2018 Public Safety Broadband Stakeholder Meeting

Dereck Orr,
PSCR Division Chief

PSCR NIST

Acronym Glossary

- 3GPP = 3rd Generation Partnership Project
- AGL = Above Ground Level
- AMBE = Advanced Multi-Band Excitation
- APCO = Association of Public Safety Communications Officials
- API = Application Program Interface
- A/V = Audio/ Visual
- BIM = Building Information Model
- CAF = Common Application Framework
- DU = Digital Unit
- ETSI = European Telecommunications Standards Institute
- IoLST = Internet of Life Saving Things
- LBS = Location- Based Services
- LMR = Land Mobile Radio
- MCPTT = Mission Critical Push-to-Talk
- OUA = Operator/ User Association
- PPDR = Public Protection & Disaster Relief
- PPE = Personal Protective Equipment
- ProSe = Proximity Services
- PSNE = Public Safety Network Entity
- RAN = Radio Access Network
- RMS = Records Management Systems
- RU = Radio Unit
- SDAIRS = San Diego Aerial Information Reconoment System
- SIP = Session Initiated Protocol
- SSO = Single Sign-On
- TCCA = The Critical Communications Association
- TETRA = Terrestrial Trunked Radio
- UAV = Unmanned Aerial Vehicle
- UI/UX = User Interface/ User Experience

PSCR

2018 Public Safety Broadband Stakeholder Meeting

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Welcome to the 10th Annual Public Safety Broadband Stakeholder Meeting!

Recent Headlines

- Seven new Public Safety Innovation Accelerator – User Interface awards announced 2 weeks ago!
- Unmanned Aerial System Challenge 2 weeks ago!
- Final Stages of the Virtual Reality Heads-Up Display Challenge THIS Week
- New Prizes and Grants coming THIS Summer

Year in Review...

Last year, we LAUNCHED this year, we're building momentum!

Mission Critical Voice | Location-Based Services | Analytics | UI / UX | Resilient Systems | Security

This is a global effort

Welcome to the 10th Annual Public Safety Broadband Stakeholder Meeting!

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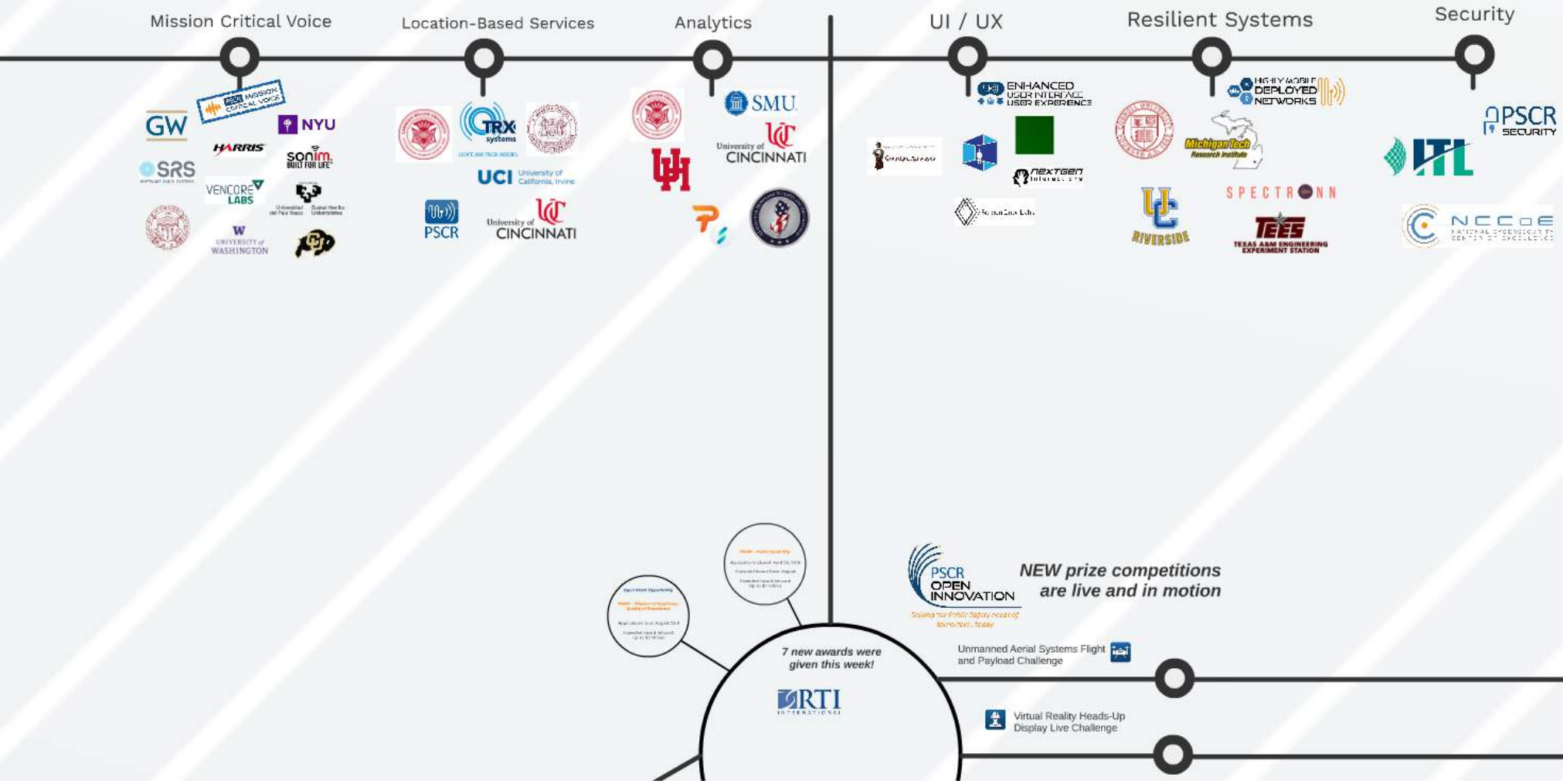

Mission Critical Voice

Lo

PSCR MISSION CRITICAL VOICE

GW

NYU

HARRIS

SRS SOFTWARE RADIO SYSTEMS

sonim BUILT FOR LIFE™

VENCORE LABS

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Universidad del País Vasco

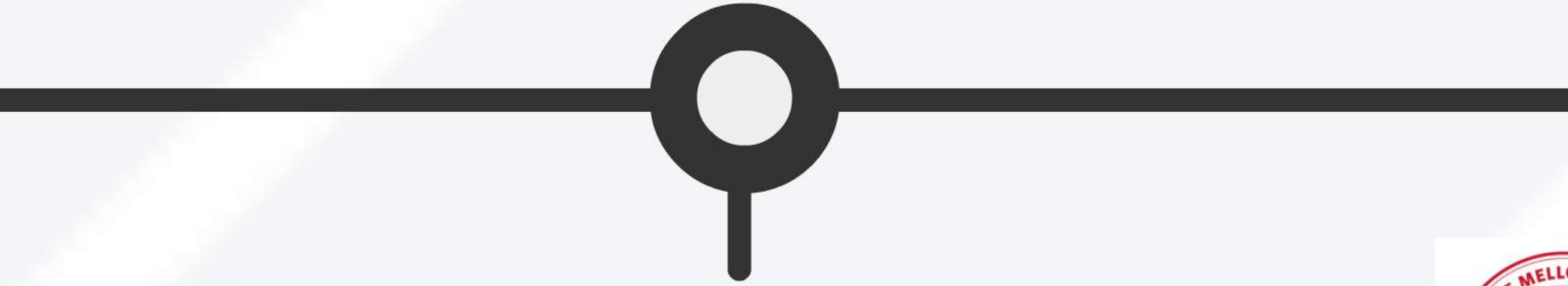
Euskal Herriko Unibertsitatea

UNIVERSITY of SOUTHERN CALIFORNIA 1880

UNIVERSITY of WASHINGTON

CU

Location-Based Services



LOCATE. MAP. TRACK. INDOORS.

UCI University of California, Irvine

vices

Analytics

of
rvine

ATI

University of
CINCINNATI

UI / UX

R

LOOKON MEDIA

VIRTUAL REALITY TECHNOLOGY UNIVERSE

ENHANCED USER INTERFACE USER EXPERIENCE

nextgen Interactions

NTIA

Screen Door Labs

Resilient Systems

NCED
TERFACE
PERIENCE

XTGEN
ractions

ST

HIGHLY MOBILE DEPLOYED NETWORKS

CORNELL UNIVERSITY FOUNDED A.D. 1865

Michigan Tech Research Institute

NIST

SPECTRONN

RIVERSIDE

TEES
TEXAS A&M ENGINEERING EXPERIMENT STATION

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Security

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NATIONAL CYBERSECURITY
CENTER OF EXCELLENCE

NEERING
TATION

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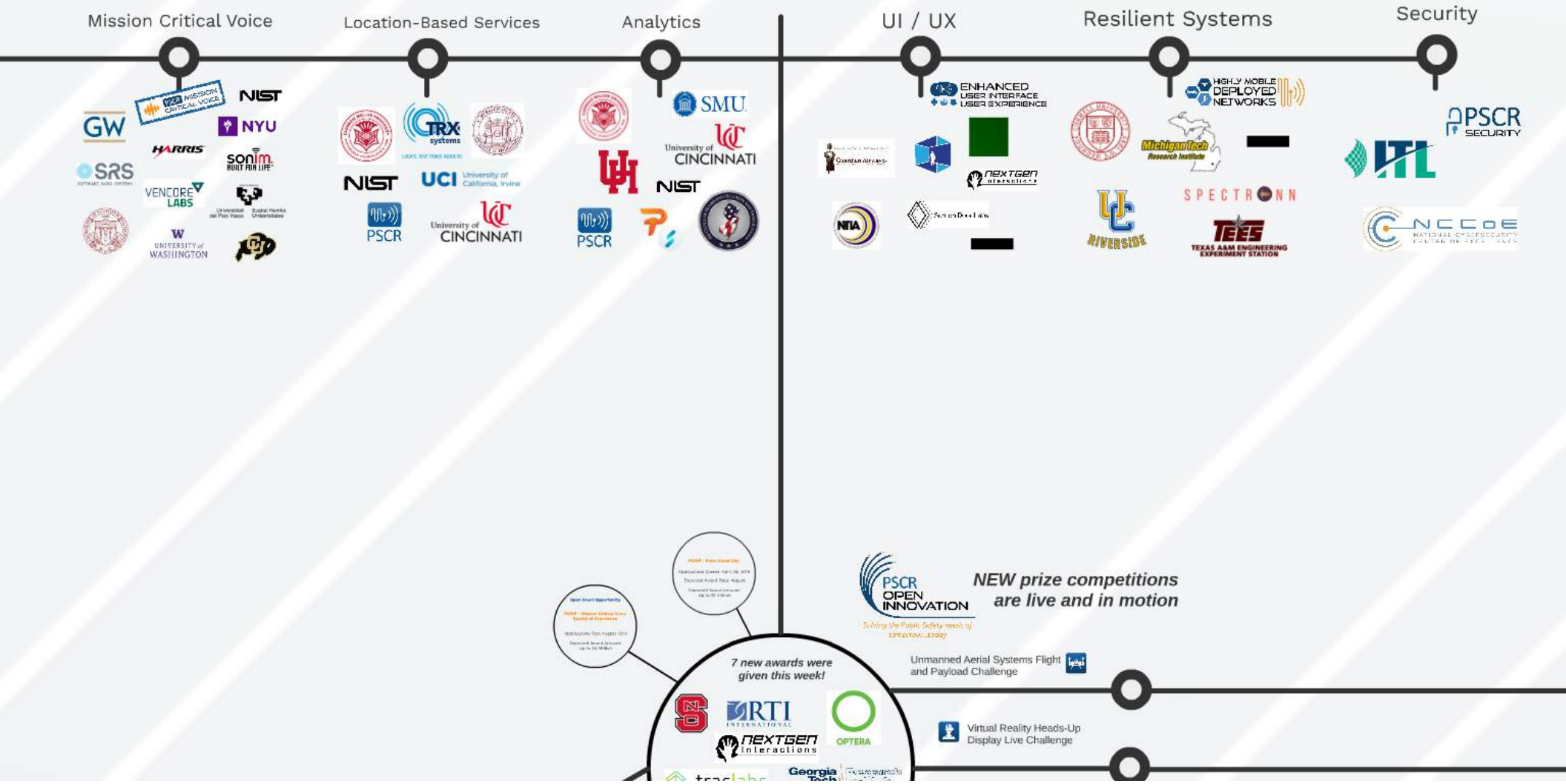

ue: August 23rd

ard Amount:
3 Million

tomorrow...today

7 new awards were given this week!

RTI INTERNATIONAL

OPTERA

NEXTGEN Interactions

traclabs

Georgia Tech Research Institute

Duke UNIVERSITY

TEES TEXAS A&M ENGINEERING EXPERIMENT STATION

NORTHEASTERN UNIVERSITY BOSTON, MASSACHUSETTS

Representing over $6.1 million in total awards

Unmanned A
and Payload

The Unl

Aut
for


Open Grant Opportunity
PSIAP - Mission Critical Voice Quality of Experience
Applications Due: August 23rd
Expected Award Amount: Up to $3 Million


PSIAP - Point Cloud City
Applications Closed: April 20, 2018
Expected Award Date: August
Expected Award Amount:
Up to $1 million

PSCR
OPEN
INNOVATION

Solving the Public Safety needs of tomorrow...today

NEW prize competitions are live and in motion

Unmanned Aerial Systems Flight and Payload Challenge

Virtual Reality Heads-Up Display Live Challenge

Virtual Reality Heads-Up Display Live Challenge

The Unlinkable Data Challenge

Automated Streams Analytics for Public Safety Challenge

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Applications Closed: April 20, 2018

Expected Award Date: August

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PSCR OPEN INNOVATION

Solving the Public Safety needs of tomorrow...today

NEW prize competitions are live and in motion

7 new awards were given this week!

NC State · RTI International · Optera · NextGen Interactions · traclabs · Georgia Tech Research Institute · Duke University · TEES Texas A&M Engineering Experiment Station · Northeastern University

Representing over $6.1 million in total awards

- Unmanned Aerial Systems Flight and Payload Challenge
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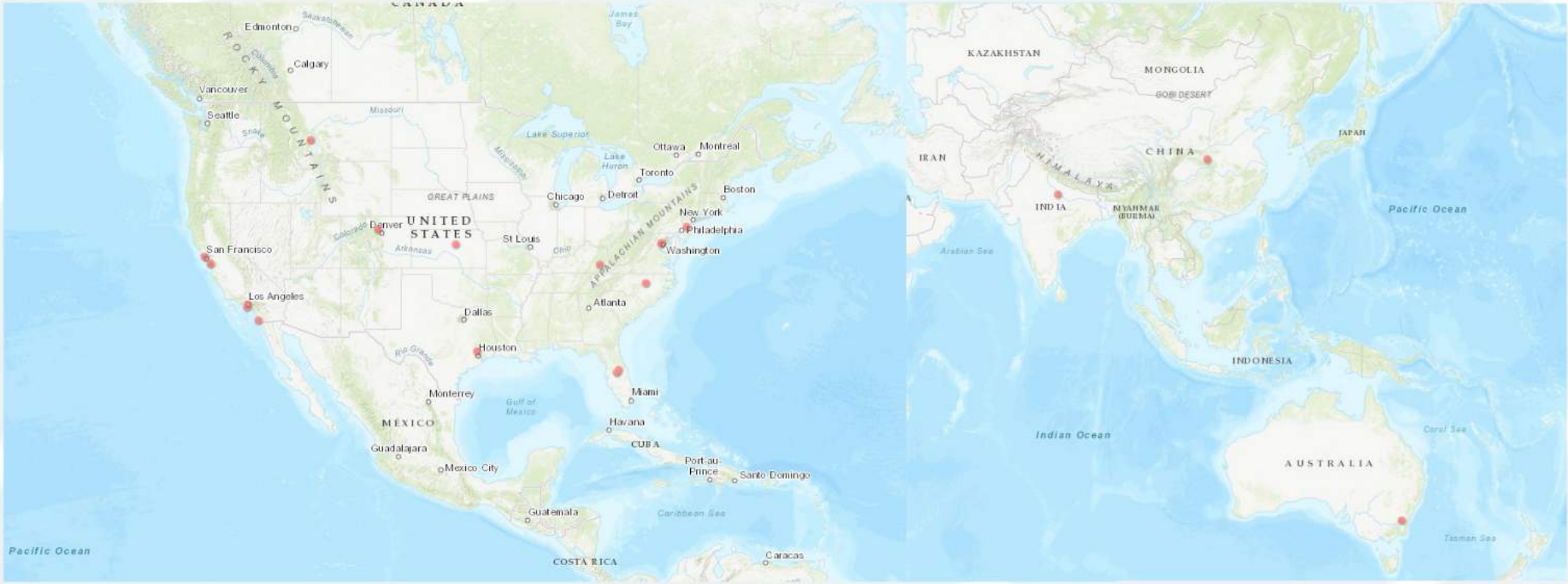
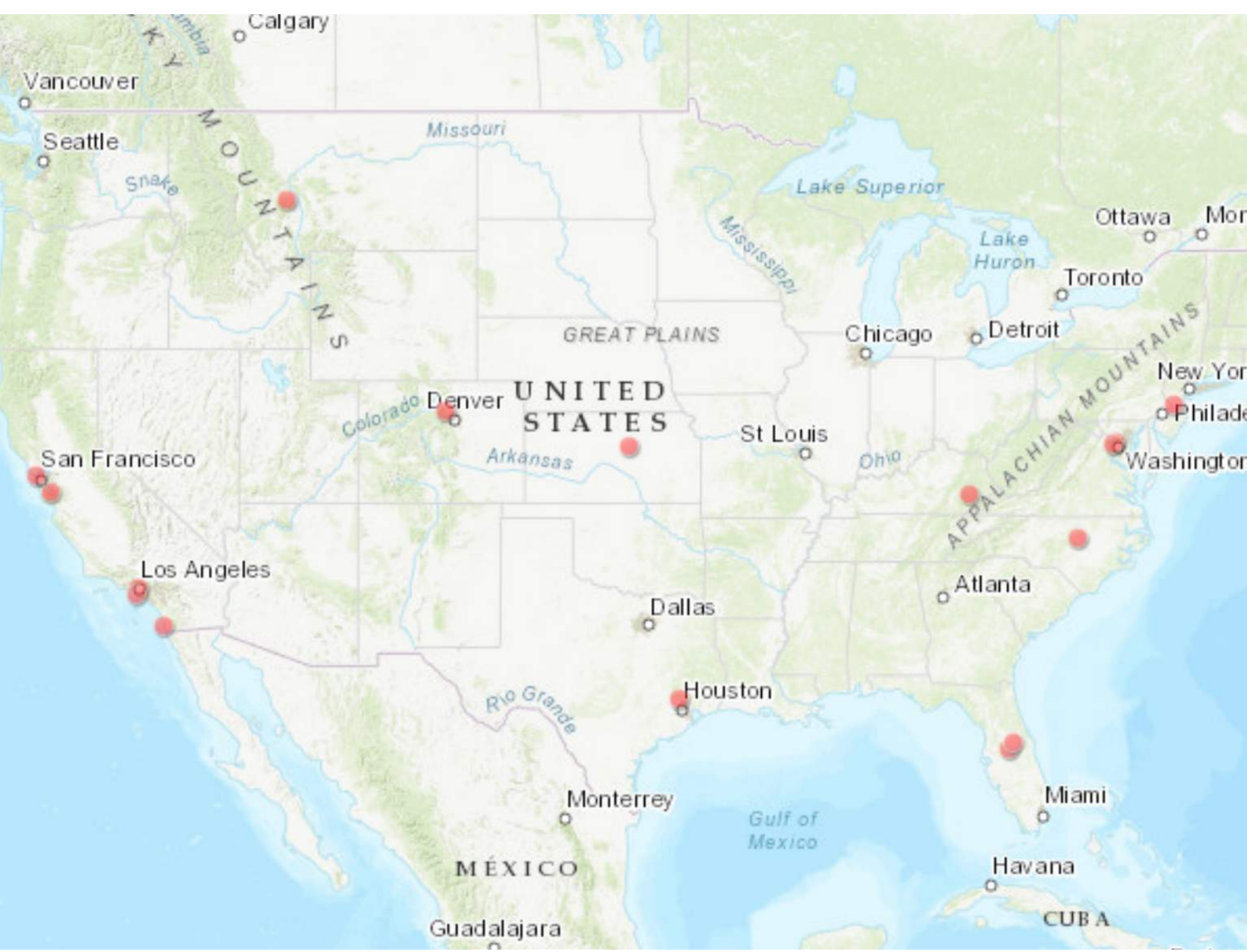
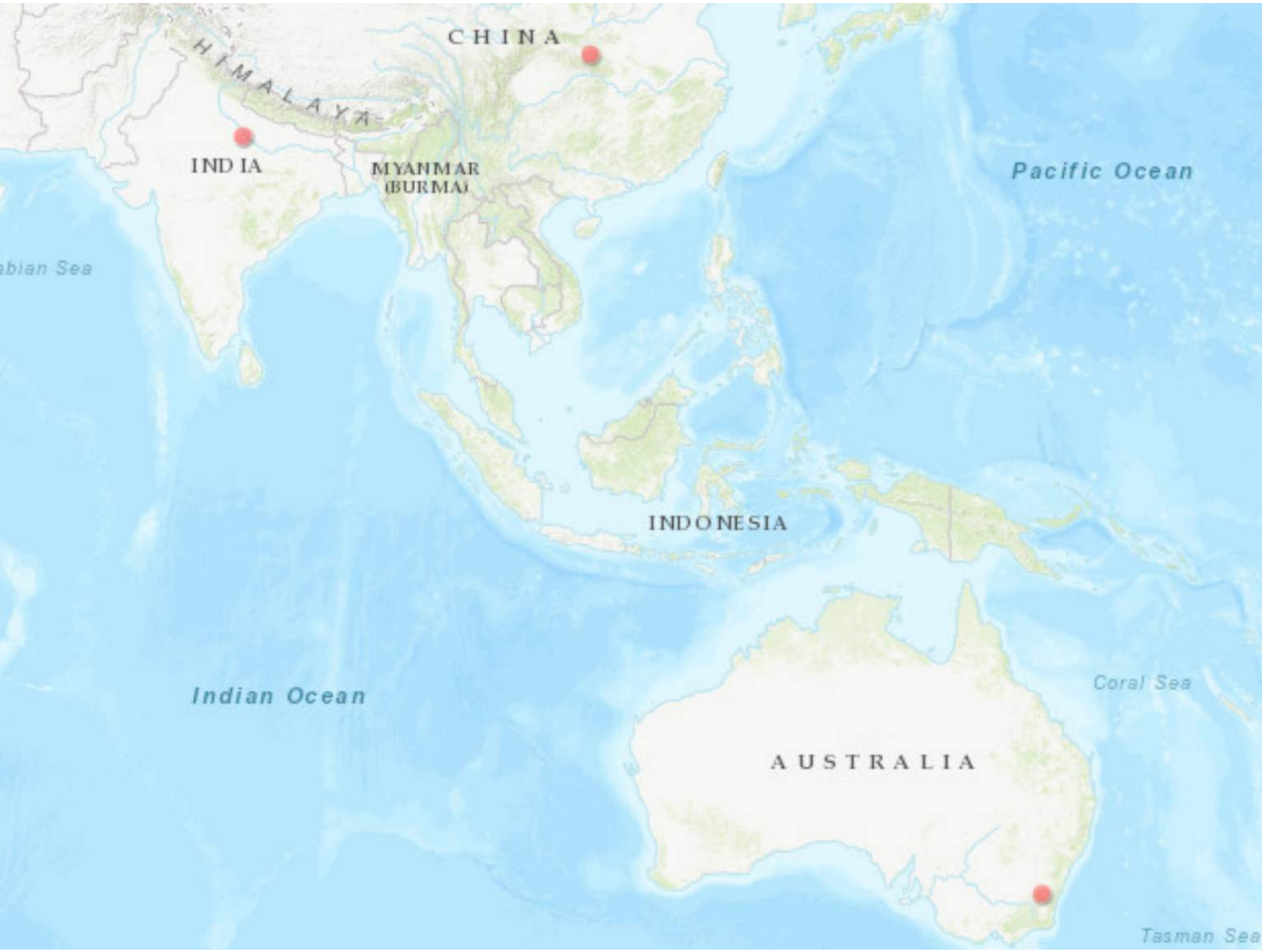
- The Unlinkable Data Challenge
- Automated Streams Analytics for Public Safety Challenge

This is a global effort




Calgary
Vancouver
Seattle
ROCKY MOUNTAINS
Missouri
Snake
Lake Superior
Lake Huron
Mississippi
Ottawa
Toronto
GREAT PLAINS
Chicago
Detroit
APPALACHIAN MOUNTAINS
UNITED STATES
Denver
Colorado
Arkansas
St Louis
Ohio
San Francisco
Los Angeles
Atlanta
Dallas
Houston
Rio Grande
Monterrey
Gulf of Mexico
Miami
Havana
MÉXICO
CUBA
Guadalajara


CHINA
HIMALAYA
INDIA
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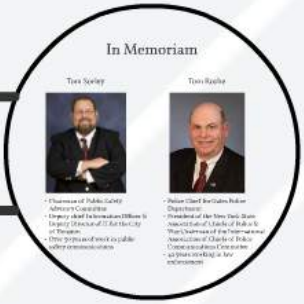
(BURMA)
Pacific Ocean
abian Sea
INDONESIA
Indian Ocean
Coral Sea
AUSTRALIA
Tasman Sea

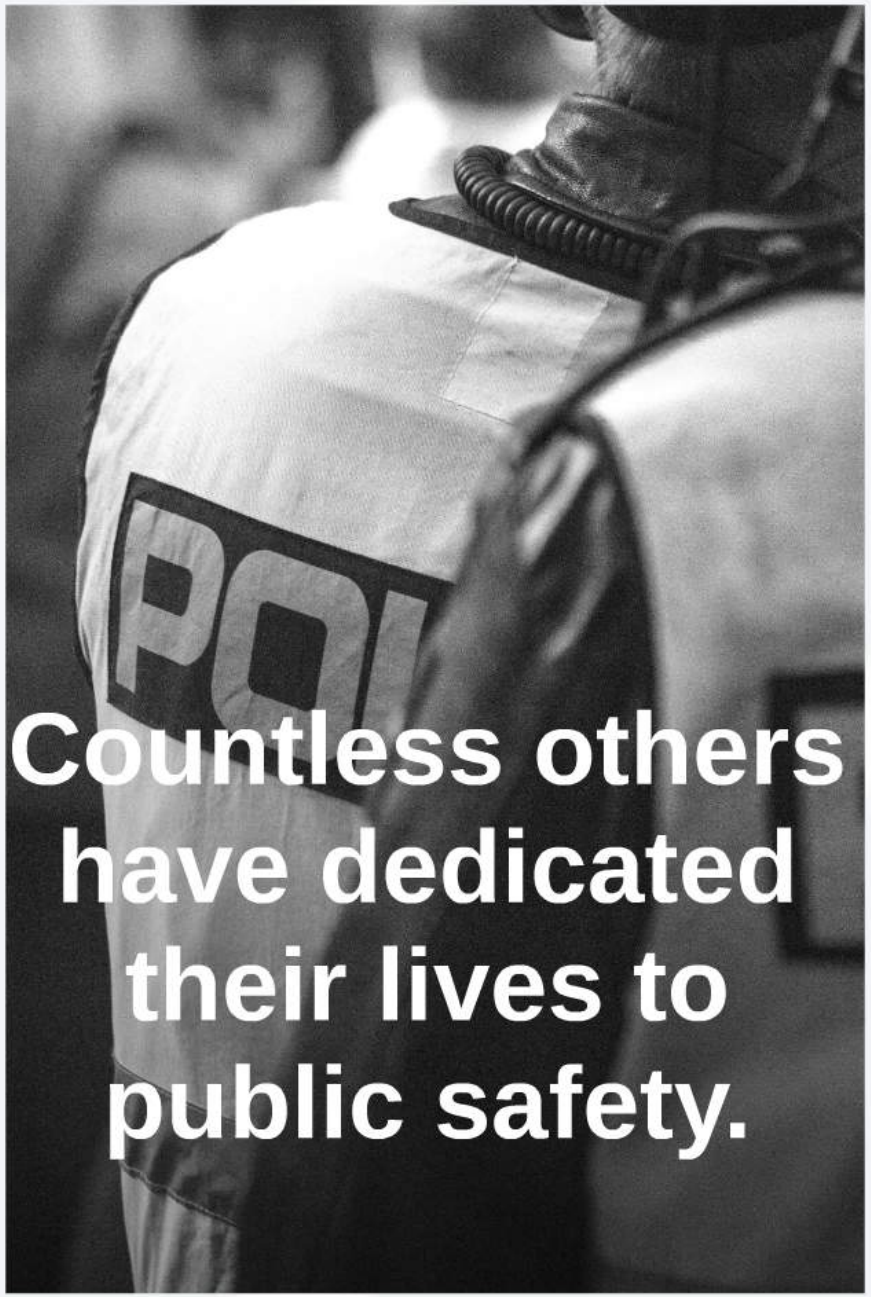
This is important work…

This hard work has positioned the Public Safety community for an unparallelled opportunity



Sue Swenson
Chairwoman, FirstNet

Brian Fennessy
Chief, Orange County Fire


POL
Countless others have dedicated their lives to public safety.

