UTAH COMMUNICATIONS AUTHORITY

Interoperability Strategic Plan

FINAL

March 8, 2024

UTAH COMMUNICATIONS AUTHORITY

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Executive Summary

The Utah Communications Authority (UCA) is an independent state agency charged with providing and maintaining a -public safety communications network on a statewide basis for the benefit and use of local, state, and federal agencies.

Since 2000, the UCA 800MHz system, which uses Motorola's SmartZone OmniLink trunked radio technology, has taken on an increasing portion of the state's public safety LMR communications and today supports more than 44,000 user radios. While the system has proven reliable over the years, Motorola has discontinued support for much of the existing 800 MHz trunked radio equipment and no longer manufactures some of the replacement parts needed for the system. UCA signed a contract with L3Harris Communications (L3H) in late June 2021 to provide a new Project 25 system. The goal of the project is to replace the existing system with:

- A digital radio system including infrastructure equipment, and software that complies with the latest applicable APCO Project 25 (P25) suite of standards, with at least the same levels of functionality as the existing system
- Radio system coverage within the geographical boundaries of the service area with mobile and portable on-street coverage, matching the coverage provided by the current system
- Replacement of equipment at the legacy 119 radio frequency (RF) sites on a site-by-site basis, and four (4) IP based Voice, Interoperability, Data and Access (VIDA) Core Pairs
- 25 new RF sites and an additional VIDA core to support the expansion
- A stable, reliable infrastructure radio environment for the next 10-15 years

Development of an Interoperability strategic plan is recognized and required by the "Utah Communications Authority Act", to facilitate planning for and administering LMR communications for the next several years. The plan should address critical coverage and interoperable communications with local, regional, federal, and other first responders throughout the State of Utah.

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The current Interoperability Strategic Plan was initially prepared in November 2019 and revised in May 2021. This strategic plan will update and replace the previous versions. The methodology employed to develop the strategic plan is illustrated in Figure ES-1.

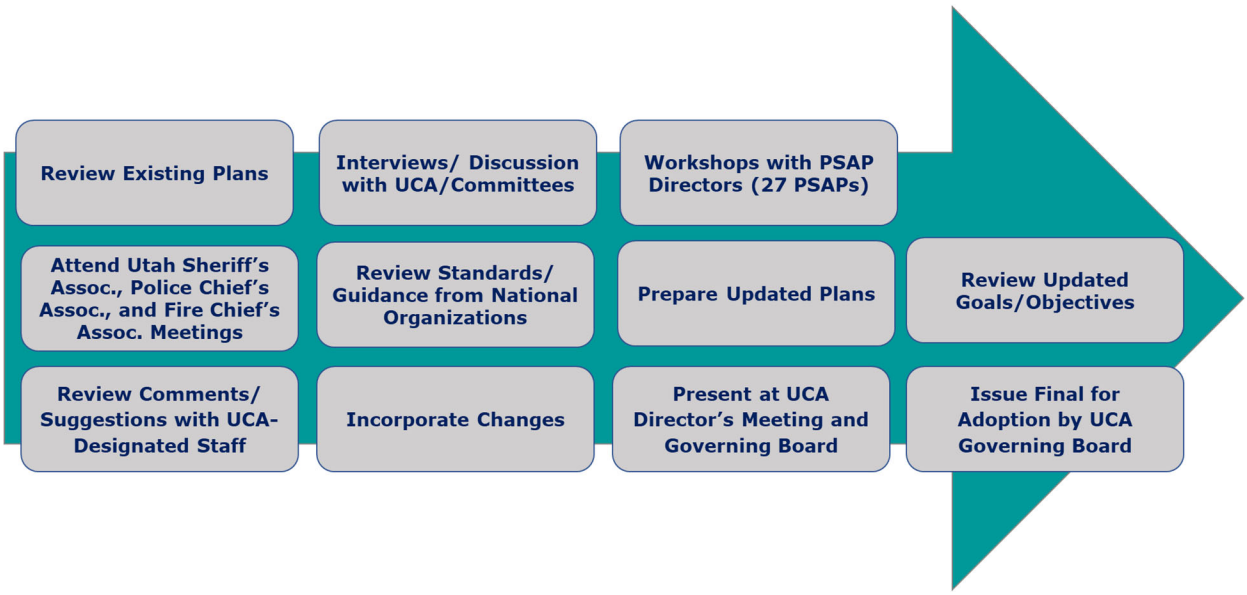

Figure ES-1: Project Methodology

A series of interviews was conducted to gather additional information from UCA stakeholders regarding their public safety communications operational and technical needs. Feedback gathered through these interviews helps to identify the ability of the current systems to meet stakeholders' needs, identify any unmet needs, and gather ideas for meeting those unmet needs.

Feedback from the interviews was captured and delivered in October 2023 in the *Initial Findings Memorandum* summarizing the analysis and recommendations focusing on the UCA LMR staffing, organizational structure, funding, interoperability requirements, and governance.

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The findings from the initial report were used as the foundation upon which to build this Interoperability Strategic Plan (Plan), and the development of the following recommendations:

1. Integrate the cybersecurity analysis as outlined in Utah's Statewide Communication Interoperability Plan (SCIP) Section 5.7 along with the DHS SAFECOM recommended Interoperability Continuum.

2. The Inter Radio Frequency (RF) Subsystem Interface (ISSI) interconnects different P25 core networks, regardless of frequency band or manufacturer, to allow roaming of user radios between networks via the P25 Common Air Interface (CAI). UCA should determine if the P25 system being deployed has sufficient ISSI connections to provide interoperability with neighboring state systems.

3. Radio training is critical for first responders for effective use of the technology. first responders must understand the protocols associated with radio use to effectively communicate with dispatchers. Best practices support first responders who are trained in radio use during regular preparedness training exercises.

4. The Tactical Interoperable Communications Plan (TICP) template link provided on the UCA website leads to an incomplete work in progress. This TICP should be completed and published. The TICP is intended to be used to clearly define the breadth and scope of interoperable assets available in the area; how those assets are shared and how their use is prioritized.

This plan identifies and prioritizes the strategic initiatives that UCA should pursue to achieve improvements in providing radio communications services that meet the needs of UCA first responders and other public safety users throughout the State of Utah.

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1. Overview

This Interoperability Strategic Plan (Plan) replaces the previous plan released in November 2019, and amended in May 2021. It outlines initiatives to improve communications capabilities throughout the State of Utah following a comprehensive strategic plan review. This Plan provides implementable actions that the Utah Communications Authority (UCA) can evaluate, embrace, and execute in the near-term and beyond, and develop budget requirements to address these initiatives for future budget cycles.

This document provides an overview of the UCA's governance structure in place today to provide interoperable LMR communication services and concludes with near-term and long-term recommendations.

