

HEARD ISLAND

The 2016 Cordell Expedition

VKØEK

Discovering Life and Links in the Extremes

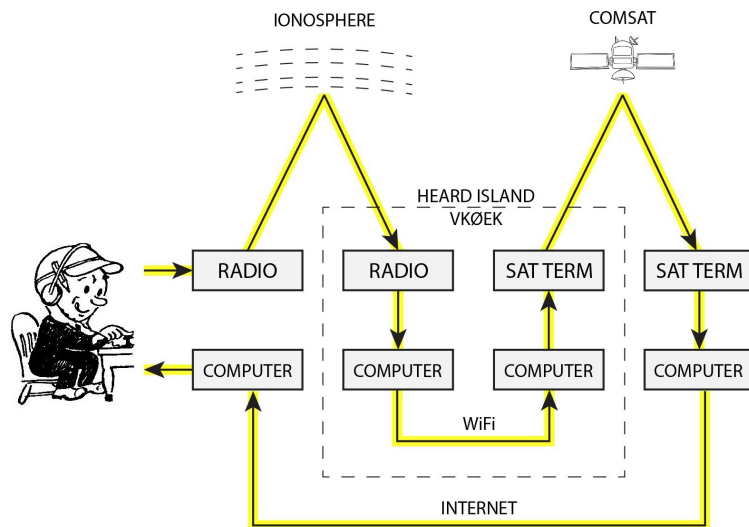
THE TOPOLOGY OF INFORMATION FLOW FOR VKØEK

To a first approximation, it takes four radios, four computers, and four “mirrors” to make a contact with a modern DXpedition. Topologically, these elements are arranged in a circle, with a DNA-like sequence -RMR-CMC-RMR-CMC-. Information flows around the circle, clockwise in the drawing below.

The first -RMR- pair is what distinguishes ham radio from IT—it introduces the imperfectly predictable and unreliable effects of the atmosphere, especially the ionosphere (the mirror). Historically, this was the only segment in amateur radio—the two-way contact between two stations separated by a significant distance. Then in 1995 a revolutionary change occurred: the XRØY Easter Island DXpedition introduced a whole new loop by including a communications satellite and the internet. By uploading the radio logs through the satellite, they could be posted on an internet server, enabling a whole new set of services for DXers. The most valuable XRØY invention turned out to be the online log server which has become *de rigour* for all major DXpeditions.

For the last two decades, the habit for almost all DXpeditions has been to use

the satellite connection to upload the logs once or twice each day, updating a database accessible to DXers who want confirmation of their QSO. This has worked nicely, but it leaves unsolved a major problem: If an error is discovered in the log, it may be too late to correct it the next day; propagation may have dropped off, or worse, the DXpedition went QRT. Then, in 2005 (20 years after XRØY!) this problem was solved by the introduction of real-time into the second -



RMR- segment (the satellite). The first demonstration of this was on the Kure Atoll DXpedition K7C. The software that enabled this breakthrough was called DXA. It was so popular that the web page graphically displaying the log received 40 million hits!

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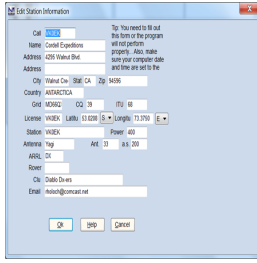
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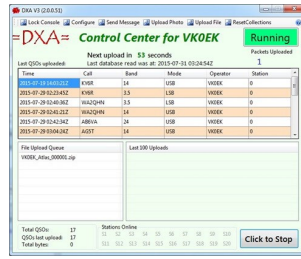
Now, after 10 years of improvements, DXA version 3 is ready to provide DXers with an almost perfect traverse

of the dataflow circle. It might take you hours or days to break through the pileup to get your QSO logged by VKØEK. But what happens next is that within 1 millisecond your QSO is passed across the first CMC link (WiFi), then within 1 minute it passes across the second RMR link (ComSat) to a central server, and within 1 more minute it passes across the second CMC link (internet). Automatically, without you

