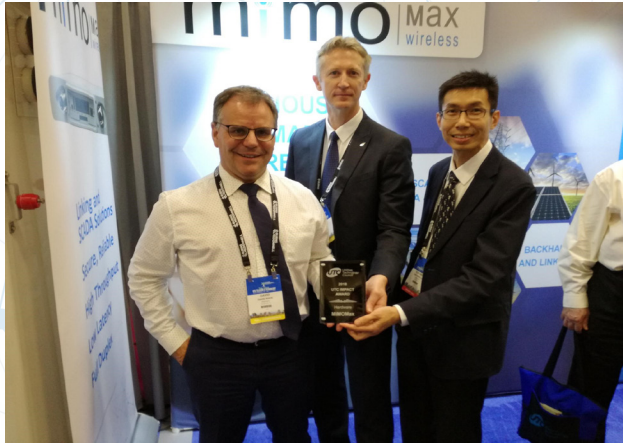




Case Studies

MISSION CRITICAL WIRELESS COMMUNICATIONS

mimomax



Managing Director, David Wade, GM for North America, Paul Reid, and Chief Operating Officer, Kok Heng Loh holding the 2018 UTC Impact Award.

WELCOME TO MIMOMAX

Our driving focus is to engineer wireless communications solutions which both optimize our customers' investment in spectrum and support their mission critical infrastructure.

As a leading provider of Field Area Networks, our high capacity, low latency links support SCADA control and monitoring, integration of DERs, teleprotection and AMI backhaul for Utilities. We also provide resilient LMR backhaul links for Public Safety, Transport & Mining where security, speed and availability are of paramount importance due to the potential impact on human life.

Having spun out of the Advanced Technology Group of Tait Communications, our team has a deep understanding of RF engineering. We combine this expertise with a continuous drive towards greater innovation in our product design – as demonstrated by our recent win of the Utilities Telecommunications Council's Impact Award for our Tornado radio.

In the following pages, you'll read success stories from some of our deployments around the world. Irrespective of the industry or the size of the customer, we pride ourselves on the close relationships we build with our clients as we deliver solutions that meet their needs. We hope you enjoy reading about the projects as much as we have enjoyed being a part of them.

David Wade
Managing Director
Mimomax

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SCADA = Supervisory Control & Data Acquisition
FAN = Field Area Network
DA = Distribution Automation
DER = Distributed Energy Resources
AMI = Advanced Metering Infrastructure
LMR = Land Mobile Radio

Ultra-spectral efficiency at the core of Great River Energy's new SCADA communications network

Requiring a communications network to support their SCADA requirements, Great River Energy in Minnesota chose to deploy radios from Mimomax for their extensive 700MHz Point-to-Multipoint communications project.

CHALLENGE

With a 56,000 square mile service area to cover, Great River Energy was in need of a robust, cost-effective and stable communications solution to support their critical infrastructure. Tree cover and challenging terrain added challenges to the coverage design of the project and the solution needed to be scalable to add an element of future-proofing for network expansion.

SOLUTION

Mimomax engineered a wireless Point to Multipoint communications network based around their world-leading Tornado radio. Utilizing full duplex, Multiple Input Multiple Output (MIMO) communications combined with high order modulation (256 QAM) effectively doubled the data capacity in the two 1MHz channels Great River Energy had leased.

"The level of throughput offered to Great River Energy via our Tornado radios allowed them to effectively utilize the available 700MHz spectrum in ways not possible with traditional radio communications," said Paul Reid, General Manager for North America, Mimomax.

Incorporating Adaptive Modulation into the Tornado radios allows for every link in the point-to-multipoint

network to be maintained independently, irrespective of any modulation fluctuations in the surrounding links. In addition, the two by two MIMO technology offers the flexibility for customers to carry out activities such as software updates while continuing to run their SCADA monitoring.

With 700MHz being a narrow slice of spectrum sandwiched between Verizon's LTE system and FirstNet's proposed public safety broadband network, further challenges were posed in terms of out-of-band interference and the potential for self-interference. The built-in duplexers in the Tornado radios assisted with removing channel perturbations and due to their operation on lower RF power, the Tornado network offered the opportunity for greater levels of frequency re-use.

“Our previous system has used three large channels which did not allow us many options for frequency re-use and, as a result, we have faced a lot of challenges with self-interference. By using 50 kHz channels, we now have a much more robust frequency plan and expect our self-interference to greatly improve or even be eliminated altogether”

KATHY SHAFT | PE SENIOR TELECOMMUNICATIONS ENGINEER - GREAT RIVER ENERGY



RESULTS - PHASE ONE ROLL-OUT

Still in the early stages of deployment, the project's detailed coverage engineering and propagation modelling carried out prior to deployment had ensured the co-channel protection could be achieved. In addition, the ability to configure radios to operate at bandwidths of 12.5, 25 or 50KHz has offered Great River Energy the ability to choose a mixture of channel bandwidths at any of their base stations, depending on their needs.

