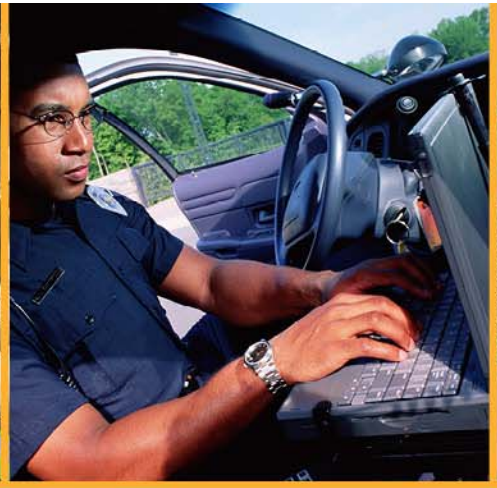




NPSTC

Drones and Broadband Data for the PSAP
The Role of Robotics and Artificial Intelligence

Barry H. Luke, Deputy Executive Director

Thursday, April 13, 2017

APCO Western Regional Conference
Ontario, California

The member organizations of the National Public Safety Telecommunications Council are grateful to the Department of Homeland Security's Science and Technology Directorate, Office for Interoperability and Compatibility (OIC) and the National Protection and Programs Directorate, Office of Emergency Communications (OEC) Points of view or opinions expressed are those of the originators and do not necessarily represent the official position or policies of the U.S. Department of Homeland Security.

NPSTC Mission Statement

The National Public Safety Telecommunications Council is a federation of organizations whose mission is to improve public safety communications and interoperability through collaborative leadership.

NPSTC Governing Board
(Voting Member Organizations)

NPSTC

International Association of Chiefs of Police – Police – Since 1893

National Sheriffs' Association

NATIONAL SHERIFFS' ASSOCIATION

International Association of Fire Chiefs Association

NASEMSO

APCO International
Leaders in Public Safety Communications

NENA THE 9-1-1 ASSOCIATION
The only organization solely focused on 9-1-1 policy, technology, operations, and education issues.

IAEM
International Association of Emergency Managers

IMSA
Your Partner in PUBLIC SAFETY

Association of Fish & Wildlife Agencies

FCCA

National Association of State Foresters – Founded 1920

AASHTO

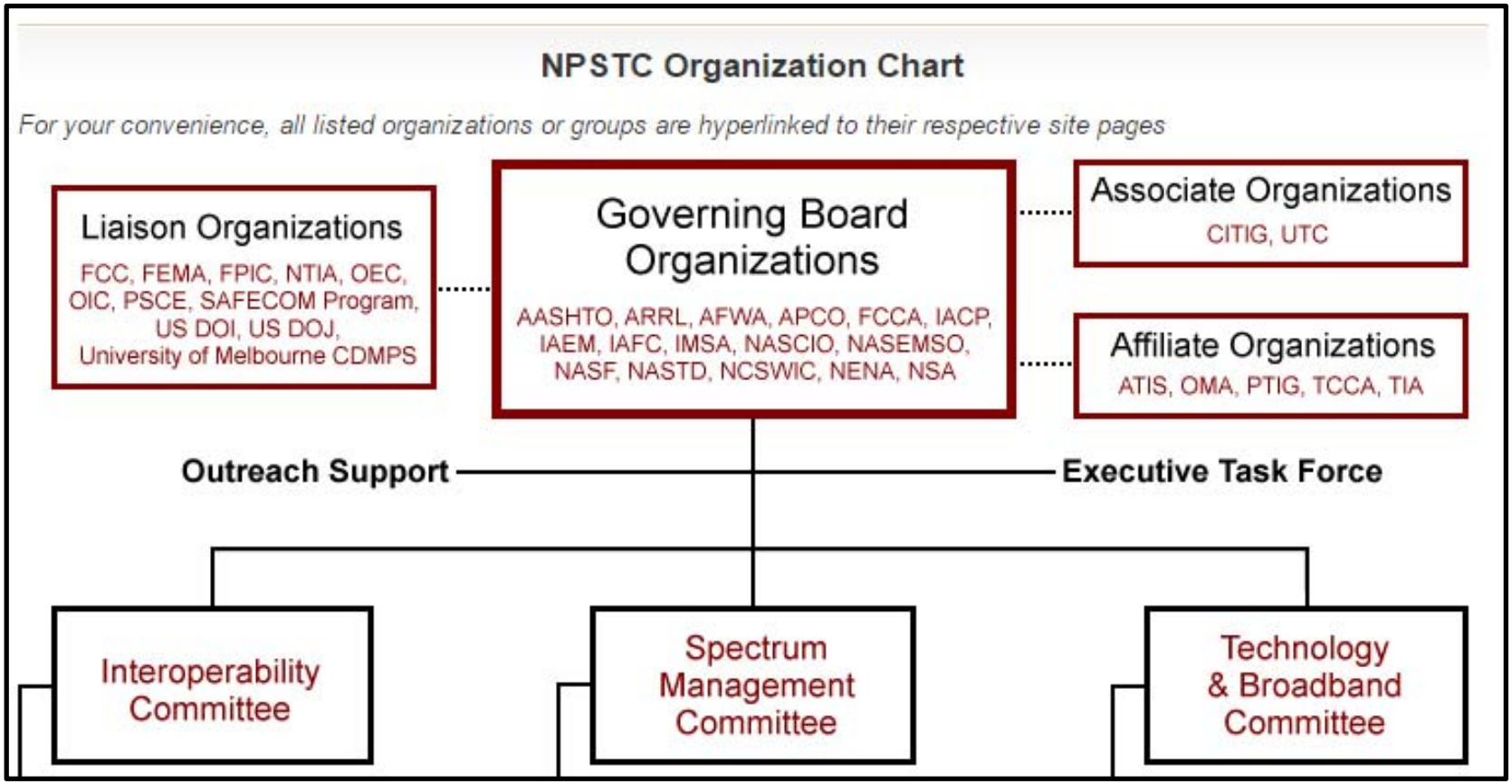
ARRL

NCSWIC

NASTD
National Association of State Technology Directors
Technology Professionals Serving State Government

NASCIO
Representing Chief Information Officers of the States

NPSTC Organizational Chart



Session Overview

- NPSTC UAS-Robotics Working Group Update
- Robots, Drones and AI
- UAS and the PSAP
- The Role of Broadband Data
- Analytics and Artificial Intelligence (AI)
- Future Vision

NPSTC UAS-Robotics Working Group

- A Working Group to study Unmanned Aerial Systems (UAS) and Robotics formed in February of 2016.
- 105 participants representing public safety, industry and academia.
- Conference calls are held on the 2nd Wednesday of each month at 9:00 a.m. Pacific Time Zone.
  - All NPSTC conference calls are open to anyone who wants to dial in.
  - Meetings listed on NPSTC.org; click on “Public Safety Calendar”
- The Working Group recently published their first report “Unmanned Air Systems and Robotics – Guidelines for Creating a UAS Program”.

