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## IV. Different Price Structures by Type of Company, cont.

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There is wide array of collocation connections and how they are paid for. **Figure 8B** shows collocation price structures when the Other Carrier is a CAP/ALT, another LEC, a wireless company, or a cable TV company. In this case, the Other Carrier pays the LEC directly. The Other Carrier pays for switch investment by paying a per minute of use charge for switching to terminate a local call and by paying a monthly flat rate per line side port. The Other Carrier also pays for routing traffic through the switch by paying a monthly flat rate for rental space.

One example of this price structure is when a LEC connects to an ILEC (**Figure 2**). The companies may use contracts to set the per minute prices for carrying each other's local and/or toll traffic. These contracts may use the different pricing methods listed in **Figure 8B**, depending on what the companies agree to and, in some cases, on regulatory approval. The negotiated options include compensation for actual traffic passing through the switch, bill and keep, and other methods.

**Figure 8C** shows collocation price structures when the Other Carrier is an IXC. Here the IXC directly pays the LEC two of the same charges paid in **Figure 8B**: a monthly flat rate for rental space for routing traffic through the switch and a monthly flat rate per line side port for switch investment. Instead of the per minute of use charge in **Figure 8B**, the IXC also pays for originating and terminating a call by paying three additional price elements listed in **Figure 6B** (long distance company access tariffs): a per minute of use charge for the local switch, the CCLC, and the RIC. Set by federal and state tariffs, these prices are for the routing of calls through the LEC.

**Figure 8D** shows the collocation price structures when a middleman is involved. The "Third Carrier," typically a new entrant, connects to the middleman's central office building and pays a fee for this. When the Third Carrier is a wireless company, another LEC, or a cable TV company, this carrier also pays the LEC directly a per minute of use charge for switching to terminate a local call. Some of these Third Carriers also pay when they receive a call. When the Third Carrier is an IXC, the IXC directly pays the LEC the three additional price elements from **Figure 6B**: a per minute of use charge for the local switch, the CCLC, and the RIC.

There are more pricing flexibilities for collocation arrangements (**Figure 8**) than for access arrangements (**Figure 6**). Also note that at the time of the 1996 Act, collocation connections themselves were optional.

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## IV. Different Price Structures by Type of Company, cont.

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### Meet Point Price Structures

**Figure 9A** shows the network configuration and price structures for meet point billing between two companies. Here, the LEC and the Other Carrier connect at a mutually agreed upon location on the trunk between their two switches. In this case, there is generally a per minute of use charge for switching to terminate a local call, or in some cases, a flat rate. Typically, small telephone companies use meet point connections. More recently, the CAPs/ALTs have used meet point connections.

Sometimes an IXC will use meet point connections to gain access to customers served by a small telephone company by using a large LEC's tandem switch and transport network. Since this paper covers only the LEC local switch, **Figure 9B** excludes these price structures. However, the IXCs pay both the small telephone company and the larger LEC in these cases.

As with collocation pricing, meet point pricing arrangements have more flexibility than those for access (**Figure 6**). At the time of the 1996 Act, meet point connections were optional.

### Price Structures for Line Side Connections

**Figure 10A** indicates the network configuration and price structures used by wireless companies and CAPs/ALTs to connect to the LEC switch.

The wireless and CAP/ALT customers pay a monthly flat rate for a line side port on the LEC switch and pay a per minute of use switching charge with a discount below the standard rate for access. The prices are set by federal and/or state tariffs. There are different rates for technically different types of wireless connections (see **Section IX, Appendix D**).

### Enhanced Service Provider (ESP) Connection Price Structures

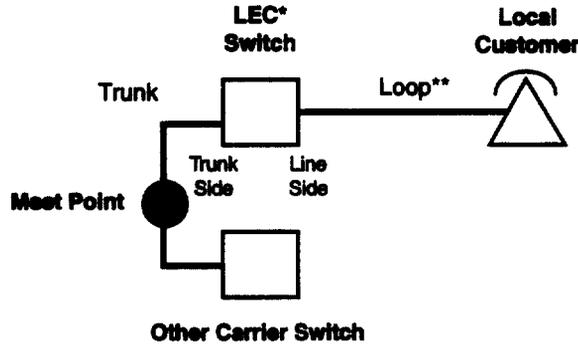
**Figure 11A** shows the primary way that ESPs connect to the LEC switch and the associated price structures. In the diagram in **Figure 11A**, the ESP looks like any other business customer. In this case (**Figure 11B**), the ESP pays a monthly business line flat rate for a line side connection, a monthly flat rate or measured rate for local telephone service that includes switching, and the SLC, which includes access to the PSN through the switch.

For the provision of enhanced services, ESPs are exempt from paying the access charges that are paid by the IXCs for routing similar traffic through the switch.<sup>49</sup> In addition, ESPs are not allowed to collocate in the LEC central office building.<sup>50</sup>

Keep in mind that the focus is on prices for connections between companies. ESP customers do not pay for what would normally be a long distance call. Instead, ESP customers only pay for local telephone service (generally a flat rate, sometimes a per minute of use rate), while the call to the ESP is paid for like any other local call.

## IV. Different Price Structures by Type of Company, cont.

**Figure 9: Meet Point: Network Configuration and Price Structures for LEC Switch Investment**



\*Either an ILEC or a new market entrant.

\*\*Also referred to as access line.

