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APRS ALTERNATIVES

Tonight's net is titled "APRS Alternatives". I gave some thought to what alternatives means in this case and realized that APRS was all about alternatives in regard to how you use it and how you make it work for you. You could spend 5 or 6 net broadcasts covering all the aspects of APRS and the danger is trying to cover too much info at one time. Tonight I'm going to cover 4 main points about APRS:

1. Basic facts about APRS
2. A basic APRS hardware setup
3. Alternatives for APRS
4. How people are using APRS for off-roading

I'll be taking frequent breaks for questions and to allow emergency traffic to break in. Notify net control if you have a question. While I do have a plan for this broadcast, it can easily be scrapped to cover another area of interest or to go into more detail on a particular topic. Give me some feedback about your interests as we go along.

First, let me state for the record that I'm not an expert on APRS. OAUSA has members who are indeed experts, but they didn't volunteer to do this broadcast so you got me instead! In tonight's broadcast, those real experts will notice that I'm simplifying some of the more technical details, but rest assured that I'll include everything you need to know about APRS and what it does.

APRS is a wide-ranging topic. The basic concept was developed by Bob Bruniga, a leader in the ham radio community who developed what eventually became APRS in the early 1980's as a means to track locations and to distribute tactical information to a local area. Bob is still very active in the ham community and he is the ultimate champion of APRS -- which, by the way, is a registered trademark owned by Bob. The APRS specification document is copyrighted by TAPR, the Tucson Amateur Packet Radio Corporation. While all this is true, it has no real impact on the user as there is no claim made to the actual APRS protocol and you are free to use and implement it in your projects.

Now -- I've used the term APRS many times in the first few minutes here so let me back up and talk about what APRS is and a bit about what it isn't.

First, the term APRS is an acronym that officially stands for Automatic Packet Reporting System. You may hear still hear APRS referred to as the Automatic POSITION Reporting System, but that name was changed by Bob Bruniga a long time back to better reflect the capability of APRS. In the most simple terms, APRS is nothing more than a special application of ham packet radio, or the use of a prescribed digital data format to transmit information over radio

frequencies. You already use a number of systems that require a prescribed data protocol, such as ethernet, RS232, 802.11, etc which share some characteristics with APRS. With the introduction of wireless communications, APRS is not as high tech as it used to be, but it is still a very useful means of ham radio communication.

APRS can be used to transmit real-time information in the form of text bulletins, announcements, and locations of stations or objects. APRS is also used to transmit a wide variety of digital data including weather reports (a very common use), telemetry data (hobby balloonists are big users), storm locations and almost any data you want. All the transmitted location data can be displayed on a wide variety of map displays.

As I just mentioned, packet radio requires the use of a specific format, or protocol, for the digital data being transmitted. In the case of APRS, the protocol is named AX.25. The details of the protocol are available on the internet, but if you try to read it I suspect your eyes will cross and you'll quickly find yourself deep asleep face down on your keyboard. For our purposes, it's not necessary to know anything about the protocol, and I'll explain why later.

So --- you have a protocol that allows you to format the digital information you want to send out. Now what?

First, let's talk about hardware:

As ham radio operators, you could easily guess that you'll need a transmitter and a receiver to send data from one place to another -- and that is exactly the case. Practically any ham radio can be used with APRS. Most of the APRS traffic will be found on the VHF band, but UHF is also used and, less frequently, the HF bands will be used for long distances.

Unlike voice communications however, for APRS you'll need an extra item in the that hardware chain to transform the digital data you want to send into an analog signal that your transmitter can send out over the radio frequency spectrum. As you'd expect, you also need that special device to transform the digital data packet received by your ham radio back into something that you can understand as a human being. This special device is called a Terminal Node Controller, or TNC. For APRS users, there are TNCs that are specially designed with APRS features, such as the Tracker2 series from Argent Data Systems or the TinyTracker series from Byonics. We'll talk more about them later. These dedicated APRS TNCs are, by the way, the reason you don't have to know anything about AX.25 protocol. The trackers do all that work for you! In fact, the Argent Data Systems Tracker2 will allow you to send the following data reports, without additional programming, at intervals you select:

Altitude

Course/Speed
Time
GPS quality
Temperature
Voltage

The Tracker2 will also allow you to remotely control a power source up to 120V and it can also be remotely operated itself. As you can see, the APRS trackers offer a wide range of applications all in themselves!

