Emerging Technologies and the Messaging Market

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As electronic messaging becomes an increasingly common means of communication, users are placing new demands on messaging products and services. New technologies promise innovative solutions to meet these customer expectations. The papers in this issue explore some of the emerging technological advances in the messaging arena. Areas addressed include messaging security, wireless messaging, international messaging standards, and illustrations of technological innovations applied in an AT&T messaging product, Definity® PBX Audix® voice-mail system, and AT&T Message Service.

Introduction

Revenues generated in the United States from electronic messaging products and services are expected to double from $4.8 billion in 1991 to $11.4 billion in 1996. This growth is phenomenal, considering that most electronic messaging applications barely existed two decades ago. The types of messaging applications dominating the marketplace vary as a function of specific customer segments. Most people in the business market are now comfortably using both electronic mail and call-answering voice-mail applications.

Large businesses, in particular, are expanding their use of more sophisticated messaging technologies, especially those provided by electronic data interchange, and fax store-and-forward applications. Mobile professionals, similar to their office-bound counterparts, use a vast array of electronic messaging services—but show a predictably strong desire for wireless data services.

The residential market, still relatively untapped with respect to emerging technologies, has a large, expanding base of telephone answering devices to receive voice messages. Additionally, some residential customers, seeking an alternative to answering machines, recently have begun to subscribe to network-based voice-mail services that help to complete calls when the called party is either busy or doesn't answer.

Within the next five years, market forecasters predict that the highest growth rates for messaging applications will occur for information services and wireless data services, and the highest expansion rates among customer segments will occur for highly mobile, internationally based workers and professionals.

As the use of electronic messaging applications expands, the technologies that support them will have to meet a growing list of customer needs. Across all customer segments, one finds a strong desire for integration—a single, logical place for accessing and retrieving voice, text, fax, and, in the future, video messages. Business customers, already exposed to the confusion and frustration caused by inconsistencies in user interfaces, communication protocols, addressing syntaxes, and service features, regard as essential the integration of messaging products and services. In addition, residential customers and mobile professionals want to eliminate the clutter and cumbersome burden of lugging around multiple communication devices, such as pagers, cellular phones, laptops, and personal communicators.

Integration can come at a high price. It increases the complexity of the user interface and adds to the development costs to seamlessly tie together often diverse architectures, formats, and protocols. Customers across most market segments show a strong intolerance for accepting this price. Instead, they want applications that are easy to use,

Panel 1. Acronyms Used in This Paper

ASN.1 — Abstract syntax notation one
CCITT — International Telephone and Telegraph Consultative Committee
MHS — Message-handling service
OSI — Open systems interconnection
PBX — Private branch exchange

and, perhaps due to the plethora of alternative technologies available, they are extremely sensitive to high-priced solutions. If they are to succeed, new technologies, such as pen-based messaging, must be as inexpensive and simple to use as picking up a phone and leaving a message on an answering device.

Another customer requirement that appears to be growing increasingly important focuses on the blurring distinction people are making between "real time," immediate conversation and the more deferred mode of communication provided by store-and-forward applications. In increasing numbers, customers report they want simultaneous access to real-time and store-and-forward communication channels. They also want full control over deciding which communication mode to use.

Perhaps not surprisingly, all customer segments report that—independent of the messaging service they subscribe to, or the messaging devices they use—they want to be able to communicate with anyone, anywhere, unrestricted by geographical boundaries or the particular equipment or service used by the recipient. In a word, the ubiquity present in telephony communications must be emulated in the messaging arena.

One final need, now being addressed by the legal and regulatory communities, concerns the security and privacy associated with messaging communications. Electronic messaging applications, so far, have been unable to emulate the security and simplicity offered by the sealed envelope that protects paper-based communications.

Overview of This Issue

AT&T currently offers a broad array of messaging products and services. AT&T Bell Laboratories, working in concert with the AT&T business units and, in some cases, external partners, is developing the technologies that will enable AT&T to meet the future needs of customers with a highly competitive set of messaging products and services. The papers in this issue examine some of the evolving technologies that will have a positive impact on AT&T's share of the messaging market.

Messaging Security. D'Angelo et al.[1] look at the requirements for security controls within the messaging domain and the technical innovations being designed to address them. They contrast these requirements with those generated from paper-based messaging and transaction systems, and delve into security services associated with identification, authentication, integrity, nonrepudiation, confidentiality, and availability. This paper provides an overview of the technologies designed to protect electronic messaging systems, such as cryptographic systems, smart cards, and trusted systems.

Messaging Standards. Griesmer and Jesmajian[2] provide a review of existing and future international standards that will affect ubiquitous communications across messaging systems. In particular, they present a comprehensive overview of both the CCITT X.400 messaging standards and the widely deployed Internet standards. They discuss the architectures supported by these standards, their evolutionary status, and their possible convergence on critical issues, such as addressing and security. This paper also contains a brief overview of potential areas of future standardization, including "smart" messaging protocols, mail-enabled application protocols, and standards that allow for the integration of paging systems with a larger set of messaging-based applications.

Wireless Messaging. Rattray[3] offers a view of how advances in a diverse set of technologies, such as chip manufacturing, cellular telephony, advanced antenna design, and digital signal processing power, have combined to stimulate the growth of a broad array of new wireless messaging products and services. He addresses AT&T's role in developing these technologies and provides a high-level survey of wireless applications designed to meet the needs of the expanding market segment of mobile workers. This paper highlights the four basic components contained in an end-to-end model of wireless messaging—the devices, access services, backbone transport network, and applications supported by these elements.

Audix® System. Breslin and Marinelli[4] describe the service enhancements and hardware-design upgrades that put the Definity® Audix voice-mail systems on the leading edge of globally deployed multimedia systems. Especially intriguing is the description of how these advancements resulted in a feature-rich product

that is well below the cost of competitive voice-mail systems. In particular, the paper focuses on the integration of Audix with the Definity private branch exchange (PBX) switch, enhancements to its reliability and manufacturability, and improvements in user-perceivable features, such as the quality of voice recordings and support of a multilingual user interface.

AT&T Messaging Service. Benimoff et al.[5] present a comprehensive overview of the first enhanced voice-messaging service, AT&T Message Service, offered by AT&T. This innovative service allows originators to choose whether their voice-based communications occur in an immediate, "real" time frame, or in a deferred store-and-forward mode. This paper describes the architectural components and key end-user features of this service. The human factors concerns that helped shape its design are highlighted. Particular attention is placed on the billing system, a complex development component that presented a set of unique challenges to the AT&T Message Service project and resulted in one of its most successful service elements.

ASN.1. Finally, Mitra[6] provides an overview of the extensive modifications to the abstract syntax notation one (ASN.1), used to specify application-layer protocols for open systems interconnection (OSI) applications, such as message-handling services (MHS). MHS is now being rewritten to reflect this new notation, making it important for designers and those who implement the messaging standard to understand the new specification.

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