The Superstructure of Infrastructure: Principles for a Future Without a Public Network

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Comments Welcome

This article defines principles of policy and regulation for the emerging "network of network" that will link up the many presently disparate networks, whether narrow or broadband, common or private, domestic or international.

In the past, regulation had been essential, partly to protect against the various forms of network monopoly, partly to protect the monopoly themselves. In the transition to competition, what was left was seen as temporary, as shrinking reciprocally with the growth of competition.

But can we expect the network of networks to be totally self-regulating, with no role for government? On the one hand, the more complex and advanced any network system becomes, the less one can guide it centrally. On the other hand, diversity does not assure operational optimality as different participants pursue different strategies. In particular, issues of free flow of information, interconnectivity, universality of service, and international asymmetry will not disappear with competition.[1]

Applied to telecommunications this means that rules and regulations will change but not disappear. Liberalization does not mean libertarianism. If so, what kind of rules should we expect?

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[1] This is analyzed in Eli M. Noam, Beyond Liberalization: from the Network of Networks to the System of Systems, *Telecommunication Policy, forthcoming*

To answer that question requires us first to step back and look at the nature of societal rules in general. When it comes to rules, it is perhaps best to think in terms of a hierarchy, analogous to the world of computers with its hierarchy of control instructions -- assembly language, machine language, and programming languages. In the regulation of telecommunications, there are *rules of detail*, for example the maximum wait for a dial tone, or the price that can be charged for a local call at 3 p.m. At the other extreme, there are *fundamental societal tenets* such as freedom of speech, property rights, or due process of law. In between are intermediate *rules of public policy*, usually codified by statutes of varying specificity.

The United States has been pretty good in framing rules of detail, being in general a pragmatic society. Although it is fashionable for participants to castigate the American regulatory system, its positives need also be acknowledged, especially in contrast to alternatives elsewhere. Regulations tend to be developed openly, with opportunity for the public and for contending stakeholders to contribute their views and analyses. The independence and bi-partisan nature of many regulatory commissions helps to create some political insulation and policy continuity, yet without a total separation from the democratic and economic forces in society. And the process is capable of adapting to changing circumstances, as the shift in telecommunications from pro-monopoly to pro-competition

regulation demonstrates.

The U.S. is also quite good when it comes to the fundamental tenets of governance, a legacy from brief but creative historic periods in American history when big-picture issues were taken very seriously, such as in the framing of a constitution. The weak link in the hierarchy of rules in America is the intermediate range. In telecommunications, the basic documents here are the creaky 1934 Communications Act; the controversial 1994 Cable Act; and the motley collection of state utility laws, as amended by legislatures of widely varying outlook and competence.

The 1934 Communications Act was written before TV was out of the labs; before microwave transmission; before satellites; before micro-electronics; before computers; before digital data communications; and before transatlantic voice cables. Indeed, many of its rules are far older than the enactment date suggests. Title II of the 1934 Act, the primary section which deals with telephony, is basically a restatement of the Interstate Commerce Commission's 1910 Mann-Elkins Act provisions that applied to telephony of railroad regulatory principles, which in turn date back to 1887. There have been some amendments, but on the whole, to read the 1934 Act today feels like watching a silent black and white movie.

It may be objected that the U.S. Constitution and the Bill of Rights are much older and yet they are not anachronistic. True, there are a few sections about the quartering of soldiers and of Letters of Marque and Reprisal that are dusty. But it also establishes principles of majestic scope – "Congress shall make no law respecting an establishment of religion" or "The right of the people to keep and bear arms shall not be infringed." These phrases were written without excessive legal verbiage or specificity, leaving it to future generations to fill out the details.

The 1934 Act, too, is at its best when its provisions are couched in generalities, with details to be provided by regulation through the specialized Federal Communications Commission that the Act creates. It works least where it gets overly specific, almost assuring problems a few years later. One reason for a growing anachronism of the Act is the much greater difficulty of changing a law in comparison with modifying a regulation. To change a law requires to fashion majorities in the relevant committees and in the two chambers of Congress, create agreement by the two chambers, and win Presidential assent. All this takes place in an intense atmosphere of interest group lobbying, logrolling, and electioneering that enables a determined minority to block the majority. The status quo is hard to dislodge.

