Razing the Silos:
An Argument for a Layered Communications Regulatory Framework

I. INTRODUCTION

It is said that change is the only constant. This applies to most everything in our world, including mass communications and the technology underlying each mode of communication. Two hundred years ago, long distance communication was only accomplished using ink on paper. One hundred years ago, long distance communication was limited to that original ink on paper method, a telegraph,[1] or a telephone.[2] Today, our world is constantly interconnected with a variety of devices and technologies that conveniently provide instant communication across far distances with mobility that no longer requires constant attachment to a physical place.

One thing that has not changed much though is how Congress regulates mass communications. The federal government regulates each mode of communication separately, a practice that began in 1888 when Congress gave the Interstate Commerce Commission power to regulate subsidized telegraph lines.[3] In 1910, Congress created nominal regulations of radio and later passed the Communications Act of 1934 to more heavily regulate radio and telephone under the auspices of the Federal Communications Commission (FCC).[4] Because of the technical differences between radio and telephone, the two were regulated by two separate sets of regulations.[5] When television was later introduced, it was regulated alongside radio because the technologies were very similar, utilizing radio frequency for communication.[6] Subsequently, as different types of communication have emerged, each has been regulated as a separate and distinct category based on the services provided.[7] The FCC first decides whether a particular activity is a "cable service," "information service," "telecommunications service," and so on and then goes about defining a set of regulations for that new technology based on the kind of service the technology provides.[8] As a result, broadcast television, cable television, wired telephone, and

cellular telephone each must adhere to its own respective, distinct set of regulations. This reflects the fact that lawmakers simply created a new set of regulations for each new mode of communication as it arrived.[9] The result is the mass of service-specific laws known as the Telecommunications Act.[10] As Justice Jackson proclaimed, each form of communication "is a law unto itself: The moving picture screen, the radio, the newspaper, the handbill, the sound truck and the street corner orator have differing natures, value, abuses and dangers."[11] As a result, Congress and the FCC treat each type of communication service differently when passing laws and regulations, including those that affect speech rights.

In the past, a regulatory approach based on the different forms of communication worked because very noticeable distinctions existed between the technologies involved and the physical medium used to carry each communication signal.[12] For example, copper wire carried voice telephone service, while coaxial cable carried cable television service. There was very little overlap between the different communication forms, and therefore, policy makers established regulations to govern each distinct media form.[13]

During the past thirty years, however, technology has changed tremendously and new communications models have been introduced that make the traditional regulatory model and its silo approach to isolating distinct communication technologies obsolete. Now held together by outdated notions, sentiment, and gumption, those regulations are as durable as dilapidated grain silos held together with spit, twine, and duct tape.

One of the greatest changes to communication in recent years has been the introduction of the Internet. Unlike any of our other communications networks the Internet was designed to operate in a decentralized fashion. The result of a cold-war project of the Defense Advanced Research Project Agency (DARPA),[14] its purpose was to build a communication system that

could withstand losing large portions of the underlying network with minimal disruption in the advent of a nuclear war.[15] As a result, the Internet was designed to continue functioning even if much of the constituent networks were taken out due to catastrophic failure.[16] That design was unprecedented at the time because it was open, minimalist, and neutral.[17] In contrast, such flexibility is missing from the design of telephone and cable networks, which rely upon a closed, physical, uninterrupted, point-to-point connection between a transmission facility and telephones or television sets.[18] In addition, the basic protocol of information exchange, Transfer Control Protocol/Internet Protocol (TCP/IP), is non- proprietary.[19] Like a set of universally agreed upon grammatical rules, TCP/IP is in the public domain and can be used by anyone.[20]

The Internet is considered to be "open" because it is willing to accept almost any kind of computer or network that wishes to join its overarching universal network of networks.[21] For example, computers from Santa Clara University, AT&T, the United States Department of Defense, and individuals can all interconnect.[22] Another word for this openness is interoperability, which means that hardware and software are designed to enable information to flow freely throughout the network without bottlenecks or barriers.[23] Without this principle, users would remain stranded on remote data islands, able to communicate only with fellow islanders who use the same closed system, instead of getting access to the resources of their choice and communicating with anyone anywhere.[24] In terms of efficiency, an open, interoperable network is generally preferred to a series of smaller, exclusive networks.[25]

The Internet design is "minimalist," because it requires very little of the computers that want to join.[26] Theoretically, a computer only needs to connect to another host computer that is connected to the Internet and that operates the same protocols that govern the exchange of data.[27]

Finally, the Internet is "neutral" between applications.[28] Unlike the Internet, some older communications networks were designed specifically for a given, narrow purpose and, as a result, distinguish between different applications. For example, the telephone network was designed for one specific purpose: transferring voice signals. That purpose is reflected in the applications traditionally allowed on its network.[29] In contrast, the Internet treats email, downloads, voice, and other applications similarly.[30] This neutrality has allowed new and better applications such as email, the World Wide Web, peer-to-peer technology, and Voice Over Internet Protocol (VOIP) to evolve and replace older applications.[31] The Internet's neutrality also provides a future opportunity for other new applications to replace the current batch efficiently.

WiFi is one of those new emerging Internet related technologies that affects our notion of communication networks and breaks through the artificial regulatory boundaries currently in place. WiFi is simply a technology that uses unlicensed radio spectrum to provide Internet access.[32] As a result, free WiFi service has sprouted up in urban,[33] suburban,[34] and rural[35] America, providing Internet access to any person with a computer that has a wireless network card, a standard feature of many new computers today.[36] Previously, the primary way people could connect to the Internet was by having a computer leashed by a wire plugged into the Internet. WiFi is on the rise; today, over one-third of all Internet users in the United States have logged onto the Internet using a wireless connection either around the house, at their workplace, or someplace else.[37] Most notably, WiFi challenges justifications used by the FCC and courts to support content-specific regulations of broadcast media. Before I tackle that issue, I will provide some background.

II. SILO REGULATION V. LAYER REGULATION REGIMES[38]

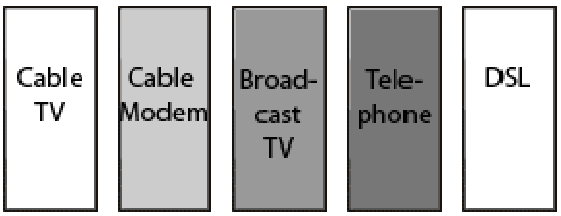
Traditionally, the Federal government has taken a silo approach to communications regulation. In other words, each mode of communication is considered and regulated differently. In contrast, a layered regulatory approach would raze those distinctions between the types of media and treat similar communication forms and services similarly. Following the design of modern communications networks, a layered model would focus on the functional parts of the network.

A. Silo Regulatory Regime

The traditional communications regulatory framework isolates and segregates each different form of communication. Several terms currently are used to describe this traditional framework, including "conduit-based," "stovepipe,"[39] and "silo,"[40] among others. I prefer the term "silo" since it provides an easy visualization for this traditional approach. Think of grain silos rising above the plains like a row of overseers. Each silo holds and isolates a specific type of grain, protects it from the elements, and prevents mixing with the other grains.

Similarly, traditional communications regulatory silos isolate individual forms of communication – as well as their respective sets of regulations – from each other.[41] There are silos for broadcast television and radio, cable television, satellite television, cable internet access, digital subscriber line (DSL) Internet access over a telephone line, telephone, and so forth. Figure 1 provides a visualization of the silo model.

Figure 1: Visualization of Silos



As a result of the silo approach, each mode of communication is controlled by a separate set of regulations, even those that carry the same, exact content. For example, broadcast television and cable television both show audio/visual content on a television set, yet each is governed by different content regulations.[42] Those content regulations in turn receive different standards of review by courts, which allow the government to continue its disparate treatment of the two.[43]

In the same way, the current regulatory approach also isolates and provides differential treatment of communications services using the same physical conduit. For example, one set of regulations govern cable television while a separate set of regulations govern cable Internet access, even though both media forms utilize the same physical cables.[44] Similarly, regular land line telephone service and DSL Internet service both utilize the same copper wiring, yet the telephone service is considered a common carrier while DSL service is not.[45] As a result, telephone service is provided as a common carrier while DSL Internet is not.