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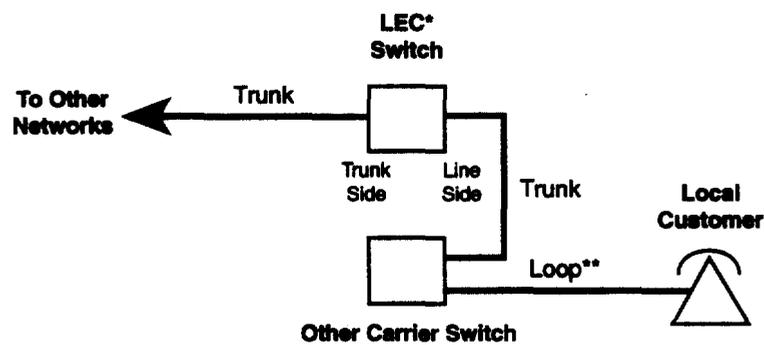
**Figure 9A. Meet Point on Trunk Network Configuration**

<i>Who pays for it?</i>	<i>How is it paid for?</i>	<i>How is the price set?</i>
Other Carrier: CAP/ALT, other LEC, wireless company, and cable TV company.	Switch Investment: Per minute of use charge and/or a flat rate for switching to terminate a local call.	One or more of the following methods: 1. Fee based on a negotiated contract. 2. State tariffs. 3. Bill and keep. 4. In some cases the tariffed rates include subsidies.

**Figure 9B. Meet Point Price Structures**

## IV. Different Price Structures by Type of Company, cont.

**Figure 10: Line Side Port Connection: Network Configuration and Price Structures for LEC Switch Investment**



\*Either an ILEC or a new market entrant.

\*\*Also referred to as access line.

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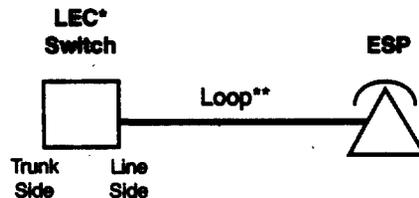
**Figure 10A. Line Side Port Network Configuration**

<i>Who pays for it?</i>	<i>How is it paid for?</i>	<i>How is the price set?</i>
Other Carrier: Wireless companies and CAPs/ALTs.	Switch Investment: Monthly flat rate for line side port on LEC switch.	Federal and/or state tariffs or contracts.
	Switch Investment: Per minute per use switching charge with a discount below the standard rate for access.	Federal and/or state tariffs or contracts.

**Figure 10B. Line Side Port Price Structures**

## IV. Different Price Structures by Type of Company, cont.

**Figure 11: ESP Line Side Connection: Network Configuration and Price Structures for LEC Switch Investment and for Routing Traffic through It**



\*Either an ILEC or a new market entrant.

\*\*Also referred to as access line.

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**Figure 11A. ESP by Line Side Port Network Configuration**

<i>Who pays for it?</i>	<i>How is it paid for?</i>	<i>How is the price set?</i>
ESP (similar to what a business customer pays)	Switch Investment and Routing through the Switch: Monthly business line flat rate for a line side port and loop.	State tariffs.
	Switch Investment: Switching is included in a flat rate, in a per minute rate, or in a per call rate in the monthly bill for local telephone service.	State tariffs.
	Routing through the Switch: Included in an end user charge, called the SLC, for access to the PSN through the switch.	Federal tariff.

**Figure 11B. ESP by Line Side Port Price Structures**

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## V. Summary

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### Summary

As broadband and wideband services (media, data, Internet, etc.) merge with traditional switched voice, many of the old pricing rules for connecting networks need to be revised. For example, movies priced on the per minute phone call basis would be prohibitively expensive. Conversely, phone calls priced by the fraction they represent of a TV program transmission wouldn't cover the cost of sending the call.<sup>51</sup> There is a tension between what might be best for the long term and what might be best for the short term. For example, while there may be a policy to treat new market entrants differently, at what point should they be treated like everyone else? What happens if differences in regulatory rules result in rate disparities between services that look essentially the same to the customer? Are there incentives for customers to rate shop due to different regulatory rules for essentially similar services?

This paper is only a snapshot in time, just before the passing of legislation that requires sweeping changes in interconnection pricing structures. However, technology is not standing still. In the future, it is likely that the percent of investment tied to specific services may increase as the ability to tailor services to individual customer needs evolves along with changes in the price structures. This paper indicates the following points:

- Service definitions and methods for setting prices for connections to the LEC switch have depended on the prevailing market philosophy — monopoly, competition, and regulation — at the time that the service first appeared.
- The major difference between the investment for types of interconnection to the ILEC switch depends on whether the connection is on the line side or on the trunk side.
- A significant portion of ILEC switch investment is common to all types of connections. Currently, the percent of investment for specific services is relatively small (with the exception of Centrex services).
- The variation in price structures for different companies connecting to a given side of the ILEC switch (line side or trunk side) is far greater than the variation in the investment for connections to that side.
- The PSN has been traditionally engineered for voice calls. The explosion of data transmission services (faxes, e-mail messages, telecommuting from home, Internet use, point of sale transactions, and online services) requires dramatic changes in the underlying assumptions about how networks need to be designed and engineered. Capacity and duration of connections vary: credit card verifications take only seconds, average voice calls take less than five minutes, and average Internet connections take approximately one hour.
- Even though customer usage patterns and technology have changed, the old price structures have remained. The 1996 legislation requires sweeping changes in these old structures.

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## VI. Appendix A: Monopoly/Competition Time Line

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### Monopoly Competition Time Line

This section provides descriptions of the events and the introduction of companies listed in the monopoly/competition time line in **Section I, Figure 1**. It is important to note that service definitions that arose in the late 1800s still influence industry and market structures today. Service distinctions for business and residential customers and for local (exchange) and long distance (toll or interexchange) markets arose in the very earliest days of telephone service.

### Local and Long Distance Services

After the invention of the telephone in 1876, there was competition between the telegraph company (Western Union) and the first telephone company, the Bell Telephone Company. The formal organization of the telephone business started in 1877 when patents were issued. These patents provided the Bell Telephone Company monopoly protection from Western Union's telegraph business.<sup>52</sup> Initially telephone service was local and was provided by the Bell Telephone Company, eventually giving rise to the name **Bell Operating Company, or BOC**. While a few companies, later called **Independents**, existed prior to the expiration of the monopoly patents, competition on a large scale arose only with the expiration of Bell Telephone's monopoly over manufacturing in 1894. This marked the beginning of first business, and then residential, service.

Long distance service arose as a technical innovation by Bell Telephone. In 1884, the first toll line was placed in service between Boston and New York City.<sup>53</sup> In 1885, AT&T was incorporated to provide interconnection among the Bell exchanges in various cities. This marked the beginning of toll service, both state and interstate. These service concepts are still in place today.

