

# Shared Loops: How Incumbent Local Exchange Carriers (ILECs) and Competitive Local Exchange Carriers (CLECs) Can Deliver Competitive Digital Subscriber Line Access Multiplexer (DSLAM) Applications

## Definition

The provisioning of digital subscriber line (DSL)–based service by competitive local exchange carriers (CLECs) and voiceband service by incumbent local exchange carriers (ILECs) on the same loop is frequently called line sharing. Digital subscriber line access multiplexer (DSLAM) applications that leverage shared lines include high-speed Internet services and small office home office (SOHO) muting for residential and small-business users.

## Overview

This tutorial examines the impact of the Federal Communications Commission (FCC) mandate that requires telephone companies to share the existing high-frequency portion of their telephone lines with CLECs. Prior to the ruling, CLECs were forced to lease a second line from incumbent local exchange carriers (ILECs), driving up operational costs and placing competitors at a disadvantage. Line-sharing levels the competitive playing field and offers consumers high-speed Internet access service via DSL over their current telephone lines at reasonable rates.

This ruling not only presents advantages to end-users and CLECs, but great challenges for expanding ILEC networks to direct the increased traffic on the shared lines. To manage this feat, service providers must explore how to provide high-density DSL output and simultaneously increase service capacity. Ideally, a single-source, end-to-end solution that resolves the narrow bandwidth dilemma should also maintain interoperability with providers' existing infrastructure.

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## 1. Introduction

Before the FCC's recent adoption of measures to promote the availability of competitive broadband access to smaller market users, ILECs charged CLECs for usage of a second line if the competing companies wanted to provide voice or DSL services. Local-loop costs were 50 to 100 percent higher, lining the pockets of incumbent service providers. The FCC believes that this latest ruling will allow all consumers to have access to high-speed, packet-switched networks, which should spur the growth and development of the U.S. economy.

### The Ruling Says

In November of 1999, the FCC passed the Advance Services Third Report and Order that allows CLECs and data local exchange carriers (DLECs) to gain access to the high-frequency portion of the local loop from incumbent providers. The approved ruling promotes competition for advance services by directing local telephone companies to share telephone lines with providers of high-speed Internet access and other data services.

It ensures that more companies should be able to deploy new technologies on a faster, more cost-effective basis, thereby accelerating the ability of residential and small-business customers to access competitive broadband services from their choice of providers.

Specifically, the ruling requires that ILECs accomplish the following:

- Provide unbundled access to the high-frequency portion of the loop to any carrier that wants to deploy any version of xDSL that is presumed to be acceptable for shared-line deployment; ILECs are not required to

unbundle lower-frequency portions of the loop, known as the voiceband

- Share the line with the requesting carrier; however, carriers may not request access to just the high-frequency portion of the loop if the incumbent is not presently using that loop to provide analog voice service

## Service Provider Issues

The impact on ILECs is twofold, as it involves both operational and competitive implications. While shared lines do not affect the incumbent carriers' ability to offer its DSL service or its voice service, network infrastructures must be expanded to handle the increased traffic. ILECs claim that network expansion will only benefit CLECs and consequently want their competitors to bear the cost burden.

In addition, incumbents claim that it will take close to a year—from the date of the ruling in November of 1999—to accommodate the expected flood of line-sharing requests. The FCC has ordered both the ILECs and competitors to share the networking infrastructure expenses and has left it up to the state governments to enforce compromise and determine how much each will contribute financially.

## Competitive Concerns

ILECs already are using line-sharing technology to offer basic telephone service and DSL services over the same line, so the Commission's action places competitive carriers on a more equal footing. ILECs now have head-to-head competition with CLECs and are concerned that they will use line sharing as a means of offering inexpensive voice-over-Internet protocol (VoIP) services to residential and small-business consumers.

These requirements place ILECs, as well as CLECs and interexchange carriers (IXCs) in the position of determining how they can maximize the value of embedded copper infrastructures and broaden their service offerings and pricing structures with DSL. Their best option is to seek out a single source-solution provider that can support multiple DSL transmission services over broadband.