1.1 Background

UCA was created by the "Utah Communications Authority Act" to provide administrative and financial support for statewide 911 emergency and public safety communication services. This Act established the method for creating a statewide public safety communications network for all state, city, county, and local governmental entities in Utah. This "Utah Communications Authority Act" also requires UCA to maintain the Utah statewide public safety communications network.

The UCA organizational structure includes the Administrative, Radio Network, 911, and Interoperability Divisions, with each cooperatively providing administrative management, technical oversight, and field support for the users of the UCA statewide systems. The public safety agencies, dispatchers, and many other partner agencies throughout the State depend on UCA to operate and maintain the UCA LMR systems, microwave backhaul, and data networks.

State, county, regional, and local public safety personnel heavily rely on mission critical LMR communication capability in order to effectively perform their duties during routine local incidents, major emergencies, and large scale events. During emergencies, the lives of citizens depend on public safety communications to have mission critical reliability. The State of Utah, in accordance with Utah Code Annotated (U.C.A.) Section 53-2a entitled Emergency Management Act, is required to prepare for, respond to, and recover from

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emergencies or disasters with the primary objectives to save lives, health, safety, property and the environment[1].

With these notable State charters in place UCA has the support required and capability of providing law enforcement, fire protection, and emergency support services throughout the State of Utah with a safe and reliable critical communication network. These UCA communications systems enhance and enable Utah's emergency management capabilities to mitigate, prepare for, respond to, and recover from natural, human-caused, and technological emergencies. To accomplish these actions UCA supports over 44,000 mobile and portable radios, 220 radio dispatch consoles across four regions, network connectivity to 63 offices and two data centers and maintains over 120 communications sites statewide. As with the other divisions, UCA Interoperability Division works with partners throughout the State, including local and federal agencies.

In accordance with Utah Code Ann. §63H-7a-206[2] UCA acknowledges the need to develop an updated Interop strategic plan to facilitate planning for and administering unified public safety communications for the next several years while addressing the critical coverage, redundancy, new technologies, and staffing constraints in the near term.

The process of strategic planning contributes greatly to UCA by laying the foundation for success by identifying key topics for making important tactical decisions. This Strategic Plan helps to build upon the solid culture already in place at UCA and strives to provide an indication of recommended areas of focus over the near term and into the future.

Mission-critical communications are defined to embody a varied range of solutions that includes a mix of devices, equipment, systems, solutions, and infrastructure all designed to enable first responders and others to communicate quickly and effectively in the field. To assist the National Institute of Standards and Technology's (NIST) Public Safety Communications Research (PSCR) Usability Team has investigated the varied settings that first responders work in, their related experiences with incident response, the requirements for communication technology and the problems encountered while collaborating over the communications systems in place. These findings and recommendations contribute to the foundation from which this Strategic Plan is constructed.

[1] State-of-Utah-EOP-Basic-Plan-Final-2016-2020.pdf
[2] Utah Code Section 63H-7a-206

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The importance of land mobile radio (LMR) operability and interoperability, as related to the public safety community UCA serves makes it vital that administrators and public safety agencies comprehensively consider best practices in all aspects of project planning. This includes the creation of partnerships and authority, identifying stakeholders, assessing technology, crafting, and updating policies, and establishing operations and maintenance (O&M) requirements that may arise in a shared resources environment[3].

As identified by the approved SAFECOM Statewide Communications Interoperability Planning (SCIP) Methodology this communications interoperability provides, "The ability of public safety agencies to talk across disciplines and jurisdictions via radio communications systems, exchanging voice and/or data with one another on demand, in real time, when needed, and as authorized." At present through its Interoperability Division, UCA works diligently to promote a statewide voice and data network that delivers effective critical interoperable communications that are fiscally sustainable. This effort to enhance and promote interoperable emergency communications involves stakeholders at the State, Local, Federal, and Tribal levels.

The Project 25 Technology Interest Group (PTIG) defines "Public Safety" as; the collection of Federal, State, Local and Tribal agencies tasked with keeping the public safe. With that perception it becomes obvious that the communication needs of these diverse and unique individual agencies are varied and can be quite unique when compared to the communication needs of the general public. In fact, depending on the respective missions, roles and operating environments, the communication needs of one Public Safety agency can even be quite different than the needs of another Public Safety agency[4]. UCA handles these tasks well in providing service for 465 unique customer agencies.

1.2 Methodology

A diverse group of multi-disciplined subject matter experts were brought in to collect and analyze available information. This approach utilized the data previously gathered by the UCA team to obtain baseline information necessary for assessing UCA's operations,

[3] Best Practices for Planning and Implementation of P25 Inter-RF Subsystem Interface (ISSI) and Console Subsystem Interface (CSSI) (project25.org)
[4] Is Project 25 "Public Safety Grade"? download.jsp (npstc.org)

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performance goals, technology needs, and staffing requirements to determine proactive strategic goals.

The P25 Radio and Interoperability Division are uniquely qualified, working for the past six years to assist UCA in procurement and implementation of the new statewide P25 radio system, making them familiar with UCA and the State of Utah.

Based on interviews and discussions with stakeholders across the State, the team evaluated the current status of the strategic goals and objectives outlined in the 2021 Interoperability Strategic Plan, identified objectives that have been achieved and gaps that remain to detect requirements for new strategic goals and objectives. Following extensive input and multiple review cycles, the outcome of the project will be the release of the updated 2023 Strategic Plan for the Interoperability Division.

The methodology used to develop this Plan comprised several steps to support effective analysis, to provide information and to guide UCA recommendations, including the following tasks:

1. A Project Initiation Meeting was conducted with the UCA's Project Manager and key stakeholders identified by the UCA to establish a mutual understanding of the project's background, goals, objectives, concerns, and vision.

2. A Request for Information (RFI) was presented to gather pertinent technical information about the UCA’s existing systems and processes, categorized into the following areas:

    - Previous Communications System Studies
    - Organizational Structure, Agency Agreements, and Stakeholders
    - Funding
    - Processes and Procedures
    - Current System Technology
    - Coverage Improvements Information
    - System Performance
    - Backhaul / Transport System Information
    - Public Safety Answering Point (PSAP) / Dispatch System Information
    - Subscriber Equipment Inventory Information

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3. Conducted onsite stakeholder interviews with representatives from the Public Safety Advisory and the PSAP Advisory Committees and other stakeholders.

4. Supplied the *Initial Findings Memorandum* summarizing the analysis and initial findings focusing on the UCA LMR staffing, organizational structure, funding, interoperability requirements, and governance.

5. The UCA team reviewed feedback compiled and received from each of the stakeholders.

In addition, examination engaged in iterative and ongoing discussions with the UCA project team on a regular basis during the analysis and development of this Plan.

