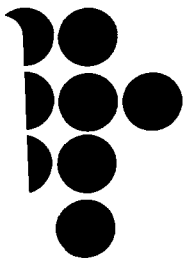


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# COMMUNICATIONS FORUM

"Competition in the Local Loop"

February 27, 1992

MIT COMMUNICATIONS FORUM  
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CAMBRIDGE, MA 02139  
(617) 253-3144

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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COMMUNICATIONS FORUM**

**"Competition in the Local Loop"**

**February 27, 1992**

**Seminar Notes**

**Ms. Beverly Baker, Federal Communications Commission**

**Mr. Mark Horan, Legislative Assistant, Congressional Staff**

**Dr. Richard Solomon, CTPID and Research Laboratory for Electronics, MIT**

**Prof. Russell Neuman, Media Lab, MIT, Moderator**

**Elizabeth H. Prodromou, MIT, Rapporteur**

Today's seminar addressed the technical convergence of advanced cordless phones and cellular phones, with respect to the new choices that these technologies will offer to consumers in how they communicate. For example, such technical convergence means that, in the case of dissatisfaction with one local telephone company, the consumer could simply select another local phone company (just as the consumer now has choices in the selection of long distance and cellular phone companies). The long-term implications of this sort of technological convergence and consumer flexibility regarding service providers are that it may no longer be necessary to regulate services and rates.

Prof. Russell Neuman, of the MIT Media Lab, introduced the seminar. He summarized the purpose of the seminar: to look at the technologies, business initiatives and the policy environment that may be leading to important developments in local telecommunications. One of the predictions that is being discussed is that we may find ourselves moving within the next five years to a dramatic deregulation of local exchange service, based on the sudden and promising growth of competition. In short, we may see a replication of what happened to long distance service with the divestiture of AT & T in the 1980s.

The first speaker was Ms. Beverly Baker, of the Federal Communications Commission (FCC). She discussed what some of the players are doing now in terms of competitive local exchange for this area. Baker began with a brief explanation of the FCC and of the Private Radio Bureau of the FCC. The FCC is generally divided into three subject matter areas or bureaus. The Common Carrier Bureau deals with the telephone companies -- generally, the wire line telephone companies and the cellular telephone companies. The Mass Media Bureau deals with the radio, television, and cable companies. The Private Radio Bureau deals with all other uses of radio, and that includes a tremendous range of things -- from ham radio operators to very large private microwave systems set up by individual companies for their own internal uses to a lot of services offered on an entrepreneurial basis (vs. a private basis). Baker explained that the private services are regulated very lightly. There is no traditional economic regulation of rates and entry, as there is for common carrier services. The regulation that does exist is mostly technical regulation to promote efficiency and to try to limit interference. Many of the services that have developed as private are actually services that could develop, ultimately, into competition for today's telephone service -- the so-called "local loop."

Referencing an article by Henry Geller, who has been in telecommunications for a long time and was a past General Counsel of the FCC, Baker noted that he had called the local loop the last frontier and that he expected competition to be the way of the future. According to Baker, Geller was right in his predictions. Competition is coming, by wire and by fiber optic networks and by wireless or radio services. In some areas for some services and for some customers, competition is already here.

In Baker's view, this competition will benefit everyone -- consumers, the general economy, those companies which provide services. The key issue on the competition has always been access to the individual customer, home, and businesses. This has been assumed, in the past, to be a monopoly; the general view was that no one would go to the expense of that last mile, either by wire or by other technology. Baker suggested that this view is not correct.

Turning to the main players who could provide such ubiquitous access to consumers, Baker referenced a whole family of services. Some of these are wire services and some are a combination of wire and wireless, which currently compete with parts of the local telephone companies, and these have the potential to develop into broader competition for the telephone companies' service. Baker also mentioned that the FCC has some major initiatives underway to try to promote new technologies and the development of competitive services. Finally, she noted that there are some very important regulatory issues that will need to be confronted to encourage a more competitive market.

In terms of the new technologies, there has been an explosion of radio-based services that allow consumers, without wire, to communicate by voice, data, and video from remote locations. Some of these services are old and well-established, like paging, and some are new, like personal communications services or enhanced specialized mobile radio services. All of these currently involve some trade-offs for customers in terms of cost, quality, and functionality of the kinds of services offered.

