

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

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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.





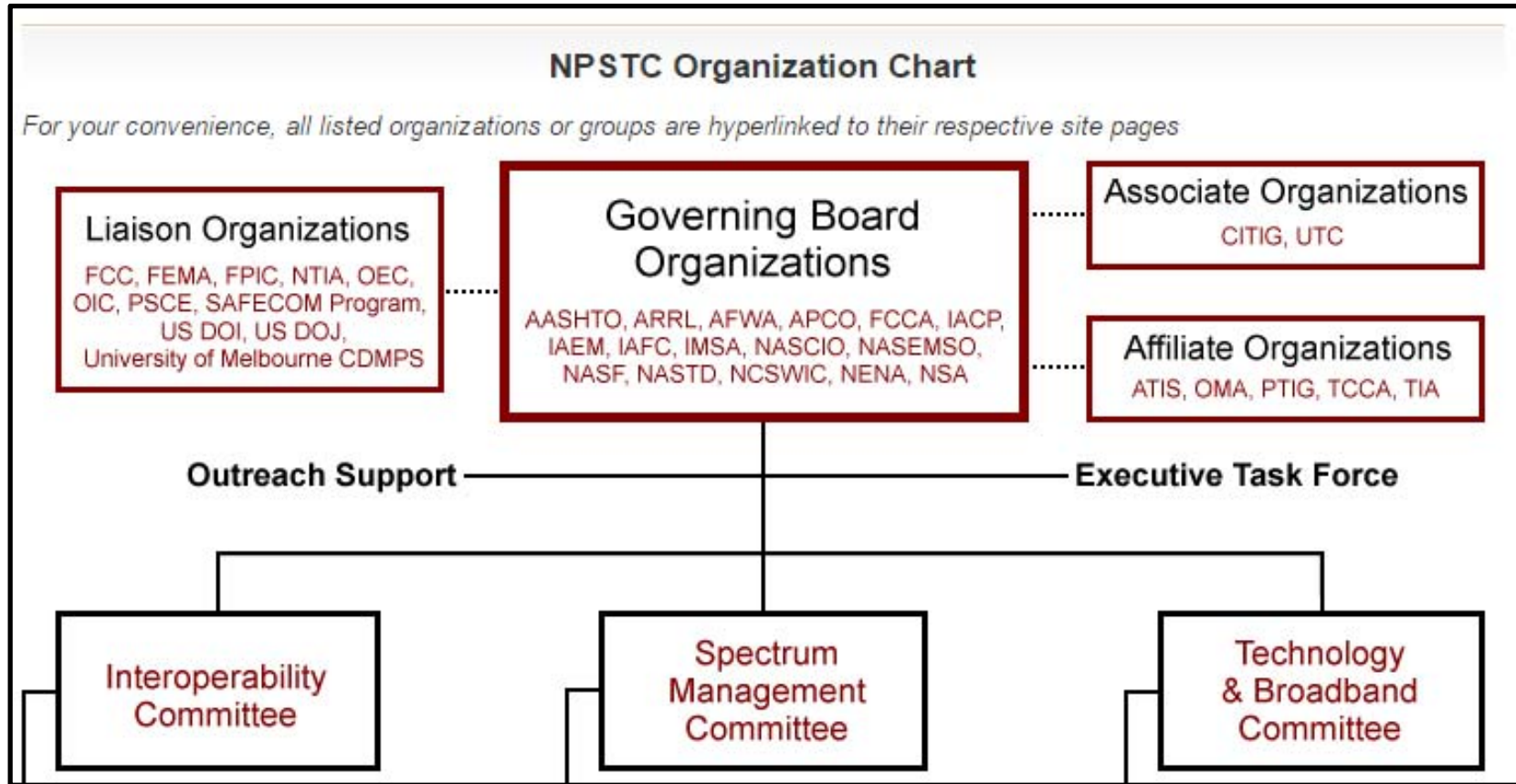
NPSTC Governing Board (Voting Member Organizations)



NATIONAL SHERIFFS' ASSOCIATION



NPSTC Organizational Chart



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

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

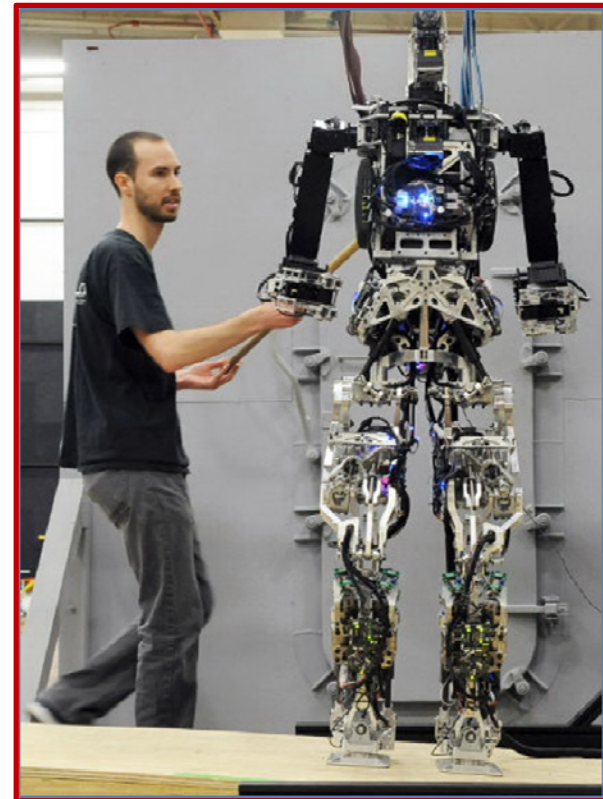


NPSTC UAS-Robotics Working Group

- 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?



