

AUTOMATIC VOICE RELAY SYSTEM

AVRS

Bob Bruninga, WB4APR
115 Old Farm Ct
Glen Burnie, MD 21060

ABSTRACT : AVRS is a ¹VOICE¹¹ addition to APRS.

Just like APRS now provides mobile-to-mobile worldwide MESSAGE capability via the Internet APRServe system, there is no reason why we cannot add voice to this same type infrastructure for mobile-to-mobile voice. And AVRS is not limited to one channel. It can be expanded to as many channels as the locals want (ie, it can handle explosive growth)...

Internet connection of local Repeaters is not new. Iphone links have been going on for several years, but with the lack of any common user commandable access-on-demand and the competition for on-air time with conventional use of the repeaters, it remains as just a novelty. But, by tying this capability into the command structure and worldwide text messaging capability of APRS, the mobile user would then have total control and could "dial up" a link anywhere on the planet. Remember, he can already communicate by text message to confirm the other person is on the air. AVRS then lets him open a voice link to that same area.

INITIAL AVRS OPERATIONS:

For one channel (the first), simply connect a local VOICE SIMPLEX frequency in your area to the Internet with IPHONE. A mobile who wants to chat to any other APRS mobile ANYWHERE, sends an APRS "AVRS link" MESSAGE from his mobile on 144.39 that ACTIVATES the AVRS link and while it is open, anything he says on that SIMPLEX channel goes via IPHONE to the other AVRS node anywhere.

Initially, until it became saturated, the link would probably just go to ALL, so that we would be able to find someone to talk to. The format for activating an AVRS link would be a short APRS message to the generic callsign of AVRS. Connections to other AVRS nodes could be by AREA or by SUBJECT matter or by CHANNEL number.

TO: AVRS	:Help	<= Responds with a list of local AVRS freqs
TO: AVRS	:ALL	c= would activate link to ALL unused AVRS sites
TO: AVRS	Chicago	c= would activate link to Chicago
TO: AVRS	:Annapolis	c= would activate link to Annapolis
TO: AVRS	AMSAT	c= would activate link to all "AMSAT" channels
TO: AVRS	:ATV	c= would activate link to all I ^r ATV" channels
TO: AVRS	:CH 1	c= would activate link to all "Channel 1%"
TO: AVRS	:Bye	c= would drop the link.

Thus, we have a worldwide VOICE channel(s), just like we have a PACKET channel. YES, as popularity grows, it will be a ZOO!, but then you simply expand the number of RADIO channels to separate out the users by SUBJECT, or by CHANNEL NUMBER. What we end up with is just like the growth potential of CELLULAR. Each local area can use ANY simplex channels they want and can MAP any "channel

designation" to any channels. This is ALL a local issue. For example, Chicago might have 3 channels on the air serving for chats on the subjects of APRS, AMSAT and RELIGION. But In Annapolis where there is little or no activity at any instant, all three of these "subject" channels would be linked to our one hardware channel which would relay which ever one was currently in use. In such a case, only the first connection works, since Iphone can only support one connection at a time.

Notice how the above "HELPI message allows you to find out about AVRS in the local area where you are. If there is an AVRS in the area, it will respond with the list of channels and frequencies to tune into in your local area. Responses from the local AVRS system will also be by packet such as:

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TO: yourcall :AVRS Greenbelt is 28.910, AMSAT is 28.916
TO: yourcall :Connected to Chicago on 28.913
TO: yourcall :Annapolis is busy
TO: yourcall :AVRS not available
TO: yourcall :Connected to AMSAT on 28.916
TO: yourcall :Goodbye. AMSAT link on 28.916 is deactivated
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AVRS CHAIUNEL FREQUENCY BAND:

So that you can do ALL this from your mobile, without interference to APRS on 144.39 and other mobile activities on 2 meters and 70 cm, we think that 10m SSB is the ideal band/mode for these simplex AVRS voice channels for several reasons:

- 1) NEW band so AVRS does not QRM your other mobile APRS and 2m activity
- 2) NEW band so AVRS nodes can be collocated at existing HIGH node sites
- 3) Simplex range to mobile is 30% greater than on 2m or 440?
- 4) Band has many many SSB channels available
- 5) Avoids political battles on 2m, 70cm
- 6) New radios cost only \$149, Antennas are FREE (CB magmounts)

The one disadvantage is band openings. But hey, if the BAND IS OPEN, then turn this AVRS kludge OFF and talk DIRECT! Band openings are only a problem during a few hours of a day and only during a few years out of every 11. By the time we get this going, we will be out of the solar maximum and so we will see the next 8 years of DEAD BAND on 10 meters. Also, since you have the 10m rig in your car, you will HEAR that the band is open before you open a link... Think of AVRS on 10m as only a crutch, like repeaters, for use only when the band is dead.