Paging has been around for about forty years. There are some eleven million subscribers nationwide. Paging can be regulated as common carriage, or as private carriage. The differences turn on whether you have an exclusive frequency channel to provide the service or whether you have to share a channel. To get into the paging business, you could apply to the Private Radio Bureau for a license; you would be put on a shared channel and could be on the air in sixty days or less. The time frame would be a bit longer -- probably close to a year -- to obtain a license to operate as a common carrier. Pagers are becoming a lot more sophisticated. They are smaller and smarter, with digital or alpha-numeric displays, and there are some wide area services being offered.

Paging is now being used in connection with other services, such as cellular telephone services. Paging allows you to be paged, rather than to be called, on your cellular telephone service. This allows for a substantial saving on your air time and, therefore, on your cellular telephone bill.

Another wireless service which has been offered in the U.S. for quite awhile is the cordless telephone. These are low power, have a limited range, and work on a base station that hooks right into your telephone wire to work with a portable handset that is actually a radio. The drawbacks are that this technology does not afford much privacy (someone with an AM band tuner can tune in and listen to your conversation) and that it is subject to interference.

The second generation of cordless phones, referred to as CT-2, are digital, are higher power, offer more privacy, higher quality and a wider range. They permit a user to make calls but not to receive them. The problems have been losing calls as you move from one place to another. They were used rather unsuccessfully in the United Kingdom as an alternative to public pay phone service. They did not have a wide enough range and were not compatible with enough other services.

CT-2-Plus is the next development on the cordless telephone. It solves the outgoing-calls-only problems of the CT-2 by adding a pager to the hand-held unit. There is no spectrum authorized in the U.S. for either CT-2 or CT-2-Plus, although there are several experiments underway in various parts of the country.

Baker discussed CT-3 as the next development in cordless phones. It permits two way calling and also permits hand-off of calls as you move from one area to another (so you don't lose calls). Erikson is trying to market CT-3 in Canada and has applied for an experimental license to test in the United States.

According to Baker, the next kind of radio service is called a specialized, mobile radio (SMR) service. This technology developed in the United States over the last ten to fifteen years. It represented a new concept in private radio service, namely a radio service provided on an entrepreneurial basis, much like the cellular telephone service had provided to customers. This new technology is a two way voice service. In the past it has been used mostly for dispatch, although Baker noted that there is no legal restriction to dispatch service. The technology can be interconnected with the public switched telephone network, so that if you have an SMR radio in your car, you can use it just the way that you would use a cellular telephone.

By statute, the SMR service is not subject to regulation by the states. In any one area there can be any number of these SMR operators, in contrast with cellular services where there are only two operators in any area. She remarked that there has been a trend toward consolidation in this industry. The only restriction on SMR service has been a practical technical one. Unlike cellular companies which have a large amount of spectrum (25 mhz for each cellular company), these SMR companies typically have only ten or twenty 25 kilohertz channels (very small amounts of spectrum). Therefore, to remain economically viable to serve enough customers, the SMR customers have to limit the amount of time that any one customer is on the air.

According to Baker, the above practical technical limitation has begun to change. Just about two years ago, a multi-system SMR provider named FleetCall came to the FCC with a proposal to take its service digital as opposed to analog and to operate in a cellular type of configuration that allows significant re-use of frequencies. By doing this, the company expects to increase its capacity by at least fifteen times and also to allow a higher quality of service. Baker commented that the FCC has given them a five-year extension period in which to construct the system, and the company is now actively at work on it in six major cities around the company. In

the meantime, other SMR companies are coming in with similar proposals which suggests, to Baker, that this is a trend which will develop.

Baker cited another variant on the SMR idea, namely RAM Mobile Data, which put together a number of these channels and is offering a worldwide data service. Bell South is a significant investor in this service.

Another interesting radio service is the in-building systems, such as Motorola's Altair system. It is a private radio service. The original concept would eliminate the need for all building communications wiring, replaced by radio transmitters (in the ceiling). The telephone, fax machine, computer would operate on this same radio device at a very high frequency band. Motorola will be experimenting with CenTel on additional uses of this technology.