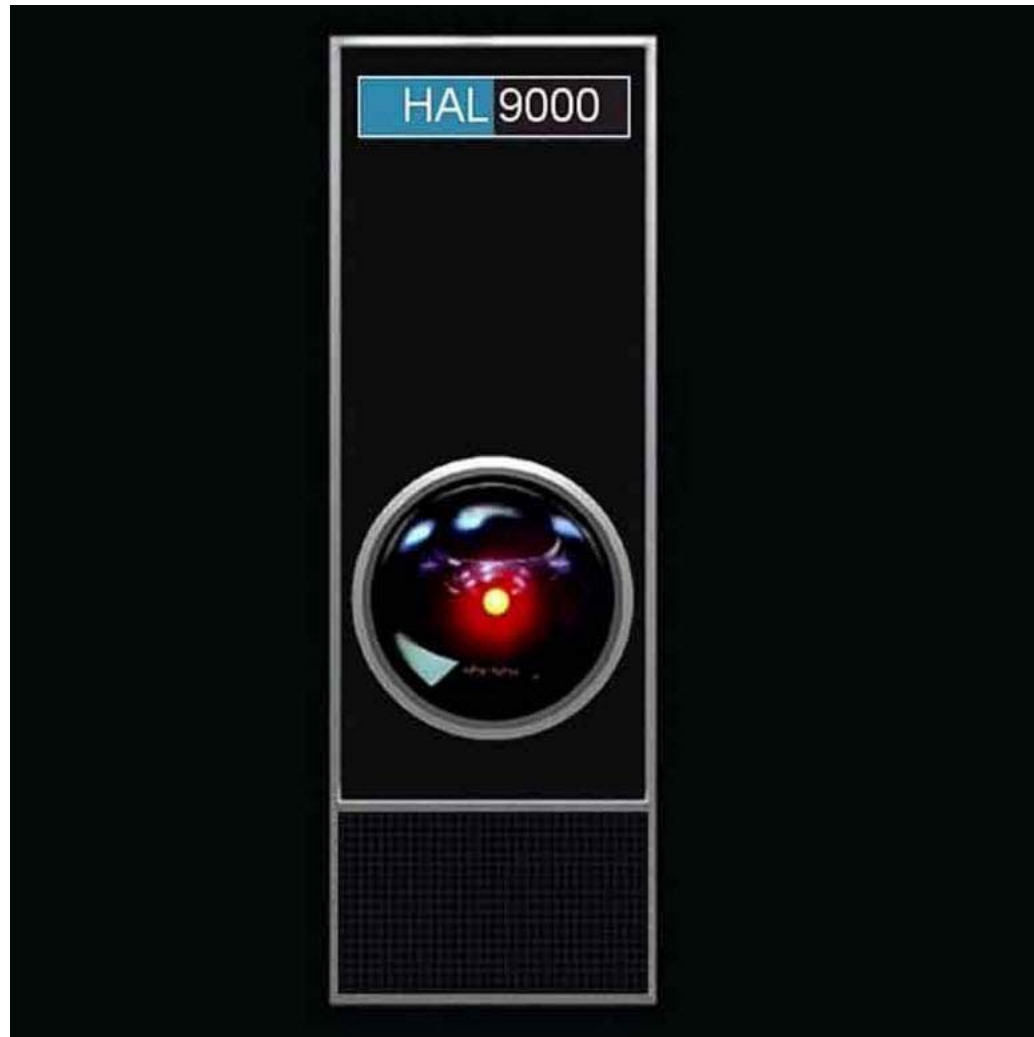
NPSTC is a federation of organizations whose mission is to improve public safety communications and interoperability through collaborative leadership.

What is a Robot?



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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.



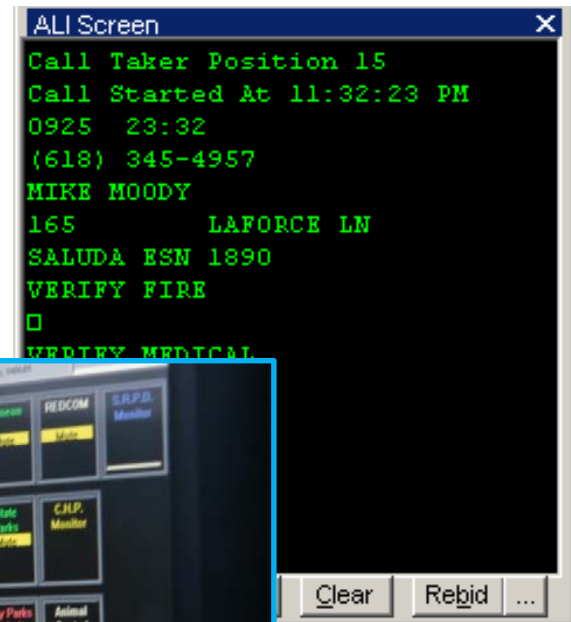
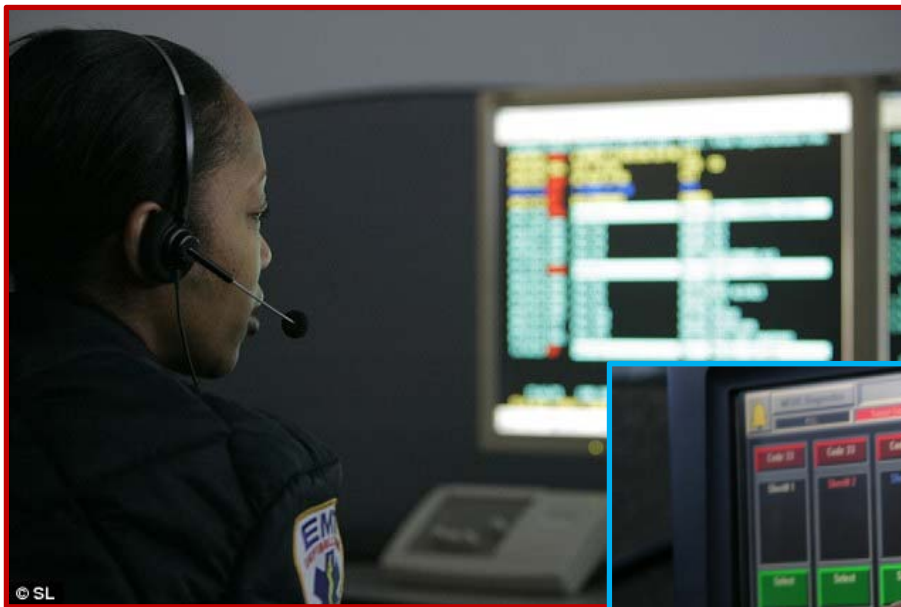
Is a Drone a Robot?



