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February 2007

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ONLY CONNECT

By Kevin Werbach

ABSTRACT

There are two kinds of legal rules for communications networks, such as the Internet and the telephone system. Interconnection rules define how and when networks must exchange traffic with each other, and non-discrimination rules prevent networks from favoring some customers' traffic over others. Each approach has unique strengths and weaknesses. The distinction has never been fully appreciated, even though regulators have imposed both requirements many times.

Non-discrimination questions predominate in communications and Internet policy today, thanks to the high-profile battle over "network neutrality" rules for broadband networks. Yet both sides in the network neutrality debate are mistaken. The central challenge of our era of digital convergence is not non-discrimination, but interconnection. Technological and marketplace developments threaten to undermine the open connectivity that feeds the Internet's extraordinary dynamism. A renewed emphasis on interconnection could better address the concerns that animate the network neutrality debate. At the same time, it could avert a disastrous balkanization of the Internet, which otherwise looms as a real possibility.

In short, non-discrimination was crucial in the old era of scarcity; interconnection is the essential input of the new age of abundance. The central mandate for the emerging field of network infrastructure policy should be the one eloquently articulated by E.M. Forster: Only connect.

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ONLY CONNECT

By Kevin Werbach*

Only connect! That was the whole of her sermon.
Only connect the prose and the passion, and
both will be exalted,
And human love will be seen at its height.
Live in fragments no longer.
Only connect...
-- E.M. Forster, Howards End[1]

I. INTRODUCTION

There are two kinds of legal rules for communications networks, such as the Internet and the telephone system.[2] *Interconnection* rules define how and when networks must exchange traffic with each other. *Non-discrimination* rules prevent networks from favoring some customers' traffic over others. Both restrict network owners from leveraging their control over physical infrastructure, and the two approaches are sometimes used in parallel. However, they have unique strengths and weaknesses.

The distinction between interconnection and non-discrimination has never been fully appreciated, even though regulators have imposed each type of requirement many times. Yet today, it is critical for understanding some of the central challenges of communications and Internet policy, as well as their solutions. By failing to emphasize interconnection, both sides of current debates

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* Assistant Professor of Legal Studies and Business Ethics, The Wharton School, University of Pennsylvania. Thanks to Dan Hunter, David Post, Phil Weiser, Susan Crawford, Tom Vest, Vint Cerf, and participants in the 2007 Huber Hurst Seminar and the 2006 Wharton Colloquium on Media and Communications Law for valuable comments. Contact: werbach@wharton.upenn.edu.

[1] E.M. FORSTER, HOWARDS END (Penguin 2000) (1910).

[2] This paper addresses the economic regulation of networks. Networks may also be regulated for social policy reasons, such as restricting the availability of certain content to children. Under the "layered" regulatory model, such content or application-specific issues are best distinguished from platform questions about network architecture and competition. *See* Kevin Werbach, *A Layered Model for Internet Policy,* 1 J. TELECOMM. & HIGH-TECH L. 37 (2002) (advocating a layered policy approach to networks)

push towards unworkable outcomes, while ignoring -- and potentially intensifying -- more significant threats to innovation and investment.

The two rule categories have a long pedigree. Non-discrimination rules of "common carriage" dominated communications law for most of the twentieth century. This made sense, because there was a single regulated monopoly network, AT&T, which delivered a fixed set of voice-based services. Interconnection rules have an equally extensive history, and fueled regulatory efforts to foster competition in end-user equipment and computer-based "enhanced services" starting in the 1960s. The development of the Internet, and the move in the 1990s toward competitive communications markets, gave additional prominence to interconnection questions. For the first time, traffic hand-offs between potentially competing networks were essential for smooth connectivity. Yet there is little appreciation of how interconnection becomes even more important in the dawning age of digital convergence.[3]

Technology is now eliminating historical differences between network platforms, as well as blurring the lines between physical networks and the service providers on top of them. The Internet, long seen as an unregulated bastion of experimentation and free expression, is becoming the central battleground for massive communications, media, and online services companies. Delivering content and applications across interconnected networks is, increasingly, the lifeblood of these industries. Interconnection should therefore take center stage.

Ironically, communications policy today is instead heavily focused on discrimination. An intense debate rages over proposed "network neutrality" non-discrimination rules to prevent broadband network owners such as AT&T, Comcast, and Verizon from disadvantaging unaffiliated content and application providers such as Google, Microsoft, and Amazon.com.[4] Both sides take it for granted that the appropriateness of discrimination is the critical question for the

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[3] There has been some attention paid to contemporary interconnection questions. *See* Adam Candeub, *Network Interconnection and Takings*, 54 SYRACUSE L. REV. 369 (2004) (discussing the applicability of interconnection rules in the digital world); Richard O. Levine & Randolph J. May, *Interconnection Without Regulation: Lessons for Telecommunications Reform from Four Network Industries*, *Progress and Freedom Foundation Special Report* (2005) (arguing that interconnection can be achieved through market mechanisms); Francois Bar, Michael Borrus & Richard Steinberg, *Islands in the Bit-Stream: Charting the NII Interoperability Debate* (Berkeley Roundtable on Intl. Econ., Working Paper No. 79, 1995) (mapping the early debate over interconnection and the Internet).

[4] *See* Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 J. TELECOMM. & HIGH TECH. 141 (2003) (comparing general approaches to the regulation of broadband providers) [hereinafter Wu, Broadband Discrimination]; Tim Wu, *The Broadband Debate, A User's Guide*, 3 J. TELECOMM. & HIGH TECH. 69 (2004) (providing information concerning the Telecommunications Act and general Broadband policy) [hereinafter Wu, Broadband Debate]; Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARV. J.L. & TECH. (2005) (rejecting network neutrality in favor of network diversity); Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 94 GEO. L.J. 1847 (2006) (attacking network neutrality on economic and technical grounds).

future of Internet infrastructure. In actuality, the core threat that network neutrality addresses is an interconnection issue, which is best addressed on those terms. Furthermore, the flawed non-discrimination perspective obscures deeper challenges, and may even make them worse. Unless policy-makers recognize the importance of interconnection, they will waste their energy on intractable conflicts, and open the door for the very threat that motivated their turn toward non-discrimination: a balkanized network in which innovation opportunities are circumscribed.

The defining characteristic of the Internet is not the absence of discrimination, but a relentless commitment to interconnection. The engineers and entrepreneurs who laid the foundations for today's commercial Internet developed a set of technical protocols, business norms, and contractual arrangements to link together diverse networks.[5] In such an environment, blockages and restrictions at any point are simply obstacles to route around. A close examination of the technical and business dynamics of next-generation broadband networks reveals that properly-defined interconnection rules could address the concerns of both sides in the network neutrality conflict.[6] They could also address the other developments that threaten the Internet's rich web of interconnection, but are receiving little attention amid the loud network neutrality controversy.[7]

In short, non-discrimination was crucial in the old era of scarcity; interconnection is the essential input of the new age of abundance. The animating mandate for a contemporary approach to network infrastructure policy should be the one eloquently articulated by E.M. Forster: Only connect.

The massive wealth destruction of the post-2000 telecommunications industry bust illustrates what can happen when network interconnection rules are uncertain and ineffectual. Moreover, the Internet today faces structural challenges that threaten its continued viability.[8] It must undergo a massive overhaul as it becomes the core platform for global telecommunications and video distribution. A long series of skirmishes over discriminatory network developments would imperil this transition. The cost of such a scenario to both Internet users and investors would be astronomical. The Internet of the future needs neither less discrimination, as network neutrality advocates urge, nor more-sophisticated discrimination, as network operators envision. It needs continued interconnection.

This article proceeds as follows. PART II develops the dichotomy of interconnection and non-discrimination rules, and traces its expression in communications law and its antecedents. PART III details the regulatory, technical, and business developments that threaten interconnection in a

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[5] KATIE HAFNER & MATTHEW LYON, WHERE WIZARDS STAY UP LATE: THE ORIGINS OF THE INTERNET (1996).

[6] *See infra* PART (IV)(B).

[7] *See infra* PART (III)(C).

[8] *See, e.g.*, David Talbot, *The Internet is Broken*, TECH. REV., Dec. 2005-Jan. 2006, at 62 (describing efforts to develop next-generation Internet architecture).

converging world. It critiques the non-discrimination turn of the current policy debate, as reflected in the confused battle over network neutrality. PART IV sketches the outlines of an interconnection-focused alternative.

II. FOUNDATIONS OF NETWORK INFRASTRUCTURE POLICY

Communications networks form the basis for the telephone, television, radio, cable television, and cellular telephone industries, as well as all the dynamic segments of the Internet economy, from broadband access to electronic commerce. It is difficult to imagine a major corporation today that does not see such networks as crucial to its operations, just as it is difficult to imagine contemporary entertainment, retail, transportation, financial services, and other industries without them. The legal rules governing networks are thus of immense significance, both for economic productivity and for democratic values.

Yet despite extraordinary legislative,[9] judicial,[10] administrative,[11] and academic[12] efforts over the past decade, communications policy has rarely been so muddled or uncertain. The current legal framework, embodied in the Telecommunications Act of 1996 (1996 Act), is widely regarded as a colossal failure.[13] There are grave concerns that the United States government's current policy direction will not only foreclose further entry into traditional markets, but will also harm the country's global competitiveness and undermine the great

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[9] Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (codified in scattered sections of 47 U.S.C.).

[10] *See e.g.*, AT&T Corp. v. Iowa Utilities Board, 525 U.S. 366 (1999) (reviewing FCC interconnection rules); National Cable & Telecommunications Ass'n v. Brand X Internet Services, 543 U.S. 967 (2005) (upholding FCC classification of broadband Internet access over telephone lines as an information service).

[11] A good example is the FCC's tortuous path in reviewing and revising its rules for unbundling of local telecommunications networks. *See* Review of the Section 251 Unbundling Obligations, 18 F.C.C.R. 16,978, 17,079 (2003) (report and order); 18 F.C.C.R. 19020 (Sept. 17, 2003) (errata), *partially vacated and sub nom.*, United States Telecom Ass'n v. FCC, 359 F.3d 554 (D.C. Cir. 2004), *on recon.* 19 F.C.C.R. 15,856 (Aug. 9, 2004), *also on recon.* 19 F.C.C.R. 20,293 (Oct. 18, 2004); Unbundled Access to Network Elements; Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, 19 F.C.C.R. 16,783 (Aug. 20, 2004) (order and notice of proposed rulemaking); Unbundled Access to Network Elements, 20 F.C.C.R. 2533 (Feb. 4, 2005) (order on remand).

[12] A string cite of all significant telecommunications law scholarship over the past decade would be as unenlightening as it was voluminous.

[13] *See* Richard A. Epstein, *Takings, Commons, and Association: Why the Telecommunications Act of 1996 Misfired*, 22 YALE J. ON REG. 315 (2005) (discussing the dysfunctional results of the 1996 Act).

innovation engine of the Internet.[14] Before considering how to escape this mess, we must explore how it arose.

The history of communications policy shows two recurring concerns: that network operators will deny necessary connections to their competitors, and that those operators will use their market leverage to treat certain customers unfairly. In response, judges, legislatures, and regulatory agencies adopted rules requiring some networks to accept and hand off traffic on defined terms, and barring some networks from treating similarly-situated users differently. I call the first category interconnection rules, and the second category non-discrimination rules.[15] This section first elucidates the two rule types, and then traces their application through the history of telecommunications networks and the Internet.

A. Interconnection and Non-Discrimination

1. A Tale of Two Approaches

Interconnection is the agreement of two or more networks to carry each other's traffic on a reciprocal basis.[16] Although networks may interconnect voluntarily, regulators often find it necessary to adopt rules specifying interconnection terms. Thus, for example, the 1996 Telecommunications Act contains a provision requiring incumbent telephone companies hand off calls to the new local competitors that it authorizes. It also includes more-specific interconnection obligations setting pricing and other terms for particular traffic types, such as local calls.[17] Interconnection is a network-to-network relationship, as contrasted with the relationships that networks have with their users.

Discrimination, the other basic concept, is the refusal to give similarly-situated customers the same treatment, including refusal to provide services that are available to other customers.[18] Non-discrimination emphasizes the

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[14] *See* Wu, Broadband Discrimination, *supra* note 4; Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities, CS Dkt. No. 02-52, Ex parte letter from Timothy Wu and Lawrence Lessig 12-15 (Aug. 22, 2003), *available at h*ttp://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6514683884.

[15] The terms "interconnection" and "non-discrimination" are widely used in communications policy. *See, e.g.*, Wu, Broadband Discrimination, *supra* note 4. However, the particular meaning developed in this paper is original.

[16] *Cf.* Daniel F Spulber & Christopher S. Yoo, *Network Regulation: The Many Faces of Access*, 1 J. COMPET. L. & ECON. 635 (2005) (stating that "access to networks is a regulatory term of art that refers to those physical connections that are external to the network and mediated by market transactions.")

[17] *See* 47 U.S.C. § 251(b)(5) (1999).

[18] In the communications context, the overwhelming concern is private economic discrimination, although the rules adopted would generally cover discrimination on other bases such as race or point of view.

relationship between networks and their customers.[19] Because customers both make and receive calls, non-discrimination rules prohibit differential treatment of traffic in either direction. The network operator cannot refuse to offer one customer a service it offers to others. Nor can it deny customers the equal ability to receive communications from other subscribers.

The two categories naturally derive from fundamental policy choices. To better elucidate the distinction, consider AT&T, in its glory days as the "Ma Bell" monopoly over telephone service in most of the US. A regulator concerned that AT&T would abuse its dominant position would have two choices.[20] Under the first approach, which could be labeled "Competition-Facilitation," it might encourage other networks to compete against AT&T. If sufficient competition developed, market forces would then discipline AT&T's behavior. Or, under the "Monopoly-Policing" approach, it might identify the specific practices it feared, and bar AT&T directly from engaging in them.[21]

Under Competition-Facilitation, the regulator would quickly run into a problem. An erstwhile competitor against AT&T would start with zero market share. Its customers would be much more likely to call AT&T customers than each other, simply because there were so many more users on the AT&T network. A service offering that could only reach the limited circle of customers on the entrant's network would thus face an insurmountable disadvantage against AT&T, even though AT&T customers were similarly limited in their ability to reach the entrant's customers.

Competition-Facilitation would therefore have to include a requirement that AT&T allow customers of the entrant to call its own customers, and vice-versa. In fact, the specific terms of this requirement would be the defining features of the Competition-Facilitation rule. The rule could specify under what circumstances AT&T would have to interconnect, at which locations, and at what prices. Thus, although Competition-Facilitation starts with a commitment to competition and avoidance of direct regulation, its essential property is that it

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[19] Thus, for example, former FCC Chairman Michael Powell's "Four Freedoms," the original blueprint for network neutrality non-discrimination rules, were couched not as restrictions on network operators, but as a bill of rights for users. *See infra* note 160.

[20] A third approach, of course, would be to challenge the monopoly directly on antitrust grounds. This was eventually the track the US government took, leading to the divestiture of AT&T into a competitive long-distance carrier and seven Regional Bell Operating Companies. *See infra* note 119 and accompanying text. Even an antitrust approach, however, must determine appropriate remedies when a violation of the Sherman Act is found. As described below, the AT&T divestiture process involved the same contention among interconnection and non-discrimination solutions. *See id.*

[21] One could also imagine a hybrid of the two approaches. Indeed, as described below, interconnection and non-discrimination rules are sometimes implemented together. *See infra* Part (II)(B)(3). To a degree, though, successful implementation of either approach should moot the other. Sufficient market competition eliminates the need for prophylactic non-discrimination regulation, and, at least in a natural monopoly environment, effective non-discrimination rules replicate the efficient outcome with no barriers to competitive entry.

regulates the terms under which competing or potentially competing networks interconnect.[22]

Under Monopoly-Policing, by contrast, the regulator would not have the same concern about how AT&T treated its competitors. In fact, there might well not be any competitors. Monopoly-Policing would focus on what AT&T offered its own customers. As a matter of elementary economics, the initial concern would be that AT&T would price its services at the monopoly level rather than at marginal cost.[23] So, some form of price regulation would be necessary.

However, the story would not end there. AT&T might decide to give preferential or inferior treatment to certain customers. And, it might decide to block customers from certain uses of the network, such as attaching a device to their telephones that potentially deprived AT&T of additional revenue.[24] Such restrictions would potentially curtail innovation and investment on top of the telephone network platform.[25] Because customers would not have the option of switching to a competitor, the regulator would have to impose rules to limit AT&T's freedom of action.

Such rules would bar either AT&T's refusal to provide its full range of services to bona fide customers, or differential treatment of customers in the same situation. In short, Monopoly-Policing would necessarily evolve toward a non-discrimination model. The critical issue would be which distinctions counted as impermissible discrimination. For example, could a large corporate customer negotiate a special volume and term discount with AT&T, which was not expressly offered to all other customers?[26]

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[22] There is an alternative view that, even in such an unbalanced situation, mandatory interconnection is unnecessary. *See* Tom W. Bell, *The Common Law in Cyberspace*, 97 MICH. L. REV. 1746 (1999) (reviewing Peter Huber's LAW AND DISORDER IN CYBERSPACE). The claim is that, without interconnection requirements, competition will still emerge if the market is not in fact a natural monopoly, and the presence of multiple facilities-based competitors will produce a better-performing market than under mandatory interconnection. I am skeptical of this viewpoint, as applied to the early telephone industry. However, my argument does not depend on whether or not interconnection is mandatory. A conscientious regulatory decision to rely on voluntary interconnection as the basis for competition and innovation is also a form of interconnection rule.