The separated silo model has led to odd policy decisions and regulatory gaps in coverage between similar services and modes of communications. For example, DSL Internet access, which uses the telephone system, was considered and regulated as a telecommunications service for several years while comparable, competing Internet access via cable systems was considered an information service and regulated as such.[46] As a result, DSL services were subject to

common carrier rules as a telecommunications service while cable Internet service was not, even though both DSL and cable Internet offered access to identical content.[47]

B. Layered Regulatory Regime

In contrast to the silo approach to regulations, a layered regulatory framework would raze distinctions between the types of communication and instead focus on the functional portions of a communications network used to transfer content.[48] Such a layered regulatory approach would treat similar content similarly, independent of source, service type, and destination.

Using a layered regulatory model is not a new concept. Layering is a well established concept in engineering and is used in the design of modern communications networks.[49] Layered models serve to enhance the development and management of a network's architecture.[50] Each independent layer, or level, of a network's architecture addresses different functions and responsibilities.[51] In turn, the layers work together, as a whole, to maximize the performance of the process.[52]

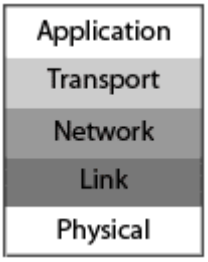
Several legal and policy analysts have advocated that communications regulatory policy should follow suit and likewise be designed to fit the design of the communications networks it is meant to regulate.[53] Not only would it fit the design of the network, but a layered regulatory model would also mirror the way that networks and markets actually operate.[54] It can even be said the FCC has some experience with a layered regulatory approach, since the distinction between basic and enhanced services stemming from *Computer II* was a partial implementation of a layered approach.[55]

1. Modern Communication Network Design

Modern communication networks are designed using a layered reference model.[56] A reference model is a common framework for defining the specific set of protocols to be used

with a particular application/network combination.[57] The resulting set of protocols is then known as the protocol stack for that application/network combination.[58] Two primary layered reference models are used or cited in modern communications network design and cited by scholars.[59] The first to come along was the seven-layered Open Systems Interconnection (OSI) model.[60] The second is the five-layer TCP/IP reference model, which has mostly subsumed the earlier OSI model.[61] The TCP/IP reference model is based on the design of the TCP/IP protocol stack used with the Internet, hence the name.[62]

Figure 2: TCP/IP Reference Model



The TCP/IP reference model consists of the application, transport, network, link, and physical layers.[63] At the top of the model is the application layer which provides the user with access to a range of multimedia communication services, such as World Wide Web (WWW) access, email, instant messaging, telephony, and videoconferencing that he or she then uses to access the content.[64] The second layer down, the transport layer, translates the content of the message to the recipient computer and masks differences between the services offered by the various network types and the application layer.[65] It also provides the application with a network-independent information interchange service and is responsible for directing each information flow to and from the related application within a computer.[66] The third layer down, the network layer, deals with how the source information gets from one end-point to another across the total network.[67] It does this by forming packets of information by dicing the source information into smaller pieces and appending each with the unique network addresses of the

source and destination end points.[68] The fourth layer down, the link layer, converts the packets into raw bits of information in binary form (ones and zeros), indicating the start and end of each block within the source data stream and for error detection in packet-switched networks.[69] The fifth and final layer, the physical layer, is concerned with how binary information associated with an application is transmitted to the network interface.[70] The foundation of this reference model, this layer provides a physical means by which to transmit raw bits of information.[71]

2. Layered Regulatory Framework

A new regulatory framework should be formed by following the lead of modern network designs and model itself after the TCP/IP reference model, described above. By creating regulatory layers based on functions of a network, the regulatory process would better take into consideration the similarities and differences between the different modes of communication and the technology platforms that underlie each and thus eliminate the disparate "silo" regulations that arbitrarily govern identical content differently. The model that works best contains four layers: content, application, logical, and physical. Kevin Werbach has already proposed such a model.[72]

Figure 2: Visualization of Layers

a. The Content Layer

The top layer of this model is the content itself. This includes anything that may be considered speech in the First Amendment context such as a television program, telephone

conversation, a photo, a song, and even this paper. Under a layered regime, similar content would be regulated similarly, and thus, indecency regulations would apply equally between cable and broadcast television because they broadcast the same audio/visual content. Such regulations also would need to consider the Internet since it can also broadcast the same content. The greatest impact of a layered regulatory regime will be on FCC regulations of indecent content in broadcast media which currently receives the lowest level of court review,[73] unlike other forms of communication such as cable television or the Internet.[74] Under a layered regulatory model, courts will review all regulations as they do non-broadcast media today, discussed below.

b. The Applications Layer

Below the content layer is the applications layer, which encodes and decodes the communications signal and allows the end-user to determine how they wish to access the content.[75] The application layer includes familiar functions such as voice, video, email, bit torrent, and World Wide Web (WWW) access.[76] Under a layered regulatory approach, similar applications would be regulated similarly. Voice applications over the traditional telephone system and voice over Internet Protocol (VOIP) would be regulated similarly. In the same vein, WWW access, whether accessed over computers or cellular phones would conform to similar regulations. In other words, similar applications would be regulated similarly, regardless of the delivery mechanism.

c. The Logical Layer

The next layer down is the logical layer. Here sits all the code that directs and routes a communications signal to its destination. It includes the management and routing functions that keep information flowing smoothly within and across networks.[77] The classic example is the telephone addressing system. Historically, the logical infrastructure of telephone systems was

tightly coupled with physical infrastructure because there was a lack of competition and a focus on voice services in the application layer.[78] However, that is not the case with the Internet, which is competitive and focused on transporting any and all data. As a result, the logical layer has not needed to be regulated much in the Internet realm because the industry has done a sufficient job preserving open standards and competition.[79] Some regulation will occur at the logical level to maintain distance between it and the physical layer, and to foster continued open standards and competition.

d. The Physical Layer

The physical layer serves as the foundation underlying all other layers. This layer includes the physical infrastructure, as well as the actual physical medium over which content is transmitted.[80] The physical infrastructure of the communications network includes any switching or transport systems within an entire network, whether it is a local area network or backbone network.[81] The physical transmission medium is most commonly air, glass, or wire, but can include any material that transmits electromagnetic energy in the form of a signal.[82] Two common signals in the physical layer are a beam of light guided by a glass fiber (fiber optics) and electromagnetic waves propagated through free space (broadcast signal).[83] Naturally, the physical layer is limited by the laws of physics. The greatest amount of regulation will occur at this level because of concerns of scarce radio spectrum, the heavy cost of deploying a network, and the vulnerability of the physical layer to monopolization.

Under the current silo model, the application, logical, and physical layers generally are treated as an integrated unit, owned and controlled by the same person or company. The most basic example of this is the cable system. From the central control facility to the home, the whole process is controlled by that one company. First, the cable company determines what channels

(content) to make available to viewers. Next, it encodes the content into the format necessary for transmission (applications). The company broadcasts the signal over the coaxial cable network to the viewer's home (logical and physical layers) where it is then decoded by a set top box programmed by the cable company (applications) and relayed to the television set to be displayed. Only the television is not controlled or owned by the cable company.

Kevin Werbach has advocated further that lawmakers use his layered model to reformulate communications policy with the Internet at the center.[84] Likewise, Richard Whitt has argued for building our laws around the Internet, and "not the other way around."[85] I disagree only so far as to say that the regulatory framework should not be built around any one particular medium. Just as the current silo approach no longer meets our needs partly because it was built around existing modes of communication, the new framework needs to be built to withstand the test of time and remain flexible to accept changes and new forms of communication as they emerge. Leaving the layered regulatory model neutral to the mode of communication should extend the useful life of the model.