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



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APCO Western Regional 2016 UAS and the PSAP



APCO Western Regional 2016

UAS and the PSAP



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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



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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



Recall Display

Quit Detail Prior Haz Add Add ER Add OS Recmnd

#000110 9/AAE AA ENTRAPMENT 636330/1
N FORSYTH RD/HANGING MOSS RD ,ORG (2398 N FORSYTH RD/7001 HANGING MOSS RD) F4/63
Map Page:47-10
RP Name:NATHAN
RP Addr:4438 N GOLDENROD RD - SW,WP RP Phone:4077164141

RUN: 636330 CLASS: H ALARM: 1 STA: 63 DAREA:F3 IN RECALL AREA

STANDARD RESPONSE: E66 E63 SQ4 R63 EMS3 B6
INCOMPLETE

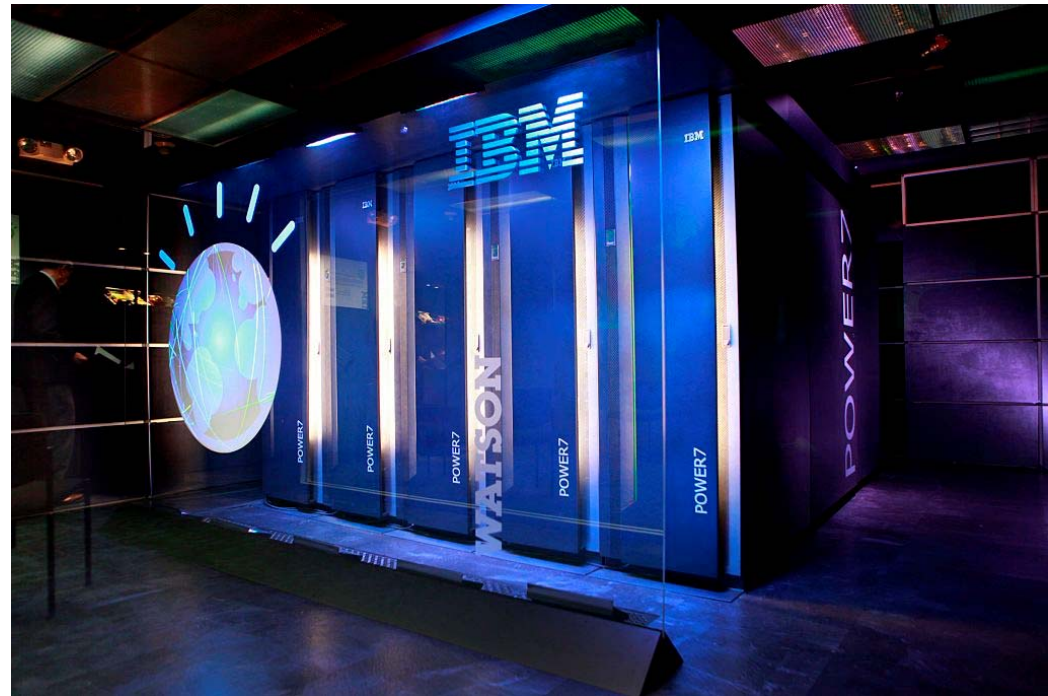
USING DISTANCES: E66 E63 SQ4 R41 EMS3 B5

AUTO ACCIDENTS WITH ENTRAPMENT
STANDARD MOVE UPS: NOT ON FILE

STATION LIST: (A) OCF (P) OCSO FHP (B) 83 72 71 41 51 33 54 HQ (MS) 80 43
31 (H) 97 ACT (SQ) 83 50 42 (**) 63 66 WP62 81 WP64 83 T61 41

13:31:06	MISC	FCES	.110, PT ACCESS; OCSO OS
13:33:09	MISC	FCES	.110, CX SQ4
13:33:14	RETURNNG	FCES	SQ4
13:33:58	BACKUP	FCES	.110 SQ4
13:33:58	ID	FCES	SQ4 <MSQ4>MDC SQ4 <OC0485>ROSS,M <OC0909>SAEZ,R <OC0757>PRIESTER,M <OC0818>ROMANO,C
13:33:58	MISC	FCES	PAGE OC0485/0:5272842
13:34:02	ONSCENE	FCES	SQ4
13:35:53	CHGLOCOS	FCES	SQ4 EXTRICATION
13:39:31	RCONTACT	FCES	SCR65
13:43:16	MISC	FCES	.110, 32 MINUTES FROM FIRST UNITS OS
13:43:33	MISC	FCES	.110, 1 OF 2 PT EXTRICATED

Robots and AI



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Robots and AI

A screenshot of an IBM Healthcare & Life Sciences Industries Blog article. The article title is "Improving Outcomes in the ICU with Streaming Analytics". The date is "March 20, 2015" and the author is "Nav Ranajee". The article text discusses the volume of data in critical care settings and the potential of streaming analytics to reduce alarm fatigue.

