Fundamentals of Telecommunications Regulation: Markets, Jurisdiction, and Challenges

Peter Bluhm

Updated by

Sherry Lichtenberg, Ph.D.

January 2011

11-03

Acknowledgments

In 2008, NRRI published Peter Bluhm's paper, *Fundamentals of Telecommunications Regulation: Markets, Jurisdiction, and Challenges.* The paper provided a rigorous, comprehensive framework for examining the complexities of telecommunications history, technology, and regulation, for use by newcomers and veterans alike. In the original paper, Bluhm acknowledged the contributions of Nancy Brockway, Bob Rowe, and Joel Shifman. The many changes in telecommunications industry structure, services, technology, and jurisdiction led us to undertake a revision of Bluhm's piece. That revision, led by NRRI's Dr. Sherry Lichtenberg, was assisted by the contributions and careful review of **Joseph Witmer**, **Shelley Jones**, **Malia Brock**, **Fred Goodwin**, **Eliot Goldberg**, and **Marjorie Conner**. NRRI alone is responsible for the final result.

Scott Hempling, Executive Director

Online Access

This paper can be accessed online at http://www.nrri.org/pubs/telecommunications/NRRI_telecomm_overview_jan11-03.pdf.

Executive Summary

The telecommunications industry is a mix of technologies, services, and providers, operating both interstate and intrastate, regulated by the Federal Communications Commission and state commissions acting under federal and state laws. Since the 1984 breakup of the national Bell monopoly, all three components of this mix have experienced continuous change. Throughout this period, regulators have sought to induce the best possible performance from those who provide essential services. To help regulators reach that goal, this paper presents a multi-layered examination of the industry's fundamentals.

Key Telecommunications Technologies

Three key technologies—circuit switching, packet switching, and Voice over Internet Protocol (VoIP)—underlie the major telecommunications products and services offered in the U.S. today.

Circuit-switched technology uses telephone switches, copper wires, and fiber to carry calls between telephone switching offices, often called local exchanges. Traditional voice service is referred to as "switched service," or "wireline service," because it goes through the service provider's telephone switch and is transmitted over "switched access lines." The entire telephone network is also called the "switched network" or "public switched telephone network" (PSTN). The network is described as "circuit-switched," because specific circuits or electronic paths for the information are established during call setup. Calls can be *local*—that is, within the same calling exchange; *intrastate*—between exchanges; or *interstate*—between states or calling areas. The majority of today's PSTN is still based on circuit-switched technology, although the switching technology itself has evolved from analog switches to digital switches, and companies are increasingly replacing copper cables with light fibers.

Packet-switching technology converts voice calls to data packets and transmits them between parties using Transmission Control Protocol/Internet Protocol (TCP/IP) rather than traditional voice switching. As the PSTN has evolved from analog to digital switching, service providers have begun to replace traditional circuit switches with packet switches that can take advantage of the higher speeds and greater bandwidth provided by data networks such as the Internet. Packet switching increases network efficiency, lowers equipment costs, and has allowed the development of new voice and data services. With packet switching, data (including voice calls) are collected into specially formatted units (called packets) that are transported from source (the calling party) to destination (the receiving party) in digital format. Unlike circuit switching, which creates a single pathway for each call, packet switching allows multiple packets to traverse the same routes simultaneously, increasing the number of calls that can be handled at one time.

Voice over Internet Protocol service (VoIP) transmits voice traffic over IP-based networks using a customer's broadband connection to the Internet. IP was designed in the 1970s to transmit data over the worldwide web from one computer to another. VoIP calling uses the Internet to transmit digital packets of voice information across the Internet from one caller to another. VoIP calling requires a broadband connection at the customer's premise. Customers

use standard telephone sets but connect this equipment to an IP-enabled "translator" that converts the analog signal to digital and formats it into information packets that are transmitted over the Internet.

Voice Services

Today's telecommunications providers offer a variety of voice and data services using the three technologies described above. Voice services include *circuit-switched wireline voice services*, *VoIP*, and *wireless voice services*.

Circuit-switched wireline voice services remain the predominant method for transmitting voice calls in the U.S. today. Wireline voice customers can connect to all of the other customers served by the national PSTN, the wireless network, or the international telecommunications network simply by dialing the other party's telephone number. As of June 2009, there were 133 million traditional circuit-switched wired telephone lines in the U.S., the majority provided by traditional telephone companies such as Verizon and AT&T.

VoIP service uses the Internet to transmit calls between users. VoIP customers can call all points on the PSTN just as wireline customers can, but the call is transmitted at least in part over a digital connection to the Internet. *Interconnected VoIP providers* use their own broadband transmission network to deliver service to their customers. *Nomadic VoIP services* utilize broadband facilities provided by others. Nomadic VoIP service users can move their service from one location to another simply by plugging their VoIP telephone into a broadband Internet connection wherever they are located. *Wireless voice telecommunications service*, also called Commercial Radio Mobile Services (CMRS) or cellular phone service, uses radio waves to transmit voice calls between the caller and the party she is calling. Wireless service uses radio frequencies licensed from the federal government to carry these calls between wireless "towers" or switching stations. Wireless-to-wireless callers who use the same provider reach each other without using the PSTN. Calls between wireless and non-wireless subscribers use the PSTN to connect.

Data Services

Data services include *dial-up Internet access service* and *broadband Internet access services*. With dial-up service, customers access the Internet by dialing an Internet Service Provider (ISP) using a circuit-switched standard telephone line to connect via the PSTN. The caller's computer uses a modem to convert analog signals to the digital signals required for Internet access. With broadband service, customers access the Internet via an "always-on" high-speed digital connection that uses packet switching to transmit data. Broadband access is available via Digital Subscriber Line service (DSL) service, cable modem service, fiber-to-the-home and fiber-to-the-node (neighborhood distribution location) services, wireless services, and, potentially, broadband-over-power-lines (BPL).

DSL carries data over the high frequency portion of a subscriber's copper telephone line to provide simultaneous voice and data connectivity. Customers must be located within 15,000 – 18,000 feet of the carrier's central office, since service degrades with the length of the circuit that connects the customer's premise to the provider's switch. DSL has been available since the late

1980s, but DSL subscriptions have grown substantially with the increased need for high-speed connectivity to the Internet. There were approximately 26 million DSL connections in the U.S. at the end of 2008.

Cable modem service (also known as cable Internet service) uses the customer's digital cable TV connection and premises wiring to provide high-speed digital access services over the cable provider's digital access lines. The signals from the cable modem are converted to IP and then routed to the Internet. The FCC reported more than 39 million cable modem connections in the U.S. as of December 2008.

Fiber-to-the-premises service delivers very high-speed data connectivity to customers via fiber optic cable that runs from the provider's switching office into the customer's home. The technology takes advantage of the ability to use fiber to carry data over long distances at high data rates without loss of signal strength and quality. Fiber-to-the-premises services require the provider not just to install fiber in its network but also to rewire the customer's home to replace the embedded copper wiring with fiber. Fiber-to-the-premises systems are available in limited areas of the country and served almost 3 million subscribers at the end of 2008.

Wireless broadband connections allow users to receive email, video, and other enhanced services via wireless "appliances," including smart phones and wireless computing devices such as the Apple iPad and similar products. Wireless companies are increasingly offering broadband service in competition with wireline companies. These providers currently offer digital services, which provide data transmission at speeds comparable to those offered by many wired networks. The FCC reported 25 million wireless broadband data connections in the U.S. at the end of 2008.

Broadband over Power Line (BPL) *service* transmits digital signals over the electric power grid using a variety of frequencies depending on the base network. BPL theoretically offers the potential for providing service to areas where the cost of conventional broadband or cable wiring is prohibitive.

Major Telecommunications Providers

Six types of companies provide telecommunications in the U.S. today—incumbent local exchange carriers, interexchange carriers, competitive local exchange carriers, wireless companies, cable companies, and electric utilities.

From the late 1800s until the breakup of AT&T in 1984, nearly all telecommunications services were provided by traditional wireline telephone companies that operated as licensed local monopolies within defined service areas. In 1984, the settlement of an antitrust suit against AT&T divided AT&T into a long-distance company and seven regional Bell Operating Companies (RBOCs). Through mergers, the seven original RBOCs have been reduced to three, Verizon, AT&T, and Qwest. Mid-sized and small LECs, some investor-owned and others cooperatives, serve the rest of the country. Together, these companies are referred to as *Incumbent Local Exchange Carriers* (ILECs).

A number of companies were formed in the 1970s to compete with AT&T in the long-distance and local toll (intra-exchange) markets before the divestiture of AT&T was completed

in 1984. These companies, called *Interexchange Carriers (IXCs)*, offered standalone long-distance service, interexchange local toll services, or a combination of both. Since early IXC customers dialed an 800 number to access the IXC switch to complete their calls, these companies were often referred to as "dial around" carriers. The largest IXCs are AT&T, MCI, and Sprint.

The Telecommunications Act of 1996 ended the RBOC's local calling monopoly and created *Competitive Local Exchange Carriers (CLECs)* to offer competitive local exchange service. As of 2010, CLECs served approximately 20% of the market for wireline local exchange services, either by the reselling of ILEC services or via their own network facilities.

Cable television companies have become major competitors for telecommunications services. These companies provide voice and data telecommunications service using interconnected VoIP.

Wireless telecommunications has grown dramatically since wireless telephony was introduced in the early 1980s. By the end of 2008, the wireless industry reported 270 million subscribers, with 20% of consumers using only wireless.

Electric utilities have also experimented with technologies that deliver internet services using electric distribution wires. Broadband-over-power-lines, or BPL, was trialed in several states beginning in 2000 but has not proved a competitor to other broadband access services. Although some electric companies remain interested in BPL, most have shifted their focus from retail broadband services to using BPL to carry smart grid communications.

Regulation of Telecommunications Services and Providers

Both state and federal laws impose regulatory obligations on the telecommunications industry. Federal law gives the FCC at least some jurisdiction over a wide variety of telecommunications services, information services (such as broadband internet service), and cable television services. For many services, substantial areas of state regulation have been preempted by federal authority.

ILEC rates are controlled under a system of dual jurisdiction. The FCC has sole jurisdiction over rates for interstate services, and state commissions have sole jurisdiction over rates for intrastate services. To allow each jurisdiction to set rates, a system of jurisdictional separation has been created that virtually divides ILECs into two companies, one offering intrastate services and one offering interstate services. In setting rates for interstate services, the FCC continues to use rate-of-return (also known as cost-of-service) methods for smaller ILECs. For larger carriers, the FCC uses a system of price caps. Most states give ILECs wide discretion in setting intrastate rates, although many states continue to apply rate-of-return methods in more limited ways.

States continue to impose a variety of standards on the retail service quality of wireline companies. States also oversee wholesale telecommunications markets and, using delegated authority, devote resources to conserving telephone numbers.

A federal statute gives the FCC sole regulatory authority over the rates and entry of wireless carriers, while states retain authority over other terms and conditions. Broadband internet services are solely within the jurisdiction of the FCC, which has defined these services as "interstate information services." State regulation of Voice over Internet Protocol (VoIP) services is an unsettled area of law, but is limited by FCC and court decisions declaring that service to be interstate. To ensure that broadband carriers provide similar access to all users, in 2010 the FCC issued an order providing three basic "rules of the road" to protect consumers from discriminatory treatment by their broadband access providers. Under these "network neutrality" rules, broadband access providers must disclose their network management practices, refrain from blocking legal content, and treat all providers equivalently.

Universal Service

The 1996 Act gave the FCC a new mandate to preserve and advance universal service, in partnership with state officials. The costs of providing service to some customers are much higher than for others. The FCC and the states each provide support to carriers serving high-cost areas, in hopes of keeping rates affordable and reasonably comparable between rural and urban areas.

Federal high cost support programs are a multilayered system. The National Exchange Carrier Association (NECA) operates two rate pools for smaller ILECs that provide administrative savings and that allow many ILECs to lower their toll access rates charged to other carriers. Explicit federal high cost support is provided through five major programs, the largest of which is the High Cost Loop program. Together, all five high-cost programs cost $4.3 billion per year.

Federal universal service programs also provide subsidies for low-income customers through the Lifeline and Link Up programs. Support is also provided for telecommunications to schools and libraries and for rural health care. With these programs added to high cost support, the total annual cost of explicit federal universal service support is $7.3 billion per year.

The Federal-State Joint Board on Universal Service recommended fundamental revisions to federal universal service mechanisms in November of 2007.

Many states also operate universal service programs. The purposes include reducing local exchange rates in high-cost areas and replacing ILEC revenues lost through toll access reductions.

State commissioners have opportunities to participate on joint federal-state regulatory or advisory bodies. These opportunities include a "joint board" for separations and another for universal service.

Major Regulatory Challenges

Regulators face four major challenges as the telecommunication industry continues to evolve in the 21st century.

1. Establishing a balance between competition and regulation that is appropriate to modern technology, particularly as those technologies evolve and converge.
2. Preserving the essential public benefits from legacy regulation, even as providers and their customers move away from traditional regulated, wireline telecommunications service.
3. Identifying new ways to balance regulatory responsibility between federal and state authorities.
4. Increasing the availability of high-speed access to the Internet by promoting rural broadband deployment.

Telecommunications Acronyms

AFOR – Alternative Form of Regulation

BPL – broadband-over-power-lines

CETCs – competitive eligible telecommunications carriers

CLASS – customer local access signaling services

CLEC – competitive local exchange carrier

CPCN – certificate of public convenience and necessity

DSL – digital subscriber line

EAS – extended area service

ETCs – eligible telecommunications carriers

FCC – Federal Communications Commission

HCL – high cost loop support

ICLS – interstate common line support

ILEC – incumbent local exchange carrier

ISDN – integrated switch digital network

IXC – inter-exchange carrier

LATA – local access and transport area

LSS – local switching support

MTAs – major trading areas

NANP – North American numbering plan

NANPA – North American Numbering Plan Administrator

NBP – National Broadband Plan

NECA – National Exchange Carrier Association

NPA – three-digit telephone area code

NXX – three-digit central office code

OSS – operational support system

RBOC – regional Bell operating company

POP – point of presence

PSTN – public switched telephone network

SLC – subscriber line charge

SPF – subscriber plant factor

TRS – telecommunications relay services

UNEs – unbundled network elements

USF – universal service fund

VoIP – Voice over Internet Protocol

Table of Contents

Introduction

The telecommunications industry is a mix of technologies, services, and providers, operating both interstate and intrastate, regulated by the Federal Communications Commission and state commissions acting under federal and state laws. Since the 1984 breakup of the national Bell monopoly, all three components of this mix have experienced continuous change. Throughout this period, regulators have sought to induce the best possible performance from those who provide essential services. To help regulators reach that goal, this paper presents a multilayered examination of the industry's fundamentals.

Part I describes the industry's basics: its technologies, the services made possible by those technologies, and the types of providers that sell those services.

> The three main *technologies* on which the majorities of telecommunications services rely are circuit switching, packet switching, and Voice over Internet Protocol (VoIP).
>
> The *services* fall into two main categories—voice and data. The Internet has stimulated many new services in both categories, and wireless service has caused many customers to "cut the cord" and rely completely on wireless services.
>
> The *providers* range from the "incumbent local exchange carriers," including large regional entities that were once part of the Bell System, to small rural "competitive local exchange carriers," to new entrants in the wireless space, to the many providers of broadband services. New players have entered the field, and old players have changed their names, merged, and begun to compete with each other to provide new services.

This mix of technologies, services, and providers bears little resemblance to the wireline-based, vertically integrated single national system that characterized the Bell System before its 1984 breakup, when customers bought nothing more than discrete local and long-distance calling plans.

Part II describes jurisdiction over telecommunications regulation. Because telecommunications services are both interstate and intrastate, there are laws and regulations at both the federal and state level. The relationship between federal and state regulation is sometimes *exclusive*, with federal and state regulators playing distinct, non-overlapping roles (the federal role preempting the state role); and sometimes *concurrent*, with federal and state regulators acting on different aspects of the same providers and services.

Part III discusses Universal Service—a special program by which customers of certain telecommunications services pay into a fund that the Federal Communications Commission then distributes to various providers to ensure that all customers in all parts of the country can obtain service.

Part IV looks to the future. Since the 1984 breakup of the Bell System, industry change—in terms of technologies, services and providers—has been a constant, with initiatives from Congress, the FCC, state legislatures, and state commissions. This part identifies the four main challenges still facing regulators and legislators:

1. Establishing a balance between competition and regulation that is appropriate to modern technology, particularly as those technologies evolve and converge.
2. Preserving the essential public benefits from legacy regulation, even as providers and their customers move away from traditional regulated, wireline telecommunications service.
3. Identifying new ways to balance regulatory responsibility between federal and state authorities.
4. Increasing the availability of high-speed access to the Internet by promoting rural broadband deployment.

I. Telecommunications Technologies, Services, and Providers

Part I of this paper focuses on telecommunications technologies, services, and providers. It describes the three basic transmission technologies underlying the majority of telecommunications services—circuit switching, packet switching, and Voice over Internet Protocol (VoIP); introduces the primary voice and data telecommunications services used in the U.S. today; and reviews the major categories of companies that provide those services.

A. Telecommunications technologies

Three key technologies—circuit switching, packet switching, and Voice over Internet Protocol (VoIP)—are used to provide the major telecommunications products and services offered in the U.S. today. This part describes these technologies.

1. Circuit switching

Before the 1990s, all telephone technology used a common architecture. The heart of the system was the "switch," an electronic device that, in the 1940s, began replacing telephone operators sitting at "switchboards."[1] Each switch is located in one of the carriers' "central offices" or "wire centers." Wire centers define telephone exchanges. Local telephone service, that is, service between one exchange and another in the same wire center, is commonly referred to as *local exchange service*. Companies that provided this service prior to the divestiture of the Bell System in 1984 are called *Incumbent Local Exchange Carriers* or ILECs. Service between wire centers but within the same area code is generally called *local toll service*. Calls between area codes are referred to as *interexchange service* and the companies who transmit these calls are referred to as *interexchange carriers* or IXCs.

When a customer wants to make a switched call, the switch provides a "dial tone," indicating that the switch is ready for a call. When the customer dials a telephone number, the switch automatically establishes an electronic "calling path" through the telephone network. The path allows electrical impulses to flow between the customer's microphone and the other user's speaker, and vice versa. When the call is over, the switch breaks the connection and releases the network resources used for the calling path. Using this method, each customer needs only one pair of wires and can make calls to any other customer attached to the same switch.[2] By adding

[1] Even into the 1980s, some rural areas still had manual offices that used human telephone operators.

[2] This was the original meaning of "local exchange" service. Originally, a call beyond the area served by the local switch automatically would have been considered a "toll call." Many states have established "extended area service" policies that allow callers to make "local" calls to customers served by other switches. Local service then became a legal concept instead of an engineering concept.

interoffice transport and "tandem" switching,[3] customers can speak to others anywhere on the worldwide switched network.

Because switching is so important, a customer who has dial tone service is said to have "switched service," and the service is provided through a "switched access line."[4] The entire telephone network is also called the "switched network" or "public switched telephone network" (PSTN), although it also includes some "dedicated" or unswitched circuits.[5] The network is also described as a "circuit-switched" network because specific circuits or electronic paths for the information are established during call setup.

Although switches always contain internal information sufficient to complete at least some calls without assistance,[6] modern switches frequently seek external data, sometimes from databases hundreds of miles away. For example, a switch may need to consult a database to complete a call to a customer who previously "ported" her telephone number to a competitive carrier. Or a switch may obtain information from a distant signal control point in order to set up an interoffice trunk.