Western Regional Conference Last Year: Robots and the PSAP

- Navy Fish Robot
- Navy Shipboard Firefighting Robot

What is a Robot?

What is a Robot?

What is a Robot?

What is a Robot?

Paro, Elder Care Robot

PARO has five kinds of sensors: tactile, light, audition, temperature, and posture sensors, with which it can perceive people and its environment. With the light sensor, PARO can recognize light and dark. He feels being stroked and beaten by tactile sensor, or being held by the posture sensor. PARO can also recognize the direction of voice and words such as its name, greetings, and praise with its audio sensor.

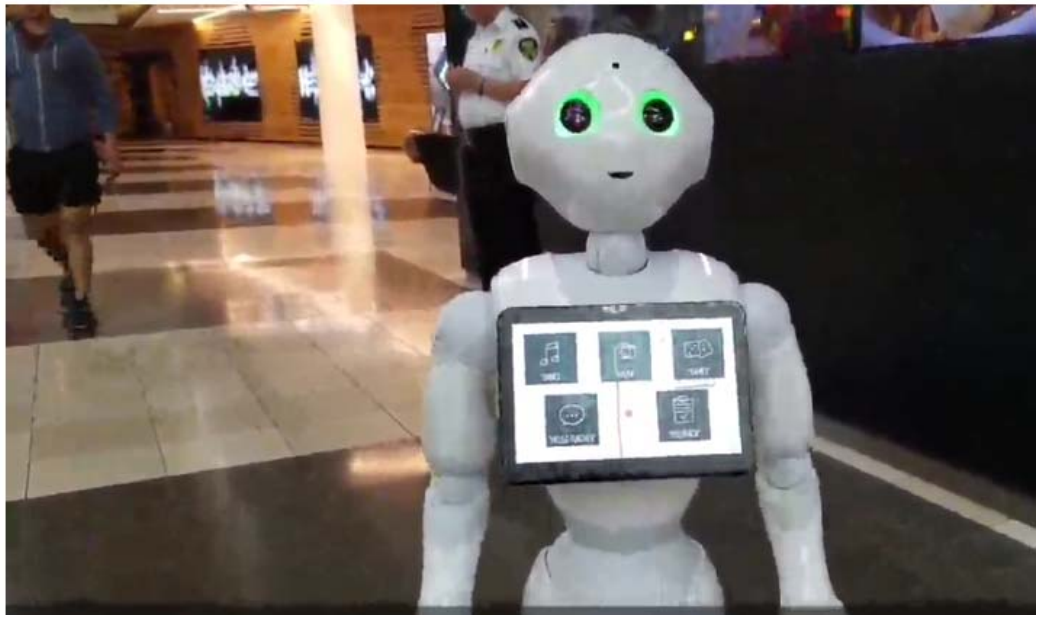
PARO can learn to behave in a way that the user prefers, and to respond to its new name. For example, if you stroke it every time you touch it, PARO will remember your previous action and try to repeat that action to be stroked. If you hit it, PARO remembers its previous action and tries not to do that action.

By interaction with people, PARO responds as if it is alive, moving its head and legs, making sounds, and showing your preferred behavior. PARO also imitates the voice of a real baby harp seal.

Robots as Concierges?

Robots greet Westfield mall shoppers in San Francisco, San Jose

By Benny Evangelista Updated 7:34 pm, Tuesday, November 22, 2016



Robots as Concierges?

HILTON AND IBM PILOT "CONNIE," THE WORLD'S FIRST WATSON-ENABLED HOTEL CONCIERGE

Domain knowledge from Watson and WayBlazer will help personalize and enhance the Hilton guest experience

March 09, 2016 | *This information originated in American English.*

MCLEAN, Va. - Hilton Worldwide (NYSE: HLT) and IBM (NYSE: IBM) today announced a collaboration to pilot "Connie" - the first Watson-enabled robot concierge in the hospitality industry. Connie draws on domain knowledge from Watson and WayBlazer to inform guests on local tourist attractions, dining recommendations and hotel features and amenities.

Connie, named for Hilton's founder Conrad Hilton, marks the first time IBM has developed a Watson-enabled robot for the hospitality market. Connie will work side-by-side with Hilton's Team Members to assist with visitor requests, personalize the guest experience and empower travelers with more information to help them plan their trips.

Robots:
Analytics and Artificial Intelligence (AI)

- ***Analytics*** is "…systematic computational analysis of data or statistics.."
- ***Artificial Intelligence*** is "…computer science dealing with the simulation of intelligent behavior in computers.."
- This is where raw data becomes usable data.
- This is where faster and better decisions become possible.

Is a Drone a Robot?

ro·bot (noun)
A machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer.

Future Vision:
UAS and the PSAP

APCO Western Regional 2016
UAS and the PSAP

APCO Western Regional 2016
UAS and the PSAP

APCO Western Regional 2016
UAS and the PSAP

APCO Western Regional 2016
UAS and the PSAP

The ambulance drone that could save your life: Flying defibrillator can reach speeds of 60mph

- $19,000 drone tracks emergency mobile calls and uses the GPS to navigate
- Operators can watch, talk and instruct those helping the victim by using an on-board camera

APCO Western Regional 2016
UAS and the PSAP

Future Vision:
UAS and the PSAP

- Drones will be “dispatched” by the PSAP.
- Drones can provide an aerial communications platform.
- Drones can provide situational awareness through transmission of data and video.
  - Drone data is more credible and usable than NG911 citizen video.
  - Drone video can be directed by the PSAP.

Future Vision:
UAS and the PSAP

- What does the PSAP do with the data?
  - Do you watch the video and make decisions?
  - Do you forward the video to the responding units?
  - Do you store the video for future use?

Future Vision:
UAS and the PSAP

- UAS has arrived and is sending broadband data
  - Location Data
  - Video/Imagery
  - Sensor Data

Future Vision:
UAS and the PSAP

- UAS has arrived and is sending broadband data
  - What do you see?
  - What do you do?

Future Vision:
UAS and the PSAP

- What if the UAS told you what it was seeing and what it was sensing?

