



Comms and get it



Internet bandwidth may be stretched to the limit, but at least the new V.90 modem standard for dialup comms speeds up connectivity. Roger Gann reviews a range of desktop and PC Card modems and assesses comms technologies, present and future.

Dial-up comms entered the nineties (the V.90s, that is) last February when the International Telecommunications Union (ITU) formally "determined" a single 56K modem standard. The new V.90 standard, which offers 56Kbps throughput downstream from your ISP and 33.6Kbps upstream, will last far longer than the V.34 standard it supersedes and is likely to be the final analogue modem standard. For the majority of web users, using a V.90 modem will be the most popular method of accessing the internet for some years to come. But if we are to fulfil the promise of the internet, the V.90's 56Kbps is not going to be fast enough. So from where will this bandwidth come? It's unlikely to come from the phone system: we've run out of steam when it comes to pumping data down the analogue PSTN (Public Switched Telephone Network). With 64Kbps digital links connecting BT's exchanges, there's an absolute ceiling on the data throughput we can expect from a normal dialup connection. In a couple of years we'll see ADSL and cable modems delivering data throughput in excess of 1Mbps, but that is jam the day after tomorrow. They will carry a premium and not everybody will have access to them.

What are the immediate prospects for faster dialup connectivity? Not good, this side of the millennium. Cheap, high-speed links to the internet threaten BT's lucrative leased-line and ISDN business, and BT is in no hurry to introduce them. ADSL and cable, which primarily offer internet connectivity, cannot replace point-to-point solutions like ISDN and leased lines, but the promise of bandwidth in excess of even a T1/E1 1Mbps leased line, at a fraction of the cost, will make many companies rethink their connectivity strategies. But isn't cable poised to swoop in and take advantage of this hiatus? It's true, the cable companies have a head start over BT; but cable modems seem bogged down at the trailing stage and commercial availability remains distant. Some of this reluctance on the part of the telcos can be placed at the door of free US local phone calls. US telcos cannot wait to introduce ADSL, a new, chargeable service which will bring in revenue and relieve pressure on the PSTN. In the UK, no such pressure exists. Until cable modems get going, why should BT cut its own throat? It may be that we will see no significant progress on the ADSL front from BT until 2001.

In the pages which follow, we review all the options: modems, ISDN, and the up-and-coming technologies. We look at which is likely to give you the best connection at the best price, and at which technologies are going to stick around and those that are already past their sell-by date.

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What to look for in a modem

Here we explain **the ins and outs** of a modem, to prepare you for that all-important purchase.

Most V.90 modems use either the Rockwell chipset or the US Robotics (now 3Com) chipset and so will have near identical basic functionality. They will all offer a complete range of connect speeds, from 300bps right up to 56Kbps. They will also offer V.42bis data compression, which can compress data by as much as a factor of four, thus accelerating downloads, plus V.42 error correction. Another common feature will be fax support: as well as being able to send and receive faxes at 9.6Kbps, the speed supported by most fax machines, most will also support faxing at 14.4Kbps.

➤ **Flash upgradeability** is an important feature. All current 56Kbps modems are upgradeable to V.90, provided the firmware is available, but there are some pitfalls here. The better modems have 2Mb of flash memory which allows them to hold both the old 56K code and V.90 code simultaneously. Most

as a year, so a dual-mode capability is important. At present, none of the major ISPs is offering V.90.

➤ **Internal/external modems**

An external modem is easy to install, is Plug-and-Play, and can be reset. It has good status LEDs, is portable, and often has a volume control. But it takes up desk space, requires a mains socket, and eats a serial port. You will also have to ensure that the UART (Universal

Asynchronous Receiver-transmitter), the chip controlling the serial port, is 16550 UART with FIFO (First In First Out) buffers. If you have a 16450 UART, it might be an idea to upgrade or use a serial card. Internal modems are cheaper, due to no case or power supply.

Also, they consume no desktop space, power socket or serial port.

But they are more fiddly to install, are not often Plug-and-Play, lack status LEDs, and require an ISA or PCI slot.

➤ **LED** Modems can be inscrutable devices and it's nice to have some sort of clue as to what they're doing at any point in time. The best modems come with a proper display that tells you things like connect speeds and data compression. Most others make do with a set of up to twelve LEDs to indicate status. Check that these are easily visible in daylight (many aren't) and that they have meaningful labels, too. Internal modems, of course, lack this luxury.

➤ **Soft modems** are cheaper because they dispense with some hardware and rely on the host PC's CPU to do the work via software emulation instead. They're not a great solution.

➤ **Leads and cables** The better external modems should come with

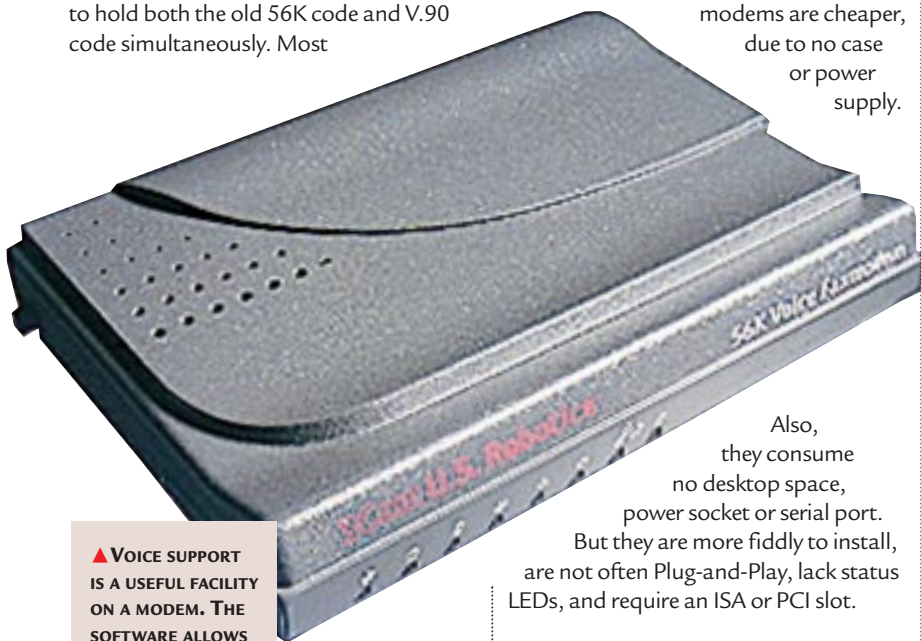
separate (as opposed to captive) leads. Also, check that there is a pass-through connector for a telephone handset. Ideally