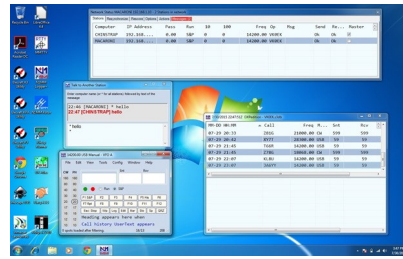
doing anything, the information is displayed on your browser (assuming you are watching the DXA page!) and you see your QSO confirmed. From logging to confirmation it takes less than 2 minutes, providing the opportunity to correct errors.



Configuring the station



Setup for DXA



Logging with N1MM+



Island side with satcom Transmit

HOW THE INFORMATION FLOWS FROM TWO OPERATING SITES

The radio operation at Heard Island is complicated by the plan to operate from two widely separated locations: Atlas Cove and Spit Bay, 20 miles apart, with the 9000-ft. volcano Big Ben smack in between. The volcano blocks HF radio signals to some parts of the world and also prevents direct radio communications between Atlas and Spit. Fortunately there is a relatively simple solution to both these problems.

From the beginning of the VKØEK DXpedition, it has been planned to upload the radio log data via a communications satellite to a central server, where appropriate software will provide status updates once per minute. This system, called DXA, has been used on previous DXpeditions (K7C and TX5K), and has been extremely popular (40 million hits each). Now, in a bit of irony, DXA will provide the means for communicating between

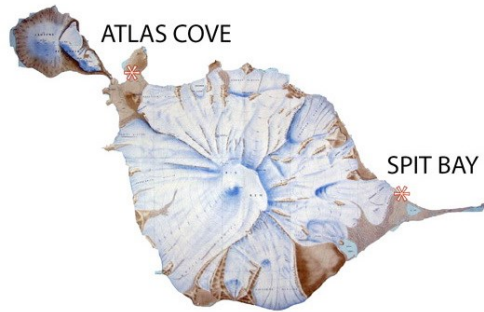
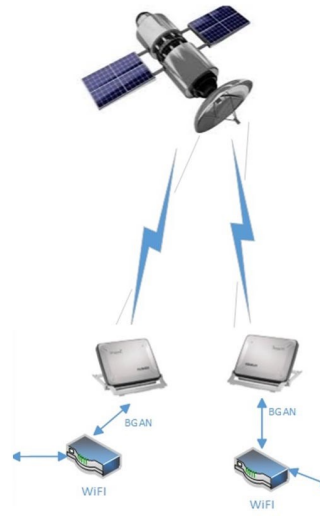
Atlas Cove and Spit Bay. This ability is very important, not only for coordination of schedules and activities, but also for emergency response.

The two sites will use the same callsign,

VKØEK, authorized by the Australian Communications and Media Authority (ACMA). Each site will have multiple computers networked together for logging the QSOs; they will use the well-known logging program N1MM+. One computer in the network at each site will assemble the log data and optional text messages into packets, and upload them to the satellite, using DXA. The uploads at the two sites are completely independent and asynchronous.

The satellite sends the data from both uploads on to the central server, for display on client browsers. Now using the latest version DXA3, the central server will have the ability to upload messages directed at either site on Heard Island. Thus, a message from Spit Bay can be sent to Atlas Cove, and vice versa, providing an effective (and fast) chat capability between the sites. The latency in the messaging will be about 1/2 second,

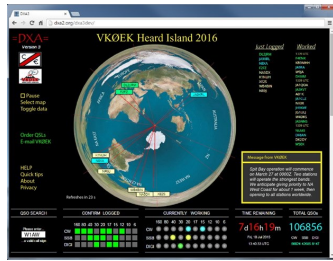
which will be negligible. A pretty expensive walkie-talkie, to be sure!