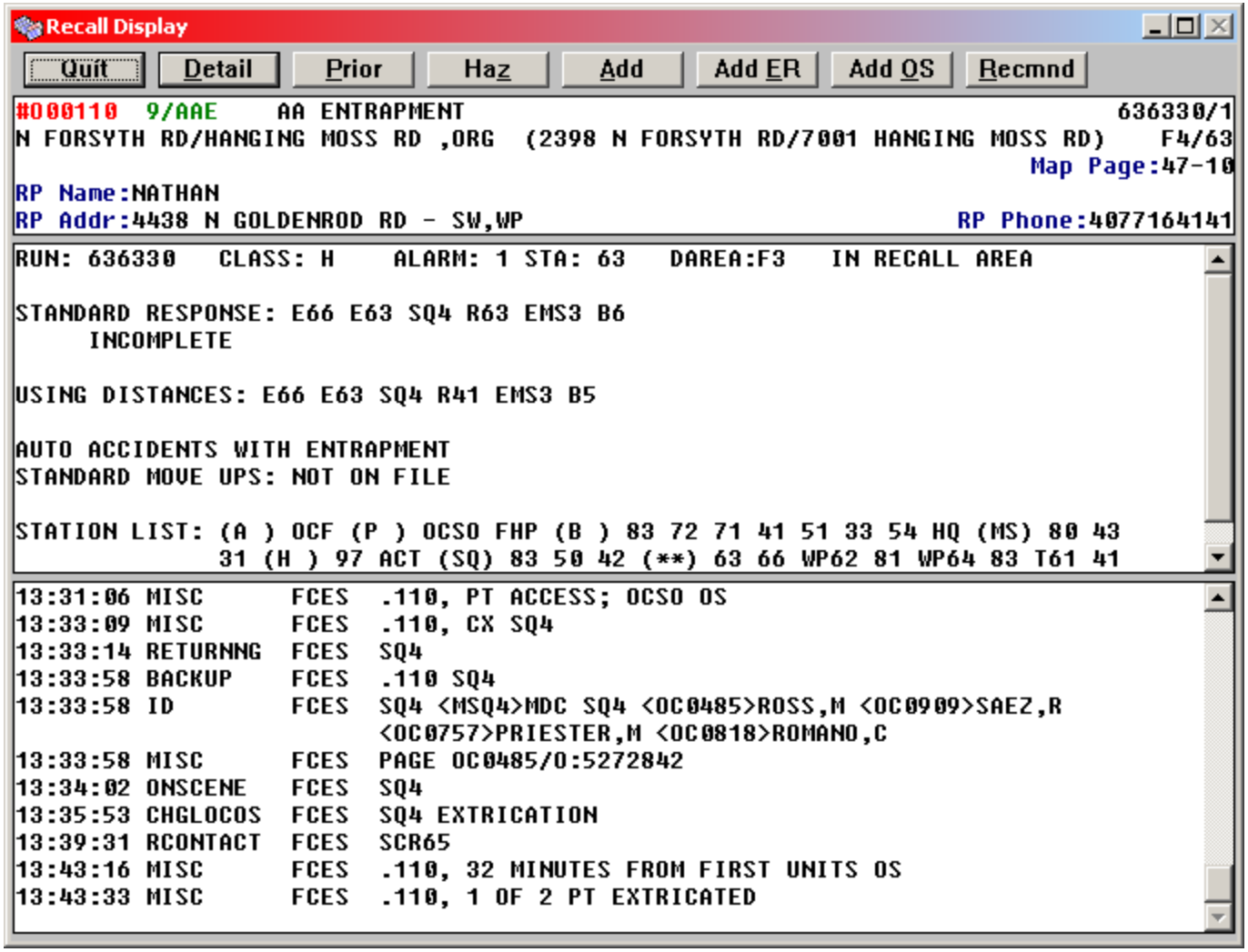
Future Vision:
UAS and the PSAP

- UAS “Arrival Report”
  - Two story structure
  - 2,100 square feet (70 feet by 30 feet)
  - Active Fire 20%
  - Fire Visible – Roof
  - No Exposure
  - Vehicles in Garage
  - Thermal Image scan progress.
- UAS “Recommendation”
  - Add 2 engines to response.

Future Vision or Current Vision?
PSAP Automation

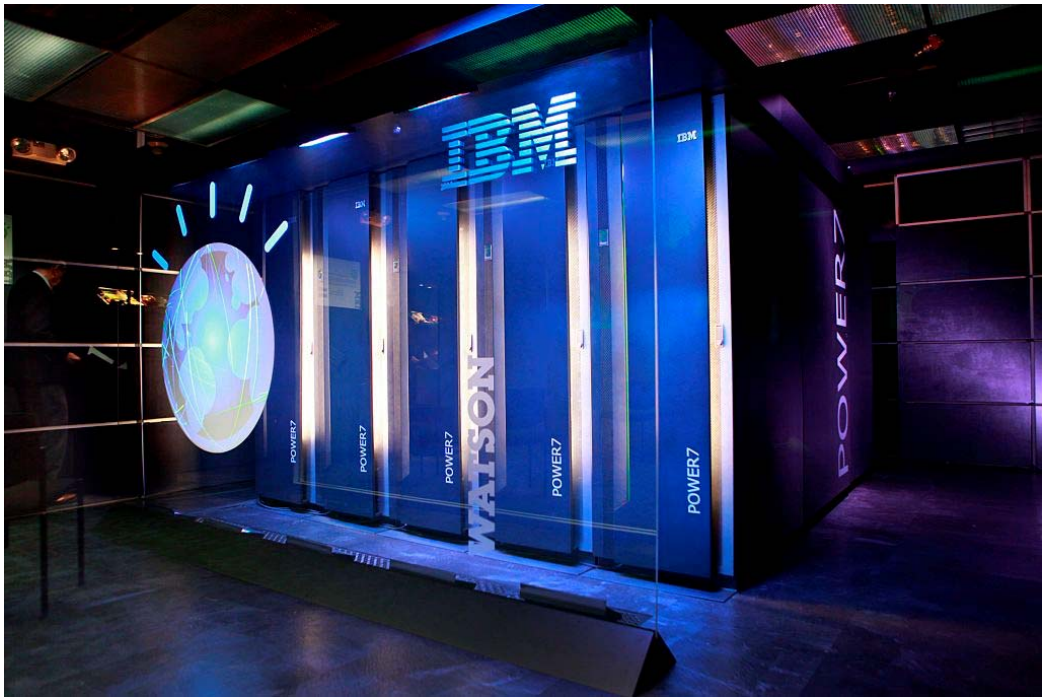
- Computer Aided Dispatch (CAD) System Functionality
  - Analyzes Location of Incident (123 Main Street).
  - Analyzes Type of Incident (Building Fire).
  - Analyzes Unit Availability (Engine 1, Engine 4).
  - Analyzes Unit Location (AVL).
  - Analyzes Station Run Order for Location (STA 1,4,3).
  - Analyzes Hazards and Special Instructions.
- CAD System then recommends units to respond
  - Automation sends dispatch alert.

