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# VIDEOTEX SYSTEM PLANNING

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INDEX TERMS - Videotex services, videotex network, videotex terminal, information retrieval, electronic mail, wired city.

## I. INTRODUCTION

Videotex has provisionally become the generic name for interactive systems offering visual information services and using a suitably modified or augmented home TV set, telephone and/or data networks, and videotex service centres. The user interacts with the system with a hand-held keypad or a keyboard. Data is retrieved interactively from videotex centres through telephone and/or data networks, and the received textual characters, graphics and even imagery are displayed on the screen of the TV set.

Videotex systems are being introduced, at least on a trial basis, in most countries in Europe [1]-[5], North America [6]-[10], and the Far East [11]. The literature on this subject is already considerable (e.g. see [1]-[11]). It is highly probable that videotex will usher in the new era of information technology [12]-[13]. Conservative estimates suggest that videotex service penetration in North America will be 5% of all households by 1985 and 10% by 1990.

Two requirements that must be met by videotex to permit the fulfilment of the goals are:

- 1) Increasing user satisfaction with the service (market acceptance) and
- 2) The existence of a cost-effective system capable of supporting the service.

The objective of this paper is to examine the problem areas in the completion of these goals and to discuss the strategic planning of the service, network and terminals that will be needed.

In Section II the service is discussed from a user's viewpoint. The planning of a cost-effective network that will support the service is the subject of Section III, and the issues affecting terminal design planning are covered in Section IV. Finally, in Section V the conclusions and some suggestions for future studies are presented.

## II. VIDEOTEX SERVICE

In the previous section we have defined videotex as an interactive system offering visual information services. In addition to information retrieval, other interactive services are possible, such as interest matching, messaging, commercial transactions, personal database, questionnaires, calculations, games, education, and software distribution. Interest matching perhaps will have the greatest market impact on videotex as this service is not available today except in a few specialized forms such as computer dating. Today's interest matching needs are only partially and imperfectly filled by the classified ad columns of newspapers, buy and sell periodicals, bulletin boards and newsletters. With these methods the information is neither standardized nor readily updated and there isn't a common database. A serious disadvantage is that a person wishing to purchase a certain item has to constantly scan new issues of newspapers or notices.

Interest matching concepts can also be applied at higher and more significant levels in videotex. In addition to specific services such as those mentioned previously, there is another level of service in videotex: the meta-service. Part of the meta-service is an intelligent interface to help the user locate and access the needed database or service provider and get the required information or service. The mechanism for doing so may take the form of alternative means of access (e.g. by menu, page number or keyword), user profiles, indices, etc., so that the number of different paths to access each item of information is maximized. Today's videotex databases are small (see Fig. 1) and information retrieval might be of little value to the user until the information available reaches a critical mass. However, in the future quite the opposite may happen if database sizes and numbers explode and if steps are not taken to facilitate the communication process between users and databases (see Fig. 2). This is where the videotex meta-service will be required (see Fig. 3). Other uses of the meta-service will be reviewed in the next section.

Concepts similar to the ones just described have recently been suggested elsewhere. Licklider and Vezza [14] talk about a meta-market in the application of packet-switched data networks, an over-arching system that interconnects and integrates the 'computerized commerce applications', or the whole gamut of things that can be bought and sold through communications [14]. Cousins and Dominick [15] have investigated the feasibility of meta-bases or data bases of data bases, and Korfhage *et al.* [16] have proposed the concept of data-physics in the action of viewing reality by using moving windows to look at databases.

Thus the presence of an intelligent interface in the meta-service will be a necessary requirement in the videotex network future. In the next section we investigate how the videotex network can support this concept.

### III. VIDEOTEX NETWORK

The expected increasing demand for videotex services will require an expanding network of service centres. In this section we propose a modular approach to the design of the videotex network. Growth in system capacity is achieved by adding new modules to the system rather than by increasing the size and complexity of a single centralized facility.

The communications network for videotex consists of the communications facilities among videotex terminals and computers in the network. As far as the customer is concerned there are two types of communications: direct terminal-to-terminal (e.g. Scribblephone [17], Visual Ear [18], videogames and home computers [19]) and terminal to specific service providers.