The network also contains wires and fibers used to carry signals between customers and switches. A "loop" is used to connect a customer to the switch in the local central office.[7] Loops usually are paired copper wires or "twisted pairs." The entire network of loops surrounding a central office is called the "feeder and distribution network." "Trunks" are used to interconnect switches; they make interoffice calling possible.[8]

The telecommunications network traditionally relied on sending varying electric impulses over wires. Today, light signals and glass fibers have increasingly replaced this technology, both for interoffice trunks and for loops. Some companies offer light fiber all the way to the customer's premises, which greatly increases data speeds.[9]

---

[3] "Tandem" is a term applied to switches that connect local networks with long-distance networks. In one sense they operate as a "switch's switch."

[4] These are also, more simply, called "access lines" or simply "lines."

[5] Unswitched or dedicated services include "special access" lines, such as "T-1" lines and the more modern service of Ethernet transport. Internet-based voice services, discussed in more detail below, are not switched in the usual sense, because they are packet-based.

[6] Some switches, called "remote switches," are not fully functional and depend on more complex "host switches" for some software and information. Often in rural areas, a carrier will have few host switches and many remote switches.

[7] "Loop" is also sometimes used synonymously with "access line" or "line."

[8] Some large-volume customers purchase trunks directly. "Umbilical trunks" are special-purpose trunks that attach host and remote switches.

[9] This architecture is usually called "fiber to the home."

Many wireline carriers today use a "remote platform" or "pedestal" in the customer's neighborhood. Newer versions of these platforms commonly use a light fiber connecting to the central office switch and a copper loop connecting to the customer. By using such fiber-fed remote platforms, a carrier can offer its higher capacity "digital subscriber line" (DSL) service to more remote customers.[10] The traditional telephone signal was "analog" because voltage changes on the wires were analogous to air pressure changes near the telephone's speaker or microphone. Most voice signals today are "digitized" in central offices (or even in remote platforms). Digitizing is valuable because digital data can be more efficiently stored, transmitted, and retrieved, and because sound quality does not degrade over distance. Digitizing also offers opportunities to add new service features. Even where a signal has been digitized, most telephones still operate on analog voltages, and a digital signal must be converted back to analog form before another user's telephone can reproduce the intended sound.

Originally, telephone switches established a unique "calling path" similar to what an operator did at a switchboard. For each call, an electrical circuit was formed that allowed current to pass directly between two end user telephones. Today the switched network still "sets up" a requested call and "takes down" a completed call, but the calling path is almost always a logical entity rather than a simple electrical circuit.[11]

Today, switches are essentially computers with some extra hardware. Switches provide a range of services beyond local exchange and interconnection with long-distance "toll" networks. Modern switches also: (1) provide connection to various forms of assistance for hearing-impaired users (Telecommunications Relay Services or TRS); (2) provide connections to emergency services (911 and E-911) and to a telephone "operator; (3) provide "vertical services" such as three-way calling, call waiting, caller ID, and voice mail; and (4) provide billing information to the carrier. A newer form of switch, known as a "soft switch," emulates switching functions, but it replaces circuit switching with packet-based networking.

2. Packet switching

As the PSTN has evolved from analog to digital switching, ILECs and others have begun to replace traditional circuit switches with packet switches that can take advantage of the higher speeds and greater bandwidth provided by data networks such as the Internet. Packet switching increases network efficiency and lowers equipment costs.

With packet switching, data (including voice calls) are collected into specially formatted units (called packets) that are transported from source (the calling party) to destination (the receiving party) via a data-switching protocol called Transmission Control Protocol/Internet

---

[10] This architecture is sometimes called "fiber to the curb" or "fiber to the platform."

[11] One development that increased the capabilities of traditional circuit switching was the introduction of "time division multiplexing" (TDM) technology. TDM divides each second into many very short "time slices," and it allocates one time slice to each voice conversation. TDM increases efficiency by allowing many calls to share common facilities. Another development was the shift to digital formats on long-range calls.

Protocol (TCP/IP) rather than traditional voice switching protocols like Time Division Multiplexing (TDM). Unlike circuit switching, which creates a single pathway for each call, packet switching allows multiple packets to traverse the same routes simultaneously (using statistical multiplexing or dynamic bandwidth technologies), increasing the number of calls that can be handled at one time. Each packet includes address information that identifies the sending computer and the destination location, so that the data can be reassembled into a single call when it is received at the far end. Thus, various packets may follow different routes to the same destination. Using these addresses, network switches and routers determine the most efficient and rapid way to transfer the packets to their destinations.

Most Wide Area Network (WAN) protocols, including TCP/IP, X.25, and Frame Relay, are based on packet switching. Packet switching uses a number of packet prioritization and buffering techniques to ensure service quality. A new technology, ATM, attempts to combine the best of both worlds—the guaranteed delivery of calls via circuit-switched networks and the robustness and efficiency of packet-switching networks.[12]

3. Voice over Internet Protocol transmission

Voice over Internet Protocol service (VoIP) refers to the transmission of voice traffic over Internet Protocol (IP)-based networks. IP was designed in the 1970s to transmit data over the worldwide web from one computer to another. The information to be transmitted is divided into "packets" of information that are transmitted individually across the Internet. These packets can be thought of as envelopes with address information that allows them to be reassembled at the far end. VoIP uses the Internet to transmit digital packets of voice information (analog voice calls that have been re-created as digital packets of information) across the Internet from one caller to another. VoIP calls are "digitized" by the carrier at the calling party's end and then translated back to analog at the receiving party's end for delivery over the public switched network. VoIP calling requires a broadband connection at the customer's premise. Customers use standard telephone sets but connect this equipment to an IP-enabled "translator" that converts the analog signal to digital and formats it into information packets that are transmitted over the Internet.

Unlike circuit-switched voice services, which connect two callers to each other via a single dedicated voice path, each VoIP packet is transmitted separately from the originating location to the terminating location and must be reassembled at the far end. When the transmission of some of these packets is delayed, the quality of the voice call may be reduced, potentially resulting in garbled or unclear transmission. Transmission delay is called "latency."[13]

---

[12] See http://www.webopedia.com/TERM/P/packet_switching.html

[13] In a network, latency, a synonym for *delay*, is an expression of how much time it takes for a packet of data to get from one designated point to another. In some usages (for example, AT&T), latency is measured by sending a packet that is returned to the sender and the round-trip time is considered the latency. *See* Search CIO at http://searchcio-midmarket.techtarget.com/sDefinition/0,,sid183_gci212456,00.html

Other quality-of-service issues include jitter, dropped or lost packets, corrupted packets, and packets delivered out of order.

B. Telecommunications services

This section describes the major voice and voice and data services available to U.S. telephone customers.

1. Voice services

a. Circuit-switched wireline voice service

Traditional circuit-switched voice services are referred to as "wireline" voice. Wireline voice calls are transmitted over the Public Switched Telecommunications Network (PSTN) using the circuit-switching protocol described in Part I.A above. Wireline voice customers can connect to other customers served by the national PSTN, the wireless network, or the international telecommunications network simply by dialing the other party's telephone number. Wireline voice services remain the predominant method for transmitting voice calls in the U.S. As of June 2009, there were 133 million traditional circuit-switched wired telephone lines in the U.S., the majority provided by traditional telephone companies such as Verizon and AT&T.[14]

b. Voice over Internet Protocol service

Voice over Internet Protocol (VoIP) service uses the Internet to transmit calls between users.[15] VoIP customers can call all points on the PSTN just as wireline customers can, but the call is transmitted at least in part over a digital connection to the Internet. There are two types of VoIP services—interconnected and nomadic.

An *interconnected VoIP provider* uses its own broadband transmission network to deliver service to its customers.[16] The FCC requires interconnected VoIP providers to offer enhanced 911 services, including automatic identification of the telephone number and location calling 911, just as wireline carriers do. As of 2009, interconnected VoIP subscriptions constituted 15% of the residential and business telecommunications market, with these lines provided primarily by cable companies. Interconnected VoIP lines increased by 10% in the first half of 2009, while switched voice lines declined by 5%.[17]

---

[14] *Federal Communications Commission, Local Competition Report* (September 2010), p. 3, Table 1. By "traditional telephone companies," we mean circuit-switched voice providers.

[15] Business VoIP customers can also transmit calls over private networks using dedicated connections between their locations.

[16] These companies refer to their service as "digital voice."

[17] Declines in switched access lines include ILEC lines lost to CLECs as well as second lines previously used for dial-up Internet service and disconnected as customers switched to broadband.

Nomadic VoIP providers[18] offer VoIP services that ride on broadband facilities provided by others. Nomadic VoIP service users can move their service from one location to another simply by plugging their VoIP telephone into a broadband Internet connection wherever they are located. Because nomadic VoIP customers can move their service from place to place and may use a telephone number that does not correspond to their true location, nomadic VoIP service providers cannot provide location-identifiable 911 emergency capabilities. Nomadic VoIP service providers obtain gateway service from other carriers so that calls can be completed to the public switched network.

The largest nomadic VoIP companies are Vonage and Skype. Vonage, an early VoIP entrant, claims 2 million lines in the U.S.[19] Skype operates a decentralized system that offers a variety of services, generally from computer to computer. Skype does not levy a charge on its customers for calls made via computer entirely over the Internet from one Skype user to another.[20] Skype offers other services that allow its customers to place calls to and receive calls from the switched network, including wireless calls. Skype claims that it has registered 246 million users worldwide.[21]

As nomadic VoIP services have proliferated, the Incumbent Local Exchange Carriers (ILECs) have begun to offer customers standalone broadband connections, often called "naked DSL." These connections provide high-speed Internet access without traditional telecommunications capabilities such as a telephone number or local calling. Customers purchase naked DSL from their local carrier and then contract separately with a VoIP provider for a telephone number and calling services.

c. Wireless voice service

Wireless voice telecommunications service, also called Commercial Radio Mobile Services (CMRS) or cellular phone services, uses radio waves to transmit voice calls between the calling and the called party. Wireless service uses radio frequencies licensed from the federal

---

[18] "Nomadic" refers to the service's capability to operate at any location with a broadband Internet connection. Another term used for these services is "over the top" because they ride "on top" of the broadband Internet service the user has purchased from another carrier. See how Vonage works at http://www.vonage.com/how_vonage_works/?refer_id=WEBHO0706010001W&lid=main_nav_how_works.

[19] ISP Planet web site is at http://www.isp-planet.com/research/rankings/2006/voip_q42006.html (1/31/08).

[20] Users must have a computer and a broadband connection to use the Skype computer to computer calling service. This service is also available on some broadband wireless networks.

[21] Skype press release, January 8, 2008, "Skype Expands Mobile Strategy at 2008 International CES," available at http://about.skype.com/2008/01/ (accessed 1/31/08).

government to carry these calls between wireless "towers" or switching stations.[22] Wireless providers connect their towers to the PSTN by means of high-capacity circuits purchased from a variety of providers. Wireless-to-wireless callers who use the same provider reach each other without using the PSTN. Calls between wireless and non-wireless subscribers use the PSTN to connect.

U.S. wireless voice providers use two different communications standards, Code Division Multiples Access (CDMA) and Global System for Mobile Communications (GSM).[23] Because these standards are not compatible with each other, wireless voice users cannot switch between these two types of networks without purchasing new telephone handsets.[24]

As of 2009, over 20% of U.S. households had "cut the cord" altogether and purchased wireless services only.[25] Infonetics Research expects the residential wireless services market to grow to $270 billion in 2014.[26]

2. Data services

a. Dial-up Internet access service

Customers can access the Internet by dialing an Internet Service Provider (ISP) using a circuit-switched standard telephone line to connect via the PSTN.[27] The caller's computer uses a modem to convert analog signals to the digital signals required for Internet access. The user connects to the ISP's pool of modems, which in turn connects to the Internet. Dial-up Internet access is significantly slower than broadband access. Today's modems transfer data at speeds of up to 56,000 bits per second (56kbit/s) but are subject to noise and interference from the telephone network that reduces the actual rate of data transfer.

---

[22] Wireless spectrum is awarded via "auctions" conducted by the FCC.

[23] Verizon Wireless is the primary user of CDMA. AT&T and providers in most of the world use GSM. *See* http://en.wikipedia.org/wiki/GSM

[24] Some newer equipment is capable of operating on multiple systems and can be used both internationally and in the U.S.

[25] http://arstechnica.com/telecom/news/2009/05/survey-one-in-five-us-households-are-cellphone-only.ars

[26] Infonetics Research: "N. American carriers to reap $246B from residential video, voice, Internet services in 2010" - FierceTelecom http://www.fiercetelecom.com/press_releases/infonetics-research-n-american-carriers-reap-246b-residential-video-voice-i?utm_medium=nl&utm_source=internal#ixzz18OVADDBj

[27] Customers must contract with ISPs to use their services. ISPs generally provide users with an 800 number in order to avoid long-distance charges.

Although dial-up access to the Internet has declined as broadband availability has increased, dial-up connections remain useful for travelers and consumers in locations without broadband access. According to a 2008 study by the Pew Research Center, 10% of customers in the U.S. continue to access the Internet via dial-up service.[28]

b. Broadband Internet access services

Customers can access the Internet via an "always-on" broadband connection that uses packet switching to transmit data. The FCC defines the minimum speed for broadband Internet access as 4 million bits per second (mbit/s).[29] Broadband access is available via Digital Subscriber Line service (DSL), cable modem service, "fiber to the home" and "fiber-to-the-node" (neighborhood distribution location) services, wireless, and, potentially, broadband over power lines (BPL). We discuss these services below.

i. DSL

DSL carries data over the high-frequency portion of a subscriber's copper telephone line to provide simultaneous voice and data connectivity.[30] Customers must be located within 15,000 – 18,000 feet of the carrier's central office, since service degrades with the length of the circuit that connects the customer's premise to the provider's switch.[31]

The DSL provider uses a Digital Subscriber Line Access Multiplexer (DSLAM) to separate the high- and low-frequency portions of the circuit. DSLAMs can be located in the provider's central office or at the remote switching module. Customers use a DSL modem to convert the digital signals generated by their computers to the frequency necessary to transmit the data over the phone line. Carriers may integrate these modems into a digital "router" that allows multiple computer to access DSL remotely or via cable from multiple locations in the same premise. DSL provides transmission speeds of up to 24 mbit/s, depending on the customer's distance from the provider's DSLAM.[32]

---

[28] See http://en.wikipedia.org/wiki/Dial_up_Internet_access. The FCC's National Broadband Plan (NBP) proposes increasing the availability of broadband connections to rural areas in order to reduce the need for dial-up access.

[29] FCC Sixth Annual Broadband Report, July 20, 2010, available at http://www.fcc.gov/Daily_Releases/Daily_Business/2010/db0720/FCC-10-129A1.pdf.

[30] There are various types of DSL, including Asymmetrical DSL (ADSL), in which data upload and download at different speeds; Symmetrical DSL (SDSL), which provides the same speed in each direction; and High Bit Rate DSL (HDSL) which provides enhanced speeds. Most consumers use ADSL.

[31] Loop lengths can be extended by locating the DSLAM in a remote switch module closer to the customer premise.

[32] *See* http://en.wikipedia.org/wiki/Digital_Subscriber_Line.

DSL has been available since the late 1980s, but DSL subscriptions have grown substantially with the increased need for high-speed connectivity to the Internet. The FCC's 2008 Trends in Telecommunications Report (September 2010), counts approximately 26M DSL connections in the U.S. as of the end of 2008.[33]

ii. Cable modem service

Cable modem service (also known as cable Internet service) uses the customer's digital cable TV connection and premises wiring to provide high-speed digital access services over the cable provider's digital access lines.[34] Cable modems may be installed externally or built into the subscriber's computer or cable television box set. The signals from the cable modem are converted to IP and then routed to the Internet. Cable modem speeds can reach up to 60 mbit/s, which is significantly faster than DSL connections.[35]

The FCC reported more than 39 million cable modem connections in the U.S. as of December 2008.[36]

iii. Fiber-to-the-premises service

Fiber-to-the-premises service delivers very high-speed data connectivity to customers via fiber optic cable that runs from the provider's switching office into the customer's home. The technology takes advantage of the ability to use fiber to carry data over long distances at high data rates without loss of signal strength and quality. Fiber-to-the-premises services require the provider not just to install fiber in its network but also to re-wire the customer's home to replace the embedded copper wiring with fiber. Fiber data rates can exceed 150 mbit/s.[37]

Fiber-to-the-premises systems are available in limited areas of the country and served almost 3 million subscribers at the end of 2008.[38]

---

[33] FCC Report: Trends in Telephone Service, September 2010, Table 2-2. Available at www.fcc.gov/wcb/iatd/trends.html.

[34] Cable modem service cannot be transmitted over existing copper in-home wiring.

[35] www.cable-modem.net, available at http://www.cable-modem.net/cable_service/basics.html

[36] FCC Trends Report, Table 2-2. Available at www.fcc.gov/wcb/iatd/trends.html.

[37] See http://en.wikipedia.org/wiki/Verizon_FiOS. Fiber-to-the-curb and fiber-to-the-pedestal services use fiber to connect the carrier's switching system to a local termination point but then use the customer's existing inside wire to provide service. These systems do not reach the speed of fiber-to-the-home services.

[38] FCC Trends Report, Table 2-2. Available at www.fcc.gov/wcb/iatd/trends.html.

iv. Wireless data service

Wireless companies are increasingly offering broadband service in competition with wireline companies. Wireless broadband connections allow users to receive email, video, and other enhanced services via wireless "appliances," including smart phones and wireless computing devices such as the Apple iPad and similar products. Wireless providers currently offer digital, third-generation (3G) wireless services, which provide data transmission at speeds of up to several thousand bits per second, comparable to the speed offered by many wired networks. Many providers are moving to fourth-generation (4G) technology, which, they claim, will become a substitute for wired data connections. In late 2010, Verizon began deploying its Long Term Evolution (LTE) standard, which will boost speeds even further.

The FCC's National Broadband Plan recommends that additional radio frequency spectrum be made available to wireless carriers to increase the availability of wireless broadband in rural areas where wireline connectivity is difficult or too costly to deploy.[39]

The FCC reported 25 million wireless broadband data connections in the U.S. at the end of 2008.[40]

v. Broadband over Power Line service

Broadband over Power Line (BPL) service, also known as Power Line Communication, Power Line Carrier, or Power Line telecommunications, transmits digital signals over the electric power grid using a variety of frequencies depending on the base network. BPL theoretically offers the potential for providing service to areas where the cost of conventional broadband or cable wiring is prohibitive. Because it uses on-premises electric wiring, BPL can be deployed without the need to install additional network cabling. Theoretically, customers would install a BPL modem in their computers and connect it to any power outlet in their home. Industry estimates project BPL data transfer speeds of up to 2 mbt/s for standard asymmetrical service.[41]

BPL has not been deployed widely in the U.S., due to signal loss from noise caused by power circuits and other interference. In addition, BPL signals cannot pass through transformers, which filter out the signal. Although electric utilities have used BPL since the 1920s for telemetry, no company has deployed a commercial system in the U.S.

The FCC has adopted various policies designed to promote BPL, and former FCC Chair Kevin Martin stated that BPL "holds great promise as a ubiquitous broadband solution that would offer a viable alternative to cable, digital subscriber line, fiber, and wireless broadband."[42]

---

[39] National Broadband Plan, Chapter 5.

[40] FCC Trends Report, Table 2-2. Available at www.fcc.gov/wcb/iatd/trends.html.