Starting in the 1910s there was a shift in market philosophy and the pendulum swung back toward monopoly. This shift accompanied an increase in both federal and state regulation of the telephone industry. The independent companies were concerned with AT&T's acquisition of independent companies and consolidations within AT&T once these companies were acquired. The independents also wanted to connect with AT&T's long distance network, which gave AT&T a competitive advantage. The Kingsbury Commitment of 1913 is a letter that heralded the start of the PSN. In the PSN, all customers could reach all other customers regardless of who owned the facilities in the interconnecting networks. In the Kingsbury letter, AT&T promised to provide the independents with interconnection to its toll network. In return for this commitment, AT&T could purchase independent companies, if the newly created federal regulatory agency (first the **Interstate Commerce Commission, or ICC**, and later the FCC) approved.

The trend toward monopoly, already seen in the temporary nationalization of the telephone industry during World War I, took root in the *Willis-Graham Act* in 1921. This Act allowed AT&T to continue its consolidation, and methods were also established for resolving conflicts over acquisitions and mergers and for division of operating territories

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## VI. Appendix A: Monopoly/Competition Time Line, cont.

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among companies. In return, the independents were promised connection with the AT&T network, leading to the ***Bell-Independent Partnership***. The *Communications Act of 1934* firmly established a monopoly philosophy for the next two and a half decades.<sup>54</sup>

### Connection of Competing Companies

Starting in 1959, there was a move back toward network competition. The *Above 890 Decision*<sup>55</sup> opened the door for large, high-volume customers to build their own networks, eventually leading to private line services and the resale of facilities and services.<sup>56</sup>

In 1969, the FCC opened the door to competition in the long distance (interexchange) market by granting MCI a license to construct facilities. Eventually MCI won the right to compete with the AT&T Long Lines Division. Initially called ***Other Common Carriers (OCCs)***, these companies are now called IXC's. After a series of FCC and court decisions in the 1970s,<sup>57</sup> AT&T had to provide the other IXC's with interconnection to its network.<sup>58</sup> In this time frame, the concept of "access" into and out of the PSN arose. In 1982, the FCC issued its *Access Charge Order*.<sup>59</sup>

### The Flurry of New Competitors

It could be argued that the institution of access charges not only made the breakup of AT&T possible, but opened the flood gates to new competitors. The IXC's and all the new types of companies wanted some form of interconnection with the LEC network. Ultimately, just as all politics, national and international, are eventually local because that's where the voters are, the same is true for communications: all communications involve local interconnection because that's where the customers connect.

Technological innovation continues to produce new opportunities for products and services. These, in turn, pressure existing markets to change and create opportunities for new markets.

In 1983, ESPs, which include on-line computer service providers, were given special exemptions for the price of connecting to LEC switches.<sup>60</sup> Most commonly known by the names of the largest ESP companies, such as America OnLine, CompuServe, or Prodigy, this group also includes companies and institutions providing connections to the Internet and other communications services.

The year 1983 also saw the introduction of cellular services, part of an ongoing evolution of mobile services, now called CMS<sup>61</sup> or wireless services (communications services where the customer is not tethered by a wire to the communications network).<sup>62</sup> Over a decade later, in 1995, the FCC created a new class of wireless services, called PCS.<sup>63</sup>

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## VI. Appendix A: Monopoly/Competition Time Line, cont.

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1984 not only marked the breakup of AT&T into one IXC and seven large LECs (also called **Regional Bell Operating Companies, or RBOCs**),<sup>64</sup> but also spurred on the entry of a number of new competitors in both local and long distance markets.

The 1980s also saw the FCC and individual states promote the introduction of competitors to the local market. For example, in 1985 the New York Public Service Commission (NY PSC) authorized Teleport Communications Group (TCG) — one of the first CAPs — to provide large business customers with private lines services that bypassed the traditional LEC networks and connected customers directly to the long distance carriers (the IXCs).<sup>65</sup> Over time the type of connections afforded to the CAPs, also known as ALTs, expanded, with increasingly fewer limits on the type of service provided. The new CAPs/ALTs are sometimes referred to as **Competitive (or Certified) Local Exchange Carriers (CLECs)**.<sup>66</sup>

As competition and technologies evolve, the group of new LEC entrants is expanding to include cable TV companies, and may in the future include more **Electric Utilities** and others.<sup>67</sup>

### **Telecommunications Act of 1996**

The *Telecommunications Act of 1996* has accelerated the drive toward competition. It mandates development of competitive markets (including rules for interconnection), the elimination of market entry barriers, and infrastructure sharing. This Act redefines many terms used to describe the various telecommunications carriers and information service providers. For the specific language in these definitions, see **Section VII, Appendix B**.

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## VII. Appendix B: Definitions

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### **Advanced Telecommunications Capability**

*Telecommunications Act of 1996, Sec. 706(c)(1)*

"is defined, without regard to any transmission media or technology, as high-speed, switched, broadband telecommunications capability that enables users to originate and receives high-quality voice, data, graphics, and video telecommunications using any technology."

### **Basic Telephone Service**

*Telecommunications Act of 1996, Sec. 274(i)(2)*

"any wireline telephone exchange service, or wireline telephone exchange service facility, provided by a Bell operating company in a telephone exchange area, except that such term does not include —

"(A) a competitive wireline telephone exchange service provided in a telephone exchange area where another entity provides a wireline telephone exchange service that was provided on January 1, 1984, or

(B) a commercial mobile service."

### **Basic Telephone Service Information**

*Telecommunications Act of 1996, Sec 274(i)(3)*

"network and customer information of a Bell operating company and other information acquired by a Bell operating company as a result of its engaging in the provision of basic telephone service."

