Network Environments of the Future

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Eli M. Noam, Featured Speaker

Marc Rotenberg, Chair

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ROTENBERG: It's a great pleasure for me to have the opportunity to introduce our guest speaker tonight, Eli Noam. ...

Eli ... is currently the Director for the Center for Telecommunications and Information Studies at Columbia University. It is one of the leading institutions in the country looking at New Age issues regarding telecommunications policy. ... [He served two years as] commissioner for the New York Public Service Commission.

During that time he prepared two reports that have been of great use to many of us in this room. One was a policy report on common carriage and the obligations of telecommunications-service providers. The other was a series of recommendations regarding telecommunications privacy.

It was this second report that made the rounds at public utility commission meetings, public service commission meetings and state legislatures throughout the country - who were trying to understand some of the new privacy issues related to the telecommunications networks, such as caller identification and automatic number identification.

Eli has two books forthcoming on telecommunications and television in Europe, from Oxford University Press. He has also recently joined ... the National Advisory Board of CPSR. Now, if there's one point that I can make about Eli's participation in this conference, and that I think is being made increasingly to all of us working on these issues, that is that freedom and privacy are inextricably intertwined. Because you cannot begin to look at

telecommunications policy and talk about freedom without some understanding of what the privacy rights might be of the users of that network. Eli Noam. [applause]

Reconciling Free Speech and Freedom of Association

Eli M. Noam

Thank you very much. I'm very pleased to be here and to be served by Marc Rotenberg as dessert to this knowledgeable audience. Marc, as well as several other people here in the audience - Alan Westin, Gary Marx and others - have been very helpful in privacy proceedings, which Marc had alluded to. I'm happy to report that just about two weeks ago the New York Public Service Commission had approved ... almost the final version of these rules and they will be issued [in] the final version shortly - whatever shortly means in the regulatory process.

... I would come back to it a bit later, about the participation of people in the regulatory process at the state level, because there was a ... substantial position both internally and externally. So thank you very much and we have made a great amount of progress.

What I would like to talk about today, however, are not these privacy principles, although I would be happy to comment on them later, but rather two fundamental bottlenecks ... to information flows that are remaining - bottlenecks that not only are not removed by the otherwise general opening of telecommunications networks that we have experienced for the last ten years successfully, but actually have been exacerbated by them, paradoxically, to some extent. This will be the subject of my talk today.

First the historic context - and it is a comforting one in some ways to contemplate - is that new forms of media have always been badly treated at first.

When movies were invented they didn't show Shakespeare but rather they exhibited vaudeville dancers and even bare ankles. Traditionalists were outraged. When sound movies were introduced a few decades later, musicians' associations agitated publicly that "sound movies are economic and cultural murder."

When the radio arrived, researchers noted that "parents have become aware of a puzzling change in the behavior of their children." In Britain, the headmaster of the elite Rugby School complained that "people listen in to what was said to millions of people, which could not be the best thing."

The telephone was no exception to the dismissal of a new medium as frivolous at best and, most likely, harmful. Soon after its introduction, it was accused by a German psychiatrist of driving people permanently insane. [laughter] Well, maybe there was something to it. Some religious groups told their members not to use the telephone, which they believed was a device of Satan to make people lazy.

As to computers, in the 1950s and 1960s many believed that they would, for sure, create the 1984-type of a State. But when 1984 rolled around, the fear had changed and had become that of 14-year-olds starting a nuclear war while skipping school.

Today, the entry of new forms of media delivery - electronic mail, electronic bulletin boards, telepublishing, whatever - continues to raise similar fears. Take "900" service as an example. In the past, the telephone was mainly used for person-to-person, real-time, voice-type communication. There were attempts at transmitting opera and concerts over the telephone, but they failed. Attempts to make the telephone the mass-medium carrier remained largely limited to weather and time announcements - things of that nature.

