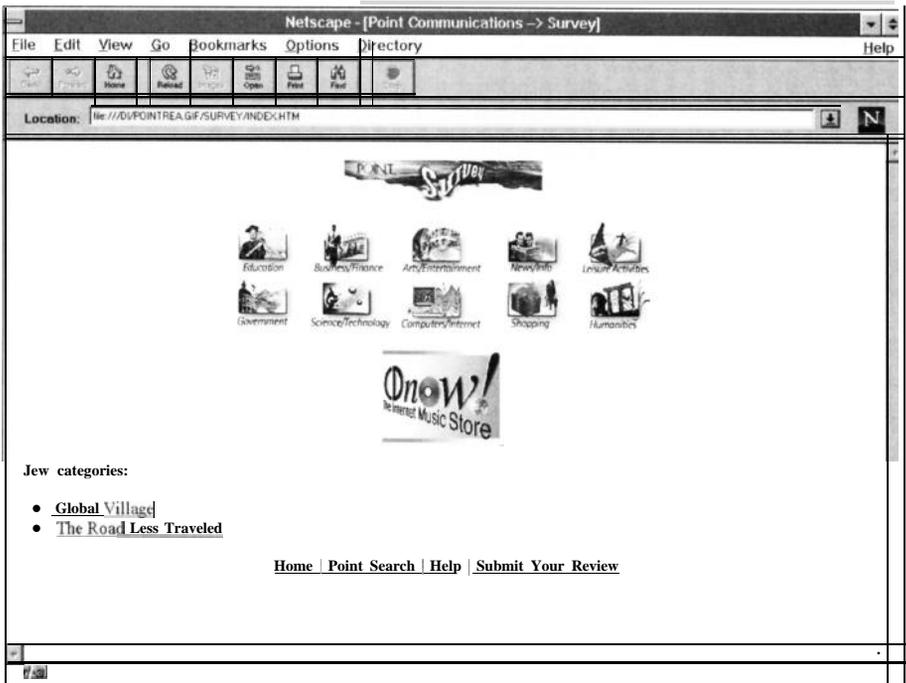


# Chapter 4. New publishing tools

*The simplest systems can, given time and space, produce quite unexpected and surprisingly complex results.* – Benjamin Woolley<sup>1</sup>

For more than 25 years, the primitive state of software technology meant that creating a serious application for Internet users required programming – serious programming. Languages such as C, C+ and perl made life a bit easier for the specialists. For most informed computer users, the payoff rarely equalled the investment.<sup>2</sup>



Consider the Web page above; constructing this page required the use of the following tools:

- Traditional artists' gear including paper, pencils, erasers and the like.
- A colour scanner with assorted drivers properly configured and installed in a desktop computer.

[1] *Virtual Worlds: A Journey in Hype and Hyperreality* London: Penguin Books, 1992, p. 111

[2] See the table of the basic toolset on page 62 below.

- Adobe Photoshop, a high-end bit map imaging and graphics software.
- Assorted shareware software to map hot links to particular areas of the image containing the main categories of information on the site,
- An HTML editor, in this instance, Soft Quad's Hot Metal Pro.
- ASCII editors, including the European-developed Editeur and the almost forgotten XyWrite III+ for MS-DOS
- A variety of UNIX utilities to compress (TAR) the files and convert them to a format suitable for uploading via communications software.
- The Netscape browser software, in this instance, version 1.22 and 2.0.
- Miscellaneous tools for smoothing out the rough edges of transparent GIF (Graphics Interchange Format) and preparing the JPEG (Joint Photographic Equipment Group) file.

The HTML(Hypertext Markup Language) code created in Hot Metal looks like this:

```
Line 1: <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML//EN"  
      "html-net.dtd">  
Line 2:  
Line 3: <HTML<HEAD><TITLE>Point Communications --> Survey</TITLE>  
      </HEAD><BODY BGCOLOR="FFFFFF"><CENTER><A HREF="/gifs/help/  
      #survey"><IMG SRC="surtyop.gif" BORDER="0"></A>  
Line 4: <BR><BR><A HREF="surbutts.map"><IMG SRC="surbutts.gif"  
      BORDER="0" ISMAP="ISMAP"></A>  
Line 5: <BR><BR><A HREF="/CDNow"><IMG SRC="cdnow.gif" BORDER="0"></A>  
Line 6: </CENTER>  
Line 7: <P>New categories:</P><UL>  
Line 8: <LI><A HREF="/gifs/reviews/gv.htm">Global Village</A></LI>  
Line 9: <LI><A HREF="/gifs/road">The Road Less Traveled</A></LI></UL>  
Line 10: <CENTER><P><A HREF="/gifs/home/">Home</A> |  
      <A HREF="/PointSearch/gif/">Point Search</A> |  
      <A HREF="/gifs/help/">Help</A> | <A HREF="/gifs/submit/">  
      Submit Your Review</A></P></CENTER></BODY></HTML>
```

**HTML Comments:**

- [a] The line numbers have been added for reference
- [b] Codes and text on each line must be typed without hard returns. Line breaks are to facilitate ease of reading.
- [c] Line 4 contains a reference to an image map, that is a graphic that has specific hypertext links attached to specific pixel locations to permit an image to act like a panel of push buttons.
- [d] The page contains a small amount of text in Lines 8 and 9. The rest of the page is a template generated by scripts.