[23] In competitive markets, prices are driven down toward marginal cost. Monopolies, however, can generate greater profits by restricting output and charging higher prices for the artificially scarce good. *See* KARL E. CASE & RAY C. FAIR, PRINCIPLES OF MICROECONOMICS 316 (4th ed. Prentice Hall 1996) (1989).

[24] *See* Hush-A-Phone Corp., 20 F.C.C. 391 (1955), rev'd, 238 F.2d 266 (D.C. Cir. 1956) (seeking to bar the attachment of a rubber noise-shield to telephone receivers).

[25] *See* LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD (2001) (explaining how open interfaces for network attachments and uses promote innovation).

[26] Under the actual common carriage rules governing pre-divestiture AT&T, such a deal would run afoul of the requirement that the carrier could only offer services pursuant to its posted tariffs.

Thus, depending on the initial choice by the government policy-maker, either interconnection or non-discrimination rules would have to be adopted. This is why the two approaches appear again and again in communications policy.

2. *Sharpening the Distinction*

There are many variations of both interconnection and non-discrimination. An interconnection rule might be more or less intrusive, and the same is true of a non-discrimination rule. However, there remain fundamental differences. Non-discrimination rules mandate full equivalence: the network operator cannot treat third parties any worse than it treats itself or its partners. The tricky question is what gets labeled as "discrimination." Interconnection rules have more leeway. A very loose interconnection regime might not even require parties to interconnect, and only limit allowable practices when they choose to do so. A very strict interconnection regime might specify every detail of mandatory interconnection.

Both rule types are means to the same ends: well-functioning markets subject to Schumpeterian competition, producing optimal social welfare gains.[27] However, they use different means to that end. To oversimplify, interconnection benefits competition, while non-discrimination benefits customers.[28] When interconnection is widely available, customers can exert pressure on incumbents by switching to competitors, or they can turn themselves into quasi-competitors using the open interfaces that interconnection promotes. Entry barriers for new facilities-based entrants are reduced, and opportunities for incumbents to leverage market power are circumscribed by the terms of their interconnection agreements with other networks. Non-discrimination rules can approximate the disciplining effects of competition, by forcing incumbents to behave as they might in a truly competitive environment. However, designing and enforcing rules that mimic the distributed constellation of decisions in a functioning market is a Herculean task, especially when that market is dynamic.[29]

The significance of both rule types can be traced to the fundamental dynamics of networks. The value of a network increases with the number of

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[27] *See* Wu, Broadband Debate, *supra* note 4; JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM, AND DEMOCRACY 81-90 (2d ed. 1947). My argument in this paper does not hinge on selection of a particular normative goal. In essence, my argument is that, whatever over-arching outcome one desires, interconnection is a better route than non-discrimination to get there.

[28] These distinctions should not be overstated. The presence of competition can reduce prices and produce service innovation, benefiting incumbents' customers as well as those of new entrants. Similarly, non-discrimination rules prevent incumbents from imposing restrictions that prevent new forms of competition. Nonetheless, interconnection and non-discrimination represent distinct concepts about the core problem and appropriate solution.

[29] This is, in essence, the powerful argument that Austrian School economists such as Freidrich Hayek leveled against socialism. *See* Freidrich Hayek, *The Use of Knowledge in Society*, 35 AMER. ECON. REV. 519-30 (1945).

users, a phenomenon known as network effects.[30] The more people or devices you can reach, the more utility you (and everyone else) gain from connectivity. Without interconnection, the largest network may have an insurmountable advantage, because customers of competing networks will defect to gain the benefits of scale.[31] In markets with low capital costs of infrastructure, such as instant messaging software, duplicate networks may be sustainable, although still raising competitive concerns and limiting the utility of the service. Otherwise, monopoly is the likely result.

In situations where government seeks to facilitate competitive entry, such as the AT&T Competition-Facilitation scenario, interconnection is critical.[32] New entrants often cannot survive without the ability to offer access to customers of the incumbent. For this reason, an interconnection mandate is the first provision of the section of the 1996 Telecommunications Act devoted to "Development of Competitive Markets."[33] Interconnection, however, does not only benefit new entrants. It is a two-way street. Each network's subscribers benefit from the ability to reach those of the other, even as the two networks compete.[34] Interconnection is thus a form of "co-opetition:" a mutually beneficial business arrangement between companies that otherwise compete. The terms of those arrangements go a long way toward defining the terms of competitive engagement for the industry.

Non-discrimination rules also shape the competitive landscape, but in a different way. Discrimination is an effort by the network operator to maintain control over the entire network ecosystem. Non-discrimination rules seek to divide the competitive environment on top of the network from whatever competition may occur among networks. However, such intervention can have unpredictable consequences. Networks are complex adaptive systems, in which the behavior of the whole often cannot be predicted accurately from knowledge of the individual components.[35] Non-discrimination rules can work effectively to

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[30] *See* Mark Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 CAL. L. REV. 479 (1998) (discussing ways in which particular legal fields should-and should not-be modified to take account of network effects).

[31] *See* Nicholas Economides, *The Economics of Networks*, 14 INT'L J. INDUSTRIAL ORG., 673 (1996); Nicholas Economides & Glenn Woroch, *Benefits and Pitfalls of Network Interconnection* (Stern School of Business, N.Y.U Discussion Paper, no. EC-92-31, 1992); Michael Carter & Julian Wright, *Asymmetric Network Interconnection*, 22 REV. OF INDUS. ORG. 27 (2003); Nicholas Economides, Giuseppe Lopomo & Glenn Woroch, *Regulatory Pricing Rules to Neutralize Network Dominance,* 5 INDUS. & CORP. CHANGE 1013 (1996).

[32] *See supra* text at note 22.

[33] 47 U.S.C. § 251 (1999).

[34] *See* Candeub, *supra* note 3 (arguing that this mutual benefit obviates the need for positive interconnection charges on transiting traffic).

[35] *See* Susan Crawford, *The Internet and the Project of Communications Law* (draft, on file with the author); David G. Post & David R. Johnson, "*Chaos Prevailing On Every Continent": Towards a New Theory of Distributed Decision-Making in Complex Systems*, 73 CHI.-KENT L. REV 1055 (1998); Daniel F. Spulber & Christopher Yoo, *On the Regulation of Networks as Complex Systems: A Graph Theory Approach,* 99 NW. U. L.

promote innovation on one side of the boundary they establish, but they can also damage the overall level of innovation, investment, and network growth. The problem is that it is difficult to predict the results ahead of time.

3. *Areas of Overlap*

There is some overlap between the two approaches. Any interconnection rule implies a limited form of non-discrimination through its reciprocity requirement: the interconnecting parties will treat each other's traffic as their own.[36] The agreement for network 2 to terminate the phone calls or Internet data packets of network 1 is also necessarily the agreement of network 1 to do the same for network 2.[37] However, under a pure interconnection regime, the obligation is limited to that relationship. Network owners are not *per se* prohibited from other discriminatory conduct, such as offering different prices and services to different users.

If regulators choose, they can incorporate more extensive non-discrimination requirements within an interconnection regime. For example, as part of the Federal Communications Commission's (FCC's) *Third Computer Inquiry (Computer III)* proceedings governing use of data processing technologies over the telephone network, the Commission in the 1980s adopted Comparably Efficient Interconnection (CEI) mandates on AT&T and its successor Bell Companies.[38] *Computer III* was an interconnection regime, defining how those network operators linked with enhanced service providers. The CEI component, however, incorporated non-discrimination principles as well.

CEI allowed the Bell Companies to offer their own integrated enhanced services, such as voicemail or alarm monitoring, if they also made the underlying network features and functions available to unaffiliated providers.[39] CEI thus ensured that the operators' own enhanced services did not have an inherent

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REV. 1687 (2005). *See generally* M. MITCHELL WALDROP, COMPLEXITY: THE EMERGING SCIENCE AT THE EDGE OF ORDER AND CHAOS (1992) (providing an overview of complexity theory); STEVEN JOHNSON, EMERGENCE: THE CONNECTED LIVES OF ANTS, BRAINS, CITIES, AND SOFTWARE (2001) (applying complexity theory to the Internet and other systems).

[36] The exact form of this embedded non-discrimination requirement is, like other aspects of interconnection rules, subject to variation. It is theoretically possible to imagine an interconnection agreement that only imposes carriage obligations on one side, but any interconnection rule would, at a minimum, guarantee the non-dominant party the benefits of reciprocal connectivity.

[37] This reciprocity reflects the fact that all forms of communications today are effectively interactive: they involve communication from as well as to the customer. The framework described in this paper does not apply to truly one-way distribution media, such as broadcast television and radio.

[38] *See* Amendment of Section 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry), Report and Order, 104 F.C.C.2d 958 (1986).

[39] An example of a network feature might be transmitting the originating phone number of a call.

advantage over those of competitors. The Commission could have simply defined the terms under which the Bell Companies had to make network features and functions available. Because it was concerned about fostering an independent enhanced services industry, it took the additional step of mandating non-discrimination.

An interconnection rule can also include standardized technical terms that produce a non-discriminatory effect. For example, the FCC's network attachment rules required AT&T and its successors to allow third-party devices, such as telephones, fax machines, and computer modems.[40] Because, under these provisions, any device conforming to technical specifications could be connected to the network, AT&T could not favor its own equipment over that of other suppliers. The rules thus had an anti-discriminatory effect, even though they are structured in interconnection terms.[41]

B. The Models in Action

For much of telecommunications history, non-discrimination was privileged over interconnection. Interconnection was seen as a necessary evil, or as an interim step to the true goal of non-discrimination.[42] Even in recent years, as interconnection has become more central, regulators have focused on the minutiae of interconnection pricing, rather than on crafting a regime to incentivize optimal interconnection arrangements.[43] The one area where interconnection has always been central is the Internet backbone, which happens to be the market regulators have largely avoided.[44]

The emphasis on non-discrimination is best understood in the appropriate historical and technological context. Interconnection has always been an important goal of communications policy. However, it was often viewed as too difficult to achieve or, in other cases, taken for granted without close scrutiny. An examination of historical approaches to communications regulation provides

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[40] *See* Connection of Terminal Equipment to the Telephone Network, 47 C.F.R. § 68 (1998).

[41] *See* Tim Wu, *Why Have a Telecommunications Law? Anti-Discrimination Norms in Communications*, 5 J. ON TELECOMM. & HIGH TECH. L. 15 (2006) [hereinafter Wu, Anti-Discrimination Norms].

[42] Part 68 is an interconnection framework because it mandates open relationships at the edges of the telephone network. A modem, of course, is just an end-user device, not a competing network. However, it can be a bridge between the regulated communications network and networks of computers on the other side. By adopting Part 68, the FCC removed from AT&T the power to bar interconnection at the customer premises. Its specifications became the technical foundations for such interconnection when it occurred. Nonetheless, because the FCC acted in a way that prevented differential treatment of network attachments, Part 68 has been labeled by other scholars as a non-discrimination framework. *See id.*; Wu, Broadband Discrimination, *supra* note 4.

[43] *See infra* text at note 124.

[44] *See infra* PART (II)(B)(2).

a basis, in Part III, to distinguish the unique elements of the current situation that call for greater attention to interconnection.

1. Common Carriage: Non-Discrimination Ascendant

The dominant communications regulatory paradigm of the twentieth century was common carriage.[45] Common carriage is primarily a non-discrimination approach, and its prominence created a distorted perception of the relative merits of non-discrimination and interconnection.

A common carrier bears special obligations not imposed on other businesses. The concept derives from the idea of "common callings" developed in England in the Middle Ages, itself building on earlier concepts dating back to ancient Rome.[46] A common carrier cannot, for example, differentiate in the treatment of similarly situated customers, evaluate the content of what it receives from its customers, or refuse to serve interested customers, even when that means building out its facilities to reach them.[47]

At common law, common carriage applied to a range of industries, including innkeepers, railroads, grain elevators, and ferry operators, which scholars have had difficulty grouping under any consistent definition.[48] In the US, the common-law doctrine of common carriage was formalized in the Interstate Commerce Act (ICA) of 1887, which imposed a comprehensive regulatory regime on the railroad industry.[49] The ICA was the model for public utility regulation in other sectors, including electricity, natural gas, airlines, and telecommunications. Its "public interest" standard and common carriage

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[45] *See* ITHIEL DE SOLA POOL, TECHNOLOGIES OF FREEDOM (1983) (arguing for the enduring significance of common carriage in the digital age).

[46] *See* BRUCE WYMAN, THE SPECIAL LAW GOVERNING PUBLIC SERVICE CORPORATIONS AND ALL OTHERS ENGAGED IN PUBLIC EMPLOYMENT (1911); Charles K. Burdick, *The Origin of the Peculiar Duties of Public Service Companies*, 11 COLUM. L. REV. 514 (1911); James B. Speta, *A Common Carrier Approach to Internet Interconnection*, 54 FED. COMM. L.J. 226 (2002); Candeub, *supra* note 3; Thomas B. Nachbar, *Open Access* (draft, on file with the author).

[47] *See* Nachbar, *supra* note 46; Jim Rossi, *The Common Law Duty to Serve,* 51 VAND. L. REV. 1233 (1998).

[48] Early accounts of common carriage offer two justifications for subjecting particular enterprises to such restrictions: they imbued with the public interest, or they are natural monopolies, *Compare* David S. Bogen, *The Innkeeper's Tale: The Legal Development of a Public Calling*, 1996 UTAH L. REV. 51 (arguing that common carriage arose from public interest, rather than natural monopoly concerns) *with* Bruce Wyman, *The Law of the Public Callings as a Solution of the Trust Problem*, 17 HARV. L. REV. 156 (1904) (arguing that common carriage arose from natural monopoly concerns); Nachbar, *supra* note 46.

[49] *See* An Act to Regulate Commerce, 24 Stat. 379 (1887).

concepts were incorporated wholesale into the Communications Act of 1934 (1934 Act), which created the Federal Communications Commission.[50]

In telephony, common carriage means that telephone companies cannot differentially treat phone calls based on their contents. Callers can say whatever they wish; how much they pay depends on neutral factors such as the length of the call, the distance involved, and broad user categories such as whether the calls is residential and a business. The common carriage obligations of the 1934 Act remain in the law today, despite the significant changes wrought by the massive legislative revision adopted in 1996, and transformative marketplace developments. However, Congress and the FCC have expressly declined to impose common carrier requirements on the most significant new communications technologies of recent decades: cable television and broadband Internet access.[51]

Despite its long pedigree and wide adoption, common carriage is subject to significant confusion. The very definition of the concept in the 1934 Act is circular: a common carrier is one who provides common carriage for hire.[52] Common law sources are also unhelpful, offering competing and largely inconsistent rationales.[53] If common carriage is an economic concept to rectify the market power of natural monopolies, it should be limited to those settings. If it is grounded in broader social obligations of serving the "public interest," a more expansive interpretation is called for. Scholars at the beginning of the twentieth century fought over which approach is better-grounded in law and history,[54] and they still do today.[55]

The relationship of common carriage to interconnection is also often misunderstood. Conventional wisdom and many leading scholars claim that interconnection requirements were foreign to telecommunications regulation prior to the 1996 Act.[56] In reality, as Adam Candeub has documented, common

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[50] Communications Act of 1934, Pub. L. No. 73-416, 48 Stat. 1064 (codified as amended at 47 U.S.C. §§ 151-615b (1999)). Thus, common carriage today is a statutory construct, although one that draws heavily on common law antecedents.

[51] *See* POOL, *supra* note 45 (showing the relation to cable television); Speta, *supra* note 46 (showing the relation to the Internet).

[52] The Act states that, "The term 'common carrier' or 'carrier' means any person engaged as a common carrier for hire...." 47 U.S.C. 153 (1997).

[53] *See supra* note 48.

[54] *See* Rossi, *supra* note 48.

[55] *See* Candeub, *supra* note 3; Nachbar, *supra* note 46.

[56] *See, e.g.*, *Speta, supra* note 46, at 258 ("[T]he common law imposed no obligation on railroads (or other carriers) to interconnect with the lines of other carriers...."). Even Jim Chen, a prominent advocate of interconnection mandates for broadband Internet networks, defends such rules against charges they are tantamount to "imposing common carriage on the Internet," with the rejoinder that: "If anything, simply requiring a carrier to interconnect with its competitors, much less on nondiscriminatory terms, is alien to the common law understanding of common carriage." Jim Chen, *The Authority to Regulate Broadband Internet Access Over Cable*, 16 BERKELEY TECH. L.J. 565 n.280 (2001).

carriage at common law included some interconnection obligations, along with other requirements.[57] For example, railroads, before the Interstate Commerce Act, were required under common law to carry freight handed off at depots by competitors.[58] Similar obligations applied at common law to stagecoaches and other common carriers.[59]

Interconnection was de-emphasized under common carriage, for several historical reasons. Some common carriers, such as innkeepers, offered services that never required shared traffic with competitors. Even railroads and stagecoaches provided mostly point-to-point service in their early days, making transit for other carriers a relatively minor issue. Moreover, the ICA was passed to counteract the power of the railroads, which had become the dominant industrial enterprises of the Gilded Age.[60] Railroads were seen as discriminating against smaller or unaffiliated shippers, and of accumulating too much economic power more generally. As a result, prohibitions on discrimination were at the core of the 1887 legislation. How railroads treated each other was less of a concern than how they treated their customers.

Specific elements of the early telephone business also favored a non-discrimination emphasis. Operators had to route calls manually outside a local exchange. There was no neutral connection point, analogous to a railroad station, which all traffic had to pass through. Telephone interconnection would therefore have required physical extension of incumbent networks to benefit competitors, something outside the bounds of the limited handoff right afforded under common law to railroads.[61] Thus, although some court decisions from the period state that no common-law interconnection obligation existed, such conclusions speak primarily to the relatively primitive state of the telephone network at the time.

