# DVBGuide

*Version 0.90, 7th December 2008*

## A DVB EPG capture utility

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# Contents

# Introduction

**DVBGuide** is a utility to capture the Electronic Programme Guide (EPG) data as broadcast over a digital television DVB network. The original intended purpose for **DVBGuide** was to provide guide data for Windows® Media Center (using a loader utility provided). However, since the EPG data is written in the widely supported *XMLTV* format, **DVBGuide** may find other uses that require the capture of EPG data on a Windows platform.

The key features of **DVBGuide** are:

❑ Runs from the Windows command line;

❑ Uses any DVB-C, DVB-S or DVB-T or tuner that has a BDA driver;

❑ Flexible tuner selection mechanism with avoidance of in-use tuners;

❑ Generates EPG data in *XMLTV* format;

❑ Generates a matching `ChannelInfo.xml` file which defines the channel name, *XMLTV* identifier and virtual channel number mapping;

❑ Option to directly generate EPG data in the proprietary Windows Media Center file format (pre-Vista TV Pack 2008 only);

❑ Separate command line Guide loader utility for Windows MCE 2005 and Vista Media Center;

❑ Support for Windows Media Center category classifications;

❑ Option to set the PC system time from broadcast timestamp;

❑ Option to write NIT, BAT, PAT and SDT Service Information tables as comma separated value files;

❑ Silent mode for incorporation into a batch process.

Windows Media Center has its own Guide service provided free by Microsoft and its partners. So, why would anyone want to use **DVBGuide** instead? There are three main reasons:

❑ The Media Center PC is not connected to the Internet making the Guide service unavailable;

❑ The Guide service is unavailable in the region of use (but broadcast EPG data is available);

❑ Dissatisfaction with the normal Guide service because of inaccuracies, bad mapping of channels to names used by the broadcaster, and slow response to scheduling changes.

## Latest changes

Changes introduced in Version 0.90 are:

- ❑ Support for DVB-S tuners (with associated new command line options to set tuning parameters specific to satellite);
- ❑ New tuner discovery and selection mechanism allowing use of a specified tuner or, alternatively, the first available tuner;
- ❑ Support for the capture of the United Kingdom's Freesat EPG;
    - • New command line options to specify alternate PIDs for PSI table capture;
    - • Partial support for the decompression of the first order Huffman compression scheme used for EPG text strings *(this is still a work in progress)*;
- ❑ New option to directly generate Media Center Guide data;
- ❑ New Guide loader command line utility supporting Vista and MCE 2005; designed with simplicity of installation and operation in mind;
- ❑ Improved support for content category/genre information and, using the aforementioned new generation and loading of Media Center Guide data, better use of categories within Media Center;
- ❑ Further revisions (since version 0.85) to the signal lock acquisition and signal reporting mechanism for improved compatibility with an even wider range of tuner hardware;
- ❑ Option to specify the *XMLTV* output file name;
- ❑ Additional information (event IDs and TV-Anytime CRIDs) included in the *XMLTV* file in the form of XML comments (for useful information fields which do not form part of the *XMLTV* specification).

# TV Pack 2008 and Windows 7

TV Pack 2008 is a major update to Vista Media Center. It introduces significant changes to the way the Guide works in Media Center and the data format used. The Guide loader utility provided with **DVBGuide** does not currently support Vista Media Center if the TV Pack 2008 is installed. This is perhaps not the problem that it might be because a major new feature of TV Pack 2008 is the direct loading of broadcast "in-band" EPG data. This perhaps negates any reason for using **DVBGuide** with the TV Pack 2008. There are still reasons though why one might want to use **DVBGuide** to provide EPG data to Vista Media Center/TV Pack 2008 (e.g. provision of the UK's Freesat EPG) so future support for the direct loading of Guide data into TV Pack 2008 is planned.

Windows 7 uses the same Guide mechanism as introduced with the TV Pack. So, **DVBGuide**'s Guide loader utility will not work with Windows 7.

# *Caveat emptor*

There are four main variables that will affect how well (or how badly) **DVBGuide** behaves for real use cases.

- ❏ *XMLTV* parser(s) used to interpret the output of **DVBGuide**;
- ❏ Windows platform and service patches/update version;
- ❏ DVB tuner hardware and driver;
- ❏ Regional differences in adherence to MPEG transport and DVB standards by transmitting systems and broadcasters.  Similarly, standards adherence variations between DVB types (i.e. satellite, terrestrial and cable).

There are a few areas of the *XMLTV* format that are either not strictly specified or the specification adhered to.  This leads to differing behaviour between parsers.  One notable example here is the way dates are formatted and interpreted by different applications.  After a few false starts, **DVBGuide** now outputs date strings in a format that seems to be acceptable to most parser applications.  However, there may still be problems of date interpretation.  The *XMLTV* specification clearly states that dates are given in UTC unless a time zone is specified.  However, some *XMLTV*-parsing applications make the incorrect assumption that such dates are in local time.

Regarding the platform, testing has so far been done on

- ❏ Windows XP with Service Pack 2;
- ❏ Windows Media Center Edition 2005 with Rollup 2 and latest patches;
- ❏ Windows Vista Media Center (32-bit).

Using any of the above operating systems should remove the second variable.  Problems have been reported when using 64-bit Vista.  Such problems will be addressed in a future release of **DVBGuide**.