Baker commented on cellular radio, a technology which is familiar to many people. It gets its name from the characteristic configuration of radio base stations in relatively small geographic cells. This has substantial channel re-use and the technology to allow a call to be handed off as your car moves from one cell to the next. According to Baker, there are just two licensees in each market under the structure that the FCC set up. One is reserved for the wireline telephone companies and one is for the non-wirelines although, as a practical matter, in most instances the non-wireline is also held by wirelines in other areas. This technology, therefore, is definitely very heavily dominated by telephone companies. They have very large spectrum allocations and are in the process of switching from analog to digital, which will greatly expand their capacity and the number and kinds of services that can be offered. The rates of these companies can be regulated by the states, but most states have at least partially deregulated these operations. Baker estimated that only about eleven states impose traditional carrier regulation rates.

Another interesting service is called BETTERS, Basic Exchange Radio Telecommunications Service. The concept here was that, for people living in fairly remote areas, we needed to get communications out to these people without the huge expense of running lines. The answer was radio. Just a couple of years ago, the FCC established this new service in order to allow these people to be served. The supplier movement is rather interesting. One of the major suppliers is International Mobile Machines. They have a very sophisticated set of equipment.

The new service that is getting a lot of attention now is the personal communications service. You will note that I will carefully avoid any precise definition of exactly what this is, because we're not sure yet. It is generally envisioned as a portable service offered to individuals and businesses on a micro-cell basis, where a user can communicate as long as he is within range of the base station. What this presents is the possibility that, ultimately, instead of having a work phone, a home phone, and a car phone, etc., you will have one telephone number that is your personal telephone number. You will carry your phone with you in your pocket and you will be reachable wherever you are, through this personal communications service.

Baker explained this service as the logical development of virtually all of the other services she had described thus far and as a logical development of local telephone service. As this service is focused on individuals, it offers the possibility to replace or to compete with the local telephone company. At last glance, there were well over one hundred experimental applications to the FCC, in various frequency bands. There are a couple of major proceedings underway at the FCC that are meant to help get this service underway. As yet, there is no agreement on a number of critical technical issues. The FCC has assumed that these services are likely to be digital, but there is still no technique established for allowing the ability to speak and listen simultaneously. Further, there is no agreement concerning where the spectrum allocation will be and concerning what to do with existing users in any band that the FCC decides to allocate.

There are also various satellite services and mobile satellite services, as well as new proposal for the low earth orbiting satellites. Baker observed that the competition is also coming from new fiber networks such as Metropolitan Fiber and Teleport, the latter of which offers service here in Boston. Teleport provides a fiber optic network service that competes with the local telephone company in seven major cities. It offers some switch service and carries phone traffic for long distance companies, large business, and other organizations which send large volumes of data and voice traffic.

In a very interesting development earlier this month, TCI, the largest cable operator, acquired 49.9 percent of Teleport. TCI has an option, if Cox Cable does not exercise it, to acquire

a great deal more. However things turn out, a cable company, with its obvious means of access to the home, is going to be owning this fiber company, a fact of which the telephone companies undoubtedly have made note.

Baker mentioned that there are a couple of regulatory initiatives at the FCC to encourage the development of the new services. The PCS, Personal Communications Services Policy Statement, was published in November; a hearing was held on the subject and, in a couple of months, the Commission is expected to adopt a notice of proposed rule-making on the issue. Baker noted that there is also a proposal for establishing an emerging technologies band, to help solve the problem of having no home for new radio technologies. This would set aside a block spectrum for new technologies. One wildcard in all of this regulation is the World Administrative Radio Conference, which is going on even as we speak. This Conference is considering the issues of PCS and of what to do with the bands that are being considered. What happens internationally obviously has an effect on what we do domestically, given the need for a degree of international compatibility.

In terms of regulatory issues vis-a-vis these services, Baker mentioned the general compatibility and standards questions on the inter-operability of equipment. Also important is the question of who would set technical standards, how to deal with obsolescence of standards, how companies should make investment decisions on the basis of said standard, the interconnection questions, etc. As PCS develops, there will be an issue of non-discriminatory interconnection to the local telephone network. This is something that the local telephone company has never been very enthusiastic about. If you recall, back in the 1960s and 1970s when MCI was just getting started, MCI filed its first application with the FCC in 1963. In 1978, after many trips to the FCC and after four trips to the Federal Courts of Appeal, MCI finally established the principle that it could offer the service and that it was entitled to interconnection on non-discriminatory terms from the local telephone company.