In Memoriam

Tom Sorley

- Chairman of Public Safety Advisory Committee
- Deputy chief Information Officer & Deputy Director of IT for the City of Houston
- Over 30 years of work in public safety communications

Tom Roche

- Police Chief for Gates Police Department
- President of the New York State Association of Chiefs of Police & Vice Chairman of the International Association of Chiefs of Police Communications Committee
- 42 years working in law enforcement

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munity

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Sue Swenson
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FirstNet™

PSCR 2018 Conference

Sue Swenson

June 5, 2018

Welcome Back to PSCR and San Diego

Welcome to America's Finest City

Agenda focused on emerging technology advancing public safety broadband communications

Public Safety finally has its own network - WE need to optimize how this **5th** network gets utilized

FirstNet™

Last year this time contract with AT&T signed

State plans delivered 3 months ahead of schedule

Continued consultation during Governor decision window

All 56 States, Territories and District of Columbia “Opted In”

Network Goes Nationwide

FirstNet™

AT&T enabled Public Safety access to all spectrum in all markets with true Priority and Pre-emption

FirstNet dedicated and redundant core launched on schedule in March

Dedicated FirstNet security network operations center online and operating

Dedicated FirstNet customer support centers and personnel

FIRSTNET™
Built with AT&T

Already have 20 devices designed for Public Safety tested by FirstNet Authority

Dedicated disaster recovery capabilities already being utilized

Continuing engagement with Public Safety - Hundreds of engagements, thousands of people at conferences, town halls, associations, federal agencies and tribal groups

FirstNet is Different

1. It is a network fought for, designed by and built for Public Safety

2. It is what Congress mandated - a single, nationwide network architecture

3. It is a network built specifically to the specifications that first responders and individual states established through a multi-year state consultation and RFP process

4. It has a separate, redundant and dedicated core - it is NOT a virtual core as part of a commercial network

5. It provides an Application Store which insures that applications are tested, certified and secure

6. It provides dedicated security monitoring of the FirstNet 24/7/365

FirstNet™

FirstNet Is Different

7. It has dedicated FirstNet customer support personnel 24/7/365

8. It has Public Safety dedicated disaster recovery resources and response coordination

9. It has a dedicated lab that tests and validates the performance of the network, devices and the application ecosystem

10. It has a sustainable financial model that guarantees reinvestment in Public Safety's network

11. It is the only network with BC14

12. It has an oversight organization in The FirstNet Authority that not only insures that AT&T delivers on their commitments but advocates for Public Safety

FirstNet™

Great progress but our work is not done

What has been accomplished exceeded everyone's expectations

Risk is being too comfortable and becoming complacent
- Happens to many - sports team and companies

FirstNet solution is analogous to Germany's "Autobahn" for transportation
- No longer driving on an old dusty road with a jalopy
- Now have a secure state of the art information highway for Public Safety

Question is - what "cars" are we going to put on this highway?

Back To The Future - Call to Action

We are at a similar place in 2018 that we were in 2007
- Except that we now have a Public Safety Network

Public Safety needs to galvanize like they did in 2007 - this time to insure that the capabilities needed are prioritized and developed
- For each respective public safety discipline
- And across public safety so capabilities are integrated and optimized

Others are supportive and are advocating for public safety
- FirstNet Authority
- AT&T

What happens next - It's up to Public Safety!
Public Safety was in the driver's seat back in 2007, then became a passenger

Now it's time to get back in the driver's seat!

FirstNet™

Future Transition

Term as Board Chair ends this year

Honor and a privilege to lead the FirstNet Board

The FirstNet organization and Board - past and present deserve credit

AT&T has delivered and exceeded expectations

FirstNet™


FirstNet™

Chief Brian Fennessy, Orange County Fire

Top 20 Most Destructive California Wildfires

	FIRE NAME *(CAUSE)*	DATE	COUNTY	ACRES	*STRUCTURES*	DEATHS
1	**TUBBS*** *(Under Investigation)*	October 2017	Sonoma	36,432	**5,300***	22
2	**TUNNEL - Oakland Hills** *(Rekindle)*	October 1991	Alameda	1,600	**2,900**	25
3	**CEDAR** *(Human Related)*	October 2003	San Diego	273,246	**2,820**	15
4	**VALLEY** *(Electrical)*	September 2015	Lake, Napa & Sonoma	76,067	**1,955**	4
5	**WITCH** *(Powerlines)*	October 2007	San Diego	197,990	**1,650**	2
6	**NUNS*** *(Under Investigation)*	October 2017	Sonoma	54,382	**1,200***	2
7	**OLD** *(Human Related)*	October 2003	San Bernardino	91,281	**1,003**	6
8	**JONES** *(Undetermined)*	October 1999	Shasta	26,200	**954**	1
9	**BUTTE** *(Powerlines)*	September 2015	Amador & Calaveras	70,868	**921**	2
10	**ATLAS*** *(Under Investigation)*	October 2017	Napa & Solano	51,624	**741***	6
11	**PAINT** *(Arson)*	June 1990	Santa Barbara	4,900	**641**	1
12	**FOUNTAIN** *(Arson)*	August 1992	Shasta	63,960	**636**	0
13	**SAYRE** *(Misc.)*	November 2008	Los Angeles	11,262	**604**	0
14	**CITY OF BERKELEY** *(Powerlines)*	September 1923	Alameda	130	**584**	0
15	**HARRIS** *(Under Investigation)*	October 2007	San Diego	90,440	**548**	8
16	**REDWOOD VALLEY*** *(Under Investigation)*	October 2017	Mendocino	36,523	**540***	8
17	**BEL AIR** *(Undetermined)*	November 1961	Los Angeles	6,090	**484**	0
18	**LAGUNA** *(Arson)*	October 1993	Orange	14,437	**441**	0
19	**ERSKINE** *(Under Investigation)*	June 2016	Kern	46,684	**386**	2
20	**LAGUNA** *(Powerlines)*	September 1970	San Diego	175,425	**382**	0

* Fires are uncontained and totals are likely to change.

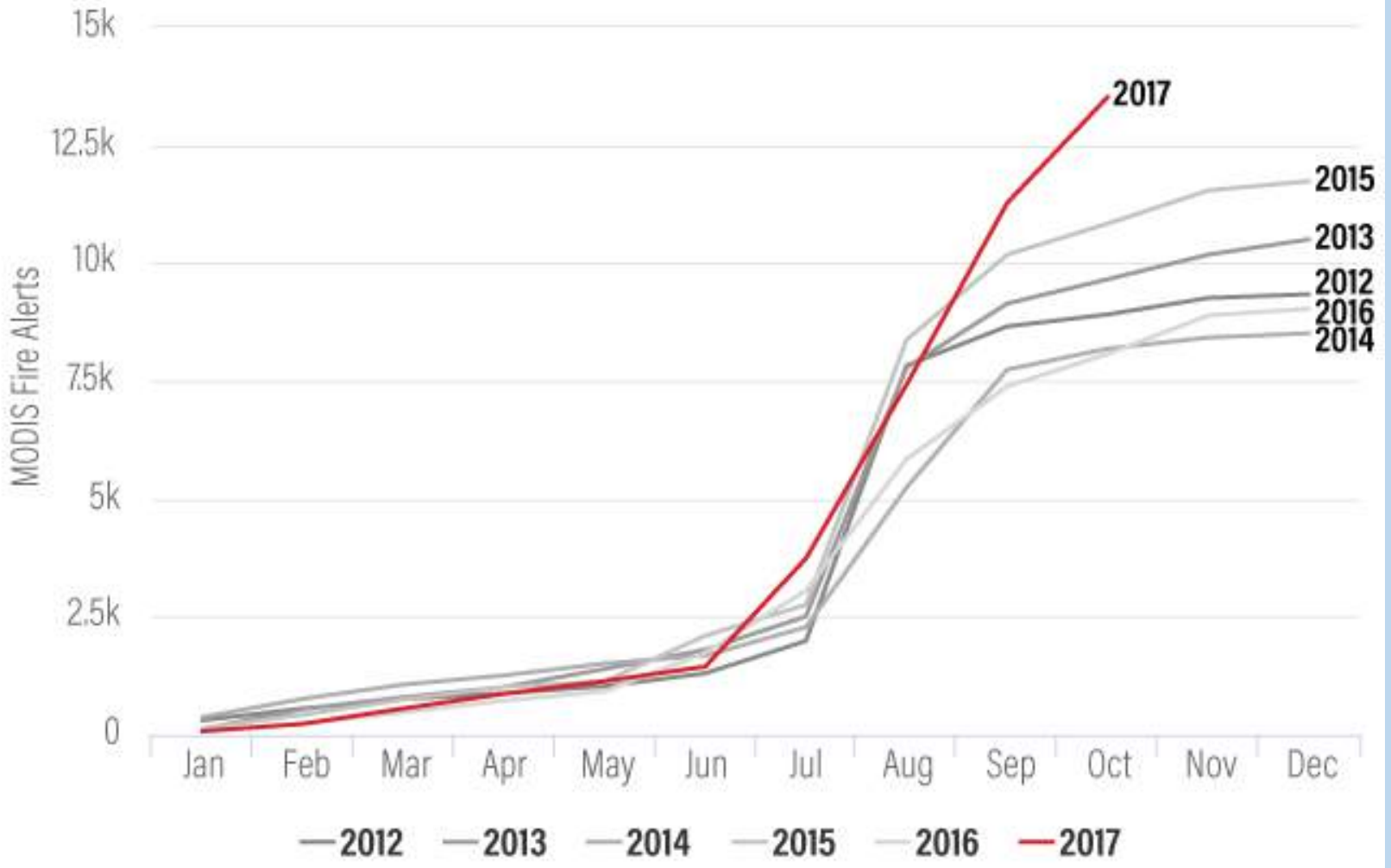
**"Structures" include homes, outbuildings (barns, garages, sheds, etc) and commercial properties destroyed.

***This list does not include fire jurisdiction. These are the Top 20 regardless of whether they were state, federal, or local responsibility.

10/20/2017

California's 2017 Annual Fire Alert Count Highest in Five Years

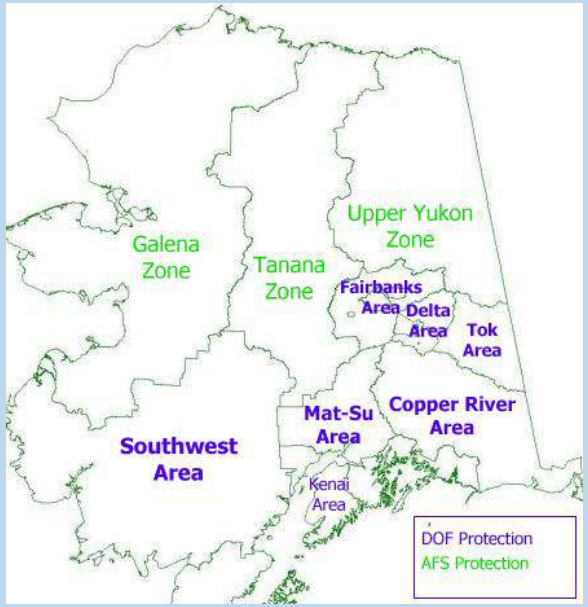
2017 Fire Alert Count To Date: 13,524

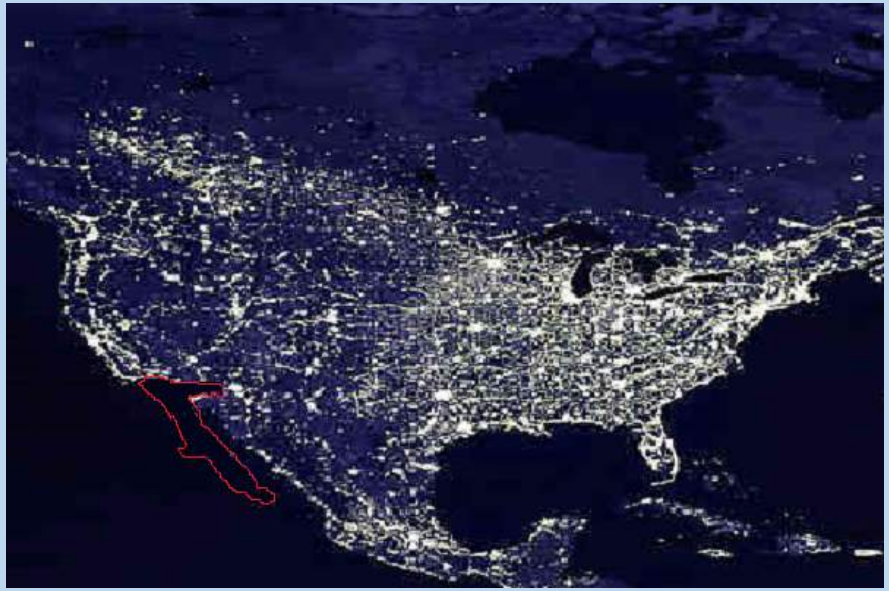


LEARN MORE: bit.ly/2ihdyKq

WORLD RESOURCES INSTITUTE


Fire name: MARBLE-CONE
Year: 1577
Est. acres: 173333
Cause: Miscellaneous
Damage:


Galena Zone
Tanana Zone
Upper Yukon Zone
Fairbanks Area
Delta Area
Tok Area
Mat-Su Area
Copper River Area
Southwest Area
Kenai Area
DOF Protection
AFS Protection




RCA


10-8
trek
vhf-fm


Motorola
SQUELCH
VOLUME


MOTOROLA

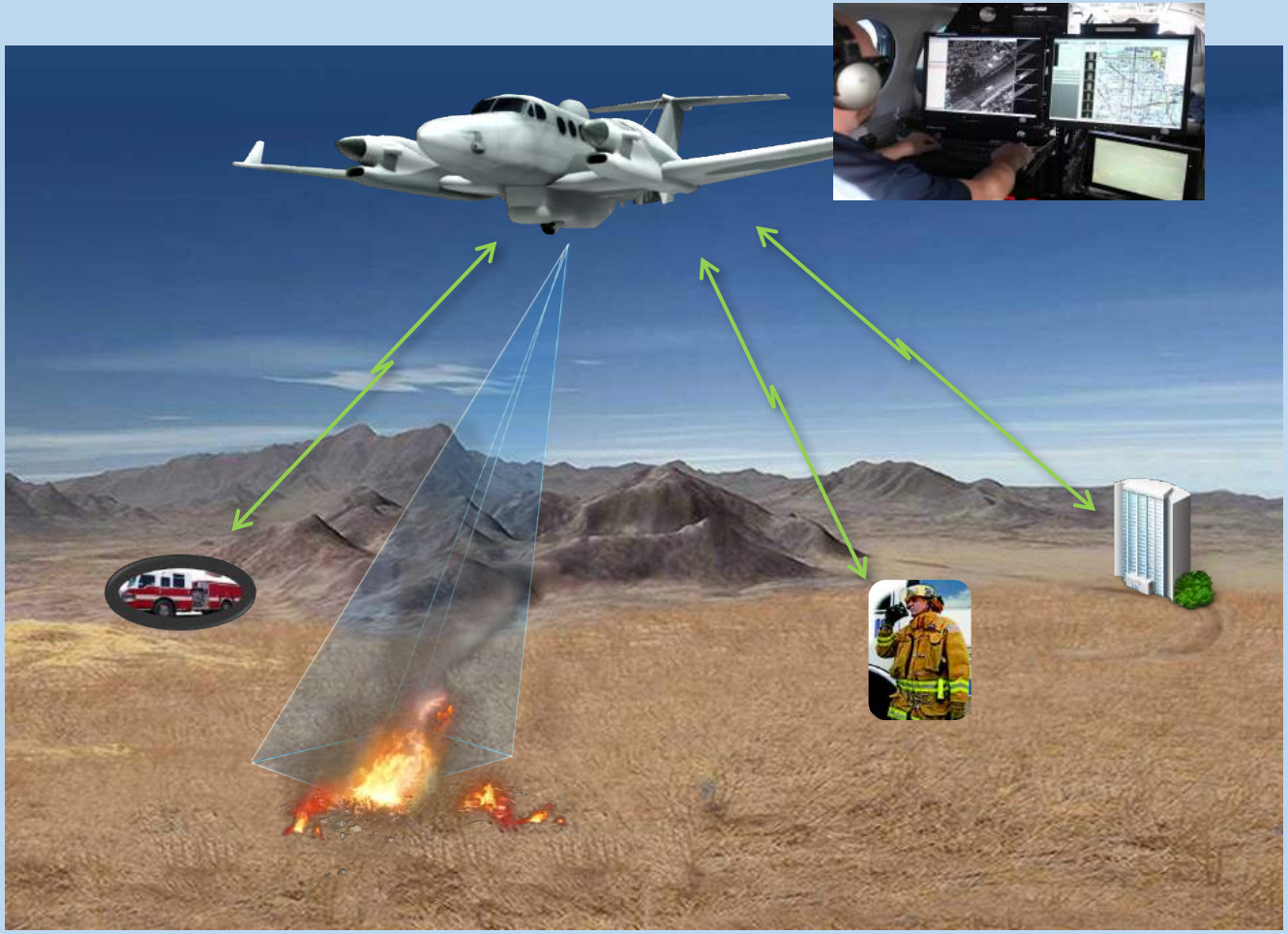

sonim
Search
3 YEAR

Situational Awareness Challenges

- Where is the problem? – Right now
- What does it look like? – Right now
- Where is the problem going?
- Communications – Can you hear me now?
  - Poor cellular or data coverage
  - Damaged infrastructure
- How can the information be shared? Right now.
- Where are my personnel?
  - Vehicle location
  - Person location

SDAIRS

- Fixed wing – medium altitude (~5,200 meters)
- High Definition Cameras
- Infrared Imagery
- Synthetic Aperture Radar Imagery
- VHF Radio Repeater
- Air to Ground Communications
- Airborne communications support with SkyTower cellular capability



Common Discussion Points re: FirstNet

- Building it out…
- Coverage sites…….deployables?
- Timeline for build out?
- In Orange County and San Diego = Verizon to AT&T cut over?
- Encryption
- Encryption
- “Ruthless preemption” (kickoff the network) vs. “priority”
- Redundancy
- Hardware
  - Approved list of devices published on April 5 – Apple is small percentage of public safety market

PSCR Public Safety Broadband Stakeholder Meeting

- Fifty (50) sessions on “public safety broadband communications”
- Learn about emerging technologies
- Indoor mapping and virtual reality tools
- Network with experts & first responders
- Mission-Critical Voice
- Location Based Services
- Analytics
- Resilient Systems
- User Interface / User Experience
- Security

2018 Public Safety Broadband Stakeholder Meeting

Dereck Orr,
PSCR Division Chief

PSCR

NIST

Welcome!

2018 Public Safety Broadband Stakeholder Meeting

PSCR PROGRAM UPDATE

setting you up for success this week

Who is attending this meeting for the first time?

7 Tracks with Concurrent Sessions

Why?

- Enables attendees to focus on topics of greatest interest
- Greater number of projects -- described in greater detail
  - Please help us stay on schedule
- All sessions will be recorded, so you won't miss anything
  - Session Q&A will not be recorded

4 Days - 7 Tracks
4 Concurrent Sessions

Mission Critical Voice (13)

PSCR MISSION CRITICAL VOICE

Analytics (12)

Resilient Systems (8)

HIGHLY MOBILE DEPLOYED NETWORKS

Location-Based Services (11)

4 Days - 7 Tracks
4 Concurrent Sessions

User Interface / User Experience (4)

ENHANCED
USER INTERFACE
USER EXPERIENCE

Security (3)

PSCR
SECURITY

DHS Analytics (1)

U.S. DEPARTMENT OF HOMELAND SECURITY

More content than ever before!

PSIAP - 2017 Award Recipients

PSIAP – UI 2018 Award Recipients

Video Quality Experiment

Poster Room

Networking Hour

LIVE Virtual Reality Heads-Up Display Prize Challenge

Unmanned Aerial Systems Challenge Results

ever before!

PSIAP - 2017 Award Recipients

PSIAP – UI 2018 Award Recipients

Video

-Up Display Prize Challenge

LIVE Virtual Reality Heads-Up Display Prize Challenge

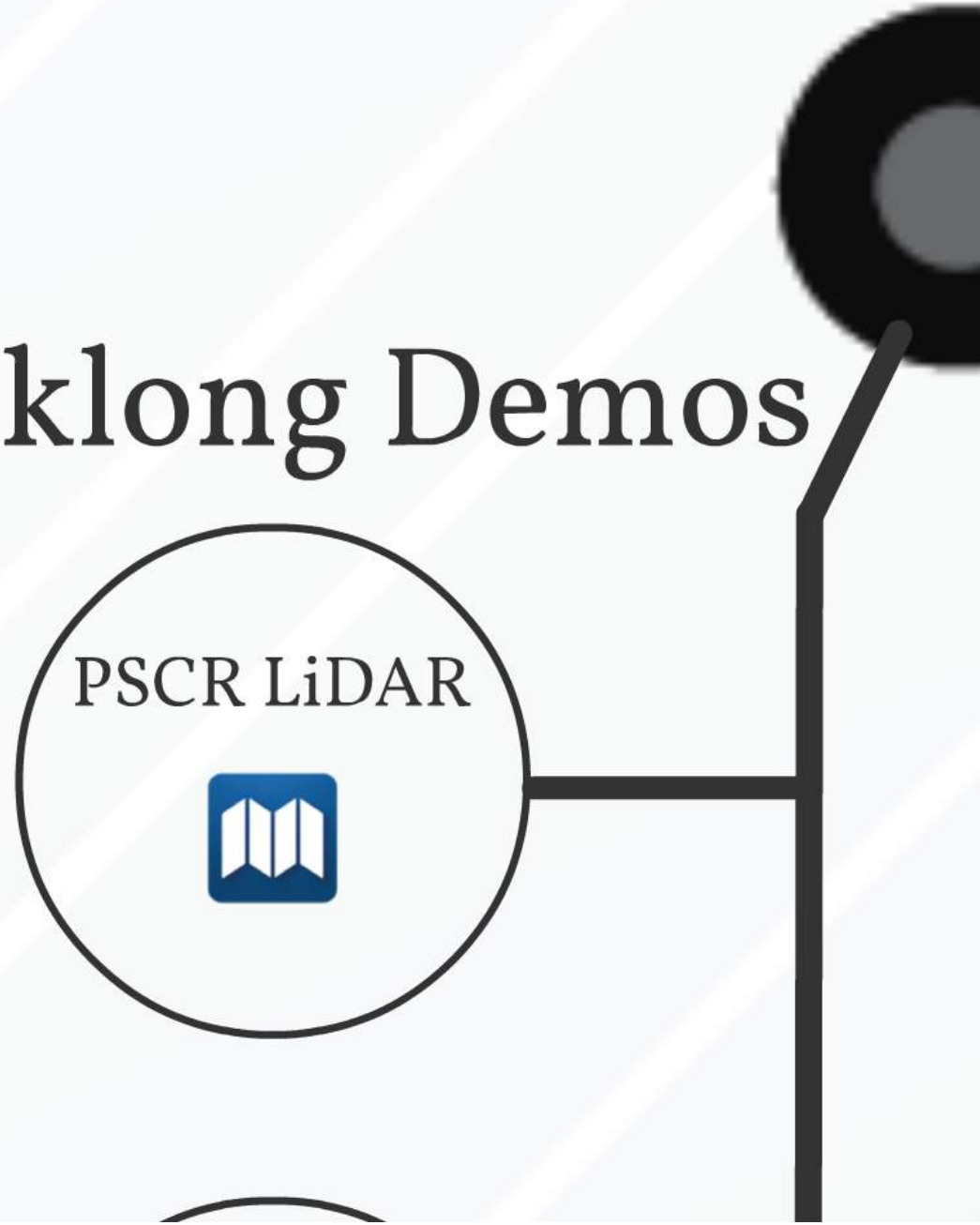
Unmanned Aerial Systems Challenge Results

Video Quality Experiment

Poster Room

Networking Hour

Featured Weeklong Demos include:



PSCR LiDAR

PSCR Virtual Reality

ENHANCED
USER INTERFACE
USER EXPERIENCE

Mission Critical Open Platform

eman ta zabal zazu

Universidad del País Vasco

Euskal Herriko Unibertsitatea

First Responder Location and Mapping Services

LOCATE. MAP. TRACK. INDOORS.

Badge Designations

- PSCR Staff = **blue** "Staff" ribbon
- Prize Participants and Award Recipients = **orange** "Awardee" ribbon
- Press = **green** "Press" ribbon

QR Code for networking

A blue border on your badge indicates the catered option (coffee, tea, water)

Concessions are available for purchase during the afternoon breaks

Mrs. Fields®

AuntieAnne's™ PRETZEL PERFECT

Convention Center Layout - Day 1

8am - 12pm, 1:30pm - 2:40pm
Plenary Sessions

3:00-3:50PM
MCV Portfolio Overview

3-3:50pm
LBS
Portfolio
Overview

3- 3:50pm
Analytics
Portfolio
Overview

3-3:50pm
UI/UX
Program
Overview

4- 5:00pm
Video
Quality
Experiment

4- 5:00pm
Featured
Demos

4- 5:00pm
Award
Recipient
Posters

7- 5:00pm
Registration

PSCR

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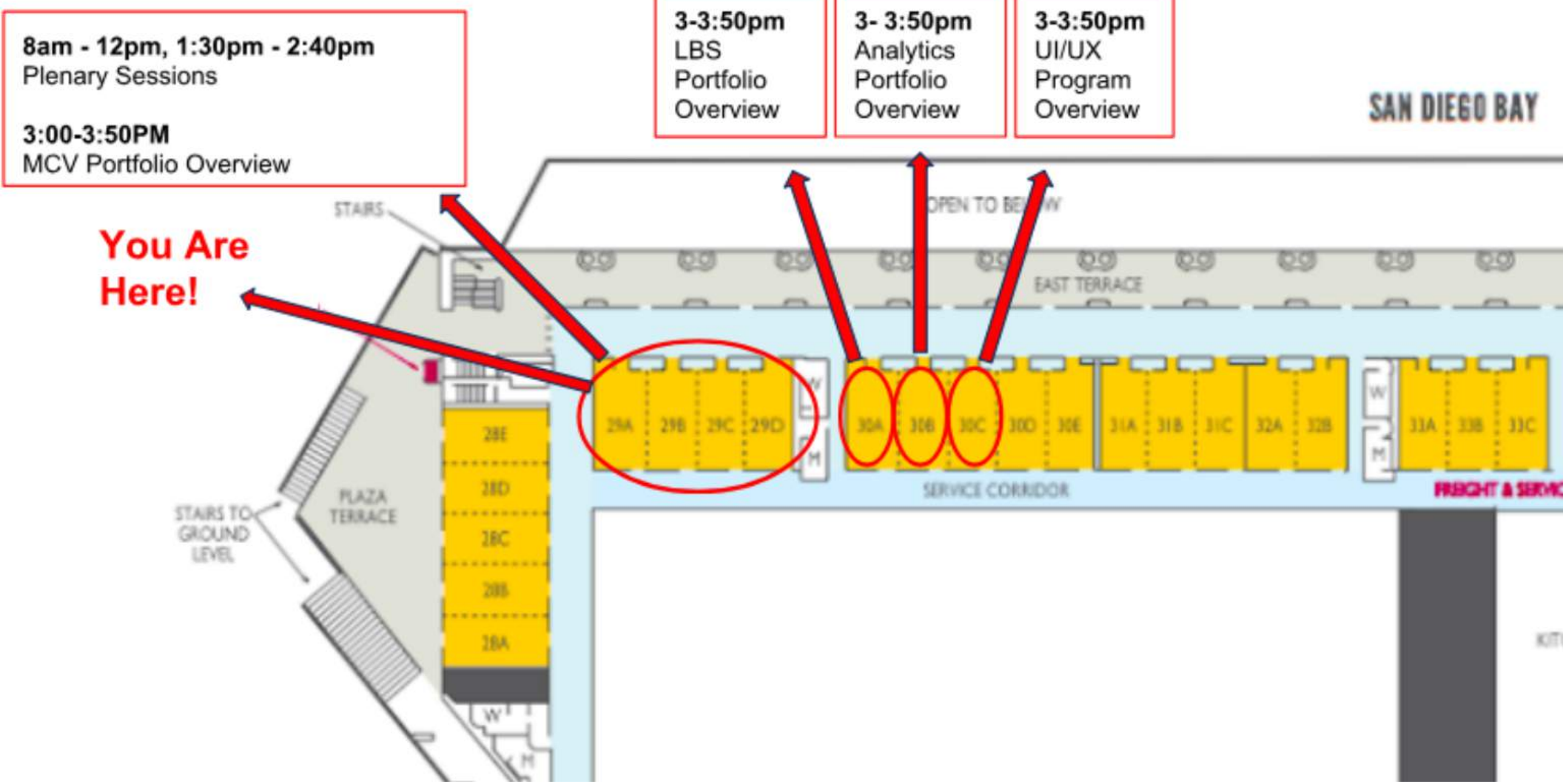
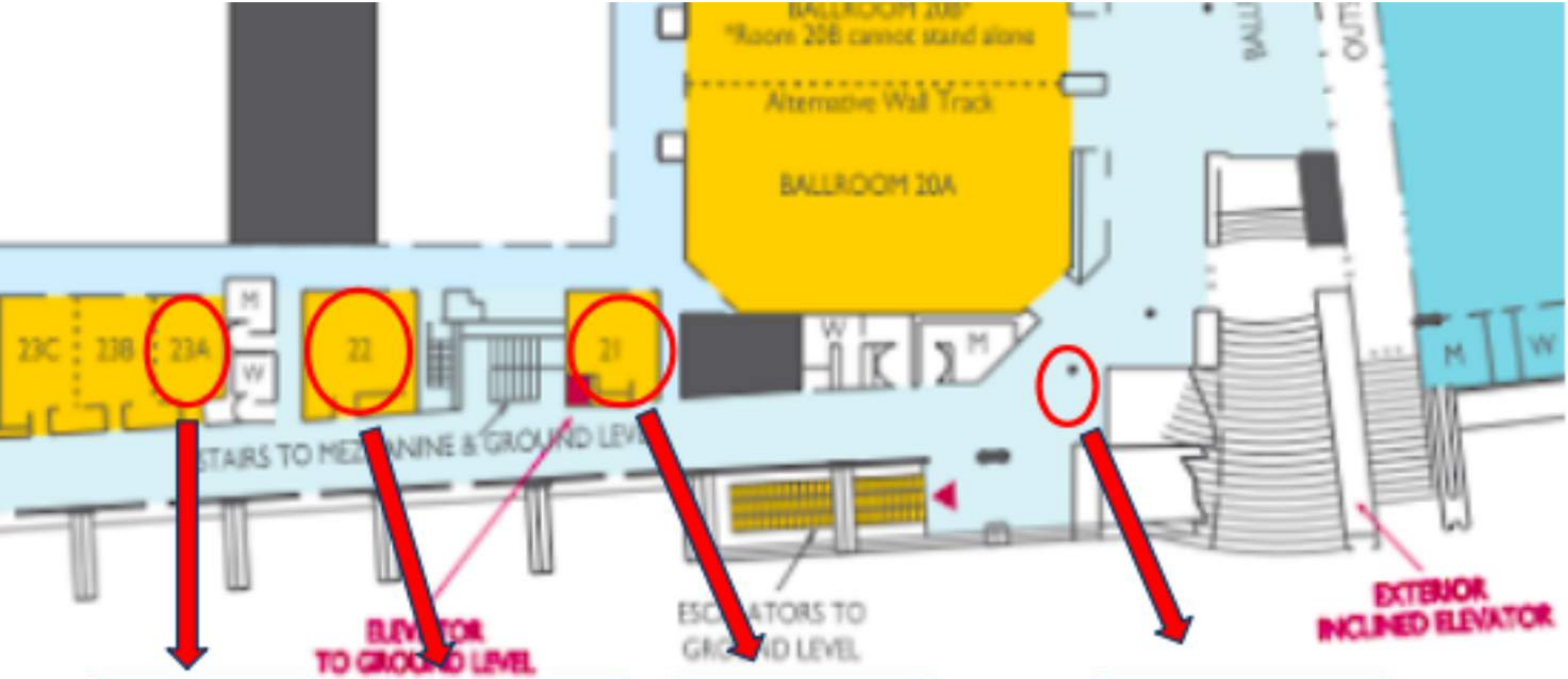




