COURT OF APPEALS
DIVISION II

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STATE OF WASHINGTON
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NO. 38347-1-II

**COURT OF APPEALS, DIVISION
OF THE STATE OF WASHINGTON**

SPRINT INTERNATIONAL COMMUNICATIONS CORP.,

Appellant,

v.

STATE OF WASHINGTON, DEPARTMENT OF REVENUE,

Respondent.

RESPONDENT'S ANSWER TO AMICUS CURIAE BRIEF OF MICROSOFT CORPORATION

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ORIGINAL

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I. INTRODUCTION

This case involves the taxation of data communication services sold by Sprint between 1989 and 1994. Amicus Microsoft claims the parties ignored key issues related to the proper classification of Sprint's data communication services. However, Microsoft largely restates arguments made by Sprint. Namely, that Sprint's service is an "internet service" under RCW 82.04.297 because it provides access to a packet-switched network. Amicus Br. at 11. As the Department pointed out in its response brief, this argument attempts to add a technological distinction to the definition of "network telephone service" that is unsupported by the statutory language and contradicts the Legislature's intent. Br. of Resp't. at 41.

Microsoft also raises two arguments that were not made by Sprint; (1) that Sprint's X.25 service qualifies as an "internet service" because it was used by internet service providers to receive dial-in connections, and (2) "network telephone service" only includes "local" telecommunication services that provide transmission to and from the site of an internet service provider. Amicus Br. at 13. Both of these arguments, however, are flawed as they ignore the statutory language and create absurd results contrary to the Legislature's intent.

If communication services used by internet service providers were classified as "internet services," as Microsoft argues, then 1-800 services purchased by ISPs would be taxable as "internet services," not "network telephone service." That result would be contrary to the Legislature's intent, as demonstrated by the provision stating "'[n]etwork telephone service' includes the provision of transmission to and from the site of an internet provider." Former RCW 82.04.065(2) (1997). Moreover, it would contradict the Legislature's intent to ratify the Department's tax treatment of internet service providers, as the legislative history shows Microsoft paid taxes on the telecommunications services it used to provide internet service.

Microsoft's argument that "network telephone service" only includes telecommunications services that provide "local" transmission to and from the site of an internet service provider is based on an unreasonable reading of the statute. The statutory provision at issue expressly includes more than "local telephone networks." In fact, it covers exactly the same telecommunications networks as the definition of "network telephone service" itself.[1] Read as a whole, the only reasonable

[1] 'Network telephone service' means ... providing ... data ... transmission for hire via a local telephone network, toll line or channel, cable, microwave, or similar communication or transmission system ... 'Network telephone service' includes the provision of transmission to and from the site of an internet provider via a local

interpretation of former RCW 82.04.065(2) (1997) is that local and interstate transmission services used to transmit signals to and from the site of an internet service provider fall within the definition of "network telephone service."

Overall, Microsoft's arguments are based on strained and unlikely readings of the statute and should be rejected. When the statute is read as a whole, it is plain that Sprint's X.25 service, which provided data transmission between corporate offices as well as transmission to and from the site of information and internet service providers, falls within the definition of "network telephone service."

II. ARGUMENT

Microsoft's arguments rest on the assumption that the definition of "network telephone service" is limited to regular telephone service. Amicus Br. at 9. However, this is incorrect. The term

> providing of telephonic, video, data, or similar communication or transmission for hire, via a local telephone network, toll line or channel, cable, microwave, or similar communication or transmission system.

(former RCW 82.04.065(2) (1983)), clearly captures more than just local and long distance telephone service.

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telephone network, toll line or channel, cable, microwave, or similar communication or transmission system." Former RCW 82.04.065(2) (1997) (emphasis added).

On its face, the definition of "network telephone service" captures all telecommunications services. This broad language was necessary to implement the Legislature's intent in 1981 to tax the services provided by regulated and unregulated telecommunications companies similarly. Laws of 1981, ch. 144, § 1. In 1981 and today, telecommunications technologies and services are changing rapidly and a broad technologically neutral definition was and is necessary to tax telecommunications services fairly and appropriately. Given such a broad definition, the term "network telephone service" is defined more by what it does not include than by what it does include.

Both the Legislature and the Department have used functional, rather than technical, distinctions to determine what is and is not "network telephone service." By using the term "for hire" and expressly excluding cable television and radio and television broadcast service, the statutory language shows the Legislature intended to exclude content providers from the definition of "network telephone service." This is a functional distinction as telecommunications companies provide a way to transmit information from point A to point B, while content providers provide people with access to information. It does not matter what technology is used to transmit the information, or what type of information (voice, video or data) is being transmitted. The key distinction is the primary function

of the service; does it primarily provide customers with a way to transmit information, or does it primarily provide them with the information itself.

It is important to remember that the 1997 and 2007 amendments to RCW 82.04.065 were merely clarifications and technical changes. They were not intended to change the scope of the "network telephone service" definition. Thus, the distinctions made in these later versions of the statute must also be found in the language of 1983 statute that is at issue in this case. When all of the versions are considered together, the only reasonable interpretation of the statute is that services that primarily provide a medium of communication or transmission fall within the definition of "network telephone service," while services that primarily provide customers with information are considered information or "internet services."