CAD System Automation



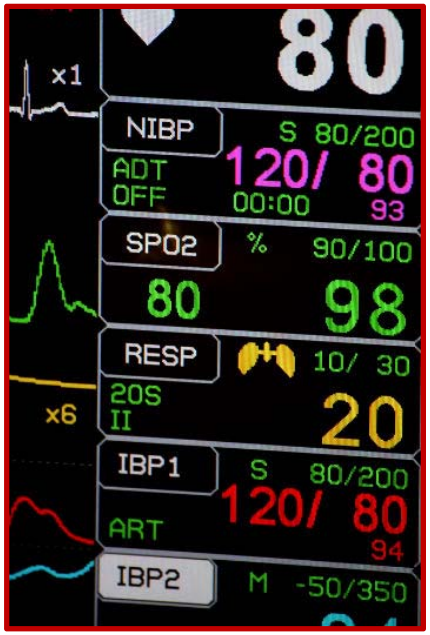
Robots and AI

IBM Watson



Robots and AI

IBM Watson



IBM

IBM Healthcare & Life Sciences Industries Blog

Improving Outcomes in the ICU with Streaming Analytics

March 20, 2015 | Written by: Nav Ranajee

The amount of data in a critical care setting has grown dramatically. Data generated from medical monitors, imaging technology and electronic charting systems generate thousands of data points leading to data overload for care providers. Patient monitors in Intensive Care Units today provide alarms whenever a vital measurement such as heart rate exceeds a predefined threshold. The care provider then must react quickly to make an instant decision about whether the alarm is false or if immediate action is required to prevent a crisis in the patient's condition. According to the Association for the Advancement of Medical Instrumentation (AAMI), between 85 and 99 percent of alarm signals do not require clinical intervention. Streaming analytics technology can mitigate the need for clinicians to operate in a constant state of urgency by enabling proactive management with real-time data.

Future Vision - AUDREY

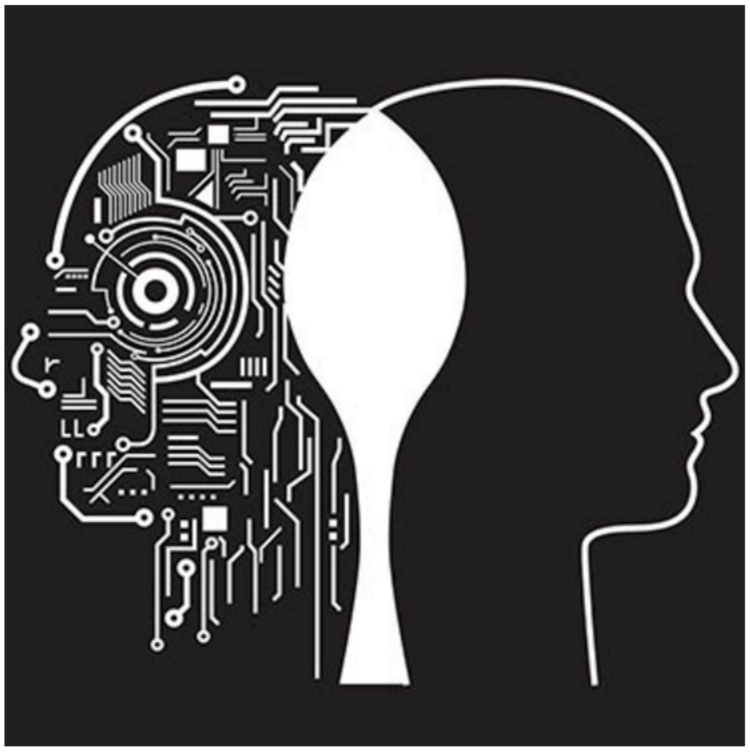
Pasadena Star-News

ARTIFICIAL INTELLIGENCE

How NASA is using artificial intelligence to save lives of firefighters, first responders

There's more data than ever available to first responders, but finding the right data at the right time poses big challenges. NASA's Jet Propulsion Laboratory might have an answer.

JPL is working on an artificial intelligence solution called Audrey (Assistant for Understanding Data through Reasoning, Extraction, and sYnthesis) that is designed to help local law enforcement, firefighters and other first responders filter the clutter of available information to achieve situational awareness.



(Razum / Shutterstock)

Future Vision - AUDREY

In one example provided by NASA, AUDREY predicted a possible explosion in a building. The AI automatically warns a police officer inside to evacuate, while also telling incoming firefighters or hazardous-material teams to address the threat quickly.

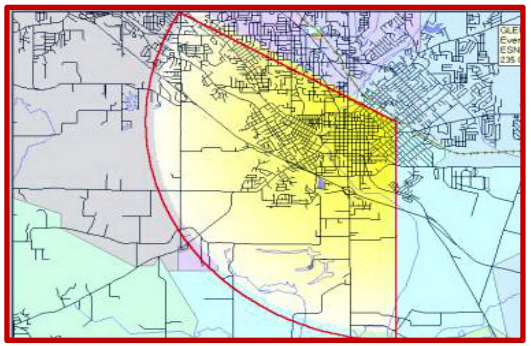
At the same time, a message goes out to personnel outside to limit access to the building.

Future Vision - AUDREY

- DHS Science &Technology Directorate is planning to install AUDREY in a PSAP.
  - Monitor incoming 911 call audio
    - Link seemingly disparate incidents
    - Extrapolate incident severity through multi-call analysis
    - Automatic alerting during call processing
      - To PSAP Supervisor
      - To First Responders
  - Analyze databases of stored information
  - Analyze CAD incidents

Future Vision - AI

- AI can “connect the dots” quickly
- Sensor Data to the PSAP
  - Analyze incident severity based on totality of available information
    - Fire Alarm Activation: Multi-Detector Smoke and Heat
    - Video Analysis: Thick Smoke
    - Video Analysis: People running toward exits
    - Location Analysis: Assisted Living Facility, reduced evacuation capability
  - Recommend agency designated full alarm response before the first call to 9-1-1 arrives in the PSAP.



Public Safety Analytics

Fight with weapons in a high school:

Impact of Technology on Time: Detection to Arrival

PROCESS SEGMENT	Emergency Occurs	Detection	Activate 9-1-1	Call Routed to PSAP	Call Taker Questions/ CAD Entry	Dispatcher Assessment/ Assign Units	Turn Out Time	Travel To Address	Arrival At Scene	Assess Conditions	Initiate Action
TIME (MIN:SEC)	TIME START	1:00	:30	:10	1:00	:30	:10	6:00	3:00	:30	TIME STOP
CUMULATIVE LAPSE TIME	0.00	1:00	1:30	1:40	2:40	3:10	3:20	9:20	12:20	12:50	
KEY FUNCTIONS	A fight breaks out in a high school and one of the suspects is holding a large knife.	* A teacher is a nearby classroom is alerted to the fight and runs into the hallway.	* Teacher alerts the school front desk. * Front desk dials 9-1-1	*9-1-1 System routes call to PSAP	*Call Taker determines location, type of emergency, and details. * Front desk has minimal information * Call Taker enters data into CAD	* Dispatcher reviews/confirms which units should respond * Dispatcher alerts units to respond.	* Units receive CAD data on MDT * Units review information * Units plan response	* Units travel to scene * Units arive at address, front door of school	* Officers enter school, determine route to specific wing. * Arrival at scene	* Officers at scene, differentiate suspects from bystanders.	* Officers take action.
Next Generation First Responder Improvements		*video analytics detect fight in progress; identify a probable weapon	* Sensor alert to PSAP via NG911	* Data call routed directly to PSAP	* Automatic call entry using ASAP protocol, reviewed by Call Taker. (Call taker also processes 911 call from school)	* Rapid dispatch to officers, with building plan and image/video file.	* Automatic Route suggestions	* Enhanced GIS data to ID building and access	* 3D building plans available prior to arrival	* video imagery provides complete suspect description	
TIME (M:SS)	TIME START	:05	:00	:05	:15	:15	:10	5:30	2:00	:30	
NEW CUMULATIVE LAPSE TIME	0:00	:05	:05	:10	:25	:40	:50	6:20	8:20	8:50	

