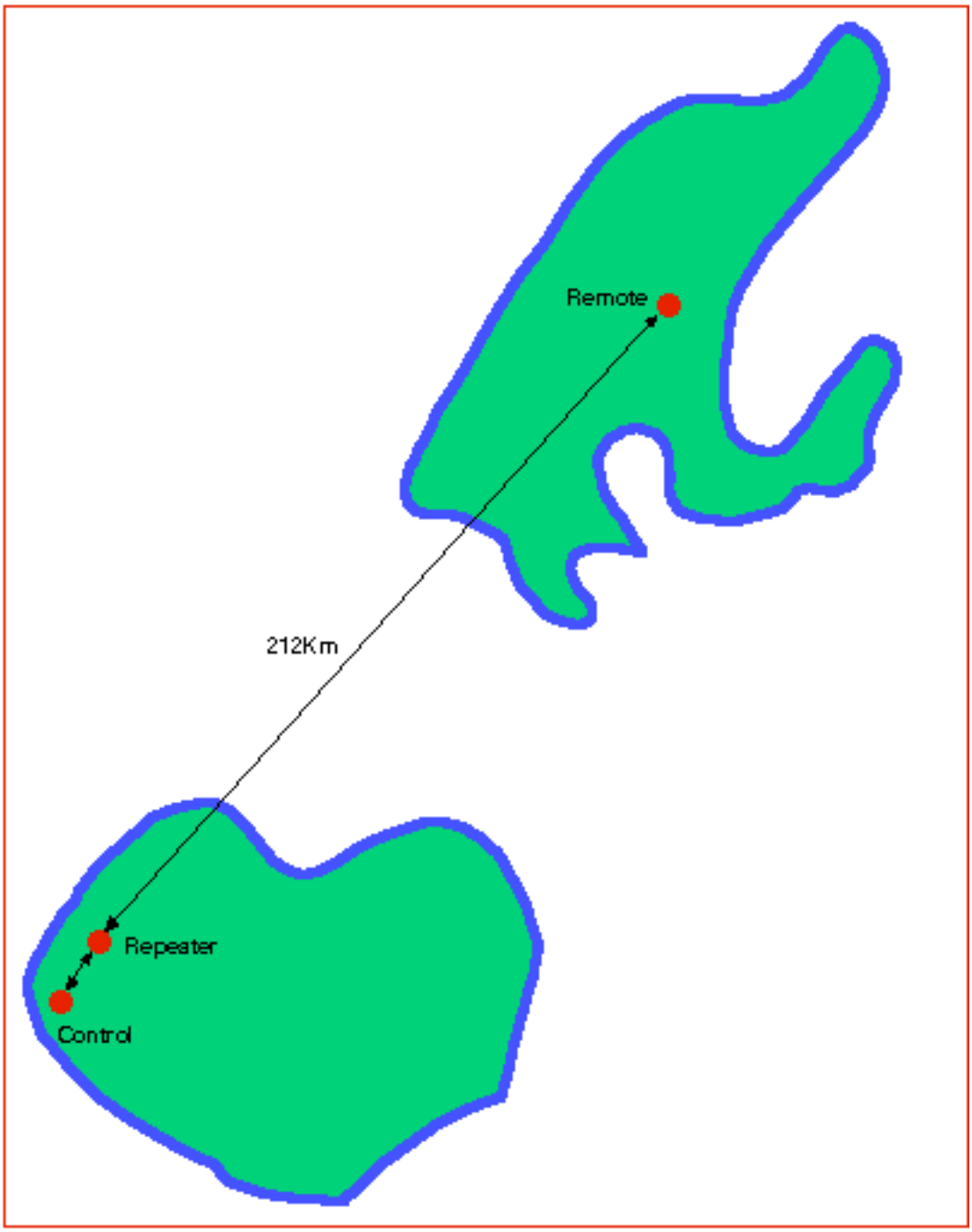
Long Distance 9600 SCADA Link

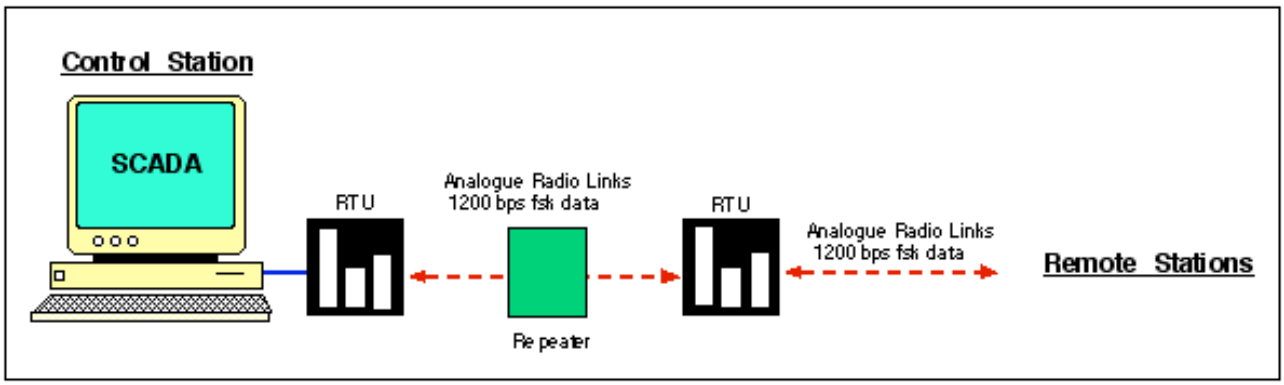
Location: South Pacific Islands
Features: Full Duplex Realtime 9600 bps Keyed Carrier

Background

The customer, an electrical utility, needed to upgrade an old and ailing low capacity data link between its SCADA host station and a remote PLC operating as a data concentrator. The hot carrier VHF analog radio links had been unreliable for some time and with new stations being added to the system at the remote end, a more reliable higher capacity radio system was required. Operating between two islands, line access via the PSTN was ruled out as too costly and not reliable enough for the system requirements.



Two hops of radio were required with the inter-island hop being around 200 km end to end. The fade margin provided by the old radios was inadequate with the links regularly "dropping out " altogether. To complicate matters, the radio site at the host end was about two kilometers from the Host PLC and the repeater station was prone to lightening strikes. Interference from adjacent radio sites had also caused problems.



