Utah Communications Authority

Radio Division Strategic Plan

March 14, 2017
Revised November 5, 2019

Utah Communications Authority Strategic Plan, Phase I
Table of Contents

Section 1 - Introduction

1.1. Background

In 1997, the Utah Communications Agency Network (UCAN) was created by the Utah State Legislature to provide statewide, two-way, public safety radio coverage for its stakeholders. UCAN was created as an independent state agency that was managed by the UCAN Board. The UCAN radio system was initially planned to cover the needs of five counties: Weber, Morgan, Davis, Salt Lake, and Utah. After Salt Lake was selected to host the 2002 Winter Olympics, Summit and Wasatch Counties were added to the system, since they contained Olympic venues. Tooele County requested and was consequently added to the system as well.

The Olympics provided significant funding to expand coverage and traffic handling capacity beyond what was initially planned. From the original eight-county footprint, the system has been expanded to provide coverage in almost every county in Utah. Additionally, the 800 trunked system has been expanded to provide coverage on most of the major highways in the state and today supports approximately 50,000 mobile and portable radios.

In the 2014 General Session of the Utah State Legislature, House Bill 155 created the Utah Communications Authority (UCA). HB 155 provided that, as of July 1, 2014, UCAN shall be consolidated with the Utah 911 Committee and renamed the Utah Communications Authority. With this consolidation, UCA assumed the operations of UCAN and the responsibilities of the Department of Technology Services (DTS) Radio Shop, and now manages all State-owned public safety wireless resources, including the microwave, VHF, and 800 systems.

The VHF radio system was the original state public safety wireless communications network throughout Utah. Though much of the VHF system has been replaced by the 800 system, the VHF system still provides radio communications in a portion of Utah. In these areas, the UCA VHF system and local VHF systems are a means of public safety communications for state and local agencies; it is estimated that the VHF systems support somewhere between 5,000 to 7,000 mobile and portable radios. Historically, many of the local agencies in this area wanted to migrate to the 800 system, but were unable to afford the more expensive trunked radios that were required to operate on the 800 system. Other agencies were satisfied with the VHF system and do not desire to migrate to the 800 system. In addition, some federal public safety agencies within Utah continue to use VHF radio technology.

In the 2017 General Session of the Utah State Legislature, SB198 was introduced and passed. Part of this legislation eliminated the user fees associated with using the system, and also created a funding mechanism for UCA operations in lieu of the user fees. Since the passing of SB198, several agencies have either already switched to the UCA system, or are planning to switch in the near future.

Since 2000, the UCA 800 system, which uses Motorola's SmartZone OmniLink trunked radio technology, has taken on an increasing portion of the state's public safety communications and today supports approximately 50,000 user radios. While the system has proven very reliable over the years, Motorola has discontinued support for much of the existing 800 trunked radio equipment and no longer manufactures some of the replacement parts needed for the system. To date, UCA has been able to obtain used replacement parts from third parties on the secondary market in order to maintain the 800 system in good working order.

1.2. UCA's Strategic Planning Efforts

In 2016, UCA's Governing Board conducted a planning retreat to discuss the strengths, weaknesses, opportunities, and challenges of the Authority and to identify the needs of the organization going forward. After an extensive discussion, the UCA Board reached consensus on the following Vision and Mission of UCA:

Vision Statement

Everyone in Utah has access to emergency services through a reliable, public safety, communications network and every first responder has the ability to communicate when and where needed.

Mission Statement

To provide and support mission critical, public safety communications throughout Utah by collaborating with our stakeholders.

We will accomplish our mission by focusing on our core competencies and honoring our core values.

Our core competencies are:

- Expertise and resources to support public safety communications statewide;
- Broad representation of stakeholders; and
- A statewide forum for collecting, sharing, and disseminating information.

Our core values are:

- Trust;
- Dedication;
- Partnership;
- Service-orientation;
- Integrity;
- Fiscal Responsibility; and
- Innovation.

* * * * *

In order to ensure that effective public safety communications will continue to be provided to the state's EMS, fire, and law enforcement personnel for the foreseeable future, UCA has prepared this strategic plan to guide the maintenance and long-term viability of the VHF and 800 radio communications networks.

