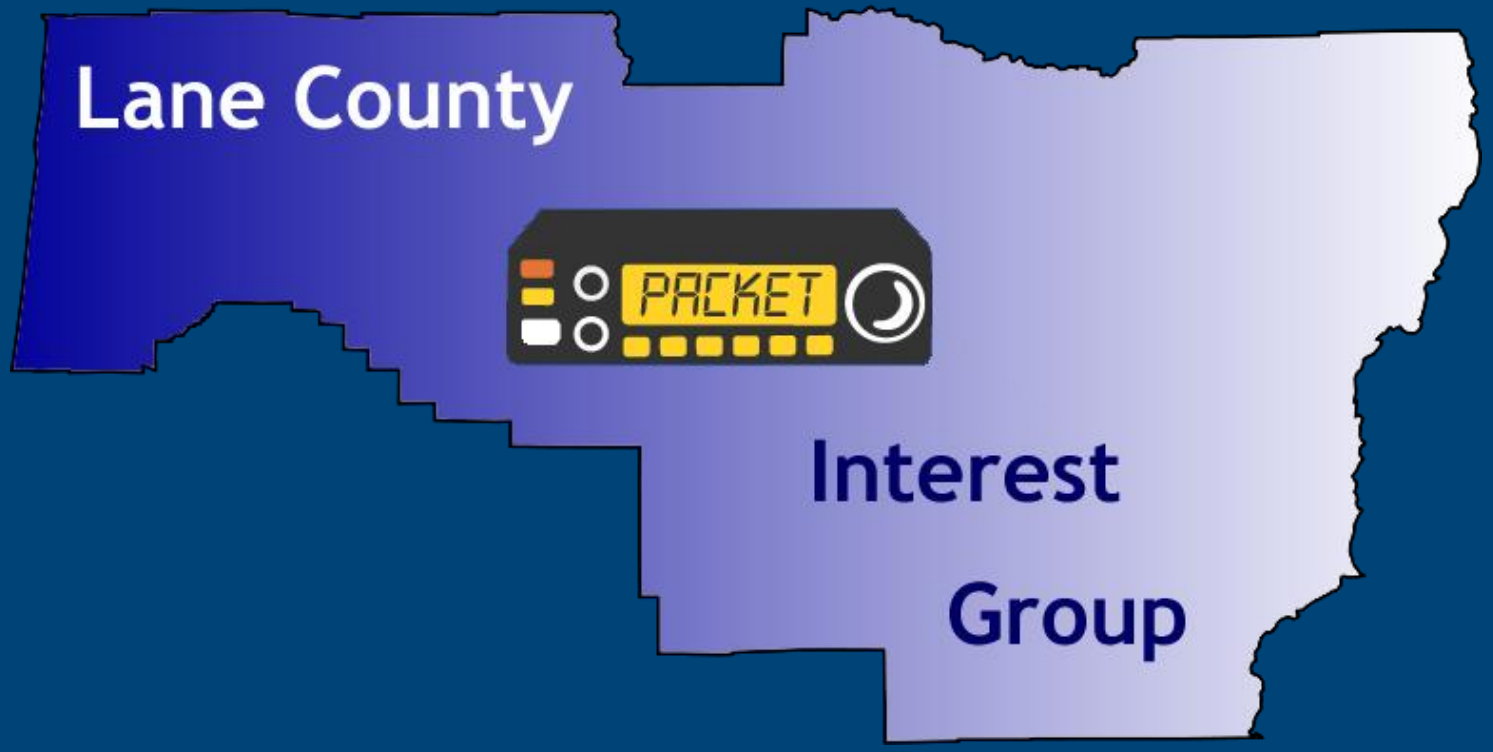

AUTOMATIC **P**ACKET **R**EPORTING **S**YSTEM

APRS

What is APRS?

- Position Tracking
- Short Text Messaging
- Weather Reporting
- Global RF and Internet Network

In its simplest implementation, APRS is used to transmit real-time data, information and reports of the exact location of a person or object via a data signal sent over amateur radio frequencies. In addition to real-time position reporting capabilities using attached Global Positioning System receivers, APRS is also capable of transmitting a wide variety of data, including weather reports, short text messages, radio direction finding bearings, telemetry data, short e-mail messages (send only) and storm forecasts. Once transmitted, these reports can be combined with a computer and mapping software to show the transmitted data superimposed with great precision upon a map display.

While the map plotting is the most visible feature of APRS, the text messaging capabilities and local information distribution capabilities combined with the robust network should not be overlooked.