The Web phenomenon would have been impossible without a wide range of tools that could be used to create the objects and code required by HTML-aware browsers. Although tools were available, HTML programmers and Web page designers quickly discovered that more features, convenience and power were needed.

The predictable result has been a flood of new software to meet the ever-escalating demands of Internet publishers. The flow of new products has been increasing and it is beyond the scope of this Briefing to provide a comprehensive overview of the

hundreds of Internet publishing tools now available as shareware, freeware and commercial shrink-wrapped software.

If this is too much trouble, CompuServe, Prodigy and America Online offer customers a fill-in-the-blank approach to creating a Web page. For a modest fee per month, subscribers can build their personal Web page, add graphics and publish on the Internet. Building a Web page requires only basic computer skills and a password to one of the commercial services.

## Browser wars

The start of the Internet publishing revolution was a slick-looking interface to a technology developed at the European Particle Physics Laboratory at CERN. Although hypertext browsing tools were available, Lynx and Cello were not snappy nor particularly user-friendly. What is known as NCSA Mosaic was. To underline the magnitude of the new software segment, Netscape Communications Inc. went from obscurity in 1993 when it was first posted on the Internet, to a \$1 billion dollar company in less than two years, on the strength of its Internet tool software.

The *browser* is a category of software that permits a person to examine World Wide Web sites in graphical form. The dominant company in this sector is Netscape Communications, Inc. (Mountain View, California). The firm's chief technical officer is Marc Andreessen, the author of the original NCSA Mosaic software that launched the Web revolution in 1993.

Netscape provides its browsers without charge on a trial basis. Individuals and organisations who want to register their copy and receive notification of updates can call and order the \$40 commercial version. Surveys of Web browser users indicate that Netscape has captured about two-thirds of the North American Internet user community.

Netscape's offer of 'free' software has several purposes. First, it gives the company significant name recognition, which is often referred to as 'market share' or 'share of mind'. Second, the company's visibility helps the stock price. Netscape has received an infusion of venture capital and added to its senior management team. Finally, the browser has allowed Netscape to incorporate extensions to the HTML specification. Users of its browser can examine pages with tables, coloured and textured backgrounds and richer graphical objects. The company licensed Java, a programming language from Sun Microsystems that permits complete applications to be created for execution within a browser when a user visits a Java-programmed site. In short, Netscape is driving the browser market with technology for viewing, creating applications and security.'

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[1] Netscape has joined with other companies, including Spry Communications, to support a standard security protocol. The technology will be developed by Terisa Systems. A more detailed discussion of this development appears in Chapter 6: Security and Copyright.

The browser stakes are high. Netscape is driving toward a functionality that permits the flexibility of Standard Generalised Markup Language buttressed with programmable extensibility. Netscape has licensed technology from Adobe, Sun Microsystems and other companies. It has purchased the groupware company Collabra. The combination suggests that purchasers of Netscape's server software will have powerful tools for creating applications for Internet applications such as group conferencing, intelligent environments and image displays that move in real time or reproduce with exactitude the artwork of a digital painter or designer.

In practical terms, it means that an Internet server equipped with the Netscape software can provide within a graphical Web page the type of interactive functionality a user would expect from a spreadsheet such as 1-2-3, a database like Access, or a multimedia 'session' comparable to a game on a CD-ROM

Netscape has a high profile, but the visibility comes from the browser software. The strategic significance of the company's software strategy hinges upon its ability to integrate best-of-breed innovations from other companies into its server software. Coupled with competitive pricing for its server at about \$5,000, Netscape may emerge as the Microsoft of the Internet software world.

The browser software tool is ubiquitous. Disks containing browsers are included with computer magazines throughout the world. There are dozens of browsers available. Some are based on the NCSA Mosaic, now licensed to Spyglass Technologies located near the University of Illinois where the Mosaic original work was done. Others have been written to include specialised features, interface details and functions not included in the original Mosaic.'

The competition is formidable. NCSA's most recent release of Mosaic has better speed and increased graphical capability. The Wollongong Group has announced an integrated browser. This new category of software collects the separate applications such as electronic mail, telnet and ftp under one common interface. In the server arena, O'Reilly & Associates (Sebastopol, California) has introduced \$500 Windows NT-based Web server software that is easier to set up, maintain and extend than a comparable UNIX server. Open Market (Cambridge, Massachusetts) has been aggressively building a base of alliances for its secure Web server technology, including deals with credit card and financial institutions. Microsoft has developed a browser that integrates seamlessly with Windows 95 and NT. Many other companies are competing in browser technology. These include Oracle, America Online, CompuServe and many others.

In short, the browser software segment has exploded into a major applications area. The risks and stakes are equally high. The variables depend upon a user community

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[1] In January 1993 there were 50 servers that supported World Wide Web technology. In October 1993, web servers numbered about 500. By June 1994, there were 1500, by January 1995, the number exceeded 5000. At the end of 1995, more than 100,000 web servers were connected to the Internet.

that can obtain a browser for free. Loyalty may be difficult to retain. Windows 95, like OS/2 Version 3.x, includes an Internet browser. In less than 24 months, this segment of the Internet software arena has become a high-stakes game with a customer base numbered in the millions. The players include firms large and small and it is difficult to predict which company will win.

