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11/06 draft -- 25774 words

ONLY CONNECT

INTERCONNECTION, NON-DISCRIMINATION, AND CONVERGED COMMUNICATIONS POLICY

By Kevin Werbach

ABSTRACT

In the present era of digital convergence, policy-makers should concentrate on ensuring effective interconnection among networks. Interconnection and non-discrimination have been the dominant objectives of telecommunications law from its inception. In the past, regulators generally emphasized non-discrimination, which made sense in environments of scarcity and relative stability. It is time for a new focus. Interconnection is the essential input for the new age of chaotic abundance.

As the Internet and traditional communications networks come together, a series of technological and marketplace developments threaten to undermine the open interconnection that fed the Net's extraordinary dynamism. Yet the policy debate is focused more strongly than ever on the potential for discrimination on networks, rather than connections between them. A new emphasis on interconnection would address the concerns of both sides of the current "network neutrality" debate, and offer the best hope for promoting continued innovation on the converged broadband networks of the future.

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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

I. INTRODUCTION

Radical changes in technology and the marketplace are undermining the current legal regime for the Internet and other communications networks.[1] Yet in the scholarly and political debate over what should replace it, both sides are caught up in an old battle about non-discrimination that offers little hope for clarity. In an era of digital convergence, policy-makers should refocus on the goal of effective interconnection. Non-discrimination was crucial in an era of scarcity; interconnection is the essential input of the new age of abundance. A policy approach based on interconnection offers the

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[1] I focus in this paper on the legal regimes governing the network infrastructure, which is essentially the domain of communications law. A similar set of battles is raging higher up, around the legal regimes governing information assets, in the form of intellectual property conflicts. *Cf.* LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD (2001) (identifying parallel conflicts over enclosure of the commons in communications and intellectual property.)

best hope for preserving the dynamism of the Internet, and promoting further deployment of broadband infrastructure.

Communications networks form the basis for the telephone, television, radio, cable, and cellular industries, as well as all the dynamic segments of the Internet economy, from broadband access to electronic commerce. The legal rules governing these networks are thus of immense significance, both for economic productivity and for democratic values. Yet despite extraordinary legislative,[2] judicial,[3] administrative,[4] and academic[5] 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.[6] There are grave concerns that the US government's current policy direction will not only foreclose further entry into traditional markets, but will also undermine the great innovation engine of the Internet.[7]

The historical contingencies of analog transmission and service-specific public utility regulation have obscured a clear understanding of the true

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

[3] *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, 125 S. Ct. 2688 (2005) (upholding FCC classification of broadband Internet access over telephone lines as an information service).

[4] 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 (Aug. 21, 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) (USTA II), 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).

[5] A string cite of significant telecommunications law scholarship over the past decade would be voluminous and unenlightening.

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

[7] *See* Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 J. TELECOMM. & HIGH TECH. L. 141 (2003) [hereinafter Wu, Broadband Discrimination]; Ex parte Letter of Timothy Wu and Lawrence Lessig at 12-15 (filed Aug. 22, 2003), 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) (CS Dkt. No. 02-52), *available at* http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6514683884.

dynamics of network infrastructure. The epochal process of convergence is removing these barriers. As boundaries blur between different kinds of communications networks, the distinction between "physical" network links and "virtual" application software is also disintegrating. Communications policy must converge as well. It should evolve into network infrastructure policy: a unified framework for telecommunications, digital media distribution, and the Internet.[8] The animating mandate of this new approach should be the one eloquently articulated by E.M. Forster: Only connect.

A workable interconnection regime can provide flexibility for voluntary negotiations, while ensuring that interconnection restrictions are not a barrier to competitive entry or new applications. Critically, interconnection must been seen not solely as a horizontal mechanism for delivery of static services to a largely stable user base, but also as a means for destabilizing Schumpeterian innovation.

Interconnection has long been an important regulatory issue in network industries such as telecommunications, transportation, and energy.[9] However, interconnection issues are particularly imperative today for the converging worlds of communications, media, and the Internet. Interconnection practices determine not only the scope and structure of competition among network operators, but also what happens on top of those networks.

Thus, for example, the "network neutrality" debate about whether the Internet will remain an open platform for user empowerment and wealth creation is, at bottom, a discussion about interconnection masquerading as one about non-discrimination.[10] Network neutrality advocates and opponents alike concentrate on whether discrimination by network operators will hinder or foster innovation, competition, and investment.[11] This debate offers little hope for a clear resolution. One person's dangerously anti-competitive discrimination is another's neutral traffic management, or

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[8] *Cf.* Kevin Werbach, *A layered Model for Internet Policy,* 1 J. TELECOMM. & HIGH-TECH L. 37 (2002) (arguing for a new policy approach that recognizes the Internet will subsume telecommunications).

[9] *See* Adam Candeub, *Network Interconnection and Takings*, 54 SYRACUSE L. REV. 369 (2004); RICHARD O. LEVINE & RANDOLPH J. MAY, INTERCONNECTION WITHOUT REGULATION: LESSONS FOR TELECOMMUNICATIONS REFORM FROM FOUR NETWORK INDUSTRIES (Progress and Freedom Foundation special report, Oct. 2005).

[10] *See* Wu, Broadband Discrimination, *supra* note 7; Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARV. J.L. & TECH. (2005); Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 94 GEO. L.J. 1847 (2006).

[11] *See id.*

even a necessary engineering tradeoff. The long-term threat to Internet openness is a shift to closed and exclusive network architectures, which non-discrimination rules do little to thwart.

In an interconnected world, there is another way. As the Internet itself has shown at multiple levels, where interfaces allow innovators to route around bottlenecks, discrimination by gatekeepers becomes futile and counter-productive. And because the vertically integrated legacy structures of telephone and television networks are giving way to layered digital platforms, there will be new opportunities to compete and innovate by substituting software for hardware… if effective interconnection options remain open. Thus, converged interconnection is not solely a pricing negotiation for the flat exchange of traffic; the quality of higher-level links among logical, application, and content layer systems may be equally or more important.[12]

In an environment of connectivity, non-discrimination is an element of interconnection policy, rather than the reverse. Privileging non-discrimination forces regulators into ongoing market supervision to defend a hypothetical "neutral" outcome. The inherent vagueness of non-discrimination norms makes enforcement difficult, without the support of substantial structural intervention. By contrast, an emphasis on interconnection harnesses the self-correcting forces of the market itself. An effective interconnection policy will achieve the goals of network neutrality – a vibrant, innovative, open, democracy-enhancing Internet – while avoiding the failings of current proposals to achieve it.

A focus on interconnection also bridges the ideological divide that rends communications policy, between proponents of deregulation and openness.[13] Deregulation advocates acknowledge that interconnection mandates are the one element of traditional communications regulation likely to remain justified in a deregulated environment.[14] Openness advocates emphasize the innovation potential of treating the network as "end-to-end" infrastructure

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[12] Thus, the approach describe herein differs from the one proposed by James Speta for common carrier interconnection between Internet carriers. *See* James B. Speta, *A Common Carraier Approach to Internet Interconnection*, 54 FED. COMMS. L.J. 226 (2002). Speta's interconnection model tracks the traditional price-based framework of the telephone network.

[13] *See* Tim Wu, *The Broadband Debate, A User's Guide*, 3 J. ON TELECOMM. & HIGH TECH. L. 69 (2004) [Wu, Broadband Debate].

[14] *See, e.g.*, Peter Huber, THE GEODESIC NETWORK: 1987 REPORT ON COMPETITION IN THE TELEPHONE INDUSTRY (Government Printing Office, 1987) [Geodesic Network].

for delivery of new applications and content,[15] a vision that depends critically on interconnection. A focus on interconnection speaks to both sides.

This article proceeds as follows. PART II traces the history of interconnection rules in telecommunications law and its antecedents. Interconnection and non-discrimination have been emphasized at different times. The current regime seeks to promote both, but fails to achieve either. PART III details the regulatory, technical, and business developments that threaten to undermine effective interconnection. It then critiques the non-discrimination turn of the policy debate in recent years. PART IV proposes an alternative, interconnection-focused approach, which takes into account the layered architecture of converged digital networks.

II. INTERCONNECTION IN NETWORK POLICY

A. The Importance of Interconnection

Interconnection is the agreement of two or more networks to carry each other's traffic.[16] The specifics of interconnection may vary widely. It may result from voluntary negotiations or regulatory mandates. An interconnection agreement may or may not involve physical extension of network facilities to join up with another network, or expansion of capacity to handle the additional traffic from the other network. It may or may involve fees for origination or termination of traffic for the other network. And it may or may not be limited to particular types of traffic. What matters is that the act of carrying users' communications changes from an isolated effort of one network to a collective endeavor of multiple networks.

Interconnection is essential in interactive communications markets, such as telecommunications and the Internet.[17] Without it, every user must subscribe to the same network. Imagine telephone service if a Verizon

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[15] *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).

[16] *Cf.* Daniel F Spulber & Christopher S. Yoo, Network Regulation: The Many Faces of Access (draft, June 8, 2005) ("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] One-way networks, such as broadcast television and radio, need not interconnect, since every customer only connects to the single broadcast source.

customer could only call other Verizon customers, and an AT&T customer could only call other AT&T customers. Users who wished to receive calls from customers of other networks would need multiple telephones and service agreements, and callers would have to check that recipients subscribed to the same network as they did.[18] Such a scenario would sharply curtail the utility of the service for everyone.

In formal terms, the value of networks increases with the number of users, a phenomenon known as network effects.[19] The great power of the telephone as a tool for modern life and commerce is its universal reach to over two billion other telephone users worldwide.[20] The Internet has the same value proposition. That universal reach depends on interconnection. Interconnection means that every provider need not construct a complete network to every customer, at potentially astronomical cost. Interconnection allows geographically distinct service providers to expand their effective reach, functioning as one larger virtual network. Given the up-front deployment costs of communications infrastructure, it is safe to say that the national and global communications networks we now take for granted would not exist without interconnection.

Interconnection also shapes the competitive landscape for communications networks and the Internet. Some forms of interconnection, such as the handoffs between local and long-distance telephone carriers, may involve providers in separate markets.[21] In other cases, though, interconnection brings together networks that compete to serve the same customers. For a customer who switches from Verizon to Comcast for local phone service to call other Verizon customers, the two companies must interconnect their networks.

A new entrant starts with zero market share, meaning that its customers need to reach the incumbent's customers far more than the reverse scenario. Without interconnection, therefore, new entrants such as Comcast effectively

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[18] This situation actually occurred in the early days of telephone service, when carriers such as AT&T selectively refused interconnection.

[19] *See* Mark Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 CAL. L. REV. 479 (1998).

[20] *See* Bruce Myerson, *Cell Phone Sales to Reach 779M This Year*, ASSOCIATED PRESS, July 20, 2005.