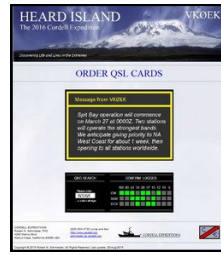
Most of the Atlas Cove computers are named for the penguins of Heard Island. (Left to right) Adelie, Macaronie, Chinstrap, Rockhopper, Gentoo, King



satcom-Receive with server



Client (browser) view of DXA



Ordering QSLs



QSL delivery

RADIO STATIONS USE RELIABLE COMMERCIAL EQUIPMENT

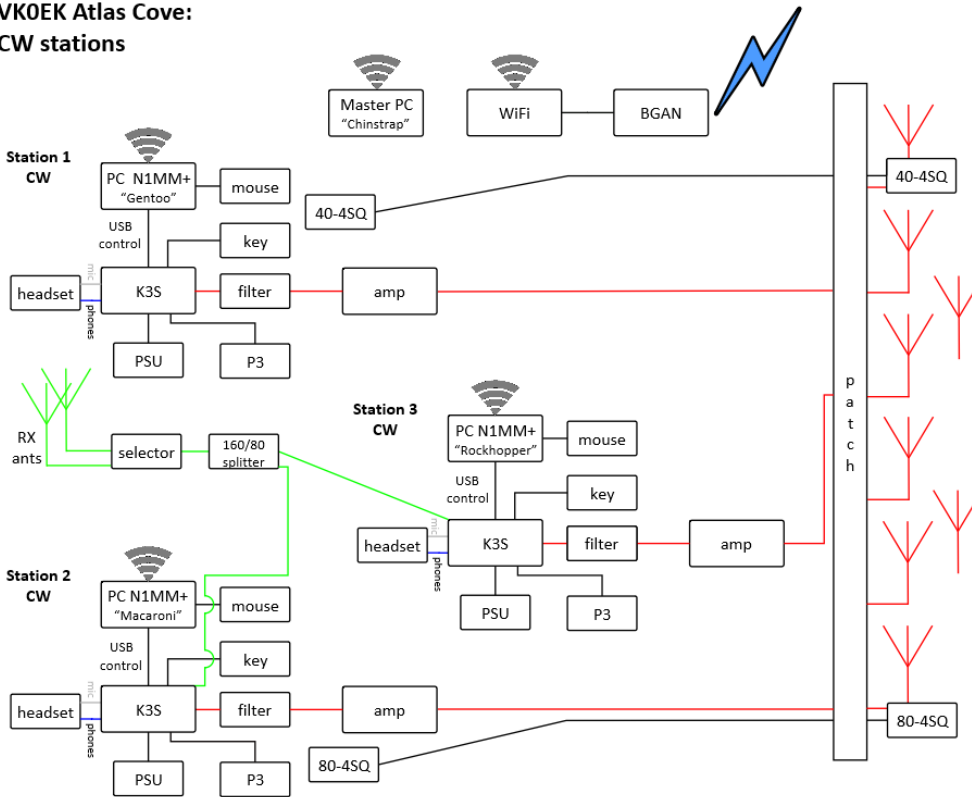
The stations on VKØEK will make use of commercially available equipment, all provided by generous sponsors. Our strategy was to make all the stations (essentially) the same, to enable substitution in case of a failure. The stations are built around the Elecraft K3S transceiver.

The computers are all Windows 7 machines. The radio logging is done with N1MM+. Other software includes chat, hardware setup and control, browsers, word and image-processing, user manuals, and documentation. With the exception of DXA, all the software is standard.

This equipment implements the first – CMC– segment in the information-flow topology (c.f., p. 1). From here the information (=QSO data) is passed to the second –RMR– segment, passing through the satellite to the internet.

Some of the people working on this are KY6R, W6OP, KJ4Z, K2ARB, VK6CQ, AEØEE, and others. Our co-organizer Rich, KY6R, is integrating the various computer and communications systems, and this work is being implemented and tested by the team in monthly work sessions in California. If you wish more information, please [Contact Rich](#).

