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DICTIONARY OF MULTIMEDIA AND INTERNET APPLICATIONS

A Guide for Developers and Users

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FRANCIS BOTTO

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PREFACE

'Thinking is a function of man's immortal soul. God has given an immortal soul to every man and woman, but not to any other animals, or to machines, hence no animal or machine can think. I am unable to accept any part of this.'
Alan Mathison Turing
Computing Machinery and Intelligence (1950 MIND paper)

The most significant paradigm shift since Caxton's printing press, the Internet and its surrounding technologies advance relentlessly. The Internet is augmenting humanity's intellect as surely as its founding fathers, among them Vannevar Bush, predicted that it would.

The Internet is quite literally expediting evolution, echoing the impact of the most primitive tools and media. At the same time, its advancing technological infrastructure provides improved global communications and the foundations upon which to build future interactive media.

Rapidly evolving from specialist markets to the mass market, the Internet has ceased to be a preserve of the upper strata of society. Rather, it has affected everyone, and has cut like a sabre through market boundaries.

A global network of computer networks, the Internet is synonymous with marketing, advertising, publishing, electronic commerce, software distribution, real-time communications, and radio and television broadcasting.

The emergence of the World Wide Web in the early 1990s added hypertext-based navigation to the *global network*, and was a catalyst for growth. Now offering multimedia playback of video, graphics and sound, the evolving Web is a universal medium.

Day-to-day Internet applications include e-mail, information browsing and file transfer. Increasingly, electronic commerce, low-cost Internet telephony and videoconferencing are entering into mainstream computing habits.

The Internet and multimedia are now standard features of modernity, and are used as widely in the home as they are at work. The growing global dependence on the Internet has created lucrative markets for all Internet-related industries. These include telecommunications, Internet service providers (ISPs), Internet application development, PC manufacturers,

software publishing etc.. Almost every possible industry could be listed, as it is difficult to cite one that is untouched by the Internet.

The Internet has become a ubiquitous word, as has its synonym, information superhighway. Earlier labels such as Infobahn and Global network may now be consigned to history. Call it what you will, knowledge of the Internet is an essential prerequisite within many professions and for studying at school, college or university.

This dictionary provides detailed explanations of important Internet-related terms and phrases. Also included are the significant attributes of defined technologies, so presenting decision-makers with factors that must be considered. The more important entries are explained concisely and then elaborated upon through detailed articles.

It is hoped that you find this book a useful source of information.

USING THIS DICTIONARY

An asterisk following a cross-reference (e.g. Java*) indicates that there are many cross-references beginning with the term preceding the asterisk, some or all of which are likely to be useful sources of further information.

Most software applications appear under the name of their manufacturer. A few major applications appear under their own names (e.g. Windows and Visual Basic).

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INTRODUCTION

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(1950 MIND paper)

The spontaneity with which the Internet has drilled down through the strata of society has yielded stories of success and stories of failure. For many enterprises, timely investment in the technology has driven higher profits, growing workforces and improved competitiveness in markets both at home and abroad. Those that ignored it, invested incorrectly or mistimed their investment may tell of success stories, but the informed will know otherwise.

The Internet, like many new and emerging technologies, is the venture capitalist's dream. Numerous Internet-related startups with minimal revenues have taken that well-worn path to becoming successful public companies in what seems like a fleeting moment.

Opportunities to invest in the Internet and to create startups remain. These are driven by the continual launch of new and improved associated technologies, while government intervention also plays a role. Growth is also significant; one current estimate indicates that the number of Web servers doubles every 55 days, and a new Web site appears every five seconds.

Advancements in the Internet see faster digital networks, growing use of more efficient internationally agreed protocols, an increasing variety of access technologies including those that are wireless, and client systems and appliances that help harness the Web to better effect.

New protocols can be designed for modern high-speed data pathways that are less susceptible to error. They can therefore be devoid of the demanding

error detection and correction schemes that were prevalent in established protocols for earlier packet switched networks.

Similarly, access technologies advance in terms of specification and variety. Users may choose between conventional analogue modems, ISDN, cable, ADSL and wireless technologies such as GSM and Direct Broadcast Satellite (DBS).