[21] Local and long-distance service were effectively discrete markets in the United States from the breakup of AT&T in 1984 until after the passage of the Telecommunications Act of 1996. The Modification of Final Judgment (MFJ) that split up AT&T prohibited the local Bell Operating Companies (BOCs) from offering interexchange service. Today, however, all the BOCs have received authorization to offer long-distance service, and the two largest long-distance companies, AT&T and MCI, have been acquired by BOCs.

could not compete. It is therefore unsurprising that an interconnection mandate is the first provision of the section of the 1996 Act devoted to "Development of Competitive Markets."[22]

Interconnection, however, does not only benefit new entrants. Interconnection 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.[23] A Verizon customer in the example above values the ability to call the new Comcast customer, and he or she therefore finds the Verizon service more valuable to the extent it facilitates that call. Interconnection is 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.

Even where interconnection is not an absolute condition of entry, network effects produce intense pressure to maximize the number of users who can be reached. Without interconnection, the largest network may have an insurmountable advantage, because customers of competing networks will defect to gain the benefits of scale.[24] 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 the early days of the telephone industry, AT&T selectively refused or conditioned interconnection with its long-distance network.[25] This proved to be such a powerful tool that AT&T was able to obtain a near-nationwide monopoly on phone service, despite the expiration of Alexander Graham

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[22] 47 USC 251.

[23] *See* Candeub, *supra* note 9 (arguing that this mutual benefit obviates the need for positive interconnection charges on transiting traffic).

[24] *See* Nicholas Economides, The Economics of Networks (undated); Nicholas Economides & Glenn Woroch, Benefits and Pitfalls of Network Interconnection, Discussion Paper no. EC-92-31, Stern School of Business, N.Y.U. (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); Jean-Jacques Laffont, Patrick Rey & Jean Tirole, *Network Competition: I. Overview and Nondiscriminatory Pricing*, 29 RAND J. ECON. 1, 20-21 (1998); Jean-Jacques Laffont, Patrick Rey & Jean Tirole, *Network Competition: II. Price Discrimination*, 29 RAND J. ECON. 38, 54 (1998).

[25] *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).

Bell's original patents.[26] That monopoly endured until broken up through antitrust action in the 1980s.

Conversely, markets with readily available interconnection are likely to be highly competitive and dynamic. Perhaps the best example is the Internet. The Internet's extraordinary propensity for generating wealth, innovation, and other social benefits is by now well-established. At a basic level, the Internet *is* interconnection.[27] 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.[28] IP is a generic protocol designed to run on top of any kind of physical or logical network, linking up proprietary data networks.[29] What distinguishes a private "intranet" from a participant in the Internet is nothing more than the agreement to exchange traffic transparently with other networks.[30]

The Internet is a packet-switched network, which means traffic does not take a fixed path between two endpoints.[31] 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. When congestion or other bottlenecks occur at one point in the network, local routers automatically redirect traffic along alternate routes.

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[26] *Id.*

[27] *Cf.* Keith Cambron, The Next Generation Network and Why We'll Never See It, IEEE Communications, 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….").

[28] *See* Kevin Werbach, DIGITAL TORNADO: THE INTERNET AND TELECOMMUNICATIONS POLICY (Fed. Communications Comm'n Office of Plans and Policy, Working Paper Series 29, Mar. 1997), *available at* http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp29pdf.html.

[29] 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.

[30] TK technical definition.

[31] *See* Digital Tornado, *supra* note 28; JOHN NAUGHTON, A BRIEF HISTORY OF THE FUTURE: THE ORIGINS OF THE INTERNET (1999).

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

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.[32] Moreover, 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.

B. Regulatory Models

1. Interconnection and Non-Discrimination

Because of their social significance and the economic dynamics that can impel them toward monopoly, electronic communications technologies have been subject to significant government involvement since their infancy. Communications law is an uncertain blend of economics-based competition policy and measures to promote distributive social welfare goals. Shifts in the public policy consensus have produced significant changes in regulatory methodology. Thus, the FCC went from actively protected AT&T's monopoly to promoting competitive entry, first in long-distance and then in local communications markets.[33] Evolving technology has also continually reshaped the landscape, posing novel questions that regulators are ill-prepared to answer.[34]

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[32] LAWRENCE LESSIG, CODE AND OTHER LAWS OF CYBERSPACE (1999).

[33] *See* Kevin Werbach, *The Federal Computer Commission*, 84 N.C. L. REV 1 (2005).

[34] *See* Digital Tornado, *supra* note 28; Geodesic Network, *supra* note 14.

At a basic level, communications law seeks to achieve two goals: interconnection and non-discrimination. Interconnection concerns whether incumbents can impose burdens on other networks, while non-discrimination addresses what incumbents do on their own network. To oversimplify, interconnection benefits competition, while non-discrimination benefits customers.[35] Both are means to the same end: well-functioning markets subject to Schumpeterian competition, producing optimal social welfare gains.[36] An interconnection rule implies a form of reciprocal non-discrimination: the interconnecting parties will treat each other's traffic as their own. However, others not party to the interconnection agreement may still receive inferior treatment, something a non-discrimination rule would block.

When interconnection, and therefore competition, are widely available, customers can discipline incumbents by switching to competitors. Further sector-specific regulation becomes less necessary. 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.

An important, under-appreciated part of this story is that new forms of competition and innovation can emerge on top of existing networks, reshaping the value chain.[37] Voice over Internet Protocol (VOIP) and advertising-fueled interactive applications such as Google are examples. Although at first glance non-discrimination, which directly attacks the relationship of networks to applications and content, might seem better suited to promote such innovation, it has in fact historically been interconnection policies that encourage it. Interconnection opens the door for unforeseen competitive entry, because it creates platforms rather than micro-manage specifics.

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[35] 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, such as voice over Internet protocol services competing against telephone companies that offer broadband Internet access. Nonetheless, interconnection and non-discrimination represent distinct concepts about the core problem and appropriate solution.

[36] *See* Wu, Broadband Debate, *supra* note 13.

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

The history of communications law demonstrates the relative value of interconnection and non-discrimination rules. Beginning with the first telegraph and telephone networks in the late nineteenth century, communications policy has utilized three primary legal approaches: common carriage, private arrangements in the shadow of government intervention, and access regulation. Given the prior discussion on the importance of interconnection, it may be surprising that for much of the history of communications law, it has privileged non-discrimination over interconnection. Interconnection has been seen as a necessary evil, or as an interim step to the true goal of non-discrimination.[38]

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. The one area where interconnection has been the central concept is the Internet backbone, which happens to be the market regulators have largely stayed out of.

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 is often seen as too difficult to achieve or, in other cases, taken for granted without close scrutiny. An examination of the historical approaches to communications regulation provides a backdrop for the discussion in Part III of the unique elements of the current situation.

2. Common Carriage: Non-Discrimination Triumphant

Common carriage was the dominant communications regulatory paradigm of the twentieth century.[39] 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.[40] A common carrier bears special obligations not imposed on other businesses.[41] For example, it cannot discriminate in the treatment of similarly situated customers, it cannot

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[38] *See id.*; Wu, Broadband Discrimination, *supra* note 7.

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

[40] *See* Speta, *supra* note 12; Candeub, *supra* note 9; Thomas B. Nachbar, *Open Access* (draft).

[41] *See* Speta, *supra* note 12; Candeub, *supra* note 9; 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 (19111).

evaluate the content of what it receives from its customers, and it has a duty to serve interested customers, including potentially building out its facilities to reach them.[42]

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.[43] 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.[44] 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 concepts were incorporated wholesale into the Communications Act of 1934, which created the Federal Communications Commission.[45]

In telephony, common carriage means that telephone companies cannot differentially treat phone calls based on their contents. Callers can say whatever they wish; what they pay depends on neutral factors such as the length and distance of the call, and broad user categories such as residential and business. To ensure that network operators do not abuse their power, the common carriage regime incorporates detailed pricing regulation. Regulators traditionally set prices on a "rate of return" basis, only allowing the carrier to earn a defined profit after recovering its costs.

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

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[42] *See* Nachbar, *supra* note 40; Jim Rossi, *The Common Law Duty to Serve,* 51 VAND. L.REV. 1233 (1998).

[43] 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). *See also* Nachbar, *supra* note 40.

[44] An Act to Regulate Commerce, 24 Stat. 379 (1887).

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

technologies of recent decades: cable television and broadband Internet access.[46]

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.[47] Common law sources are also unhelpful, offering competing and largely inconsistent rationales. 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,[48] and they still do today.[49]

The relationship of common carriage to interconnection is also the subject of confusion. Conventional wisdom and many leading scholars claim that interconnection requirements were foreign to telecommunications regulation prior to the 1996 Act.[50] In reality, as Adam Candeub has documented, common carriage at common law involved both non-discrimination and interconnection obligations, along with other requirements.[51] For example, railroads, before the Interstate Commerce Act, were required under common law to carry freight handed off at depots by competitors.[52] Similar obligations applied at common law to stagecoaches and other common carriers.[53]

Interconnection was obviously not an issue for some common carriers, such as innkeepers, whose services never required shared traffic with

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[46] *See* POOL, *supra* note 39 (cable television); Speta, *supra* note 12 (Internet interconnection).

[47] 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(10).

[48] *See supra* note 43.

[49] *See* Candeub, *supra* note 9; Nachbar, *supra* note 40.

[50] *See, e.g.*, *Speta, supra* note 12, at 258 ("[T]he common law imposed no obligation on railroads (or other carriers) to interconnect with the lines of other carriers….") *Even* an advocate of interconnection mandates for broadband Internet networks such as Jim Chen has defended them against charges they were 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).

[51] *See* Candeub, *supra* note 9; WYMAN, *supra* note 41.

[52] *See id.*

[53] *See id.*

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 Interstate Commerce Act was passed to counteract the perceived power of the railroads, which had become the dominant industrial enterprises of the Gilded Age.[54] 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.

In early telephone networks, there was no direct analogue to the handoff of freight or passengers between railroads at existing depots. Telephone service required operators to route calls manually outside a local exchange. Interconnection would require physical extension of incumbent networks to benefit competitors, something outside the bounds of the limited interconnection right afforded under common law to railroads.[55] Thus, although some court decisions from the period state that no common-law interconnection obligation exists, these conclusions must be viewed in light of the technology of the day.

Interconnection was, however, a hot topic in the nascent telephone industry at the end of the nineteenth century.[56] 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. They were limited by their inability to offer long-distance service, which required greater resources as well as newer technology covered by different patents. The independents sought interconnection with AT&T, which selectively used refusals and advantageous terms for interconnection to strengthen its own position.

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

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

[55] *See* Candeub, *supra* note 9, at 394, *citing* United States Tel. Co v. Cent. Union Tel. Co., 171 F. 130 (N.D. Ohio 1909).

