# INTEGRATED SATELLITE AND CABLE BUSINESS COMMUNICATIONS NETWORKS

David C. Russell

Satellite Business Systems
McLean, Virginia

ABSTRACT

Innovative communications satellite networks appearing in the early 1980's have the capability of providing, for the first time, a switched wide-band system for integrated business networks offering voice, data, image, and teleconferencing service. This paper considers the current business communications environment, and it describes the architecture of integrated business networks employing satellite backbone and regional distribution networks to interconnect local user networks, local hosts, PBX's, and teleconferencing facilities. Business communication opportunities involving cable TV systems as the regional component of integrated business networks are outlined. Also discussed is a forthcoming local-data-distribution experiment involving integrated cable and satellite transmission links between users in San Francisco and New York City.

## 1. INTRODUCTION

This paper is focused on emerging business communications opportunities for integrated satellite and cable TV networks. This subject will be considered from the perspective of a communications satellite carrier that offers a full range of integrated communications services. Four aspects of this subject will be addressed:

- The current business communications environment.
- An overview of a switched communications satellite network.
- Elements of a private business network.
- Business communications opportunities for cable television.

## 2. THE CURRENT BUSINESS COMMUNICATIONS ENVIRONMENT

Timely information is perceived by many observers of the business scene as the key to successful operations (1) (2). However, the gathering, processing, analysis, and distribution of information is no better than the communications that support these information-processing activities. To date, relatively narrow bandwidth communications technology has resulted in the following situation:

| | | |
|---|---|---|
| Voice | - | Universally available, but dependent for long hauls on extensive terrestrial facilities. |
| Data | - | Generally available up to 9.6 kbps on the voice network. A few networks in large metropolitan areas with capacities of 50 Kbps or higher. |
| Bulk Data | - | Special-construction microwave or express service by air or truck. |
| Conferences | - | Travel by one or more sets of participants to a common meeting site. |
| Document Distribution | - | Mail or messenger service, limited-rate facsimile. |

Wide-band, all-digital, time-division multiplexed satellite communications service, which will be available soon, offers the opportunity to integrate these services onto a single business network. Consideration of a role for the cable TV industry in complementing that opportunity is the subject of the presentation.

## 3. AN OVERVIEW OF A SWITCHED COMMUNICATION SATELLITE NETWORK

Satellite Business Systems (SBS) is establishing a domestic satellite system, to be operational in early 1981 that will provide private, switched communications networks for integrated voice, data, and image applications. The SBS system is designed to serve the full spectrum of communications needs of a large community of business and government organizations and other communications users. The greatest benefits will be derived from the SBS system by those customers who generate communications traffic at a number of locations geographically dispersed throughout the 48 contiguous states and where requirements include the need for high-speed digital transmission service.

The features of the SBS system concept are shown in Figure 1:

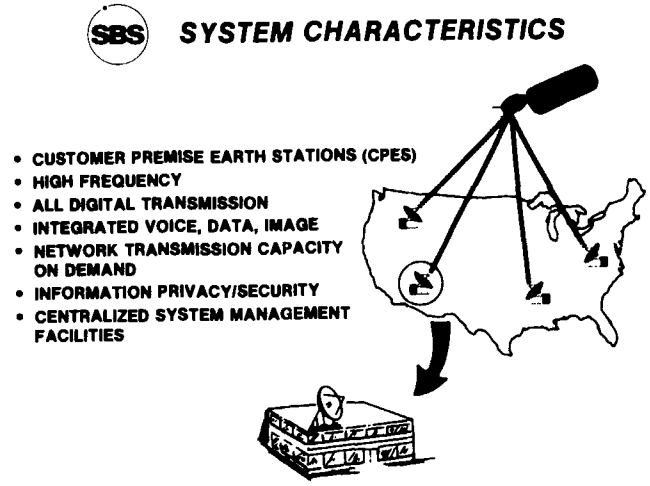


FIGURE 1

By utilizing relatively small earth stations operating at 12 and 14 gigahertz and placed on the customer's premises at his major traffic nodes, the SBS system will permit direct access to a switched, wideband, communications network.

