PRIVATE NETWORKS PUBLIC OBJECTIVES
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Taxonomy: Defining the Network Environment

A Taxonomy of Networks: Is it Public or Not?

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1. HISTORY

1.1. International

The terms "public" and "private" in telecommunications instruments can be traced back to the very earliest international agreements. Indeed, the first multilateral treaty for telecommunications begins with the preamble "With the intention of enabling both public and private traffic..."[1]

In this context, the term "public" in the preamble is synonymous with "State," while "private" has the connotation of non-State messages. However, the Dresden Convention also introduces another notion regarding public access that has subsequently emerged as a key concept. Article 6 states that "The use of the telegraphs of the Union Governments shall be open to all, without any exceptions."

Several years later when the Conference de Paris adopted the 1865 Convention, hereafter call the Paris Convention, that established the International Telegraph Union, a three-fold distinction is made between *dépêches d'État, dépêches de service*, and *dépêches privées*. *Dépêches de service* are basically messages relating to running the network. The Paris Convention also uses the term "private" in the context of states dealing with *compagnie privée* owning and/or operating an interconnecting telegraph network.

The Paris Convention enshrined the notion of "open-to-the-public" in Article 4 which obliges that "The contracting High Parties recognize for all persons the right of correspondence by means of international telegraphs." The Convention also obliges states in their important cities to maintain "offices open to the public" during certain hours.

It is worth noting that when an international regime for radio communication first began to emerge in 1903, the whole issue of public versus private was effectively sidestepped. Private sector entrepreneurs had already effectively established private telecommunications networks and services. By taking a facilities-based approach which involved sovereign states licensing radio station operators, there was no need to deal with the question of "private networks" as long as the stations were licensed to operate in the respective countries. In practice, this potential leak of revenue-earning public correspondence traffic was partially plugged through a special supplementary group of international Radio Regulations.

This concept of a private company -- either owning facilities or operating a network -- has remained essentially unchanged since 1865. It is now embedded in the 1982 Nairobi Convention currently in force:

> ***Private Operating*** Agency: Any individual or company or corporation, other than a governmental establishment or agency, which operates a telecommunication installation intended for an international telecommunication service or capable of causing harmful interference with such a service.
>
> ***Recognized Private Operating*** Agency: Any private operating agency, as defined above, which operates a public correspondence or broadcasting service and upon which the obligations provided for in Article 44 of the Convention are imposed by the Member in whose territory the head office of the agency is situated, or by the Member which has authorized this operating agency to establish and operate a telecommunication service on its territory.[2]

Similarly, the concept public access became metamorphosed into phrases such as "making services...generally available to the public" as well as "the right of the public to correspond by means of the international service of public correspondence."[3]

The concept of what today is often regarded as a "private network" does not even arise in the international treaty instruments until the 1973 Telegraph Regulations, where it is noted under an article dealing with "services offered to users" that:

> "Administrations or recognized private operating agency(ies) may, subject to the applicable national law, provide telex, photo telegraph, data transmission and/or other telegraph services and may place international circuits at the exclusive disposal of users in those relations where circuits remain available after the needs of the public telecommunication services have been satisfied."[4]

This 1973 provision was superseded at the 1988 WATTC by the famous Article dealing with "special arrangements" where it is recognized that:

> "a) ...Subject to national laws, Members may allow administrations or recognized private operating agency(ies) or other organizations or persons enter into such special mutual arrangement with Members, administrations, or recognized private operating agency(ies) or other organizations or persons that are so allowed in another country for the establishment, operation, and use of special telecommunication networks, systems and services, in order to meet specialized international telecommunication needs within and/or between the territories of the Members concerned, and including, as necessary, those financial, technical, or operating conditions to be observed."

This provision explicitly allowed for the first time in international law the establishment of internetworks on a global scale. It is particularly notable for purposes of this study, that the undefined term "specialized networks" is the term employed, as opposed to "private networks." This fortuitously sidesteps the quagmire of attempting to deal with any kind of public-private dichotomy. Indeed, there is nothing to prevent a specialized network from providing any kind of service or capability to the public, if it is allowed under national law.

1.2. U.S. Domestic

It is beyond the scope of this study to present a historical overview on the use of the terms "public" and "private" in U.S. domestic telecommunications law. It's fair to say, however, that by the time of the adoption of the Communications Act of 1934, the U.S. model with respect to private networks was similar to the international models -- if for no other reason that the U.S. obligated itself to follow many of the international treaty provisions.