A. Merely Providing Access To A Packet-Switched Network Does Not Exclude A Service From The Term "Network Telephone Service" Because It Would Insert An Arbitrary Technological Distinction Into The Statute That Contradicts The Legislative Intent.

Microsoft's first argument is that providing access to a packet-switched network alone qualifies as "internet service." Amicus Br. at 8. Yet, this argument seeks to add an arbitrary technological distinction to the definition of "network telephone service" that is not supported by the

statutory language, and is contrary to the legislative intent to treat similar telecommunications services similarly.

Courts will not insert words into a statute where language is clear and unambiguous. Plouffe v. Rook, 135 Wn. App. 628, 633, 147 P.3d 596 (2006). The statute does not exclude packet-switched networks from the definition of "network telephone service," nor is such an exclusion reasonably implied. Further, when interpreting statutes, courts should give effect to legislative intent and should interpret the language to avoid absurd results. Johanson v. Dep't of Social and Health Services, 91 Wn. App. 737, 749, 959 P.2d 1166 (1998). As discussed above, the relevant distinction is whether the service primarily provides a medium of transmission or a method of acquiring new or processed information.

Using this distinction, a service that merely provides access to a packet-switched network and does not give users access to information, such as SprintNet, falls within the definition of "network telephone service." Like all telecommunications networks, packet-switched networks send signals over channels or circuits connecting two physical locations. CP 314, 320. Thus, packet-switched networks fall within the definition of "network telephone service" because they provide "telephonic, video, data, or similar communication or transmission for hire via a … channel … or similar communication or transmission system."

Former RCW 82.04.065(2) (1983). Furthermore, in modern telephone networks, packet switching technologies such as asynchronous transfer mode (ATM) are being used to transport all types of information, including voice signals from regular telephones, across telephone companies' networks.[2] Annabel Z. Dodd, The Essential Guide to Telecommunications, 207-208 (2nd ed. 1995), Appendix A.

Adopting Microsoft's position would mean that a telecommunications carrier providing telephone service using a packet-switched network would not be subject to retail sales tax, while a carrier using an older circuit-switched network would be. Nothing in the statutory language supports this result. Furthermore, it would directly contradict the Legislature's intent to create a broad definition that treats similar telecommunications services the same. Laws of 1981, ch. 144, § 1. The Legislature reinforced this principle when it adopted the Streamline Sales Tax Agreement telecommunications definitions in 2007. Laws of 2007, ch 6. In that act, the definition of "telecommunications service" expressly includes VoIP services, which use packet-switched IP networks to transmit the call.[3] RCW 82.04.065(8). Thus, providing

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[2] With the emergence of voice over internet protocol ("VoIP") service, the signal is sent to and received from the telephone network as a digital packet. CP 1321-22.

[3] It is important to note that just because a network uses an IP protocol does not mean that is it part of the Internet. In fact, Sprint operates an IP network that does not connect to the Internet. CP 1319 (Brennan at 38:22-24).

access to a packet-switched network alone cannot exclude a service from the definition of "network telephone service."

1. VoIP services that provide transmission over a packet-switched network fall within the definition of "network telephone services" even if they do not provide access to the public switched telephone network.

Microsoft incorrectly asserts that VoIP services only fall within the definition of "network telephone service" if they allow subscribers to call persons on the public switched telephone network. Amicus Br. at 11. Microsoft misinterprets a white paper on telecommunications tax policy distributed by the Department as part of a conference on technological developments and their impact on telecommunications tax policy. The white paper provided a general overview of tax policy, but it was not a detailed or official statement of the Department's positions, such as an excise tax advisory. The statement in the white paper that VoIP services are considered to be "network telephone services" if they provide access to the public switched telephone network ("PSTN"), while computer-to-computer VoIP services are not, is a generalization that Microsoft misconstrues.

Computer-to-computer VoIP services are generally software applications, such as Skype, that run over an Internet connection users purchase from another company. In this situation, the VoIP service is only

turning the conversation into IP packets that are sent using the user's existing Internet connection similar to the way an Internet browser application sends and receives IP packets. The computer-to-computer VoIP application is not providing the data transmission. See CP 1321 (Brennan at 49:3-13) (describing how Sprint provides the IP network to transport the VoIP packets generated by Sprint's customers). Since the VoIP application is not providing the transmission, it is not a "telecommunications service" or "network telephone service."

On the other hand, VoIP services that connect to the PSTN provide some or all of the transmission themselves. Thus, they fall within the definition of a "telecommunications service" or "network telephone service." The distinguishing factor is the provision of data transmission, not a connection to the PSTN. As such, a VoIP service provided over the VoIP provider's own IP network would still fall within the definition of "network telephone service," even if it did not connect with the PSTN, because the company would be providing data transmission for hire over a telecommunications network.

2. An "internet service" provides access to information, not just a telecommunications network.

Microsoft also asserts that "internet service" merely means providing access to the internet or a proprietary subscriber network.