Interconnection was, however, a hot topic in the nascent telephone industry at the end of the nineteenth century.[62] Alexander Graham Bell's patents initially blocked competition with the Bell Company he established. Following the expiration of the Bell patents, however, independent telephone companies began to spring up. [63] They were limited by their inability to offer long-lines service, which required greater resources, as well as technical innovations protected

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[57] *See* Candeub, *supra* note 3; WYMAN, *supra* note 46.

[58] *See id.*

[59] *See id.*

[60] *See* Joseph D. Kearney & Thomas W. Merrill, *The Great Transformation of Regulated Industries Law*, 98 COLUM. L. REV. 1323 n.20 (1998) (showing that "non-discrimination was unquestionably the overriding goal of the Interstate Commerce Act.").

[61] *See* Candeub, *supra* note *3*, at 394, *citing* U.S. Tel. Co v. Cent. Union Tel. Co., 171 F. 130 (N.D. Ohio 1909).

[62] *Id.*

[63] *See* MILTON MUELLER, UNIVERSAL SERVICE: COMPETITION, INTERCONNECTION, AND MONOPOLY IN THE MAKING OF THE AMERICAN TELEPHONE SYSTEM (MIT Press 1997); AMY FRIEDLANDER, NATURAL MONOPOLY AND UNIVERSAL SERVICE: TELEPHONES AND TELEGRAPHS IN THE U.S. COMMUNICATIONS INFRASTRUCTURE 1837-1940 (CNRI 1995).

under later Bell patents.[64] So, the independents sought interconnection with AT&T. AT&T selectively used refusals and advantageous terms of interconnection to strengthen its own position.[65]

Before significant caselaw could develop on whether a common-law interconnection right did in fact exist, Congress passed the 1934 Communications Act. The Act essentially formalized a regulatory deal between AT&T and the US government, which had been articulated in 1913 in the Kingsbury Commitment.[66] The government acquiesced in AT&T's refusal to offer universal and non-discriminatory interconnection to rivals, in return for the ability to impose price regulatio1n and non-discrimination obligations on the monopoly phone provider.

"Universal service," the mantra of AT&T CEO Theodore Vail, became the guiding principle of communications policy. Although it later came to stand for a framework of cross-subsidies to make phone service more affordable for users in rural and other high-cost areas, the irony is that universal service was originally meant to promote the virtues of an exclusive AT&T network.[67] Only AT&T, the long-lines monopoly, could provide "universal" connections between distant callers.

Perversely, it was AT&T's refusal to serve customers of some independent telephone companies, or to give them comparable service to its own customers, that gave it the economic leverage to cross-subsidize its own deployment and pricing efforts.[68] "Universal service" was built on non-universal interconnection.

2. *The Internet: Interconnection Dominates*

Through its shrewd maneuvers, AT&T enjoyed a legally-protected monopoly for nearly fifty years after the passage of the 1934 Act. As its universal service regime was beginning to unravel in the 1970s and 1980s, an alternative communications network was quietly growing, in a very different regulatory environment. The Internet was never part of the common carriage universe. Allowed to develop their own rules through enlightened "unregulatory" decisions of the FCC, the organizations that constructed the Internet infrastructure know today chose a different path.[69] It was a path based not on non-discrimination, but upon ubiquitous interconnection.

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[64] *See id.*

[65] *See id.*

[66] *See* PETER W. HUBER, MICHAEL K. KELLOGG & JOHN THORNE, FEDERAL TELECOMMUNICATIONS LAW (2d. 1999) (describing the rising of packet-switched broadband networks and the concomitant decline in narrowband circuit-switched networks); GERALD W. BROCK, THE TELECOMMUNICATIONS INDUSTRY: THE DYNAMICS OF MARKET STRUCTURE 155 (1981).

[67] *See* MUELLER, *supra* note 63.

[68] *See* HARRY MACMEAL, THE STORY OF INDEPENDENT TELEPHONY (1934).

[69] Jason Oxman, The FCC and the Unregulation of the Internet (Fed. Comms. Comm'n Office of Plans and Pol., Working Paper No. 31, 1999), *available at*

At a deep level, the Internet *is* interconnection.[70] Hence the name, "inter-net." Though widely described as one network, the Internet is actually a collection of several thousand independent networks, whose common characteristic is an agreement to interconnect to deliver Internet protocol (IP) datagrams.[71] IP is a generic protocol designed to run on top of any physical or logical infrastructure, linking up proprietary data networks.[72] What distinguishes a private "intranet" from a participant in the Internet is nothing more than the agreement to exchange traffic transparently with other networks.

The Internet is a packet-switched network, which means traffic does not take a fixed path between two endpoints.[73] Instead, messages are broken up into small packets of data, which are transferred independently by each router they encounter along the way, and then reassembled. An Internet transmission may thus traverse many different interconnected networks during the course of its journey, potentially without the knowledge of the sending or receiving network. This architecture is critical to the Internet's robustness.[74] When congestion or other bottlenecks occur at one point in the network, local routers automatically redirect traffic along alternate routes.

The Internet architecture means that each service provider can only control what happens on its own network. End-to-end service typically operates on a "best efforts" basis; there is no guarantee that any packet will reach its destination.[75] Customers pay a service provider for a specified level of data capacity (bandwidth) and other characteristics, but they have no control over the service providers at the other end of the connection, or in the middle. To provide high-quality service to their own customers, these service providers have incentives both to optimize the quality of their own networks, and to enter into

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http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp31.pdf; Steve Bickerstaff, *Shackles on the Giant: How the Federal Government Created Microsoft, Personal Computers, and the Internet*, 78 TEXAS L. REV. 1 (1999); Kevin Werbach, *The Federal Computer Commission*, 84 N.C. L. REV 1 (2005).

[70] *Cf.* Keith Cambron, *The Next Generation Network and Why We'll Never See It*, COMMS. MAG., Oct. 2006, at 10 ("…IP's greatest contribution is its ability to switch information across diverse networks, independent of the underlying technology; the greatest legacy of IP is the universal acceptance of the address scheme and message structure….").

[71] *See* Kevin Werbach, Digital Tornado: The Internet and Telecommunications Policy (Fed. Comms. Comm'n Office of Plans and Pol., Working Paper No. 29, 1997), *available at* http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp29pdf.html.

[72] Today, IP is the dominant protocol for digital communications, and proprietary alternatives such as X.25 are forgotten. Originally, however, the benefit of the Internet was not so much what it could deliver itself, but the fact that users of existing proprietary data networks, primarily at that time used for research and educational applications, could communicate with one another.

[73] *See* Digital Tornado, *supra* note 71; JOHN NAUGHTON, A BRIEF HISTORY OF THE FUTURE: THE ORIGINS OF THE INTERNET (1999).

[74] *See* Digital Tornado, *supra* note 71.

[75] *See id.*

optimal interconnection agreements with other networks.[76] The quality of the Internet experience is thus as much a function of how networks deal with each other as how they operate internally.

There are two types of Internet networks.[77] Internet service providers (ISPs) offer connectivity directly to end users, and to businesses offering content, applications, and service to those end users.[78] Backbone providers provide connectivity between ISPs. The boundaries are fuzzy, and many companies offer both functions, but the distinction is important. Access networks touch the regulated last-mile infrastructure of common carrier networks, with their non-discrimination obligations, except where the FCC has seen fit to remove such requirements. Backbones are different. They are in essence "carriers' carriers." Their entire business comes from interconnection with other networks.[79]

The Internet developed through three phases. Initially, it was an academic and scientific research network, funded primarily by the US government and consortia of academic institutions.[80] This original Internet had a single network backbone, operated by the US National Science Foundation (NSF).[81] The NSFNet backbone was, in effect, the point of interconnection for the various local and regional networks that participated in the Internet. The NSF promulgated an Acceptable Use Policy for its backbone, under which commercial activity was prohibited.[82] Interconnection in this first phase of the Internet was therefore achieved through centralized public control.

In the second phase of Internet development, in the early 1990s, the NSF privatized its backbone function, eventually withdrawing from the Internet infrastructure market.[83] The transition from the academic NSFNet to the commercial Internet was a multi-year, multi-step process. The NSF made several critical decisions in this time period that shaped the later architecture of

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[76] *See id.;* Michael Kende, *The Digital Handshake: Connecting Internet Backbones*, 11 COMMLAW CONSPECTUS 45, 47-48 (2003) (describing the economic relationships among networks comprising the Internet).

[77] *See* Digital Tornado, *supra* note 71.

[78] A better term is Internet access providers, because these entities offer end users the ability to access the Internet. However, because Internet service provider is the more familiar term, I employ it here.

[79] *See* Kende, *supra* note 76.

[80] *See* Naughton, *supra* note 73; Hafner & Lyon, *supra* note 5.

[81] *See* Digital Tornado, *supra* note 71.

[82] Some commercial networks and exchange points such as CIX and UUNet were started as an alternative, but they were not a significant factor until the NSF opened up to competition. *See* Jay P. Kesan & Rajiv C. Shah, *Fool Us Once Shame on You - Fool Us Twice Shame on Us: What We Can Learn From the Privatizations of the Internet Backbone Network and the Domain Name System,* 79 WASH. U. L.Q. 89, 111-17, n.6 (2001).

[83] *See* Digital Tornado, *supra* note 71.

the Internet.[84] In particular, it mandated that not only would the Internet backbone be privatized, but it would also be subject to competition.[85] The NSF funded the creation of three network access points (NAPs), at which backbones could exchange traffic.[86] It adopted rules to ensure that there would be multiple backbones for the commercial Internet, which competed but also interconnected to hand off traffic to one another.[87] Independent backbones such as UUNet and Sprint soon entered the market.

In the current, third phase of Internet development, private commercial arrangements define terms of interconnection.[88] There are a substantial number of independent backbone network operators worldwide. These include affiliates of incumbent telephone operators, such as Verizon and AT&T, "pure-play" wholesale data carriers such as Level 3 and Global Crossing, and hybrid wholesale/retail data carriers such as XO Communications.[89] The backbones negotiate interconnection arrangements so that traffic flows across the network. These agreements are not generally subject to government oversight, and thus represent a parallel universe to the non-discrimination environment of common carriage. Their primary thrust concerns not what passes across networks, but how networks come together to deliver that content. In other words, in the Internet backbone, interconnection is the currency of the realm.

Backbone operators have developed two basic models for traffic exchange: peering and transit. Under peering, "Tier 1" backbones exchange traffic on a settlement-free or "bill and keep" basis.[90] In other words, no payments flow between the networks. The assumption is that, since both peers are major network operators, with significant traffic and distributed physical infrastructure, the relative benefits to the two networks from interconnection will be roughly equal. The costs of metering and distinguishing traffic would exceed any benefits. In contrast, non-Tier 1 networks must pay larger networks to transport their traffic. These smaller networks enter into transit agreements, under which they pay fees related to the volume of traffic they deliver or other metrics.[91]

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[84] *See* Kesan & Shah, *supra* note 82; Brett M. Frischmann, *Privatization and Commercialization of the Internet Infrastructure: Rethinking Market Intervention into Government and Government Intervention into the Market*, COLUM. SCI. & TECH. L. REV. (2001) (describing the privatization process).

[85] *See* Kesan & Shah, *supra* note 82.

[86] *See id.*

[87] *See id.*

[88] *See* Kende, *supra* note 76; Jacques Cremer, Patrick Rey & Jean Tirole, *Connectivity in the Commercial Internet*, 48 J. INDUS. ECON. 433 (2000); Speta, *supra* note 46.

[89] Companies such as Comcast, AOL, and Google also operate backbone assets for their own internal use.

[90] *See* Kende, *supra* note 76.

[91] *See id.*

For most of the Internet's history, there have been sufficient backbone competitors to limit the market power any one might enjoy.[92] Backbones represent alternative points of entry for the entire Internet, making them relatively good substitutes for one another. A backbone that raises transit prices, or restricts peering terms, is therefore subject to market forces.

In recent years, a matrix of private exchange points and content delivery networks (CDNs) have sprung up to help traffic flow across this mesh of connectivity more smoothly. Private exchange points purchase transit from multiple backbones and resell it, optimizing performance and pricing through dynamic routing technologies.[93] When a network or company purchases transit from one of these exchange points, its traffic is automatically routed across the backbone network that offers the best performance at that moment. Customers are thus insulated from congestion as well as pricing decisions of individual backbones. The private exchange point, which charges a set rate to its customers, has incentives to use the lowest-priced backbone, all things being equal, further limiting backbone market power.

CDNs such as Akamai operate distributed networks of caching servers, hosted on large numbers of networks, which automatically serve content to end-users from nearby caches.[94] A cache is simply a large storage device that automatically captures certain content. An Internet content provider such as AOL has servers in a small number of locations, but customers distributed around the globe and across many networks. The CDN first checks to see if a copy of the requested object (such as large video file) is already available in a cache on the customer's own network.[95] If so, it serves the file from there.

By avoiding the need to send content across the Internet from the origin servers, CDNs both improve performance and reduce cost. The CDNs generate revenues from content providers who seek improved delivery of their content. ISPs are generally willing to host CDN caches for free on their networks to reduce their own bandwidth utilization, because those ISPs must pay for transit and/or fiber optic capacity proportional to their usage. The result is that, when a user views a web page or downloads a file, the performance he or she experiences may be determined more by an independent CDN than by either the user's ISP or the backbone provider.

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[92] *See id.*

[93] *See* David Greenfield, *Internet-based VPNs: Business or Cattle Class?*, NETWORK MAG., July 1, 2002, at 54.

[94] *See* J. Dilley, B. Maggs, J. Parikh, H. Prokop, R. Sitaraman & B. Weihl, *Globally Distributed Content Delivery*, 6 IEEE INTERNET COMPUTING 50 (2002) (describing the Akamai system and how the authors overcame specific system challenges); Mike Afergan et al, Experience with Some Principles for Building an Internet-Scale Reliable System (presented at WORLDS '05 Workshop on Real, Large, Distributed Systems) (showing that "…Akamai has built a network of 15,000+ servers located in 1,100+ third-party networks.")

[95] CDNs employ sophisticated algorithms to automatically push certain content out to local caches, and also to reallocate requests in situations of high demand or failure of a particular cache. *See id.*

Actual performance of the market isn't always harmonious. Prices can still vary for seemingly equivalent backbone services. Furthermore, most peering terms are secret, so it is difficult to assess their fairness or uniformity. Peering disputes occasionally erupt, most notably in 2005 between backbone operators Cogent and Level 3.[96] Mergers among the companies that own major backbones also produce regular spasms of controversy over peering policies, with government-imposed merger conditions crafted to crack down on perceived anti-competitive behavior.[97]

Nonetheless, the FCC has declined to use its legal authority to mandate interconnection or non-discrimination among Internet backbones across the board.[98] An FCC staff working paper in 2003 concluded that competition in the backbone market was sufficient to prevent abuses, and that backbone networks should be treated as unregulated "information service."[99] Although commentators such as Jim Speta have advocated a mandatory interconnection regime for Internet carriers,[100] the Commission has shown no interest in going down that road.

The fact that, on the Internet, interconnection is seen as a technical principle of network architecture, rather than an exogenous legal mandate, does not diminish its importance. As cyberlaw scholars led by Lawrence Lessig have exhaustively demonstrated, the technical code of cyberspace can regulate behavior as effectively as the legal mandates of law.[101] The two mechanisms are interdependent. Architecture evolves in response to law, and law (if it is to be effective) must take into account the realities of extant architectures.

Moreover, it would be naïve to view the Internet backbone market as an unspoiled preserve, free from the tribulations of telecommunications regulation. The structure of the market developed because of the NSF's decisions in the mid-1990s privatization process. The NSF ensured that multiple backbones could compete, but it declined to impose specific interconnection performance requirements for those backbones. The trajectory of the Internet backbone market was a direct result of these governmental decisions.[102] And today, as a practical matter, the dominant US backbone operators are regulated

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[96] *See* Stacy Cowley, *Level 3, Cogent Call Time Out on Peering Spat*, IDG NEWS SERVICE, Oct. 10, 2005.

[97] *See, e.g.*, Sarah L. Roberts-Witt, *Opening the Books: Major Telecom Players Make Their Peering Guidelines Public*, INTERNET WORLD, March 15, 2001.

[98] *See* Kende, *supra* note 76.

[99] *Id.*

[100] *See* Speta, *supra* note 46. Speta labels his proposal a "common carrier regime" for Internet interconnection, which is something of an oxymoron, since common carriage rules primarily concern non-discrimination. *See supra* Part (II)(B)(1). His use of the term is apparently intended as a shorthand for the application of rules analogous to those for regulated telecommunications carriers.

[101] *See* LAWRENCE LESSIG, CODE AND OTHER LAWS OF CYBERSPACE (1999).

[102] *See* Kesan & Shah, *supra* note 82.

telecommunications carriers such as AT&T and Verizon.[103] Those carriers may not experience direct FCC scrutiny of their Internet backbone relationships, but all their strategic decisions are necessarily colored by the regulatory environment.