A large, nationwide enterprise may require 20 or more earth stations to support its communications requirements. Through the use of demand assignment, the satellite acts as a central concentrator for a large ensemble of earth station traffic nodes. By permitting continuous real-time assignment of satellite capacity to meet the varying needs of the user, the SBS system will offer an attractive alternative to traditional, long-haul, terrestrial communications systems. Unused communications capacity on the West Coast in a terrestrial system has little or no utility in meeting the traffic demand in the Boston-Washington corridor. In contrast, the SBS system will permit a user's total satellite transmission capacity to be applied to the instanteous traffic demands of that user without respect to location (3).

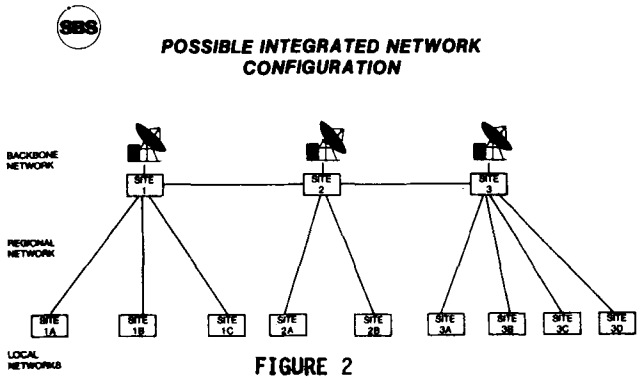


FIGURE 2

## 4. ELEMENTS OF A PRIVATE BUSINESS NETWORK

As one looks carefully at communications needs in the marketplace, it is clear that a mix of long-haul, regional, and local networks are required to serve anticipated needs. Picture, for example, a regional element of a nationwide corporate network with 12 or more nodes distributed around the region (Figure 2). Of these 12 nodes, three have on-premises earth stations. An area of opportunity lies in connecting customer sites without earth stations to the sites with on-premise earth stations.

A typical private business communications network can be pictured as shown in Figure 3. The inner ring represents the core satellite transmission links. The outer ring represents the boundary of a communications subnet. Note that local interconnect lines, regional extensions, and the necessary voice and data switches are included within the subnet. Users then can interface their PBX's, computers, and terminals to the subnet and concentrate on their primary business.

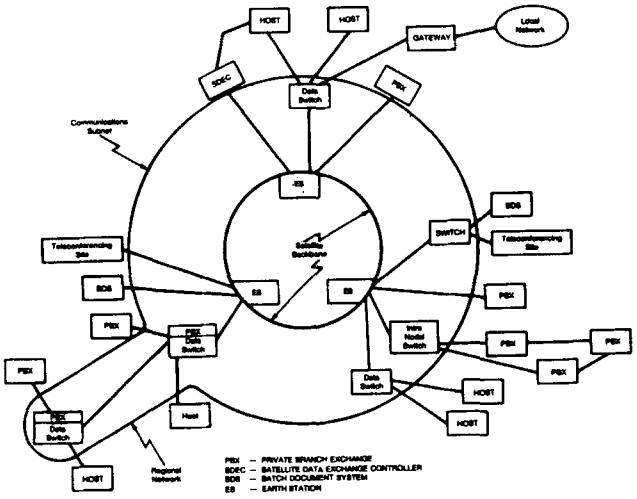


FIGURE 3
TYPICAL BUSINESS COMMUNICATIONS NETWORK

Integration of the multiple communications services of a satellite communications node and a regional network extension can be seen in Figure 4. On the customer premise with the earth station are the voice, data, bulk data, electronic document communications systems, and teleconferencing capabilities that are elements of a total business communications system.

A regional network provides the connections between the earth-station premises node and the off-premises node. This network extension could be a few miles to 50 miles long. At the regional node are communications facilities similar to those found at the on-premises earth-station node.

