

WHITE PAPER

# Critical Communications for Utilities

Choosing the right technology  
for now, and the future



## FOREWORD

As a young Utilities communications professional in Mississippi some decades ago, Dan Draughn recalls facing natural disasters – both hurricanes and ice storms – almost every year.

Each time, the Utility’s leaders acted decisively, not only to restore power, but to implement initiatives that saved time, money, and lives. And each time, it underscored the importance of crystal clear communication they could count on; without it, the decisions and actions of those leaders would have never reached their teams in the field.

In the aftermath of each event, the formal evaluation process proved to be a valuable learning experience, as leaders sought improvement opportunities, best practice examples and the right tools and processes. The lessons learned have become the foundation and strategy of Dan’s subsequent career as a critical communications expert, across multiple industries and organizations.

This paper is intended for Utility leaders and decision-makers. The author provides insight into:

- ▶ the common challenges all Utilities face,
- ▶ selecting communications tools for Utility-specific requirements,
- ▶ what the next generation of Utility communications will look like.



## THE CHALLENGES ALL UTILITIES FACE

As Utilities re-evaluate their wireless communications options, decision-makers often ask: “Do I still need an LMR system, or can we use LTE or satellite to address our mobile communications?” In response, it’s first important to acknowledge that while communications technologies may have advanced, the challenges that Utilities face remain constant.

*Utilities communications must support a reliable, cost-effective and safe worker environment 24 hours a day, 7 days a week, 365 days a year.*

However, during day-to-day outages, emergencies and disasters, rapid restoration has become increasingly important. Why? Because our energy dependence has increased exponentially. Of course, essential public services and businesses need power to function safely, efficiently and securely. Even at home, losing power goes well beyond the inconvenience of having to reset clocks or go without Netflix; life-sustaining medical equipment is now common in homes everywhere.

Regardless of where in the world they operate, every Utility faces three challenges:

- ▶ power must be restored quickly to keep public services and businesses
- ▶ operating smoothly,
- ▶ restoration must be done safely – Utilities cannot endanger the men and women
- ▶ on their teams,
- ▶ regulators and customers demand cost-effective operations that pass savings to customers and investors.

Without reliable communications, these challenges are unlikely to be met. Dispatchers making multiple individual calls or relying on cell coverage – for construction, line maintenance, line stringing, blackouts, black-starts etc – risk communication delays that no Utility can afford.

Regardless of weather, time of day, location or terrain, when individual workers and interconnected groups communicate effectively in the field and with their dispatch control centers, team efficiency increases. Data applications like AVL, SCADA, field operations and text with effective, wide-area coverage not only improves daily operations but enables efficient pre-staging of crews as they prep and respond to storms and disasters.

## WEIGHING UP THE OPTIONS

Utility leaders will rightfully consider the big picture of their voice and data critical communications strategy, including potential positive and negative impacts on their operations. They recognize that technologies like satellite, LTE, and LMR cannot be viewed independently, but must all be considered as part of a Unified Critical Communications plan.

Around the world, the most common forms of wireless communication for Utilities are LMR, cellular/LTE, and satellite. We'll review the strengths and weaknesses of each.

### LAND MOBILE RADIO

Tried and trusted LMR has transformed over recent years. Historically, proprietary standalone systems were industry-standard for Utilities, until LMR standards bodies transformed the industry, ensuring that both the core and functional features adopted open standards. Today, those standards bodies work closely with manufacturing communities to define and incorporate Utility-specific requirements.



The leading LMR open standards are P25, TETRA, and DMR.

- ▶ P25 was designed specifically for Public Safety and other mission-critical organizations, and is most widely adopted in the United States.
- ▶ TETRA is popular in Europe, providing great coverage in dense urban areas, but tower density requirements make it prohibitively expensive in less dense environments.

**A frustrated lineman stressed the importance of his portable two-way radio like this: “When the sun is shining, I can restore power with a pocket full of quarters. When the communication system is down, we cannot restore power. And worse yet, someone will get hurt if we can’t talk in the field or with the operation centers.”**

- ▶ DMR is the most recent standard and defines both voice and data over a wide area. Although it is narrowband, Utility SCADA and field operation data is generally small enough that DMR's narrow data pipe is not an issue.