Regulators have intervened in the backbone market on several occasions. When, in 2004, AT&T sought to exclude voice traffic transiting its Internet backbone from the interstate access charges it pays to local carriers, the FCC rejected its efforts, forcing AT&T to pay millions of dollars.[104] AT&T claimed it was engaged in an unregulated information service, but the FCC concluded it was simply re-labeling a regulated telecommunications service. Telecom mergers involving Internet backbone assets are also subject to government review. Transactions such as Worldcom's acquisition of MCI, MCI Worldcom's attempted acquisition of Sprint, and Verizon's acquisition of GTE raised concerns about market power in the backbone segment.[105] Regulators stepped in and imposed antitrust conditions to thwart such a possibility.[106] And today, it is the possibility that Verizon and AT&T will use their Internet backbones to discriminate against unaffiliated Internet content providers that is driving the debate over network neutrality.[107]

The Internet backbone market is thus an example of largely private interconnection decisions in the shadow of regulatory intervention. The FCC has no general rules governing Internet backbones, but it retains the right to impose either non-discrimination or interconnection obligations as the situation requires. Moreover, the Commission has never formally declared all backbones as unregulated information services, and its decision in the 2004 AT&T access charge case expressly preserved its ability to decide otherwise.[108] Backbone providers must therefore consider how their regulators might interpret their actions, even when not subject to explicit rules. Although the Level 3/Cogent dispute never reached this point, there is no doubt that the FCC was carefully watching how it unfolded.[109]

Regardless of whether the government or companies contractually define the rules, the major policy questions in the backbone market involve

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[103] Verizon obtained significant backbone assets through acquisition of GTE and MCI, which had themselves acquired some of the largest backbones. AT&T developed a major backbone operation prior to its acquisition by SBC, which then took the AT&T name.

[104] Petition for Declaratory Ruling that AT&T's Phone-to-Phone IP Telephony Services are Exempt from Access Charges, 19 F.C.C.R. 7457 (2004).

[105] *See* Roberts-Witt, *supra* note 97.

[106] *See, e.g.*, GTE Corp. & Bell Atlantic Corp., Consent to Transfer Control of Domestic and International Sections, Memorandum Opinion and Order, 15 F.C.C.R. 14032 (2000).

[107] Network neutrality is couched as a policy governing last-mile broadband service providers. However, the potential actions giving rise to concerns about "non-neutral" behavior involve linkages between those last-mile operations and the same companies' backbones, which interconnect with unaffiliated content and application providers.

[108] *See supra* note 104.

[109] *See* Dilley, *supra* note 70.

interconnection, not non-discrimination. Backbones are free to shape traffic on their networks as they please. However, they are required to fulfill their obligations to carry traffic handed off to them at interconnection points. The terms of peering and other interconnection agreements are the battlegrounds that matter.

3. The Access Model: An Uneasy Combination

Interconnection eventually re-emerged in mainstream -- that is, non-Internet -- communications policy. The final decades of the twentieth century witnessed a dramatic shift away from the non-discrimination focus of common carriage.[110] Rather than regulate rates to forestall discrimination and approximate the consumer welfare benefits of a competitive market, regulators increasingly devoted their energy to creating the conditions under which real, live competitive markets could do such work themselves. Legislative, judicial, and administrative policy-makers now see it as their duty to eliminate barriers to competition, whether those barriers are encoded in law or enforced by market participants enjoying market power.[111]

After so many years of a legally-protected AT&T monopoly, simply removing formal prohibitions on competitive entry would not suffice. The traditional tools of the communications regulator, directed at the incumbent's practices towards its customers, said nothing about how the incumbent treated erstwhile competitors. And, for reasons explained in the previous section, those competitors simply could not function without effective interconnection.[112]

Once the decision was made to promote competition, the central task for regulators was no longer to calculate what the incumbent could charge its customers, but to determine the mechanisms (and sometimes prices) under which it allowed competitors to connect to its network. The extreme market power of incumbents still necessitated non-discrimination protections, but these were no longer sufficient. Communications regulation thus shifted from an emphasis on *rate* regulation to one on *access* regulation: an uneasy combination of non-discrimination and interconnection obligations.[113]

There were three phases in this reformation of US telecommunications policy. First, from the 1960s to the early 1980s, the FCC sharply limited the ability of AT&T to control how its customers used its network. It did so through what were effectively interconnection obligations. The Commission, in the landmark 1968 *Carterphone* decision, mandated that AT&T provide access for

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[110] *See* Kearney & Merrill, *supra* note 60 (describing this shift in the context of a broader revolution in regulatory policy).

[111] *See id.*

[112] *See supra* Part (II)(A)(1).

[113] *See* Kearney & Merrill, *supra* note 60; Daniel F. Spulber & Christopher S. Yoo, *Access to Networks: Economic and Constitutional Connections*, 88 CORNELL L. REV. 885, 919, 921, 926 (2003); Spulber & Yoo, *supra* note 16.

customers to attach devices of their choosing to its network.[114] It also mandated that AT&T offer "private line" circuits that could be employed for data transmission and other "enhanced services," which AT&T itself could not offer except through compliance with strict safeguards.[115]

Although these decisions did not, given the technology of the time, allow AT&T's customers to offer basic telephone services comparable to those AT&T provided, they did permit AT&T's customers to compete in the provision of equipment (which AT&T itself manufactured, through its Western Electric subsidiary), and in the provision of enhanced services. In a string of *Computer Inquiry* decisions in the 1980s, the FCC defined the interconnection terms for such enhanced services.[116] While some, such as voicemail, still resided on AT&T's network, others linked the public switched telephone network to nascent data networks.

An important point about access regulation is that it can determine not only how network operators link to other networks outside their boundaries, but also where those boundaries are located.[117] The "edge" of a network is not just a physical concept; it represents the demarcation point beyond which the network cannot exert its logical control. This becomes particularly significant for an interoperable packet-switched network such as the Internet. The FCC's *Carterphone* and *Computer Inquiry* decisions meant that data services, which could ride transparently on top of the voice telephone network, were effectively outside of that network's sphere of influence. The Internet is perhaps the most significant development that was made possible by this division.[118]

The second phase of access regulation was a more direct challenge to AT&T's monopoly. Prodded by the Department of Justice, AT&T signed a consent decree in 1983, which opened the door for long-distance competition. The best-known aspect of the AT&T divestiture was the structural separation of AT&T into a competitive long-distance carrier and seven regional "Baby Bell" monopoly local carriers, which were initially precluded from offering long-distance and other services.[119] The FCC created a regime of access charges, essentially interconnection rates, for the local transmission portions at the beginning and end of a long-distance call.

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[114] *See* Federal Computer Commission, *supra* note 69; Use of the Carterphone Device in Message Toll Telephone Services, 13 F.C.C. 2d 420 (1968), *recon. denied*, 14 F.C.C. 2d 571 (1968).

[115] *See* Federal Computer Commission, *supra* note 69. Tom Vest argues that the growth of private lines is the crucial metric for the success of the Internet. *See* Tom Vest, The Wealth of Networks (unpublished Ph.d dissertation) (on file with author).

[116] *See* Federal Computer Commission, *supra* note 69; Robert Cannon, *The Legacy of the Federal Communications Commission's Computer Inquiries*, 55 FED. COMMS. L.J. 169 (2003).

[117] *See* Spulber & Yoo, *supra* note 16.

[118] *See* Bickerstaff, *supra* note 69; Federal Computer Commission, *supra* note 69.

[119] *See* HUBER ET AL, *supra* note 66.

The third phase of the transformation involved efforts to open the local market to competition, with the promise of banishing traditional rate regulation from its final domain. The 1996 Telecommunications Act adopted not one but several overlapping access regimes for local telephone networks.[120]

The shift to access regulation marked a decreased emphasis on non-discrimination, and a parallel re-emergence of interconnection. Traditional common carriage regulation, and its administrative embodiment under the 1934 Communications Act, held that any differential pricing of services to similarly situated end users constituted impermissible discrimination.[121] AT&T was required to tariff its services, and not to deviate from those filed rates, even when a customer would prefer a special deal.[122] Under access regulation, regulators focus less on discrimination, and more on whether the carrier doing it has market power.

Non-discrimination did not vanish from communications policy. Telecommunications carriers that offer their service to the public are still common carriers, with everything that implies.[123] Telephone companies still cannot discriminate among their customers, including customers (such as ISPs) who use the incumbent access networks to deliver Internet-based services that may compete against the incumbents.

The idea of the 1996 Act was that these non-discrimination rules could coexist with new interconnection obligations, with competition eventually allowing the regulatory superstructure to wither away. In reality, the combination of non-discrimination and interconnection rules is unstable. Something had to give. Access regulation sought to marry the competition focus of interconnection rules with the more direct intervention of non-discrimination rules. It foundered when it came time to set prices for the new linkages the 1996 Act envisioned.

Deciding the appropriate pricing for any interconnection relationship can be challenging.[124] Interconnection always creates some benefits for customers of both networks. Even in the Internet backbone world, where private arrangements have worked well, there are still cases such as the Level 3/Cogent dispute where parties deadlock. In the case of access regulation, Congress and the FCC made the mistake of micro-managing pricing disputes among competitors. Pricing rules for the unbundled network elements (UNEs) that

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[120] *See* Spulber & Yoo, *supra* note 16.

[121] *See* Kearney & Merrill, *supra* note 60.

[122] *See* Jim Rossi, *Lowering the Filed Tariff Shield: Judicial Enforcement for a Deregulatory Era*, 56 VAND. L. REV. 1591 (2003) (assessing how the filed tariff doctrine creates an opportunity for strategic manipulation of the tariffing process, encouraging firms to rent seek by over-divulging information to regulators).

[123] 47 U.S.C. 153 (1997).

[124] *See* Candeub, *supra* note 3. The FCC has an entire proceeding posing the question of what regime is appropriate, and as expected the parties propose wildly varying answers. *See* Developing a Unified Intercarrier Compensation Regime, Notice of Proposed Rulemaking, 16 F.C.C.R. 9610 (Apr. 27, 2001).

incumbents are required to offer under the 1996 Act consumed the telecom industry for years.[125]

Ultimately, the delays, uncertainties, and expense of the battle proved too great for most of the new entrants in the local phone market to bear. Many of these companies rode the venture capital-fueled late-1990s boom, and crashed when public markets decided no longer to reward potential over profits. The failure of the UNE pricing regime dragged down the entire competitive vision of the 1996 Act.

The present interconnection environment is thus a somewhat uneasy mixture of different models. Telecommunications services, which fall under Title II of the Communications Act, are subject to a set of somewhat arbitrary regulated interconnection arrangements, with vestiges of the common carrier non-discrimination rules still in place. Information services, and Internet backbones, are allowed to operate through private negotiation, but with the ever-present possibility of government intervention. This system is only sustainable as long as the boundaries among its constituent parts remain in place.

That is not likely to be the case for long.

III. CONTEMPORARY CHALLENGES

A. The Convergence Age

1. From Silos to Layers

The major force shaping the present and future of communications policy is convergence. Digital convergence is generally understood as the elimination of distinctions between analog communications systems such as broadcast television, cable television, and telephone networks.[126] Once encoded in digital form, all information is ultimately interchangeable.[127] This means that networks previously in distinct markets can become direct competitors. The transformation of local telephone and cable television companies into competing

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[125] *See* Epstein, *supra* note 13.

[126] *See* Kevin Werbach, *Breaking the Ice: Rethinking Telecommunications Law for the Digital Age*, 4 J. TELECOM. & HIGH TECH. L. (2005) (mapping a new grammar for telecommunications policy); Layered Model, *supra* note 2; Digital Tornado, *supra* note 71.

[127] Some information flows may have special performance requirements, such as low latency and jitter (variability of latency) for real-time voice traffic, but the bits involved as identical to other kinds of bits.

providers of "triple-play" bundles of voice telephony, multi-channel video programming, and high-speed Internet access is a canonical example.[128]

It is particularly significant that convergence implies a transition from analog to digital delivery.[129] In other words, converged networks are data networks, first and foremost. The Internet and its data-networking predecessors have traditionally functioned as "value added networks" on top of the core communications infrastructure. Now it is the data networks that are becoming primary, with other service offerings as special-purpose optimizations of that core infrastructure.

At the same time as the horizontal convergence of communications network silos is progressing, the vertical dimension of the network is being transformed as well.[130] Traditional telecommunications networks were vertically integrated. Each physical network was optimized for delivery of a particular service, such as voice calling or television broadcasts, and the operators of those networks controlled every aspect of their functionality. By contrast, data networks tend to be organized in layers.[131] A layer is a functional aspect of the network, which conceptually operates on top or underneath other layers.[132] Each layer is distinct, in that it need only interface with the adjacent layers.

An Internet application such as eBay's auction site, for example, need not consider whether it reaches its customers over the coaxial cable of a cable modem service or the wireless signals of a WiFi connection to a laptop. Nor does it need to consider the congestion algorithms that the routers along the way

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[128] *See* Legg Mason, Battle of the Bundles Report (on file with author). Convergence has in the past been over-hyped as an investment thesis. The fact that bits are ultimately fungible does not eliminate all differences among networks in cost structure, culture, capabilities, and regulatory treatment. And even though convergence is happening, particular strategies for taking advantage of it may be poorly designed, timed, or executed. However, none of these caveats undermine the central fact that formerly distinct communications networks increasingly find themselves in overlapping if not identical competitive spaces.

[129] *See* Digital Tornado, *supra* note 71.

[130] In an earlier paper, I referred to this as the horizontal aspect of layered networks. *See* Layered Model, *supra* note 2. Here I adopt the more common formulation.

[131] *See id.*; Breaking the Ice, *supra* note 126.

[132] In the past, I have proposed a four-layer model, dividing the network into physical, logical, application, and content slices. *See* Layered Model, *supra* note 2. This model distinguishes the primary layers of concern to policy-makers: the underlying network infrastructure; the systems that allow information to flow among nodes on those networks; the functionality that information delivers to end users; and the information itself that is sent and received. Other variations of the layered model have been proposed, most notably the three-layer model of Yochai Benkler. *See* Yochai Benkler, *From Consumers to Users: Shifting the Deep Structures of Regulation Towards Sustainable Commons and User Access,* 52 FED. COMMS. L.J. 561 (2000). In a more recent paper, I attempt to refine the four-layer model to highlight the significance of "interface" layers, and to incorporate network-connected elements at the user premises. *See* Breaking the Ice, *supra* note 126. Although it uses the original four-layer model, the instant discussion does not rely on the selection of a particular layered framework.

employ. It sees the network from the perspective of its own layer. The layered approach allows companies at each layer to optimize their services, without having to worry about the rest of the stack.[133] It creates flexibility for innovation, because new entrants can operate on top of the existing network, and ignore other layers unrelated to their emphasis.

Separating networks into layers does not mean layers must always remain discrete, or that certain functionality must be delivered by means of a particular layer. On the contrary, a layered approach provides a map to visualize such combinations and transformations when they occur. The Internet architectural model does not forbid layer crossing; it provides a small set of "spanning layers" that allow freedom of movement on either side.[134] The critical spanning layer for the Internet is the Internet Protocol itself.[135] Above and below IP, providers can recombine functionality to produce innovation and value. Thus, Google can combine content (its search results), applications (tools such as an email service, video hosting, and aggregated news stories), and logical delivery (distributed server farms throughout the world).

Convergence and layering make interconnection both more vital and more complex. Voice, video, and data providers are no longer in separate worlds. If they wish to provide users with seamless connectivity they expect, different kinds of networks must interconnect. Moreover, interconnection is no longer flat. Every layer can potentially interconnect horizontally with analogous layers on other networks.[136] And, every layer within a network also interfaces vertically with layers above and below it.[137] The FCC's *Computer Inquiry* decisions, which differentiated "basic" connectivity from the computer-driven "enhanced services" on top of the network, represented the first effort to regulate such interactions.[138] By mandating open interconnection with enhanced services through its CEI rules, the FCC created the conditions for explosive growth in innovative computer-driven devices and applications.[139]

Future network regulation must account for this multi-dimensional environment. Non-discrimination rules, which emphasize the internal relationship of networks and their customers, are ill-suited for the web of modular linkages among interconnected data networks. Even along the vertical dimension, a sharp division between a physical network substrate and the

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[133] *See* Layered Model, *supra* note 2.

[134] David Clark *et al*, New Arch: Future Generation Internet Architecture, Final Technical Report (Dec. 31, 2003).

[135] *See id.*

[136] *See* PETER HUBER, THE GEODESIC NETWORK: 1987 REPORT ON COMPETITION IN THE TELEPHONE INDUSTRY (1987).

[137] Thus, the approach describe herein differs from the one proposed by James Speta for mandatory interconnection between Internet carriers. *See* Speta, *supra* note 46. Speta's interconnection model tracks the traditional price-based framework of the telephone network.

[138] *See* Federal Computer Commission, *supra* note 69; Cannon, *supra* note 116.

[139] *See* Federal Computer Commission, *supra* note 69.

innovation occurring on top of it, as non-discrimination approaches presuppose, fails to do justice to the increasingly network-like character of many logical and application-layer entities, such as Google and Akamai. The new converged, layered network is a complex tapestry, on which both individual threads and larger patterns contribute to the overall whole. Viewing all of these interactions as potential network-to-network interconnections provides a richer set of tools to evaluate the policy implications of behavior by various actors.

2. *Out of the Regulatory Box*

Convergence poses a challenge for regulators such as the FCC. Unfortunately, the FCC's response to these challenges has at times generated more questions than answers. The time is ripe for a new approach.

The Communications Act, even after its 1996 rewrite, divides up the world into discrete regulatory silos: Title II for telecommunications carriers, Title III for broadcasters, and Title VI for cable television.[140] It offers definitional categories, such as "telecommunications service" and "information service" that are anachronistic in a world where all communications is ultimately just bits of data organized in different ways. Assignment of a service to one of these categories has tremendous consequences. Yet in a converged world, there is often no good way to map the categories to reality. Voice over Internet Protocol (VOIP), for example, is fundamentally both voice and data, straddling the line between telecommunications and information services.