### **Bell Operating Company (BOC)**

*Telecommunications Act of 1996, Sec. 3(a)(35)*

"(A) means any of the following companies: Bell Telephone Company of Nevada, Illinois Bell Telephone Company, Indiana Bell Telephone Company, Incorporated, Michigan Bell Telephone Company, New England Telephone and Telegraph Company, New Jersey Bell Telephone Company, New York Telephone Company, U S West Communications Company, South Central Bell Telephone Company, Southern Bell Telephone and Telegraph Company, Southwestern Bell Telephone Company, The Bell Telephone Company of Pennsylvania, The Chesapeake and Potomac Telephone Company, The Chesapeake and Potomac Telephone Company of Maryland, The Chesapeake and Potomac Telephone Company of Virginia, The Chesapeake and Potomac Telephone Company of West Virginia, The Diamond State Telephone Company, The Ohio Bell Telephone Company, The Pacific Telephone and Telegraph Company, or Wisconsin Telephone Company; and

"(B) includes any successor or assign of any such company that provides wireline telephone exchange service; but

"(C) does not include an affiliate of any such company, other than an affiliate described in subparagraph (A) or (B)."

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## VII. Appendix B: Definitions, cont.

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### **Cable Service**

*Telecommunications Act of 1996, Sec. 301(a)(1)*

"Section 602(6)(B) (47 U.S.C. 522(6)(B)) is amended by inserting 'or use' after 'the selection'."

47 U.S.C. 522(6)(B) Definitions, cable service, with revision from the Act added.

"Subscriber interaction, if any, which is required for the selection *or use* of such video programming or other programming service; [emphasis added]."

### **Cable System**

*Telecommunications Act of 1996, Sec. 301(a)(2)*

"Section 602(7) (47 U.S.C. 522(7)) is amended by striking '(B) a facility that serves only subscribers in 1 or more multiple unit dwellings under common ownership, control, or management, unless such facility or facilities uses any public right-of-way;' and inserting '(B) a facility that serves subscribers without using any public right-of-way;'"

47 U.S.C. 522(7) Definitions, cable system, with revision from the Act added.

"a facility, consisting of a set of closed transmission paths and associated signal generation, reception, and control equipment that is designed to provide cable service which includes video programming and which is provided to multiple subscribers within a community, but such term does not include (A) a facility that serves only to retransmit the television signals of 1 or more television broadcast stations; (B) a facility that serves subscribers without using any public right-of-way; (C) a facility of a common carrier which is subject, in whole or in part, to the provisions of subchapter II of this chapter, except that such facility shall be considered a cable system (other than for purposes of section 541(c) of this title) to the extent such facility is used in the transmission of video programming directly to subscribers; or (D) any facilities of any electric utility used solely for operating its electric utility system; [emphasis added]."

### **Cellular Service**

47 C.F.R. §22.99 Definitions

"Radio telecommunication services provided using a cellular system."

### **Cellular System**

47 C.F.R. §22.99 Definitions

"An automated high-capacity system of one or more multi-channel base stations designed to provide radio telecommunication services to mobile stations over a wide area in spectrally efficient manner. Cellular systems employ techniques such as low transmitting power and automatic hand-off between base stations of communications in progress to enable channels to be reused at relatively short distances. Cellular systems may also employ digital techniques such as voice encoding and decoding, data compression, error correction, and time or code division multiple access in order to increase system capacity."

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## VII. Appendix B: Definitions, cont.

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### **Collocation**

*Telecommunications Act of 1996, Sec. 251(c)(6)*

"The duty to provide, on rates, terms, and conditions that are just, reasonable, and nondiscriminatory, for physical collocation of equipment necessary for interconnection or access to unbundled network elements at the premises of the local exchange carrier, except that the carrier may provide for virtual collocation if the local exchange carrier demonstrates to the State commission that physical collocation is not practical for technical reasons or because of space limitations."

### **Commercial Mobile Service Provider (CMS)**

*Telecommunications Act of 1996, Sec. 3(a)(44)*

"[ local exchange carrier] does not include a person insofar as such person is engaged in the provision of a commercial mobile service under section 332(c), except to the extent that the Commission finds that such service should be included in the definition of such term."

The United States Code defines the regulatory treatment of commercial mobile services, 47 U.S.C. 332(c). This includes the common carrier treatment of commercial mobile services, Sec. 332(c)(1); non-common carrier treatment of private mobile services, Sec. 332(c)(2); state preemption, Sec. 332(c)(3); regulatory treatment of communications satellite corporation, Sec. 332(c)(4); space segment capacity, Sec. 332(c)(5); and foreign ownership, Sec. 332(c)(6).

### **Comparable Carriers as Incumbents**

*Telecommunications Act of 1996, Sec. 251(h)(2)*

"(A) such carrier occupies a position in the market for telephone exchange service within an area that is comparable to the position occupied by a carrier described in paragraph (1);

"(B) such carrier has substantially replaced an incumbent carrier described in paragraph (1); and

"(C) such treatment is consistent with the public interest, convenience, and necessity and the purposes of this section.

### **Enhanced Services**

47 C.F.R. §64.702(a) Furnishing of Enhanced Services and Customer-Premises Equipment by Communications Common Carriers

"services, offered over common carrier transmission facilities used in interstate communications, which employ computer processing applications that act on the format, content, code, protocol or similar aspects of the subscriber's transmitted information; provide the subscriber additional, different, or restructured information; or involve subscriber interaction with stored information. Enhanced services are not regulated under title II of the Act."

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## VII. Appendix B: Definitions, cont.

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### **Electronic Publishing Definition**

*Telecommunications Act of 1996, Sec. 274(h)*

"(1) the dissemination, provision, publication, or sale to an unaffiliated entity or person, of any one or more of the following: news (including sports); entertainment (other than interactive games); business, financial, legal, consumer, or credit materials; editorials, columns, or features; advertising; photos or images; archival or research material; legal notices or public records; scientific, educational, instructional, technical, professional, trade, or other literary materials; or other like or similar information.

"(2) EXCEPTIONS.—The term 'electronic publishing' shall not include the following services:

"(A) Information access, as that term is defined by the AT&T Consent Decree.

"(B) The transmission of information as a common carrier.