So -- for those of you that haven't left the net to watch re-runs of Glee, we've figured out that the hardware required to use APRS in its basic application is really very simple:

1. A standard ham radio system, most commonly a 2m or 70cm band radio tuned to 144.390 or 445.925.
2. A TNC in the form of an APRS tracker
3. A GPS input to provide position data to the tracker.
4. Cables to connect your radio, your tracker, and your GPS.

In the simplest applications for using APRS, this is really all the hardware you need to get on the air. This form of APRS is a transmit-only system that will broadcast information, typically text or location data, to the world.

In keeping with tonight's theme, let's call this simple option our first alternative and call it local broadcasting. It is the easiest and quickest way to get on the air using APRS, and it has a lot of applications.

First, some additional background about APRS:

The APRS protocol is an 'unacknowledged' protocol, meaning that your messages are sent out into the world with no verification that anyone heard what you had to say. In the APRS world, there is no ACK or acknowledgement that lets you know that anyone heard your message. Before anyone jumps in with evidence to the contrary, let me say that the applications that use the APRS protocol, and the tracker hardware that implements it, may add their own ACK protocols to the APRS protocol. For instance, messages sent between the Argent Data System's Tracker2 models will ACK control messages. Email applications, which I'll cover in a minute, will acknowledge receipt of your message with an ACK transmission. These are special cases and don't change the fact that APRS is sent out with no expectation of a verification that any particular packet of information was received. As a matter of fact, many APRS packets 'collide' and are lost in transmission.

So -- you're transmitting on 2m, which is pretty much limited to line of sight. How can that possibly be useful if you don't know if anyone even heard you?

Bob Bruniga's scheme for APRS was to make it a useful means of broadcasting local information by sending out Bulletins, Announcements, and locations. There are some technical differences between bulletins and announcements, but generally they're short text messages meant to announce information of interest to local hams or hams passing through the area. For instance, you could broadcast the info for club meetings, swap meets, weather info, repeater info, or personal info, such as what frequency you're monitoring. How many times have you seen a fellow ham rolling down the highway with 4 or 5 antennas on their vehicle but you weren't able to raise them on the air? APRS may help with that by broadcasting the frequency being monitored, and in fact, some of the most advance radios, like the Kenwood D-710, will automatically insert your current channel info into your APRS broadcasts.

In local broadcasting, you just put the information out there on a specific frequency and let people know what you have to say.

The local option is useful, but a bit limited, so let's move on the the next level and call this option APRS-IS -- which, coincidentally, is what the rest of the world calls it as well -- and this is where the magic happens! The ham radio packet radio community provide what are known as digipeaters and iGates. Digipeaters are ham stations, typically located at higher elevations, that receive APRS packets and re-broadcast them with a wider range. Several digipeaters can team up and pass your APRS broadcast over ranges of hundreds, and theoretically even thousands, of miles! In reality, it normally doesn't require that much range because of another feature of packet radio called an iGate. An iGate is a ham radio station that receives your APRS transmission, usually from a digipeater, and transfers it to the internet. Once on the internet, dedicated software looks for your APRS packet and routes your data. There are several popular websites that display your location, along with any status messages, bulletins, or announcements, such as APRS.FI, FINDU.COM, or OPENAPRS.NET. These three websites are the most popular and are a great resource for people using the transmit-only method of APRS. A few minutes exploring the website will show you how useful it can be. For instance, you could transmit your location and status while in the boondocks on an offroad trip and have someone at home monitoring your position and status. APRS-IS is a simple, cost effective form of vehicle tracking that can provide a basic safety net for off-road adventurers.

Another application for APRS-IS is the ability to send short, 135 character email messages from the back country to anybody who has an email address. The email capability is a sub-category of APRS messaging, and is an offshoot of the bulletins and announcements feature. In this case, the dedicated software monitoring your input via an iGate looks for a special format you've sent as a bulletin. The special format includes a key word, such as EMAIL in the most popular service, which is then pulled out of the APRS data stream and transferred to an email server.

All these features of APRS can be used with 'one way', transmit only, APRS implementation. If a receive capability is added, even more applications quickly become apparent for APRS. The two-way APRS, meaning your tracker is able to receive and 'decode' the APRS protocol as well as to send it, means that you can make use of APRS capabilities in real-time. For our purposes tonight, we'll define this implementation that allows you to receive and decode the digital data stream as Two-way APRS, but you probably won't hear that term anywhere else.

