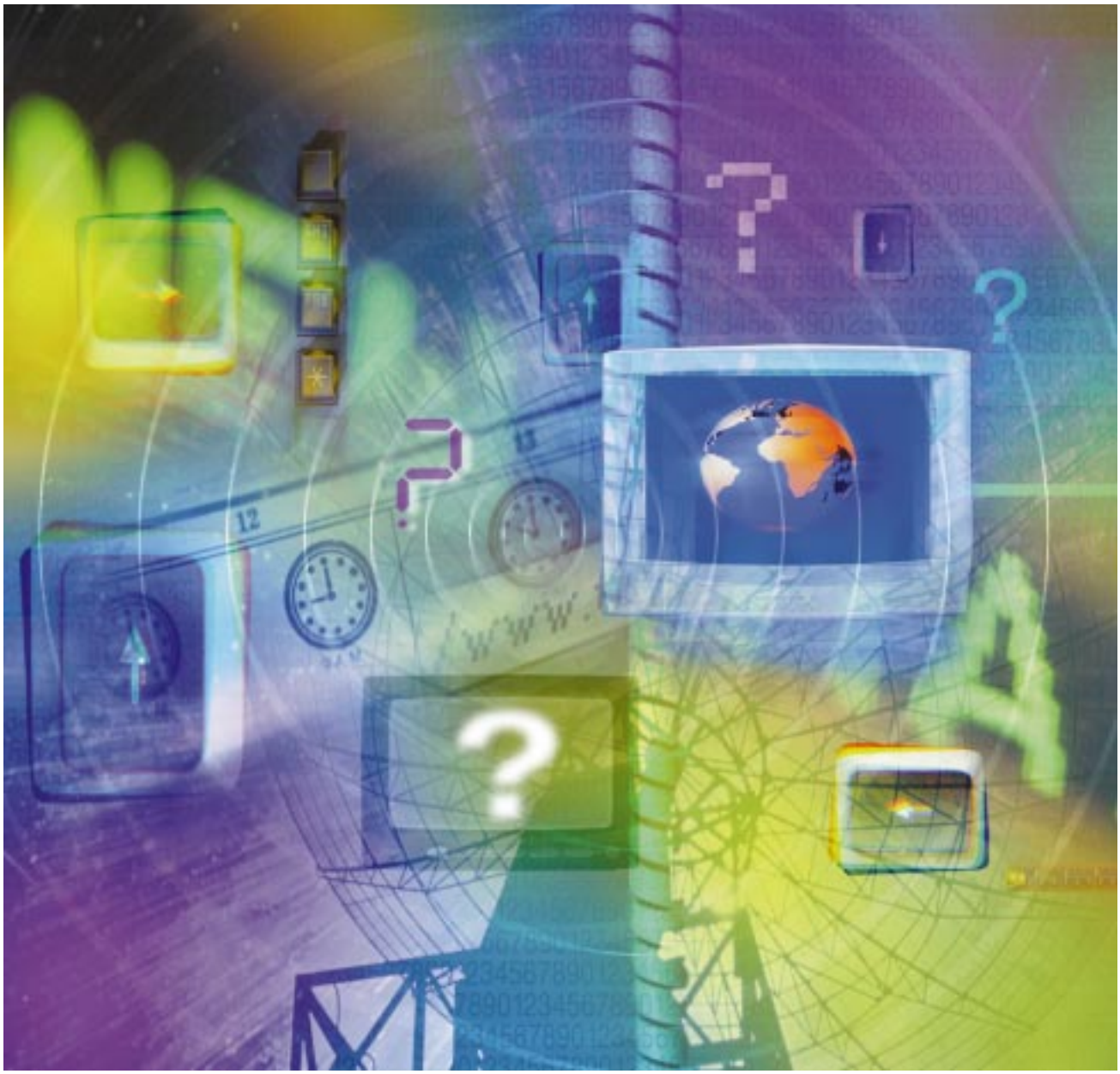

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Broadcast news

YOU'VE HEARD THE HYPE AND SEEN THE ADVERTISEMENTS, BUT IS DIGITAL TV REALLY READY NOW, OR ARE THERE STILL TECHNICAL AND PRACTICAL ISSUES TO BE ADDRESSED? ADELE DYER PUTS YOU IN THE DIGITAL PICTURE.