Amicus Br. at 8. However, "internet service" is not defined in terms of providing access to a telecommunications network. It is defined in terms of providing access to information. See RCW 82.04.297 ("'Internet service' means a service that ... provides the user with additional or restructured information, or permits the user to interact with stored information through the internet or a proprietary subscriber network."; "'Internet service' includes ...access to the internet for information retrieval, and hosting of information for retrieval over the internet") (emphasis added). The fact that the Legislature chose to include "internet service" as an "information services" in former RCW 82.04.055(1)(c) (1993) also shows that it thought of "internet service" as a service that provided access to information. Thus, the critical component of "internet service" is providing access to information, not a telecommunications network.

Microsoft claims the Legislature recognized that "internet services" were inherently communications activities. Amicus Br. at 10. However, Microsoft provides no authority for this proposition. Moreover, as discussed above, the statutory language shows that the Legislature considered "internet service" an information service and not a communications service. See, infra at 10. Microsoft goes on to assert, Sprint's X.25 service like e-mail, is inherently a data transmission activity

that falls within the definition of "network telephone service," but was exempted by the 1997 Act. Amicus Br. at 10. Again, Microsoft is incorrect. This claim contradicts the express legislative intent and is unsupported by the facts.

The 1997 Act states:

> The legislature further finds that there is no clear statutory guidance as to how internet services should be classified for tax purposes and intends to ratify the state's current treatment of such services.

Laws of 1997, ch. 304, § 1. If, as Microsoft claims, "internet service" was inherently a data transmission activity that fell within the definition of "network telephone service," then there would be no ambiguity to resolve. Accordingly, the 1997 amendments would create a substantive change in the scope of the statute rather than the clarification the Legislature intended. Given the statutory language, the only reasonable interpretation is that the Legislature considered "internet services" to be information services that did not fall within the existing definition of "network telephone service."

Furthermore, an amendment that substantively changes a statute will not be applied retroactively unless the Legislature expressly states that the change should be retroactive. See In re Personal Restraint of Stewart, 115 Wn. App. 319, 340, 75 P.3d 521 (2003). Thus, if the 1997 Act did

change the scope of the "network telephone service" definition, that change would be inapplicable to this case as it was made after the time period at issue.

3. "Internet electronic mail" is inherently an information service that primarily provides data processing and information storage, not data transmission.

As a factual matter, Microsoft provides no evidence that "internet electronic mail" is inherently a data transmission service. From the facts in the record, it appears that e-mail is primarily a data-processing and information storage service, rather than a transmission service. See CP 1330 (SprintMail, a forerunner to e-mail, was an application customers connected to on a Prime computer). Like computer-to-computer VoIP, e-mail is an application or information service that runs over a separate data communications service. CP 1328 (Brennan at 75:8-9) (X.25 was medium over which SprintMail was transmitted). Also, if a person uses Gmail as their e-mail provider, they are using an Internet connection from another company to access servers run by Google that store and process the e-mails. Thus, the primary aspect of Internet e-mail service is data storage and processing, not a medium of transmission. Accordingly, e-mail falls squarely within the definition of an information service under the functional test, further illustrating that "internet service" is primarily an information service, not a transmission service.

4. Sprint's X.25 service was a "network telephone service" because it primarily provided a medium of transmission and did not give users access to information.

Microsoft also seems to claim that Sprint's X.25 service provides users with additional or restructured information or permits users to interact with stored information through the internet or a proprietary subscriber network. Amicus Br. at 8. However, this is incorrect. Sprint's X.25 service did not give users access to information. CP 1243 (Elliot at 9-14); CP 1313-14 (Brennan at 17:25 – 18:6); CP 316 (Stip. Fact ¶ 38). Nor did Sprint's X.25 service give customers access to the internet or a proprietary subscriber network. Rather, customers used the X.25 service primarily to transport their own data between different office locations. CP 319 (Stip. Fact ¶ 50); CP 1264 (Elliot at 196:25-197:9); CP 1313 (Brennan at 15:9 – 16:2).

In the case of information service providers such as MSN and AOL, these companies purchased X.25 service from Sprint to provide their own customers access to the information on MSN's and AOL's proprietary subscriber networks. See CP1242, 1248-49 (online service providers, such as MSN and AOL, purchased X.25 to give customers access to their proprietary subscriber networks); H.B. Rep. on Substitute SB 5763, 55th Leg., 1997 Reg. Sess. (Wash. 1997) at 2 (online service providers provide access to proprietary subscriber networks). As such,

AOL and MSN were not purchasing a service to interact with stored information on a proprietary subscriber network, but rather using Sprint's X.25 service to create their own proprietary subscriber networks.

Furthermore, the FCC has found X.25 services "involve neither processing that creates, deletes or changes information itself, nor subscriber interaction with stored information." Protocol Waiver Order, 100 F.C.C. 2d 1057 ¶ 101 (1985), CP 369. Therefore, Sprint's X.25 service does not qualify as an "internet service" because it does not "provide[] the user with additional or restructured information...or permit[] the user to interact with stored information through the internet or a proprietary subscriber network." RCW 82.04.297(3).

B. Sprint's X.25 Service Falls Within The Definition Of "Network Telephone Service" Because It Provided Transmission To And From The Site Of Internet Service Providers.