Several observations about browsers can be made:

- Browser technology represents a new class of desktop software. It will become a development platform in its own right.
- Browsers make it possible for distributed software applications to run across a wide range of computing platforms. No network-enabled application will be limited to a particular user's computing platform. A Macintosh user equipped with a browser will have access to the same software as the user of Sun Ultrasparc.
- Browsers place no functional limits on what can be displayed within their shell. Thus, new extensions to HTML or programming languages that allow a browser to interact with a full-blown application such as a spreadsheet are possible.
- With sufficient bandwidth and a robust computer, a user with a browser can interact with an environment that contains a wide range of objects such as sound, text, images and video. Furthermore, these objects can be endowed with intelligence so that the environment responds to the user's needs.

In summary, the browser has inaugurated a new era in computer software innovation.

## The principal categories

The Internet has upstaged Windows 95, one of the most anticipated products in the history of the computer industry. One indication of the magnetic power of the Internet is its ubiquity. Nary a magazine, newsletter, motion picture advertisement or television show is without some reference to the Internet.

Newspapers such as the *San Jose Mercury News* have started running 3,000 word articles about HTML tagging.<sup>1</sup> Few cities enjoy the demographics of San Jose, California, the solar plexus of Silicon Valley, but similar stories are popping up in smaller town newspapers like the *Louisville Courier Journal*. Inserting structured tags to provide hypertext links to GIF or JPEG files now has equal billing with sports results and foibles of local politicians.

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[1] Dan Gillmor, the computing editor, ran a how-to feature under the headline 'Building Your Own Home Page', *San Jose Mercury News*, 21 May 1995, Section F.

Not surprisingly, there is an expanding line of products aimed at the home or casual Internet publisher. These products cluster in three main groups:

- *Tagging tools.* These facilitate the insertion of HTML tags into a document or turn a standard word processing document into a Web-compliant HTML file. Although the tools vary widely in capabilities and ease of use, they are widely available. Microsoft, for example, provides without charge an HTML tagging add-in for Microsoft Word at <http://www.Microsoft.com>.
- *Image editing and conversion tools.* Low cost programs such as Hijack 95, CorelDraw and shareware programs like Graphics Workshop Pro have added features to facilitate the touch up and conversion of bit map images to browser formats. A quick review of image editing files at one of the repositories for Macintosh or Windows software reveals more than 200 programs that can handle the basics of producing 72 dot per inch images in one of the format supported by HTML.
- *Non-text preparation tools.* A surge in software to allow the incorporation of audio, video, animation and three-dimension objects into Web pages began in the summer of 1995 when the VocalTec software was made available on the Internet. In a matter of days, Internet users were rigging their PCs to allow real-time voice conversations between Internet users anywhere in the world.

Many of the commercial products now offered to professional Web developers began as programming projects to implement a specific function in the limited environment of HTML 1.0 and HTML 2.0. The new specification for Hypertext Markup Language (HTML3.0) supports a number of advanced functions such as tables and somewhat more sophisticated syntax that Netscape and Microsoft are extending to add new features. Working within these specifications and ever mindful of the rapid innovations included in the Netscape Communications browsing software, required fast assessment of market needs and rapid coding – attributes not found in large, slow moving software and information publishing companies.

New companies with new products have entered the market to serve the needs of serious Internet publishers. The products now available are in many instances immature, but they prove that the Internet has been one of the most powerful spurs to creativity and programming innovation since the introduction of the personal computer. The Internet has become a computing platform. Robust commercial applications will be developed for the Internet just as Lotus 1-2-3 was developed for the IBM personal computer, Pagemaker was written for the Macintosh, or collaborative white-boarding was built for the Intergraph UNIX workstation. The Internet is the new computing platform.

What does this mean in terms of software? Stated in plain words it means that all major categories of software will be reinvented for this new computing platform. Because the software available for a platform spans all application types, the software industry as we have known it will be redefined. Dominant companies such

