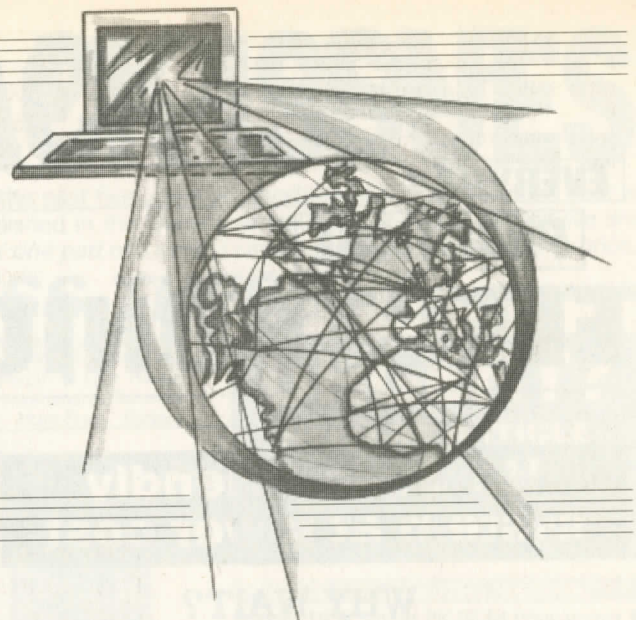


THE INTERNET

WHAT'S IN IT FOR YOU?

ALAN WINSTANLEY



A fascinating history of the development of the world's most powerful communications system, and present day techniques and systems.

TRACING the history of the development of the Internet, from a network of four American computers, right up to today's estimated 35 million, brings forth some interesting facts.

Surfing Safari

Take a close look at a few recent television advertisements: for example, those promoting Vauxhall Cars, or alternatively a favourite tippie, Guinness. In tiny letters, a solitary string of characters flashes on-screen briefly: <http://www.vauxhall.co.uk> and <http://www.guinness.co.uk>. Or how about Pirelli Tyres: <http://www.pirelli.com>. Even H.M. Government joins in with <http://www.open.gov.uk/inrev/irleaf.htm> which was spotted in a newspaper advert concerning the gripping world of Inland Revenue self assessment of tax. Talking of gripping, try a TV advert for Polycell wallpaper paste, no less, followed by one for IBM Computers: they're all at it!

Even a humble television programme such as *BBC Points of View* mentions that it has an "E-mail address" of pov@bbc.co.uk placed at the disposal of its band of techie viewers. Meanwhile, people ask, "Do you surf the net" followed by "What's your URL?" Yes, the Internet is here, accompanied by a techno-speak language all of its own and supported by a cast of millions. Thirty five million, or so, in fact.

Nowadays it's fashionable to talk about the "Information Superhighway", "E-mail addresses" and "web sites". Indeed, it's positively trendy to have an E-mail address, just as it was to have a fax number ten or twelve years ago. So let's set the record straight in this no-hype, fanatic-free guide as to what the fuss is really all about.

Growth of the Internet

First of all, unlike a telephone system for instance, nobody's really in charge of the Internet as a whole. It's just *there*. The Internet exists as a world-wide collection of computer networks, all hooked together via global communication links, fibre optics and good old copper wire, with the odd satellite orbiting inbetween. Many of these computers access the Internet just for the few minutes of the day that they are "on line". Some other parts of the networks are connected to the Internet permanently.

It's estimated that there are well over 35 million Internet users world-wide, with 100 million or more projected by the end of this century. In the United Kingdom, it's hard to say precisely how many users there are; to offer some idea,

Demon Internet Services of London claim to be the United Kingdom's largest "Internet service provider" having some 60,000 customers, whilst the American company CompuServe Information Systems, with four million customers world-wide, reckoned rather optimistically they would achieve half-a-million customers in the UK by the end of 1996. Excluding individual users in academic and industrial/ commercial networks, I guess there are probably well under half a million UK users or so, but rising – fast.

So how did this thing called the "Internet" come about? One theory points to the launch of Russia's *Sputnik 1* satellite in October, 1957 as the turning point, an event which in its time must undoubtedly have unnerved America's military planners. In the 1960s with the advent of the space race, the US Air Force surmised that their land-based communications systems could be crippled easily in times of war, and therefore they funded some research into developing a safe and secure network which, if damaged during nuclear warfare, could still guarantee that data and information would find its way through by one means or another – even if part of the network had been destroyed.

They reasoned that by ensuring that their communications systems were *dispersed* and never reliant upon one single *central* site, their network was rendered inherently much less susceptible to attack. In the late 1960s, the US Department of Defence directed its Advanced Research Project Agency (ARPA) to analyse and resolve the problem of making military communications invulnerable to military attack and consequently in Summer 1968, the ARPANET – the *ARPA Network* – was created. This consisted of exactly four US academic and research computer sites linked together by telephone lines, see Fig. 1.