1.3 Interoperability Strategic Plan

UCA is responsible for maintaining and expanding the cooperative public safety radio communications network infrastructure, providing for the continuity of public safety communications throughout Utah along with cybersecurity and data management. This makes possible the ability to assist partner agencies in overcoming interoperability challenges.

Updating the Statewide Communications Interoperability Plan (SCIP) makes certain that UCA can continue to facilitate regional and statewide collaboration in the development and adoption of common technology standards, Standard Operating Procedures (SOP), purchasing guidance, and implementation strategy. This includes outreach and information sharing, a continuing education plan to share information with stakeholders regarding P25, FirstNet, and other emerging technologies to assist public safety professionals in executing emergency response duties.

This Plan incorporates analysis and findings to support near-term strategies for the UCA LMR systems interoperability. This Plan structures the content in each of the following categories:

- Overview of Existing Systems
    - VHF System
    - The Statewide P25 Trunked System

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- CAD Systems
- 911 Systems
- Dispatchers

- Interoperability in Utah
  - Intrastate Interoperability
  - Interstate Interoperability
  - The Tactical Interoperable Communications Plan (TICP)
  - Training for Interoperability
  - FirstNet/LTE Evaluation and Implementation
- UCA Action Plan
  - Interoperable Solutions
  - Cybersecurity Initiatives
  - Key Initiatives
- Glossary of Acronyms

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2. Overview of Existing Systems

2.1 VHF System

The UCA supported VHF infrastructure (historically known as the Statewide and/or SRS systems) provides coverage from 53 radio towers and connectivity to 27 PSAPs in Utah, supporting an estimated 5,000 to 7,000 mobile and portable radio users, primarily in the Southeastern portion of the State. The majority of all Federal land management agencies also utilize the VHF public safety band giving this system multiple uses. The USFS and BLM maintain individual VHF systems for the most part. Some law enforcement officers may utilize UCA VHF or 800 systems and infrastructure, but by and large, they use their own disparate systems.

In addition to this UCA owned VHF network, there are numerous independent county owned VHF networks. These autonomous operators can and have caused some confusion for users when it comes to system maintenance. As a matter of statutory responsibility, UCA maintains its Statewide VHF network, but does not maintain these local independent county owned VHF systems.

Utilizing the Project 25 standard delivers capability that may not be available on this Statewide VHF network system at this time. Additionally, the US Department of Agriculture Forest Service (USFS) has also mandated the purchase of P25 compliant radio VHF equipment[5]. A transition to P25 VHF could enhance UCA interoperability with Federal agencies that fight wilderness wildfires.

2.2 The Statewide P25 Trunked System

A work in progress, UCA's Statewide Project 25 (P25) radios system will equip 144 radio towers with a suite of digital radio features to provide improved coverage and quality of services for radio users. The new L3Harris Voice, Interoperability, Data and Access (VIDA) services platform integrates critical services, converged communications, and integrated applications into a scalable, feature-rich communications solution to meet diverse Public Safety challenges. This P25 Phase 2 trunked solution utilizes a suite of standards that specify P25 requirements and standards for the wireless digital Common Air Interface (CAI) designed for first responders. The P25 Phase 2 solution brings added

[5] P25 Digital Radios (nifc.gov)

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system capacity and backward capability; P25 Phase 2 radios and infrastructure must support P25 Phase 1. The P25 Standard provides for hardware and software systems that have been exhaustively tested, and are rugged, dependable, and resilient platforms first responders can rely upon for their mission critical communication needs.

The P25 system delivers clear digital audio using the AMBE+2 vocoder, advanced emergency call options, text messaging, strong encryption options, increased traffic carrying capability, and spectrum efficiency. It has added features, and functionality, and 25 more tower site locations, to enhance the RF coverage footprint and provide additional capacity. As a service to public safety operators Utah stays current with this P25 radio system that utilizes a suite of standards to make certain digital two-way radio products from various vendors can interoperate with each other. The Utah Communications Authority has tested radios, developed, and published an approved radio list. This service to the UCA system users authorizes specific approved radio manufacturer models that have been evaluated and proven capable of operating upon this UCA provided P25 radio system.

2.3 CAD Systems

Computer Aided Dispatch (CAD) is a technology used in PSAPs and Dispatch Centers to assign and track emergency responder resources to specific calls for service. CAD systems are critical because they are often the very first point of storage and transmittal to responders of key information collected during interactions with members of the public. They facilitate quick and accurate incident handling and dispatching of emergency services, and efficiently route information from the caller to the appropriate emergency responders, reducing response times and saving lives.

In use for more than 40 years, CAD is inclusive of many systems and requires layers of interoperability. The typical functions of a CAD system include resource management, call taking, location verification, dispatching, unit status management, and call disposition. CAD systems can also support responder safety through knowledge of prior calls for service (incident history), critical mapping capabilities, and interfaces with state and national databases, mobile data terminals, and neighboring CAD systems.

Utah's PSAPs have chosen a variety of CAD vendors, mirroring their counterparts in other states. Understanding this, efforts within the industry have been underway since the mid-1990s to create a CAD-to-CAD interface standard. At this point in the CAD-to-CAD

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evolution, the industry seems to be settling on the National Information Exchange Model (NIEM) and the Emergency Incident Data Object (EIDO) Standard as the standardized specification for exchanging emergency incident information between different agencies. These methods would allow PSAPs with disparate CADs to connect them together for the purposes of fostering awareness between PSAPs, enabling mutual aid, automatic aid and boundary drop agreements, and providing backup and continuity of operations to and for each other. In the context of an agreement to handle overflow 9-1-1 calls, for example, a properly functioning CAD-to-CAD connection can allow the receiving PSAP to interrogate the caller and place a call for service into the target jurisdiction's CAD queue.

Interest in creating these interconnections is evident in Utah. Wasatch and Summit Counties are just one example of a growing trend. In order for the full promise of NG911 to be realized, ubiquitous CAD-to-CAD connectivity will be an expected capability in Utah.

UCA has the authority to assist PSAPs in the state to connect their CADs together. Utah Code §63H-7a-302(h) states that the UCA's 911 Division shall:

"coordinate the development of an interoperable computer aided dispatch platform:
(i) for public safety answering points; and
(ii) where needed, to assist public safety answering points with the creation or integration of the interoperable computer aided dispatch system."

UCA has addressed the importance of the use of a CAD-to-CAD in the Statewide CAD-to-CAD Call handling and 911 Call Transfer Protocol, as approved by the UCA Governing Board.

2.4 911 Systems

In the 2018 911 Strategic Plan, last amended in June of 2022, the implementation of Next-Generation 911 (NG911) was described as a work in progress, with the statement that "*Utah is currently transitioning from its legacy ESInet*." The "legacy ESInet" referred to was a transitional implementation that allowed the installation of IP terminating Customer Premise Equipment (CPE) at Utah PSAPs, allowing the use of RFAI to carry analog calls (routed through traditional E911 methodology) to the new IP-equipped CPE at the PSAPs.