4 Minute Faster Arrival

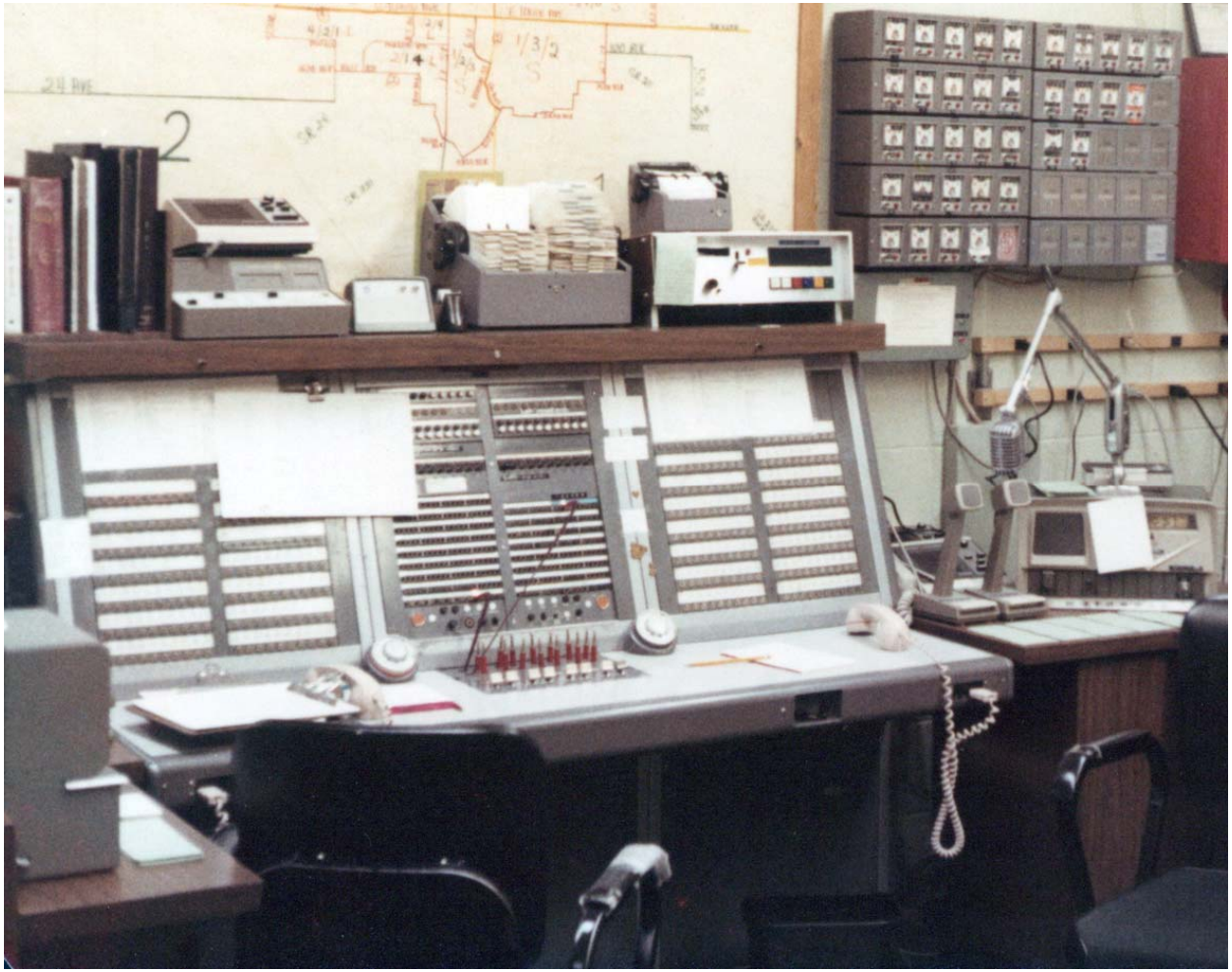
* Time segments are estimates and actual values vary greatly among public safety agencies
* Chart is designed to show conceptual time savings made possible through the use of sensor technology

APCO Project 43

Summary

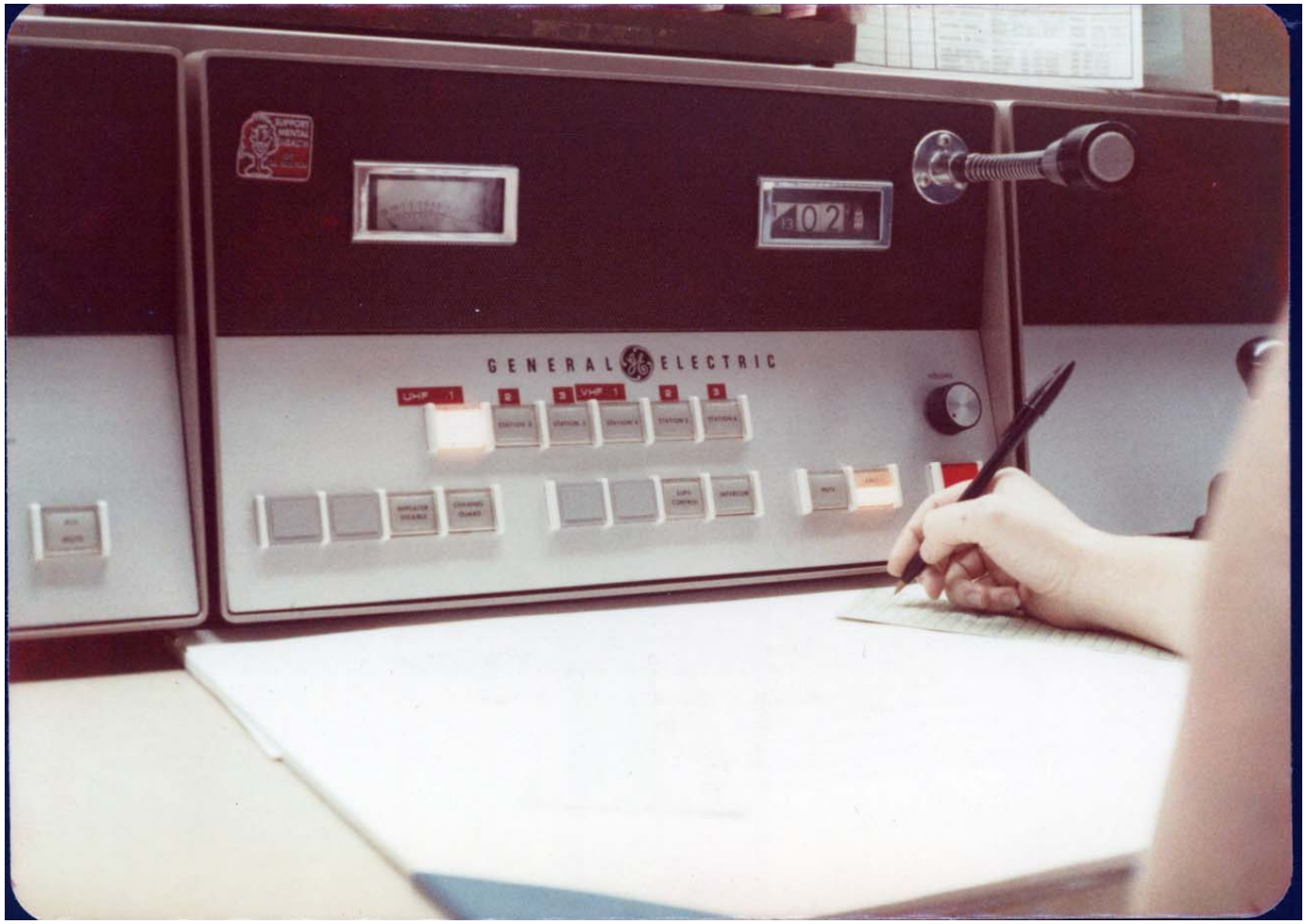
- UAS will become an important tool for PSAPs.
- Advancements in AI will help PSAPs manage an incoming flood of broadband data.
  - NG911 data flows from voice, text, images, video; as well as from machine to machine interfaces and sensors.
  - FirstNet data flows from applications, sensors and cameras.
- The Challenge is to envision the future
  - PSAPs should determine how they want to fit into this new technology puzzle.
  - PSAPs should start advocating for staffing, training, and inclusion in the planning process.

