requesting carriers may provide narrowband services over them.[626] For these reasons, we also direct incumbent LECs to unbundle stand-alone copper loops and subloops for the provision of broadband service. However, subject to a transition plan discussed below, we do not reinstate the Commission's vacated line sharing rules because we determine that continued unbundled access to stand-alone copper loops and subloops enables a requesting carrier to offer and recover its costs from all of the services that the loop supports, including broadband service.

200. In addition, we find that different policy considerations, as well as different technical considerations, are associated with copper loops, hybrid copper/fiber loops, and FTTH loops. For example, we decline to require incumbent LECs to provide unbundled access to their hybrid loops for the provision of broadband services.[627] Similarly, we decline to unbundle loops that consist of FTTH facilities for broadband services. As explained more fully below, this unbundling approach – *i.e.*, greater unbundling for legacy copper facilities and more limited unbundling for next-generation network facilities – appropriately balances our goals of promoting facilities-based investment and innovation against our goal of stimulating competition in the market for local telecommunications services.

201. With respect to our enterprise market analysis, we make national impairment determinations based on loop characteristics that do not vary significantly from area to area. Our conclusions with respect to loop deployment do vary, however, according to the loop type, *i.e.*, dark fiber[628] or "lit" fiber,[629] and the capacity level of the particular loop. We find that different economic characteristics impact a competitive LEC's ability to self-deploy or utilize wholesale alternatives based on the capacity level of the loop facility demanded by its customer.[630]

[626] As explained below, in overbuild situations where the incumbent LEC elects to retire existing copper loops for FTTH loops, we also require incumbent LECs to make available unbundled access to a 64 kbps transmission path over that FTTH loop so that a competitor may provide narrowband service to that end-user customer.

[627] Incumbent LECs must continue to provide unbundled access to the TDM features, functions, and capabilities of their hybrid loops. This will allow competitive LECs to continue providing both traditional narrowband services (*e.g.*, voice, fax, dial-up Internet access) and high-capacity services like DS1 and DS3 circuits.

[628] Dark fiber is optical fiber through which no light is transmitted and no signal is carried. It is unactivated deployed fiber that is left dark, *i.e.*, with no necessary equipment, *i.e.*, "opto-electronics" or "optronics" attached to light the fiber to carry a signal to serve customers. *See* NEWTON'S TELECOM DICTIONARY 201 (18th ed. 2002) (definition of Dark Fiber); *see also UNE Remand Order*, 15 FCC Rcd at 3771, para. 162 n.292. Once the optronics are attached to the fiber to make signal transmission possible the dark fiber becomes "lit." *See* NEWTON'S TELECOM DICTIONARY 538-39 (18th ed. 2002) (definition of Opto-Electronics and Optronics).

[629] *Id.*; *see also* NEWTON'S TELECOM DICTIONARY 433 (18th ed. 2002) (definition of Lit Fiber).

[630] We also know that alternative transmission technologies such as fixed wireless, satellite and unlicensed wireless may exist as potential enterprise market loop alternatives in limited circumstances and, therefore, consider these alternative transmission capabilities in our impairment analysis where appropriate. *See, e.g.*, BellSouth Comments at 42-44; SBC Reply at 91; Verizon Comments at 118-19.

202. With regard to the highest capacity loop facilities, *i.e.*, OCn loops,[631] we conclude that no impairment exists on a nationwide basis. At the OCn level, requesting carriers have the ability to economically self-provision their own loops or are able to obtain unbundled dark fiber and light it at the OCn level. With respect to dark fiber loops,[632] DS3 loops,[633] and DS1 loops,[634] we conclude that requesting carriers are impaired on a location-by-location basis without unbundled access to incumbent LEC loops nationwide. We find, however, that some competitive carriers have been able to deploy certain high-capacity loops to particular customer locations and that some wholesale alternatives also exist at particular customer locations. Because the record does not provide the specific information necessary to identify the precise customer locations

[631] OCn is an optical interface designed to work with a Synchronous Optical Network (SONET). *See* NEWTON'S TELECOM DICTIONARY 528 (18th ed. 2002) (definition of OCn). SONET is an optical interface standard for translating electronic communications signals into photonic signals for transmission across fiber optic facilities. Ideally, SONET transmission systems are laid out in a ring formation to provide redundancy. *See* NEWTON'S TELECOM DICTIONARY 684-85 (18th ed. 2002) (definition of SONET). OCn transmission facilities are deployed as SONET channels having a bandwidth of typically 155.52 Mbps (OC3 or the equivalent capacity of 3 DS3s) and higher, *e.g.*, OC12 (622.08 Mbps); OC48 (2.488 Gbps) etc. *See* NEWTON'S TELECOM DICTIONARY 527 (18th ed. 2002) (definitions of OC3, OC12, and OC48).