this will have a BT-style socket, but many modems come with RJ-11 adapter leads.

➤ **Voice support** Increasingly, more modems offer voicemail support as standard. This allows your PC to act as a small-scale but still relatively sophisticated voicemail system, similar to those you come across when you dial large companies. Or, you can use the modem as a simple answering machine. Often, these facilities are poorly explained. Typically, the voice software supplied is either SuperVoice or Trio Comms Suite. Some modems can be used as a speakerphone: while some have the requisite sound hardware and so have sockets for speakers and a microphone, others require a sound card. Some can even function as a standalone message centre with the PC switched off. If you are a gamer and like playing across the internet, some modems offer simultaneous voice and data, allowing you to "talk" to your opponents as you play.

➤ **V.80 support** Not an essential standard, but it's a Good Thing to have if you're intent on using voiceover IP (internet protocol).

➤ **Documentation** A small point, perhaps, but increasingly modems are shipping with ever-skipier documentation. Complete listings of the AT command set are very useful, as are instructions detailing use of the sound hardware. Some modems come with good online help files, though.



▲ **VOICE SUPPORT** IS A USEFUL FACILITY ON A MODEM. THE SOFTWARE ALLOWS YOUR PC TO ACT AS A VOICEMAIL SYSTEM

dual-mode modems let you dial different ISPs and still get the best throughputs, irrespective of whether or not they have upgraded to V.90. Modems with 1Mb of flash memory can hold only one set of firmware, which means that if you upgrade to V.90 and your ISP hasn't, you'll connect at speeds no faster than 33.6Kbps. The transition to V.90 could be a lengthy business, perhaps as long

3Com 56K Voice Faxmodem



This is the first "USR" x2 modem to wear the 3Com badge. As with other voice modems, it offers the usual features like fax on demand, multiple voicemail boxes and remote message retrieval. It's a dual-mode modem and conveniently supports x2 and V.90 out of the box. Installation under Windows 9x is straightforward. The thickish User's Guide and Reference Manual is surprisingly bad, with some crucial setup diagrams marred by illegible labels, poorly arranged, and with no real explanation of how to use the voice aspects of the modem. Given its price, this is inexcusable.

PCW DETAILS

Price £119
(£101.28 ex VAT)
Contact 3Com UK
0118 922 8200
www.3com/mobile

Usability ★★★
Overall ★★★

Aztech 56K PCI Modem



This new modem stands out from the others here; it is an internal modem and PCI (rather than ISA). It is truly Plug-and-Play, so you don't need to configure the serial port settings. Installation is therefore straightforward. The user manual shows you how to install the modem but little else, and there are no upgrade instructions. This Aztech modem has some nice features like support for "wake-up on ring" power management. It's a K56flex voice modem based on the Rockwell chipset but this wasn't apparent when running V.90 firmware. Worse, the Aztech web site didn't mention the modem.

PCW DETAILS

Price £79.95
(£68.04 ex VAT)
Contact Micro Peripherals
01256 707070
www.aztech.com.sg

Usability ★★
Overall ★★★

BT Prologue K56EV Plus



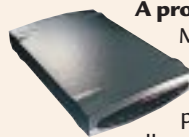
The Prologue is a K56flex modem but a V.90 firmware upgrade is not available at present. Unlike the others in this group, the Prologue is not supplied with a modem INF file so has to be set up as a standard modem. And, it comes with only skimpy installation instructions. The Prologue's status LEDs are bright but the labels are difficult to read. It has convenient front-mounted jacks for the included mic headset, which lends itself to AudioSpan/ASVD gaming. Voice software is the venerable but dependable SuperVoice v2.2. Overall, this is an unremarkable modem.

PCW DETAILS

Price £99.99
(£85.10 ex VAT)
Contact BT Sales
0800 800800
www.shop-atworl.bt.com/business/data.htm

Usability ★★★
Overall ★★★

Compaq 56K External Fax Modem with Voice



A product of Compaq's acquisition of Microcom, this is the first modem to bear the Compaq badge. It has a suitably businesslike appearance, except for dim, poorly labelled LEDs. Paper documentation tells you how to install, and the remainder of the documentation is provided in high-quality Acrobat format on CD. The disc also contains Trio Communications Suite 5.3. As expected, installation under Windows 9x proceeded smoothly. The Compaq is a single-mode K56flex modem but despite hunting high and low for a V.90 upgrade, I could find no trace of it at Compaq's rather confusing web site.

