Mobile Command Vehicles – Interoperability on Wheels

Take a look back, say fifteen or twenty years, and compare capabilities then to now. Interoperability, terrestrial and wireless network infrastructure, satellite communications, advanced cellular broadband connectivity, information sharing and situational awareness – all have advanced so much that they have become common place and readily available at all times – or are they?

Today’s first and secondary responders must take many atypical situations into account - conditions that could hamper the fulfillment of their primary mission to safeguard life and property. Time and again their efforts have been disrupted by natural disasters, inclement weather, loss of communications infrastructure, and the simple limitations in local infrastructure that exist in some areas.

Many federal, state and local agencies, along with the National Guard, have combated these conditions through the use of deployable mobile command and tactical solutions. These Mobile Command Vehicles (MCVs) provide redundancy and replacement technology to ensure that vital voice and information capabilities are available in times of need.

ACU gateways are well known for flawless voice interoperability, but can also function as a key component in providing basic communications infrastructure where it is (or has suddenly become) lacking.

We will share examples of how users of our ACU technologies have integrated them into mobile packages to enhance their communications infrastructure and provide them the ability to support critical operations outside of their everyday operations.

Taking Part in History - Selma Freedom March

On March 25, 2015, Alabama experienced a historic event honoring the 50th Anniversary of the Alabama Voting Rights March from Selma to Montgomery. This brought in a huge number of dignitaries, press and other visitors.

State and Local first responders were responsible for participant safety as well as the coordination of public services that an event of this size and importance demands. Not only would members of these agencies need to talk to their colleagues; just as important was the capability of on-the-fly interoperability links between the agencies.

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The public safety agencies were challenged with the need for seamless communications throughout the route of the march that included both highly populated and rural areas from Selma to Montgomery Alabama. The use of mobile command and communications resources, along with their interoperability capabilities to knot all of these agencies together, aided in the vital command, control, and communications that supported this event.

Mobile Command Vehicles and the Alabama Interoperability Network (ALIN)

Back in 2005, the State of Alabama had immediate needs for interoperability and operability during both daily and emergency operations. They also desired a scalable, IP-based capability that could expand as necessary and incorporate both new and legacy systems. Following an extensive evaluation, the state invested in the ACU-1000 Intelligence Interconnect Switch technology with a long-term vision to develop a Wide Area Interoperability System (WAIS).

A Scalable, Phased Approach

Adopting a phased implementation, Raytheon JPS first met their immediate local and regional interoperability needs by installing fixed-site ACU-1000 gateways throughout the state. Focus then turned to the deployment of Regional Mobile Command Vehicles. These MCV’s would take advantage of the ACU technology’s IP capabilities, which allow the creation of a wide area interoperability system (WAIS). Alabama’s WAIS first linked the MCVs together via SATCOM, and later pulled them and the fixed site ACUs into an integrated statewide system.

The Phase I Wide Area Interoperability System (WAIS) implementation consisted of eight MCVs linked over an IP Network via SATCOM. WAIS Dispatch operators, using the WAIS Controller Software, are able to monitor and control the system from anywhere on the network.

Each MCV’s ACU-1000 has twelve (12) local communications assets, which can be radios, phones, cell phones or Network Extension Modules (NXM). The NXMs form the backbone of the Voice over Internet Protocol (VoIP) / Radio over Internet Protocol (RoIP) connection between the Regional Mobile Command Vehicles. Each NXM talkpath is an available link into the WAIS system, controlled by a WAIS Dispatch Position Operator using the WAIS Controller Software.

How do you plan for an event that will increase the size of a town’s population almost 900 percent overnight?

Selma, a town of only 19,912 people, had to develop an answer to this when it hosted a group of more than 170,000 in a two-day period to commemorate one of this nation’s most iconic civil rights events: the 50th Anniversary Bridge Crossing Jubilee. Attending the jubilee were President Barack Obama, along with the first family, former President George W. Bush and first lady Laura Bush, four Cabinet members, a Georgia Congressman and Civil Rights Leader John Lewis, more than 100 Congressional members, dozens of Civil Rights leaders, VIPs and other leaders.

