Communications redundancy leads to swift restoration of service following natural disaster

Orion New Zealand Ltd
Christchurch, New Zealand

mimomax

BACKGROUND

In February 2011, a 6.3 magnitude earthquake struck the city of Christchurch, New Zealand. Centered directly under the city, the quake and ensuing aftershocks caused catastrophic infrastructure damage and, sadly, loss of life. Power and landline communications ceased across most of the city and cellular communications rapidly became congested. As a result, much of the commercial, industrial and residential areas of the city were without power and voice communications for many days.

Utility company, Orion, is responsible for power distribution in Christchurch and surrounding areas. Utilizing an independent, hardened private communications network with redundancy built into their network via Mimomax UHF IP radios was at the core of Orion's service continuity in the hours and weeks after the earthquake struck.

"The earthquakes simpy confirmed our choice of UHF IP radios as a mission-critical communications solution. There was, and still is, no other alternative."

NEVILLE DIGBY | SENIOR SYSTEMS ENGINEER - ORION NEW ZEALAND LTD

CHALLENGE

When the earthquake struck, severe damage was inflicted on Orion's electrical and communications networks in areas across the city. Massive earth movement had stretched some underground cables up to 1 meter and caused more faults in a matter of minutes than would normally have been experienced in a decade. Four substations received significant damage and some network equipment was buried under rubble in the central business district, damaged by falling debris or flooded when the quake caused a soil phenomenon called liquefaction. As a result, much of this network equipment was instantly rendered non-functional.

Orion's communication network comprised of underground copper SDSL and fiber-optic cables combined with the UHF IP radios from Mimomax. The copper cables being smaller and more malleable fared better than the fiber-optics. However, the utility experienced damage to around 10% of the copper cables in addition to an even higher percentage for their fiber. Several areas in the network were therefore inaccessible and critical SCADA communications were prevented. Aiming to restore functionality to areas with no visibility, Orion attempted to connect in to their sites using the public cellular network. Heavy use of cellphones by the public, however, had led to severe congestion and cell tower sites had a limited capacity to operate from their reserve power until the electricity network could be restored.

"Because our wireless radios operate in licensed UHF frequencies and have relatively widebeam antennas, antenna towers can be skewed up to 45-degree angles and still retain functionality."

NEVILLE DIGBY | SENIOR SYSTEMS ENGINEER - ORION NEW ZEALAND LTD

SOLUTION

Seamless communications across the grid is at the heart of successful service provision for any utility. One of the predominant challenges Orion faced when specifying their network requirements was the need to transmit SCADA IP data through wireless links, over long distances, as rapidly as possible. They also had a desire to optimize their available narrowband spectrum as well as build in redundancy to their communications network.

The industry-leading spectral efficiency and ultra-low latency offered by the UHF radios from Mimomax were a good fit to meet Orion's standard operational requirements in addition to providing an alternative communication network.

"In some areas, the shaking was so violent wires were simply pulled off poles and the boards of houses."

ROGER SUTTON | FORMER CEO - ORION NEW ZEALAND LTD

RESULTS

Immediately after the earthquake, while some of the wired communications equipment in parts of Orion's network had been damaged beyond functional tolerances, the radios provided by Mimomax continued to perform.

- Antenna tower misalignment due to the massive earth movement had no impact on the radio communication due to the high antenna beam width in UHF frequencies. In comparison, other telecommunications providers in the city had experienced network failure when their microwave towers had tilted from the force of the quake.

- The advanced remote software capabilities of the Mimomax radios enabled the automatic facilitation of recovery efforts in the minutes following the quake. Remote radio configuration & fault repair features plus routing adaptation protocols based on OSPF (Open Shortest Path First) integrated into the radios resulted in the radio network's ability to self-heal and re-route traffic almost instantaneously to the next available link. A later investigation of network operations at the time of the earthquake reported no apparent loss of data over the UHF channels - even during the actual seismic activity.

- The ability to remotely configure and troubleshoot the radios eliminated the need for a technician to physically travel to sites which was particularly advantageous given the poor state of the roads immediately following the disaster due to flooding, sinkholes, destroyed bridges and grid-locked traffic.

- After failing to connect into their inaccessible sites using the public cellular network, Orion swiftly installed another Mimomax radio in the center of Christchurch to connect in with their operations center as they began the critical work of restoring network service.

The 2011 earthquake demonstrated that radio communication solutions continued to operate when underground fiber, public cellular and microwave solutions were severely impacted by the disaster. Throughout the emergency phase, Orion was able to maintain control of their infrastructure and their workforce via their hardened, privately-owned communications network.

Orion's choice of utilizing a Mimomax system is estimated to have saved the region over $250 Million in economic losses.

KEY BENEFITS

- Sophisticated routing adaptation protocols incorporated for near instant traffic re-routing
- Ability to maintain operations even with misaligned antenna towers due to wide beamwidth
- Remote radio configuration and fault repair minimizes need for technician callouts
- Redundant communications solution to maintain operations during an emergency

ABOUT ORION NEW ZEALAND LTD

Location: Christchurch, New Zealand

Industry: Electric 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.

mimomax

About Mimomax

Mimomax develops wireless communications solutions for narrowband channels which enhance visibility and control - right to the edge of our customer's networks.

Our award-winning radios utilize Multiple Input, Multiple Output (MIMO) technology combined with full duplex communications and ultra-low latency to provide our customers with communications solutions which optimize data throughput and provide rapid feedback and control of their mission-critical assets.

Winner of the 2018 UTC IMPACT Award for Mimomax Tornado Radio.

US Office

4630 East Elwood St, Suite 4
Phoenix, AZ 85040
Phone: 602 441 2448
Email: sales@mimomax.com
mimomax.com

Regional

New Zealand/Australia: Ronald Martinez, ronald.martinez@mimomax.com
West North America: Dennis Sullivan, dennis.sullivan@mimomax.com
East North America: Keith Woodall, keith.woodall@mimomax.com
International: Paul Reid, paul.reid@mimomax.com

February 2020