Circa 1968



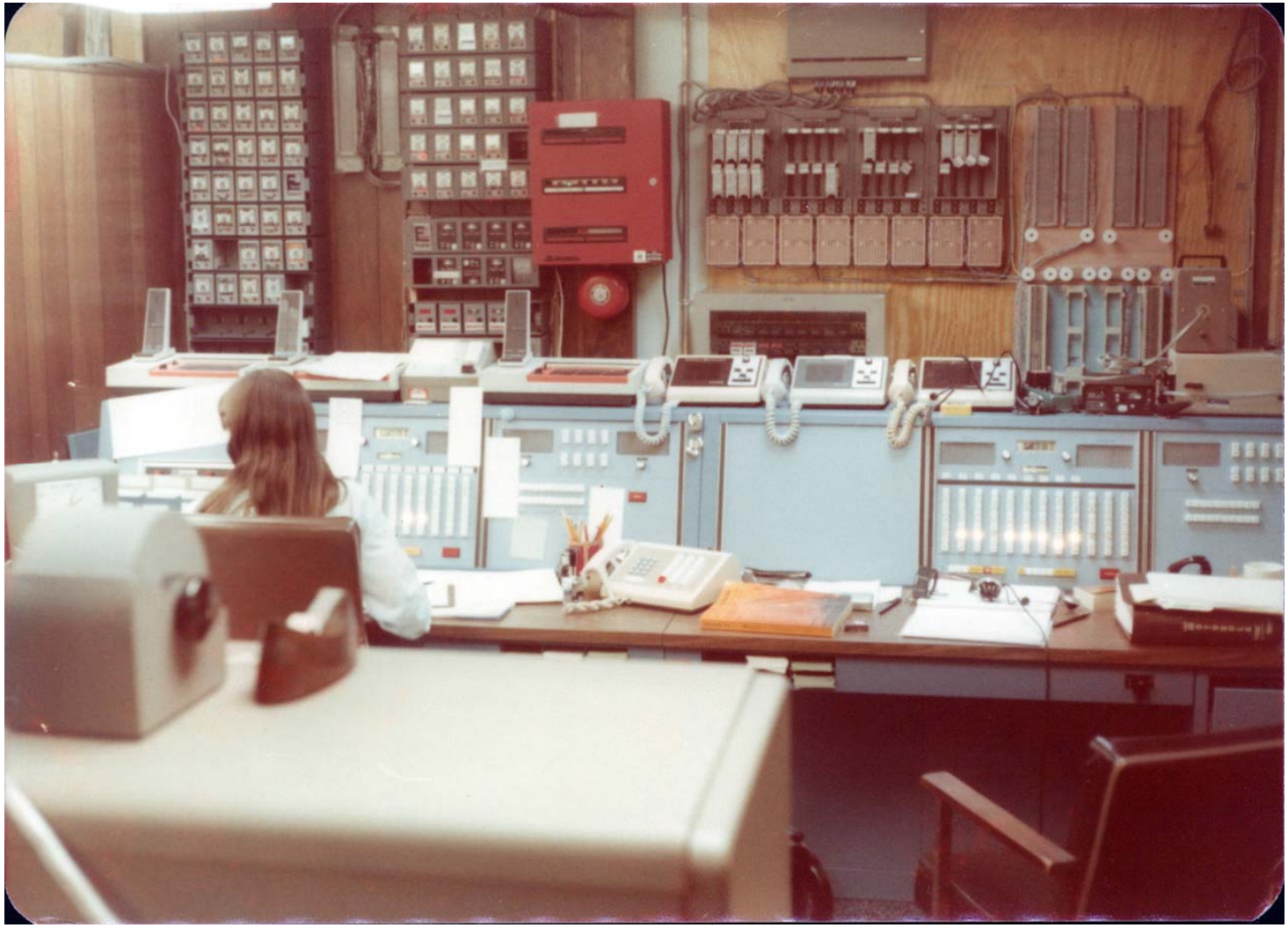
Circa 1970

Circa 1972



Circa 1974

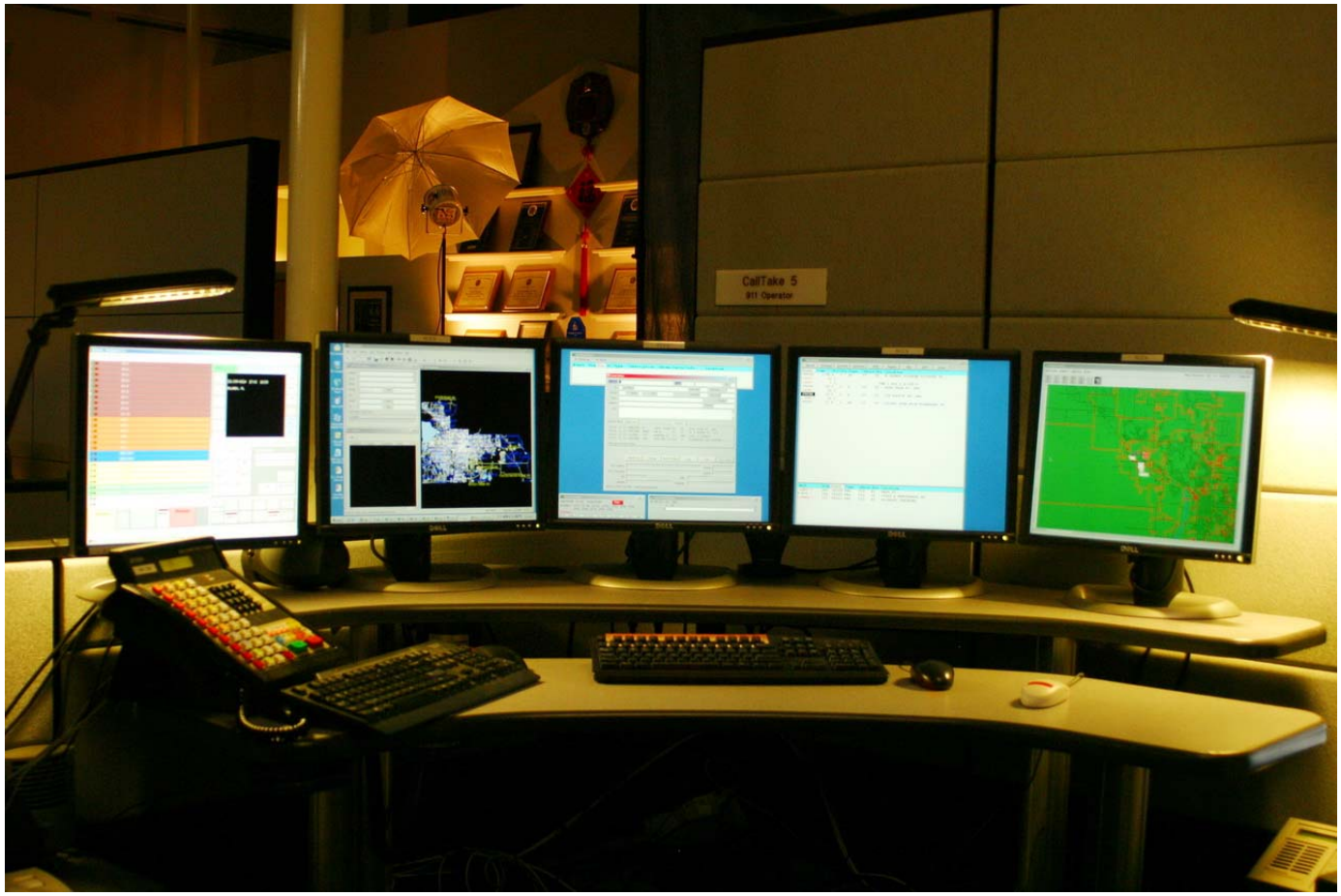
Circa 1978



Circa 1980

Circa 1986

Circa 2008

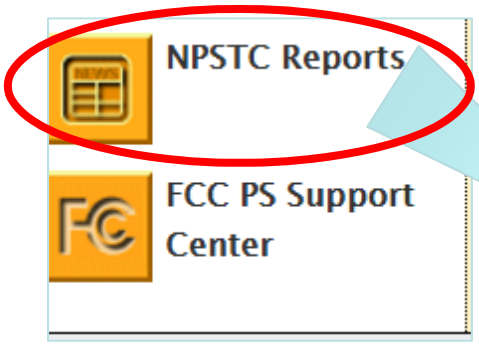