Microsoft also makes two new arguments that were not made by Sprint. Microsoft's first unique argument is that Sprint's X.25 service is an "internet service" because "internet service providers and proprietary subscriber networks used Sprint's X.25 network to accept calls from dial-in customers." Amicus Br. at 12. Microsoft contends this constitutes "reception of the dial-in connection" by the ISP or proprietary subscriber network and is itself an "internet service." Id. This argument ignores the express statement that "network telephone service" includes "transmission

to and from the site of an internet provider." Former RCW 82.04.065(2) (1997). If services used by internet service providers to transmit signals to and from their customers are considered "internet services," then this provision would be meaningless. It would also mean that 1-800 services purchased by ISPs to receive dial-in connections from their customers would be exempt as well. This result would clearly be contrary to the language of the statute and the Legislature's intent to ratify the Department's tax treatment of internet service providers. Laws of 1997, ch. 304, § 1.

Reading the statute as a whole, the term "including reception of dial-in connection" is aimed at preventing the sale of "internet service" from being broken up into a data transmission component and an information service component. In Community Telecable, the Washington State Supreme Court relied on this provision to reject the City of Seattle's argument that the transmission component of Comcast's cable internet service could be separated out and taxed as "network telephone service." Community Telecable of Seattle v. City of Seattle, 164 Wn.2d 35, 43-44, 186 P.3d 1032 (2008). The Court stated that "the transmission component of cable Internet services cannot be taxed separately from those very services." Id. at 45. Thus, Seattle could not breakout $30 from

Comcast's $45 charge to its customer for Internet service and tax the $30 as "network telephone service."

Community Telecable did not address the situation described in Excise Tax Advisory (ETA) 2029.04.245, where an ISP purchases telecommunications services from another company to provide "internet service." See CP 348 (ETA 2029.04.245). In fact, the Court expressly distinguished the situation described in the ETA from the one at issue in that case. Community Telecable, 164 Wn.2d at 44 n.2. By distinguishing the situation in the ETA, the Court seems to have acknowledged that sales of "network telephone service" are not exempt merely because they are sold to an internet service provider.

In addition to the statutory language, the legislative history shows that the Legislature intended telecommunications services purchased by ISPs to fall within the definition of "network telephone services." In the Senate Energy & Utilities Committee hearing on the 1997 Act, the State Local and Government Affairs Manager for Microsoft, Bill Murphy, testified that the underlying transmission services purchased by Microsoft were already taxed.[4] Since the Legislature did not intend to change the

[4] "While telecommunication services – telecommunications like services may be a component of internet online services, it is a very small part. Secondly, a very important piece – the underlying transmission services provided by telecommunication companies are already taxed at the state and local level. Our customers pay taxes on the local phone lines they use to access our service and we pay taxes on the capacity we lease

scope of the "network telephone service" definition, Mr. Murphy's testimony shows that the Legislature intended to continue to tax the telecommunications services ISPs purchased to connect to their customers, such as Sprint's X.25 service. Accordingly, Sprint's X.25 service falls within the definition of "network telephone service."

C. "Network Telephone Service" Is Not Limited To "Local" Telecommunications Services That Provide Transmission To And From The Site Of An Internet Provider Because The Statute Expressly Includes All Telecommunications Networks.

Microsoft's other unique argument is that only "local" services that provide transmission to and from the site of ISPs are included in the definition of "network telephone service." Amicus Br. at 13. This argument rests on a selective reading of the statute and ignores most of the statutory language. In its brief, Microsoft only quotes a small portion of the applicable provision. Microsoft states "'[n]etwork telephone service' includes the provision of transmission to and from the site of an internet provider via a local telephone network..." Amicus Br. at 12 (emphasis in original). However, the full provision reads:

> "Network telephone service" includes the provision of transmission to and from the site of an internet provider via a local telephone network, toll line or channel, cable, microwave, or similar communication or transmission system.

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or purchase from the carriers." Senate Energy & Utilities Committee Hearing, Feb. 17, 1997, TVW.org audio file at 1:06:15 to 1:06:45 (emphasis added).

Former RCW 82.04.065 (1997) (emphasis added). The entire provision shows that the Legislature intended to include transmission over all telecommunications networks, not just "local telephone networks."

Furthermore, the listed networks are the same networks described in the definition of "network telephone service" itself.

> (2) "Network telephone service" means... the providing of telephonic, video, data, or similar communication or transmission for hire, via a local telephone network, toll line or channel, cable, microwave, or similar communication or transmission system.

Former RCW 82.04.065 (1997)(emphasis added). Since the definition of "network telephone service" includes interstate services, the term "local" cannot reasonably be read to modify the other networks. See RCW 82.04.065 (1997) ("'Network telephone service' includes interstate service..."). Accordingly, it is not reasonable to read the provision regarding transmission to and from the site of an ISP as limited to local transmission services.[5] Thus, Microsoft's argument that Sprint's X.25 service is not a "network telephone service" because it is not a "local" service contradicts the plain language of the statute and should be rejected.