Section 2 - Current Radio Systems

Wireless voice radio communications are an essential tool for public safety first responders in Utah. Over the years, a variety of state and local systems have been developed to provide real-time communications capabilities between dispatch and field personnel. A brief overview of the public safety radio systems and technologies currently utilized in the state is provided below:

2.1. VHF System

The framework of the state's VHF high-band system was initially developed in the 1970s to support the Utah Department of Transportation (UDOT) and the Utah Highway Patrol (UHP); the system was further developed throughout the 1980s and 1990s to eventually provide coverage throughout Utah for state users. In parallel, many local agencies developed their own VHF systems to address individual needs and worked with the state to provide interoperability among state and local users.

While the VHF system had been the primary system for most agencies since the 1970s, during the past approximately 20 years more than 300 agencies have migrated to the 800 system in order to take advantage of the improved features, capabilities, and capacity that trunking technology provides. Today, UCA's VHF infrastructure provides coverage from approximately 70 radio towers and supports what is estimated to be between 3,000 to 7,000 mobile and portable users, primarily in the South Eastern portion of the state. Some of the local agencies in this area would like to migrate to the 800 system, and are currently considering the most cost-effective way to do so.

Analog Conventional Channels

UCA's VHF system continues to utilize the same basic technology (analog, FM radio) that was deployed in the 1970s, which has proven reliable and cost effective for many users. All of the state's VHF channels operate on analog, conventional base stations, which are relatively inexpensive and easy to deploy. Historically, conventional user equipment (mobile and portable radios) for the system has been much less expensive than the radios required for the 800 system, making it difficult for many rural users to justify migrating to the 800 system, even when it is available to them. However, the transition to the P25 system, discussed more fully below, should decrease the costs of the end user equipment on the 800 system.

Recent and Planned Upgrades

Much of UCA's VHF system has been in place for more than 25 years and most of the base stations need to be replaced. To ensure that the VHF system remains reliable, and as a showing of UCA's commitment to its VHF network, UCA is using funds allocated by the legislature in FY2015-16 for a modernization program that will see up to 90% of UCA's VHF base stations replaced by the end of 2019. This upgrade, however, will have no effect on disparate county VHF systems.

Interoperability channels

The VHF system also incorporates national interoperability channels into the network to support communications between agencies that do not otherwise share common radio channels. These channels can be programmed into any VHF user radio and can serve as a common "meeting place" for VHF users. There are a limited number of these channels available, but they can be used to effectively coordinate operations where the interoperability channels have been deployed.

2.2. NEXEDGE VHF System

The Emery County Sheriff's Office has developed a VHF trunking system using Kenwood's proprietary NEXEDGE technology that covers Carbon and Emery Counties. This system has many of the advanced trunking features of a Project 25 (P25) system, such as digital transmission and multiple talk groups, but costs less than a corresponding standards-based P25 system. Unfortunately, NEXEDGE and P25 use different technologies, so NEXEDGE and P25 radios are not compatible with one another at this time. Carbon County officials have indicated to UCA the expectation that in the future, the NEXEDGE system can be upgraded to be compatible with the statewide P25 system being installed by UCA.

2.3. 800 MHz Trunked System

A substantial portion of public safety wireless voice communications in the state takes place on UCA's 800 MHz trunked system (the "800 system"), which has been deployed over the past two and a half decades. This system was initially planned in the mid to late 1990s to improve interoperability among public safety agencies, alleviate channel congestion, and provide economies of scale to radio users. The 800 system has been very reliable and greatly enhanced the communications capabilities of its users.

Motorola SmartZone/OmniLink

The foundation of UCA's 800 system is currently a proprietary Motorola SmartZone OmniLink 800 MHz trunked radio system that was originally developed to provide communications capabilities along the Wasatch Front. The system was initially planned to cover the needs of five counties (Weber, Morgan, Davis, Salt Lake and Utah), however, Summit and Wasatch Counties were added to the system after Salt Lake was selected to host the 2002 Winter Olympics. Tooele County requested and was consequently added to the system as well. The Olympics provided significant funding to expand coverage and traffic handling capacity beyond what was initially planned.

From the original eight-county footprint, the system has been expanded to provide coverage in almost every county in Utah. A concerted effort has been made to provide 800 coverage on most of the major highways in the state and today the system supports more than 50,000 mobile and portable radios from more than 119 radio sites.

800 MHz Conventional Channels

In portions of the state where there are a limited number of users, conventional 800 system channels have been deployed to provide basic communications capability for 800 system users. These conventional channels can be deployed more economically than a trunked channel, yet still provide a way for users of the 800 system to communicate with one another, though with fewer advanced features. The limitations of these conventional channels make them unsuitable to be the only communications solution in areas where significant radio traffic can be expected.