The simplest approach, already in limited use, is to connect information consumer with information vendor via the public switched telephone network. However this approach has some disadvantages:

- 1) The telephone network has been designed for voice communications and is fine tuned for that type of traffic. Using it for videotex without adequate reinforcement may eventually degrade service to voice customers.
- 2) The telephone network uses circuit switching which is known to be less efficient than packet switching for the bursty data communications traffic patterns from terminals.
- 3) The expected increasing number of service providers will puzzle and

confuse the user if he has to dial each database or service centre separately.

Consequently the use of the public switched telephone network as is will not be a good long term solution. An interesting alternative is the use of packet switched networks, but the problem of local access to them still exists, and they would also have to be upgraded to handle the full spectrum of videotex services.

The solution we propose is the creation of a network of videotex exchanges using the most suitable combination of the existing communications facilities. The design of the videotex exchanges would be tailored to the requirements of the videotex service. A logical diagram is shown in Fig. 4. Service customers are connected to the front end on the videotex exchange and service providers to the back end. The module implementing the meta-service is referred to as a videotex node. The role of the videotex node in this approach is that of a front-end processor with a minimum of three functions (meta-service):

- 1) User interface procedures (e.g. handling communication error messages and echoing characters to the terminal plus other terminal support such as reformatting and speed conversion). The module implementing these functions will be referred to as the Videotex Interface Module (VIM).
- 2) Intelligent routing of calls (e.g. determine customer needs and establish and control temporary connections between the user terminals and service computers).
- 3) Checking customer identity and keeping track of statistics and billing information.

This approach supports the creation of an intelligent network to provide widespread retail outlets for independent databases. Indeed, a hierarchy of videotex centres could be formed with customers connected to the lower end and information suppliers higher up in the hierarchy depending on the nature of their information and the location of their customers.

The service providers and the videotex exchanges form a distributed computer network, and for the purpose of this analysis it is convenient to divide the network into logical subnetworks as shown in Fig. 4. There is a backbone network of videotex exchanges and a number of service subnetworks. It must be emphasized that this is only a logical division, since the actual communication

links in each case will depend on the location, distribution and traffic of the various computers.

With the proposed configuration a given user is registered with a single videotex exchange and all his requests for service are interfaced through that exchange. If for some reason (e.g. when travelling) a user accesses a videotex exchange other than his own, that exchange would be responsible for obtaining credit clearance and sending accounting information to the exchange with which the user is registered. Alternatively, the user could ask that control of his session be passed to a distant videotex exchange, at an additional cost for communications, of course.

Keeping the videotex exchange as the interface to the service centres has distinct advantages, for example:

- 1) Easier use (common log-on procedures) and easier switching from one service to another.
- 2) Easier routing, accounting, charging and statistics collecting.
- 3) Fewer ports/modems necessary in the system because they are shared. Helps reduce the cost of the system.
- 4) Provision of retail service is facilitated.

The salient feature of this configuration is the presence of an intelligent network which provides the access and vehicle for a number of independent and/or interrelated services. Economical and reliable services will be achieved in the long term by the network of distributed databases and distributed processors with their interconnection logically structured into layers. The main capability of this network will be to provide interactive communications efficiently between people and service centres.

#### IV. VIDEOTEX TERMINALS

The home terminal is the user's window into videotex and hence is the most important hardware component in the videotex system. It is surpassed in importance only by the information or service the users are paying for. Hence special care is needed in the design of the videotex terminal. The early videotex systems have put all the intelligence into centralized facilities in the videotex network but little or none into the terminals. With the declining costs of memory and processing power, the overall cost-efficiency factor can be improved by

distributing the processing and storage functions. The terminal features and design alternatives depend on the type of information to be marketed (e.g. textual, graphic, photographic or aural). The coding of that information is also important. The ideal goal is a flexible coding scheme compatible with terminals of different characteristics, so that old terminals can access new services and new terminals are compatible with existing services.

There is much national and international activity aimed at developing standards for videotex. Unfortunately the details of the applications and the needs and size of the market are unclear. There is also much controversy about the marketability of features such as simple graphics, sophisticated graphics, colour, grey scale, animation and audio.

The foregoing discussion rules out the choice of a single, rigid terminal realization, because of its lack of flexibility. At the other end of the scale, an unstructured approach would allow terminal designers and service centres to offer any combination of features. However, this scenario could soon become chaotic as terminal manufacturers and service providers pursued specific market segments. This would ultimately inhibit the growth of information services.