[56] *See* MUELLER, *supra* note 25; FRIEDLANDER, *supra* note 25.

in the Kingsbury Commitment.[57] The government acquiesced in AT&T's refusal to provide universal and non-discriminatory interconnection with rivals, in return for the ability to impose price regulation 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 came to stand for a framework of cross-subsidies to make phone service more affordable for users in rural and other high-cost areas, universal service was originally meant to promote the virtues of an exclusive AT&T network.[58] Only AT&T, which operated the monopoly long-distance network, 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. [59]

Interconnection did not return as the focal point of telecommunications policy until the FCC and Department of Justice intervened in the 1970s to ensure MCI the opportunity to engage in long-distance competition. The 1983 AT&T divestiture consent decree ultimately mandated "equal access" for competing interexchange carriers. And only with the 1996 Act was a general interconnection mandate imposed on all telecommunications carriers.[60]

3. The Internet: Interconnection Dominates a Parallel Universe

While AT&T's universal service regime was gradually unraveling 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 as we know it today chose a different path.[61]

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[57] *See See* PETER W. HUBER ET AL, FEDERAL TELECOMMUNICATIONS LAW, SECOND EDITION (1999); GERALD W. BROCK, THE TELECOMMUNICATIONS INDUSTRY: THE DYNAMICS OF MARKET STRUCTURE 155 (1981).

[58] *See* MUELLER, *supra* note 25.

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

[60] 47 USC 251.

[61] Jason Oxman, The FCC and the Unregulation of the Internet (Fed. Communications Comm'n Office of Plans and Policy, Working Paper Series 31, July 1999), *at* http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp31.pdf; Steve Bickerstaff, *Shackles on the Giant: How the Federal Government Created Microsoft, Personal*

The goal of the Internet's architects was to create a mesh of heterogeneous networks that worked together as one, rather than to deliver any particular value through any particular network. So a good deal of their work, such as the transfer control protocol (TCP) that manages most Internet data flows, and the Border Gateway Protocol (BGP) that coordinates traffic routing between networks, was focused on the problem of interconnection. However, they left implementation of those protocols to the networks themselves. The Internet interconnection regime today is almost entirely private and voluntary, although it operates in the shadow of potential regulatory involvement, and was forged through a series of architectural decisions by agencies of the US federal government.

There are two types of Internet networks. Internet service providers (ISPs) offer connectivity directly to end users, and to businesses offering content, applications, and service to those end users.[62] 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.

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.[63] This original Internet had a single network backbone, operated by the US National Science Foundation (NSF).[64] 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.[65]

Computers, and the Internet, 78 TEXAS L. REV. 1 (1999); Federal Computer Commission, *supra* note 33.

[62] 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.

[63] *See* Naughton, *supra* note 31; KATIE HAFNER & MATTHEW LYON, WHERE WIZARDS STAY UP LATE: THE ORIGINS OF THE INTERNET (1996).

[64] *See* Digital Tornado, *supra* note 28.

[65] 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*

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. 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 the Internet.[66] In particular, it mandated that not only would the Internet backbone be privatized, but it would also be subject to competition. The NSF funded the creation of three network access points (NAPs), at which backbones could exchange traffic. 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.

In the current, third phase of Internet development, private commercial arrangements define terms of interconnection.[67] There are a substantial number of independent backbone network operators worldwide, which negotiate interconnection arrangements so that traffic flows across the network. These arrangements are not generally subject to government oversight, and thus represent a parallel universe to the non-discrimination rules 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, two "Tier 1" backbones exchange traffic on a settlement-free basis.[68] 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

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Backbone Network and the Domain Name System, 79 WASH. U. L.Q. 89, 111-17 & n.6 (2001).

[66] *See* Kesan & Shah, *supra* note 65; 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 (2000-2001); Digital Tornado, *supra* note 28.

[67] Michael Kende, *The Digital Handshake: Connecting Internet Backbones*, 11 COMMLAW CONSPECTUS 45, 47-48 (2003). Jacques Cremer, Patrick Rey & Jean Tirole, *Connectivity in the Commercial Internet*, 48 J. INDUS. ECON. 433 (2000); Speta, *supra* note 12.

[68] *See* Kende, *supra* note 67.

exceed any benefits. Non-Tier 1 networks must pay larger networks to transport their traffic. These networks enter into transit agreements, under which they pay fees related to the volume of traffic they deliver or other metrics.[69]

For most of the Internet's history, there have been a sufficient number of backbone competitors to limit the market power any one might enjoy. Backbones represent alternative points of entry for the entire Internet, making them relatively good substitutes for one another. A backbone that raised prices, or restricted peering terms, is therefore subject to market forces. In addition, a matrix of private exchange points and content delivery networks (CDNs) have sprung up to make 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. 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. By avoiding the need to send content across the network, CDNs both improve performance and reduce cost.

Actual performance of the market isn't quite as harmonious as this picture suggests. Prices can vary widely for seemingly equivalent services, and most peering terms are secret. Peering disputes occasionally boil over, most notably in 2005 between backbone operators Cogent and Level 3.[70] Level 3 temporarily dropped its connections with Cogent over a pricing dispute, but the two sides eventually reached a compromise. 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.

Nonetheless, the FCC has declined to use its legal authority to mandate interconnection or non-discrimination among Internet backbones across the board.[71] 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."[72] Although commentators such as Jim Speta have advocated a common carrier regime

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[69] *See id.*

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

[71] Kende, *supra* note 67.

[72] *Id.*

for interconnection among Internet carriers,[73] the Commission has shown no interest in going down that road.

Despite this, 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 requirements for those backbones.[74] And today, as a practical matter, the dominant US backbone operators today are regulated telecommunications carriers such as AT&T and Verizon.

When AT&T, before its acquisition by SBC, 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.[75] Telecommunications mergers 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 market. Regulators stepped in and imposed antitrust conditions to thwart such a possibility. 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."[76]

The Internet backbone market is thus an example of largely private interconnection decisions in the shadow of regulatory intervention. The FCC mandates neither the blanket non-discrimination rules of common carriage nor blanket interconnection rules, but it retains the right to impose either as the situation requires. Moreover, the Commission has never formally declared all backbones as unregulated information services, and its decision in the AT&T VOIP case expressly preserved its ability to decide otherwise. 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.[77]

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[73] *See* Speta, *supra* note 12.

[74] *See* Kesan & Shah, *supra* note 65.

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

[76] 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.

[77] *See supra* note 70.

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

4. The Access Model: A Muddled Combination

While the Internet backbone market developed in the shadows of regulation, the main thrust of communications policy shifted as well. The final decades of the twentieth century witnessed a dramatic change away from the historical non-discrimination focus. Rather that regulate rates to forestall discrimination and approximate the consumer welfare benefits of a competitive market, regulators increasingly devote 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.

After so many years of legally-protected 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.[78] 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. Communications regulation thus shifted from an emphasis on *rate* regulation to one on *access* regulation: an uneasy combination of non-discrimination and interconnection obligations.[79]

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, however, through what were effectively interconnection obligations. The

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[78] *See supra*

[79] *See* Kearney & Merrill, *supra* note 54; Daniel F. Spulber & Christopher S. Yoo, *Access to Networks: Economic and Constitutional Connections*, 88 CORNELL L.REV. 885, 919, 921, 926 (2003).), Spulber & Yoo, Many Faces, *supra* note 16.

Commission mandated that AT&T provide access for customers to attach devices of their choosing to its network.[80] 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.[81] Although these mandates 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.

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.[82] 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.[83]

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 precluded from offering long-distance and other services. 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.

A critical element of the process was the requirement of "equal access" for competing long-distance operators. Equal access meant that customers of

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[80] *See* Federal Computer Commission, *supra* note 33; 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).

[81] *See* Federal Computer Commission, *supra* note 33. Tom Vest argues that the growth of private lines is the crucial metric for the success of the Internet. TK Vest materials.

[82] Spulber & Yoo, Many Faces, *supra* note 16.

[83] *See* Shackles on the Giant, *supra* note 33; Federal Computer Commission, *supra* note 33.

new entrants such as MCI and Sprint could make long-distance calls in the same way as AT&T customers. Prior to the equal access mandate, AT&T had implemented interconnection in such a manner that MCI's customers had to dial additional digits. Implementation of equal access forced AT&T to invest significant sums of money to upgrade its switching and operations support systems. The result, however, was a competitive long-distance market that, over the course of a decade brought brought prices down substantially.

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.[84]

The shift to access regulation marked a decreased emphasis on non-discrimination, and conversely a 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.[85] 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.[86]

Under access regulation, regulators focus less on discrimination, and more on whether the carrier doing it has market power. Access regulation thus brings communications policy closer to competition regulation in other sectors, in which the mere fact of discrimination is not usually seen as an evil justifying government intervention. Instead, regulators have devoted their attention to developing and policing the rules for access to incumbent networks. The greatest struggle over implementation of the 1996 Act concerned the FCC's policies for unbundled network elements, and other interconnection-oriented rules.

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. 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

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[84] Spulber & Yoo, Many Faces, *supra* note 16.

[85] Kearney & Merrill, *supra* note 54.

[86] *See* Jim Rossi, *Lowering the Filed Tariff Shield: Judicial Enforcement for a Deregulatory Era*, 56 VAND. L.REV. 1591 (2003).

regulatory superstructure to wither away. In reality, the combination of non-discrimination and interconnection rules is unstable. Something had to give, and as Part III explains, something did.

C. Pricing Interconnection

When networks interconnect, the next question is what financial arrangements will govern that relationship. Three basic pricing models are used for interconnection: bill and keep, reciprocal compensation, and transit charges.

Bill and keep means that neither party pays the other anything for carriage of its traffic.[87] The basic assumptions of bill and keep are that interconnection benefits both networks, and that each network should recover its costs from its own subscribers.[88] 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.

Under reciprocal compensation, each network pays the other an equal charge, generally on a usage basis, terminating its traffic.[89] Like bill and keep, reciprocal compensation operates on the principle that each network benefits from interconnection with the other, but it presumes that networks should recover the costs involved in that interconnection from another. Since both parties pay the same rate, the net beneficiary of the arrangement is either the larger network (which terminates more traffic), the network with the highest ratio of terminating to originating traffic (such as, for example providers serving inbound call centers or dial-up Internet service providers), or the network with the lowest marginal costs (because a reciprocal rate that merely compensates the high-cost network generates a net profit for the low-cost network). Reciprocal compensation is the traditional model used for settlement payments between international carriers, and it is the model specified by the 1996 Act for exchange of local traffic.

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[87] In re Developing a Unified Intercarrier Compensation Regime, 16 F.C.C.R. 9610 (Apr. 27, 2001). Jay M. Atkinson & Christopher Barnekov, A Competitively Neutral Approach to Network Interconnection, (FCC Office of Plans & Policy Working Paper No. 34) (2000); Patrick DeGraba, *Central Office Bill and Keep as a Unified Inter-Carrier Compensation Regime*, 19 YALE J. ON REG. 37 (2002).