[41] *See* http://en.wikipedia.org/wiki/Power_line_communication.

[42] *See* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266773A2.pdf.

C. Major telecommunications providers

Part I.A and Part I.B described the three basic technologies used to provide telecommunications services in the U.S., the three major types of voice services available, and the four major types of data services. This Part I.C reviews the six types of companies that provide these services. Not all provider types provide all service types; this combination of providers and services is dynamic as new players enter the markets and veterans expand their service offerings. Table 1, at the end of this Part I.C, displays the current relationships between services and providers.

1. Incumbent local exchange carriers

From the late 1800s until the break-p of AT&T in 1984, nearly all telecommunications services were provided by traditional wireline telephone companies. These companies operated as licensed local monopolies within defined service areas. In 1984, the settlement of an antitrust suit against AT&T ended AT&T's monopoly over long-distance and telecommunications equipment manufacturing, allowing competition in the long-distance market. The 1984 breakup divided AT&T into a long-distance company and seven regional Bell Operating Companies (RBOCs), the "Baby Bells." AT&T continued to provide long-distance services, while local telecommunications services (with the exception of regional toll calling) became the exclusive domain of the seven regional companies. This structure lasted until 1996.

In 1996, Congress passed the Telecommunications Act of 1996, ending the Baby Bell's local calling monopoly. To differentiate the old companies from the new competitive companies allowed to enter the market as a result of the Act, Congress coined the term "Incumbent Local Exchange Carriers" (ILECs) to describe the telephone companies that provided "local exchange service"[43] at the time of divestiture.[44]

The largest ILECs are the successors of the seven RBOCs created by the breakup of AT&T in 1984.[45] In 2009, these companies served about 112 million access lines in the country, about 84% of the national total. Through mergers, the seven original RBOCs have been reduced to three: Verizon, AT&T (formerly Southwestern Bell), and Qwest.[46] AT&T is the largest ILEC,

---

[43] Federal law usually calls local exchange service "telephone exchange service." *See* 47 U.S.C. § 153(26) (ILEC defined); 47 U.S.C. § 153(47) (telephone exchange service defined). Occasionally the Act uses the more common term "local exchange service." *See* 47 U.S.C. § 227(c)(3)(C); 47 U.S.C. § 228(c)(5).

[44] *See* 47 U.S.C. § 251(h)(1)(A) (ILEC defined, in part, as company providing local exchange service in February, 1996).

[45] In 1984, pursuant to a federal court order, AT&T was separated into seven regional Bell operating companies and a new AT&T offering toll services.

[46] This number will be reduced to two when the proposed CenturyLink – Qwest merger is completed in 2011.

serving Northern California, the Southwest, the South, Connecticut, and much of the Midwest.[47] Verizon's footprint ranges from Massachusetts to Virginia and also includes parts of Florida, California, and Texas, covering 28.8% of the national landline market.[48] With 44.7% of the national market, Qwest is the smallest remaining RBOC, with 8% of the market.[49] It serves the 14 states west of the Mississippi River.

Mid-sized ILECs that were not part of the original AT&T serve about 7% of the switched telephone lines in the country, and are growing in size as a result of mergers and acquisitions.[50] For example, Century Telephone (now called CenturyLink) acquired Embarq (originally the wireline portion of Sprint, formerly known as United Telephone Company) in 2009 and will complete its merger with Qwest in 2011. Several of these mid-sized companies specialize in serving rural areas.

The remaining approximately 1,000 small ILECs serve about 8% of the access lines in the country. Some of these companies serve only a few hundred lines, and many serve the most rural and highest-cost areas of the country. Some of these companies are investor-owned; others are cooperatives.

Prior to the 1996 Act, the ILECs were the primary providers of local exchange services, but over time they have begun to lose switched access lines to competitors. At the end of 2006, ILECs had only 142 million lines, having lost more than one line in five.[51] This total had decreased to approximately 112 million lines by the end of 2009.[52]

There are three causes for ILEC line loss. The first cause is competition from other providers, including the Competitive Local Exchange Carriers (CLECs), cable companies, and wireless carriers. These carriers are described in sections I.C.3, I.C.4, and I.C.5 below. The second cause is the shift to wireless service as a replacement for traditional fixed-location

---

[47] FCC *Trends in Telephone Service*, September 2010.

[48] Verizon has sold its lines in Maine, New Hampshire, and Vermont to FairPoint Communications. FairPoint is treated as an RBOC for some legal purposes. Verizon also sold its lines in Hawaii to the Carlyle Group and its lines in the former GTE territories, with the exception of Florida, California, and Texas, to Frontier Communications.

[49] Qwest has sold large rural areas in some of its states. As of 1/11, Qwest was in the process of merging with CenturyLink. When this merger is completed in 2011, only two of the seven original RBOCs will remain.

[50] FCC *Trends in Telephone Service*, September 2010.

[51] FCC, Wireline Competition Bureau, Industry Analysis and Technology Division, *Trends in Telephone Service*, Feb. 2007, (*2007 Trends Report*), available at www.fcc.gov/wcb/iatd/trends.html, Table 8.4.

[52] FCC Local Competition report, 9-3-10. Available at http://www.fcc.gov/wcb/iatd/comp.html.

telecommunications services. According to the Center for Disease Control's National Heath Care Statistics survey, by the end of 2008, 20% of all households had eliminated wireline service altogether.[53] A third reason for the loss of ILEC switched lines is the elimination of second lines as customers have shifted away from dial-up Internet access[54] to broadband connections.

2. Interexchange carriers

Today, we think of local and long-distance calling as a single, bundled product, most often with a single monthly price. Prior to the AT&T divestiture in 1984, however, local and long-distance services were separate services, offered by distinct companies. This section discusses the long-distance or *interexchange carriers* (IXCs) that began to compete with AT&T prior to its breakup.[55]

A number of different types of telecommunications companies emerged as competition with AT&T began in the late 1970s. One of the earliest was the IXC, a carrier that offered standalone long-distance service, interexchange local toll services, or a combination of both.[56] Since early IXC customers dialed an 800 number to access the IXC switch to complete their calls, these companies were often referred to as "dial around" carriers. In the 1990s, the largest IXCs were AT&T, MCI, and Sprint.

The IXC industry originated through FCC decisions that allowed the newly created MCI, to offer a service it called Execunet. Execunet allowed MCI customers to make interstate toll calls via microwave without using the Bell companies to carry the traffic. In response to this new calling method, the FCC created "access charges,"[57] a system of payments in which other carriers pay the local ILEC a per-minute rate whenever the carrier originates or terminates a toll

---

[53] http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200905.htm. The CDC collects data on the number of wireless-only subscribers as part of their health information research.

[54] During the 1990s, ILECs had experienced a large surge in second lines due to increased computer usage through "dial-up" lines.

[55] Prior to divestiture, even the Bell System thought of long-distance and local service as two distinct services. Long-distance service was provided by the AT&T Long Lines division, while local service was provided by the Bell company in each state.

[56] The term "toll" originated from the per-minute charges applied for these calls. Another term for toll traffic is "interexchange traffic," although the term is misleading. Some calls actually travel from one exchange to another, yet they are treated for regulatory purposes as "extended area service" calls, a variety of "local" calling.

[57] For the early history of the IXC and of access charges, including the original "ENFIA" agreement, *see* FCC, *MTS and WATS Market Structure*, 97 FCC 2d 834, ¶¶ 51-54 (1984).

call on the ILEC's facilities.[58] These charges are referred to as "originating access" and "terminating access." We discuss these charges in Part II.A of this paper.

In 1982, the U.S. Department of Justice settled an antitrust case against AT&T.[59] The final settlement of the case (called the Modified Final Judgment) in 1984 allowed AT&T to enter the computer business and created the seven RBOCs to provide local service, leaving AT&T with long-distance service and the right to enter other markets. The court (under Judge Harold Greene) ordered the RBOCs to refrain from offering toll services across the boundary of any of 164 "Local Access and Transport Areas" (LATAs) created by the ruling.[60] This action left the toll market open primarily to the IXCs, including MCI and the reorganized AT&T.

One objective of the divestiture was to create long-distance competition by allowing the IXCs to use local networks to originate and terminate their own customers' calls. This required creating new regulatory obligations beyond the traditional access charge system. Regulators imposed "equal access" obligations that allowed customers to "pre-subscribe" their toll service to an IXC rather than their ILEC.[61] Later, when "slamming" (transferring customers to another provider without permission) became a problem, regulators imposed additional rules that limited the methods by which carriers might seek new subscribers.

Toll competition generated industry investment. To interconnect with the ILECs, facilities-based IXCs established a "point of presence" (POP) in each LATA. For their part, the ILECs needed new "tandem" networks within each LATA to handle regional interoffice

---

[58] "Originating access" payments are made when the toll carrier's customer dials a toll call using the ILEC's local exchange facilities. "Terminating access" payments are made to an ILEC when the toll carrier's customer places a call to a different customer who is connected to that ILEC's facilities.

[59] *United States v. American Telephone and Telegraph Co.* 552 F. Supp. 131 (D.D.C. 1982), aff'd sub. nom. *Maryland v. United States*, 103 S. Ct. 1240 (1983). The federal court's order is often called the "Modified Final Judgment" or "MFJ."

[60] Originally, the RBOCs had been ordered to refrain from interexchange service. *Id.* at 330. Later, the court adopted LATA terminology. *See United States v. Western Electric Co. and American Telephone & Telegraph Co.*, 569 F. Supp. 990 (D.D.C. April 20, 1983).

[61] When a customer who is presubscribed to an IXC dials a "1" and then a ten-digit telephone number, the call is routed to the customer's presubscribed IXC network. Customers may presubscribe to one carrier for interLATA calling and a different carrier for intraLATA calling. Other dialing patterns were also developed to allow customers to reach IXC networks, including "1010" prefix codes and ten-digit toll-free numbers. Today, some carriers call intraLATA toll service "regional" calling service.

transport between the IXC's POPs and the various ILECs.[62] Nearly all ILECs eventually purchased and installed equal access software in their switches.

Major IXCs later built their own switching and transport facilities. In the 1990s, AT&T, MCI, and Sprint invested in fiber optic-based networks, which have much greater capacity than traditional copper lines. Yet not all IXCs had facilities. Toll "resellers" purchased large blocks of toll capacity from facilities-based carriers and then resold that capacity to their retail customers in smaller, higher-priced pieces.[63] The standalone IXC industry declined after 2000,[64] as customers began to purchase "bundles" of long-distance and local service from the ILECs and their competitors and retail rates declined. Today, most customers can make interstate toll calls for a few pennies per minute, and many customers subscribe to unlimited usage plans. Regulatory changes contributed to these lower rates. The FCC decreased interstate toll access rates in 2000 and 2001,[65] and this decrease tended to reduce toll rates. In addition, wireless competitors have had a regulatory advantage for regional toll calling, reducing their intercarrier costs as compared to wireline carriers.[66] Simultaneously, the large ILECs reentered the toll markets.[67] Finally, mergers and acquisitions have reduced the number of standalone IXCs. AT&T and MCI, two of the three original principal IXCs, have now merged with the regional Bell operating companies, AT&T (formerly SBC) and Verizon.

---

[62] These tandem services were particularly important to rural ILECs, who generally did not operate their own tandems.

[63] AT&T, Sprint, and MCI also resold local toll and long-distance service to smaller companies, creating a new wholesale market.

[64] IXC revenues were $110 billion in 2000 and $71 billion in 2004. *2007 Trends Report*, Table 9.1. Although the FCC has not reported subsequent revenues, most observers agree that the decline continued after 2004.

[65] The FCC reduced access rates for large "price cap" companies in 2000. *See* FCC, *Access Charge Reform*, CC Docket No. 96-262, Sixth Report and Order, 15 FCC Rcd 12,962 (2000) (*CALLS order*). The FCC reduced rates for the smaller "rate-of-return" companies in 2001. FCC, *Multi-Association Group (MAG) Plan for Regulation of Interstate Services of Non-Price Cap Incumbent Local Exchange Carriers and Interexchange Carriers*, Second Report and Order and Further Notice of Proposed Rulemaking, 16 FCC Rcd 19613, 19667-68 (2001) (*MAG Order).*

[66] Calls involving wireless devices can be made within "Major Trading Areas" (MTAs) at lower wholesale and retail cost than IXC-carried calls that use wireline facilities.

[67] Under 47 U.S.C. § 271, the RBOCs had an opportunity to petition the FCC to reenter inter-LATA toll markets. The FCC has granted this right to RBOCs in every state.

3. Competitive local exchange carriers

The 1996 Act gave all telecommunications companies the right to enter the local exchange business.[68] The new entrants were called Competitive Local Exchange Carriers (CLECs) to differentiate them from the existing local carriers (ILECs). The 1996 law imposed new duties on the ILECs and required new investments, including measures intended to open the local exchange market to the nascent CLEC industry. While the law recognized that ILECs would continue to control facilities that were essential for new competitors but that could not economically be duplicated, it sought in three ways to ensure that the ILECs could not use this control to block CLECs from entering markets. First, ILECs were required to offer their retail services for "resale" by other carriers, i.e., the CLECs.[69] Second, the act mandated that ILECS offer to CLECs certain "unbundled network elements" (UNEs), such as loops, switches, operational support systems, and databases at wholesale prices.[70] Third, the 1996 law required that local exchange carriers make telephone numbers "portable," so that customers might easily switch carriers while keeping their existing telephone number.[71]

To further promote local exchange competition, the FCC required the seven RBOCs to develop "Operational Support Systems" (OSSs) that provided CLECs with an opportunity to order and deliver service to their customers at the same speed and with the same computerized systems as those used by the RBOCs for their own customers.[72] These computerized interfaces allowed CLECs to place orders electronically using graphical user interfaces (GUIs) or electronic data interchange (EDI) computer to computer interfaces. The FCC also required the ILECs to establish "dialing parity" so that CLEC customers would dial the same numbers as ILEC customers in order to reach the same destination. Finally, the FCC mandated that customers be allowed to move their telephone number from one carrier to another, regardless of the type of

---

[68] *See* 47 U.S.C. § 253(a). Before 1996, three states had established some or all of the forms of local exchange competition authorized in the 1996 Act. New York authorized interconnection agreements for local exchange competitors and mandated ILECs to offer retail services at a discount that would promote resale. Illinois also mandated the ILEC to make residential services available for resale. Maryland approved applications by several carriers to provide local service to business customers. *See* Rosenberg, *Assessing Wireless and Broadband Substitution in Local Telephone Markets*, National Regulatory Research Institute, June 2007 at 2, available at http://nrri.org/pubs/telecommunications/07-06.pdf.

[69] 47 U.S.C. § 151(b)(1). Under resale, a CLEC would buy a residential access line from an incumbent provider at a wholesale discount and then resell it to the CLEC's own residential customer.

[70] 47 U.S.C. § 151(c)(3).

[71] 47 U.S.C. § 151(b)(2).

[72] Non-Bell System companies such as General Telephone, Cincinnati Bell, and the Southern New England Telephone Company and rural companies were not required to develop equivalent systems for CLECs.

carrier—wireline, VoIP, or wireless.[73] This decision, called "number portability," simplified the process for migrating to a new carrier and increased competition.

As of 2010, CLECs served approximately 20% of the market for wireline local exchange services, either by the reselling of ILEC services or via their own network facilities.[74]

4. Wireless carriers

The wireless telecommunications industry has grown dramatically since wireless telephony was introduced in the early 1980s. By the end of 2008, the wireless industry reported 270 million subscribers,[75]up from 255 million subscribers in 2007.[76] Statistics compiled by the Centers for Disease Control (CDC) show that as of December 2008 about 20% of U.S. households were wireless-only.[77] According to the FCC, 177 wireless carriers provide service to over 265 million customers nationwide,[78] with 98% of those customers able to choose between three or more wireless carriers.[79]

The two largest U.S. wireless carriers are AT&T and Verizon Wireless, which together serve more than half the national wireless subscribers.[80] Wireless service is also provided by Sprint, T-Mobile, and smaller companies such as Cricket and Virgin Wireless, as well as pre-paid wireless providers such as TracPhone.[81]

---

[73] Today, a customer may "port" a telephone number to or from a wireline carrier, a wireless carrier, and a Voice over Internet Protocol provider. As the result of a 2009 order, porting must be completed in one business day.

[74] Even those CLECs that provide their own facilities must purchase the "last mile" connection to the customer premise from the ILEC.

[75] *FCC Trends in Telecommunications*, p 95. Available at http://www.fcc.gov/Daily_Releases/Daily_Business/2010/db0930/DOC-301823A1.pdf

[76] Cellular Telecommunications Industry Association website, available at http://www.ctia.org/advocacy/research/index.cfm/AID/10323 (accessed 4/28/08).

[77] http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200905.htm

[78] *Id*. Table 17, p. 28.

[79] CTIA ex parte presentation to FCC, PS Docket No. 06-229, Jan. 23, 2008, available at http://files.ctia.org/pdf/filings/080123_Ex_Parte_Wireless_2007_Facts_-_FILED.pdf (accessed 4/28/08) at 2.

[80] *Id.* at 8.

[81] Prepaid wireless companies charge customers for a block of minutes of use at the time of sale, and customers may add minutes as they need them.

5. Cable companies

Cable television companies have become major competitors for telecommunications services. In the late 1990s, some cable companies began to offer voice service by installing telephone switching equipment at their distribution hubs or "head ends." As more customers subscribed to broadband Internet connections, the cable companies converted their systems to digital packet formats and began providing voice and data telecommunications service using interconnected VoIP.

The National Cable and Telecommunications Association (NCTA) reports that cable companies now reach 93% of U.S. households and provide high-speed Internet and voice services across their footprint.[82] Deployment of cable television, voice, and data systems has expanded in rural as well as urban areas, although there are still gaps in very rural areas where lower customer densities make line extensions unprofitable. Having upgraded their networks for digital video, cable companies have been able to offer new services at a low incremental cost.[83] These services include both Internet connectivity and voice calling. Cable companies generally offer a bundled service that combines television, high-speed Internet access, and unlimited voice service (including call waiting and other "vertical" services).[84]

Cable company sales have grown rapidly, both for Internet service and voice offerings. In 2007, cable systems provided high-speed Internet service to 36 million customers.[85] By 2010, cable companies provided high-speed Internet access service to 43.8 million customers.[86] Voice customers have also increased rapidly in number, with the NCTA reporting 23.5 million voice customers in September 2010.[87]

Companies like AT&T and Verizon have recently begun to challenge the dominance of the cable companies in television by offering their own bundles of voice, data, and TV. AT&T's U-Verse product uses a DSL-based interface (Internet Protocol TV or IPTV) to offer a bundle that includes TV in its territory, while Verizon has deployed fiber to the home to offer their FiOS

---

[82] National Cable & Telecommunications Association statistics, available at http://www.ncta.com/Statistics.aspx

[83] In contrast, the costs can be much higher when adding video to a traditional voice network running on copper twisted pair loops.

[84] At least one cable company, Cox Communications, had added wireless to its portfolio by the end of 2010, creating a "quadruple play" of cable TV, voice, data, and wireless services.

[85] National Cable & Telecommunications Association website, available at http://www.ncta.com/Statistic/Statistic/Statistics.aspx (accessed 4/6/08).

[86] National Cable & Telecommunications Association statistics, available at http://www.ncta.com/Statistics.aspx.

[87] Ibid.

bundle, which also includes TV. Other companies such as Hawaiian Telephone and Qwest have announced that they will offer television and other advanced services using the IPTV model.