"(C) The transmission of information as part of a gateway to an information service that does not involve the generation or alteration of the content of information, including data transmission, address translation, protocol conversion, billing management, introductory information content, and navigational systems that enable users to access electronic publishing services, which do not affect the presentation of such electronic publishing services to users.

"(D) Voice storage and retrieval services, including voice messaging and electronic mail services.

"(E) Data processing or transaction processing services that do not involve the generation or alteration of the content of information.

"(F) Electronic billing or advertising of a Bell operating company's regulated telecommunications services.

"(G) Language translation or data format conversion.

"(H) The provision of information necessary for the management, control, or operation of a telephone company telecommunications system.

"(I) The provision of directory assistance that provides names, addresses, and telephone numbers and does not include advertising.

"(J) Caller identification services.

"(K) Repair and provisioning databases and credit card and billing validation for telephone company operations.

"(L) 911-E and other emergency assistance databases.

"(M) Any other network service of a type that is like or similar to these network services and that does not involve the generation or alteration of the content of information.

"(N) Any upgrades to these network services that do not involve the generation or alteration of the content of information.

"(O) Video programming or full motion video entertainment on demand."

### **Exchange Access**

*Telecommunications Act of 1996, Sec. 3(a)(40)*

"the offering of access to telephone exchange services or facilities for the purpose of the origination or termination of telephone toll services."

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## VII. Appendix B: Definitions, cont.

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### **Exchange Access and Interconnection Requirements**

*Telecommunications Act of 1996, Sec. 251(g)*

"each local exchange carrier, to the extent that it *provides wireline services*, shall provide exchange access, information access, and exchange services for such access to interexchange carriers and information service providers...until such restrictions and obligations are explicitly superseded by regulations prescribed by the Commission [emphasis added]."

### **Facilities-Based Competitors**

Conference Report to Accompany S. 652, pages 147-148,

Clarification of the Act, Sec. 271(c)(1)(A), Bell Operating Companies Entry into InterLATA Services

"With respect to the facilities-based competitor requirement, the presence of a competitor offering the following services specifically does *not* suffice to meet the requirement: (1) exchange access; (2) telephone exchange service offered exclusively through the resale of the BOC's telephone exchange service; and (3) cellular service. The competitor must offer telephone exchange service either exclusively over its own facilities or predominantly over its own facilities in combination with the resale of another carrier's service.

"This conference agreement recognizes that it is unlikely that competitors will have a fully redundant network in place when they initially offer local service, because the investment necessary is so significant. Some facilities and capabilities (e.g., central office switching) will likely need to be obtained from the incumbent local exchange carrier as network elements pursuant to the new section 251. Nonetheless, the conference agreement includes the 'predominantly over their own telephone exchange service facilities' requirement to ensure a competitor offering service exclusively through the resale of the BOC's telephone exchange service does not qualify, and that an unaffiliated competing provider is present in the market."

### **Incumbent Local Exchange Carrier (ILEC)**

*Telecommunications Act of 1996, Sec. 251(h)(1)*

"with respect to an area, the local exchange carrier that —

"(A) on the date of enactment of the Telecommunications Act of 1996, provided telephone exchange service in such area; and

"(B)(i) on such date of enactment, was deemed to be a member of the exchange carrier association pursuant to section (47 C.F.R. 69.601(b)); or

"(ii) is a person or entity that, on or after such date of enactment, became a successor or assign of a member described in clause (i)."

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## VII. Appendix B: Definitions, cont.

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### **Infrastructure Sharing**

*Telecommunications Act of 1996, Sec. 259(a)*

"The Commission shall prescribe...regulations that require incumbent local exchange carriers...to make available to any qualifying carrier such public switched network infrastructure, technology, information, and telecommunications facilities and functions as may be requested by such qualifying carrier for the purpose of enabling such qualifying carrier to provide telecommunications services, or to provide access to information services, in the service area in which such qualifying carrier has requested and obtained designation as an eligible telecommunications carrier section 214(e)."

### **Information Service**

*Telecommunications Act of 1996, Sec. 3(a)(41)*

"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."

### **Interconnection Duty of the ILEC**

*Telecommunications Act of 1996, Sec. 251(c)(2)*

"The duty to provide, for the facilities and equipment of any requesting telecommunications carrier, interconnection with the local exchange carrier's network —

"(A) for the transmission and routing of telephone exchange service and exchange access;

"(B) at any technically feasible point within the carrier's network;

"(C) that is at least equal in quality to that provided by the local exchange carrier to itself or to any subsidiary, affiliate, or any other party to which the carrier provides interconnection; and

"(D) on rates, terms, and conditions that are just, reasonable, and nondiscriminatory, in accordance with the terms and conditions of the agreement and the requirements of this section and section 252.

### **Local Access and Transport Area**

"The *Modification of Final Judgment*, provided guidelines for setting up LATAs in Section IV(G), page 229. However, the federal court overseeing the breakup of AT&T spelled out the definition: "The purpose of the establishment of the LATAs is only ...to delineate the areas in which the various telecommunications companies will operate; it is not to distinguish the area in which a telephone call will be 'local' from that in which it becomes a 'toll' or long-distance call." *U.S. v. Western Electric*, Civil Action No. 82-0192 (following *MFJ*), 569 F. Supp. 990, Section I(A), pages 994-995.

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## VII. Appendix B: Definitions, cont.

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### **Local Exchange Carrier (LEC)**

*Telecommunications Act of 1996, Sec. 3(a)(44)*

“any person that is engaged in the provision of telephone exchange service or exchange access. Such term does not include a person insofar as such person is engaged in the provision of a commercial mobile service under section 332(c), except to the extent that the Commission finds that such service should be included in the definition of such term.”

Conference Report to Accompany S. 652, page 115,  
Clarification of the Act, Sec. 3(a)(44), Additional Definitions, Local Exchange Carrier Conf. Report, p. 115: this term “does not include a person insofar as such person is engaged in the provision of CMS under section 332(c) of the Communications Act, except to the extent that the Commission finds that such service as provided by such person in a State is a replacement for a substantial portion of the wireless telephone exchange service within such State.”