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

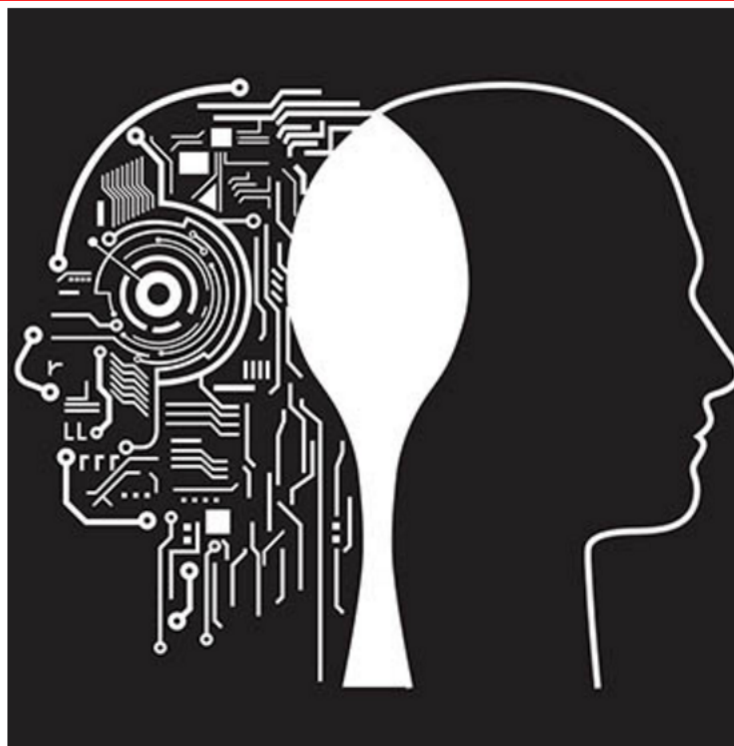
Pasadena Star-News

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.



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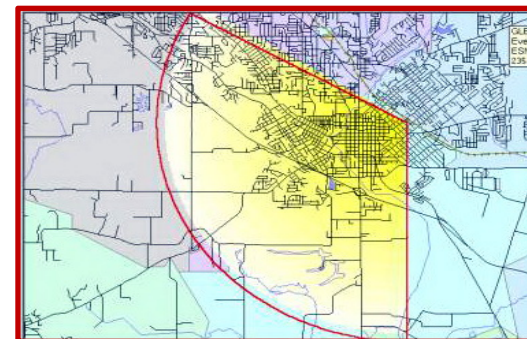
Future Vision - AUDREY

- 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/confirm 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 arrive 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



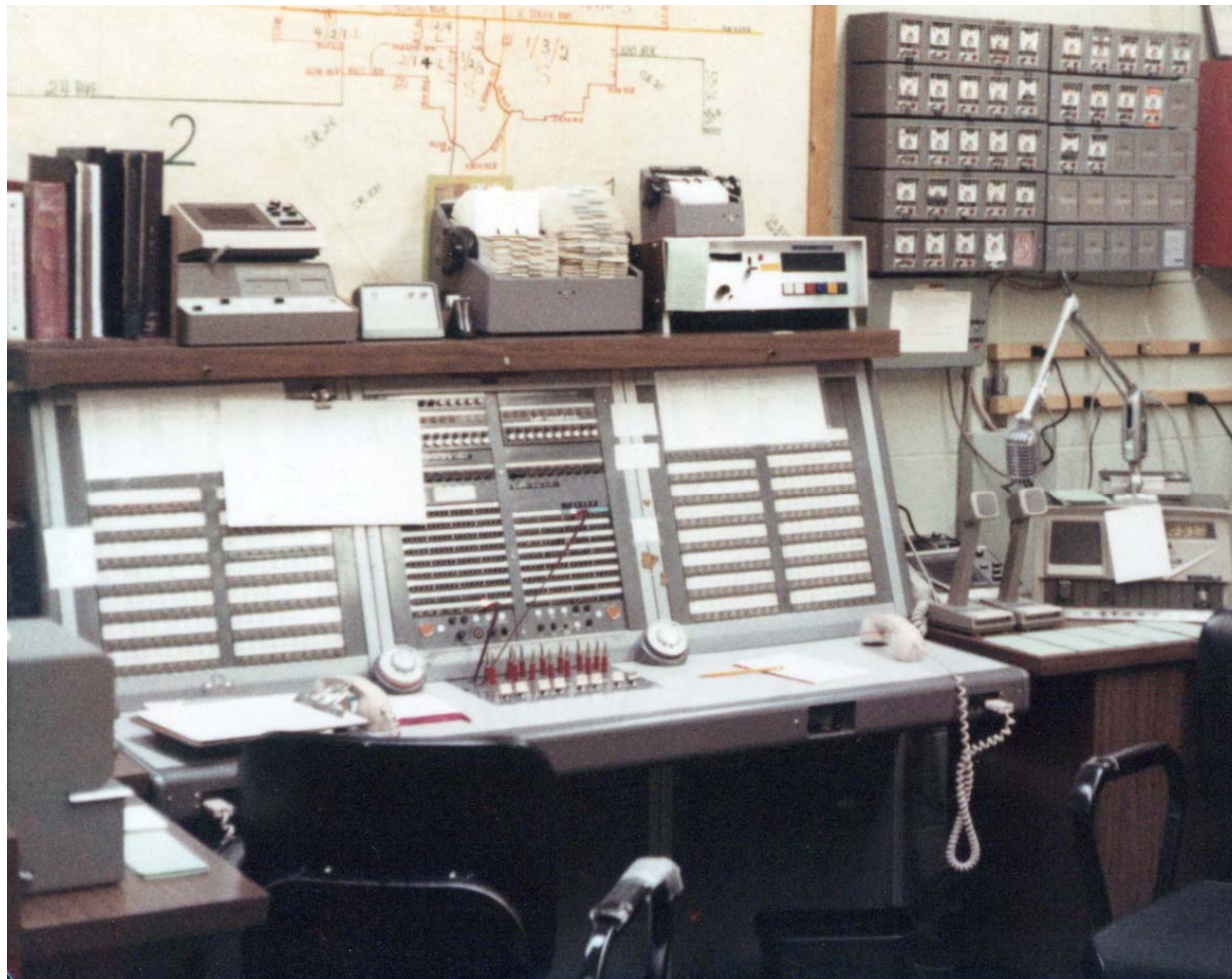
A screenshot of the PSC ONLINE website. The header features the text "PSC ONLINE" in large, bold, blue letters against a background of a globe with grid lines. Below the header is a dark blue navigation bar with white text for "APCO", "Industry", "Government", "Operations", "Technology", and "Product & Service Announcements". The main content area displays a news article titled "APCO Launches Project 43 to Tackle Broadband Implications for the PSAP" in a large, bold, black font. Below the title, in a smaller font, it reads "APCO International • February 10, 2016 • 0 comments • APCO, News".