We have all seen the ads: TVs about to throw themselves off high buildings until they are given SkyDigital, Stephen Fry asking his television to pass the salt, and so on. But is this enough to persuade you to be an early adopter, or should you wait until the system is well established and well supported?

Currently, there is one obvious stumbling block to digital. The service we have now may not be the service we have in a few years' time and the equipment needed to receive the signals may also change. So should you choose digital TV now or wait until everyone, including the broadcasters, are a little more clear on just what services they intend to offer? All analogue television is due to be phased out in the next ten to fifteen years, so sooner or later you will have to jump onto the digital bandwagon. The main question is, 'when?'

Digital is ones and zeros rather than waves as in analogue broadcast, and this difference brings about a shake-up in the way that television is broadcast. In the past, the free-to-view channels were mainly only available via a terrestrial aerial and everything else was from satellite. With the advent of digital broadcasting, the BBC, ITV, and Channels 4 and 5 are required to transmit 80 percent of their programmes simultaneously, either through terrestrial analogue aerials or digitally to terrestrial aerials, satellite dishes or cable, and these are all free to view. Additional digital services are available from Sky and OnDigital, although these have to be paid for.

All digital TV broadcast in Europe conforms to a standard known as DVB (digital video broadcast). However, each broadcaster uses a different modulation technique according to the broadcast medium they use. Satellite broadcasters use QPSK modulation, digital terrestrial uses OFDM (Orthogonal Frequency Division Multiplex) and digital cable transmission uses 64QAM. This has an impact on the viewer in their choice of set-top box as they will need one that is specific to the digital medium they are using.

A set-top box is essentially a decoder which can receive the signal, strip out the programme data from the transmission data, decode the compressed file and convert the digital signal into an analogue signal which the TV can display.

Most broadcasters are pushing digital TV to the consumer based on the incentives of more programmes, better picture quality and, in some cases, widescreen broadcasts. Currently most films, some drama and the news is delivered in widescreen format from the BBC, but this still makes up only around 25 percent of their peak time evening viewing on digital and few analogue programmes are broadcast in widescreen. It is an undisputed fact that picture quality is very much improved, and the same quality is maintained from the time it leaves the broadcaster to when it reaches the viewer. This is rarely the case with analogue broadcast techniques.

Digital TV could potentially offer far more than a wider choice of programmes. It allows for a compromise between two extremes: greater quality and more programmes. Digital broadcasts take up far less bandwidth than the existing analogue versions. Over 30 digital channels, offering the same picture resolution and stereo sound, can be transmitted within the same amount of bandwidth required to send just five analogue channels. If higher-quality digital broadcasts were sent, greater bandwidth would have to be used, yet the picture and sound quality would be much greater than that of current digital broadcasts.

▲ **Sony's VTX-D500U is a digital terrestrial TV receiver**

Current PAL analogue provides a resolution of 625 lines, with 480 lines appearing on your television set. Standard Definition Television (SDTV), the standard presently used by most digital broadcasters, sends the same number of lines although the quality will not be impaired. HDTV (high definition television) can almost double the resolution, with up to 1,080 lines being transmitted. However, the HDTV specification most often quoted is 720 lines as this uses progressive scanning — that is, it uses a non-interlaced signal — and as any monitor user can tell you, a non-interlaced signal gives you a much better-quality picture.

The FCC (Federal Communications Commission) standard for HDTV in the US includes AC-3 audio in the specification. This allows for surround sound made up of 5.1 channels of audio, each of which can be sent to up to five separate speakers and a subwoofer. In other words, if you have a complete home cinema setup, you should theoretically hear as good a sound as when playing your DVDs. Also included in the US HDTV standard is provision for additional data to be broadcast with the programme. This could be anything from scrolling text to software downloads.