## 2. Shared Loops

Line sharing enables competitive carriers to provide DSL-based services over the same telephone line that ILECs use. Creating more efficient use of the existing telephone network permits consumers to obtain innovative data services from

either an incumbent or competitive carrier. Lack of access would raise the cost for CLECs to provide advanced services to residential and small-business users, delay broad facilities-based market entry, and limit the scope and quality of competitor service offerings. Benefits to consumers include the following:

- retention of their current telephone numbers with added access to a competitive carrier's high-speed Internet service capabilities
- further investment by competitive data providers; providers are encouraged to deploy advanced services in areas not previously considered economically viable

## ILEC Duties

ILECs must endure line-sharing responsibilities, including loop conditioning and subloop implementation. Loop conditioning requires incumbent carriers to condition loops, enabling CLECs to provide acceptable forms of xDSL-based services over the high-frequency portion of the loop. ILECs are off the hook if conditioning would significantly degrade their analog voice services. According to the FCC, loop conditioning must occur to loops under 18,000 feet, and ILECs must prove to a relevant state commission that loops over 18,000 feet would suffer degradation.

Subloops require the incumbent LECs to unbundle the high-frequency portion of the loop even where ILECs' voice customers are served by digital loop carrier (DLC) facilities. While the incumbents' customers bear the brunt of the responsibility, the FCC has made assurances that line sharing does not significantly degrade analog voice service. Asymmetric digital subscriber line (ADSL) is the most widely deployed line-sharing technology that ensures that access to the high-frequency portion of the loop does not impede analog voice service.

## Solutions to Consider

CLECs and DLECs that request shared lines from incumbent carriers must share the operational expansion burden as well as reap the benefits and expedite the shared-line process. To ramp-up to wide bandwidth capacity, competitive and incumbent carriers alike should seek out broadband access solutions that deliver multiple network services, including voice, Internet, data, and video over secured DSL connections.

End-to-end data networking solution providers are ideally suited to furnish systems that support multiple DSL transmission types with high-capacity ATM switching. Systems that provide extensive quality-of-service (QoS) capabilities

will enable providers to offer multiple services with tiered pricing to both residential and commercial customers.

### 3. Unbundled Analysis

In conjunction with its shared loop ruling, the FCC conducted an unbundled analysis to assess the competitive viability of alternate considerations posed by ILECs other than line sharing. To distinguish between the two concepts, unbundling allows competitors to lease portions of the incumbent's network to provide telecommunications services. Shared lines enable competitive carriers to provide DSL-based services over the same telephone lines simultaneously used by ILECs to provide basic telephone service.

The Commission reaffirmed, per its ruling in September of 1999, that incumbents must provide unbundled access to network elements, including the following:

- **loops**—ILECs must offer unbundled access to loops, including high-capacity lines, xDSL-capable loops, dark fiber, and inside wire owned by the incumbent LEC.
- **subloops**—ILECs must offer unbundled access to subloops, or portions of the loop, at any accessible point.
- **network interface device (NID)**—ILECs must offer unbundled access to NIDs throughout their service territory. The NID is a device used to connect loop facilities to inside wiring.
- **circuit switching**—ILECs must offer unbundled access to local circuit switching, except for switching used to serve end users with four or more lines in the top 50 metropolitan statistical areas.
- **interoffice transmission facilities**—ILECs must unbundle dedicated interoffice transmission facilities, or transport, including dark fiber.
- **signaling and call-related databases**—ILECs must unbundle signaling links and signaling transfer points (STPs) in conjunction with unbundled switching and on a stand-alone basis.
- **operations support systems (OSSs)**—ILECs must unbundle OSS throughout their service territory. OSS consists of preordering, ordering, provisioning, maintenance and repair, and billing functions supported by an ILEC's databases and information.