In addition, those involved in planning had to consider such supporting agencies as the U.S. Secret Service, Department of Homeland Security, Federal Bureau of Investigation, Bureau of Alcohol, Tobacco, Firearms and Explosives, U.S. Capitol Police, state law enforcement, mutual aid law enforcement, and local law, fire and EMS responders who would be on-site -- all occupying a space equivalent to less than five city blocks. The main focus for the event was at Broad Street, which is the street that crosses the Alabama River over the Edmund Pettus Bridge...
Depending on their assigned authorizations, dispatchers within the MCVs and throughout the state can cross-connect assets at their local level (local interoperability) as well as cross-connect assets from remote fixed sites or MCVs (wide area interoperability). Dispatchers may also use the system to converse with each other over IP.

To allow all of the MCVs to connect through their satellite up-links at the same time, a centralized network hub provides VoIP/RoIP connectivity. Each MCV is also equipped with a repeater to provide on-site repeated infrastructure, to allow incorporation into the wide area system. These repeaters are able to set up a radio communications channel at an incident site, and the ACU gateways can patch this channel into other appropriate response channels.

**Additional Mobile Resources Create or Restore Basic Communications Infrastructure**

Beyond the MCVs, Alabama also added new tower trailers and P-Com trailers to provide onsite support. The towers can not only set up a repeated radio system, but can also use ACU gateways to link this temporary radio system to any other Alabama Interoperability Network voice communications asset.

These trailers can be towed to an incident site that lacks sufficient communications resources. This lack can be due to an unusual high demand (for example, the 50th anniversary of the Freedom March), a remote setting, or where some type of disaster has devastated the local infrastructure.

The assets are self-sustaining and do not require that they be manned during operation. This is made possible by IP connectivity that allows them to be remotely operated from any point on the ALIN. This includes various broadband and network connectivity including terrestrial, Mobile 3G – 4G cellular modems and KU Band Satellite uplink.

This IP connectivity is not only used for control purposes - combined with the VoIP/RoIP capabilities of the ACU WAIS technologies they can also provide on-demand voice communications to other locations in the ALIN, allowing access between local Emergency Operations Centers (EOCs) and the ALIN system’s operators at the fixed sites or in the mobile assets.

**The Entire Fleet of State of Alabama Incident Support Units**

Following completion of the Phase I MCV Wide Area Interoperability System, following phases incorporated the state’s fixed ACU Local Interoperability Sites into the WAIS, linking them to each other and to the MCVs, eventually creating a true statewide system.

Phase II focused on the major population areas in the state, and provided their local agencies the ability to access their radio infrastructure both locally or wide area. The fixed ACU infrastructure is located at different communication centers, the Alabama Department of Homeland Security and the Alabama Emergency Management office.

The state’s WAIS application is a migration capability that complements other ongoing efforts to upgrade and establish new radio systems throughout the state. The system provides a seamless method to access both their legacy systems and future radio infrastructure. It provides redundancy through IP connectivity that supports LMR and VoIP voice communications, as well as backhaul and access to radio and telephone resources anywhere on the network.

The final phases continued the fixed site build out, ultimately linking each county and/or region through the WAIS system. Remote counties are linked into the system using remote audio consoles linked into the Regional ACU Host Sites throughout the state.
Planning and Training are Crucial as Mother Nature Follows Nobody's Schedule

Technology alone can’t completely solve voice interoperability requirements. Just as we wouldn’t dream of sending a police officer into the field without firearms training, or firefighters without fire suppression training, communications technologies gain vital value with proper training. Experience teaches us that success is gained through Standard Operating Procedures, executed Memoranda of Understanding, and adherence to established Incident Command System communications protocols. Included are communications exercises to drill, test and train with the technologies they will use in response to special events, disasters and even day-to-day activities. This helps ensure preparedness, review procedures and agreements, and ensure all technologies are functioning properly "before the emergency."

Considerable advance planning went into the preparation for the support of the 50th anniversary of the Freedom March in Selma, but planning and training regimens are even more vital for an unplanned event, such as the swarm of tornados that struck Alabama in late April of 2011, including a violent EF-4 tornado that hit Tuscaloosa and Birmingham Alabama. The devastation in its 80.7-mile wake included $2.8 billion in property damage, the deaths of 64 people and injuries to another 1,500. It was just one of 355 tornados in the April 25 - 28, 2011 tornado outbreak, the largest in US history.