The bad news is that if you add all this together, you'll end up with high bandwidth requirements to transmit it all and some very expensive equipment both for the broadcaster

and the viewer. Even in the US it is estimated that only 100 people have the equipment to receive HDTV signals in their homes. But the *really* bad news is that we are unlikely to see HDTV for some years to come. The standard has not been ratified in Europe and many broadcasters are loath to give up bandwidth to higher-definition transmissions just yet, especially while they see how the current system works and while so few viewers have equipment that is good enough to notice the difference between SDTV and HDTV.

Michael Gleave, technical adviser at the BBC, says: 'Our view is that if you look at a standard screen size from a reasonable distance, the difference...between DVB and HDTV is not dramatic. But as screen sizes get larger and we start to see new technologies such as plasma, which will be in the home in four to five years, then there is an argument for HDTV. The BBC is monitoring the situation carefully.'

HDTV would have an impact throughout the broadcast chain, requiring a hike in the quality of scenery, costumes, cameras and transmission equipment, through to the units we need to receive it in our homes.

The current system for digital TV is not without its problems. Only some of the UK is covered by digital broadcasts, and, as a digital signal does not degrade, unless you get good reception you will see no picture at all. Digital TV does mean an end to ghosting and noise, but there again you might be left looking at a big, black blank.

Similarly, widescreen is a wonderful advance for those who have widescreen TVs. For those of us with standard boxes, with their 4:3 ratio, widescreen broadcasts can be more trouble than they're worth. Widescreen comes in a 16:9 ratio, so to show this on a 4:3 ratio TV, broadcasters have three main choices:

- To show it in a 'letterbox' format. You get the whole width of the picture but there are large black bars above and below it.
- To crop a bit off either side, taking the ratio aspect down to just 14:9, which still leaves you with black lines top and bottom although they are relatively thin.
- A 14:9 cropped picture can be squashed sideways and stretched in height until it is forced to fit a 4:3 screen. But while this will force the picture to cover the whole of the screen, it has obvious drawbacks as it makes everything, including the actors, look taller and thinner than they are and thus unnatural.

Then there is the question of whether or not you want to pay now for expensive equipment. With set-top boxes costing up to £300, do you choose one of these now, or wait to see how the technology develops?

If the compression or signal modulation technique changes, your set-top box should be capable of adapting to the new signals automatically. However, with the nature of s et-top boxes likely to change soon and with the possible inclusion of storage, internet access and links to your other home entertainment systems on your set-top box, do you really want to spend this money now? Do you even need a set-top box, or should you buy one of the new breed of digital TVs which will integrate set-top boxes within them? Sony has just launched two flatscreen CRT TVs (28in and 32in) both of which receive free-to-view TV channels and are upgradeable to receive pay digital TV signals.

The biggest sea change might come with the convergence of digital TV and PCs. At the moment, the two could not be more different. Digital broadcasting raises two interesting questions for the PC user: will I be able to access the internet via my set-top box; and will digital TV mean the picture will be better on a monitor, with its non-interlaced high refresh rates, than on a TV set? Several companies already offer internet boxes which let you view web pages and send and receive email using a TV. In these cases the TV acts in much the same way as would a monitor on a PC and the boxes act as stripped-down PCs, usually containing a hard disk and a modem for communication with the ISP.

▼ SONY WEGA DIGITAL TV WITH A VERTICALLY FLAT SCREEN

Perhaps the best known version of this is WebTV from Microsoft, although apart from a limited number of trial users, no-one has access to it in the UK. WebTV lets you connect an internet box, running Windows 98, to a local ISP. The 1Gb hard disk lets you set the machine to download large amounts of data overnight.

All analogue television is DUE TO BE PHASED OUT in the next ten to fifteen years

You can also access the internet via satellite. Eutelsat runs a service which lets you download information to your PC via satellite, and upload via a modem. Instructions to access a web page are sent via modem to the ISP and the page then arrives at your desktop via satellite, with data transfer rates of around 2Mbit/sec. But this does not mean that internet access will arrive via our TV set-top box just yet.

