Electronic message system as a function in the integrated electronic office

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INTRODUCTION

The fully integrated electronic office is composed of six fundamental elements, or functions:

- Dispersed Data Processing
- Communications Management
- Word Processing
- Electronic Message System
- Individual Computing
- Information Storage and Retrieval

In order to evaluate trends in what some industry people call “electronic mail” it is necessary to first define each of the functions of the evolving electronic office, of which handling internal messages is only one factor. For too long we have approached problems in the office on a piecemeal basis, i.e., solving problems one at a time, and independently of the other.

Technology is furnishing totally new concepts for problem solving and we see a rise in thinking at a systems level, rather than thinking in terms of independent machines or functions.

Dispersed data processing

In its simplest form, dispersed data processing is hardware and software that allow the local user, no matter what his organizational level, to program his own machine. That is the key: He can program his own machine. This then implies that the user is free from the traditional centralized host processing environment. Yet, even with that freedom he maintains the ability to communicate with other computers. The dispersed computer can operate—besides as a stand-alone machine—as part of an integral network as a host to even smaller dispersed equipment and terminals.

An important factor, the software technology—the ability to have an easy-to-use, programmable system—is a key element in labeling a product as a distributed processing product. The distribution of dispersed processing equipment and its utility in the electronic office can be either functional or geographic. Communications, therefore, is a necessary integral part of distributed processing and office functions.

Traditionally, the functions of early dispersed data processing were primarily (1) intelligent data entry or the very efficient single-point of entry data capture; (2) batch processing of that data and the preparation of local reports; (3) shared processor, the clustered terminal approach or business time sharing; and (4) interactive processing. Of course, (5) stand-alone processing includes both telecom to the host or stand-alone without telecom to the host. As we move to advanced dispersed data processing, we are using a general purpose computer that does all of the above principally through software changes.

Dispersed data processing has provided us with these small in size, but powerful, computers. We can apply the same techniques used in DDP multi-function systems.

IBM has recognized that dispersed or distributed processing is important in the commercial end-user environment and has endorsed the concept. So every other manufacturer of small computers is making a valid attempt to relate his product line to this environment to handle office functions.

Communications management

Over the years, most large organizations have built up larger, more comprehensive telecommunications systems. These systems have grown because management realizes that good telephone communications are an essential element for the smooth functioning of their businesses. But as these systems have grown, so have the costs of telecommunications services. Higher rates, especially the frequent increases in long distance telephone rates, have raised telephone costs to one of the largest items in the corporate budget.

But while telecommunications costs have increased, the ability of management to control this expense has not kept pace. The heart of this problem is that the basic information to make intelligent management decisions is just unavailable. Telephone systems, whether telephone company-operated or privately owned, have not included features that provide information for telephone management and control.
Today, newer computer-controlled telephone systems provide many new features and services, but there is still little product innovation and far too few alternatives from the telephone company for management to take effective action to solve telecommunications problems.

The same computers that drive DDP systems can be harnessed to control voice telecommunications. Software changes leverage hardware investment into a truly multi-functional system. Management has additional new tools as additional functional concepts are developed and systems design brings more total integration.

For example, the same computer engine from a dispersed processing system powers a Long Distance Control System for control and management of outbound long-distance telephone communications. Only an intelligent switching sub-system and turn-key software are added to produce a system that requires no user programming and can be utilized with any standard PBX or Centrex telephone system, to control DDD and all types of WATS, Foreign Exchange, Tie Lines and other telephone facilities and optimize call placement. Even remote locations can be centrally controlled with the same efficiency.

In urban areas with local message-unit charges, a similar system can also handle local traffic with complete user charge-back capability, and becomes a Station Message Detail Recorder.

For incoming calls, the same engine again drives a fully-featured Automatic Call Distributor for uniform distribution of incoming calls into agent groups such as reservation or claims services, classified ad placement, order taking, etc.

With the commonality of processors, peripherals and software, these communications management and dispersed data processing applications can be handled with ease.

**Word processing**

Word processing today is generally performed either at a clerk’s desk in a compact stand-alone electronic typewriter or CRT with memory, or in a pooled location where multiple electronic typewriters or CRTs share a larger memory facility and perhaps a higher quality/speed printer.

Now, if the same general purpose computer that powers the other office functions and systems also drives the word processor, we can begin to share and exchange files and use the communications facility to handle the intra-company transfer of files, data, correspondence, messages, etc. The personnel data base can supply data on people, locations, departments to add to the communications data base for telephone numbers. With data files, word processing, and communications management we have the beginnings of handling internal mail electronically and automatically, all within the same system.

**Electronic message system**

In the fully integrated electronic office, if you have data processing, control of the telephone system for both voice and data, and word processing, then the mail or message function becomes almost a technology by-product. All the elements are there; why not implement it?

The optimum advantage this level of systems integration has is that data need be input into the system only once . . . at any one of the multi-function stations—and it becomes a resource to the total system with no further intervention. The output of any one functional part becomes the input to any and all others. All functional parts of the integrated system “talk” to all other functional parts, yet can “sign-off” and be independent at the user’s command.

**Individual computing**

Individual computing is the placing of the full power of a company’s computer and all information in its common data base at the fingertips of every executive, administrator and clerical worker in its offices, with necessary security protections, of course. This, too, is a by-product of the fully integrated electronic office.

Each individual’s work station becomes his personal access to the system for sending and receiving messages, researching and evaluating data, and a myriad of other systems functions.

**Information storage and retrieval**

Information storage and retrieval is inherently part of all the other functions of the fully integrated electronic office. This function manages the files and serves as the intelligent library resource for the entire system.

