The GB3HV digital project – part 2

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The first part of this article described how the Home Counties ATV Group had implemented digital transmit and receive at GB3HV, the 23cms ATV repeater at High Wycombe.   The second part of the article describes how the group is taking advantage of the internet to add additional features to the facilities offered by GB3HV.

Internet streaming

During 2004 the group began work on a project to the stream the output of GB3HV on to the Internet.

Dave, M0SAT, undertook a lot of the early experimentation and during summer 2004 began streaming GB3HV from his home station using a USB capture card fed from his off air receiver.   The stream was run over a cable modem connection at 200Kbit/s using Windows Media Player 9 format which was chosen due to the high video quality achievable at low bit rates, the mass adoption of the media player and free download encoder software.

Whilst these tests were successful, there were a number of issues that need to be resolved if this was to become a permanent service. Firstly, the streaming was dependant on Dave being at home and not using full bandwidth Internet for other purposes. Also the video quality was not clean as it was received off air at P3-4. But perhaps the most significant disadvantage was that the bandwidth of Dave's connection limited the number of simultaneous users who could view the stream – each user is a separate connection and requires a separate video stream so only 2 users could be served with a 100k video stream on a 250K DSL upstream connection.

However, the group has since been very fortunate and obtained the use of a streaming port on a professional content distribution network provided by StreamingWizard (www.streaminwizard.com) that can serve many simultaneous users (a bit like an amateur repeater in some ways!).

This facility allowed Dave's streaming output to be sent to the Streaming Wizard network and an embedded media player on the HV website (http://www.gb3hv.com/gb3hv/streaming.htm) was set up. This facility meant that an unlimited number of users could connect to the stream at any one time.

DSL connection to site

With the streaming facility being made semi permanent, at the end of 2004 the group decided to invest in a DSL connection at site and for a one-year trial period to place a PC at the HV site to run streaming directly in to the Streaming Wizard network. This

eliminated 2 problems in that the streaming encoder is fed directly from the repeater with clean video signals and it also freed up M0SAT's home connection to the internet.

The DSL connection was arranged with Demon who offers a fixed IP address – essential to avoid constant reconfiguration of the network input – and a PC was built with an Osprey 100 semi professional video input card.   We have since discovered the services of sites such as www.dyndns.com , which allow you to use a dynamic IP address but provide a static url to the outside world – thereby meaning we can now move to any ISP who supports streaming on port 8080.

This was just the start of the fun! Firstly we had to convince BT and Demon that this was not a commercial installation and hence qualified for residential service rates. Then BT could not find the other end of the "existing" but dead phone installation on site and so had to get a cherry picker in to put up new poles etc – this resulted in the group having to pay the £83 new connection charge which we hoped we could avoid. Then the Demon install package with modem and DSL filters were delivered to the site (an umanned cellular radio site) and not to the billing address!

Despite all of this, the onsite streaming went live at the end of January 2005 and then we learnt all about using a domestic PC on a remote site 30 miles away! The first problem was that the DSL connection did not automatically come up on PC restart – this was easily cured by putting Internet Explorer in to the start menu which forced a connection every time the PC was reset.

Block diagram of PC etc

The PC was configured to have the ability to for remote access using VNC (www.realvnc.com), and PC hardware reset via DTMF commands. However, the system was not configured to reset the USB DSL modem hardware but after 2 site visits to find the modem had hung up, a DTMF controlled relay was put in the USB DC feed to the modem! More recently we have discovered we need a relay across the ATX chassis main power switch to cause a reboot after power cuts and hopefully this will also reset the machine after accidentally shutting down the machine (rather than reset) via the VNC control screen – an event which caused much muttering in the G8GTZ shack! A UPS power supply on the PC become essential after Bios was corrupted during a thunderstorm – there is nothing more frustrating than watching a screen from a PC 30 miles away that says "press F1 to continue"!

Results

This was certainly an interesting phase of the project but the results seem worthwhile. We now have a high quality reliable streaming feed at 200Kbit/s with repeater and 144.750MHz audio (that is another story – see below), which is available whenever the repeater is active – see http://www.gb3hv.com/gb3hv/streaming.htm and judge for yourself. There is a considerable delay of typically 20 seconds in the system caused by both the steaming encoder on site and the streaming wizard distribution network but this

does not cause a problem for the typical remote user who cannot see the live off air signal.