While the deployment of the Mimomax network will continue to roll out through 2018, key elements of the project, such as the comprehensive training plan designed and delivered by Mimomax are now complete. Aiming to build an extensive knowledge base in-house at Great River Energy thereby lowering long term operational costs, the training plan focused on topics such as antenna installation, RF configuration and Multipoint Digital Linking.

KEY BENEFITS

- Mitigation of out-of-band and self-interference via channelization and frequency re-use
- Double the data throughput, optimizing investment in spectrum
- Solution equipped for challenging terrain and harsh weather conditions
- Ability to simultaneously monitor SCADA applications and update software

ABOUT GREAT RIVER ENERGY

Location: Maple Grove, Minnesota

Industry: Power & Water Utility

Services: Great River Energy provide wholesale electric service to 28 member cooperatives which distribute electricity to approximately 695,000 member consumers in Minnesota - or about 1.7 million people.



Engineering a robust Field Area Network for critical industry infrastructure

Servicing over a million end-users in an approximately 2900 square mile area, Salt River Project is one of the USA's largest public power utilities. In addition to electricity, SRP also delivers over 800,000 acre-feet of water to customers annually.

CHALLENGE

Aiming to build a new communications network which would allow for centralized monitoring and control of their distributed power and water systems, Salt River Project acquired 2 MHz of spectrum in the 700 MHz Upper A Block. With spectrum being both scarce and valuable, the biggest challenge for the utility was to find a solutions provider who could optimize data throughput in the narrowband channel they now had available. SRP then began the search for a partner to provide the communications infrastructure for a new 1300 square mile Field Area Network (FAN) which would encompass three Arizona counties, including the metropolitan Phoenix area. In addition to monitoring and controlling power flows into and out of the grid from numerous advanced solar installations, the FAN was also required to connect Distribution Automation applications and provide AMI backhaul.

SOLUTION

Requiring coverage for a geographically large network incorporating a multitude of endpoints across the Phoenix basin, the Mimomax team worked closely with SRP's engineers to create a customized design which would provide the coverage and functionality required.

The Mimomax solution was engineered to:

- Ensure ease of deployment in order to save costs and reduce reliance on specialist radio engineers to deploy endpoints;
- Incorporate a sophisticated Network Management System solution with which to monitor and report on such a large number of devices;
- Offer very low latency to allow for ultra-rapid feedback on the state of SRP's large-scale network of industrial infrastructure;
- Provide saturation coverage over the operational area to a wide variety of devices with a complex set of functionality via the design of a high power, dense network with multiple frequency re-use;

- Comply with stringent US Homeland Security requirements relating to Critical Infrastructure, including encryption, authentication and traceability;
- Incorporate detailed propagation modelling and drive testing to validate predictions from the models;
- Deliver a customized network design where data relating to separate internal business units at SRP could remain secure and isolated.

The resulting multi-tier solution designed by Mimomax combined higher functionality, higher capacity radios at the center of SRP's network (where large amounts of data are aggregated) with lower cost, lower capacity radios at network endpoints. This approach provided SRP with appropriate levels of coverage across their network and a lower total cost of ownership for the Field Area Network.

“The Mimomax team has done an outstanding job meeting SRP’s needs. Their technical expertise, innovative approach and customer service have been very much appreciated. It is clear that SRP made the right choice to partner with Mimomax and we are very excited for the future.”

CHRIS CAMPBELL | SENIOR DIRECTOR OF GRID MODERNIZATION SERVICES
- SALT RIVER PROJECT

THE PILOT

Following a robust pilot process where a live network was created to test the NMS and auto-discovery features of the radios, SRP provided Mimomax with a Notice to Proceed and the deployment phase began.

Key highlights of the project at this point include:

- Mimomax’s Tier I Tornado radios have been successfully deployed to connect a variety of endpoint devices across the FAN.
- The new Tier II radio, Pyxis, was also developed as part of the 2017 Pilot and was successfully tested on a range of devices including DER, Meters and Volt/VAR controllers;
- Advancements made during the project have also included the development of new antennas and pole mount technology and the incorporation of a GPIO controller driven directly by DNP3. This is now fully accessible via a new feature rich command line interface;
- New IP networking advancements include router-on-a-stick, enhanced port security, advanced tunneling and mixed mode routing.