Regarding the third variable, user feedback shows good compatibility across a wide range of DVB-T tuner hardware.  But a small minority of tuners still give rise to problems (either unable to initialise/build graph or unable to lock signal).  The more recent addition of support for DVB-C and DVB-S tuners means that less testing has been performed with cable and satellite tuner hardware.  With each release of **DVBGuide** these various tuner-related issues have been reduced.

The author would be interested in details of any tuner that is not able to get as far as the capturing of EPG stage (assuming that the signal is otherwise OK).  For such hardware, please run **DVBGuide** with the "-d" debug option and capture all programme output to a text file.  Then email this text file with a report of the problem.

The last variable is the hardest one to deal with.  Testing by the author has only been carried out in the United Kingdom with DVB-T broadcasts from London's Crystal Palace transmitter and DVB-S Freesat broadcasts from Astra/Eurobird.  If you're one of the 10 million people within the coverage area of the Crystal Palace

transmitter then you're in luck! Hopefully, **DVBGuide** should work for you. If you receive the Freeview DVB-T service elsewhere in the UK then you're also likely to be OK (although regional variations in the content and format of MPEG Transport Streams may just possibly cause problems). You should also be in luck if you wish to capture the Freesat EPG.

If you live outside of the United Kingdom (and particularly in a non-English language speaking area) or are using DVB-C or DVB-S then problems with EPG capture are more likely. **DVBGuide** captures all the EPG data by tuning to a single Transport Stream (TS) multiplex/transponder frequency. However, unlike the UK's DVB-T Freeview service, broadcasters may choose not to send the entire network EPG data set on every transport stream (just as broadcasters may choose not to send EPG data at all – in which case you're really out of luck!).

If your broadcaster only sends EPG data for the current TS then you can still use **DVBGuide**, but it will need to be run separately for each multiplex frequency. The separate *XMLTV* data files produced would then need to be renamed and merged in some way. This whole process could perhaps be automated in a batch file and there are utilities and scripts that have been written to assist in this process.

# Operation: EPG capture

The **DVBGuide** software package consists of the main **DVBGuide** EPG capture utility plus loader utilities used to import the EPG data into Windows Media Center. In this section we look at the operation of the main **DVBGuide** command line utility.

**DVBGuide** has the following command line options:

| | |
|---|---|
| **-?** or **?** | Display a help summarising all command options |
| **-a**_X_ | Set DVB tuner type to **C**able, **S**atellite or **T**errestrial (default is **T**). |
| **-b**_N_ | Set tuning bandwidth to _N_ MHz (default is 8). _DVBT only._ |
| **-c**_NNN_ | Set tuning carrier frequency to _NNN_ kHz (default is 506000). |
| **-d** | Show debug information. Not normally required. |
| **-e**_NNN_ | Set EPG capture timeout to _NNN_ seconds (default is 600 or 10 minutes). A timeout of 0 will disable EPG capture. |
| **-f**_X_ | Set output guide data format to **X**MLTV or **M**edia Center (default is **X**). |
| **-l** | List installed tuner devices and exit. |
| **-m**_XXX_ | Set tuning modulation type (e.g. "64-QAM"). |
| **-o**_FILE_ | Write output EPG data to _FILE_. If not specified, the default filename is `dvbepg.xml`. |
| **-p**_X_ | Set tuning polarisation to **H**orizontal, **V**ertical, **L**eft circular or **R**ight circular (default is **H**). _DVBS only._ |
| **-q** | Enable quiet mode. |
| **-s**_NNN_ | Set tuning QPSK symbol rate to _NNN_ symbols per second. |
| **-t** | Set the system time from the broadcast time stamp. |
| **-u**_XXX_ | Use specified tuner, where _XXX_ may be the number 0 for first available tuner, tuner number (as given by "-l" option), the tuner name or the fully specified tuner device identifier. |
| **-v** | Display version information and exit. |
| **-w** | Write NIT, PAT and SDT Service Information tables as comma separated value files. Not normally required. |
| **-x**_NN_ | Set packet identifier (PID) for NIT capture (default is 0x0010). |
| **-y**_NN_ | Set packet identifier (PID) for BAT & SDT capture (default is 0x0011). |
| **-z**_NN_ | Set packet identifier (PID) for EIT capture (default is 0x0012). |

Numbers are specified using C language conventions (i.e. default is decimal, prefix with 0x for hex, prefix with 0 for octal).

Unknown options or syntax result in the display of a help summary similar to that above.

# Command options in detail

We'll now take a look at all but the most self-explanatory of the command line options in more detail.

## DVB tuner type

**DVBGuide** defaults to working with DVB-T (i.e. terrestrial) tuners. If using a satellite or cable tuner then it is necessary to specify the tuner type using this command line parameter.

## Tuning parameters

There are five individual tuning parameters that can be set. Some of these are only appropriate for certain DVB tuner types. The parameters are:

- ❑ Carrier frequency;
- ❑ Bandwidth *(DVB-T only)*;
- ❑ Polarisation *(DVB-S only)*;
- ❑ Modulation type;
- ❑ Symbol rate *(QPSK modulation only)*.

Typical operation requires at least one of these parameters to be set: the carrier frequency for the Transport Stream multiplex that is to be used for EPG data capture. The only occasion when this parameter can be omitted is when the **DVBGuide**'s default of 506000 kHz is acceptable.