In Baker's view, the local telephone companies are unlikely to be any more enthusiastic this time, especially since the new services raise the possibility of putting them out of business altogether. She suggested that as we look at the regulatory issues and as we think about the appropriate form for regulation, we must keep in mind the core purpose of regulation: when you have customers who must take service from a monopoly service provider, regulation is necessary to protect the customers from monopoly abuse. This is especially so when the monopoly has been conferred by the government. If there are no captive customers, then this economic regulation is not necessary and, indeed, it is harmful. As the services develop, we have some choices to make. To the extent that we make these choices wisely and the regulators are able to stand aside, Baker expects the market to develop in a vigorous and competitive way and that the companies will become vigorous domestic and international competitors.

The next speaker was Mr. Mark Horan, Legislative Assistant on the Congressional Staff. His assignment for the seminar was to describe his boss's (Congressman Ed Markey) philosophy and thinking in the area of competition in the local loop, as well as to discuss the kind of current array of legislation and proposals in front of the Congress on these related issues. Neuman explained that Horan is Special Assistant to Congressman Markey and was formerly on the Subcommittee on Telecommunications and Finance. His current duties include working on issues of economic development and high technology, with special attention to telecommunications. He was a policy consultant to the Massachusetts Corporation for Educational Telecommunications.

Horan explained that he wanted to give the audience a sense of what the politics are around these issues on Capital Hill. He noted that, in the next few months, Congress will take up three bills which, if they succeed in moving on them, will change the telecommunications marketplace quite dramatically. The first piece of legislation is the Cable Reregulation Bill, which passed the Senate last month and will be taken up by Markey's Subcommittee in a couple of weeks. The second piece of legislation is a bill which some say will slow, or even stop, the Bell Companies from entering the information services marketplace or, at least, to build some safeguards before they do enter it. The third is a bill to allow the Bell Companies to enter into the manufacturing of telecommunications equipment. The latter two bills will probably be taken up by Congress in April or May.

According to Horan, these issues have been on the burner for the past three years and there has been a wait for the emergence of some consensus and movement. The cable bill is more or less ready to be moved; it passed the House in 1990. The other two bills, particularly the Informations Services Bill, are likely to be given a pretty good hearing because of recent court decisions.

One of the things that Horan's group will try to do as they take up these bills is to take a closer look at emerging competition in the local loop. He made a few observations on Markey's view on competition in the local loop. First, he recognizes that competition is already here in many major cities, with the growth of services like the ones outlined by Baker. With expanded use of cellular telephone services and with the advent of personal communications systems, Markey recognizes that this is not something that is merely fantasy but that competition is changing the marketplace. According to Horan, Markey and members of the Subcommittee understand that the federal government must begin to move on these issues because the states are already moving. Because the states deal with local service, they are leading the charge and, with recent decisions in certain states, it is time for the federal government to take a serious look at the competition issue.

Horan noted that another important point is that Markey and members of the Subcommittee view competition as important to spurring innovation. Markey has been regarded as a consumer advocate and as someone who believes in a certain degree of regulation, but he has always been very concerned about bringing innovation to the marketplace. He was one of the first to identify HDTV as a concern for American electronics companies, and was one of the first in Congress to talk extensively about Japanese plans in consumer electronics and in telecommunications. He has a history of understanding that competition is an important way to spur innovation. Horan discussed a recent conference at the Kennedy School, where the focus was on what competition has done to bring a whole new array of small companies into Massachusetts in the area of telecommunications. There will be a continuing effort by Markey and Gov. Weld to spur the telecommunications industry in this state.

Another observation made by Horan was that members of the Subcommittee regard competition, as opposed to regulation, as the preferred way to deal with consumer problems. This is one of the by-products of the Reagan era - market principles are still popular amongst Democrats and Republicans in Congress. But having said that, Horan noted that the most important issue for many members of Congress is universal service. He commented that Congress is sometimes misjudged on this point. A lot of people think that one of the reasons why Congress does not move quickly is because it is bogged down by special interests. This is true, but when it comes to issues of how the telecommunications market is regulated, it is important to understand that members of Congress feel very strongly that they must protect their local constituents. Every member of Congress has the idea that they are there to serve their constituents.