KEY BENEFITS

- Private, secure, scalable network
- Multi-tier approach for appropriate levels of coverage across their network
- Lower total cost of ownership for the FAN
- Saturation coverage via multiple channels and greater frequency re-use
- Connectivity to multiple SCADA, DER and DA devices
- Replacement for carrier-based AMI backhaul

ABOUT SALT RIVER PROJECT

Location: Phoenix, Arizona

Industry: Power & Water Utility

Services: Serving central Arizona since 1903, SRP is one of the USA’s largest public power utilities. An integrated utility providing generation, transmission and distribution, SRP delivers electricity to 1 million retail customers in three Arizona counties including most of metropolitan Phoenix and provides 800,000 acre-feet of water annually to Arizona customers.



Consolidating AMI Backhaul & SCADA in one high capacity network

Requiring a new communications solution to support and consolidate an AMI upgrade with their SCADA control, Navopache Electric Cooperative engaged Mimomax to supply a high capacity network in locations without a microwave backbone in their New Mexico and Arizona service area.

CHALLENGE

With their existing AMI backhaul nearing end-of-life, Navopache Electric was looking for a vendor who could provide a private communications solution in 700MHz. The new network would need to offer the bandwidth required to be able to manage both the AMI backhaul and mission critical SCADA communications simultaneously.

Furthermore, the solution would need to be designed to not only ensure Navopache Electric's frequencies did not interfere with the adjacent spectrum owned by Salt River Project but to also be able to maintain high availability despite the challenges of mountainous terrain and tree cover.

SOLUTION

Navopache Electric selected Mimomax to provide a point-to-multipoint network based on the Tornado radio. The solution was designed to provide reliable ethernet connectivity plus backhaul from both AMI collectors and their upgraded SCADA controllers.

One of the key priorities for Navopache Electric was to be able to prioritize serial traffic over Ethernet to ensure the availability of the SCADA network. A past situation

where a firmware upgrade was sent to several downstream devices over the Ethernet had caused the serial traffic to stop thereby disabling the organization's SCADA network. Prior to deployment, the utility ran a series of robust lab tests to ensure the ethernet ports could handle the level of SCADA traffic they were expecting.

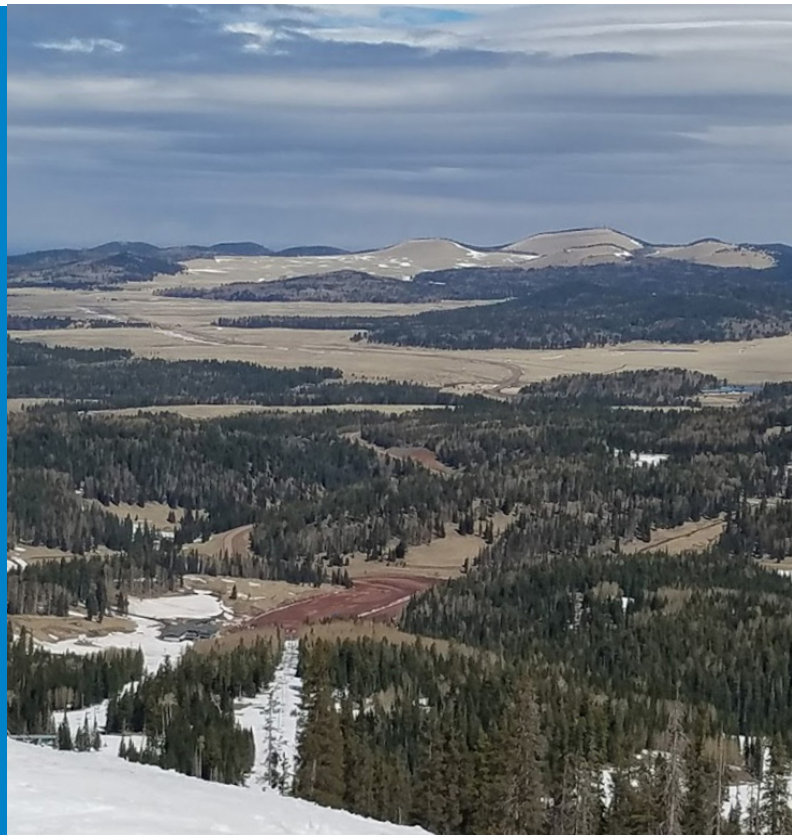
“Throughout this project, every member of the Mimomax team has been vastly knowledgeable about the products and always eager to answer any questions or help solve individual issues. The result is that they have ensured that Navopache Electric is getting exactly what we need out of their radios.”