The tornados incapacitated critical communications infrastructure. Alabama’s MCVs helped set up essential replacement LMR repeater infrastructure and the ability to provide local and wide area voice communications via their deployable ACU technologies. Similarly, last April they deployed one of their STR tower trailers responded to tornado activity in Jefferson County, using its ACU-M to link the local fire department VHF system in Kimberley to the Jefferson County 800 MHz system.

Flexible Architecture Open to New Opportunities

An ACU-2000 IP gateway is installed in the Alabama Air National Guard 117th Air Refueling Wing’s Mobile Emergency Operations Center (MEOC). During joint training exercises with various state and local agencies the 117th MEOC personnel realized that it would be advantageous to integrate this gateway with Alabama’s wide area system.

A joint agreement between the ANG and the State of Alabama added the MEOC to ALIN and greatly increased communications capabilities of both parties.

A Lot of Work, but Well Worth the Effort!

From Charles Murph, State Wireless Interoperability Coordinator for the Alabama Law Enforcement Agency:

The state of Alabama’s investment over the last 10 years in Raytheon’s ACU products has allowed the creation of the Alabama Interoperability Network (ALIN). ALIN consists of numerous sites, including our Strategic Technology Reserve (STR) assets. The network is a partnership of various state agencies and local response agencies. We also have a public/private partnership with Southern Linc to crosspatch multiple state agency groups on their platform. We are very pleased with the Raytheon technologies and the interoperability solutions they provide.

For more information regarding Raytheon’s WAIS Controller software, or how we can assist with Wide Area Interoperability, please email publicsafetysales@raytheon.com or call 1.888.627.1088 and ask for the inside sales department.
Making Sure You Receive a Quality Product

The employees of Raytheon JPS Communications take great pride and a strong sense of responsibility in the knowledge that the products we design and manufacture are used in emergency situations by first responders and other agencies throughout the USA and in many countries around the world. We take special precautions to ensure our products are manufactured and tested to meet the most demanding requirements. Historical data confirms the success of these efforts.

Our products are designed in the USA, and final assembly, test and configuration is done in the USA. All products are fully tested to engineering-approved procedures and experience a powered up burn-in period to try to flush out any components that might be susceptible to premature failure.

As part of our ongoing quality checks on each production run we randomly select and pull at least 10% of our finished and tested products and subject them to retest and re-inspection.

James Foye and Michael Johnson Perform Software Regression Test

Continual Improvement Based on Six Sigma Principles

JPS Communications employs a continual improvement process based on Six Sigma. All manufacturing employees have achieved R6S (Raytheon Six Sigma) Specialist rank and some have R6S Expert training.

R6S is based on the foundation of DMAIC, a 5-step quality program (Define, Measure, Analyze, Improve, Control) developed for the manufacturing environment. Raytheon took DMAIC’s data-driven approach to improving products and services and added key emphasis on customer success. JPS Communications implemented the R6S (Raytheon Six Sigma) program in 2003.

R6S has given us the tools to help:

- Eliminate waste and non-value added activities.
- Apply the right analytical tools for each situation.
- Assure safe, reliable, quality products and services throughout product lifecycles

This helps us to prioritize and focus on what is most important and relevant. With R6S we use facts and data to discover improvement opportunities, readiness and resources, define goals and high-level action plans and commit resources to focused improvement project(s) in order to realize significant results.

Outside Certification and Inspection

Many of our products including the NXU-2 and SNV-12 are TUV certified. TUV (Technischer Überwachungs-Verein, English: Technical Inspection Association) is a leading world-wide test and compliance organization.

From the TUV Website: “TÜV Rheinland is the leading and most competent provider of product testing and certifications for the worldwide marketplace. TÜV Rheinland offers safety testing and certification services for products commonly encountered in modern life such as home appliances, audio/video products, medical products, textiles, and telecommunication equipment to name a few.”

Facilities that build TUV Certified products are subject to surprise audits at least every 6 months by TUV. The audits verify that we are following procedures and policies that ensure our products are built to set quality standards with approved parts and approved testing.

Proof in the Numbers

Historical data confirms the high quality of JPS products. From 2009 to 2014, of 103,604 JPS manufactured products shipped only 338 were returned with genuine warranty issues (and all were quickly repaired or replaced). This extremely low rate of warranty return, plus the very low rate of service return even for products that have been in the field for many years (many in 24 hour per day service), attest to how well-made and reliable JPS products are.