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[5] Additionally, in 2002 the Legislature removed the term "local" and the provision stating that "network telephone service" includes interstate service as part of adopting the federal Mobile Telecommunications Sourcing Act ("MTSA"), Pub. L. No. 106-252, 114 Stat. 626 (2000), which dealt with sourcing charges for mobile telecommunications services. Laws of 2002, ch. 67, § 1. As the main point of the 2002 Act was to adopt the MTSA, deleting the term "local" merely cleaned up the language and did not create a substantive change. As such, Microsoft's reliance on the term "local" is misplaced.

D. The Court Should Render Its Opinion Without Reference To "Internet Gateway" Services Because These Services Are Not At Issue In This Case, Nor Is There A Factual Record To Determine Whether Or Not They Fall Within The Definition Of "Network Telephone Service."

Microsoft also argues that "Internet Gateway" services provided by Sprint in later periods are exempt as "internet services." Amicus Br. at 15. However, these services are not at issue in this case, nor is there a factual record to determine what "Internet Gateway" services provided customers. Accordingly, there is no basis for the Court to conclude that "Internet Gateway" services are or are not taxable. Nor is there a basis to distinguish or analogize them to the X.25 services at issue. Therefore, the Court should render its opinion without reference to "Internet Gateway" services.

III. CONCLUSION

Sprint's X.25 service does not fall within the definition of "internet services" because it provides a medium of transmission, not access to information. Microsoft's arguments to the contrary are unpersuasive because they rely on selective and strained readings of the statutory languages and create results that are clearly contrary to the legislative intent. As such, they should be rejected, and the Court should affirm the trial court's order granting summary judgment to the Department.

RESPECTFULLY SUBMITTED this 17th day of July, 2009.

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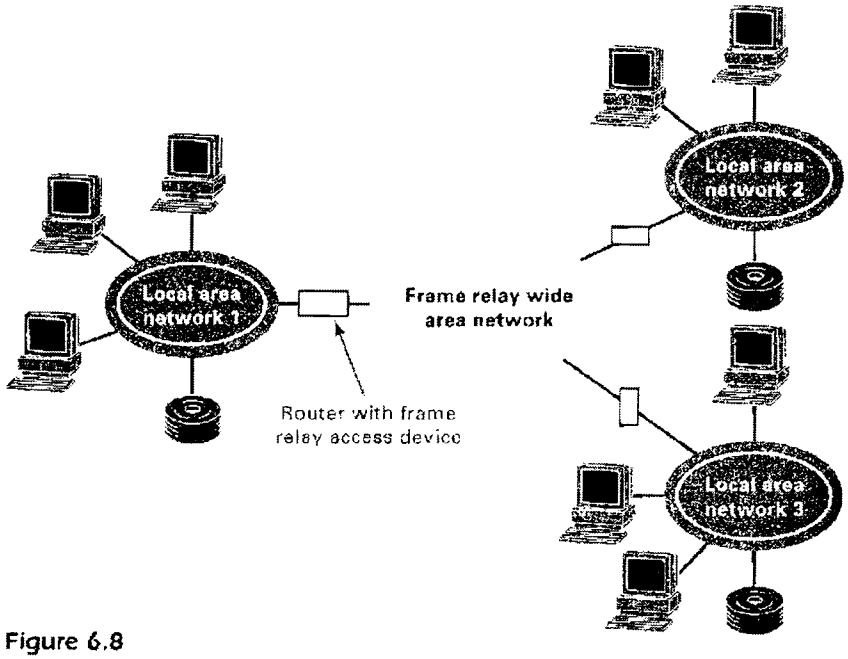

Figure 6.8
A local area network connection to frame relay.

Frame Relay Pricing—Ports, Circuits and Committed Information Rate

Frame relay pricing is a fixed monthly fee based on the following three elements, plus the cost of the telephone line used to connect each site to the frame relay service. The three elements are the type of circuit (switched or permanent), the port and the committed information rate.

1. ***The PVC (permanent virtual circuit)*** is a logical predefined path or link through a carrier's network. For example, if San Francisco and Tucson sites need to exchange data, the carrier defines a permanent virtual circuit between these two locations. PVCs are charged for at a fixed monthly fee.
2. ***The SVC (switched virtual circuit):*** Unlike PVCs, SVC charges are based on usage. Temporary connections are setup between points on a frame relay network. SVCs can be used to carry voice traffic if volumes are low. Thus users only pay for what they use instead of incurring fixed monthly fees associated with permanent virtual circuits.

3. ***The frame relay port*** is the entry point, on a frame relay provider's switch, to the frame relay network. Multiple permanent virtual circuits can use one port. Ports are available in variable speeds such as T-1, 56 KBPS, 256 KBPS and 512 KBPS.
4. ***The CIR (committed information rate)*** is the minimum guaranteed number of BPS throughput, typically half the capacity of the port the customer is guaranteed to be able to send from each site. Some customers save money by using zero committed information rate. Customers can "burst," send data at the maximum speed of their frame relay port, where the port speed is higher than the committed information rate. If the port is a 56-KBPS-speed port, the location cannot send data through that port at higher than 56 KBPS speeds.