[632] In the *UNE Remand Order*, the Commission determined that the loop facility includes dark fiber, stating that both copper and fiber alike represent unused loop capacity therefore dark fiber and extra copper both fall within the loop network element's "facilities, functions, and capabilities." *See UNE Remand Order*, 15 FCC Rcd at 3776, para. 174. The Commission went on to state that there is "no reason to distinguish dark fiber from our general unbundling analysis for loops." *UNE Remand Order*, 15 FCC Rcd at 3785, para. 196. The record contains no basis for departing from this determination.

[633] A DS3 loop is a digital local loop having a total digital signal speed of 44.736 Mbps provided over various transmission media including but not limited to fiber optics, coaxial cable, or radio. DS3 loops can be channelized into 28 DS1 channels. *See infra* note 634. They can also be unchannelized. *See* NEWTON'S TELECOM DICTIONARY 242 (18th ed. 2002) (defining DS3).

[634] A DS1 is a 1.544 Mbps first-level signal in the digital transmission hierarchy. In the time division multiplexing hierarchy of the telephone network, DS1 is the initial level of multiplexing. Traditionally, 24 64 kbps DS0 channels have been multiplexed up to the 1.544 Mbps DS1 rate, with each DS0 channel carrying the digital representation of an analog voice channel. *See* TELCORDIA, INC., NOTES ON THE NETWORK, TELCORDIA TECHNOLOGIES SPECIAL REPORT, SR-2275, Issue 4, Oct. 2000, Glossary at 46 (TELCORDIA NOTES ON THE NETWORK). DS1 loops are provided over various transmission media and combinations of transmission media, including but not limited to two-wire and four-wire copper, fiber optics, or radio. DS1 loops may be channelized typically into up to 24 DS0 channels of 56/64 kbps each, or unchannelized, *i.e.*, providing a continuous bit stream for data (such as frame relay, ATM, or Internet access) or other customer applications. We note that throughout the record in this proceeding parties use the terms DS1 and T1 interchangeably when describing a symmetric digital transmission link having a total 1.544 Mbps digital signal speed. Carriers frequently use a form of DSL service, *i.e.*, High-bit rate DSL (HDSL), both two-wire and four-wire HDSL, as the means for delivering T1 services to customers. We will use DS1 for consistency but note that a DS1 loop and a T1 are equivalent in speed and capacity, both representing the North American standard for a symmetric digital transmission link of 1.544 Mbps. *See* NEWTON'S TELECOM DICTIONARY 242 (18th ed. 2002) (definition of DS1); *id.* at 718 (definition of T1); *see also* ENGINEERING AND OPERATIONS IN THE BELL SYSTEM 198-201 (R.F. Ray Technical ed., 2d ed. 1983) (channelization process for transmission of telecommunications), 369-73 (technical characteristics of DS1 loops), 386-93 (describing T-carrier hierarchy and necessary equipment); TELCORDIA, INC., NOTES ON THE NETWORK, SR-2275, section 7.7 (Dec. 2000) (describing digital data services provided over local loops) at 7-23 (overview of DS hierarchy).

where this deployment has occurred,[635] we delegate to state commissions the authority to make findings of fact within the scope of the deployment triggers we define, to identify on a more granular scale where carriers are not impaired without access to incumbent LEC unbundled high-capacity loops.

2. Background

203. Loops in their simplest form are the transmission facilities between a central office and the customer's premises, *i.e.*, "the last mile" of a carrier's network that enables the end-user customer to receive, for example, a telephone call or a facsimile, as well as to originate similar communications.[636] Loops were included on the initial list of UNEs in the *Local Competition Order*, and even the incumbent LECs agreed that the loop network element must be unbundled pursuant to sections 251(c)(3) and 251(d)(2) of the Act.[637] In the *UNE Remand Order*, the Commission broadened the definition of the loop to include all features, functions, and capabilities of these transmission facilities, including high-capacity loops, dark fiber and all attached electronics (except those used for providing advanced services).[638] The Commission also concluded that obtaining all types of loops from alternative, non-incumbent LEC sources, *i.e.*, third party or self-provisioning, would impede competitive entry by materially raising entry costs; delaying entry; and limiting the scope and timeliness of competitor's offerings.[639] Accordingly, the Commission applied a one-size-fits-all approach to loops, and ordered

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[635] We do, however, determine that the record contains sufficient information to enable us to identify appropriate triggers and related criteria that will, after a more particularized analysis, identify the specific customer locations where certain types of high-capacity loop impairment does not exist. To that end, we develop a mechanism for a further level of granular inquiry by state commissions on a customer location-specific basis where our defined triggers exist. We both delegate authority to and direct state commissions to undertake more granular analyses for dark fiber loops, DS3 loops, and DS1 loops at specific customer locations based upon our defined triggers and related criteria for each of these three types of loops, as described below. These more granular impairment analyses may result in non-impairment determinations for one or more of these three types of high-capacity loop facilities at specified customer locations.