PCW DETAILS

Price £88.13
(£75 ex VAT)
Contact Compaq Computer
0845 270 4000
www.compaq.co.uk

Usability ★★★
Overall ★★★

Diamond SupraExpress 56ePRO



The new 56ePRO sports a number of subtle improvements, including status LEDs which are now easier to read and a non-captive serial lead. This is a 2Mb dual-mode modem, holding K56flex and V.90 firmware. The modem is also Shotgun-ready [see p223] and supports AudioSpan/ASVD gaming. There is no other voice support. The cursory installation instructions were wrong, but using the CD installation was easy. The default DTE speed was set low, at 57.6Kbps rather than 115.2Kbps, but from then on it speedily delivered the goods.



PCW DETAILS

Price £75
(£63.83 ex VAT)
Contact Diamond Multimedia
0118 9444401
www.diamondmm.com/56k/

Usability ★★★★★
Overall ★★★★★

LASAT Safire 560 Voice



The Safire 560's bevelled black strip on the front contains membrane switches for power and volume, plus eight easily-visible LED status lights. The rear panel is taken up by the various sockets. Disappointingly, the Safire 560 is not V.90 enabled: LASAT is waiting until the technology stabilises before releasing the firmware upgrade. The 560 does come with a reassuringly thick (but dull) user manual, though, and a CD full of goodies including the Trio Communication Suite voice software. Installing the modem was the usual Windows 95 no-brainer and in a few minutes I was up and surfing at 46Kbps.

PCW DETAILS

Price £105.75
(£90 ex VAT)
Contact Ingram UK
0190 826 0160
www.lasat.com

Usability ★★★★★
Overall ★★★

MultiTech MultiModem MT5600ZDXV



Based on the Rockwell chipset, the 5600ZDXV is a single-mode modem with the usual range of data speeds, fax, and full-duplex speakerphone capabilities. It is not V.90 enabled and there's no upgrade at present.

It retains MultiTech's traditional form factor with ten bright LEDs on the front panel, but the labelling is poor. Installation was par for the course under Windows 9x. There is a thorough model-specific owner's manual and a few update sheets. There's no paper documentation for the voicemail software, though, nor is there mention of Windows 95 and Plug-and-Play, which might stump some users.

PCW DETAILS

Price £99
(£84.25 ex VAT)

Contact Multitech
Computers
0118 959 7774
www.multitech.com

Usability ★★★★★
Overall ★★★

Olitech Self Memory II 56000



The Olitech is a small desktop modem that crams two quarts into a pint pot. It's a fully-featured K56flex voice modem which can also act "standalone" to receive messages and faxes without a PC.

It has small, clear status LEDs and, due to its size, requires a remote control for its "answerphone" facilities. An external mic is also supplied. It was easy to install, as Windows 98 has the right drivers in stock. As for V.90 code, the web site is ambiguous. The Olitech comes with proprietary (but not TAPI) OliFax/Voice software and a better-than-average user manual.

PCW DETAILS

Price £149.95
(£127.61 ex VAT)
Contact Direct Source
0118 981 0011
www.olitech.com

Usability ★★★★★
Overall ★★★★★

Pace 56 Voice



This is a well-designed K56flex modem that can be placed vertically. It has nice, bright status LEDs which include fax, video and voice indicators, but the labels are too small. There's a volume control plus speakerphone button,

and you can use the modem as a "handset". It holds K56flex firmware but it was easy to upgrade to V.90. Installing under Windows 9x was a snap; the user manual is basic but more than adequate. The HTML online manual gives more depth. A CD-ROM with almost 500Mb of comms goodies accompanies the modem. The Pace is a good choice, but expensive.

PCW DETAILS

Price £139
(£118.30 ex VAT)

Contact PMC
Consumer Electronics
0990 561001
www.pacecom.co.uk

Usability ★★★★★
Overall ★★★

Premier MT56KSVe



Like most of the modems in this group test, the Premier is a K56flex voice unit based on the Rockwell chipset. This budget model shows evidence of cut corners, though: there's no on/off switch and the status LEDs are tiny and dim. The installation

instructions, a triple-folded A4 page, and the user guide, a Word document on the CD, border on the pathetic. Windows 9x installation was uneventful. The V.90 upgrade is provided on disc but as this is a single-mode device, upgrading is an either/or decision and anyway, it's a two-stage process requiring the upgrade of both sets of firmware.

PCW DETAILS

Price £79.95
(£68.04 ex VAT)
Contact Direct Source
0118 981 0011 (no URL)

Usability ★★
Overall ★★★

Tashika 5600BPS



A budget K56flex modem based on the Rockwell chipset. This is an ASVD AudioSpan modem and comes with a mic headset — good for online gaming. Some corners

have been cut but it has an on/off switch and a 9/25-pin serial lead. The nine status LEDs are bright but the labels could be clearer. The Tashika installs as a K56flex modem and the Rockwell V.90 upgrade wizard is provided on floppy for this single-mode modem. Installation was straightforward but the original INF file sets the DTE speed to 57.6Kbps, corrected by the V.90 upgrade.

PCW DETAILS

Price £70.44
(£59.95 ex VAT)

Contact Software
Warehouse
01675 466467
www.softwarehouse.com.uk

Usability ★★★★★
Overall ★★★

Zoom FaxModem 56Kx



A well thought-out 56K dual-mode modem which can run V.90 or K56flex out of the box. There are 14 status LEDs, including indicators for EC/DC, V.34 and 56K, fax and voice message.

It has a front-panel on/off switch but sadly a continental two-pin mains plug. The Zoom comes with the Zoomlink utilities CD, an antique offering which badly needs updating. It comprises Communicate Lite, an all-in-one comms/voice package, and 440Kb of various goodies. There are Acrobat versions of the reference manual, and a proper (compact) owner's manual.