[88] *See* Candeub, *supra* note 9.

[89] 47 U.S.C. § 252(d)(2).

Transit payments operate like reciprocal compensation, except that only one of the interconnecting networks pays the charge. The assumption in such arrangements is that one network is the net beneficiary of the interconnection agreement, while the other bears net costs. Therefore, the "cost causing" network should be responsible for the costs it imposes. Transit payments can be structured in a variety of ways, based on the directionality of traffic. For example, payments between Tier 1 and non-Tier 1 Internet backbones typically do not depend on directionality of traffic, but on factors such as bandwidth (bits per second that can be transferred) and monthly transfer volume. Interstate access charges are collected from interexchange carriers by both the originating and terminating carriers on a call.

Unfortunately, deciding which of these pricing rules is the "right" one for any interconnection relationship is at best challenging.[90] To say that originating or receiving traffic imposes a "cost" on another interconnected network implies that the relationship produces more harm than benefit. However, interconnection always creates some benefits for customers of both networks. And the marginal cost of an additional bit of traffic is often negligible in telecommunications, where fixed costs of infrastructure dominate. 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, not necessarily on the level of charges, but on who should charge whom.

The inherent uncertainty of interconnection pricing creates significant oddities. Thus, even though the distinction between local and long-distance traffic is entirely artificial, and not based on any real cost differences in delivering traffic, it has a dramatic effect on how interconnection is priced for voice traffic. The originating carrier for a local call must pay the terminating local carrier a reciprocal compensation charge. By contrast, the originating carrier for a long-distance call actually received an access fee from the terminating long-distance carrier… at a significantly higher rate!

Interconnection pricing is the Achilles' heel of access regulation. The simple question of how to calculate the appropriate price for unbundled network elements that incumbents are required to offer under the 1996 Act consumed the telecom industry for years.[91] Numerous FCC proceedings, state regulatory proceedings, court decisions, law review and economics

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[90] *See* Candeub, *supra* note 9. 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, *supra* note 87.

[91] *See* Epstein, *supra* note 6.

articles offered wildly conflicting views. Because these regulatory decisions defined the basic economics of competitive entry, incumbents and entrants alike fought tooth and nail for more favorable terms.

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 road 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. Although not as dramatic, the FCC has experienced similar struggles in its later efforts reform the inter-carrier compensation system. It has opened a proceeding to develop a uniform alternative, and has published several whitepapers advocating variations of bill and keep, but it remains unclear when and if it will move forward.[92]

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 could be sustainable, as long as the boundaries among its constituent parts remain in place. However, that is not likely to be the case for long.

III. THE CURRENT LANDSCAPE

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.[93] Once

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[92] Developing a Unified Intercarrier Compensation Regime, *supra* note 87

[93] *See* Kevin Werbach, *Breaking the Ice: Rethinking Telecommunications Law for the Digital Age*, 4 J. TELECOM. & HIGH TECH. L. __(2005); Layered Model, *supra* note 8; Digital Tornado, *supra* note 28 (distinguishing "deep convergence").

encoded in digital form, all information is ultimately interchangeable.[94] This means that networks previously in distinct markets can become direct competitors. The transformation of local telephone and cable television companies into competing providers of "triple-play" bundles of voice telephony, multi-channel video programming, and high-speed Internet access is a canonical example.[95]

It is particularly significant that convergence implies a transition from analog to digital delivery.[96] 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.[97] 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.[98] A layer is a functional aspect of the network, which conceptually operates on top or underneath other layers. 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

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[94] 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.

[95] *See* Legg Mason "Battle of the Bundles" Report TK. 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.

[96] Digital Tornado, *supra* note 28.

[97] In an earlier paper, I referred to this as the horizontal aspect of layered networks. *See* Layered Model, *supra* note 8. Here I adopt the more common formulation.

[98] *See* Layered Model, *supra* note 8; Breaking the Ice, *supra* note 93.

way 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.[99] It creates flexibility for innovation, because new entrants can operate on top of the existing network.

Network layers are a conceptual overlay on top of software and hardware systems. The number and location of layers in a real-world digital network is not unambiguous. The main requirement is that service providers delineate functions they perform, and provide interfaces between their own services and those of others. In the past, I have proposed a four-layer model for policy-makers, dividing the network into physical, logical, application, and content slices.[100] 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.

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, the layered model provides a map to visualize such combinations and transformations when they occur. The critical element of the Internet architectural model is not that it forbids layer crossing; it is that it provides a small set of "spanning layers" that allow freedom of movement on either side.[101] The critical spanning layer for the Internet is the Internet Protocol itself.[102] 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 makes interconnection both more vital and more complex. Voice, video, and data providers are no longer in separate worlds. That

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[99] *See* Layered Model, *supra* note 8.

[100] *See id.* 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 93. Although it uses the original four-layer model, the instant discussion does not rely on the selection of a particular layered framework.

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

[102] *See id.*

means they must interconnect with one another to provide users with the seamless connectivity they expect. Moreover, interconnection is no longer flat. Every layer can potentially interconnect with analogous layers on other networks.[103] Interconnection in layered networks is also a vertical question, covering the terms of interfaces between layers. 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.[104] By mandating open interconnection with enhanced services through its Comparably Efficient Interconnection (CEI) rules, the FCC created the conditions for explosive growth in innovative computer-driven devices and applications.[105]

2. *Out of the Regulatory Box*

Convergence poses a challenge for regulators such as the FCC. 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.[106] 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 now 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.[107] It was concerned that imposition of regulatory obligations designed for established traditional communications providers would stifle

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[103] *See* Huber, Geodesic Network, *supra* note 14.

[104] *See* Federal Computer Commission, *supra* note 33; Robert Cannon, *The Legacy of the Federal Communications Commission's Computer Inquiries*, 55 FED. COMMS. L.J. 169 (2003).

[105] *See* Federal Computer Commission, *supra* note 33.

[106] *See* Layered Model, *supra* note 8.

[107] *See* Digital Tornado, *supra* note 28; *See* Federal-State Joint Board on Universal Service, Report to Congress, CC Docket No. 96-45 (April 10, 1998), at 16-25, *available at* http://www.fcc.gov/Bureaus/Common_Carrier/Reports/fcc98067.pdf (Stevens Report) (declining to impose traditional telephone regulation on certain VOIP services).

this nascent technology.[108] It recognized that, although some forms of VOIP bore a striking resemblance to regulated telephone service, VOIP was also difficult to distinguish technically from any other Internet application. Excessive regulation of VOIP could thus spill over and chill development of the Internet. Moreover, VOIP providers in the early days were small companies with few customers, making the risks of under-regulation minimal.

So, when faced with a petition in 1995 to classify VOIP as a regulated telephone service, the FCC declined to act on it.[109] When charged by Congress to issue a report justifying its non-regulation of VOIP, the agency crafted a nuanced statement that left open the possibility of future action, but took no steps toward imposition of regulation.[110]

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.[111] 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

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[108] *See* Remarks of FCC Commissioner Kathleen Q. Abernathy before the Federal Communications Bar Association New York Chapter, The Nascent Services Doctrine, at 1-2 (July 11, 2002); Powell speeches and statements TK.

[109] *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.

[110] *See* Stevens Report, *supra* note 107.

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

@Home, which was then the market leader.[112] 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.[113]

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.[114] The Court deferred to the Commission's action on administrative law grounds.[115] *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 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.[116] Commentators have questioned the legal basis for this assertion,[117] but the Supreme Court used it to support its decision in *Brand X*.[118] Exactly what Title I rules the FCC might adopt remains an open question.

While the broadband reclassification debate was making its way through the FCC and the courts, the Commission issued another decision removing traditional regulatory obligation from the incumbent telecommunications carriers. Under the 1996 Act, the FCC is required every three years to review its regulations, and to eliminate those rules that competition or other market developments render unnecessary. In the most recent Triennial Review, the Commission eliminated both existing and potential future ILEC interconnection obligations. Specifically, it did away with line sharing, an

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[112] *See* Lemley & Lessig, *supra* note 15.

[113] *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) [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.

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

[115] *Id.*

[116] *See* Cable Broadband Reclassification, *supra* note 113.

[117] *See* James B. Speta, *FCC Authority To Regulate the Internet: Creating It and Limiting It,* 35 LOY. U. CHI. L.J. 15 (2003).

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

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.[119]

Thanks to these decisions, it is now clearer what rules do *not* apply to converged broadband networks than which requirements do. The FCC announced a desire to promote intermodal competition between facilities-based broadband competitors as the primary means of preventing anti-competitive activities.[120] 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 possibility 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, although at this point that possibility is unfulfilled.

Congress has also joined the debate in recent years. Recognizing that the 1996 Act failed to produce either the competitive entry or the market clarity its supporters desired, several members of Congress have introduced bills to reform part or all of the statute. To date, none have passed, although the debate continues.

B. Threats to Interconnection

Interconnection has never been more important than in today's convergence era, when no network is an island. Perversely, interconnection is now under siege.

1. From Network Neutrality 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.[121] The current proposals for network neutrality are non-discrimination rules.[122] They would prevent broadband operators from differentiating traffic on their network, similar to the obligations placed on

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[119] *See supra* note 4.

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

[121] *See supra* note 10.

[122] *See* Wu, Broadband Discrimination, *supra* note 7; Lessig & Wu, *supra* note 7.

common carriers. It is perhaps surprising, therefore, that the major threat these rules seek to combat is an interconnection challenge.

When network neutrality was first promoted, around 2002, the focus was on restrictions that broadband access providers might impose on their users.[123] For example, they might block access to certain websites, or they might adopt unreasonable restrictions on how users employed their broadband connections.[124] Tim Wu, for example, conducted a survey of allegedly discriminatory actions by broadband access providers that included restrictions on streaming video, prohibitions on using virtual private networking software, and prohibitions on operating home servers.[125]

Then-FCC Chairman Michael Powell expressed sympathy for these concerns, although he rejected calls for enforceable prophylactic neutrality regulations.[126] 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.[127] 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.[128] The FCC, under the leadership of Kevin Martin, formally adopted a version of the Four Freedoms as a non-binding policy statement.[129]

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

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

[124] *See* Wu, Broadband Discrimination, *supra* note 7; Lessig & Wu, *supra* note 7.

[125] *See id.* 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.*

[126] 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.

[127] *Id.*

[128] *See* Madison River Commc'ns, LLC, Order, 20 F.C.C.R. 4295 (2005).

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

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 second 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 implement capabilities in their network to block or degrade unaffiliated content, unless the providers of that content pay supplemental fees. Then-SBC CEO Ed Whitacre, whose company has since acquired AT&T and BellSouth, gave ammunition to this position when he declared:

> 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 have spent this capital and we have to have a return on it. So there's going to have to be some mechanism for these people who use these pipes to pay for the portion they're using. Why should they be allowed to use my pipes?[130]

Companies such as the new 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.[131]

Though both are covered under the network neutrality umbrella, access tiering and broadband discrimination are different issues. One concerns how a broadband provider constrains its own network. The other concerns how that provider constrains or assists providers on other networks. Access tiering is a different model for linking content providers and access providers across the Internet. It is, in other words, an interconnection practice.

