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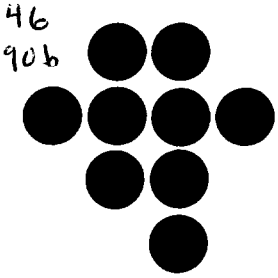

COMMUNICATIONS
FORUM

"ISDN: Hype or Revolution?"

March 8, 1990

Seminar Notes

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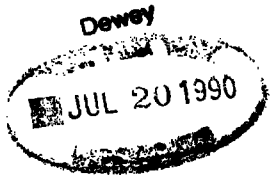

Andrew Lippman, M.I.T., Organizer

Walter Johnston, NYNEX

Christopher M. Schmandt, M.I.T.

Eli Noam, New York Public Service Commission

Richard J. Solomon, M.I.T.

Antonio J. J. Botelho, Rapporteur

This session of the Communications Forum assessed the promises and current realizations of ISDN. Richard J. **Solomon**, M.I.T. opened the session commenting on the appropriateness of the topic since MIT's ISDN system was about to complete its first anniversary.

The first speaker was Walter **Johnston**, NYNEX. He aptly titled his talk "ISDN: Hype and Evolution." The underlying idea was to give an overview of the planning assumptions for ISDN in the past, some of the hopes in the more recent past and the current reality today.

Johnston said that for the engineering community ISDN technology can be traced back to the mid 1970s. At that time the technology was basically all analog. But planners were cognizant enough to understand that the technical trends were clearly digital in the long run. From an environmental viewpoint people had centralized computing, dumb terminals, limited local data network architectures, low terminal speeds, and expensive modem technology. In 1990 the situation has changed quite dramatically. In terms of basic equipment elements everything we have is digital. In addition we are in the process of implementing a new type of signaling capability which allows the switches and ultimately other types of peripherals to communicate on a much higher protocol level with other elements across the network. From a software operations perspective, there is still an analog view of the world. We are in the process yet of changing the many software systems in the telephone companies to accommodate an environment that is all digital. There are between 5,000 to 8,000 people in the aggregate working on that.

Johnston went on to say that technology devoted to specifically supporting ISDN occurs in very discrete portions of the network: specific software for local central office switching equipment and hardware equipment which supports digital loop access. **Johnston** argued it took fifteen years to change the system due to required technical evolution and its related economics of implementation, and capital constraints. Typically different elements in a network roll out with stable historical averages: transmission systems at an average 10% a year; customer loop systems at 3-4% a year; and switching systems at an average 7-12% a year. Another development of the last fifteen years is that the environment has changed enormously, in an unforeseen direction. The 1990 ISDN environment comprises: distributed computing, PC/workstations in the workplace, complex local data network architectures, and inexpensive modem capability.

Johnston moved onto talk about the hypes of ISDN. One was that ISDN is a total solution for all communication needs. Another was that ISDN would be available in 1986, 1987, 1988, 1989,... However, we are getting to a point where just starting to be fulfilled. The point is that when hype takes hold it is hard to argue the truth. And the psychology of the marketplace is to make promises. What is actually happening is an evolution, not a revolution. ISDN is a natural evolution of technology based on standards and on accelerating digital trends. ISDN will permit new services which will be different from

what was anticipated. Moreover, ISDN implementation will stimulate developments. Today the amount and diversity of research on ISDN goes beyond telecommunication companies.

ISDN benefits in the near term include an international standard for telecommunication. For the first time there will be an ability for "world service" availability and a service reference model will be established. Another near term benefit is narrowband data transport. ISDN supports data transport at rates of 64 KB/s to 1.5 Mb/s. In effect, opportunities of what people need in terms of high performance "modem" capability are within the scope of what ISDN will offer in the near term. Still another benefit will be the provision of efficient access to network services. As customers gain access to ISDN they will also gain access to other network services such as packet network transport capability (X.25), digital circuit transport capability, and E-Mail and V-Mail services.

Johnston then said that our understanding of how ISDN will be complementary to alternative data architectures points to an extension of capabilities to low-end users. Another thing happening in the marketplace is that ISDN seems to be stimulating the development of groupware capabilities (for example, remote sharing of spreadsheets). In the longer term we are starting to revise what is an appropriate model for ISDN. We are starting to understand, in a radical departure from the thinking of 15 years ago when ISDN was assumed to be a way for people to communicate, that ISDN will be used for objects to communicate (Exhibit 1).