The differences largely arose from an early willingness at the outset of availability of the technology to allow:

- Extensive intra-corporate radio-based networks
- Extensive computer networks
- The emergence of distinctions between "basic public" and other kinds of telecommunications networks and services that remained outside the scope of regulation
- A shift toward dealing with public carrier networks as facilities or "tools" rather than an exclusive service-based approach
- The application of modular open architecture approaches to allow access to resources that were part of public common carrier networks

Another factor of major importance is the traditional distrust of "bigness" -- especially monopolies public or private. Antitrust concerns are a fundamental part of American culture. Indeed, it is amazing that the AT&T monopoly held as long as it did. The emergence of digital technologies, however, effectively spelled the end of the monopoly era in telecommunications. There is no "natural monopoly" in today's information-telecommunication world.

2. DOMINANT CARRIERS AND PUBLIC OBLIGATIONS

The primary problems of "public" communications policy today fall into two areas involving market distortions. Each area begs a distinct question:

- How do you continue to deal with organizations -- public or private -- that acquired their facilities and their market share based on public largesse in granting them monopoly privileges?
- How do you continue to deal with organizations that operate under legal obligations to provide certain kinds of telecommunication capabilities they might not otherwise provide?

Today, practically all our telecommunications "regulatory" activities worldwide focus on one or both of these questions.

These problems have a special relevance for this study, because they arise out of legal, social, and government policy concerns, not from technical ones. Whatever *indicia* are fashioned for "public" must be directly relevant to the two major policy problems above.

However, the information systems/digital technology is not going to make this an easy task. In any kind of exacting sense the task is impossible. There are no magic solutions, no opportunities to do things with smoke and mirrors. The variables are too numerous and complex, with all kinds of entrenched interests.

On the other hand, there may be opportunities to encourage shared models. There are some good examples already with various "open network" regulatory approaches at national, regional, and global levels. The trick will be to avoid details that are either technology dependent or have anti-competitive trap doors, or have the potential to be used in anti-competitive ways. The OS model and many of its siblings are a good example of all three.

A.D. Little's Hugh Small raised a very significant point at the Financial Times Conference by noting that the time is ripe for "building in" opportunities for competition in many of the facilities and network models being constructed. In the same sense, it is also possible to build in some solutions to the primary problems raised above by developing some good, widely shared models.

3. THE INFORMATION ARRAY MODEL

Today's networking world can be described as a combination of physical facilities and virtual everything. It's virtual reality riding on top of a web of glass. The classical old link and node definitions have no relevance. Dave Farber, who heads the University of Pennsylvania's Distributed Systems Lab, describes what he calls the emerging "National Backbone." The national (if not international) fiber grid is simply conceptualized as a big, distributed computer bus.

We're not there yet, but it's where we're heading. Bob Kahn's Gigabit Testbeds are already presenting lots of interesting options. Any model that this study develops must accommodate this emerging environment if the model is to be useful.

Along these lines, for purposes of developing a network taxonomy for parsing things public and private, the following definition of *network* might be useful:

> A network is an interoperating array of information objects whose prime function is to allow the sharing of information and information processes among multiple objects.

This model is also useful, if a bit abstract, because it's similar to the approaches actually being taken by information systems people trying to deal with their own boundary problems. Its beauty is the elementary simplicity. You can apply it to everything from three tin-cans with strings to knowbots(R) traversing the Internet.

An *information object* is simply a discrete, definable information function that can be used or acted upon. Basic service elements can be regarded as information objects. A computer file can be an information object. So if you create a network, you are simply establishing a known structured relationship among information objects -- an architecture -- through which the objects can interoperate.

It is further useful to elaborate some of the basic properties of such a network:

> Networks are scalable, nettable, and capable of multiple gateways in both physical and logical dimensions.

Scalable means basically that you can make the network bigger, following a similar architecture. *Nettable* means that you can embed one network within another network. *Multiple gateways* mean that you can have separate networks that have multiple means dedicated to avenues of interoperation between them.

This network model is useful because information objects can be characterized being "public" or "private" to varying degrees. This shifts the problem away from dealing with public or private networks -- which is a basically hopeless, if not meaningless, task -- and focuses instead on individual information objects. In a sense, the FCC did the same thing in the Computer III Inquiry with the concept of Basic Service Elements (BSEs). BSEs are defined public information objects that are made available through networks. This model doesn't worry about characterizing the networks themselves.