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History of APRS

Bob Bruninga (WB4APR) implemented the earliest ancestor of APRS on an Apple II computer in 1982. This early version was used to map high frequency Navy position reports. In 1984, Bruninga developed a more advanced version on a Commodore VIC-20 for reporting the position and status of horses in a 100-mile endurance run. During the next two years, Bruninga continued to develop the system, which he now called the Connectionless Emergency Traffic System (CETS). Following a series of Federal Emergency Management Agency (FEMA) exercises using CETS, the system was ported to the IBM PC. During the early 1990s, CETS, now known as the Automatic Position Reporting System, continued to evolve into its current form. As GPS technology became more widely available, 'Position' was replaced with 'Packet' to better describe the more generic capabilities of the system and to emphasize its uses beyond mere position reporting.

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Position / Objects

APRS contains only four packet types: Position/objects, Status, Messages and Queries. The Position/object packets contain the latitude and longitude, and a symbol to be displayed on the map, and have many optional fields for altitude, course, speed, radiated power, antenna height above average terrain, antenna gain, and voice operating frequency. Positions of fixed stations are configured in the APRS software. Moving stations (portable or mobile) automatically derive their position information from a GPS receiver connected to the APRS equipment.

The map display uses these fields to plot communication range of all participants and facilitate the ability to contact users during both routine and emergency situations. Each position/object packet can use any of several hundred different symbols. Position/objects can also contain weather information or can be any number of dozens of standardized weather symbols. Each symbol on an APRS map can display many attributes discriminated either by color or other technique. These attributes are:

- Moving or fixed
- Dead-Reckoned or old
- Message capable or not
- Station or object
- Own object or other station object
- Emergency, priority, or special

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Status & Messages

The Status packet is free-field format that lets each station announce his current mission or application or contact information or any other information or data of immediate use to surrounding activities. The message packet can be used for point-to-point messages, bulletins, announcements or even email. Bulletins and Announcements are treated specially and displayed on a single "community Bulletin board". This community bulletin board is fixed size and all bulletins from all posters are sorted onto this display. The intent of this display is to be consistent and identical for all viewers so that all participants are seeing the same information at the same time. Since lines are sorted onto the display, then individual posters can edit, update, or delete individual lines of their bulletins at any time to keep the bulletin board up-to-date to all viewers.

All APRS messages are delivered live in real-time to on-line recipients. Messages are not stored and forwarded, but retried until timed out. The delivery of these messages is global, since the APRS-IS distributes all packets to all other igates in the world and those that are messages will actually go back to RF via any IGate that is near the intended recipient.

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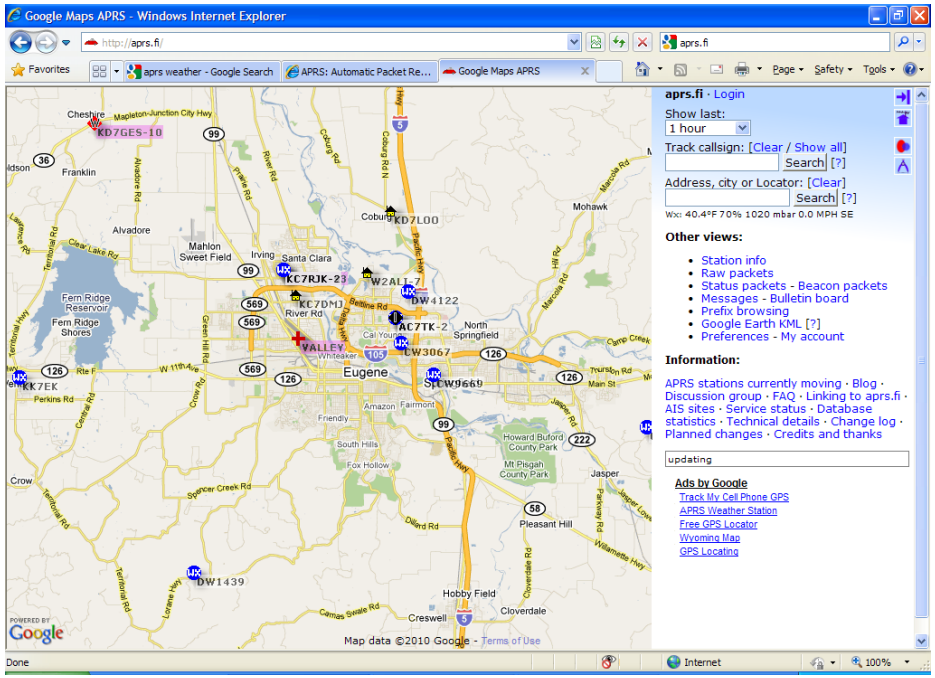
APRS-IS - FINDU .COM - APRS.FI

APRS-IS, the APRS Internet System: The APRS-IS is a worldwide network of internet gateways that provides end-to-end RF connectivity from any where on the globe within range of an IGate. In addition K4HG maintains FINDU.com which maintains a database of all packets heard anywhere at any time, up to the minute.