But now, the telephone is becoming a mass medium in new and interesting ways. Some of it is, frankly, sexual in nature. In New York City, for example, there are about 100 such 900-type services coming and going, and this tells you something, of course, about New York City. On the other hand, there are none of these services available in upstate New York. [laughter] This is not because of the higher moral standards there but rather because New York Telephone, a common carrier, has decided for several years now that upstate New York is [not] really ready for this yet, and need[s] to be shielded.

Sex isn't the only worst aspect. Some 900 services are used by various fly-by-night operators. And now, I have to report, there are even 900 services offered by lawyers offering legal advice. What next?

There is a great temptation to deal with 900 services - which I would much rather refer to as telepublishing or teletransactions - in a strict way: Protect our children. Protect our consumers. Protect the reputation of our telephone companies and, perhaps most importantly, protect our re-election.

For politicians, the 900 issue is ideal. There is widely publicized and exotic consumer harm and virtually no public opposition to restriction. There seems to be unanimity in Washington and in the state legislatures on these issues. Back in Albany [New York state capitol], the legislature couldn't even agree unanimously on the question of designating the official state muffin. [laughter] In contrast, agreeing on restricting 900 service is much easier.

What about the future? There are two fundamental bottlenecks we have to deal with.

The first deals at the periphery of networks. This is the problem I'd like to refer to as "the problem of the last 20 inches." I'm sure you've heard about the problem of the last mile. [The] last mile referred to is the fiber [fiber optic cable, providing very high-capacity communications] to the home, fiber to the barn, whatever. These problems of the fiber, the last mile of fiber, are relatively easy to solve in the sense that if you have enough money and enough lawyers you probably could get this job done. But there is a more serious bottleneck, which is what I call the "last 20 inches." These 20 inches are the distance from the display terminal to the human brain. [laughter]

The human senses and processes - eye, ear and brain - can only handle so much information. They are subject to biological constraints. Now, there are more books written than ever; there are more movies made than ever; cable television provides dozens of channels.

Soon, no doubt, voice-recognition technology will finally reach the stage that any random thought could be typed as one speaks and almost instantaneously distributed by electronic mail ... and to hundreds of innocent bystanders.

The real issue for future technology does not appear to be the production of information, and certainly not the transmission of information, but rather its absorption. Almost anybody can add information. It may even get you tenure. [laughter]

The real ... difficult question is how to get rid of information. I'm really ... serious about this.

Let me kind of quantify the information trend. In the first half century after Gutenberg, ..., about 20-million books were produced. That's not a small number. Incidentally, most were far less holy than Gutenberg's Bible. For example, there were lots of books about testing the faithfulness of the wives of absent Crusaders. No wonder kings and popes quickly went into the censorship business.

But the number of early books is dwarfed by today's figure - by a factor of about 50,000. In the U.S. alone, about 2.3-billion books were distributed in 1987.

It's been said that 80 or 90 percent of all scientists who ever worked are alive today. That's the good news. The bad news is that it's [a] similar figure for economists, too. [laughter] One study found that in 1980, the mass media supplied to an average American household was about 11-million words per day, including unwatched television, unread papers, unlistened-to radio, etc. That's 11-million words per day, an increase of 270 percent from 1960.

Now, several strategies are possible to increase absorption. First is education - make humans smarter. But there are severe limits to this as one finds out after about two semesters of teaching experience. [laughter]

Two: Add time allocation - spend more time on informational activities. This is clearly happening. The average cable-TV household in America has its set on for an unbelievable 8-1/3 hours per day.

Individuals also create individualized coping strategies, such as scanning correspondence while answering a telephone call, while listening to radio news. In office settings, people spend more time on information flows; lunch gets shorter; work hours longer. But obviously there are limits to this strategy.

Third: The possibility of tinkering with Mother Nature, by pharmacological or biological engineering. This is not an attractive proposition.

[Next]: Change the way in which information gets presented. Print takes up only of a tiny fraction of our absorption capacity. We're using hopelessly outmoded Phoenician and Latin communications protocols. But we're stuck with them. The written word is often sacrosanct. Try to change a letter in the Bible and you start a religious war. So instead of junking the Latin alphabet in traditional forms of written language, what is more likely to happen is a shift to a multimedia form of communications with parallel tracking of visual and symbolic information.

