

# WXtoImg - Receive APT on both Windows and Linux

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WXtoImg is one of those strange programs that may at first frighten the casual user but offers an impressive performance for its price (free for the limited version). I does most of what has to be done in automated APT reception and processing, and does it very well indeed. Some say I'm somewhat biased (or worse) towards Linux, but I feel that somehow this operating system reflects part of the radio amateur spirit. Do continue reading - there's a Windows version for the others too!

I freely admit that software offerings for Linux are somewhat limited, not entirely unlike the recent problems we have faced in electronic component procurement. But generally, programs that are available are of excellent quality, offer many options, and are very reliable (and free, with source code!). A case in point is the WXtoImg[2] program, which is available on the Internet, both for Windows and Linux (there's also a MacOS version but it isn't updated as frequently).

WXtoImg comes in two forms; the 'standard' version which is free, and which is the one I'm describing below, and the 'professional' version, for which a low registration fee is required. The latter adds several projections, some processing options, and can even automatically create and update web-pages with your images. You can download WXtoImg from:

<http://www.weather.net.nz/wxtoimg/index.html>

## Installing WXtoImg

Installing WXtoImg in Linux is easy—there's just one executable file. Copy **xwxtoimg** to `/usr/local/bin` where the operating system will find it, and you're set. (If you use Windows, then just double-click the **wxinstnnnn.exe** file and installation is automatic, complete with a desktop short-cut icon.)

There's a command line version for Linux, which permits execution of all reception and processing from batch files (in fact, it consists of a suite of 5 command-line programs: *wxtoimg*, *wxrec*, *wxmap*, *wxproj*, and *wxbatch*, each of which does the task which its name implies).

The most recent few versions display a nag screen which waits for 10 seconds before enabling the rest of the program. (Personally, I do not approve of this method of trying to get the user to register. Still, you will normally never stop the program, so it's not too bad either). A stumbling block with Linux programs is the sometimes more austere user interface. Some of this is noticeable in WXtoImg.

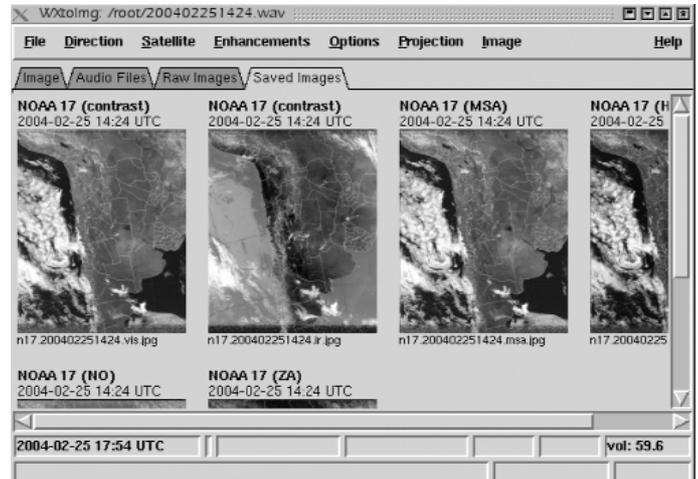


Figure 1 - Thumbnail page of recently decoded images

You can select from several options to start processing:

- Select an existing audio file
- Select what's called a 'raw image'
- Select 'Record'

Standby (waiting for a 2400 Hz carrier) and reception take no noticeable CPU resources and I leave them running all the time. Once an image has been received, it takes the PC just a few seconds to do the processing and to generate the final image. A new feature in the most recent versions of WXtoImg is that they actually show the raw satellite image during reception.

Figure 6 (page 29) shows the program after processing an audio file (or receiving a satellite pass). Note the tabs above the image—this is another relatively new feature and permits you to browse through thumbnails of your images (fig. 1), for example, or to check which audio files are still available:



Figure 2

## Available features

Let's have a quick look at the main menus, and discuss some of the possibilities.

### File Menu

In the File menu (fig.2) there are many options, but the most frequently used will probably be *Open Audio File...*, *Save Image as...* and *Record....* In most cases this will be very straightforward. Under Linux, I prefer to use the standard *GTK gmixer* application, which I am more comfortable with (I don't like the aesthetics of WXtoImg's built-in mixer).

The use of most options is simple, as most of the parameters (JPEG quality, recording settings etc.) need only be programmed once into the Options menu item.