800 NPSPAC Interoperability channels

Like the VHF system, the 800 system has incorporated national interoperability channels (NPSPAC channels) into the network to support conventional, non-trunked communications and provide limited backup capabilities for the trunked system. These interoperability channels are deployed at approximately 25 radio sites throughout the state.

800 UCA Interoperability channels

In addition to the NPSPAC channels, the UCA network also includes region talkgroups to provide a channel that all system users can use to contact a PSAP without needing the local area talkgroup. These region talkgroups are generally not meant to be used for incidents or events. The network does, however, have operation talkgroups for specific incident assignemtns within the local area, and event talkgroups for specific incidents involving agencies from outside the local area.

2.4. Backhaul Network

To connect the radio sites with the radio switching equipment and dispatch radio consoles, UCA maintains an extensive network of microwave radio links, which is supplemented by services leased from third party network providers. This network provides point-to-point communications between sites so that radio traffic can be routed to the correct radio tower and field users, and provides some data and network connectivity for government agencies.

Section 3 - System Needs and Recommendations

UCA's VHF and 800 communications networks have served federal, state, and local agencies well over the past two and a half decades. In order to maintain the reliability and effectiveness of these systems, UCA must address the following issues:

3.1. Replace Obsolete 800 System with P25 System

Motorola has discontinued, or will discontinue in the near future, support for a significant number of the components of the existing 800 trunked radio infrastructure; consequently, replacement parts to support the system are becoming increasingly difficult to obtain. As the 800 system continues to age, failures of the system may become more common and users of the system will begin to experience more frequent and prolonged communications outages. Repairs of the system will be more difficult and costs to maintain the system will rise.

To address these issues, UCA needs to replace the current proprietary trunked system with a standards-based, P25 trunked radio system. The P25 standard has been widely adopted by local, county, tribal, state, and federal agencies, and is recommended by the US Department of Homeland Security (DHS).

By replacing UCA's proprietary 800 system with a standards-based, P25 system, Utah's first responders will be in the mainstream of public safety communications and will enjoy the benefits of an effective and reliable radio system for decades to come.

In 2018, UCA, with the assistance of the Utah State Division of Purchasing and an independent consulting firm, published a request for proposals to upgrade the existing proprietary radio system to a P25 radio network. In the spring of 2019, after an extensive review process, the RFP was awarded to the Harris Corporation, now known as L3Harris Technologies following its merger with L3 Communications. In July of 2019, this upgrade process began and, at present, it is expected to take just under five (5) years to complete.

The recently signed contract with L3Harris secured many benefits to UCA and the users of the new system. Some of these benefits include:

- Up to 65% off the retail price of mobile and portable end user radios;
- Extensive factory training for UCA technicians;
- 3 years of full warranty starting after the system has been installed and approved; and

- All available software and firmware upgrades and updates at the time of acceptance and again at the end of the warranty period.

3.2. Maintain Existing VHF System

UCA's VHF system will be maintained to support the public safety users that have not migrated to the 800 system for as long as the Utah legislature directs UCA to maintain it. The VHF system has proven to be cost effective and reliable over the years and many users in the most rural parts of the state rely on it for their day-to-day public safety communications at present, and may do so until the 800 system is expanded.

UCA is currently using funds allocated by the legislature in FY2015-16 for modernization program that will see up to 90% of UCA's VHF base stations replaced by the end of 2019. UCA would like to replace the remaining 10% of its base stations by the end of 2020 in order to standardize the system equipment and maintain the reliability of the entire system. UCA will consider providing any requested coverage enhancements on a case-by-case basis, but intends to focus most of its expansion efforts on the 800 network.

3.3. Maintain System Backhaul Network

The backhaul network that connects the UCA system makes public safety wireless communications possible in the state and enables radio communications to be relayed between the public safety answering points and the radio towers. The network, which is comprised of microwave radio links owned primarily by UCA and fiber optic circuits leased from private telecommunications companies and regional internet service providers, also provides data connectivity for mission critical applications (e.g. CAD-to-CAD interfaces) in some of the Public Safety Answering Points ("PSAPs") throughout Utah.

As new radio sites/towers are added to improve coverage and increase interoperability, UCA's backhaul network will need to be expanded and/or upgraded. UCA will utilize its statutory criteria as it compares expansion of its own microwave radio network against private fiber optic circuits. In addition, for many of its main backhaul arteries, UCA intends to rely on both technologies, microwave and fiber, to provide greater reliability and redundancy.