4- 5:00pm
Video Quality Experiment

4- 5:00pm
Featured Demos

4- 5:00pm
Award Recipient Posters

7- 5:00pm
Registration

Convention Center Layout - Days 2 &3

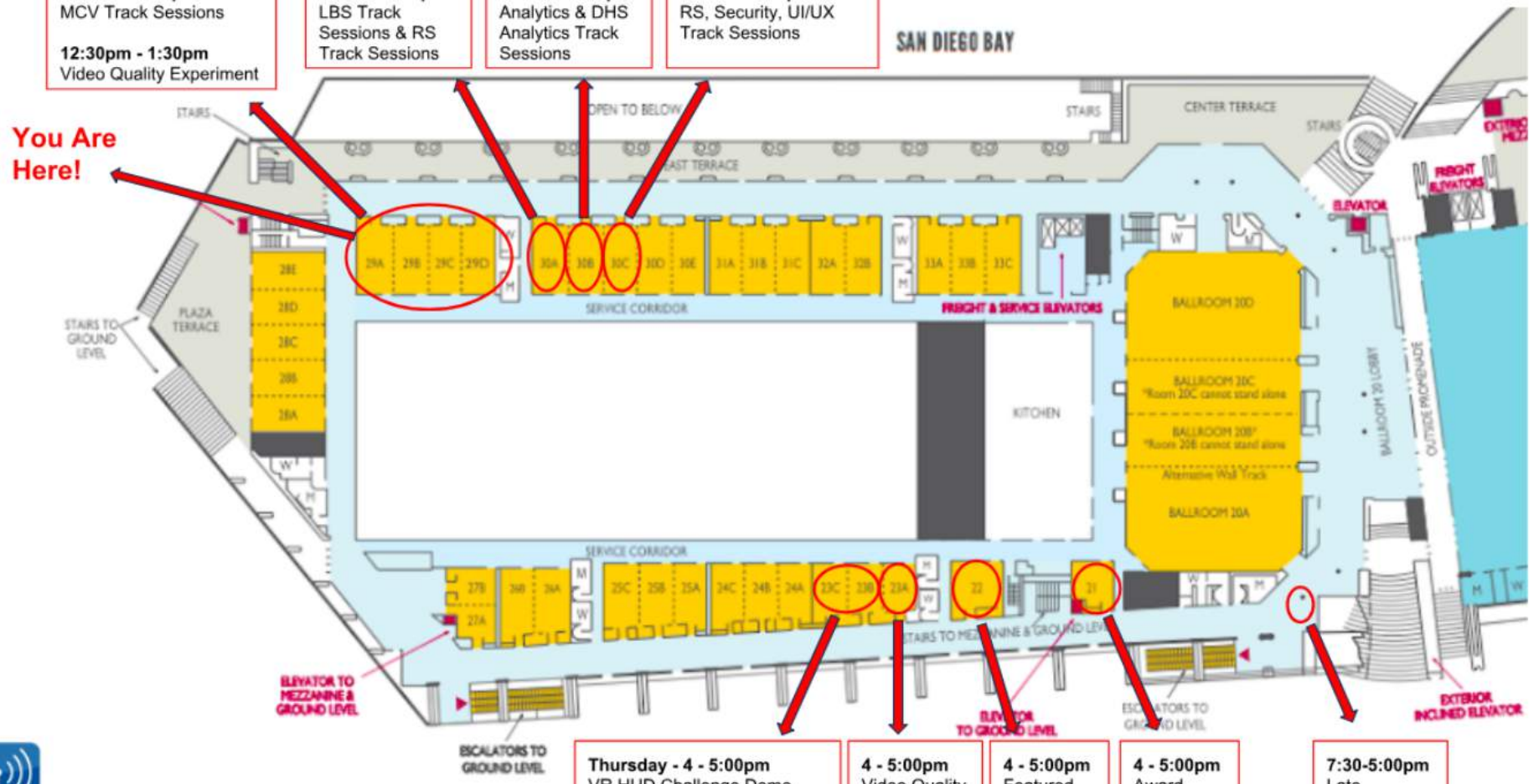
8:30am - 3:50pm
MCV Track Sessions

12:30pm - 1:30pm
Video Quality Experiment

8:30am-3:50pm
LBS Track Sessions & RS Track Sessions

8:30am- 3:50pm
Analytics & DHS Analytics Track Sessions

8:30am- 3:50pm
RS, Security, UI/UX Track Sessions



Thursday - 4 - 5:00pm
VR HUD Challenge Demo

4 - 5:00pm
Video Quality Experiment

4 - 5:00pm
Featured Demos

4 - 5:00pm
Award Recipient Posters

7:30-5:00pm
Late Registration

PSCR

Convention Center Layout - Days 2 &3

8:30am - 3:50pm
MCV Track Sessions

12:30pm - 1:30pm
Video Quality Experiment

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LBS Track Sessions & RS Track Sessions

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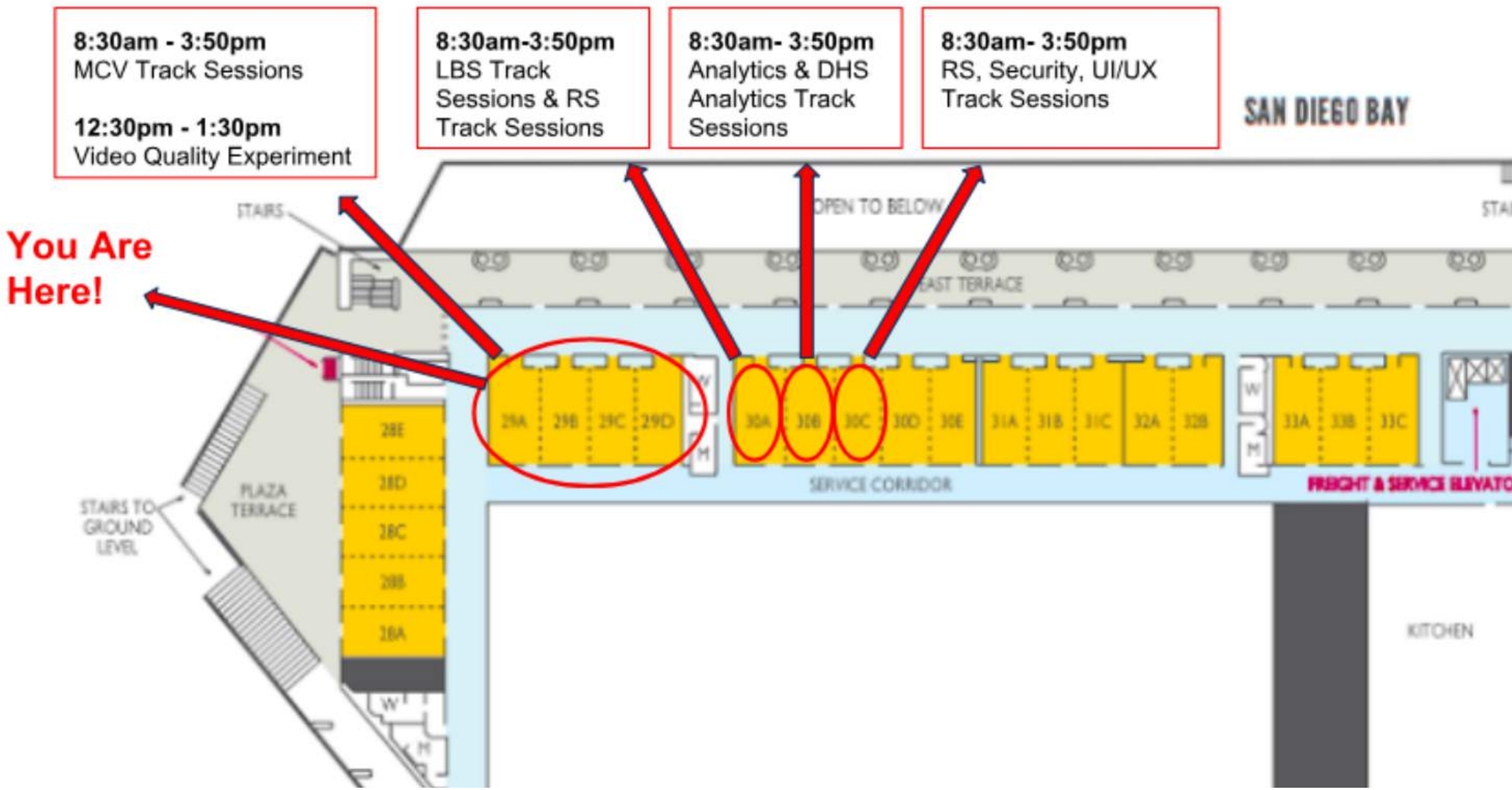
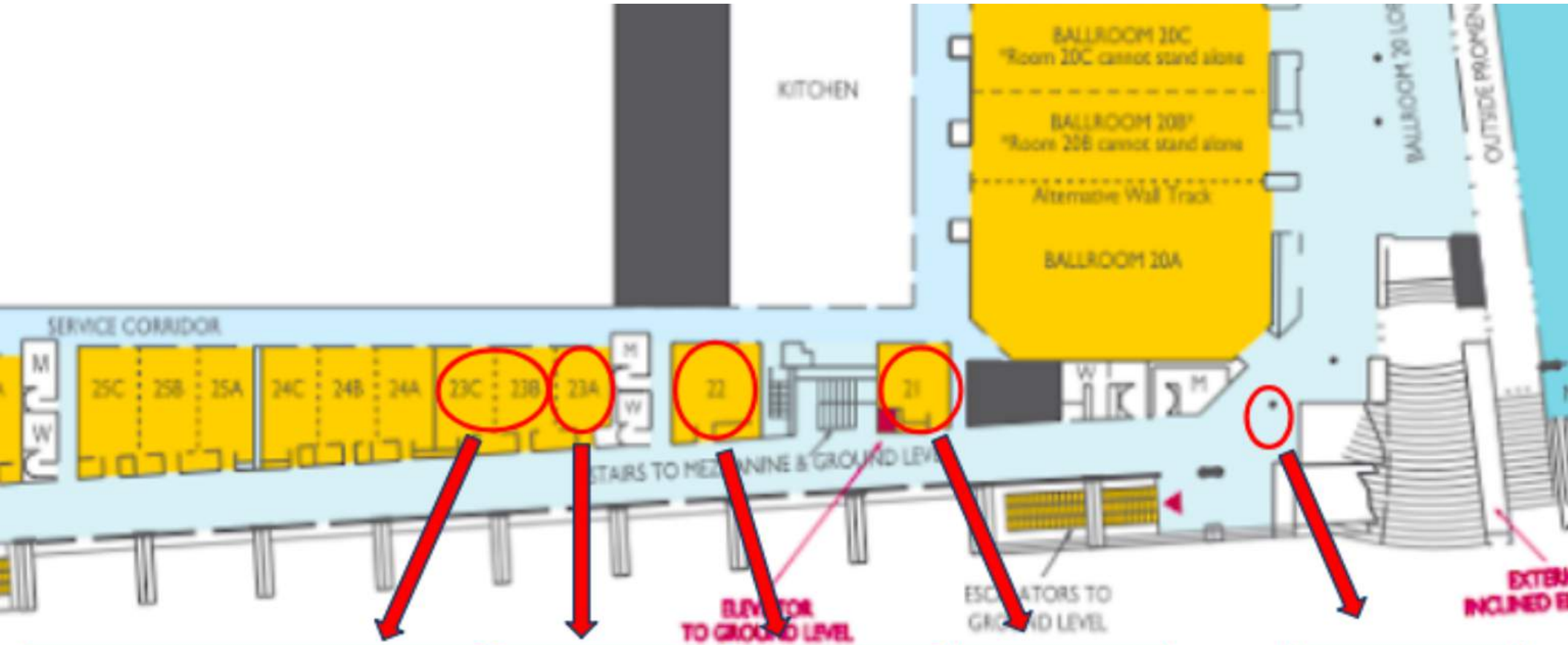




Thursday - 4 - 5:00pm
VR HUD Challenge Demo

4 - 5:00pm
Video Quality Experiment

4 - 5:00pm
Featured Demos

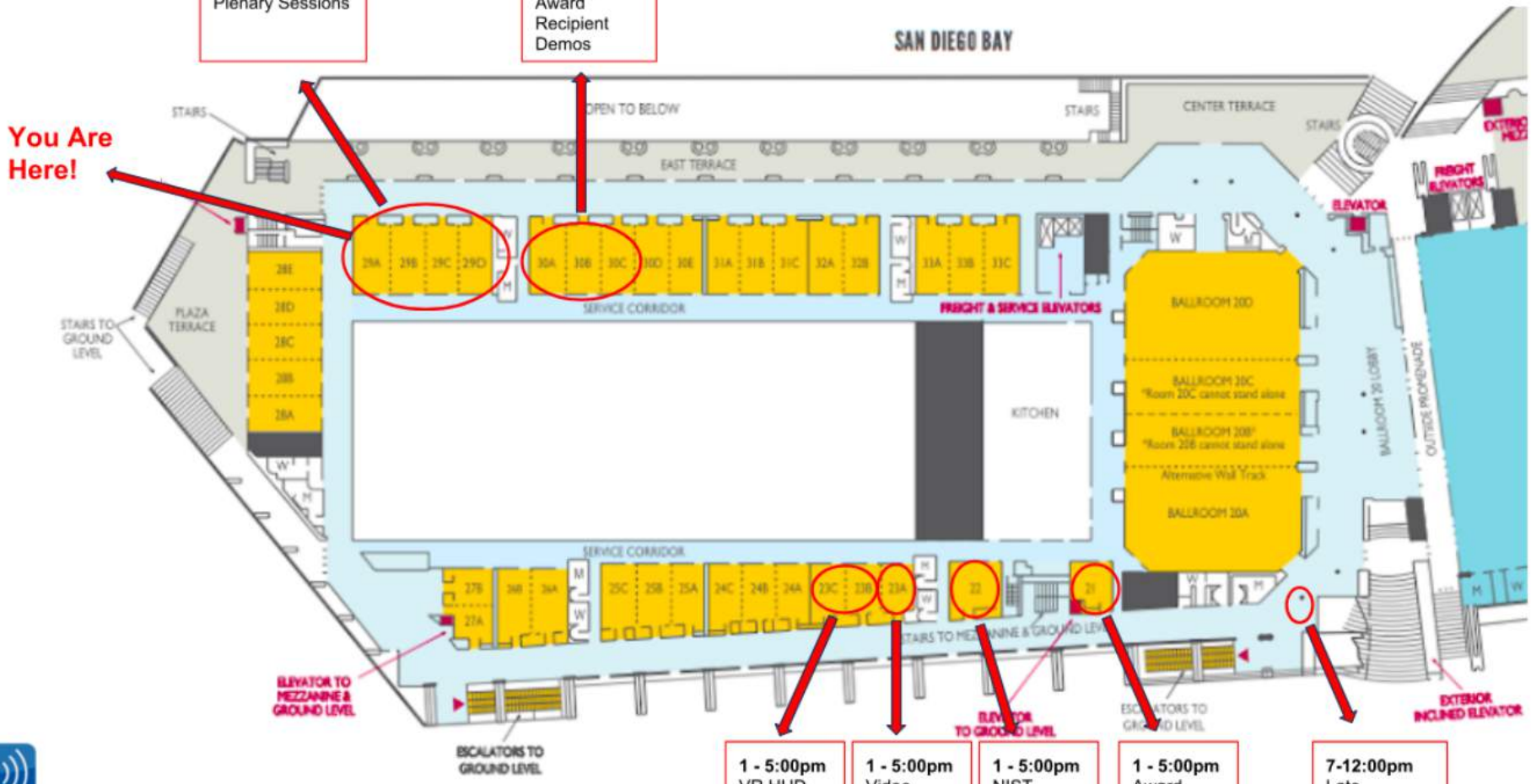
4 - 5:00pm
Award Recipient Posters

7:30-5:00pm
Late Registration

Convention Center Layout - Day 4

8:30- 11:30am
Plenary Sessions

1- 5:00pm
Award Recipient Demos



1 - 5:00pm
VR HUD Challenge Demo

1 - 5:00pm
Video Quality Experiment

1 - 5:00pm
NIST Demos and Featured Demos

1 - 5:00pm
Award Recipient Posters

7-12:00pm
Late Registration

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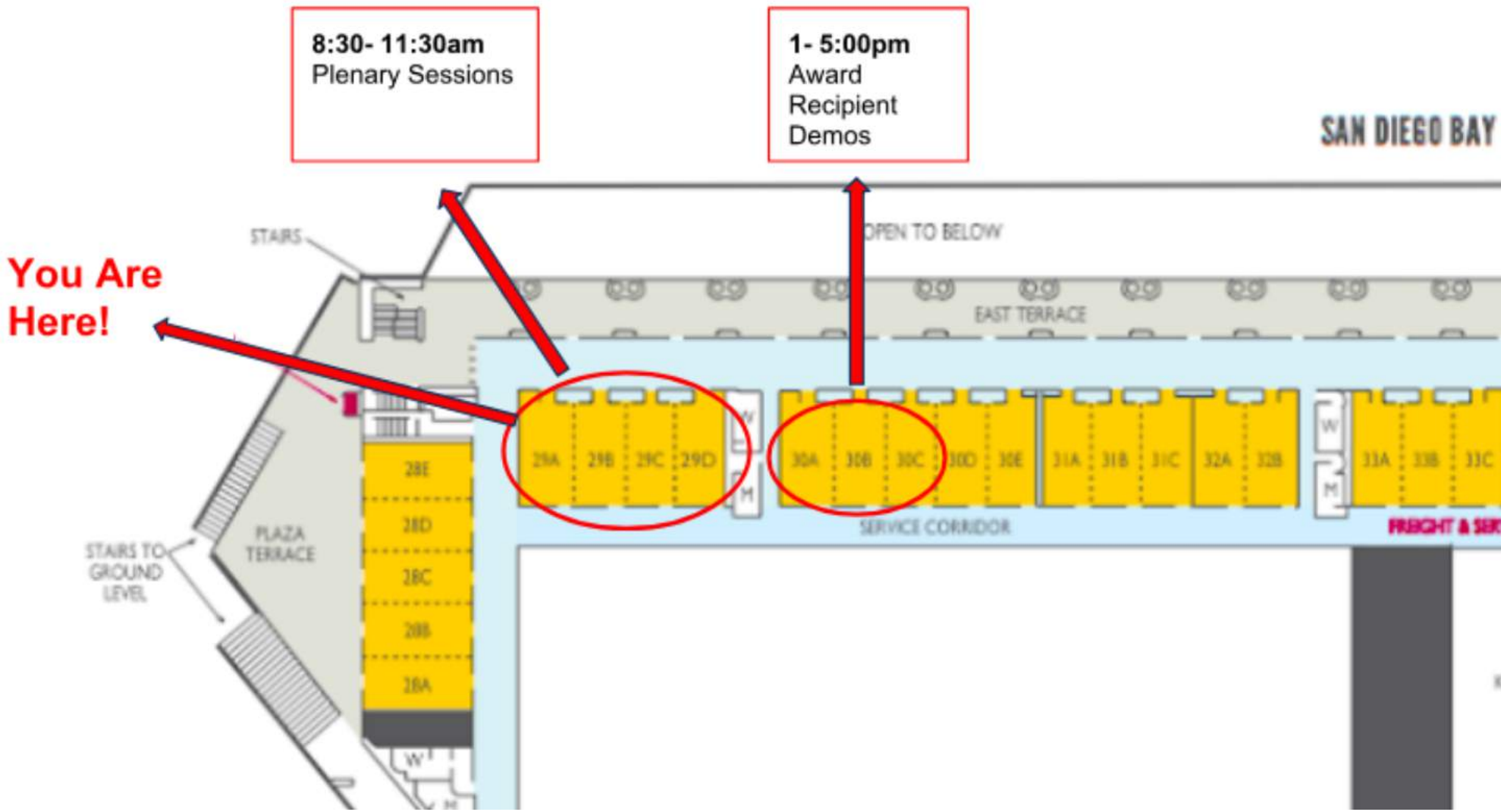
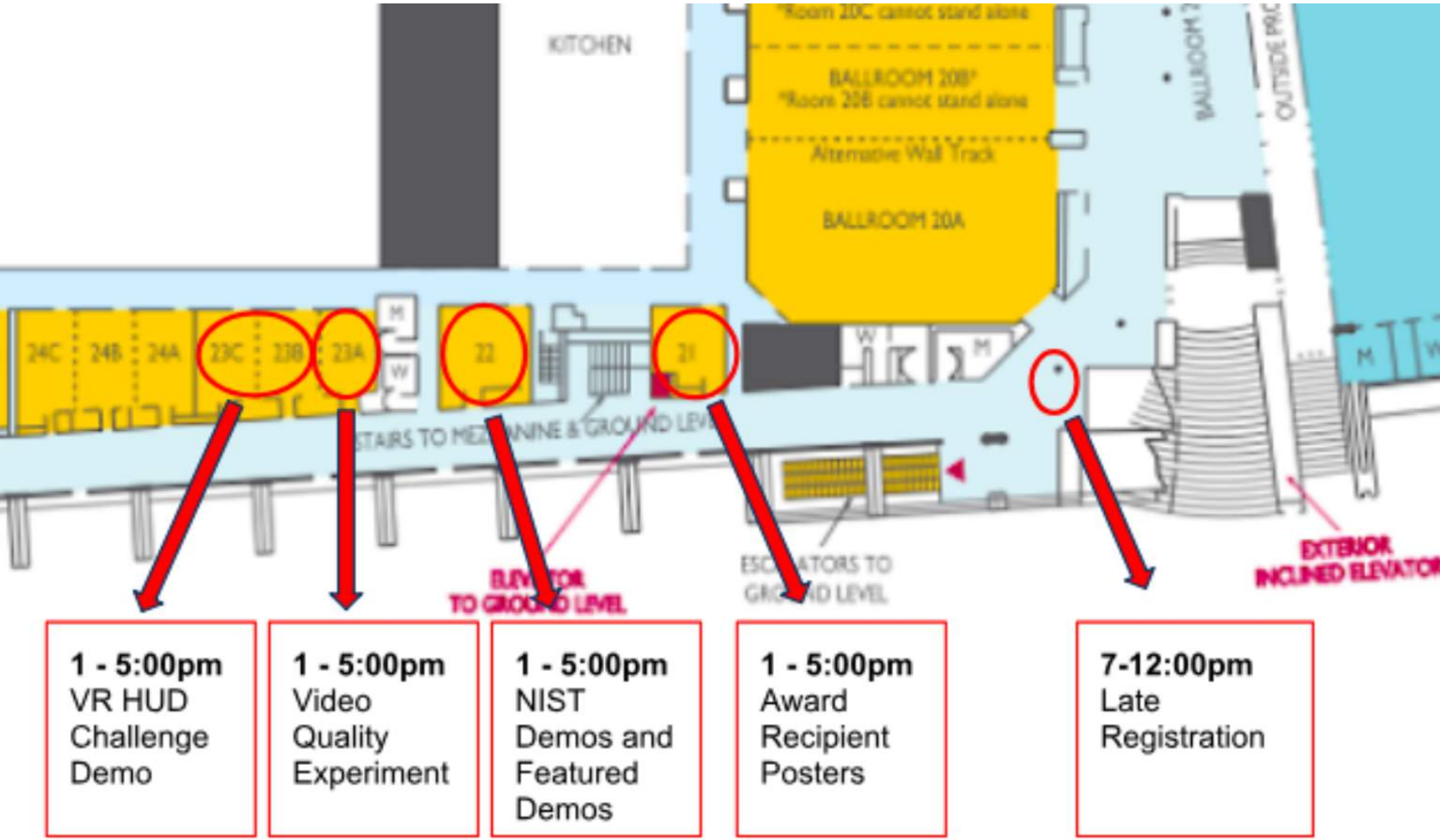
Convention Center Layout - Day 4