Television advertisements are an example. It is very easy to make fun of them but they pack in awful lot into 30 seconds of picture, voice, music, written language - all superimposed on each other and conveying messages on a variety of levels.

The last and foremost - and by far most important - [a] major strategy for dealing with information flows is to create screening mechanisms.

Here [are] alternatives for establishing those screening mechanisms:

First: "Screening professionals," such as editors.

Second: Intra-organizational screens, such as secretaries and staff. As former President Ronald Reagan proved, one can boil down any issue onto one index card. But it helps, of course, if you have 3-million people working for you. [laughter]

Three: Use economics as a screen, for example, by imposing an access charge to senders. Why is our time a free good for anyone who wants access to our mailbox or telephone receiver? Let them pay for access. That's how economists would approach it. For example, we could have, hypothetically, a personalized 900 telephone service that forces anybody calling us without knowing a personal-access code to pay credit into our telephone account. ... This would sure help deal with junk calls because it would establish a market transaction for access. [applause]

Most important, however: Automatization of the information- screening process. This is arguably the key technological challenge for the information sector. The super-pipes of communications require super- screens. We need technologies to help us get only information we want or need. The main "value added," then, will become the

"information subtracted."

One example for a very simple screening mechanism is a personally customized newsletter, which has only the information the individual is interested in. For me, for example, it would include only items on Columbia College football victories and, until recently, ... about the Albany nightlife. Of course, this makes for a very short newsletter. ... [laughter]

But, as you know, the difficult part is how to suppress repetitional, unimportant information. One needs a screening by quality and incremental value to the receiver. Expert systems and artificial- intelligence applications might be useful here, but we shouldn't hold our breath for their arrival. Screening is in its infancy. Right now, no computer can summarize a text. No computer in the world at any price can write one of those dumb four-line plot capsules for TV guide. [laughter]

Furthermore, meaningful information screening is highly personal. Even sensational news is an unimportant item to a person who has heard it five minutes ago. Thus, information screening requires a lot of brute-force matching of the new information with the already-existing information base that requires personal supercomputer capacity of huge strength, storage and mobility.

Today, everyone in the telecommunications industry is worried whether all those fiber lines will be filled in the future and would they pay for themselves? These people worry about the wrong thing. Of course the pipes will be filled, but only if there's a decent screen available.

The problem is not the addition of information. The problem is the subtraction of unnecessary information. If one can screen out the information garbage at the output stage, one will [put] the garbage in at the input stage - which means traffic for the fiber networks. Therefore the Golden Rule for communications network is: "Garbage out, garbage in."

There are fascinating problems to discuss about these screens, such as who programs them? For example, in the case of children, is it the schools that program the screens or the parents? Or is it private companies that do that? What happens to the ... stored information-base after an owner's death? How can information screens network with each other? Under what circumstances? How can screens be secure from attack by parties interested in having the information passed through the screen? But this should not be the subject for this particular talk.

The main point of the screening discussion here is that openness in network and information flows are blocked without opening of those last 20 inches. Without it, the rest of the system will back up like a sewer pipe.

Electrical engineers speak of impedance as a measure for a generalized resistance in a circuit. If the impedance of parts of a system do not match each other, energy transfer is inefficient. By analogy, we may speak of information impedance - a non-matching of resistances to information flows. This is the first fundamental bottleneck at the periphery.

Let me talk about the second structural bottleneck, which is more at the center of telecommunications networks, related to the structure of the future network itself. ...

Telecommunications are shaped today by two basic but conflicting tendencies: The trend towards technical integration on the one hand, which is what network engineers dream about at night, and the trend towards institutional and business diversity on the other hand, which is what economists and lawyers dream about. To some extent these two are substitutes for each other. Generally, speaking, the European monopoly PTTs [public telephone and telegraph organizations] stress ISDN-style integration [Integrated Services Digital Network],

whereas the United States mostly follows the path of diversity.

Diversity is the competitive advantage of American society. In the United States, network diversity is far ahead [of] the rest of the world. ...