Once your hardware setup can receive and translate incoming APRS data, more applications open up. For instance, regarding the email capability we just talked about, there are special applications, such as OPENAPRS.NET that will actually allow short return messages to be sent back to you! This can be a very useful capability to have in your 'emergency kit' or for when someone at home has to reach you in an emergency. When I've need to stay in touch on a trip, I've set up specific times when I monitor the radio for messages from home. In this special EMAIL case, you know that your message has reached the internet because you will receive an acknowledgement from the EMAIL server that your message was received and was decoded properly.

Two-way APRS also opens up another very popular feature of APRS-IS which is the ability to show the location of APRS stations on a map. In the case of mobile stations, this would allow you to track the changing position of a mobile station in relation to your station. For use in the back-country, this ability would come in handy in locating friends that have become separated or in just rendezvousing with other travelers. You can also see where this capability could be a critical part of participating in search and rescue operations!

Perhaps the most comprehensive application of APRS is the "all of the above" option where your hardware application will allow you to both send and receive APRS data and to map it locally on a moving map display. In addition to distant stations, whose signal have reached you via digipeaters, you will also see the positions of people nearby who are transmitting their location via APRS. This can give you a very clear tactical picture of where your traveling companions are at any give time. If your group likes to split up and explore promising areas on their own (as I often do) then it is easy to join back up using their position on a topo map to re-group.

Earlier I called the local mapping application the most comprehensive application for APRS. I was referring to the hardware and software required to support this real-time information exchange and mapping. There are several software programs in popular use which will display APRS data, including UI View, OziExplorer, and Overland Navigator. These programs run on personal computers, which can be mounted in your vehicle. Modern versions of these programs can be run on tablet PCs and iPad versions for a few applications are

in the works. Having a PCs hooked into your APRS system can also enhance the ability to control the APRS TNC for messaging and email and monitor the actual data being transmitted. There are some simpler solutions for moving map display however! Some GPS units will accept the position data from your tracker and display it along with your track and other waypoints. The Garmin GPSMap 60Csx for instance will display and properly update APRS stations on your map. Some Garmin NUVI units (such as the Nuvi 350, which is unfortunately no longer sold0 will also work well with APRS and can included a basic, but functional, messaging capability.

I've talked to people who have become discouraged by all there is to know about APRS. I try to help by explaining that APRS is really very simple, and it really is, but that you have a lot of choices in how to use it . The APRS TNCs now available are cheap and very capable. There is a lot of information on the web about how to make up cables and install your APRS hardware. If you search for the term APRS on OAUSA, you'll find a lot of useful info about using APRS and which hardware works well.

The hard part about APRS is in deciding how you want to use it! There are many different applications for APRS but the best reason to experiment with it is to have fun and explore the technical features of ham radio. Satellite personal trackers, such as SPOT, and cell-phones are readily available nowadays and can give you most of the same features that APRS provides, but they aren't nearly as much fun. Also, cell phones aren't useful unless you're in range of a cell tower -- and isn't' that why getting out in the backcountry is so much fun?

Modern ham radios, such as the Kenwood D-710 and the Yaesu FT-350 have an APRS TNC built in and support many APRS features right out of the box. These radio are very capable and provide a wealth of information but have their own characteristics. They are too detailed to include in this net, but they're well worth looking into if you're in the market for a new radio (or a fourth radio, for that matter!)

If you're interested in more information about APRS applications, or more technical details about APRS itself, the internet is your friend. There is a lot of information available to you, including a dedicated forum on OAUSA.net in the Communications section. If you post your questions there, you'll almost certainly useful information! For more information on trackers, visit www.argentdata.com or www.byonics.com. There are a lot of options, including some plug-and-play systems that will get you on the air quickly.

As I mentioned earlier, I've covered the basics of APRS tonight but there are many other areas of APRS that would be of interest to get down into the details. The subject of digipeaters, how to best program your APRS tracker, or how to use APRS features such as EMAIL would fill a net all on their own. If you think there is enough interest in a specific area of APRS to warrant a

dedicated net broadcast, let "toms" (KI6FHA0 know and he find room in the schedule.