Of course, if a network exists somewhere and is not connected to anything else, and all the information objects are purely private, then the network could comfortably be characterized as private. Relatively few networks in this world are so simple and bounded.

4. PUBLIC INDICIA

Ultimately, however it is necessary to begin dealing with the properties that make an information object "public." Private can simply be regarded as whatever is left, i.e., non-public.

Five prominent properties seem relevant for the purposes of the study:

Who provides it? In other words, who makes the information available? If it is a public body that makes it available, or a non-public body operating under an obligation established by a public body, then the object can be said to be at least partially public. Under old legal regimes this property was very important.

Who can access it? In other words, who can effect communication with the object. If this can be done anonymously, i.e., by anyone, then the object can be said to be at least partially public. For example, anonymous File Transfer Protocol (FTP) servers on the Internet are usually regarded as having these public qualities.

In our increasingly complex information infrastructure environment, this property of access may be the most significant one. Another way of portraying accessibility is connectivity; and connectivity is a big issue today It was one of the more interesting new requirements embedded in the new International Telecommunication Regulations adopted by WATTC '88. Connectivity might become the new "public" good. In a sense, government already overtly funds connectivity. The big policy question however is how much connectivity is enough?

Who owns it? In other words, who has title. This can involve ownership of real physical property, or of intellectual property. If a public body owns the object, or if it is in the public domain, the object is at least partially public. The characterization becomes more difficult when you attempt to deal with the issue of acquisition of facilities (and customers) arising from former public largesse? One could even argue that where the property is subject to government regulation, that at least some of the rights of use have been effectively ceded to the government.

Who controls it? This is one step beyond access. It involves giving the object instruction if it is involved in an information process; or moving, or altering it if it is pure information. Once the object is accessed, what can be done with it?

This property is made more complex because there can be widely varying degrees of control. There may also be a time factor. Control for how long? In complex network management processes, there may also be different priority levels invoked under failure

conditions. In the case of a simple information file, read/write permissions are a good example of different kinds of control. In electronic news networks today, editors of monitors frequently exercise control functions over distribution capabilities. Stodolsky's INET '91 presentation, for example, examines the public policy options and considerations underlying this aspect of control.

Generally, if the control of an information object is anonymously equal, it can be regarded as public. Real world environments, however, are fairly complex. The providers or owners of objects usually exercise some control, and objects necessarily exist under the control of operating or network management systems.

Who pays for it? Information objects and their array in networks have associated economic costs. If those costs are borne by or otherwise underwritten by public bodies, the object may be described at least partially as public.

The National Science Foundation, for example, pays for all the information objects associated with a major Internet backbone. The Department of Defense pays for MilNet. The General Services Administration pays for FTS-2000. The Swiss federal government and cantons similarly pay for SWITCH. This property is obviously rather tempered by other properties in determining the overall characterization of the object or network as public or not

5. CONCLUSIONS

The use of the term "public" with respect to telecommunication or to information communication networks is highly complex. To even attempt to make a characterization in all but the most simple situations, it is useful to proceed through a two-step analytical process.

First the network architecture must be examined and be parsed into an array of information objects. Each one of those objects must then be examined in light of face properties: who provides it, who can access it, who owns it, who controls it, and who pays for it. On the basis of the combined aggregate of all the results, it is possible to say that the object has a certain "public index figure." For example, on a scale of one to one hundred, a central office telephone switching object might rate a 70.

It seems, however, that the continued use of the term "public" only has meaning today with respect to residual historical developments (regulation of dominant carriers, international legal obligations, etc), potential disputes over unfair trade practices, or the striving for a meaningful, current public good like the promotion of connectivity.

In these contexts, it seems necessary to focus more on information objects than networks because of the essential impossibility today to characterize most networks as public in any kind of consistent or definitive way. In addition, there may be individual information objects that represent such an important public asset, that they should be protected with a high "public index factor."

ENDNOTES

[1] *see* State Treaty Between Austria, Prussia, Bavaria, and Saxony of 25 July 1850 (official ITU translation), generally referred to as the Dresden Convention.

[2] *See* nos. 2008 and 2009, International Telecommunication Convention, Nairobi, 1982.

[3] *See ibid* nos. 15 and 131.

[4] *See* no. 8, Telegraph Regulations, 1973, International Treaty.