Yesterday I ... came from Costa Rica. ... To come from Costa Rica to the United States, ... my plane landed in four other countries until I finally reached the United States. Which explains the reason why I didn't get here before three in the morning. I mention this because [in] Costa Rica we went to one village - it wasn't even a tourist place - on the Atlantic Coast, and the entire ... town ... had only one telephone line: 38- 1515. If one person in that town talked, the entire town was busy. And ... Costa Rica has the most developed telecommunications system in Central America.

For countries like that, obviously - what I'm talking about sounds like somebody coming from Mars talking - ... they have very different problems. They're in a much earlier stage of evolution of the network, where ubiquity, universal service of the public network, are the critical issues.

But in countries like the United States, and increasingly Western Europe and Japan, the evolution has moved on and the public network, the unified centralized monopoly system, is giving way to a different network structure, to an incredibly complex overlay of multiple sub-networks of various kinds. It becomes a "network of networks."

A few years ago it became fashionable to speak of communications creating the "global village." There was something inspiring in this image, communal and peaceful. There is nothing village-like in the unfolding of reality. Instead, groups with shared economic interests are extending national-group pluralism into the world at large and create global interconnection with each other. These new group-networks do not create a global village.

They create instead the world as a series of electronic neighborhoods of virtual communities. In the past, neighborhoods had economic and social functions. In New York, for example, Chinatown, the garment district, Wall Street, Madison Ave, etc. Elsewhere, there are regions with specialized productions, Hollywood for film, ... Silicon Valley, Route 128 for microelectronics, etc.

Physical proximity was a key. But now, group networks can serve many of the functions of physical proximity. They interconnect specialized producers, suppliers, buyers, experts and markets. They create new ways of clustering, spread around the world. These group-networks possess and acquire powers of their own. They already, in fact, link powerful entities and can bring their combined powers to bear. For example, the combined weight of them - of the members of the Swiss Banking Network - got the powerful national PTT monopolies to cave in on a number of crucial issues.

There is no reason to expect the power of network combinations to be directed only at communications issues. Once groups are in constant touch, they may as well get organized on other issues as well. Thus, communications networks become the political networks, and political networks will not simply be ... metaphors, but they will become real networks in their technological-hardware terms.

Networks will also coordinate in the economic spheres. In the 1920s various American industries established so-called ... fair-price bureaus that gave each member of the industry a convenient look at what its competitors were charging to whom. This practice was outlawed in a series of anti-trust cases.

Imagine if one leaves, instead, information exchange to a series of artificial-intelligence programs communicating internationally. One has a real problem of conceptualizing, detecting and preventing international cartels. One person's collusion is another person's programmed-trading, and the network becomes the cartel.

The networks themselves are also likely to become quasi- jurisdictions themselves. They have to mediate the conflicting interests of their members; they have to establish cost shares, creating their own de facto taxing mechanisms; as well as redistribution. They have to determine major investments, to set standard[s] to decide whom to admit and whom to expel.

As a group network becomes more important and complex, control over its management becomes fought over. Elections may take place; constitutions, bylaws and regulations are passed. Arbitration mechanisms are set up. Financial assessments of members takes place. Networks become political entities. ... We may be witnessing the creation of new and extra-territorial forms of new quasi-jurisdictions that are not clearly subordinated to any others.

The power of the networks becomes most obvious when it is applied towards its users. Take, for example, Columbia, my own university. Columbia has its own private telephone system. It resells services to customers, called students and faculty, setting rates that are not lower and often higher than those of the public network. And this is quite typical. There's nothing unusual about Columbia's treatment here. Columbia also dictates the kind of equipment that can be interconnected.

There are exactly four kinds of terminals, one-color only. Does this sound familiar? You have to rent them. Forget about answering machines. Columbia can also - although it doesn't choose to do so, but it has, I believe, the rights to - censor the messages in electronic mailboxes. And it can also refuse service, for example, to a radical political group if it chose to do so.