Broadcasters seem coy about distracting viewers from the main business of watching TV. The BBC has plans to broadcast an additional information service later this year; a kind of enhanced teletext with improved text quality and graphics. A service similar to BBC Online could subsequently become available as set-top boxes may in future contain some sort of storage medium. Not only will the content be richer than Ceefax, but it will be available to view immediately rather than waiting for the pages to be broadcast, as in the present basic teletext system.

Real internet access via your TV will have to wait. As the BBC's Gleave puts it: 'It will be a little while before we see full internet services, but the industry is moving that way. We are seeing a convergence of technologies and so the services that run on top of that technology will also converge.'

The likelihood is that this internet access will use the existing telecomms infrastructure, whether over phone lines, cable or satellite, as this allows for a greater degree of interactivity. Cable could be the ideal platform for this, although movement towards this is very slow for both phone and TV. Links between a TV set-top box and a PC could be made easier by a common platform, though. The Digital TV group is currently developing DVBJava as a possible solution.

For those who want to display TV on their PC, the future looks equally mixed. The problem lies in the way in which TVs and monitors draw the image on the screen. A TV interlaces its images, drawing every other line before going back to the starting point to draw the lines in between, while a monitor will use progressive scanning, drawing each line in turn. PC users in America are fortunate: ABC, NBC and Fox have all come out in support of the progressive format for digital broadcasting.

We may not see the same happening here for some time yet. Henry Price, senior technical policy adviser at the BBC, explains: 'We will be continuing to use the normal 625-line interlace format on digital TV. It is compatible with all the TV sets that people will be using to watch the digital TV transmissions and with all the studio cameras. For display on the PC, the picture will have to be converted to progressive format. It was felt that it was better to load this extra processing onto the PC rather than having a progressive-to-interlace converter in the digital set-top box, which is a very price-critical item at this stage.'

But it's not all bleak. Intel has announced an all-format software decoder for HDTV to work with KNI [*see our Pentium III feature, page 122*]. Also available is a set of cards from Broadlogic, a subsidiary of Adaptec, which converts interlaced TV pictures into a progressive image to provide the best image on a PC monitor.

So should you buy now or should you wait? If you are prepared to purchase now, and then again at a future date, there is no reason why you shouldn't go ahead and benefit from the extra channels. However, if you want outstanding quality, you could wait and get a metre-wide plasma screen, HDTV video and AC-3 sound for that complete home cinema experience. ❐

HOW DIGITAL TV WORKS

All digital broadcasts use MPEG-2 encoded data. MPEG achieves a high compression rate by using the JPEG algorithm: data is stripped away to reduce file sizes, although the reduction cannot usually be seen by the human eye. It then stores only the changes between one frame and the next, so any data which stays the same for each frame is automatically dumped. This results in variable compression rates and different rates needed for different programmes. Compare TV's *Gladiators* and the Alan Bennett *Talking Head* monologue. The first has lots of action, with contestants and the camera moving around rapidly. The second is one actor talking to the camera, perhaps moving their head and their hands while the camera remains still. Picture frames in the first example change constantly and cannot be compressed much, so the programme needs a great amount of bandwidth. Conversely, the second can be greatly compressed and so needs far less bandwidth.

As a result, TV broadcasters may want to allocate their bandwidth dynamically. Each is given a certain amount of space on a multiplex line and it is up to them how they fill it. Sky and the BBC have different approaches. The latter chooses to allot a fixed amount of bandwidth to each channel because dynamically allocating bandwidth is overly complicated when you take regional programming into account. If it needs more than the allotted bandwidth, the picture quality doesn't suffer unduly. Sky allocates its bandwidth dynamically so when necessary it can allow more to such topics as sport. MPEG-2 allows for various resolutions and frame rates, supporting PAL and NTSC through to HDTV and CD-quality audio. It is the default standard used by DVD so all digital TVs will be able to display MPEG in the future. MPEG encoding is processor-heavy yet most stations will encode in real time as the broadcasts leave the TV station, allowing programmes to be broadcast immediately. The BBC takes this one step further, sending all its digital output through the real-time encoder, whether live or pre-recorded.