8:30- 11:30am
Plenary Sessions

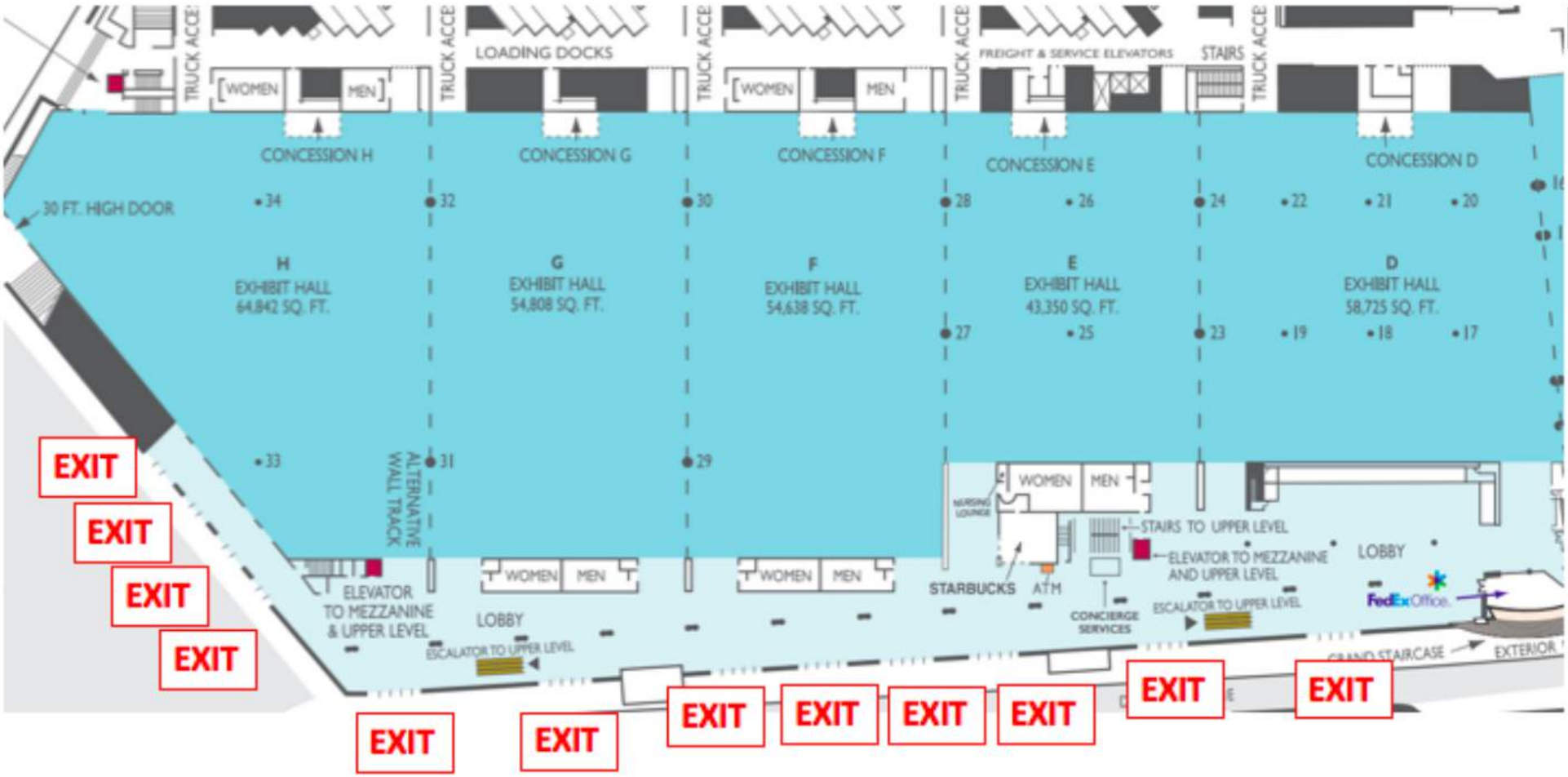
1- 5:00pm
Award Recipient Demos



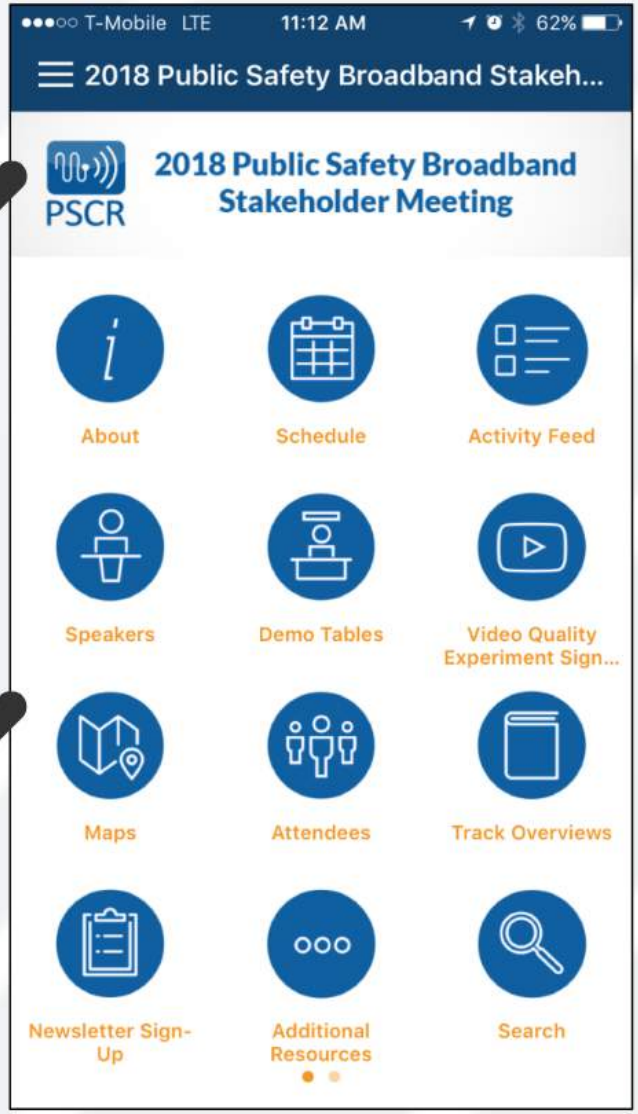

KITCHEN
BALLROOM 20B*
*Room 20B cannot stand alone
Alternative Wall Track
BALLROOM 20A
24C
24B
24A
23C
23B
23A
22
21
M
W
OUTSIDE PATIO
BALLROOM 2
1 - 5:00pm
VR HUD
Challenge
Demo
1 - 5:00pm
Video
Quality
Experiment
1 - 5:00pm
NIST
Demos and
Featured
Demos
1 - 5:00pm
Award
Recipient
Posters
7-12:00pm
Late
Registration

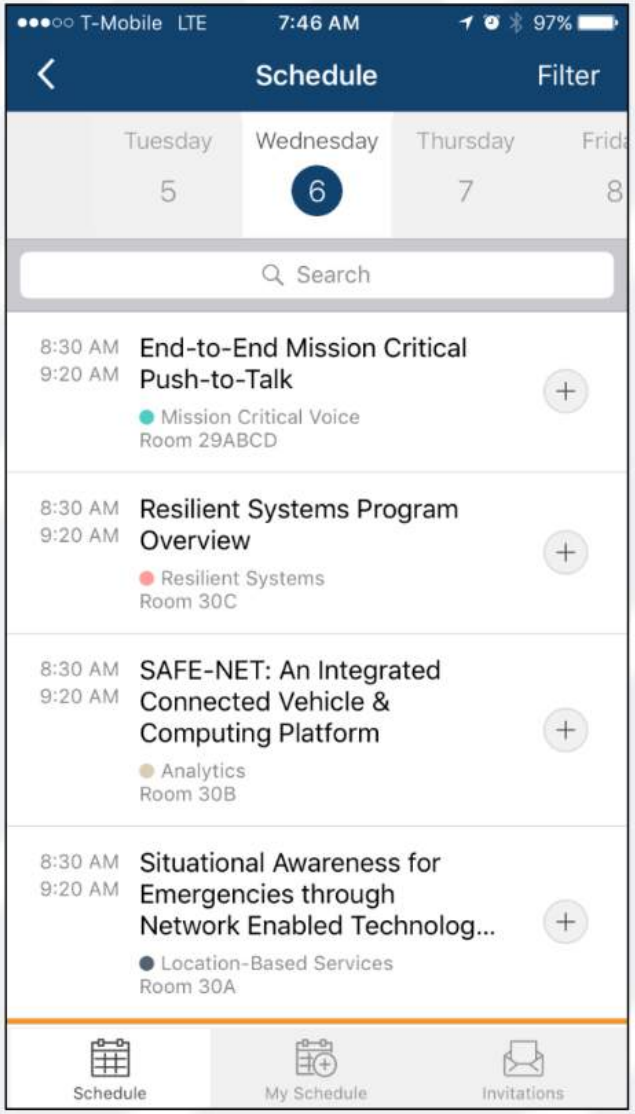
Emergency Exits - Upper Level

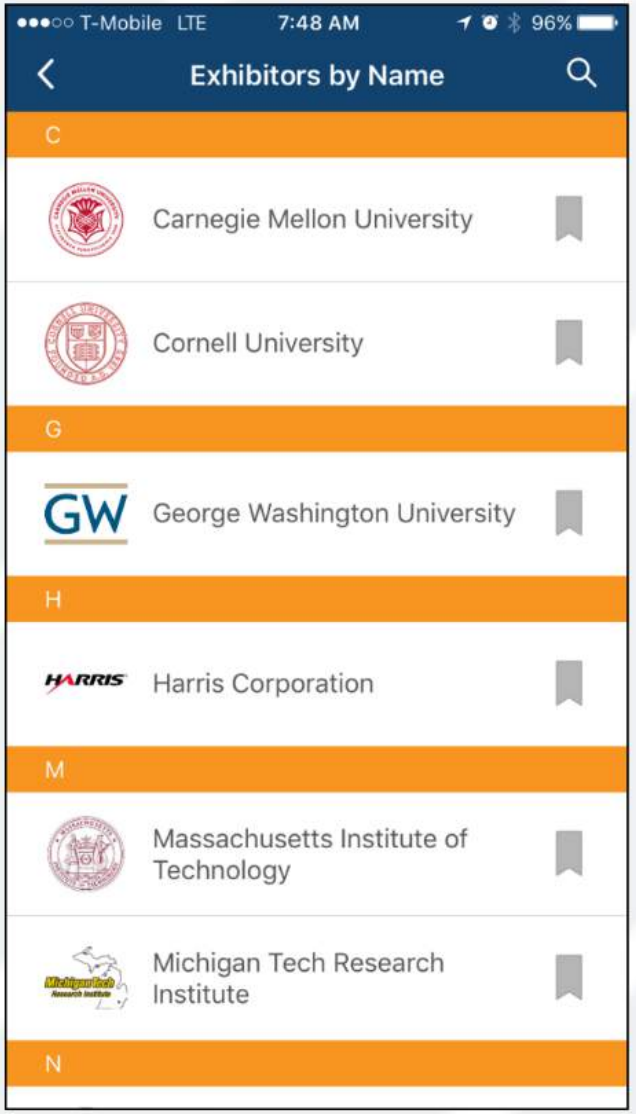
Emergency Exits - Ground Floor



Download the Mobile App!







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Public Safety Broadband Stakeholder Meeting

Mobile App

- Personalized Meeting Schedule
- Demo Table Descriptions
- Event Announcements
- Session Handouts
- Speaker Information
- Attendee Messaging

1. From your app store, download the ***Crowd Compass AttendeeHub*** App
2. Type the meeting name into the search bar: 2018 Public Safety Broadband Stakeholder Meeting
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- Personalized Meeting Schedule
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Speaker Information

Attendee Messaging

1

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THANK YOU
COLORADO SPRINGS

2018 Public Safety Broadband Stakeholder Meeting

Dereck Orr,
PSCR Division Chief

PSCR NIST

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UNMANNED AERIAL SYSTEMS PAYLOAD & FLIGHT TIME CHALLENGE

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PSCR OPEN INNOVATION VIDEO

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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, all information and data presented is preliminary/in-progress and subject to change.

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UAS FLIGHT & PAYLOAD CHALLENGE AGENDA

- UAS Challenge Overview
- Challenge Results
- Top 3 Winning Solutions
- Lessons Learned
- Audience Q&A

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CHALLENGE OVERVIEW

- Up to $432K in Prize awards
- Ten different teams & designs
- Three stages: concept, prototype, test & evaluation
- Test & evaluation included:
  - 10 lbs, 15 lbs, 20 lbs payloads
  - Vertical take-off and landing with ability to hover in place
  - Autonomous and human controlled flight capability
- UAV Design Parameters
  - Weigh < 55lbs
  - Transport Size < 6 ft x 4 ft x 3 ft
  - Hardware Cost < $20k

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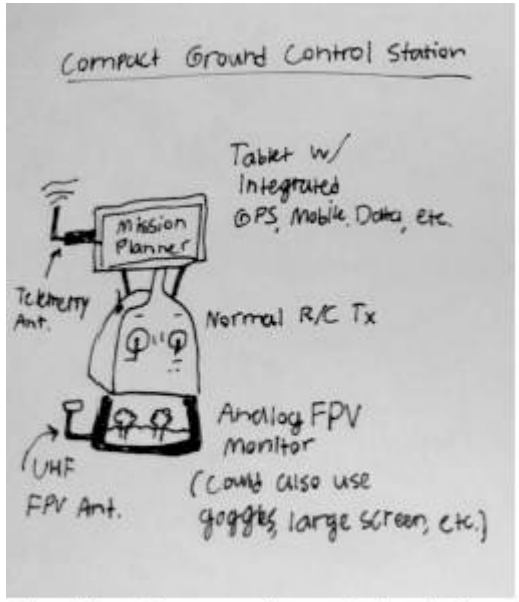
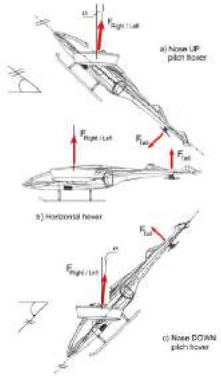
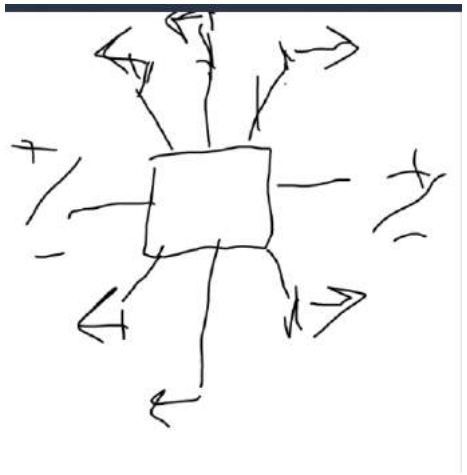
STAGE 1: CONCEPT

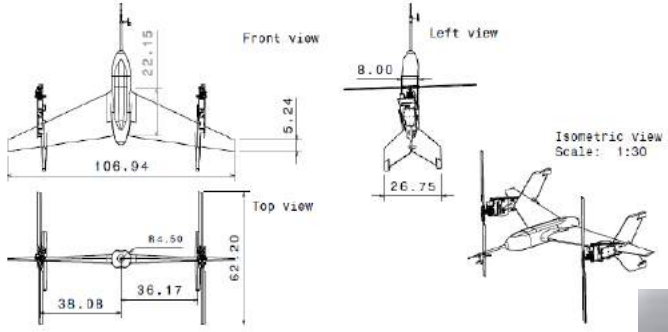
- Goals:
  - Engage the UAS community to integrate their innovative ideas into our public safety focused mission
  - Generate exciting, innovative, and diverse design concepts
  - Invite new applicants' from various backgrounds
- Timeframe:
  - Jan 9th – Jan 29th 2018

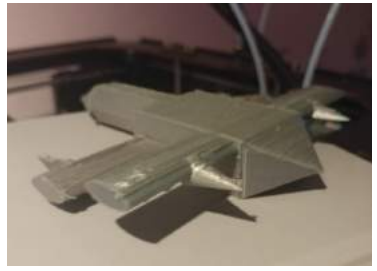


Sketch of ground control station

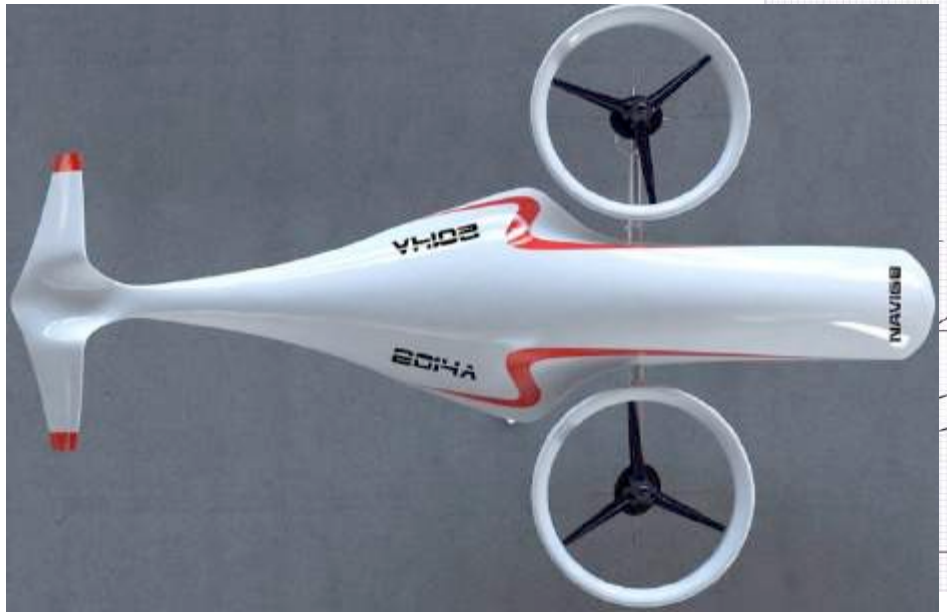


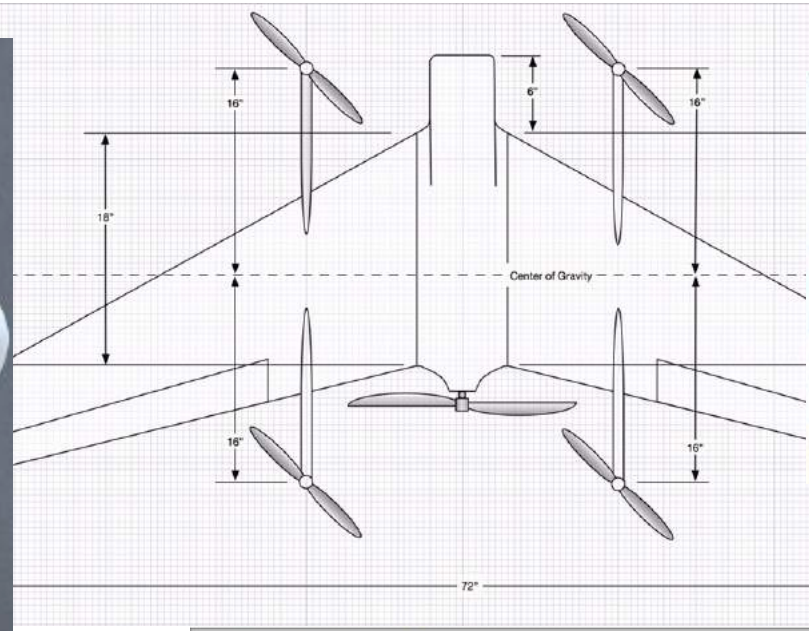


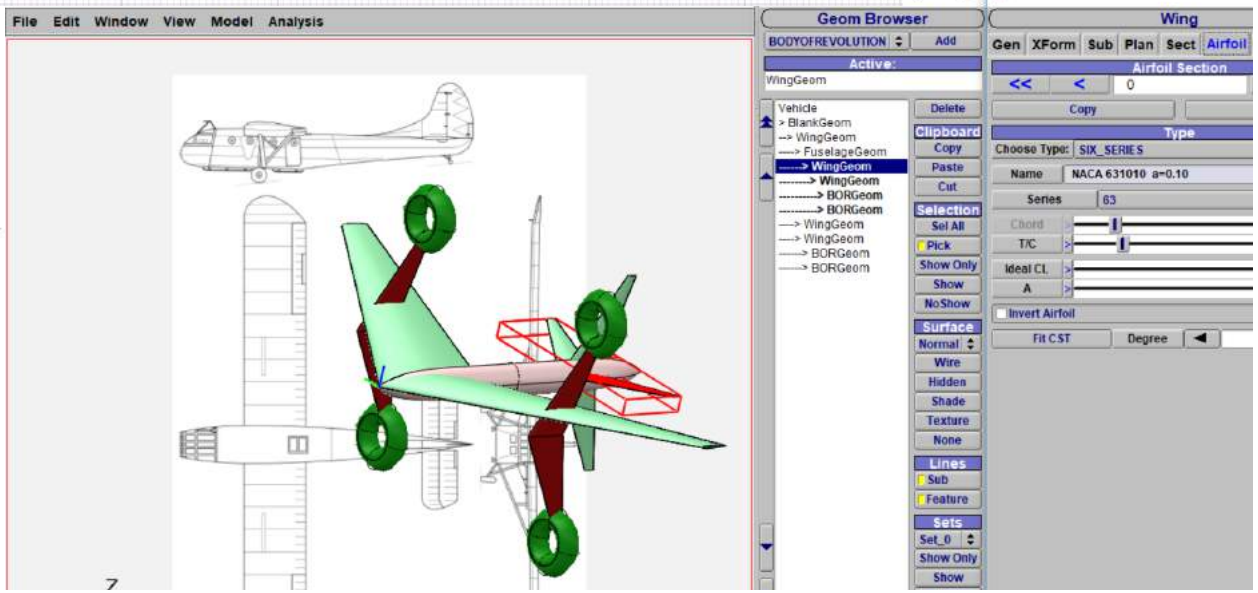




STAGE 1: CONCEPT







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STAGE 2: PROTOTYPING & VIDEO TESTING






- Goals:
  - PSCR selected 10 contestant teams based on their concept, team members, and project plan
  - Contestants worked to transform their concept into reality
  - Once built the contestants completed a series of test flights and safety evaluations
  - Judges reviewed contestant's ability to build a compliant UAS within the hardware constraints and ability to complete a series of flight & safety tests
- Timeframe: Feb 8th – May 14th 2018

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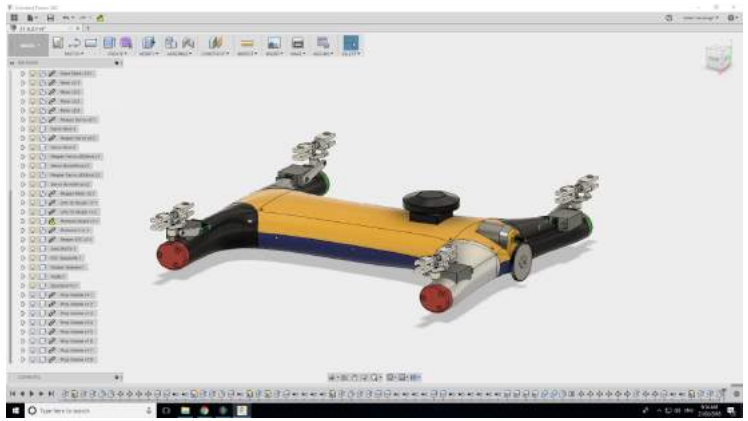
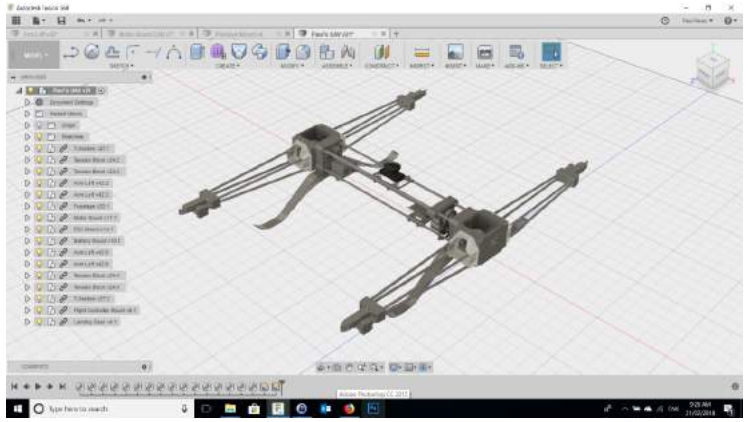
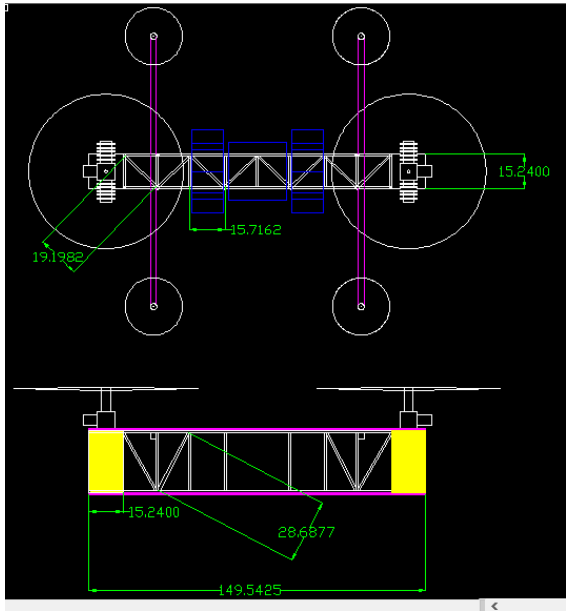
STAGE 2: PROTOTYPING & VIDEO TESTING







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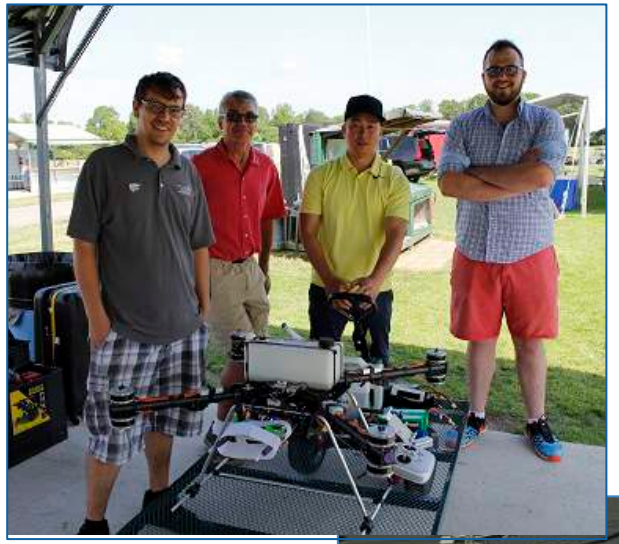
STAGE 3: LIVE COMPETITION

- Goal:
  - Verification of safe and stable pre recorded flights
  - Extensive safety review of UAVs
  - Complete flight and payload tests for official review
  - Best of four flights with 10, 15, & 20 lb payloads, and a 4th optional ‘redo’
  - Scoring based on flight time, stability, and landing accuracy
- Timeframe: May 21st – 24th 2018



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STAGE 3: LIVE COMPETITION - JUDGING CRITERIA

- UAS Safety Review (pass/fail)
  - Powered & Non-Powered Safety Inspections
  - Safety Flights
    - Hold Position and Rotate (3 min)
    - Climb, Turn, and Descend (3 min)
    - Move & Rotate / Fly Straight and Level (3 min)
    - Land Accurately (3 min)
    - Demonstrate Manual Override of Autonomous Functions
    - Review Kill Switch safety & control
- Position Stability & Landing Accuracy
- UAS Flight & Payload review

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STAGE 3: LIVE COMPETITION - SCHEDULE

5/21/18 M	5/22/18 T	5/23/18 W
AM Safety /PM Flights • **Safety Checks** 9am-12pm • **Break** 12-2pm • **6 Safety Flights** 2-5pm	**AM/PM Flights** • **10 Pound Flights** 9am-12pm • **Break** 12-2pm • **15 Pound Flights** 2-5pm	**AM/PM Flights** • **20 Pound Flights** 9am-12pm • **Break** 12-2pm • **Redo Payload Flights** 2-5pm

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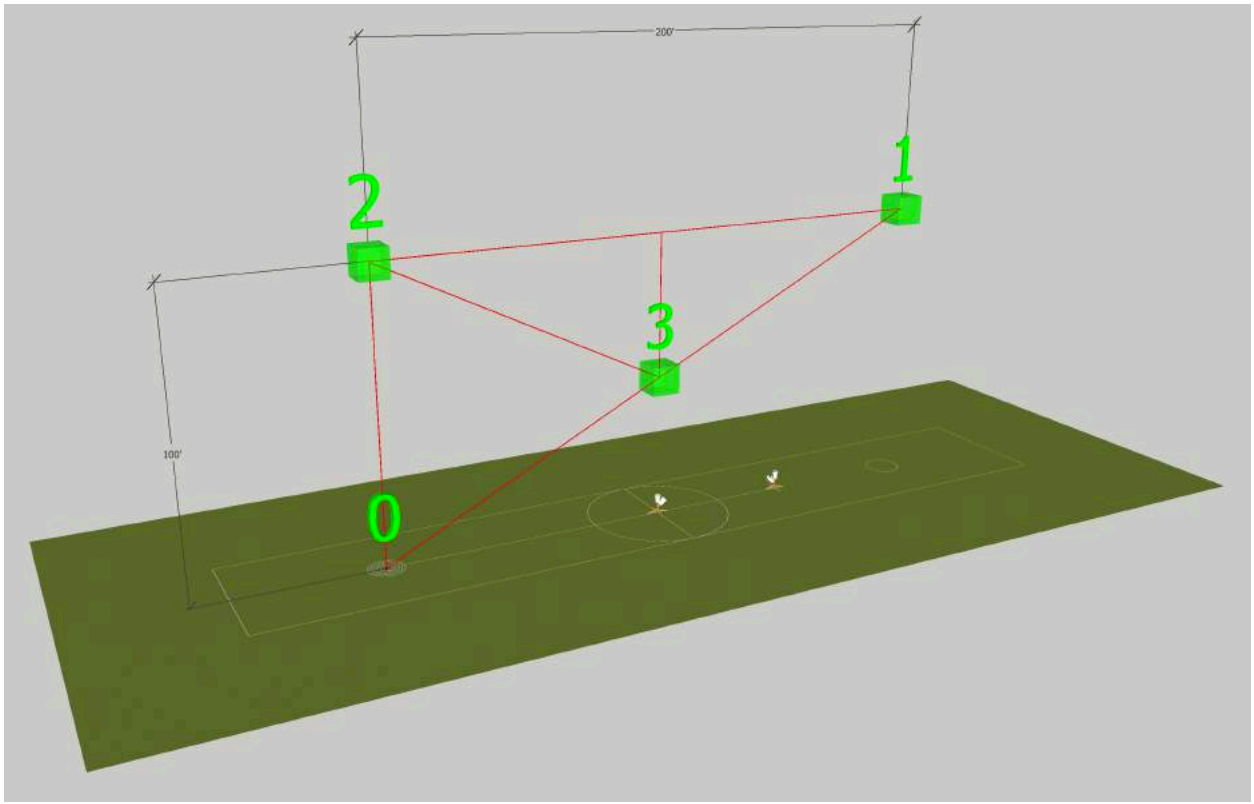
STAGE 3: LIVE COMPETITION - EVALUATED FIGHTS



- Take off from the assigned launch/land location (Waypoint 0)
- Achieve Waypoint 1 at 100 ft. AGL and 200 ft. away from the launch/land location
- Safely navigate the UAV to Waypoint 2
- Safely navigate to the hover location (Waypoint 3) at 50 ft AGL and 100 ft away from Waypoint 2
- Maintain position (within ± 5 ft. in X, Y, and Z) at Waypoint 3 for as long as possible
- Safely navigate back to the launch/land location (Waypoint 0) and land

