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Professional Program Session **1**

ISDN EVOLUTION

The Seattle Center
Tuesday, October 4, 1988
9:30 am - 11:30 am

Co-organizers: Dar S. Biring, Pacific Bell, San Ramon, CA and
M. Kursat Kimyacioglu, EXAR Corporation, San Jose, CA

Realm Of ISDN

Dar S. Biring

Pacific Bell, San Ramon, California

Abstract

Telecommunications network is under constant pressure to change due to advances in technology, ISDN Standards, and end-users communications needs. This paper deals with the ISDN capabilities and benefits to end-users. Three forces (market, regulation, and technology) which will shape the future network of the 1990's i. e. ISDN have been mentioned. Technological forces have been described in some details and their impacts have been evaluated on the future network of the 1990's i. e. ISDN. In short, this is a description of realm of ISDN in terms of capabilities, benefits to end-users and impacts of technological forces on the future network of the 1990's.

1. Introduction

ISDN is a natural step in the evolution of both public and private networks. It is representative of the trend towards digital communications and the standardization of interfaces. ISDN simplifies access to existing services and technologies, while providing a vehicle for the migration to new capabilities.

ISDN will provide users with end-to-end networking, capabilities for voice, data and video, real-time bandwidth allocation, and user control over cofiguration of both their private and publicaly provided wide area networks.

ISDN will provide standardized access to existing services and cpabilities such as packet switching and digital circuit switching. The popularity of these two technologies should greatly increase in the coming years. ISDN also makes possible new services, to be offered by carriers, value added networks, or managers of private networks. These services include; sophisticated supplementary services like conference calling, call waiting and call screening; on-line information services such as yellow pages, and telemetry such as meter reading and alarm bureaus.

Transaction routing services such as home banking and reservations services will also be more common place. ISDN will provide the basic transport for these services, but if ISDN's true potential is to be realized it must remain open enough to serve all sectors of the industry.

ISDN will first be offered in islands, in public network and in

private ISDN's. Migration towards ISDN will be gradual, and for the forseeable future, users will have hybrid networks. Three forces will shape the network of the 1990's. These three forces are: the market, regulation, and technology. The market i. e. cusromer demand will play a key role in the evolution of network towards ISDN. The regulation will exert a significant influence on the ISDN architecture. The emerging technologies will affect the network of the future i. e. ISDN. In the following paragraphs, the speculative impacts of the technological forces on the network of the 1990's is discussed.

2. Technology

The current network has been designed and optimized for voice communications. The future network will be more and more digital, the main reason being cost savings and openess to new services. The latter gives rise to many speculation.

The voice-service paradigm, a 4KHZ analog bandwidth a universally compatible numbering plan, has been simple and stable for many years. Contrast this with the diversity and vast range of possible non-voice services which are not yet well understood. The requirements of new services with respect to delay and throughput, reliability, and connective topology cover wide ranges.

Therefore, the most important technological imperative for the future network is flexibility. The network must be highly adaptable to new services and easy to change.

The technological implications of this observation apply to both software and hardware. Advances in computer technology will increasingly find their way into the network. The ISDN service model will evolve under the influence of the OSI reference model, with message-oriented signaling leading the way.

3. Computer In Telecommunications

The network architecture will more and more reflect the image of network operating systems, with the operating system concept originating from the computer world. An operating system has two major tasks: first, it offers a user interface to easily define operations to be performed by the system; second, it conducts the execution of functions by managing the resources under its control. Instead of dealing with a single computer, the network operating system is controlling the network as a whole.

New services will differ from today's services in several aspects. First, multimedia services will deal with voice, text, data, and images with increasingly higher levels of interpretation. Also, connectivity patterns will be more elaborate, e.g. for conferencing or lectures. A substantial growth in the area of information services can be expected as

well, just as with a computer operating system, the network operating system will provide the means to add new services to the network, advertise them, bring the customer and services together, and last but not least -help in billing for the srvice. New higher level application-specific language will become available to allow fast implementation of new services by the network provider, the end user, or third parties.

The trends in hardware will also influence the network of the future i.e. ISDN. Certainly, the greatest revolution taking place is the proliferation of optical fiber transmission facilities, making transmission bandwidth ever cheaper. The remaining cost will increasingly be incurred by the end user and central office equipments, but advances in VLSI will also supply increased functionality at reduced cost.

With the expected growth of nonvoice traffic, widely differing traffic characteristics on the network will appear. One new technology that is extremely well suited to this challenge is fast-packet technology. This technology is especially well suited to help in managing the wide range of different service requirements.