## Line-Sharing Alternatives

The FCC considered a range of alternatives to line sharing before issuing the shared-loop ruling. Options included self-provisioning and second-line installations; however, each were dismissed and determined not to provide the same competitive functionality as sharing the existing copper wires. The compelling reasons these alternatives were not recommended by the FCC are as follows:

### Self-Provisioning Loops

The FCC found that carriers seeking to deploy voice-compatible, xDSL-based services cannot self-provision loops. This is not a viable alternative to the incumbent's unbundled loop because replicating an ILEC's vast and ubiquitous network would be prohibitively expensive and delay competitive entry.

### Second Loop

There are several reasons why purchasing or self-provisioning a second loop is not a practical, operational, or economical option. Second loops are not widely available, reducing the efficient use of existing loop plant and diminishing the scope of potential customers to whom CLECs can market xDSL-based services. This limits the competitive choices available to consumers where copper loops are not accessible.

Cost considerations rule out second loops as a viable alternative. Purchasing a second loop would be materially more costly—and less efficient—than purchasing the unbundled high-frequency portion of the loop. Finally, competitive positioning is diminished with second loop purchases. A CLEC is at a disadvantage in providing xDSL over a second line, compared to an incumbent's single-line offering. The ILEC can market its services to customers to provide quick and convenient add-ons, whereas the competitive carrier must persuade the customer to purchase a second line.

### Preferred Shared Lines

CLECs and DLECs have a financially vested interest in providing DSL services over shared lines, versus the alternatives that ILECs have previously proposed and offered. This will relieve the competitors and their customers of the costly, inefficient, and time-consuming process that often limits consumers from selecting a broadband service provider of their choice.

## 4. Incumbents versus Competitors

"We believe in competition. We believe in the ability of the market to solve problems. And we believe that competition is in the best interest of the consumer," said Deborah A. Lathen, Chief, Cable Services Bureau for the FCC.<sup>1</sup>

To that end, the FCC's ruling opened up a competitive arena for ILECs and CLECs to vie for the DSL services that residential and small-business consumers are demanding. Disgruntled incumbents can no longer prevent competitors from gaining ground in the high-speed Internet market and will lose revenue from CLEC leased lines. ILECs contend it was their investment into the existing infrastructure that should have allowed them to monopolize the market, but arguments fell on deaf ears.

### ILEC Options

Because incumbents must produce expanded networks to share the voice and data traffic with a competitive carrier, several considerations must be weighed. How can ILECs broaden their capacity cost effectively within the time frame set forth by the FCC? What are the available options in terms of technology and solution providers to manage the process? Are there methods of recapturing revenues that could potentially be lost to competitors?

### Technology Solutions

Broadband access switching platforms that support high-end voice, data, and video services can increase carriers' revenue and profitability. Ideally, incumbents and competitors must examine the offerings of single-source solution providers to implement end-to-end networks and to address profitability and cost-management requirements. Enhanced service capabilities are attainable, using solutions that combine support for multiple DSL transmission types with high-capacity asynchronous transfer mode (ATM), QoS, traffic management, and switching.

### Established Subsidiaries

The FCC ruling dictates that incumbents will lose the fees traditionally imposed on CLECs for leased lines. In addition, expenses will be incurred to expand the network, while market strongholds are expected to slip. However, numerous

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<sup>1</sup> Excerpted from a speech delivered by Deborah A. Lathen, Chief, Cable Services Bureau for the FCC, to a meeting of state legislatures

ILECs are considering how they can retain market leadership and solely benefit from infrastructure upgrades without losing ground to competitors.

One option open to incumbent carriers is to create a subsidiary CLEC that would meet the FCC's requirement of selecting a competing company in which to share the line. In essence, the ILEC could share the line with its own revenue-generating CLEC. A number of ILECs have selected this option.

To establish a subsidiary successfully, incumbents retain voice services and allocate high-speed data services to their CLEC holding companies. Because the ILEC meets the regulations set forth by the FCC, and it is the holding company for its subsidiary, the CLEC it develops is unregulated and free from a range of regulations.

## Going out of Territory

Another alternative that incumbent carriers can consider is moving out of their existing territory to gain competitive ground against CLECs and other established incumbents. For example, ILECs that serve rural communities can move into cities that are serviced by larger incumbent carriers and recruit customers from that market.