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



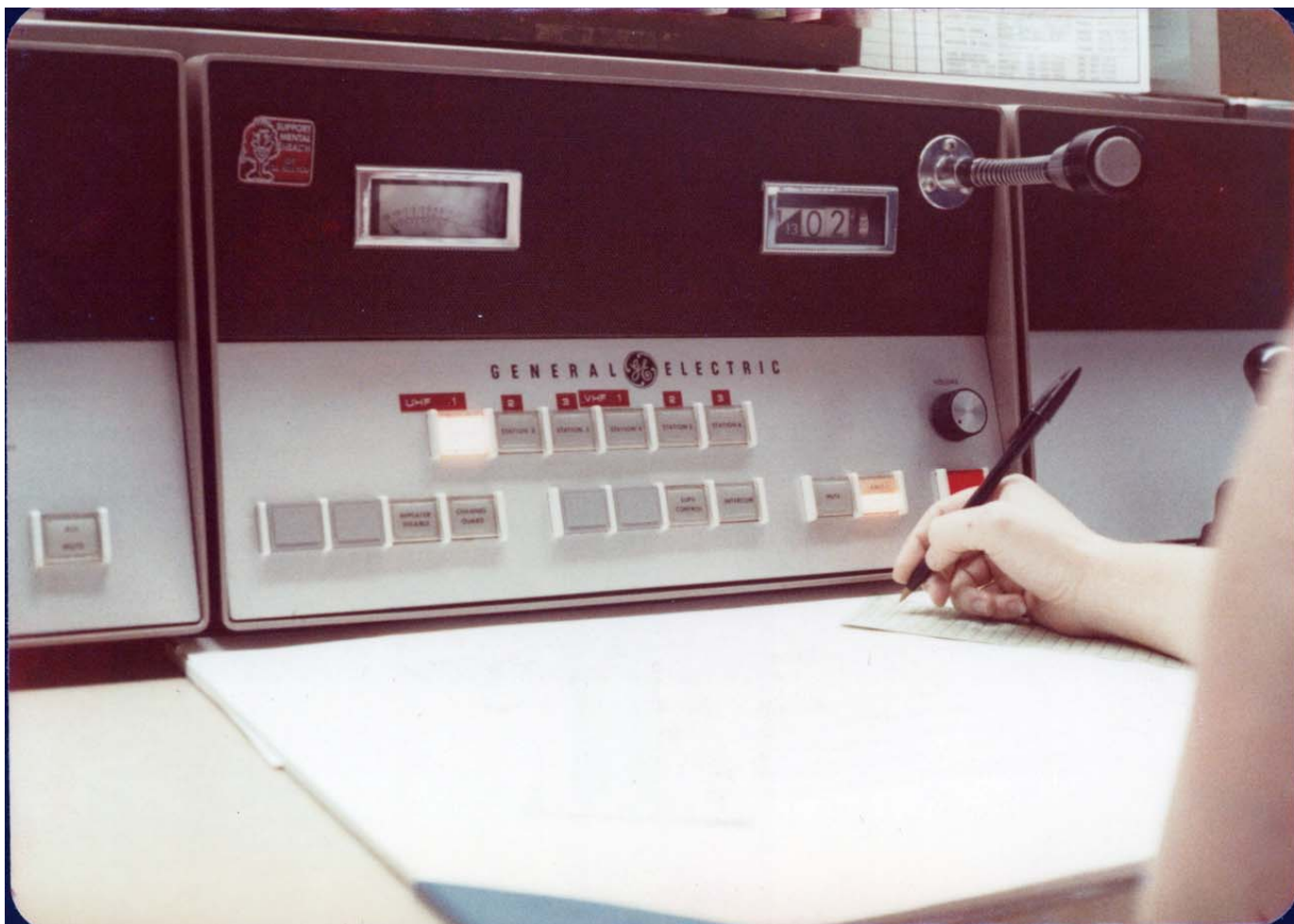
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Circa 1970



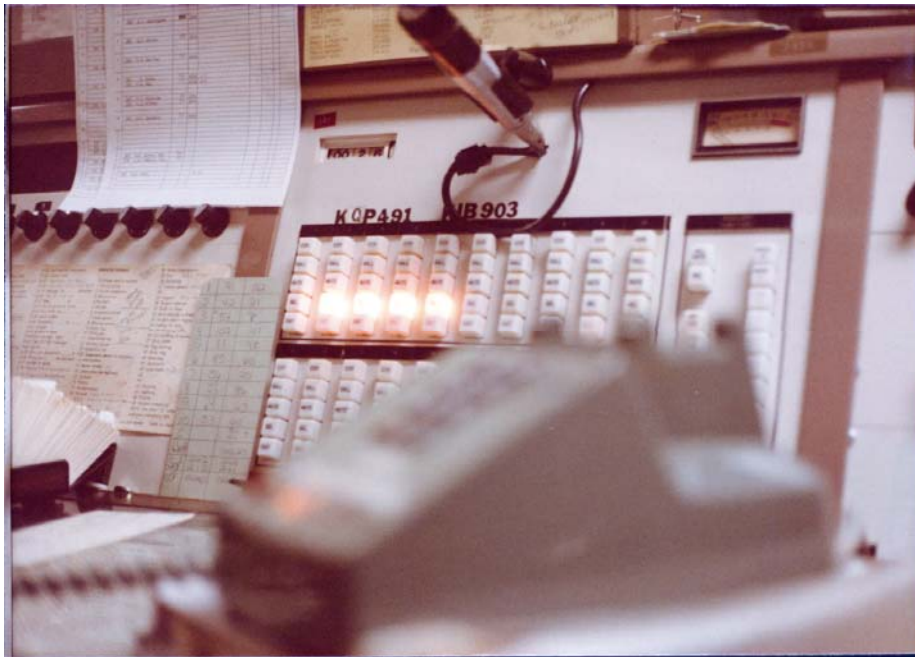
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Circa 1972