VKØEK Atlas Cove: CW stations



Connections for 3 CW stations and 8 antennas at Atlas Cove. The stations are comprised of Elecraft K3s radios, KPA500 or OM2000+ amplifiers, and Dell Latitude E6410 laptop computers. The computers are networked with a local WiFi. One of the computers in the network is a "master," with a connection to the satellite.



The Spit Bay and backup computers are named for other birds of Heard Island. (Left to right) Albatross, Petrel, Cormorant, Sheathbill, Tern, Skua



THE HEARD ISLAND PROJECT

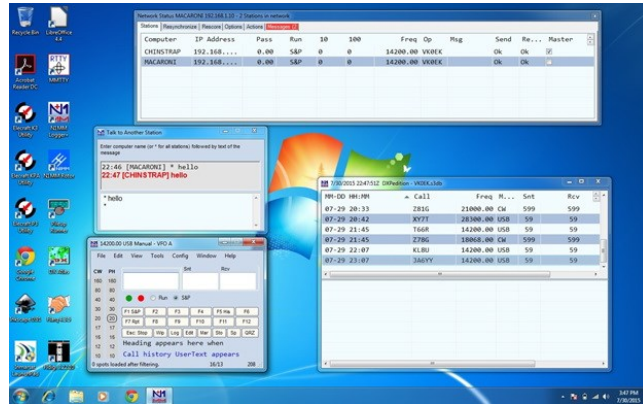
The Heard Island Project is centered around an expedition to Heard Island, lying at 53°S 73°E in the Southern Ocean. The island is extremely isolated, and very seldom visited.

The project will include an ambitious amateur radio operation using the callsign VKØEK, and a variety of scientific investigations under the title “Discovering Life and Innovative Communications in the Extremes.”

The expedition team of 14 will sail on or around March 8, 2016, from Cape Town, South Africa, spend up to 21 days on Heard Island, and end the voyage at Fremantle, Western Australia.

WATCHING THE QSOS ROLLING IN (AND OUT)

Most DXers and DXpeditioners are familiar with N1MM, for years one of the most popular logging programs. We will use the latest version, N1MM+. The operators see the QSOs as they are logged, and except for infrequent band changes, only have to type in callsigns as they roll in. The following shows typical Windows desktop with N1MM running. The op only watches his own QSOs as they accumulate.



One computer watches ALL the QSOs. It is an equal node on the local network, hence maintains a complete copy of the entire log, including QSOs from all stations. This computer is also connected to the satellite terminal (e.g., BGAN). Once per minute it uploads log updates to the stateside server, using the DXA control panel, shown below. QSOs logged in the last minute scroll up the window, and at the next upload the screen is cleared and a new cycle begins. If there is an interruption in service, the software automatically recovers and updates the database on the server. This self-repair happens in minutes.



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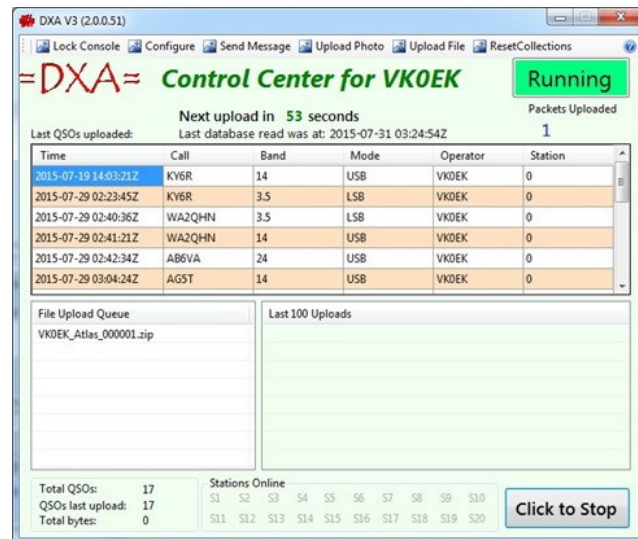
[David Lloyd K3EL](#)

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