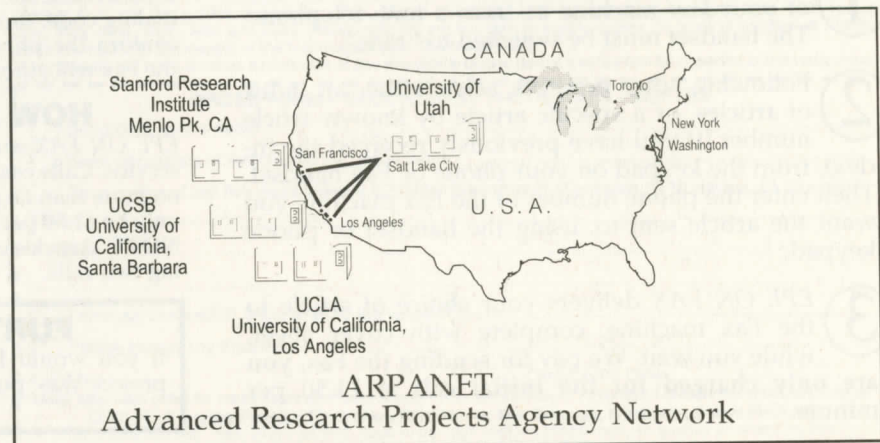


Fig. 1. ARPANET, the original packet switching network.

These particular sites had been chosen because they were computer research centres already known to ARPA whom, it was hoped, possessed the resources to solve some very thorny problems which undoubtedly would lay ahead. In order to meet the demands for a secure communications system, what would be required was a completely different way of *thinking* and a new means of *operating* if the concept of a computer network, connecting several different sites over telephone lines, was to prove a viable system of communicating data. Little did they envisage the colossal impact which their early trials would have on the world's population, some 25 years later.

Packets of Mail

The four sites were all interconnected by a *packet switching system*. Whilst some experiments in computer-based communications had already taken place, the ARPANET differed from earlier experiments in that it used packet switching on a large scale for the first time. The concept of packet switching is said to have been shaped at the National Physical Laboratory (NPL) in the United Kingdom starting in 1968, with ARPANET introducing its own implementation about a year later.

"Packets" are small chunks of the whole message which are transmitted over a communications link and re-assembled upon reception, see Fig. 2. Put simply, each packet has the "address" of the intended destination so they never go astray, and error-checking systems mean that packets can be re-sent over the network if a discrepancy arises in their contents during transmission; the message is guaranteed ultimately to arrive intact. If part of the network is down for any reason (such as war damage or hardware failure) then packets can be re-routed through other operational parts of the network.

A "self-healing", secure communications network was thus proposed: but imagine, ARPA's ideas were completely different from anything else happening at the time, and they started out with nothing except a completely blank sheet of paper.

Packet switching would turn out to be the key to disaster-proof transmissions. ARPANET used specially-built "Interface Message Processor" (IMP) machines based on Honeywell 516s. IMP's were conceived as custom-built peripherals which were to be spliced into their parent mainframe computer, being designed purely for the purpose of communicating on a network. They had some 12K of memory, which was handsome at the time! (Recall that spacecraft *Apollo 11* landed on the moon in 1969 guided by computers which were far less capable than today's average desktop PC.) A computer language called "Unix" was also introduced by Bell Laboratories which was to become the *de rigeur* language for most computer communication networks, right up to the present day.

The very first IMP machine was delivered by sub-contractors BB&N on 30 August 1969, to University of California, Los Angeles (UCLA). The second was delivered to Stanford Research Institute (SRI) that October. The two computers formed the first true packet switching network, from which the Internet would eventually evolve - firstly with a cautious, toe-first dip in the waters and eventually a springboard dive headlong into global connectivity. The two remaining University sites were installed soon afterwards.

At the same time, much effort had gone into the actual computer command structures or "protocols" which were needed to make the computer systems communicate with each other. It is said that the communication interfaces developed on an IMP at UCLA worked first time when the system was powered up, which must have been a very encouraging sign for the developers. ARPANET allowed users at one site to "log in"

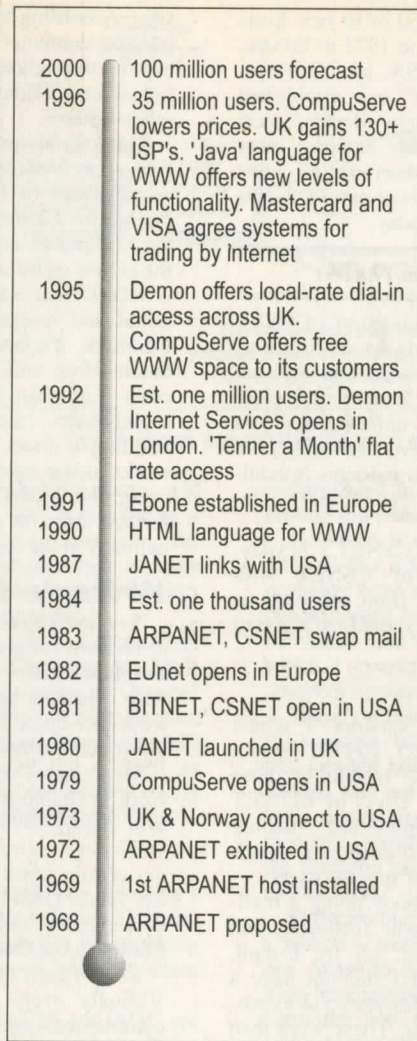


Fig. 3. Plotting the growth of the Internet.

to a remotely-located computer, and it allowed data files to be transferred between two sites, as well as sending messages or "electronic mail" (E-mail) from one user to another. These functions (e.g. Telnet and File Transfer Protocol - FTP) are still used today very much as a matter of routine.