The FCC's initial response to this difficulty was to avoid making any decision. When VOIP was first commercially offered in the mid-1990s, the FCC saw it as an innovative new offering, with potentially significant benefits for customers.[141] It was concerned that imposition of regulatory obligations designed for established traditional communications providers would stifle this nascent technology.[142] So, when faced with a petition in 1995 to classify VOIP as a regulated telephone service, the FCC declined to act on it.[143] When charged by Congress to issue a report justifying its non-regulation of VOIP, the agency

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[140] *See* Layered Model, *supra* note 2.

[141] *See* Digital Tornado, *supra* note 71 (outlining the FCC's initial views on VOIP); Federal-State Joint Board on Universal Service, Report to Congress, CC Docket No. 96-45, 16-25 (April 10, 1998), *available at* http://www.fcc.gov/Bureaus/Common_Carrier/Reports/fcc98067.pdf (declining to impose traditional telephone regulation on certain VOIP services) [hereinafter Stevens Report].

[142] *See* Kathleen Q. Abernathy, Commissioner, Fed. Comms. Comm'n, Remarks before the Federal Communications Bar Association New York Chapter, The Nascent Services Doctrine, 1-2 (July 11, 2002).

[143] *See* Provision of Interstate and International Interexchange Telecommunications Service Via the "Internet" by Non-Tariffed Uncertified Entities, America's Carriers Telecommunication Association, Petition for Declaratory Ruling, Special Relief, and Institution of a Rulemaking, RM 8775 (Mar. 4, 1996), *available at* http://www.fcc.gov/Bureaus/Common_Carrier/Other/actapet.html.

crafted a nuanced statement that left open the possibility of future action, but took no steps toward imposition of regulation.[144]

Eventually, though, the FCC was forced to act. VOIP services began to gain significant numbers of subscribers. The leading independent VOIP provider, Vonage, now has over two million customers, making it an appreciable competitor for incumbent carriers.[145] The incumbents themselves began to offer VOIP services, in particular cable operators, who are now employing VOIP as their primary means to compete in the telephony market. And, beyond VOIP, the incumbent cable and telephone providers launched broadband Internet access services over their existing networks.

Broadband connectivity services such as digital subscriber line (DSL) and cable modem service combine the pure transmission capabilities of the carrier networks with the data processing attributes of the Internet. If those two attributes were separable, the transmission component could be classed as regulated telecommunications under Title II of the Communications Act. That would mean the interconnection and unbundling obligations of the 1996 Act would apply, forcing the incumbents to give independent Internet service providers access to their networks. In 1999, the FCC rejected calls to impose such an "open access" mandate on the cable modem services of @Home, which was then the market leader.[146] Following a change in leadership at the FCC, the Commission opened parallel proceedings to classify both DSL and cable modem services as inseparable information services, excluded from the Title II unbundling requirements.[147]

In *National Cable and Telecommunications Association v. Brand X Internet Services (Brand X)*, decided in 2005, the Supreme Court upheld the FCC's decision to classify cable modem services as information services.[148] The Court deferred to the Commission's action on administrative law grounds.[149] *Brand X* ended the legal battle over the FCC's decision, but it did not conclude the issue. By classifying cable modem and DSL services as information services, the

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[144] *See* Stevens Report, *supra* note 109.

[145] *See* Vonage Fact Sheet, *at* http://www.vonage.com/corporate/factsheet/images/FactSheet.pdf.

[146] *See* Mark Lemley & Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era*, 48 UCLA L. REV. 925 (2001) (addressing the question of "open access" and its relationship to the architecture of the internet).

[147] *See* Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, Notice of Proposed Rulemaking, 17 F.C.C.R. 3019 (2002) (concerning DSL service); Inquiry Concerning High-Speed Access to the Internet over Cable and Other Facilities, Declaratory Ruling and Notice of Proposed Rulemaking, 17 F.C.C.R. 4798 (2002) (concerning cable modem service) [hereinafter Cable Broadband Reclassification]. The underlying telecommunications components such as loops and interoffice transport are still available unbundled from the phone companies, but these do not allow competitors to take advantage of the broadband infrastructure.

[148] *See* Nat'l Cable & Telecomm. Ass'n v. Brand X Internet Servs., 125 S. Ct. 2688 (2005).

[149] *Id.*

Commission excluded them from the specific unbundling requirements of Title II, but not the general grant of FCC authority under Title I of the Act.

The FCC asserted that its decision was not an abdication of its regulatory responsibilities, because it retained the power to fashion pro-competitive rules under Title I.[150] Commentators have questioned the legal basis for this assertion,[151] but the Supreme Court used it to support its decision in *Brand X*.[152] Exactly what Title I rules the FCC might adopt remains an open question. Title I requirements could conceivably include some interconnection obligations, although information services are not subject to the express interconnection mandates of Title II.[153]

While the broadband reclassification debate was making its way through the FCC and the courts, the Commission issued another decision removing traditional regulatory obligations from the incumbent telecommunications carriers. Specifically, it did away with line sharing, an arrangement that gave independent broadband providers access to just the data portion of the local loop at a reduced rate, and declared that new deployments of fiber optic connections directly to homes and neighborhoods would be exempt from unbundling.[154]

Thanks to these developments, it is now clearer what rules do *not* apply to converged broadband networks than which requirements do. The FCC today promotes "intermodal" competition between facilities-based broadband competitors as the primary means of preventing abuse of market power by network operators.[155] Thus, it retained the emphasis of access regulation on competition as the primary goal, but removed many of the access rules that typically attend such an effort. Because the cable and telephone companies providing broadband access remain regulated, and the option of new Title I rules for broadband information services remains in the air, the possibility exists that the FCC will impose new requirements of some sort. At this point, however, that possibility is unfulfilled. The project of adapting communications regulation to the Convergence Age is still just getting off the ground.

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[150] *See* Cable Broadband Reclassification, *supra* note 147.

[151] *See* James B. Speta, *FCC Authority To Regulate the Internet: Creating It and Limiting It,* 35 LOY. U. CHI. L.J. 15 (2003) (arguing for the development of a substantial regulatory regime for the internet).

[152] *See id.* at 2708 ("[T]he Commission remains free to impose special regulatory duties on facilities-based ISPs under its Title I ancillary jurisdiction").

[153] The best precedent so far for such an extension is the FCC's imposition of conditions on instant messaging in the AOL/Time-Warner merger. *See* Philip J. Weiser, *Internet Governance, Standard Setting and Self-Regulation,* 28 N. KY. L. REV. 822 (2001) [hereinafter Weiser, Internet Governance]; Philip J. Weiser, *The Internet, Innovation, and Intellectual Property Policy*, 103 COLUM. L. REV. 534 (2003) [hereinafter Weiser, Innovation].

[154] *See supra* note 11.

[155] Michael K. Powell, *Digital Broadband Migration*, Part II, press conference (Oct. 23, 2001), *available at* http://www.fcc.gov/Speeches/Powell/2001/spmkp109.html.

B. Network Neutrality and the Non-Discrimination Turn

Instead of confronting interconnection challenges, the communications policy debate is shifting back toward non-discrimination questions. The primary vehicle for this shift is the battle over network neutrality. Unfortunately, non-discrimination rules are a poor fit for the current environment of convergence and layered networks.

1. Network Neutrality: From Broadband Discrimination to Access Tiering

The most intense debate in telecommunications policy today concerns network neutrality: whether broadband access providers should be barred from discriminating against unaffiliated providers of Internet content and applications. The current proposals for network neutrality are non-discrimination rules.[156] They would prevent broadband operators from differentiating traffic on their networks, similar to the obligations placed on common carriers. Ironically, though, the major threat these rules seek to combat is a breakdown in interconnection. This disconnect between means and ends undermines most network neutrality proposals.

Yet it is not only proponents of network neutrality who are misguided. Both sides of the debate are wrong. By fighting over whether the Internet of the future will foster discrimination, they distract attention from the more pressing issue of whether it will continue to foster interconnection. In so doing, they ignore a better approach to the questions that network neutrality raises. They also raise the likelihood of a fragmented Internet that harms both users and service providers.

When network neutrality was first promoted, around 2002, it followed a classic non-discrimination script. The focus, at that time, was on restrictions that broadband access providers might impose on their users.[157] For example, they might block access to certain websites, or they might adopt unreasonable restrictions on how users employed their broadband connections.[158] Tim Wu, for example, conducted a survey of allegedly discriminatory actions by broadband access providers that included restrictions on streaming video,

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[156] *See* Wu, Broadband Discrimination, *supra* note 4; Lessig & Wu, *supra* note 4.

[157] *See id;* Declan McCullagh, *Tech Companies Ask for Unfiltered Net,* CNET NEWS.COM, Nov. 18, 2002, *available at* http://news.com.com/2100-1023-966307.html.

[158] *See* Wu, Broadband Discrimination, *supra* note 4; Lessig & Wu, *supra* note 4. Although this shift in the network neutrality debate isn't widely acknowledged, some other scholars recognize it. *See, e,g.,* Barbara van Schewick, *Toward an Economic Framework for Network Neutrality Regulation*, 5 J. TELECOMM. & HIGH TECH. L. __ (forthcoming 2007).

prohibitions on using virtual private networking software, and prohibitions on operating home servers.[159]

Then-FCC Chairman Michael Powell expressed sympathy for these concerns, but he rejected calls for enforceable prophylactic neutrality regulations.[160] Instead, Powell propounded what he called the "Four Freedoms": the unfettered ability of users to access content, use applications, attach personal devices, and obtain service plan information.[161] The FCC should use its authority, Powell, indicated, to address individual cases in which these freedoms were violated. Indeed, when a rural telephone company, Madison River Communications, apparently blocked network ports used by VOIP provider Vonage, the FCC stepped in and secured a fine and consent decree to stop it.[162] The FCC later, under the leadership of Kevin Martin, formally adopted a version of the Four Freedoms as a non-binding policy statement.[163]

Rather than allay network neutrality concerns, the FCC's action spurred greater outcry. By adopting the policy statement, the Commission gave credence to those who argued that broadband discrimination was a legitimate worry. Yet by refusing to adopt enforceable mandates, the Commission left those network neutrality advocates unsatisfied. The FCC's simultaneous decision to classify broadband access as an information service added fuel to the fire. There was a perception that the FCC had eliminated existing safeguards for broadband, or that the common carriage and interconnection/unbundling obligations for Title II carriers were equivalent to network neutrality mandates.

Concern about limitations broadband providers might place on their users were not, however, what stoked the network neutrality controversy after the FCC's actions. Rather, the current wave of network neutrality focuses on how broadband access providers relate to unaffiliated providers of content and applications. Specifically, it involves concerns that the broadband providers will implement capabilities in their network to block or degrade unaffiliated content, unless the providers of that content pay supplemental fees.

AT&T CEO Ed Whitacre gave ammunition to this position when he declared, somewhat inaccurately: "Now what [content and application providers] would like to do is use my pipes free, but I ain't going to let them do that because we

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[159] *See* Wu, Broadband Discrimination, *supra* note 4. In proposing a rule to address broadband discrimination, Wu does distinguish between permissible discrimination based on local network characteristics (such as limited bandwidth in the last mile) and impermissible discrimination based on external factors (such as the originating address of a packet). *See id.*

[160] Michael Powell, Preserving Internet Freedom: Guiding Principles for the Industry, Remarks at the Silicon Flatirons Symposium (Feb. 8, 2004), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-243556A1.pdf.

[161] *Id.*

[162] *See* Madison River Comms., LLC, 20 F.C.C.R. 4295 (2005).

[163] *See* Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, 20 F.C.C.R. 14986 (2005).

have spent this capital and we have to have a return on it."[164] Less colloquially, companies such as AT&T and Verizon say what they seek is "access tiering:" charging content and application providers additional fees for preferential access to their broadband access customers.[165]

Though each is posed as the threat that network neutrality addresses, broadband discrimination and access tiering are different issues. The former concerns how a broadband provider constrains its own network, through actions such as banning particular applications or customer practices.[166] The latter concerns how that provider constrains or assists providers on other networks, through actions such as tiered performance for connections to its backbone. Broadband discrimination is a textbook case of discriminatory conduct by a network operator. By contrast, access tiering is a different model for linking content providers and access providers across the Internet. Whether justified or not, it involves the business terms under which packets are routed from service providers such as eBay and Google across the Internet backbone cloud to and from their users. Access tiering is, in other words, an interconnection practice.

The FCC's "Four Freedoms" policy statement squarely targets broadband discrimination. The open questions are whether the FCC has sufficient legal authority to implement its principles, especially for networks not traditionally subject to Title II common carriage obligations, and whether the Commission will choose to act when situations arise. Most of the serious Congressional proposals would add enforcement heft to the policy statement. However, network neutrality advocates oppose those bills that couple solidification of the policy statement with the removal of FCC authority over access tiering.[167] Access

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[164] Roger O. Crockett, *At SBC, It's All About "Scale and Scope,"* BUSINESSWEEK ONLINE (Nov. 7, 2006), *available at* http://www.businessweek.com/@@n34h*IUQu7KtOwgA/magazine/content/05_45/b3958092.htm; Arshad Mohammed, *SBC Head Ignites Access Debate*, WASH. POST, Nov. 4, 2005, at D1 (describing the firestorm in response to Whitacre's comments). At the time, Whitacre's company was called SBC. It adopted the AT&T name when it acquired AT&T in 2005.

[165] Although the policy debate around network neutrality has not yet reached the same intensity elsewhere, similar tiering efforts are underway outside the US. *See* Alexander Panetta, *Videotron Lobbying for Internet "Transmission Tariff,"* CANADIAN PRESS, Nov. 1, 2006 (discussing a proposal to make content owners pay some of the costs of broadband networks used to carry video); Michael Geist, *Fear of a Two-Tier Internet*, TORONTO STAR, Nov. 6, 2006 (describing the Videotron example as well as a case in South Korea involving Internet video).

[166] A broadband access provider that blocked a network-based application such as the Vonage voice over IP service would only be deciding what packets flowed across its own network. Such an act would be a violation of non-discrimination rather than interconnection policies. Even though the ISP would be treating its own customers equally, it would be treating some application providers (functioning as users on the end of the connection) differently than others.

[167] *See* Anne Broache & Declan McCullagh, *Senate Deals Blow to Network Neutrality*, NEWS.COM, June 28, 2006, *available at* http://news.com.com/Senate+deals+blow+to+Net+neutrality/2100-1028_3-6089197.html.

tiering has thus quietly replaced broadband discrimination as the focus of the network neutrality debate.

Fears about access tiering are warranted, although the reasons have not been effectively articulated. Access tiering plans may represent a direct challenge to the Internet's traditional interconnection model. The network operators are suggesting that they can charge higher fees for interconnection for the privilege of enhanced delivery of packets to their subscribers, and potentially deny or degrade delivery for other interconnected traffic. Existing backbone transit agreements incorporate differential pricing for greater capacity or otherwise enhanced delivery, but those arrangements are for connectivity to the whole Internet, rather than the end-user broadband customers affiliated with the backbone provider.

Today's Internet already countenances discrimination, in the sense that only larger backbones are entitled to peering, and only those who pay for private exchange points and CDNs receive the benefit of enhanced delivery they offer. It is also a two-sided market, in that network operators may receive revenue both from end-user customers and from content and application providers on the "server side" of the network.[168] Neither is a challenge to the "neutral" character of the Internet, because, from the end-user perspective, there is still one universal network. Providers of content and applications that desire enhanced delivery have several options: they can buy a bigger pipe or a stricter service level agreement (SLA) from their backbone operator; they can go to a private exchange point or CDN that overlays intelligence on the Internet infrastructure; or they can self-provision distributed capacity, as companies such as Google and Microsoft do today.[169]

If access tiering is widely practiced, such providers will have more limited options. If the backbone operator connected to a last-mile network conditions enhanced delivery on the purchase of quality of service (QOS) capabilities that it hard-wires into its network, that operator becomes the sole arbiter of how the content or application provider can reach some of its customers. Connectivity across the Internet becomes less of an opportunity to take advantage of pervasive interconnection than a set of isolated, private negotiations with broadband carriers.

Such an environment would threaten the delicate balance of the existing peering and transit regime, and could undermine the dynamic of network effects through which a parade of unexpected Internet-based innovations – Amazon.com, Hotmail, eBay, Google, MySpace, YouTube, and more – have emerged.[170] Today, such businesses can select among the various options for

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[168] *See generally,* Jean Charles Rochet & Jean Tirole, Two Sided Markets: An Overview (Institut d'Economie Industrielle, Working Paper, 2004), *available at* http://www.frbatlanta.org/filelegacydocs/ep_rochetover.pdf .

[169] *See supra* text at note 94.

[170] *Cf.* William B. Norton, Video Internet: The Next Wave of Massive Disruption to the U.S. Peering Ecosystem (v.0.91), *at* http://www.pbs.org/cringely/pulpit/media/InternetVideo0.91.pdf (describing how video

network-wide connectivity as they grow, and the facilities-based and distributed service providers who facilitate that connectivity compete and cooperate to do so. In an access-tiered world, the last-mile broadband operator defines the economic and technical arrangements for reaching its users. Such operators are unlikely to optimize for the unexpected and uncertain benefits of new market entrants.

The present indeterminacy of end-to-end Internet connectivity actually provides valuable incentives.[171] Because no network can control the full experience it provides to its customers, networks that seek to offer enhanced delivery are willing to overprovision capacity or pay for overlays such as CDNs and private peering. In those cases where the service involved (such as secure transmission of financial information or point-to-point videoconferencing) requires a particular guarantee between endpoints, the network serving the end-user or service provider can either expand its own infrastructure or negotiate SLAs with other networks to achieve the desired result. Such private and tiered arrangements supplement, rather than replace, the default model of open interconnection. Under access tiering, the initiative for enhanced connectivity to a particular endpoint comes from the last-mile broadband network operator and its affiliated backbone carrier, not the service provider or user defining the application or content.