JEREMY HELLMAN | COMMUNICATION ELECTRONICS TECHNICIAN
- NAVOPACHE ELECTRIC COOPERATIVE

RESULTS

Utilizing in-house expertise in network engineering and coverage design, the Mimomax team was able to mitigate both cross boundary and self-interference for Navopache Electric. Combining this detailed design and testing with the in-built internal duplexers and sophisticated filtering of the Tornado radio resulted in superior performance for the whole network.

The high throughput rates and full duplex communications offered by the Tornado radio also allowed Navopache Electric to maintain their SCADA traffic without interruption. “We’ve done tests with the Mimomax radios where we have bombarded the Ethernet ports with traffic and have never seen even the smallest hiccup in the serial transmissions,” said Jeremy Hellman, Communication Electronics Technician at Navopache Electric Cooperative.



KEY BENEFITS

- Solution equipped to cope with harsh environmental conditions
- Ability to prioritize serial traffic to ensure the availability of SCADA network
- Private, secure network for AMI backhaul
- Detailed coverage design and integrated filtering to mitigate interference from adjacent bands

ABOUT NAVOPACHE ELECTRIC COOPERATIVE

Location: Eastern Arizona & Southwestern New Mexico

Industry: Electric utility

Services: Established in 1946, Navopache Electric has continually expanded from a few miles of power lines to now providing electricity to over 25,000 homes and businesses across a service area totaling almost 10,000 square miles.



Real time monitoring & control for Italian oil pipeline

As part of a SCADA modernization project for an oil pipeline in Italy, Mimomax was selected to provide a network of highly reliable, ultra-low latency links for IG O&M S.p.A by their system integrator, Ponti Radio PR, Italy.

CHALLENGE

Hampered by a technologically obsolete radio network which had very low-speed FSK links and was unable to support any new applications on their network, the oil pipeline was undergoing an upgrade to the telecommunications system which underpinned their SCADA system.

The addition of new pumping stations, valves and a leak detection system as part of a 180km extension project created additional requirements for communications links, combined with a need for higher data capacity than could be achieved at FSK. Challenged also by limited access to spectrum, sourcing a solution which offered excellent bandwidth efficiency combined with ultra-low latency for rapid feedback was critically important.

SOLUTION

Working in collaboration with Ponti Radio PR, Mimomax designed a network comprised of Point to Point and Point to Multipoint Digital Links which would replace the old analog technology. The new links needed the following attributes:

- Spectral-efficiency – with high volumes of over-IP SCADA traffic combined with a large number of out-stations spread over a wide geographic area, the new network was required to optimize the data throughput in narrowband UHF channels;
- Low latency – near real-time monitoring was required for the SCADA traffic to ensure rapid feedback on the state of the pipeline;
- Utilization of existing infrastructure – the project demanded the use, where possible, of existing radio towers and antennas in order to minimize the overall cost of the project;
- Ease of implementation – incorporating a managed soft migration from the existing system to the upgraded one, thereby guaranteeing uninterrupted service delivery;
- High reliability – with hill terrain and some long-distance links to contend with, it was imperative that the radio network was immune to fading phenomena caused by weather conditions.

“The high data throughput we have been able to provide with our full duplex radios has resulted in a system capable of supporting each SCADA system independently - with no negative impact on either system and all within a single 25kHz channel.”

DOUG MCCONNELL | CHIEF TECHNOLOGY OFFICER - MIMOMAX

RESULTS

- Offering a data throughput of 320 Kbps on a 25 KHz channel and ultra low latency (sub 10 milliseconds), the Mimomax solution has successfully provided the ability to constantly monitor the oil pipeline in near real-time for improved efficiency and far greater reliability of service. The level of data throughput provided has resulted in a system capable of supporting each SCADA system independently, with no impact between systems.
- By positioning Base Radio Units (BRUs) in existing radio towers and linking new telemetry points from the same towers, Mimomax was able to minimize the quantity of BRUs required. In addition, all existing antenna were re-used, further increasing the overall cost-effectiveness of the solution.
- The radio network was also setup with a back-up power system, guaranteeing communication links remained in operation even during power outages.
- Required to cope with links up to 45 kilometers long, the new communications system benefitted from the superior propagation qualities offered by lower UHF frequency ranges.

KEY BENEFITS

- High data throughput to cope with large volumes of IP SCADA traffic from multiple outstations
- Near real-time monitoring for rapid feedback due to ultra low latency
- Lower overall project cost through use of existing infrastructure for antennas
- Detailed path planning and testing to ensure high availability of links

About PONTI RADIO PR

Ponti Radio PR is an Italian System Integrator, specializing in Private Radio Networks.