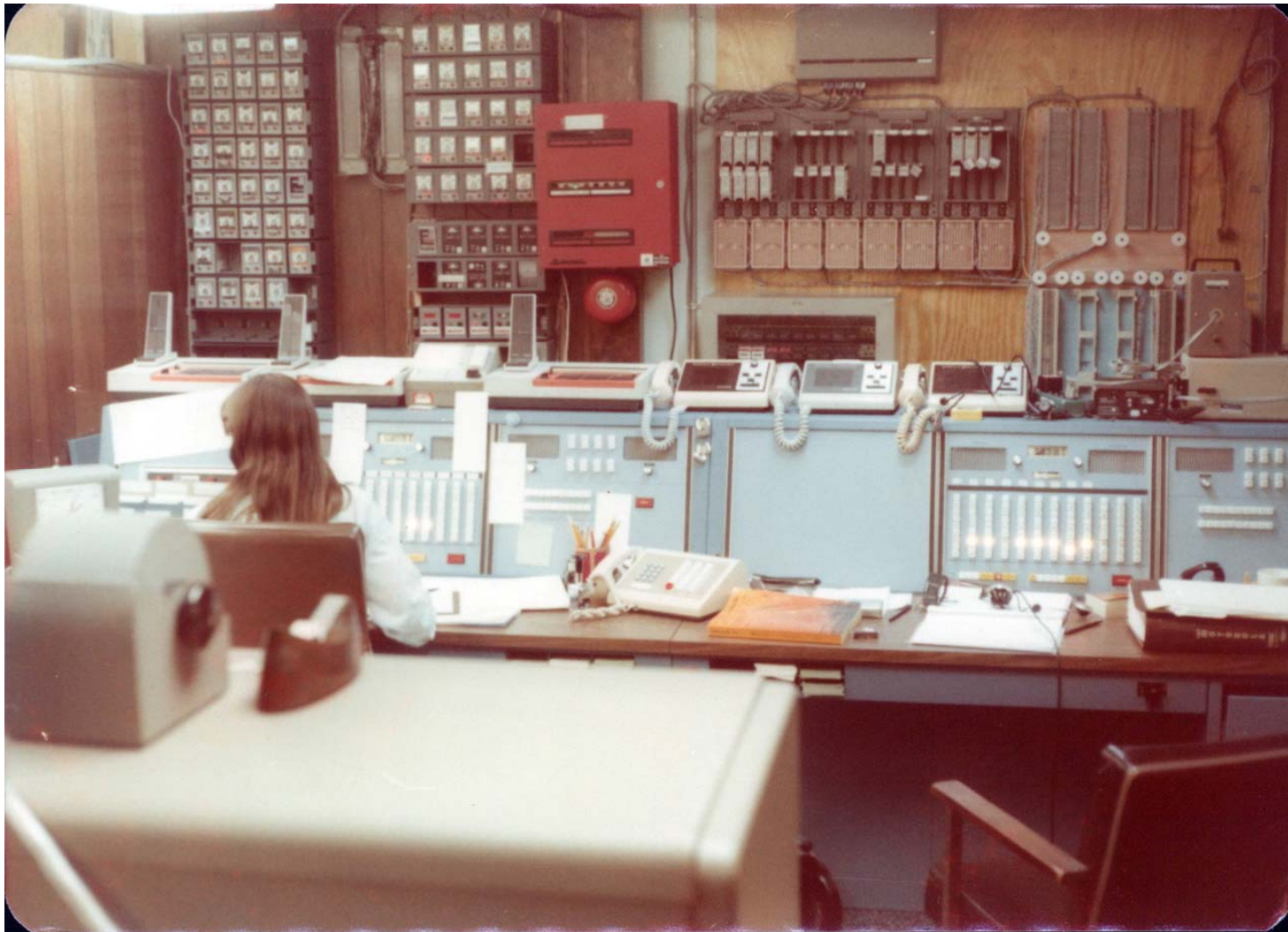
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Circa 1974