PCW DETAILS

Price £89
(£75.75 ex VAT)
Contact Zoom
Telephonics UK
01245 352403
www.zoomtel.com

Usability ★★★★★
Overall ★★★★★





COM One Platinum MC220



The French-made Platinum is a combo PC Card 56K modem solution. As well as data and fax, you can buy add-ons for GSM, ISDN and network support; the COM One rivals the Gold Card NetGlobal for flexibility. This single-mode K56flex modem is upgradeable to V.90 but the UK translations on its web site don't make it clear whether the upgrade is currently available. Installation was straightforward, for a combo card, because all the bells and whistles are extras. Documentation was on the thin side. The Platinum comes with a wealth of software including PhoneTools, an interesting alternative voice/fax/data utility. The bad news is that PhoneTools is a 16-bit Windows application and so not TAPI-aware, which is a shame.

PCW DETAILS

Price £210.33
(£179 ex VAT)
Contact PPCP
0181 893 2277
www.comeone.tm.fr

Usability ★★★★★
Overall ★★★★★

Psion Dacom Gold Card NetGlobal



This is another combo PC Card modem which covers most bases: K56flex, fax, 10Mbps Ethernet, ISDN and GSM, although you have to pay extra to get the two latter features. It's a conventional Type II card with different sockets. There is one for the network, and another for phone, GSM and ISDN adapters. The network cable has a short lead with a 10Base-T socket plus Link and Data LEDs. This is a K56flex modem but Psion Dacom has yet to release V.90 firmware for any of its modems. Combo PC Cards can be troublesome to install but the Psion Dacom was pretty smooth, despite the fact that the card comes with no documentation whatsoever, which is just plain daft. A floppy disc carries the online manual.

PCW DETAILS

Price £257.33
(£219 ex VAT)
Contact Psion Dacom
01908 261686
www.psiondacom.com

Usability ★★★
Overall ★★★★★

The V.90 standard

The V.90 specification finally agreed by the ITU in February bridges the gap between the rival x2 and K56flex protocols, providing a solution that has the potential for greater stability and speed. It draws from the rival 56K technologies in near equal measure, taking the best technology from each, using the K56flex connection sequence and x2 modulation technologies.

Apart from guaranteeing interoperability between competing vendors, these advances should result in more consistency from connection to connection than with either of the previous 56K protocols. Also, the reported connect speed will be more accurate, and the connection speed should remain constant during a file transfer, barring a change in line conditions. This might mean a lower initial connect speed, but the actual throughput should be slightly higher.

● Connection

The connection or line-probing sequence establishes the clarity and quality of the phone connection. The V.90 standard implements a line-probing technique from K56flex called Spectral Shaping. V.90 accurately determines the qualities of the signal path, optimising signal-to-noise ratios for maximum throughput. As new digital line-noise types are identified, the modem can be updated to better handle them. This will allow vendors to tweak modem performance for specific countries or regions.

● Modulation

Modulation, also known as "symbol encoding", is the process of converting digital data into an analogue signal

Xircom RealPort Ethernet 10/100 + Modem56



Combining V.90 data, fax, Fast Ethernet and GSM support, the RealPort's claim to fame is the use of normal sockets for the leads you plug into it. This is a Type III card made of tough Lexan material, with room for a 10Base-T RJ-45 socket and a pair of RJ-11 sockets for the phone line and handset. British Telecom, of course, does not use RJ-11s so the advantage of the RealPort in the UK is debatable. It does have four status LEDs, however, unusual for PC Card modems. This model is a single-mode K56flex modem and, at the time of writing, only a beta of V.90 firmware was available. Installation was problematical under Windows 98 and it really needs a "clean" PC to start with. I suffered loads of trouble with this card: at one point, inserting it actually caused Windows 98 to crash spectacularly.