### The Direction Menu

The Direction item (fig.3) allows you to select a satellite direction manually or to leave WXtoImg to do this automatically for you.

### The Satellites Menu

The Satellite menu (fig.4) permits selecting the satellite manually. This is useful if, for some reason, the program gets confused by very weak signals or strange schedules, or older passes for which WXtoImg doesn't have orbital data stored.

### The Enhancements Menu

Interesting though, are the enhancements you can select. I haven't seen another program that permits so many excellent—and different—algorithms for processing the received imagery. For example, the 'ZA' infrared enhancement is excellent where intense storms develop, as the normal IR image tends to saturate in the white clouds. The ZA remaps the intensities and nicely shows the storms centres. Also useful is the 'NO' enhancement, which colours clouds starting at -25°C or so, down to -90°C. We had some very severe storms here in Argentina a couple of months ago, and they were very nicely rendered using this mode (I even warned the local Civil Defence authorities).

All the time, temperature at the cursor position is available on the screen (except for a bug, that stops the display of temperature after saving a file—I've notified the problem to the author). The value corresponds quite well with reality.

### The Options Menu

The Options menu (fig.8) is the most complicated—I had never really considered that the actual reception of images depended on so many factors!

Several items that are normally only used when post-processing images, such as despeckling, and sharpening are available. The **despeckling** algorithm works fine on removing shot-noise. I was originally very sceptical about despeckling, after having tried several algorithms on other programs, but I must admit that the one implemented in *WXtoImg* works very well!

Be careful when setting the level though. While the default value of 2.0 works fine, I personally prefer to use 2.5. A value of 3.0 despeckles less while a setting of 1.0 is basically useless—it modifies cloud detail strongly and does not really improve the image (you can check the effects of different despeckle settings in fig.9)

**Interpolate** makes a brave try to interpolate the video (or the audio) and double the resolution. This succeeds in some images but in others the image just becomes larger without any noticeable improvement. The **Noise Filter** works, but, as expected also removes some of the details of the image, which is really unavoidable, I guess...

The **Illumination Compensation** again makes a brave attempt to compensate for predictable variations of light conditions in the images. Though some images do improve, in extreme cases the image gets too noisy because of the increased gain being applied.

**Active APT Satellites** lets you select, as the name implies, the satellites for which Kepler elements have to be fetched from the Web, and which have to be monitored. (WXtoImg downloads the data from the *Celestrak* [1] website.

On the same menu, you can also program the satellite's frequency (to control a receiver, for example), and to assign a priority in case two satellites have overlapping passes.

**Ground Station Data** is, as you would expect, where you input your station information (name, latitude and longitude), though the registered version has the possibility of synchronising with the NMEA data stream from a GPS receiver (I use the Internet to sync the PC's clock and a program called *Chrony* [3] which connects to NTP servers, measures the PC's crystal frequency error and, using saved statistics, is able to correct the clock should the