The first thing to check, if **DVBGuide** fails to get a signal lock, is that all the required tuning parameters have been specified correctly.

### Carrier frequency

The carrier frequency is specified in kHz. Tables of multiplex frequencies for regional transmitters and satellite transponders are usually freely available from your broadcaster. However, if you are using Windows Media Center[1] then there is an easy way to determine channel frequencies. Go into the *Settings/Guide/Edit Channels* menu and frequencies will be given for each channel that you normally receive. Note that these frequencies are in MHz so add three zeros (or move the decimal point three digits to the right) to get a frequency in kHz.

A typical DVB network will consist of a number of multiplexes, transponders or carriers, each broadcast on a different carrier frequency. Your broadcaster may choose to send the EPG data for all channels across all multiplexes on each

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[1] At the time of writing, Vista Media Center has a bug where it rounds frequencies towards 0 which results in the displayed frequency being 1 MHz less than the nearest whole number of MHz when negative frequency offsets are in use. This is not a problem on Windows MCE 2005 which correctly shows carrier frequencies to the nearest MHz.

individual multiplex.  If that is the case, the same EPG data will be captured whatever multiplex frequency is chosen.  The only reason for choosing one multiplex over another for EPG capture would be if one multiplex has better signal strength/reception than another.  Different multiplexes may be broadcast at different power levels or using different modulation schemes.  Both of these can affect reception.  Also, higher carrier frequencies or frequencies further from the mid-point of the frequency range of your aerial can result in poorer reception.

If your broadcaster does duplicate their EPG data across all multiplexes and your reception is marginal then it is worth spending the time to find the multiplex with the best reception.  This may be obvious from normal TV viewing (i.e. avoid multiplexes that carry channels known for freeze frame or picture break-up).  Also, **DVBGuide** displays signal strength and signal quality metrics when it runs.  The multiplex that gives the highest signal strength and best quality (ideally 100%) will normally be the best choice.  It is important to note though that there are differences between tuners in the way they report these signal metrics and consequently the signal strength values reported are not always useful or comparable between different tuner models.

The Freeview DVB-T system in the United Kingdom is an example of a network where the same EPG data is transmitted on all six main multiplex frequencies. **DVBGuide**'s default carrier frequency of 506000 kHz will work for the 10 million people or so in the coverage area of London's Crystal Palace transmitter since this is the frequency[2] of the main BBC multiplex (i.e. that carries BBC ONE and BBC TWO).  Since this frequency is low down in the UHF frequency range and the modulation scheme[3] is less susceptible to reception problems than that used on some of the other multiplexes this carrier frequency is usually a good choice for most people in London and the South East of England.

For countries and networks where the EPG data is not duplicated across multiplexes then a different (and more complicated) EPG strategy is required. These networks only include EPG data for the services (i.e. channels) carried by the specific multiplex being tuned to.  The DVB-T system in Australia is an example of this type of network.

For networks where the EPG data is not duplicated it will be necessary to run **DVBGuide** on each multiplex carrier frequency in turn, placing the *XMLTV* output into a different file each time (or renaming the default output file).  These

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[2] The Crystal Palace BBC mux frequency is actually 506 MHz less an offset of 167 kHz.  Such offsets are sometimes introduced to avoid co-channel interference between neighbouring transmitters. However, most BDA tuner cards will cope without this offset being specified (and Media Center does not include these offsets in its display of frequencies).

[3] The modulation scheme will change after the digital switch-over but the transmitter power will be increased at the same time which should more than compensate for any reception issues due to modulation type.

separate *XMLTV* files will either need to be combined in some way (or imported individually into the application using the EPG data).

Probably the most common cause of tuning errors (i.e. signal failing to lock) is incorrect specification of the carrier frequency. **DVBGuide** requires this to be specified in kHz. Often published information will show transmitter frequencies in MHz or, for satellite transponders, GHz. So, it may be necessary to append a number of zeroes to such a number to convert to kHz. If in doubt, a simple sanity check on the number should help. Cable carrier frequencies are usually of the order of tens of MHz, VHF and UHF terrestrial broadcasts have carriers of hundreds of MHz (but always less than 1 GHz) and satellite transponders usually have frequencies of tens of GHz.

### Bandwidth

For DVB-T, another parameter that you may need to supply is the bandwidth frequency in MHz. This information will be available from your broadcaster but since there are only three permissible values (6, 7 or 8 MHz) it is easy to determine by trial and error. If the default of 8 MHz doesn't work (i.e. fails to result in a tuning lock) then try 7. And if that doesn't work try 6.

For the United Kingdom, the default bandwidth of 8 MHz applies across the entire region.

### Polarisation

Only required for DVB-S, the polarisation must be specified. Normally this will be either Horizontal or Vertical although for completeness the command line parameter may also be used to specify left or right circular polarisation.

### Modulation type and symbol rate

There are two other optional parameters, modulation type and QPSK symbol rate, either of which may need to be supplied. For the values to use here, again the technical information should be available from your broadcaster. Both parameters can usually be omitted for terrestrial but may be required for cable or satellite. Whether or not these parameters can be omitted has been seen to vary between different tuners. If the tuner fails to get signal lock then the first thing to try is to specify both modulation and symbol rate parameters from known accurate published information.

When specifying modulation types such as 64-QAM, **DVBGuide** accepts the strings "64-QAM", "64-qam", "64QAM" or "64qam" (i.e. with or without the hyphen and case is ignored).

