

# How the *Weather Underground* Works

## Introduction

The *Weather Underground* is a menu-driven, interactive C program that reads data files containing current weather information, and prints user-selected information to the screen. The executable program is attached to a Transmission Control Protocol (*TCP*) port on the host IBM RS6000 computer, so that any user on the *Internet* can run the program by connecting to the proper port. Currently, the Weather Underground runs on TCP port 3000 on the computer ***downwind.sprl.umich.edu*** (141.212.196.177).

## History of the *Weather Underground*

The concept for the Weather Underground was developed by University of Michigan Professor Perry Samson, of the Department of Atmospheric, Oceanic, and Space Sciences. The C code was written by graduate student Jeff Masters in 1991, as a class project for Professor Samson's Interactive Weather Computing class. The original version was designed to provide weather information for users of the University of Michigan computer networks, and for secondary schools across Michigan. Thanks to the networking efforts of MichNet, a subsidiary of Merit Network, Inc., and CAEN, the Computer Aided Engineering Network of the University of Michigan, the Weather Underground was made available to

anyone on the Internet in April 1991. The original version of the Weather Underground consisted of about 200 lines of C code, which displayed only 1 menu (forecasts for 240 cities across the U.S.), and was accessed approximately 500 times per week. By June 1992, it had expanded to over 10 menus and 1700 lines of C code, and accesses have grown to over 100,000 per week.

### **The Data Feed**

The Weather Underground accesses conventional National Weather Service data and forecasts through a data broadcast provided by Unidata, a National Science Foundation funded program, and by Zephyr Information Services, Inc. We receive 3 data feeds--the Domestic Data Plus (DD+), Numerical Product Service (NPS) data, and an International data feed. Unidata's Scientific Data Management (SDM) software package is used to handle the incoming data stream. The data is collected by a satellite dish and piped to a Sun 4 computer. Selected information from the incoming data stream is stored in standard ASCII files on the computer's hard disk, and updated continuously as new forecasts and weather information come in. The selection process is performed using a special pattern file provided by Unidata; some additional processing is done using shell scripts written at the University of Michigan. The final data is sent over the network to the computer running the actual C code (***downwind.sprl.umich.edu***).

### **Hardware Requirements**

The Weather Underground requires about \$20,000 in hardware, including a satellite dish to receive the data broadcast (about \$2500), a workstation to ingest the data (about \$8000), about \$4000 in specialized computer boards, plus a hardware rack from Zephyr Weather Information Service. One can also lease the equipment needed from Zephyr. Zephyr also charges a monthly access fee, which is approximately \$500/month for educational institutions, and about \$800/month for commercial establishments. Contact Zephyr Weather Information Service (508-898-3511) for more information.

### **Software Requirements**

The software needed to ingest Zephyr's data broadcast is free, thanks to the NSF-funded **Unidata** program. Contact ***support@unidata.ucar.edu*** for more information.

The Weather Underground C code and associated shell scripts are available via anonymous ftp. Note that this code will not work unless you have your own data feed! Contact ***sdm@madlab.sprl.umich.edu*** for more information.