The early ARPANET worked on a simple "user/server" model, whereby one computer site (the user or "client") would log onto and interrogate another computer site (the server or "host"). This basis was to prove unsatisfactory and a new technique quickly evolved instead ("host-to-host" protocol) whereby the computer systems communicated more on equal terms. This newer method was incorporated into the first real networking command structure called Network Control Program, or NCP.

Open for Business

By 1970, ARPANET was on-stream and in 1972 made its first public appearance in the USA. The network had by now reached out to some 40 research sites in the USA, with each site sharing information and data files and also starting to send E-mail messages between individuals at the supercomputer sites. Thereafter, sites added to the system so that by the mid 1970s there were over one hundred host sites, all using a variety of commercial computer systems.

In 1973, according to Vint Cerf, then an Assistant Professor in Computer Science at SRI, ARPA proposed the idea of internetting - "between nets," interlinking not just individual computers, but entire networks. This saw the evolution of the Internet proper, with the objective of transmitting packets between computer networks of any flavour. It is true to say that this would be the vanguard of

the present-day Internet - a network of computer network systems communicating through "backbones" - major electronic carriers of electronic data.

It was increasingly apparent that the NCP protocol would not be able to cope with a projected increase in the number of host sites. In anticipation of an upsurge in the number of host systems requiring a connection to the network, in the mid 1970s a new communications structure called TCP/IP (Transmission Control Protocol/ Internet Protocol) was developed and adopted by ARPANET in 1983 as the standard protocol, and is still with us today.

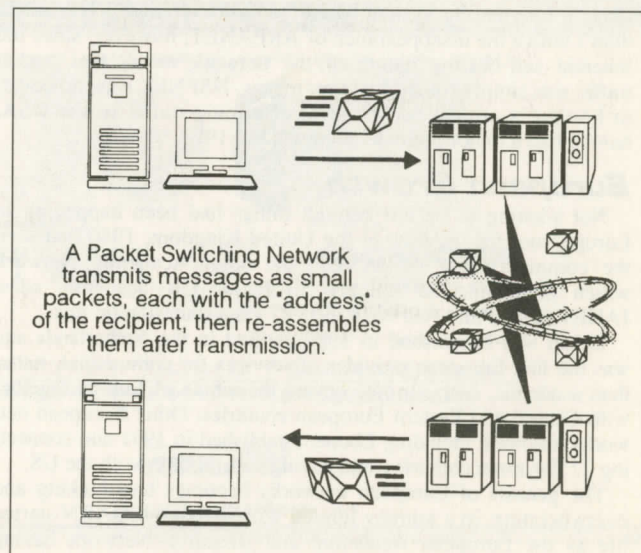


Fig. 2. How the packet switch operates.

Thus ARPANET continued to grow, adding 60 or so new hosts by 1977, and gaining its first international links in 1973 to Europe. Other computer networks sprang up in the USA, too. One system called the Unix User Network or "Usenet" was established at the end of the 1970s and was an open system whereby users could broadcast or exchange views electronically amongst other users subscribing to the same "newsgroup". Usenet – often called "news," though not a reference to news bulletins or current events in the conventional sense – is alive and kicking today.

"Anything and everything is available on The Net"

In the early 1980s, the National Science Foundation's CSNET became operational – the Computer Science Network mail service conceived for research groups at industrial and academic sites not connected to ARPANET. Even at that time, it had become clear that access via ARPANET was advantageous – unfairly so, if you couldn't access it – and demands for alternative networks were rising. CSNET was designed to be operated via modems (modulator-demodulators) enabling communications via ordinary telephone lines on demand.

Some twenty countries were connected in CSNET's heyday. However, connectivity and compatibility of CSNET with ARPANET was pencilled into the plan right from the start, as demonstrated in 1983 when the two networks started exchanging E-mail.

Now is the Time

IBM's BITNET (the "Because It's Time Network"), which served educational users, sprang up too, in 1981. BITNET was a "Store-and-Forward" system operated for the benefit of those populating the higher echelons of education. Users of BITNET could send E-mail and also subscribe to a computerised "mailing list" relevant to their particular interests which enabled a broadcasting of information amongst whole groups of specific users.

This was the electronic equivalent of somebody doing a mail-shot to interested parties, receiving subsequent feedback, and other users then broadcasting their response, all by E-mail. However, unlike ARPANET, users of BITNET did not have a direct connection to others but had to send messages via expensive leased lines for storage on a central server. These were then forwarded to the intended recipients or mailing-list subscribers. Both CSNET and BITNET combined to form CREN (the Corporation for Research and Educational Networking) in 1987 and CSNET was officially made redundant by CREN in 1991.