PCW DETAILS

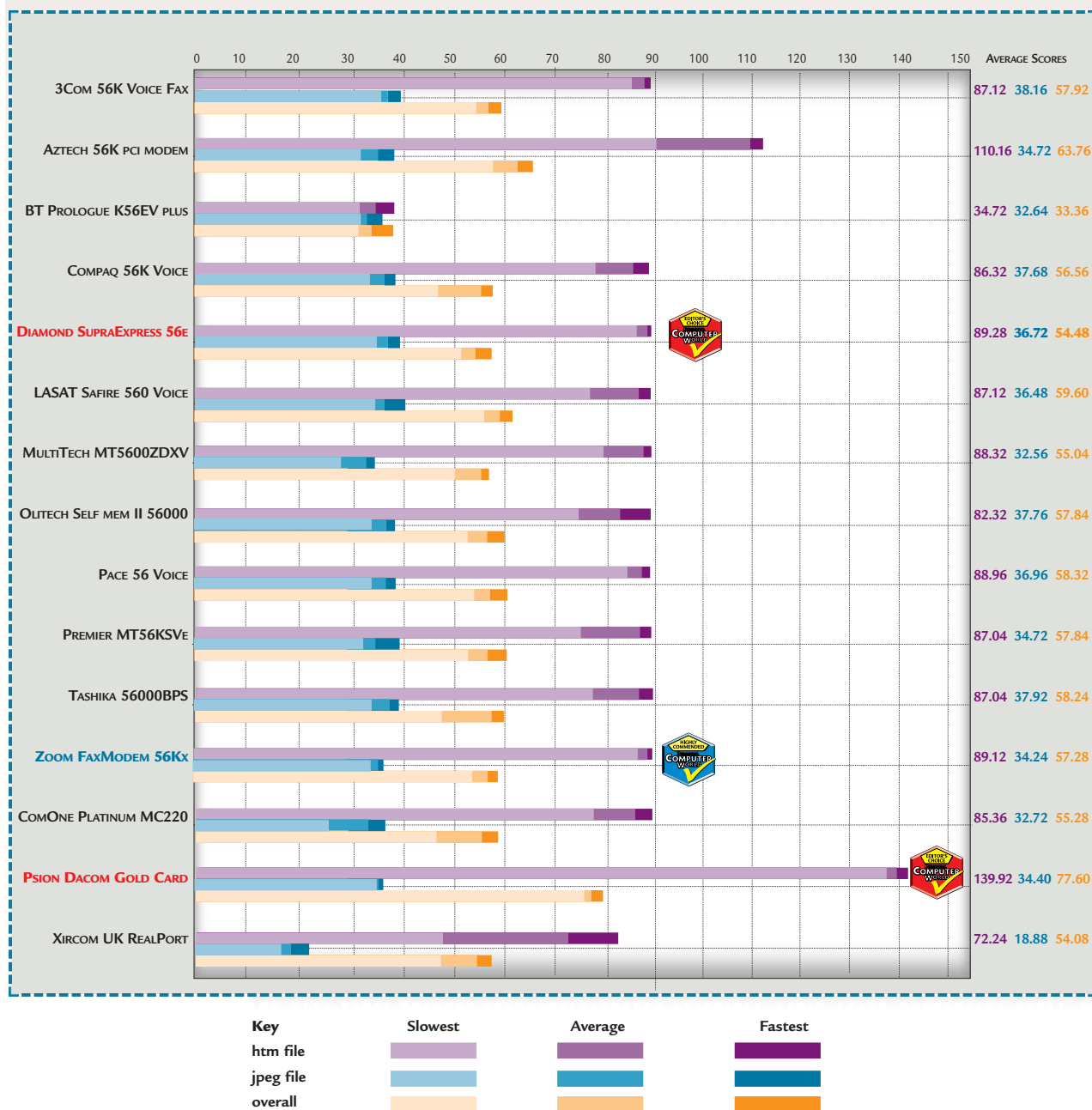
Price £280.83
(£239 ex VAT)
Contact Xircom
01256 332552
www.xircom.com

Usability ★★
Overall ★★★

and vice versa. Symbol encoding uses both the phase and the amplitude of an analogue waveform to send and receive bits of data. The key to symbol encoding is to reliably interpret tightly-packed bits from an analogue curve. More bits packed on a single curve yields more data throughput on a modem.

The V.90 standard implements a symbol encoding technique from x2 called Modulus Conversion. The K56flex alternative, called Shell Mapping, was more compute-intensive and required additional hardware.

PCW Labs Report



How we did the tests



Most of the modems we tested adhered to the new V.90 standard. As the V.90 standard is asynchronous, with download speeds of 56Kbps and upload speeds of only 33.6Kbps, we concentrated on the download speeds of these modems. We connected to an ftp site on Direct Connection, which supported both the V.90 and K56flex standards. We chose to use an ftp site because, as there would be little traffic, each modem would be accessing the site under roughly the same circumstances. We loaded five 1Mb files, each of a different type, on to the ftp site. There was one executable, one zip file, one htm and two graphics files (a tiff and a jpeg). Each file type was chosen as being representative of the files typically downloaded, and their various compression rates would

give a range of results. Using each modem, we downloaded each file 20 times each. We recorded the time taken to download each file, and have shown the slowest and fastest download times as well as the average download time (above). The figures are shown in kilobits per second (Kbps). The figures at the side of the graph indicate average connection rates for each of the file formats and are colour coded according to file type. Overall speeds are the combined results from all file types. As each file format can be compressed to varying degrees, the data transfer rates will also vary. Jpeg files are already compressed, but htm files are not and so can benefit hugely from on-the-fly compression. Hence the htm results which seem to be impossibly high, but which are in fact perfectly normal.

Editor's Choice

Here's our choice of modem and PC Card for **carefree comms** — these are modems à la mode.

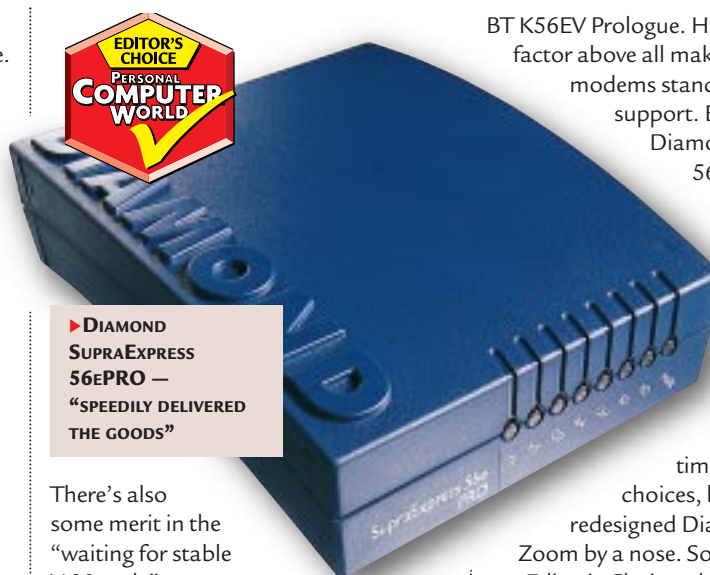
By and large, 56Kbps modems are almost ready for prime time. Virtually all are based on the Rockwell K56flex chipset (with the obvious exception of the x2-based 3Com range) and all deliver appreciably faster performance than their V.34 predecessors. However, the old-timers are far more "honest" and are more likely to deliver their rated 33.6Kbps throughput than any of the 56K class, all of which are subject to the vagaries of the PSTN and rarely top 50Kbps, even with the wind behind them.

