"Micro-Local" Weather Available Globally via APRS

Still another APRS application: Thanks to a remote locating system, the author knows the precise weather conditions at his weekend home.

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I like knowing the weather conditions in a very precise location — my weekend home, 10 acres on the Sassafras River, an estuary of the Chesapeake on Maryland's Eastern Shore. This is how I have met that need.

The Automatic Position Reporting System (APRS) is a very efficient means of allowing moving stations to be pinpointed on a map by an indefinitely large number of observers. For example, there is a 2 meter FM transceiver installed in my wife Kathleen's car. She is a ham, K2KWB, and this is a safety measure. For a few dollars more, I added a virtually invisible GPS receiver, mag-mounted on the roof, and now her car can be tracked with high precision by anyone with Internet access. It happens that I drive her car more than she does, so mostly she is tracking me. Our daughter, Zane, 17, also a ham — W2YL — would have one of these installed in her backpack if I thought I could get away with it.

It is easy to configure an APRS station to transmit additional data along with position information, and weather information is a natural. And since, by design, APRS data quickly finds its way into the Internet, the weather data that radiates over the APRS network is also accessible, via Internet, from anywhere in the world. Follow this link, and you'll see contemporaneous weather data as transmitted by W3BW-5: **www.findu.com/cgi-bin/wxpage.cgi?call=w3bw-5&last=240**.

What You'll Need

There are only a few building blocks in a Micro-Local weather station. First, you need weather measuring equipment. A complete suite can be acquired from reputable vendors. I set up my station using equipment from Peet Bros: **www.peetbros.com**. I use the Ultimeter 2100 system with sensors for wind speed and direction, a rain gauge and an outdoor temperature and humidity gauge. All of these sensors plug into a small console, about the size of a large handheld transceiver. Inside the console, besides all the circuitry to gather, display and output data is a barometer and another temperature gauge ("indoor").

In the normal home weather station, the console would be placed on a table or desk, its LCD screen visible and its control buttons accessible. Cables would then run from the console to those sensors which must be placed outdoors — the anemometer (wind speed and direction), rain gauge and outdoor temperature/humidity sensor. In my setup, and I suspect many others, the house is not the best site for the weather sensors. Rain gauges and wind sensors need to be out in the open, well away from trees and structures that can distort readings. This requirement means that many Micro-Local weather Stations are *untended* and *remote*.

This is how my weather station looks today.

My neighbor, Ted, is a marine pilot who spends long stretches of time away from home guiding enormous ships up and down the Delaware River. He has a magnificent dock, complete with boathouse. Also at his dock is his obsession, the *Nellie Crockett*, a beautifully restored Chesapeake Bay "Buy Boat," the subject of a glowing article in *Chesapeake Bay Magazine* a few years ago. He and I sited my weather station in his boathouse. The boathouse provides a sheltered spot as well as "shore power." Ted likes to keep close tabs on weather conditions around *Nellie Crockett*, and I like to know if there is wind for sailing on the Sassafras.

I have to confess: This was a third attempt at siting the station. Attempt #1 was in the base of my tower, but the sensors were

Here is *Nellie Crockett* viewed from my dock. You can just see the weather sensors.

The toolbox in position in Ted's boathouse. Note the lock on the box. The transceiver is set with an automatic time-out-timer at 3 minutes to avoid an "accidental carrier" on the APRS frequency.

constantly fouled by infestations of wasps and ants. The second site was my own dock, in a locked box, covered by a tarpaulin. This attempt came to a sudden conclusion when Hurricane Isabel left the not-quite-waterproof installation about 6 feet under water.

In the current incarnation, now in service for more than two years, all the outdoor sensors are mounted on a $10 collection of PVC pipes and couplings, glued together. The anemometer is at the top, well in the clear. The rain gauge is off to one side, again away from overhanging trees or eaves. The temperature/humidity gauge is at the bottom, housed in a special Peet Bros "solar shield." It is accurate even in direct sunlight. The whole thing is mounted above Ted's boathouse, well out into the Sassafras River.

There are two other major pieces of the system, once you have the weather gear. You'll need a 2 meter FM transceiver. By convention, all APRS activity in the US is on 144.39 MHz. If you can get the antenna high enough, you can use something no more powerful than a handheld transceiver. I use an ICOM IC-2100H, a low-priced plain vanilla mobile rig set for 5 W output power. Very importantly, in the untended mode, you must have a time-out timer. This avoids an equipment failure that could cause a constant carrier on the APRS frequency. Using a menu on the IC-2100H, I set the "TOT" to 3 minutes.

The TNC

The *heart* of the system is the terminal node controller, and I strongly recommend a Kantronics KPC3+. For about $170, this thing works miracles. It has sophisticated capabilities intended especially for APRS. When you think of packet radio, you probably picture a PC and a monitor. Not so with an untended remote weather station. You use your PC for initial setup of the TNC, and you then place it in service without the PC. In fact the serial port of the TNC will be used instead as the port through which weather data arrives from the weather equipment.

The interior of the toolbox holding the Peet weather console, 2 meter transceiver, TNC, battery and battery charger.

There are many KPC3+ units in operation in weather applications. This means that it is easy to *Google*-up information on how to hook up the TNC and how to configure it to do what you want. The KPC3+ is designed to use changing GPS data in a conventional position tracking application. In the case of a weather station, the known fixed position is entered into the TNC, and it never changes. The TNC uses its normal GPS functionality instead to input data from the weather equipment, and it formats the weather data for transmission as APRS packets. I have my system set up to "squawk" position every 30 minutes and weather data every 5 minutes. These packets, when they make their way into the Internet, appear as a very usable numerical and graphic record of weather conditions on a multi-day basis — cumulative rainfall, temperature, humidity, barometric pressure, average wind speed, speed of wind gusts and wind direction.

The weather console, TNC and transceiver, along with a 12 V gelled electrolyte battery and a trickle charger all live in a locked toolbox in Ted's boathouse. There's a small 2 meter mag-mount whip antenna outside the boat house. The configuration of my property is such that the house is on a bluff above the Sassafras, but the tower is on another, higher bluff, above the house, to the west. The signals from Ted's dock were not making it into the APRS network. I solved that problem by placing a 50 W, 2 meter mobile transceiver and another KPC3+ in the relay box at the base of my tower, about 1000 feet from the boathouse. The tower is topped by a ⅝ wavelength 2 meter vertical, 135 feet above the Sassafras. This is configured as a digipeater ("W3BW-15"), and it carries the weather data easily into the system. It also fills in a needed coverage gap for APRS users on the upper Eastern Shore.

A while back, worried about a drought killing some trees we had planted, I had the chance to check the weather at my home in Maryland from an Internet café in Juneau, Alaska. That was a real thrill. Any of you who want to set up your own Micro-Local weather station, please feel free to use me as an Elmer.

Photos by the author.

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