Location: Italy

Industry: Oil

Services: Ponti Radio PR focuses on System Integration, RF Planning, Structural Engineering Assessment in addition to Installation and Commissioning primarily in the Oil and Gas market in Italy.

ABOUT IG O&M S.P.A

IG O&M has 40 years' experience in the operation, maintenance and servicing of oil and gas pipelines.



Ultra-low latency & ultra-high reliability for substation protection network

Owning and operating an electricity distribution network of 8000 square kilometers of diverse geography in central Canterbury, Orion NZ Ltd is focused on maintaining an uninterrupted, reliable power supply to the 200,000 customers connecting into their network.

CHALLENGE

Power distribution lines and substations are typically protected by protection relays to ensure that even under severe fault conditions the line and the equipment connected to that line is protected. This protection thereby minimizes both the impact on end users from any power disruption and the cost of repairing any damage resulting from the fault.

Combine those impacts with the potential effect on human life if a severe fault was to occur in the public domain and the requirement for a robust teleprotection solution becomes clear.

Orion's requirements for a teleprotection solution included:

- Ultra-low latency and phase jitter to meet the design criteria for teleprotection circuits;
- The ability to be installed across difficult terrain - often in areas where stringent environmental standards would need to be met, and;
- An approach which would not depend upon the installation of fiber or microwave links.

SOLUTION

Mimomax developed an "Optimized Protection Variant" (OPV) for Orion – a variant of its MiMO linking product family.

Key features of this solution include:

- The ability to support dedicated serial protection circuit with 128kb/s in a 25kHz bandwidth channel;
- Operation on licensed channels to ensure interference-free operation;
- A typical latency of 5mS to allow three concatenated MiMO links with a total latency inside one power cycle;
- Phase jitter minimized to less than 55nS;
- The ability to use residual capacity to carry IP/SCADA traffic with no impact on the dedicated protection circuit.

“Installing Mimomax teleprotection equipment not only helps to minimize the impact to end-users from power outages but also helps Orion maintain their focus on safety for the public and their contractors.”

DAVID WADE | MANAGING DIRECTOR - MIMOMAX

RESULTS

Having installed Differential Protection radio links across their network, Orion continues to expand their protection circuits into new areas including a recent project on the Banks Peninsula. With difficult terrain to contend with and constraints created by Department of Conservation concessions, the Peninsula Protection Ring project has benefited from the cost-effectiveness and ease of installation allowed by Mimomax's OPV solution.

Key results from the Mimomax solution included:

- World leading spectral-efficiency in a licensed, interference-free channel with up to 256kb/s capacity;
- Complete substation protection in addition to SCADA and voice communications over one radio link and on one 25kHz channel with the option in the future to run multiple protection channels on the one link;
- 450MHz antennas were easy to align and less affected by severe weather events or minor path obstructions (i.e. tree shading) than other antennas or microwave solutions;
- Easy and economic integration with Orion's existing GE L90 relays.



KEY BENEFITS

- Ability to run SCADA traffic in addition to dedicated teleprotection due to high data throughput
- High network availability due to 450MHz antennas - greater immunity to weather and path obstructions
- Ultra-fast network feedback with typical latency of 5ms and jitter less than 55ns
- Interference-free operation on licensed channels
- Future potential to run multiple protection channels on the one link

ABOUT ORION

Location: Canterbury, New Zealand

Industry: Electrical Utility

Services: Orion owns and operates one of the largest electricity distribution networks in New Zealand, providing power to 200,000 residential and business customers in an 8000-square kilometer network in central Canterbury.

Multiple radio channels and real time data transfer for Puget Sound Energy

Puget Sound Energy (PSE) is Washington state's oldest energy utility, providing power and natural gas to nearly 1.4 million homes and businesses. Spanning 6,000+ square miles and providing electricity to over one million customers and gas to a further 790,000, PSE's service territory is home to some of the world's most-recognized brands, including Microsoft, Amazon.com and Starbucks.

CHALLENGE

PSE were looking to link a new mobile radio site to transfer voice and data over hilly terrain with a path distance of 9 miles (14km). Given the critical nature of the utilities industry and the high expectation of grid reliability from a number of nationally significant customers, PSE needed to ensure that the linking to this site was secure and offered high availability.

Furthermore, latency and jitter are serious factors for the transfer of PMR voice and data traffic for mission critical applications. As a result, PSE were requiring a solution that could deliver the high performance that they required with the assurance that the system would not fail in a state of emergency.