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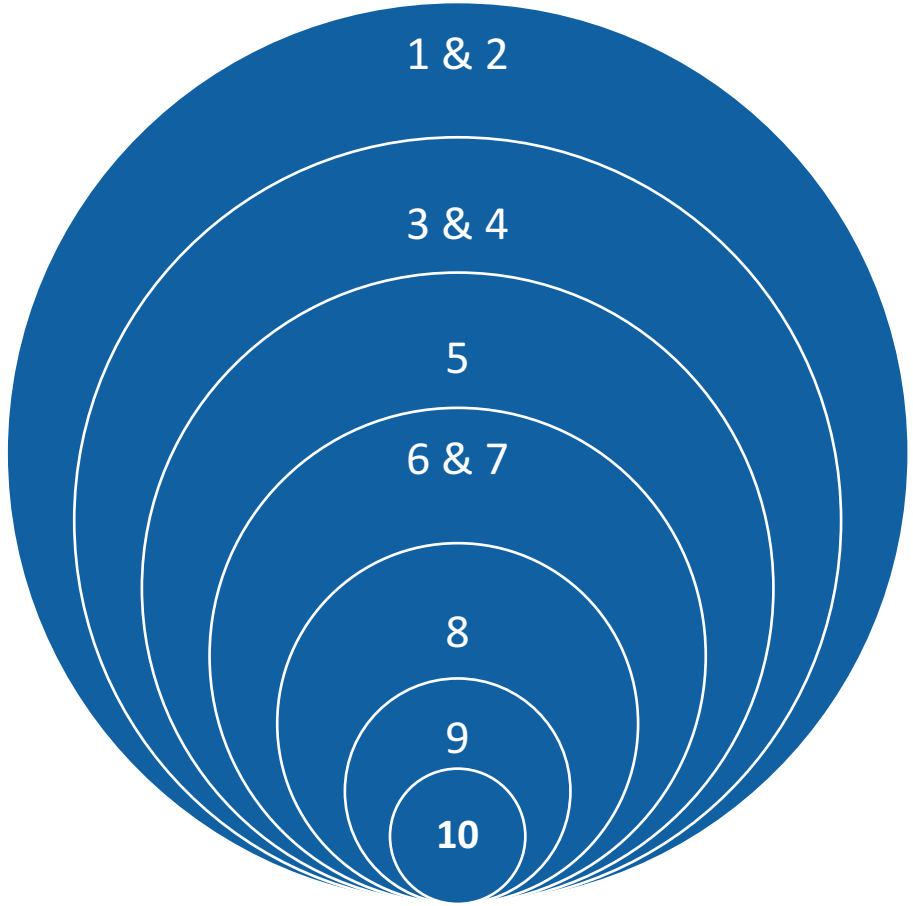
STAGE 3: LIVE COMPETITION - SAFETY

Seven Layers of Safety with Ten independent Safety Controls
1. FAA Certified Pilots & Insured 2. Well Practices with Pre Recorded 6 Test Safety Flights
3. On the ground safety checks (8 independent tests) by experts before anyone is allowed to fly 4. Onsite Fuel Management Policy
5. Independent Live Assessment of their 6 Safety Flights by an onsite expert
6. Safe Distance 100 to 100 ft 7. Emergency Kill Switch w/ clear procedure
8. Steel Chain Link Fence Barriers & SIP Locations
9. A/V Signals & Field Access Controls / Management
10. Everyone on site completes a safety brief and is required to wear PPE



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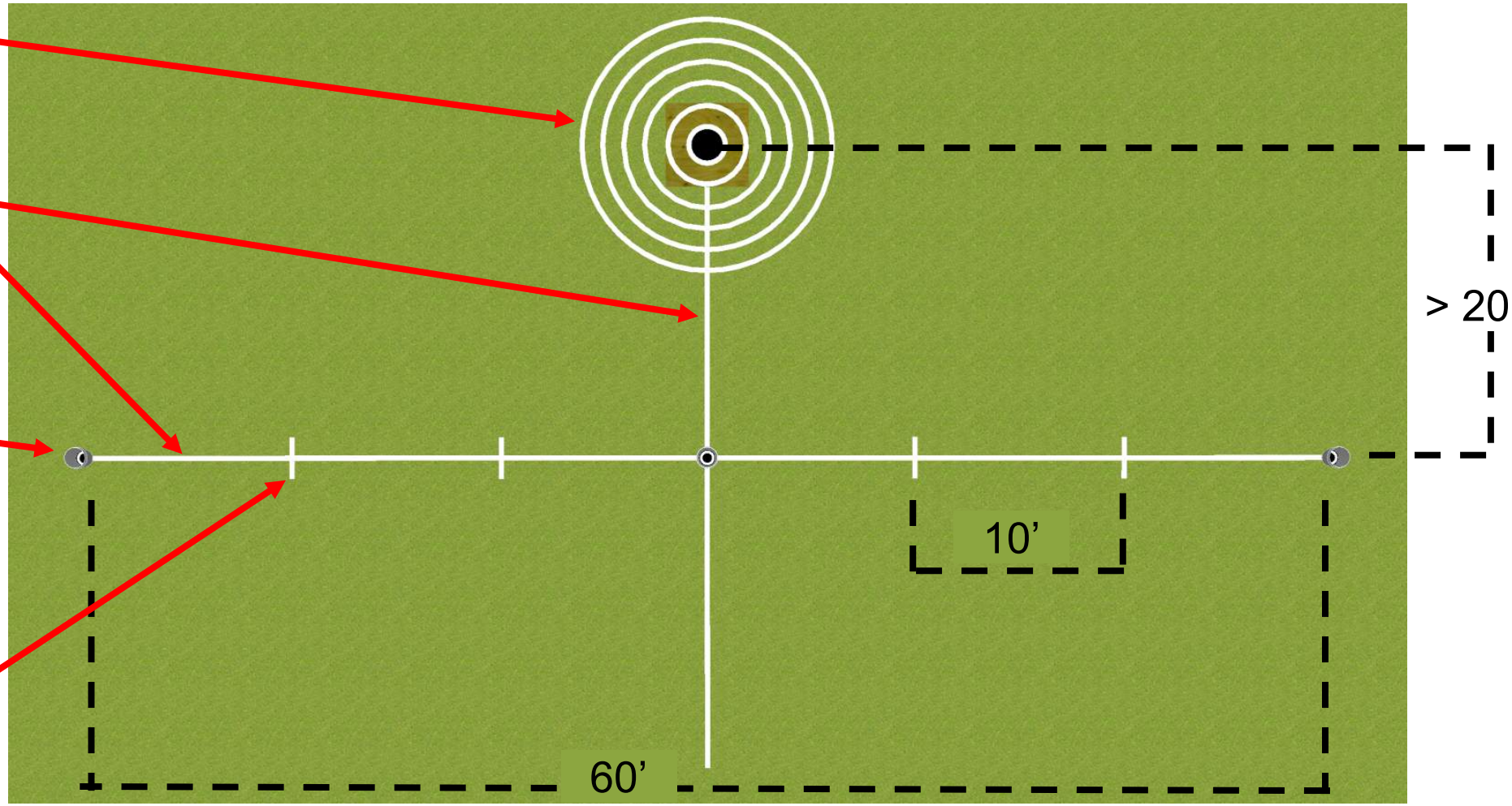
STAGE 3: LIVE COMPETITION - SAFETY TESTS

Bulls Eye

Bright Rope

Buckets with Black Dot

Chalk Line Marks



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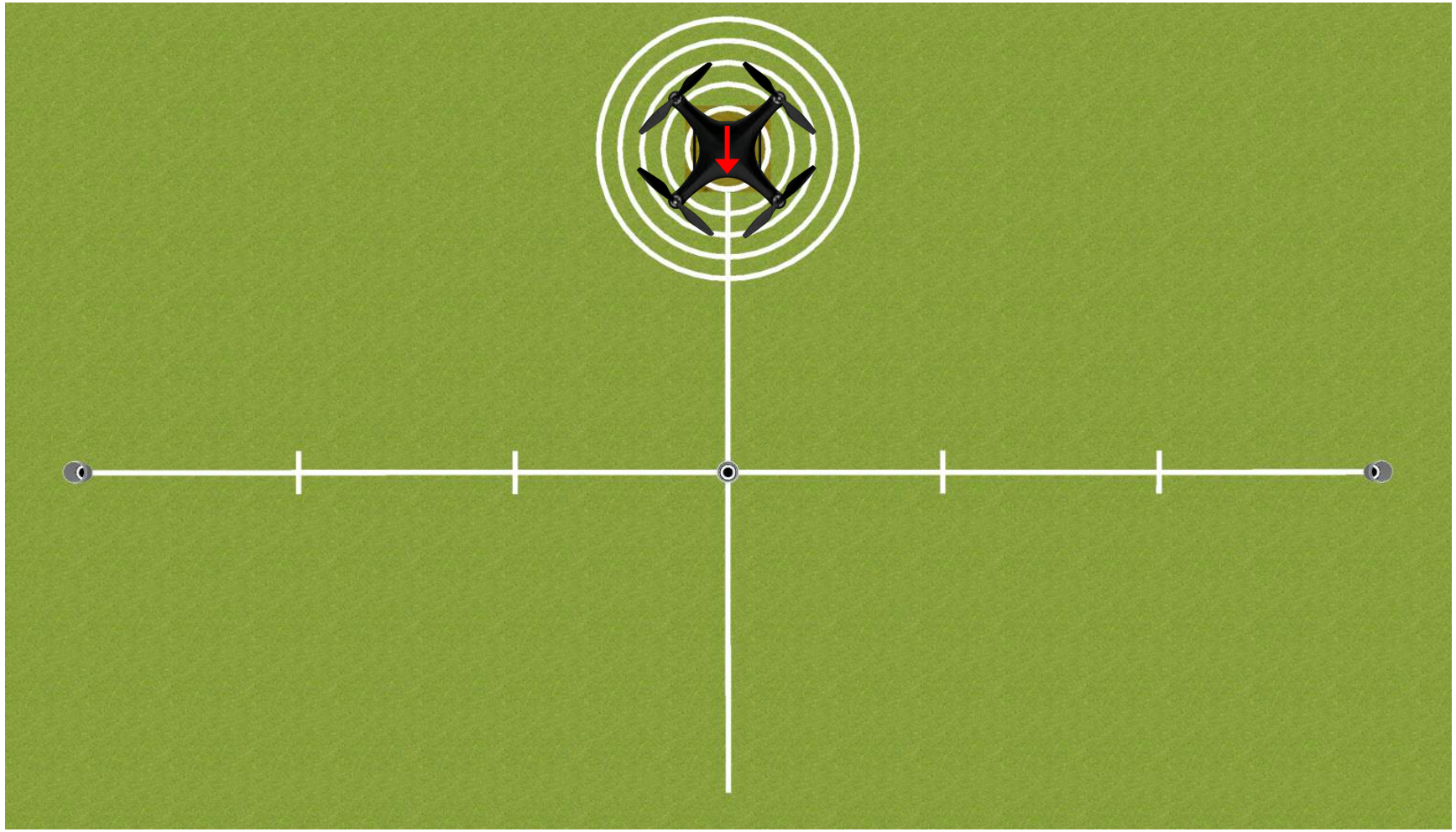
REQUIRED SAFETY TEST: HOLD POSITION AND ROTATE

(at least ten
90° yaw turns)



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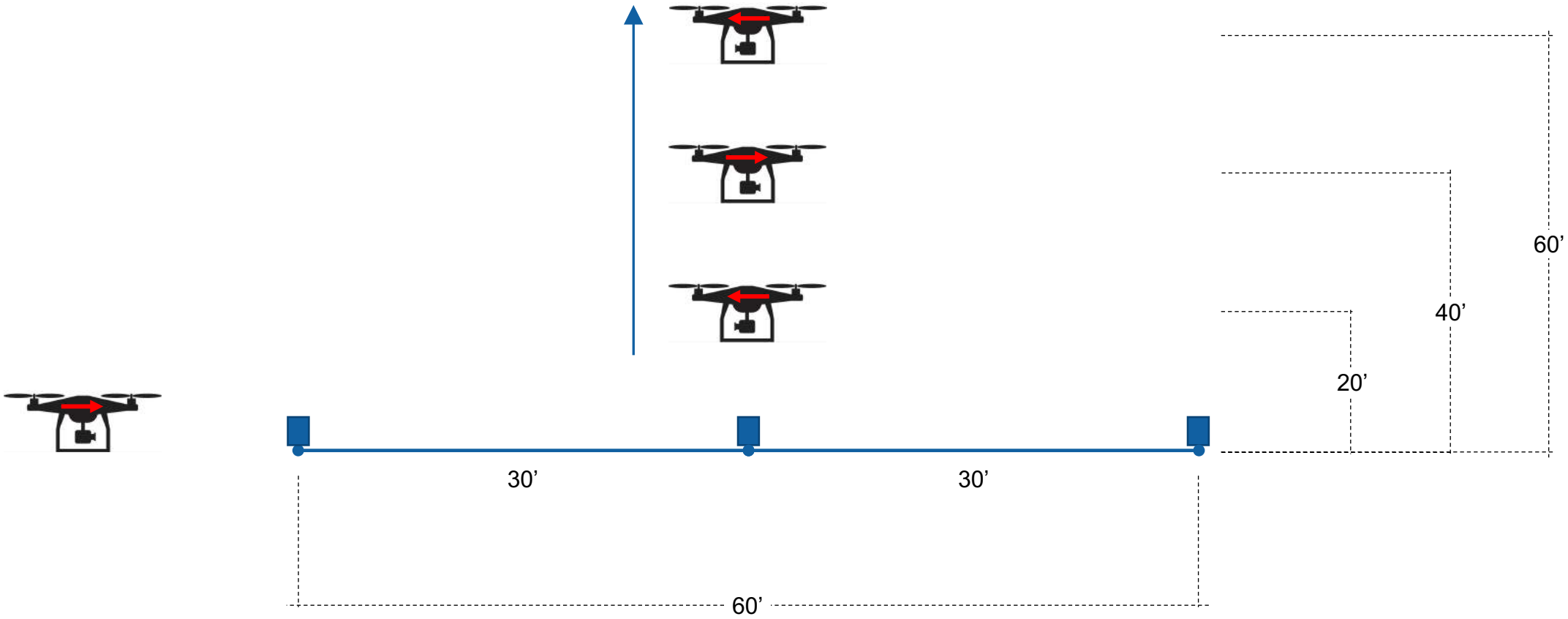
REQUIRED SAFETY TEST: CLIMB, TURN & DESCEND

(at least ten elevation changes and ten 180° yaw turns)



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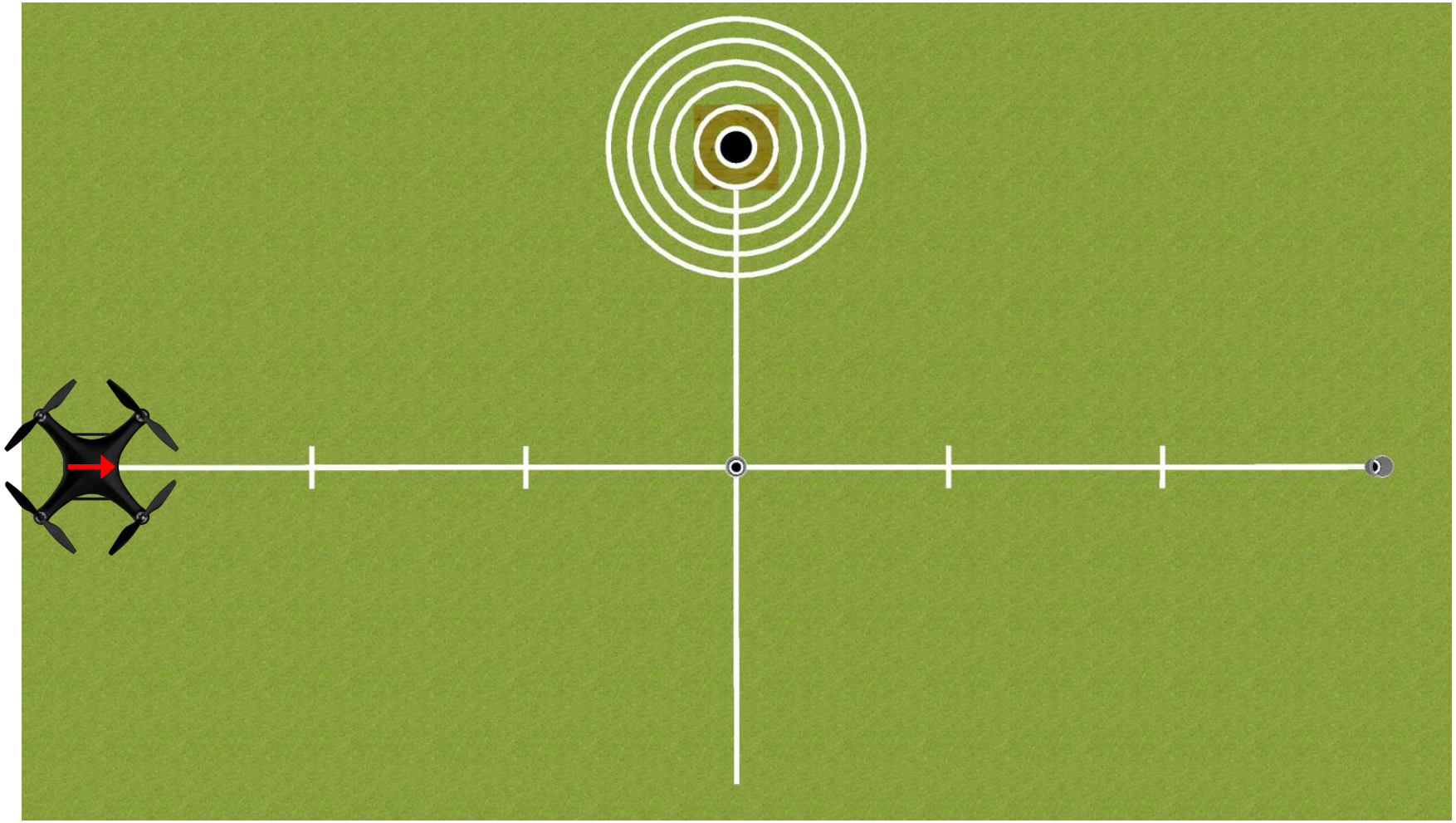
REQUIRED SAFETY TESTS: MOVE & ROTATE | FLY STRAIGHT & LEVEL

(at least ten 60’ flights and ten 180° yaw turns)



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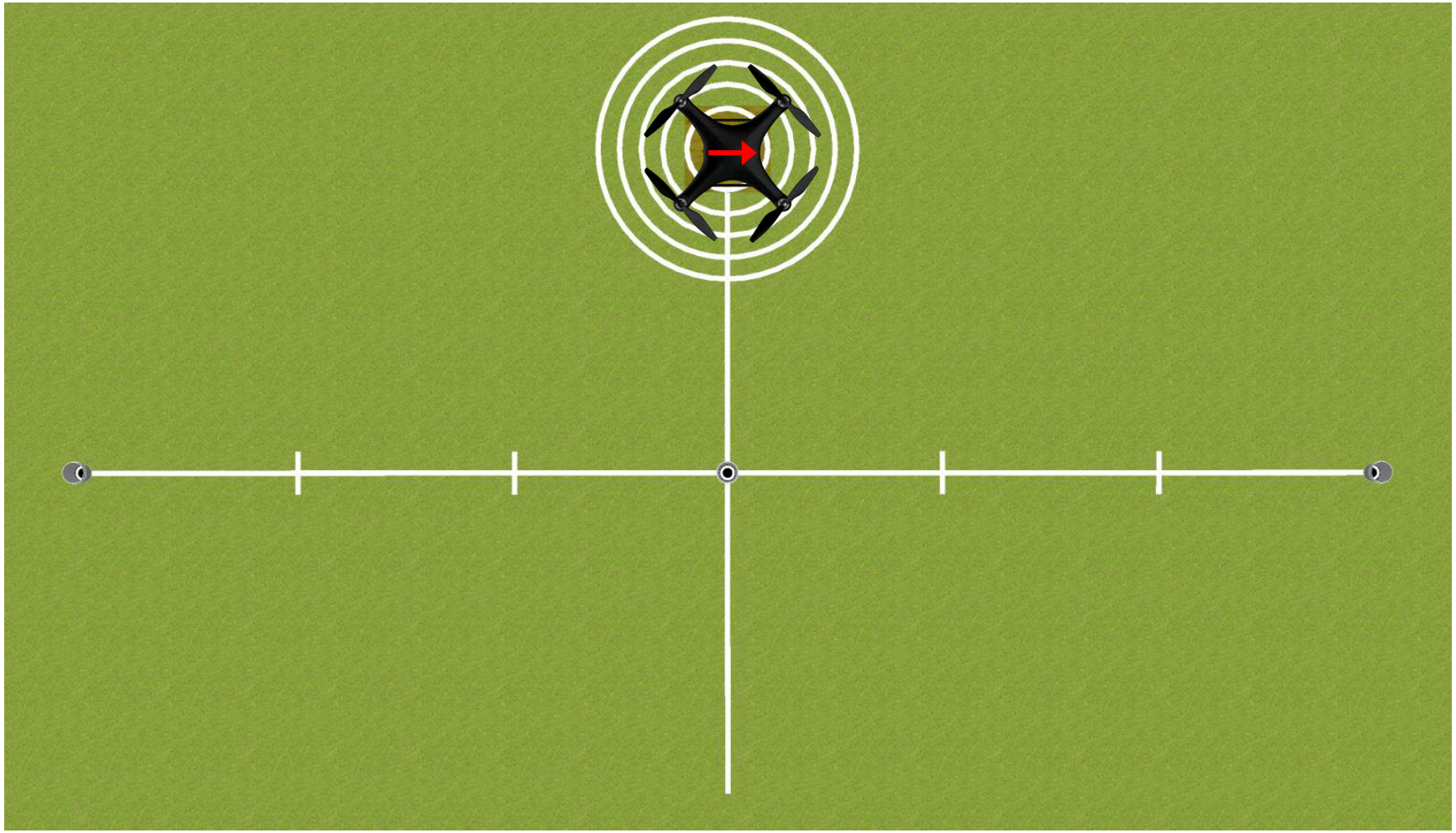
REQUIRED SAFETY TESTS: LAND ACCURATELY, DEMONSTRATE MANUAL OVERIDE & DEMONSTRATE KILL SWITCH



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STAGE 3: LIVE COMPETITION - EVALUTED FLIGHT SCORING

- Official Flight Scoring
  - Flight Time = 90 % of total score
  - Landing Accuracy = 10 % of total score
- How is the Flight Time Score calculated?
  - Flight time points are earned while at or inside ± 5 ft. of the Hover Location
  - Flight Time = (Time at or inside ± 5 ft. of Hover Location) – (Time outside ± 5 ft. of Hover Location)

Payload	Time	Multiplication Factor
10 lbs.	1 point per minute	1
15 lbs.	1 point per minute	3
20 lbs.	1 point per minute	6

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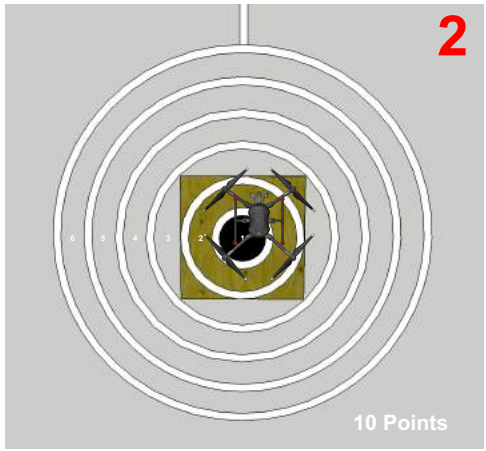
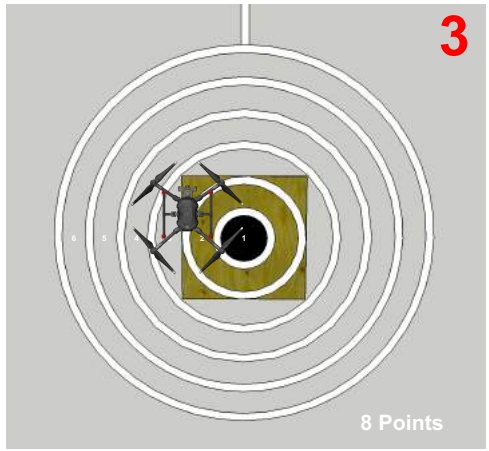
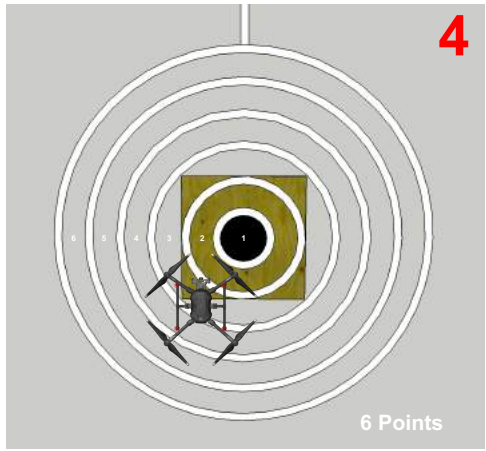
STAGE 3: LIVE COMPETITION - EVALUTED FLIGHT LANDING ACCURACY

Landing Number	Starting Band	Final Band	Score
1	2	2	10
2	2	3	8
3	2	4	6
		Final Score	**8**







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THE CHALLENGE COMPETITION

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SUMMARY OF CHALLENGE RESULTS

Team 1 Scores

Payload	Factor	Date	Total Flight Time	Recharge Time	Hover Time	Landing Score	Total Score
10 lb	1	5/21/18	18	NA	0	2	2
15 lb	3	5/22/18	15	NA	9	10	37
20 lb	6	5/22/18	6	NA	0	8	8
10 lb	1	5/23/18	18	NA	0	6	6
						Totals	53

Team 2 Scores

Payload	Factor	Date	Total Flight Time	Recharge Time	Hover Time	Landing Score	Total Score
10 lb	1	5/21/18	87	45	0	8	8
15 lb	3	5/22/18	75	62	42	10	136
20 lb	6	5/23/18	40	29	26	8	164
						Totals	308

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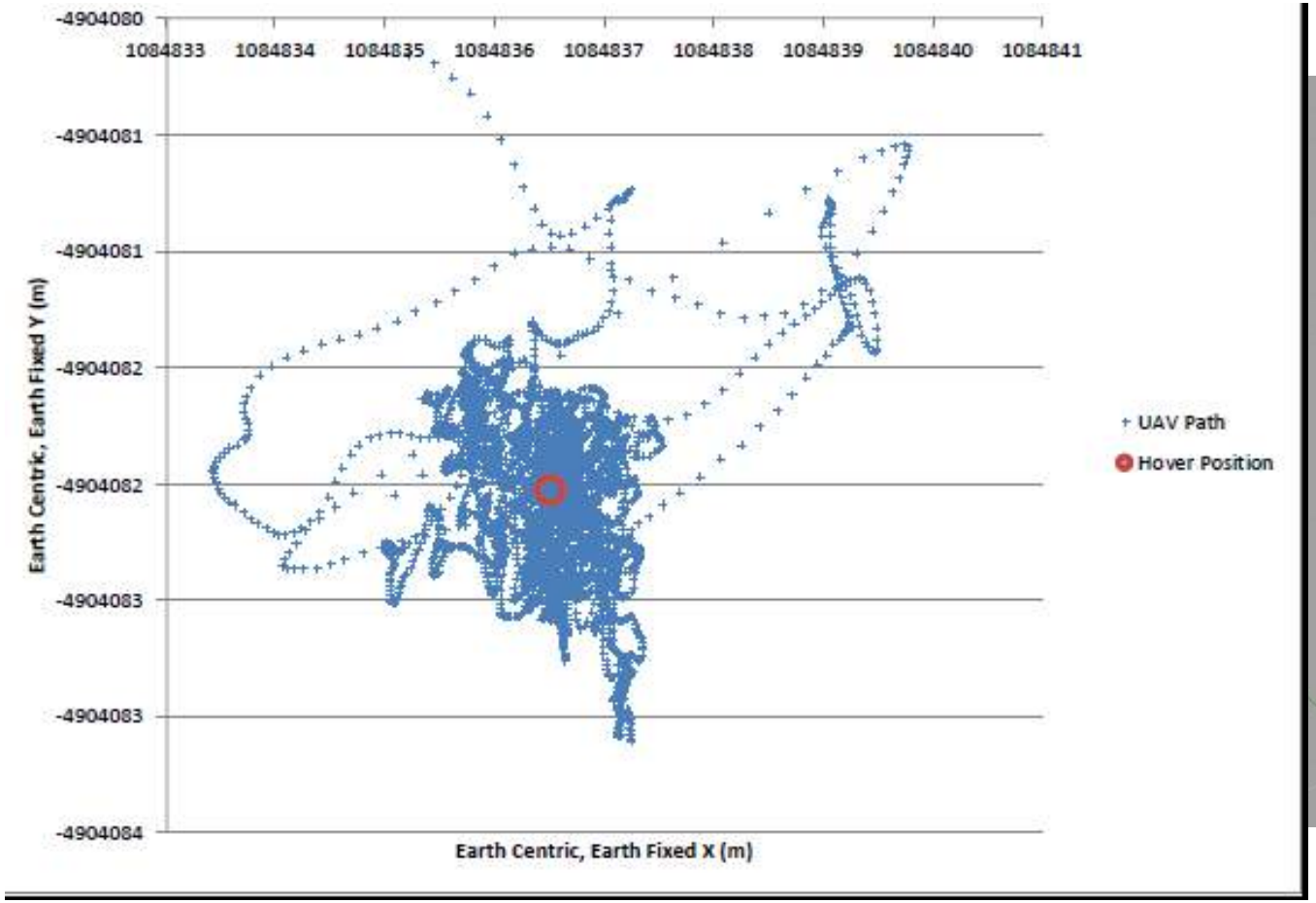
FLIGHT DATA COLLECTED



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PARTICIPANT: TEAM ENDURE AIR with HELICOPTER (California/India)

Sagar Setu

Dr. Abhishek

Ankur Duhoon

Aircraft Solution

A helicopter with rotors in tandem configuration, powered by a single gasoline engine. The airframe, transmission and controls were designed from scratch, while the rotor heads were from an existing 'Endure 800' conventional helicopter platform with a proven track record. Tandem configuration is more efficient in hover for a given payload and provides more lift with compact rotor arrangement, thereby the best solution for public safety mission requirements.