Similarly, you are all familiar to with the Prodigy situation, where Prodigy prohibited its users from discussing certain issues, such as politics, Prodigy's pricing policies, and so on.

There are other examples: The employer's blocking the ability of the employees to reach certain numbers. This starts with the blocking of certain 900 numbers because that would impose a cost. And that sounds reasonable, but of course it could also be applied to access to labor unions and to other numbers that employers don't want employees to speak to.

Or take the example of shared tenant services, where landlords could restrict the interconnection options of the tenants ... [such as] what networks they can reach.

All this adds up in my mind to petty monopolies - new monopolies that emerge largely unencumbered by the protection built into the public network, at least in the past, by law, custom and regulation. And if you don't like these petty monopolists, sure there's competition. For example, you can give up tenure and move to another institute which has much of the same kind of restrictions to its users. Even the public network has kind of evolved - quietly, but I hope not much longer quietly - certain kind of censorship arrangements.

For example, U.S. Sprint - and it's only an example, 'cause others do exactly the same - has 23 people who make sure that no 900- service provider violates its 45 rules that restrict the users in established conditions of service. ... Many of these rules would be clearly unconstitutional if a government imposed them. So the question is, just because ... all long-distance telephone carriers imposed them, whether this is an arrangement that should be condoned. After all, we would think that those censorship decisions should be made by responsible officials subject to procedures and ... reviews rather than quietly, inside [communications] carriers.

[There are] other freedom-of-speech rights for users in such private or group networks: The scope of these rights is undefined. Constitutional First Amendment rights may not exist, given the absence of state action. Regulatory

imposition of such obligations [is] possible but they are limited ... by the rights of groups to substantially define their own membership and to define the rules under which they operate - especially where a major purpose of the groups is communications itself and thus the exercise of a fundamental right itself, that is, of speech.

In the network environment, the granting of access and nondiscrimination [and] content-neutrality is required of the general public network by law of common-carriage regulation.

But common carriage does not necessarily apply to group networks. Groups may institute restrictions in the exercise of speech over their networks and assert that their status is like that [of] publishers. Hence, the evolving pluralistic structure of telecommunications may bear the seeds for a new type of bottleneck to the free flow of information that did not exist in the traditional public network and its common carriage.

Thus, and perhaps paradoxically, one freedom - the freedom of association - can conflict with another freedom, the freedom of speech.

How do we deal with this problem? This is where common carriage comes in. Common carriage means a non-discriminatory conduit service, neutral as to content, as to users and as to usage. Importantly, it also absolves carriers from liability for the impact of content which they transmit.

My argument for common carriage is not just based on belief in free-speech principles. That's only part of it. It's just as much based on the practical needs of the future network environment.

One reason for common carriage generally - whether in transportation or in communications - is to foster infrastructure services and its easy use. As such, it is similar to societal arrangements to encourage economic transactions by devices - such as legal-tender status for currency or negotiable instruments in commercial transactions, or free-speech protections for the press, or limited liability for corporations. The protection of common carriage is essential to the well-functioning of a network of networks.

The question may be asked, "If we don't have monopoly anymore, why do we need common carriage?" Actually the opposite may be true. Common carriage is critically important today because, in the increasingly open network environment, information travels across numerous sub-networks until it reaches its destination. If each of these networks sets its own rules about which information is carried and which is not, information cannot flow easily. This constricts the information life- blood of society and the economy.

It is as if each local government were to establish its own automobile-construction requirements and will check any passing motorist for compliance. Therefore a decentralized network system requires some basic and fundamental rules-of-the-road - and the non-discriminatory treatment of those "ones and zeroes" of digital communication is one of them.