6. Electric utilities

Electric utilities have experimented with technologies that deliver Internet services using electric distribution wires. The technology, known as "broadband over power lines" or BPL, was trialed in several states beginning in 2000, including in Manassas, Virginia, but has not proved itself a competitor to other broadband access services.[88] Although some electric companies remain interested in BPL, they have shifted their focus from retail broadband services to using BPL to carry smart grid communications. The Puerto Rico Electric Power Authority is currently trialing such a system.[89]

Table 1 shows the relationship between the major voice and data services offered in the U.S. today and the types of carriers that provide those services. Any carrier may offer any service, but—with the exception of the ILEC's new television offers—providers have generally not chosen to enter each other's specialized territory. Blank cells indicate that a provider type does not offer the specific service listed. This may change over time as, for example, cable companies (or ILECs) choose to offer the nomadic VoIP or some other product they do not offer today.

[88] Om Malik, "Finally Broadband Over Power Line," R.I.P, 4/8/10, available at http://gigaom.com/2010/04/08/finally-broadband-over-powerline-r-i-p/

[89] *See* "Puerto Rico Approves High Voltage Broadband over Power Lines Trial," Electricity On-Line, 11-22-2010, available at www.electricenergyonline.com/?page=show_news&id=144552 and Sherry Lichtenberg, *Smart Grid Data: Must There Be Conflict Between Energy Management and Consumer Privacy?* http://www.nrri.org/pubs/telecommunications/NRRI_smart_grid_privacy_dec10-17.pdf.

Telecommunications Services and Their Main Providers as of January 2011

SERVICE	PROVIDERS (Note 1)			
	ILEC (Note 2)	**CLECs (Note 3)**	**Cable Cos. (Note 4)**	**Other**
Voice Services				
Circuit-switched wireline voice	VZ, AT&T, Frontier, CenturyLink , etc.	Cavalier, DeltaCom, Verizon Business, etc.		
Voice over Internet Protocol (VoIP)				
Nomadic				Vonage
Interconnected	Verizon FiOS, AT&T, others	Covad, CBeyond, DeltaCom, others	Comcast, Time Warner, Cox	
Wireless Voice	Qwest, Hawaiian Telcom, others		Cox via resale	Verizon Wireless, AT&T Wireless, T-Mobile, Sprint, others
Data Services				
Dial-up Service				ISPs such as AOL, Earthlink, and others
Broadband Access				
Digital Subscriber Line (DSL)	VZ, AT&T, etc. over existing copper lines	Covad, CBeyond, DeltaCom, others		
Cable modem			Comcast, Time Warner, Cox	
Fiber to the home	VZ FiOS			
Wireless	Qwest, Hawaiian Telcom, others		Cox	VZ, AT&T, Sprint, Clearwire, others
BPL				Electric utilities

Note 1: Blank cells indicate no current providers for this service in this category.
Note 2: Incumbent local exchange companies provided service over their own network facilities at the time of the Bell System divestiture in 1984. This category includes the former Bell companies, independent carriers, and rural carriers.
Note 3: Competitive Local Exchange Carriers (CLECs) provide service through resale or unbundled network elements. And were formed as a result of the 1996 Telecommunications Act.
Note 4: Digital voice services provided by traditional cable TV companies over their own network facilities.

II. Regulation of Telecommunications Services and Providers

This Part II describes jurisdiction over telecommunications regulation. Because telecommunications services are both interstate and intrastate, there are laws and regulations at both the federal and state levels. The relationship between federal and state regulation is sometimes *exclusive*, with federal and state regulators playing distinct, non-overlapping roles (the federal role preempting the state role); and sometimes *concurrent*, with federal and state regulators acting on different aspects of the same providers and services.

Telecommunications companies are often called "common carriers." Originally, a common carrier was a business that provided service to the public. The common law imposed specialized duties on common carriers, including the duty to carry all passengers without discrimination and the duty to charge uniform rates. Early common carriers were coaches and ferries, and eventually railroads. Later, the same concepts were applied to telegraph and telephone companies.

The primary sources of federal authority over telecommunications today are the Communications Act of 1934 (1934 Act) and the Telecommunications Act of 1996 (1996 Act).[90] Title I of the Act governs information services, including high-speed broadband Internet access services and other services such as voice mail. Title II of the 1934 Act is titled "Common Carriers," and federal common carrier regulation is often called "Title II" regulation.[91]

States also have authority to prescribe rules and standards for telecommunications. State regulators often encounter federal terminology, particularly when state law replicates federal terminology or simply assumes federal definitions. Federal classifications often define the extent to which state authority has been preempted.

Between 1970 and 2000, telecommunications regulations accommodated, even encouraged, an increasing array of competitive services. Many decisions by the FCC and the courts opened many services to competition that previously had been provided on a monopoly basis. First, customer premises equipment (telephone handsets) and inside wiring were opened to competition. Then, long-distance toll markets opened in the 1970s and 1980s. Finally, state and federal actions opened local exchange markets (in-state calls).

---

[90] *See, generally,* 47 U.S.C. Title 47. The 1996 Act amended the 1934 Act, but it is usually cited independently.

[91] Federal statute uses a circular definition of "common carrier." It is defined as "any person engaged as a common carrier for hire, in interstate or foreign communication by wire or radio or in interstate or foreign radio transmission of energy . . ." 47 U.S.C. § 153(10).

A. ILEC rates for telecommunications services

Under federal law, "local exchange service"[92] is a form of "telecommunications service,"[93] which in turn is a form of "telecommunications."[94] An "incumbent Local Exchange Carrier" ("ILEC") is a carrier that offered local exchange service when the Telecommunications Act was passed in 1996.[95]

1. Dual regulation and separations

Consistent with limitations in the U.S. Constitution, property may not be taken for public purposes without just compensation. All governmental regulators, state and federal, must observe this restriction. Typically, the statutes articulate this standard as an obligation to ensure that carrier rates are "just and reasonable."[96]

An ILEC's switched network functions as a single entity, but only some of its services cross state lines. The 1934 Communications Act, confirming earlier U.S. law, enshrined this distinction as fundamental to jurisdiction. Under federal law, the Federal Communications Commission has sole authority to approve or disapprove the rates charged by ILECs for telecommunications services that are jurisdictionally interstate.[97] Likewise, only the states have

---

[92] Federal law usually calls local exchange service "telephone exchange service." *See* 47 U.S.C. § 153(26) (ILEC defined); 47 U.S.C. § 153(47) (telephone exchange service defined). Occasionally the Act uses the more common term "local exchange service." *See* 47 U.S.C. § 227(c)(3)(C); 47 U.S.C. § 228(c)(5).

[93] "Telecommunications service" means the offering of telecommunications for a fee directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used. 47 U.S.C. § 153(46).

[94] "Telecommunications" means the "transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received." 47 U.S.C. § 153(43).

[95] As the ILECs have merged and divested some of their properties, the new owners, like Hawaiian Telcom, Frontier, and FairPoint, have accepted the ILEC duties and requirements of the carriers they have replaced.

[96] E.g.: 47 U.S.C. § 201(b), 205(b) (all charges for interstate or foreign communication by wire or radio must be just and reasonable).

[97] The Communications Act of 1934 asserted federal jurisdiction over "all interstate and foreign transmission of energy by radio, which originates and/or is received within the United States." It excluded from that federal jurisdiction, however, all "intrastate communications." 47 U.S.C. § 152(a), (b). The FCC has also asserted jurisdiction over "interstate information services." The FCC also asserts jurisdiction over interstate "information services." See discussion below.

authority to require a carrier to alter its rates for telecommunications services that are jurisdictionally intrastate.[98]

The Act thus establishes a dual system of regulation. While each service provided by an ILEC is theoretically subject to either the federal or state regulator, the company as a whole must answer to two regulatory systems.

Traditionally, it was a simple matter to find the jurisdiction of a switched call. Jurisdiction is determined based on the location of the calling party and called party. A toll call is interstate if and only if the calling party and called party are in different states. Local exchange service was always deemed a state service because most local calls originate and terminate in the same state.[99]

Even for switched traffic, there turned out to be cases requiring interpretive rules. The FCC developed two major rules for these questions. First is the "end-to-end" analysis rule under which multi-part communications are analyzed as a single call. Second is the rule for jurisdictionally mixed traffic. Where a service includes both intrastate and interstate component services, but the two are practically inseparable, the FCC has sole jurisdiction.

These rules were applied in a 1992 FCC decision involving voice mail. Suppose A makes an interstate call and leaves a voice message for B. B later retrieves that message through a local call. Under the end-to-end rule, the two calls are analyzed as a single interstate transaction. Under the mixed-use rule, since some A's will be in B's state and other A's will not, one cannot be sure of the jurisdiction of a particular call. Therefore the traffic is mixed but inseparable, and the FCC has sole jurisdiction.[100]

Earlier, the FCC applied the same analysis to "special access" circuits, point-to-point dedicated (unswitched connections limited to a single customer) communications circuits on the public network.[101] The FCC determined that special access circuits can carry both intrastate and

---

[98] Each state has elected to create some form of commission to exercise this authority over intrastate rates. Details vary widely. For example, several states expressly deny their state commissions authority over wireless telecommunications services.

[99] The "local calling area" of a customer is the area within which calls, when made, are not rated as toll calls. States set the boundaries of local calling areas, although the FCC authorizes local calling boundaries that cross state lines. Most states have adopted "extended area service" policies allowing customers to make "local" calls to other nearby exchanges.

[100] FCC, *Petition for Emergency Relief and Declaratory Ruling Filed by BellSouth Corporation*, Memorandum Opinion and Order, FCC 92018, 7 FCC Rcd 1619 (1992). The FCC holding was actually broader, ruling that all voice mail traffic is interstate. This was based on the mixed but inseparable traffic theory discussed below.

[101] Originally, the term applied more narrowly to unswitched communications purchased by other carriers under wholesale tariffs. After AT&T's breakup in 1984, many IXCs bought

interstate communications, but that the two components were practically inseparable. Once again, that was a basis for holding special access to be interstate. In a slight variation from the usual rule, customers of special access may declare that interstate usage is "*de minimis"* (less than 10%), and the circuit will be treated as intrastate.[102] In practice, most customers elect to buy the interstate service.

Since the U.S. has a dual system, each rate-setting regulator needs information sufficient to set just and reasonable rates within its own jurisdiction. Each regulator therefore needs to compare jurisdictional revenues with jurisdictional costs. The process for dividing these revenues and costs between the interstate and state jurisdiction is known as "separations."[103] Essentially, the separations rules direct ILECs to divide themselves financially into two virtual companies, one that sells interstate services and the other that sells state services.[104]

Separation of revenue has been straightforward. Carriers record customer revenue in the same jurisdiction to which the service was assigned. Local exchange services and state tolls are state revenues. Interstate services produce interstate revenues.[105] The rules became less clear as carriers began to offer bundled services that included mixtures of interstate and state services.

The separation of costs (investment and expenses) is more complex. Separations rules prescribe distinct treatments for various "categories" of carrier investment. Where identifiable investments support services in only one jurisdiction, those investments are "directly assigned" to the relevant jurisdiction. For example, special access circuits are sold in one jurisdiction or the other, and that investment is directly assigned.

---

special access circuits. After the Telecommunications Act of 1996, CLECs also began buying special access circuits.

[102] FCC, *MTS and WATS Market Structure, Amendment of Part 36 of the Commission's Rules and Establishment of a Joint Board*, CC Docket Nos. 78-72 and 80-286, Decision and Order, FCC 89-224, 4 FCC Rcd 5660 (1989).

[103] *See* 47 C.F.R. Part 36.

[104] Typically the ILECs apply the separations rules by conducting the required underlying studies. Regulators see the results whenever they review the carrier's rates.

Part 36 separations rules are mandatory for the states, but an exception exists for "average schedule" companies. For these small ILECs, the FCC sets interstate rates based upon an "average schedule" formula, and not based upon the use of Part 36 separations rules. In these cases the courts have allowed states to set rates for these companies on a "total company" basis, disregarding classical separations rules for the separation of investment, expense, and revenue and treating the company as a single operating entity. *See Crockett Tel. Co. v. FCC*, 963 F.2d 1564 (D.C. Cir. 1992).

[105] More complex issues can arise when state and interstate services are bundled and sold as a unit, such as when an ILEC sells local exchange service bundled with an unlimited interstate and intrastate toll package.

Switched traffic travels over facilities that are used in common by both jurisdictions, and direct assignment is not possible. Instead, this "common investment" is separated using "factors." The majority of common investment, notably including customer "loops," is separated using a "fixed" factor that uniformly assigns 75% of costs to the state jurisdiction.[106] Central office facilities are separated by other factors that are based on local calling patterns.[107]

Expenses generally are separated using the factors that apply to the corresponding investments. In the end, about 70% of a large ILEC's investment and expenses are typically assigned to the state jurisdiction, and these costs must be recovered from intrastate service revenues.[108]

In 2001, the FCC froze separations for five years. Under the freeze, ILECs continue to use usage-based separation factors for plant investment and expenses based upon their 2000 operations.[109] In 2006, the FCC extended the freeze until 2009.[110]

2. ILEC rates for interstate services

Once an ILEC's interstate revenue, investment, and expense have been determined by separations, the FCC can calculate an interstate revenue requirement (or interstate "cost-of-service") for the ILEC and determine whether its existing interstate rates are just and reasonable. In actuality, the FCC applies this form of rate regulation only to smaller ILECs.[111]

Many rate-of-return ILECs share revenues and costs with other smaller carriers, through the National Exchange Carrier Association (NECA). All small ILECS that are NECA members participate in a "common line" revenue pool,[112] and most participate in a separate "traffic-

---

[106] 47 U.S.C. 36.154 (Exchange Line Cable and Wire Facilities, Subcategory 1.3).

[107] For example, if 15% of the ILEC's network usage minutes had been used for interstate toll calls, then 15% of the ILEC's central office investment would be separated to interstate.

[108] Author's calculation from ARMIS Report 43-04 for 2006, for all large ILECs.

[109] Under the freeze, large "price cap" ILECs also were allowed to freeze investment "categories" at 2000 levels. In conjunction with an opinion from FCC staff, large carriers have stopped making annual direct assignments of special access facilities.

[110] FCC, *Jurisdictional Separations and Referral to the Federal-State Joint Board*, CC Docket No. 80-286, Order and Further Notice of Proposed Rulemaking, FCC 06-70, rel. May 16, 2006.

[111] These smaller ILECs are often known as "rate-of-return" companies.

[112] The common line pool applies to loop costs. RBOCs are NECA members, but they do not participate in either pool.

sensitive" pool.[113] NECA prepares and files tariffs at the FCC on behalf of local exchange carriers. Pool members then charge both wholesale and retail customers the rates set in the NECA filings,[114] contribute their interstate revenues to NECA, and draw from NECA sufficient funds to cover their interstate revenue requirements. Pool members enjoy administrative savings (from not having to file their own FCC tariffs) and a more stable cash flow. The pools also allow high-cost companies to charge averaged access rates to other carriers. For high-cost companies, these averaged rates are lower than rates based on the carrier's own costs and demand levels.

The FCC also has adopted a simplified approach to setting interstate rates for some very small ILECs. These "average schedule" companies are permitted to estimate their costs using a formula established by the FCC that considers only their size, not their actual costs. NECA annually files a tariff to set these rates.[115]

For larger ILECs, the FCC sets rates using a "price cap" method. This system allows ILECs to adjust their rates annually based on a predetermined formula that does not require a detailed cost analysis for each company.

A major component of an ILEC's federal retail rates is the "Subscriber Line Charge" ("SLC," pronounced "slick"). [116] This fixed monthly charge requires the subscriber to pay all (or a large portion) of the loop cost that has been separated to the interstate jurisdiction

ILECs also derive revenue from other carriers, and the FCC has sole authority to limit intercarrier charges for interstate services. The most important categories of interstate intercarrier revenues are toll access charges for interstate switched toll calls and interstate special access circuits.

Under the 1996 Act, the FCC may "forbear" from applying certain federal statutes or rules. The statute requires the FCC to act on any petition for forbearance within 15 months. The FCC has granted many of these forbearance petitions: exempting broadband services from traditional common carrier rules;[117] limiting carrier duties regarding cost allocations;[118] and limiting carrier duties regarding service quality reporting.[119]

---

[113] The traffic-sensitive pool applies to costs other than loop costs, including switches and interoffice trunks.

[114] NECA common line rates are the maximum SLC charges allowed by the FCC. For traffic-sensitive rates, NECA sets rates annually based on pool member costs and demand levels.

[115] A rate-of-return company that is not an "average schedule" company is often called a "cost company."

[116] Another name for this charge, the official one, is the "End User Common Line Charge" or "EUCL."

[117] *E.g.* FCC, *Petition of AT&T Inc. for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Its Broadband Services*, WC Docket No. 06-125, Memorandum Opinion and Order, FCC 07-180, 22 FCC Rcd 18705 (Oct. 2007).

3. ILEC rates for intrastate services

Once separation has determined an ILEC's intrastate revenue, investment, and expense, the state commission may calculate the ILEC's state revenue requirement and determine whether its existing intrastate rates are just and reasonable. To do this, the state commission takes the carrier's intrastate investment and applies an allowed rate of return. The state commission then adds intrastate expenses, once again as determined by separations. Notwithstanding separations, states are free to adopt their own plant depreciation schedules.[120] The total of return on investment plus expense defines the carrier's intrastate revenue requirement or "cost of service."

Most states have made significant changes to their traditional cost-of-service policies. Initially, states adopted price cap plans for some or all of their carriers, most often the larger carriers. State reliance on price cap formulas varies greatly. Some states expect never to conduct rate-of-return analysis again, while others merely suspend that analysis for a specified period of years.[121]

After adopting price cap plans, some states found that customer service quality declined and carrier investment lagged. Renewed plans frequently contained new elements such as detailed investment and retail quality-of-service standards, and some included formulas to calculate automatic penalties for serious or repeated failures. Most recently, some plans have included commitments to build broadband. Later versions of such plans commonly were called "Alternative Form of Regulation" (AFOR), "alternative regulation" or "incentive regulation" plans.

An even more recent development is outright deregulation of rates in specified markets, often called "pricing flexibility." These flexibility provisions have increasingly been incorporated into commission-prescribed AFOR plans.

---

[118] *E.g.* FCC, *Petition of AT&T Inc. For Forbearance Under 47 U.S.C. § 160 From Enforcement of Certain of the Commission's Cost Assignment Rules*, WC Docket No. 07-21, Memorandum Opinion and Order, FCC 08-120, 23 FCC Rcd 7302 (Apr. 2008).

[119] FCC, *Service Quality, Customer Satisfaction, Infrastructure and Operating Data Gathering*, WC Docket No. 08-190, Memorandum Opinion And Order And Notice Of Proposed Rulemaking, FCC 08-203 (Sept. 2008).

[120] States are not generally free to disregard the separations rules in 47 C.F.R. Part 36, but states may use their own depreciation rules for investment that has been separated to intrastate. *Louisiana Public Service Commission v. FCC*, 476 U.S. 355 (1986). Depreciation rules also affect depreciation expense. States may also disregard investment that was imprudent or that is not used and useful.

[121] *E.g. Investigation into a Successor Incentive Regulation Plan for Verizon New England Inc., d/b/a Verizon Vermont,* Vermont Public Service Board Docket No. 6959, Order, Sept. 26, 2005, available at http://www.state.vt.us/psb/orders/2005/files/6959finalorder.wpd (reviewing cost of service at beginning of five-year incentive regulation plan).