You can probably expect maximum transfer rates in the real world to be in the 44Kbps to 48Kbps range. Nevertheless, the 56K class comes a reasonably close second to ISDN's 64Kbps rate and makes the cost of upgrading to it, or Home Highway, debatable. For the moment, 56K modems remain the most hassle-free and inexpensive way to speed up your web browsing.

Surprisingly, although the standard was effectively set in February, many modem manufacturers have yet to release V.90 firmware. To some extent, this is not a pressing problem as



most ISPs have still to make the switch. In any event, many K56flex modems are single-mode devices and can hold only one set of firmware — K56flex or V.90. Try connecting to a K56flex ISP with a V.90 modem and the odds are it will connect at 33.6Kbps.



▶ **DIAMOND SUPRAEXPRESS 56ePRO** — "SPEEDILY DELIVERED THE GOODS"

There's also some merit in the "waiting for stable V.90 code" argument.

Among the desktop modems, £90 or less seems to be the going rate for a 56Kbps model. At this price there's no shortage of "no-name" brands around (rebadged, anonymous, Taiwanese models). Intrinsically, these should be similar to their pricier, branded equivalents: after all, they all use the same Rockwell K56flex hardware. However, other aspects such as online support and documentation make them less attractive in the long term.

We feel you get better overall value from well-known modem makers. Despite their common ancestry,

there is a wide discrepancy in branded-modem pricing. The Pace 56 Voice and the 3Com 56K Voice Faxmodem are both good products and so merit an "Honourable

Mention", but their three-figure price tags are just too high. As for the others, there is quite tight bunching, and picking a winner is a tough call.

If you're into online gaming and need simultaneous voice and data, consider a modem with a mic headset, like the

BT K56EV Prologue. However, one factor above all makes two sub-£90 modems stand out: dual-mode support. Both the Diamond SupraExpress 56e PRO and the Zoom FaxModem 56Kx have this feature, which is essential during these transitional times. Both are good choices, but the cheaper, redesigned Diamond pips the Zoom by a nose. So the Diamond is our Editor's Choice while the Zoom is Highly Commended.

On the PC Card front, there is fierce competition among combo cards. In terms of functionality, all three



▶ **PSION DACOM GOLD CARD NETGLOBAL** — "COMBO PC CARD MODEM WHICH COVERS MOST BASES"

offered more or less the same range of options. Only the

Xircom RealPort lacked support for ISDN. It was also the dearest. The cheapest was the COM One Platinum but that was a bare-bones data/fax modem. The Psion Dacom Gold Card NetGlobal costs £40 more but includes network support. If you want full modularity, plump for the Platinum; if you want more standard features, pick the Psion Dacom. Overall, our favourite was the Psion Dacom Gold Card and so is our Editor's Choice of PC Card modems.

The ISDN alternative

V.90 not **fast enough** for you? Then consider ISDN instead. Here's what you need to know.

If V.90 isn't fast enough for you, then the most common alternative short of a leased line is the Integrated Services Digital Network, or ISDN. ISDN is a digital line and, unlike regular lines and modems, your data is never converted into tones but remains digital, end to end. ISDN has been available in the UK for many years now but it is only in the past year or so that BT has actively marketed the service. ISDN is also provided by some other telecom carriers in certain areas such as CableTel, Energis and Cable & Wireless.

Basic Rate ISDN or BRI (currently marketed by BT as ISDN 2e) is not only cheap to install — £99 at the time of writing — but it is

an established comms technology which enjoys good operating-system support as well as a wide range of inexpensive

hardware. ISDN cards can be had for less than £70. BRI comprises two 64Kbps "Bearer" or B channels, which can be combined (or aggregated) for a maximum capacity of 128Kbps without compression; roughly four times the capacity of a V.34 modem. Such connections are treated as two calls but as they should now last half as long, the speed premium shouldn't be too much. Sadly, while most UK ISPs offer ISDN connections at no extra charge, they do not offer 128Kb connections — well, not for "tenner-a-month" dialup accounts. However, MSN does offer this in the United States. If you want a 128Kb ISDN link to your ISP, then you have to pay quite a bit extra for it.

An ISDN 2e line comes in to your premises via a wall socket with two RJ-45 sockets and not the more familiar single BT 600 phone socket. You can only connect ISDN equipment directly to an ISDN line, and ISDN equipment cannot be used on normal analogue lines. However, if your ISDN device has analogue ports, you can plug your phones or faxes in there and use them in the normal way. Effectively, you have a pair of phone lines with ISDN 2e.

The ISDN 2e tariff is unbelievably complicated. While ISDN running costs are modest — call charges are the same as voice calls — the quarterly rental is high; typically £133.75 (ex VAT). However, you do get a £230 call allowance to soften the blow. In addition to offering faster data speeds, ISDN has very quick connect times, perhaps just two or three seconds compared to the 30 seconds typically required by an ordinary modem. So, if you connect frequently throughout the day and need to send lots of data, ISDN is worth considering.

A domestic version of ISDN 2e was launched this year by BT on 15th September. Called Home Highway, it

upgrades your existing phone line by splitting it into two channels: each can be used as a digital or analogue

(normal) phone

line. Your new Home Highway junction box will have four outlets: two for digital equipment such as a PC, and another two for analogue equipment like phones, faxes and answering machines. You can connect a combination of equipment to the outlets and use any two outlets simultaneously.

Home Highway is not cheap.