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[130] Roger O. Crockett, *At SBC, It's All About "Scale and Scope,"* BUSINESSWEEK ONLINE (Nov. 7, 2006), *at* http://www.businessweek.com/@@n34h*IUQu7KtOwgA/magazine/content/05_45/b3958092.htm. *See also* Arshad Mohammed, *SBC Head Ignites Access Debate*, WASH. POST, Nov. 4, 2005, at D1 (describing the firestorm in response to Whitacre's comments).

[131] 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). TK Korean video case.

Broadband discrimination such as application blocking is what the FCC's "Four Freedoms" policy statement targets. The open questions are whether the FCC has sufficient legal authority to implement the principles it articulated, 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 are fighting those bills that couple solidification of the policy statement with the removal of FCC authority to address access tiering.[132] Access tiering has thus quietly replaced broadband discrimination as the focus of the network neutrality debate.

This shift is 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 is a tiered network, 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.[133] 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.

If access tiering is widely practiced, such providers will have more limited options. If the backbone operator connected to a last-mile network

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[132] TK Stevens bill.

[133] *See generally,* Jean Charles Rochet & Jean Tirole, Two Sided Markets: An Overview (March 12, 2004), *available at* http://faculty.haas.berkeley.edu/hermalin/rochet_tirole.pdf.

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 interconnection question 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.

The indeterminacy of end-to-end Internet connectivity actually provides valuable incentives. 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. Peering Disputes

Even without access tiering, which broadband operators have yet to implement widely, the Internet interconnection regime is under stress. Among Internet backbone operators, a relatively stable structure of peering and transit relationships has persisted for most of the period since the National Science Foundation turned over the backbone to private control. With changes in Internet usage patterns and business interests, however, there are reasons to worry that such stability will no longer hold.

The dispute between Level 3 and Cogent in 2005 is indicative. The two companies had an established peering contract, but it was terminable with 60 days notice. Level 3 argued that Cogent should no longer be entitled to peer with it, because Cogent sent significantly more traffic to Level 3 than the

reverse.[134] 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. So 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 one backbone to reach sites on the other. After a few days, Level 3 agreed to re-establish the link, and the parties ultimately reached a confidential agreement.[135]

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. 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 will, 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.[136] The directionality of Internet traffic, although complex, is well-understood by network engineers today, because it derives from the dominant uses of the network: 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.[137] 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

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[134] *See* Level 3 Issues Statement Concerning Internet Peering and Cogent Communications, *PR Newswire*, Oct. 7, 2005.

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

[136] *See* Level 3 press release, *supra* note 134.

[137] *See* Kevin Werbach, *The Implications of Video P2P on Network Usage*, *in* VIDEO PEER TO PEER (Columbia Institute for Tele-Information, forthcoming 2007)

telephone companies in the US.[138] Backbone providers that came from 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.

3. The IP Interconnect Challenge

Convergence is bringing together two forms of interconnection with very different traditional models: telephony and the Internet. If the relationship purely involves telephone traffic or Internet data traffic, the parameters are clear. However 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 traffic, even if converted at the edge back to time division multiplexed (TDM) signals and delivered to ordinary telephones.

Data-centric carriers are seeking interconnection terms and pricing with incumbent telephone companies that more closely resemble the Internet the PSTN. For example, they are seeking to deliver traffic in native Ethernet format at central hubs, rather than connecting to TDM lines at every central office. Some telephone companies are refusing. Qwest and Level 3 are in arbitration before several state commissions over Qwest's insistence that Level 3 interconnect the traditional PSTN model.[139]

The next frontier for interconnection disputes is likely to be in the area of VOIP peering. Today, there is no general standard for VOIP networks to interconnect with one another. A Skype user can reach a Vonage user only by routing their connections through the legacy PSTN infrastructure. That adds cost and complexity, and prevents the use of new features in addition to the basic voice channel. Moreover, VOIP users wishing to call PSTN 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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[138] *See* Om Malik, Backbone Consolidation Continues -- Level 3 buys Broadwing, GigaOm, Oct. 17, 2006, *at* http://gigaom.com/2006/10/17/level3-broadwing/.

[139] TK Qwest/Level 3 dispute.

To overcome these limitations, VOIP carriers are looking to implement VOIP peering. 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.

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 seems unlikely to produce a unified environment in which all VOIP users can benefit from seamless connectivity, as they do on the Internet and PSTN.

4. 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).[140] 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.[141] The best-articulated example of an NGN in a major market is British Telecom's 21CN, which is now in the process of deployment.[142] Throughout the world, though,

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[140] 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.

[141] *See id.*

[142] *BT Transforms Phone Network*, BBC NEWS, June 9, 2004, *available at* http://news.bbc.co.uk/2/hi/technology/3791319.stm.

incumbent carriers are making massive investments to move toward NGNs.[143]

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. Despite the commitment of major carriers to move to an IMS architecture, many details about the timing and implementation are still uncertain. Moreover, the last unifying technology that carriers saw as a basic platform for convergence, Asynchronous Transfer Mode (ATM), never achieved the expected level of ubiquitous adoption.[144] To a large extent, ATM, the preferred telephone company technology, lost out to the data-centric Internet protocol. Now, with IMS, the same vendors and standard bodies who once backed ATM are pushing a solution that incorporates IP into a structured environment similar to the ATM vision.[145]

The IMS architecture is designed to differentiate and segregate all traffic that passes through the network. At interconnection points, IMS-enabled networks can apply pre-established settlement rates for particular classes of traffic.[146] 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, is 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."[147] 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

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[143] *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.)
[144] *See* Digital Tornado, *supra* note 28.
[145] *See* No Signal, *supra* note 143 ("…NGNs will consist of a core IP network that will function like the Internet of today, but will also have service control and application layers. These latter layers will separate NTT's customers, for example, from everyone else….")
[146] Tom Vest, email exchange with author.
[147] No Signal, *supra* note 143

process will parallel the development of broadband cable modem access networks, which were at the center of the original open access debate.[148] 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. This does not mean regulators should act based on mere hypotheticals. IMS could be implemented in a way that extend the richness of existing Internet interconnection practices to a converged environment, or it could turn out to be a complete failure. However, by defining the essential terms of open interconnection in a converged world, policy-makers can ensure that decisions about IMS-related technologies are constrained by public policy objectives, rather than the reverse.

5. An Uncertain Future

With all forms of communications converging onto digital broadband distribution platforms, and the FCC classifying those very platforms under the lesser regulatory obligations of information services, 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 before, because it involves not only the physical links between network platforms, but also the higher-level connections among databases, applications, and content. Yet 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 from a regulatory standpoint. The private Internet peering model, which works in an environment of relatively even and relatively flat competition, is being imported to an entirely different competitive ecosystem. Meanwhile, the interconnection obligations embedded in common carrier regulation have been thinned virtually to the point of meaninglessness. At the very time that converged, layered competition among multi-faceted and interconnected providers is becoming the norm, policymakers have largely abandoned the very tool best suited to such an environment.

The greatest difficulty with adopting new interconnection rules is that interconnection appears on the surface to be a poor regulatory tool. Today's situation is radically different from the telephone wars of a century ago,

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[148] *See* Kevin Werbach, *The Architecture of Internet 2.0*, RELEASE 1.0, Feb. 1999.

which was the last time selective interconnection was a major issue in telecommunications. Moreover, interconnection seems to be a difficult task for regulators, requiring close and ongoing supervision of businesses, and impossibly arbitrary pricing decisions that produce results inferior to the market.[149] While this assessment is not entirely accurate, as will be discussed below, the reality is that the policy debate has moved away from interconnection at the very time it is most important.

C. The Non-Discrimination Turn

Instead of confronting interconnection challenges, the communications policy debate has shifted back further toward non-discrimination. Incumbents argue that they need freedom from non-discrimination obligations on their new broadband platforms in order to have sufficient incentives to deploy. A coalition of public interest groups, broadband competitors, and Internet application and content providers are challenging those assertions. They see non-discrimination protections as essential to the healthy development of the next-generation broadband ecosystem. Both fail to appreciate the difficulties in adapting non-discrimination rules to the current environment of convergence and layered networks.

1. Network neutrality takes center stage

As previously discussed, network neutrality is a non-discrimination rule now promoted primary 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.[150] "Open access" was the argument between approximately 1998 and 2002, that cable modem services should be required to allow unaffiliated Internet service providers access to their broadband platforms.[151]

The open access controversy did not generate nearly the level of public debate as the current network neutrality controversy. This was likely due in large part to the relatively small adoption of broadband at the time. The

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[149] Verizon Commc'ns, Inc. v. Law Offices of Curtis V. Trinko, L.L.P., 540 U.S. 398, 414 (2004) (describing interconnection arrangements as challenging and "highly technical…given the incessant, complex, and costly changing interaction of competitive and incumbent LECs implementing the sharing and interconnection obligations").

[150] Spulber & Yoo, Many Faces, *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.)

[151] *See supra* note 112.

battle also took place relatively soon after the passage of the 1996 Act, during the optimistic days of the late-1990s telecom boom. Opponents of 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 requiring physical interconnection with broadband access networks would be burdensome to implement.

To address these objections, proponents of network neutrality today, such as Tim Wu, expressly prefer non-discrimination to interconnection.[152] Wu gives two primary reasons for preferring 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. 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. So, according to Wu, policy-makers should target non-discrimination directly through rules barring discriminatory conduct.

Though not expressly stated, a third justification for the non-discrimination turn was instrumental. The FCC rejected calls for broadband open access. 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 in the broadband policy debate 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 catalyzed valuable scholarship on the relationship of network infrastructure to higher-level innovation.[153]

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[152] Wu goes farther, arguing that anti-discrimination has always been the core element of telecommunications policy. *See* Wu, Anti-Discrimination Norms, *supra* note 37. 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).

[153] *See* Yoo, *supra* note 10; Brett M. Frischmann, An Economic Theory of Infrastructure and Commons Management, 89 MINN. L. REV. 917 (2005); Barbara van Schewick. *Towards an Economic Framework for Network Neutrality Regulation*, 5 J. ON TELECOMM. & HIGH TECH L ___ (2007).

Network neutrality proponent argue that non-discrimination rules will ensure application and content providers unfettered access to their end-user customers.[154] Their opponents argue that such rules will chill investment and competitive entry in broadband infrastructure, and will close off innovation opportunities built around optimization of broadband networks. At this writing, the outcome of the policy debate is uncertain. Yet even if the network neutrality rules now being debated in Congress and at the FCC are adopted, the end result may not be what either side envisions.

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 environment is problematic. 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.