Bandwidth requirements for the regional network would vary widely depending on local sizing, but should be in the range of:

- o For voice--multiple T1 circuits at 1.544 Mbps (4).
- o For data and fax--56 kbps to 1.544 Mbps.
- o For teleconferencing--up to 3.7 Mbps.

Voice service and low-speed data-communications applications are capabilities reasonably well understood by most users of communications services. High-capacity satellite data channels will create opportunities for users to create new applications that can improve organizational productivity. SBS is supporting the development of three products to demonstrate these capabilities.

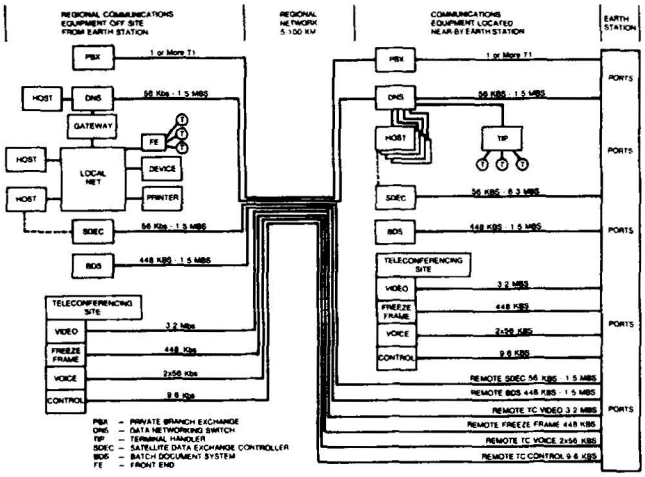


FIGURE 4
INTEGRATION OF MULTIPLE SERVICES

The first is a Satellite Data Exchange Controller (SDEC), which permits high-speed bulk transfer of data between two host computers across a satellite link at data rates up to 6.3 mbps. This device is under development by Bunker Ramo. An efficient satellite protocol is included in this device (5).

The second is a prototype of a new communicating copier that will be able to send and receive copier-quality documents either from point-to-point or to many locations. It will transmit more than 60 pages a minute. At the receiving locations, the pages are automatically collated, stapled, and addressed to multiple addresses. This application has been developed by AM International under an SBS contract.

The third is a prototype teleconferencing system to be assembled by E-Systems, Inc. Figure 5 shows the layout of a teleconferencing room with a video view of another conference site shown on the left screen and a high resolution display on the right screen. An audio system provides a range of frequency response and tonal quality that is superior to traditional conferencing devices. A control console permits

FIGURE 5
TELECONFERENCING ROOM LAYOUT

the conference chairman to select various options such as camera positions, availability of store-and-forward graphics devices, etc. A teleconference site can require data rates of up to 3.7 mbps when video, high-resolution display, audio, and control are included. Figure 6 illustrates possible multisite, multi-conference configurations which are feasible.

Plans for business communications networks based on a satellite transmission backbone providing various combinations of voice, data and teleconferencing services are real. Five users are under contract to begin service on the SBS system in 1981.

## 5. BUSINESS COMMUNICATIONS OPPORTUNITITES FOR CABLE TV

One area of significant opportunity for the cable TV industry lies in providing regional network transmission services for business communications networks. There are a range of techniques for providing regional transmission services, including:

- o Point-to-point analog or digital microwave,
- o Omni-directional digital radio,
- o Fiber optics (6),

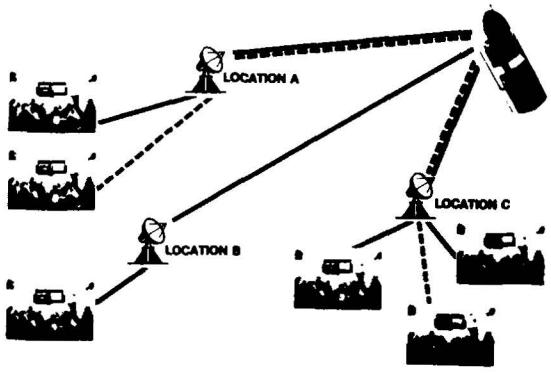


FIGURE 6
TELECONFERENCING CONFIGURATIONS

- o Infra-red systems,
- o Cable systems,
- o Telephone company service.