### The basic Internet UNIX toolset .

<i>Function</i>	<i>Extension</i>	<i>Application</i>
Electronic mail	Transfer standard alpha-numeric characters, binary objects, and multimedia extensions	Provide data for multimedia messaging and basic documents for collaborative computing
Filters (perl scripts)	Monitor flows of information for specific words or phrases plus event triggers to cause specific actions to be taken by other scripts or programs	The Department of Education at the Massachusetts Institute of Technology will monitor the Internet and send via e-mail articles that match user interests
ftp (File Transfer Protocol)	File transfer functions integrated into user-friendly browsing software	Transfer functions integrated into advanced scripting and programming languages like Java from Sun Microsystems and Adobe's Portable Document format files
gopher	New programs such as Archie, Jughead and Veronica have been upgraded to provide machine-built directories	Yahoo, Lycos, WebCrawler and other search tools provide access to the various resources on the Internet
Internet Relay Chat	The packet structure has been used to support full-duplex telephone conversations	Toll free conversations in real time can be held using RealAudio, VocalTed and DigiPhone software
News	The basic LISTSERV and USENET functions now accommodate distribution to individuals, automated text processors for filtering and redistribution	The Point Communications 'What's on the Web Today?' monitors news and extracts current Web events for real time posting
Software agent	Software drives processes that visit Internet sites, updating directory information, and creating summaries of site content	The Architext Xcite service updates more than 200,000 Web listings each week using software agents
Text search	More than 60 services provide some type of text searching of Internet resources	The Lycos search engine maintains information on more than 400,000 sites and supports a natural language search statement. DejaNews provides an index to USENET archives
Tool Control Language (tcl)	Allow executable programs or specific routines	The Java programming tools allow customised real-time applications to be downloaded to a user's machine and compiled for that machine. Microsoft has developed Blackbird with somewhat related functions

. UNIX Internet servers offer most of these functions as part of the operating system, or they may be obtained from public ftp sites.

as Microsoft will have to compete in a world where a start-up like Netscape is defining standards in the new medium. Other established companies such as Oracle, which has introduced a complete range of web tools, must reshape their technologies for the new internetwork environment. If they accomplish this, they can expand their market share from relational databases to other application areas. A mis-step can cost Oracle its leadership position.

Several areas of software development warrant further investigation. These are clusters of products that provide building blocks for Internet publishing. The profiles are not exhaustive. They are intended to identify the software tools that are likely to have a significant impact on the new medium and the information delivered on it over the next 18 to 24 months.

## Page-creatingtools

The hand-crafting of Web pages is a useful learning exercise. However, once the basics of the SGML syntax upon which HTML was built have been mastered, page generation can be automated. One exception, of course, are pages designed as art objects. These will be produced by graphics experts who will employ the full array of image editing and video editing tools necessary for this type of creative expression.

Products are expanding rapidly. There are the tools that integrate several functions to automate the creation of useful, attractive Web pages.'

Microsoft Office enjoys a dominant position in the software suite market. Figures range from 75% to 90% penetration. With this commanding position, Microsoft's Internet initiative is gaining momentum.

In addition to the HTML add-in mentioned earlier in this section, Microsoft offers a suite of integrated Internet publishing tools. When the product entered beta test in late 1995, it carried the code name *Blackbird*. The purpose of the software suite is to allow anyone using Microsoft products to create an electronic document suitable for publishing on either the Microsoft Network or the Internet. The first beta release of Blackbird supported only Microsoft's browsing technology which is not compliant with that of industry leader Netscape. Subsequent builds of Blackbird have eliminated most of the inconsistencies, giving the user the ability to produce pages compliant with MSN or the HTML standard but not all of Netscape's proprietary extensions.<sup>2</sup> The tools will support such features as sending the file to a service bureau for hard copy output, a form of on-demand printing for Windows users.

The direction of office software is clear: HTML tools will be built into word processors, spreadsheets, presentation program and desktop publishing software. Examples include:

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- [1] Software for building web pages is proliferating. Tools include Best Enterprise's 'Web Weaver' (<http://www.northnet.org/best/>), Sausage Software's 'Hot Dog' ([http:// www.sausage.com](http://www.sausage.com)), and SoftQuad's HotMetal (<http://www.SQ.com>).
  - [2] Netscape has anticipated and helped influence the HTML standards. Each release of Netscape's browsers incorporate more advanced features. Netscape was an early adopter of Sun Microsystems' Java programming language, the Adobe Acrobat Portable Document Format display technology and other powerful tools for enriching Web pages.

- **FrameMaker 5.0 and Adobe PageMaker 6.0**, both owned by Adobe. These programs allow the user to create documents for print but output as standard format Web compliant pages. Because Adobe has developed a powerful variant of Postscript marketed as Acrobat, users of **FrameMaker** and **Pagemaker** can create standard HTML pages as well as pages in the Acrobat format.’
- **Quark Express**. Quark is the standard for magazine publishing and design-intensive books. Quark now includes add-ins and new functions to allow designers and creators to output HTML compliant pages from a standard Quark document. One extension to Quark allows a designer to create a standard magazine page and include still images. The designer can then link the frame to digitised video. When the document prints, the standard image occupies the frame. When the document is saved in HTML format, the image becomes a hot link to the digitised video. The viewer of the Web page can, with a mouse click, view the video running in the Quark document.\*
- **Electronic Book Technologies**. Publishers using EBT’s SGML-compliant CD-ROM publishing software can output an HTML-compliant page from the EBT software. Once a text or multimedia CD-ROM has been created, the publisher can recompose the CD-ROM for Web publishing. Similar functions have been added to the Interleaf publishing software.<sup>3</sup> Other high-end publishing software also incorporates similar HTML functionality.

In summary, the HTML format has become a standard file output format. Industry-standard software can generate Web compliant documents with little or no additional tagging or document manipulation.