LMR's spectral efficiency advancements have effectively doubled the number of available channels, worker safety features monitor the status of your team, and voice calls are clearer, right to the edge of your coverage area. But undoubtedly, the great advantage of LMR is its proven reliability in the face of severe weather events which render other networks useless. Even if an LMR network fails, it can still provide simplex communications, so that workers within range can communicate with each other directly. This is an essential feature for Utilities that LTE and satellite simply cannot provide.

An additional LMR benefit is re-use of licensed spectrum which you may have purchased decades ago, for technology that is now end-of-life. You can use this spectrum for future communications advancements, such as a move to DMR. (To purchase that spectrum to cover a typical service area today would easily cost millions of dollars.)

#### CELLULAR/LTE

LTE has unlocked an exciting new world of broadband data for Utility organizations. Both private and commercial LTE networks adhere to open standards, and while private LTE networks are a great fit for Utilities, it's important to note that the cost is significantly higher than commercial LTE or private LMR. However, PTToc and broadband applications are available to Utilities considering private LTE.

Commercial LTE offers incredible bandwidth for transmitting data at a low cost, but sacrifices some reliability and availability, because commercial networks are prone to failure during large event – precisely when you need it the most. While coverage tends to be highly available in densely populated areas, Utilities decision-makers should note that they must also provide reliable service in remote areas, where commercial LTE coverage is typically limited.

**“I need to know when I say, ‘stop,’ everyone hears me, or someone is going to get hurt.”**

**These are the words of a bucket truck operator who spent his working day stringing lines over an Interstate Highway. Emphasising his need for reliable communications, he added,**

**“We wouldn't send a Line Truck when we need a Bucket Truck to do the job. Why use something other than a radio system – designed for critical communications – for stringing transmission line?”**



## SATELLITE

Orbiting above the earth, satellites can receive signals from any location, and communications can be configured for voice and data. Where terrain is too challenging or remote for LMR or LTE, satellite can be both cost-effective and quick to set up. It does come with some disadvantages:

- ▶ Bouncing a signal to a satellite and back to earth can take several seconds. This high network latency can mean life or death for a lineman trying to restore power during
- ▶ a storm.
- ▶ Satellites require clear line of sight to the dish antenna. Bad weather can get in the way – even rain can severely degrade performance.
- ▶ While satellite networks are generally reliable, satellites themselves represent a single point of failure, vulnerable to damage from orbiting debris or solar flares, and difficult to repair.

LMR offers back-up base stations and simplex communications that satellite cannot.

The table compares features and attributes of each technology:

	Land Mobile Radio	Private LTE	Commercial LTE/Cellular	Commercial Satellite
<b>Primary benefits</b>	Coverage and reliability	Capacity	Commercial capacity	Commercial Global Coverage
<b>Infrastructure</b>	Few towers	Many towers	Many towers	Uplinks and 77 Satellites
<b>Power</b>	High	Low	Low	Low
<b>Spectral efficiency</b>	Low	High	High	Medium
<b>Data Capacity</b>	Low	High	High	Medium
<b>Duplex</b>	Half	Full	Full	Full
<b>Groups</b>	Group mode	PPToC only	PPToC only	Group Call
<b>Talkaround</b>	When infrastructure fails	Limited, specialized units	Limited, specialized units	None
<b>Voice quality</b>	High	Consumer	Consumer	Consumer
<b>Call priority</b>	Confirmed	Best Effort	Best Effort	Best Effort
<b>Purpose</b>	Voice, narrowband data	Voice, broadband data	Voice, broadband data	Voice, messaging
<b>Reliability</b>	Multiple layers of redundancy	Many single points of failure with site backup generators	Many single points of failure, limited backup generators	Single points of failure including weather
<b>Overload</b>	Designed for peak emergencies	As specified	Subject to event overload	Subject to event overload
<b>Cost</b>	CAPEX-intensive, low TCO	Expensive CAPEX, high TCO due to spectrum acquisition	Low CAPEX, OPEX similar to LMR	Highest OPEX and TCO



**Dane Clemons, Director of Information Technology and Communications at Talquin Electric, explained the importance of reliable communications during storms in 2017.**

**“When a storm such as (Hurricane) Irma comes to town it brings a lot of pre-storm and post-storm anxiety. Knowing that you have clear and reliable communications helps relieve some of that. During Irma, our Tait radio system performed solidly and was never a concern. Communications were clear and reliable throughout the entire event, which ultimately contributed to a timely restoration operation.”**

## Which network is right for my Utility organization?

The services Utilities provide are critical. Not only does power enable us to flip the light switch, turn on the heat, or cook a meal, it also ensures that critical services like hospitals, public transport, and more continue to operate. To provide these essential services, Utilities need mission critical communications networks.