In contrast, regulatory change by independent commissions is much easier. It tends to be developed by an expert staff. Typically, it requires only two or three commissioners to agree. If due process has been preserved and jurisdiction exists, such decision is largely irreversible by courts. It can be overturned by Congress in a direct fashion only by going through the cumbersome legislative process described above, or by trying to intimidate the agency with a variety of threats.

Given such differences in adaptability, it is not surprising that virtually none of the main changes in telecommunications policy over the past two decades that in the aggregate broke the monopoly system have originated in Congress. This is not a reflection on individuals, but simply of structure, and structure is destiny.

Congress is at its legitimate best when it sets national policy. It is often at its worst -- in process terms -- when it assumes the role of quasi-regulatory agency and writes into law numerous little details. This happens when it distrusts an agency controlled by another party; when a transitional leadership vacuum exists at an agency; when congressional committees seek to arbitrate nettlesome but intoxicating power struggles among stakeholders; interest groups; or when interest groups get some Congressional sponsorship for their concerns.

The Need for New Principles

The conventional way to think of deregulation is as a reduction in the rules of detail. If one had once twenty such rules, and now only ten, that's deregulation. This would mean, however, that the recent liberalizations of entry and competition could not be considered deregulation, because they actually increased the aggregate of rules, given the much greater complexity of a multi-carrier system over that of a monopoly. More useful therefore than regarding deregulation in quantitative terms is to think of it as a shift *upwards* in the hierarchy or rules – from specifics to fundamental principles. If that occurs, the regulatory system can become more flexible.

Yet much of the 1934 Act is the opposite, specific rules that were written by public and private utility lawyers and for utility lawyers. What are its basic principles? To answer that question is difficult. If one edited all those parts out of the Act that have become irrelevant, and eliminated repetitive legal verbosities, and if one dropped the housekeeping provisions, the Act's many pages would probably collapse into fewer than a dozen. At that point, one could search for some structure, some principles. But what one would find would be disappointing. No principles are stated. To find them is no job for telecommunications experts but for literary deconstructionists.

In the authoritative book, *A Legislative History of the Communications Act of 1934*[2] major academic experts interpret the various sections of the 1934 Act. Yet they offer no light on those principles. As a typical piece of legislation, the 1934 Act was cobbled together to pass Congressional muster. Its legislative history reminds one of Bismarck's observation that one should not look too closely into how sausages and laws are made. It is not a blueprint on how to regulate the constantly changing communications industries.

The guiding light of the recent past -- market competition -- does not provide all the answers. In the past decade, policy was correctly focused on creating **openness** by reducing barriers and permitting entry. But, with fragmentation of the network environment proceeding apace, the primary issue now is to create an **integration** that permit the functioning of a "network of networks".

We are in the midst of at least five different types of network integration. The first is digital integration, such as the one of standardized ISDN, which joins the various narrowband telecommunications services such as voice and data into a narrow digital pipe. A second integration creates an interconnected narrrowband network of telephone networks. A third integration

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[2] Max Paglin, editor, *A Legislative History of the Communications Act of 1934* (Oxford University Press), New York, 1989.

links narrowband and broadband networks such as cable TV. A fourth dimension of integration reaches across national borders, creating global systems. And a fifth dimension is across legal status, linking common and private carriage. Together, these trends create a quintuply integrated network system. Such an "I^{5}SDN" is not primarily an issue of technology development such as fiber transmission and ATM; it is just as much a concept of interoperability and interconnectivity with legal, financial, technical and content dimensions.

On the conduit side, the quintuple integration requires inter-connectivity, interoperability, interfaces, standards, signalling, numbering, billing, security, privacy, access, financial compensation, and network universality. On the content side, different approaches govern the different segments of the communications system, such as common carriage, private network status, cable television regulation, or the print publishing model. The difference in regulatory status is sustainable only as long as the underlying transmission media are kept apart. But as these grow together and interconnect, the differing rules of content status come into conflict.

One of the 1934 Act's major problem, from tomorrow's perspective, is that it deals with separate transmission media differently. In other words, it is not transmission-path neutral. This was workable in the past, but is not where

technology and applications are taking us. For that reason, the Clinton Administration proposed in 1994 to establish a new voluntary regulatory classification (in a new "Title VII" of the Communications Act) for switched interactive digital broadband transmission. This proposal, too, is not technologically neutral.