In addition, the repeater sites would be at busy RF sites which had the potential to be subject to interference due to the large number of transmitters in adjacent or nearby bands. While exploring many options, PSE also encountered the reliability limitations of lower cost solutions and the high installation and maintenance costs associated with some of the high reliability solutions on the market. Although the link path was only 9 miles, the cost to lay a fiber connection was considered too high (buried fiber being more than 10 times the cost of a narrowband link) and also ran the risk of vulnerability in extreme scenarios such as earthquakes. Given the challenge in isolating and correcting problems in a buried fiber link, the organization sought a different solution which would offer the required reliability but would also be easy to deploy and cost-efficient.

SOLUTION

PSE chose a Mimomax 900MHz NDL linking solution to link to an MPT-IP LMR repeater. Selected for the ultra-spectral efficiency, the Mimomax solution can deliver a large number of radio channels with very low latency and jitter (latency typically 8ms in a 25 kHz channel). The link can also support all open PMR network standards including MPT 1327, MPT-IP, P25, DMR, TETRA and QS Simulcast in trunked and conventional configurations.

The 900MHz frequency band was selected because of the availability of spectrum and the fact that using 900MHz MiMO panel antennas provided a high gain of 16dBi with independent horizontal and vertical polarizations. Equipped with a fully enclosed radome,

this low-cost antenna was also a good fit for harsh weather conditions.

Specializing in "customized" wireless linking solutions, Mimomax worked closely with PSE to design a solution meeting their unique requirements. The NDL link equipment was delivered preconfigured and tuned to the customer's specifications and was tested under laboratory conditions for a week to ensure performance met the specifications provided by Mimomax. As a result of the successful lab test, the equipment was subsequently deployed into the field without any issues due to the radio's ability for "Plug and Play" with most PMR systems.

“Combining low latency and high bandwidth with easy plug ‘n’ play deployment offered PSE an excellent PMR linking alternative to the substantial expense of laying fiber.”

PAUL REID | GENERAL MANAGER NORTH AMERICA - MIMOMAX



Solar and Wind Farm: Puget Sound Energy's Wild Horse © Jeff Wilcox, Flickr

RESULTS

Offering ultra-high spectral efficiency and exceptionally low latency, Mimomax NDL radios have provided PSE with a linking solution capable of supporting multiple radio channels with real-time data transfer and low error rates. Improving network efficiency, the NDL solution also provides higher data throughput in less RF bandwidth, resulting in return on investment in spectrum and substantial cost savings. In addition, Mimomax radios have the capability of integrating seamlessly with other onsite IP-based equipment such as routers – a flexibility allowing ease of implementation and further reduction in the cost of ownership.

Furthermore, Mimomax NDL radios deployed in the end customer's network are equipped with remote Configuration, Control & Monitoring Software (CCMS). The CCMS allow system operators to access their network “over-the-air” (web-based) without having to visit the site physically, thereby reducing travel time and offering lower associated support costs for PSE in the future.

KEY BENEFITS

- Improved network efficiency resulting in greater return on investment in spectrum
- Solution supports multiple radio channels with real-time data transfer and low error rates
- Less travel and lower support costs via over-the-air configuration
- Easy plug'n'play deployment
- MiMO panel antenna offered 16dBi gain

ABOUT PUGET SOUND ENERGY

Location: Bellevue, Washington

Industry: Electricity & Gas Utility

Services: Serving more than a million customers in a 6,000 square mile service area in the Puget Sound region of Western Washington, PSE is committed to providing safe, sustainably produced low-cost energy.



Resilient IP linking radio (RoIP) solution deployed for Fire & Rescue NSW

As part of an upgrade from an ageing analog radio system to a digital P25 system from Tait Communications, Mimomax were selected as the backhaul, point to point linking solution for Fire & Rescue NSW (FRNSW).

CHALLENGE

The FRNSW requirement called for new digital links between 45 radio sites located in the harsh climates of remote southern NSW.

With environments ranging from Mt Perisher, the highest communications site on the Australian continent, to flat sites located in remote western NSW, FRNSW required a resilient communications solution which would connect these remote sites to the Communication Centers in Sydney and Newcastle.

Involving some longer links and, at times, severe weather to be accounted for, the Mimomax solution required extensive RF engineering and careful antenna selection at some sites.

SOLUTION

A Mimomax point-to-point network was deployed in a ring topology with dual antenna/phased arrays used at some locations to ensure connections over long paths. Heated antennas were also selected to meet the climatic conditions at sites which experience snowfall through winter.