Push to Talk (PTT) over LMR continues to be the primary mode of communications, as operations such as connect/disconnect, outage management, distribution, transmission, and generation services all require a significant amount of voice coordination. Voice remains king as the universal data translator. However, data provides many benefits and as Utilities recognize how it can improve overall efficiency, commercial cellular broadband is playing a larger role in Utility communication strategy.

When choosing the right network, here are several questions to consider:

- ▶ Do our applications require broadband or narrowband data?
- ▶ Which applications are mission critical and which support business-as-usual?
- ▶ Which open standards should we take advantage of?

In response, Utilities no longer ask “which network is right for my organization?” Instead, they’re asking, “how do we leverage the best of all available networks?”

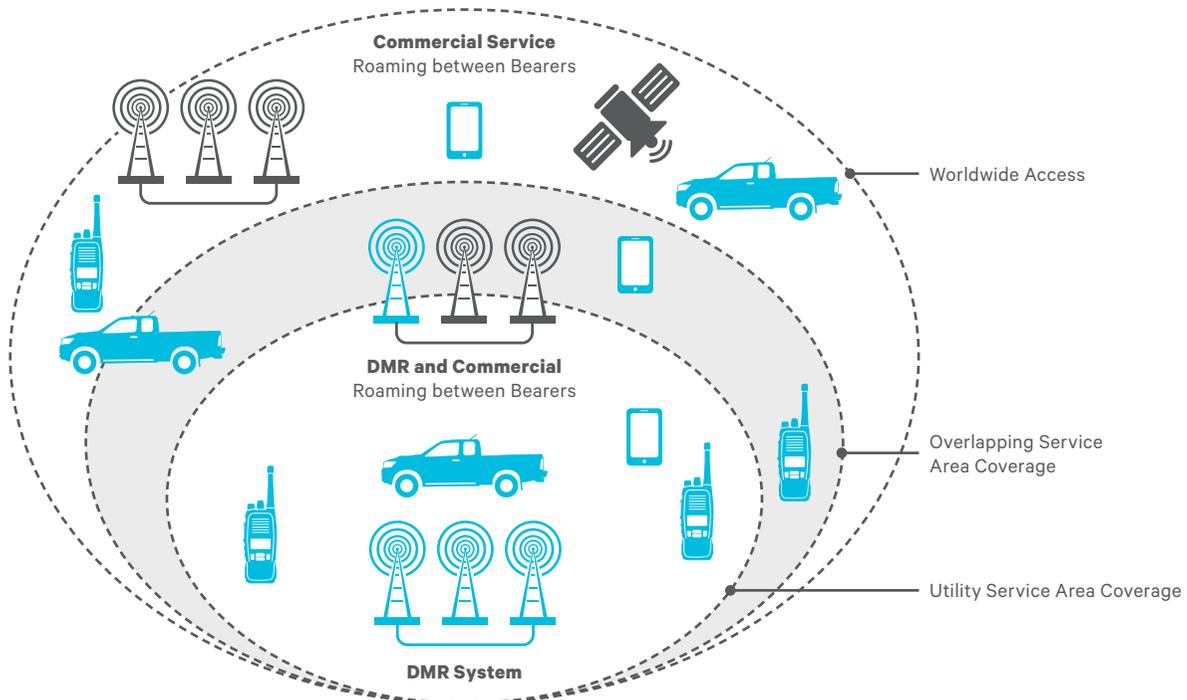
Commercial cellular provides data capability that enhances day-to-day operational productivity wherever there is coverage. LMR fills in coverage gaps for both voice and data, and provides a reliable communications pathway when outage events – thunderstorms, tornados, earthquakes, and hurricanes – strike. Satellite can provide coverage in areas that are otherwise impossible to reach.

Commercial systems can improve operational efficiency of Utility organizations, but at this point they cannot fully replace the reliability of a private LMR network. LMR reliability, like private fiber and backhaul networks, is critical to daily and emergency operations of any Utility.

The future of wireless lies in a convergence that unifies the best of LMR, LTE, and other wireless bearers, so that workers have LMR reliability and the broadband capabilities of commercial LTE in a single device. Products like Tait Unified Vehicle bring together the best of wireless communications, to create a network of networks – LMR, LTE, WiFi, Bluetooth, and in the future, satellite.