The alternative is cumulative drag on the free flow of information. If each segment operates with its own test of acceptable content, the overall impact is one of frequent bottlenecks. Either there must be content tests, like censorship at each interface point, or the most-restrictive rules apply to the entire system. This already was exercised in the case of the satellite- transmitted soft-porn channel, which was killed by some backwater municipality somewhere because its community standards were so strict that it had a case that ultimately bankrupted the provider. [The American EXXXtasy Channel was a scrambled "hard-core" satellite feed. It went off the air in March, 1990, after county District Attorney Jimmy Evans obtained grand jury indictments in Montgomery, Alabama, against American EXXXtasy and also against General Telephone & Electronics, U.S. Satellite, Inc., GTE Spacenet for 50 misdemeanor counts of violating Alabama's obscenity law. There was no trial, no finding of guilt, and no Alabama residents were named as defendants. -JW]

Today we have public networks operating as common carriers and we have private carriers operating as private ... networks. I am not suggesting that we abolish private carriage. That would make no sense and violate the principle of freedom of association. But what is needed is the establishment of a mixed system. Such a system would permit private- network arrangements, but would also create what might be called common-carriage rights-of-way.

Such rights-of-way would function like public roads and highways that pass private property. They permit the access of various networks and the transmission of information across the network federation.

Some rights-of-way would be quite wide superhighways while others would be narrow but otherwise unobstructed lanes. In such a system, we ... keep private networks, which the owners control.

But if such networks interconnect freely with public networks, they must also offer some capacity for the reverse flow. For example, cable television networks ... would have to permit an easier way into the leased-network system once they interconnect, as is inevitable, with other forms of communications networks.

I don't have time to get into the specifics of these regulatory issues that I'm exploring now, myself, except to observe that this is all part of a broader issue. In the 1980s, telecommunications policy was centered on open entry. This was correct then and correct now, even if it was often unpopular. But in the 1990s there will be a different emphasis to regulatory policy.

Now, issues of interconnection, of integration of the various network parts, would be at the forefront. It is, so to speak, the post- deregulatory agenda. For that reason, when I was on the New York Public Service Commission, I concentrated on network-integration issues with proceedings and rules on - as Marc already mentioned - common carriage and privacy, [and] also multi-carrier ISDN, open-network architecture, co-location and others.

These are examples of the many free-flow-of-information issues that will emerge. Many of those will be fought over on the state level because they involve carriers under state regulation. I sincerely hope that CPSR and all of you will be active there, by patiently investing in credibility before these bodies and by teaching and instructing them. If you do that, you will find that you can have a surprising bang for the buck.

Everybody is very Washington-centered, obviously, but it's often very hard to get things done in Washington because there're so many industry organizations and so much lobbying going on there. Change is very hard to effectuate and certainly very slow.

In the states, on the other hand, if you get the right state and the right staff person or commissioners you can get a lot of action relatively quickly. And then other people take notice and might learn from the experience of that particular state.

The converse is also correct - which is that other people and wrong principles can also emerge relatively quickly and quietly in a variety of states. Therefore it is also important to be alert in a defensive way to establish kind of an early-warning network to know if bad things are happening in various states that one should know about. ... You should participate as actively as possible. Again, you will be surprised how much attention the comments of respected groups that are not constant, "usual suspect"-type commentors will have. They're really kind of read and given considerable attention.

And finally, one can have considerable impact on the agenda through the petition process. I've always been surprised [how] few groups make use of the petition process, which in effect helps set the regulatory agenda. If one doesn't do that, the agenda is largely set by the tariff-fighting of established companies. There's no reason why

the structuring of the agenda has to be surrendered. One can try to affect it through the petition process.

Now, while some of you hopefully do that, the rest of you, especially the technologists, ... will help resolve the information-screening process I discussed earlier.

So now we are come to the end. In the longer term, we can create a communication system which, by working together, will follow the principle that Thomas Jefferson didn't quite say - but could have if he had lived long enough. It is the constitutional principle for the free flow of information, when the electronic frontier - I love that expression - becomes the electronic republic. And it says:

"All electrons and photon - all digital zeros and digital one - are created equal."

Thank you very much. [applause]

QUESTION & ANSWER PERIOD:

ROTENBERG: We will take questions.

TED NELSON: Within my understanding of the common carrier, there is both the requirement of equal treatment of all customers with regards to the goods carried, but also the requirement of an identical tariff, which it seems to me under electronic circumstances might essentially render this kind of service uneconomical in the large proportion of the circumstances.