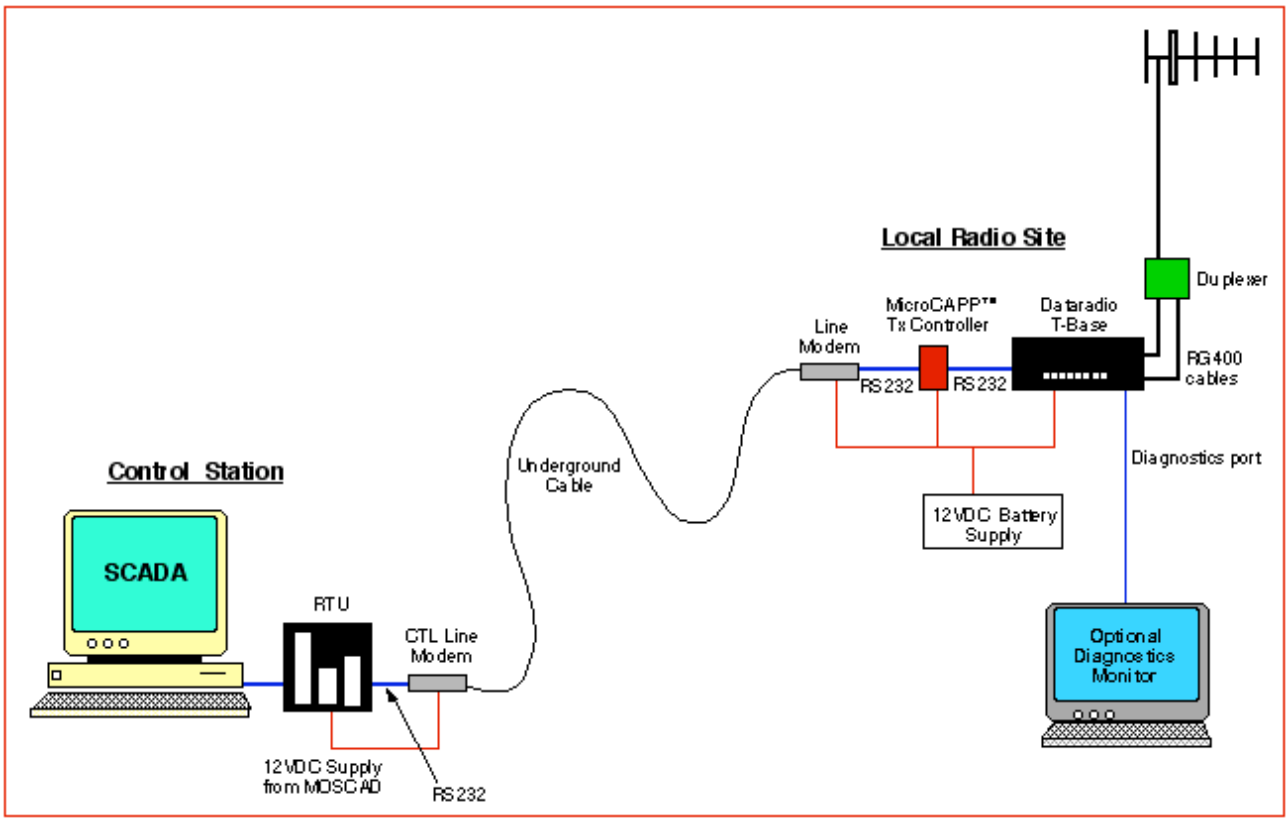
The Old System

The PLC supplier who had been commissioned to add the new outstations approached Radata because of our specialist knowledge of radio data communications. With a large range of high performance equipment to choose from the task was challenging but achievable.

The Radata Systems Solution:

The Host Site

The first problem to solve was how to connect the radio modems at the local radio site to the SCADA host. Previously this had been done by using the underground cable between the two sites to carry the modulation tones from the PLC's 1200 bps modem to the analog radio. Although this method had worked, noise accumulated in the various stages of the system made it unworkable in fading conditions. The new system had to overcome this problem along with the rest.