3.4. Replace Radio Consoles

To communicate with public safety field personnel, emergency dispatchers utilize numerous radio consoles deployed in the PSAPs throughout the state. Like the 800 system, these radio consoles are approaching the end of their operating life and are no longer officially supported or maintained by their manufacturer. Additionally, the majority of the existing

radio consoles do not provide P25 functionality and will not directly interface to a P25 radio system.

In conjunction with the L3 Harris P25 radio system upgrade, all existing, non-federal, PSAP consoles will be replaced by UCA with the new L3 Harris Symphony radio consoles. This will initially be done at UCA's expense, however, at present, radio consoles are considered end-user equipment, not system equipment, and future expansion or replacement expenses will be the responsibility of the PSAP. The Symphony consoles are capable of interfacing with conventional VHF and conventional 800 radio systems, as well as the new P25 radio system being installed. Interfaces between new consoles and the NEXEDGE system in Carbon and Emery Counties will likely need to be provided via NEXEDGE control stations or through gateways.

3.5. Improve Interoperability Where Practicable

There are multiple technology solutions that can be used to improve interoperability where a single system supporting all users does not exist. These methods include patching radio channels thru consoles (i.e., gateways), sharing common interoperability channels, or using multiband/multi-mode radios. These can all be deployed in various ways to improve interoperability but, unless a single system is utilized, limitations on interoperability will still exist. UCA should work with its stakeholders to provide cost-effective interoperability improvements, where practicable.

3.6. Improve Coverage of 800 System

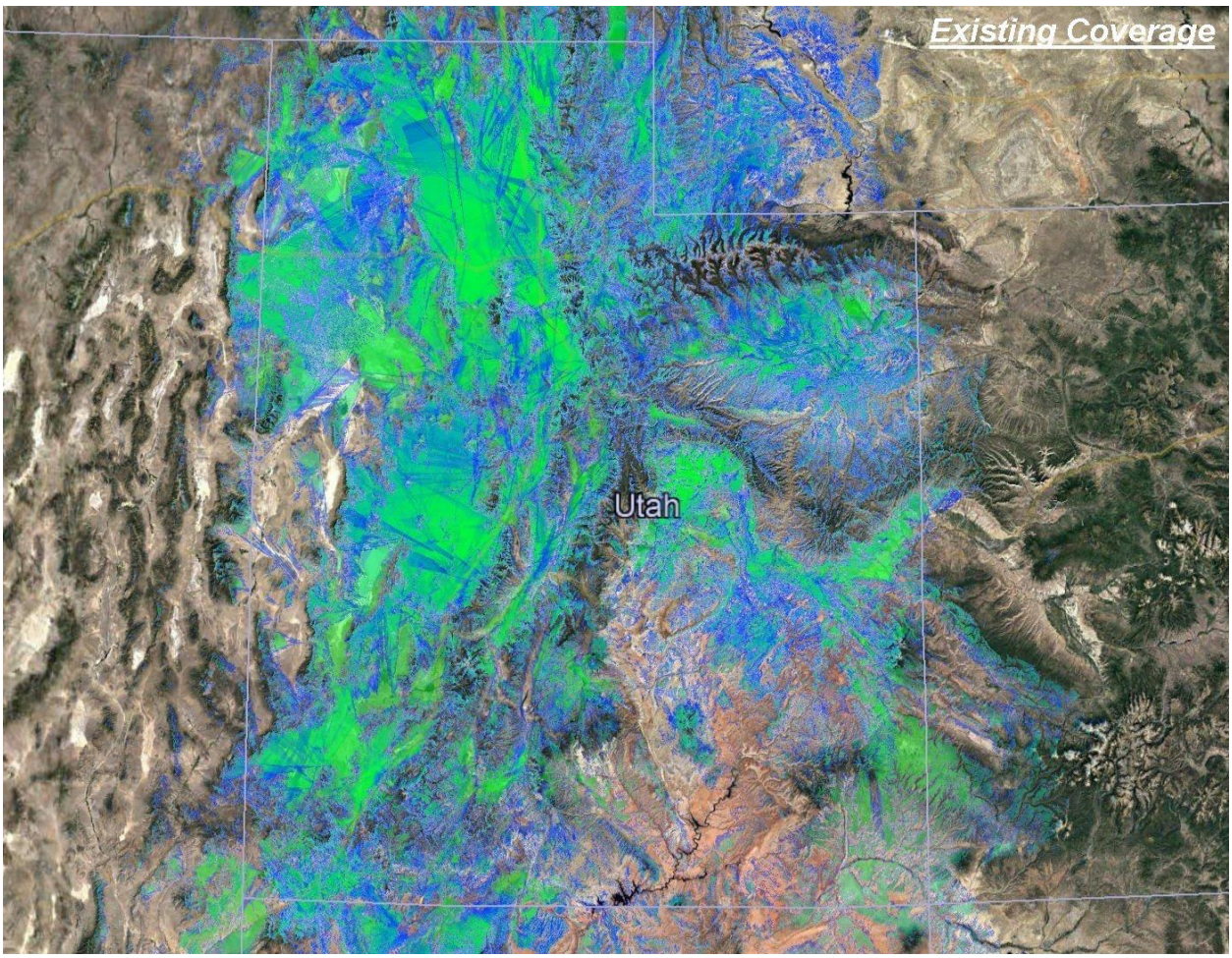
Ultimately, the best technical solution for Utah would be to have statewide coverage on UCA's 800 system. This would provide users of the 800 system with the ability to operate throughout the state on a single network using a single radio with the advanced trunking features they have come to expect. Additionally, a statewide 800 system would provide a platform for improved interoperability with local VHF systems, the UCA VHF system, and the NEXEDGE system in Carbon and Emery Counties.

