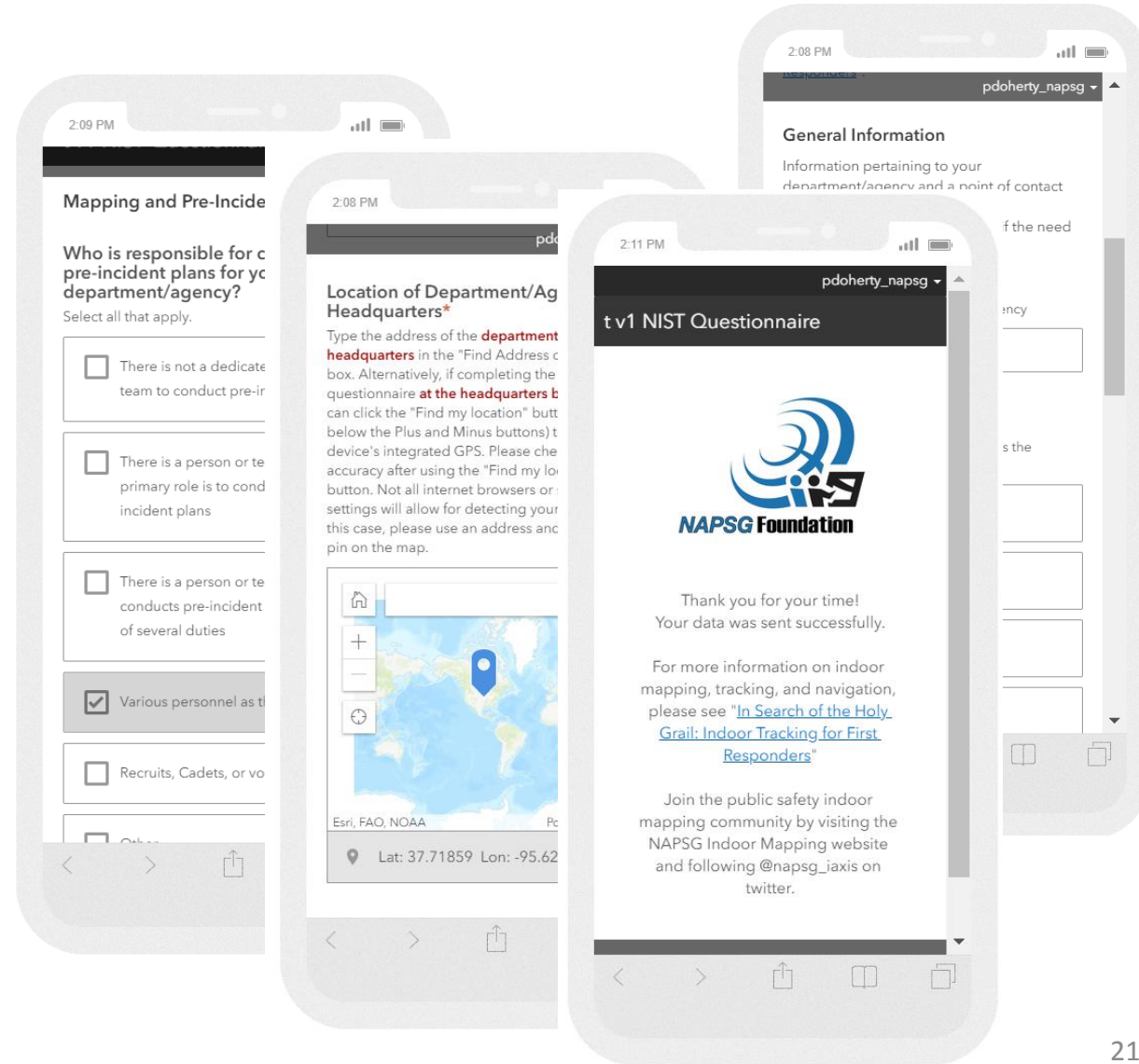
Add your department to the map  
and share how you are using:

- Mapping
- Tracking
- Navigation



Outreach:

- Conferences
- Webinars
- Demos
- Workshops



# Wireless 911

NIST



# PSCR Success Framework

## PSCR 2022 Success Framework [March 2018]

Measurable  
impact on  
saving lives,  
property, etc.

PSCR research indirectly  
supports this goal

Transforming  
Public Safety  
Operational  
Capabilities

PSCR research directly  
supports this goal

Research  
Capacity

Disruptive  
Approaches &  
Technology

Standards

Products

Public Safety  
Methods

PSCR primarily focuses on developing, expanding, or influencing these 5 areas

# Investment Priorities

NIST

Standards

Innovation

Public Safety Systems

Research Capacity



# Momentum



**140**

**R&D personnel & students**

**90%**

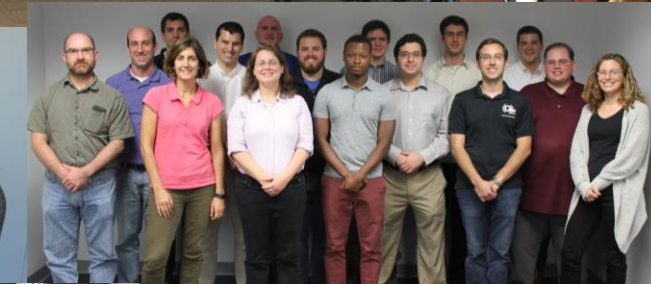
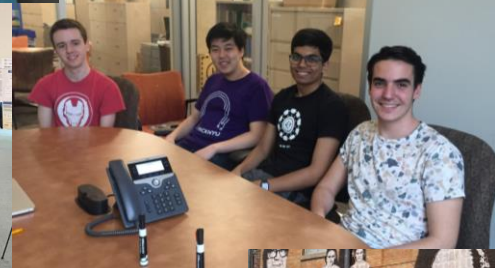
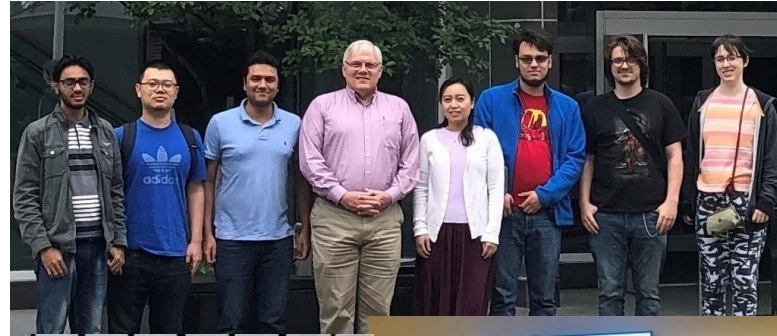
**New to public safety**

**500 hrs.**

**Testing with public safety**

**32**

**Publications**



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



- **Goals**

- Demonstrate 1 m accuracy is within reach
  - Laser-focus on localization – no *navigation, UI* or *communications*
- Benchmark performance of sensors and systems
- Demonstrate strengths of multi-sensor fusion approach
- Identify most promising technologies for future investment
- Create datasets and valuable experiences for follow-on research
  - Analyze potential benefits of maps and cooperative localization
  - Identify areas for integration and standardization

- **Unique features**

- Infrastructure-free AND survey-free
- Realistic first-responder motion
- Novel sensor suites and fusion techniques optimized for use case
- Cooperative localization

# Thank you