2. *The Open Access Back-Story*

In essence, network neutrality is now a non-discrimination concept being promoted to address interconnection behavior. This disconnect is particularly interesting because today's network neutrality argument grew out of an interconnection-focused antecedent: broadband open access.[172] The open access debate, between approximately 1998 and 2002, concerned whether cable modem services should be required to allow unaffiliated ISPs access to their broadband platforms.[173] The open access controversy did not generate the level of public debate as the current network neutrality battle, because there was relatively limited broadband adoption at the time. However, it covered much of the same ground as the current fight.

Opponents of broadband open access successfully painted the proposed requirements as protecting particular competitors – the independent ISPs – rather than competition and innovation *per se*. And they convinced the FCC that physical interconnection with broadband access networks would be burdensome

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distribution across the Internet will undermine the current backbone interconnection equilibrium).

[171] The architects of the Internet considered and rejected adoption of "source routing," in which the originator of a transmission can specify its exact path through the network. Instead, routing decisions are fully distributed to the intermediate devices along the path.

[172] Spulber & Yoo, *supra* note 16, at 8 (describing "platform access" as a species of access, meaning that the facilities conform to a standard allowing others to provide complementary access).

[173] *See* Stevens Report, *supra* note 146.

to implement. The Commission declined to impose general open access mandates, although it did adopt limited requirements for Time Warner Cable in connection with the AOL/Time-Warner merger.[174]

Current proponents of network neutrality, such as Tim Wu, reject the broadband open access approach.[175] Wu gives two primary reasons to prefer non-discrimination rules (network neutrality) over interconnection-oriented solutions (open access). First, open access is itself discriminatory. Since non-discrimination is the deeper goal of telecom policy, regulators should choose the least discriminatory mechanism.[176] Second, open access sought to promote competition among broadband access providers, but such competition is only a means to the ultimate aim of non-discrimination.[177] So, according to Wu, policy-makers should target non-discrimination directly through rules barring discriminatory conduct.[178]

A third justification for the shift from open access to network neutrality was instrumental. The FCC rejected calls for broadband open access requirements. It did so in part because of concerns that interconnection regulation would be too intrusive, and would dampen incentives for broadband deployment. Network neutrality, as a policy toward *how* broadband providers use their network rather than one guiding *what* networks they built, seems on its face a more palatable approach.

The shift toward network neutrality has had salutary effects. It has started a debate, both at the FCC and in Congress, as well as in other countries, about the impact of actions such as access tiering on the future broadband ecosystem. It has also catalyzed valuable scholarship on the relationship of network infrastructure to higher-level innovation.[179] Yet the abandonment of open access, and of interconnection-based approaches more generally, has significant downsides.

There are two main reasons to question the value of casting broadband policy primarily in non-discrimination terms. First, any discrimination rule will involve behavioral determinations. There is benign discrimination and harmful discrimination. Distinguishing the two in the current technological and market

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[174] *See* Patrick Ross & Evan Hansen, AOL, *Time Warner Complete Merger with FCC Blessing*, CNET NEWS.COM (2001), http://news.com.com/2100-1023-250781.html.

[175] *See* Wu, Broadband Discrimination, *supra* note 4. Wu goes farther, arguing that anti-discrimination has always been the core element of telecommunications policy. *See* Wu, Anti-Discrimination Norms, *supra* note 27. Other network neutrality proponents are not so categorical. *See* Lawrence Lessig, *Reply: Re-Marking the Progress in Frischmann,* 89 MINN. L. REV. 1031 (2005) (posing the challenge of what solutions are best for the problem).

[176] *See* Wu, Broadband Discrimination, *supra* note 4.

[177] *See id.*

[178] *See id.*

[179] *See* Yoo, *supra* note 4; Brett M. Frischmann, *An Economic Theory of Infrastructure and Commons Management*, 89 MINN. L. REV. 917 (2005); Van Schewick, *supra* note 158.

environment is nearly impossible, because from a technical perspective, they look identical.

Second, the current network neutrality debate fails to appreciate the engineering tradeoffs that will determine the shape of the next-generation converged broadband Internet. The expected all-or-nothing choice between universal and fine-grained quality of service management on the one hand, and unfettered best-efforts delivery on the other, misrepresents technical realities. The actual future will be messier and more heterogeneous, making it even harder to evaluate actions against a discrimination-oriented backdrop. For example, most video services require tremendous bandwidth but can tolerate some latency (delay), because they are not live, while voice is demands reliable real-time delivery, and wireless connections need robustness to interruptions and the ability to support hand-offs across geographically fixed infrastructure. When all these services are delivered through the same handheld device, which is capable of using several distinct network access technologies, seeing the Internet as a featureless mass is unhelpful.

It should be emphasized that questioning the non-discrimination turn of the debate does not challenge the fundamental point that network neutrality advocates make: namely, that broadband access providers may use their bottleneck control to disadvantage unaffiliated applications and content, with negative consequences for usage and innovation. The core network neutrality thesis is that an industry model in which innovators can introduce new services without reliance on network operators is superior to the alternative that those operators are now promoting.[180] That claim does not rest on a non-discrimination worldview. In fact, the arguments for this innovation thesis were originally introduced as reasons for interconnection-oriented open access requirements.[181]

3. Good and Bad Discrimination

In a competitive market, it is eminently natural, even desirable, for firms to maximize competitive advantage. Exercising leverage over partners, customers, and suppliers is, in and of itself, an unexceptional example of such behavior. Discrimination, in the general sense of treating some customers differently than others, is also not normally a troubling practice. To take but one example, an airline may charge every passenger on a flight a different price, even though the seats are largely identical and the flight arrives at the same time for everyone.[182] Closer to home, telephone companies charge business customers higher rates for the exact same local calling service they sell to residential users. Regulators for many years actually encouraged such discrimination as a cross-subsidy mechanism. And on the Internet, companies such as Google and Yahoo! sell top

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[180] *See* Lessig, *supra* note 25.

[181] *See* Lemley & Lessig, *supra* note 146; Francois Bar et al., *Access and Innovation Policy for the Third-Generation Internet*, 24 TELECOMMS. POL'Y 489 (2000).

[182] Such "yield management," an extreme form of discrimination, optimizes the airline's revenues from relatively fungible but time-limited asset.

listings in their paid search results and ads on their pages to the highest bidder, "discriminating" against everyone else.

Discrimination is, in fact, not ordinarily something regulators worry about today.[183] Government intervenes, as the antitrust mantra intones, to protect competition, rather than competitors. Certain forms of conduct, such as deceptive trade practices or predatory pricing, may be considered "beyond the pale" and legally precluded. However, the mere act of preferring your partners over your competitors generally does not fit that bill.

To support their non-discrimination argument, network neutrality advocates make two moves. First, they claim that network infrastructure providers are a special class of companies, which should be subject to higher standards.[184] There are several potential bases for this distinction: government use of eminent domain power and rate-of-return regulation to grant incumbent operators special economic privileges; the sense that communications access networks are natural monopolies, where unregulated competition is infeasible; the absence of actual competition for broadband access, even if theoretically possible; and claim that the broadband Internet is an "infrastructure" technology that serves as a foundation for a wide range of innovation. It is not my goal to critique these arguments. However, it bears noting that all of them are amenable to challenge on factual grounds. There are no bright lines distinguishing companies deserving special non-discrimination obligations and those that do not.

The second element of the mainstream network neutrality argument is a claim that a non-discrimination rule can effectively address the innovation-killing behavior of network operators.[185] Yet that assumes government can craft and enforce a rule that distinguishes benign from anti-competitive discrimination. And that is more difficult that it might seem. This is why virtually every article or bill advocating network neutrality uses a slightly different definition.[186] Network neutrality advocates use as examples clear cases of anti-competitive animus, such as blocking ports of rival VOIP providers or slowing down the responsiveness of a search engine that refuses to pay a toll.[187] However, major broadband operators are unlikely to engage in anything so blatant.

Given the technical characteristics of the Internet, a broadband operator that degraded traffic from an unaffiliated application or content provider could easily

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[183] This section focuses on economic discrimination. Invidious discrimination on the basis of categories such as race, gender, age, or sexual orientation may be Constitutionally proscribed.

[184] *See* Wu, Broadband Discrimination, *supra* note 4.

[185] *See id.*

[186] *Compare* Wu, Broadband Discrimination, *supra* note 4 (distinguishing acceptable on-network discrimination from unacceptable cross-network discrimination) *with* Network Neutrality Act of 2006, H.R. ___ (prohibiting broadband providers from "discriminate in favor of itself in the allocation, use, or quality of broadband services....).

[187] Also, these examples primarily involve broadband discrimination, rather than the access tiering that is the current focus of network neutrality advocacy. *See supra*

claim its actions were benign. It would label the degradation as either an accidental outcome of neutral network engineering decisions, or a legitimate effort to maintain acceptable network performance for its users. Such a claim could be well-grounded technically. Every router decides to drop some packets some of the time. That is the nature of packet switching.[188] Routers use algorithms to determine which packets to drop when, whether as part of a network-wide traffic shaping effort or as a purely local response to transitory conditions.[189]

Regulators will have a difficult time determining if such algorithms are motivated by legitimate network management concerns or anti-competitive impulses.[190] For example, some Internet service providers now block network Port 25, used for email relaying, as a means of cutting down on unsolicited commercial email (spam). Network neutrality proponents have raised concerns that such blocking may be designed to harm competing providers.[191] There are technical arguments why blocking Port 25 is a poor response to spam, but for regulators to evaluate such claims effectively forced them to second-guess network operators' engineering decisions. That is something they are ill-equipped to do.

There are many legitimate reasons for network operators to discriminate against classes of traffic. It may be "malware" such as spam, phishing traffic, worms, viruses, or part of a denial of service attack. It may involve a distant server, requiring transit payments, instead of coming from a local Akamai cache. Or it may simply tax their network in ways they aren't prepared to handle. Studies suggest that a third of all traffic on the Internet is peer-to-peer video file-sharing, a category of application involving massive quantities of bandwidth and non-traditional traffic patterns.[192] Many ISPs, while not specifically looking to disadvantage such applications, are implementing traffic management approaches to reduce the load they place on their networks.[193]

Broadband access providers could well engage in anti-competitive discriminatory practices masquerading as neutral traffic engineering. And those practices may have a chilling effect on welfare-enhancing innovation on the Internet. The problem is that the Commission will be hard-pressed to assess

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[188] Edward Felten, Nuts and Bolts of Network Neutrality, *at* http://itpolicy.princeton.edu/pub/neutrality.pdf.

[189] *See id.*

[190] *See id.*

[191] *See* Wu, Broadband Discrimination, *supra* note 4.

[192] See Andrew Packer, The True Picture of Peer-to-Peer Filesharing, http://www.cachelogic.com/press/CacheLogic_Press_and_Analyst_Presentation_July2004.pdf, at 12; Kevin Werbach, The Implications of Video P2P on Network Usage, *in* VIDEO PEER TO PEER (Colum. Inst. Tele-Info, forthcoming 2007).

[193] *See* Bad ISPs, http://www.azureuswiki.com/index.php/Bad_ISPs (listing more than 40 service providers worldwide who limit BitTorrent in some way).

whether that is taking place.[194] Madison River's blocking of VOIP ports, precluding its customers from using a service that directly competed against its core telephone business, was a much simpler case. Significantly, Madison River's behavior was tantamount to an interconnection restriction, preventing Vonage from linking with its network.

Another dispute involving Vonage further illustrates the slippery nature of non-discrimination obligations. Shaw, a major cable operator in Canada, has deployed technology on its network that it claims enhances the performance of VOIP. It uses this technology for its own VOIP offering. However, it also demands that unaffiliated VOIP providers, such as Vonage, pay a $10/month fee to take advantage of the enhanced capabilities.[195] Shaw's argument that it is helping VOIP providers by offering a QOS-enhanced service seems odd when one of those very providers is attacking it. Rather, Shaw's imposition of a $10 fee for independent VOIP providers to receive QOS capabilities that Shaw's own VOIP service receives for free looks like a classic price squeeze.[196]

Assume for the moment that Shaw's actions are definitely anti-competitive and produce an inefficient result as a matter of social welfare. Would a network neutrality regime prevent this harm?[197] Shaw's position is that it is engaged in neutral traffic management (to deal with congestion caused by real-time applications such as VOIP), and that it is offering a beneficial enhancement on top of its platform. Under a network neutrality regime, a regulatory agency would have to decide that Shaw was, in effect, not honestly describing its motivations. It would have to substitute its engineering judgment for that of the operator, and conclude that the QOS service was an anti-competitive action rather than an innovation.

Any blanket non-discrimination rule is likely to quickly run into situations where a straightforward application produces unacceptable results. A feasible neutrality regime would have to operate as a vague "thumb on the scale", essentially suggesting that, while some engineering decisions that incorporate

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[194] For this reason, some network neutrality advocates have shifted to a hortatory argument, hoping to make discriminatory practices too embarrassing or risky for carriers even if not expressly prohibited. *See, e.g.*, Doc Searls, Just as it Was in the First Place, (Nov. 11, 2006), *at* http://doc.weblogs.com/2006/11/11#justAsItWasInTheFirstPlace.

[195] *See Shaw, Vonage Engage in War of Words Over Internet Phone Service,* CBC NEWS, March 8, 2006.

[196] Chicago School antitrust analysis might take issue with such a characterization, on the grounds that any customers Shaw took from Vonage would cost it the $10 in additional revenue, plus any additional value the Vonage application brought to the platform. However, the potential for the Vonage VOIP service to be a substitute, rather than merely a complement, for Shaw's own offerings, is a recognized exception to this analysis. *See* Joseph Farrell & Phil Weiser, *Modularity, Vertical Integration, and Open Access Policies: Towards a Convergence of Antitrust and Regulation in the Internet Age*, 17 HARV. J.L. & TECH. (2003) (assessing whether regulation should mandate open access to information platforms).

[197] Because the situation arises in Canada, it has not been tested under the U.S. legal framework described herein.

application-aware elements into the network are legitimate, the presumption is that such decisions are ultimately harmful to innovation, and should be blocked. Such an approach would require a difficult case-by-case assessment, where public choice considerations suggest that many external factors will influence decisions. At a minimum, a non-discrimination rule is unlikely to provide the certainty and predictability that investors crave.

4. The QOS Mirage

A second flaw in the non-discrimination turn of the debate is that it wrongly presumes a particular technical trajectory for broadband networks. Any network architecture makes engineering tradeoffs, which influence the feasibility and economic viability of different classes of applications. The decentralized packet-switched architecture of the Internet was developed with relatively latency-tolerant applications such as file transfer and email in mind.[198] There were good reasons for this tradeoff. The existing PSTN did an excellent job of handling reliable, low-latency voice telephone traffic. The Internet's designers saw no need to reinvent that wheel. Moreover, file transfer was a primary activity that the researchers who built the Internet engaged in themselves.[199]

Engineering tradeoffs are not absolute. The Internet architecture made real-time communications more difficult to implement, but not impossible. As Internet performance increased, and commercial demand developed, engineers worked out mechanisms to build real-time communications such as VOIP and video streaming over the best-efforts Internet. Some of these efforts involved proposed changes to basic network standards, such as implementation of the RSVP protocol for bandwidth reservation. Others, such as the caching networks deployed by Akamai and others, were layered on top of the standards-based infrastructure.

The Internet's end-to-end design philosophy allows such adaptability. The end-to-end approach directs the network to focus solely on delivering packets.[200] Application-specific functionality can be added later, at the network's edges. Network architectures optimized for real-time services, such as asynchronous transfer mode (ATM) are less flexible, and have generally lost out to IP as a result.[201] Despite pronouncements that the Internet would never support real-time audio or video, such media types are now a significant component of the commercial Internet landscape. Most recently, YouTube, a site that hosts and distributes streaming video clips across the public Internet, was acquired for $1.65 billion by Google, demonstrating the significance of online video as a business opportunity.[202]

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[198] *See* Andrew Orlowski, *How 'Saving the Net' May Kill it*, THE REGISTER, July 17, 2006.

[199] *Id.*

[200] *See* Lemley & Lessig, *supra* note 146.

[201] ATM is widely deployed for certain functions within the network, but it never become the uber-protocol its designers anticipated.

[202] *See YouTube Serves Up 100 Million Videos a Day Online*, REUTERS, July 7, 2006.

YouTube's success points out a flaw in the arguments of both network neutrality proponents and opponents. Both sides of the debate accept the premise that new "quality of service" (QOS) mechanisms are necessary for the next generation of Internet-based services. Wu, for example, accepts that QOS may require close cooperation or vertical integration between a broadband access provider and Internet backbone, and argues for limits to prevent discriminatory behavior.[203] On the other side of the debate, Christopher Yoo argues that such discriminatory behavior may be necessary to make the QOS-based services economically viable, and that excessive discrimination will prompt competitive entry of other access/backbone hybrids.[204] If, in fact, the kinds of cross-network QOS that broadband network owners seek are unnecessary or unworkable, the fight over their adoption loses much of its salience.

In reality, the technological and business cases for QOS are more complex, and far from definite. QOS is a broad term covering a variety of technical approaches. Outside of the policy and business domains, network engineers have struggled for years to determine how to make QOS function effectively across the Internet. While QOS mechanisms are widespread on today's networks, and are essential to its smooth functioning, these are generally not the QOS techniques the network neutrality debate assumes.