Page 116, “The Senate definition of ‘local exchange carrier’ was included to ensure that the Commission could, if circumstances warrant, include CMS providers which provide telephone exchange service or exchange access in the definition of ‘local exchange carrier.’”

### **Local Loop Transmission**

*Telecommunications Act of 1996, Sec. 271(c)(2)(B)(iv), from the Competitive Checklist*

“from the central office to the customer’s premises, unbundled from local switching or other services.”

### **Local Transport**

*Telecommunications Act of 1996, Sec. 271(c)(2)(B)(v), from the Competitive Checklist*

“from the trunk side of a wireline local exchange carrier switch unbundled from switching or other services.”

### **Local Switching**

*Telecommunications Act of 1996, Sec. 271(c)(2)(B)(vi), from the Competitive Checklist*

“unbundled from transport, local loop transmission, or other services.”

### **Network Element**

*Telecommunications Act of 1996, Sec. 3(a)(45)*

“a facility or equipment used in the provision of a telecommunications service. Such term also includes features, functions, and capabilities that are provided by means of such facility or equipment, including subscriber numbers, databases, signaling systems, and information sufficient for billing and collection or used in the transmission, routing, or other provision of a telecommunications service.”

### **Personal Communications Services (PCS)**

47 C.F.R. §24.5 Terms and Definitions,

“Radio communication that encompass mobile and ancillary fixed communication that provide services to individuals and businesses and can be integrated with a variety of competing networks.

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## VII. Appendix B: Definitions, cont.

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### **Point of Presence**

*AT&T Plan of Reorganization*, page 12, note 11.

"a physical location where there is a point of interface between the BOC facilities providing a LATA access functions and an interLATA carrier's facilities providing an interLATA function. A POP must be located within the boundary of the LATA being served, and it may contain an interLATA carrier's system or some other designated facility."

### **Pricing Standards — Interconnection and Network Elements**

*Telecommunications Act of 1996*, Sec. 252 (d)(1)

"Determinations by a State commission of the just and reasonable rate for the interconnection of facilities and equipment for purposes of subsection (c)(2) of section 251, and the just and reasonable rate for network elements for purposes of subsection (c)(3) of such section —

"(A) shall be —

"(i) based on the cost (determined without reference to a rate-of-return or other rate-based proceeding) of providing the interconnection or network element (whichever is applicable), and

"(ii) nondiscriminatory, and

"(B) may include a reasonable profit.

### **Public Telecommunications Network Interconnectivity**

*Telecommunications Act of 1996*, Sec. 256 (d)

"the ability of two or more public telecommunications networks used to provide telecommunications service to communicate and exchange information without degeneration, and to interact in concert with one another."

### **Qualifying Carrier**

*Telecommunications Act of 1996*, Sec. 259(d)

For the purposes of Infrastructure Sharing, Sec. 259(a), this "means a telecommunications carrier that—

"(1) lacks economies of scale or scope, as determined in accordance with regulations prescribed by the Commission pursuant to this section; and

"(2) offers telephone exchange service, exchange access, and any other service that is included in universal service, to all consumers without preference throughout the service area for which such carrier has been designated as an eligible telecommunications carrier under section 214(e)."

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## VII. Appendix B: Definitions, cont.

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### **Rural Telephone Company**

*Telecommunications Act of 1996, Sec. 3(a)(47)*

“a local exchange carrier operating entity to the extent that such entity —

“(A) provides common carrier service to any local exchange carrier study area that does not include either —

“(i) any incorporated place of 10,000 inhabitants or more, or any part thereof, based on the most recently available population statistics of the Bureau of the Census; or

“(ii) any territory, incorporated or unincorporated, included in an urbanized area, as defined by the Bureau of the Census as of August 10, 1993;

“(B) provides telephone exchange service, including exchange access, to fewer than 50,000 access lines;

“(C) provides telephone exchange service to any local exchange carrier study area with fewer than 100,000 access lines; or

“(D) has less than 15 percent of its access lines in communities of more than 50,000 on the date of enactment of the Telecommunications Act of 1996.”

### **Rural Competitor**

Conference Report to Accompany S. 652, pages 127-128,  
Clarification of the Act, Sec. 253(b), Barriers to Entry,

“a State may require the competitor seeking to provide service in a rural market to meet the requirements or designation as an eligible telecommunications carrier. That is, the State may require the competitor to offer services and advertise throughout the service area served by a rural telephone company. The provision would not apply if the rural telephone company has obtained an exemption, suspension, or modification under new section 251(f) [Interconnection — Exemptions, Suspensions, and Modifications] that effectively prevents a competitor from needing the eligible telecommunications carrier requirements. In addition, the provision would not apply to providers of CMS.”

### **Telecommunications**

*Telecommunications Act of 1996, Sec. 3(a)(48)*

“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.”

### **Telecommunications Carrier**

*Telecommunications Act of 1996, Sec. 3(a)(49)*

“any provider of telecommunications services, except that such term does not include aggregators of telecommunications services (as defined in section 226). A telecommunications carrier shall be treated as a common carrier under this Act only to the extent that it is engaged in providing telecommunications services, except that the Commission shall determine whether the provision of fixed and mobile satellite service shall be treated as common carriage.”

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## VII. Appendix B: Definitions, cont.

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### **Telecommunications Equipment**

*Telecommunications Act of 1996, Sec. 3(a)(50)*

"equipment, other than customer premises equipment, used by a carrier to provide telecommunications services, and includes software integral to such equipment (including upgrades)."

### **Telecommunications Service**

*Telecommunications Act of 1996, Sec. 3(a)(51)*

"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."

Conference Report to Accompany S. 652, page 114,  
Clarification of the Act, Sec. 3(a)(51)

"'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 to the public, regardless of the facilities used to transmit the telecommunications service. This definition is intended to include commercial mobile service ('CMS'), competitive access service, and alternative local telecommunications services to the extent they are offered to the public or to such classes of users as to be effectively available to the public."