How To Get Involved

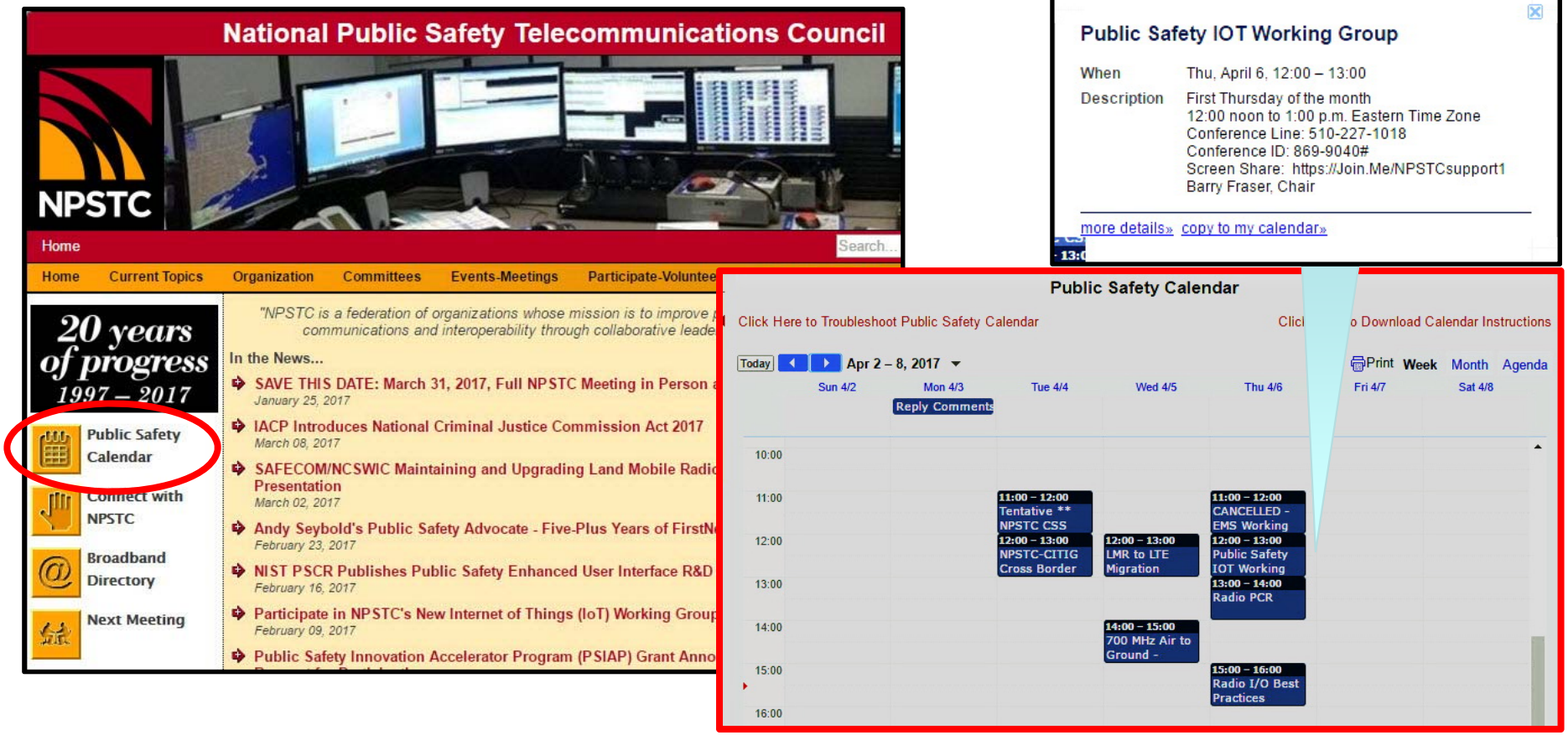
NPSTC is a federation of organizations whose mission is to improve public safety communications and interoperability through collaborative leadership.