In the spring of 2019, UCA's Governing Board approved the expansion of UCA's 800 system by approving 25 new sites. These 25 new sites will greatly increase the coverage footprint of the 800 system to be nearly statewide. The 25 new sites were selected based on limited coverage in Southeastern Utah, the West Desert, Daggett County, and other known areas where coverage may be insufficient for VHF users to switch to the 800 system. UCA is actively working with federal, state, and local agencies, as well as private partners to secure land rights and site agreements in order to build and incorporate the 25 new sites. Construction began on the first of these sites in August of 2019 and UCA is hoping to have completed a significant number of these sites before the fall/winter of 2020. Going

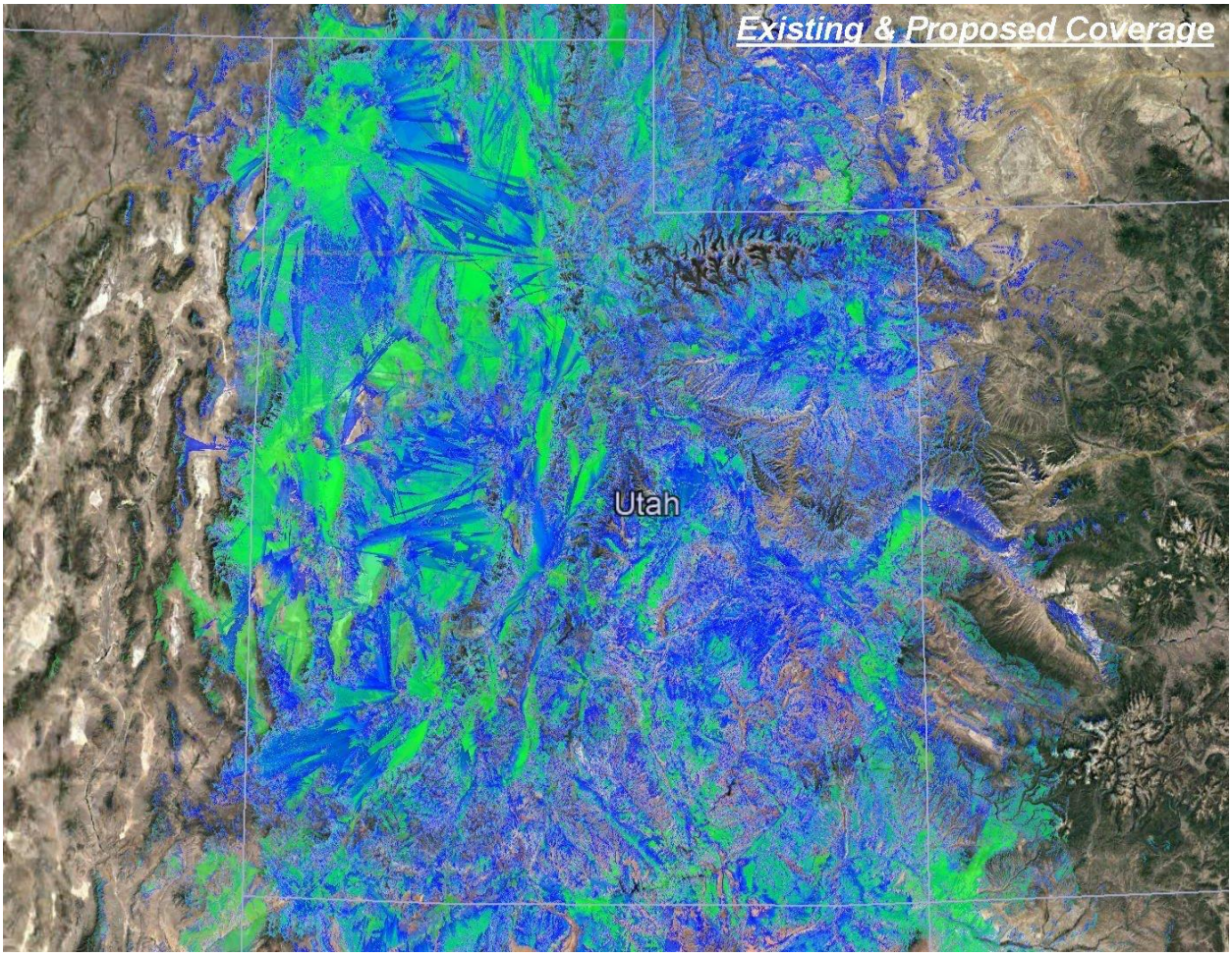
forward, UCA will continue to expand radio coverage as needed beyond the approved 25 new sites.