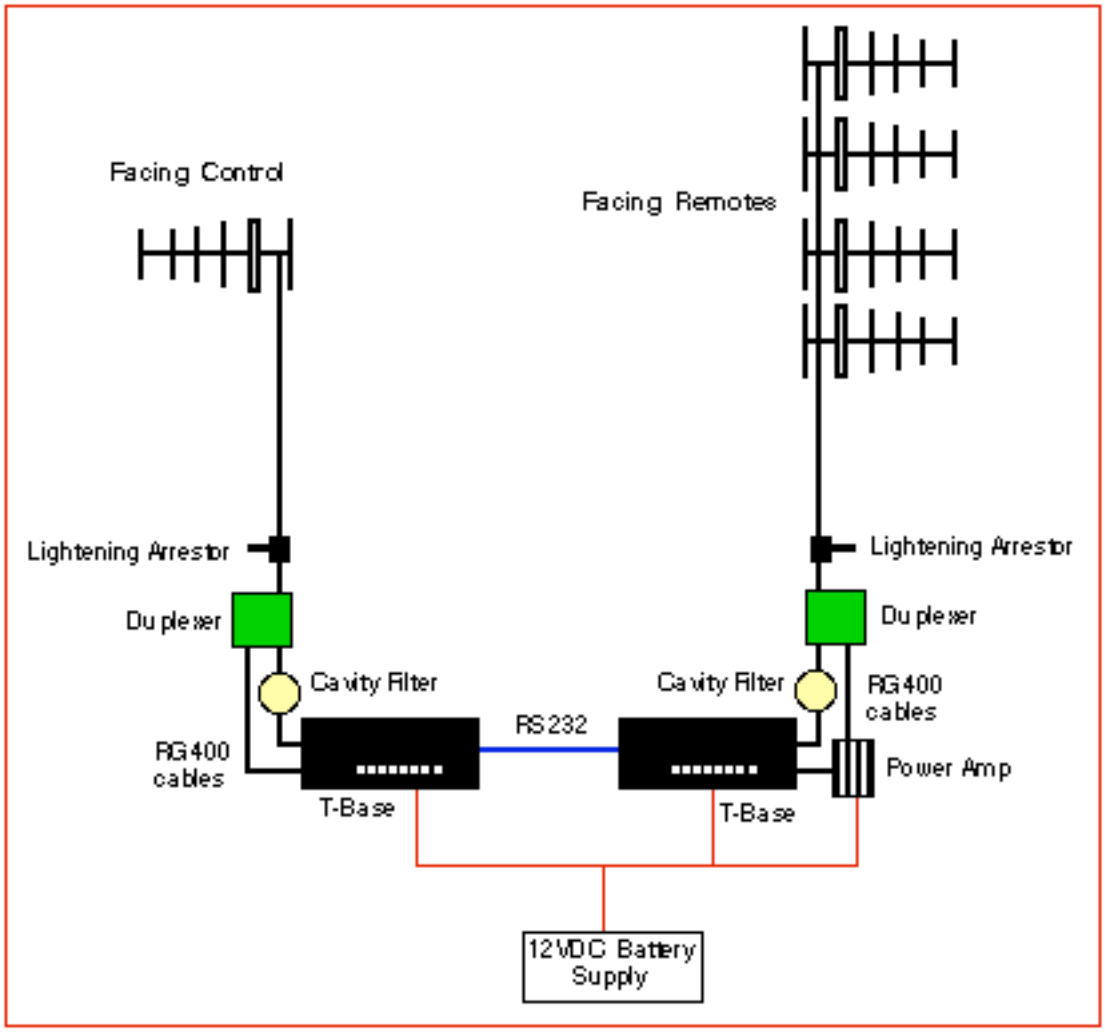


Host Site

The interface on the new radio modems was RS232 so a line modem link was established to carry RS232 data from the hosts PLC to and from the first radio site. Because the line modems could not provide RTS/CTS control for the radio transmitter, a MicroCAPP™ transmitter controller was used to do this. This allowed the system to be "keyed control" rather than "hot carrier" which saved precious battery current at all radio sites as a bonus. DC powered line modems were used to ensure there would be no downtime with local power outages. The whole system now runs at 9600 bps and can be stepped up to 19k2 if and when traffic increases above what can be handled at 9600. A diagnostics port on the radio modem can be used to monitor the remote radio sites equipment. This is a very useful feature a the remote site is an hours (very rough) drive from the nearest settlement.

The Repeater Site

At the repeater site two full duplex T-Bases were connected together back to back. This provided full duplex repeating capability with the data being regenerated so that there would be no accumulated noise problems as before. To provide adequate fade margin on the 200 Km hop, stacked yogis were used for aerials and a 15 watt power amplifier was added to boost the transmitter power. Luckily this site and the remote one were at reasonable altitude. Cavity filters on the receivers provided additional isolation from the many other older radios on the site and nearby land mobile and television transmitter sites. "Shorting stub" lightening arrestors installed in the cable entry window provide lightening protection. This type of EMP device does not need to be repeatedly checked for effectiveness as with gas discharge types.