In this article we’ve noted just a few of the things we do to ensure you receive a quality product. With our proven and reliable designs, highly controlled manufacturing and quality processes, third party audits, and continual improvement processes, we have a strong basis for our pride in knowing that many products we built over 15 years ago are still serving our customers in daily operation.

A Way for Our Customers to Help

One of the most common (and most devastating) causes for equipment failure is lightning damage. Records kept since 2009 show 147 systems returned due to lightning damage. This is a very conservative number, based on customer input or indisputable evidence, and undoubtedly customers didn’t bother to return additional, uncounted units with severe lightning damage.

The only sure response for a unit suffering damage due to a confirmed lightning strike is outright replacement of any affected modules, as components not completely taken out by the strike are likely to have suffered damage and will experience premature failure.

While nothing will prevent damage from a direct strike, proper grounding techniques are an important protective measure not only for Raytheon JPS Communications products but also for any communications gear. This issue of ACULink has a related article in the Customer Corner section.
Training Schedule Remainder of 2015

We offer classes at our facility in Raleigh, North Carolina. These classes are free-of-charge and include lectures as well as hands-on training. The classes cover ACU technology and WAIS (Wide Area Interoperability Systems that link multiple ACU gateways together). The WAIS classes are scheduled as a follow-on to the ACU classes.

The schedules for these open classes are provided below.

To register, please contact us at: publicsafetysupport@raytheon.com.

- Cancellations may result if class student minimums are not reached.
- Travel and room & board expenses are the responsibility of the trainees.
- Onsite dealer training is also offered. Please contact us for more information.

ACU Technology Training Classes – Cover the ACU-1000, ACU-2000IP, ACU-M, ACU-T and ACU-5000 products

2015

- June 9-10
- July 14-15
- August 11-12
- September 15-16
- October 6-7
- November 3-4
- December 15-16

WAIS Training Classes - Cover all Versions of WAIS: Classic, Enhanced, and Enterprise

ACU Technology Training above is a prerequisite

2015

- June 11
- September 17
- December 17

Software/Firmware Updates Are Available Online

Software and firmware updates are available for many of our products and modules to ensure you are benefitting from the latest technology.

The following software and firmware updates are available online at no charge:

- ACU Simulator (Allows simulation of ACU operation when used with the ACU Controller Software; allows familiarization and training without needing to actually exercise an ACU gateway)
- ACU Controller Software (ACU-2000 IP, ACU-1000, ACU-M, ACU-T)
- ACU-M Software Upgrade (ACU-M)
- ARA-1 Software Upgrade (ARA-1)
- CPM-3 Module (SNV-12)
- CPM-4 Module (ACU-1000, ACU-T)
- CPM-6 Module (ACU-2000 IP)
- DSP-2 Module (ACU-1000, ACU-T)
- DSP-2 IP Module (ACU-2000 IP, ACU-T)
- DSP-3 Module (for ACU-1000, ACU-2000 IP or ACU-T when used with WAIS Enhanced or Enterprise)
- NXU Setup Utility (NXU-2A, NXU-2)
- NXU-2 Software Upgrade (NXU-2)
- NXU-2A Software Upgrade (NXU-2A)
- PCNXU (ACU-2000 IP, ACU-1000, ACU-M, ACU-T, NXU-2A, NXU-2)
- SCM-1 Module (ACU-2000 IP)
- SCM-2 Module (ACU-2000 IP)

Software and Firmware Request Form

Upon request, we will email a Software/Firmware request form; it includes pulldown menus to make the process easy.

To request the form, or if you have any related questions, click on this link: mailto:JPS.firmware@raytheon.com

You can request up to four software or firmware updates at a time. The procedure involves filling out the form and working through and agreeing to some basic export-related statements.

This procedure is necessary to make sure that we fully comply with all US export regulations.

Once you have completed the form, return it to the same address that sent it to you. After we review it, our customer service department will contact you, typically within a few hours if during a business day. You will be provided with instructions to download and install the software/firmware.

If any questions arise during the process, don’t hesitate to call our Customer Service Department at 1.888.627.1088.
24-hour Customer Support Hotline 800.498.3137

Our 24-hour customer support hotline, available to U.S. and Canadian customers only, provides our customers an outstanding level of service.