It should be emphasized that questioning the non-discrimination turn of the current network neutrality argument 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 application and content providers can introduce new services without permission from network owners is superior to the alternative that those operators are now promoting.[155] That claim does not rest on a non-discrimination worldview. In fact, the arguments for this innovation thesis were originally introduced not in the network neutrality context, but as reasons for interconnection-oriented open access requirements.[156]

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[154] In fact, the providers may themselves be customers, through the process of collective peer production. *See* YOCHAI BENKLER, THE WEALTH OF NETWORKS (2006).

[155] *See* LESSIG, *supra* note 1.

[156] *See* Architecture of Internet 2.0, *supra* note 148; Lemley & Lessig, *supra* note 15; Francois Bar et al., *Access and Innovation Policy for the Third-Generation Internet*, 24 TELECOMM. POL'Y 489 (2000).

2. 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.[157] 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 listings in their paid search results and ads on their pages to the highest bidder, "discriminating" against everyone else.

Discrimination, although it sounds harmful, is in fact not normally something regulators today worry about.[158] Although in theory the Robinson-Patman Act prohibits charging similarly-situated customers different prices for the same goods, enforcement of those provisions is generally limited to cases of anti-competitive behavior by companies with market power.[159] 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. There are several potential bases for this distinction: the history of government use of eminent domain power and rate-of-return regulation to grant incumbent operators special economic privileges; the sense than local communications access networks are natural monopolies, where unregulated competition is infeasible; the absence of actual competition for broadband

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

[158] 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.

[159] 15 U.S.C. § 13. The legislation does not apply to telecommunications and Internet-based offerings, which are services rather than products.

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. 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. 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. However, real-world cases will be more difficult.

Given the technical characteristics of the Internet, it would be trivial for a broadband operator to degrade traffic from an unaffiliated application or content provider, and claim its actions were either an accidental outcome of neutral network engineering decisions, or motivated by a legitimate desire to maintain acceptable network performance for its users. Every router decides to drop some packets some of the time. That is the nature of packet switching.[160] 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.

Regulators will have a difficult time determining if such algorithms are motivated by legitimate network management concerns or anti-competitive impulses.[161] 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.[162] 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, 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,

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

[161] *See id.*

[162] *See* Wu, Broadband Discrimination, *supra* note 7.

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.[163] Many ISPs, while not specifically looking to disadvantage such applications, are implementing traffic management approaches to reduce the load they place on their networks.

The point here is not that broadband access providers will not engage in discriminatory practices masquerading as neutral traffic engineering. It is quite likely they will. 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 evaluate claims that that is what is going on.[164] Madison River's blocking of VOIP ports, precluding its customers from using a service that directly competed against its core telephone business, is a much simpler case. That is because 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.[165]

The Shaw-Vonage dispute illustrates both the importance of network neutrality and the difficulty of implementing it. Shaw's argument that it is helping VOIP providers by offering a QOS-enhanced service seems odd when it is being attacked by one of those providers for its actions. Rather, Shaw's imposition of a $10 fee for independent VOIP providers to receive QOS

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[163] See Andrew Packer, The True Picture of Peer-to-Peer Filesharing, *available at* http://www.cachelogic.com/press/CacheLogic_Press_and_Analyst_Presentation_July2004.pdf, at 12.

[164] 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, Doc Searls Weblog, Nov. 11, 2006, *at* http://doc.weblogs.com/2006/11/11#justAsItWasInTheFirstPlace.

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

capabilities that Shaw's own VOIP service receives for free looks like a classic price squeeze.[166]

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? 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, and would have to substitute its engineering judgment for that of the operator in concluding that the QOS service was an anti-competitive action rather than an innovation.

Any blanket non-discrimination rule is likely to quickly run into situation where a straightforward application produces unacceptable results. A feasible neutrality regime would have to operate as a vaguer "thumb on the scale", essentially suggesting that, while some engineering decisions that incorporate application-aware elements into the network are legitimate, the presumption is that such decisions are ultimately harmful to innovation, and should be blocked. Yet such an approach would still 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.

3. 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

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[166] Chicago School antitrust analysis might take issue with such a characterization, on the grounds that Shaw would have no anticompetitive incentive to harm independent VOIP providers with such a fee structure, because any customers it took from Vonage would cost is the $10 in additional revenue, plus any additional value the Vonage application brought to the platform. *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. LAW & TECH. ___ (2003).

mind.[167] There were good reasons for this tradeoff. The PSTN did a perfectly adequate job of handling reliable, low-latency voice telephone traffic. The Internet's designers saw no need to reinvent that wheel. Moreover, file transfer was the primary activity that the researchers who built the Internet engaged in themselves.[168]

Engineering tradeoffs are not absolute. The Internet architecture made isochronous 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 networked deployed by Akamai and others, were layered on top of the infrastructure.

The Internet's end-to-end design philosophy, by deferring application-specific innovations, makes it possible to layer real-time communications on a best-efforts file-sharing network. Network architectures optimized for such services, such as asynchronous transfer mode (ATM) are less flexible, and have generally lost out to IP as a result.[169] 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.[170]

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.[171] 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

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[167] *See* Andrew Orlowski, *How 'Saving The Net' May Kill it*, THE REGISTER, July 17, 2006 (interview with Richard Bennett).

[168] *Id.*

[169] *See supra* note 144. ATM is widely deployed for certain functions within the network, but it never become the uber-protocol its designers anticipated.

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

[171] *See* Wu, Broadband Discrimination, *supra* note 7.

discrimination will prompt competitive entry of other access/backbone hybrids.[172]

In reality, the case for QOS is 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 kinds of QOS approaches the network neutrality debate assumes.

Broadly speaking, there are two approaches to QOS. 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.[173] 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. 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. The IMS vision, in which all traffic flows are tracked and categorized, might create a better economic infrastructure for interdomain QOS.[174] However, as noted above, it would do so at great cost to the Internet's open interconnection norms.[175]

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.[176] Instead, Internet2 researchers are exploring voluntary

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[172] *See* Yoo, Economics of Congestion, *supra* note 10.

[173] 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.

[174] *See supra* note 140.

[175] *See supra* text at note 140.

[176] *See* Stanislav Shalunov & Ben Teitelbaum, Why Premium IP Service Has Not Deployed (and Probably Never Will), Internet2 QoS Working Group Informational

mechanisms, such as allowing users to identify traffic with less-than-average delivery requirements, opening up more capacity for everything else.[177]

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. For this scheme to work, the videos will effectively have to reside on Verizon's network. From Google's perspective, however, Verizon is just one of many broadband access providers. Verizon's customers are only a small 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 each network, which is likely to be a costly proposition. Moreover, 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.[178] Other major Internet companies are doing the same thing, even if not at quite Google's scale.[179] And for those companies not in a position content delivery networks 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 fundamentally non-neutral.[180] 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 (identical treatment of every packet, always).[181] 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-

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Document, May 3, 2002, *at* http://qos.internet2.edu/wg/documents-informational/20020503-premium-problems-non-architectural.html.

[177] *See id.*

[178] *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.

[179] *See id.*

[180] *See* Craig McTaggart*, Was The Internet Ever Neutral?* (paper 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.

[181] *See* Wu, Anti-Discrimination Norms, *supra* note 37.

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 offer value to content providers (who want to deliver a better experience to their customers, and who want to avoid the expense of replication 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. ESPN, for example, offers ESPN 360, a package of proprietary video content for its website to broadband access providers, for a fee.[182] 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.

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. What will degrade the vitality of the Internet is if its fundamental architecture – based around ubiquitous interconnection – starts to move towards something more private and fragmented.

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

The future evolution of the Internet is impossible to predict with certainty. Even if the interdomain QOS dream of the broadband access providers is ultimately realized, there is certain to be a drawn out process between here and there, with different market players taking different approaches. If regulators will find themselves in the middle of this process, as they likely will, they will need clearer tools than non-discrimination to sort out the best approach.

IV. INTERCONNECTION REVISITED

If the non-discrimination turn in communications policy is misguided, how would an interconnection-focused approach avoid the same pitfalls? This section explains how a policy framework based on interconnection would better harmonize with the business and technical realities of the converged network.

A. The new topography of the layered world

1. Flexibility for unstable times

Non-discrimination rules work best in relatively stable environments, in which easily identifiable boundaries make it clear when one party has overstepped them. The common carrier model thrived during the heyday of AT&T as a regulated monopoly. Interestingly, the debate at either end of that period, when the market experienced a sharp disruption, was focused on interconnection. The primary battle between AT&T and independent telephone companies in the early twentieth century concerned the dominant network's selective refusal to interconnect. The breakup of AT&T toward the end of that century likewise focused on interconnection terms with the new independent long-distance operators.

The current environment is doubly disruptive. Horizontally, convergence is fostering competition from new kinds of providers, in both legacy voice telephony and video programming markets as well as the new battleground of broadband access. Vertically, application and content providers are breaking out of their historical position as distinct benefits at the far end of the network. They are becoming economic drivers of the entire connectivity experience, connecting with one another in ways that abstract out or subsume the network platforms beneath.

Enforcing a sharp boundary between "the network" and "everything else" runs counter to the dynamics of this shift. We are gradually moving toward an environment in which every element in the communications environment is a mixture of general-purpose computing hardware and flexible software, with interconnection hooks both horizontally and vertically. The greatest threats are not that one provider will try too hard to connect these pieces, but that barriers will be interposed to preclude such connections. The solution is not to separate this complex interconnected web into its historical component parts, but to allow the transformation to reach its logical conclusion. In short, the best answer is more interconnection.

This section first explains how communications networks are being decomposed from vertical silos into horizontal layers of functionality, with interfaces on all sides. In such an environment, interconnection takes on new importance.[183] Competition can develop not only among vertically integrated bundles that networks assemble, but within and across those stacks as well. Participants at every layer, not just the networks, succeed or fail based on their ability to bring the largest community onto their platform, thus shaping the market. Users of the network can become contributors to its productive activity as well, further expanding the sphere of operation for interconnection.

Current interconnection rules do not reflect these changed circumstances any more than non-discrimination rules. In fact, the existing interconnection regime is so fragmented that it causes as many problems as it solves. When networks link themselves together today, they may be subject to a dizzying array of different pricing rules, depending on the classification of traffic. To take but one example, interstate telecommunications traffic is subject to access charges (transit fees paid to the local carrier in both directions), local telecommunications traffic is subject to reciprocal compensation (equal rates in both directions, based on the volume of traffic), and information services traffic is essentially unregulated.[184]

Such divisions create significant opportunities for strategic behavior, especially when digital technology makes it easy to manipulate traffic.[185] The FCC's efforts to push broadband services into the information services box,

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[183] In the past, I have argued for the use of layered models in Internet policy primarily on non-discrimination grounds. *See* Layered Model, *supra* note 8. The interconnection-focused proposal in this paper shows another dimension of the layered framework, which is a general approach amenable to a range of specific claims.