This option may not be viable for all ILECs to consider, but frequently incumbent carriers have made the decision to move out of territory and thereby gain customers and market-share in new areas. While additional revenue streams can be gained, providers must weigh the pros and cons of this scenario. Operating expenses must be optimal for profit margins to rise, including the cost and logistics of managing the new territories' telephone line infrastructure.

## 5. Shared-Loop Benefits

Line sharing translates into numerous advantages for ILECs, CLECs, and their end users. While on the surface ILECs are argumentative about having to share lines, they will benefit from network improvements. Furthermore, they can possibly generate an additional method of revenue by establishing subsidiary CLECs, share the lines with themselves, and avoid competition in their areas.

## Cost and Efficiency Savings

Competitive carriers gain substantial benefits from the shared loop mandate, including entry into the DSL services market and significantly reduced operating expenses. Monthly savings of local loop costs could range from 50 to 100 percent. Although line-sharing expenses must be shared between the ILECs and CLECs, the cost of expansion is clearly favorable to both teams.

If carriers explore broadband access systems that support multiple DSL services and rely on a solutions provider that can deliver turnkey services to expand networks, implementation pains can be reduced. Operating efficiency will increase with upgraded infrastructures that reduce floor space required in a central office (CO), allowing carriers to provision thousands of customers, offer a variety of DSL services, and lower the network ownership cost.

## Customer Benefits

FCC's shared-loop ruling benefits service providers, but the main focus is to create more options for the end-user. Consumers will realize a number of cost and efficiency savings for a range of services that use DSL technology. And now that incumbents and competitors must compete for their business, marketing programs will emerge that bundle services and offer better performance at more affordable prices—which provides more options to the consumer.

## Winning Consumer Business

Factors that drive this market are the elimination of the need for a second telephone line and the competitive atmosphere between ILECs and CLECs. Customers that require a range of services will shop and compare the expenses and service offerings that incumbents and competitors must develop to win their business.

## SOHO Rewards

DSLAM applications that leverage the high-frequency portion of the loop include high-speed Internet services, independent home offices, and SOHO corporate telecommuters. This user set, which has been tied to standard modem dial-up connections, can expect faster Internet access and competitive pricing for services. DSL services use existing telephone lines and provide continuous, 24-hour connection to the Internet without causing busy signals if users are on the Internet. DSL offers speeds ranging from 32 kbps to more than 50 Mbps and can deliver bandwidth-intensive applications such as video-on-demand and distance learning.

## 6. Broadband Access Systems

Broadband refers to high-speed Internet access and, put simply, is the difference between using a common garden hose and a high-pressure fire hose. Broadband issues are rapidly moving to the forefront of the consumer, business, and technology agendas of numerous households, businesses, service providers, and product-development companies.

## Broadband Statistics

According to the FCC, less than two million Internet users are using broadband services (i.e., less than 3 percent of all Internet users in North America). By 2004, however, it is predicted that there will be more than 25 million high-speed households in the United States. This rapid increase will drive service revenues from \$580 million to over \$7 billion in the next five years.

That is why it is critical that service providers understand the potential of broadband and the issues surrounding its development and deployment. In practical terms, this translates into download times that are up to 100 times faster than the speeds to which users are presently accustomed.

Broadband is currently being deployed in two forms: the cable modem and DSL offered by phone companies, with broadband deployment in other technologies soon to follow. The deployment of broadband has sparked a national debate over access to delivery systems, with the debate currently focused on access to the cable platform.

## Managing the Network

To accommodate the onslaught for the demand of DSL network services, service providers must consider investment into a carrier-class broadband access system that supports both multiple DSL transmission types with high-capacity ATM switching. Broadband network service providers that are significantly scaling their networks with new customers—including business and residential users of data, voice, and video services over DSL—require a comprehensive set of provisioning tools.

When the appropriate technology solutions are deployed by knowledgeable single-source solution organizations, service providers gain the ability to differentiate themselves from competitors by delivering service-level agreements (SLAs) for DSL-based services that guarantee network availability and reliability.

