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# LA-RICS Adds Deployables to Provide Coverage During Outages, In Remote Areas

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**Tuesday, July 28, 2020 | Comments**

The Los Angeles Regional Interoperable Communications System (LA-RICS) Authority was formed in 2009 to cooperatively establish a countywide, interoperable public-safety communications network. The early efforts of LA-RICS were focused on the creation of a Project 25 (P25) LMR system.

*Photo courtesy LA-RICS*

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However, in 2010, LA-RICS embarked on a parallel initiative to enhance broadband communications throughout Los Angeles County due to the growing reliance on broadband communications for public-safety operations and the need for a dedicated, public safety grade broadband network. Thanks to a National Telecommunications and Information Administration (NTIA) grant, LA-RICS constructed a dedicated countywide LTE network. The network was completed in 2015 and later was integrated into the nationwide public-safety broadband network (NPSBN) under the First Responder Network Authority (FirstNet) in 2018.

As part of this broadband experience, LA-RICS saw the tremendous continued need to address public-safety coverage in the event of NPSBN outages and in remote areas within Los Angeles County. Recent natural disasters in California have underscored the critical need for broadband data as they often occur when broadband coverage is scarce. During the 2018 Woolsey Fire that went through the Santa Monica Mountains to the Pacific Ocean, areas that once had good coverage were dead spots due to burned aerial fiber and power poles. And, remote areas of Los Angeles County like the Angeles National Forest have little to no permanent coverage. In fact, data is often needed most in scenarios where broadband coverage is most impacted. These incidents can span several square miles, far beyond the reach of Wi-Fi, and occur in areas that have little to no infrastructure. There is no fiber or poles for small cells, only rugged terrain and trees. So, the solution needs to bring "backhaul" with it to connect local coverage with a core, nationwide network.

The FirstNet program already has a cadre of emergency systems to do just that. So, you may be wondering why LA-RICS would need its own cell on light trucks (CoLTs). The answer lies in response time and supporting multiple-wide area events. While the 14-hour response time objective is helpful for major incidents that last days, many incidents are over within five hours, and by the time the vehicles are requested, approved and 14 hours elapses, agencies are wrapping up. A solution was needed for rapid response and where Los Angeles County agencies could make requests whenever the need occurred, providing enhanced local control.

Major public-safety incidents involving potentially dozens of regional responders occur frequently in remote areas of the county from local, city, state and federal responders. The solution needs to accommodate users from potentially dozens of disparate agencies, and these agencies need to seamlessly connect and benefit from subscriber devices they already possess. And, a key factor for the LA-RICS CoLT program was the ability to support multiple incidents. So, the FirstNet program might handle a single large incident with a nearby CoLT, but if other resources are not available to support multiple wildfires, the LA-RICS CoLT program needs to be there and support several simultaneous incidents.

Different terrain and environmental requirements necessitate vehicles that can be easily moved, can be set up quickly and can handle the diverse deployment scenarios expected throughout Los Angeles ranging from foothills, islands, mountain roads and even urbanized areas in the event of widescale cell outages.

As a result of these needs, LA-RICS requested a grant modification to support the purchase of multiple emergency deployable vehicles. This request was granted and the LA-RICS COLT program was born.

**The Solution**

LA-RICS made an early decision to leverage the AT&T First Responder Mobility Zone (FRMZ) solution. Many in the LA region have embraced FirstNet and tying the emergency response coverage to the FirstNet service was the first key direction. LA-RICS began discussions with AT&T to understand the FRMZ program and to discuss available options. AT&T does offer a trailer solution, but LA-RICS quickly determined it needed an integrated vehicle for quick set up and service. So, an early decision was made to leverage the FRMZ services and AT&T equipment but to house the equipment in customized vehicles.