Yamin Durrani

Nidhish Raj

Karthik S

PSCR

ENDURE AIR
FLY WITH PURPOSE

FINALIST: TEAM MAXPRAN with LE C2 X8 (New Jersey)

Jim Faunce, P.E./E.E.

LE C2 X8 Aircraft Design

MaxPran's Long Endurance C2 X8 UAS is designed to be used by First Responders for reliable Command and Control (C2). Their experience, skills and facilities developed over years of R&D in the energy, aerospace and UAS industry has allowed them to design, build and optimize an X8 multicopter providing maximum performance for Group 2 UAS.

Matt Koestner, E.E.

Tanway Sawant, M.E.

Ben Faunce, FS Tech

PSCR

FINALIST: TEAM MAXPRAN with LE C2 X8 (New Jersey)

PSCR

MAXPRAN

FIRST PLACE: TEAM DV8 with ODS (Kansas)

James Salter

Truc Quach

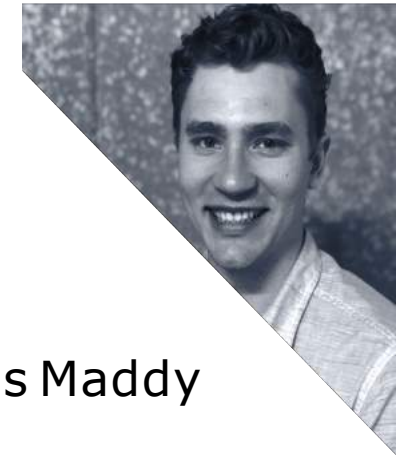
ODS Aircraft Design

ODS or On Demand Support, is designed for both heavy lift and long endurance missions, this platform is tailored to carry an on-board LTE module which will provide first responders access to vital communications in remote areas.

Toby Tracy

Rudy Voldrich

Ryan Zoller



Chris Maddy

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FIRST PLACE: TEAM DV8 with ODS (Kansas)

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DV8 TECH

LESSONS LEARNED

- **Flight Time**
  - The hybrid design approach explored practical solutions to solving key issues; at least one team exhibited modest success. As these approaches are refined and improved, in-flight battery charging has the potential to expand the possibilities for small UAS for use by First Responders.
- **Payload**
  - Limiting the design to one payload weight would allow specialization for the UAS platform; tradeoffs were made to design elements to support various payload weights.
- **Accuracy/Versatility**
  - Maintaining accurate location while in flight (to within +/-5 ft) was a significant challenge for all contestants; accuracy requirements should be refined for use by First Responders.
- **Cost**
  - More funds were spent on hardware vs software; advanced software components may add stability, accuracy and autonomous functions to the UAS.
- **Other**
  - Telemetry, RF signaling, noise, simplicity, reliability, communications device, mesh networking

SPECIAL THANK YOU

Judge Panel

- **Dereck Orr**
  Division Chief PSCR NIST
- **Thomas Sebastian**
  Aerodynamicist & Early Concept Developer, MIT Lincoln Laboratory
- **Adam S. Jacoff**
  Robotics Research Engineer, Intelligent Systems Division at NIST

Safety & Set Up Team

- **Howie Stockhowe,** Master Firefighter, UAS Training Coordinator / Marine Team, Virginia Beach Fire Dept.
- **Tom Haus**, Captain Los Angeles Fire Department
- **Tony Galladora,** Sergeant Montgomery County Police Dept
- **Max Delo**, Assistant Chief Tactical Operations Division, Office of Emergency Management, U.S. Marshals Service
- **Devyn Whitaker**, Lieutenant, York County Sheriff's Office
- **Jim Hazelwood,** Deputy, York County Department of Fire and Life Safety

Technical Review Team

- **Ben Miller,** UAS Technical and Outreach Specialist DFPC Center of Excellence for Advanced Technology Aerial Firefighting
- **Garrett Seddon**, Military & UAS Integration Specialist DFPC Center of Excellence for Adv Technology Aerial Firefighting
- **Tony Tao**, PhD Candidate MIT
- **Peter Hallenbeck**, Efland Fire Department

NIST

- Jeremy Marvel
- Kam Saidi
- CheeYee Tang
- Kenny Kimble

PSCR

- Hien Nguyen
- Chris Dennis
- Lisa Soucy
- Tim Thompson
- Alison Kahn
- Sam Ray
- Don Harris
- Chris Walton
- Wyatt Suess
- Jacob Crouse

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Q&A + CONTACT INFORMATION

Contact the PSCR
Open Innovation team

@USNISTGOV
#PSCR2018
email: psprizes@nist.gov

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THANK YOU
COLORADO
SPRINGS
5

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International Public Safety Panel

Moderator - Jason Kahn, NIST PSCR

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Ministry of the Interior
and Safety

KOREA SAFENET

(P S – L T E)

June. 2018

JIN-HONG, SIM

Director, Korea SafeNet project Division, MoIS

Contents

I. Korea Safe-Net Status

01

8 departments

National Rescue Service

Police

Electric

Medical

Gas

Coast Guard

Military

Local Government

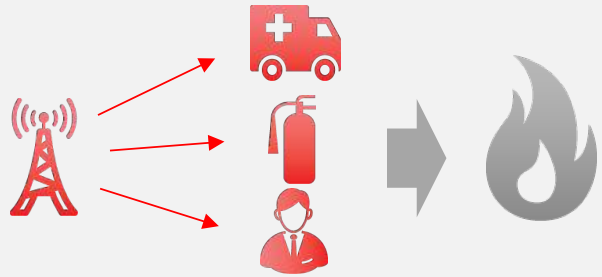
Nationwide

Unified PS-LTE Network

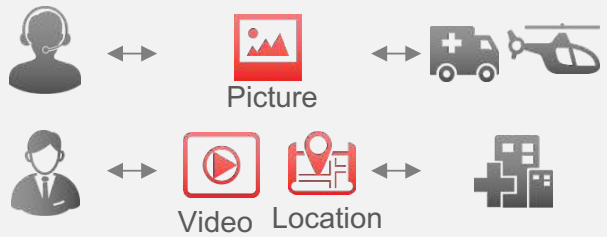
Integrated

Command & Control

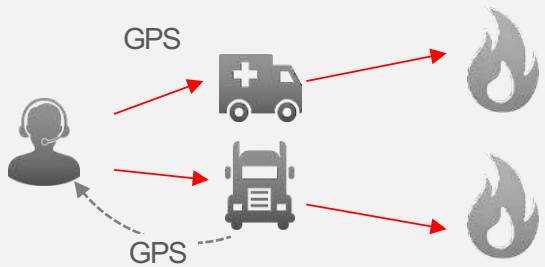
Unified Broadcast Call & Quick Response



PS-LTE based Multiple Media Communication

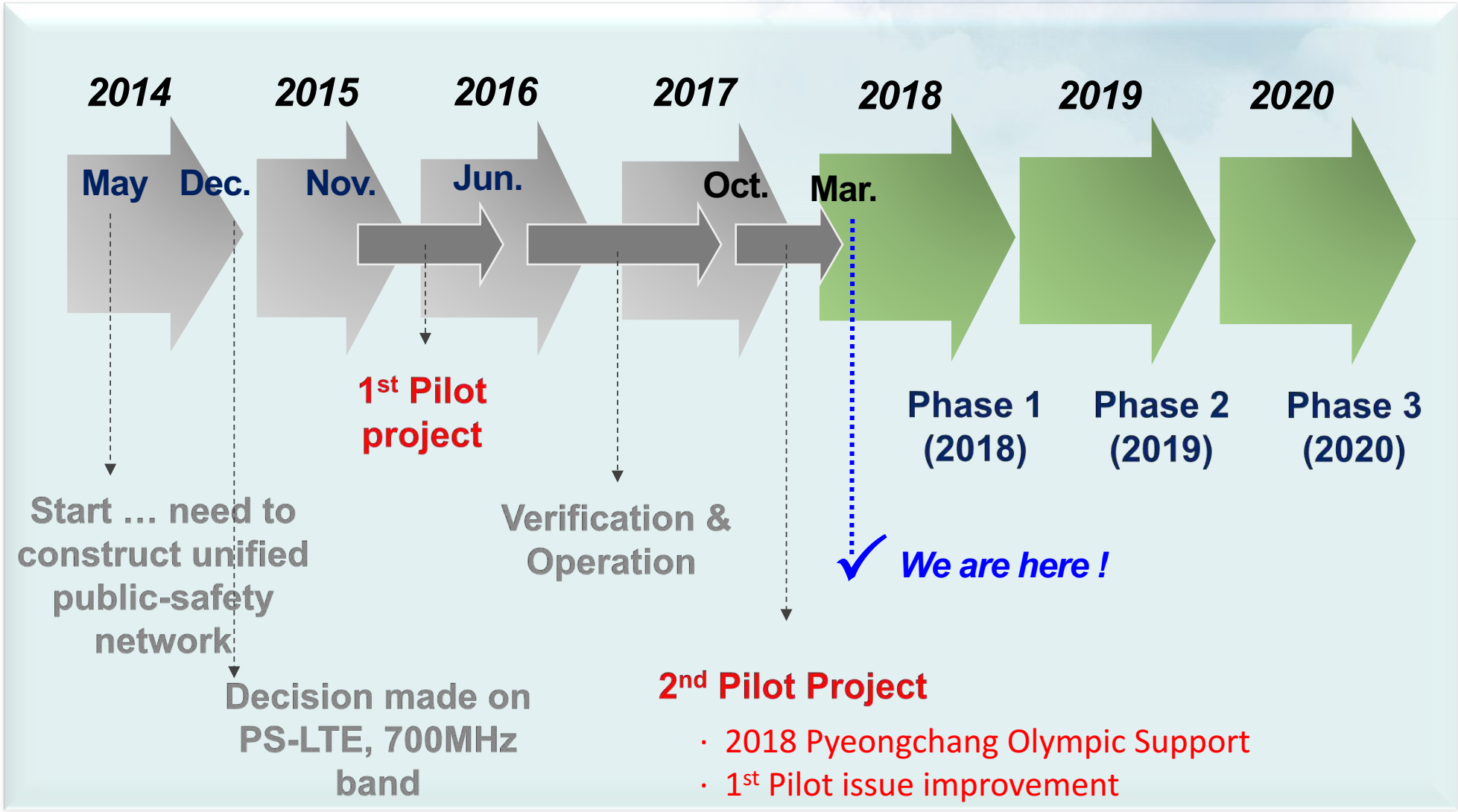


GPS based Optimized Resource Allocation



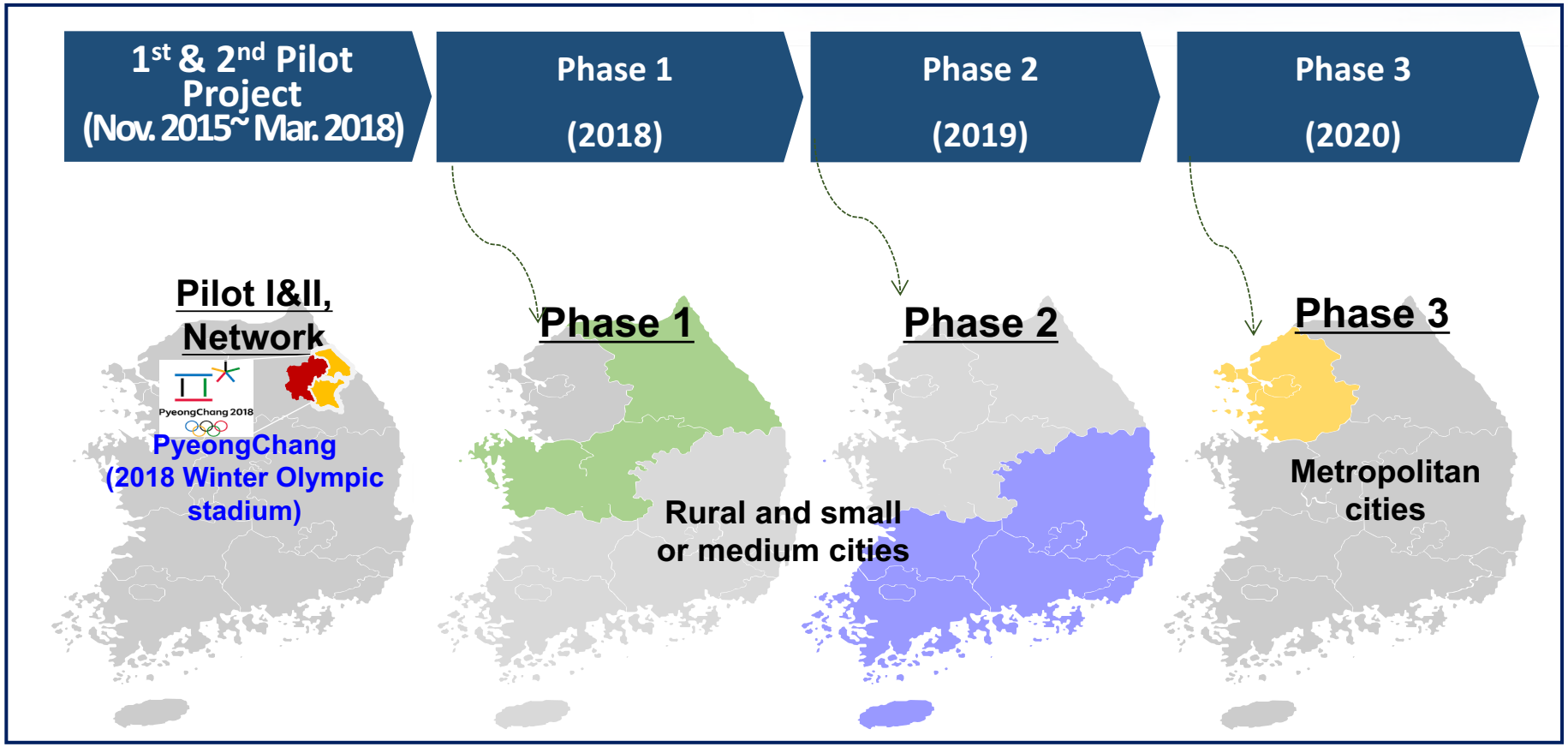
※ PS-LTE(Public Safety – Long Term Evolution)

02


2014
2015
2016
2017
2018
2019
2020
May
Dec.
Nov.
Jun.
Oct.
Mar.
1st Pilot project
Phase 1 (2018)
Phase 2 (2019)
Phase 3 (2020)
Start … need to construct unified public-safety network
Verification & Operation
We are here !
Decision made on PS-LTE, 700MHz band
2nd Pilot Project
· 2018 Pyeongchang Olympic Support
· 1st Pilot issue improvement

03

- Pilot I&II : Verifying & coverage solutions of PS-LTE technologies
- Phase 1~3 : National Area Network, 3GPP Rel.13 implementation



04

All – 4 - One

National Coverage Strategy with the Purpose and Economy of Disaster Safety Network

◎ Main means ○ Sub means

Index	National infrastructure	Road	Densely populated area	mountain	Rural region	Indoor/ underground	Marine	Railroad
① Fixed BS	◎	◎	◎	○	○	○		
② Commercial networks		○		○	◎	◎		
③ Mobile BS				◎	○	○	◎	
④ Other networks				○ (LTE-M)	○ (LTE-R)	○ (U/VHF, TRS, LTE-R, SAT)	○ (LTE-M)	◎ (LTE-R, TRS)

Detailed explanation

- Fixed Base Station : Macro RAN (DU, RU)
- Commercial Network : LTE Network of Telecommunication Operator
- Mobile Base Station : Installed in vehicles or ships
- Other Networks : Interworking of LTE-Railway and LTE-Maritime, Using TETRA, UHF, VHF, etc.

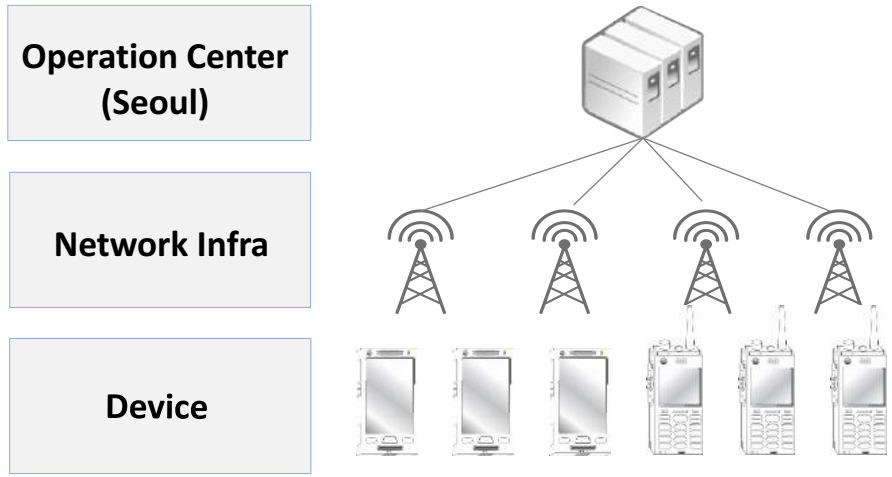
II. Pilot Project (1st & 2nd)

01

- **Period: Nov.2015 - Jun. 2016 (7 months)**
- **Area: PyeongChang, GangNeung, JeongSeon**
- **Budget : 34.5Bil.KRW ($32 million, US)**
- **Working scope**

  - Operation Center(1), Fixed Base Station(220), Mobile Base station(1), Wireless Phone(2496)

Network Configuration



Gangwon Province

"SafeNet" in Pyeong Chang region, selected as a host city of next Olympic Winter Games in 2018

02

- **Period: OCT. 2017 - Mar. 2018 (6 months)**
- **Area: PyeongChang Olympic regions, etc.**
- **Budget : 5.2Bil.KRW ($4.8 million, US)**
- **Working scope**

  - 1st Pilot Coverage Expansion

  - Olympic & Paralympic Support

2018 PyeongChang Olympic & Paralympic

- **Games Period**
  - **Olympic : 9 - 25 February (17 days)**
  - **Paralympic : 9 – 18 March (10 days)**
- **Location**
  - **Pyeongchang / Gangneung / Jeongseon**

03

Reinforce 1st Pilot and interwork with commercial network

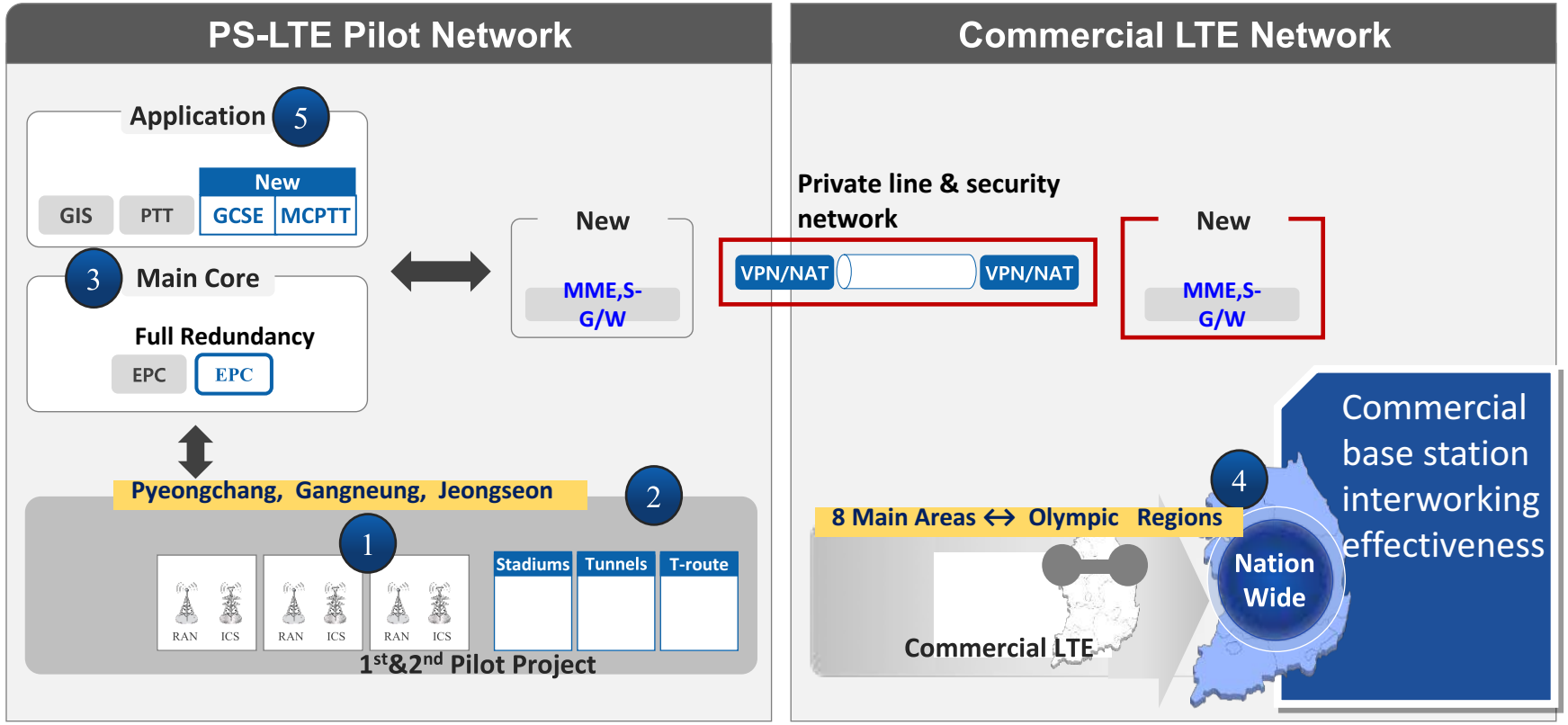
Successful Olympic & Paralympic support

Establish national consensus on disaster safety network project

Establishing the foundation for the nationwide project

Seamless service in Olympic area (Stadium. Main transport Route)	High quality commercial LTE interworking (Minimize shaded areas)	Build optimized Infrastructure (Operational system, terminal)	Advanced application services	2018 Successful Olympic support

1. Pilot Network Vulnerability Analysis
2. Coverage expansion in core areas
3. Full redundancy through multiplexing of main control equip.
4. Provide the highest quality commercial LTE network
5. Implement differentiated application services



1st Pilot Coverage Expansion (Oct. 2017 ~ Dec.)

Radio facilities Reinforcement

Additional Installations

	Pyeongchang	Gangneung	Jeongseon	Etc.	Total
RU	24	9	8	2	43
ICS	2	2	2	-	6
RF	3	3	-	-	6
Total	29	14	10	2	55

Key spots Quality Improvement

< RU Installed >
- Skating Stadium(I/O)

< RF Installed >
- Olympic Organizing Committee
- Gangwon Situation Room

Interworking with commercial networks in major transportation routes

- Using 'RAN Sharing' Technology

Olympic & Paralympic Support (Jan. 2018 ~ Mar.)

Supplied and re-arranged PS-LTE device to organizations → **Trained organizations in how to use PS-LTE system** → **Supported organizations to operate PS-LTE Communication System**

Organizations	devices
Total	**2496**
Gangwon(L.G.)	449
O.O.C.	274
National Rescue Service	544
Police	607
Coast Guard	424
Military	100
Electric	68
Gas	4
Medical	26

PTT Group System	
Main Group	Every organization
Sub Group	Each organization

Type of devices

Walky-Talky

Smart Phone

Communication System Support

- Run Field Operation Center and vehicle B.S., etc.
- Each organization used PS-LTE system to do their duties.

III. Future Plan

01

Phase 1 (’18)	Phase 2 (’19)	Phase 3 (’20)
Middle Area (5 Provinces)	**Southern Area (9 Provinces)**	**Seoul, GyeongGi & Incheon (Metropolitan cites)**
▪ 2 Operation Center Location Selection and Construction	▪ 2 Operation Center Core-Network Deployment	▪ 1,2 Operation Center inter – backup
▪ Fixed Based Station 3299 Sites Deployment	▪ Fixed Based Station 6936 Sites Deployment	▪ Fixed Based Station 4992 Sites Deployment
▪ Terminals 1000 units	▪ Terminals 37 000 Units	▪ Terminals 81 000 Units

02

Short term (~ 2020)	Mid term (~ 2022)	Long term (~ 2026)
Public Safety Network Completion	**Expansion (Military, Organization)**	**Expansion (Mobile Government)**
▪ Terrestrial Coverage ▪ Coastal ~ 20 km	▪ LTE-R/LTE-M Interworking ▪ Coastal ~ 100 km	▪ Expansion to Aeronautic Area
▪ LBS ▪ Device Remote Control	▪ IoT ▪ u-Health, ▪ Drone/UAV	▪ m-Workspace, ▪ Robotics, ▪ Wearable devices

THANK YOU

simddang@korea.kr

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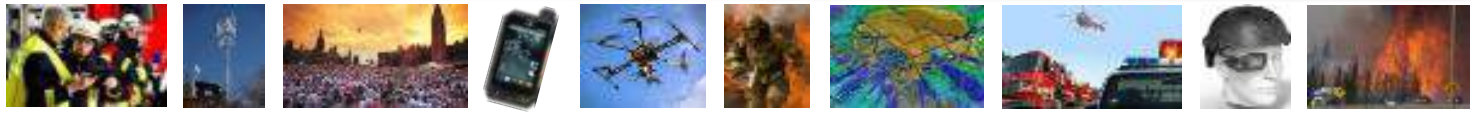
Canadian Safety and Security Program

Public Safety Broadband Activity in Canada



Joe Fournier

PSCR 2018 PS Broadband Stakeholder Meeting
San Diego, CA
June 05, 2018

DRDC | RDD

Canada

Public Safety Broadband Network (PSBN)

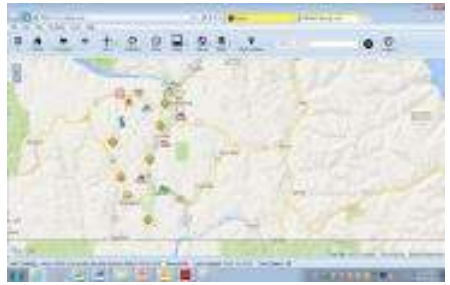
- A transformational national capability
- Canada very active since 2010
- Key tenets – Interoperability, affordability, sustainability, efficient use of spectrum, 24/7 availability
- Band 14 (758 to 768 MHz D/L, 788 to798 MHz D/L)









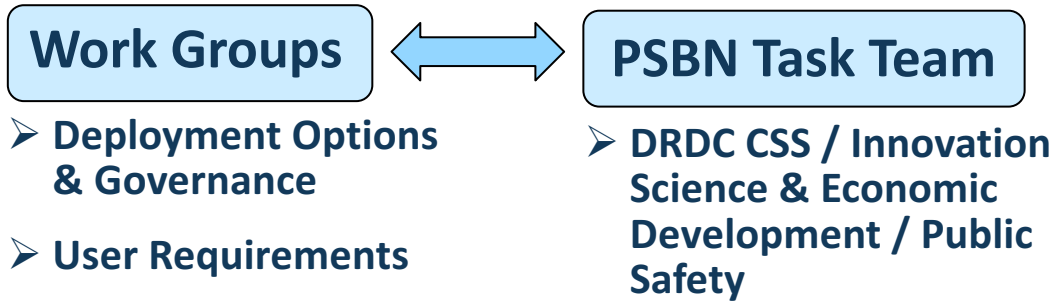



PSCR San Antonio – June 2017

- Federal / Provincial / Territorial governments and tri-services have been actively engaged on PSBN for many years now

May 2016 - "Ministers agreed on the creation of a public-private advisory group to inform the way forward on this important, yet complex initiative."

May 2017 - Public Safety Canada and Innovation, Science and Economic Development announce a commitment of $3 million in 2017-18 to engage diverse stakeholders and produce evidence-based analysis on implementation models for a potential Public Safety Broadband Network (PSBN).



Since we last met!

- Conducted 15 stakeholder engagement workshops throughout Canada on user requirements, deployment options and governance
- Innovation, Science and Economic Development (ISED) Decision Paper – June 2017

> ***D-1**: Spectrum in the band 758-763 MHz and 788-793 MHz (D Block) is designated for public safety broadband use.*
>
> ***D-2**: The spectrum in these bands will not be auctioned.*
>
> ***D-3**: Spectrum licences will be issued either directly to a single PSNE or multiple PSNEs, to be determined at a future date.*
>
> ***D-4**: Commercial use of unused capacity will be allowed provided that public safety users will have priority and pre-emptive rights over any form of commercial usage.*
>
> ***D-5**: ISED will not mandate specific technology, though any technology employed on the 700 MHz public safety broadband spectrum must ensure national and cross-border interoperability and ensure priority and pre-emption capability for public safety services and must be consistent with the interoperability solution "sharing standards-based systems."*

- ISED launched an RFI on PSBN and received many responses
- Centre for Security Science (CSS) worked on five technical reports on PSBN

User Requirements	Network Architecture	Interoperability	Security	Operability

Where has this all led?...