The transition to i3 NG911 has been completed. All of Utah's PSAPs are live on the ESInet, and calls are being routed based upon the location of the caller when the

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originating service provider for a given call provides a location for the caller within the time window required, before a call routing decision must be made carrier is providing location information with the call. For the balance of the calls, where the OSP does not respond within the established time window, routing is determined based on wireless cell sector vs. the location of the caller's device.

The ESInet and its attendant NG911 core services are provided under contract as a Software as a Service (SAAS) procurement, and the vendor has been pursuing these last issues as a part of their contract.

Additionally, the Federal Communications Commission has noticed that there have been problems with entities (such as the State of Utah) getting carriers to connect to the ESInet and deliver calls in a format that enables NG911 to work correctly. The FCC's Notice of Proposed Rulemaking #23-47, Docket 21-479, released on June 9, 2023, if adopted as written will require wireline, voice over IP and telecommunications relay service providers to deliver "*911 calls, along with relevant location information, in the requested IP-based format". These providers would be considered presumptively responsible for the costs associated with the delivery to the designated point(s).*" The last part of the sentence *in the requested IP-based format* should assist the UCA and the state's SAAS provider in getting the last of the non-compliant carriers delivering i3-compliant data with their 9-1-1 calls, and the final sentence makes it clear that the costs for the connection will be on the carrier, not on the 911 Authority.

FE recommends that UCA should monitor the progress of the NPRM, and presuming these provisions survive in the final, adopted version, should follow up with the offending carriers to finish the NG911 transition for the entire State.

2.5 Dispatchers

Interoperability is the ability of emergency response providers and relevant government officials to communicate across jurisdictions, disciplines, and levels of government as needed and as authorized[6]. Reliable, timely communications among public safety responders and citizens are critical to carrying out public safety missions effectively and, in many cases, saving lives. This can extend to other governmental agencies and non-traditional public safety agencies the UCA partners with for reciprocal aid and cooperation

[6] National Emergency Communications Plan (cisa.gov)

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when responding to planned and unplanned events. These partnerships rely upon the UCA LMR system to communicate with local and state users.

Training and technology are the most critical pieces of the puzzle to ensure that robust and reliable interoperable communications are not just possible but are routine. Unfortunately, the most perishable skills for dispatchers are those things that do not happen very often. Low probability, high-impact events such as an escalating regional incident that requires the use of console patching or requires dispatchers to know the particular wide-area radio resource already programmed and installed, that is planned for exactly that type of incident so that it gets used by the field practitioners and covered by a trained dispatcher providing coordination services to those practitioners. UCA is positioned by the ownership of the statewide P25 project and their management of statewide VHF resources to develop and help provide that training to Utah dispatchers.

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3. Radio User Training

3.1 Training

It is crucial to first responders that they receive proper training on how to use their assigned equipment. It is also crucial that technicians receive the appropriate training regarding the maintenance of such equipment to provide a cost-effective way of keeping it in good condition.

A well-defined training process, including UCA fleet mapping, will help maintain exact standards for the first responders and increased proficiency contributes to their safety on the job. From the stakeholder interviews, it is evident that both first responders and technicians believe training needs increased attention.

3.1.1 First Responder Training

Radio training is critical for first responders for effective use of the technology. First responders must understand the protocols associated with radio use to effectively communicate with dispatchers, stay in contact with nearby units, and evaluate mutual aid support for public safety. Training may occur in several ways, including in-person lectures, online video tutorials, and hands-on sessions. Additionally, first responders engage in drills to assess the understanding and use of the radio system. First responders must also refresh these skills regularly to maintain proficiency in their radio skills.

Training is also a key component for the local agency to consider during their budgeting process. The UCA Interoperability Division website provides a wealth of information in support of promoting an understanding of the nature and availability of shared interoperable communications channels. It remains a local agency initiative to examine the processes, policy decisions and procedures in place while confirming that all necessary education and exercises are provided to their users. Through an ongoing training focus the local agency can improve the overall effectiveness of its communication infrastructure by reducing unnecessary response delays and unnecessary costs.

Best practices support first responders who are trained in radio use during regular preparedness training exercises. Intentional training maneuvers can serve multiple purposes from Emergency Preparedness to Interop and Cyber Awareness. These should

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be scheduled and include coordinated tabletop exercises designed to enhance end-user abilities.

Hands-on practice during these exercises equips stakeholders with the knowledge of how to operate effectively in an emergency. The Department of Homeland Security's SAFECOM Program provides excellent resources to develop the skills and expertise of UCA and stakeholder personnel. It provides guidelines for developing responsibilities, roles, and functions within the Communications Unit. The ICS Resource Center[7] of the Federal Emergency Management Agency (FEMA) Emergency Management Institute (EMI) includes the self-paced briefings from the National Incident Management System (NIMS) Communications Unit Training[8].

First responders must thoroughly understand radio use and protocol. A proper radio training program administered by those specializing in this area is key to assuring this understanding. Training to include procedures, protocols, best-practice techniques, and role-playing scenarios to analyze preparedness for effective communication is recommended. First Responders should receive periodic refresher training, from their agencies, to maintain proficiency in radio use and stay current with any protocols or new technology changes.

3.2 Organizational Assessment and Recommendations

The following are recommendations for UCA LMR staffing, organizational structure, and training:

- Increased table-top radio exercises around the State. These should be hands-on local events that maximize local and state talk group resources.
- Evaluation of staffing level needs as new systems are brought online with reassessment of the promotions and compensation levels designed to improve retention.

[7] ICS Resource Center (fema.gov)

[8] Communications Unit Training Resources | CISA

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- UCA to work to improve hiring campaigns, offer a defined career path, and develop a formal training plan to help with successfully recruiting, training, and retaining qualified technicians.

- Expand its social media campaign to appeal to civilian positions.

- Identify an outsourcing agency to provide interim support for UCA vacancies within the existing budget.

- UCA to revisit, update, and repackage the online training programs used primarily for initial training of first responders. This includes integrating a refresh of the radio training curriculum to include curricula on radio features, functions, and proper use.

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4. Interoperability in Utah

Interoperability is defined as the ability for public safety agencies throughout the state to communicate during incidents that require the response of multiple departments or agencies. This assessment analyzed the radio interoperability capabilities for the conceptual design in reference to CISA's SAFECOM program. Figure 1 illustrates the "five lanes" of the SAFECOM *Interoperability Continuum* as a tool to assist emergency response agencies and policy makers to plan and implement interoperability solutions.