“FRNSW chose the Mimomax product because of its ability to provide the required capacity and reliability without the need for large antennas which would have added cost to the project by needing tower upgrades. Operating at 400MHz the links have proved to be more tolerant to path obstructions & fading than microwave, and this has allowed links to be implemented between sites that would be difficult at microwave

frequencies,” said Richard Cervený, Communication Systems Officer, FRNSW.

An additional point of difference for the Mimomax solution was that the radio links can also act as both routers and multicast units, offering value for money and less equipment in the network. In addition, the interchangeable nature of the radios meant that units could be swapped out easily and fewer spares carried. Incorporating several diagnostic features for ease of remote fault finding & reporting, the links provided by Mimomax were also configured and tested in the factory prior to deployment to ensure a smooth and rapid roll-out (plug and play).

“The (Mimomax) links have proved to be more tolerant to path obstructions & fading than microwave, and this has allowed links to be implemented between sites that would be difficult at microwave frequencies.”

RICHARD CERVENY | COMMUNICATION SYSTEMS OFFICER - FIRE & RESCUE NSW

RESULTS

The reliability of the equipment was put to the test during a night of significant snowfalls in the Snowy Mountains shortly after deployment. “The data log from the Mimomax radio link at Crackenback showed that despite the conditions, the link did not fail even once. The worst impact experienced was a 10-15db fade on the link. In my view, this has demonstrated the benefit of installing the heated antenna at these sites and further shows the value of having access to the Mimomax performance logs,” said Cerveny.

Critics of links offering lower capacity than microwave often point to the benefit of multi-agency sharing of larger capacity links. The project with FRNSW has highlighted that P25 requires relatively small amounts of bandwidth, proven by combining traffic from FRNSW and the NSW State Emergency Service (SES) over shared Mimomax links. This approach has yielded significant savings to both agencies.

Delivering much-needed coverage, resilience and communications interoperability with other state agencies, the new communications system will support the work of over 13,000 staff at Fire & Rescue NSW.



KEY BENEFITS

- Links act as both routers and multicast units resulting in lower total cost and less equipment in the network
- Radios factory configured and tested in advance for rapid plug 'n' play roll out
- Heated antennas to ensure high availability during harsh winter conditions
- High data throughput allowing combined P25 traffic from two emergency services
- 400MHz links for greater tolerance to fading and path obstructions

ABOUT FIRE & RESCUE NSW

Location: New South Wales, Australia

Industry: Public Safety

Services: FRNSW is one of the world's largest urban fire and rescue services and the busiest in Australia, providing fire, rescue and hazmat services across New South Wales.

ABOUT TAIT COMMUNICATIONS

With almost 50 years' experience in radio, Tait Communications provides critical communication solutions to a wide range of industries across the globe.



Quick deployment of resilient communications system for Surf Life Saving NSW

With 12,000 beaches to patrol and 100 million annual beach visits to keep a watchful eye over, Surf Life Saving Australia is on a mission to reduce the coastal drowning rate by 50% before 2020.

CHALLENGE

Maintaining a reliable, secure communications network is at the heart of Surf Life Saving's service. The network needs to offer full coverage with no congestion and the infrastructure used must be able to stand up to weather events and other natural disasters.

For Surf Life Saving Australia, the challenge was to find a partner to provide the links for their digital voice communications along difficult coastal terrain in New South Wales. The solution must use licensed spectrum due to the mission objective of maintaining public safety and there was a desire for cost-effective, easy deployment of infrastructure.

Microwave and fiber solutions were quickly discounted due to the cost of installation – in particular the difficulty and expense of constructing large microwave towers along the coast. Fiber and microwave would also offer far too much capacity for Surf Life Saving's DMR requirements, making the expense of deployment untenable.

In addition, there was a desire that the new network could be managed centrally and would allow for interoperability with other emergency services in order to share information effectively and rapidly during an emergency.

Finally, the new solution also needed to be financially sustainable both in terms of capital expenditure and long-term operation for the non-profit organization.

“Achieving longer paths in a single link, the Mimomax NDL offered Surf Life Saving a solution which was both cost-effective and quick to deploy.”

SOLUTION

Karera Communications were chosen as the Systems Integrator to manage the project, due to their extensive experience in deploying mission-critical communications systems.

Based on the successful deployment of Mimomax Wireless equipment for Surf Life Saving New Zealand, the team at Surf Life Saving Australia requested a Mimomax Network Digital Link (NDL) for this NSW-based project. Karera Communications successfully managed the installation of a series of UHF network links, to provide coverage along 1500 kilometers of NSW coastline.