3.7. Existing and Future Coverage

The image below represents the UCA 800 trunked radio coverage as of August 2019.



The image below represents the combined coverage of existing and proposed 25 new sites.



3.8. User Equipment for State and Local Agencies

With the transition of the radio system to the P25 standard, some of the mobile and portable radios used by local and state agencies will have to be upgraded to support the P25 standard. Some of the mobile and portable radios can be upgraded with simply a software upgrade, while other radios (older, lower tier radios, etc.) will need to be replaced. Historically, local and state agencies have been responsible for providing their own user equipment, so UCA will need to coordinate the upgrade of the system with agencies so that P25 radios are in place when the new system is implemented in their area.

Although this strategic plan does not include costs for user equipment (since agency mobile and portable radios are not part of UCA's budget), UCA has negotiated significantly discounted pricing on new end-user radios to help make this transition easier for its user agencies. For example, the recent contract signing for the P25 upgrade with L3 Harris will allow end users to purchase L3 Harris portable and mobile radios at discounts up to 65% off retail prices. In addition, the non-proprietary, open architecture nature of the P25 system will permit multiple manufacturers radios to operate on UCA's network. This increased competition should spur innovation while driving cost down. It is anticipated that a process will be adopted by UCA to approve end user radios for use on UCA's system. In the meantime, UCA encourages agencies to work with UCA's P25 Division Director and/or Radio Programming Manager when selecting new radios for use on the system today or in the future.

Section 4 - Administrative

In the coming years, UCA's Administration will undertake the following initiatives:

4.1. Succession Planning for UCA

Due to the number of tenured employees, the mission critical deliverables, and the unique skill set required of the employees, it is critical that UCA ensures that there is a plan for succession and training, and that adequate funding is available to hire employees and train them under tenured staff.

To address the need for skilled radio technicians, UCA will explore recruiting at colleges that have wireless communications (radio frequency/RF) programs, including at out-of-state colleges such as Idaho State University. UCA will also consider the services of a professional recruiter that could identify experienced candidates from the wireless communications sector.

4.2. Co-Locate Technical Staff in a Single Warehouse Facility

UCA would like to consolidate its Northern Utah technical operations and various storage facilities, into a single location within the Salt Lake Valley. This will allow a more efficient way to store and gather parts and equipment. Currently, UCA is utilizing four different locations to store parts and equipment and conduct operations, ranging from Draper to Ogden. UCA would like to hire a warehouse manager to maintain this warehouse and UCA's parts, equipment, and inventory.

In the fall of 2018, the UCA Executive Board approved the purchase of a consolidated warehouse. UCA worked with the State Department of Facilities and Construction Management as well as a private realtor to find a warehouse that would suit the needs of UCA. In August of 2019, UCA signed a contract for the construction of new facility and is anticipating centralizing and moving into the facility in Q1 of 2020.

Section 5 - Conclusions

In summary, we believe that implementation of the recommendations outlined in this Strategic Plan will ensure that UCA maintains modern, effective, and reliable radio systems throughout Utah for decades to come. This should directly improve the effectiveness and safety of local and regional field personnel and enhance the delivery of public services to the citizens of Utah. We look forward to working with UCA's stakeholders to make this plan a reality.