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Circa 1978



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Circa 1980



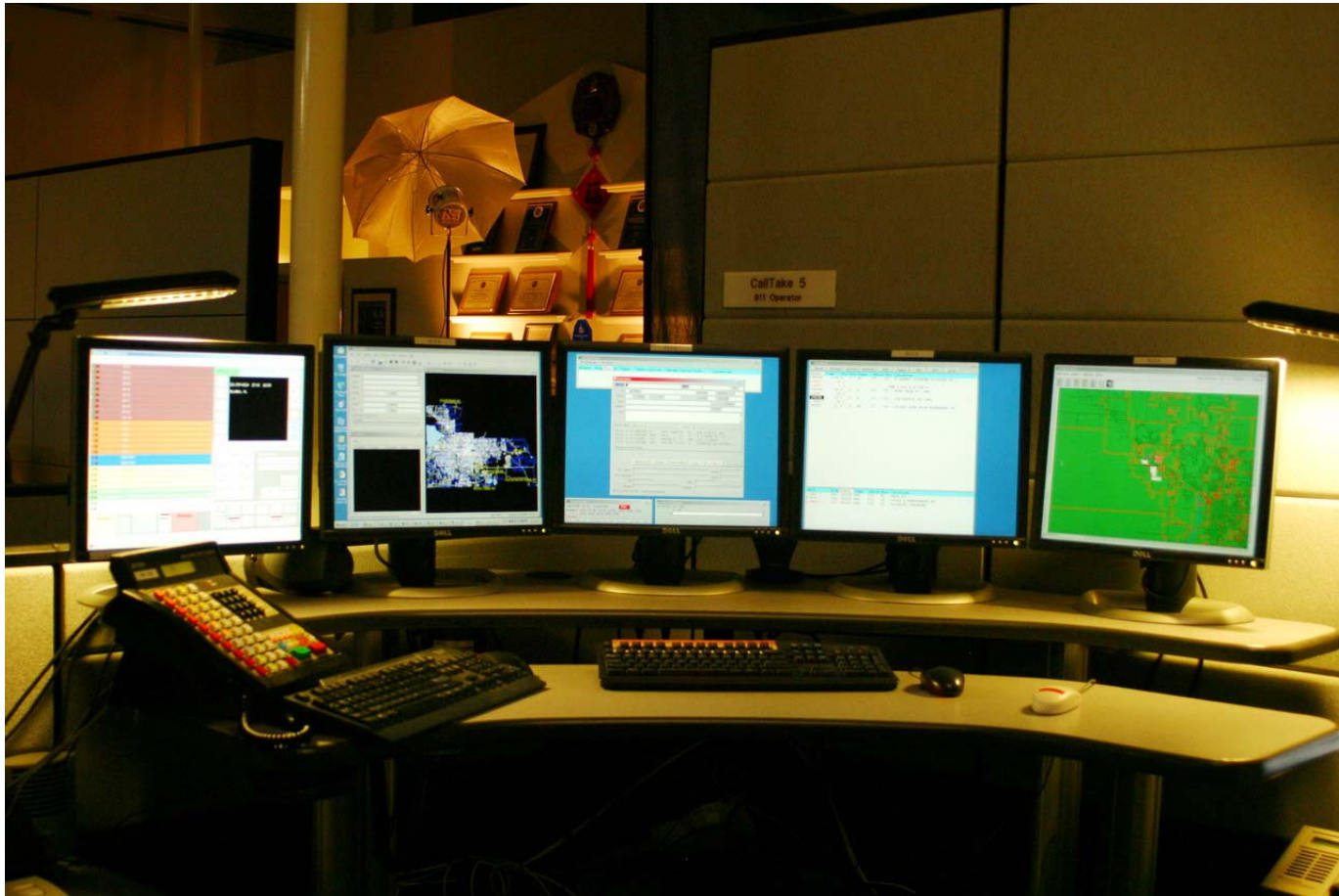
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Circa 1986



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Circa 2008



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How To Get Involved

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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



National Public Safety Telecommunications Council

NPSTC

Home Current Topics Organization Committees Events-Meetings Participate-Volunteer

20 years of progress 1997 – 2017

Public Safety Calendar

Connect with NPSTC

Broadband Directory

Next Meeting

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

In the News...

- SAVE THIS DATE: March 31, 2017, Full NPSTC Meeting in Person
- IACP Introduces National Criminal Justice Commission Act 2017
- SAFECOM/NCSWIC Maintaining and Upgrading Land Mobile Radio Presentation
- Andy Seybold's Public Safety Advocate - Five-Plus Years of FirstN
- NIST PSCR Publishes Public Safety Enhanced User Interface R&D
- Participate in NPSTC's New Internet of Things (IoT) Working Group
- Public Safety Innovation Accelerator Program (PSIAP) Grant Anno

Public Safety IOT Working Group

When Thu, April 6, 12:00 – 13:00

Description First Thursday of the month
12:00 noon to 1:00 p.m. Eastern Time Zone
Conference Line: 510-227-1018
Conference ID: 869-9040#
Screen Share: <https://Join.Me/NPSTCsupport1>
Barry Fraser, Chair

[more details»](#) [copy to my calendar»](#)

Public Safety Calendar

Click Here to Troubleshoot Public Safety Calendar Click Here to Download Calendar Instructions

Today | Apr 2 – 8, 2017

Sun 4/2 Mon 4/3 Tue 4/4 Wed 4/5 Thu 4/6 Fri 4/7 Sat 4/8

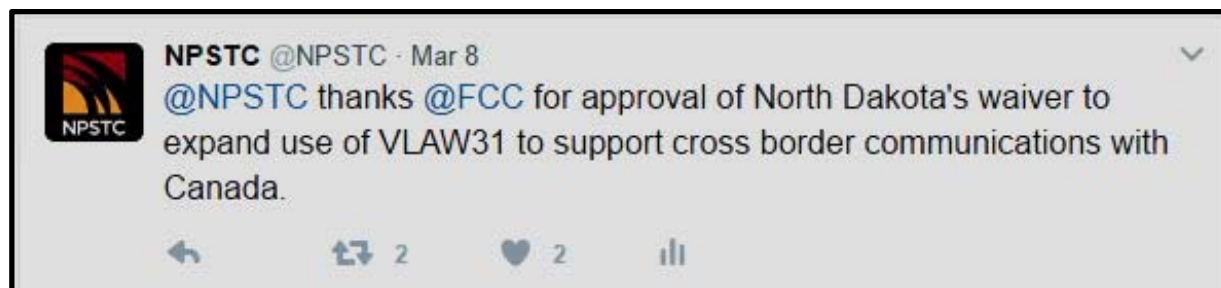
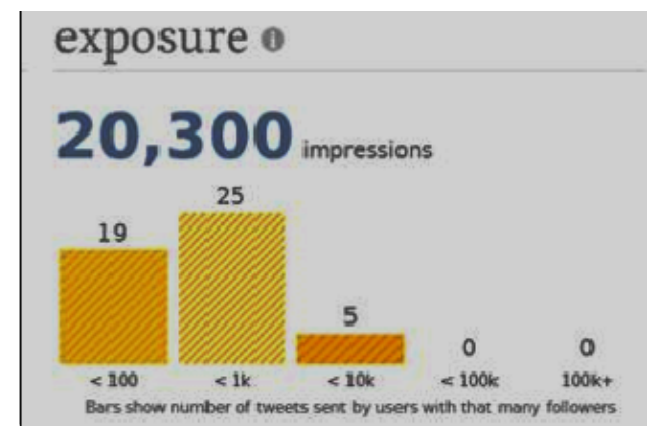
10:00					
11:00		11:00 – 12:00 Tentative ** NPSTC CSS		11:00 – 12:00 CANCELLED - EMS Working	
12:00		12:00 – 13:00 NPSTC-CITIG Cross Border	12:00 – 13:00 LMR to LTE Migration	12:00 – 13:00 Public Safety IOT Working	
13:00				13:00 – 14:00 Radio PCR	
14:00			14:00 – 15:00 700 MHz Air to Ground -		
15:00				15:00 – 16:00 Radio I/O Best Practices	
16:00					