An increasing number of state legislatures have enacted laws that eliminate or restrict commission rate authority over some or all ILECs. Some of those statutes also prescribe maximum permissible rate increases in future years and thus function as a kind of legislated price cap plan.

Most states also set limits on the wholesale access rates charged by ILECs for the origination and termination of intrastate toll calls. Many states have decided to "mirror" interstate access rates. In these states, access rates are low, but the ILECs often are allowed to recover some or all of their lost revenues in other ways, such as through state universal service funding (discussed below).

Classically within the PSTN, there is an important distinction between a "local" call and a "toll" call. Historically, customers did not pay an incremental retail charge for local calls, while there was an incremental per-call or per-minute cost for toll calling.[122] The local-toll distinction affects wholesale payments as well.[123] For landline calls, state commissions define the "local calling area" as the boundary between a local and a toll call. Originally, "local" calls were simply calls within the originator's own exchange that could be served by a single wire center. Later, many state commissions changed the boundary and established "Extended Area Service" (EAS) areas that allowed local calling between exchanges. As more companies have offered "bundled" local and long-distance service, the distinction between long-distance and local calls has blurred. Generally, bundled products include either a "package" of long-distance and local minutes or unlimited calling regardless of the location to which the call is placed. Wireless carriers offer similar plans, although most generally cap the total number of minutes available for use each month. International calls are usually excluded from both plans.

4. Reciprocal compensation

Reciprocal compensation is a form of wholesale compensation in which carriers pay one another for completing calls.[124] If ILEC A (the originating carrier) has a customer who makes a local call to a customer of ILEC B (the terminating carrier), then ILEC A will make intercarrier compensation payments to ILEC B on a per-minute basis to reimburse ILEC B for the use of its network. The reciprocal compensation system establishes different rate structures and prices for the same activity, depending on whether the carrier is transmitting or receiving a call and where the call begins and ends (jurisdiction). The current compensation structures are bill-and-keep (settlements without rates) for balanced traffic, reciprocal compensation for local calling,

---

[122] The exception is where a carrier has "local measured service" per-minute charges or "local measured calling" per-call charges.

[123] Toll calls generate "access" payments. As discussed in the next section, local calls generate "reciprocal compensation" payments.

[124] The FCC has construed the reciprocal compensation statute as limited to local traffic. *See* 47 CFR § 51.701(a). If customers A and B were not in the same "local calling area," and if the call was carried by an IXC, then, as explained above, the IXC would pay "access charges" to A for originating the call and to B for terminating the call.

intrastate state access rates for in-state long-distance calling, and interstate access rates collected for interstate long-distance calling.[125]

The state role in setting reciprocal compensation does not have the same legal basis as access charges, and dual jurisdiction does not apply. Under the system created by the 1996 Act, reciprocal compensation rates may be established by carrier negotiations as part of the Interconnection Agreements (ICAs) between companies.[126] Where the carriers cannot agree, either party may request that the state commission arbitrate and set rates. The state commission's decision must comply with the FCC's rules regarding pricing methodology.[127]

The intercarrier compensation structure was developed to support a circuit-switched network where costs were incurred individually by the calling and the called company. It does not support broadband networks where costs are bandwidth-related rather than mileage-related. In a circuit-switched network, the cost of transmitting a call depends on the distance the call must travel, the number of switches it must pass through, and the depreciated cost of the equipment used to transmit the call. Broadband transmission is distance-insensitive. Broadband costs depend on the amount of data to be transmitted, not the distance that data must travel.

Because it was developed piecemeal to support multiple companies providing services in multiple states, the current intercarrier compensation structure includes different rates for the same service, despite the fact that the process of originating and terminating calls is the same regardless of company or location. These rate differences have led to arbitrage opportunities such as generating phantom traffic, in which the originating carrier for the traffic is masked to avoid paying compensation to the terminating carrier, or traffic pumping, where calls are artificially increased to high-cost destinations to generate higher compensation for the terminating carrier.

To resolve these problems and create a compensation structure that supports both circuit-switched and broadband calling, the National Broadband Plan (NBP) recommends eliminating the per-minute charges paid for call completion and creating a single rate plan for all carriers.[128] We discuss the NBP in more detail in Part III.B.3 of this paper.

---

[125] Ed Rosenberg, Lilia Perez-Charolla, and Jing Liu, *Intercarrier Compensation and the Missoula Plan*, October 2006. Available at http://communities.nrri.org/web/telecommunications-in-general/share-and-view-files-members?p_p_id=20&p_p_lifecycle=1&p_p_state=exclusive&p_p_mode=view&_20_struts_action=%2Fdocument_library%2Fget_file&_20_folderId=83915&_20_name=DLFE-3122.pdf.

[126] *See* 47 U.S.C. §§ 251(b)(5), (c)(1).

[127] *AT&T Corp. v. Iowa Utilities Board*, 525 U.S. 366, 119 S.Ct. 721 (1999).

[128] National Broadband Plan, p. 142.

B. CLECs' entry and rates

States typically allow CLECs to provide local exchange wireline service after obtaining a Certificate of Public Convenience and Necessity (CPCN). In many states, a certificate can be obtained soon after making a simple filing.

Most states do not actively regulate the retail intrastate CLEC rates, although the 1996 Act does not preempt their authority to do so. In nearly all states, either CLEC retail rates are not reviewed or CLECs have been granted flexibility in setting rates.[129] A few states do impose limits on CLEC intrastate access charges. Generally, the FCC has ordered CLEC rates to mirror ILEC rates for interstate access charges.

C. Wireless carriers

Federal law prescribes a unique jurisdictional allocation for wireless carriers. No state or local government has any authority to regulate the entry of or the rates charged by wireless carriers.[130] States, however, do retain authority over "other terms and conditions," which the courts have found includes control over line items on the customer's bill.[131]

State authority over wireless carriers varies by state and is a dynamic area of law. A majority of state legislatures have decided not to regulate wireless services. In addition, Congress has considered several bills promoted by the wireless industry that would broadly preempt state authority over service quality.[132]

---

[129] *See* Perez-Chavolla, *State Retail Rate Regulation of Local Exchange Providers as of September 2004*, National Regulatory Research Institute, November 2004, available at http://nrri.org/pubs/telecommunications/04-13.pdf.

[130] 47 U.S.C. § 332(c)(3).

[131] *Nat'l Ass'n of State Utility Consumer Advocates v. FCC*, 457 F.3d 1238 (11th Cir. 2006), cert.den. *Sprint Nextel Corp. v. Nat'l Ass'n of State Util. Consumer Advocates*, 128 S. Ct. 1119, 169 L. Ed. 2d 948 (2008).

[132] Some state commissions do assert authority over wireless carriers when they designate those carriers as "Eligible Telecommunications Carriers" for federal universal service support. Some states have imposed facilities build-out requirements.

Wireless carriers have distinct regulatory advantages and disadvantages. One disadvantage is that wireless carriers are not permitted to purchase unbundled network elements (UNEs).[133] On the other hand, wireless can offer lower rates for some calls because they have lower wholesale costs.[134]

During 2010, the FCC placed additional scrutiny on wireless billing practices, including contract termination fees, billing for data services customers did not order, and "bill shock" (i.e., charges for exceeding the number of minutes for which a customer contracted).[135] The FCC's 2010 order on network neutrality requires wireless companies that provide Internet access to disclose their rates and network management practices to consumers before purchase and to allow access to all "legal" applications and websites.[136]

D. Retail service quality

Many states impose retail service quality standards on wireline voice telecommunications provided by ILECs and CLECs.[137] Carriers who provide voice service over broadband

---

[133] FCC, *Unbundled Access to Network Elements; Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, Order on Remand, 20 FCC Rcd 2533, 2552, ¶ 34 (2005) (*TRRO Order*).

[134] Carriers pay reciprocal compensation rates for a local call. These rates are usually lower than the toll access rate. For landline calls, state commissions define local calling areas, and this is often the boundary between access and reciprocal compensation payments. When a call is to or from a wireless phone, however, FCC rules apply. The FCC has decided that reciprocal compensation must be paid within large areas called "Major Trading Areas" (MTAs). FCC, *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, First Report and Order, ¶ 1036, 11 FCC Rcd. 15,499, 16014 (1996). MTAs generally are much larger than local calling areas. Therefore, calls from wireless phones to a destination within the MTA but outside the local calling areas can be made at lower wholesale cost by a wireless carrier.

[135] See Verizon Wireless FCC Consent Decree, 10/28/10 available at http://reboot.fcc.gov/verizon-wireless-fcc-consent-decree-tip-sheet?utm_source=fcc.gov&utm_medium=rotator&utm_campaign=verizon-wireless-mystery-fees

[136] *In the Matter of Preserving the Open Internet Broadband Industry Practices*, FCC 10-201.

[137] *See* Davis, et.al, *Telecommunications Service Quality*, National Regulatory Research Institute, March, 1996, available at http://nrri.org/pubs/telecommunications/96-11.pdf (*Davis, 1996*). *See also* Perez-Chavolla, *Survey Of State Retail Telephone Quality Of Service Regulations For Selected Categories Of Service: Metrics, Penalties And Reports*, National Regulatory Research Institute, May 2004, available at http://nrri.org/pubs/telecommunications/04-09.pdf.

connections, such as VoIP providers and fiber-to-the-home providers, have generally claimed exemption from these rules. The states have no jurisdiction over wireless carriers, which are regulated solely by the FCC.

Typically, state commissions establish standards in a variety of performance areas. Each performance area has one or more performance "metrics" or measures, and each metric has a standard for carrier performance. Depending on the state, these standards may apply only to "basic" wireline service, defined as a single residential line with no features.[138] Service bundles that include various categories of products such as local, long-distance, and data are generally excluded from these standards. The most common areas for carrier performance monitoring are the speed of wireline service installation, mean time to restore service, mean time to repair troubles, and service availability (often expressed as the percentage of outages longer in duration than 24 hours). A common metric measures the percentage of new service requests that are completed within a fixed number of days.[139] Most states also have metrics for service reliability, typically measuring trouble report rates and the timeliness and percentage of success in clearing reported troubles that affect service.[140] Many states also measure carrier responsiveness, such as the average time taken by a carrier to answer customer calls for assistance from an operator, directory assistance, business office assistance, or repair calls.[141]

As states have increasingly adopted new price-cap or Alternate Form of Regulation (AFOR) plans, they often have incorporated specific retail service quality provisions. Some of these price-cap plans have provisions for financial penalties when service-quality standards are violated.[142] Some states have also made service quality a condition for approving the merger of

---

[138] "Basic local exchange service" or "local exchange service" means the provision of an access line and usage within a local calling area for the transmission of high-quality two-way interactive switched voice or data communication. *Michigan Telecommunications Act*, §102, available at http://www.dleg.state.mi.us/mpsc/comm/telecom/pa179.pdf

[139] *E.g.*, 170 Indiana Administrative Code § 7-1.2-9 (92% of installation requests must be met within five business days).

[140] Davis, 1996, at 243. *See, e.g.* Regulations of Connecticut State Agencies, Section 16-247g-2 Quality of Service Standards (90% of all service repair requests in any given 24-hour period shall be cleared within 24 hours); 170 Indiana Administrative Code § 7-1.2-13(c) (90% of troubles shall be cleared within 48 hours, excepting weekends and holidays).

[141] *E.g.*, 170 Indiana Administrative Code § 7-1.2-16(a) (average speed of answer for calls to repair service shall not exceed 60 seconds).

[142] *See, e.g., Verizon New England Inc., d/b/a Verizon Vermont, Request for Waiver of Compensation to Consumers pursuant to Verizon's Retail Service Quality Plan*, Vermont Public Service Board, Docket No. 6984, Order on Motion for Reconsideration, September 20, 2004, available at: http://www.state.vt.us/psb/orders/2004/files/verizonwaiverfnlruling&dissent.wpd.

telecommunications companies or approving bankruptcy reorganizations.[143] Changes in technology have made some traditional service-quality standards irrelevant, while introducing the need for new ones. For example, past service-quality standards routinely measured the average "off-hook" time delay before a customer received a dial tone. Newer switching technologies have largely eliminated this concern. Conversely, new technologies also sometimes prompt new standards. For example, some states have standards relating to the frequency and length of signaling system failures, while others have considered adding measurements for the speed of porting numbers between carriers.[144]

E. Wholesale markets

In most states, utility commissions have authority to arbitrate wholesale disputes among telecommunications providers. Many states have statutes that authorize commissions to mandate that telephone companies interconnect their networks and establish rates for use of interconnected facilities. Some of these state statutes date back many decades.[145] State commissions also have authority to oversee wholesale rates for intrastate services.

The 1996 Act aims to promote local exchange competition. One provision requires ILECs to provide unbundled network elements (UNEs). Under the Act, an ILEC must provide a UNE whenever its absence would impair competition.[146] Another statutory provision establishes specific interconnection duties for specific classes of telecommunications carriers. If disputes arise between two such carriers, section 252 authorizes state commissions to arbitrate, using a broad pricing standard set in federal law.[147] These statutes have generated lengthy and complex dockets at some state commissions.

In some ways, the 1996 Act has actually limited state authority to promote competition. The Act allows the FCC to define when UNEs are required and to set the rules for pricing

---

[143] *Decision and Order In the Matter of the Application of HAWAIIAN TELCOM, INC. and HAWAIIAN TELCOM SERVICES COMPANY, INC. For an Order Approving the Joint Chapter 11 Plan of Reorganization Of Hawaiian Telcom Communications, Inc. and its Debtor Affiliates, Including Certain Security Arrangements*. Docket No. 2010-000. Available at http://dms.puc.hawaii.gov/dms.

[144] The FCC mandates that numbers be ported between carriers in 24 hours or less.

[145] The vintage of some of these statutes can be inferred from their texts, which frequently refer to both telephone and telegraph companies. *E.g.*, Cal. Public Utilities Code § 766 (allows state commission, after hearing, to order telephone or telegraph companies to interconnect where physical interconnection "can reasonably be made" and to joint rates, tolls, or charges for service over each others' lines); Vt. Statutes Annotated, Title 30, § 2701.

[146] 47 U.S.C. § 251(d)(2)(A), (B).

[147] 47 U.S.C. § 252(b).

UNEs.[148] Under this legal structure, the courts have not allowed state commissions to impose supplemental UNE obligations on ILECs.[149]

F. Telephone numbers

Under the North American Numbering Plan (NANP),[150] a customer's telephone number has ten digits. The first three digits are the "NPA" or "area code."[151] The second set of three digits is called the "NXX," "exchange code," or "central office code." The last 4 of the 10 digits have no geographic meaning and are individually assigned to customers. Each central office code can generate 10,000 usable telephone numbers.[152]

The switched network uses the six digits of the NPA and NXX as proxies for locations in North America. Each NPA/NXX "code" corresponds to a call center (often an ILEC switch) at a particular location. Under this plan, switches can route calls efficiently based upon prearranged tables that translate number sequences to locations.[153] The NPA/NXX code is also used to determine when a call is "rated" (priced) as local or toll and sometimes to determine when a call requires 10-digit or 7-digit dialing.[154]

With the arrival of competition in the local exchange market, many competitive carriers needed telephone numbers for their new subscribers. The smallest unit assignable at the time

---

[148] *AT&T Corp. v. Iowa Utilities Board*, 525 U.S. 366, 119 S.Ct. 721 (1999).

[149] *Verizon New England, Inc. v. Maine Pub. Util. Comm.*, 509 F.3d 1, 20 (1st Cir. 2007) (allowing states to impose additional UNE obligations could retard investment, handicap competition detrimentally, and discourage alternative means of achieving the same result that could conceivably enhance competition in the long run).

[150] The NANP historically was developed and administered by the wireline telephone industry. The current plan administrator is Neustar. See http://www.nanpa.com/.

[151] Area codes are derived from Numbering Plan Areas (NPAs) created in the 1940s by AT&T as part of an integrated toll dialing plan that involved dividing the U.S. and Canada into eighty-three "zones," each of them identified by three digits.

[152] Each of the four digits has ten possibilities, from 0 to 9. Therefore each code contains 10^4 or 10,000 possible numbers.

[153] This geographic assignment system is becoming less reliable. For example, some VoIP carriers assign telephone numbers to customers without regard to the customer's actual location. Customer A in California, for example, might receive a Manhattan telephone number. When A uses that Manhattan number, the switched network will for some purposes treat the call as originating in Manhattan, regardless of where A is actually located and regardless of where the call enters the switched network. Likewise, a Manhattan customer with the same NXX as A will be able to place a "local" call that actually reaches A in California.

[154] As more area codes are added, the majority of locations now require 10-digit dialing.

was a full central office code, which included 10,000 numbers. When a new CLEC entered the market, NANPA would give the CLEC 10,000 numbers. Many CLECs received codes after 1996, but they sometimes used relatively few of the telephone numbers in their codes.[155] This raised a fear that some NPAs would be quickly exhausted and new NPAs would be needed to meet the demand. Opening a new NPA, however, was stressful. States were forced to choose between an "overlay" NPA[156] or a "split" of the existing NPA.[157] Either choice could impose inconvenience and costs on millions of customers. At the time, some observers even saw a risk of using up all the reserve NPAs and thereby exhausting the entire North American Numbering Plan.

To reduce these risks, and with encouragement from the states, the FCC established a newer system of "pooling" for thousand-number "blocks."[158] Now, when a new carrier enters the market, it receives a "block" of 1,000 numbers, rather than 10,000. The FCC also established number utilization and reclamation procedures. These procedures ensure that issued blocks are fully utilized before new, empty blocks are made available. Together, thousands-block pooling and reclamation have extended the life of many area codes by years or decades.

Acting under delegated federal authority, many state commissions today are active partners with the NANPA in number conservation and management. Commissions frequently assign staff members to manage their state's number pools. When an NPA is expected to be exhausted, state commissions also participate in planning for the new NPA and deciding whether it will be through an overlay or split.

G. Regulation of broadband Internet access service

Federal law distinguishes between "telecommunications services"[159] (regulated under Title II of the Telecommunications Act) and "information services"[160] (regulated under Title I).

---

[155] In some cases, codes were issued to carriers who had no physical presence in the state where the NPA had been assigned.

[156] An "overlay" places the new NPA over the same geographic area as the old NPA. Once an overlay is in place, 10-digit dialing is required for all calls made from the area.

[157] A "split" leaves a portion of the existing customers with the same NPA and assigns a new NPR to the remaining customers. A split requires a large portion of the existing customer base to change the NPA portion of their telephone numbers and to incur a variety of costs, including reprinting letterhead and business cards and reprogramming business telephone systems. Because of the costs of implementing NPA splits, most recent NPA additions have been overlays.

[158] "Blocks" or "thousands blocks" are composed of the last three numbers of the ten-digit telephone numbers. They therefore have 10^3 or 1,000 possible numbers per block.

[159] "Telecommunications service" is defined in federal law as the "offering of telecommunications for a fee directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used." 47 U.S.C. § 153(46).

Information services include broadband Internet access services like VoIP, as well as non-communications services like voice mail.[161] The FCC has sole jurisdiction over Title I services.

In a series of decisions beginning in 2002, the FCC clarified its regulation of information services. These decisions amplified the FCC's definition of several of the important terms used in the 1996 Act and have implications for the extent of both federal and state regulation of broadband services.

The FCC's *Cable Modem Declaratory Ruling* was issued in 2002.[162] The FCC classified cable modem service[163] as an information service[164] and not a telecommunications service.[165] In

---

[160] "Information service" is defined in federal law as "the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications, and includes electronic publishing, but does not include any use of any such capability for the management, control, or operation of a telecommunications system or the management of a telecommunications service." 47 U.S.C. § 153(20).