According to **Johnston,** in the mid term the benefits of ISDN will include user capability to request complex services and will be an effective way to link customer information systems to network functionality, joining computers and communications. In the area of communications management capability, ISDN could support things like telemarketing, service bureaus, unified corporate communications, and vertical services (videotext, V-Mail. E-Mail).

Based on the recent experience of ISDN, **Johnston** asserted that we have learned that the presence of technology affects innovation, as there is a steady increase in the number of companies developing ISDN products. We have also learned that it is often difficult to make long term technology forecasts and that it is almost impossible to make long term market forecasts. Finally, we have learned that services are defined within the marketplace, offering a better model for service delivery.

Johnston concluded by presenting an assessment of ISDN for the future. First, we are better off because most of the broadband transmission infrastructure is nearly complete, only loop plant is lacking. By and large we already have a broadband network. Next we will have to understand what types of selected broadband services are feasible now. It is his belief that in bringing these capabilities to the marketplace we will need to focus on a much shorter service delivery cycle. We want to drive the co-operative involvement of diverse sources of innovation and use market experience to refine long term goals. The idea is to use the experience of these shortened delivery cycles to build a better view of what broadband ISDN should be, and continually refine that view.

Johnston concluded that there has been a lot of hype about ISDN. On the one hand, in the seventies ISDN held promises that did not take place. On the other hand, we are starting to see an era where the signaling and digital transport capabilities of ISDN are starting to be reflected back into the planning process and development process of other external companies. That is the promise of what ISDN will become.

The next speaker was Christopher **Schmandt**, Media Lab, M.I.T. **Schmandt** started by saying that his view was that telephones were made to carry voice, and people talk about ISDN from the point of view of data communication. For narrowband, from the point of view of most of the users, ISDN does not have any value and from the point of view of broadband, voice is uninteresting to the carriers because 64 Kb is not something you can charge a lot for. If you move megabits you can charge more for a second. **Schmandt's** objective was to assess how can we evolve voice services in the future in concert with computers and telephones. The question posed is where does ISDN takes us, specially basic ISDN, in terms of integrated voice and telephony and computer systems.

In terms of hype, **Schmandt** showed a video describing his experiences of integrating ISDN with his desktop computer for personal agenda management. The system developed makes use of voice recognition and picture phones. In short, his computer acts as a server for the simultaneous management of voice and data communications, including E-mail.

ISDN has been at MIT for over a year now. One of ISDN's impact on the everyday use of telephony around campus is that with voice mail you can get messages. However, voice mail without a message waiting light provided by the digital telephones is pretty boring. In fact, there is virtually nothing you can do in your digital phone that you cannot do in your old black telephone set. Obviously there is no need of ISDN either for the stutter or for the message waiting light. The next thing we see is calling line ID, a big winner. Even though the display in most of the sets are often illegible under any circumstances. Yet people use it for call screening. Again you do not need ISDN to get caller line ID. What we do need in terms of caller line ID is off-campus caller line ID. Thus the attraction of ISDN is that the network is gradually evolving to give us this possibility. Another thing we got at MIT with ISDN, which again has nothing to do with ISDN, is a number of free services such as speed dialing and variable call forwarding. But there is not much utilization of these services.

The problem with many of these services is that they are really used as a configuration, which stays permanent because changes in configuration are not easy. Access to the services is abysmal and there is virtually no feedback, as part of a designing down of the system.

Has it been a total waste? No. Because you can enhance the services by bringing computers to bear. The key is how to integrate the ISDN network to the computer network. Things are easy at the beginning. Dealing with the analog world placing a call is easy. Signalling is easy. Moving to ISDN, you are talking about serious data communications, it is not cheap, and there are time requirements. The telephone now is part of a continuous network. UNIX is not noted for its ability to service real time requests! There are ways around it, but in the end the operation is not cheap because all

the computer cards needed and ISDN telephone sets are not cheap. Moreover in ISDN when you have several lines there is only a single channel.

The system shown in the video is basically a telephone line hooked up to a computer-based telephone server. You can do several things with it, whether you are sitting there or not: store calls and their ID in memory, forward calls, forward calls to V-Mail, forward calls to another computer. One can also dial a telephone with the assistance of a speed dial stack list and keep a record calls, which facilitates redialing. The keys are both to numbers and names, very much like a rolodex card. The point is that there is a number of things that ISDN is not for us and there is a number of things that ISDN has not so far evolved into in terms of satisfying long range communications needs. But through common channel signalling one has the ability to add some enhanced telephony features and applications to the computer.