By the mid 1980s these American networking systems were starting to groan under the strain and the US National Science Foundation (NSF) decided to turn up the heat again using the latest technology, together with some heavyweight investment, to create a more effective network in the form of NSFNET. One source suggests that few of the costly NSFNET supercomputer centres were very efficient in practice.

The mushrooming volumes of computer "traffic" finally spelt the end of ARPANET itself in 1989/1990, having now outlived its usefulness and being engulfed by NSFNET. So, the world's first computer network which had laid the foundation stones for today's internetting system, dissolved without trace. The world didn't notice the disappearance of ARPANET, however, since the inherent self-healing nature of the network meant that packet traffic was simply routed by other means. NSFNET was, however, to become a critical backbone of electronic traffic in the USA, having had a major upgrade completed in 1992.

European Growth

Not wanting to be left behind, things had been happening in Europe, too: for instance in the United Kingdom, 1980 had seen the commencement of JANET: the Joint Academic Network which interconnected roughly 50 major UK academic sites. JANET tapped into NSFNET in 1987 via a transatlantic link.

EUnet was established in 1982 centred in the Netherlands and was the first European provider of services for commercial, rather than academic, users. It now covers the whole of Europe together with Central and Eastern European countries. Other European networks followed, including Ebone, established in 1991 and connecting 27 European countries, and having several links with the US.

The genesis of European networks becomes breathtaking and overwhelming, in a journey littered with acronyms. EARN started life as the European Academic and Research Network having some 40 member countries, to serve non-commercial interests only, including the European Space Agency and other high-level

sites. According to their brochure, EARN became the first general purpose computer network dedicated to universities and research centres throughout Europe, the Middle East and Africa. EARN linked into EUnet, JANET in the United Kingdom and several other systems.

More acronyms: TERENA – the Trans-European Research and Education Networking Association – formed in October 1994 as an amalgam of EARN and RARE (*Réseaux Associés pour la Recherche Européenne*) the latter having been funded partly by the European Union with a view to influencing and co-ordinating the efforts of European networking in the research sectors.

NORDUnet was founded in the early 1980s to serve educational and research sites only, within the Nordic countries of Denmark, Finland, Iceland, Norway and Sweden. It is very much alive and kicking today with connections to US and other European backbones, and, since many of its member shareholders' countries border on Russia, NORDUnet is said to be building a direct access through St. Petersburg to Russian networks, using satellite links. Neighbouring Scandinavian countries using the NORDUnet network seem pretty keen to establish further links on a scientific/academic basis with their opposite numbers in the former Soviet Union.

Writer's Bloc

Yes, even Russia and the former Soviet bloc countries are keen to become connected and they have their own series of computer communications networks. BALNET covers the Baltic states. Also, Moscow has its own backbone connection and several networks are open, including MSUNET and SovAM. And, naturally, Australia and those "down under" are connected too.

Meantime, DANTE – short for the Delivery of Advanced Network Technology to Europe – was created as a non-profit-making firm in July 1993 to link together European national research and University networks via its EuropaNET backbone. It also helps out certain lower-capacity European networks by providing their US links. DANTE was recently strengthened, thanks to the involvement of British Telecom which now provides the Western European backbone for the DANTE R&D network.

So to return to the opening paragraph, yes, everybody is at it. Virtually every country in the world has its own computer communications network system, and all of these systems are networked together to form the Internet. The Internet is still an incredibly fluid medium, demand-driven, ownerless and self-regulating. Often it doesn't cope too well with the spiralling demands placed on it by users, and it is constantly being re-inforced, re-built and re-routed.

"There's a jawdropping upside to having on-line access . . ."

The world has shrunk immeasurably within the last twenty-five years. With the advent of the next development – the "World Wide Web" – now anybody, anywhere in the world can exchange information complete with graphics, sound, moving pictures, and 3-dimensional graphics, in a completely revolutionary way. We'll look at the World Wide Web (WWW) shortly, but let's now catch our breath and take a look at the present state of the art in the United Kingdom.

Dial I for Internet

Most Internet users like myself have a "dial in" connection to the service network. Internet Service Providers (ISPs) – Demon Internet Services in London claim to be the largest – provide local "Points of Presence" through which access may be gained to the Internet. The key, critical word is "local". All that is required is a suitable computer, preferably an IBM-compatible PC or Apple Macintosh, but Amigas and Acorns may also be used, a domestic phone line, a modem, and some Internet access software. (Even Windows 3.1 "Terminal" will get you off the ground, but it's far from ideal.)

The fact that local access is now generally available (but not universally so) means that the cost of telephone calls need no longer be prohibitively expensive. You only pay when you are connected to the Internet. You can exchange dozens of E-mail messages in a matter of minutes!

Looking at VAT-inclusive costs of a *local* phone call, British Telecom charge about one penny per minute using the telephone at off-peak times during the weekend, and 1.645 pence per minute during evenings and nighttime in the week. Peak time, daytime costs are 3.9 pence per minute, or nearly 10 pence a minute if you have to dial nationally (over 35 miles) during the working

day. Also recall that BT was the world's first national telephone company to charge actual time used per second. The minimum cost of any call, though, is about five pence.