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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

A screenshot of the NPSTC Participant Registration form. The form is titled "NPSTC Participant Registration" and features the NPSTC logo at the top left. The form includes several input fields: "Email Address", "First Name", "Last Name", and "Company". Below these fields is a section titled "Email Lists" with a list of checkboxes for various committees and working groups. The "Sign Up" button is located at the bottom right of the form.

NPSTC
National Public Safety
Telecommunications
Council

NPSTC Participant Registration

* Email Address
[Input Field]

* First Name
[Input Field]

* Last Name
[Input Field]

* Company
[Input Field]

Email Lists

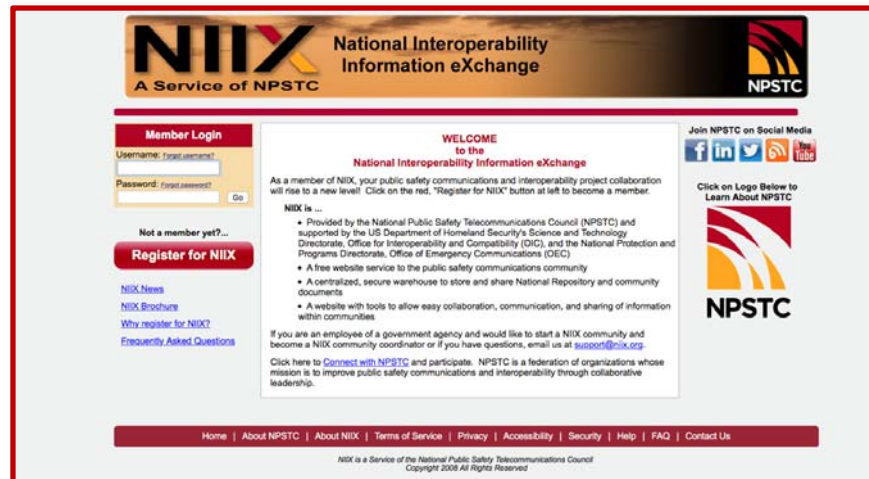
- 1.0 - Interoperability Committee
- 1.1 - Cross Border Working Group
- 1.2 - Emergency Medical Services (EMS) Working Group
- 1.3 - Radio IO Best Practices Working Group
- 2.0 - Spectrum Management Committee
- 2.1 - Interference Protection Working Group
- 3.0 - Technology & Broadband Committee
- 3.1 - Broadband Deployable Systems Working Group
- 3.2 - Broadband Emerging Technologies Working Group
- 3.3 - LMR LTE Integration & Interoperability Working Group
- 3.4 - Radio Programming & Compatibility Reqmts (Radio PCR) WG
- 3.5 - Unmanned Aircraft Systems and Robotics WG
- 3.6 - Video Technology Advisory Group
- 3.7 - Internet of Things (IoT) Working Group

Sign Up

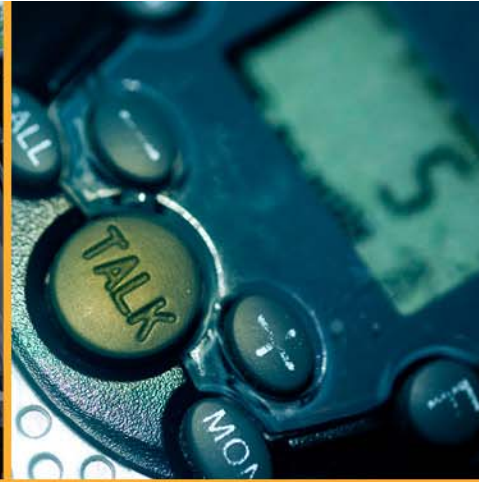
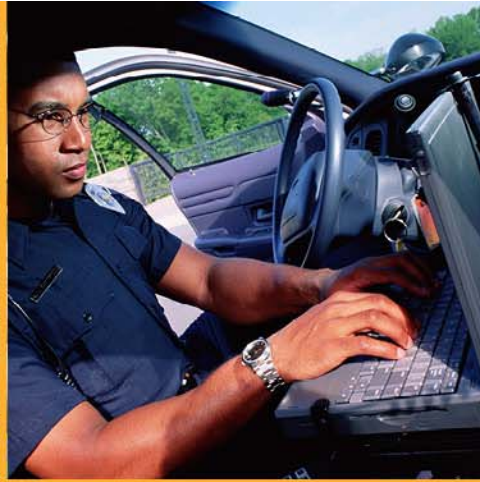
National Interoperability Exchange (NIIX)



- 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.



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Questions (and Answers)

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