Increasingly sophisticated client systems include personal digital assistants (PDAs), palmtop and notebook systems, desktop PCs, Apple Macintosh systems, RISC workstations, network computers (NCs), and Internet access appliances for the home.

Client software, such as Web browsers, and the underlying component architectures also advance. The addition of such software components as ActiveX controls and plug-ins yields such functionality gains as the playback of audio-visual broadcasts from streaming media sites, which form one of the many focuses of this text.

Equally, the Java Virtual Machine (JVM), a software processor, enables browsers to interpret Java applets. Such components may integrate both dynamic and static features into Web applications and distribute processing to the client.

Glues are the fabric of such modern distributed processing and of component architectures such as JavaBeans, ActiveX, OLE and OpenDoc. Low- and high-level glues include protocols like IP and HTTP, respectively. Glues also include schemes for inter-component communications and interactions, enabling them to transmit and receive messages over local and remote paths.

Client-side operating systems are also significant, with Microsoft Windows variants advancing at a pace which (understandably) lags behind that of the underlying processor technology. Logically, the next significant advancement of Windows will be the introduction of a 64 bit implementation.

Of the many component parts that drive client system performance, processors are perhaps the most important; and Intel PC processors, as well as equivalent processors from competing vendors such as AMD, are most important of all.

The inclusion of Intel's MMX multimedia technology within processor architectures sees improved delivery of multimedia, audio, video, 2D/3D animations, and speech recognition. Processor clock speeds also advance relentlessly, but the most significant quantum leap is the emergence of seventh generation Intel processors. This sees the introduction of affordable 64 bit processor architectures, which will outperform today's fifth and sixth generation processors by considerable margins.

Similarly, the active Web model is seeing heightened levels of server-side processing, and advancing server hardware architectures, which are moving

toward symmetric multiprocessing (SMP), non-uniform memory architectures (NUMA), and even massively parallel processing (MPP).

Such improved server-side architectures might in future make feasible the idea of users purchasing remote processing. This may become as common as buying server-side hard disk space for personal Web pages/sites or files, or paying that little extra for an improved mail gateway through which to send larger file attachments. The user may simply buy MIPS or FLOPS from a as easily as megabytes or gigabytes are bought today.

Such a paradigm might see acquired applications or objects running remotely and possibly locally through applets. Software publishers, distributors and perhaps dealers would not require removable distribution media such as DVD, CD-ROM or floppy disk; rather, applications could simply be written directly to host sites using FTP or a similar future protocol. Users may have their entire application library and associated files stored remotely, as might be their book libraries and their video, music and photograph collections.

The geographical location of users' acquired objects, processing and files won't matter; they may be spread across the continents, and in cities such as London, New York, Tokyo and Peking.

The partial displacement of processing, application logic and data from the client side yields an opportunity to design and manufacture unobtrusive client systems. The degree of unobtrusiveness is naturally a function of time, et cetera.

At the same time, levels of miniaturisation at the processing site become less significant; such a scenario sees compactness of design relegated to levels associated with that of mainframe computer design and manufacture.

The emergence of such remote processing hinges on the speed of two data paths: the first is that between the client processor and its memory and mass storage devices; the second is that of the access technology itself. The former offers a bandwidth many orders of magnitude wider than the latter.

Developments in recent years indicate that the gulf that separates the two is widening, but this might not always be the case, as is highlighted by Internet 2 and the forthcoming Internet 3. Incremental improvements in access technologies could yield such a Web model, particularly when considering OO systems, distributed computing and MPP architectures.

As the hardware infrastructure develops in momentous leaps and bounds, it is left to operating systems, programming languages, development tools and even programming models to do the same. The gradual shift to improved concurrency and MPP brings parallel programming closer to the mainstream.

Solid evidence of this is provided by the Java concurrent programming language. This is the first general purpose (and successful) programming

language to integrate such a facet, which came to prominence through earlier concurrent programming languages, most notably Occam.

The parallel programming model and associated MPP architectures are perceived by many as the Holy Grail of computing, and a paradigm shift more significant than the first generation of programming languages. If some of the world's greatest computer scientists are correct, these will unlock artificial intelligence and drive a plethora of new technology paradigms, many of which have been visualised conceptually but have yet to be realised.

In essence, developers of all sorts will be presented with a more persuasive medium within which to work, and one that will be considerably more empowering for the end user.