A whole hour of "surfing the Internet" may be had for as little as 60 pence plus a modest monthly subscription. Discount packages are also available which reduce the cost by a further 20 per cent. A particularly ironic fact is that normal "off peak" times (after 6 p.m.) on the telephone network actually result in very many more users coming on-line to benefit from the off-peak prices. There's therefore a bit of a rush during the evenings when "off peak" prices produce peak levels of demand! It can therefore take several attempts to gain access, and connections can sometimes be slow due to the heavy traffic – especially if transatlantic links are involved. However, the situation has improved immeasurably over the past year as more Internet Service Providers have opened for trade, and more Points of Presence, and more lines, have gradually been added.

How a dial-in access works, using my own North Lincolnshire home as an example, is illustrated in Fig. 4. Choosing an ISP is rather like buying a mobile phone. Vodafone, Cellnet or Orange? And what is the reception like in your locality? Whilst Demon, Pipex and many other UK communications companies (over 130 ISPs at the moment) provide dial-in connections as well as managing permanent ones for large accounts, one or two others are more correctly called *On-Line Service Providers (OSPs)*.

At Your Service

The two best known OSPs, and intense rivals, are America's CompuServe Information Systems (CIS) and America On-Line (AOL), both very active in the UK. These provide a breathtaking array of informative on-line services such as news, weather, share prices, and special topical "help" areas.

OSPs work in rather a different way. Both CIS and AOL are *closed* networks offering many "internal" services to subscribers, together with a gateway to the outside world and the Internet. They are rather more "squeaky-clean", priding themselves on being good "internet citizens". The rest of the Internet world is a bit more rough-and-tumble, at times. OSPs are ideal for family use, but they are arguably not the most powerful, cheapest or versatile way of accessing the Internet. Demonstration packs and free-access samplers are the best way to find out.

Additionally, service providers charge a modest subscription fee. Demon currently charge £11.75 per month which is a flat rate fee giving you unlimited access to the Internet. Certain systems, such as CompuServe, charge a further hourly fee after a basic month's allowance has been used. The minimum you will pay is about £6.65 per month.

So what's available on the Internet? There's a staggering array of things to see and places to visit. Like browsing through a library, not everything is of a high quality, some of it is a waste of time, not all of it will be to everyone's tastes, and some of it is not at all suitable for younger people. Remember, anything goes in "cyberspace", it's uncensored (but parental control software is available), and it's only a local call away.

Not only can you send electronic mail at a fraction of the cost of ordinary "snail mail" (letter post), but a bottomless mine of information is suddenly at your fingertips. Anything and everything is available on the Internet. In particular, the World Wide Web coupled with "search engines" – methods of searching the globe's Internet sites for a particular topic – offer the potential to unearth

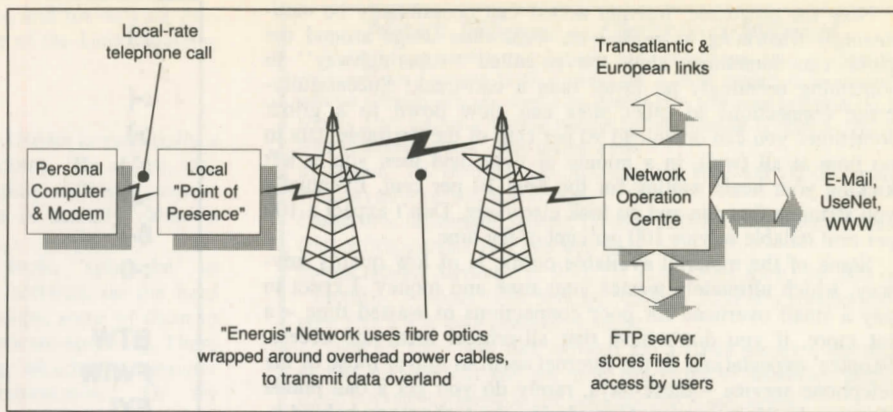


Fig. 4. Block schematic diagram showing how the "dial-in" access works.