Broadly speaking, there are two approaches to QOS.[205] One involves mandatory partitioning of the network to allocate more capacity, or even guaranteed end-to-end "virtual circuits" to a given class of users or applications. The other provides voluntary mechanisms for providers and users to opt into higher QOS arrangements. On a single network, mandatory QOS mechanisms can work effectively. Across networks, however, engineers have found QOS surprisingly difficult to achieve, due to a combination of technical and economic factors.[206] Policies are simply too difficult to synchronize with the necessary specificity to enforce end-to-end performance guarantees. And without a complex billing infrastructure that might cause more problems than it solves, providers have insufficient incentives to make QOS work for the benefit of someone else's customers.[207]

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[203] *See* Wu, Broadband Discrimination, *supra* note 4.

[204] *See* Yoo, *supra* note 4.

[205] The primary example of these two approaches was the effort to standardize INT-SERV (integrated services) as an Internet standard for QOS, and the later shift to DIFF-SERV (differentiated services) when that approach failed.

[206] *See* Stanislav Shalunov & Ben Teitelbaum, *Why Premium IP Service Has Not Deployed (and Probably Never Will)* (Internet2 QoS Working Group Informational Document, 2002), *available at* http://qos.internet2.edu/wg/documents-informational/20020503-premium-problems-non-architectural.html.

[207] The IMS vision, in which all traffic flows are tracked and categorized, might create a better economic infrastructure for interdomain QOS. However, it would do so at great cost to the Internet's open interconnection norms. *See infra* text at note 233.

The same story played out even more clearly in the Internet2 research project. Internet2 is a government-funded consortium of universities that seek to advance the state of the art for IP networking. Among its primary projects was the development of interoperable QOS mechanisms. However, after substantial effort, the Internet2 QOS working group declared the effort a failure.[208] Instead, Internet2 researchers are exploring voluntary mechanisms, such as allowing users to identify traffic with less-than-average delivery requirements, opening up more capacity for everything else.[209]

To understand why the broadband QOS model is unlikely to succeed, consider a Google-owned video service, such as YouTube. Verizon approaches Google and demands an incremental fee for enhanced delivery of YouTube-hosted videos to Verizon broadband customers. From Google's perspective, Verizon is just one of many broadband access providers. Verizon's customers are only a fraction of those Google wishes to reach with YouTube.

When other broadband access providers such as AT&T, Qwest, Comcast, Time Warner, and Cablevision approach Google with the same proposition, not to mention broadband access providers elsewhere, Google will be faced with a dilemma. To make these QOS systems work, it would effectively have to replicate its content onto caches on each network, which is likely to be a costly proposition. Moreover, the broadband operators' QOS initiatives are not the only enhanced delivery options available today on the Internet. Google itself is spending heavily to create a distributed, high-capacity network optimized for delivery of its own content and services, and linked together with its own private dark fiber.[210] Other major Internet companies are doing the same thing, even if not at quite Google's scale.[211] And CDNs such as Akamai have built out their own virtual networks of caches to provide enhanced delivery across many networks and access providers.

Network neutrality opponents point to these webs of overlapping QOS mechanisms as evidence that the Internet is already non-neutral, without damaging innovation.[212] While that is true at some level, the point is trivial. Network neutrality advocates are promoting the good (sufficient neutrality to allow for innovation and competition on the network) rather than the perfect

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[208] *See* Shalunov & Teitelbaum, *supra* note 206; Gary Bachula, Testimony before the United States Senate Committee on Commerce, Science and Transportation (Feb. 7, 2006) ("For a number of years, we seriously explored various 'quality of service' schemes.... [A]ll of our research and practical experience supported the conclusion that it was far more cost effective to simply provide more bandwidth.")

[209] *See id.*

[210] *See* George Gilder, *The Information Factories*, WIRED, Oct. 2006; Saul Hansell & John Markoff, *Hiding in Plain Sight, Google Seeks an Expansion of Power*, N.Y. TIMES, June 14, 2006.

[211] *See id.*

[212] *See* Craig McTaggart, Was The Internet Ever Neutral?, presented at the 34th Research Conference on Communication, Information and Internet Policy (2006), *available at* http://web.si.umich.edu/tprc/papers/2006/593/mctaggart-tprc06rev.pdf.

(identical treatment of every packet, always).[213] What concerns them is that broadband access providers can use their market power in the access market to distort opportunities for investment and competition through their non-neutral practices. The traditional Internet "best efforts" model may not be strictly neutral, but it avoids such mandatory linkages.

In fact, the more accurate picture of how QOS works and doesn't work on the Internet poses more of a challenge for the broadband access providers fighting network neutrality requirements. They argue that non-discrimination rules are harmful because QOS mechanisms that tie end-user broadband access to backbones are essential for next-generation Internet investment and innovation. Yet in reality, any such arrangement can only succeed with a proper alignment of interests. Akamai and other CDNs are effective because they align the interests of content providers (who want to deliver a better experience to their customers, and who want to avoid the expense of replicating content themselves), network operators (who value the reduced bandwidth requirements when content is served from a cache rather than delivered across the network), advertisers (who appreciate the presence of intermediaries between the large number of content providers and users), and users (who value faster and more reliable content delivery).

In the case of broadband QOS, it is not clear that content providers will see a benefit from the service the broadband operators hope to offer. In fact, some content providers may seek to reverse the money flow. The cable television channel ESPN, for example, offers ESPN 360, a package of proprietary video content for its website to broadband access providers, for a fee.[214] If the broadband providers pay, their customers see the content on the ESPN site; if not, they don't. ESPN and its content are the valuable asset for users; that is why ESPN is able to charge cable operators huge monthly fees simply for carrying the channel on their cable systems. Users forced to choose between no ESPN online content and switching broadband providers might well take the latter route. One could certainly make that assumption about Google, if it were to use a similar approach. The assumption that network operators will be able to extract supplemental revenue from content or application providers is thus a questionable basis for policy arguments.

The business realities of QOS belie the hyperbolic claims of both sides of the network neutrality debate. The Internet is always evolving, both in terms of technical protocols and the business relationships among the providers that own its infrastructure. That evolution will not stop if some providers push QOS arrangements beyond what their customers will bear, nor will it stop if government adopts rules limiting the scope of QOS mechanisms the providers can impose. Even if the interdomain QOS dream of the broadband access providers is ultimately realized, the process is certain to be drawn own, with

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[213] *See* Wu, Anti-Discrimination Norms, *supra* note 27.

[214] *See* George Ou, *Is ESPN Committing Reverse Net Neutrality?*, ZDNET, June 21, 2006, http://blogs.zdnet.com/Ou/?p=251; Bob Wolfley, *ESPN's Decision to Bump Badgers*, MILWAUKEE J.-SENTINEL, Oct. 5, 2006.

different players taking different approaches. Regulators will need clearer tools than non-discrimination to evaluate market developments.

C. Other Threats to Interconnection

The current emphasis on non-discrimination has broader consequences than distortion of the network neutrality debate. Interconnection is under siege in several areas. Yet, because of the prominence of the network neutrality fight, policy-makers are both distracted and unwilling to wade into interconnection disputes that seem difficult to resolve. This is a dangerous mistake. The collapse of robust interconnection, not the introduction of differentiated QOS, is the greatest threat to the Internet's ongoing vitality.

1. Peering Disputes

Among Internet backbone operators, a relatively stable structure of peering and transit relationships has persisted for most of the period since the NSF turned over the backbone to private control.[215] With changes in Internet usage patterns and business interests, however, there are reasons to worry that such stability will no longer hold.

The earlier-referenced dispute between Level 3 and Cogent is indicative.[216] Level 3 is one of the largest US and international Internet backbones, providing wholesale capacity over its massive fiber optic network to carriers, Internet service providers, and corporations. Cogent is a smaller but still substantial wholesale provider, whose primary business is providing high-speed "Ethernet" data connections to businesses and carriers. The two companies had an established peering contract, but it was terminable with 60 days notice. Level 3 precipitated the dispute in 2005. It argued that Cogent should no longer be entitled to peer with it, because Cogent sent significantly more traffic to Level 3 than the reverse.[217]

From Level 3's perspective, the peering relationship was unbalanced, with Cogent receiving most of the benefits. Level 3 invoked the contract's termination clause, and asked Cogent to switch to a paid termination agreement. Cogent refused, arguing that it was a "Tier 1" provider of similar status to Level 3. After some public back-and-forth, Level 3 "depeered" Cogent, severing the direct connection between the networks. While Level 3 was within its contractual rights, this was a draconian step, making it difficult for customers on

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[215] *See* Kende, *supra* note 76.

[216] *See supra* note 96.

[217] *See* Level 3 Issues Statement Concerning Internet Peering and Cogent Communications, PR NEWSWIRE, Oct. 7, 2005, *available at http://www.prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/10-07-2005/0004164041*.

one backbone to reach sites on the other.[218] After a few days, Level 3 agreed to re-establish the link, and the parties ultimately reached a confidential agreement.[219]

In all likelihood, the Level 3/Cogent dispute is not unique. Most backbones do not publish their peering terms, and negotiations usually take place under confidentiality agreements. Every backbone is different, and there are sure to be contentious issues in many peering negotiations. The Level 3/Cogent situation was distinguished by the fact that it became public, and that it resulted in the temporary severance of connections between the two networks. Depeering is an extreme step, because it means customers may, for reasons they cannot identify, simply be unable to reach certain sites on the Internet.

As the Internet evolves, however, it is unlikely this will be the last such experience. The Level 3/Cogent dispute revolved around traffic asymmetries, which affected the costs and benefits each network expected from the peering arrangement.[220] The directionality of Internet traffic, although complex, is something network engineers understand. It derives from the dominant uses of the network: for the past decade, symmetric high-latency email traffic, and asymmetric lower-latency client-server connections to websites. Newer applications such as peer-to-peer file sharing could change those traffic patterns, because they involve different distributions of outbound and inbound traffic.[221] Whether the peering regime can accommodate such changes remains to be seen.

One reason to be skeptical the voluntary peering regime will endure is the consolidation of the backbone market. Following a series of mergers, a relatively small number of operators dominate backbone capacity, and three of them – AT&T, Verizon, and Qwest – are also the major incumbent telephone companies in the US.[222] There is a perception that backbone providers originating in the data networking world are more likely to observe the Internet cultural norms that promote voluntary peering. In contrast, the dominant paradigm of the telephone world is regimented, billed settlements for all traffic. The current balance of peering and transit arrangements for the Internet backbone is not written in stone; it is a particular stage of evolution in an industry marked by constant change. If transit-type arrangements replace peering for a significant percentage of major backbone interconnects, however, the basic economics of Internet transport could shift in unpredictable ways.

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[218] The exact impact was difficult to gauge, since most users can reach virtually any point on the Internet through more than one backbone. More pervasive peering disputes, or disputes among the very largest backbones, would have more significant consequences.

[219] *See* Stacy Cowley, *Level 3, Cogent Call Time Out on Peering Spat*, IDG NEWS SERVICE, Oct. 10, 2005.

[220] *See* Level 3 Press Release, *supra* note 217.

[221] *See supra* note 192.

[222] *See* Om Malik, Backbone Consolidation Continues - Level 3 buys Broadwing, GigaOm.com, (2006), http://gigaom.com/2006/10/17/level3-broadwing/.

2. *The IP Interconnect Challenge*

In the peering context, the parties involved at least agree on the market and regulatory context for their contractual arrangements. Even that cannot be said for a new wave of interconnection disputes. Convergence is bringing together two forms of interconnection with very different traditional models: telephony and the Internet. Data-centric operators such as Level 3 and Global Crossing increasingly mix the two together. A growing percentage of voice traffic is being routed across the network as IP packets, even if converted back at the edge for delivery to ordinary telephones.

Data-centric carriers are seeking interconnection terms and pricing with incumbent telephone companies that more closely resemble the Internet than the telephone network. For example, they are seeking to deliver traffic in native Ethernet format at central hubs, rather than connecting traditional voice lines at every central office, as they do for telephone traffic. Some telephone companies are refusing. Qwest and Level 3 are in arbitration before several state commissions over Qwest's insistence that Level 3 interconnect using the traditional phone network model.[223]

The next frontier for interconnection disputes is likely to be in the area of VOIP peering.[224] Today, there is no general standard for VOIP networks to interconnect with one another. A user of the Skype VOIP software can reach a user of the Vonage VOIP service only by routing their connections through the legacy telephone infrastructure. In other words, recipient's address must be translated into an ordinary telephone number, the call must be converted back into the time-division multiplexed format of the telephone system, and the traffic must be handed off to a conventional telephone company, only to have the entire conversion happen again on the terminating end.

This process adds cost and complexity. The VOIP providers must pay the phone companies involved the access or reciprocal compensation charges applicable to traditional telephone traffic, rather than peering directly through Internet backbones.[225] The absence of VOIP peering also prevents the use of new features. If Skype and Vonage could peer directly, they could exchange data such as presence status, allowing the caller to see in real-time whether the recipient is online. Moreover, VOIP users wishing to call ordinary telephone users must dial traditional phone numbers, rather than take advantage of the flexibility of the Internet to bring together different communications channels and identity-based services.

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[223] *See* Level 3 Communications, LLC's Petition for Arbitration Pursuant to Section 252(b) of the Communications Act Of 1934, Arizona Corporation Commission Docket No. T-01051B-05-0350, Level 3's Post-Hearing Brief, *available at* http://gordoncook.net/FinalAZBrief.pdf.

[224] *See* Carol Wilson, *VoIP Peering's Business Model Shifts*, TELEPHONY, Sept. 25, 2006, at 6; James Kobielus, *New Federation Frontiers in IP Network Services*, BUS. COMMS. REV, Aug. 1, 2006, at 37; David Passmore, *Connecting Islands of VOIP*, BUS. COMMS. REV., Sept. 1, 2003, at 14.

[225] *See id.*

To overcome these limitations, VOIP carriers are looking to implement VOIP peering.[226] Such arrangements would allow VOIP services to interconnect and exchange traffic with addressing, services, and reliability mechanisms intact. Cable operators, who are aggressively deploying VOIP services on their broadband networks, are establishing private VOIP peering arrangement among themselves, in order to avoid paying access charges to telephone companies. Other VOIP peering schemes are open to anyone. Several companies are seeking to be intermediaries to facilitate such arrangements, the way public and private exchange points function in the Internet backbone.[227]

So far, efforts to facilitate VOIP peering have taken place outside the purview of regulation. However, the case for excluding VOIP interconnection from the rules governing telecommunications services is weaker than for ordinary Internet traffic. After all, the protocol may be different, but the end-user service is voice rather than data connectivity. Moreover, the current fragmentation of VOIP peering efforts seem unlikely to produce a unified environment in which all VOIP users can benefit from seamless connectivity, as they do on the Internet and telephone network.

Voice peering hints at a broader set of questions about interconnection mandates at the application layer. On data networks, real-time voice is simply a class of application. Requiring VOIP services to interconnect is therefore not all that different from imposing such a requirement on instant messaging applications or search engines.[228] There is already some precedent in this area. In its review of the AOL/Time Warner merger, the FCC imposed conditions to force the merged company to open up its market-leading AIM and ICQ instant messaging services.[229] AOL dragged its feet in implementing the requirement, and changes in the market reduced the competitive significance of instant messaging applications. Because the requirements arose in a merger, they were never generally applicable to the industry, or to other Internet applications.

One lesson of the layered regulatory model is that regulators should be increasingly hesitant to impose obligations at higher levels of the protocol stack.[230] The application layer is likely to function more effectively under private arrangements than the logical and physical layers, and the content layer more still. Sunk costs are lower and markets are more fluid for applications than for physical networks. The AOL-Time Warner instant messaging case is a good illustration.[231] At the time of the merger, instant messaging seemed like a central leverage point for online activity; instead, search engines, especially

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[226] *See id.*

[227] *See* Wilson, *supra* note 224.

[228] Indeed, network neutrality opponents have questioned why network neutrality would only impose non-discrimination requirements on broadband network operators. *See* Speta, *supra* note 46 (proposing "common carrier" interconnection requirements for instant messaging).

[229] *See* Weiser, Internet Governance, *supra* note 153.

[230] *See* Layered Model, *supra* note 2.

[231] *See supra* note 153.

Google, have taken on that role. The FCC's mandates for AOL had little impact on the market. Proposals for an Internet interconnection right that fail to distinguish among network layers are thus likely to be overbroad.[232]

Nonetheless, it is possible for applications to become exclusive platforms with anti-competitive effects similar to those of exclusive physical broadband networks. Google's dominant search engine and MySpace's massive social networking site might be candidates for such scrutiny at point in the future. Because these are network-centric applications, whatever ability they have to distort competition and innovation arises from their ability to capture network effects. If a policy concern does arise, the most effective remedy is likely to be one built around interconnection.

3. IMS and rationed interconnect

The final threat to interconnection has received less attention in policy circles, perhaps because it is still largely in the technical planning stages. Throughout the world, telecommunications carriers are making plans to deploy a technology called Integrated Multimedia Subsystem (IMS).[233] To the carriers, IMS is the holy grail of convergence: an architecture for bringing together voice, video and data, wireline and wireless, onto a unified platform. IMS goes hand-in-hand with the deployment of broadband "next-generation networks" (NGNs), in which incumbents adopt Internet protocol technologies as the core for their entire infrastructure.[234] The best-articulated example in a major market is British Telecom's 21CN, which is now in the process of deployment.[235] Throughout the world, incumbent carriers are making massive investments to move toward next-generation networks.[236]

IMS is not a single product or network design; it is an evolving collection of standards, implemented independently by a large number of equipment vendors and operators. Many details about the timing and implementation are still uncertain, and carriers may be wrong in their IMS adoption estimates. Given the public commitments of most major carriers worldwide to move to an IMS approach, though, ignoring the potential implications of IMS would be unwise.

The IMS architecture is designed to differentiate and segregate all traffic that passes through the network. At interconnection points, IMS-enabled networks

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[232] *See* Speta, *supra* note 46 (stating that his proposed interconnection rule would apply to instant messaging, suggesting that it would cover other Internet applications as well).