Schmandt concluded that even though there is a lot of hype about ISDN that has not really been met there are real possibilities for doing some creative enhancement of telephone services to a cluster of numbers without modifying switching software.

The next speaker was Eli **Noam**, Commissioner, New York Public Service Commission, and Professor of Business Administration, Columbia University, on leave.

In **Noam**'s view, the private network is a kind of ISDN and a major issue is whether there is a role for narrowband ISDN. There is no doubt that fiber technology will eventually dominate. But full penetration is still far away because of the costs for replacing existing copper. There are several other reasons: optical transmission technology is dynamic and the cost of associated electronic transmission equipment extremely expensive, the workforce is not trained yet for fiber, broadband full channel switching is still mainly a lab event, photonic switching is still further off, there is hardly any broadband terminal equipment, aside for computer and analog TV sets; and there are practically no software applications. Furthermore, the regulatory process is far behind. Cable companies fight the idea, regulators fear the cost and drag their feet, and the industry itself is not sure whether it wants to invest all that money in the network instead of other business. There are no completed standards, in spite of considerable progress made.

Noam then asserted that in spite of all this he is quite optimistic. It will take time to sort out and solve all these problems, so the question is what to do in the meantime, and in particular what to do with the intermediate narrowband ISDN technology. Engineers disdain narrowband technology and want to leapfrog. The problem with the leapfrogging view is that it is built upon a "stalinist" view of what communications are. That is, that there is a "right" technical solution and one should therefore replace the existing and "wrong" technology by fiat. Ignoring the issue whether there is in fact correct technical solution, the real issue is the integration of the new technologies in the existing system. Society works in incrementalism (as opposed to a menu).

Noam went on to say that in New York, The Public Service Commission's ISDN trial has to overcome numerous complexities of compatibility. Yet people think that all these problems will somehow not happen for broadband, that narrowband ISDN's problems of

compatibility are an aberration. But that is naive, because everything that happened to ISDN will be even more complex with broadband, partly because one also adds new and diverse partners.

Another fallacy is to miscalculate the financial comparison of various types of services. This is done by looking only at the cost but not at their price. But as anyone knows in the regulatory environment, cost and price are only vaguely related. Some users and some applications will support other users and other applications. But once you get beyond test trials and early introductions, reality sets in, and broadband will then not be a leading edge prestige project but a business-oriented service. And as such will be milked for subsidy for basic residential service. This may make it less attractive as proponents believe.

And what about residential broadband services? That only raises a bigger set of problem, because once one establishes residence-oriented broadband services for some customers, probably based on some form of video, one sets up a set of demands for "broadband entitlement." In network expansion, one has to reach a certain critical mass to make the system self-supporting. Thus early phases justify some sort of external subsidies. Beyond the critical mass one has self-sustained growth. The network will stop growing somewhere at the point of private optimum, because beyond that the members of the network will feel that the additional costs imposed by the network growth will not justify the benefits. So the network stops growing. This however may well be below social optimum and it is at that point that the political process will come in and direct growth to go beyond private optimum towards social optimum. The problem is that once one introduces the political directedness into the system one will almost certainly overshoot the social optimum and move in the direction of fully universal service. At which point it becomes relatively expensive for some of the earlier users to support the entire network, because of the way in which latecomers through political coalitions are likely to dominate the process.

Noam remarked that when one compares how much ISDN and broadband are going to cost, one cannot simply look at the hardware cost, one has to look at what is going to cost to the user in relation to competing technologies. This incidentally also establishes incentives for some of the large users to drop off the shared network because they feel they are subsidizing too much of the rest of the users. It means that the arguments of economies of scale and scope may also not be valid because the system will not hold together given those cross-subsidies. Another reason is that economies of scale and scope are often assumed for integrated broadband networks and they are used as an argument to go all the way, integrating voice, data and video. That may be so, but there are certainly other incentives for some users or some applications to exit the network and use more specialized services.

Noam pointed out that still another fallacy in the "everything will be broadband" scenario is that everything goes in the direction of broadband. But that is only partly true in a linear communication world. Another trend is mobile communication which will have to be integrated in the future broadband environment.

Summing up, **Noam** said that broadband will still need a long evolutionary stage: technical, institutional, investment in loop plants (evolution of reach), development of applications.