The FRMZ solution offered by AT&T includes a band 14 eNodeB, AT&T's customized satellite service with quality of service (QoS), and a Cradlepoint router to remotely manage the platform and provide Wi-Fi service locally. The QoS feature is helpful as it makes sure that LTE service, and important LTE signaling information, receives priority treatment over the limited satellite connection. And, by interconnecting the Cradlepoint router's Wi-Fi capabilities with the satellite backhaul, the solution can provide (lower priority) Wi-Fi service to those devices that don't have FirstNet service.

Because the FRMZ service operates on the FirstNet band 14 spectrum, each deployment must be coordinated with AT&T. Deployments can only occur where coverage does not exist, so it can't be used to augment capacity; however, because of satellite speeds, that's probably not advisable anyway. And these are fully functional cell sites that can handle phone calls. So, each new deployment has to be coordinated to properly route 9-1-1 calls, and LA-RICS will have to notify AT&T in advance for each new location before we bring it on the air.

A major challenge of the LA-RICS COLT program was to find resources capable of deploying emergency deployable vehicles as quickly as possible. Given the objectives, LA-RICS needed a solution to support rapid "immediate" deployments 24/7/365. LA-RICS explored a variety of operational models that were either excessively expensive or would not achieve the desired deployment timeframes. Fortunately, the Los Angeles County Sheriff's Department (LASD) has a mature and extensive program for mobile communications solutions. As a result, LA-RICS partnered with the LASD Communications & Fleet Management Bureau. The bureau's staff has decades of experience deploying mobile communications solutions and will be responsible for operating the CoLTs. LASD's mobile communications unit is located centrally in Los Angeles County and is able to get to most of the county within an hour. So, the expectation is that LASD will have equipment on site within two hours of request in most cases. Many are not aware that Los Angeles County is more than 4,000 square miles, which is roughly four times the size of the state of Rhode Island, so this is an aggressive goal.

Multiple vehicle form factors were considered, but ultimately, LA-RICS settled on vehicles that could accommodate free-standing masts capable of supporting multiple antennas and electronics at the top of the mast, onboard generators and HVAC. Importantly, they were also equipped with auto-aligning geostationary (GEO) satellite communications to be able to connect to the LTE packet core nearly anywhere in the county in a timely manner. LA-RICS considered fly-away kits that were fully portable, but those options did not allow for tall masts that could see over treetops and would be more time-consuming to set up.

After weighing all the options, LA-RICS settled on two form factors: a CoLT and a Cell on "Pickup" Truck (CoPT). The former option provided a "box truck" design that could accommodate much more growth for equipment down the road with a large enclosure as well as a 60-foot mast, and the latter option could be built on a 4x4 platform capable of handling rougher terrain but would be limited to a 30-foot mast. While both vehicles are capable of off-road scenarios, the 4x4 is expected to be able to handle rougher terrain more easily.

Since you can't find such vehicles at your local dealership, LA-RICS bought the vehicles from Sun West Engineering, a firm with decades of experience building mobile communications vehicles. The firm's expertise in building these vehicles is unparalleled and its design added a lot more functionality and ease-of-use to the finished product. For example, Sun West designed a cable management solution that will make raising and lowering the mast far easier and designed a tilt-over solution for the antennas so that they could be permanently installed. Both vehicles are equipped with sturdy masts that can support light winds without guy wires and have additional space for expansion in cabinets or racks and on the masts should LA-RICS' needs change down the road. The design provides three primary sources to meet our needs: generator, shore power (local power from the grid) and battery. The generator fuel source will provide power for up to 48 hours. "As a result of our discussions with LA-RICS during the course of this program, we were able to introduce some innovative new designs that we expect to provide a far easier and more efficient launch," said Dean Dougherty, National Sales Manager with Sun West Engineering. "We were honored to be a part of this landmark program and to support the public safety community."

Sun West was also able to design a mounting structure to locate the eNodeB at the top of the mast, resulting in more output power and better performance. AT&T's FRMZ solution is limited to 5 watts (W) output power and low-gain omnidirectional antennas, so the ability to avoid the extra cable loss will help provide better range for these units. Sun West was also able to design a removable platform solution for the CoPT. The platform can be left at the incident scene allowing use of the base truck or allowing the base vehicle to be taken in for maintenance. This flexibility is expected to come in handy down the road.