Customers can call 800.498.3137 for immediate assistance with any technical problems, day or night.

The 24-hour customer support hotline is available to JPS customers needing assistance with our voter equipment, ACU products, NXU-2A, VoIP/RoIP products and, for systems issues rather than product-specific support, to the customers who have purchased the 24-hour support option with their system installations.

Repair Service

All equipment returned for repair must be accompanied by an RMA number (Returned Material Authorization).

Email jpsrmasubmit@raytheon.com to request a repair RMA number.

Please include the following in the body of your email: failure symptoms, product name, serial number, contact name and shipping information.

Customer Corner

Equipment Grounding Procedures

Proper equipment grounding is essential for many reasons including protection against:

- Lightning strikes
- Safety from electrical shock
- Fire prevention
- Electrical faults and disturbances on the power system
- Noise interference to telecommunications circuits

Improper grounding can be worse than no ground at all, especially when considering electromagnetic interference.

Over the years there have been many standards covering grounding published by various industry groups. Many of these, like The National Electric Code (ANSI/NFPA70), address grounding for safety but fall short on the subject of equipment protection.

What is the Telecom System Designer / Installer to do when determining which standard to use?

A good place to start is ANSI/TIA-607-B 2011 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

This is a comprehensive and recent standard developed by engineers on the Telecommunications Industry Association (TIA) TR-42.16 Subcommittee on Premises Telecommunications Bonding & Grounding.

TIA provides this abstract for TIA-607-B on their website:

The purpose of this Standard is to enable and encourage the planning, design, and installation of generic telecommunications bonding and grounding systems within premises with or without prior knowledge of the telecommunications systems that will subsequently be installed. While primarily intended to provide direction for the design of new buildings, this Standard may be used for existing building renovations or retrofit treatment. Design requirements and choices are provided to enable the designer to make informed design decisions.

Two recent amendments to TIA-607-B cover testing of the grounding system and the use of structural metal as a grounding backbone.

TIA-607-B and Amendments are available at http://www.tiaonline.org/standards

Good sources for technical support and application information on telecom grounding are the manufacturers and suppliers of grounding components.
Recent and Upcoming Events

**IWCE 2015**

We want to extend thanks and appreciation to everyone who visited our booth at the International Wireless Communications Expo last month. It was a pleasure to catch up with each of our existing customer who came by as well as meet potential new ones during the show. We're quite excited at the interest expressed in all of the technologies we demonstrated.

They included:

- Our various Wide Area Interoperability System (WAIS) offerings - Classic, Enhanced Dispatch and Enterprise Dispatch;
- Our newest product offerings, the SIP VoIP to LMR and RoIP to LMR Channel Banks;
- The SNV-12 Signal and Noise Voter
- Our One Force Mobile Collaboration (OFMC) advanced command, control, collaboration and situational awareness solution for smart devices and PCs
- Raytheon’s state of the art Cyber Security solutions
- Integration of PTT over smart devices with Cisco IP solutions.

If you were unable to visit the booth, or desire additional information regarding these technologies, please contact us at: publicsafetysales@raytheon.com

**Quarterly Roadshows**

Raytheon JPS Communications will be hosting Quarterly roadshows throughout the year to highlight our technology and solution offerings and provide technical assistance and refresher training. Working with our established manufacturer representatives and dealers these events provide an overview of our interoperability and situational awareness solutions, live system demonstrations as well as examples of the many operational systems being used to provide mission critical interoperability.

We thank PMC Associates and Gately Communications for hosting our Q-1 events in Richmond and Tidewater Virginia this past January. Our customer feedback was exceptional for the first event and we are looking forward to our Q-2 event hosted by CMSE June 16 and 17 in Savannah and Atlanta Georgia.

For more information contact Marty Ingram via e-mail: publicsafetysales@raytheon.com

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Support Inquiries: publicsafetysupport@raytheon.com

Product Information – enter product name in search engine raytheon.com

Do you have a question about how our technologies can help your agency, business or mission?

Roman Kaluta is the customer advocate and public safety liaison for Raytheon JPS Communications.

As director of Interoperability Solutions he is available and eager to discuss your needs. He can be contacted directly at jpsadvocate@raytheon.com

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