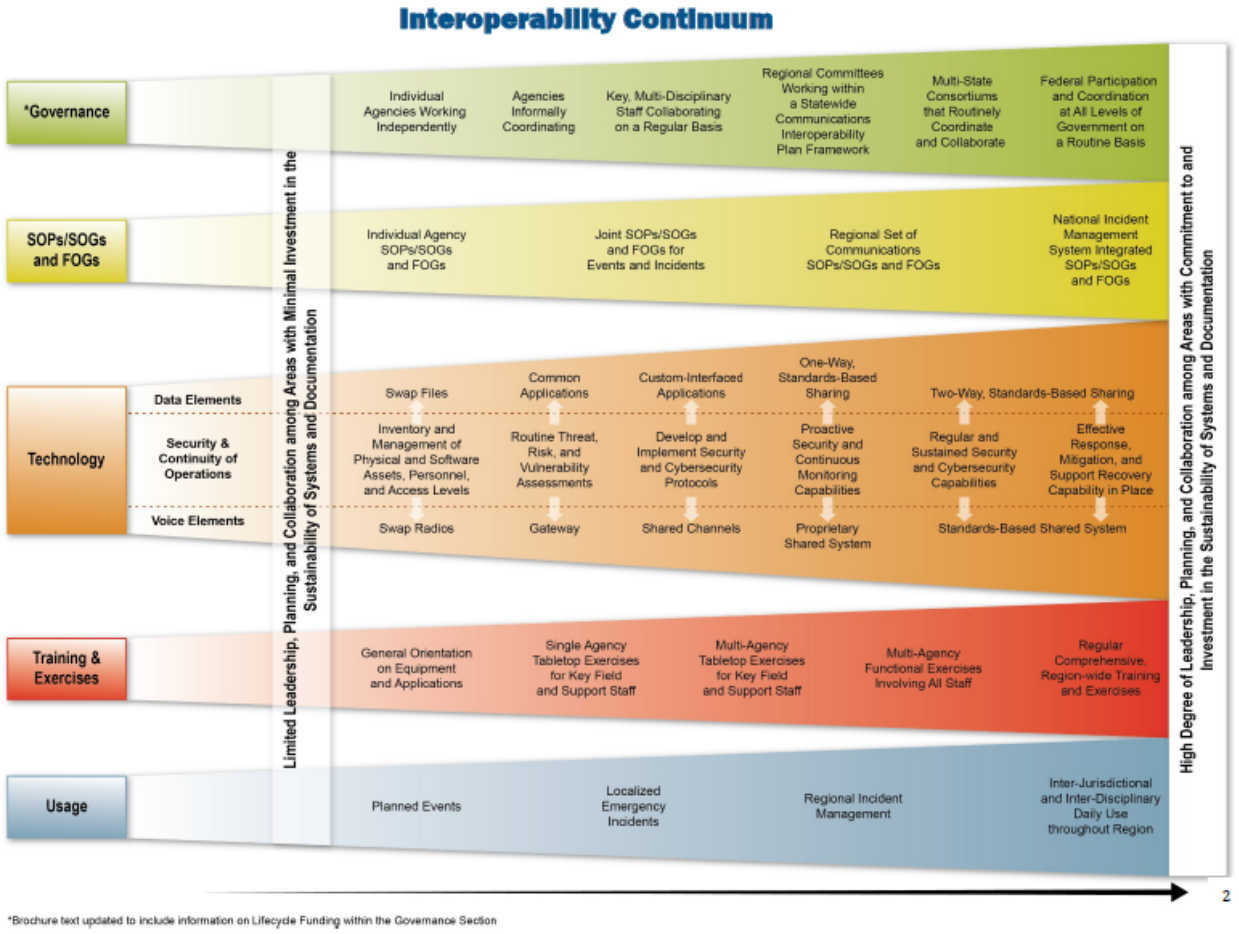

Figure 1 – DHS-OEC Interoperability Continuum

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The orange shaded area in Figure 1 depicts Technology as a key enabler of interoperability. While it is not the sole driver of an optimal solution, these Technology Voice Elements are focal points of this Plan. Moving from left to right, the methods become more advanced and effective in their ability to address interoperability requirements, and rely more on technology to increase the ease of interoperability, as described in SAFECOM's June 2021 brochure[9]:

- **Swap Radios**. While expensive and human-resource intensive, swapping radios or maintaining a cache of standby radios is a reliable but least sophisticated solution to achieve interoperability.

- **Gateway**. Gateways retransmit across multiple frequencies and talk groups, and also allow access to phone and cellular systems. Gateways provide an interim interoperability solution as agencies move toward shared systems. However, gateways encumber spectrum because each participating agency must use at least one channel in each band per common talk path and because they are tailored for communications within the geographic coverage area common to all participating systems. A gateway may also create latency and other technical obstacles between push-to-talk and traffic reception which can be adjusted to decrease impact on operations.

- **Shared Channels**. Interoperability is enhanced when agencies share a common frequency, talk group, or air interface (analog or digital). This is in place from UCA as agencies use the developed interoperability talk groups for each region when providing or requesting mutual aid from outside agencies. A clear understanding of the nature and availability of interoperable communications channels in each area is essential to prevent congestion, and to assure that shared channels and/or talk groups can be assigned quickly and to appropriate end users when needed. The training identified in section in 3.1.1 can be used to provide public safety agencies with the necessary tools.

- **Proprietary Shared Systems and Standards-Based Shared Systems**. LTE Broadband combined with Regional shared systems are the optimal solution for interoperability. While proprietary systems limit the user's choice of product with regard to manufacturer and competitive procurement, standards-based shared

[9] https://www.cisa.gov/sites/default/files/publications/21_0615_cisa_safecom_interoperability_continuum_brochure_final.pdf

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systems promote competitive procurement and a wide selection of products to meet specific user needs. An optimal technology solution can be provided with proper talk group architecture and capacity planning, and both operability and interoperability are addressed by system design.

Project 25 (P25) remains the predominant standard for public safety in North America. Most U.S. Federal Government and state grants require use of P25 based equipment. The P25 standard supports both conventional and trunked operations, with over 1,800 conventional systems and over 1,100 trunked systems in operation throughout the United States.

At the time of this Plan, there are 12 P25 Conventional[10] systems and 9 P25 Trunked[11] systems in the State of Utah, as reported by the P25 Technology Interest Group (PTIG). There are also many other P25 systems that could be connected for interoperability in adjacent states. Therefore, the use of P25 systems and subscribers provides the highest likelihood of achieving interoperability with other public safety users. P25 is a mature and robust standard, providing detailed specifications with a well-defined interface path for connecting with other P25 radio systems, even with potentially disparate manufacturers.