Reports Available for Review

- Reports located on NPSTC website, *www.npstc.org*
  - Mission Critical Voice Over LTE
  - Local Control Definitions
  - Unmanned Air Systems and Robotics – Guidelines for Creating a UAS Program
  - FirstNet Web Status Page
  - EMS Telemedicine Report

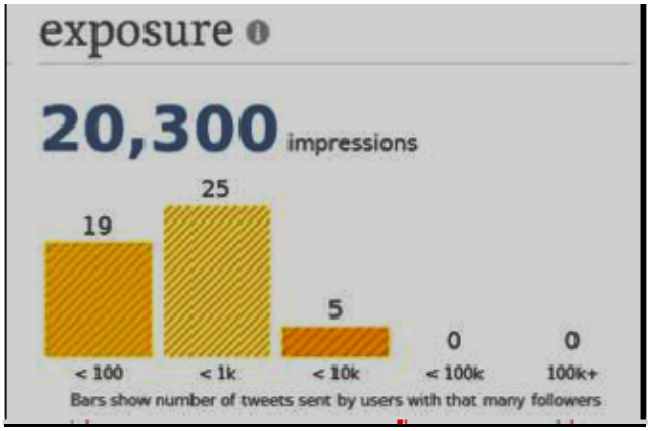


NPSTC Website and Calendar

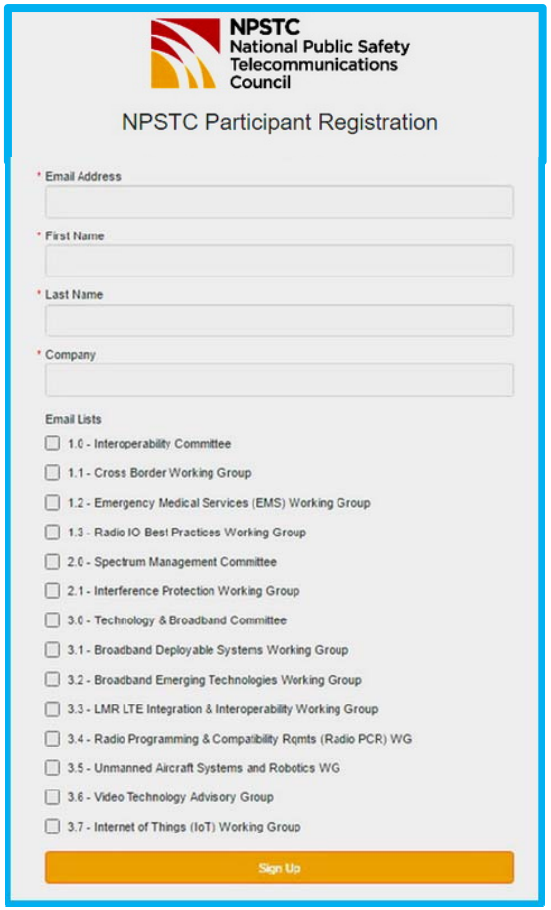


Social Media Outreach

- Outreach and Distribution
  - Constant Contact
  - NPSTC Web Site
  - NPSTC Blog
  - Linked-In
  - Facebook
  - Twitter
  - Coordinate with industry and member publications
  - Broadband Directory

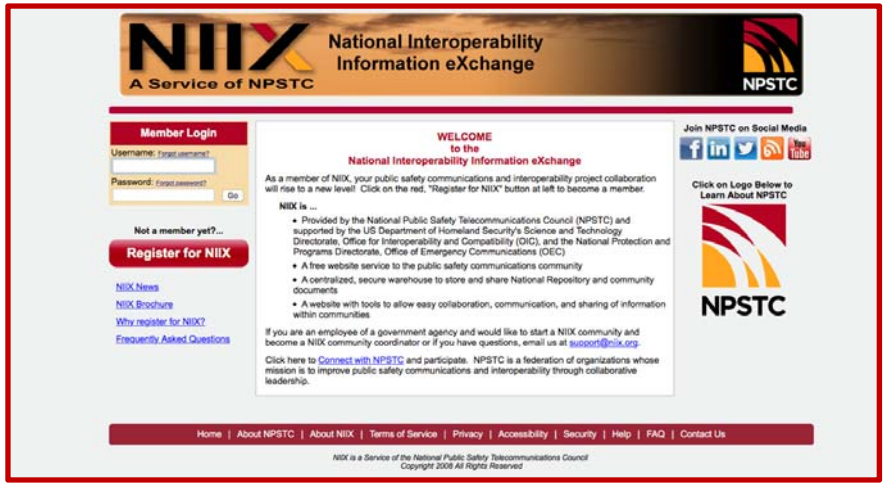


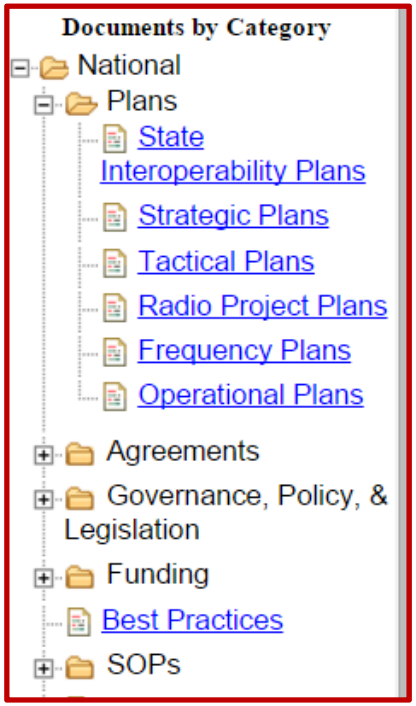
NPSTC Participation Sign Up

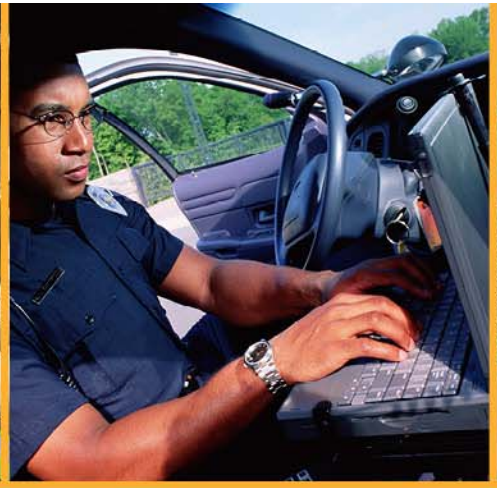


National Interoperability Exchange (NIIX)

- NIIX
  - A free centralized, secure warehouse to store and share National Repository and community documents.
  - A website with tools to allow easy collaboration, communication, and sharing of information within communities.
  - Locally controlled.





NPSTC

Questions (and Answers)

Barry H. Luke, Deputy Executive Director

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