Horan explained that it is useful to consider Markey's typical constituent - he referred to the mythical, typical constituent, "Mrs. Carpolucci." This is a person in her late fifties or early sixties, who has lived most of her life in a lower middle income area like Revere or Everett; she probably has a large family and is involved in the local senior citizen chapter. She regards Markey as being in Congress to protect her interest. Horan emphasized that it is important to keep in mind that Congressmen are aware of this perception on the part of their constituents and that this awareness impacts their views on bills under consideration in Congress. For the above mythical constituent, amongst the most important things in her house would be her telephone and television. Members of Congress understand that the telephone and television are something like lifelines for these people. As a result, policy formulation must address the needs of these constituents.

Discussion of deregulation of local telephone service turns on this baseline concern of how it will affect such people. While experts in Congress might say that deregulation is in the best interests of this average constituency, Congressmen must consider the issue very carefully. It will take Congress awhile to look at this issue.

In Horan's view, Markey and other members of the Subcommittee are very interested in bringing competition to the local loop. They would hope that is the best way of dealing with consumer concerns, but they must also deal with these other questions of how it competition would affect universal service; how to ensure fair competition should the new competitors be forced to subsidize the Mrs. Carpoluccis of the world (the way the Bell Companies have had to in

the past); are personal communications systems a legitimate form of competition and, if so, who should be allowed to participate; how to balance competition with the legitimate need to get the Bell Companies to invest in updating the network, etc. These are the issues that we will start to look at more aggressively in the next month or two.

Neuman remarked on the interesting balance between how the average constituent sees the importance of the media that comes to them versus how they have taken for granted the freeness of t.v. and the full universality of the telephone. The inventors and entrepreneurs are trying to push new concepts through and they are dealing with technologies and tradeoffs that do not translate easily to the language of the typical constituent.

The next speaker was Dr. Richard Solomon, CTPID and Research Laboratory for Electronics at MIT. Neuman explained that Solomon is an expert in telecommunications policy and technology, and has a strong international bent. Neuman asked him to focus his remarks on the domestic situation regarding competition in the local loop and to suggest drawing on a book in which the authors have derived a set of principles and are trying to find a way to put them on the agenda that is currently defined around issues of existing services and the proposal for PCS. The question for these authors is how to bring a holistic paradigm to the consideration of new services and competition, when there are so many players and so many specific policy dockets; how can one step back and look at the broader questions.

Solomon observed that the average constituents are, in fact, the mainstays of the nation. He remarked that a good definition of PCS is "positively confusing systems." The telephone system is fairly easy to understand, even for the average constituent, until recently. It followed a pattern that we saw develop with the railroads and highways, and it is no coincidence that the Federal Communications Act of 1934, which was derived from the Federal Radio Act and previous acts, repeats verbatim the Interstate Commerce Act of 1887 with the exception of replacing the word railroad with telephone and telegraph -- this suggests the fungibility of these technologies.

The big shifts in the plan began to take place at the end of the 1950s and, over a 75 year period, it was still two copper wires from your telephone to some kind of centralized switch. The big innovations occurred in the 1890s with a loading coil that allowed you to get further out by using some fundamental electromagnetic theory. The next big innovation was in distribution plan, by finding ways of using a WWII spin-off of radar. (overhead)

Solomon reviewed the use of modems in the late 1950s, initially for military purposes. But the network was still a telephone network, with computer data converted into telephone tones. The plan began to get a little more complicated with cable head-ins going to the home. By the way, the initial cable plant was built by AT & T in the 1950s, but they decided to get out of that business because they didn't understand t.v. and wanted to stick to basic telephone technology. We see different models more or less growing the same way.

The vision from the telco point of view for the 1990s is as follows: it is similar to the railroad model of 1887, with the addition of high-speed, broad-band switches, which are basically parallel processing computers. They took over the cable industry, and now they have a new transmission mode for the local loop, using radio. They are still in the business of offering telephone service.

There are other visions of what you might get on local loop. These views come from the local area network, wide area network, and metropolitan area network. They assume the same business and use the same plant. They have now coordinated the standards.

What we ended up with after 75 years of developing a telephone system as a railroad, which probably made a lot of sense, was state-mandated universal service. The federal government really didn't get into the picture until they started passing rural electrification laws, and there was never any Congressional mandate saying that everyone must have a phone -- there were only state mandates that basically implied that. There was differential pricing for essentially the same service. Business pricing was based on value of service. Residential pricing was based on ability to pay, though they said it was also value of service, so this involved a subsidy. This was a recognized, accepted cross subsidy, until the late 1960s when the major users began to feel that they were paying too much for telephone services and there were new alternatives growing from the options of microwave and computer switching. The capital was raised by dominant carriers, meaning that AT & T was a sort of bank. Until the end, AT & T was a bank that collected roughly



ten billion dollars per month in cash from all the users. If you didn't pay your bill, you got cut off. Everyone paid their bills in advance. The cost engineering function was averaged for the network as a whole, but was artificially separated into the state and federal domains.