4. Fast-Packet Technology

Packet-switching technology is well established in data communications systems. Recent technological advances have demonstrated that one can build fast-packet equipment with sufficient performance capabilities to handle interactive voice or even non-compressed standerd video signals in packetized form. New fast-packet switches will handle millions of packets per second with a cross-switch delay of less than one millisecond. This will bode well for the future network, which has to handle more and more bursty and dissimilar multimedia traffic- just the right domain for packet technology. Self routing packet-switch fabrics which allow practically unlimited growth in total capacity due to their two-dimensionality and distributed control are at the core of the new technology. The concept applies both to transmission and switching and offers as a most important property ease of bandwidth management, i.e. allocation of bandwidth dynamically and instantaneously.

The service paradigm of a "bit-pipi" with a constant though selectable bit rate will be insreasingly replaced by the paradigm of shipping a certain number of bits subject to a service grade, which can involve a variety of characteristics, such as response time, accuracy, and regularity. These units of information called packets need to be handled differently in different parts of the network, depending upon the requested service. The headers or labels of the packets give the ability to perform such a differentiated treatment very easily in a distributed way. This is an essential requirement for managing network complexity, which will probably remain the major obstacle in the fast evolution of the future network.

5. Conclusion

In this paper, we have shed lights on the ISDN capabilities and benefits to the end-users. We have also mentioned three forces (market, regulation, and technology) which will influence the realization of ISDN. We have explained technological forces in some details and their impacts on the future network of the 1990's. So in conclusion, this paper gives a realm of ISDN in relation to capabilities, benefits to end-users, and technological forces.

Evolution And Main Issues In The Realization Of ISDN

Dar S. Biring
Pacific Bell, San Ramon, California

1. INTRODUCTION

Telecommunication networks around the world are evolving toward an infrastructure that has the capacity to support existing service capabilities, extensions to existing service capabilities, and new service capabilities. This infrastructure is known as an Integrated Services Digital Network (ISDN). The evolution to ISDN, which is considered inevitable, is being driven by perceived market needs that are fueled by advances in technology.

Initially, telecommunications and information processing technologies evolved independently according to the separate demands of analog communication and digital information processing. However, for the past twenty-five years, new telecommunications technology has evolved based largely upon the use of digital signals for transmitting and switching customer information and for controlling and operating the network. The use of digital technology is evidenced by the current widespread application of T-carrier, fiber and digital radio transmission systems, stored program control and time division switching systems, common channel signaling, and numerous automated operations systems. This proliferation of digital telecommunications technology is complementary to information processing technology and together, they have stimulated the development of end-to-end digital networks that are tailored to meet specific customer needs. Examples include private line networks that support Digital Data Service (DDS) and High Capacity Digital Service (HCDS), and switched networks supporting Public Switched Digital Service (PSDS) and Public Packet Switched Service (PPSS).

The realization of ISDN is the next major step in the evolution of current telecommunication networks. It is the logical end result of the network's continued use of digital technology to provide transmission and switching functions economically. In this light, ISDN can be viewed as a plan for organizing digital technology to provide both voice and non-voice services in an efficient and economical manner. One of the key elements of this plan is the support of a wide range of services in the same network. This affords the ISDN certain economies of scale that will lead to lower costs for customers. Another key element is the use of digital technology to provide operational advantages, extensions to existing service capabilities and the introduction of new service capabilities. Thus, ISDN is seen as the vehicle that will allow customers to optimize their access and utilization of information.

2. SERVICES

ISDN has the capacity to support existing service capabilities, extensions to existing service capabilities, and new service capabilities. This translates into cost effective solutions for customers through the integration of services, access to a rich menu of network services and features, increased customer control and flexibility, and a graceful transition from existing to future network services. The following paragraphs discuss this capacity by describing the major service features supported by ISDN.

2.1 Single Socket Network Access:

ISDN access is independent of the services to be provided. This means that a customer can access a wide range of network services over a single access link. This leads to the concept of single socket access or universal ports. The realization of this concept will provide a significant increase in flexibility and control to the end-user. This increase in flexibility and control will allow customers to increase the utilization of their communications facilities to attain economies. Another customer benefit is the use of existing premises wiring and local loop facilities to access both voice and non-voice services. This benefit will avoid expensive recabling of customer premises and will reduce the coordination with the network provider when rearrangements are considered.

Single socket access will also influence the development of multifunctional terminals, such as integrated work stations. This will provide a significant improvement in a customers ability to use various communications modes to access and utilize information.

2.2 Interworking With Existing Services:

The ISDN will support both new services and the services currently available on existing networks. As such, ISDN users will not be precluded from communicating with users served by existing networks that support voice, circuit-mode data and packet-mode data.

2.3 Customer Control:

ISDN will significantly increase the customer's ability to define service mixes to meet communications needs. For example, customers could utilize their communications facilities for voice and interactive data applications during normal business hours, and they could then use the same communications facilities to transport bulk data during evening hours.

2.4 Availability of High Speed Digital Access:

The provision of high speed access, 64 kbps, will significantly enhance many applications. Some of these include secure voice,