Designed for difficult links which would otherwise have required multi-hop microwave links, the Mimomax NDL offered the following:

- Robust and secure communications based on licensed spectrum;
- Better propagation characteristics due to UHF frequency band - with less impact from atmospheric conditions and path obstructions;
- Ability to install antennas on smaller, existing site infrastructure.

RESULTS

- Achieving longer paths in a single link, the Mimomax NDL offered Surf Life Saving a solution which was both cost-effective and quick to deploy.
- The Mimomax solution offered compression techniques specifically designed for digital radio voice streams, far greater capacity in the available spectrum due to the use of MIMO (Multiple Input, Multiple Output) technology and very low latency to ensure real-time communications. The solution also allowed the use of lower modulation rates while still providing capacity-exceeding design requirements at a higher system gain compared to other narrow-band linking solutions.



KEY BENEFITS

- Security and resilience from private, licensed spectrum
- Higher capacity via utilization of sophisticated DMR compression techniques
- Cost savings through use of existing infrastructure for antennas
- Greater tolerance to weather conditions and path obstructions due to use of UHF

ABOUT SURF LIFE SAVING AU

Location: New South Wales, Australia

Industry: Public Safety

Services: With over 75,000 members spread across 129 clubs, surf lifesavers in NSW have patrolled over 1500 kilometers of coastline for over 100 years.



Coverage, Reliability and Security for Surf Life Saving New Zealand

With an aging analogue network to upgrade and a requirement for a robust linking solution offering superior coverage, Surf Life Saving New Zealand selected Mimomax to provide the links which would underpin their critical operations.

CHALLENGE

Surf Life Saving New Zealand (SLS) was planning a full upgrade of their analogue network but were contending with constraints created by cost, topography and some non-line of sight linking. Working closely with Logic Wireless, a distributor of Business Critical Communications solutions, to determine their needs, SLS had assessed Land Mobile Radio and Broadband (LTE) options prior to settling on a Digital Mobile Radio Tier II solution. For the linking component of the project, microwave had been considered but was found to be cost-prohibitive compared to using a high capacity, narrowband link.

Due to the critical nature of their operations, maintaining the integrity of Surf Lifesaving's communications solution was vital – it was imperative that there could be no interference which would impact either the security or availability of their network.

SOLUTION

Digital Mobile Radio technology was selected by Surf Life Saving due to the clarity of the audio, lower power consumption, integrated data applications and open standards platform. Hytera radios were therefore combined with Mimomax narrowband links, deployed in UHF 440-446MHz band, to carry Surf Life Saving's network IP traffic.

Offering the ability to achieve secure, fast, reliable links over water in addition to non-line of sight links, the Mimomax solution proved to be ideal in terms of both

data capacity and low latency. Compared to installing microwave towers which would require a multi-hop approach, the Mimomax link could cover the same distance in a single hop, making it a far more cost-effective solution overall.

In addition, specialist coverage engineers at Mimomax carefully analyzed all of the radio paths prior to deployment to ensure risk had been significantly mitigated.

“The first two links in this project were relatively long paths, at 72km and 55km respectively. As the links were predominately over tidal seas paths, the UHF Mimomax solution enabled us to avoid the multipath challenges often associated with tidal variation.”

JOHN WILKINSON | NETWORK DESIGN MANAGER - MIMOMAX



RESULTS

Three years following the first phase deployment, the Mimomax links continue to operate without fault. As funding becomes available, the network upgrade is being rolled out into additional regions.

Through basing their communications network on licensed narrowband spectrum, SLS have ensured both the reliability of their links today and the availability of their network into the future. Furthermore, in selecting high capacity, ultra-low latency Mimomax radios for the linking element of the project, their new network is well-equipped to transfer their IP traffic rapidly and reliably without distortion due to congestion or environmental factors.

Through working closely with Logic Wireless to gain independent advice and support, SLS have managed to create a best-fit communications solution that services their mission critical needs.

KEY BENEFITS

- Mitigation of out-of-band and self-interference via channelization and frequency re-use
- Double the data throughput, optimizing investment in spectrum
- Solution equipped for challenging terrain and harsh weather conditions
- Ability to simultaneously monitor SCADA applications and update software

ABOUT SURF LIFE SAVING NZ

Location: New Zealand

Industry: Public Safety

Services: Supporting 74 clubs with 17,000 members around New Zealand, each year Surf Life Saving NZ provides over 220,000 patrolled hours on New Zealand beaches.

ABOUT LOGIC WIRELESS

Logic Wireless offers value-add distribution and technical support of high quality business critical communications products, solutions and accessories.



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