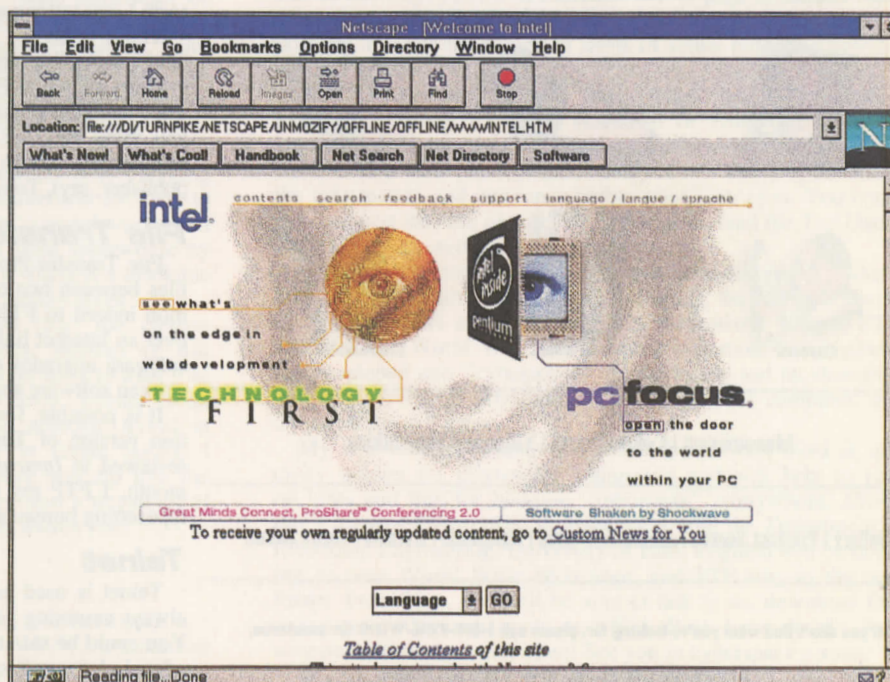
unparalleled quantities of data from around the planet, right onto your desktop computer.

However, it's worth asking yourself, what are you going to do with all this information? Can you live without it? After all, you probably *have* so far! You can quickly find yourself completely overwhelmed with facts, figures, mail, data, graphics and bits of software . . . in fact, an absolute tidal wave of on-line information, which I guarantee can far outstrip anyone's capacity to either absorb it or stay abreast of it.

There's a jawdropping upside to having on-line access. Usenet, for example, is a way of openly discussing thorny questions with like-minded people who may reside anywhere on the planet (assuming you get an answer). If you are struggling with Windows '95 – or you need the latest video drivers for your monitor, say – then the Internet offers tantalising access to the information and the files you need, delivered via the Usenet, or World Wide Web or FTP sites.

Software bug need fixing? There may be a solution – or at least a reason – available from the American manufacturer's Internet site. Want to see the latest pictures from the Hubble telescope? They're available by internet, directly from NASA. Interested in a particular new product – like a car tyre or wallpaper paste? Or self-assessment of income tax? Browse a brochure, on-line . . . the list is endless.

You might alternatively simply use Internet access for specific research purposes or for handling E-mail, as well as for a little general interest or "net surfing". In short, the Internet is as big as you want it to be – and the cost need not be very high at all, if used sensibly and with discipline (an enormous amount, at times!). One thing is for certain, the Internet is here to stay and there's no ignoring it.



Screen shot of product information from Intel.

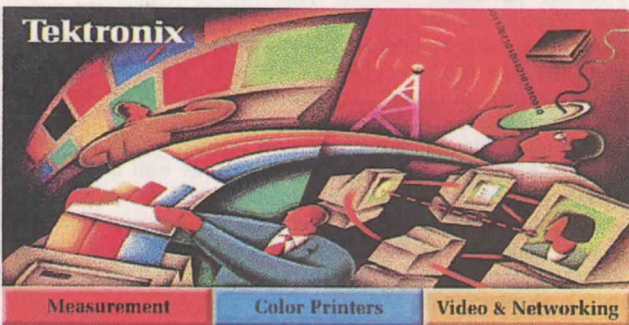
Now the downside: Internet access can occasionally be *mad-deningly* frustrating to work with. Peak-time usage around the globe can sometimes slow the so-called "superhighway" to something seemingly no faster than a cart-track! Successfully-made connections to other sites can slow down to a grind: sometimes you can download 90 per cent of the desirable data in no time at all (well, in a minute or two), and then you're left kicking your heels waiting for the final 10 per cent. Eventually you abandon that site and go look elsewhere. Don't expect a 100 per cent reliable service 100 per cent of the time.

Some of the material available online is of low quality anyway, which ultimately wastes your time and money. Expect to pay a small overhead for poor connections or wasted time – a lot more, if you don't have that all-critical local-rate access. Peoples' expectations of the Internet seem to mirror those of the telephone service – these days, rarely do you get a bad phone line or a break in service. Considering the technology behind it, sometimes a morse-key seems a mighty improvement over a humble dial-in Internet access account! The situation is improving all the time, but this is unfortunately partly compensated by a proportional increase in traffic. Now let's look at what "being wired" really means in practice. What do you get for your money?

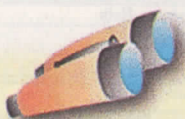
E-mail

Electronic mail (E-mail) is used by virtually everybody with Internet access, for sending messages to other users. The main point of note is that delivery isn't instantaneous, and sometimes (rarely) mail may get lost. E-mail may only be "delivered" when the recipient dials-in to the Internet from their end, and collects it. It may also take a short time to be transmitted by the packet switching networks, to the ISP at the other end. This can be minutes or hours, or even longer.

Millions of these messages flow around the world every day. But even if the recipient is in Australia (which some of my readers indeed are), it can still only be a local phone call away. I receive E-mail from readers in many countries. It isn't generally



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Example WWW graphics of "what's new" from Tektronix.

