




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

Orion New Zealand Ltd



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

An "Optimized Protection Variant" (OPV) of the MimoLink family of radios was developed for Orion.

Key features of this solution include:

- The ability to support dedicated serial protection circuit with 128kb/s in a 25kHz bandwidth channel;
- 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;
- Operation on licensed channels to ensure interference-free operation;
- The ability to use residual capacity to carry IP/SCADA traffic with no impact on the dedicated protection circuit.

“Installing MimoLink 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.”

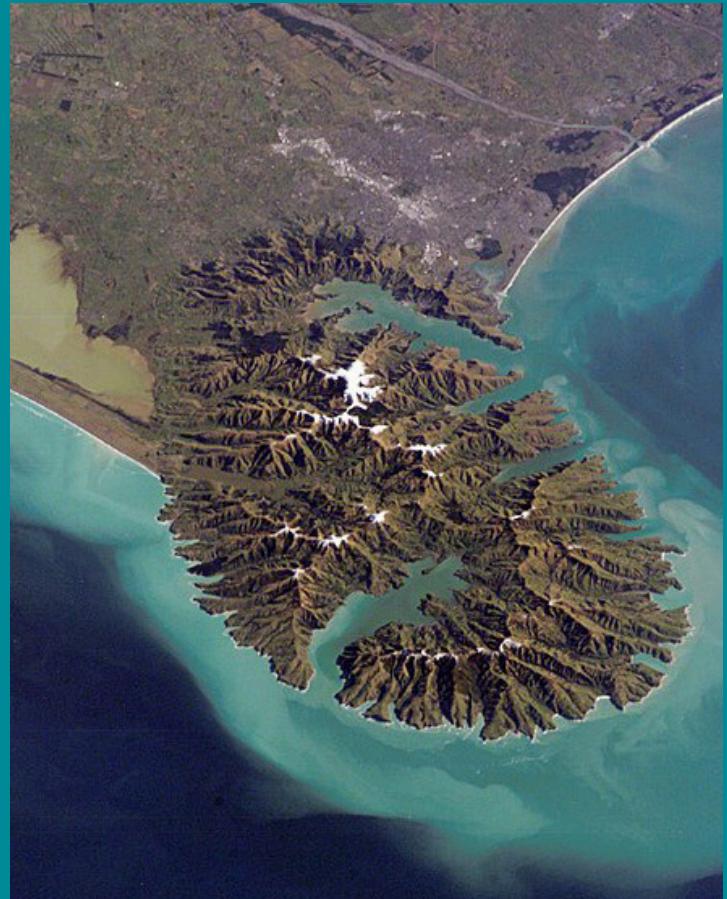
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RESULTS

Having installed Differential Protection radio links across their network, Orion continues to expand their protection circuits into new areas including a 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 the Tornado OPV solution. Key results from the 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.



Ubiik develops private wireless communications solutions for utilities, oil, mining, governments and public safety which enhance visibility and control - right to the edge of our customer's networks.

Our award-winning MimoLink™ 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.

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