[184] *See* Digital Tornado, *supra* note 28.

[185] *See supra* note 75.

along with the migration of voice and video capabilities to IP networks, risk making interconnection even more of a strategic weapon for companies with market power, and less of a resource for the kinds of beneficial network dynamics witnessed with the Internet.

Fortunately, as the latter portion of this section explains, there are interconnection approaches that avoid such pitfalls.

2. Convergence of Users and Service Providers

The boundaries of the network are also blurring. Traditionally, the "edge" of the network was the outermost point within the network operator's infrastructure. It was the local switch in the telephone network, or arguably the telephone that originated and terminated calls. Anything beyond that point was a separate, internal activity of the end-user, rather than an element of the interconnected network. Today, the devices at the user premises are digital computing and switching equipment, which extend the network beyond its historical edge.

Most analysis of network policy questions assumes a sharp division between "service providers" and "end-users." Yet it is one of the defining characteristics of the next-generation Internet that such boundaries are eroding. On the individual customer side, information consumers are turning into information producers, through blogs, etc. On the "server" side, content and application providers are morphing from business customers to carrier-like entities themselves, running distributed server farms with links between them. Google is an excellent example. It is buying up dark fiber and helping to build municipal wireless networks, not normally functions of a content provider.[186]

Some of the adherence to the carrier/customer distinction derives from the FCC's enhanced service provider (ESP) exemption.[187] In the 1980s, when AT&T was broken up, the FCC established the regime of access charges to govern interconnection between local and long-distance carriers. Access charges replaced a set of internal transfer payments within the integrated Bell System, which had long been set at deliberately distorted levels. In order to support universal service, Bell, with the complicity of regulators, systematically priced basic residential local service below its perceived "cost",

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[186] Large enterprise users always have also self-provisioned infrastructure for some time. The difference here is that companies like Google are doing more than internal provisioning. They are taking on aspects of the carrier function with regard to the services they offer to their customers.

[187] *See* MTS and WATS Market Structure, Memorandum Opinion and Order, 97 F.C.C.2d 682, 711-22 (1983).

and made up that alleged loss by systematically over-pricing business and long-distance services, perceived as luxuries.

Thus, although access charges did not completely mirror the internal Bell transfer payments, they replicated the general model of extra-high prices. This was possible at the time, because even though long-distance service was being opened to competition, local exchange service remained a protected monopoly. Thus, competitive arbitrage would not undermine the supra-competitive access rates. In addition to their high levels, most access charges were computed on a per-minute basis.

As enhanced serviced began to develop, the FCC had to decide how to treat providers of such services under the access charge regime. Some providers of enhanced services, such as alarm monitoring or answering services, were not traditional carriers. Others were. Some of the most significant, such as IBM, were not carriers, but they offered enhanced services that bore a striking resemblance to communications services, albeit for transporting data rather than voice. They were "carriers" in the sense that they carried messages for their own customers.

The enhanced service providers did not wish to be subject to the inflated access charges. The FCC, concerned that imposition of access charges would harm the nascent enhanced services market, adopted an exemption in 1983.[188] It determined that ESPs should be permitted to purchase services from LECs as business users.

Although expressly phrased as a temporary exemption, the treatment of ESPs remains the same today, twenty years later. It was essentially codified by the 1996 Act in its treatment of information services. The ESP exemption produced many significant benefits. The dial-up Internet industry would never have succeeded in the same way without the possibility of flat rates, and the opportunity for ISPs to avail themselves of the customer-focused protections of common carriage.[189]

Nonetheless, allowing ESPs to purchase services under regulated business line tariffs rather than under regulated exchange access tariffs does not mean ESPs actually *are* end-users. And with content and application providers at the edges of the Internet becoming network operators themselves, the conceptual distinction between users and service providers becomes difficult to defend. Non-discrimination rules focus on the relationship of service providers to their customers; if some of those customers actually function more like network-based competitors, a

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[188] *See id.*

[189] *See supra* note 61.

difference approach is called for. The traditional policy framework for such provider-to-provider interactions is, of course, interconnection.

3. The Value of Routing Around

Interconnection rules can address many of the concerns that network neutrality proponents raise, because they create opportunities to "route around" bottlenecks that incumbents establish.[190] 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. 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. Because of its design, 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.

As activist John Gilmore recognized, the Internet also routes around other types of blockages. When governments were attempting to impose restrictions on Internet content, Gilmore famously declared that, "The Internet treats censorship as damage and routes around it." If a certain service provider will not deliver traffic from a website or user, routers will automatically reconfigure paths so that the traffic is delivered from other service providers.

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 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

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[190] *See, e.g.*, David Gilo, *A Market-Based Approach to Telecom Interconnection*, 77 SOUTHERN CAL. L.REV. (2003).

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.[191] 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.

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.[192] 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 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.[193]

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[191] This is similar to the Shaw-Vonage case mentioned above. *See supra* note 165.

[192] *Cf.* CLAYTON CHRISTIANSEN, THE INNOVATORS DILEMMA.

[193] *See* Kevin Werbach, Meta Service Providers: The Internet's SS7 Network, RELEASE 1.0, December 1999.

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. 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 concerns Internet-based services that compete against the operators' core businesses. The early cable modem service leader @Home imposes 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.

In platform economics, situations involving substitutes rather than complements are a recognized exception to the general rule that platform owners are likely to have efficient incentives to maximize welfare in the management of their platforms.[194] 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 complements, restricting the potential for innovation. Jim Speta inadvertently makes this point in attacking proposals for open

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[194] *See* Farrell & Weiser, *supra* note 166.

access to cable broadband networks.[195] 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.[196] 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.

4. The logical layer

A significant difference between traditional telecommunications interconnection and the converged interconnection of the future is the importance of the logical layer of the communications network stack.[197] The logical layer represents the software and systems that define how information moves from place to place on the network.[198] It thus includes the addressing databases, interdomain routing protocols, traffic engineering systems, overlay CDNs, and other mechanisms. Where the Internet Protocol is the spanning layer that ensures the flexibility of the Internet architecture, the logical layer is likely to serve this function for converged networks.[199]

In the terminology of NGNs, the question is not so much whether traffic can pass between networks, but whether entrants can gain access to the "control plane" of the incumbent infrastructure.[200] This includes systems such as the addressing databases that allow for a seamless user experience, regardless of the complexities of underlying transport, as well as the overlapping mechanisms for routing, traffic shaping, and caching, which together determine the quality of the end-to-end experience. The access tiering proposals of incumbent telephone companies are effectively a refusal

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[195] *See* James Speta, *The Vertical Dimension of Cable Open Access,* 71 COLO. L. REV. 975 (2000).

[196] *Id.*

[197] *See* Kevin Werbach, *Breaking the Ice: Rethinking Telecommunications Law for the Digital Age*, 4 J. ON TELECOMM. & HIGH TECH. L. 59 (2005).

[198] *See* Layered Model, *supra* note 8. Yochai Benkler and some other commentators use logical layer in a different sense, to encompass all the software that sits between physical networks and content. For the goals relevant herein, the distinction between a customer-facing application layer and a provider-facing logical layer is important.

[199] *See* Clark et al, *supra* note 101.

[200] *See* Rob Nicholls, *Interconnection of Next Generation Network – A Regulatory Perspective* (on file with author).

to interconnect logical-layer QOS systems.[201] How these systems might efficiently be made accessible to other networks, and under what terms and conditions, should be the starting point for an interconnection-focused alternative to the current network neutrality debate. While precedents such as common carriage are relevant, they are generally too flat to capture the important interconnection questions in a layered world.[202]

Such a conversation is not a new idea. Nearly a decade ago, it was the basis for the open access debate around cable broadband networks. Open access was cast as a matter of mandatory physical interconnection between networks, entailing detailed FCC price regulation.[203] In the traditional silo concept of network regulation, there was no conceptual apparatus to disentangle physical interconnection from access at the logical layer.[204] To the traditional way of thinking, either traffic flows or it doesn't, and the central issue is what price can be charged for that traffic flow. In a converged world, by contrast, many systems for managing and interpreting traffic flows operate simultaneously. Proponents of open access to cable broadband were arguing for access to the private caching and routing systems that differentiated the rest of the Internet.[205] The conversation never got very far, with the exception of narrow open access requirements on Time Warner as part of its merger with AOL.[206]

A reinvigorated interconnection-based policy approach would start where cable open access left off. Many specific questions would need to be addressed in particular cases; an interconnection focus does not magically eliminate all the challenging issues in communications policy. However, interconnection rules need not be perfect to be valuable. The more paths there are for innovators and broadband competitors to tie into the network of networks, the more likely it is that competition will ensure the efficient outcomes that regulators cannot precisely map.

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[201] *See supra* text at note 131.

[202] Nonetheless, common-carrier-based interconnection proposals of James Speta and Eli Noam provide useful analytical tools for such an approach. *See* Speta, *supra* note 12; Eli M. Noam, *Beyond Liberalization II: The Impending Doom of Common Carriage*, 18 TELECOMM. POL'Y 435 (1994).

[203] *See* James B. Speta, *Handicapping the Race for the Last Mile?: A Critique of Open Access Rules for Broadband Platforms*, 17 YALE J. ON REG. 39 (2000).

[204] *See* Breaking the Ice, *supra* note 197.

[205] *See* Architecture of Internet 2.0, *supra* note 148.

[206] *See* Patrick Ross & Evan Hansen, AOL*, Time Warner Complete Merger with FCC Blessing*, CNET NEWS.COM, Jan. 11, 2001, *at* http://news.com.com/2100-1023-250781.html.

B. Interconnection without Micromanagement

The traditional objection to interconnection rules is that they are complicated and intrusive to implement. The two problematic elements of interconnection are the mandates for physical alteration of networks, and the need for rigid pricing rules. Fortunately, properly designed interconnection regimes for converged networks can overcome both difficulties.

As an initial matter, there are several examples of successful FCC-mandated interconnection regimes:

- The Part 68 rules for interconnecting devices with the telephone network.
- The *Computer III* CEI rules for access to underlying network features necessary to provide enhanced services.
- The equal access rules that allowed for long-distance competition.
- The program access mandates that cable operators allow competitors to carry content in which they have a financial interest.
- The must carry rules requiring cable operators to retransmit broadcast television networks.

The first three regimes involve different types of services that use the public switched telephone network, while the other two involve cable television, showing that interconnection is a concept that spans traditional regulatory silos. The rules involved are far from perfect, and of course there have been disputes over their implementation. The point is simply that interconnection mandates can succeed in their objectives, and the FCC has experience crafting interconnection rules to address challenging competitive situations.

The most significant counter-example is the failed unbundling regime of the 1996 Act. It bears noting, however, that other countries such as Japan experienced significantly different results when they adopted unbundled network element requirements around the same time as the US. Moreover, the interconnection difficulties with the 1996 Act primarily involved the definition and pricing of unbundled network elements, rather than the core interconnection mandate itself. There are several reasons to think that a new more general framework for converged interconnection would not suffer the same fate.