10 METER CHANNEL RANGE:

Although the primary advantages of 10m are the ability to add the band to existing mobiles and Igates without interference to priority use of the other APRS and mobile bands, there is supposedly an additional advantage of extended simplex range on 10m, although so far, some practical experience has not shown the same conclusions.

From the ARRL FM & REPEATER MANUAL, using graph 6-18 in the 1970 edition, yields the following approximate (eyeball) results. This analysis takes into account not only the better link margin with longer wavelength but then also the better antenna gains available with the shorter wavelengths. One thing the

book was not clear on, was the gain of the BASE antenna for the graph. I took the conservative approach and assumed that they also were 1/4 wave radiators, thus I applied better antenna gains for both the mobile and base as shown in the 6th column below:

BAND	FOR 100' HAAT 1W	FOR 25W	FOR 40'	FOR 40' 1	RESULT	SSB	
	EQUAL AREA ANTENNAS	QUARTER WAVE WHIPS	QUARTER WAVE WHIPS	QUARTER WAVE WHIPS	ACTUAL MOBILE-1 BASE ANTS	ACTUAL MOBILE RANGE	SAME ANTS
70cm	18	8	3	1	5/8 dB	20 mi	28mi
2m	22	14	23	20	3/6 dB	27 mi	34mi
10m	25	28	42	32	-3/3 dB	36 mi	43mi

The RESULT column assumes high gain antennas at the base and typical mobile antennas for the bands involved. Note, that I assumed - 3dBd for the mobile 10m antenna assuming everyone would use a shortened loaded whip magmount. The final column assumes a 7 dB advantage of SSB over FM based on the Bandwidth ratio.

Still, though, no one has given practical experience that supports these numbers, and in fact, many suggest that 10m is no better, if not worse than 2m in general. But range is not the primary factor in the AVRS application, the new-band-non-interference-with-existing-mobile-ops and low--cost of the 10m SSB radio system are the primary advantages of 10m. As a sampling, here are some preliminary opinions received from others on the APRSSIG:

Walter Holmes wrote:

> We have a 50W 10 meter FM remote base... at about 150 feet. The range is
> about 25 to 30 miles to a 25 watt mobile... about the same as 2m...

w04U said:

> We experimented [on] 2 M and 10 M . . . using a multi element beam the two
> frequencies seem to behave similar . . . but 2 M (whips) aILways wins for
> distance per watt when going beyond about 5 - 7 miles. [But the]
> tests were all conducted in East TN - which is very mountainous...

MY SIMPLE TEST:

> I listened to the local APRS 10 meter feed while driving home from the site.
> The feed antenna was in clear with 80' above local terrain out 2mi. But
> Local terrain is at sea level. Actual HAAT is probably much less than 20'
> if not below zero in the 15 miles I drove home. At 6mi and beyond it was
> nominal weak signal good copy with no AGC action. Only minor additional
> reduction out the full 15 miles to home.

Since most 10m activity is for the DX when the band is open, my disussions with other operators reveals very little experience with it as a Base-to-mobile channel, so this paper and this subject is ripe for further experimentation.

CONCLUSION:

For \$149 and a CB magmount, AVRS should be a POPULAR capability that will REVOLUTIONIZE amateur mobile voice connectivity just like APRS revolutionized mobile packet. Initially, if operators disagree with the choice of the 10m band as the ideal AVRS band, they can even put it on 2m or any other band from their shack to see if the concept will fly. It does not matter, it is purely a local issue.

We have everything we need, off the shelf, including iPhone and APRS and the radios... All we need is the interest "land a little software" to glue it all together... And the hope that Radio Shack will continue to sell the low cost radio even after the solar max...

de WB4APR, Bob