The new system maintains local and regional interoperability with public safety agencies, while striving to improve interoperability with other county, state, federal and tribal agencies. Operating on a P25 system increases interoperability opportunities with other P25 users in the region. It is important to note that interoperability with other P25 systems may require additional system hardware and/or software, agreements, planning, and programming on the foreign system and subscriber units, but the potential for increased interoperability is there. With multi-band radios (VHF, UHF, and 7/800 MHz), UCA can retain existing interoperability with agencies on VHF but also program other UHF and 7/800 MHz channels for mutual aid purposes.

Interface Requirements

The P25 ISSI and Console Subsystem Interface (CSSI) provide the ability to interconnect radio and console subsystems, even when their manufacturers and software versions differ. This provides public safety agencies the opportunity to link their networks together to create a “system of systems” architecture. The ISSI could allow for interconnection of

[10] https://www.project25.org/images/stories/ptig/P25_Conventional_Systems_List_Final_REV02_March_2020_200324.pdf
[11] https://www.project25.org/images/stories/ptig/P25_Trunking_Systems_Update_November_2021_REV_16_X.pdf

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the UCA system to other P25 systems with necessary hardware, software, and programming on both ends. In addition to the existing ISSI connection, interoperability with the UCA and other P25 systems would require backhaul connectivity and ISSI hardware, software, and licenses on both systems, with ISSI talk groups programmed on the radio systems and subscriber units.

It is important to note that ISSI provides the entire set of P25 features and the following tools that can be supported between UCA and other ISSI interconnected system(s):

1. Automatic (hands-free) roaming to both systems.
2. Confirmed group call.
3. Unconfirmed group call
4. Announcement group call
5. Emergency group call
6. Priority call (with and without preemption)
7. Advanced Encryption Standard (AES) encryption
8. Call alert
9. Emergency alarm
10. Emergency clear
11. Unit ID

Although not listed in the Interoperability Continuum, a dispatcher can create a “patch” between the channels used by different agencies so that transmissions on either channel are heard on both channels. Dispatchers typically create console patches for short durations and for specific events, but it can lead to operational confusion because of infrequent use. Console patching is also inefficient in that it uses the channels of all agencies involved. Nevertheless, the conceptual design includes interoperability gateways at each communications center, allowing interfaces to 700/800 MHz P25 trunking, VHF P25 Conventional, and VHF analog conventional channels. SAFECOM offers comprehensive information on topics relevant to emergency response

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communications and features best practices that have evolved from real-world situations[12].

4.1 Intrastate Interoperability

The urgency for pre-planned interagency sharing is carried out alongside the SAFECOM Strategic Plan[13] and the National Emergency Communications Plan (NECP)[9]. This urgency is documented again in planning for and implementing the security of the connections between different wireless communications modes or mediums. The mission of maintaining and improving emergency communications capabilities for emergency responders that serves as the nation's roadmap for ensuring emergency communications interoperability at all levels of government[14] is complex. The standards that govern Interworking (LMR-LTE) continue to evolve and any agency planning to implement this technology should make certain the solution selected adheres to open standards. This includes both the suite of P25 published American National Standard Institute (ANSI) accredited technical standards and specifications as well as the European Telecommunications Standards Institute (ETSI) published third generation partnership project (3GPP) group of standards which develop protocols for mobile telecommunications, the standards for long-term evolution (LTE).

Utah's Statewide Communication Interoperability Plan (SCIP) should receive an update after P25 system goes live, to continue the ongoing effort toward cooperative, cost-effective Statewide operational and technological coordination for voice and data communications among all public safety interests. This provides strategic direction and alignment for those responsible for interoperable and emergency communications at the State, regional, local, and tribal levels.

While recently done as part of the new fleet map, a periodic review augmenting this effort should be conducted. This exercise will identify areas of need to continue to increase capabilities and coordination. The P25 network paired with the VHF statewide radio system provides ample opportunities for all public safety entities (local, state, county) that will be UCA customers at the time of cutover to have interoperable communications.

[12] SAFECOM | CISA
[13] ICS Resource Center (fema.gov)
[14] National Emergency Communications Plan | CISA

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There are commercial options available to bridge different radio communications frequency bands and modes. This initiative is evident as the State of Utah continues to benchmark the state solution against the SAFECOM Continuum. Each connection provides an opportunity to further develop communication resources, policies, procedures, training opportunities, and exercises for Utah's first responders.

There remain interoperability shortcomings within the State of Utah. Not every VHF mobile or portable radio can utilize the P25 system. Interoperability is emphasized in the pre-planned interagency sharing recommendations from SAFECOM and NECP, however, practicality tempers this ideal solution on a case-by-case basis when all member agencies cannot afford multi-band radios. PSAP Consoles are utilized currently to interconnect the systems to assure interoperability between conventional and trunked systems.

4.2 Interstate Interoperability

Adjacent states and Tribal authorities require special consideration including a well-defined memorandum of understanding (MOU) for each entity involved. As with interoperability within the state, interaction with other agencies outside of the state incorporates attention to public safety mutual aid as it relates to which agencies need to communicate with another agency. This plan should recognize how cooperative service can benefit all parties involved and guide how communication links are established and maintained, perhaps over disparate radio solutions.

LTE is recognized as a method of augmenting public safety systems with an ability to fill a role that no other solution could. LTE can provide a means for better in-building penetration and in connecting disparate radio networks. The canyon effect within city centers could represent a use case where a Broadband LTE talk group could be utilized as a street-level, parking deck and in-building coverage enhancements.

Broadband LTE could provide seamless tripod connectivity while relieving third parties of needing to share keys. In this seamless tripod connectivity example, if Agency A needs to interact with Agency B, a Broadband LTE talk group can be used to bridge these independent LMR systems. Pulled together in a single cooperative venture, through a single secure LTE enabled talk group, each Agency maintains their own encryption scheme while this mutual aid LTE talk group bridges the two distinct systems together. This single secure LTE enabled talk group can also provide a method for the local PSAPs

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to also join the conversation, as required. Innovative concepts like these will allow members of the public safety community to gather and share information with counterparts outside of their service area locations securely and reliably.

There are still interoperability deficiencies with surrounding states, tribal authorities and Federal agencies that must be addressed.

4.3 Tactical Interoperable Communications Plan (TICP)

The Tactical Interoperable Communications Plan (TICP) is designed to allow urban areas and regions in the State of Utah to document interoperable communications governance structures, technology assets, and usage policies and procedures. The TICP is intended to be used to clearly define the breadth and scope of interoperable assets available in the area; how those assets are shared and how their use is prioritized; and the steps individual agencies should follow to request, activate, use, and deactivate each asset. The TICP Template provides a description of the standard structure of a TICP and the relevant sections to be populated according to the unique needs of an urban area, county, region, state/territory, tribe, or Federal department/agency[15]. The TICP Template link provided on the UCA website leads to an incomplete work in progress. This TICP should be completed and published.