During 2006 we experienced problems with Streaming Wizard and were one of the first groups to discover Camstreams – www.camstreams.com , we managed to persuade the operator to give GB3HV more bandwidth than the normal user and are capable of running 200Kbit/s to concurrent 15 users. Since August 2006 we have used this facility and it has proved highly reliable, although we are at somewhat of a loss to understand the Camstreams business plan!
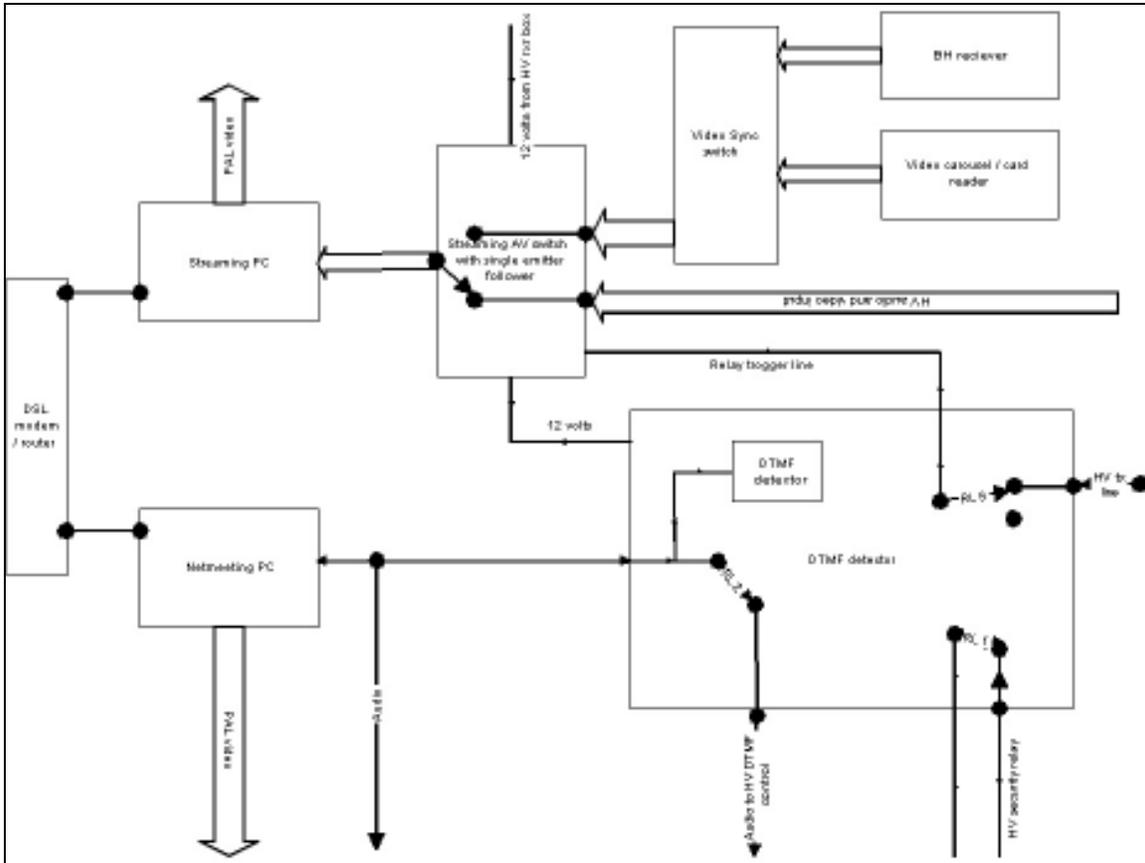
In order to fully utilise the streaming facility, a sync detector is provided on the input to the streaming encoder to overcome the fact that GB3HV only transmits video for the first 30 minutes of every hour when in idle mode. The switch is used to select either a receiver tuned to the GB3BH 13cms TV repeater at Bushey Heath when it is on air or a local JPEG photo player which displays further captions describing GB3HV and the Home Counties Amateur Television Group.

The video quality is good, although varies depending on the amount of noise on the received video signal, and we know several groups who are now relaying the streamed output over their own repeaters, particularly during the RSGB news broadcast by G8CKN on Sunday morning.

Video conferencing input

Having got a relatively stable PC with broadband connection on site we then looked what else we could do. As several of our members tend to travel on business, it was felt it would be neat if we could offer a remote access via the internet – always under local control of the repeater keeper.

It was decided to adopt a standard video conferencing type facility and Microsoft Netmeeting was chosen as, although it is no longer supported by Microsoft, it has all the features we needed, including a DTMF keypad and clean user interface for display on the HV link input screen. The USB modem was replaced with a 4 port router/modem and Netmeeting was set up on a second PC to auto answer an incoming H.264 call to the repeater's DynDns address. This was not without problems as not all DSL routers will support H263/netmeeting traffic – in particular the Linksys WAG54 unit which we initially had on site caused a lot of grief and in the end was replaced with WAG354 which seems to work perfectly!

A graphics card with PAL output has been fitted in the second PC and this output, along with audio output from the PC, is fed in to the main repeater video switcher as a link input.