FindU is a database archiving weather, position, telemetry, and message data. The primary source of data is an amateur radio system called APRS, some weather data comes from an internet based system called the Citizen Weather Observer Program. This large (58 GB) database is hosted on two servers using data replication techniques. the data is constantly updated (about 20 new reports come in every second), and is accessed via a number of dynamic web pages



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Citizen Weather Observer Program

The Citizen Weather Observer Program (CWOP) is a public-private partnership with three main goals: 1) to collect weather data contributed by citizens; 2) to make these data available for weather services and homeland security; and 3) to provide feedback to the data contributors so that they have the tools to check and improve their data quality. In fact, the web address, wxqa.com, stands for weather quality assurance.

There are over 8,000 registered CWOP members world wide. Members send their weather data by internet alone or internet-wireless combination to the findU server and then every five minutes, the data are sent from the findU server to the NOAA MADIS server. The data undergo quality checking and then are distributed to users. There are over 500 different user organizations of the CWOP mesonet data. Here is a partial list:

- NWS Weather Forecast Offices
- National Center for Environmental Prediction
- National Center for Atmospheric Research
- Department of Homeland Security
- Weather Underground

Popular APRS Software

UI-View

-Windows

WinAPRS

- Windows

AGWTracker

- Windows w/AGW

Xastir

-Linux/ Mac OS X

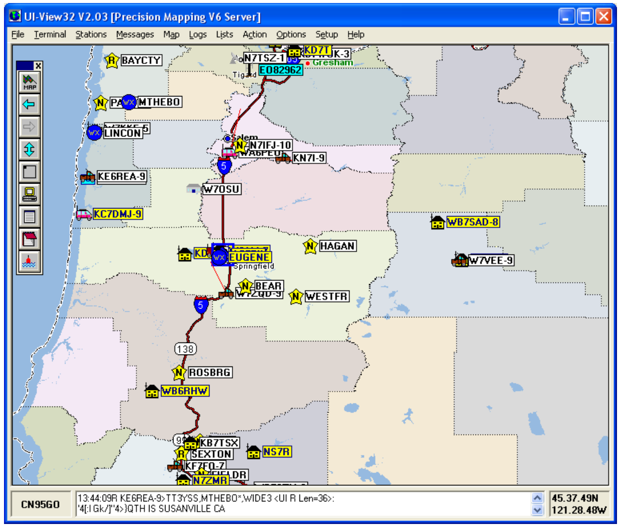
X-APRS

- Linux

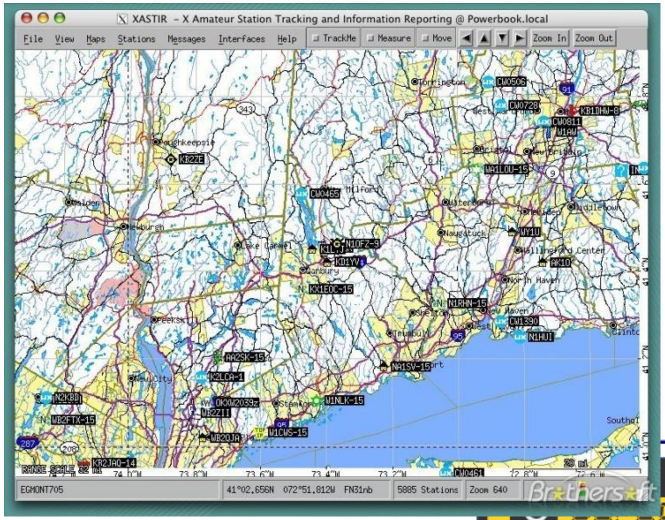
APRSDos

-MS DOS

UI-View



XASTIR



Equipment Settings

In its most widely used form, APRS is transported over the AX.25 protocol using 1200 baud (AFSK) on frequencies located within the amateur 2-meter band.