### **Telephone Exchange Service**

*Telecommunications Act of 1996, Sec. 3(a)*

amends 47 U.S.C. 153

"(1) in subsection (r) —

"(A) by inserting '(A)' after 'means'; and

"(B) by inserting before the period at the end the following: ', or (B) comparable service provided through a system of switches, transmission equipment, or other facilities (or combination thereof) by which a subscriber can originate and terminate a telecommunications service';"

47 U.S.C. 153(r), Definitions, Telephone Exchange Service, with additions from the Act.

"'Telephone exchange service' means (A) service within a telephone exchange, or within a connected system of telephone exchanges within the same exchange area operated to furnish to subscribers intercommunicating service of the character ordinarily furnished by a single exchange, and which is covered by the exchange service charge, or (B) comparable service provided through a system of switches, transmission equipment, or other facilities (or combination thereof) by which a subscriber can originate and terminate a telecommunications service."

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## VII. Appendix B: Definitions, cont.

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### **Unbundled Access Duty of the ILEC**

*Telecommunications Act of 1996, Section 251(c)(3)*

“The duty to provide, to any requesting telecommunications carrier for the provision of a telecommunications service, nondiscriminatory access to network elements on an unbundled basis at any technically feasible point on rates, terms, and conditions that are just, reasonable, and nondiscriminatory in accordance with the terms and conditions of the agreement and the requirements of this section and section 252. An incumbent local exchange carrier shall provide such unbundled network elements in a manner that allows requesting carriers to combine such elements in order to provide such telecommunications service.”

### **Universal Service, Advanced Services Access**

*Telecommunications Act of 1996, Sec. 254(h)(2)*

“The Commission shall establish competitively neutral rules –

“(A) to enhance, to the extent technically feasible and economically reasonable, access to advanced telecommunications and information services for all public and nonprofit elementary and secondary school classrooms, health care providers, and libraries; and

“(B) to define the circumstances under which a telecommunications carrier may be required to connect its network to such public institutional telecommunications users.”

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## VIII. Appendix C: Competitive Checklist

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### **Telecommunications Act of 1996, Competitive Checklist Requirements**

*Telecommunications Act of 1996, Sec. 271(c)(2)(B)*

"Access or interconnection provided or generally offered by a Bell operating company to other telecommunications carriers meets the requirements of this subparagraph if such access and interconnection includes each of the following:

"(i) Interconnection in accordance with the requirements of sections 251(c)(2) and 252(d)(1).

"(ii) Nondiscriminatory access to network elements in accordance with the requirements of sections 251(c)(3) and 252(d)(1).

"(iii) Nondiscriminatory access to the poles, ducts, conduits, and rights-of-way owned or controlled by the Bell operating company at just and reasonable rates in accordance with the requirements of section 224.

"(iv) Local loop transmission from the central office to the customer's premises, unbundled from local switching or other services.

"(v) Local transport from the trunk side of a wireline local exchange carrier switch unbundled from switching or other services.

"(vi) Local switching unbundled from transport, local loop transmission, or other services.

"(vii) Nondiscriminatory access to —

"(I) 911 and E911 services;

"(II) directory assistance services to allow the other carrier's customers to obtain telephone numbers; and

"(III) operator call completion services.

"(viii) White pages directory listings for customers of the other carrier's telephone exchange service.

"(ix) Until the date by which telecommunications numbering administration guidelines, plan, or rules are established, nondiscriminatory access to telephone numbers for assignment to the other carrier's telephone exchange service customers. After that date, compliance with such guidelines, plan, or rules.

"(x) Nondiscriminatory access to databases and associated signaling necessary for call routing and completion.

"(xi) Until the date by which the Commission issues regulations pursuant to section 251 to require number portability, interim telecommunications number portability through remote call forwarding, direct inward dialing trunks, or other comparable arrangements, with as little impairment of functioning, quality, reliability, and convenience as possible. After that date, full compliance with such regulations.

"(xii) Nondiscriminatory access to such services or information as are necessary to allow the requesting carrier to implement local dialing parity in accordance with the requirements of section 251(b)(3).

"(xiii) Reciprocal compensation arrangements in accordance with the requirements of section 252(d)(2).

"(xiv) Telecommunications services are available for resale in accordance with the requirements of sections 251(c)(4) and 252(d)(3)."

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## IX. Appendix D: Switch Modeling Definitions and Assumptions

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### Definitions of Large and Small Switches

It should be noted that no single definition exists for what elements constitute a switch since companies purchase switches based on market needs and projections, and switch manufacturers offer products with different designs, features, and functions. The definitions for modeling switch investment in this paper are based on the sources and assumptions listed below.

#### *General Description of Switch:*

The basis for modeling switch investment percentages was Nortel DMS 100/200 switch engineering standards. The model assumed that the switch used a supernode (enhanced) processor and ENET (enhanced network) to allow for the engineering of *vertical services* — i.e., Centrex, ISDN, and enhanced customer service options. This allows for compatible mixing of various equipment combinations on the switch. The ENET is fully duplicated, with two mounting cabinets, serves both copper (DS-30) and fiber (DS-512) links and allows for modular growth.<sup>68</sup>

Where there were multiple choices for type of equipment, the investment percentage was derived from combined types.

#### *Small Switch:*

The average size of a small switch used in the model is approximately 1,200 lines. This estimate is based on switch size data from several sources:

- Data provided to the FCC in response to its Universal Service Fund Data Collection.
- Data published in a National Exchange Carrier Association (NECA) study entitled *Telecommunications: America's Vital Link*, 1995.
- Averages from large LECs rural service areas.

The first two sources listed above use NECA traffic-sensitive pool members, which are typically small telephone companies and serve predominantly rural markets. In rural areas, there is a larger percentage of residential customers compared to business customers. The range for small switches for rural telephone companies is 1,000 lines up to 7,500 lines.

#### *Large Switch:*

The average size of a large switch used in the model is 25,000 lines. However, in some large urban areas, a switch may have over 100,000 lines and a central office building may have more than one switch.

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## IX. Appendix D: Switch Modeling Definitions and Assumptions, cont.