:-)	Smiley ("Don't take this seriously")
:-(Unhappy
;-)	Wink (make a joke)
:^)	Jokingly, nose out of joint
:-P	Sticking tongue out!
8-)	Smiley wearing glasses
:-0	Shock

BTW	By the way
FWIW	For what it's worth
FYI	For your information
HTH	Hope this helps
IMHO	In my humble/honest opinion
OTOH	On the other hand
ROFL	Rolls on floor laughing
RTFM	Read the (ahem!) Manual

<g> or	
<grin>	writer grinning
word	for stressing a word
word	for underlining

Fig. 5. Some common "Smileys" or emoticons used on Internet.

necessary to write a polished letter, since it's accepted that timely communications are more important than producing a beautifully penned message.

Sending an E-mail is rather like sending an open postcard. A message may pass through several systems in transit. In theory, confidentiality is not guaranteed. E-mail is not recommended for sending confidential information such as a credit card number, though I have yet to hear of anyone suffering as a result of doing so.

You don't need to be Shakespeare to pen an E-mail message but you *are* judged by exactly what you write. The recipient cannot hear the tone of your voice or see the twinkle of your eyes. It is embarrassingly easy to write something which is misinterpreted by the reader, especially if you have a dry, warped sense of humour like mine! (Such as the time that I joked on Usenet that you can receive satellite TV by gluing a steel coat hanger on top of the TV: an Internet user from Singapore wondered what on earth I was talking about! No sense of humour, some people.)

You'll often see strange punctuation used in E-mail messages (and Usenet, see later) to accentuate your feelings. The most common are shown in Fig. 5, along with some common abbreviations. They're called *emoticons* or *smileys*. No matter how bizarre or silly you think they are, smileys are a critical part of Internet communications, though I wouldn't use them in formal messages (to my publisher, say). To read, just turn the page through 90 degrees!

File Transfer Protocol

File Transfer Protocol (FTP) is a simple means of transferring files between two computers, in either direction. It is very common indeed to FTP files from another machine and download it over an Internet link, onto your own machine. Files could include software upgrades or fixes, information files, text files, graphics, or even software applications themselves.

It is possible, for example, to download by FTP a demonstration version of Turnpike, the Internet access software which I reviewed in *Innovations* (News pages), *EPE* April 1996. Every month, I FTP my material, text, graphics and all, down to the typesetting bureau at *EPE*. Floppy disks never change hands.

Telnet

Telnet is used as a way of logging in to a remote computer, always assuming you have been granted the right "permissions." You could be sat at your PC in Peterborough, and Telnet over (at a local phone call rate) to a machine in Pittsburgh, USA. For all it knows, the American computer thinks you're somebody using that computer system whilst sat in the computer room next door.

Telnet is used for interrogating machines, and for moving files around on that machine. A brief knowledge of the Unix language is often required.

Usenet Newsgroups

Now things start to get more interesting. Usenet is essentially a collection of global topical conference rooms. (Be aware, that the term "Conference" is used in a slightly different context by CompuServe.) Each conference room is actually called a "newsgroup".

Folks who are interested in a particular topic, "subscribe" to that newsgroup – or rather, they let their software do the hard work. There are now some 15,000 newsgroups, some of them in foreign languages but mostly English (American)-speaking. There are some United Kingdom groups, including: *uk.adverts.computer* and *uk.d-i-y*, or how about *uk.education.misc*? Or try *rec.food.cooking*? It's all there, covering recreation, leisure, science, computing, and more.

Usenet subscribers may post new "threads" to the newsgroup, which are read and "followed up" by any number of subscribers anywhere in the world. Like E-mail, you will only receive follow-ups and threads when you dial-in to the Internet. The reading and composing is performed off-line, to save the phone bill.

It is also possible to follow-up by sending an E-mail to those who have posted into the newsgroup. An excellent example was a recent request of mine in *sci.electronics.components* to track down a particular i.c. on behalf of a reader. Within eight hours, I had several replies from the USA followed by an E-mailed response from National Semiconductor themselves. The reader probably never appreciated the global effort which we undertook to find the chip.

The newsgroups I tend to handle are the *sci.electronics.** which are broadly American, but where I'm a regular contributor. Indeed, I have made many "on-line" friends through Usenet, some of whom E-mail me, others I have since met in the flesh. There is a whole protocol of manners and procedures called "*netiquette*" which, if followed by subscribers, will result in many happy hours burning the midnight oil. Some regulars can get upset if the wrong type of "off-topic" question is posted into a newsgroup, and steps are taken to ensure that everyone keeps in line.

By the way, concerned parents may need to be aware that there are some notorious "adult" newsgroups too, with names to match, which are used for posting pictures as encoded binary data: they would still have to be decoded after receipt, and would need special software to view, so there is certainly no danger of inappropriate pictures popping up on screen.

A small number of newsgroups are in fact "moderated" so that all posts are filtered by an appointed moderator. Posts which are deemed inappropriate for the "charter" of that group, are simply "killed" by the moderator.