Several criticisms of the layered regulatory approach are that it lacks market-based checks and balances,[86] results in a loss of technical neutrality,[87] and stifles innovation. [88] I did not find any legal arguments against a layered regulatory model. The first criticism of the layered regulatory approach is that it lacks the benefits of an open marketplace, relying instead on ill-equipped regulators to set prices on unbundled services.[89] Furthermore, as the argument goes, government intervention in pricing reduces network efficiency because it precludes companies from realizing economies of scale, scope, or other material benefits across unbundled services, and therefore such intervention should be disfavored.[90]

Such an argument considers the marketplace a panacea when it is not one. A key assumption in this criticism is that an open marketplace exists in the current communications industries and an open marketplace is not possible under a layered regulatory model because it places less reliance on market mechanisms than the silo regulatory model does.[91] Currently, telephone and cable companies have monopolies or duopolies in most areas in which they operate. It is hard to believe that an open market can exist to set prices where there is no counter balance to the power of a monopoly. For instance, the Government Accounting Office found that communities with cable overbuild competition experience lower subscription rates (an average of twenty-three percent lower for basic cable) and higher quality service.[92] Unfortunately, overbuilders operate in very few markets,[93] have difficulties competing for access to programming and access to multiple dwelling units, and have a difficult time meeting franchise requirements imposed by local municipalities.[94] Concerns of monopoly power also have led Congress to order the FCC to keep an eye on communications industries and compile annual reports regarding its findings.[95] As such, concerns that a layered regulatory model will interfere with the market place in setting prices are unfounded since the market place today shows little influence in setting prices thanks to the monopolistic advantages of cable monopolies. The economic effects of a layered regulatory model should be fully studied before arguments are made that the model interferes with the market place.

A second criticism is that the layered regulatory model results in a loss of technical neutrality. The great fear here is that the layered model will place regulators in the position of selecting technical winners and losers, instead of relying upon the market, since specific technical elements will need to be chosen and maintained regarding the interaction between the layers.

Contrary to the fear that regulators will choose technical standards under a layered regulatory model, there is no absolute requirement for regulators even to be involved in considering or designing technical standards. Rather, non-governmental, independent standards bodies can be delegated responsibility to choose technical standards. The Internet provides a good example of how this would work. A number of independent standards organizations, rather than governmental regulators, set certain fundamental standards for the Internet, guide its operation, and perform administrative and support activities.[96] Regulators' roles can be limited to setting timelines for standards to be developed and making sure the independent standards bodies represent all constituencies involved, such as service providers, equipment manufacturers, academics, and other experts in a field.

The third criticism is that a layered regulatory model will stifle innovation because regulatory oversight and approval processes will hinder deployment and development of new capabilities and services based on cross-layer technologies.[97] Moreover, as the argument goes, the combination of regulatory inertia and the interest of industry incumbents will make it difficult for new technologies and techniques to be introduced once any particular standard is adopted and approved.[98] Critics assert regulations will influence the direction and pace of innovation further by directing investment only toward certain technologies.[99] Combined, all these actions will supposedly increase development costs and introduce potentially inefficient market dynamics into the process of innovation.[100]

Such arguments ignore history and reality. Monopolies are even more likely to stifle innovation than regulations related to a layered regulatory model. For example, before AT&T was broken up in 1984, innovation with regards to the telephone network was controlled almost entirely by AT&T.[101] The only way to change how a communications network was designed or

implemented was to work for AT&T or convince AT&T that the alternative design had merits.[102] Paul Baran, a RAND researcher, proposed an early design idea for the Internet in the early 1960s.[103] AT&T provided the strongest resistance to Baran's design, summarized with this outburst from a representative of AT&T: "First, it can't possibly work, and if it did, damned if we are going to allow the creation of a competitor to ourselves."[104] In this way, the monopoly that was AT&T served as a bottleneck to creativity that stifled innovation.[105]

The example of the AT&T monopoly also helps demonstrate that innovators who know that a company with the power to behave strategically against them and control whether their innovations would ever be deployed are likely to be cautious about whether to invest in a market and how they spend their research efforts. [106] The risk that a company in a power position will behave strategically against the innovator is a cost to innovation, and such a cost should be expected to reduce innovation.[107]

A fourth, unstated criticism of a layered regulatory model is that it takes away power over a network from the company that owns it, providing fewer incentives for that company to upgrade it and letting other companies leech from the owner's investments. Nothing in the layered regulatory model suggests a company should not receive a reasonable price for use of its facilities and investments. In addition, focusing on the underlying functions performed in a communication system will provide more equal treatment of parties involved, and through that provides more power to customers. After all, it is the rights of viewers and listeners that are paramount.[108]

III. FIRST AMENDMENT JURISPRUDENCE

In the First Amendment context, silo regulations often are identified as conduit-based, differentiating between forms of media by their delivery mechanisms. First Amendment speech protection currently is split in two general categories: broadcast and non-broadcast.

A. Broadcast Regulation

"Of all forms of communication, it is broadcasting that has received the most limited First Amendment protection" because the broadcast medium is a "uniquely pervasive presence in the lives of all Americans" that extends into the privacy of the home and is "uniquely accessible to children, even those too young to read."[109] Other justifications for subjecting broadcast radio and television regulations to the lowest level of judicial scrutiny include spectrum scarcity[110] (physical limits on the amount of radio spectrum available), and vulnerability of broadcasting to monopolization.[111]

A court just needs to ask: Does this regulatory action serve "the public interest, convenience, and necessity"?[112] This is the case, even with content or viewpoint specific regulation. The FCC action in *Pacifica* was content-specific, directed at a particular George Carlin monologue that admittedly was offensive, although not obscene.[113] The monologue had been broadcast by the *Pacifica* radio station in New York City during the afternoon.[114] Unique pervasiveness and accessibility to children were the primary justifications given for upholding the FCC action in question.[115] Likewise, the Supreme Court in *Red Lion* provided that the "First Amendment confers no right on licensees to prevent others from broadcasting on 'their' frequencies and no right to an unconditional monopoly of a scarce resource which the Government has denied others the right to use."[116] More recently, the FCC has been pursuing the

use of fleeting expletives in specific broadcasts in a case that is currently on appeal to the Supreme Court.[117]

B. Non-broadcast Regulation

In contrast, greater First Amendment protection is afforded to non-broadcast outlets (i.e. not radio or television). Content-specific regulations receive strict scrutiny and content-neutral regulations that incidentally affect speech receive a form of intermediate scrutiny from the courts.

1. Content-specific Regulation

As a general rule, laws and regulations that distinguish favored from disfavored speech on the basis of the ideas or views expressed are content-based.[118] Such regulations that suppress, disadvantage, or impose differential burdens upon speech because of its content receive the most exacting scrutiny by courts.[119] The Supreme Court also has recognized that even a facially neutral regulation may be content-based if its manifest purpose is to regulate speech because of the message it conveys.[120] Likewise, regulations that discriminate among media, or among different speakers within a single medium, often present serious First Amendment concerns.[121] However, such heightened scrutiny is unwarranted when the differential treatment is "justified by some special characteristic of" the particular medium being regulated (i.e. the regulation is directed at a broadcast medium).[122]

The Supreme Court also has held that the right of expression generally prevails over content-based speech restrictions designed to shield the sensibilities of listeners, even where no less restrictive alternative exists.[123] This is because the principle that each person should decide for himself or herself the ideas and beliefs deserving of expression, consideration, and adherence is at the heart of the First Amendment. Our political system and cultural life rest upon this

ideal.[124] "We are expected to protect our own sensibilities. 'Simply by averting our eyes'"[125] Similarly, regulations directed at Internet content are treated like any other non-broadcast, content-based regulation and receive the highest level of judicial review.[126]

Content-based speech restrictions generally are unconstitutional unless they are narrowly tailored to a compelling state interest.[127] There must be some pressing public necessity, some essential value that has to be preserved, and even then the law must restrict as little speech as possible to serve the goal.[128] To do otherwise would restrict speech without an adequate justification.[129]

2. Content-Neutral Regulation

Regulations that don't target specific content may still have an effect on speech. Such regulations, unrelated to the content of speech, are subject to an intermediate level of scrutiny.[130]