The rates were based upon planned investments, so you had unlimited flat rates for local service and this stabilized the revenue projections. AT & T was able to make revenue projections five to ten years in advance, even in the Depression years; they knew how fast the population was growing, they had a pretty accurate model of how people used the telephone, and they could project what their revenues would be and how to invest their monies. There was no obvious "cream skimming." To prevent erosion of the rate base, you couldn't use connective plastic jackets. This was considered cream skimming.

The trends changed, however. Now we are getting customer premise equipment, including telephones, video terminals, t.v. sets, and computer modems. It is becoming a more intelligent network. Transmission is becoming faster than the customer premise equipment can handle -- sort of the flip side of what we had during the first 30 years of computer networking. The switching is becoming relatively passive, although there are those who would like to make it more active. If we look at broad-band switching proposals, there are micro second delay times. We are also getting all-digital networks, meaning bits of bits -- you don't know whether it's voice, data, video, or a combination of the three, or something else. You can set parameters for how fast the bits can get there, how accurate they have to be when they get there, whether you want them all at once, etc. But bits are bits; this is a basic premise toward which we are moving in the new networks.

The new networks have very powerful stored programming processors, that is, computers. Computers are stored programming processors. This trend toward powerful, computerized stored programming processors is occurring not only in the network where they began to make the first big changes, but at the customer end and in between. This leads to a fungibility of the carrier versus the customer network. Particularly with the big networks, we are getting to the point where we can't tell which side of the switch is the customer and which side of the switch is the carrier. I suspect that we will get customer networks with fast switching, fast programming, and universal open standards. I can envision a large customer saying to the carrier, "we will carry your overload, and you pay us."

We are getting constant proposals for more and more band width, especially for band width on demand. This is much different than the model we started with in 1887. This will affect future traffic profiles; the voice will become part of the data traffic. If you have a lot of broad-band data, let's say for t.v., you can have quite a few voice channels in between the packets.

Demand will be very difficult to predict and, as a corollary, revenue will be difficult to predict. Another way to look at the effects on carriage is to say that the customer shares control with the carrier. We already have this today with ISDN. There are ways of manipulating the ISDN network at the customer end, and the smart user is already doing that. Even before ISDN, you could do simple things like manipulate the international toll traffic if you didn't want it to go via satellite. This wasn't in the tariff, it wasn't quite illegal; you needed to know what the "blue box" codes were, but these were published and therefore available. The carrier-customer boundaries are becoming vague, making it difficult to do cross subsidization. We are getting virtual networks that may become dominant in the future. The bypass option will proliferate.

One of the interesting paradoxes to emerge from the above trends is that we are going towards broad band networks, fungible networks, variable networks, and the band width on demand. The cost structure is a step. It is not continuous and does not accelerate, but works on a step function. The problem with this is pricing. How do you price a network like this? In one of the recent FCC reports, it was pointed out that if you charge a nickel for a 64 kilobit per second phone call per minute, you would have to charge \$700 per hour for a 1.5 megabit video connection. This is impossible. Voice becomes free in broad-band networks for broad-band users. Unless we figure out how to handle the pricing paradox, we are not going to get these networks to be viable. The new players will make money and the old players will be put out of business.

We thought about the above issues and came out with the term (coined by Neuman) "open communications infrastructure," or OCI. There are three basic points to consider in future networks. Whether this handled through tariffs or otherwise is actually quite critical. The government could mandate these things, but perhaps we should allow the entire thing to be

deregulated. We need to address the question of what is the role of government. What we need to do is to guarantee access to these networks, which means you must publically define an interface. Then you can guarantee access, as long as the interface is public. What does this buy you? It buys you diversity, which we feel is more important for future networks. Diversity means technological diversity. It also means cultural diversity and economic diversity. We do not get this with unified, universal service from one carrier.