A full list of the supported modulation types is given in the command help summary (i.e. type `DVBGuide -?`).

Note that symbol rates are often published as ksymbols/second. Such figures will require three zeroes to be appended since DVBGuide uses units of symbols/second.

## EPG timeout

Be prepared to wait some minutes for an entire set of EPG data records to be captured. It can be a relatively slow process. The actual time taken will depend on your broadcaster's choice of number of days in the EPG and the TS bandwidth devoted to EPG data packets. It will also obviously depend on the total number of channels carried by the network.

As a reference point, the UK's Freeview seven day EPG is specified to have a broadcast repetition rate of 270 seconds (i.e. every individual EPG event will be broadcast at least once on each multiplex during that time). This is confirmed by experiments that show that the complete EPG is usually captured in a little less than five minutes and results in around 12,000 unique EPG records. Consequently the default EPG timeout of 10 minutes seems appropriate.

EPG capture is not always slow. On one specific transponder used by the UK's Freesat system the entire EPG is repeated every 30 seconds. At the time of writing, that is for around 190 channels and results in around 37,000 unique records. Quite impressive! Pick a different transponder though and the same data is repeated only once every 30 minutes.

If the timeout is set too short then only a partial capture of the EPG will result. Since EPG capture is unlikely to be a time-critical process there is usually little to be gained by setting a short timeout.

If the EPG timeout is set to 0 then the EPG capture part of **DVBGuide** does not take place. This may be used if **DVBGuide** is only being used to set the system date or to write tables as CSV files.

## Setting system date/time

An accurate EPG is only useful to a PVR application if the current date and time is also accurate. **DVBGuide** may optionally be used to synchronise the PC system date/time to that broadcast.

Note that **DVBGuide** must be run with Administrator privileges if the system time is to be set successfully. This is most likely to be an issue encountered on Vista since users and command windows do not usually run with Administrator privileges.

## Output files

In EPG capture mode (i.e. if EPG timeout parameter is non-zero) **DVBGuide** always generates two files: one containing the EPG data (in *XMLTV* or Media Center format) and a companion file containing a mapping between logical (or

virtual) channel numbers and the *XMLTV* channel identifiers. Optionally, one other type of file can also be generated: a set of Service Information files in comma separated value format.

### *XMLTV* data file

The choice of EPG data format (*XMLTV* or Microsoft's proprietary Guide data) is selected with command line option "**-f**". *XMLTV* data is generated by default.

By default, the EPG data file is named `dvbepg.xml`. This default output file name can be over-ridden with a command line option.

Note that for the technically minded; **DVBGuide** eschews the normally recommended dotted channel domain notation and uses the channel service number (in hexadecimal) as the channel identifier in the *XMLTV* data.

### Channel information file

Historically, broadcasters have associated specific channels with specific tuning buttons (older television sets) or tuning channel numbers (electronic tuning without separate buttons). For example, in the United Kingdom, the first five tuner buttons/numbers are always:

1. BBC ONE
2. BBC TWO
3. ITV 1 (originally, just ITV)
4. Channel 4
5. five

As can be seen with *Channel 4* and *five*, the tuning number has even been incorporated into the service name. Similar standard numbering exists in other countries and on cable and satellite networks. Also, as in the UK example, the channel number often forms an important part of the naming/branding of a service.

We are now in an age where a network may carry a hundred or more channels and, other than perhaps for those long-standing channels, the numbering is less important than the name. However, most televisions, set top boxes, PVRs and PVR software such as Windows Media Center still use channel numbering in some form as part of their user interface.

So, applications that make use of *XMLTV* data have a requirement to associate logical (also known as virtual) channel numbers with channel names. Unfortunately, the *XMLTV* file format does not include an official mechanism to do this. Consequently, there is a need for a separate file containing service "friendly" names, virtual channel numbers and their mapping to the channel identifiers used in the *XMLTV* format file.

The *XMLTV* format file itself contains the channel identifier to friendly name mapping but does not include the virtual channel numbers. Actually, that is not strictly true. **DVBGuide** does put the virtual channel numbers into the *XMLTV* file, but only in the form of XML comments.

The separate channel mapping file that is generated is always called `ChannelInfo.xml`. This file is in a format suitable for use by Windows Media Center guide loading utilities such as *QuickGuide* or *Bladerunner*. This channel mapping file is not needed (and can therefore be safely ignored) if **DVBGuide**'s own Media Center guide loader mechanism is used.

There does still remain one problem with logical channel numbering. The broadcast of logical channel (i.e. virtual channel) numbers is not a mandatory part of the DVB specifications. For the UK's Freeview system, this information is sent as "user defined" data[4]. It is this information that **DVBGuide** uses to construct the `ChannelInfo.xml` file and also populate the "tune request" section of the Media Center guide data file.

With the UK's Freesat system, the logical channel numbers are contained in a different table, but again this uses a private extension to the DVB specification.

So, channel mapping will work correctly in the United Kingdom for Freeview and Freesat. Happily, some other countries have seen the sense in broadcasting logical channel number records and have also adopted the same user defined data descriptor in the NIT as used by the Freeview DVB-T network to send that information. However, in territories where logical channel numbers are not broadcast or are sent using a different mechanism to that used in the UK then the channel mapping file will still be generated but all the virtual channel numbers will be set to 0.