NOAM: Common carriage does not mean regulated rates, per se. For example, airlines are common carriers but they are now unregulated when it comes to their pricing policies. It is true that telecommunications carriers have largely been regulated as to their prices, but it is not an essential aspect of telecommunications carriage to have that.

Now it is true that you can make a mockery of the notion of access by establishing wildly divergent pricing. And presumably at that point you would have a problem. But I don't see that you necessarily have to have tariffed rates in order to have common carriage. You may have, however, to have some vigilance that in fact you will not use this in this fashion.

Let me give you an example. On the 900 service, the position of telephone companies is frequently that anybody can use the service, it's just that they're not providing the billing services. And the billing services are not common carriage; therefore they should be able to do that. Of course the service becomes impractical without the availability of easy and relatively cheap billing. It's a way of undercutting it and therefore, given the absence, that should not be permitted.

AUDIENCE MEMBER: Many ... believe that the First Amendment restricts only government action, not private individuals or businesses, and that in fact the Ninth and Tenth amendments prevent the government from trying to enforce the First Amendment on private individuals and businesses.

Do you not agree that in a free market for the transport of information users would choose to use service providers that do not restrict the content of information, and this would result in most networks acting as de facto common carriers without the requirement for government intervention?

NOAM: I agree with parts of what you say, but I think it's useful to distinguish between the content and the

conduit functions. I think there's no question that in the content provision there should be no governmental restrictions and regulations. Here, First Amendment protection[s] against government lie.

But when you talk about conduit-type services that is a different matter. Here you have basic regulatory principles that can apply. And those could include common carriage. I did not say that there is some kind of constitutional obligation for imposition of ... a constitutional right for common carriage. But I think it is a matter of regulatory policy.

My suggestion was that you would have common carriage based on these rights-of-way that I've discussed. I did not suggest to make everything a common carrier, but establish rights-of-way as ... a condition of the right to interconnect into common-carrier arrangements.

If a private network takes [to] itself the right to access ... into a common-carrier arrangement, I believe that there is, through that nexus, kind of the possibility for the regulatory process to require ... the opening of some reverse channels, too.

BOB JACOBSON: ... Where are exciting things happening in the states besides New York [and] California? What are some of the other places where things might be actually developing?

NOAM: The State of Washington. ... Sharon Nelson [Washington State Utilities Commissioner] has been a very active chairman, as well as chairman of NARUC [National Association of Regulatory Utility Commissioners]. I think California has been active both on the Public Service Commission level and also in the Legislature, where Bob [Jacobson] has been active. Tennessee and Michigan have been active in the notion of telecommunications becoming part of a more general economic-development policy. Other states have been more innovative in other matters. For example, Nebraska has entirely dropped the regulation of local rates.

... A lot of states have experimented here, experimented there - not across the whole gamut of issues. That's ... the strength of the state system, which is that it permits experimentation. ... It's important to remember that [federal-level regulation] clearly has a price. It's the only ... country in the world that has a federal telecommunications regulatory system. Canada used to have it, but after a decision by the Supreme Court in Canada two years ago, ... it's essentially been largely suppressed. The United States is an exception of one. Clearly there is a cost to that.

But at the same time, ... the ability of experimentation that a federal system has [is] it's strong point that should offset the negatives. If it doesn't, then there is a real problem in the federalism. That's why it's important to have experimentation in the states and no lock-step type of agreements, which has been somewhat of a feature in some instances.

HARRY GOODMAN: Would you say that it makes sense to distinguish between the "common-carrier perspective" that we've had on point-to- point communications ... and the more regulated sort of broadcasts, whether it's from one individual to many, or many to many?

NOAM: I'm not sure how one, in the future, can distinguish between that. If you have a broadcast-like fax, for example, ... or packet messages, ... how exactly ... would you structure that? I think that, conversely, would you have - through switched-video, on-demand video - ... traditional TV, mass media become highly individualized, too? Everybody's watching at their own time, at their own channel, so to speak.