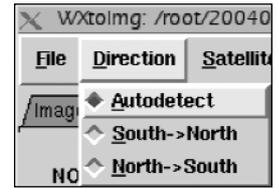


Figure 3



Figure 4

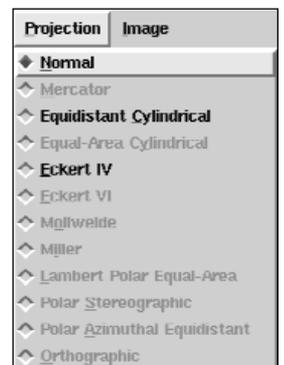


Figure 5  
Projection menu

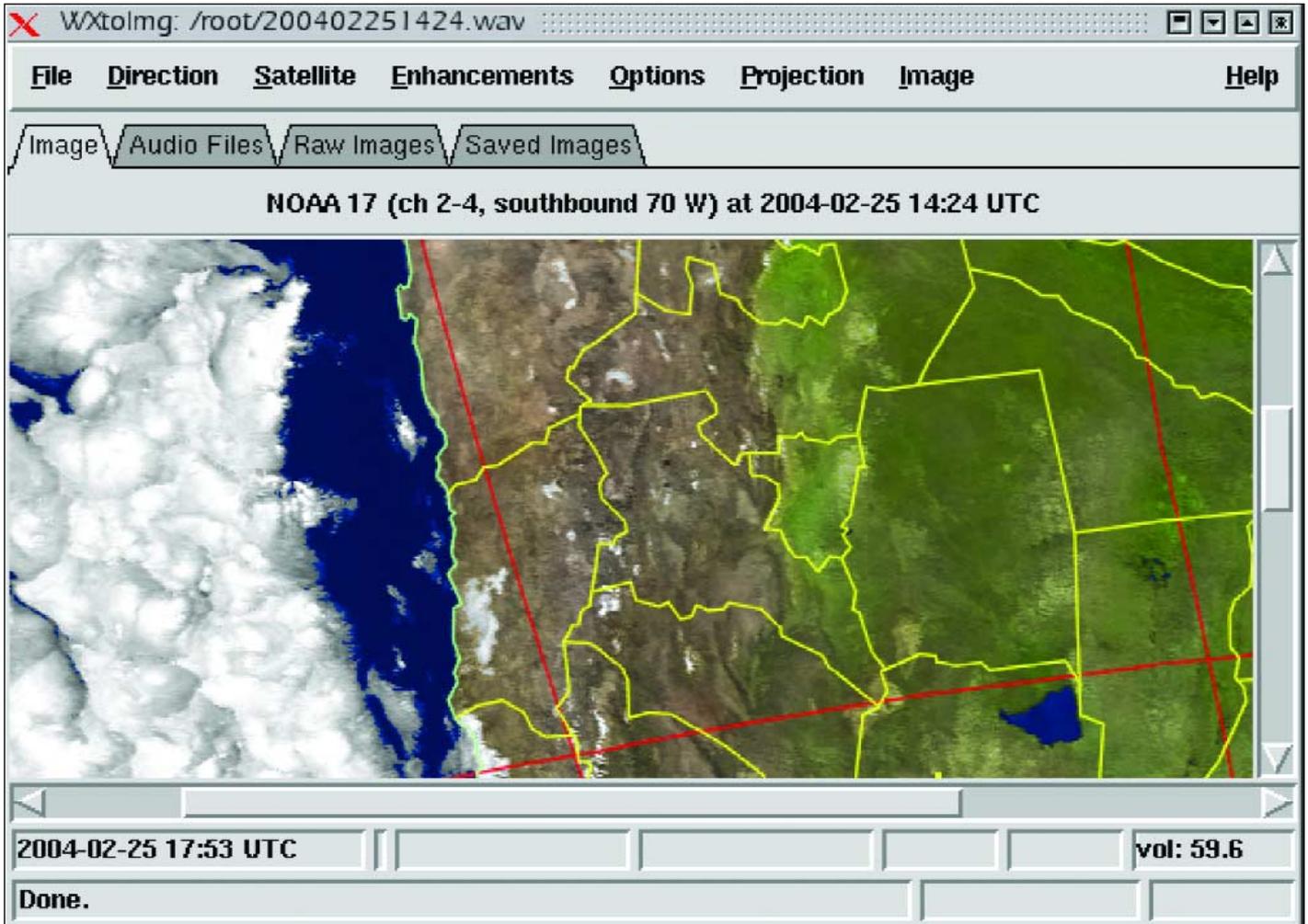


Figure 6: WXtolmg running

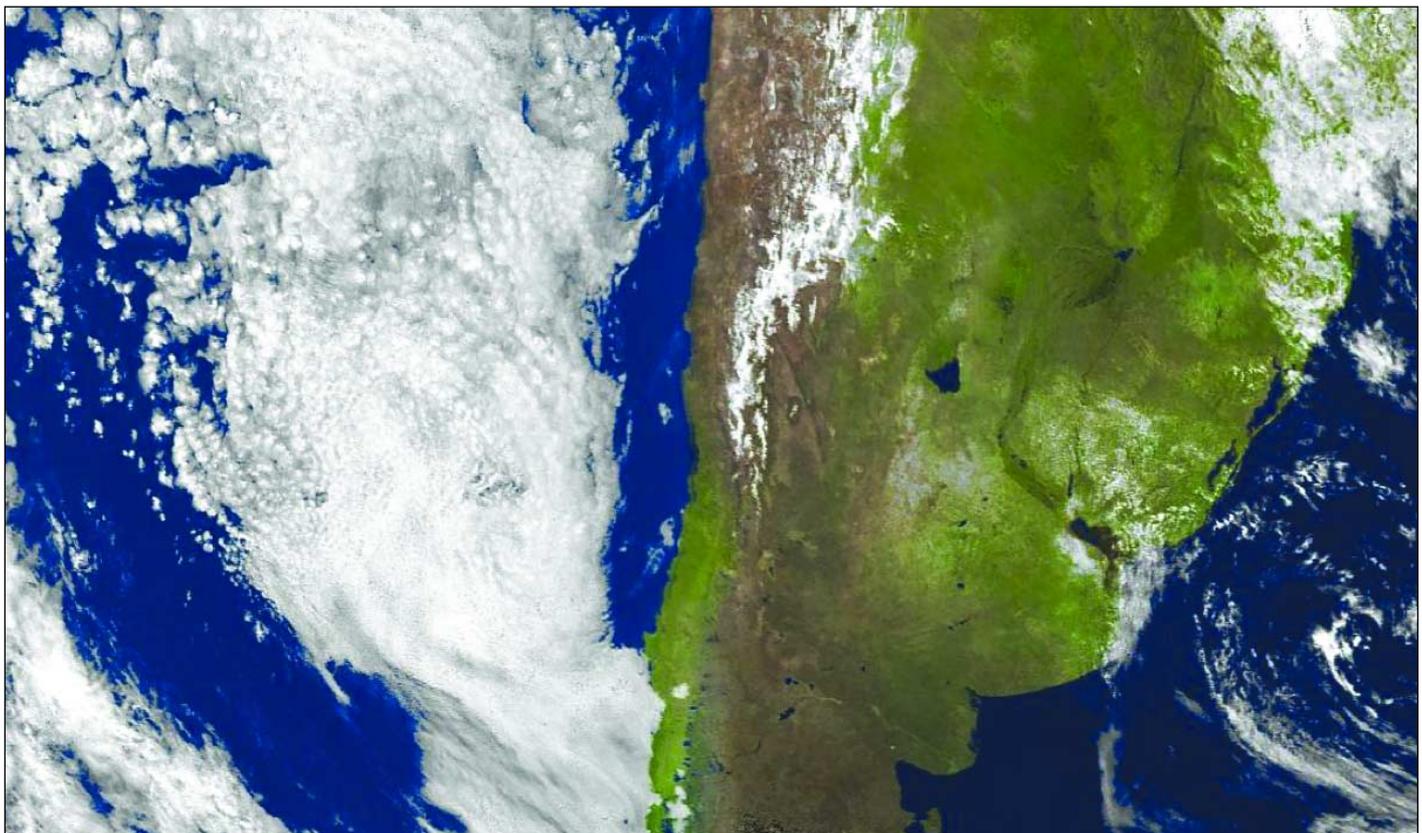


Figure 7 - A two-pass composition of NOAA-17 multispectral analysis images

Internet connection drops temporarily.

**Recording Options** offers four different methods for initiating recording:

- Start using WEFAX start tones
- Record when a 2400 Hz tone is detected (with safeguards at the beginning and end, the method that I normally use)
- Record when the sound level rises—nice if you have a squelch implemented in your receiver, preferably a tone-activated squelch.
- Record when an APT satellite is overhead. The program has its own orbital prediction program built-in, so it can activate the receiver using those data. In my particular location this system is not very useful because I'm actually living on the slope of a rather steep hill; in some directions I have a minimum elevation of only 25° to 30° while in other azimuths I can actually receive the satellite till it is under the horizon—this defeats the minimum elevation setting for me. To paint it another way: I have only sunsets, the sun rises well behind the 'mountain'.

Just one final option— it really goes on and on—is **Map Overlay**, which even permits you to select how the maps are going to be overlaid on the images, how detailed they're going to be and the colours and line widths used to display boundaries, etc.

**Projections**

The projections menu (fig.5) is the item that is most restricted from the registered version, I guess. It offers three projections:

- Normal (as sent by the satellite)
- Equidistant cylindrical, a projection which I particularly have little use for
- And Eckert IV, which is a very interesting one, as it permits fairly easy combination of the images from two consecutive passes. In fact, in the registered version, this combination can be done automatically.

The registered version offers a lot of other projections, some of which seem interesting, other less so.