If virtual channel numbers are missing then a warning message will be displayed. This does not have to be a major problem since the channel mapping file can still be edited or generated manually if it is required. Unlike the EPG data, channel mappings are relatively static and therefore any such manual editing need not be done on a day-to-day basis.

## Media Center guide data file

The **DVBGuide** package includes a loader utility to directly update the guide data in Windows Media Center (both Vista and MCE 2005 versions). This loader requires the data in Microsoft's proprietary guide data format rather than *XMLTV*.

The Media Center guide data file includes the logical channel to name mapping and therefore does not require a separate channel mapping file (see discussion in previous section). However, as with the generation of the channel mapping file, if a logical channel number record is not broadcast then will be set to 0 in the "tune

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[4] A logical channel number descriptor in the Network Information Table.

request" section near the start of the guide data file and a warning message will be displayed. This does not appear to cause a problem in Media Center if it has already determined the channel numbers by some other means (e.g. from in-band data that it knows how to decode or from configuration data automatically downloaded when setting up the TV signal).

If you find that Media Center is confused by zero channel numbers then it would be possible to edit[5] (either manually or using a script) the guide data file between capture by **DVBGuide** and loading into Media Center.

### Service Information tables

A bonus extra feature, but probably one not likely to be used much, is the option to write the Network Information Table (NIT), Bouquet Association Tables (BAT), the Program Association Table (PAT) and the complete set of Service Description Tables (SDT) to comma separated value files. This does not serve any useful purpose as far as EPG capture is concerned but might be of value in debugging DVB network and broadcast data issues.

## Tuner discovery and selection

**DVBGuide** includes a powerful and flexible mechanism to select the DVB tuner to be used for EPG capture. To provide information to assist that selection, there is a separate command line option to perform tuner discovery and display the results.

The tuner discovery command lists all installed BDA tuners. Each tuner is numbered (starting from 1). Information listed for each tuner includes its name and unique device path. **DVBGuide** currently only works with cable, satellite and terrestrial DVB tuners. Analogue, ATSC or other tuner types are not supported. The DVB type(s) supported by a tuner will be shown along with confirmation that it is working (or error information if it is not).

For working DVB tuners, additional information is listed showing whether the tuner is currently in use and, if set up for use by Media Center, what the Media Center preferences are for the device.

The main purpose of the tuner discovery command is to associate tuner numbers with tuner names and unique device paths. This number, name or device path information can then be given in the tuner selection option for normal EPG capture operations.

When selecting a tuner, it is also necessary to specify the DVB type. Most tuner devices only support one type (e.g. either cable or satellite or terrestrial) so this might be thought of as unnecessary if the tuner is otherwise fully specified.

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[5] Microsoft has not published documentation on this file format but the use of the logical channel numbers is self-evident from examination of the file.

However, to cope with hybrid tuners which support multiple types, **DVBGuide** requires the type to be specified to make tuner selection unambiguous.

There is a single tuner selection option that performs one of four possible functions according to the parameter passed to it:

- ❑ The number "0" to select the first suitable and available tuner;
- ❑ The tuner number (starting from 1) to uniquely specify a tuner;
- ❑ The tuner friendly name to select the first tuner of that name;
- ❑ The tuner device path to uniquely specify a tuner.

We'll now look at each of those four cases in more detail.

Specifying "0" as the tuner selection parameter performs the special function of selecting the first suitable (i.e. matching specified network type) and available (i.e. not in-use by another application) tuner. Since, for the majority of cases this is likely to be the most useful option this is also the default if no tuner selection parameter is supplied. If an installation contains a mix of DVB-C, DVB-S and DVB-C tuners, the DVB tuner type specifier (parameter option "**-a**") narrows the choice down to only tuners of that type..

The second style of tuner parameter simply takes the tuner number (as given in the tuner discovery list) to uniquely specify an individual tuner. The DVB tuner type parameter must match a type supported by the specified tuner.

The one problem with using tuner numbers to uniquely specify a tuner is that the numbers can change as hardware is added to or removed from a system or when drivers are updated. USB devices can also be susceptible to "re-discovery" even on a static hardware setup. Use of tuner numbers is mainly provided as a convenience for commands manually entered at a command prompt. For automated EPG capture and commands embedded in scripts it is recommended that either the tuner name or device path is used to identify the tuner (assuming, that is, that a specific tuner needs to be used and the default of using the first available tuner is not satisfactory).

The tuner "friendly" name string is the third way to specify a tuner. These name strings are shown by the tuner discovery command. The name strings are also shown in a short-form version of the discovery list every time **DVBGuide** runs. Tuner names usually contain spaces and therefore will normally need to be enclosed in double quotes (e.g. `DVBGuide -u"Creative DVB-T Tuner"`). The case of the string is ignored when looking for a name match so it is not absolutely necessary to capitalize the string in precisely the same way as the listed name.

One thing to be aware of is that, if multiple identical tuners are installed, the tuner name will not uniquely identify one specific tuner. In this scenario, the first tuner found (searched in ascending tuner number order) that matches the name will be chosen.

The fourth and final way of specifying a tuner is the most verbose but also the most robust to tuner hardware configuration changes. The full tuner device path

(i.e. the string starting "`@device:pnp:....`") will uniquely specify a tuner even if multiple tuners of the same type are installed. Although this device path should not contain spaces it is still usually necessary to enclose it in double quotes because, with certain command interpreters (e.g. on Vista), the ampersand character has a special meaning.