[161] In 1980 the FCC adopted a definition of "enhanced services" as anything but "basic transmission service," which consisted of "a pure transmission capability over a communications path that is virtually transparent in terms of its interaction with customer supplied information." FCC, *Amendment of Section 64.702 of the Commission's Rules and Regulations*, Docket No. 20828 (*Computer II Proceeding*), Order, FCC 80-189, 77 ¶ 96-97, 77 FCC 2d 384, 415-421 (1980). Later, the FCC determined that "Congress intended the categories of 'telecommunications service' and 'information service' to parallel the definitions of 'basic service' and 'enhanced service' developed in [the] *Computer II* proceeding . . . ." *National Cable & Telecommunications Ass'n v. Brand X Internet Services*, 545 U.S. 967, 992-94 (2005).

[162] FCC, *Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities*, GN Docket No. 00-185, Declaratory Ruling and Notice of Proposed Rulemaking, FCC 02-77, 17 FCC Rcd 4798 (2002) (*Cable Modem Declaratory Ruling)*.

[163] "Cable modem" service is a broadband Internet service offered over cable television systems.

[164] The FCC's information service holding was based on the FCC's perception of cable modem customers' perceptions. The FCC concluded that end users do not perceive cable modem service as consisting of both a data processing component and a transmission component. Rather, the FCC said consumers viewed cable modem service as an integrated service combining Internet access with "the transmission of data with computer processing, information provision, and computer interactivity, enabling end users to run a variety of applications." *Cable Modem Declaratory Ruling*, ¶ 38.

[165] The FCC acknowledged that cable modem service is provided "via telecommunications," but it concluded nevertheless that the service does not include a separate "telecommunications service." *Cable Modem Declaratory Ruling*, ¶ 39. Whether VoIP service provided over a cable modem is telecommunications service is discussed below.

that context, the FCC held that cable modem service does not fall under the "common carrier" rules prescribed in Title II of the 1934 Act. Instead, the FCC claimed "ancillary jurisdiction" under Title I of the Act. The extent and nature of ancillary jurisdiction is not well defined in statute.[166] The FCC has latitude to regulate various aspects of a Title I service, so long as those regulations are "reasonably ancillary" to its statutory authority.[167] Most importantly, in its Cable Modem decision, the FCC declared broadband access services to be interstate and preempted state regulatory authority over them.[168] In 2005, the Supreme Court upheld the FCC's decision.[169]

Later in 2005, the FCC issued its second decision in this line, determining that digital DSL[170] is an interstate information service.[171] Parallel holdings followed in 2006 for BPL[172] and in 2007 for broadband using wireless facilities.[173]

---

[166] The key statutory provision charges the FCC with "execut[ing] and enforc[ing] the provisions of this Act." 47 U.S.C. § 151. This authority extends "to all interstate and foreign communication by wire or radio . . . and . . . all persons engaged within the United States in such communication." 47 U.S.C. § 152(a).

[167] *See United States v. Southwestern Cable Co*., 392 U.S. 157, 178 (1968). *See also FCC v. Midwest Video Corp*., 440 U.S. 689 (1979); *United States v. Midwest Video Corp*., 406 U.S. 649 (1972) ("*Midwest Video*").

[168] The FCC's preemption analysis was brief. The FCC stated that although Internet-bound traffic "is both interstate and intrastate in nature," it is "properly classified as interstate and it falls under the Commission's jurisdiction." The decision noted that based on an "end-to-end analysis," cable modem communications "often" travel to points in "different states and countries." *Cable Modem Declaratory Ruling*, ¶ 59 (internal quotations omitted).

[169] *Nat'l Cable & Telecomms. Ass'n v. Brand X Internet Services*, 545 U.S. 967, 125 S. Ct. 2688 (2005) (*Brand X Internet Services*).

[170] "DSL" is a broadband Internet service offered over telephone wires.

[171] FCC, *Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, CC Docket No. 02-33, Report and Order and Notice of Proposed Rulemaking, FCC 05-150, 20 FCC Rcd. 14,853, ¶ 5 (2005). The FCC also allowed ILECs, for purposes of wholesale sales to other companies, to offer broadband Internet access transmission arrangements for wireline broadband Internet access services on a common-carrier basis or a non-common-carrier basis. If a carrier does elect to offer wireline broadband Internet access on a common-carrier basis, it may be allowed to include the supporting facilities and associated expenses in its costs that are subject to separations, and therefore it may be able to recover some or all of those costs through regulated rates in both jurisdictions. The FCC's order was upheld on appeal. *Time Warner Telecom, Inc. v. FCC*, 507 F.3d 205 (3rd Cir. Oct 16, 2007).

This may be the only instance in which a carrier has been allowed to decide finally whether a certain investment shall be included in regulated rate base. Under this rule, certain

In April 2010, a decision by the U.S. Court of Appeals for the D.C. Circuit in *Comcast v. FCC* changed the landscape once again, re-opening the debate over the nature of Internet access services, including those services provided by wireless broadband carriers.[174] One of the key issues in this debate is the question of *network neutrality*, that is, whether the FCC has the authority to require carriers to treat all Internet-bound traffic equally, without favoring one carrier or one destination over another.[175] In 2008, Comcast slowed the transmission of customer files transported via Bit Torrent software across its network, raising complaints by customers and watchdog groups such as the Freedom Foundation. The FCC ordered Comcast to transport all traffic equally, regardless of its source or destination, based on its "ancillary authority" as defined in section 4(i) of the Communications Act of 1934, which

> authorizes the Commission to perform any and all acts, make such rules and regulations, and issue such orders . . . as may be necessary in the execution of its functions.[176]

Comcast stopped slowing the traffic but appealed the FCC Order. The Court ruled in Comcast's favor, stating:

> The Commission may exercise [its] "ancillary" authority only if it demonstrates that its action—here barring Comcast from interfering with its customers' use of peer-to-peer networking applications—is "reasonably ancillary to the . . . effective

---

kinds of investment and expenses are in regulated costs in some parts of the country and unregulated costs in other parts of the country.

[172] FCC, *United Power Line Council's Petition for Declaratory Ruling Regarding the Classification of Broadband over Power Line Internet Access Service as an Information Service*, WC Docket No. 06-10, Memorandum Opinion and Order, FCC 06-10, 21 FCC Rcd 13281 (2006).

[173] FCC, *Appropriate Regulatory Treatment for Broadband Access to the Internet Over Wireless Networks*, WT Docket No. 07-53, Declaratory Ruling, FCC 07-30, 22 FCC Rcd 5901 (2007).

[174] *Comcast v. Federal Comms. Comm'n***,** 600 F.3d 642 (D.C. Cir. 2010)

[175] *PC Magazine* defines network neutrality as "a level playing field for Internet transport. It refers to the absence of restrictions or priorities placed on the type of content carried over the Internet by the carriers and ISPs that run the major backbones. It states that all traffic be treated equally; that packets are delivered on a first-come, first-served basis regardless from where they originated or to where they are destined." See http://www.pcmag.com/encyclopedia_term/0,2542,t=Net+neutrality&i=55962,00.asp

[176] *Comcast Corp. v. FCC*, 600 F.3d 642 (D.C. Cir. 2010)("*Comcast*").

> performance of its statutorily mandated responsibilities." *Am.Library Ass'n v. FCC*, 406 F.3d 689, 692 (D.C. Cir. 2005). The Commission has failed to make that showing.[177]

The Court's ruling opened a new-chapter question of how to classify broadband Internet access services.[178]

In an attempt to resolve this issue, the FCC issued its Network Neutrality Order in December 2010. This Order continues to treat Internet access services as information services under Title I of the Telecommunication Act, but provides three basic "rules of the road" to protect consumers from discriminatory treatment by their broadband access providers.[179] These three rules require broadband access providers to disclose their network management practices, refrain from blocking legal content, and treat all providers equivalently. The Order prohibits wireline and cable broadband Internet service providers from blocking lawful content, applications, services, or devices, or discriminating in favor of specific applications, websites, or content. It also prohibits wireless broadband providers from blocking access to websites or services that compete with their own services but allows wireless companies to manage their networks to reduce congestion. Under the FCC's Order, both wireline and wireless providers are required to post information explaining their network management practices, speeds, and other rules on their websites and explain them to customers at the point of sale.[180]

The FCC based its authority for issuing the Network Neutrality Order on Section 706 of the 1996 Act, as well as its congressionally mandated duty to deploy advanced telecommunications services, promote competition, and remove barriers to the adoption of advanced communications services.[181]

H. Voice over Internet Protocol Services

State regulation of VoIP services is limited by both technology and federal law. In a 2004 decision, the FCC clarified the status of the nomadic VoIP service offered by Vonage

---

[177] United States Circuit Court of Appeals for the District of Columbia, Case No. 08-1291, April 6, 2010.

[178] See Austin Schlick, *A Third-Way Legal Framework for Addressing the Comcast Dilemma*, May 6, 2010.

[179] The Open Internet Order applies to all broadband access providers, including DSL, cable broadband, and wireless providers.

[180] *In the Matter of Preserving the Open Internet Broadband Industry Practices*, FCC 10-201.

[181] The Network Neutrality Order was issued on December 21, 2010. We expect challenges in the courts and by Congress.

Holdings Corp.[182] The FCC preempted state regulation on the grounds that the Vonage VoIP product is a jurisdictionally mixed service, containing both intrastate and interstate components, where it is impossible or impractical for VoIP providers to separate the two components.[183] Specifically, the FCC preempted the Minnesota commission from requiring that Vonage obtain a state certificate to operate. The FCC also preempted application of other regulations that Minnesota had applied to "telephone companies," including a requirement that Vonage provide and fund the state's 911 services.[184] The FCC decision was upheld on appeal by the Eighth Circuit.[185]

In later decisions, the FCC imposed a number of traditional telephone company duties on "interconnected VoIP" providers, that is, those companies that offer their customers the ability to place and receive calls via the PSTN. These decisions required interconnected VoIP providers to offer emergency "enhanced 911" services to their customers,[186] to contribute to federal universal service programs,[187] to protect customer proprietary network information,[188] to comply with common carrier disability access requirements,[189] to contribute to

[182] The FCC declined to rule on whether the service was a "telecommunications service" or an "information service."

[183] A key fact was that Vonage customers could originate calls anywhere on the Internet, and Vonage could not identify from where a given call actually originated.

[184] FCC, *In re Vonage Holdings Corp.*, WC Docket No. 03-211, Memorandum Opinion and Order, 19 F.C.C.R. 22404, ¶ 23 (2004).

[185] *Minn. Public Util. Comm v. FCC*, 483 F.3d 570 (8th Cir. 2007).

[186] FCC, *IP-Enabled Services*, WC Docket No. 04-36, First Report and Order and Notice of Proposed Rulemaking, FCC 05-116, 20 F.C.C.R. 10245 (2005) (requiring VoIP providers immediately to provide E-911 service that identifies customer locations, but allowing VoIP providers to require customers to self-report those locations).

[187] FCC, *Universal Service Contribution Methodology*, WC Docket No. 06-122, Report and Order and Notice of Proposed Rulemaking, FCC 06-94, 21 FCC Rcd 7518, 7538-43, paras. 38-49 (2006) (*VoIP Contributions Order), aff'd in part, vacated in part, Vonage Holdings Corp. v. FCC*, 489 F.3d 1232, 1244 (D.C. Cir. 2007).

[188] FCC, *Implementation of the Telecommunications Act of 1996: Telecommunications Carriers' Use of Customer Proprietary Network Information and Other Customer Information; IP-Enabled Services*, CC Docket No. 96-115, WC Docket No. 04-36, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 6927, 6954-57, ¶¶ 54-59 (2007).

[189] FCC, *IP-Enabled Services*, WC Docket No. 04-36, Report and Order, 22 FCC Rcd 11275, ¶¶ 17-31 (2007).

telecommunications relay service (TRS) programs for the hearing impaired,[190] and to make telephone numbers portable when customers change providers.[191]

The FCC rules regarding nomadic and interconnected VoIP created a clear distinction between these two services, placing them under two different regulatory jurisdictions. The FCC preempted state regulation of nomadic VoIP services, since the beginning and end points of the service cannot be identified. Thus, for example, states are not permitted to require registration or certification of nomadic VoIP carriers like Vonage. States may also be prohibited from requiring universal service contributions from VoIP providers, although this issue has not been settled.[192] These limitations apply only to nomadic VoIP services.[193] Where a provider has fixed transmission facilities and, therefore, has the technical ability to determine the state in which its customer is located, the FCC has not preempted state jurisdiction.[194]

In an order in *Docket 2008-0421* in October 2010, the Maine Public Utilities Commission reevaluated the question of whether fixed VoIP providers, specifically providers of cable voice services, are providing a telecommunications service that can be regulated under Maine statutes. In its Order, the Maine Commission found that "the statutory language defining 'telephone

---

[190] *Id.* at ¶¶ 32-43. TRS, created by Title IV of the Americans with Disabilities Act of 1990 (ADA), enables a person with a hearing or speech disability to access the nation's telephone system to communicate with voice telephone users through a relay provider and a Communications Assistant. *See* 47 U.S.C. § 225(a)(3); *see also* 47 C.F.R. § 64.601(14) (defining TRS).

[191] FCC, *Telephone Number Requirements for IP-Enabled Services Providers,* WC Docket No. 07-243, Report and Order, Declaratory Ruling, Order On Remand, and Notice of Proposed Rulemaking, FCC 07-188, 22 FCC Rcd 19,531 (2007).

[192] *See Vonage Holdings, Corp. v. Nebraska Pub. Serv. Comm.*, Case No. 4:07CV3277, Memorandum and Order, (U.S. District Court, D. Nebraska, Mar. 3, 2008) (preliminary injunction granted against state commission seeking to require nomadic VoIP provider to contribute to state universal service fund).

[193] The FCC has suggested that it may no longer be willing to apply its *Vonage* holding to a nomadic service where the provider can find a way to track the geographic end-points of its customer's calls. *VoIP Contributions Order,* above, ¶ 56. In January 2011, in response to petitions from Nebraska and Kansas, the FCC ordered that states may require nomadic VoIP providers to contribute to state USF.

[194] *Id.* Missouri Public Service Commission, *Staff of the Public Service Commission of the State of Missouri v Comcast IP Phone, LLC,* Case No. TC-2007-0111, Report and Order, (Nov. 1, 2007) (ordering provider of VoIP service over cable TV facilities to obtain state certificate of service authority); *Minn. Public Util. Comm. v. FCC*, 483 F.3d 570, 582-83 (8th Cir. 2007) (dismissing as unripe the question of whether FCC preemption covers fixed VoIP services).

service' is broad, unambiguous, and readily encompasses VoIP service."[195] The Commission, therefore, ruled that the

> digital VoIP offerings [provided by cable companies] constitute "telephone services" pursuant to 35-A M.R.S.A. §102(18-A) and . . . are subject to [Commission] jurisdiction [and. . .] that this Commission is obligated to exercise its regulatory authority to regulate the[se] VoIP services as "telephone services" pursuant to Maine law.[196]

The Vermont Board made a similar decision in Phase I of its evaluation of whether the "digital voice" services provided by Comcast and Time Warner Telephone meet the definition of telecommunications services.[197]

I. Joint federal-state boards

State regulators have an interest in coordinating their activities with the FCC. A variety of formal mechanisms exist to allow state and federal regulators to work together. Joint boards and committees provide the states with a forum for direct interaction and negotiation with FCC members regarding issues of common interest. Generally, the FCC has the final say, but historically the FCC has often adopted recommendations from a joint board or committee. Three of those joint activities are described here.

In 1971, Congress mandated the creation of a Federal-State Joint Board for Separations.[198] The FCC must refer a separations issue to this body whenever it proposes to formally change separations rules. The Separations Joint Board has four state members who are state utility commissioners. This joint board issues recommended decisions that are not binding on the FCC.

In 1996, Congress created a new joint board for universal service.[199] The Federal-State Joint Board on Universal Service has four members who are state commissioners and one member who represents the National Association of State Utility Consumer Advocates. The FCC must act on decisions recommended by this Board within one year.

---

[195] *State of Maine Public Utilities Commission, Docket 2008-0241*, p 10.

[196] Id., p. 24

[197] Public Service Board of Vermont, *Phase I Docket 7316*, 10/28/2010.

[198] Pub. L. 92-131, creating 47 U.S.C. § 410(c).

[199] 47 U.S.C. § 254(a).

Also in 1996, Congress mandated cooperation by the FCC and the states to encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans.[200] The FCC convened a Federal-State Joint Conference on Advanced Services in 1999. The Joint Conference was reactivated in 2008, and it also includes commissioners from state public utilities commissions.

[200] Pub. L. 104-104 § 706.

III. Universal Service

In this Part III, we discuss Universal Service—a special program by which customers of certain telecommunications services pay into a fund that the FCC then distributes to various providers to ensure that all customers in all parts of the country can obtain basic voice telephone service.

Universal service is a controversial subject within the telecommunications community. The phrase first appeared in a motto adopted by AT&T in 1908: "One policy, one system, universal service." The intent of AT&T's leader, Theodore Vail, was to promote his company as a single, regulated telephone monopoly in the country. Over the next 70 years, a number of federal and state universal service mechanisms were implemented, all of which had a principal goal of increasing telephone "penetration"[201] by reducing fixed monthly local exchange rates for residential customers.

A. Pre-1980s implicit subsidies

One method to reduce customer A's fixed monthly rate is to increase her usage rates; another is to increase B's fixed rates. Over the years, both of these kinds of rate designs have been characterized as "subsidies." The subsidies were said to be "implicit," because the shifting of costs and benefits were hidden within various regulatory mechanisms and the resulting dollar flows were not measured. A more correct term might be "implicit support."[202]

One implicit support mechanism was a flow from interstate toll and access rates to local rates. The mechanism had two components: (1) separations rules assigned a high percentage of costs to the interstate jurisdiction; and (2) the FCC authorized recovery of ILEC interstate costs primarily through per-minute toll and access charges. The combined effect was that when a dollar of ILEC cost was assigned to interstate, that dollar of cost could not be recovered through fixed monthly charges.

For regulators looking to make residential service more affordable, this mechanism offered a temptation. During the 1970s, regulators succumbed to that temptation by adopting

---

[201] Penetration data report on the percentage of residential households that have telephone service or that have telephones available nearby.

[202] A subsidy in economic terms occurs when the price to customer A goes up to fund service to B, and B's service is priced below what an economist would call the incremental cost of that unit of service. The telecommunications industry depends heavily on sunk investment in common facilities. Once the network is in place, it often costs little to add an additional service or to serve an additional customer. Therefore, incremental cost is usually small, and it is difficult to prove that any particular telecommunications rate design produces economic subsidies. Universal service commenters usually assume a looser definition of subsidy, equating it with improper or imprecise allocations of common costs. That concept is here termed "implicit support."

"Subscriber Plant Factor" (SPF) as the separations factor for loop plant.[203] SPF assigned a percentage of costs to interstate that was much higher than interstate's network usage. SPF therefore created a large support flow from interstate toll and access rates to intrastate rates, including local exchange rates.

On the intrastate side, state commissions often allowed ILECs to impose high access rates for intrastate toll calls or failed to update access rates when costs fell. This practice left many customers paying high rates for intrastate toll calls.