What the emerging network of networks needs are underlying principles. In America, Vice President Gore, in several speeches and in an Administration background paper, took that approach. The principles were very general: encouragement of private investment; competition; open access; universal service;and regulatory flexibility. So far, so good, as long as this is followed by the adoption of more operational principles linked up in a coherent whole.

Let us think of ourselves as a kind of electronic constitutional convention. What should the principles of this communications system look like?

1. Preamble

- We, the people, in order to create a more perfect union of various transmission and content media, establish principles by which all electronic communications should be governed, with the goals of encouraging the production of information of many types, sources, and destinations; assuring the existence of multiple pathways of information; encouraging their spread across society, the economy, and the world; and enhancing social and economic well-being, technology, and education.

2. Free Flow of Information

- Freedom of content is technology neutral. Government shall not prohibit the free exercise of communications or abridge the freedom of electronic speech, or of content provided by the electronic press, or of the right of the people to peaceably assemble electronically.

This is basically a freedom of speech provision as applied to telecommunications. In order to establish a legal parity of electronic speech with other speech.

The First Amendment of the US constitution protects against governmental restrictions, but does not protect speech against private restrictions. Here, common carriage establish free information flows in telecommunications. Common carriage is a frequently misunderstood concept. It does not mean universal service, regulated monopoly, or price or rate of return regulation. It means non-discriminatory conduit service by a carrier, neutral as to content, users and usage. The FCC's concept of the video dial tone has such a common carrier orientation. In the Clinton Administration's 1994 Title VII proposal, "open access" was substituted as a term for common carriage, and defined to permit "anyone, including end users and information service providers..., to transmit information including voice, data, and video programming, on a non-discriminatory basis."

But common carriage is not only a free speech matter. The reason for common carriage generally, whether in transportation or communication, is to reduce transaction costs in the use of infrastructure, and hence to benefit the development of communications.

Information travels across numerous subnetworks 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. While it may be in the interest

of every carrier to maintain full control over "its" segments, in the aggregate this would be as dysfunctional as if each commercial bank issued and used its own money rather than a common legal tender.

At present, who is a common carrier? Basically, the providers of the "public switched telecommunications network." Other carriers operate as private contract carriers, subject to their own discretion on access and use. But with competition and interconnectivity, it is difficult to designate some networks as common carriers and others not. One alternative is to abolish all private carriage. Yet that would violate principles of property, freedom of association, and encouragement of innovation. Another alternative is to abolish all common carrier obligations. This may be, in the long run, the outcome of competition.[3] But in the intermediate term, what is needed is the establishment of a mixed private and common carrier network system. This can be accomplished in the following way:

☛ All bits are created equal. Carriers operating as a common carrier must be neutral as to content, use, and users. The transmission of lawful communications shall not be restricted by a common carrier. Common carriers are not liable for the use to which their conduit is put.

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[3] Eli Noam, Beyond Liberalization: The Impending Doom of Common Carriage, *Telecommunications Policy*, forthcoming.

This is the basic definition of common carriage. (The term "conduit" is not used here in the strictly technical sense, but rather in the sense of "transmission path.")

Who is a common carrier?

- **Where no competition exists in an essential conduit, it must be offered on a common carrier basis on at least part of the capacity.**

- **Competitive transmission segments need not be common carriers. But if a transmission segment interconnects with other networks by taking advantage of common carriage access rights, then it must also offer reciprocal rights on at least equivalent capacity to other carriers.**

Thus, a purely private network which does not demand interconnection with a common carrier may refuse to carry the signals of any user or of other network. It is not a common carrier. However, once it does make use of common carrier access to another carrier and joins the network of networks, it must reciprocally open up part of its own capacity to others. Where common carriage is claimed in a downstream direction, it must also be offered in a upstream direction. In such a fashion, one creates common carriage "rights-of-way." Such rights-of-way would function like public roads and highways that pass private

property, or like easements that allow public passage through private land. They would permit the unimpeded transmission of content and services across the various interconnected networks and enable end-to-end connectivity, although not on the entire bandwidth of a transmission, only to the extent of the transmission capacity required in the opposite direction.