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Essentially everything that is not a small switch is a large switch. However, since there is no official definition of a large switch, the size for the model was determined by individual samples and company-wide averages from several large companies with different regional and network characteristics. Large switches generally service urban areas, with a larger percentage of business customers compared to residential customers. Traffic is mix of patterns: between customers attached to the same local switch (intra-office), between switches in the same local calling area (intra-exchange), and between local switches and tandem switches.

### Basic Switch Investment Modeling Assumptions

The following assumptions formed the basis for the investment in **Figure 5**:

1. This model does not attempt to indicate actual dollars because these numbers are based on averages across a number of companies. Investment for specific switches are based on a number of different characteristics, such as type of customers and companies interconnecting, type of services, and traffic patterns. Since companies purchase switches based on actual markets, there is no standard definition for switch sizes. Other types of companies, such as IXC's and new entrants, may have switches with other investment characteristics.
2. For simplicity, the investments modeled exclude overheads for engineering, installation startup, and taxes.
3. All interconnection arrangements are for switched message (voice) services. This ignores the connections for fixed connections such as private line services. Generally, private lines don't use the switch, but there are some exceptions, such as virtual private lines.
4. Only connections to the ILEC switch are modeled: line side and trunk side. Connections that are made through an adjunct to the switch (*i.e.*, special ISDN arrangements) are excluded.
5. All switched minutes are treated the same regardless of jurisdictional classification: local/toll/access or state/interstate.
6. The duration of all connections are the same. For details on call duration and other traffic-based statistics, see **Figure 4** and the discussion of these numbers later on in this section under "Sources for Figure 4 and Switch Modeling."

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## IX. Appendix D: Switch Modeling Definitions and Assumptions, cont.

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### Technical Definitions: Common to All Investments

Common equipment generally does not vary with switch size, lines, or trunks (with the exception of the processor). The "Common to All" category includes cable and framework costs, power systems, operations support systems (maintenance and testing), and any other vendor equipment. Equipment for this category includes the following: S/DMS CORE cabinet, message switch processor, computing module, central processor, program and data storage, input/output equipment, maintenance and test equipment, breakage, spares, initial office engineering and installation, main distributing frame, protector frame, DS-1, DS-30, and DS-512 interface central processor, and integrated services module.

### Technical Definitions: Common to Line Side Investments

The "Common to Line Side" category includes line cards (types A through E) for basic loop service, multi-line services, data services, and message waiting; shelves and drawers; line test equipment; tone and ring generators; line concentration modules with frame; interface cards and circuits; line group controllers with circuits; universal tone receivers; and other miscellaneous circuits. Lines cards were a combination of speech and data types.

### Technical Definitions: Common to Trunk Side Investments

The "Common to Trunk Side" category includes trunks cards, tone circuit cards, shelves, frames, trunk test equipment, circuits pads, and the links to the social processor in the switch. This category also includes trunk modules (analog), maintenance trunk modules, digital recorded announcement modules, and activity trunk controllers. Trunk cards were set up for a combination of DS-1, DS-30, and DS-512 trunks.

### Technical Definitions: Specific Services

- **Centrex:** Used by large businesses and institutions, a portion of the switch is dedicated to a specific customer, allowing the customer to have an on-site network for speech and data. A dedicated trunk routes traffic between the switch and this on-site network, making it look like the customer has an on-site switch.
- **Signaling System 7 (SS7):** Equipment used to determine the availability of a call route (voice or data) using a separate path before the call is switched. SS7 equipment sends the signal to a **Signal Transfer Point (STP)** to check the trunks needed to complete the call. This frees up trunks or short periods of time between dialing and completion of the call. The STP is a fast packet switch that also routes information between the central office switch, the **Service Control Point (SCP)** — a database with information on customers and their service requirements, other STPs, and other switches.

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## IX. Appendix D: Switch Modeling Definitions and Assumptions, cont.

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- **Multi-Frequency (MF) Signaling** : Used for analog signaling, MF determines call routing, but unlike SS7, MF does not use a separate path. Therefore, SS7 is referred to as “out-of-band” signaling and MF is referred to as “in-band” signaling. SS7 is replacing MF as technology moves from analog to digital.
- ISDN/Wideband Video: There are two ISDN transmission rates:
  - **Basic Rate Interface (BRI)**, called “basic” for short: two 64 kilobit bearer (voice/data) channels and one 16 kilobit data signaling channel. Also referred to as “2B + D.” The total is 1.5 mbps or the equivalent of a T1 line. BRI ISDN “is a phone line that is divided into two large paths and a smaller one, making it possible to be on the phone and the Internet at the same time.” *The New York Times*, Business Day Section, “Quick Look at a Faster Interconnection,” March 25, 1996, page D1.
  - **Primary Rate Interface (PRI)**, called “primary” for short: 23 channels of 64 kilobits and one 64 kilobit channel for signaling.

ISDN uses packet handlers for link peripheral processors. ISDN services include ISDN signal processor, lines group controller for BRI, digital trunk controller for PRI, and line trunk controller for both BRI and PRI. The BRI lines terminate in an enhanced line concentration module.

- AIN: This service employs SS7 and intelligent peripherals (IPs) — an off-network computer with LEC-Pacific software applications that provide off-network advance customer services that use the SS7 network for routing calls. For example, the **Intelligent Network (IN)** allows the IP to determine the shortest call routes based on the customer’s location.
- Wireless: Model assumes Type I, II, and IIA connections. See description of types of wireless connections discussed later in this section. The majority of the investment is outside of the switch. This category includes line side or trunk side ports along with associated software.
- CLASS: These services include call forwarding, call waiting, caller identification (caller ID), and three-way calling. These services are primarily software-based.
- Voice Mail: A software based message storage system that allows the switch to act like an answering machine.
- E911/911: Allows a customer to dial three digits (911) to reach a centralized local emergency services site for connections to police departments, fire departments, ambulance services, and others. E911 uses SS7 data bases and software in the switch to provide additional information, such as the location of the closest emergency service provider, the customer’s telephone number, the customer’s locations, and other caller information.