Fixed business and residential rates created a different kind of implicit support, or subsidy. In the 1980s, the average business monthly local exchange bill was 230% of the average residential bill.[204] At one time this rate difference may have been justified because business customers tended to make more calls at peak hours. The reasoning weakened over time, though, as network costs dropped and as switch improvements increased peak network capacity. Moreover, in the 1990s peak network usage shifted to the early evening, when residential lines, not business lines, tended to be in use. But the business-residential rate differential remained largely intact.

When digital switches arrived in the 1980s, "vertical services" became available. These included "call forwarding," "call waiting," and "caller ID."[205] Once the digital switch was in place, the incremental cost of vertical services was small, but the rates were set far above cost. This produced a support flow from the purchasers of vertical services to those who bought only more basic services.[206]

Geographic cost variation also generates implicit support. When ILEC investments are allocated to smaller geographic areas, the per-customer cost varies enormously.[207] Costs typically vary from one exchange to another by factors of ten or more. Within exchanges, the cost variation can be even greater. Individual customers who live in the so-called "donut" far

[203] The SPF factor originated with the so-called "Ozark Plan."

[204] In 1986, the average residential total monthly charge in urban areas was $17.70. The average business rate was $41.25. *2007 Trends Report*, tables 13.1, 13.2.

[205] These services are also sometimes called "CLASS services" (Custom Local Access Signaling Services).

[206] A similar but earlier phenomenon was the practice of adding a charge for "touch tone" calling. This dialing method operated slightly faster than the older "pulse" dialing pattern. Often the incremental cost of touch tone was negative, since it shortened each call by a few seconds.

[207] Usually that ideal cost distribution is estimated on an exchange-by-exchange basis using a computer program that models the cost of constructing a new un-depreciated telecommunications network. Important common assumptions are: (1) that current telecommunications technology will be used; and (2) that all common facilities will be included to serve all of the ILEC's current subscribers.

from the central office can have long loops, and their per-line cost can be hundreds of times higher than for customers who live in the "hole" near the central office.[208]

Until the 1990s, no state commission had explicitly "de-averaged" rates, charging rural customers in a given franchise area more than urban customers. On the contrary, in many states, the urban customers paid more.[209]

The five implicit support flows are summarized in Table 2.

Table 2. Implicit Support Flows in the 1980s

Subsidy	***Mechanism***	***Contributing Customers***	***Assisted Customers***
Interstate toll and access	High separation factor to interstate, no fixed interstate charges	Heavy interstate toll users	Light interstate toll users
State toll and access	High intrastate toll and access rates, low local exchange rates	Heavy intrastate toll users	Light intrastate toll users
Business to residential	High fixed local exchange rates for business, low for residences	Business customers	Residential customers
Vertical services	Intrastate rate designs	Purchasers of vertical services	Other customers
Urban to rural	Geographically uniform local exchange rates	Customers in low-cost exchanges and customers located near central offices	Customers in high-cost exchanges and customers located far from central offices

[208] The geographic subsidy argument usually adapts to the finest-scale cost data currently available. In the 1990s, the best cost models aggregated costs by telephone exchange, and it was frequently said that urban exchanges subsidized rural exchanges. More sophisticated models make it possible to calculate the costs of serving individual customers. Now the subsidy argument has been extended to apply to support flows among customers within single exchanges.

[209] Local rates often were based on "value of service" concepts. Urban customers usually could reach more subscribers with a local call than rural customers, and they often paid higher monthly rates.

B. Federal high-cost programs

Today, federal universal service fund (USF) programs expend approximately $7.3 billion per year. About 60% of this, $4.3 billion, is spent for "high-cost" programs aimed at keeping rates low in high-cost rural areas.[210] As discussed in the following sections, the FCC operates five major high cost support mechanisms.

1. High cost support in the 1980s

Universal service mechanisms changed dramatically in the 1980s. First, in 1983, the FCC created the National Exchange Carrier Association (NECA).[211] As discussed above, the NECA cost pools allow high-cost companies to reduce the rates they charge other carriers for interstate toll access rates, while still recovering their full interstate revenue requirement.

In 1984, to avoid further increases in interstate access rates, the FCC abandoned SPF. The new factor uniformly allocated 75% of loop costs to the state jurisdiction,[212] thereby increasing the intrastate costs for many carriers. The FCC anticipated local exchange rate increases in some areas. To mitigate the risk, the FCC established the first formal universal service support program. Originally, the new program was separations-based. By an "expense adjustment" that moved loop costs from state to interstate,[213] the program reduced the cost pressure on local rates. Today, this program is an explicit universal service mechanism known as the "High Cost Loop Support" (HCL) program.[214] HCL currently distributes $1.3 billion per year.[215]

In 1986 the FCC created the federal "subscriber line charge" (SLC), a fixed interstate monthly charge. ILECs apply their SLC revenues to their "common line" interstate revenue

---

[210] The estimate is based on the annualized cost of USAC estimates for 2008Q1 and 2008Q2. As discussed below, the remaining programs provide support for schools and libraries, low-income customers, and rural health care, and they are discussed below.

[211] FCC, *MTS and WATS Market Structure*, CC Docket No. 78-72, Phase I, Third Report and Order, 93 FCC 2d 241 (1983), effective 01/01/84; *see, generally*, 47 C.F.R. Part 69, Subpart G (rules for Exchange Carrier Association). NECA's original name was "Exchange Carrier Association.

[212] *See* 47 C.F.R. § 36.154(c); FCC, *Jurisdictional Separations Procedures, Amendment of the Commission's Rules and Establishment of a Joint Board*, CC Docket No. 80-286, Decision and Order, FCC 83-564, 96 F.C.C.2d 781 (1984).

[213] *See* 47 C.F.R. § 36.631.

[214] *See* 47 C.F.R. § 36.631(c) and (d).

[215] The FCC has a separate support program for the intrastate costs of large so-called "non-rural" companies. The $1.3 billion figure and other expenditures reported below include support to ILECs and to competitive carriers serving those same ILEC study areas.

requirement, most of which arises from the cost of customer loops. Creating the SLC allowed the FCC to reduce per-minute rates for interstate toll calls, which the FCC believed to be higher than incremental cost. For many years, the SLC for residential customers was capped at $3.50 per month per line.[216]

The SLC broke the classical formula that a dollar of ILEC cost that separations moved to interstate became a dollar that could not be recovered through fixed monthly charges. With the SLC in place, if that dollar of cost related to loops, moving it to interstate would simply increase the SLC charge. The net effect of reducing local rates and increasing the SLC would be small, at best, and it could not materially affect affordability.

In 1988, the FCC created a second universal service support program, "DEM weighting."[217] As with HCL, the mechanism chosen for this new program was separations. The new program shifted some of the costs of local switching from the state jurisdiction to the interstate jurisdiction. Only carriers with fewer than 50,000 access lines were eligible, and the very smallest carriers received the largest benefit.[218] As with HCL, the net effect was to increase interstate toll and access rates and to reduce the cost pressure on local rates. Today, DEM weighting is known as "local switching support" (LSS), and it still supports the switching cost of small companies with fewer than 50,000 lines.[219] The LSS program distributes $0.5 billion per year.

2. Post-1996 high-cost programs

The Telecommunications Act of 1996 dramatically changed the legal context of universal service policies. For the first time, the FCC was given a statutory duty to "preserve and advance" universal service. More specifically, the 1996 Act directed the FCC to provide sufficient support so that rates would be "affordable" and so that rates and services would be

[216] The SLC is currently capped at $6.50 per month.

[217] FCC, *MTS and WATS Market Structure*, CC Docket No. 78-72, Report and Order, 2 FCC Rcd 2639 (1987). *See* 47 C.F.R. § 36.125.

[218] For carriers with 10,000 lines or less, the measured interstate usage of the switch was multiplied by 3.0. 47 C.F.R. § 36.125(f). For example, if 20% of a carrier's switch time (dial equipment minutes) was used for interstate calling, the carrier's switching investment would be separated, with 60 percent assigned to interstate. Smaller multipliers were used for carriers with more than 10,000 lines but less than 50,000 lines.

[219] Today, many NECA pool carriers contribute their LSS revenues to the NECA pool and therefore treat LSS support as interstate revenue. Some states are still using LSS revenues to offset intrastate costs.

"reasonably comparable" between urban and rural areas.[220] The Act also required that federal universal service mechanisms be "explicit."[221]

After 1996, the FCC defined three classes of receiving carriers. Under the Act, high cost support can be provided only to "eligible telecommunications carriers" (ETCs). Most states conduct proceedings to determine which carriers qualify for this designation.[222] Among ETCs, there are three important classes: "rural" ILECs,[223] "non-rural" ILECs, [224] and "competitive ETCs" (CETCs).

In 2000, the FCC added a third high-cost program. "Model-based support" distributes support to non-rural carriers serving states with high average cost. Model-based support is based upon a per-line cost estimate generated by a complex computer "model" that estimates "forward-looking" telephone company costs.[225] Today this program distributes $0.3 billion annually. Model-based support is controversial, in part because the support is distributed to carriers in only ten states. In 2005 the Tenth Circuit remanded this program to the FCC, concluding that the FCC had not demonstrated the sufficiency of its support.[226]

In 2000 and 2001, the FCC added its fourth and fifth USF programs as part of comprehensive plans to reform interstate access charges. At that time the FCC decided to

---

[220] 47 U.S.C. § 254(a), (b), (d).

[221] 47 U.S.C. § 254(e).

[222] Beginning in 2010, pre-paid wireless providers such as TracPhone have qualified for ETC status in some states.

[223] Generally, carriers with less than 100,000 lines qualify as rural. *See* 47 U.S.C. § 153(37)(D).

[224] Non-rural carriers are carriers that are not qualified to be rural carriers. Far more rural customers are actually served by "non-rural carriers" than by "rural carriers."

[225] Forward-looking models attempt to estimate the cost of providing service using current technologies and component costs. In contrast, the "embedded" method of measuring costs is based on an ILEC's actual historical investment, as shown in its accounting records. Embedded costs are the basis for support in all other USF high-cost programs, including HCL, LSS, IAS, and ICLS.

Embedded costs tend to be lower than forward-looking costs when embedded plant is highly depreciated and when labor cost or material cost has increased. Forward-looking costs tend to be lower when existing networks do not have modern feeder and distribution plant designs.

[226] *Qwest Communications Int'l Inc. v. FCC*, 398 F.3d 1222 (10th Cir. 2005).

eliminate the "common line" component of access charges[227] and to lower access rates generally. To replace the lost interstate revenues, the FCC authorized ILECs to increase the SLC for residential users to $6.50 per month. Where revenue losses were not fully offset by those increased SLC revenues, the FCC made up the shortfall with universal service support.

The FCC acted twice in similar ways, creating two new support programs. For the large "price cap" companies, the FCC adopted a modified version of the "CALLS" plan and created the Interstate Access Support (IAS) program.[228] For the smaller "rate-of-return" companies, the FCC adopted a modified version of the "MAG" plan and created Interstate Common Line Support (ICLS).[229] Together, IAS and ICLS distribute $2.3 billion annually. These two programs, devoted to post-1996 reform of interstate access charges, thus generate slightly more than 50% of all current federal high cost support. Table 3 summarizes the major federal high cost programs.[230]

[227] An ILEC's "common line" revenue requirement is that portion of its interstate revenue requirement associated with loops. "Common line" charges thus were per-minute access charges, paid by other carriers, intended to recover loop costs.

[228] *See* FCC, *Access Charge Reform*, CC Docket No. 96-262, Sixth Report and Order, 15 FCC Rcd 12,962 (2000) (*CALLS order*).

[229] FCC, *Multi-Association Group (MAG) Plan for Regulation of Interstate Services of Non-Price Cap Incumbent Local Exchange Carriers and Interexchange Carriers*, Second Report and Order and Further Notice of Proposed Rulemaking, 16 FCC Rcd 19613, 19667-68 (2001) (*MAG Order)*.

[230] The table excludes financially minor high-cost programs. The table includes National Exchange Carrier Association pools because they also serve universal service objectives.

Table 3. Purposes of Major Federal High Cost Programs

	Small ILECs - State Costs	***Small ILECs - Interstate Costs***	***Large ILECs - State Costs***	***Large ILECs - Interstate Costs***
Loop costs	High Cost Loop Support	NECA Common Line Pool	Model-based	
Switching costs	Local Switching Support	NECA Traffic-Sensitive Pool	Model-based	
Interoffice trunking costs		NECA Traffic-Sensitive Pool	Model-based	
Interstate access reform		Interstate Common Line Support		Interstate Access Support

As noted above, rural ILECs and non-rural ILECs receive support under different mechanisms. Competitive ETCs receive support under yet a third rule. ILECs and CETCs each report line counts by ILEC exchange quarterly. Under the so-called "identical support rule," CETCs receive the same per-line support in each exchange as the local ILEC. Support under the identical support rule increased rapidly from 2001 to 2007, in part due to the large numbers of CETCs designated in some high-support states. In May of 2007, the Federal-State Joint Board on Universal Service recommended imposing a cap on CETC support.[231] Later in 2007, the joint board recommended abolishing the identical support rule.[232]

In November 2007, the Federal-State Joint Board on Universal Service recommended fundamental revisions to federal universal service mechanisms. It recommended creating three separate funds: broadband, mobility, and provider of last resort.[233] The first two of these funds would be new, aimed primarily at promoting deployment of new facilities. The Joint Board also recommended that the current legacy high cost programs (including the Provider of Last Resort Fund) remain in place until a new USF plan is implemented.

[231] *Matter of High-Cost Universal Service Support,* WC Docket no. 05-337, Recommended Decision, 22 FCC Rcd 8998 (May, 2007).

[232] *High-Cost Universal Service Support*, WC Docket No. 05-337, Recommended Decision, FCC 07J-4, 22 FCC Rcd 20,477 (November, 2007).

[233] *High-Cost Universal Service Support*, WC Docket No. 05-337, Recommended Decision, FCC 07J-4, 22 FCC Rcd 20,477 (2007).

In April of 2008, the FCC capped support to most CETCs.[234]

In November 2008, the FCC issued several new proposals aimed at reforming the Federal Universal Service Fund (FUSF) as recommended by the Joint Board, partly in response to a court mandate.[235] The *Order on Remand* included three separate proposals aimed at reforming universal service and intercarrier compensation, as well as proposing a broadband pilot program.

3. High cost support under the National Broadband Plan

The FCC issued the National Broadband Plan (NBP) in March 2010 in response to a Congressional mandate to ensure that

> everyone in the United States today [has] access to broadband services supporting a basic set of applications that include sending and receiving email, downloading web pages, photos and video, and using simple video conferencing.[236]

The NBP recommends reforming the current universal service and intercarrier compensation programs in three stages, beginning in 2010 and completing in 2020, in order to transfer support funding from the legacy existing wireline network to new broadband networks.

Stage One (2010–2011) would lay the foundation for reform by improving USF accountability and performance, establishing a Connect America Fund (CAF) to provide low-income support for broadband adoption, and creating a new Mobility Fund to increase broadband wireless deployment in rural areas.

Stage Two (2012–2016) would accelerate reform by beginning to disburse funds from the CAF to support wireless broadband and broadening the base of companies that contribute to the USF by including providers such as cable companies and nomadic VoIP providers. In Stage Two, the plan also proposes to begin a comprehensive reform of intercarrier compensation, including reducing per-minute rates to reflect the declining number of switched minutes of use on the existing wireline network as a result of increased VoIP traffic.

---

[234] FCC, *High-Cost Universal Service Support; Federal-State Joint Board on Universal Service; Alltel Communications, Inc., et al. Petitions for Designation as Eligible Telecommunications Carriers; RCC Minnesota, Inc. and RCC Atlantic, Inc. New Hampshire ETC Designation Amendment,* WC Docket No. 05-337, Order, FCC 08-122, 23 FCC Rcd 8834 (rel. May 1, 2008).

[235] *In re: Developing a Unified Intercarrier Compensation Regime, High Cost Support, Federal-State Joint Board on Universal Service, and Universal Service Contribution Methodology*, Docket Nos. 01-92, 05-337, 96-45, and 06-122 (November 5, 2008) (the *Order on Remand*).

[236] *Connecting America: The National Broadband Plan*, The Federal Communications Commission, GN Docket No. 09-51, 20 (2010). P. 135

Stage Three (2017-2020) would complete the transition to a new funding methodology, eliminating existing USF programs, including legacy High Cost Fund support, and moving to provide all support through the CAF. Stage Three would continue the phasing out of per-minute intercarrier compensation for originating and terminating calls.[237]

To begin the shift from the current Universal Service Fund to the new Connect America Fund, the NBP proposes shifting up to $15.5 billion in federal high cost support funds from the voice network to broadband deployment and implementation. The plan makes four specific recommendations for shifting these existing high cost funds to broadband deployment:

1. Recapture the approximately $3.9 billion in Eligible Telecommunications Carrier (ETC) funding[238] received by Sprint and Verizon Wireless as part of their acquisitions of Clearwire and Alltel and redirect these monies to broadband deployment.[239]

2. Require rate-of-return carriers to move to incentive regulation.

3. Redirect Interstate Access Support funding (IAS) to broadband deployment.

4. Phase out legacy high cost support to competitive ETCs.

The FCC anticipates that the reallocation of USF funding described in the NBP will make broadband available to 99% of the U.S. population by 2020.

C. Federal low-income programs

The FCC provides support for two programs, Lifeline and Link-Up, that assist low-income consumers. The annual federal cost for these programs is $0.8 billion.

The "Lifeline" program provides discounts on monthly local exchange service charges.[240] States may define the qualifications of low-income customers eligible for this program, and states may define the methods of enrollment.[241] Customers enrolled in the program receive a benefit equal to a full waiver of the subscriber line charge plus an additional discount of $1.75

[237] Id. P. 136

[238] See Part II.b.2 above

[239] Id., p. 147. Sprint and Verizon Wireless agreed to return these funds as part of each of their merger agreements with Clearwire and Alltel.

[240] *See generally,* 47 C.F.R. § 54.400-54.410.

[241] *See* 47 C.F.R. § 54.409. A default definition applies in states that have not adopted their own definition. 47 C.F.R. § 54.509(b).

from the usual local exchange rate. Many states increase the discount with supplemental state funds, and a 50% FCC match is available.[242]

The "Link-Up America" program reduces telephone installation costs for low-income consumers by up to $30 per installation.[243] Carriers who provide these customer discounts receive reimbursement from the FCC.

The NBP proposes the creation of three new funds to ensure that broadband is available to low-income subscribers. The Broadband Availability Fund will reallocate the current universal service support provided to high-cost carriers in rural locations where consumers lack access to high-speed services to carriers that will build broadband networks. The second fund, the Broadband Adoption Fund, will create support mechanisms to assist customers in lower-income and rural communities in accessing affordable broadband services. The third fund, the Wireless Mobility Fund, will subsidize the deployment of wireless facilities and services in areas of the country without broadband access.

D. Federal schools and libraries and rural health care programs

The 1996 Act authorized universal service support for schools and libraries. Today that support distributes $2.1 billion per year. The Act also authorized support for telecommunications to rural health care facilities. Today that program distributes $0.2 billion per year.

E. State universal service programs

Several states have adopted their own, supplemental, universal service programs. The purposes vary.[244] Some states used universal service to replace carrier revenues lost during intrastate access reforms. Other states provide support to carriers who otherwise would be allowed to charge high rates for local exchange service in their rural areas. About two-thirds of the states provide state-generated support to further reduce rates for Lifeline customers. A few states also provide support for telecommunications in schools and libraries and for rural health care.