Under *O'Brien*, a content-neutral regulation will be sustained if: (1) it furthers an important or substantial governmental interest; (2) if the governmental interest is unrelated to the suppression of free expression; and (3) if the incidental restriction on alleged First Amendment freedoms is no greater than is essential to the furtherance of that interest.[131]

IV. WIFI

WiFi refers to technology that provides wireless Internet access using unlicensed spectrum. It has both commercial and non-commercial purposes and provides flexibility in a variety of settings. For example, WiFi commonly is used by people in their homes as an access point to an Internet connection provided by a cable modem or DSL service.[132] It serves as an affordable and efficient alternative to wiring their homes with Ethernet cables. Similarly, businesses often set up WiFi access points in strategic locations around an office to provide

Internet access to employees and guests. A second set of businesses set up individual WiFi "Hotspots" in small, fixed locations to provide Internet access for a fee.[133] And a third set of businesses deploy WiFi networks, often referred to as "municipal WiFi," to cover cities or portions of cities. I will focus on this third category of WiFi networks because they have the greatest similarity to broadcast radio and television. Like broadcast television and radio, the majority of WiFi Networks are free, advertising supported services.[134] Of ninety-two services deployed in the United States, more than half offer free options.[135]

Under its current regulatory model, the FCC first will need to determine whether WiFi fits within a current regulatory silo and whether it has regulatory jurisdiction over WiFi. In March 2007, the FCC issued a declaratory ruling that classified wireless broadband Internet access service as an information service, which places it in a comparable regulatory position as DSL and cable broadband services.[136] The FCC defined wireless broadband as a "service that uses spectrum, wireless facilities, and wireless technologies to provide subscribers with high speed Internet access capabilities."[137] Wireless broadband Internet access service can be provided using mobile, portable, or fixed technologies, and wireless broadband technologies can transmit data over short, medium, or long ranges.[138] WiFi fits under that definition, uses spectrum, wireless facilities, and wireless technologies to provide users with high speed Internet access. The FCC considers any service of 200 kilobits per second (kbps) in either direction to be an advanced telecommunications service, and thus a broadband provider.[139] Two examples of WiFi service providers are Google and MetroFi. Google provides its free WiFi service at 1,000 kbps in both directions.[140] MetroFi provides its free WiFi service at 1,000 kbps downstream and 256Kbps upstream.[141] I have not seen any challenges to this exercise of jurisdiction, but only time will tell.

Assuming that the FCC does have jurisdiction over WiFi networks, the question left remaining is whether WiFi also would qualify as a broadcast service and thus be subject to content indecency regulations with the softest of court review, as opposed to a non-broadcast service, in which case content regulations directed at it likely would be subject to strict scrutiny.

A. Applying Current Broadcast Regulation Justifications to WiFi

WiFi shares many characteristics and attributes with broadcast radio and television. Its signals travel over the airwaves, it is free,[142] and accessing its content only requires a ubiquitous device that many households have. In the case of WiFi, that device is a computer.[143] These similarities provide a favorable comparison for considering whether justifications for providing broadcast media the least amount of First Amendment protection are still rational. Four justifications that have been used are spectrum scarcity, unique pervasiveness, uniquely accessible to children, and vulnerability to monopolization.

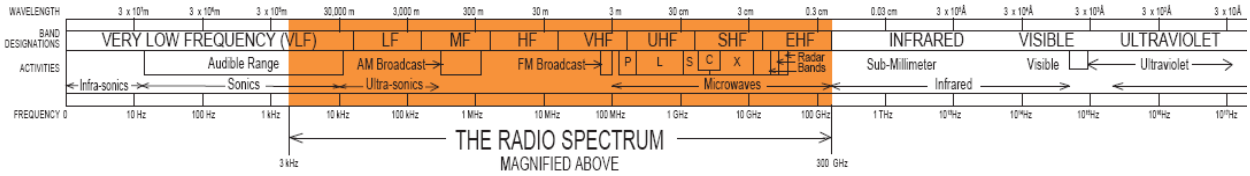
1. *Spectrum Scarcity*

Justice Frankfurter first posited what has come to be called spectrum scarcity. He reasoned: "Freedom of utterance is abridged to many who use the limited facilities of radio. Unlike other modes of expression, radio inherently is not available to all. That is its unique characteristic, and that is why, unlike other modes of expression, it is subject to governmental regulation."[144] The scarce resource referred to by Justice Frankfurter that makes radio inherently not available to all is the electromagnetic spectrum.

The electromagnetic spectrum ranges from cosmic rays to sound waves and is shared by all communications that use a particular physical transmission medium.[145] Radio spectrum is a small slice of the full electromagnetic spectrum and encompasses the segment between audible

sound waves and infrared, which is one step down from visible light.[146] Communications systems that use free space (air) utilize a portion of the radio spectrum. (See Figure 3.)

Figure 3: Part Of The Electromagnetic Spectrum[147]



As a result, all devices that use air as the physical transmission medium share the same spectrum, albeit not at the same frequency, and all are bound by its limited nature. This is the case with radio, television, WiFi, satellites, cellular networks, baby monitors, etc. Each mode of communication is assigned a specific portion of the spectrum and any other electromagnetic waves traveling at the same frequency potentially serve as interference.[148] Likewise, cable television and cable Internet share the spectrum available within a coaxial cable.[149] Consequently, spectrum scarcity is a concern for each mode of mass communication available today, including WiFi. It is not a problem unique to just one mode of communication.

2. *Unique Pervasiveness*

Borrowing a phrase from *Pacifica*, Internet content carried by WiFi technology "presented over the airwaves confronts the citizen, not only in public, but also in the privacy of the home, where the individual's right to be left alone plainly outweighs the First Amendment rights of an intruder."[150] That phrase still remains true even after substituting broadcast media for WiFi.

Most signals transmitted in the radio spectrum using air as the physical transmission medium will be pervasive, penetrating through walls and roofs of buildings, into cars, homes, and any other place imaginable.[151] Walls and roofs, along with the weather, do provide some interference but do not block all signals completely.[152]

Electromagnetic waves radiate from the antennae, broadcasting a signal in the radio spectrum to the farthest extent of its range.[153] Broadcast systems also are referred to as unguided, or unbounded, systems; in other words, such signals spread from the antennae in all directions and do not discriminate or choose where to go, or not go, within its range.[154] As such, the signal will enter homes, businesses, and places of worship, places where people expect privacy or sanctuary. The key difference between each signal is the frequency with which it is sent, as well as the encoding used. Any person with a receiver built to capture and decode that specific signal will be able to access the content hidden within.[155]

WiFi, like television and radio, uses an open standard to decode signals. Just as any person with a television or radio can watch television or listen to the radio, any person who has a computer with a wireless network card can receive WiFi signals.[156] In a similar way, WiFi inherently is not secure.[157] Security of a WiFi signal must be imposed by encrypting the signal at the transmitting end and decrypting the signal on the receiving end.[158] Any encryption added to the signal is done so using specific applications installed on the computer, such as a web browser, in the applications layer of the TCP/IP model described earlier.[159] An added dimension to WiFi, not available with television and radio, is the bi-directional, interactive nature of the Internet. Parties on both ends of the Internet connection can send and receive content.

In contrast, cellular telephone systems use radio spectrum to broadcast signals, but use a closed standard that is available only to users of that cellular system. Control over the applications layer, in the TCP/IP model, is also retained by the cellular provider. Unlike broadcast media, content sent over a cellular network using radio spectrum is not available to everyone. Although cellular network signals are equally as pervasive as television, radio, and WiFi, the content contained within are only available to that person on the closed cellular

network. Although inherently insecure, like broadcast media, cellular systems encrypt signals and use spread spectrum (breaking a signal up into smaller pieces and sending over several frequencies) to make it unlikely for signals to be intercepted.[160]

WiFi itself is not per se pervasive in American society as radio and television are; however, the Internet is.[161] According to Pew Internet, fully seventy-three percent of American adults (about 147 million) are Internet users.[162] A total of seventy-eight percent of Americans have gone online at least once.[163] The number of people who use and rely on the Internet daily is still growing. As of 2003, sixty-two percent of American households had one or more computers.[164] Of the seventy-three percent of the adult American population who are Internet users, thirty-four percent have logged onto the Internet using a wireless connection either around the house, at their workplace, or someplace else while using a computer, personal digital assistant (PDA), or cellular phone.[165] Among users under age thirty who access the Internet wirelessly, forty percent have laptop computers, of which eighty-eight percent are wireless-enabled.[166] Also, twenty-six percent of those people have wireless networks at home.[167] In contrast, ninety-nine percent[168] of all American households have a radio and ninety-eight percent[169] have a television set.