## **Java: write one program, run it everywhere**

Sun Microsystems’ executives use in public a phrase attributed to founder Scott McNeely: “The network is the computer”. What their product literature reveals is that about two-thirds of the Internet sites run on Sun hardware. Sun’s hardware and software were designed from the ground up to be Internet-ready. Aggressive

- [1] The Portable Document Format requires that the user view the file with special software called Acrobat Reader. Now built into Netscape’s browser, Reader allows hypertext links within a document, search-and-jump capabilities and precise rendering of the page in the exact format of the original. An added benefit of the Acrobat format is that it is less easy to extract and re-use the contents of a Portable Document Format file than standard HTML ASCII text. Acrobat offers creators an edge in protecting the fidelity of their intellectual creation. Adobe acquired the fully-graphical HTML page generator for the Macintosh, PageMill. Its technology will be integrated into other Adobe products.
- [2] Quark files can also be converted to the Adobe Portable Document Format file with the use of the Adobe Distiller software.
- [3] Interleaf has also introduced an object-oriented database management tool to permit extraction and manipulation of structured data stored in the Access software.

innovation has allowed Sun to keep comparatively high prices because it offered a combination of hardware and software that provided research and academic computing centres with reasonable performance, connectivity and price. Java offers a new software paradigm.

Sun was also one of the first companies to introduce a plug-and-play Internet security package. For about \$8,000, a Sun reseller would install Netra, a specialised version of the basic SPARC workstation, configure the software and plug in the device. Within a matter of hours, a Sun server would be connected to the Internet with password control, special intruder alert routines and software management tools.

Less visible is the rapid development in software used to create robust Web sites. The Java language, developed by Sun Microsystems, represents the invention of a set of tools to permit stand-alone applications to be created by a programmer with a working knowledge of C. There are far more C programmers available than perl specialists. As a result, Java gives more programmers a way to get in the business of cashing in on the lucrative World Wide Web site building business; it is an extension and codification of a number of esoteric tools that have been available for UNIX site administrators for several years. Java is a tool control language as well as an application development language; Java sites can take action. To illustrate: a user comes to a Web site that is programmed in Java. The user clicks on a graphic that requires a file viewer that the user does not have installed on his computer. Java routines will acknowledge the absence of this tool, download it to the user's computer and compile the viewer so the graphic can be displayed. The user sees the graphic but does not know the intelligence behind the scenes. This functionality requires the use of Hot Java, a browser incorporating the Java technology. <sup>1</sup>

In summary, Java is revolutionary for the following reasons:

- It provides validation for programming languages such as Telescript, Frontier and others that network-based applications envisage needing in the future of computing.
- The functionality of HTML can be extended without embracing the architecture of SGML in totality. The browsing environment supports a new type of structured document innovation that is related, but the browser-based paradigm permits developers to move far beyond the SGML model because the learning curve for Java is shorter.

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[1] Netscape has licensed the Java and Hot Java technology for incorporation into the Netscape browser and web server software. The companies have announced plans to merge Netscape's LiveScript with Java. Companies licensing Java include Apple, Hewlett Packard, Oracle and Sybase.

- Interactivity can be shaped by the developer to meet the needs of the specific Web application. There are no conceptual or structural barriers imposed by a programming language other than its robustness and the cleverness of the programmer.
- Java is a network applications development tool. Users do not have to worry about being able to use Java-enabled functions. The downloading of code, compilation of an executable for the user's machine and presentation of the programmed environment are handled without user intervention.
- Java creates an option for software developers who had to pick a platform and develop for the market served by that platform. Java allows a developer to create a platform-independent application, thus increasing marketing opportunities without the cost and time required to rewrite traditional code for other platforms.

In short, Java represents a turning point in computing. Applications on the local PC will persist, but new applications that thrive in the inter-networked environment will become more widely available. The dominant companies in what amounts to a new applications platform are likely to be upstarts and newcomers who can respond rapidly to the new market opportunities.

## Drag-and-drop software

Typical of such do-it-yourself kits is CompuServe's *Home Page Wizard* (HPWIZ). Made available (free download to subscribers) in late November 1995, the software allows CompuServe customers to build their own Web sites and to post them to CompuServe's web server. HPWIZ allows novices to create their own multipage Web documents offline on their PCs using a simple drag-and-drop interface. No knowledge of HTML is assumed or needed, since the necessary codes are generated 'invisibly' within the program. Via a toolbar at the top of the window, HPWIZ lets the user grab iconic representations of basic Web-page elements and place them on a blank page or into a ready-made HPWIZ template. Headlines, text, horizontal lines, GIF, JPEG and PNG-format images, and hot links to 'internal' pages, an e-mail message form, as well as 'external' pages, can be dropped and moved around on the display. A 'test' button can then launch the user's local browser on the local PC for a real-time emulation of how the pages will look when hanging in cyberspace. Tweak, modify, re-test; then the pages are ready to become the proud owner's real, live personal Web site, accessible globally to anyone with access to the World Wide Web.

What is especially notable with the above software is the fact that, even nine months before, to duplicate what our CompuServe novice can now do would have taken either a considerable amount of skill and *HTML* knowledge, or the expenditure of a few thousand dollars in contracting out the Web site design and make-to-work to a specialist company.