**Utopian?**

Perhaps all this discussion of the logical way the electronic office can be assembled sounds utopian. It is not. This system exists in its fully integrated form and its unique architecture has been proven over years of research, development and in-place commercial use.

The technology and architecture that permits full integration of disparate functions into a common system is called attached processing. Attached processing offers as its basic premise the idea that a computer system can be designed to accommodate the specific and varied needs of a business rather than the business tailor its demands to the requirements of the computer. The tangible product of the attached processing concept is Datapoint’s ARC System (The Attached Resource Computer). This is an extremely efficient and adaptable, though totally integrated, computing facility which links together an arbitrary number of functionally dispersed smaller computers by means of a high-speed electronic pathway, or bus, and a fully compatible library of systems software. One major difference then in what we have been doing in the past, which may be considered geographically dispersed data processing, is the arrival of true functionally dispersed processing.

Functionally dispersed as it is, each user of the ARC sys-
From the time-consuming data storage and retrieval tasks, management of data and data storage units. Because this is their only task, they can locate and deliver remotely stored data faster data access times are necessary, an additional processor or two may be easily attached to the existing system. Should additional data storage space be called for, more disk drives can be attached to the common system data base. Impressively, this sort of system reconfiguration and expansion can be accomplished while the system remains in operation and does not necessitate changes in the existing application programs for operating systems software.

The Datapoint ARC system avoids many of the pitfalls that are normally associated with more conventional computer systems. Unlike the traditional computer architecture, the ARC system does not require re-programming or computer-upgrade investments each time more processing power or larger database is called for. Likewise, the ARC system, capable of supporting a variety of functionally dispersed tasks with one common database, is not dependent upon the relatively slow telephone communications or physical media transfers that are normally used to link separate databases in multiple-computer configurations. Rather, the transfer of data is accomplished at extremely high speeds over the ARC system interprocessor bus and is always completely transparent to system users.

ARC systems, whether small or large, incorporate three basic components: applications processors, file processors, and an interprocessor bus. Applications processors, an almost unlimited number of which may be contained within the system, are dedicated to performing batch or transaction processing tasks either in single or multi-user modes. Freed from the time-consuming data storage and retrieval tasks, these processors operate at extremely high speeds to get more actual data entry and data processing work done. File processors, on the other hand, are dedicated to the management of data and data storage units. Because this is their only task, they can locate and deliver remotely stored data to the applications processors as fast or faster through software techniques than this data could be retrieved from local disk storage areas.

The ARC system interprocessor bus includes a number of hardware and software components, all of which are used to connect applications processors and file processors into one totally integrated computer system. An essential hardware component of the system interprocessor bus is the inexpensive coaxial cable which physically connects all the other components of the bus. Another component of the interprocessor bus is the Resource Interface Module, or RIM, a special purpose data transfer module which connects directly to the processor input and output bus. The RIM provides a unique address for the processor and ARC system and allows data to be transferred over the system bus at exceptionally high speeds. The ARC system RIMs, in turn, are linked to the system interprocessor bus by means of passive or active hubs. A total of 256 processors can join a single ARC node.

ARC systems may be comprised of as many or as few resource units, processors and peripherals as a business requires, and any number of possible configurations. This is possible because the growth and the shape of the ARC system is determined solely on the basis of each company’s own functional requirements and not on the basis of conventional computer architecture. Since the ARC system architecture does not employ a central controlling host computer, failure of any individual processor in the system will not bring all operations to a halt.

Should an ARC system unit have to be taken off-line, operations will continue without interruption and all other system components function just as before. If a file processor goes down, for instance, its disk units can be transferred readily to another file processor or even to an application processor that has ample data storage capabilities. Applications processors, printers, and other system peripherals can also be interchanged quite easily in the event of a failure.

Should the need arise, access to data in the ARC system can be restricted under several types of security controls. For example, with the built-in security provisions of the ARC system, any user may designate portions of the common database as “Restricted.” Data can also be restricted by locally attaching disk volumes to a systems applications processor. These directly attached disk drives are completely private and can be accessed only by the applications processor to which they are attached.

Another important feature of the ARC system architecture is the optional capability it provides to interface to large central mainframes. By means of the Datapoint Direct Channel Interface Option (DCIO), an IBM 360 or 370 is permitted to participate in the ARC system by attaching to the interprocessor bus. Acting as any other applications processor within the ARC environment, the IBM 370 can utilize data stored in the common database to execute a variety of mainframe application programs running in any language. The most recently announced feature of the ARC system includes the addition of the INFOSWITCH communications management system to manage voice communications on the ARC system. Truly, then, is this the realization, the merging of disparate functions.

I think we all agree that the market direction in the 1980s is to the electronic office. However, the office is the only business function that has not been significantly affected by automation and it will require a great deal of technology and an attention to human interface to mask that technology to achieve market acceptance.
Some of the technological trends which we have observed are the convergence of computer and communications technology. As we demonstrated in our ARC system, data processing, voice communications and data communications are available today in a single computer system. Continued evolution of semiconductor technology, microprocessor, LSI and VSLI devices will offer cost improvements. Lasers will have a major impact on printing and imaging. Fiber optics will help reduce the cost of terminal and computer interfaces. Computer graphics will be in evidence as the requirements for sophisticated output as MIS evolve. Of course, underlying all these hardware technologies will be increasingly sophisticated software and programming techniques. The result, then, is that over the next few decades the office of the future will become the office of today, or the fully integrated electronic office.

Electronic mail, or electronic message systems, will require an inordinate amount of overhead if they are installed as stand-alone functions. The other option is that they only do a portion of the function, with no pretense of integration into the total office. I believe, however, that through proper integration of these office functions into a common system—electronic message systems included—the maximum efficiencies, effectiveness, flexibilities and productivity gains will be realized.