Potential Congestion on Frame Relay

Frame relay is a popular and growing network service. It is used frequently when organizations add new applications or build new networks. It saves them from the tasks of leasing individual private lines, purchasing multiplexing equipment, and designing and maintaining the network. Frame relay is a value-added, shared network. Customers rely on carriers not to oversell capacity. Once end-users have the service, they depend on their carrier's managing capacity, using the best telecommunications switches and providing them with reports on the success of their transmissions. If the carrier's network is oversubscribed, the carrier may drop frames. Organizations with mission-critical data communications or high levels of security requirements often hire the staff and spend the money to manage their own private networks.

ATM—ASYNCHRONOUS TRANSFER MODE . . . . . .

ATM, or asynchronous transfer mode, is a high-speed (up to 2.5 gigabits) switching service capable of carrying voice, data, video and multimedia images. It is *not* the automatic teller machine (ATM) service used in banking. ATM, asynchronous transfer mode, is used mainly in network service provider networks. However, large users are beginning to use ATM as a way to send large files between sites. For example, the entertainment industry uses it to ship film clips to other locations for editing. The key advantage of ATM is that it enables providers and end-users to carry multiple types of traffic without building separate networks for voice, video and data communications.

It is a higher-cost, higher-speed, and more flexible service than frame relay for end-users to implement. Where frame relay excels at LAN-to-LAN communications, ATM can carry multiple types of traffic over a single connection.

The distinguishing point about asynchronous transfer mode (ATM) is that it can prioritize traffic. It can give different types of traffic different qualities of service. This is known as QoS and is reviewed in ATM elements below. ATM carries parallel streams of traffic at different levels of service quality.

Asynchronous transfer mode (ATM) is used by:

- long distance providers
- bell telephone companies
- competitive local exchange carriers
- cellular providers
- cable TV networks
- frame relay networks
- Internet service providers
- Virtual Private Network providers
- large financial companies
- fortune 500 companies
- universities
- large hospitals

ATM's speed is due to three characteristics:

1. The cells are fixed in size.
2. The cells are switched in hardware in a connection-oriented manner.
3. Switching is performed asynchronously.

Fixed-Sized Cells—Less Processing

Asynchronous transfer mode (ATM) packages the data it switches into discrete groups called cells. This is analogous to putting the same number of letters into each envelope. These envelopes are called fixed-sized cells. Handling fixed-sized cells requires less processing than switching with variable-sized packets. The ATM switch does not have to look for bits telling it when the cell is over. Each cell is a standard 53 bytes long. The switch knows when the cell ends.

Five of the 53 bytes are header information. This includes bits that identify the type of information contained in the cell (e.g., voice, data or video) so that the cell can be prioritized. Voice and video, which need constant transmission (bit rate) so that there is no interruption in the voice or picture, need higher qualities of service than LAN data. Other header information is used for routing, putting the cells in the correct sequence and error checking. The remaining 48 bytes are the "payload"—user data such as voice, video or sales proposals.

Switching in Hardware—Less Address Look-up

A significant reason why ATM is fast is that the cells are switched in the hardware. This means that an ATM switch does not have to look up each cell's address in software. Rather, an ATM switch sets up a route through the network when it sees the first cell of a transmission. It puts this information into its hardware and sends each cell with the same header routing information down the virtual path previously established. For example, all cells with XXX in the header use route 234. Using the same path for each cell makes ATM a connection-oriented service.

Asynchronous Switching—Improving Network Utilization

With asynchronous switching, every bit of the network capacity is available for every cell. This is different than synchronous multiplexing technologies such as T-1 and T-3. With T-3 multiplexing, every one of the 672 input transmissions is assigned a time slot. For example, terminal A may be assigned time slot 1 and terminal B assigned time slot 2. If terminal A has nothing to send, the time slot is sent through the network empty. ATM has no synchronous requirements. It statistically multiplexes cells onto the network path based on quality of service information in the header. For example, voice and video need better service, fewer delays and higher aggregate speeds than e-mail messages. With ATM, this is accomplished without wasting network capacity.

Scalability—The Ability to Use ATM for Both High- and Low-Speed Applications

ATM can carry traffic of various speeds. It accepts streams from different inputs (e.g., telephone systems, routers and video devices) and sends them across paths, or virtual circuits established by the ATM switch. This is scalability. ATM can be scaled from low-speed (56 kilobit) to high-speed video and multimedia applications. Currently, ATM is installed mainly in carrier networks. As the technology matures, it is envisioned that more large corporations will use ATM as a way to carry both their voice and data traffic over wide area networks.

ATM—Edge and Core Devices

ATM switches are common in frame relay carrier networks for switching multiple customers' traffic at 622 megabits over their core or backbone facilities. ATM ports are also used by customers who want higher than T-3 access to a service provider's network. This enables customers to access virtual private network services at high speeds.

They receive many of the benefits of a private network, without having to manage a network.

Frame relay vendors use frame relay devices to connect directly to their customers at the edge of the network. The edge of the network is the point where traffic enters and leaves the network. The edge of the network where traffic exits the network is known as the egress point. Most carriers now deploy multi-platform switches with both frame relay and ATM ports.