4.4 Training for Interoperability

Interoperability is crucial to public safety agencies. UCA has built a foundation for support in this area. Ultimately the responsibility lies with the local agency policy to make certain its radio user personnel receive proper training on how to properly use its assigned equipment on the UCA LMR systems and with all of their interoperable partners. Agencies should encourage their administration to engage in more training opportunities. This well-defined training process will help maintain high standards for the first responders and ultimately contribute to their safety on the job. From stakeholder interviews, it is evident that both first responders and technicians believe training needs increased attention.

[15] Tactical Interoperability Communications Plan (TICP) (uca911.org)

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4.5 FirstNet/LTE Evaluation and Implementation

On Tuesday, November 6th, 2017 then Governor Herbert announced that Utah had now opted in to using FirstNet for its first responders, making Utah the 31st state and territory to opt into this wireless broadband network. The FirstNet First Responder Network[16] is built by an independent agency within the federal government with AT&T in a public-private partnership with the First Responder Network Authority (FirstNet Authority) to provide the fundamental characteristics, such as first responder priority, a hardened, redundant network, being sustainable in the event of a natural or human-caused disaster as well as a means by which interoperability is built.

Supporting Utah and CISA Region VIII the Statewide Interoperability Coordinator (SWIC) acts as a single point of contact within the state to promote the efficient use of UCA LMR systems along with better program management of essential statewide, regional, and local systems[17]. In this role, the SWIC leverages real-world experience working in partnership with disparate agencies to provide critical input on the interoperable communications landscape and understand the obstacles first responders face during their day-to-day operations and couples that knowledge with the role that technology plays in navigating these mission critical connectivity challenges.

One real-world example carried on from Section 2.1 VHF System would be to enhance UCA interoperability with Federal agencies that fight wilderness wildfires using FirstNet as a bridge for PTT audio and GPS. Creating connectivity in this way would keep UCA users on the forefront of technology by providing the mandated location services called for in the Natural Resource Management Act (the Dingell Act 2019) [18] without the need to upgrade the UCA VHF infrastructure to P25. No single communications network approach will suit every use case. It is important to remember that each individual component plays an important role, but also works in harmony within the totally integrated UCA systems. UCA administrators should view the problem from multiple perspectives and understand how each of the various components work together as well as how each module operates independently. The FirstNet Authority was designed and built as a nationwide wireless broadband network specifically for first responders.

[16] FirstNet Brings First Responders Innovative Tools (att.com)
[17] Supporting and Leveraging Your Statewide Interoperability Coordinator (cisa.gov)
[18] PCAST_Wildfires-Report_Feb2023.pdf (whitehouse.gov)

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FirstNet should be evaluated as an enhancement to the UCA LMR systems as part of the plan for maintaining, upgrading, and expanding the public safety communications network. Helpful guidance for assessing interoperable communications capabilities can be found in The National Emergency Communications Plan (NECP) Assessment Guide. UCA should explore the many ways that this technology can augment their counterparts in other locations and agencies securely and reliably. In connecting disparate radio networks and where there is a concern about sharing encryption keys Broadband LTE could provide a conduit through which this multi-network interoperability can be achieved.

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5. UCA Action Plan

5.1 Interoperable Solutions

In support of Section 2.2 The Statewide P25 Trunked System, UCA should continue using the P25 standards-based shared system for many reasons including compliance with the P25 Common Air Interface (CAI), backwards compatibility to analog systems, and U.S. Federal Government and state grant funding. The P25 CAI enables over-the-air interoperability between P25 radios regardless of manufacturer. If another agency has a P25 radio system within the state or in a surrounding state, the UCA can program their P25 mobile and portable radios with talk groups on the other P25 system, and vice-versa. The P25 ISSI interconnects different P25 core networks, regardless of frequency band or manufacturer, to allow roaming of user radios between networks. ISSI supports many common P25 features, including Caller ID, group calls, encryption, and emergency calls. A user roaming into a foreign system must have radios which are on the same frequency or multi-band compatible with the foreign host.

In support of Section 4, multi-band P25 capable radios could allow agencies to program other P25 agencies and VHF analog channels into their mobile and portable radios. With the use of gateways and patching, other analog or conventional system(s) can also connect to the UCA P25 trunked and conventional VHF systems. In support of Section 4.1 Intrastate Interoperability, UCA should explore the methods, on a case-by-case basis, that Intrastate Interoperability can be effectively built and maintained. As a component of this UCA should continue evaluation into using FirstNet for its first responders. FirstNet can be used as an augmentation to the existing UCA LMR systems to reach its neighboring states.

In support of Section 4.3 Tactical Interoperable Communications Plan (TICP), UCA should complete the development of the Tactical Interoperable Communications Plan (TICP) along with the template while making appropriate revisions, as required.

In support of Section 4.4 Training for Interoperability, first responders must thoroughly understand radio use and agency protocol. The UCA Interoperability Division website provides a wealth of information in support of promoting an understanding of the nature and availability of shared interoperable communications channels. It remains a local agency initiative to examine the processes, policy decisions and procedures in place for their fleet. This well-defined training process will help maintain high standards for the first

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responders and ultimately contribute to their safety on the job. Each local agency should dedicate training to review procedures, protocols, best-practice techniques, and role-playing scenarios to analyze preparedness for effective communication in any situation. First Responders should receive periodic refresher training to maintain proficiency in radio use and stay current with any protocols or new technology changes.

5.2 Cybersecurity Initiatives

Cybersecurity has risen to the forefront of organizational concerns with the abundant use of prolifically connected digital technologies. Regardless of whether these communications are over a wired or wireless medium, the same rules related to third-party risks apply. To equip the State of Utah with the information and guidance required to combat ongoing threats, the Department of Homeland Security created a communications program called SAFECOM. SAFECOM is an integral component of the Department of Homeland Security's (DHS) efforts to enhance the Nation's interoperable emergency communications. Managed by the Cybersecurity and Infrastructure Security Agency (CISA) SAFECOM provides a wealth of public safety grade "mission critical" field-tested solutions, use cases, related guidelines, and associated information.

"SAFECOM works with existing federal communications programs and key emergency response stakeholders to address the need to develop better technologies and processes for the coordination of existing communications systems and future networks"[19]. "Through these partnerships, SAFECOM has created key documents such as the Interoperability Continuum, the Statement of Requirements (SoR) for baseline communications and interoperability standards, the Statewide Communication Interoperability Plan (SCIP) Methodology, and the National Emergency Communications Plan (NECP) to assist emergency responders nationwide with improving communications and interoperability"[20].

The SAFECOM Interoperability Continuum, at present an important part of the UCA system, has served as a pillar for emergency communications and critical infrastructure communities for decades. It explains ways to improve the operability and interoperability

[19] SAFECOM | CISA (SAFECOM Blog)
[20] SAFECOM | CISA (SAFECOM Blog)

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of public safety communications[21]. As stated previously, these valuable tools from CISA are already in use by UCA administrators.