Although device paths usually remain static once a tuner is installed they can still change under certain circumstances. One example here is if a USB tuner is moved from one USB port to another.

In summary then, **DVBGuide** provides a simple scheme to select the first suitable and available tuner (i.e. option "**-u0**" together with "**-a**" option to set DVB type). This will satisfy the majority of use cases. Where a specific tuner is required (e.g. to avoid Media Center's preferred recording device) then three alternate ways of specifying a tuner are provided. Numeric identifiers are best suited to direct command line entry whilst use of full device paths is more appropriate for script use. Tuner names are appropriate for direct entry or script use but will not uniquely identify one of a number of identical tuners. Whenever tuner hardware configurations change (hardware installed or removed or drivers updated) it is good practice to check that tuner specifiers being used in scripts are still valid.

## Platform

**DVBGuide** is a Win32 console application. It requires DirectShow support and a DVB tuner card with a Broadcast Driver Architecture (BDA) driver. Currently, testing has been performed on Windows XP SP2 and Windows Media Center 2005 with Rollup 2 and Windows Vista. It may work on older versions of Windows but no guarantees are offered.

Typically, you will run the **DVBGuide** from a command line window or from a batch file or command script (possibly as part of a scheduled task).

# Operation: Freesat EPG capture

The capture of the United Kingdom's Freesat EPG data deserves special mention because it requires extra parameters to be specified on the command line. The Freesat EPG doesn't just use a special text compression scheme (see discussion later in this document) but also uses non-standard PIDs (Packet IDentifiers) for the SI (Service Information) tables.

Command line options are used to force use of specific PIDs in preference to the default values (i.e. as defined in the DVB specifications). Up to three PID parameters may be specified: to individually set the PIDs used for NIT capture, BAT & SDT capture and EIT capture.

The special Freesat PIDs actually vary according to which transponder is being tuned to.  It is not currently necessary to set the PID for NIT capture (although the command line option is provided in case that does becomes necessary).  On the main Arqiva transponder (11.42783 GHz, horizontal) the Freesat BAT & SDT data is present on PID 3002.  The EIT data is present on PID 3003.  On most of the other transponders the data is present on PIDs 3841 (BAT & SDT) and 3842 (EIT).

Full information on tuning parameters and the Freesat PIDs used may be found on various web sites and discussion forums.  However, unless problems are found, it is recommended that the main Freesat transponder is used for EPG capture for the simple reason that the EPG data repeats every 30 seconds.  I.e. it takes just 30 seconds to perform a full EPG capture.  On the other transponders the repetition rate is much slower and it can take nearer 30 minutes to perform the same capture.

A sample batch file is provided to show how to capture Freesat EPG data:

```
DVBGuide -as -c11427830 -ph -mQPSK -s27500000 -y3002 -z3003 -o fsat.xml
```

All being well, this should result in around 38,000 (at the time of writing) EPG records captured in 30 seconds.

# Operation: Media Center loading

In addition to the **DVBGuide** data capture utility, **MCGuideLoad**, a companion command line program is supplied to load Media Center's Guide database from a data file generated by **DVBGuide**.

A key design goal for the Media Center Guide loader was simplicity of installation and use and compatibility with both MCE 2005 and Vista Media Center. Installation of other Guide loaders have involved copying system files, making registry changes, changing system security settings and/or setting up web servers.

**MCGuideLoad** requires absolutely no installation and does not require Media Center to have previously been set up for Guide use.  It is simply run from the command line or executed as part of a batch file.  It has just one option "**-q**"to suppress messages (i.e. quiet mode) and takes one parameter: the name of the EPG data file.  This file *must* be in Microsoft's proprietary Guide format (i.e. **MCGuideLoad** will not load *XMLTV* files).

After running **MCGuideLoad**, new Guide data should be available within Media Center.  If Media Center had not been set up to use the Guide then "Guide" should now appear as an option in the TV menu.

**Important note:** the one known problem with using **MCGuideLoad** is that the Media Center user interface does not immediately reflect changes made externally to the Guide database.  What this means in practice is that if **MCGuideLoad** is run whilst the Media Center UI is running (i.e. *ehshell.exe*) then Guide changes will not be seen until the UI shell is restarted.  This is not ideal and will hopefully be fixed

in a future release, but it is only really a problem if the Guide is updated frequently and whilst Media Center is in use. If Guide updates are performed once every 24 hours during the night, say, then the Media Center shell can be restarted as part of the EPG batch file. Alternatively, it is possible to simply rely on Media Center itself restarting the UI shell (i.e. as part of the so called "Optimization" schedule setting – just make sure to set the optimization schedule to a time soon *after* the Guide update is scheduled).

An example batch file is provided which combines EPG capture and Media Center Guide loading. This will almost certainly need editing to set tuner type and tuning parameters but could serve as a template for automating Media Center Guide updates. Such a batch file can be set to run at specific times using the Windows Task Scheduler.

# Future enhancements

Whilst there is no guarantee that future versions will be released, some or all of the following areas are likely to receive attention in any future version:

- ❑ Improved support for content categories (localisation for both category names and the use of the DVB content data which varies from broadcaster to broadcaster);
- ❑ Support for re-tuning during EPG capture to support regions where the entire EPG is not broadcast on every transport stream in a network;
- ❑ Full support for all languages and character sets possible according to the DVB specification;
- ❑ Full implementation of the Freesat Huffman decompression scheme;
- ❑ Improvements to the Media Center Guide loader to force the UI to be updated with external Guide changes;
- ❑ Support for loading Guide data into Vista Media Center with the TV Pack 2008 installed and/or Guide loading for Windows 7.