I don't think you'll be able to establish those distinctions. This would be an instance which would violate my principle of all photons and electrons being equal, because you would distinguish between point-to- point and

point-to-multipoint electrons.

AUDIENCE MEMBER: ... Your image of the rights-of-way brought to my mind the idea of informational easements, where one is not trying to change the character of the context through which information's flowing - whether that's the village, the state, the country, or whatever [other] global demographic chunk you want. I'm assuming we're not discussing world government, if we are talking about informational one-world government, even though we discuss rights-of-way or informational easements. [Do you see] any utility in the present structure of the United Nations and some task force within it as working on some of the standards for an inter-lingua or a set of universal protocols?

NOAM: That particular issue I can't address for you. You're presumably talking about translation-type arrangements. There are considerable international arrangements in telecommunications available. The ITU, the International Telegraph Union at the time, is the oldest international organization that exists. So internationalization existed ... almost right from the beginning of telecommunications.

But frequently its major function was not just technical coordination, which sounds all right, but it was also essentially the coordination of national monopolies into an ... internationalized cartel - so that, in effect, you could not route messages from, let's say, France to Russia through other countries, thereby undercutting the monopoly profits along the route.

Over time, these international organizations have become essentially support organizations for the monopoly. That's why I don't think that these various notions are based on a pluralistic network structure, that they really would be dealt with sensibly in those fora.

Those are still dominated by the First World. If you kind of throw in the Third World ... - and there seems to be no Second World left these days - ... it becomes even more complicated. ... I'm perfectly mindful [of] the need for internationalization of this. ... [Somebody recently said that] the way things are going the First Amendment is becoming a local ordinance. I think that is a very nice way of expressing the notion of who exactly, in a global-communications-flow environment, controls the regulatory regime over it?

...[I've written] a two-volume book on Europe. ... [I'm] finishing one on the Pacific, and I'm working on something on Latin America and Africa. So I have a lot of sympathy for the internationalized approach. But this is one instance where I'm not so sure if it's going to work.

... The ... commitment to free speech is very strong in this country. But the evolution of the networks is very strong. I think that - just as some states within the United States should take some experimental lead and [invite] the rest to join - that the United States should establish and provide leadership for the rest of the world.

DAVE HUGHES: ... You have not touched on a question of jurisdiction. Right now there's a $988-million High Performance Computing Act in front of Congress that includes such things as the NREN, the National Research and Education Network.

But my understanding is you're not talking about anything that's regulated data networks across [state] lines. I am hearing U.S. West wanting to go across lines - that's not under the Colorado Public Utilities Commission. MCI wants to get into the data networks - that are not under the FCC [Federal Communications Commission], and are not under the Public Utilities Commission. ... You've got regulatory bodies that regulate certain media and carriers, but you have data networks that do not appear to be under any. Where do we come out?

Does this mean the utility commissions are going to extend by law over these and then open 'em up, or does it go

the other way, in which you're going to see a withering of those regulatory bodies? Because right now you're having a burgeoning of data networks that are not under regulation. That's great. I think it's terrific.

But it seems to be a conflict, because even the FCC is looking at the high-performance computing and wondering whether they ought to be in that. I don't know whether there's any real movement to suddenly bring all data networks underneath regulation.

NOAM: I haven't thought this quite through - all these aspects. I think ... that for certain kinds of more experimental communications forms, such as the one that you described, that you should not come up with a full panoply of regulatory treatment.

You should give this thing some time to develop and establish itself, if we're talking about experimental-type services. When you're talking of ... more routine-type services, in the case of the data networks, it really depends what kind of regulations you're talking about. I certainly am not talking about a rate regulation or technical-standards regulation, or anything of that sort.

What I was suggesting is [the] particular way these kind of information networks can become (a) important and (b) used by many people. [And, the way] that the rules under which they can restrict usage by customers - for example, based on content, and based on the nature of the user - should be subject to some [of] what I call common-carrier rights-of-way. ... Some of the capacity should be assured of access by people as a matter of right.

COORDINATOR: Thank you, Professor Noam.... [applause]

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