Stakeholders will benefit when UCA continues to utilize this proven governance structure. Doing so means UCA is prepared to take proactive measures to manage cybersecurity risks, expand field training opportunities and content to improve operational readiness policies and procedures through design continuity. Additional emphasis on resiliency measures, including backup power, overlapping coverage, and route diversity will enhance UCA's ability to build a better statewide public safety communications network for its customers.

5.3 Key Initiatives

As outlined in Utah's Statewide Communication Interoperability Plan (SCIP) Section 5.7 along with the DHS SAFECOM recommended Interoperability Continuum, UCA should integrate their cybersecurity analysis program.

UCA should continue to use the commonly recognized four pillars of an effective cybersecurity strategy, namely risk assessment and management, security control implementation, security awareness and training, and incident response and recovery.

UCA should continue to concentrate upon building closed networks to assist with any cybersecurity approach. Where this approach is impractical perimeter firewalls should be employed. Remember that each individual component connected to the network plays an important role, while it works in harmony within the totally integrated system. In this holistic approach, it is more important to review and understand how all the various parts work together to make certain that the UCA cybersecurity strategy is successful.

UCA should continue building a standard corporate structure that encourages daily due diligence combined with network security at the forefront where everyone that touches the UCA network is aware and conscious of ongoing threats and how to counter them.

In support of Section 4.2 Interstate Interoperability, UCA should recommend agencies consider a single secure FirstNet LTE-enabled talk group that can also provide a method for the local PSAPs to join the conversation. This is the instance where a FirstNet talk

[21] SAFECOM Publishes Updated SAFECOM Interoperability Continuum and Frequently Asked Questions | CISA

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group can be utilized to bridge geographically separated LMR systems. Pulled together through a single secure LTE-enabled talk group, each Agency continues to maintain its own policies and encryption scheme while this reciprocal aid talk group bridges the two different systems together.

In support of Section 4.2 Interstate Interoperability, UCA should recommend agencies be aware that LTE can assist their efforts with in-building coverage and the urban canyon effect that exists within city centers where high skyscrapers and tower buildings give any city its own unique geometry. To counter this, a FirstNet talk group could be utilized as a street-level, parking deck and in-building coverage enhancement for users that frequent these areas.

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UCA Glossary of Acronyms

3GPP	The Third Generation Partnership Project group
ANSI	American National Standard Institute
APCO	Association of Public-Safety Communications Officials
AVL	Automatic Vehicle Location
Broadband	Broadband is a term used to describe wireless high-speed internet access, as defined by the FCC
CAD	Computer Aided Dispatch
CAI	Common Air Interface (P25)
CISA	Cybersecurity and Infrastructure Security Agency
COMLs	Communications Unit Leaders
COMTs	Communications Technicians
COMU	Communications Unit
Core	a **Core is a networking term** that refers to a distributed architecture computing design composed of multiple servers each acting as a central conduit to reliably connect and transfer network traffic at high speeds
CPE	Customer Premises Equipment

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DEM	The Utah Division of Emergency Management
DHS	Department of Homeland Security
DTS	Department of Technology Services
ECD	Emergency Communications Division
EMS	Emergency Medical Services
EOC	Emergency Operations Center
ESInet	Emergency Services IP network
ETSI	European Telecommunications Standards Institute
FCC	The Federal Communications Commission
FirstNet	(The) First Responder Network Authority
GIS	Geographical Information System
ICS	Incident Command System
INCM	Incident Communications Center Manager
Interop Continuum	Developed by the Department of Homeland Security's SAFECOM program, the **Interoperability Continuum** is a tool that helps emergency response agencies and policy makers plan and implement solutions for data and voice communications that can work across different disciplines and jurisdictions.

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IT	Information Technology
ITIL	IT Infrastructure Library
ITSM	IT Service Management
ITU	The International Telecommunication Union
KPI's	Key Performance Indicators
LMR	Land Mobile Radio, a wireless communication system that uses push-to-talk radios and repeaters to create real-time, one-to-one or one-to-many communications
LTE	Long-Term Evolution, a standard for wireless broadband communication, based on the GSM/EDGE and UMTS/HSPA standards
MOU	Memorandum of Understanding
MSAG	Master Street Address Guide
NCSWIC	National Council of Statewide Interoperability Coordinators
NECP	The National Emergency Communications Plan
NENA	National Emergency Number Association
NFPA	National Fire Protection Association
NG911	Next Generation 911

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NIMS	National Incident Management System
NIST	National Institute of Standards and Technology
NPSBN	Nationwide Public Safety Broadband Network
NPSPAC	National Public Safety Planning Advisory Committee
NPSTC	National Public Safety Telecommunications Council
O&M	Operations and Maintenance
OEC	Office of Emergency Communications
P25	The **Project 25** Suite of standards, published by ANSI.
PRC	Peer Review Committee
PSAC	Public Safety Advisory Committee
PSAP	Public Safety Answering Point
PSCR	Public Safety Communications Research (a part of NIST)
PTIG	Project 25 Technology Interest Group
RCC	Regional Communication Center

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RFAI	Ready for Active Installation, used in a 9-1-1 context to mean that the IP path and IP terminating (CPE) equipment are in, but calls are actually analog and converted to IP. Used to differentiate between IP E911 and true i3-style NG911
SAFECOM	A program of the Department of Homeland Security (DHS) that aims to improve public safety communications across different levels of government and emergency response agencies.
SatCom	Satellite Communications
SCIP	The Statewide Communication Interoperability Plan
SERT	State Emergency Response Team
SmartConnect	A product from Motorola Solutions that automatically switches PTT voice communications between P25 and broadband and provides interconnectivity to 3rd party cores
SOP	Standard Operating Procedure
SoR	The Statement of Requirements, a baseline for communications and interoperability standards between agencies
SWIC	Statewide Interoperability Coordinator
THSP	Technical Specialist

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TICP	Tactical Interoperable Communications Plan
TTX	Table-Top Exercise
UCA 911	The UCA 911 Division
UCA Interop	The UCA Interop Division
UCA P25	The UCA P25 Division
UCA Radio	The UCA Radio Division
UCA	The Utah Communications Authority
UDOT	The Utah Department of Transportation
UHF	Ultra High Frequency, one of the first designated public safety bands, typically 450-470 MHz
UHP	The Utah Highway Patrol
Vesta	VESTA Call Handling Software, a product from Motorola Solutions
VHF	Very High Frequency, one of the first designated public safety bands, typically 150-174 MHz
VIDA	**V**oice, **I**nteroperability, **D**ata and **A**ccess (VIDA) a product from L3Harris that automatically switches PTT voice communications between P25 and broadband and provides interconnectivity to 3rd party cores