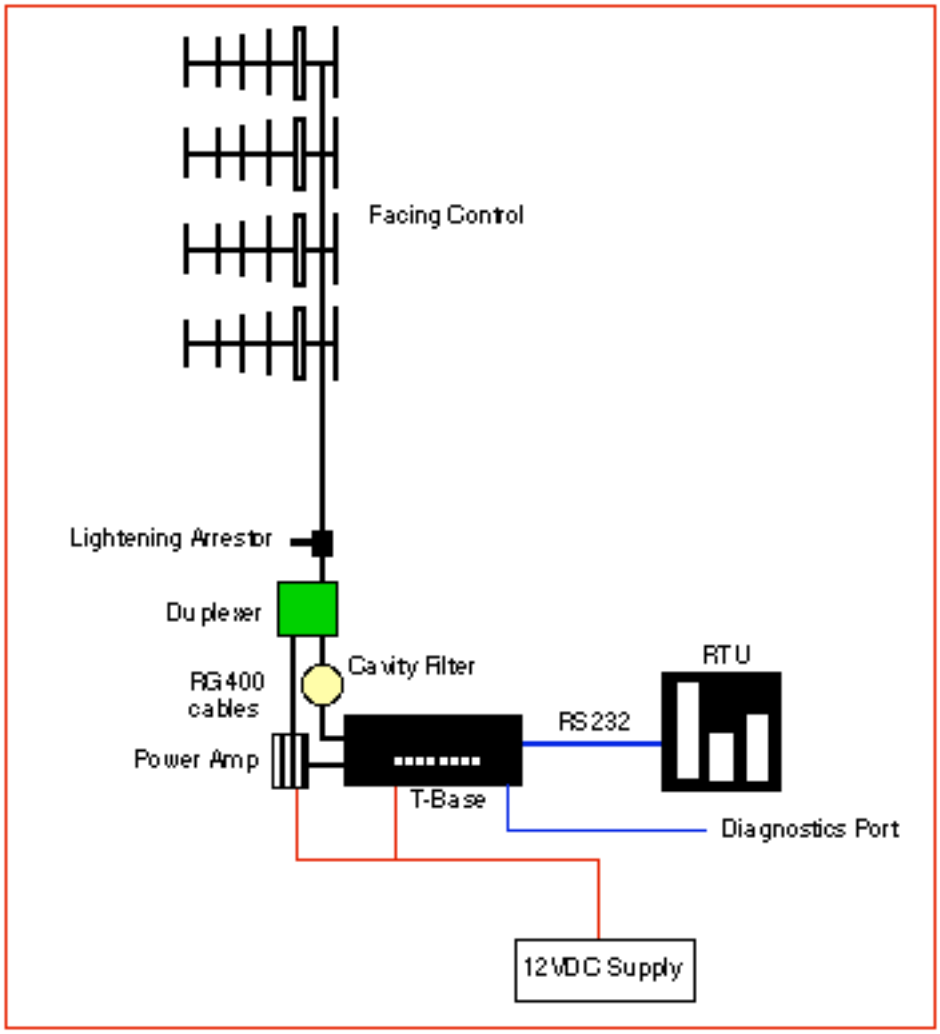


Repeater Site

If necessary diagnostics from the other two radio sites can be monitored at the repeater. This allows monitoring of the system performance on a hop by hop basis.

The Remote Site

Equipment on this site was effectively a mirror image of the equipment facing it at the repeater site. The RTU had RTS/CTS control facilities so the radio could be keyed directly by it.



Remote Site

Benefits

With good signal levels at all sites the system now has in excess of 30 dB fade margin on both links. Duty Cycle on the new system is low so there is now capacity for further growth. With the change from hot carrier to keyed carrier there is now less battery consumption at all sites. Diagnostics are available to allow the system to be monitored while the application is running.

Summary of Equipment Used

At the base station:

* PLC interfaced to the SCADA Computer
* Leased Line Modems
* Dataradio Full Duplex T-BaseR Realtime Radio Modem
* DCI MicroCAPP™ Tx Controller
* Sinclair Antenna Duplexers
* Yagi Antenna

At the repeater:

* Two Dataradio T-BaseR's back to back

* 15 watt power amplifier
* Cavity Filters
* Stacked Yagi Antennas
* Sinclair Antenna Duplexers

At the remote site:

* Dataradio T-BaseR
* 15 watt power amplifier
* Cavity Filter
* Stacked Yagi Antennas
* Sinclair Antenna Duplexer
* PLC interfaced to the SCADA Computer