Equipment Settings

An APRS infrastructure comprises a variety of Terminal Node Controller (TNC) equipment put in place by individual Amateur Radio operators. This includes soundcards interfacing a radio to a computer, simple TNCs, and "smart" TNCs. The "smart" TNCs are capable of determining what has already happened with the packet (unit of information) and can prevent redundant packet repeating within the network.

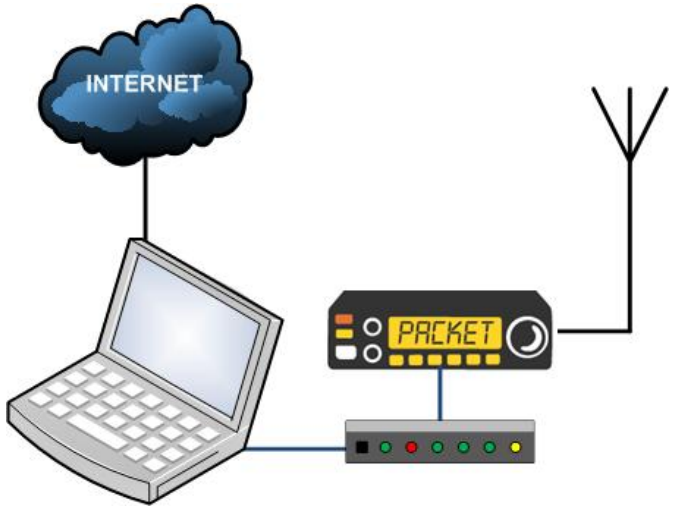
Reporting stations use a method of routing called a "path" to broadcast the information through a network. In a typical packet network, a station would use a path of known stations such as "via n8xxx,n8ary." This causes the packet to be repeated through the two stations before it stops. In APRS, generic callsigns are assigned to repeater stations to allow a more automatic operation.

Recommended Paths

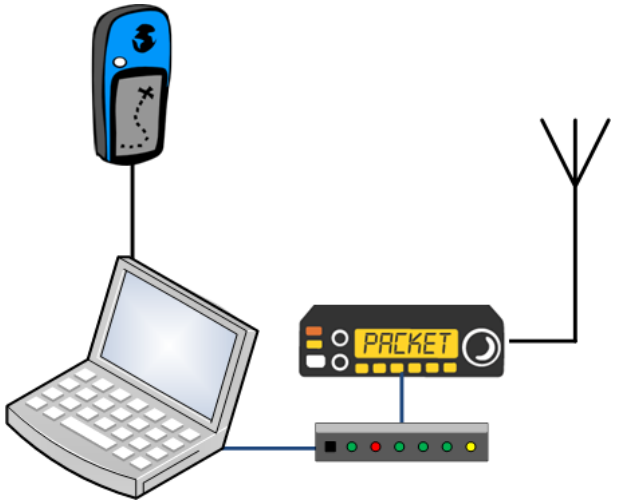
Throughout North America (and in many other regions) the recommended path for mobiles or portable stations is now **WIDE1-1,WIDE2-1**. Fixed Stations (homes, etc.) should not normally use a path routing if they don't need to be digipeated outside of their local area (and most don't). Otherwise a path of **WIDE2-2** or less should be used as requirements dictate. This path actually reflects the routing of packets via the radio component of APRS, and fixed stations should carefully consider their choice of path routing(s) to avoid unnecessary RF clutter outside of their local VHF listening area.

Typical APRS Station Types

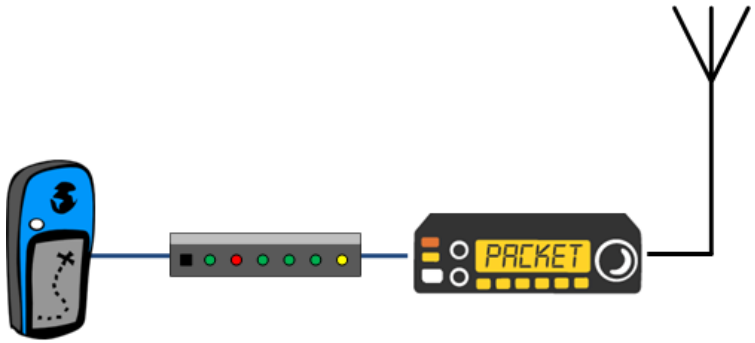
Base (Fixed) Station



Portable Station



Tracker



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APRS Tracker Examples

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