We also buy something which is very important, namely, redundancy. This can be considered as robustness and security. The more networks, the better chance of getting something across them. So, while multiple railroad systems may be inefficient from a pure economic point of view, but multiple railroad systems at least will lead to competition and to lots of traffic under a variety of conditions. We see that today. Our transportation system may not be the most efficient in the world, but you can always get someone to carry a package overnight, you can fly anywhere overnight, etc. Maybe efficiency is not the supreme goal.

There are basic shifts required in terms of how we think about networks -- how networks divide and provide services; how providers and customers define what services are; how carriers offer access to services; etc.

Solomon pointed out that when you get progress you get pain. It is very difficult to make a radical transition in something like a network, without someone getting hurt. This may be the Bell Operating Companies or it may be the individual. As Schumpeter pointed out, when you get lots of progress and lots of pain, you must consider how to control the transition process. So, there is another way of making the transition -- we call it divestiture, which happens without deregulation. Deregulation in the U.S. had nothing to do with divestiture. They were both happening at the same time but not necessarily for the same reasons. You could have envisioned them happening separately. We are now going through a worldwide change in the structure of how basic telephone carriers are in business. They are either being denationalized or broken up, or both. So, we get progress plus pain. But we can modify the results and we can make the transition easier.

We are not counselling that we deregulate all at once. We know who the big players are. We have twelve of them now in the U.S. We broke up AT & T and ended up with multiple AT & T-type players. It is difficult. We don't want to get rid of them, but nor do we want them to be in charge of everything. So we need Congress, the FCC, the public, and the big corporations who are major users to be involved.

What should government do? The details need to be worked out over a reasonable transition time. In general, the government needs to facilitate the open interfaces. There are lots of ways to do that. We can, and have had, whole day meetings on open interfaces and how the government might facilitate that. The government needs to minimize pollution. In the case of local radio networks, we want to minimize interference. We may not want to forbid it completely but, in any case, the market can't do all of this. We need to protect privacy. This is something that private organizations do not do all too well, and it is perfectly reasonable for the government to take this rule. The Supreme Court has ruled repeatedly that the Bill of Rights implies that the government must protect privacy. There is also a need for government to assume the responsibility of intellectual property protection. If we are going to take all our media and digitize it and send it over networks, we have to find some way of getting paid for it.

### Question & Answer

Neuman observed that the speakers have offered a sort of tool box of ideas, information about existing industry players, and regulatory issues under consideration. Although they did not provide a coherent vision of the future of competition in the local loop, they did move in that direction.

The first question concerned the "typical, mythical constituent." The questioner referenced a recent experiment in a small California town, and asked whether there has been any formal study or examination of that experiment by the FCC or any other government committees.

Baker did not know of any such examination. Horan remarked on the FCC decision that gave permission for a cable company working in cooperation with the phone company, GTE, to get the cable franchise with objective of experimenting with advanced services and fiber. The entire

18 pages of the waiver from the usual regulations referred to the fact that no one else had filed, and there was not one reference to the notion that this was an aggressive, proactive exploration of a new issue. The regulatory circumstances, at least in the documented record, showed that no one else moved fast enough to block GTE and the cable company. I think everybody at the FCC knew what was going on and was looking forward to the results. The only opposition I remember as being on record was from the California Cable Television Association, which objected to GTE doing anything in this area.

The follow-up question considered how these futuristic services play out in the real world, particularly with reference to how the typical constituent might use these services.

Horan suggested that this is probably more of a legislative rather than a regulatory question. This is now paid for by the private companies involved, and they have a proprietary interest in learning what they and their co-venturers are doing. So, although they have filed some preliminary reports with the Commission, a lot of what they learn has come with large investments so they want to maintain a competitive advantage as a result. The question is what incentive would there be for those companies to file this information with the FCC and ergo to provide information on what they have learned to their competitors.

A discussion ensued on the availability to the public of what issues are pending discussion and legislation by the FCC. Baker noted that there are various trade publications that will summarize comments on any given docket, and most of the proceedings that attract attention (e.g. the video dialtone) will get some press in the newspapers. But it is difficult to get information on what issues are pending at the FCC without reading the Federal Register.

With regard to the questioner's comment on standards, Baker remarked that the FCC has a preference for the affected industry and for the consumers of the products in the affected industry to develop a standard. The FCC does not think that it can sit as a regulator inside the beltway in Washington and have any precise idea of what kind of standard is going to make an industry work in a particular market. As a result, the FCC looks for that kind of input to come from the private sector.