However, the voice, data, and teleconferencing services that future business communications networks can be expected to provide will require multiple T1 (1.544 Mbps) transmission capacities. Cable systems with data-transmission capabilities are candidates to provide that service by providing bi-directional service and the necessary interface equipment. As a demonstration of that capability, cable systems have been supporting data transmission in Manhattan (7) for several years.

Reflecting SBS' interest in ensuring the availability of cost effective and reliable high bandwidth local loops, we have recently announced our joint plan with Tymnet to demonstrate innovative techniques for intracity distribution of business communications carried between cities via satellite and packet switched networks. This Local Data Distribution Demonstration Program, to demonstrate multimedia distribution techniques, will involve intracity networks in New York City and San Francisco. Although program arrangements are still to be finalized, the plan includes the use of a cable system in at least one of the cities (Figure 7).

***LOCAL DATA DISTRIBUTION DEMONSTRATION NETWORK***

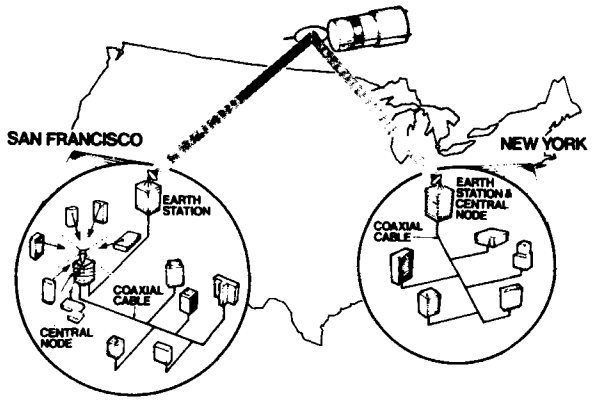


FIGURE 7

A limited number of end-user participants in New York and San Francisco would utilize, on a test basis, the end-to-end facilities established under the program. Digital connections would be provided ranging from low speed to 56 kbps.

The schedule contemplated for the program calls for central nodes and subscriber equipment to be installed by year-end 1980 and for testing to continue through July 1981.

## 6. CONCLUSION

The phenonmenon known as the information society is estimated to include 46% of our present GNP. This segment will almost certainly continue to grow. Improved communications services are essential tools in supporting this growth by providing the foundation for information processing and information distribution systems. Key to this growth are wideband communications services which satellite and cable systems are capable of providing. Timing for planning regional and local network extensions in support of satellite transmission links is critical as service begins in 1981 with a backlog of additional service demands on hand. There is an opportunity for cable systems to participate in this growth as a regional or local component of an integrated satellite, regional, and local business-communications network. To take advantage of these opportunities, the cable industry will have to consider a number of issues. These include:

- o Can the economic feasibility of providing regional network services be established?
- o Can reliability standards for business communications be met?
- o Are rights-of-way available in areas that would serve business communications users?

Answering these issues is a challenge of decade of the 1980's.

## REFERENCES

1. D. Bell, "Communications Technology for Better or For Worse", Harvard Business Review, Vol. 57, Nr 3, May-June '79.

2. T. J. Crotty, "Satellite Business Systems, It's Impact on the Communications, Computer and Office Automation Industries", E. F. Hutton Review, August 8, 1978.

3. C. Kittiver, (Principal Author), "The SBS Communications System", March 1980.

4. Bell System Communications Technical Reference, Pub. 41451, "1.544 Mbps Service Channel Interface Specifications", Feb. 1974.

5. Owings, J. L., "Satellite Transmission Protocol for High Speed Data" Satellite Business Systems, Systems Briefs, undated.

6. "AT&T Plans to Spend $79 Million to Develop a laserbased System", The Wall Street Journal, January 24, 1980.

7. J. Kutler, "NY City Banks Take Leading Role in Using Cable Television for Transmitting Data", American Banker, May 5, 1977.