Whilst Netmeeting will automatically answer incoming calls, nothing will be displayed on the repeater output until the keeper using 432MHz telemetry input enters the correct DTMF commands to select the input. Thereby the internet input does not have any control over the repeater, although a DTMF * received on the input will transmit a 1Khz "notification" tone for 5 seconds when GB3HV is in transmit but the selection of the input is always under local control.

The repeater video and 144.750Mhz audio is returned by Netmeeting, as the delay of typically 20 seconds on the main streaming output means the 144.750 audio is useless for a 2 way QSO. This facility allows the remote user to experience the real feel of a typical ATV QSO with Audio and video going in to the repeater and talk back audio and video being received on a separate channel.

The facility works well and a half size picture of reasonable quality and full frame rate has been received from Noel, G8GTZ, from a hotel room in Japan and the US.

Website

In parallel with the developments on GB3HV, Dave M0SAT have enhanced www.gb3hv.com and it is now perceived once of the best ATV websites on the web.

As well as making the streaming available via the website, we have implemented a chat room facility, primarily to make contact with those watching the streaming and this is now used to alert people that there is a incoming video conferencing signal which requires the keeper to switch on to the output.

As well as embedded streaming output and the "atvstreaming" chat room, a recording of the GB2RS news service is available for viewing at any time.

But perhaps most importantly Dave ensures the website is maintained regularly and it serves as a very good window into the GB3HV ATV scene and we typically get 1,500 hits per month.

Weather and dynamic information page

In July 2006 the group set up a weather station and the software is run on the netmeeting PC and used to update the GB3HV web site with live weather data every minute. A graphics card with a second TV output was fitted to the original streaming PC and this is used to provide a weather station display selected by DTMF commands.
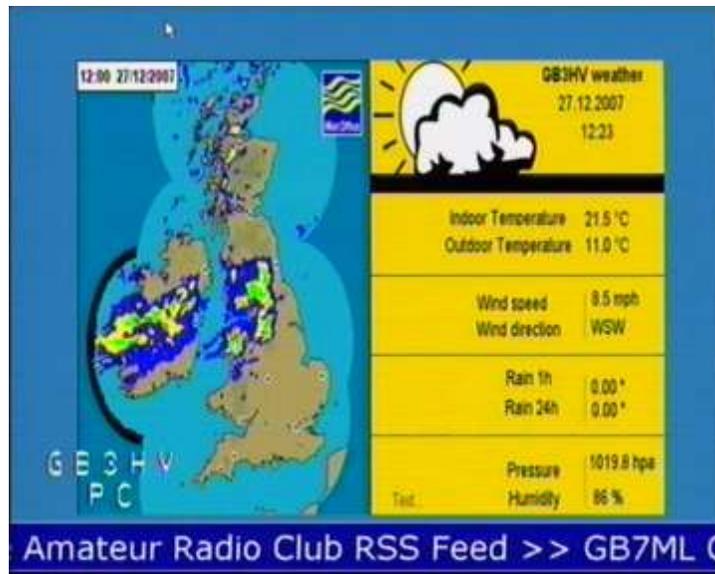
The screen is generated by a program called justwatching, available from
www.lincolnbeach.com , which dynamically updates an XP desktop with website pages.
For the display shown above, we load the GB3HV weather page from the website and the
met office rain radar data from
http://www.meto.gov.uk/weather/europe/uk/radar/data/3EF_PS_0.GIF .

We also run an RSS news ticker at the top of the page using www.newzcrawler.com to
display news feeds from the ARRL and Southgate amateur radio club.

What next?

With several other TV repeaters being streamed on Camstreams, we are turning our
attention to how these feeds can be used to provide a national or even international
network of linked TV repeaters.

The major problems to overcome include how to decode and present several streamed
video feeds to the GB3HV video input router. This could be done using one PC and a
web interface to select the appropriate streamed feed – this facility is available using
VLC (http://www.videolan.org/vlc/) but has proven to be unreliable in operation.
Another idea was to use a modded Xbox running Xbox media centre – this has the benefit
of cheap dedicated hardware and does work and XBMC does offer a web control port -
http://www.xboxmediacenter.com/ - however this has proven unreliable over a period of
time.

The second problem to overcome is how and whether it is legal to allow a remote user
access to the video switcher of GB3HV. Technically this is relatively easy to do using
one the many IP based switches with simple web interfaces to control the switcher -
http://www.digidave.co.uk/product_info.php?cPath=25&products_id=208&osCsid=f976
19a03a0a1e2292d29b0a26e31446 – as to the legal position??

We then need to agree a protocol for linking between the groups and we can all watch each other's repeater idents!

Conclusion

Hopefully these articles have given an introduction in to how the world of ATV is advancing and embracing all digital technologies. They will hopefully encourage other amateurs to investigate ATV in its widest sense and also encourage other ATV repeater groups to look at developing similar projects.

For further details go to our web site www.gb3hv.com or drop us an email…..