Upgrading an existing phone line will cost £99 and the quarterly line rental will



▲ **BT HOME HIGHWAY REPLACES YOUR STANDARD PHONE JACK WITH A BOOK-SIZE WHITE BOX**

be £102, though this will include a free call allowance of £38. Call charges are the same for ordinary lines.

Rather depressingly, compared to an "ordinary" ISDN 2e line, Home Highway offers little in the way of cost savings; perhaps as little as £15 per quarter. The yearly rental cost of an ISDN 2e line is £535. This drops to £305 when the call allowance is deducted. The yearly rental cost of a Home Highway line is £408, which drops to £254 after deducting the call allowance. By comparison, the yearly line rental of an ordinary phone line is £106. [Prices quoted are ex VAT.]

● Also see www.homehighway.bt.com

What you need to know about ISDN hardware

ISDN Terminal Adapters (TAs) come in two flavours, Active or Passive. An active TA is one which has an on-board processor, typically a Digital Signal Processor, and firmware which handles all the protocols and controls the device: for example, the Eicon DIVA Pro. A passive TA is one in which the data pump is driven directly by drivers installed on the PC. A passive device is thus a lot simpler and cheaper because it acts purely as an interface to the ISDN line. Passive TAs are usually internal cards (ISA or PCI bus) and are considerably cheaper than active TAs, which are usually external models. Although a passive device does use some of your PC's CPU power, you are unlikely to notice anything.

If you run a small network, consider one of the new breed of personal ISDN routers, such as the 3Com OfficeConnect ISDN LAN modem — £300 buys you a four-port hub plus ISDN router. With all your workstations plugged in to the hub, you merely have to fire up a browser for the router to automatically dial out and connect — a process that takes just a few seconds.

Up-and-coming technologies

Here are the main runners and riders in the race to provide **better and faster** communications.

ADSL

Like cable, DSL (Digital Subscriber Line) technology was developed in the late eighties to deliver video-on-demand but over ordinary, twisted-pair copper phone lines, the existing copper pairs that connect the world's 800 million telephones. Despite this advantage, the roll-out of ADSL has been slow: by the end of the year there will be only 25,000 US ADSL subscribers at most.

There are various flavours of DSL, the most popular being Asymmetrical DSL (ADSL). Under ADSL, voice data occupies that portion of the audio spectrum between 0kHz and 4kHz, while data uses 4kHz to 2.2MHz. Data is sent through two channels, one for upstream and another for downstream. It's asymmetrical because the downstream and upstream channels are transmitted at different speeds. Downstream speeds go as high as 8Mbps, while the upstream rate tops out at 1Mbps. Because it uses a range of frequency bands, you use the same copper wire to simultaneously send data, receive data and talk on the phone (in theory, that is).

The other DSL technologies, gathered under the "xDSL" label, include high data rate DSL (HDSL), rate-adaptive DSL (RADSL), symmetric DSL (SDSL) and very high data rate DSL (VDSL). The latter offers speeds as high as 70Mbps

but only over distances of less than a mile. ADSL is considered to be the most viable version of DSL as it works over longer distances of up to two miles.

An ADSL connection requires two modems: one on the subscriber side and another on the telco's or ISP's end. The subscriber can only place calls to the modem at the other end of the line, not to other ADSL-equipped computers. More likely, an ADSL connection will always be connected, just like a leased line. This makes it an excellent vehicle for internet connectivity.

Universal ADSL

The ADSL that home users will eventually see in the UK will most likely be a slower version, offering lower throughputs in return for a cheaper, simpler technology. Its development is being supervised by the Universal ADSL Working Group (UAWG). Similar in principle to the G.Lite standard under development by the ITU, the proposed UAWG standard, known as ADSL Lite, will enable users to download data at up to 1.5Mbps and upload at 512Kbps. Although this is just a fraction of the normal 8Mbps available from full-rate ADSL, it's still about 25 times faster than the rate of analogue modems and should keep the initial price of ADSL modems below £200. In any event, neither PCs nor network computers can

support full ADSL bandwidth, and the internet itself lacks the bandwidth required by a mass deployment of ADSL. The UAWG has opted for a "splitterless" solution. Full ADSL requires a low-pass filter, or splitter, to isolate analogue phone devices from the RF (radio frequency interference) put out by ADSL, which should reduce costs and speed telephone companies' deployment of the service by allowing users to install their own ADSL modems.

BT is currently trialling ADSL (not ADSL Lite) in West London, and Florida firm directNET Telecom has announced plans to offer 2Mbps ADSL internet access to businesses and homes for £199 per month. The expected UK launch is set for the third quarter of 1998.

Cable modems

The early deployment of cable modems seems as far away as ever: the cable TV network in the US is already well established yet the uptake of cable modems has been slow. By the end of the year, US analysts predict that no more than 0.5million users in the US, out of 12million cable users, will subscribe to a cable modem service.

The prospects for cable are tantalising. The cable network is digital from end to end and thus eliminates the slow "local loop" bottleneck at the customer's end.

Other PSTN solutions

Right now, V.90's asymmetric 56Kbps/33Kbps is the fastest throughput we'll see with ordinary modems over ordinary phone lines: with exchanges using 64Kbps links for the PSTN, there's just no bandwidth left. But there is a way to achieve higher throughputs — channel aggregation. This involves "bonding" two V.90 modems connecting two ISP accounts over two phone lines to form a single Multi-Link PPP connection, delivering a theoretical maximum of 112Kbps. You need no special kit to do this, just Windows 98 or the Windows 95 Dial-Up Networking upgrade v1.2 and a lot of patience! Some exotic hardware performs a similar trick to bump up throughputs, such as Ramp Technologies' WebRamp personal router which can harness

three modems to act as one. Sadly, the speed gain isn't linear: with two modems you get perhaps 75 percent of the theoretical maximum, and with three you get two-thirds. Another example of this approach is Diamond's forthcoming Shotgun technology. Like ISDN, Shotgun offers bandwidth on demand, bringing up the second line as needed, so if an incoming voice or fax call is detected, the second line is released. You can use either a pair of SupraExpress 56K modems or the forthcoming SupraSonic II dual modem. While these modem solutions are cheap and easy to install, they double your line and (probably) ISP costs, although in the US, ISP NetCom is offering a dual analogue dialup account for about £20 per month. [See Contacts box, p224.]