In order to steer a middle path between inflexibility and fragmentation, it has been proposed [7] that the visual feature capabilities of a videotex system be arranged in a Layered Capability Structure (LCS), as shown in Fig. 5. This structure strikes a balance between a single, rigid realization and a multitude of embodiments. This will give the vendor and consumer some freedom of choice without creating confusion (and high costs) in the marketplace. Indeed, given  $N$  feature capabilities, the arbitrary combination method could result in  $M$  (where  $M = 2$  raised to the  $N$ th power) different types of terminals, generally incompatible with each other. On the other hand, the Layered Capability Structure yields only  $N$  different types of terminals with a maximum of compatibility.

The Layered Capability Structure could, for example, consist of a hierarchy of five types of videotex terminal structures to cover five different types of visual features [7], namely:

- A. General Text Only
- B. Type A + Positional text
- C. Type B + Mosaic graphics
- D. Type C + Geometric graphics
- E. Type D + Photographic imagery

In practice, these different terminal categories may represent evolutionary phases or a range of terminals that may be available in the marketplace. It is important to note that the initial offering can be made at any level desired. Features can subsequently be added to (or subtracted from) future terminal offerings depending upon the results of market trials, cost projections, etc. The Layered Capability Structure can be extended upwards to include animation and even perhaps motion video. Non-visual features such as audio can be added to any layer of the structure, although additional standards would be needed eventually to cover these areas. For further details and discussion of the advantages of the Layered Capability Structure the reader is referred to [7].

The Layered Capability Structure helps considerably in the design of the videotex network. Since the videotex exchange is the common access point for terminals of diverse characteristics, the conversation between the user and the exchange should be in text only. The desired services and information accessed through the exchange, however, can contain mosaic, geometric or photographic features at the discretion of the service providers.

The final key element in the system (in reality it is the first, especially in information retrieval applications) is the means of creating and editing the database. As these operations are labour intensive, it is essential to simplify them and so reduce the labour costs by using the appropriate information provider terminal. Investing in optimized information supplier terminals will result in the creation of attractive pages, ease of editing and reduced overall cost. It is expected that in this area also, the Layered Capability Structure could be applied profitably. Good text editing facilities will be essential since text is expected to be the major portion of the database material. However, there will be an increasing demand for simplified creation and editing of graphics (mosaic, geometric and photographic).

## V. CONCLUSIONS

The strategic planning of the evolution of videotex has been considered briefly. The discussion has concentrated on the areas of the service, network and terminals.

The service opportunities in videotex have been pointed out. The need for interest matching services has been demonstrated. In particular, interest matching at a high level is the foundation

of the videotex meta-service, an intelligent interface to help the user locate and access the required database or service provider and get the desired information or service.

A logical network evolution strategy has been proposed which can accommodate increasing numbers of users and services. A backbone network of videotex exchanges will provide the access and transportation vehicles in an intelligent manner to a number of different services. The communication links between the various centres can be chosen on an individual basis to make optimum use of existing facilities.

The design of the home terminal needs careful attention to the standardization issues to allow for compatibility between terminals and services both in time and space. A Layered Capability Structure has been discussed regarding the visual features of videotex terminals. This strategy for terminal evolution proposes a hierarchy of five types of videotex terminals to display general text, positional text, mosaic graphics, geometric graphics and photographic imagery.

Further studies will be necessary in all these areas, for example, the feasibility and structure of the videotex exchanges and databases, access mechanisms and query systems and security and reliability of the public network. Introductory systems (e.g. for a market trial) most probably will be centralized at the videotex exchanges. However, in the long term the network will evolve towards a decentralized (distributed) system.

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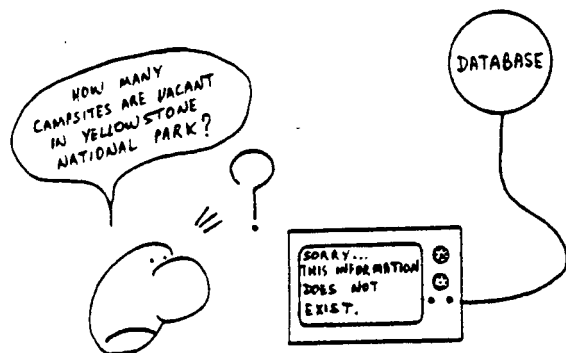


Fig. 1. A Videotex System Today.