## Tiered Pricing

The ability to offer superior-quality DSL services allows service providers a competitive advantage with residential and small-business DSL customers and the ability to deploy tiered rate structures reflecting different service offerings. DSL service and availability is still in its early stages, but pricing in some areas has been very aggressive. Costs change overnight and differ significantly, depending on the service provider and locale.

Local tariffs and government regulations may also play a role in determining end-user cost. Generally, service providers can achieve tiered pricing and provide

maximum customer segment coverage and SLAs by deploying the appropriate solutions suite.

## Self-Test

1. The FCC mandate of November 1999 allows ILECs to continue to dominate the high-speed services market.
  - a. true
  - b. false
2. Before the FCC mandate, local-loop costs were 50 to 100 percent higher.
  - a. true
  - b. false
3. According to the FCC, who will cover networking infrastructure expenses?
  - a. ILECs
  - b. CLECs
  - c. both
  - d. neither
4. If loop conditioning significantly degrades their analog voice services, ILECs are exempt from this responsibility.
  - a. true
  - b. false
5. Which of the following is the most widely deployed line-sharing technology that ensures that access to the high-frequency portion of the loop does not impede analog voice service?
  - a. ATM
  - b. SDSL
  - c. HDSL
  - d. ADSL

6. Which of the following did the FCC recommend in September of 1999?
- a. self-provisioning loops
  - b. second-line installations
  - c. shared lines
7. DSL services require the installation of cable wiring.
- a. true
  - b. false
8. Line sharing is beneficial for which of the following?
- a. CLECs
  - b. ILECs
  - c. customers
  - d. all of the above
  - e. a and c only
9. Eventually, broadband will be deployed in which of the following forms?
- a. cable modem
  - b. DSL
  - c. wireless
  - d. satellite
  - e. all of the above
10. Tiered pricing is advantageous for service providers.
- a. true
  - b. false

# Correct Answers

1. The FCC mandate of November 1999 allows ILECs to continue to dominate the high-speed services market.

a. true

**b. false**

See Overview.

2. Before the FCC mandate, local-loop costs were 50 to 100 percent higher.

**a. true**

b. false

See Topic 1.

3. According to the FCC, who will cover networking infrastructure expenses?

a. ILECs

b. CLECs

**c. both**

d. neither

See Topic 1.

4. If loop conditioning significantly degrades their analog voice services, ILECs are exempt from this responsibility.

**a. true**

b. false

See Topic 2.

5. Which of the following is the most widely deployed line-sharing technology that ensures that access to the high-frequency portion of the loop does not impede analog voice service?

a. ATM

**b. SDSL**

c. HDSL

**d. ADSL**

See Topic 2.

6. Which of the following did the FCC recommend in September of 1999?

a. self-provisioning loops

b. second-line installations

**c. shared lines**

See Topic 3.

7. DSL services require the installation of cable wiring.

a. true

**b. false**

See Topic 5.

8. Line sharing is beneficial for which of the following?

a. CLECs

b. ILECs

c. customers

**d. all of the above**

e. a and c only

See Topic 5.

9. Eventually, broadband will be deployed in which of the following forms?

a. cable modem

b. DSL

c. wireless

d. satellite

**e. all of the above**

See Topic 6.

10. Tiered pricing is advantageous for service providers.

a. true

b. false

See Topic 6.

## Glossary

### **ADSL**

asymmetric digital subscriber line

### **ATM**

asynchronous transfer mode

### **CLEC**

competitive local exchange carrier

### **CO**

central office

### **DLC**

digital loop carrier

### **DLEC**

data local exchange carrier

### **DSL**

digital subscriber line

### **DSLAM**

digital subscriber line access multiplexer

### **FCC**

Federal Communications Commission

### **ILEC**

incumbent local exchange carrier

### **IXC**

interexchange carrier

### **QoS**

quality of service

**SLA**

service-level agreement

**SOHO**

small office home office

**VoIP**

voice-over-Internet protocol