# Contacting the author

Feedback to the author may be made via pclare@bigfoot.com or via the community forums on The Green Button.

# Version history

| Version | Date | Comments |
|---------|------|----------|
| 0.90 | 7th December 2008 | Added support for DVB-S tuners. New tuner selection mechanism. Media Center Guide data generated directly and loaded into Vista Media Center or MCE 2005 using new loader utility. Freesat EPG support *(provisional)*. Improved content category/genre support. Other usability improvements. |
| 0.85 | 6th January 2008 | Added support for DVB-C tuners. Revised initialisation and tuner lock mechanism for better compatibility with certain tuners. Added support for extended event descriptions and multiple languages per event. |
| 0.80 | 4th September 2007 | More changes to date/time formats to fix problems with certain parsers. *Bug fix:* attempt to use tuners other than DVB-T. |
| 0.75 | 18th June 2007 | Further changes to date/time specification. *Bug fix:* invalid stop date for event durations longer than 24 hours. |
| 0.72 | 29th March 2007 | Minor changes to date/time specification to fix problems when *QuickGuide* is used with daylight saving time in operation. |
| 0.70 | 11th February 2007 | *Bug fixes:* empty or missing event title. *Additions:* multi-lingual character set support, programme events in *XMLTV* file sorted in date/time order. |
| 0.60 | 3rd December 2006 | First public release. |

## Version 0.90

This release introduces three major new features: DVB-S support, a tuner selection mechanism and a means to directly generate and load Guide data into Media Center.  The second of these features is a long-overdue usability enhancement.  The Guilde loader will only be of interest to users of Media Center, but for those users

it greatly simplifies the process of getting new Guide data recognised by Media Center and completely removes any reliance on external loader utilities such as *QuickGuide*.

In summary, the changes in Version 0.90 are:

- Support for DVB-S tuners (with associated new command line options to set tuning parameters specific to satellite);
- New tuner discovery and selection mechanism allowing use of a specified tuner or, alternatively, the first available tuner;
- Support for the capture of the United Kingdom's Freesat EPG;
  - New command line options to specify alternate PIDs for PSI table capture;
  - Partial support for the decompression of the first order Huffman compression scheme used for EPG text strings *(this is still a work in progress)*;
- New option to directly generate Media Center Guide data;
- New Guide loader command line utility supporting Vista and MCE 2005; designed with simplicity of installation and operation in mind;
- Improved support for content category/genre information and, using the aforementioned new generation and loading of Media Center Guide data, better use of categories within Media Center;
- Further revisions (since version 0.85) to the signal lock acquisition and signal reporting mechanism for improved compatibility with an even wider range of tuner hardware;
- Option to specify the *XMLTV* output file name;
- Additional information (event IDs and TV-Anytime CRIDs) included in the *XMLTV* file in the form of XML comments (for useful information fields which do not form part of the *XMLTV* specification).

# Version 0.85

The main new feature that Version 0.85 brings is support for DVB-C cable tuners in addition to the DVB-T support that has been present in all previous versions.

Whilst problems of **DVBGuide** not working with a small minority of tuner hardware have not been fully resolved, changes to initialisation and the signal lock mechanism have improved the situation.

Some broadcasters use an alternate mechanism (known as extended event descriptors) to transmit programme event text. Support for this was missing from previous versions of **DVBGuide** (since initially no broadcaster had been found that used this method). Extended event descriptor support is now present (and confirmed as working with one particular cable EPG that uses them). A related

addition is the support for title/description records in multiple languages for a single programme event.

In summary, the changes in Version 0.85 are:

- ❑ Support for DVB-C tuners (with associated new command line options to set tuning parameters and a command line option to set DVB type);
- ❑ Revised tuner initialisation and signal lock acquisition for better compatibility with a wider variety of tuner hardware;
- ❑ Support for extended event descriptors (used by some broadcasters instead of the short text description);
- ❑ Support for multiple language title/description records per EPG event.

# Version 0.80

The "+0000" date/time suffix introduced in Version 0.75 caused problems with some *XMLTV* parsers. The ISO 8601 standard (which specifies the date formatting) defines the "+" character to immediately follow the date/time numerals. However, it is common practice in *XMLTV* files for the "+" to be preceded by a space character. Whilst some *XMLTV* parsers don't care whether the space is there or not, other parsers insist on it. Hence, the EPG data produced by Version 0.75 was unreadable by some applications. The extra space is now present.

**DVBGuide** 0.80 only works with DVB-T sources; other DVB variants (e.g. satellite or cable) are not supported. In previous versions, **DVBGuide** would attempt to use the first BDA tuner that it found – whatever the type. In some cases this meant that it would try to use a DVB-S tuner and then fail even if a DVB-T tuner was also present. Version 0.80 uses a new mechanism that ignores all tuners unless they are DVB-T.

In summary, the changes in Version 0.80 are:

- ❑ All dates in *XMLTV* file are UTC and given the suffix " +0000";
- ❑ Tuners that are not digital terrestrial are ignored.
- ❑ Additional information included in generated NIT and SDT table files (carrier frequency and bandwidth in NIT, default authority domain string in SDT).