Sadly, errant newcomers or "newbies" may sometimes be treated with little mercy by the regulars. The only sure way to avoid "flames" (abusive messages with varying levels of "temperature") is to read the newsgroup for several weeks to see what gives. You can expect to see swearing, at times. It is vital that you realise that everyone has exactly the same rights as everyone else, on Usenet.

One of the prime methods of stopping newbies from clogging the system with irritating questions is the requirement for them to read the FAQ ("Frequently Asked Questions") pertaining to that newsgroup or topic. This is often available from somewhere by FTP, and people are generally happy to say where it's available from. Some groups post a FAQ automatically every week.

I would say that the UK newsgroups (e.g. the *Demon* newsgroups) can be pretty rough at times. Internet is still relatively young in the UK and some posters do seem to treat it as a new toy: each newsgroup has its own level. Usenet is an amazing example of a self-regulating and anarchic world in action. I will be covering it extensively in future issues. I guarantee, it will only be a short time before you dip into the newsgroups, follow up to a posting, and then start a thread all of your own. Hermit-dom (and possible divorce) awaits you!

World Wide Web

Most of you have heard about it, many of you have seen it – even if only on TV. The World Wide Web (WWW) is a method of displaying information in a graphically-presented and appealing way. World Wide Web pages are, in essence, personal "brochures" or fact files deposited on a "web server" computer,

Next Steps - Getting Wired

If you're now keen to get "wired", firstly ensure you have a computer equipped with a suitable 14.4K or better still, a 28.8K modem (a fax-modem, with fax software, lets you send a fax directly from your word processor, as a bonus). Then contact a suitable Internet Service Provider to open a "dial-up Internet access account". Here are just a few:

BT Internet, Tel. 0800 800 150 (Residential) or 0800 800 152 (Business). Windows software, with Mac to follow.

CompuServe Information Systems, Tel 0800 289378. Offers Windows, Mac, OS/2 or DOS software. Free 1Mb Web space.

Demon Internet Services, Tel. 0181 371 1234. Offers KA9Q for DOS or "Turnpike" Windows (with Netscape Navigator 1.22) at a concessionary price. Free WWW space promised by August.

There are many more such providers and a glance through a specialist Internet magazine will give you many more contacts. Sometimes, sample access software is available to give you a free trial. *Happy surfing!*

and permanently connected to the Internet for anyone to look at. It's estimated there are 22 million web pages with 11 million words. Hence the WWW is enormously popular, and will undoubtedly form the key to global information exchange in future years.

Originally created in 1989 by the European Particle Physics Laboratory (CERN) in Switzerland, the use of Hyper Text Markup Language (HTML) for creating web pages was very rapidly adopted world-wide as a way of creating information sites, and for distributing work on the Internet. It's an excellent medium for donating information to the planet's Internet population.

Web pages use a combination of text with "tags", very similar to the way the Locoscript language used by old Amstrad PCWs used to work. Using HTML, plain (ASCII) text is tagged to give it attributes – bold, heading, italics, bullets, and so on. Graphical images (.gif or .jpg files) are referenced with tags too, and downloaded separately. Forms can be included too, which the viewer fills in when on-line. (That's how I got a wall poster from DANTE EuropaNET, yesterday. It arrived this morning!)

The tags and text are downloaded onto your computer, using "browser" software. The Netscape and Mosaic browsers are the best known, and the latest version of Windows 95 include a browser (*Microsoft Internet Explorer*) too. The browser's job in life is to unscramble the text, tags and graphics and display the final results on your computer. It's usual for web page space to be rented on a server computer somewhere. Indeed, major ISPs now give their Internet customers some free web space to play with, as part of the service.

All major international corporations have their own web sites, and researchers such as myself are able to "search on the web" looking for data and information stashed away on web servers anywhere in the world. The most stunning part of it is that one web page may often refer you to another web page belonging to someone else. One mouse click and you're on your way to that site. In this way, you travel from one WWW page to another – but these sites could be absolutely anywhere in the world, and it is possible to circle the planet, in terms of actual mileage traversed, very many times per hour!

WWW pages start with a "Home Page" having a complex-looking "address" or URL (Uniform or Universal Resource Locator) which needs to be typed into the browser software when on-line. The software will then seek out this address, download the information and unwrap it before your very eyes. You could see the latest satellite pictures from NASA or read the Tap Dance Home Page! Everything imaginable is there.

There are now separate magazines available describing "what's hot" together with "what's cool". Surfing the net and checking out web sites are now hobbies in themselves. E-mail, FTP, and now the World Wide Web: that information superhighway has developed into "cyberspace", an intangible and inexhaustible electronic world of information viewed on your computer, and only a phone call away.

My new Internet column starts next month. *Net Work* is specially written for electronics enthusiasts and will help to pass on hints and tips for budding "internauts" everywhere. *Everyday Practical Electronics*, in association with the Department of Electronic Engineering, University of Hull, England will be opening its own World Wide Web page, and FTP site, in the near future. From here, you will be able to talk to us, download files associated with our projects, text files, Back Issue details, Subscription information and more! See you in cyberspace – soon.

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