- On May 25 2018, Federal, Provincial and Territorial Ministers responsible for emergency management met to discuss joint Canadian priorities and progress

> *May 2018 - "To strengthen emergency preparedness communications in Canada, Ministers endorsed guiding considerations for the development of a potential Public Safety Broadband Network (PSBN) across the country. This secure high-speed wireless data communications network would support the work of first responders and public safety personnel in communicating with each other in emergency situations and during day-to-day operations. Acknowledging the benefits of a potential PSBN in Canada, Ministers also supported the establishment of a Temporary National Coordination Office in partnership with federal and provincial/territorial officials." **

* http://www.scics.ca/en/conference/meeting-of-federal-provincial-territorial-ministers-responsible-for-emergency-management-3/

PSBN – recent supporting initiatives

- Test and evaluation capabilities
- PSBN Pilots
  - Ottawa region PSBN pilot network
  - Calgary Police
  - Yukon / BC deployable LTE
  - Halton
- Experiments
  - Ottawa Fire Services
  - Hastings County EMS
  - CAUSE Resiliency
- Other Projects
  - Public safety broadband applications – University of Regina
  - Emerging wireless for public safety
  - In-building broadband wireless





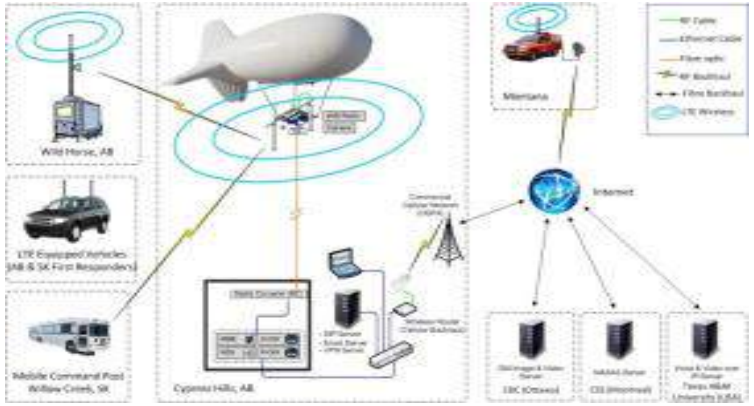






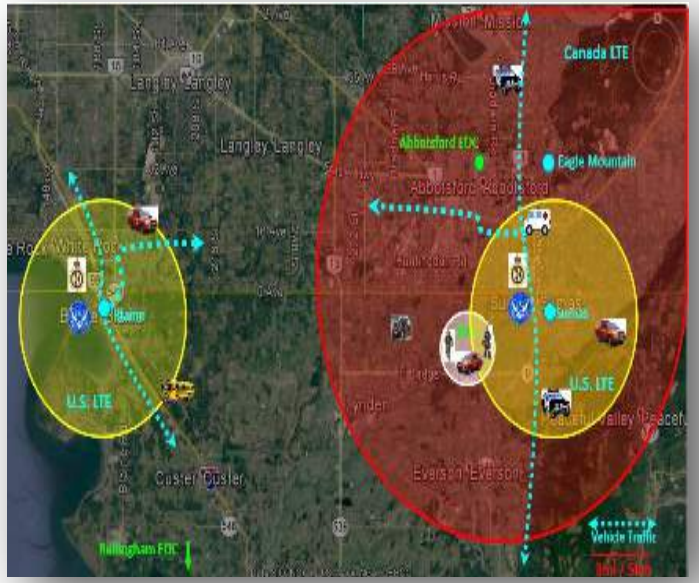
Canada-US Enhanced Resiliency Experiments

CAUSE III

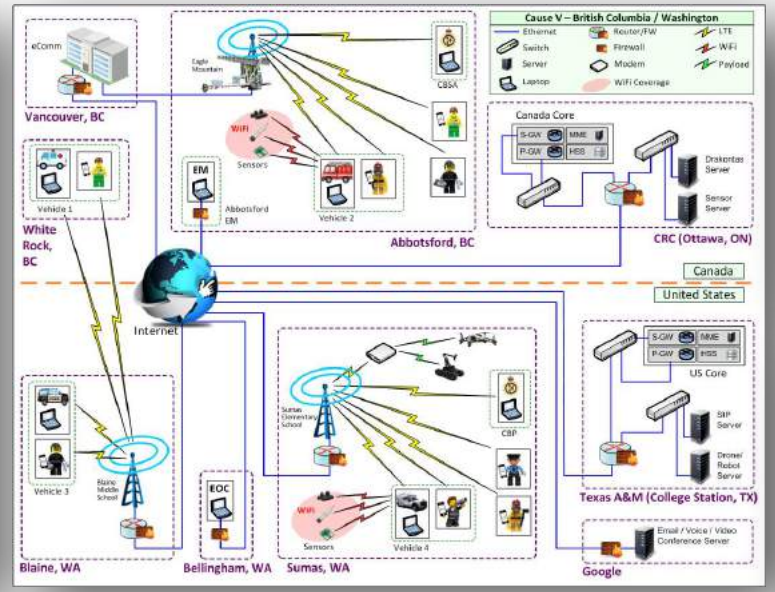


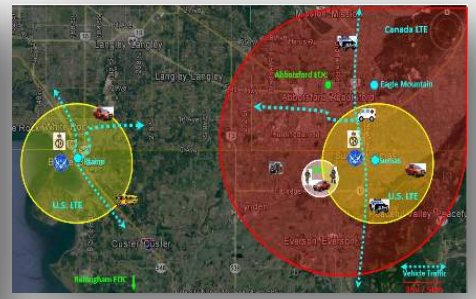
CAUSE IV

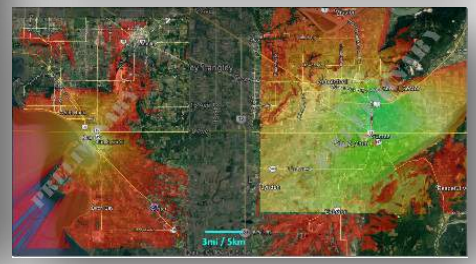
CAUSE V



CAUSE V

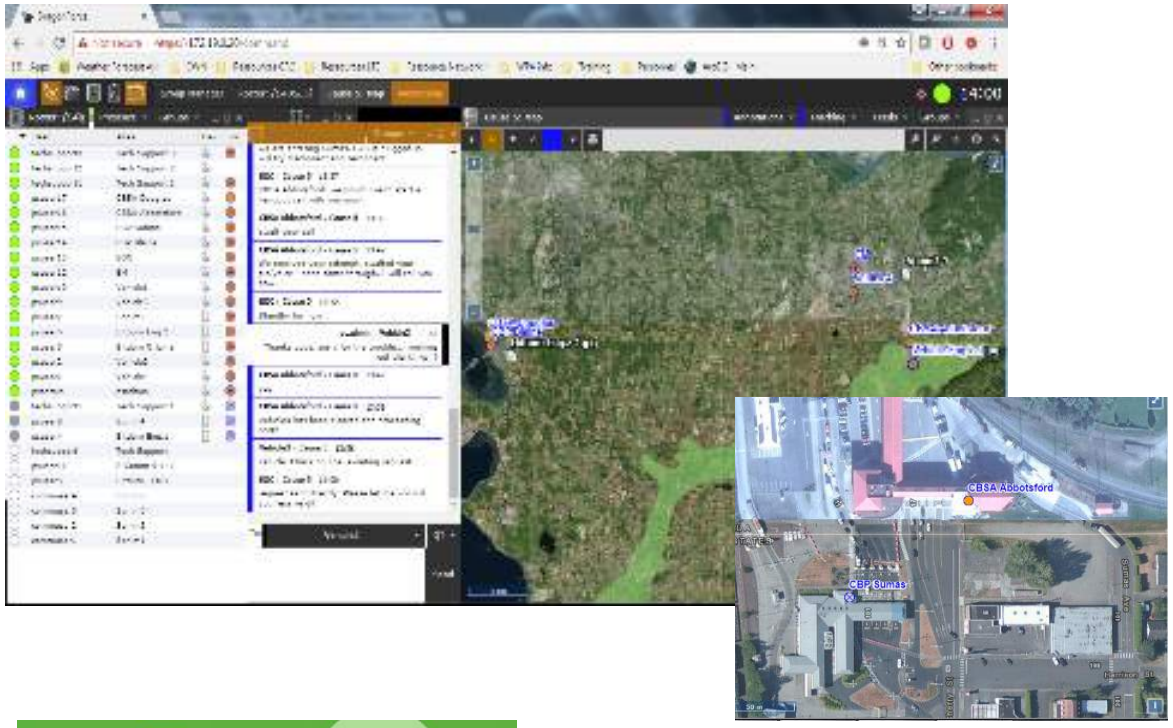


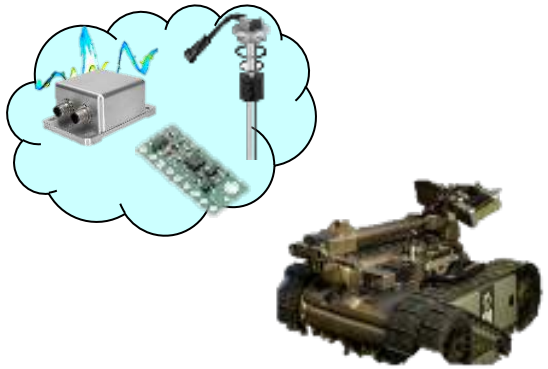




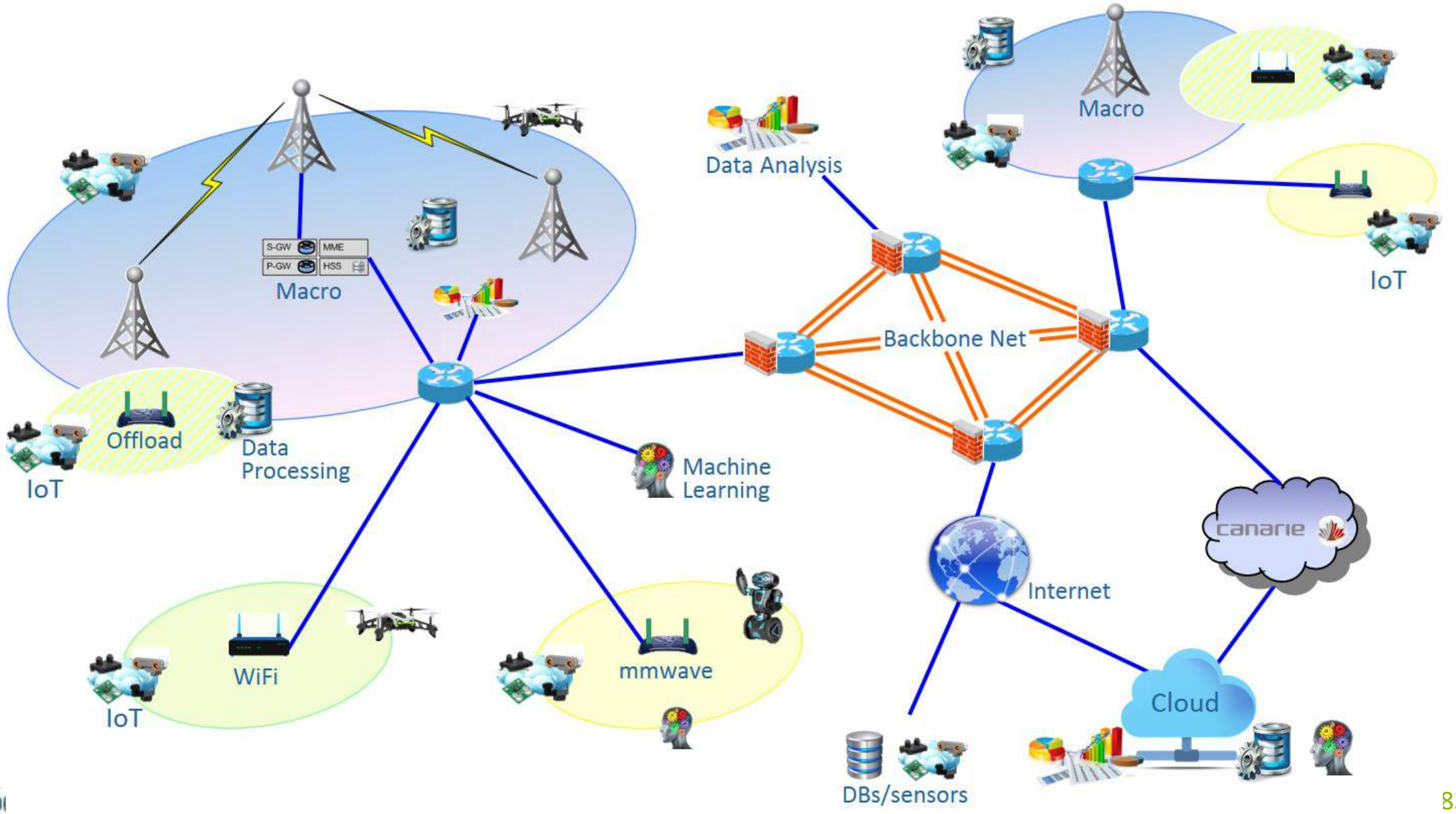
- November 2017
- Fraser Valley spanning British Columbia and Washington State
- Mount Baker eruption and ensuing lahar (anticipate, respond to and recover from)
- Key technology demonstrations - High volume traffic / many users / prioritization / pre-emption / session persistence / congestion-based session persistence / robots, drones and sensors

Some of the cool applications…





Communications Innovation Platform



So why are we doing this?

- S&T research
  - Heterogeneous networking
    - 3GPP to non-3GPP session persistence
    - Outdoor-indoor communications
  - Sensors, IoT and IoLST
    - Assess impact (loading, …) of IoT and IoLST , “smart” stuff
  - 5G and WiFi
    - Millimeter wave
    - PSBN offloading (3GPP to 3GPP)
    - Identify/address gaps specific to public safety communications needs
  - Data science
    - Analytics (trends/patterns ➔ prediction ➔ automation)
    - Processing (retrieval, storage, aggregation, fusion, manipulation, transformation)
    - Data mining, modeling, classification
    - Machine learning, cognition
- Test and evaluation capability
- Experimentation and demonstrations

Canadian Next Generation First Responder Initiative

PROTECTED · CONNECTED · AWARE

S&T contributions to evolving operator capability by:

- Studies/experiments
- Technical assessments
- Operational research
- Threat and hazard assessment

Priority on:

- Enhanced Preparedness
- Situational Awareness
- Advanced Operator Safety and Capability

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SCIENCE, TECHNOLOGIE ET SAVOIR POUR LA DÉFENSE ET LA SÉCURITÉ DU CANADA

Canada

CDMPS
CENTRE FOR DISASTER MANAGEMENT AND PUBLIC SAFETY

PSCR

THE UNIVERSITY OF MELBOURNE

Public Safety Mobile Broadband Stakeholders Meeting

Australian Public Safety Communications

An Overview

Geoff Spring Senior Industry Advisor
University of Melbourne

San Diego
June 2018

unimelb.edu.au/cdmps

UoMCDMPS

www.linkedin.com/company/cdmps

The Australian Context - Geography and Population

Australia

Population: 24.9 Million
Land Mass: 7.7 Million square kilometres

UK

Canada

Population: 36.9 Million
Land Mass: 9.1 Million square kilometres

USA

USA Population: 326.4 Million
USA Land Mass: 9.8 Million square kilometres

Population: 66.6 Million
Land Mass: 209,331 square kilometres

Europe

Population: 742.6 Million
Land Mass: 10.2 Million square kilometres

Australia – Public Safety Communications

Waiting for the Australian Government to release a Tender for the national NG Triple Zero Service.

The Australian Government is yet to consider a 2015 House of Representatives Standing Committee recommendation that *mission critical public safety communications be recognised as critical infrastructure.*

Legislation relating to the Telecommunications Sector Security Reform (TSSR) and Security of Critical Infrastructure Bill 2017 have past through the Australian Parliament which will have ramifications for PSMB.

The Australian Government announcement in November 2017 that a Request For Information (RFI) for a PSMB capability would be released to gather information to provide advice on the way forward to the Council of Australian Governments (COAG) in February 2018.

PSMB Request For Information - What Do We Now Know?

- The "public" RFI was released through the New South Wales Telco Authority on behalf of the Federal and State Governments on 27 November 2018 and closed 10 January 2018
- The RFI advised that Australia's PSMB capability is to be provided based on:
  - A Federated Model i.e. the States and Territories can chose their time to provide this capability
  - The use of a commercial mobile network operator as per the recommendation to Government by the Australian Productivity Commission
  - The potential for a pilot network
- Australia has three commercial mobile network operators with a fourth about to be launched
  - Telstra; Optus; Vodaphone and TPG
- The Council of Australian Governments meeting was scheduled for 9 February 2018 – however it is understood that advice on the PSMB RFI outcomes was not provided.
- No further advice has been released about the outcomes from the RFI

PSMB Request For Information - What Do We Now Know?

- The University of Melbourne CDMPS and Australian TETRA Critical Communications Forum (ATCCF) both provided responses to the PSMB RFI
- The University of Melbourne CDMPS response has been used in submissions to the Australian Government's Joint Parliamentary Committee for Intelligence and Security Inquires(*) into:
  - The Security of Critical Infrastructure Bill 2017
  - Machinery of Government arrangements associated with the new Department of Home Affairs
- The preparation of the PSMB RFI and the RFI process was undertaken by a Functional Working Group drawn from across Federal and State Government bureaucracies i.e. the members of this Group all had their own jobs to continue to perform because there has been no dedicated resources or budget allocated for the PSMB
- In the same time period Norway released a PSMB RFI and the outcomes have been published (**)
- New Zealand has also released a Concept Brief and Indicative Architecture for its Next Generation Critical Communications Program (***)

(*) https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Intelligence_and_Security/CriticalInfrastructure/Submissions

(**) http://www.nodnett.no/Documents/NGN/20180503%20Conceptual%20models%20for%20NGN%20v1.0.pdf

(***) http://www.police.govt.nz/about-us/programmes-and-initiatives/next-generation-critical-communications-ngcc?nondesktop

Mission Critical Public Safety Communications Ecosystem

PSMB - Critical Infrastructure and *National Security*

- **Critical Infrastructure Centre**(1)

On 23 January 2017, the Australian Government launched the Critical Infrastructure Centre(2). The Centre works across all levels of government and with critical infrastructure owners and operators to identify and manage the *national security* risks of espionage, sabotage and coercion in critical infrastructure.

The Centre will have an initial focus on the *national security* risks to four high-risk sectors: Electricity, Water, Ports and Telecommunications.

- **Department of Home Affairs - (The new *national* home of public safety communications)**

Australia has created a new Home Affairs Department responsible for a "federation of border and security agencies":

- **Australian Security Intelligence Organisation**
- **Australian Federal Police**
- **Australian Border Force**
- **Australian Criminal Intelligence Commission**
- **Australian Transaction Reports and Analysis Centre**
- **Office of Transport Authority**

(1) https://www.ag.gov.au/NationalSecurity/InfrastructureResilience/Pages/default.aspx
(2) http://www.criticalcomms.com.au/content/public-safety/article/putting-the-critical-in-mission-critical-208626779#axzz4vttkv6Wq

Mission Critical Public Safety Communications Echo System

What is critical infrastructure?

"Those physical facilities, supply chains, information technologies and communication networks, which if destroyed, degraded or rendered unavailable for an extended period, would significantly impact on the social or economic wellbeing of the nation, or affect Australia's ability to conduct national defence and ensure national security*. Ref: Trusted Information Sharing Network (TISN) (www.tisn.gov.au)"*

"Critical infrastructure underpins the functioning of Australia's society and economy and is integral to the prosperity of the nation. It enables the provision of essential services such as food, water, health, energy, communications, transportation and banking." ***Ref: Explanatory Document to the Security of Critical Infrastructure Bill 2017***

23 January 2017 - The Australian Critical Infrastructure Centre identified Australia's most critical infrastructure as Electricity, Water, Gas, Ports and Communications

Communications - The Australian telecommunications systems and networks are *part of our national critical infrastructure* and form the backbone for many other critical infrastructure sectors and services. ***Ref: Explanatory Document to the Security of Critical Infrastructure Bill 2017***

18 September 2017 - Telecommunications Sector Security Reforms (TSSR) legislation introduces obligations on carriers and carriage service providers to *do their best* to protect networks and facilities from unauthorised access and interference.

Mission Critical Public Safety Communications Ecosystem

New Cyber Security Legislation - The Cyber Security Posture of the Australian Economy(*)

Three new regulatory forces:

1. Notifiable Data Breach – Security of peoples' data

- Came into operation in February 2018
- Encourage organisations to understand the personally identifiable information they have
- Understand the impact that unauthorised disclosure of this information could have on people
- Make informed decisions about how to protect this data

2. The Security of Infrastructure Bill – Technology that supports our lives

- Recently passed by the Australian Parliament
- Identifies "critical infrastructure" organisations – electricity, water, gas, ports and telecommunications
- Requires "critical infrastructure" organisations to have a clear and current view of their assets and who can control them – financially and electronically
- Accurately forecast interactions between the physical and cyber domains; maturity in asset management; provide deep insight into the supply chain
- Telecommunications is considered so complex it is addressed by separate legislation – Telecommunications Sector Security Reform (TSSR) Legislation comes into operation in September 2018

3. Prudential Standards – Processes and governance that supports our wealth

- Boards are ultimately responsible for ensuring the security of its information assets
- Commensurate with the size and extent of the threats to these assets
- Enables the continued sound operation of the entity

Expect cross organisation and cross industry comparisons to occur so collaboration will be critical

(*) The Australian Financial Review 8 May 2018 Cyber Risk by James Turner

Strategic Opportunities for Government

The CDMPS has identified the following "Opportunities" for the Australian Government:

- **The Government should consider the recommendation of the House of Representatives Standing Committee on Infrastructure, Transportation and Cities in 2016 that *mission critical public safety communications be considered as critical infrastructure.***

- **Provide a secure safe working environment for Australia's First Responders as they attempt to keep all Australians safe from harm by effectively and efficiently sharing intelligence generated through use of the PSMB capability and the mission critical public safety communications ecosystem more generally.**

- **Leverage the recognition of mission critical public safety communications as *critical infrastructure* to formally involve Infrastructure Australia and the Infrastructure and Project Financing Agency to manage the introduction of private sector involvement and investment in the public safety market and the evolution of the mission critical public safety communications ecosystem.**

- **Formally constitute a national co-ordination body to provide collaborative leadership, strategic oversight and policy direction to the evolution of the mission critical public safety communications ecosystem.**

Strategic Opportunities for Government

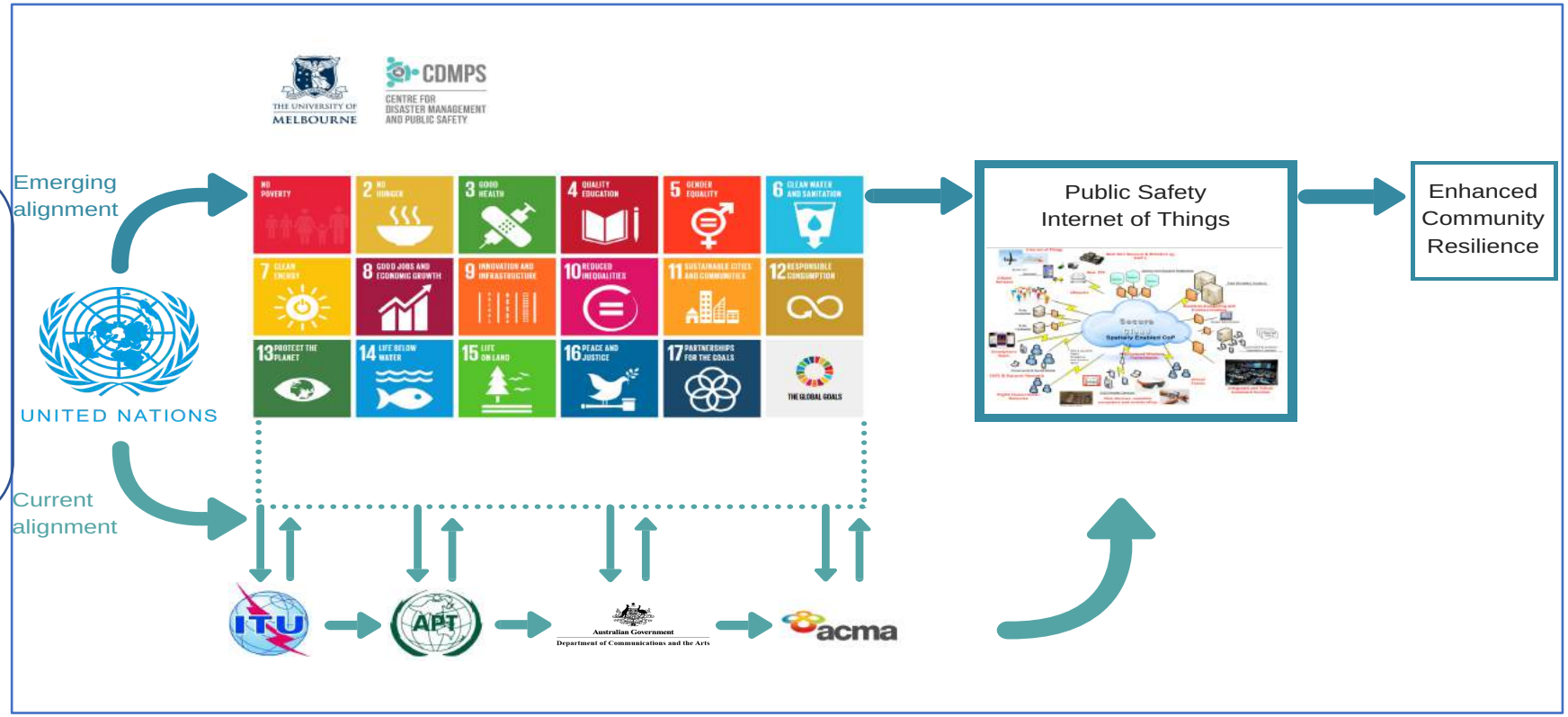
- **Provide increased transparency and clarity about the governance, strategic direction and underlying processes to support the evolution of the mission critical public safety communications ecosystem.**
- **Establish a trusted relationship between the public safety community, governments, industry and academia to address the impact of public expectations, and technological change in conjunction with the opportunity for organisational and cultural change that a PSMB capability will present.**
- **Establish a research capability leveraging international experience to support Australia's PSAs and First Responders in using the PSMB capability to facilitate innovation in enhanced decision making, personal protection, productivity, and public safety outcomes.**
- **Encourage the public safety community to develop specific public safety "Apps" for use in conjunction with the PSMB capability.**

United Nations Sustainable Development Goals:

How will they influence critical communications?

The movement of mission critical public safety communications into mainstream ICT through PSMB Projects and Next Generation Emergency Call Services will enable the investigation of the relationship between these new capabilities and the United Nations Sustainability Goals (SDGs). http://www.un.org/sustainabledevelopment/

The University of Melbourne CDMPS has commenced research into this relationship.