An additional, implied aspect of pervasiveness is the free nature of broadcasting. All it takes to view content is access to a television or radio built to receive and decode the signals. No additional costs, such as subscriptions, necessarily are incurred. The only thing requested of the broadcast media recipient is to endure intrusive advertising campaigns. WiFi is similarly situated. When using WiFi provided by a WiFi network, users often are required only to endure advertising to access their content of choice.[170] Otherwise, WiFi is as free as television and radio.

In contrast, the number of Americans who subscribe to cable or satellite television exceeds the number of Americans who use the Internet or watch broadcast television. According to the FCC, approximately eighty-six percent of American television households subscribe to a pay television service such as cable or satellite television, while only fourteen percent of Americans rely solely on broadcast television.[171] These statistics do more than suggest that broadcast media is no longer uniquely pervasive. At least one court has noted that these and other realities have "eviscerated" the notion that broadcast content is "uniquely pervasive" and observed that it is increasingly difficult to describe broadcast media as uniquely pervasive and uniquely accessible to children.[172] The justification given in *Pacifica* was that "broadcast media have established a uniquely pervasive presence in the lives of Americans."[173] It is true that broadcast media are pervasive; however, as discussed above, other media are now just as pervasive, if not more pervasive than broadcast media. Thus, broadcast media is pervasive, but not uniquely so.

3. *Uniquely Accessible To Children*

Another concern highlighted in *Pacifica* is that broadcasting is "uniquely accessible to children, even those too young to read."[174] Today, that is not necessarily true. With the explosion of different communication devices, children are exposed from a very early age to many forms of media. Young children talk with their grandparents using telephones and mobile phones. Computer games and web cams also have helped expose countless children to the wonders of computers at very young ages. I know at least one couple who utilize computers as electronic babysitters for their young children, similar to how parents in previous generations used television.

Any child with access to a computer with a wireless network card can use WiFi to access Internet content. Anecdotally speaking, my seven-year-old nephew learned to use the family computer when he was three. By the time he was four, he knew how to turn on the computer, access bookmarks to his favorite web sites, PBS Kids[175] and Nickelodeon[176], and play games on those web sites.

Similar to the uniquely pervasive argument, broadcast media is no longer uniquely accessible to children. WiFi, as a portal into the Internet, is another form of communication that is accessible to children in households with computers.

4. *Vulnerability to Monopolization*

Organizations deploying WiFi networks must expend capital to build out the network physically. In addition, those organizations must ask for and receive permission from cities to use lamp posts and rights of ways to install their equipment.[177] There are a lot of questions about what price cities will ask, as well as how many different WiFi networks each will allow to utilize its rights of ways.

Furthermore, the effects of spectrum scarcity upon WiFi may also create roadblocks that deter potential competitors in the marketplace. Spectrum scarcity becomes an issue when too many WiFi nodes are stacked close to each other, such as on the same lamp post or in a densely populated building. WiFi has eleven potential channels it uses to limit the chance of interference.[178] Adjacent channels overlap each other.[179] Put twelve WiFi nodes close together and they are likely to interfere with each other. The interference does not only come from other WiFi network providers, but people who use a nearby WiFi router to deploy their personal home or business networks. Whether the potential startup costs and risks of interference are enough to

make WiFi Internet access vulnerable to be monopolized in the marketplace has yet to be determined.

In conclusion, after applying these four justifications used to subject broadcast media to content-specific indecency regulations that would be unacceptable for other media forms, WiFi provides ample reasons why those justifications are no longer valid. First, WiFi suffers from spectrum scarcity, similar to broadcast radio and television. Second, WiFi is also as pervasive as broadcast radio and television in invading the private space of home. As such, it conflicts with the justification given in *Pacifica* that broadcast media were subject to indecency regulations because they were "uniquely pervasive." Third, broadcast media is pervasive, but not uniquely so. WiFi also is readily accessible to children who have computers around. More than half of American households have computers according to the Census Department.[180] No doubt, many of them also have children. Moreover, pay television (cable or satellite) found in eighty-six percent of American homes is even more pervasive.[181] Lastly, WiFi potentially is vulnerable to monopolies, or at least duopolies. It probably is too new a technology to tell right now.

V. FURTHER ARGUMENTS FOR LAYERING

WiFi is just one of the emerging shifts in technology and the delivery of media that bleeds between the different silos in the current silo regulatory model. Delivery mechanisms are converging. So, too, are receiving devices. In addition, less restrictive alternatives that were not available at the time of *Red Lion* and *Pacifica* are now in the market or technologically and economically feasible.

A. Delivery Mechanisms Are Converging

Voice over Internet Protocol (VOIP) is an alternative to the traditional circuit-based voice over copper wire provided by telephone systems. VOIP may, in fact, replace the traditional telephone and be the dominant protocol in the next generation communication system for voice signal transfer.[182] As suggested by its name, VOIP is transmitted using Internet Protocols as is any other content using the Internet. It can connect computer-to-computer, telephone-to-computer, or telephone-to-telephone.[183] There are also times in which an analog signal in the conventional telephone network is converted to a digital format for transmission and then converted back to analog for the recipient on the other end.[184] In the layered regulatory model, VOIP is part of the application layer.

Another example of converging delivery mechanisms is the television broadcast system. In conjunction with the digital television transition, television stations now broadcast their content over the air waves in the MPEG-2 digital format which is a format used for video on the Internet.[185] This is part of the application layer in the layered regulatory framework

B. Receiving Devices Are Converging

In addition to making phone calls, people can use mobile phones to access the Internet, watch videos, listen to radio broadcasts, listen to stored music, play electronic games, and take and view photos.[186] In the past, a bevy of different devices such as telephones, computers, televisions, radios, record players, video game consoles, and cameras would have been required to accomplish the same activities. In a layered regulatory environment, these activities all take part in the application and content layers and the underlying network that allows the content to be communicated falls under the logical and physical layers.

Similarly, computers increasingly are becoming more integrated into televisions and home entertainment centers. MSN TV, formally called Web TV, makes the Internet directly available through the television set.[187] Video game consoles, which utilize the television, are computers that allow users to play games against each other over an Internet connection. Televisions and computer monitors that once were technologically different are now converging into a single device. High Definition (HD) Televisions are essentially computer monitors. Sling Media sells devices and software that lets people watch broadcast television on a computer or cell phone.[188] In a layered regulatory framework, video game consoles and the Slingbox device are part of the physical and logical layers while the application and the content they display are in the application and content layers.

In addition, televisions and radios now contain simple computers that allow viewers to interact with those devices in ways that were not available at the time of *Pacifica*. The computers in these devices are not personal computers and do not have the same computing power, but they are programmable devices that provide added functionality to users of a device. Television viewers are able to change channels with a remote control instead of turning a dial, save favorite channels, display the time at the press of a button, and watch two channels simultaneously. Those who bought televisions built since the year 2000 also have an additional option in the V-Chip filter, discussed below, which is also a computer function.

C. Options For Less Restrictive Alternatives Are Now Available

A lot has changed in technology since *Red Lion* and *Pacifica* were decided. New technology provides less restrictive alternatives to protect children from inappropriate material.