Cable-modem solutions can promise very high throughput but in practice this will be variable and unpredictable. Throughput will vary, depending on the number of people sharing a line: the more people online, the less bandwidth each gets. In theory, a user could get as much as 30Mbps of bandwidth, although, on average, bandwidth will be typically about 2Mbps.

Another problem is asymmetry: most cable networks were not designed with high-speed comms in mind. At present, many US cable modems only deliver high speed in one direction with upstream traffic being carried over a dialup modem connection. Symmetrical transmission is coming, but its rollout has been slow in the US. The biggest problem is that two-way cable connectivity requires cable companies to install special head-end equipment for two-way communication.

Like ADSL, cable remains a standards minefield, and as a result you'll probably have to buy proprietary hardware direct from the individual cable networks. One big factor expected to drive cable modem sales is the agreement by leading players to adhere to the Data Over Cable Service Interface Specification (DOCSIS), a standard devised by the Multimedia Cable Network Systems (MCNS) consortium which represents cable TV firms. It has been adopted as a *de facto* industry standard and is an international standard recognised by the ITU.

In the UK, progress on the cable-modem front has been glacial. Cable operator Nynex undertook cable modem trials in Manchester but was swallowed up by Cable & Wireless (C&W) and the trial was terminated shortly afterwards. The only bright light was the announcement, this July, that C&W had ordered 100,000 Pace Micro Technologies digital set-top boxes. These incorporate a high-speed cable modem conforming to the open MCNS standard.

Last May, the UK's ComTel cable company announced the development of a cable modem service in conjunction with the US cable modem internet provider @Home Network. The Thames Valley and Oxford areas will be the first to receive the service, with the remaining 11 franchises rolling out over the next two years. Pricing is expected to be in the region of £30 to £40 a month with no usage charges. Businesses are excluded from subscribing. It devotes a single, 6MHz-wide channel to data on ComTel's broadband bi-directional service, following the MCNS DOCSIS protocols. This gives 27 or 36Mbps from supplier to home, with 320Kbps to 10Mbps in the other direction; however, the channel may be shared, with up to 600 users potentially slowing down the service.

Digital PowerLine

In October 1997, US telecoms giant, Nortel, and UK power utility subsidiary, NORWEB Communications, announced

the feasibility of delivering 1Mbps internet access over ordinary electricity power lines, access being gained through mains socket outlets rather than phone lines. Digital PowerLine technology uses a signalling scheme to separate data from electrical interference on the power line, allowing users to connect even if the power goes out. Fibre-optic cabling connected to a central switch carries data between substations and homes, much as it would work on a network of computers. Customers will need a £200 interface card and software for their PCs to handle logging on, security and subscriptions.

Nortel's signalling scheme carries data between the local electricity substation and home. Substations are linked by fibre-optic to a central switch to provide access to the rest of the world.

● *NORWEB plans to begin rolling out Digital PowerLine in its home town, Manchester, later in 1998.*

PCW CONTACTS

ADSL Forum www.adsl.com
 Cable & Wireless Watch
www.unmetered.org.uk/watch/index.htm
 Diamond Multimedia
www.diamondmm.com/shotgun
 Eutelsat www.eutelsat.org,
www.convergence1.com, www.easynet.net
 Hughes Olivetti 01908 319101
www.directpceu.com
 MegaSpeed www.btinternet.com/~direct/telecom.htm
 NORWEB Communications
 0800 1951234 www.norweb.co.uk
 Universal ADSL Working Group
www.uawg.org

Satellite-based internet services

Two satellite-based internet services are available in Britain, both using Eutelsat's Hot Bird satellite for a fast downlink and a land-based ISP for the uplink. The oldest is Hughes-Olivetti's DirectPC service which offers a Turbo Internet delivery at up to 2Mbit/sec (data rates in all these services depend on the load on the transponder). As the uplink is only at the speed of your landline, sending a lot of data will be no faster than when using a conventional service. Start-up costs vary according to which firm installs your satellite dish, but are not cheap at around £500. Then there is a £15 per month subscription and finally a per-megabyte download charge.

There are two main advantages. One is to people in remote areas, where an ISDN link is too expensive. The other is for organisations which want to use DirectPC services to deliver bulk data to multiple clients. Large firms are already using it to deliver data and even TV to dispersed branch offices.

The other Eutelsat-based service, Convergence1, is still at the pilot stage. This uses the Digital Video Broadcasting (DVB) signal as a carrier and is run in conjunction with Easynet, which provides the landlink. Pricing was not known as we went to press, but Easynet's Justin Fielder said there would be no per-megabyte charge and that he hoped to offer "twice the speed of ISDN at half the cost."

Such services could become far more interesting next year when digital PC TV cards hit the shops. This may create a viable market for content loaded on Eutelsat or fast ISP servers. There are various ways this can be used, but the potential is there for small-scale business activities — sales of music, live concerts, software or whatever — exploiting one-to-many broadcasting, which is clearly the most efficient use of satellites. Reception can be passive, like TV, so the punters are not paying line charges.

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