Elements of an ATM Network

The ITU has defined the elements of an ATM network. The elements are:

- User Network Interface
- Quality of service
- Connections between customer locations

These elements are important as they create a common way to prioritize traffic, send traffic between sites and create connections to ATM networks. The multiple definitions for quality of service are important because ATM is used to switch many types of traffic. Voice and video traffic are less tolerant of delay than e-mail, for example, and can be carried at a different quality of service.

The majority of ATM switches are located in carrier networks. For example, they are used in certain cellular networks to switch calls between antennas in different cells. However, customers can lease ATM services from network service providers. ATM is more suitable than frame relay for mixed media communications such as voice, video and data.

UNI—User Network Interface, The Physical Connection to the ATM network

The UNI, or user network interface, is the dedicated digital telephone line connection between the customer and the ATM equipment. The dedicated connection to ATM can be implemented at various speeds including:

- T-1
- T-3
- Fractional T-3
- OC1 (52 megabits)
- OC3 (155 megabits)
- OC12 (622 megabits) and above

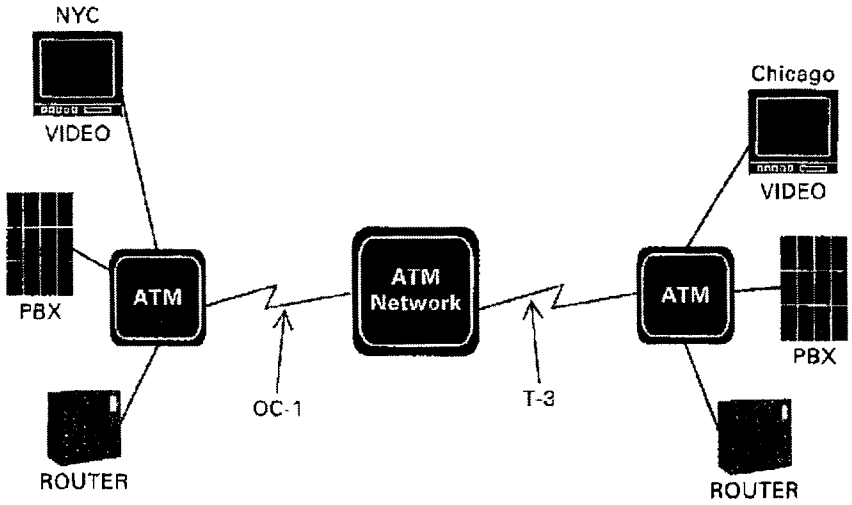

Figure 6.9
One set of ATM services for both voice and data.

ATM service is known as native ATM when customers contract with public network service providers for ATM service. In native ATM where customers lease ATM connections from network service providers, each ATM access line is connected to the carrier's network via the UNI physical telephone line. Each site does not need a connection to every other site in the organization. Figure 6.9 shows ATM over a public ATM network.

Some large organizations use native ATM for connections over their own private dedicated lines to other corporate sites. For example, they might use these lines to send voice calls, video conferences, e-mail and LAN-to-LAN communications. Just as carriers use ATM to eliminate separate voice and data networks, large organizations use ATM to obviate the need for separate voice and data private lines (see Figure 6.10). Organizations can use public carrier ATM offerings or they can use ATM over their own private lines.

Quality of Service Categories—For Different Applications

Quality of service (also known as QoS) parameters include availability, information transfer accuracy, priority and delay. These parameters assume that there may be a scarcity of available bandwidth. If there is a scarcity, customers and carriers have the option of deciding which traffic should be given priority and paying for the priority

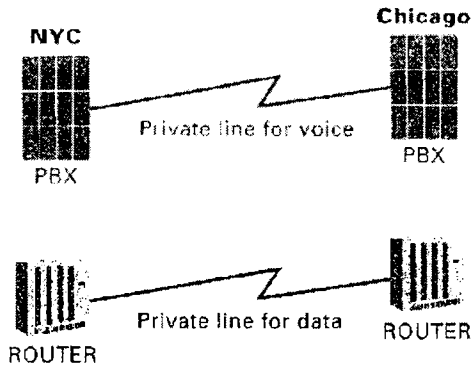

Figure 6.10
Separate networks for voice and data.

service. If a customer wants fewer delays on video and voice communications, they have the option of selecting a quality of service such as constant bit rate on which fewer delays are present. Level of service information is communicated to the network in the ATM cell's 5-byte header.

When customers lease native ATM services from carriers, they pay more for higher levels of services such as constant bit rate and real-time variable bit rate (see below). Customers that lease native ATM services select classes of service depending on their requirements. This enables them to pay for only what they need and use. Enterprises that use only data need not pay for higher quality services suited for real-time voice.

In addition to the following services, standards bodies are working on the development of service specifications for IP traffic carried on ATM high-speed backbones. It is currently not clear whether future high-speed IP networks will use new router and switches called terabit routers or ATM switches. (See Chapter 1 for a discussion of terabit routers and Chapter 9 for a discussion of converged IP networks.)

Constant Bit Rate provides the highest priority and lowest delay through a network. It assumes a continuously available bandwidth with predictable performance during the transmission. Typical applications include videoconferencing, voice, television and video-on-demand.

Real-Time Variable Bit Rate applications are assumed to be able to tolerate small variations in the rate of transmission and small losses of cells. Applications include compressed voice and some types of interactive video.