Congress acknowledged that technology provides less restrictive alternatives when it mandated that a V-Chip filter be installed on every television over thirteen inches sold in the

United States after 2000.[189] The V-Chip filter provides broadcasters an opportunity to rate programs based on content and gives parents the power to block programming from coming into their home based on a program's rating.[190] It is technologically feasible for a V-Chip type filter to be built smartly into any device. Congress recently missed a key opportunity to make the V-Chip available to viewers with older televisions built before 2000. As part of the digital television (DTV) transition, Congress is providing forty dollar coupons to subsidize the cost of digital-to-analog converters. It mandated that the converter boxes eligible for the subsidy only provide functionality that converts digital signals to analog format.[191] Congress missed an excellent opportunity to help people who are less likely to afford a newer television to have access to V-Chip functionality so they too can avoid broadcast programming they wish to block from the privacy of their homes. Under a layered regulatory regime, video from broadcast stations, cable systems, and satellite providers will be regulated similarly. As such, Congress and the FCC could mandate that V-Chip rating across the different modes of video transmission regulated by the FCC, as opposed to just the one mode subject to the V-Chip regulations today, which is broadcast television.

Although not available today, V-Chip type filters for radio can be developed. In the meantime, reasonable restrictions on time, place, and manner can be put on the format or content until such V-Chips are available. In addition, the marketplace is likely to take an active role in limiting indecent content in broadcast media. Advertisers play a big role in determining what content is produced. Advertisers can choose to avoid sponsoring programs with indecent content or that have a history of offending listeners. A similar role can be played by funders, sponsors, and viewers of publicly funded stations that rely on donations, rather than advertising to pay the

bills. In such cases, the constituencies who donate to a particular public station can withhold funds if the station provides indecent or other programs that violate community standards.

VI. CONCLUSION

The current communications regulatory framework is obsolete and needs to be razed and replaced by a layered regulatory approach that focuses on the current design of modern communications networks. By this, I mean that regulations should be based on one of the four layers (content, applications, logical, or physical) of the layered regulatory model rather than individual modes of communication. WiFi is just one of several rapidly developing technologies that erase the previous justifications for the old silo approach to regulating communications. In particular, WiFi eviscerates the justifications established to use the most deferential standards to review broadcast media indecency standards under the First Amendment.

As such, Congress should proactively cast aside the old silo regulatory framework long ago codified in the Communications Act. It needs to re-write the Communications Act from scratch with a layered regulatory approach in mind. In the meantime, courts should take judicial notice of changes in communications technology that make the old justifications moot.

Congress should continue to have the power it currently does to regulate mass communications for those same reasons. A change in regulatory models does not alter or negate the justifications for regulating communications in the first place. Once a layered regulatory model is adopted, courts will review all regulations as they do non-broadcast media today. In which case, content-specific regulations will receive strict scrutiny and content-neutral regulations that incidentally affect speech will receive a form of intermediate scrutiny using the *O'Brien* test.

One unfortunate downside in a transition to a layered regulatory model is that people may be subject to indecent content. Such a negative impact can be mitigated by Congressional and regulatory policies that develop and foster implementation of affordable tools that make it easier for people to avoid indecent content and helping people afford such tools by subsidizing them.

[1] Samuel Morse sent the first long-distance telegraph message, "What hath God wrought!", in 1846 from Baltimore, Maryland to Washington, D.C. RAY HORAK, COMMUNICATIONS SYSTEMS AND NETWORKS 213 (3rd ed. 2002).

[2] Telephones first became commercially available in 1877, offered by the Bell Telephone Company. HORAK, *supra* note 1, at 77.

[3] Tim Wu, *Why Have a Telecommunications Law? Anti-Discrimination Norms in Communications*, 5 J. TELECOMM. & HIGH TECH. L. 15, 30 (2006).

[4] Nat'l Broad. Co. v. United States, 319 U.S. 190, 210 (1943).

[5] *See* Communications Act of 1934, ch. 651, Pub. L. No. 73-416, 48 Stat. 1064 (current version at 47 U.S.C §151 (2000)).

[6] *Id.* ("[T]his Act shall apply to all interstate and foreign communication by wire or radio and all interstate and foreign transmission of energy by radio, which originates and/or is received within the United States, and to all persons engaged within the United States in such communication or such transmission of energy by radio.").

[7] Wu, *supra* note 3, at 20.

[8] *Id.*

[9] *Id.* at 19.

[10] *Id.* at 19.

[11] Kovacs v. Cooper, 336 U.S. 77 (1949) (Jackson concurring).

[12] Richard S. Whitt, *A Horizontal Leap Forward: Formulating a New Communications Public Policy Framework Based on the Network Layers Model*, 56 FED. COMM. L.J. 587, 596 (2004).

[13] *Id.*

[14] The Internet is a successor of the United States Department of Defense Advanced Research Project Agency network (ARPANET) a packet switching network first deployed in 1971. ARPANET was established to support interactive, asynchronous computer-to-computer communications between the defense and university communities. HORAK, *supra* note 1, at 28.

[15] *Id.* at 474.

[16] *Id.*

[17] JACK GOLDSMITH & TIM WU, WHO CONTROLS THE INTERNET? 23 (2006).

[18] Turner Broad. Sys. v. FCC, 512 U.S. 622**,** 628 (1994).

[19] ANDREW L. SHAPIRO, THE CONTROL REVOLUTION 17 (1999).

[20] *Id. See also* HORAK, *supra* note 1, at 496 (noting that TCP/IP was developed with public funds and thus is a public domain protocol).

[21] GOLDSMITH, *supra* note 17, at 23.

[22] *Id.*

[23] SHAPIRO, *supra* note 16, at 17.

[24] *Id.*

[25] *Id.*

[26] GOLDSMITH, *supra* note 17, at 23.

[27] HORAK, *supra* note 1, at 474.

[28] GOLDSMITH, *supra* note 17, at 23.

[29] *Id.*

[30] *Id.*

[31] *Id.*

[32] HORAK, *supra* note 1, at 302.

[33] *Historic Little Tokyo in Downtown Los Angeles Goes Live with Community Wi-Fi*, GOVERNMENT TECHNOLOGY, Apr. 16, 2007, https://www.govtech.com/gt/105000 (last visited Jan. 10, 2008). *See also* Marguerite Reardon, *Citywide Wi-Fi Network Put to Test in Minneapolis*, CNET NEWS.COM, Aug. 8, 2007, http://www.news.com/Citywide-Wi-Fi-network-put-to-test-in-Minneapolis/2100-7351_3-6201561.html (last visited Jan. 10, 2008).

[34] Chris Gaylord, *Municipal Wi-Fi Thrives – on a Small Scale*, CHRISTIAN SCIENCE MONITOR, Sept. 13, 2007, available at http://www.csmonitor.com/2007/0913/p13s01-stct.html (last visited Jan. 10, 2008) (discussing availability of WiFi in Rio Rancho, a suburb of Albuquerque, New Mexico).

[35] *Id.* (discussing availability of WiFi in Kurtztown, PA and Owensboro, KY).

[36] JOHN HORRIGAN, PEW INTERNET AND AMERICAN LIFE PROJECT, WIRELESS INTERNET ACCESS 1 (2007), http://www.pewinternet.org/pdfs/PIP_Wireless.Use.pdf (last visited Dec. 20, 2007) (asserting that thirty-nine percent of Internet users have laptop computers and of these laptop users, eighty percent say their laptops can connect to the Internet on a wireless network). *See also* Dell Online Store, http://www.dell.com (last visited Jan. 10, 2008) (selling laptop computers in which WiFi capability is a standard feature, including one $499 model, and desktop computers in which WiFi capability is standard on some models and an optional $20 to $40 upgrade for all others).

[37] JOHN HORRIGAN, *supra* note 36 (asserting thirty-four percent of Internet users have logged on using a wireless Internet connection).

[38] Horizontal and vertical have each been used to describe both silo and layered regulations, so I will avoid using either term, if at all possible. *Compare* Kevin Werbach, *A Layered Model for Internet Policy*, 1 J. TELECOMM. & HIGH TECH. L. 37 (2002) (referring to silos as horizontal regulation and layers as vertical regulation), *with* Lawrence B. Solum & Minn Chung, *The Layers Principle: Internet Architecture and the Law*, 79 NOTRE DAME L. REV. 815 (2004) (referring to silos as vertical regulation and layers as horizontal regulation).