F. Post-1996 implicit subsidies

Prior to the implementation of the 1996 Act, five implicit subsidies supported low local exchange rates. When the 1996 Act passed, many observers expected that local exchange competition would force ILECs to eliminate these subsidies. Since CLEC customers generally

---

[242] 47 C.F.R. § 54.403. Additional discounts are available for qualified subscribers living on tribal lands.

[243] *See,* 47 C.F.R. § 54.411- 54.416.

[244] *See generally,* Liu, Rosenberg, *State Universal Service Funding Mechanisms: Results of the NRRI's 2005-2006 Survey,* National Regulatory Research Institute, Report No. 06-09, available at http://nrri.org/pubs/telecommunications/06-09.pdf.

did not have to make similar contributions, many predicted that ILECs would either eliminate the subsidies, largely through redesign of their rates, or seek to convert them into explicit subsidies through state universal service funds. These predictions have proven to be only partly accurate.

The subsidy within interstate toll rates has largely disappeared. As noted above, in 2000 and 2001, the FCC adopted the CALLS and MAG plans and reduced interstate access charges. These orders eliminated per-minute interstate access elements that previously supported loop costs.[245] Some commenters see a need for still more access rate reductions, because most interstate access rates remain above incremental cost and because ILEC access revenues are facing increasing competitive pressure.[246] The NBP addresses these reductions.

The second subsidy, within intrastate toll rates, has been greatly reduced, but only in some states. Either by legislation or by commission action, many states now "mirror" interstate access rates. Some of these states replaced lost carrier revenues with universal service support. In contrast, other states continue to allow carriers to charge intrastate rates that are much higher than the comparable interstate rates. In some of these states, intrastate access rates are as much as ten times as high as equivalent interstate rates.

Subsidies from business to residential customers have eroded but still exist. From 1986 through 2005, the ratio of average business local exchange service to average residential local exchange service declined from 230% to 177%.[247] Although the differential is now smaller, it still has little relation to cost.[248]

---

[245] After CALLS and MAG, all common line costs were recovered from a combination of SLC charges, universal service support payments, and, in the case of NECA carriers, revenues from the NECA common line pool.

[246] Industry efforts after 2001 to reduce intercarrier compensation (including interstate access and intrastate access) have not been successful at the FCC. *See generally,* Liu, *Intercarrier Compensation Reform at Debate: Major Issues of the Missoula Plan*, National Regulatory Research Institute, Report No. 07-05, available at http://nrri.org/pubs/telecommunications/07-05.pdf.

[247] During this period, the average rates for both groups increased, but the residential increase was larger. In 2005, the average residential total monthly rate in urban areas was $24.74. The average business rate was $43.94. *2007 Trends Report*, Tables 13.1, 13.2.

[248] Average local exchange rate data may overstate the remaining differences between residential and business. Many business customers do not buy simple business lines for their telecommunications service. Larger business customers can often benefit from additional discounts from their local ILEC or from a CLEC. Larger businesses also commonly buy more sophisticated equipment, such as "private branch exchange" (PBX) switches, and then purchase special access circuits from the local exchange carrier. Those discounts and service substitutions are not captured by published rate data.

Subsidies from purchasers of vertical services have also eroded. Competitors, particularly application-based competitors like nomadic VoIP, typically offer vertical services at no extra charge, and this has put competitive pressure on ILECs. Some have reduced vertical service charges. Others have bundled vertical services into larger packages that include local and toll calling.

The final subsidy, from urban to rural customers, has been the most durable. In most states, the ILECS still charge approximately the same local rates in their low-cost urban areas as in their high-cost rural areas.[249] To the extent that this arrangement subsidizes customers in the rural areas, making that subsidy explicit would require a large amount of new USF funding, probably several billion or even tens of billions of dollars.[250]

[249] Wyoming is a notable exception. A 1995 Wyoming law directed its commission to eliminate urban-rural subsidies. Accordingly, rural Wyoming residents can pay ILEC local exchange rates significantly higher than in Wyoming's cities. The state has reduced the rate differences with state universal service funds. In other states, more modest forms of "rate rebalancing" have occurred, usually within the context of a price cap or AFOR cases.

[250] An estimate of the increased demand for support can come from the current federal model-based support mechanism. Currently that program provides support to nonrural companies based on forward-looking costs. A central design element is that costs are averaged at the state level before support is calculated. That policy is appropriate if, within every state, implicit rural-urban subsidies either remain intact or are replaced by explicit state support programs. On the other hand, if implicit support within each state can no longer be assumed, then federal support should be calculated at a finer scale. If the existing mechanism were changed solely by calculating using wire center costs rather than state costs—and this is not the smallest scale possible—then the program size would increase by a factor of ten, from $0.3 billion to approximately $2.4 billion.

This estimate covers only non-rural companies, because rural companies have different support mechanisms. Rural carrier support mechanisms generally average costs over study areas rather than states, but the costs tend to be higher because rural carriers serve some of the very highest-cost areas in the country. Calculating support by wire center for these rural companies would also increase their support, but that amount is more difficult to estimate.

One version of the rural subsidy argument suggests making support explicit as to cost differences *within* individual exchanges. The argument is that the "hole" areas near the central office switch subsidize the more remote "donut" areas. If costs were calculated at this finer scale, still more support would be needed because implicit subsidies within exchanges could no longer be assumed.

The political dimension may be more important. Most state regulators don't see a pressing need to eliminate implicit rural subsidies. To do so would make the urban-to-rural support more visible politically and thus more controversial than a support mechanism buried within a uniform rate design.[251] Explicit funds also raise complex issues about contributions from CLECs and wireless carriers.

Nevertheless, the issue of rural subsidy is unlikely to disappear, even with the new programs contemplated by the NBP. Rural ILECs are increasingly claiming that the existing implicit system discourages investment in their more remote exchanges. As ILECs continue to lose lines and revenues to competitors in their more densely populated areas, and as state regulators seek additional rural investment for broadband, the ILECs are likely to press harder for explicit new state and federal USF support programs.

[251] On the other hand, making subsidies explicit creates opportunities to expand the contribution base to more customers, including customers of wireless and VoIP service providers.

IV. Major Regulatory Challenges

This Part IV focuses on the future. Since the 1984 breakup of the Bell System, industry change—in terms of technologies, services and providers—has been a constant, with initiatives from Congress, the FCC, state legislatures, and state commissions coming at a rapid pace in an attempt to respond to rapidly evolving technology. Regulators face four major challenges as the telecommunication industry continues to evolve in the 21st century.

1. Establishing a balance between competition and regulation appropriate to modern technology, particularly as those technologies evolve and converge.
2. Preserving the essential public benefits from legacy regulation, even as providers and their customers move away from traditional regulated, wireline telecommunications service.
3. Identifying new ways to balance regulatory responsibility between federal and state authorities.
4. Increasing the availability of high-speed access to the Internet by promoting rural broadband deployment.

We discuss those challenges below.

1. What is the best possible mix of competition and regulation?

Alfred Kahn said that "competition and direct regulation are the two principal institutions of social control in a private enterprise economy." Finding the best mixture of the two is, according to Kahn, the "central, continuing responsibility of commissions and legislatures."[252] As telecommunications markets evolve and converge, finding and maintaining the proper balance is the greatest challenge facing telecommunications regulators. As Kahn notes, there are no simple, scientific rules, and good policy invariably calls for a judicious balancing, heavily informed by experience, of conflicting considerations and predictions.[253]

Many states have reduced or eliminated rate regulation of intrastate telecommunications services, usually after concluding that ILEC rates are now constrained by competitive market forces. Either through legislative or regulatory action, many states have abandoned cost-of-service regulation for some or all of their carriers. Other states have remained committed to cost-of-service analysis and have concluded that they should continue to exercise substantial oversight of local rates, even where competition has become relatively well-established in limited areas.

The trend for wholesale services has largely been toward greater state regulation. The 1996 Telecommunications Act imposed new duties on ILECs to interconnect, provide services

---

[252] A. Kahn, *The Economics of Regulation: Principles and Institutions* (1970 Wiley; repr. with new author's introduction, Cambridge, Ma.: MIT Press, 1988), Introduction at xxxvii, Vol. II at 114-15.

[253] *Id.*, Vol. II at 115.

for resale, and unbundle network elements; the Act also gave state commissions the authority to arbitrate disputes relating to these matters. State wholesale authority also increased as a by-product of having authorized regional Bell operating companies (RBOCs) to reenter toll markets. As part of the "section 271"[254] cases before the FCC, the RBOCs were given very detailed wholesale service quality obligations designed to ensure that they provide service to their local exchange competitors equal to what they provide to themselves. Today, many state commissions actively monitor how well the RBOCs meet these standards.[255] As a result, some states are engaged in evaluating very fine details of complex intercarrier relationships.

As we discussed in Part II.A, inter-carrier compensation[256] is an especially challenging area of wholesale market regulation. Under the reciprocal compensation rules, companies compensate each other for the costs incurred in terminating calls originated by their customers. Under access charge rules, long-distance carriers compensate local carriers for the cost of originating and terminating their customer calls. Historically these compensation mechanisms provided a revenue source to the ILEC that covered the switching and transport components of completing interstate and intrastate calls to/from their subscribers. Today, calls using Internet protocol bypass classical PSTN toll-based access rules, partly because of the so-called Enhanced Service Provider Exemption from the payment of access rates for interconnection.[257] The National Broadband Plan proposes revising the intercarrier compensation rules by implementing a non-jurisdictional, flat rate that will be reduced over time and eventually phased out.

Achieving the best possible mix between competition, regulation, and reform is complicated by the age and layered structure of the national telecommunications statutes. Over decades, Congress has enacted separate laws for individual industries, including

---

[254] *See* 47 U.S.C. § 271.

[255] RBOCs received authority to originate inter-LATA toll traffic under 47 U.S.C. § 271. As a part of the cases examining whether to grant that authority, RBOCs often established complex wholesale quality-of-service measurement systems that required measurement and reporting of dozens or even hundreds of performance measures and often mandated penalties for failures. These plans were often called "performance assurance plans" or "PAPs." *See* Davis, et al, *Performance Assurance Plans: State Experience So Far*, National Regulatory Research Institute, 2002, available at http://nrri.org/pubs/telecommunications/02-12.pdf.

[256] Intercarrier compensation is the term used to describe the many systems of wholesale compensation among telecom carriers. Once an ILEC or IXC accepts a subscriber, that carrier becomes obligated to complete all the calls that the subscriber places to the PSTN and therefore to make associated access and reciprocal compensation payments to other carriers.

[257] See *In Re: Feature Group IP Petition for Forbearance from the Obligation to Pay Access Charges for Voice-Embedded Internet Communications*, Docket No. 07-256 and Petition of the Embarq Local Operating Companies for Forbearance From Enforcement of the Commission's Orders on the ESP Exemption, Docket No. 08-08. The FCC denied the Feature Group IP Petition on January 21, 2009. On February 11, 2009, Embarq withdrew its petition concurrently with the FCC's consideration of an Embarq proposed merger.

telecommunications, cable television, and wireless. The resulting legal structure has been compared to a series of "silos," in which each industry has its own independent set of rules. Although the industries are now increasingly entering each others' markets, each of the silos imposes different duties. Such partitioning inevitably creates disparate regulatory treatment and competitive inequalities.[258] Politically, the silo structure has proven surprisingly stable, in part because each silo generates some unique advantages that a more general statute might jeopardize.

2. As technology evolves, how do we preserve the traditional benefits of the regulated telecommunications system?

The telephone network benefits consumers in many ways, many simply because statutes require state or federal regulators to provide them. Table 4 lists a number of public benefits and the corresponding ILEC duties.

[258] The FCC has also enacted what amounts to still another silo by classifying broadband Internet services and nomadic VoIP services as "information services" subject to the FCC's ancillary jurisdiction. Unlike statutory silos, the ancillary jurisdiction silo gives the FCC broad discretion over what duties to impose on service providers.

Table 4. PSTN Benefits and ILEC Duties

PSTN Benefit	Corresponding ILEC Duties
Nondiscriminatory service and rates	File public tariffs and contracts
Service is available almost everywhere	Serve all new customers seeking service from within franchise area[259] (except for line extensions); administer or pay universal service surcharges
Low monthly rates for basic service	Submit rate designs for state commission approval
Customers can call any NANPA telephone number	Terminate all submitted PSTN traffic in real time, and sort out billing later
Emergency services, including E-911	Maintain customer location data and special-purpose 911 trunks; operate "left-in" dial tone on disconnected telephones[260]
Customer information protected	Maintain security for customer information
Law enforcement uses PSTN data for investigations	Use approved switching equipment; keep calling records; comply with pen register and wiretap orders
Assist hearing-impaired customers	Contribute to Telecommunications Relay Service programs
Assist visually impaired customers	Provide discount services to visually impaired customers
Assist sick or vulnerable customers	Disconnect only under conditions authorized by state commissions

New services like VoIP that use broadband connectivity rather than the existing wireline network challenge the states' ability to continue to require carriers to provide these benefits. As we explained in Part II.A., broadband Internet access service provided via packet switching is regulated under Title I of the Telecommunications Act and thus not subject to state jurisdiction. As service providers begin to convert the bulk of their networks from circuit switching to packet switching and cease to offer traditional wireline services, regulators must address the question of how (or whether) they can continue to require these providers to fulfill the traditional ILEC duties.

[259] This is referred to as the Carrier of Last Resort (COLR) obligation.

[260] "Left-in" dial tone means that a telephone retains limited communications ability after it is disconnected for general service. Such a phone can make only emergency calls and calls to the telephone company's business office.

Resolving this question is complicated by the regulatory complexity surrounding broadband based services such as VoIP. Increasingly, VoIP providers and the providers of bundled service packages have disputed the need for service quality measurements for new products offered over broadband networks. These providers argue that competition gives customers the opportunity to "vote with their feet" and move to another provider should they dislike the service provided by their current carrier. This issue and others related to how broadband services are categorized and who has jurisdiction over them present state regulators with an important challenge, as the market changes and still more new services are introduced. For example, as carriers replace their current circuit-switched networks with broadband transport, regulators will need to determine how and whether they can continue to hold carriers to existing performance and repair standards.

For each public benefit, the regulator's challenge is to find the best among a limited range of options. The most basic question is whether to retain the public benefit. If so, the second question is whether to convert it from an uncompensated duty to a financial inducement or contractual arrangement.[261] Finally, if the duty is to be imposed, regulators must identify the carriers and service providers that will carry the duty. One choice is to maintain the status quo and apply the duty solely to more traditional carriers. Alternatively, regulators might broaden the duty and apply it to incumbents and new entrants alike.[262]

3. How can we best allocate responsibility between state and federal regulators?

The third major regulatory challenge is to find a federalism model that suitably allocates responsibility between the FCC and state regulators. Over time, state regulators and others have challenged the traditional wireline concept of dual jurisdiction.

Over the last 20 years, state commissions have exercised rate authority over a declining share of the telecommunications business. Legal changes are a major reason. Congress has reduced state authority over wireless telecommunications,[263] and the FCC has preempted broad areas of state authority over growing new technologies, including broadband Internet services and VoIP services. Market evolution is an equally important factor. The remaining area of state rate-regulation authority—intrastate telecommunications services provided by non-wireless, a non-Internet VoIP carrier—is a declining market.

---

[261] For example, some states now provide explicit support for carriers who provide discounts to low-income and hearing-impaired customers.

[262] For example, the FCC has recently required interconnected VoIP carriers to provide E-911 services and to allow the porting of telephone numbers.

[263] The FCC has plenary authority over rates, and states retain authority over line items and other terms and conditions. *Nat'l Ass'n of State Utility Consumer Advocates v. FCC*, 457 F.3d 1238 (11th Cir. 2006), cert.den. *Sprint Nextel Corp. v. Nat'l Ass'n of State Util. Consumer Advocates*, 128 S. Ct. 1119, 169 L. Ed. 2d 948 (2008).

Certainly, valid reasons for federal preemption exist, such as to have common technical, reporting, and accounting standards for a common network. Common advertising, billing, and consumer protection standards also can reduce a carrier's cost of providing a regional or nationwide service. Customers may nevertheless benefit more from allowing state participation, even with the inevitable policy variation. Under the 1996 Act and under subsequent FCC decisions, states have made a variety of policy contributions.

1. State participation is desirable whenever a sound regulatory decision requires knowledge of local conditions or when controversies are so numerous or time consuming as to be beyond the resources of the FCC. State commissions have, in the aggregate, far more fact-finding resources than the FCC.

2. State financial participation is preferable whenever it seems likely to advance the overall objective. For example, the courts and the Universal Service Joint Board have recognized the advantages of a state-federal partnership in universal service.

3. State enforcement of existing federal or state standards has sometimes been found to produce better results for retail or wholesale consumers. States are often the first point of contact for consumer complaints, and states ordinarily offer quicker and more effective responses to consumer complaints.

4. States are better able to respond to new problems where a single national policy would be premature. Early state actions regarding slamming and telephone number pooling, for example, guided subsequent FCC policies.

4. How can regulators encourage the deployment of broadband services in rural and underserved areas?

An immediate challenge for state regulators is promoting broadband availability, including working with the FCC and the federal government to implement the National Broadband Plan (NBP). Broadband not only makes possible high-speed access to Internet-based services and new voice technologies, but also creates economic opportunity, particularly in rural areas. Although small ILECs have been successful in deploying DSL services to the majority of their customers, there are still very rural areas where broadband is available only through satellite service.[264] Congress moved to remedy this situation by requesting that the FCC develop a plan to ensure that all Americans have access to broadband capability, regardless of their location and income level by 2020. Congress directed that the plan provide

> a detailed strategy for achieving affordability and maximizing the use of broadband to advance consumer welfare, civic participation, public safety and homeland security, community development, health care delivery, energy independence and efficiency, education, employee training, private sector

[264] Satellite service is expensive, subject to time delays, and does not match the speeds of terrestrial services.

investment, entrepreneurial activity, job creation and economic growth, and other national purposes.[265]

The four key recommendations of the NBP are:

1. Design policies to ensure robust competition and, as a result, maximize consumer welfare, innovation, and investment.

2. Ensure efficient allocation and management of assets that government controls or influences, such as spectrum, poles, and rights-of-way, to encourage network upgrades and competitive entry.

3. Reform current universal service mechanisms to support deployment of broadband and voice in high-cost areas and ensure that low-income Americans can afford broadband; in addition, support efforts to boost adoption and utilization.

4. Reform laws, policies, standards, and incentives to maximize the benefits of broadband in sectors that government influences significantly, such as public education, health care, and government operations.

The states have been working with the FCC and other government agencies, including the Rural Utility Service (RUS), to expand broadband into their rural areas as recommended by the NBP. A number of state legislatures have passed new statutes, including laws creating public authorities that issue bonds and laws promoting wireless broadband cooperatives. In other states, utility commissions have used their regulatory powers, including AFOR plans, to increase broadband deployment. Others have imposed conditions mandating broadband deployment when they designate ETCs for FUSF. On the federal level, the Federal-State Joint Board on Universal Service has recommended that broadband be added to the list of services supported by existing universal service programs and provided with an independent support mechanism.[266]

As broadband continues to emerge as the primary vehicle for data and voice communications services, state regulators must focus even more directly on ensuring its availability, affordability, and service quality in their states. They can do this by continuing to participate with the FCC in the development of the rules implementing the NBP and by working with their state legislatures to craft state regulations that will ensure broadband availability in both urban and rural areas.

---

[265] *Connecting America: The National Broadband Plan*, Executive Summary.

[266] FCC, *High-Cost Universal Service Support*, WC Docket No. 05-337, Recommended Decision, FCC 07J-4, 22 FCC Rcd 20,477 (November, 2007).