This system ensures a co-existence of common and private carriage in a static sense. It is important to recognize, however, that in a dynamic world, the duality of common and private carriage is not stable. The ability of private carriage to price differentiate and to select customers will make it superior in head-to-head-competition to common carriage. Hence, the latter will fade away, and carriers will become essentially private. In that situation, different rules need to apply assure the information free-flow goals of common carriage. A way to do so is by replacing the principle of common carriage by a new principle of *neutral interconnection*. A carrier can elect to be private by running its own self-contained infrastructure, and having full control over its content, use and access. But if it interconnects into other networks and accepts transmission traffic from them, it cannot pick some bits over other bits. This means that while a private carrier can be selective in its direct customers, whether they are end-users or content providers, it cannot be selective in what it accepts from another interconnected carrier.

☎ Among interconnected carriers, no carrier can transmit selectively traffic passed on to it by another carrier, based on content, uses, or usage, or refuse interconnection on these grounds. Any carrier offering interconnection to others must offer it to other carriers, to, within technical constraints.

These provisions do not require interconnection on equal terms, as in the case of common carriage. But it establishes the possibility of arbitrage if differentiated pricing occurs. All of common carriages free-flow, goals of low transaction cost, and no liability goals are preserved by a system of (a) non-exclusive interconnection (b) neutral traffic acceptance.

3. Market Structure and Prices

☎ Government shall make no law establishing a network privileged in terms of territory, function, or national origin. Nor shall it burden any network more than its competitors, except with compensation.

☎ For competitive conditions in a market segment to be said to exist, three or more offerors of substantially similar or equivalent services constitute a rebuttable presumption, absent evidence of oligopolistic behavior. With two, evidence for vigorous price competition is necessary.

☎ Competitive conduits and all content can be priced freely. Prices for non-competitive conduit segments are presumptively regulated where their increase exceeds inflation, taking into account other important factors, too, including distortion of competition for non-monopolistic services.

4. Reliability and Security

☎ Interconnected carriers in a chain of transmission must meet minimum standards of protection of interoperability, quality, privacy, and security.

☎ Electronic information cannot be searched and seized arbitrarily by the state.

☎ Electronic information is the property of its creators or assignees. Where information is created by a transaction involving two parties, the consent of both is needed for the use of the information. Each party needs to disclose jeopardies of privacy to the other.

5. Universality of Networks

At present, redistribution operates within the public network across its customers. But this system cannot be stable

over time. Instead, subsidies need be explicit and broadbased in their origin.

☎ **Where government policy mandates to support some users for social reasons, to offer services requiring the creation of a critical mass, and to provide infrastructure that is not self-sustainable, such support must be generated and allocated explicitly, and the burden be placed on general tax revenue, or pro-rata on all carriers.**

☎ **Where a new service is subscribed to by a significant majority of the population at market prices, a rebuttable presumption is created to try offer affordable service to the remainder of the population.**

7. Jurisdiction

The traditional notion of jurisdictional separation was based on a linear, spatial concept of networks. To simplify, networks were configured to minimize transmission distance. But as transmission costs decline telecommunications becomes distance-insensitive, and definitions of interstate, intrastate and national services become increasingly irrelevant. Networks become relational, not locational.

☎ **Information should move freely across interstate and**

international borders, without unreasonable burdens by state or national jurisdictions. No content or carrier should be treated in a country more restrictively than domestic providers are. But the right to equivalent treatment in another country requires reciprocity at home.

- The federal jurisdiction sets basic national telecommunications policy where it can demonstrate that national solutions are necessary. It may delegate flexibility in application and implementation to lower-level governmental bodies, who may also set policy for functions of clearly local or regional nature.

Conclusion

These principles, in the aggregate, provide a framework that provides an integration of common and private carriage, of narrow and broadband networks, and of domestic and international providers. And it does so without the prerequisite of a "public" network.

The proposed principles listed should not be read too strictly. Obviously we do not start with a clean slate. Established interests exist. We cannot reach the ideal, nor would it necessarily be fair to change the rules on some participants in mid-stream.

To return, therefore, to the original question whether telecommunications will operate effectively under the guidance of an invisible hand mechanism – the answer is, to a large extent, yes. But only on a foundation of basic rules of the road, with less of a "retail approach" of detailed legislation and more of the "wholesale approach" of principles. As communications media converge, the invisible hand must ultimately be connected to a body of law. Ritualistically invoking competition is not enough. We need a principled superstructure to the technical infrastructure.