NaviSoft, now a unit of America Online, also offers software that facilitates network publishing. The company provides authoring tools for creating World Wide Web pages and a Web server. The authoring tool, NaviPress, lets the user create content for the NaviServer's Web pages and view it. Most authoring tools, including the popular Hot Metal Pro from SGML-specialist SoftQuad, require that a browser program be launched in order to view the Web pages. NaviPress integrates these functions.

The NaviPress authoring tool can display the links among Web pages in graphic or list form. The suite of software tools allows a Web developer to create pages, verify links and integrate them into an Internet site.

The NaviServer includes standard server functionality for Windows NT and UNIX platforms. The software includes code to pass usage data directly to a database. The database module can be used to extract information from an SQL database. NaviSoft bundles a version of the powerful object-oriented Illustra database engine with its product.' The NaviServer lets site administrators impose password security on individual Web pages. The price for the NaviPress is about \$100. The NaviServer software is \$1,500 for Windows NT and \$5,000 for UNIX

For personal computer users, database tools that permit the manipulation of text and other objects containing audio, image and video objects are entering the market. The new release of Paradox, version 7.0, provides the user with more flexibility in accessing and manipulating binary large objects. The scripting language permits the output of HTML compliant pages. The sample of HTML code presented earlier in this chapter was generated using Paradox's PAL language. Software intended for network deployment is also finding its way to the desktop.

One example is Spider 1.5, a software that enables users to make a client-server database web-accessible.\* Spider software simplifies Web access to Oracle, Sybase and Informix databases. (A more detailed discussion of the Oracle network DBMS technology appears in the following chapter of this Briefing.)

## Live audio

This software category for most users did not exist in January 1995. Commercial applications range from a new type of radio advertising to the pay-for and play of sporting and cultural events. Within the span of one year, audio and video have become the hottest sector in software tool development. Most of the products have

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- [1] The Illustra DBMS is an example of a new class of database software that facilitates Internet publishing. Illustra supports SQL queries. It can manage massive files of digitised video. There is no practical limit as to the number or size of video objects the database can manipulate. However, the video capable version of Illustra runs at the time of this writing on Silicon Graphics servers. Onyx and Challenger class machines are recommended for Internet video applications. Information about Illustra and a demonstration of the DBMS tool can be located at <http://www.illustra.com>.
- [2] The Spider technology is available at <http://www.w3spider.com>

been designed to operate under Windows NT 3.x or Windows 95 and support Internet publishing as one of their primary functions.

The trend in delivery of audio falls into two distinct categories: real-time audio for telephony and other collaborative purposes, and broadcasts of programmes in either real time or as files for local storage and use at a user-defined time.'

Several companies are driving Internet telephony forward, The leader is VocalTec with sales offices in New Jersey and headquarters in Israel. VocalTec software allows a PC user to conduct real-time telephone conversations via the Internet. The only proviso is that both users must have the VocalTec software running on their multimedia PCs and a 28.8 Kb/s or better connection being used. If the VocalTec software is run with a standard sound card, the effect is akin to talking over a standard two-way radio. However, if two sound cards are installed in the PC, the software supports full duplex conversation; that is, like the conversation held over a standard telephone.

Other companies are competing in this fast-growing sector. They are DigiPhone and Quarterdeck, the developers of the QEMM memory management product. Both firms want to make the telephony experience easier to use than VocalTec. Quarterdeck will bundle its telephony software into its suite of Internet utilities. The telephone conversation can be activated from within the Quarterdeck browsing software. DigiPhone has formed numerous alliances and is one of the firms attempting to create a telephone appliance that non-PC owners can use to place calls via the Internet. Internet telephony eliminates the long distance charges and has the potential to have a significant impact on the long distance telecommunication industry.

The firm Real Audio introduced software that brought live radio broadcasts to the Internet. The previous audio technology required that the user download an audio file and then play the file on the PC. The early O'Reilly & Associates' radio feature 'Geek of the Week' used this technology. Real Audio users click on the icon of the show in which they are interested and the programme begins playing immediately. A number of Real Audio sites have flowered, including programmes broadcast on public radio stations in America. Live broadcasts using the Real Audio technology have been held of athletic events and commercial radio programmes. The enhancements and development of functions in this software sector complement the hunger for audio via the Internet and set the stage for real video. <sup>2</sup>

To complement the developments in audio, upgrades to electronic mail packages and Lotus Notes now support the attachment of sound and other objects. Audio is emerging as a standard means of communication via the Internet. Rapid innovation

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[1] Other audio technology is available from VocalTec (<http://www.vocaltec.com>) and from The Internet Telephone Co (<http://www.itelco.com>)

[2] The list of sites featuring audio is extensive. Consult <http://www.realaudio.com> and <http://www.musicbox.com> for links to audio-enabled sites.

is under way in such areas as multi-party conversations, collaborative conversations with shared workspaces in which participants mark up the same 'document', and enhanced audio fidelity for audio objects. Hundreds of audio file converters and sound editors are available as shareware or freeware. Windows 95 comes bundled with sound applets to facilitate audio object use and manipulation.