**Image**

The image menu really contains a lot of things I'd rather leave to a paint program. But then *WXtoImg* is targeted as a 'do-it-all' program that does everything from reception to publishing, so any post-processing enhancement has to be provided too. The only two items I ever use are the *Move Map Overlay* (rarely, if for some reason the Internet connection breaks down and the map slips in the image) and even more infrequently, the *Magnify Area* option, to look at an enlargement of part of an image. It's often interesting to observe the *Enhancement Curves* though.

**Help**

The *Help* menu does just that, and quite well. It has several chapters on the different aspects of the normal use of *WXtoImg*, and also provides help for the command line version (which might otherwise prove rather tricky). *Help* also has the tools to register the program and to enable the features unavailable (greyed-out) in the unregistered version. I can vouch for the development activity on the program. Though I haven't registered yet (I plan to do so real soon now). I have sent the author details of a few problems and always had a helpful reply.

**Some Final Musings**

*WXtoImg* is performing excellently here. So much so I have pretty well archived the processing program I wrote a few years ago. The splash screen with the 10 seconds delay bugs me a little, particularly as it wasn't there in previous versions. On the other hand, the program runs here for weeks on end, so it does not make me suffer too much.

As a free program, the relation between performance and price would probably be acceptable, but in a Linux world where most programs are free, performance is normally judged separately—and *WXtoImg* scores very well indeed.

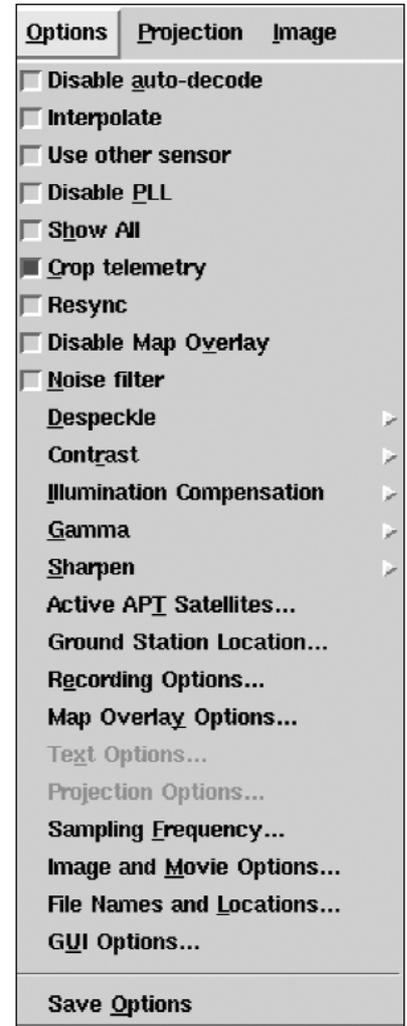


Figure 8  
Options menu

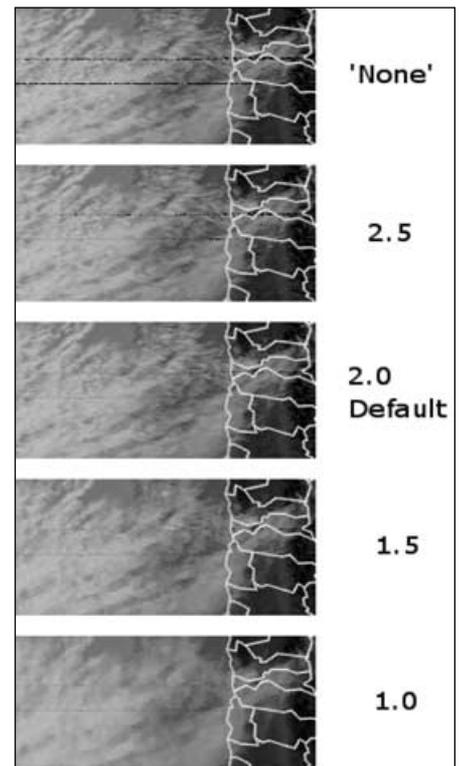


Figure 9  
Despeckle Options

## **References**

- [1] **<http://www.celestrak.com>**  
Dr. Kelso's unique Kepler information database
- [2] **<http://www.weather.net.nz/wxtoimg/>**  
Software to decode APT and WEFAX signals from weather satellites
- [3] **<http://chrony.sunsite.dk/>**  
is a pair of programs which are used to maintain the accuracy of the system clock on a computer.
- [4] **<http://www.jcoppens.com/sat/index.en.php>**  
My own humble site (chronically in development), with some info on satellites and equipment, and recent satellite APT imagery