1. Virtual interconnection

Verizon Communications v. Law Offices of Curtis V. Trinko (*Trinko*) offers a good summary of the mainstream view of interconnection. In *Trinko*, the Supreme Court considered whether entrants could seek interconnection with incumbents on antitrust grounds, independent from the 1996 Act.[207] The plaintiffs, a group of CLECs and their customers, sought antitrust relief on essential facilities and refusal to deal theories. The Court rejected such claims. It held that the comprehensive access regime of the 1996 Act effectively precluded parallel antitrust enforcement to achieve the same goals.[208] The Court emphasized that interconnection was a complex, technical subject better suited to administrative than judicial oversight.[209] The thrust of *Trinko* is that interconnection obligations require the kind of expansive, ongoing regulatory intervention typified by the 1996 Act.

Going back to the common law notion of common carriage, interconnection was only required when it involved a hand-off at an existing meet-point, such as a railroad terminal. It did not obligate railroads and other common carriers to construct new facilities in order to link up with competitors.[210] Avoiding required build-out for interconnection finessed the question of whether interconnection mandates might be considered a taking of property under the Fifth Amendment, requiring the payment of just compensation.[211] Furthermore, it would get the government deeply involved in private decisions about how to deploy capital and construct infrastructure.[212]

For converged IP networks, however, interconnection does not implicate the same physical intrusion as it did for telephone networks. On a packet-

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[207] See Verizon v. Trinko, 540 U.S. 398 (2004). *See* Adam Candeub, *Trinko and Re-Grounding the Refusal to Deal Doctrine*, 66 U. PITT. L. REV. 821 (2005); Philip J. Weiser, *The Relationship of Antitrust and Regulation in A Deregulatory Era*, ANTITRUST BULLETIN 50 (2005).

[208] *See* Trinko.

[209] *See* Trinko.

[210] *See* Candeub, *supra* note 9, at 394.

[211] Some scholars have sought to disinter this argument in the context of telecom reform, in the form of deregulatory takings. *See* J. GREGORY SIDAK & DANIEL F. SPULBER, DEREGULATORY TAKINGS AND THE REGULATORY CONTRACT: THE COMPETITIVE TRANSFORMATION OF NETWORK INDUSTRIES IN THE UNITED STATES (1997) (arguing that imposing a zero rate for interconnection constitutes a taking without just compensation). However, as Adam Candeub has shown, interconnection obligations *per se* are not takings without a requirement of compensation, because interconnection benefits both networks. *See* Candeub, *supra* note 9.

[212] *See* Candeub, *supra* note 9

switched network, each transmission does not require dedicated capacity. Handing off traffic between networks, the exception in traditional telephone systems, is the rule for the Internet. Moreover, today's converged networks are by nature linked together through a dense web of connections, with the potential for traffic to flow through a large number of alternate paths. A mandate that two networks interconnect on particular terms is therefore not necessarily a requirement for physical modification.

In today's environment, interconnection 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.

2. Coasian pricing

The sticking point in most interconnection negotiations is likely to be the price. The problem with most interconnection pricing regimes is that they require regulatory determination of appropriate charges. If there is no market price for interconnection, regulators must decide what price would obtain in a hypothetical market. Despite their best efforts, regulators suffer from limited access to information and the various difficulties that public choice theory highlights. Keeping track of traffic volumes in order to assess interconnection charges is also costly in itself, especially as the level and complexity of traffic increases.

The history of common carrier regulation of telephone companies shows both the benefits and difficulties of price regulation for interconnection. Carriers were required to offer their services under tariffs, which regulators reviewed in order to determine if rates were "just and reasonable." Carriers were forbidden from deviating from the tariffed rate.[213] The filed rate doctrine, like many regulatory requirements adopted to restrain incumbents, has the perverse effect of protecting them.[214]

For all these reasons, the FCC in recent years has expressed great interest in bill and keep models for interconnection. The Commission released two staff working papers proposing variations on the bill and keep approach.[215] It launched a proceeding in 2001 seeking to move to a unified intercarrier compensation regime, with bill and keep featured prominently among the options.[216]

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[213] *See* Rossi, *supra* note 86.

[214] *Id.*

[215] *See supra* note 87.

[216] *See* Developing a Unified Intercarrier Compensation Regime, *supra* note 87

A paper by two FCC economists, Jay Atkinson and Christopher Barnekov, offers an approach that captures the benefits of both traditional interconnection pricing and bill and keep.[217] 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. They 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.[218] 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.[219] 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.[220] However, once interconnection is mandated, a quasi-Coasian bargaining process can produce efficient interconnection pricing without dragging in regulators.[221]

3. Procedural rules

Beyond the substance of interconnection agreements, procedural rules are critical. For example, under the 1996 Act, local interconnection agreements are to be privately negotiated in the first instance, and only subject to state arbitration, FCC legal interpretation, and judicial oversight when those private negotiations break down. However, the framework provided too many opportunities for delaying and challenging interconnection arrangements. Contentious state and federal rulemaking, followed by waves of lawsuits and remands, effectively provided the terms for interconnection under the 1996 Act, not private negotiation. Both entrants and incumbents engaged in strategic behavior around regulatory and judicial decisions, rather than treating interconnection as a business

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[217] *See* Jay M. Atkinson & Christopher C. Barnekov, *A Coasian Alternative to Pigovian Regulation of Network Interconnection,* (working draft, Sept. 2004), *at* http://web.si.umich.edu/tprc/papers/2004/348/CoasianAlternative040901b.pdf#search=%22atkinson-barnekov%20coasian%20pigovian%22; *see also* Candeub, *supra* note 9 (describing the policy implications of the Atkinson-Barnekov model).

[218] *Id.*

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

[220] *See supra* note 24 and accompanying text; Candeub, *supra* note 9.

[221] *See* Atkinson & Barnekov, *supra* note 217.

negotiation. The delay and confusion that resulted contributed significantly to the failure of the 1996 Act's local competition vision.

An effective set of interconnection procedural 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. The business terms of these agreements, however, are left up to the companies involved. Although on at least one occasion a dispute over must carry terms resulted in temporary removal of a network from a cable system,[222] for the most part these negotiations have proceeded smoothly and outside the public eye.

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 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

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[222] *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.

cases where parties go to arbitration, mandatory disclosure of contractual terms will improve transparency of the interconnection process and enhance efficiency of future negotiations.

C. Interconnection and Deregulation

A final benefit of an interconnection-focused approach is that it bridges the gap between advocates of open broadband networks and proponents of deregulation.[223] Even opponents of most traditional telecom regulation acknowledge the need for interconnection obligations. For example, Richard Epstein, a noted deregulation proponent, recently expressed his view of the 1996 Act that, "Going forward we should rethink the question from scratch and devise a new plan under which the chief role of the FCC is to oversee interconnection arrangements."[224] Peter Huber's seminal *Geodesic Network* report, advocating removal of post-divestiture restrictions on the Bell Operating Companies, similarly urged that interconnection be the remaining foundation for communications regulation.[225] Huber even recognized that interconnection would have to occur at multiple layers of the digital communications stack.[226]

Some deregulation advocates challenge the need for any mandatory interconnection obligations. The most cogent advocates of this position in light of the technological changes of the converged network are Daniel Spulber and Christopher Yoo.[227] Spulber and Yoo attack mandatory access obligations on the grounds that they impose transaction costs that distort strategic and architectural decisions by network owners.[228] Specifically, they assert that access regimes "forc[e] networks to externalize functions that would otherwise be carried out within the boundary of the firm," and in so doing "greatly increase the complexity of the decisionmaking process" about network architecture.[229]

Spulber and Yoo make the important points that networks are complex, and that business decisions are also architectural decisions in the face of

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[223] *See* Wu, Broadband Debate, *supra* note 13.
[224] *See* Epstein, *supra* note 6.
[225] *See* Huber, Geodesic Network, *supra* note 14.
[226] *See id.*
[227] Spulber & Yoo, Many Faces, *supra* note 16. *See also* Daniel F. Spulber & Christopher Yoo, *On the Regulation of Networks as Complex Systems: A Graph Theory Approach,* 99 NORTHWESTERN L. REV. 1687 (2005).
[228] *See id.*
[229] *See id.*

uncertainty.[230] However, unbridled decision-making by network owners will not necessarily generate efficient results either. Precisely because network-wide effects are the complex result of interconnecting pieces, some of which are outside of the control or predictability of any operator, there is never a "right" answer that can be implemented with confidence. The network is constantly changing. Prices for transmission, switching, and storage are plummeting, but usage is skyrocketing at the same time. All network operators in the converged digital environment are constantly making bets about the future. If the past is any indication, these bets are often wildly off the mark.

In functioning competitive markets, such as the Internet backbone, this leads companies to adopt politics of "rough justice", involving significant flexibility. Hence, the Internet peering and transit regime, which uses general concepts such as "Tier 1 networks" that turn out to be imprecise in application. Moreover, most operators significantly overprovision their networks, because leaving a cushion of excess capacity is the most reliable and least expensive method to deal with unpredictable demand. Contrast this with the precisely calibrated, service-specific, permission-only vision of IMS.

The ultimate question is how much government needs to intervene in order to achieve such a result, and, secondarily, what form such intervention should take. There are negative precedents on both sides. The 1996 Telecom Act's micromanaged approach to interconnection clearly failed to deliver its promised results. However, so did the opposite approach of relying on general-purpose post-hoc antitrust rules, when it was tried in New Zealand.[231] An interconnection focus is a general rule that, by definition, does not tell policy-makers how to decide every specific case. However, it offers them the tools to attack the right problems, and to do so consistent with the business and technical dynamics of the marketplace.

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[230] *See id.*

[231] See The Clear-Telecom Dispute, at 242; Jacques Cremer, Patrick Rey & Jean Tirole, *Connectivity in the Commercial Internet*, 48 J. INDUS. ECON. 433 (2000), at 441 n.14. *See also* DAMIEN GERADIN, CONTROLLING MARKET POWER IN TELECOMMUNICATIONS: ANTITRUST VS. SECTOR-SPECIFIC REGULATION

V. CONCLUSION: FROM UNIVERSAL SERVICE TO UNIVERSAL CONNECTIVITY

The time has come to make universal connectivity the pre-eminent goal of a new converged communications policy. Universal connectivity, like universal service, implies an anywhere-to-anywhere network. However, it escapes from the legacy assumption of a defined offering (historically, voice telephony) provided by a facilities-based "service provider." Connectivity is the ability to access any node on the network, not just as a physical matter, but potentially including logical, application, and content links across networks. Policy-makers should seek to give all users the ability to engage in communications-based activities of their choosing. The only way to achieve that goal is to ensure that networks connect.