The rapid integration of authoring and database technology in these software products underlines the emergence of a tool infrastructure for network publishing. Within a span of 12 months, Internet sites have moved from the arcane world of UNIX, dependent upon C and perl, to a far more accessible point-and-click world. The new tools make the development of richer, more complex and dynamic sites easier. Internet sites adopting newer network publishing technologies will be able to offer more attractive sites that will be easier and less expensive to create and maintain.

### **3-D and VRML**

A game-like environment for online users is not enough. The future lies in interactive objects in realistic environments. Users want to immerse themselves in full colour, realistic environments. Commercial applications include presentation of products in 3D, distribution of decorative materials such as wallpaper for architectural tendering, and test drives of vehicles. The first Internet tool that brings three dimensional graphics to the average computer user's desktop is the Virtual Reality Modelling Language or VRML. VRML's official birthday was October 1994.

VRML is a language for describing multi-participant interactive simulations – virtual worlds networked via the global Internet and hyperlinked with the World Wide Web. All aspects of virtual world display, interaction and inter-networking can be specified using VRML. It is the intention of its designers that VRML become the standard language for interactive simulation within the World Wide Web.

The first version of VRML allowed for the creation of virtual worlds with limited interactive behaviour. These worlds can contain objects which have hyperlinks to other worlds, HTML documents or other valid multimedia enhanced messages. When the user selects an object with a hyperlink, the appropriate viewer is launched.

When the user selects a link to a VRML document from within a correctly configured WWW browser, a VRML viewer is launched. Thus VRML viewers are the perfect companion applications to standard WWW browsers for navigating and visualising the Web. Future versions of VRML will allow for richer behaviour, including animations, motion physics and real-time multi-user interaction.

VRML was conceived in the spring of 1994 at the first annual World Wide Web Conference in Geneva, Switzerland. Tim Berners-Lee and Dave Raggett organised a Birds-of-a-Feather (BOF) session to discuss Virtual Reality interfaces to the World Wide Web. Several BOF attendees described projects already underway to build three dimensional graphical visualisation tools which inter-operate with the Web. Attendees agreed on the need for these tools to have a common language for specifying 3D scene description and WWW hyperlinks – an analogue of HTML for

virtual reality. The term Virtual Reality Markup Language (VRML) was coined and the group resolved to begin specification work after the conference. The word 'Markup' was later changed to 'Modelling' to reflect the graphical nature of VRML

Shortly after the Geneva BOF session, the www-vrml mailing list was created to discuss the development of a specification for the first version of VRML. The response to the list invitation was overwhelming: within a week, there were over a thousand members. After an initial settling-in period, list moderator Mark Pesce of Labyrinth Group announced his intention to have a draft version of the specification ready by the WWW Fall 1994 conference, a mere five months away. There was general agreement on the list that, while this schedule was aggressive, it was achievable provided that the requirements for the first version were not too ambitious and that VRML could be adapted from an existing solution. The list quickly agreed upon a set of requirements for the first version and began a search for technologies which could be adapted to fit the needs of VRML<sup>1</sup>

The search for existing technologies turned up a several worthwhile candidates. After much deliberation, the list came to a consensus: the Open Inventor ASCII File Format from Silicon Graphics. The Inventor File Format supports complete descriptions of 3D scenes with polygonally rendered objects, lighting, materials, ambient properties and realism effects. A subset of the Inventor File Format, with extensions to support networking, forms the basis of VRML. Gavin Bell of Silicon Graphics has adapted the Inventor File Format for VRML, with design input from the mailing list. SGI has publicly stated that the file format is available for use in the open market and has contributed a file format parser into the public domain to bootstrap VRML viewer development.<sup>2</sup>

Silicon Graphics has been a leader in three dimensional software. One of its technology demonstrations is a kitchen planner. The site allows the user to create a custom kitchen by selecting from a database of parts. The parts models can be viewed individually, along with prices and other information. When the user is ready, he or she can view a VRML model of the customised kitchen, along with an itemised list of the parts selected. The kitchen planner is an attempt to show how the integration of VRML and database technology can allow businesses to provide products and services on the World Wide Web. Aerial has created Serch, a database of links to multimedia sites, especially VRML URLs. Serch can be accessed through a standard WWW browser, or a VRML browser in Virtual Reality. Apple Computer introduced a virtual reality software tool aimed at its Macintosh customers.

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- [1] VRML information is becoming more widely available. Consult Mark Pesce's site: <http://hypersearch.com/~mpesce/> and the VRML Forum at <http://vrml.wired.com>.
- [2] For more information visit <http://vrml.wired.com/vrml.tech/> and [http://www.sgi.com/ion/Spring\\_95/vrml.ezine.3.95.html](http://www.sgi.com/ion/Spring_95/vrml.ezine.3.95.html).

## Video on the Net

An almost irresistible force in the Internet is for live video. It is a natural complement to words and sound. Video is a challenge because of the size of the files. A single second of uncompressed video can easily exceed 30 megabytes of data. Compression is necessary to transfer even brief video segments. For users, the decompression and display of video files requires a powerful personal computer with sufficient memory and a fast video display card.

The number of video software tools available is substantial. One of the best known is CuCme. Many of the products are aimed at the professional videographer who must work with video files for motion picture, video game or training purposes. An Avid digital video editing suite costs hundreds of thousands of dollars when fully equipped for professional editing.