### Converged Critical Communications

Expanded Voice/Data Services for Utility OT and IT Operations



Now let's look at the experience of a typical Utility company, investigating the cost, functionality, reliability and expansion capabilities of LMR, LTE and satellite. Their decisions – which we summarize here – were not made lightly.

- ▶ They considered data requirements, such as bandwidth to support PTTc and narrowband data applications like messaging and individual calls. Those requirements drove up the estimated cost of commercial cellular, for functionality which they could access on LMR.
- ▶ They discovered the annual cost per user of operating private LMR was roughly same as the annual cellular subscription, while the cost to operate exclusively on satellite was more than double. LMR had a variable annual operating cost of US\$900-1200 (per user) because:
  - operating cost is generally lower in densely populated areas,
  - communicating during extended blackouts in remote rural areas (with limited or nonexistent cellular coverage) requires additional generators and battery backup.

- ▶ LMR gave them increased reliability over cellular, despite a slightly higher monthly cost. For emergency back-up, they leased a small fleet of satellite handsets at around US\$1,500 annually (per user) for voice, and a minimal amount of data.
- ▶ When it came to satellite, they identified potential for delays in switching and restoration, during or following a typical thunderstorm when the satellite system was unreliable. The cost of these delays alone could pay for the entire radio system.

Ultimately, the annual cost, potential for lost productivity, and safety concerns that came with spotty cellular coverage and inconsistent satellite reliability were the major reasons to invest in an LMR system, rather than leasing cellular or satellite services.

## SUMMARY

Utilities continue to see voice and data technology advancements from both private and commercial network providers, and they will continue to make individual investment decisions on which combination best meet their requirements.

Advancements in LMR mean that Utilities transitioning from analog to digital effectively double the use of their existing spectrum, and simulcast can expand capacity and coverage even further. Worker safety features like Man Down, Lone Worker, and GPS enhance their ability to restore power safely and efficiently.

LTE continues to develop rapidly; its data capabilities unlock countless efficiencies for day-to-day Utilities operations, but it cannot match LMR reliability under pressure. And ultimately, if workers in the field do not have reliable communications, they simply cannot restore power in a safe, cost-effective way.

So rather than choosing one technology or another, modern Utilities are choosing to unify multiple critical communications networks. For Utilities who follow this unified approach, communicating with anyone, anywhere, on any device is now a reality.

## ABOUT THE AUTHOR

### **Daniel Draughn, Director Market Development – Critical Industries.**

With more than 35 years of executive leadership, Dan Draughn offers Tait clients and partners a client-focused approach to critical communications solutions. With experience in helping organizations implement solutions in complex and emerging markets, he has worked in diverse industries including Utilities, public safety, transportation, state and local governments, wireless and wire-line telecommunication companies. He believes it has never been more important for critical communications professionals to leverage technologies to manage critical infrastructure solutions.

Dan can be reached at [daniel.draughn@taitradio.com](mailto:daniel.draughn@taitradio.com).

For more on Critical Communications for Utilities, see the following resources:

- [White Paper: Tough Calls – Dedication in the face of disaster](#)
- [Brochure: Unified Critical Communications for Utilities](#)
- [Article: Utilities, is your grid resilient?](#)
- [Article: Will LTE be the Death of LMR?](#)
- [Article: 8 Reasons Utilities are Choosing Tait](#)



+ Stay updated with our latest contents

### Follow Us



---

#### COPYRIGHT

General terms of use for Tait technical documentation. While Tait has taken every care to ensure that the information and contents are correct and up-to-date at the time of printing, the information may contain technical inaccuracies and/or printing errors. Tait does not guarantee the accuracy or correctness of the information. Tait cannot be held liable or responsible for errors or omissions in the contents of the technical documentation. All information contained in the technical documentation is given without warranties or representations, expressed or implied.

Disclaimer. Tait Limited marketed under the Tait Communications brand. Tait Limited expressly disclaims all warranties, expressed or implied, including but not limited to implied warranties as to the accuracy of the contents of this document. In no event shall Tait Limited be liable for any injury, expenses, profits, loss or damage, direct, incidental, or consequential, or any other pecuniary loss arising out of the use of or reliance on the information described in this document.

The words "Tait", "Tait Unified", the "Tait" logo and "Tait Unified" logo are trademarks of Tait International Limited.