# Version 0.75

Unfortunately, the "UTC" suffix introduced in Version 0.72 does not appear to be understood by all *XMLTV* parsers. It is hoped that the "+0000" suffix change in Version 0.75 now fixes the problem for all parsers. The changes are:

- ❑ All dates in *XMLTV* file are now specified with the suffix "+0000" to signify that they are specified as UTC rather than local time;

- *Bug fix:* invalid event stop date in *XMLTV* file for the (unusual) case of an event duration being specified as longer than 24 hours;

# Version 0.72

Version 0.72 fixes just one problem when *QuickGuide* is used on the resulting *XMLTV* file whilst daylight saving time is in operation. The changes are:

- All dates in *XMLTV* file are now specified with the suffix "UTC". According to the *XMLTV* specification this is not strictly required, but does appear to be necessary for *QuickGuide* to interpret times correctly;
- The creation date at the start of the *XMLTV* file is now specified in UTC rather than local time;
- Additional messages when the set system time command line option is used.

# Version 0.70

Version 0.70 includes the following main changes:

- *Bug fix:* crash when writing *XMLTV* file for an event where the programme title was not broadcast;
- *Bug fix:* generating invalid *XMLTV* file for events where the title is broadcast but is empty;
- Support for many of the multi-lingual and accented character mechanisms defined in the DVB specification added;
- ISO639 two character language code attribute now correctly present in programme title and description;
- Programme events in the *XMLTV* file are now sorted in date/time order – not strictly required by the *XMLTV* specification but it makes manual examination of the file contents easier;
- Improved MCE category support (but this is still very much work in progress);
- *XMLTV* programme events now include audio and video attributes if those attribute descriptors are present in the broadcast EPG;
- Other minor bug fixes.

# Version 0.60

First public release.

# Freesat text compression

The Freesat EPG data uses a text compression scheme that is a variant of the first order Huffman compression used for ATSC EPG data. That scheme is described fully in specification document ATSC A/65C. The Freesat compression scheme differs from the specified ATSC scheme though by using compression tables that are optimised for the character pairings found in typical United Kingdom EPG data. Unlike the ATSC data tables, those for the Freesat scheme have not yet been made public. It has therefore been necessary to derive the code tables by observation of the received bit stream.

There are two main code tables: one optimised for use on programme titles and the other for programme descriptions. The tables are normally used as such but occasionally the titles table is used to compress the description part. Similarly, the description table is sometimes used to compress the titles field. Occasionally (and usually for very short titles such as "ER" or "Coast") neither compression scheme is used and the data is present as plain text (as described in the DVB standard).

Each of these two code tables contains entries for each pair of characters used in the plain text. For example, to decode a bit stream into the word "Freesat" requires table entries corresponding to the character sequences "Fr", "re", "ee", "es", "sa" and "at". Two additional entries in the table are also required for the character pairings at the start and end of the word (i.e. "?F" and "t?" where ? represents the character either side of the word in the plain text).

The above should serve to illustrate that the code tables are large with a great many data points corresponding to all possible character sequences (remember, it's not just alpha characters but numbers and punctuation too). Without an official specification the decode tables have had to be constructed by observing the Freesat EPG data over a period of around six months.

Although there are still many missing data points in the decode tables used by **DVBGuide** these do correspond to rare and unusual character sequences (so rarely occurring that such sequences have not been observed in six months of EPG data). Consequently, although the tables may only be 80% complete (a guess since, without the specification it is impossible to be sure how many data points there are in the full tables) these partial tables will correctly decode over 99% of the EPG text likely to be encountered.

# References

The following publications were referred to in the course of the development of **DVBGuide**.

[1]     *Information technology − Generic coding of moving pictures and associated audio information: Systems*, International Standard, ISO/IEC 13818-1, Second Edition, December 2000.

[2]     *Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems*, ETSI, EN 300 468 V1.8.1, October 2007.

[3]     *Digital Video Broadcasting (DVB); Carriage and signalling of TV-Anytime information in DVB transport streams*, ETSI, TS 102 323 V1.2.1, November 2005.

[4]     *Digital Video Broadcasting (DVB); Guidelines on implementation and usage of Service Information (SI)*, ETSI, TS 101 211 V1.8.1, August 2007.

[5]     *Digital Video Broadcasting (DVB); Specification for System Software Update in DVB Systems*, ETSI, TS 102 006 V1.2.1, October 2002.

[6]     *Digital Video Broadcasting (DVB); Implementation guidelines for Data Broadcasting*, ETSI, TR 101 202 V1.1.1, February 1999.

[7]     *Digital Video Broadcasting (DVB); DVB specification for data broadcasting*, ETSI, EN 301 192 V1.1.1, December 1997.

[8]     *Digital broadcasting systems for television, sound and data services; Allocation of Service Information (SI) codes for Digital Video Broadcasting (DVB) systems*, ETSI, Working Draft ETR162, April 1999.

[9]     *ATSC Standard: Program and System Information Protocol for Terrestrial Broadcast and Cable (Revision C) With Amendment No. 1*, ATSC, A/65C, May 2006.

[10]    *Plan for UK DTT SI*, Digital TV Group, Version 4.

[11]    *Windows SDK Documentation*, Microsoft Windows SDK v6.1.