That will all take time. In order to give a taste **Noam** described the ISDN proceeding and trial at the New York Commission. After a year of informal contacts with NYNEX and others, when little progress was made, he initiated an inquiry as to what the commission should do about ISDN. This lead to a trial involving six carriers, two switch manufacturers, and six large users. The group came up with two types of networks involving a mixture of companies and services. The complexity in bringing all these actors together reflected in the design of interoperability requirements.

Noam argued that narrowband ISDN, if nothing else, will provide a model in multicarrier collaboration in network upgrade. He concluded that the problem in the present American communications environment is that we have been working so much in the direction of segmentation of the market, of entry of new participants, and of competition, that we have neglected the integrative aspects that must accompany such centrifugalism.
Noam concluded that broadband networks is the way we are going but it will take time. In the meantime, narrowband ISDN is a transition technology. The main building blocks for ISDN are already there so that the incremental effort is not very large. Proponents of broadband should not underestimate the complexities. The window for ISDN is much longer than the broadband optimists believe. Once one gets beyond the ISDN hype, and sees it in a more modest fashion as a transitory step there is a good future for ISDN over the next decade.

Question & Answer

The first comment by Richard **Solomon** was that in 1975 we had only one carrier. He also said that in France there is not a monopoly anymore. In fact, you now have 2 MB lines between France and West Germany because of ISDN. ISDN is forcing European governments and engineers to work together on standards. The RACE program is very excited about broadband. In the United sates broadband network may make people talk to each other, like the National Highway System did many years ago.

Noam noted that RACE is a subsidy program that brings people together and some kind of subsidy will also be needed here in the U.S. in the early stages. Large-scale development programs may require some help. There is trend in regulation towards price regulation to increase efficiency. But a often neglected negative side of it is that it takes away some incentives to capital investment. This could possibly lead to a short-term orientation for companies which were in the past quite good at taking a long term view. **Johnston** added that in fact, having lived through divestiture, he could assure that the planning cycles are shrinking rapidly with some good and bad aspects. **Solomon** reminded that the Corporate Committee of Telecommunications, representing the thirty largest non-governmental telecom users, has made a proposal to the FCC that they be taxed a small percentage to be put into a trust fund to be used for the development of broadband for the home.

The first question asked how do we avoid history from repeating itself in the policy arena

as we move from narrowband to broadband. **Noam** reply was that in the United States the institutional set up is still geared to the old telephone system. The system needs serious revision. Regulatory federalism should be reformed. Specific functions should be assigned to the states and to the Federal government, rather than use the antiquated test of "interstate" versus "intrastate" communications. However, this is unlikely to happen because people are very outcome oriented. On the standard setting level that is similarly true. There should be some strengthening of the federal level along the lines of the National Labor Relations board, which does not decide the way settlements should be but provides a framework for parties to engage in serious negotiations. **Johnston** added that on standards, one can support a standard but have different implementation. One exception is the TCPIP, which has worked because it is a reference model based on Internet. One thing that we should be looking at is the effort by the National Research Initiative to build a broadband network across the country to support leading universities. Carriers such as NYNEX and other long-distance carriers are looking into it. The importance of this enterprise is that will force people to work together. Internet is a good reference model.

The next question asked for views on the recent demand by RBOCS for a new regulatory environment, freeing them from existing constraints on expanding services. **Noam** said that there should be a clean separation in policy terms between the conduit functions and the content functions. Which is not to say that the RBOCS should not be in the content business themselves. But RBOCS should not force change by not providing conduit let into content. Because one gets leveraged into mixing these two functions, New York recently issued rules of non-discriminatory common carriage for telephone carriers operating as mass media carriers.

The following multiple question was about: 1- the future role for voice recognition, 2- how does ISDN compares to cable TV ?, and 3- what are the advantages of fiber-to-the-home over satellite TV ? **Schmandt** answer was that voice recognition will take place in the desktop. What is really interesting is Voice Mail based on a client server model very popular in the computer world. Voice mail is a separate piece of equipment in the ISDN system and therefore there is considerable room for improvement towards greater decentralization with small effort. The matter is what is cost effective and convenient. **Johnston** added that probably voice recognition will show up in the desktop associated with the telephone. NYNEX experiments have shown benefits, but still small. One is to reduce the number of calls going to the operator. Voice recognition can also improve user interface.