[233] *See* John G. Waclawsy, *IMS 101: What You Need to Know Now*, BUS. COMMS. REV., June 2005, at 18; John G. Waclawsy, *IMS: A Critique of the Grand Plan*, BUS. COMMS. REV., Oct. 2005, at 54.

[234] *See id.*

[235] *See BT Transforms Phone Network*, BBC NEWS (June 9, 2004), http://news.bbc.co.uk/2/hi/technology/3791319.stm.

[236] *See No Signal*, TOTAL TELECOM. (Sept. 1, 2006) (pointing to data from Ovum-RHK that over 70% of teleccom carriers' equipment spending in 2005 was on NGN equipment).

can apply pre-established settlement rates for particular classes of traffic.[237] The loose arrangements that typify the competitive Internet backbone market, in which a great deal of traffic flows without charges under no-cost peering arrangements, are anathema to the traditional carrier mindset. For example, at a CEO summit in July 2006, hosted by the International Telecommunications Union, NTT CEO Norio Wada called for an interconnection framework "that will extend national NGNs into a secure and fully managed global IP network."[238] Such a "fully managed" network would be far different from today's Internet, in which each network controls traffic on its own facilities, but cannot extend that control to its interconnection partners without voluntary service-level agreements.

Widespread deployment of IMS will not preclude interconnection, but it will frame it in terms significantly different from today's Internet. Once the network architecture is established, it automatically biases business relationships in a particular direction. Thus, the IMS implementation process will likely parallel the development of broadband cable modem access networks, which were at the center of the original open access debate.[239] Today, when the standards are being developed and investment decisions being made, is the best time to consider how architectural choices may impact competitive relationships, and the policy implications of such changes.

Regardless of how the IMS story unfolds, these decisions are extremely relevant to any conversation about the future of the Internet. If policy-makers wish to preserve the kind of open, unsegmented interconnection that dominates today's Internet, they should pay more attention to the process of IMS implementation. Once next-generation network architectures are defined and infrastructure investments have been made, their policy ramifications may be difficult to change or event to observe. Carriers' business decisions about IMS-related technologies should be constrained by public policy objectives, rather than the reverse.

D. An Uncertain Future

With all forms of communications converging onto digital broadband platforms, and the FCC classifying those very platforms under the lesser regulatory obligations of information services,[240] the future of interconnection is ambiguous. Interconnection is essential, because users demand global connectivity and no one network can deliver it. The layered nature of converged networks means makes interconnection, if anything, more crucial than ever. It now involves not only the physical links between network platforms, but also the

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[237] *See id.*

[238] *See supra* note 236.

[239] *See* Kevin Werbach, *The Architecture of Internet 2.0*, RELEASE 1.0 (Feb. 1999), *available at* https://www.release1-0.com/release1/abstracts.php?Counter=7532233.

[240] *See supra* text at note 147.

higher-level connections among databases, applications, and content. Yet, in the current environment, network operators are free to condition interconnection in ways that hearken back to the monopoly days of pre-divestiture AT&T.

The convergence of the Internet and traditional telecommunications is producing the worst of both worlds. The private Internet peering model, which works in an environment of relatively even and flat competition, is being imported to an entirely different competitive ecosystem. Meanwhile, the interconnection obligations that once accompanied common carrier regulation have been thinned out. As converged, layered competition among multi-faceted and interconnected providers is becoming the norm, policy-makers have largely abandoned the very tool best suited to such an environment. Pushed by the network neutrality debate, regulators are focused on models that address exactly the wrong question. To combat this dangerous trend, interconnection-based approaches should assume primacy.

IV. THE INTERCONNECTION ALTERNATIVE

A. The Value of Routing Around

Interconnection rules can address the core concerns that network neutrality proponents raise, because they create opportunities to "route around" bottlenecks that incumbents establish.[241] One of the subtle benefits of the Internet's interconnection-centric architecture is that it offers multiple alternative paths, which can be selected in real-time. This gives the network a powerful resiliency, both to external attacks and to internal power grabs.[242] The Internet has proven surprisingly capable of scaling and continuing to function amid cable cuts, distributed denial of service attacks, worms, power outages, and both natural and man-made disasters.

Interconnection rules leverage this capacity for routing around. Non-discrimination regulates operator behavior directly, while interconnection controls it indirectly through competitive pressure. For example, imagine that Verizon designs its Internet backbone network to limit capacity and reliability for content providers who do not pay for "enhanced delivery" services. A non-discrimination rule might block such behavior, but only if competitors could

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[241] *See, e.g.*, David Gilo, *A Market-Based Approach to Telecom Interconnection*, 77 S. CAL. L. REV. (2003) (explaining how interconnection rules can address competitive bottlenecks by routing around them).

[242] Though it is fable that the Internet was designed primarily to allow military communications to survive in the event of a nuclear war, a desire for resiliency against infrastructure attacks did motivate the original research into packet switching by Paul Baran, and the funding of the Internet predecessor ARPANet by the Department of Defense.

demonstrate that Verizon's behavior was other than a normal example of network engineering. An interconnection rule, by contrast, might do two things. First, it could mandate that Verizon's enhanced delivery service be available to any content provider willing to pay. Second, it could give those content providers the opportunity to send their content over other backbone networks, which would then interconnect with Verizon to deliver the traffic to Verizon's broadband customers. Again, Verizon could offer a special enhanced delivery service to that other backbone, which could pass the charge on to the content provider, but it couldn't refuse to accept the packets for delivery on terms equivalent to those under which the independent backbone carries traffic it receives from Verizon.

Or consider what would happen if AT&T offered an Akamai-like caching service that provided faster performance for content and application providers who subscribed to it.[243] Under a non-discrimination approach, AT&T might be forbidden from offering the service, because those companies who paid the additional charge would gain a benefit relative to others when AT&T's customers accessed them. Under an interconnection approach, the key question would be whether AT&T offered the caching service to all providers who might take advantage of it. If so, it would effectively be offering a new form of interconnection to its backbone.[244]

This is, in fact, what Akamai offers to its customers today, and has for several years without raising network neutrality concerns. Websites that use Akamai and other CDNs offer better performance and reliability than those that don't. For that reason, virtually all of the most popular sites on the Internet either subscribe to a CDN or self-provision distributed caching infrastructure. Smaller providers who cannot afford such service are thus at a disadvantage. However, the fact that larger companies have advantages over smaller ones is one of the forms of discrimination traditionally seen as benign. After all, smaller firms may have advantages as well, especially in nimbleness and their ability to innovate.[245] Small firms can, if successful, become big themselves, and thus take advantage of enhancements like CDNs at the time when they most need it.

The CDN example shows how interconnection dynamics change in a layered environment. CDNs operate at the logical layer of the network: the software that manages how information flows from place to place, on top of the physical network connections but beneath the specific applications and content. They are

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[243] *See supra* note 195 (showing similarities to the Shaw-Vonage case mentioned above).

[244] If, however, AT&T simultaneously eliminated existing interconnection options, an interconnection-focused approach might well lead to regulatory intervention as well. The argument of some opponents of access tiering is that, in providing enhanced delivery of some packets across their backbones, the broadband access providers will be driven to degrade the baseline "best-efforts" services they offer today. An interconnection approach would focus in on whether such degradation is actually taking place, rather than on the relative positioning of existing and new services.

[245] *Cf.* CLAYTON CHRISTIANSEN, THE INNOVATORS DILEMMA (1997) (showing how successful established firms sometimes miss new market opportunities because they are too focused on existing customers).

both complements to networks, enhancing performance and adding additional functionality, as well as substitutes for that same infrastructure. A cross-network CDN such as Akamai reduces traffic across its participating networks. It also begins to abstract out those networks, from the perspective of the content or application provider. The CDN, not the network, starts to become the platform the content or application provider builds to.[246]

Such "diagonal competition" between players at different levels of the communications network stack is a defining characteristic of the convergence era. VOIP, which both rides on top of and competes against incumbent telephone networks, is a canonical example. In an interconnected, layered environment, a vertical customer can route around a gatekeeper platform by turning into a horizontal competitor. This process is crucial for game-changing innovation. Compare Vonage, a VOIP service that involves end-user hardware and ties into the legacy addressing and termination infrastructure of the PSTN, with Skype, which arose as a purely software-based alternative. Vonage offers a very similar feature set to the incumbents, albeit at an attractive price. Skype, by contrast, has introduced a number of innovative features, including flexible instant conference calls and instant messaging integration.

By emphasizing interconnection, in both the vertical and horizontal directions, regulators can ensure that such opportunities for disruptive innovation remain available.[247] When higher layers can change from complements into substitutes for the underlying platform, the competitive dynamics change. Not surprisingly, the most blatant examples to date of discriminatory conduct by broadband operators concern Internet-based services that compete against the operators' core businesses. The early cable modem service leader @Home imposed significant restrictions on streaming video to protect the video revenues of its cable operator parents, and Madison River blocked VOIP ports in order to preserve its voice-based revenues.

Situations involving substitutes rather than complements are a recognized exception to the general economic argument that platform owners are likely to have efficient incentives to maximize welfare in the management of their platforms.[248] Even though the platform owner benefits from the opportunity to internalize complementary externalities on its platform, it suffers from the substitution of revenue from its core business, potentially including the platform itself. While not every higher-level service in the converged broadband world will be a substitute for existing offerings of network operators, convergence creates an environment in which all providers can offer bundles that overlap at least in part.

Interconnection, as a safety valve for routing around platform bottlenecks, is the best mechanism to tame anti-competitive behavior in such an environment. Otherwise, operators will have incentives to turn substitutes back into

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[246] *See* Kevin Werbach, *Meta Service Providers: The Internet's SS7 Network*, RELEASE 1.0 (Dec. 1999), https://www.release1-0.com/release1/abstracts.php?Counter=1770650.

[247] *See* Weiser, Innovation, *supra* note 153.

[248] *See* Farrell & Weiser, *supra* note 196.

complements, restricting the potential for innovation. Jim Speta inadvertently makes this point in attacking proposals for open access to cable broadband networks.[249] He asserts that open access rules are not needed to preserve potential substitutes such as streaming video, because cable operators will change video from an independent application into an explicit part of their broadband service bundle.[250] To be indifferent to new competition for their incumbent service, the cable operators must ensure that Internet-based video becomes a paying part of that incumbent service. The best way to avoid such a scenario is to guarantee users the ability to benefit from video services based on *other* networks; something only possible through interconnection rules.

B. Interconnection Without Micromanagement

The traditional objection to interconnection rules is that they are complicated and intrusive to implement. Fortunately, a properly designed interconnection regime for converged networks can overcome both difficulties. In today's environment, interconnection is does not involve the same physical alteration it once required. It is increasingly a matter of software, rather than hardware. The wires are connected; what matters is how the data they carry are encapsulated, and how standardized are the logical-layer standards that define its end-to-end delivery parameters. Handing off traffic between networks, the exception in traditional telephone systems, is already the rule for the Internet.

Moreover, the pricing issues that bedeviled some earlier interconnection mandates, such as the unbundled elements mandates of the 1996 Act,[251] can readily be avoided through "bill and keep" approaches. Bill and keep means that neither party pays the other anything for carriage of its traffic.[252] The basic assumptions are that interconnection benefits both networks, and that each network should recover its costs from its own subscribers.[253] Bill and keep is particularly attractive when the costs of metering and billing for traffic seem significant relative to the net inflows carriers would receive from any positive interconnection charge. It is essentially the model used today for peering between Tier 1 Internet backbones. However, bill and keep is controversial when networks have different cost structures or traffic patterns, making it hard to simply declare that interconnection is a wash financially.

A paper by two FCC economists, Jay Atkinson and Christopher Barnekov, offers an approach that captures the benefits of both traditional interconnection

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[249] *See* James Speta, *The Vertical Dimension of Cable Open Access,* 71 U. COLO. L. REV. 975 (2000) (considering the possibility that a broadband platform owner would seek to extend that monopoly into ISP or content markets).

[250] *Id.* at 977.

[251] *See supra* text at note 125.

[252] *See id.*

[253] *See* Candeub, *supra* note 3.

pricing and bill and keep.[254] Atkinson and Barnekov's "Coasian" approach starts with bill and keep as a baseline, but permits interconnecting operators to recover the incremental cost of interconnection from each other. The authors develop a formal method to calculate such incremental costs, and then adopt an initial default rule that such costs be split among the interconnecting networks.[255] Networks are free to negotiate alternative arrangements.

The Atkinson-Barnekov approach builds on Ronald Coase's famous insight that parties will, absent transaction costs, bargain around legal rules to the welfare-maximizing result.[256] An interconnection regime cannot entirely do away with legal entitlements, because, absent the level of competition and other pro-interconnection elements of the Internet backbone, larger networks have incentives to block interconnection as a way of excluding rivals.[257] However, once interconnection is mandated, a quasi-Coasian bargaining process can produce efficient interconnection pricing without dragging in regulators.[258]

An effective set of interconnection rules would be designed to maximize the likelihood of voluntary private agreement. Such an outcome is not farfetched. Ever since the FCC adopted "must carry" rules, cable television operators and broadcasters have had to negotiate agreements for carriage under an obligation of mandatory interconnection.[259] The business terms of these agreements, however, are left up to the companies involved. For the most part, these negotiations have proceeded smoothly and outside the public eye.[260]

A brief outline of a workable interconnection regime would be as follows. If a network service provider wished to obtain interconnection, it would first enter into private negotiations with the other party. The service provider category would include not only the existing incumbent and competitive carriers, but others, including application or content providers such as Google, with substantial distributed network infrastructure. The parties would be free to adopt any mutually agreeable interconnection terms. However, if they could not agree within a specified time limit, perhaps 60 days from the initiation of

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[254] *See* Jay M. Atkinson & Christopher C. Barnekov, A Coasian Alternative to Pigovian Regulation of Network Interconnection (Working Paper, Sept. 2004), *available at* http://web.si.umich.edu/tprc/papers/2004/348/CoasianAlternative040901b.pdf#search=%22atkinson-barnekov%20coasian%20pigovian%22. *See also* Candeub, *supra* note 3 (describing the policy implications of the Atkinson-Barnekov model).

[255] *Id.*

[256] *See* R.H. Coase, *The Problem of Social Cost*, 3 J. L. & ECON. 1 (1960).

[257] *See supra* note 31; Candeub, *supra* note 3.

[258] *See* Atkinson & Barnekov, *supra* note 254.

[259] *See* HUBER ET AL, *supra* note 66.

[260] On at least one occasion, a dispute over must-carry terms resulted in temporary removal of a network from a cable system. However, this exception proved the rule, as the parties reached a compromise soon thereafter. *See* Paul Farhi & Peter S. Goodman, *Viewers Casualties in TV War; Skirmish Between Time Warner, Disney Sharpens Focus on Media Consolidation,* WASH. POST, May 4, 2000, at E01.

negotiations, the Atkinson-Barnekov Coasian variant of bill and keep would apply.

As an alternative, parties could opt for baseball-style "best and final" arbitration, with the arbitrator selecting from the two parties' proposals. Best and final arbitration would also be used, absent voluntary agreement, to assign any costs attributable to interconnection under the Atkinson-Barnekov model. Any arbitrated agreements would be filed with the FCC and subject to public review; voluntary private agreements would not be subject to such disclosure obligations. Judicial review would be limited to procedural flaws, or misconduct by one of the parties.

Such a structure would bring to bear powerful incentives for parties to negotiate in good faith. Strong default rules and an expedited dispute resolution process would limit opportunities for delay and strategic behavior. Parties will also often see mandatory disclosure of terms as a strong incentive for voluntary agreement. In the Internet backbone market today, for example, most companies keep peering terms and agreements confidential, seeing them as competitively sensitive. Conversely, in those cases where parties go to arbitration, mandatory disclosure of contractual terms will improve transparency of the interconnection process and enhance efficiency of future negotiations.

At a more general level, interconnection rules could vary depending on the market context. In nascent markets, such as the Internet backbone, where robust interconnection arrangements seem likely to develop through private arrangements, regulators should hesitate to impose mandatory obligations. On the other hand, as the cable open access debate illuminated, policy decisions at the initial stages of infrastructure deployment may define the architecture of new networks.[261] While policy-makers should not assume that mandatory interconnection or pricing rules are always needed, neither should they assume that the legal framework can always be adopted at a later date. Careful analysis of the nature of the platforms and competitive dynamics involved can guide decisions about the proper scope of interconnection rules.

C. Conclusion: From Universal Service to Universal Connectivity

The time has come to make universal connectivity a pre-eminent goal of a new, converged, network infrastructure policy. "Universal service" made sense in an environment of vertically integrated monopolies, but today, the greatest benefits flow from connections among multiple networks. Likewise, a non-discrimination emphasis was appropriate for the flat world of traditional telephony, but falls down amid the complexity of converged networks.

In communication and Internet policy today, network neutrality advocates raise important and legitimate concerns about broadband network operators. However, the non-discrimination solution they propose will not work, and it is

[261] *See* Architecture of Internet 2.0, *supra* note 239.

distracting attention from more significant developments: Namely, the erosion of the Internet's robust interconnection model. The true choice facing policy-makers is not whether or not to sanction network discrimination, but whether to defend network interconnection.

The successor to universal service should not be an unreachable vision of a totally neutral network, nor an increasingly fragmented network where physical network owners dominate. It should be universal connectivity. Connectivity is the ability to access any node on the network, not just as a physical matter, but through logical, application, and content links. Preventing anti-competitive and innovation-killing discrimination is important, but not at the expense of the interconnection that feeds the virtuous circle of connectivity.

Communications and the Internet should live in fragments no longer. They should only connect.