**Flexible Backhaul**

Ordinarily, a single omnidirectional eNodeB using multiple bands could support tens of megabits per second (Mbps). But, the AT&T FRMZ program only allows customers to use band 14. So, our capacity on the spectrum is expected to be around 15 Mbps perhaps peaking up to 30 Mbps. But, our capacity is really limited by the backhaul. We need backhaul to be available throughout the county, especially in the mountains where we expect to deploy. So, to be certain that we can have some reasonable data speeds throughout the county, we opted to use AT&T's satellite service with one Mbps committed information rate (CIR), with a 10 Mbps peak rate. That backhaul is expected to deliver sufficient capacity for phone calls and light data use for the incidents. And, importantly, it should be accessible nearly anywhere we need service throughout Los Angeles County with few exceptions.

LA-RICS had considered trying microwave solutions but ensuring line-of-sight communications county-wide or for a large portion of the county was unlikely. Where possible, we'll use local telco facilities for a larger pipe that doesn't include the extensive delay from GEO satellite service. Other services may bear fruit in the future, like low earth orbit (LEO) solutions.

The LEO solutions should also give us the benefit of quicker setup as some solutions are reportedly capable of handling high-bandwidth mobile connectivity and would not require a rotating dish like GEO solutions. But ,with our need to be able to handle remote locations, and the fact that we cannot presume some other backhaul exists at each incident location, geostationary satellite services will be our “go to” backhaul.

**Supporting the Regional Community**

AT&T allows different configurations for FirstNet users to use the FRMZ customer-operated deployables. The system can be restricted to specific users who subscribe to FirstNet using their phone numbers, or it can be open to any FirstNet subscriber. AT&T does this to avoid congesting the eNodeB to only essential users with the limited available bandwidth because the deployables only operate over band 14 and satellite. However, there are obvious operational concerns about maintaining a current phone list and ensuring that all regional agencies are in the access list. While the units will also operate Wi-Fi access points with greater access control, they lack the range of 700 MHz LTE signals. LA-RICS is currently still considering the options of whether it will open the deployables to all FirstNet users. But dozens of local, state and federal agencies could show up at a major incident in Los Angeles County, and some stick around after a long shift consuming resources for entertainment, so this is a big concern. Planning is still underway in Los Angeles on how these units will be initially configured, but phone numbers from local agencies are being collected.

**The Future**

There is still much work to do as we proceed into an operational mode with these units. We need to get a better feel for where we can operate the units without interfering with AT&T’s local band 14 operations. That will take some time to understand because there are no objective measures to determine where we are permitted to operate today. There is a great degree of uncertainty over the capacity of these units and whether it will be enough. We’ll be looking into alternative sources for backhaul in the near future and potentially ways to improve over-the-air capacity, too. We are also looking in to reports of band 14 causing interference with 700 MHz public-safety LMR narrowband, which LA-RICS is in the process of building right now.

We’re highly optimistic that these vehicles will provide our region with tremendous value and local control, and look forward to reporting back after we have a few deployments under our belt.

Joss Ross, a senior partner at Televate, has nearly 25 years of leadership in designing and operating LMR and commercial cellular systems. Ross chaired several working groups for the National Public Safety Telecommunications Council (NPSTC) Technology Committee and is an editorial advisor to MissionCritical Communications.

Ted Pao leads the LA-RICS team to deploy its public-safety LTE system and is the lead technical engineer to deploy the Project 25 (P25) system.

Mana Elliott is a retired Marine Corps Communications and Data Systems Chief (Master Gunnery Sergeant). He has 35 years of experience in Department of Defense and public-safety land mobile Communications systems. He is a professionally licensed communications professional with knowledge and experience in plans, coordination, supervision and installation of communications networks and systems integration, backhaul solutions, data communications, encryption systems, fiber rings, radio systems, systems interoperability, telephone systems and wire.