[39] Randolph J. May, *Why Stovepipe Regulation No Longer Works: An Essay on the Need for a New Market-Oriented Communications Policy*, 58 FED. COMM. L.J. 103, 104 (2006).

[40] *See* Wu, *supra* note 3, at 20 ("The larger structure of the resulting system is sometimes called a 'vertical' or 'silo' regulatory system."). *See also* Whitt, *supra* note 12, at 590 ("[P]olicymakers should adopt a new public policy framework that regulates along horizontal network layers, rather than legacy vertical silos.").

[41] Whitt, *supra* note 12, at 595.

[42] Fox Television Stations, Inc. v. FCC, 489 F.3d 444, 465 (2d Cir. 2007).

[43] Content specific regulations of cable television receive the strictest scrutiny while the same regulations of broadcast television receive the most deferential review. Fox Television Stations, Inc. v. FCC, 489 F.3d 444, 465 (2d Cir. 2007).

[44] Nat'l Cable & Telecomm. Ass'n v. Brand X Internet Svcs., 545 U.S. 967, 975 (2005).

[45] *In re* Appropriate Framework for Broadband Access to the Internet Over Wireline Facilities, 20 F.C.C.R. 14853, (Sept. 23, 2005), available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-05-150A1.pdf (last visited Jan. 17, 2008) (reclassifying DSL from a telecommunications service provided on a common carrier basis to a less regulated information service). *See also* H. Russell Frisby & David A. Irwin, *The First Great Telecom Debate of the 21st Century*, 15 COMMLAW CONSPECTUS 373**,** 388 (2007).

[46] Nat'l Cable & Telecomm. Ass'n v. Brand X Internet Svcs., 545 U.S. 967, 996 (2005).

[47] Nat'l Cable & Telecomm. Ass'n v. Brand X Internet Svcs., 545 U.S. 967, 996 (2005).

[48] Wu, *supra* note 3, at 20.

[49] FRED HALSALL, MULTIMEDIA COMMUNICATIONS: APPLICATIONS, NETWORKS, PROTOCOLS AND STANDARDS 240-246 (2001).

[50] HORAK, *supra* note 1, at 207.

[51] *Id.*

[52] *Id.*

[53] Kevin Werbach, *supra* note 38. *See also* Yochai Benkler, *From Consumers to Users: Shifting the Deeper Structures of Regulation Toward Sustainable Commons and User Access*, 52 FED. COMM. L.J. 561 (2000); Whitt, *supra* note 12; Wu, *supra* note 3. *Contra* David P. Reed, *Critiquing the Layered Regulatory Model*, 4 J. TELECOMM. & HIGH TECH. L. 281 (2006).

[54] Whitt, *supra* note 12, at 621.

[55] Werbach, *supra* note 38, at 65.

[56] HALSALL, *supra* note 49, 243.

[57] *Id.*

[58] *Id.*

[59] *Id.*

[60] Werbach, *supra* note 38, at 59

[61] HALSALL, *supra* note 49, at 243.

[62] *Id.*

[63] *Id.*

[64] *Id.*

[65] *Id.*

[66] *Id.*

[67] HALSALL, *supra* note 49, at 243.

[68] HALSALL, *supra* note 49, at 243.

[69] *Id.*

[70] *Id.*

[71] *Id.*

[72] Werbach, *supra* note 38, at 60.

[73] FCC v. Pacifica, 438 U.S. 726 (1978). See also Fox Television Stations, Inc. v. FCC, 489 F.3d 444, 465 (2d Cir. 2007) (holding that FCC policy regarding "fleeting expletives" was arbitrary and capricious under the Administrative Procedure Act).

[74] Reno v. Am. Civil Lib. Union, 521 U.S. 844 (1997) (holding that content regulations of the Internet receive strict scrutiny).

[75] Werbach, *supra* note 38, at 63.

[76] *Id.*

[77] *Id.* at 61.

[78] *Id.*

[79] *Id.*

[80] Werbach, *supra* note 38, at 60.

[81] *Id.* at 60.

[82] HORAK, *supra* note 1, at 33. *See also* DAVID J.E. INGRAM, RADIO AND MICROWAVE SPECTROSCOPY (1976) (explaining that electromagnetic waves are not restricted only to certain materials, as demonstrated through spectroscopy (electromagnetic spectrum analysis) which is a standard tool with which to study the structure of atoms and molecules in gaseous, liquid, and solid states).

[83] HALSALL, *supra* note 49, at 291. *See also* HORAK, *supra* note 1, at 33 ("Fiber optic systems conduct light, or optical, energy, generally using a glass conductor.").

[84] Werbach, *supra* note 38 at 38.

[85] Whitt, *supra* note 12, at 591.

[86] Reed, *supra* note 53, at 282.

[87] Reed, *supra* note 53, at 282.

[88] *Id.*

[89] *Id.* at 285.

[90] *Id.*

[91] *Id.* at 282.

[92] *In re* Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, Twelfth Annual Report, 21 F.C.C.R. 2503, 2519 (Mar. 3, 2006), [hereinafter Twelfth Annual Video Competition Report], available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-11A1.pdf (last visited Jan. 10, 2008).

[93] *Id.* at 2507 (stating that overbuilders have approximately 1.4 million subscribers while cable companies have 65 million subscribers).

[94] *Id.* at 2550.

[95] *Id.* at 2504 ("Congress imposed this annual reporting requirement in the Cable Television Consumer Protection and Competition Act of 1992 . . . as a means of obtaining information on the competitive status of the market for the delivery of video programming.").

[96] Examples include The Internet Society, Internet Architecture Board, Internet Engineering Task Force , Internet Research Task Force, and Internet Corporation for Assigned Names and Numbers. HORAK, *supra* note 1, at 487.

[97] Reed, *supra* note 53, at 286.

[98] *Id.*

[99] *Id.*

[100] *Id.*

[101] Mark A. Lemley & Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era*, 48 UCLA L. REV. 925, 933 (2001).

[102] *Id.*

[103] *Id.* at 934.

[104] *Id.*

[105] Lemley, *supra* note 101, at 933.

[106] *Id.* at 945.

[107] *Id.*

[108] Red Lion Broad. Co. v. FCC, 395 U.S. 367, 390 (1969).

[109] Fox Television Stations, Inc. v. FCC, 489 F.3d 444, 448 (2d Cir. 2007) (citing FCC v. Pacifica, 438 U.S. 726, 748 (1978)).

[110] Red Lion, 395 U.S. at 390. *See also* Nat'l Broad. Co. v. United States, 319 U.S. 190 (1943).

[111] Red Lion, 395 U.S. at 390.

[112] Pacifica, 438 U.S. at 748.

[113] *Id.* at 729.

[114] *Id.*

[115] FCC v. Pacifica, 438 U.S. 726, 748 (1978).

[116] Red Lion Broad. Co. v. FCC, 395 U.S. 367, 391 (1969).

[117] *F.C.C. Case is Appealed to Justices*, NEW YORK TIMES, Nov. 3, 2007, available at http://query.nytimes.com/gst/fullpage.html?res=9D00E5DC1539F930A35752C1A9619C8B63 (last visited Dec. 20, 2007). *See also* Fox Television Stations, Inc. v. FCC, 489 F.3d 444 (2d Cir. 2007).

[118] Turner Broad. Sys. v. FCC, 512 U.S. 622**,** 642 (1994).

[119] *Id.*

[120] *Id.* at 645.

[121] *Id.* at 660.

[122] *Id.* at 661.

[123] United States v. Playboy Entm't Group, 529 U.S. 803, 813 (2000).

[124] Turner Broad. Sys. v. FCC, 512 U.S. 622**,** 641 (1994).

[125] Playboy, 529 U.S. at 813.

[126] Reno v. Am. Civil Lib. Union, 521 U.S. 844, 868 (1997).

[127] Turner, 512 U.S. at 680.

[128] *Id.*

[129] Playboy, 529 U.S. at 813.

[130] Turner, 512 U.S. at 662.