Non-Real Time Variable Bit Rate applications are bursty, not constant in nature. LAN-to-LAN communications fit into this category. More delay and variation on speeds can be tolerated than in real-time variable bit rate applications. Internet service providers use this service for carrying Internet traffic.

Available Bit Rate services are intended for applications that can adjust their requirements according to the speed of the available network resources. These applications can tolerate variations in speed and delay. Applications include routers equipped with TCP/IP and frame relay. Paging is also an application for Available Bit Rate service. Available Bit Rate services are not widely available on native ATM directly from carriers.

Unspecified Bit Rate services are for non-time-sensitive applications such as file transfer, telecommuting and message and image retrieval. They take advantage of unused bandwidth and are lower in cost.

Cell Rate Transfers—ATM Speeds

Speeds on ATM services are thought of in terms of cell rate transfer. Cells are sent through the network at specific rates in increments of 64 kilobits. For Constant Bit Rate and Variable Bit Rate quality of services, the following cell rate transfer parameters are specified:

- Peak Cell Rate: The highest speed cells will be transmitted at in increments of 64 kilobits.
  - For Constant Bit Rate service the peak cell rate is sustained throughout the service.
  - For Variable Bit Rate service, the Peak is the highest rate for an instantaneous "burst" of speed.
- Sustained Cell Rate: For variable bit rates, the sustained Cell Rate is defined in the length of time the Peak Cell Rate is sustained.

Connections Between Customer Locations: Permanent Virtual Connections (PVCs)

Each connection between ATM sites supports multiple, parallel communications. For example, a videoconference can be taking place on the same line that large files are being downloaded between the same sites. Thus, even though there is only one physical connection, multiple communications are taking place in parallel. Each of these transmissions is routed over predefined paths. Predefined paths between network locations are called PVCs or Permanent Virtual Connections.

The two types of permanent virtual connections are:

- Virtual Channel Connection (VCC)
- Virtual Path Connection (VPC)

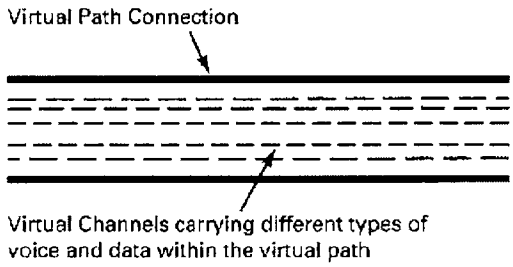

Figure 6.11
An ATM virtual path connection carrying virtual channels

A *virtual channel connection* is a single path that is set when the service is put in place. Each virtual channel connection is identified in the cell's header with Virtual Path Identifier (VPI) bits.

A *virtual path connection* has many virtual channels running within it between two locations. This is analogous to a pipe with many wires inside it. A virtual path identifier (VPI) and a virtual channel identifier (VCI) located in cells' headers identify each Virtual Channel Connection.

Each virtual channel within a virtual path can be assigned a different quality of service. The voice channels might have Constant Bit Rate service and the channels used for LAN connections might have Non-Real Time Variable Bit Rate service. Figure 6.11 illustrates the way ATM is used to carry communications at multiple qualities of service.

Communicating Between ATM and Frame Relay Services—Frame Relay ATM Interworking

Some organizations have a mix of frame relay and ATM equipped sites that communicate with each other. If an organization has many sites that send data to a central site, they might have frame relay connections at their smaller branch office sites. The central site, which has the highest traffic because it communicates with all other sites, may have an ATM connection. For example, the central site might have a T-3 ATM User Network Interface access line and the branch offices may have T-1 and 56-kilobit frame relay access lines. This functionality is called Frame Relay ATM Interworking.

Frame Relay ATM Interworking is possible on carriers' multiplatform switches. Manufacturers such Ascend Communications (now part of Lucent Technologies), Cisco Systems, Newbridge Networks and Nortel Networks make switches that can accommodate cards for both frame relay packets and ATM cells. The carrier's switch internally modifies the frames and cells for the interworking between frame relay and ATM equipped sites.

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COURT OF APPEALS, DIVISION II
OF THE STATE OF WASHINGTON

SPRINT INTERNATIONAL COMMUNICATION INC., Appellant, v. STATE OF WASHINGTON, DEPARTMENT OF REVENUE, Respondent.	DECLARATION OF MAILING

Candy Zilinskas, states and declares as follows:

I am a citizen of the United States of America and over 18 years of age and I am competent to testify to the matters set forth herein. On July 17, 2009, I provided a true and correct copy of Respondent's Answer to Amicus Curiae Brief of Microsoft Corporation and this Declaration of Mailing to be sent electronically via email and by U.S. Mail, postage prepaid through Consolidated Mail Service, to:

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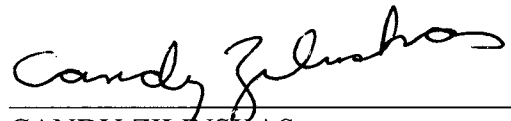
I certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Executed this 17th day of July, 2009, in Tumwater, Washington.



CANDY ZILINSKAS
Legal Assistant