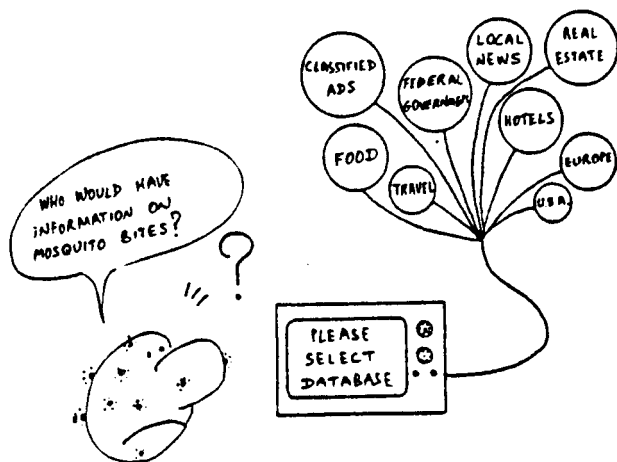


Fig. 2. A Potential Problem of a Future Videotex System.

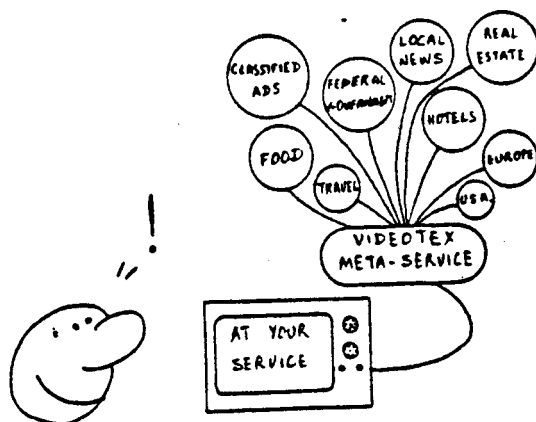


Fig. 3. A Possible Solution: Videotex Meta-Service.

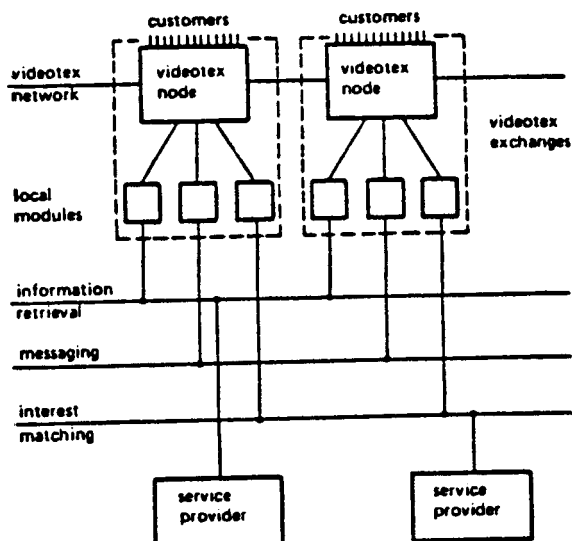


Fig. 4. Long Term Logical Videotex Network.

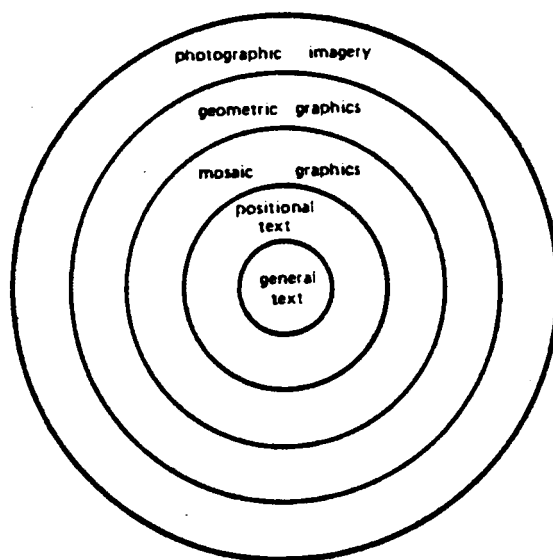


Fig. 5. Layered Capability Structure.