[131] *Id.*

[132] Nicole A. Ozer, *Companies Positioned in the Middle: Municipal Wireless and Its Impact on Privacy and Free Speech*, 41 U.S.F. L. REV. 635, 637 (2007).

[133] *Id.*

[134] *Id.* at 638.

[135]MUNIWIRELESS.COM, LIST OF U.S. CITIES AND REGIONS WITH MUNICIPAL WIRELESS NETWORKS (2007), http://muniwireless.com/reports/docs/Aug-1-2007summary.pdf (last visited Dec. 20, 2007).

[136] *In re* Appropriate Regulatory Treatment for Broadband Access to the Internet Over Wireless Networks, 22 F.C.C.R. 5901 (Mar. 22, 2007), available at http://fjallfoss.fcc.gov/edocs_public/attachmatch/DOC-271695A1.pdf (last visited Dec. 20, 2007).

[137] *Id.*

[138] *Id.*

[139] Availability of Advanced Telecommunications Capability in the United States, Fourth Report to Congress, 19 F.C.C.R. 20540, FCC 04-208, GN Docket No. 04-54 (Sept. 9, 2004), available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-208A1.pdf (last visited Dec. 20, 2007) (defining "advanced telecommunications capability" and "advanced services" as services and facilities with upstream, customer-to-provider, and downstream, provider-to-customer, transmission speeds of 200 kbps or greater).

[140] Google WiFi, What Data Speeds Should I Expect?, http://wifi.google.com/support/bin/answer.py?answer=30794 (last visited Jan. 10, 2008).

[141] MetroFi, About Metrofi's Service, http://www.metrofi.com/services.html (last visited Jan. 10, 2008).

[142] MUNIWIRELESS, *supra* note 135.

[143] As of 2003, sixty-two percent of households had one or more computers. U.S. CENSUS BUREAU, COMPUTER AND INTERNET USE IN THE UNITED STATES: 2003 (2003), available at http://www.census.gov/prod/2005pubs/p23-208.pdf (last visited Dec. 20, 2007).

[144]Nat'l Broad. Co. v. United States, 319 U.S. 190, 226 (1943).

[145] WARREN J. SMITH, Modern Optical Engineering, 1 (3rd ed. 2000).

[146] *See* Figure 3.

[147] NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, U.S. RADIO SPECTRUM FREQUENCY ALLOCATION CHART AS OF OCTOBER 2003 (2003), available at http://www.ntia.doc.gov/osmhome/allochrt.pdf (last visited Jan. 17, 2007).

[148] HORAK, *supra* note 1.

[149] *Id.* at 47-49 (explaining that specific types of coaxial cables are referred to by Radio Guide (RG) in reference to Radio Frequency (RF) signals that are guided down the cable).

[150] FCC v. Pacifica, 438 U.S. 726, 748 (1978).

[151] HORAK, *supra* note 1, at 37.

[152] HALSALL, *supra* note 49, at 298. *See also* HORAK, *supra* note 1, at 50, 432, 37.

[153] HALSALL, *supra* note 49, at 298.

[154] HORAK, *supra* note 1, at 34.

[155] *Id.* at 440.

[156] *Id.*

[157] *Id.* at 52.

[158] *Id.*

[159] HORAK, *supra* note 1, at 522.

[160] *Id.* at 52, 266.

[161] WiFi, as a technology, was not available until after the FCC opened up unlicensed spectrum for WiFi's use in April 1997 with its U-NII order. Benkler, *supra* note 53, at 293. *See also*

Official IEEE 802.11 Working Group Project Timelines, http://grouper.ieee.org/groups/802/11/Reports/802.11_Timelines.htm (showing the initial 802.11 standard, popularly known as WiFi, was not approved by American National Standards Institute until February 2000) (last visited Jan. 16, 2008).

[162] MARY MADDEN, PEW INTERNET AND AMERICAN LIFE PROJECT, INTERNET PENETRATION AND IMPACT: APRIL 2006 1 (2006), http://www.pewinternet.org/pdfs/PIP_Internet_Impact.pdf (last visited Dec. 20, 2007).

[163] *Id.*

[164] U.S. CENSUS BUREAU, COMPUTER AND INTERNET USE IN THE UNITED STATES: 2003 (2003), available at http://www.census.gov/prod/2005pubs/p23-208.pdf (last visited Dec. 20, 2007).

[165] JOHN HORRIGAN, *supra* note 36.

[166] *Id.*

[167] *Id.*

[168] U.S. CENSUS BUREAU, 1099 - UTILIZATION OF SELECTED MEDIA: 1980 TO 2005 (2007), available at http://www.census.gov/compendia/statab/tables/08s1099.pdf (last visited Jan. 10, 2008) [hereinafter CENSUS BUREAU UTILIZATION OF SELECTED MEDIA].

[169] *Id.*

[170] Ozer, *supra* note 132, at 648.

[171] Twelfth Annual Video Competition Report, *supra* note 92, at 2508. *See also* THE NIELSEN COMPANY, DMA MEDIA RELATED UNIVERSE ESTIMATES**:** NOVEMBER 2007 (2007), available at http://www.nielsenmedia.com/nc/nmr_static/docs/Nov2007DMA_Media_UEs.xls) (last visited Dec. 20, 2007) [hereinafter NIELSEN DMA ESTIMATES] (showing that only twelve percent of television households rely on broadcast television, while eighty-eight percent subscribe to cable or satellite services).

[172] Fox Television Stations, Inc. v. FCC, 489 F.3d 444, 465 (2d Cir. 2007) ("Nevertheless, we would be remiss not to observe that it is increasingly difficult to describe the broadcast media as uniquely pervasive and uniquely accessible to children, and at some point in the future, strict scrutiny may properly apply in the context of regulating broadcast television.").

[173] FCC v. Pacifica, 438 U.S. 726, 748 (1978).

[174] *Id.*

[175] PBS Kids, http://pbskids.org/, (companion web site to the Public Broadcasting Service's child oriented television programming) (last visited Jan. 16, 2008).

[176] Nickelodeon, http://www.nick.com, (companion web site for the cable television station) (last visited Jan. 16, 2008).

[177] Tim Wu, *Where's My Free Wi-Fi?*, SLATE, Sept. 27, 2007, http://www.slate.com/id/2174858/ (last visited Jan. 10, 2008) ("[M]ajor cities didn't really want to build out Wi-Fi networks as public works projects. Instead, places . . . announced "private/public" partnerships. Often, this simply meant giving a company like Earthlink the rights to install Wi-Fi devices on street lamps and charge citizens for access."). *See also* Jon Weiner, *Council Unanimously Approves Google WiFi*, MOUNTAIN VIEW VOICE, Nov. 18, 2005, available at http://www.mv-voice.com/morgue/2005/2005_11_18.4google.shtml (last visited Jan. 10, 2008) ("Under terms of the deal, Google will pay the city $12,600 a year, adjusted for inflation, for the right to put radio frequency devices on about 350 light poles throughout the city.").

[178] HORAK, *supra* note 1, at 302.

[179] *Id.*

[180] CENSUS BUREAU UTILIZATION OF SELECTED MEDIA, *supra* note 168.

[181] Twelfth Annual Video Competition Report, *supra* note 92, at 2506.

[182] HORAK, *supra* note 1, at 172.

[183] *Id.*

[184] *Id.*

[185] *Id.* at 543.

[186] Martin Fackler, *Rival Manufacturers Chasing the iPhone*, NEW YORK TIMES, July 2, 2007, available at http://www.nytimes.com/2007/07/02/technology/02cellphone.html (last visited Jan. 10, 2008).

[187] MSN TV, http://webtv.net/pc.

[188] Sling Media, http://www.slingmedia.com.

[189] Fox Television Stations, Inc. v. FCC, 489 F.3d 444, n.14 (2d Cir. 2007).

[190] *Id.*

[191] 47 C.F.R. 301 (2007), available at http://www.ntia.doc.gov/ntiahome/frnotices/2007/DTVFinalRule_2e.htm (last visited Jan. 10, 2008).