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Enhancing Resilience in a Changing Landscape

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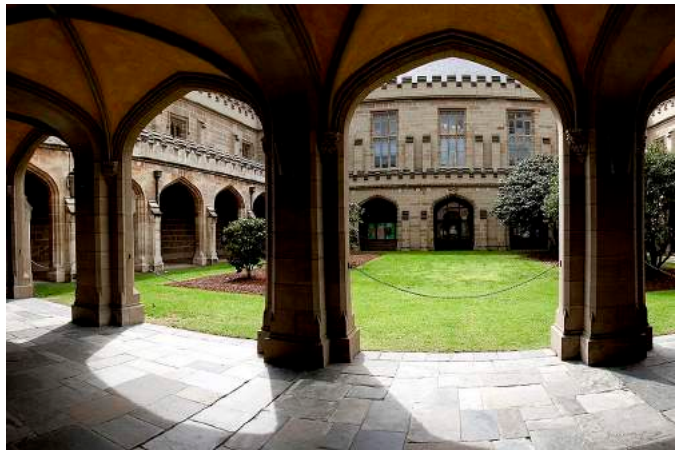
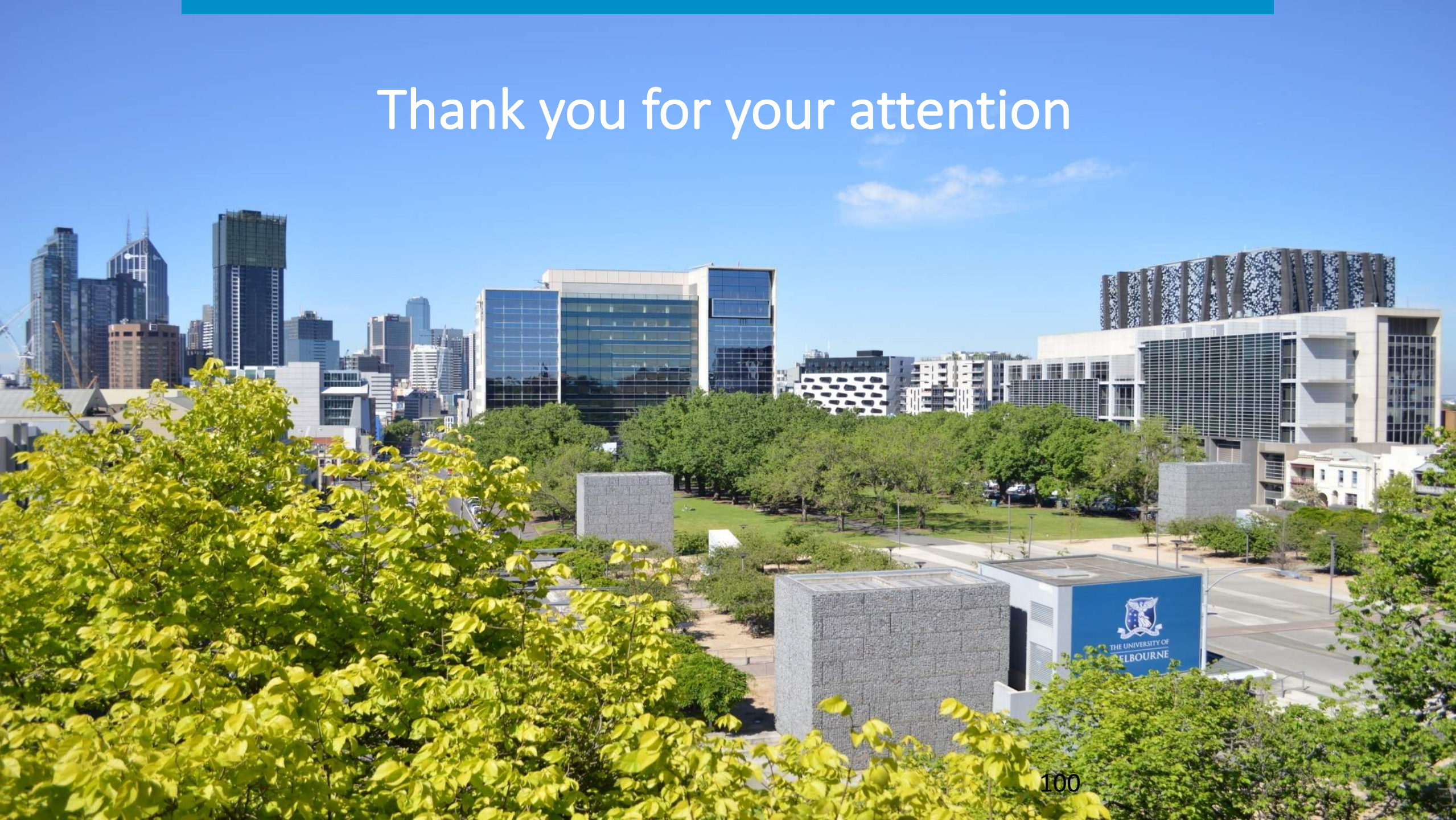


Key Themes

- Smart cities and sustainable development
- Disaster resilience and emerging or changing global risks, including climate adaptation
- Resilience and resilience impact of land and geospatial information for disaster risk management
- Spatial (3D/nD), BIM and emerging technologies in advancing the Sustainable Development Goals (SDGs)
- Planning, design and management of critical infrastructures
- New generation public safety technologies and platforms
- Community resilience and participatory governance

Thank you for your attention



Federal Agency
for Public Safety
Digital Radio

Public Safety Digital Radio - Status of the German Network

Federal Agency for
Public Safety Digital Radio (BDBOS)
Barbara Held, Head of Directorate Operations
San Diego, June 05, 2018

Background

The German TETRA Network for Public Safety Key Milestones 1/2

2004/03	Agreement between the Federal Government and the Federal States on common procurement and financing for digital radio: **'One network for all Public Safety organizations'**
2006/09	BDBOS Act enters into force
2007/04	The Federal Agency BDBOS is established
2007/09	Procurement for network operation started
2007/08	Set-up of the reference network (launch)
End of 2008	Roll-out started

Federal Agency for Public Safety Digital Radio

The German TETRA Network for Public Safety Key Milestones 2/2

2010/03	Conclusion of contract with network operator
2013/05	Core Network completed and in operation
2016/06	Roll-out completed
2016/12	BDBOS Advisory Board decides for mid-term upgrade
2018/04	more than 4600 base stations provide radio coverage for 99 % of the territory of Germany; 793 000 subscribers

Federal Agency for Public Safety Digital Radio

Status

Operations in Number

April 2018

Tetra Base Stations (TBS)	4608
Subscribers	793 000
Radio Messages per month	up to 50 millions
Net Availability	99.97 %

Federal Agency
for Public Safety
Digital Radio

Subscriber Distribution

Status as of April 2018:

Police	258 000
Non-police (fire fighters, ambulances etc.)	508 000
Others (e.g. Federal Customs Dep.)	27 000
TOTAL	**793 000**

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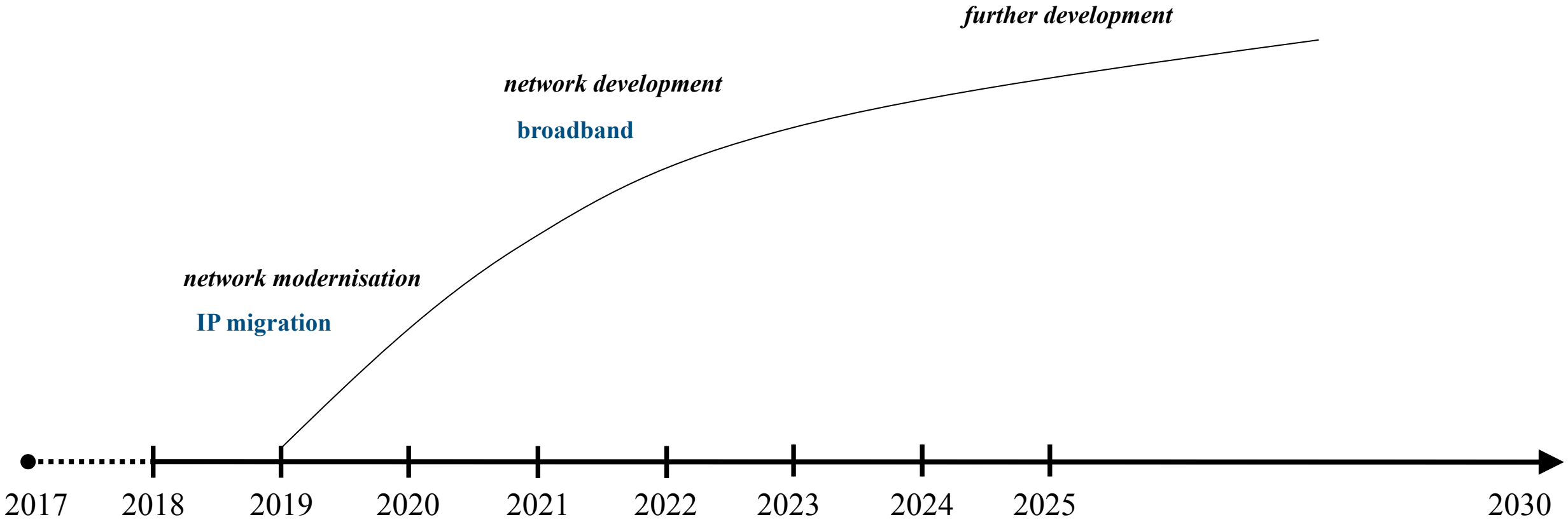
The way forwards

Roadmap



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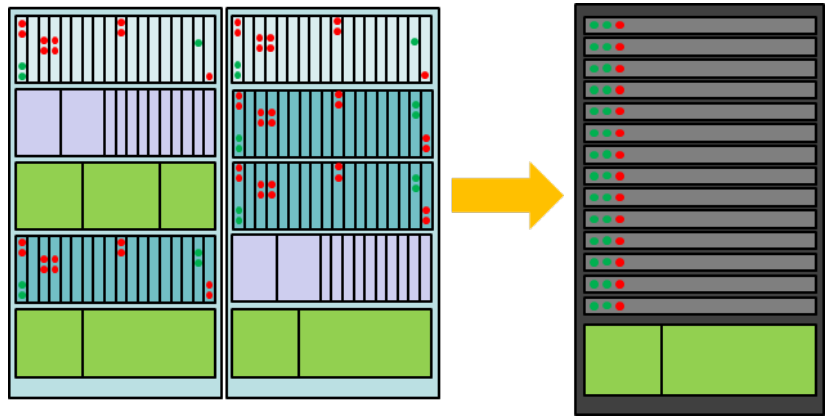
IP Capable TETRA Components

- Core Network: Replacement of existing TETRA switching centres
  - Server based virtual solution using IP
  - Higher sustainability / hardware flexibility
  - Reduction of number of switching sites
  - Access points remain unchanged
  - Investment protection
  - Less effort to ensure reliability
  - Ensuring availability level during IP migration / Maintaining the security level



- Access Network: Upgrade of TETRA base stations to support IP

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International Activities

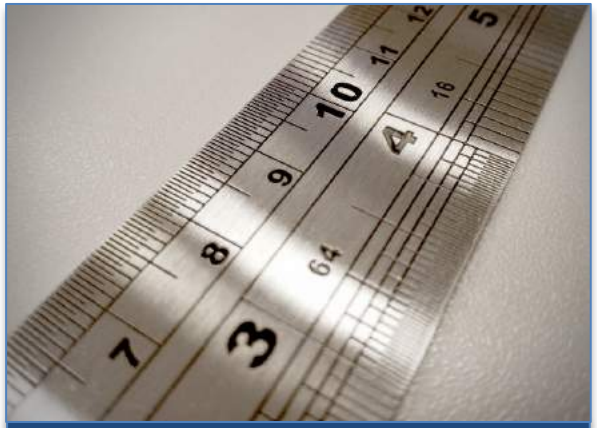
BDBOS International Activities

- TCCA Board member and chair of OUA working group
- ETSI membership
- Active participation in LTE/5G-standardisation at 3GPP
- Exchange with PPDR network operators worldwide
  - TETRA experiences, e.g. handling of large scale events
  - Steps towards broadband services for PPDR
- Co-Signer of the transatlantic declaration* for the international Public-Safety Community

* https://www.bdbos.bund.de/SharedDocs/Downloads/DE/Meldungen/171023_declaration.html?nn=8285366

Federal Agency for Public Safety Digital Radio

About us



We support open and standardised mobile critical communications technologies and complementary applications.

3GPP Market Representation Partner.

Catalysing competitive multivendor markets worldwide through open standards.

Our members include end users, operators, industry and other stakeholders globally sharing knowledge and experience.

Collaborative working across the critical communications ecosystem to develop and drive the most effective solutions for all.

Critical communications for all professional users

Events: *The Critical Communications Series*

2019 in Bangkok

http://www.critical-communications-world.com

Critical communications for all professional users

Thank you for your attention!

Contact

BDBOS
Federal Agency for Public Safety Digital Radio

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PC-Fax: +49 (0)30 18-681-45880
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Website: www.bdbos.bund.de

Pictures: BDBOS/Wilke, Feuerwehr Berlin

Federal Agency for Public Safety Digital Radio

The Public Safety Technology Alliance

Helping Public Safety Readily Leverage the Internet of Life Saving Things (IoLST) through Open Standards

ABOUT PSTA

PSTA Mission

- Foster and promote, open, best-in-class, standards-based technology for the public safety user community.
- Accelerate the conformance of open and standards compliant technology that will offer public safety a safe, secure and interoperable framework for the next generation of communications tools.
- Guide the implementation and testing of technical specifications requirements for applications, handsets, connected devices, and cloud applications and storage that will be used by the first responder community.

ABOUT PSTA

PSTA Vision

- Drive industry standards and compliance for both hardware and software for the public safety user community by collectively identifying and selecting best in class standards.
- Identify common specifications requirements for applications, handsets, connected devices, and cloud applications and storage that will be used by the first responder user community.
- Maintain open-standards based APIs and open application frameworks, and focus on security with standards - compliant single sign-on initiatives.

THE VALUE OF PSTA

- Empower public safety professionals through selection of best in class standards and open standard API's
- Facilitate and improve emergency response
- Promote and enhance first responder and community safety
- Foster industry collaboration while providing a broad platform enabling maximum stakeholder participation
- Promote innovation of new technologies and solutions
- Create economies of scale
- Facilitate simpler leveraging of open standards for public safety
- Leverage and grow the evolving IoLST

GOVERNANCE STRUCTURE

Board of Directors

- 9 members - 5 from public safety and 4 from industry
- Governance and oversight of operations of PSTA

Executive Advisory Council

- 21 members, majority from public safety, headed by an elected Chair
- Provides advice, insight and recommendations to the Board of Directors

COMMITTEE STRUCTURE

- **Technical Committee**
  - **Recommended standards adoption, to include among other topics**
    - Single Sign-On/Security
    - MCPTT
    - Video
    - Common Application Framework/ UI/UX
    - Interoperability
    - Alliance Liaison
    - Test and PSTA Certification
    - NG911

- **Marketing and Certification Committee**
  - PSTA messaging
  - Tradeshow and plugfest/hackathon sponsorships and activities
  - Marketing related alliance activities
  - Overall liaison relationships with other industry standard bodies and associations
  - Standards and process for PSTA certification

- **Membership Committee**
  - Drive membership activity through awareness campaigns
  - Support direct and indirect membership activities
  - Work with Marketing Committee on strategies to drive membership participation

KEY TECHNICAL INITIATIVES

Technical Initiative	Summary
Single Sign-On	Group committed to defining/recommending a best-in-class SSO platform based on a well defined architecture that is standards-compliant technology with elements and network modules/solutions that are combined to provided a recommended platform for public safety.
MCPTT/MCVideo/MCData	Group dedicated to providing a recommended set of criteria and test plan that fosters and encourages the delivery of standards-compliant MCPTT/MCVideo platforms based on the 3GPP standard. This includes the support and management of plugtests, liaison work with other groups, and ability to publish and certify the test criteria with features that are inline with the needs of public safety users.
Common Application Framework	This group will define a common application framework with proposed minimum set of UI/UX criteria for public safety users. This group will work closely with the SSO group in defining and recommending the necessary application attributes required for integration with SSO. The group will showcase this common framework by demonstrating and certifying applications that can adhere to the SSO and CAF.
LMR/PMR Interoperability	Group committed in working on/with other standards groups on defining and recommending a common solution/framework for LMR/PMR integration with LTE broadband. This group will work closely with both the MCPTT and SSO groups to make sure there is a cohesive set of recommendations along with the ability to validate/certify the overall solution.
Cybersecurity	This group will focus on delivering best-practice cybersecurity recommendations as well as test/validate against defined use cases. A pass/fail validation test plan along industry standard metrics will be utilized to make sure public safety has the best information possible when tackling cybersecurity threats.
Records Management Systems	Group will define and publish recommendations on common RMS/CAD data constructs to help with system and platform integration as well as a defined schema that can be utilized for sharing information in a more standards compliant format.
NG911/PSAP/ESINet Integration	Working group will help define a recommendation around NG911/PSAP integration with public safety broadband. This group will work closely with the LBS, RMS, and MCPTT working groups in creating a unique set of criteria for public safety. The group will also work closely with other industry groups associated with ESINet standards and other unique association liaison opportunities.
Indoor Location/LBS	This group will help pull together the test plan and define the test criteria for indoor location based technology. They will work closely with other technical working groups to help define a recommended solution for public safety as well as provide a test bed and test cases that can be measured against a common set of test criteria.

Driving common adoption of open standards and compliance for the public safety user community

www.pstalliance.org

PSCR MISSION CRITICAL VOICE

Mission Critical Voice (MCV) Overview

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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, all information and data presented is preliminary/in-progress and subject to change.

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Overview

- What is the MCV Portfolio?
- MCV Portfolio Strategy
- NIST Projects
- Current Federal Funding Opportunities (FFOs)
- New FFO – MCV Quality of Experience

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What is the MCV Portfolio?

- MCV Definition
  - Mission Critical Push-to-Talk (MCPTT)
  - Direct Mode
  - Efficient Group Communications
- Encompasses All PSCR MCV Activities

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What is the MCV Portfolio?

- Internal NIST Capabilities
  - Public Safety Communications Research Division (Boulder)
    - Measurement Development
  - Wireless Networks Division (Gaithersburg)
    - Modeling and Simulation
- External Capabilities
  - Grant Awardees – Public Safety, Academia, and Industry
  - Prizes & Challenges (Future)

MCV Portfolio Strategy

- Mission Critical Push-to-Talk (MCPTT)
- LMR to LTE
- Direct Mode
- Quality of Experience (QoE)

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MCV Portfolio Strategy

- Middle Class Taxpayer Relief Act and Job Creation Act of 2012
  - (b) REQUIRED ACTIVITIES.—In carrying out the requirement under subsection (a), the Director of NIST … shall—
    - (2) accelerate the development of the capability for communications between currently deployed public safety narrowband systems and the nationwide public safety broadband network;
    - (4) accelerate the development of mission critical voice, including device-to-device "talkaround" capability over broadband networks, public safety prioritization, authentication capabilities, and standard application programing interfaces for the nationwide public safety broadband network, if necessary and practical;
    - (5) accelerate the development of communications technology and equipment that can facilitate the eventual migration of public safety narrowband communications to the nationwide public safety broadband network; and (6) convene working groups of relevant government and commercial parties to achieve the requirements in paragraphs (1) through (5).

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MCV Portfolio Strategy - MCPTT

- NIST Programs
  - MCV Quality of Experience Key Performance Indicators
    - Compare LMR to LTE
      - On Network and Direct Mode
    - Internal PSCR Division Projects
    - Develop User-Referenced Measurements
    - Technology/System Agnostic (Where Possible)
  - MCPTT Modeling and Simulation
    - On and Off Network Performance of LTE MCPTT
      - NIST Wireless Networks Division
  - 3GPP MCPTT Standards
    - Test Cases

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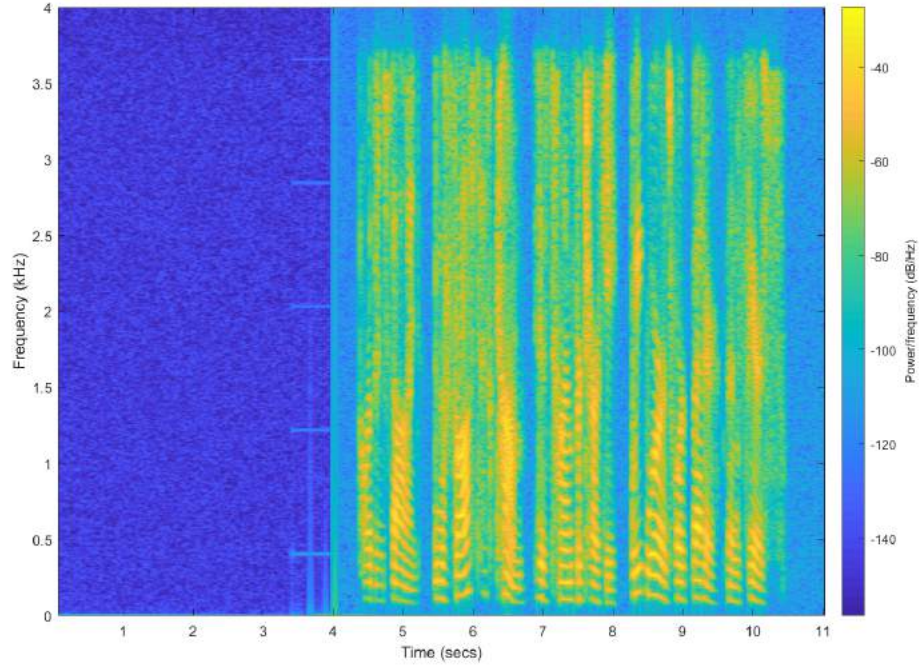
MCV Portfolio Strategy - MCPTT

- Federal Funding Opportunities
  - Prototyping and Development Platforms
    - Direct Mode and MCPTT
  - Quality of Service, Priority, and Preemption
  - Propagation
    - New Frequency Bands
  - Microwave Frequency Implementation
  - New MCV QoE Federal Funding Opportunity (FFO)



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MCV Portfolio Strategy – LMR to LTE

- Emerging Focus Area
- Focus on Mechanisms and Capabilities Existing LMR Systems to 3GPP Standard Interfaces
  - Standards Based
  - Open Source
  - Affordable for Public Safety

MCV Portfolio Strategy – Direct Mode

- NIST Programs
  - LTE Out-of-Band Modeling and Simulation
    - Wireless Networks Division
- Federal Funding Opportunities
  - Prototyping and Development Systems
  - Propagation
  - ProSe Performance

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MCV Portfolio Strategy – QoE

- Focus on Impact to Users
  - Communication System Impairments
    - Access/Retention Probability
    - End-to End-Access Time
    - Mouth-to-Ear Latency
    - Audio Quality/Intelligibility
  - Realistic Operational Environments
- Develop Quantities That Describe Overall Experience
  - Job Performance
- MCV QoE FFO

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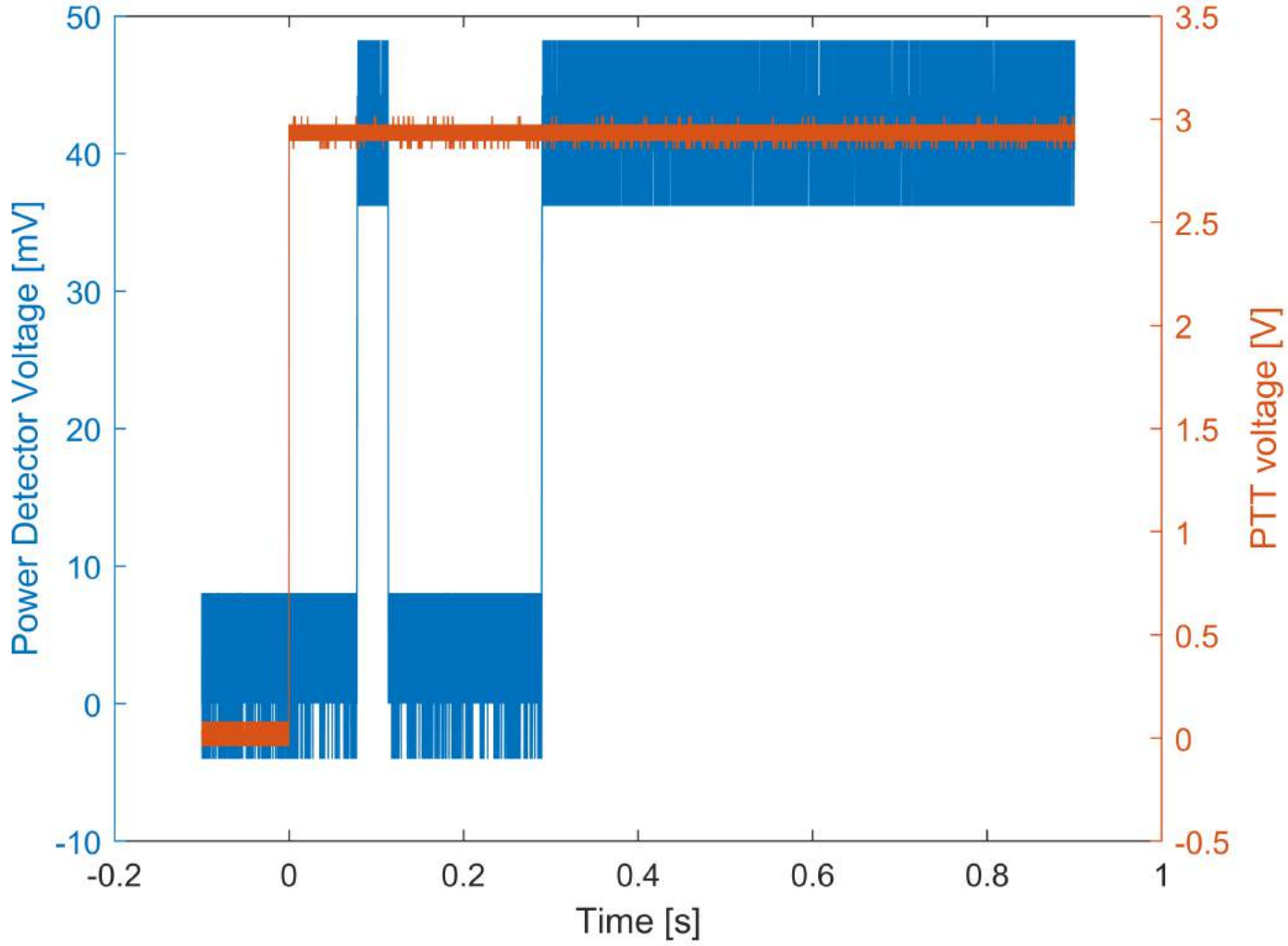
NIST Projects – MCPTT QoE KPIs

- Strategy Area: MCPTT, Direct Mode, and Group Communications
- Session Time: Wednesday, 2:00 PM



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NIST Projects – QoS, Priority, Preemptions (QPP)

- Strategy Area: MCPTT
- Session Time: Thursday, 9:30 AM

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NIST Projects – Off-Network MCPTT

- Strategy Area: MCPTT, Direct Mode
- Session Time: Thursday, 2:00 PM

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FFOs – 2017 PSIAP Award Recipients

- 9 Grants and Cooperative Agreements in the area of Mission Critical Voice

VENCORE LABS

UNIVERSIDAD DEL PAIS VASCO/ EUSKAL HERRIKO UNIBERTSITATEA

NEW YORK UNIVERSITY

UNIVERSITY OF WASHINGTON

sonim BUILT FOR LIFE™

UNIVERSITY OF SOUTHERN CALIFORNIA

SOFTWARE RADIO SYSTEMS

HARRIS®

GEORGE WASHINGTON UNIVERSITY

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FFOs – Coverage Capacity and Resilience Enhancement in Limited Public Safety Networks

- Strategy Area: MCPTT, Direct Mode
- Session Time: Wednesday, 9:30 AM
- Awardee: George Washington University

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FFOs – Device-to-Device System for Public Safety

- Strategy Area: Direct Mode
- Session Time: Thursday, 11:30 AM
- Awardee: Vencore Labs

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FFOs – Modeling, Simulation, and Performance

- Strategy Area: MCPTT
- Session Time: Wednesday, 11:30 AM
- Awardee: The University of Washington

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FFO - End-to-End Research Platform for Public Safety Millimeter Wave

- Strategy Area: MCPTT
- Session Time: Wednesday, 3:00 PM
- Awardee: New York University

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FFOs – OpenFirst

- Strategy Area: MCPTT, Direct Mode
- Session Time: Thursday, 8:30 AM
- Awardee: Software Radio Systems

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FFOs – Propagation Channel Models & System

- Strategy Area: Direct Mode
- Session Time: Thursday, 10:30 AM
- Awardee: The University of Southern California (USC)

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FFOs – Proximity Services

- Strategy Area: Direct Mode
- Session Time: Wednesday, 10:30 AM
- Awardee: Harris

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FFOs – End-to-End MCPTT

- Strategy Area: MCPTT
- Session Time: Wednesday, 8:30 AM
- Awardee: Sonim

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FFOs – Modeling, Simulation, and Performance

- Strategy Area: MCPTT
- Session Time: Thursday, 3:00 PM
- Awardee: Universidad del Pais Vasco

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New FFO – MCV Quality of Experience

- Purpose
  - Measure Impact of Impairments to MCV Systems and Quantify QoE for First Responders
- General Idea
  - First Responders Use LMR Systems Everywhere
    - Have been doing so for a very long time
  - LMR System Impairments and Job Performance
    - How do they relate?
  - Test Users' Performance in Realistic Environments
    - Reduce Impact of Perception on Results

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New FFO – MCV Quality of Experience

- Goal #1: LMR Simulation Tools
  - Communications Device(s) that Look/Behave Like LMR Radios
  - Key Performance Indicators (Minimum)
    - Mouth-to-Ear Latency
    - Access Time (End-to-End)
    - Link Establishment and Retention
    - Speech Intelligibility and Background Audio Quality
      - Analog FM and APCO 25 AMBE+2 Vocoder
  - Able to Adjust KPIs While Measuring QoE Variables
    - Adjust Individually and Together

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New FFO – MCV Quality of Experience

- Goal #2: Development of Test Facilities, Scenarios, and Protocols
  - Facilities Mimic Real-Life Environments
  - Must be Developed with Experience/Expertise of Public Safety Practitioners
  - Applicable to Diverse Group of Users
    - Geography and Job Function
  - Protocols
    - Quantify Task Success, Efficiency, and Other Attributes of User Experience

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New FFO – MCV Quality of Experience

- Goal #3: Development of Public Safety Testing Cadre
  - Full-Time Practitioners
    - Not Leadership Staff, Part-Time, Retirees
  - Representation from Major First Responder Job Groups
    - EMS, Fire, Police
  - Possible Diversity from Specialties and Support Functions
    - Police Tactical
    - Explosive Ordinance Disposal
    - Hazardous Material Handling
    - Dispatch
  - Geographic Representation
    - Urban, Suburban, Rural

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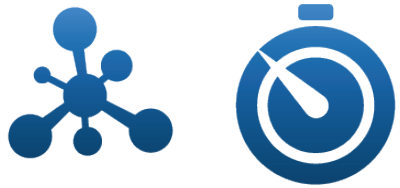
New FFO – MCV Quality of Experience

- Goal #4: Test and Measurement of Public Safety User Performance
  - Scientific and Repeatable
  - Baseline Performance of System Known
    - Defined Uncertainties
  - Raw Data and Results Publicly Released



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New FFO – MCV Quality of Experience

- Goal #5: Analysis and Modeling of Public Safety User QoE
  - Develop Mathematical/Functional Models
    - Describe Public Safety User QoE
    - Relationships Between Independent Variables and Dependent Variables
      - Independent – KPIs
      - Dependent – Performance Measures
  - Generalized Models

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New FFO – MCV Quality of Experience

- Dates
  - 23 MAY – Posted
  - 19 JUN - Webinar
  - 03 AUG – Application Closing Date
- Grants.gov
  - Funding Opportunity Number: 2018-NIST-PSIAP-MCVQOE
- Points of Contact
  - Program/Technical Questions: pscr@nist.gov (‘MCVQoE’ in subject)
  - Grants.gov Submissions: grants@nist.gov
  - Grant Rules/Regs: scott.mcnichol@nist.gov

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SPRINGS
5