The low-end software and hardware have been plagued with incompatibilities with various operating systems and with instability. Within the last year, products for Macintosh and Windows have matured and provide individuals and small businesses with the tools needed to integrate digital video into CD-ROMs and specialised applications such as stand-alone PCs running demonstrations at trade shows.

VDOLive is a new technology platform for broadcasting and narrow casting of motion video over distributed networks. The VDOLive compression technology enables motion video on the Internet due to its ability to compresses video images so they fit into the many small 'pipes' that make up much of the Internet. It is also able to accommodate the complexities of the Internet communications environment.

VDOLive is based on two core technologies. The first is a wavelet compression algorithm that not only can compress video effectively enough to run over the small bandwidth portions of the Internet, but also allows the quality of the video to increase with the size and quality of the connection at the other end. The second core technology at the heart of VDOLive is a communications protocol which maintains the integrity of the video as it makes its way through the complex Internet.

The relative benefit of these combined technologies is that VDOLive motion video will be able to run in real time at 10 to 15 frames per second with a 28.8 Kb/s modem and will enable a whole series of desktop video broadcasting applications. The technology has been a crowd pleaser whenever it is put through its paces. VDOLive will also benefit high-tech marketers, since online product demonstrations, video-rich customer service information and interactive information kits all become possible.

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[1] White Pine Software now owns this product (<http://www.wpine.com>). Xing Technology Corp (<http://www.xing.com>) and VDOLive (<http://www.vdolive.com>) also offer interesting technology.

A dip into the archives of InfoSeek, Lycos, Yahoo and Xcite reveals that one of the main applications of live video on the Internet is 'adult' material. One of the most heavily used sites for real time video technology allows Internet users to conduct videoconferencing in the nude. Despite the promise of live video, some of the early applications of this important technology is Internet users' lowest common denominators.

A richer video future is on the horizon. Among the video-enabled sites are broadcasts from the Sony VISA site. An video-rich site featuring motor sports is under development. Hundreds of sites feature digitised video. Within 12 to 24 months, a range of video objects will be available to Internet users. The applications of video for Intranet applications are even more promising. Education and training will benefit from digitised video delivered via the Internet. The blend of the computer and video technology inaugurates the era of cybercasting.<sup>1</sup>

## Outlook

These snapshots of innovation do not exhaust the new categories of software spawned by the Internet and the need to publish on the network. The staggering fact is that virtually none of the products cited in this chapter existed when *Internet 2000: The Path to the Total Network* was completed in early 1994.<sup>2</sup> More than the number of people jumping on the Internet bandwagon, it is the fecundity of innovation that marks a computing development as significant as the invention of the personal computer or Lotus 1-2-3.

What vectors of change have been launched by this explosion of creativity? Just one: tools to build new applications. The proliferation of low-cost tools to build complete electronic, interactive, multi-object sites is equivalent to giving creative people a new medium. The skills of the past do not go wanting; they are simply applied to the user-friendly tools needed to build the new.

Less inspired individuals may use the new tools to build replicas of old information media in the electronic medium of the datasphere. In a sense, the old given a fresh coat of paint can pass for new when the customer is not familiar with the product or finds the new presentation compelling in itself.

The vector of change launched by these tools is simply the ability to create new information constructs easily and without the costs associated with such media as print and CD-ROM. The innovators will not be segmented by age, education or geographic location. The thread uniting the exploiters of network publishing will be individuals who understand how to use the new medium effectively and what tools to use to create their vision.

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- [1] The video applications of Internet technology will help offset the slowing expansion of the present web mania. The TV-consuming segment of Internet and intranet applications will emerge as a major revenue-generating business sector by the year 2000.
- [2] Stephen E. Arnold and Erik S. Arnold, *Internet 2000: The Path to the Total Network* (Infonortics, Calne, Wiltshire, 1994).

It is not clear how long the Internet's spring of creativity will flow.<sup>1</sup> The growth curve must flatten. What can never be undone is the demonstration that wide access to low-cost electronic communications creates a self-fulfilling or recursive environment. The flow of information creates needs for tools to manage the information itself. Once managed, new information constructs become possible and needs emerge. The peculiar characteristic of electronic information breeding new information drives innovation itself. It is unlikely that the 200 years that elapsed between the invention of movable type and the first newspaper will be repeated in the network publishing world. Innovation will gain momentum and the organic nature of the datasphere or cyberspace will create new products, a new rhetoric and a new syntax of information.

The impact of driving advanced electronic publishing technology into homes, small businesses, and individual users anywhere in the world, will be significant. We will explore the ramifications of putting industrial-strength network publishing tools in the hands of millions of computer users in another chapter. Our focus here has been upon somewhat less grandiose software tools. But despite their lack of glamour, there are significant developments in 'enabling software' that make it possible to sustain for the next two to three years, the new medium that has exploded into computer users' consciousness.

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[1] There may be a slowing of certain types of Internet activity. It is unlikely that the software tool category will suffer a significant shakeout for nine to 18 months. Consolidation is likely to appear in the service provider segment, not the software segment of the Internet / intranet industry.