[636] *Local Competition Order*, 11 FCC Rcd at 15691, para. 380.

[637] *Id.* at 15689-90, para. 377; *see also UNE Remand Order*, 15 FCC Rcd at 3771, para. 162 n.292.

[638] *UNE Remand Order*, 15 FCC Rcd at 3772, paras. 166-67 nn.300 & 301; *see also* 47 C.F.R. § 51.319(a)(1), which defined loops as:

> Local loop. The local loop network element is defined as a transmission facility between a distribution frame (or its equivalent) in an incumbent LEC central office and the loop demarcation point at an end-user customer premises, including inside wire owned by the incumbent LEC. The local loop network element includes all features, functions, and capabilities of such transmission facility. Those features, functions, and capabilities include, but are not limited to, dark fiber, attached electronics (except those electronics used for the provision of advanced services, such as Digital Subscriber Line Access Multiplexers), and line conditioning. The local loop includes, but is not limited to, DS1, DS3, fiber, and other high-capacity loops.

[639] *UNE Remand Order*, 15 FCC Rcd at 3772, para. 165.

unbundling of all incumbent LEC loops, from DS0 to OCn and dark fiber, throughout the nation.[640]

204. In the *Triennial Review NPRM*, as part of its overall inquiry about the viability of adopting more granular unbundling rules, the Commission asked whether its impairment analysis should make "service, geographic, capacity or other distinctions to the unbundled loop."[641] In addition, the Commission asked whether there were meaningful distinctions between those loops capable of providing basic services versus those capable of advanced or broadband services.[642] Finally, for high-capacity loops (DS1 and above), the Commission sought comment on whether there was a particular capacity level at which new entrants could economically self-deploy.[643]

3. General Economic Characteristics of Loop Deployment

205. Constructing loop plant is both costly and time consuming, regardless of the type of loop being deployed.[644] Notably, both the Supreme Court and the D.C. Circuit recognized that incumbent LECs may be required to unbundle loop facilities because they are "very expensive to duplicate."[645] Because the distribution portion of the loop serves a specific location,[646] and installing and rewiring that loop is very expensive, most of the costs of constructing loops are sunk costs. Unless that loop is subsequently purchased by another provider wishing to serve that same location, a carrier's ability to recover the cost of that loop is generally constrained except in limited circumstances at certain capacity levels. While fixed costs for constructing loops are quite high, economies of scale in deployment can accrue in constructing loops to locations that are geographically close to a carrier's transport network, assuming other barriers do not preclude

[640] In the *UNE Remand Order*, the Commission did not engage in a capacity-based analysis beyond confirming that high-capacity loops were included in the definition of the loop. The Commission found that because "the wire facility used for transmission of the traffic is indistinguishable from any other copper wire" there was no reason to modify the definition of loops to describe various categories of capacity. *UNE Remand Order*, 15 FCC Rcd at 3777, para. 176. The Commission, however, did separately consider dark fiber local loops, finding the characteristics to be similar to dark fiber transport ("Because fiber is currently a more significant component of interoffice transport than the loop network element, we discuss aspects of dark fiber common to both elements when we discuss interoffice transport below."). *UNE Remand Order*, 15 FCC Rcd at 3785-86, para. 198.

[641] *Triennial Review NPRM*, 16 FCC Rcd at 22804, para. 51.

[642] *Id.* at 22804-05, para. 51.

[643] *Id.*

[644] *See, e.g.*, ALTS *et al.* Comments at 56-57 (stating that fiber deployment costs $100,000-$300,000 per mile underground, $50,000 per mile on poles, and $10,000 to $60,000 through pipelines and adding a building averages $250,000 – and that if the building is more than a mile from the competitive LEC's existing networks , it can cost more that $1,000,000 per mile to construct fiber loops in urban areas); WorldCom Comments at 74-75 (stating that it costs approximately $250,000 for a "building add" and can take six to nine months for a competitive LEC to deploy a new DS1 loop).

[645] *USTA*, 290 F.3d at 426 (citing *Verizon*, 535 U.S. 467 at n.27).

[646] This contrasts with the feeder portion of the loop which may serve multiple locations.

construction.[647] This is especially true in urban areas where the concentration of potential customer locations is very dense.[648] Conversely, because of long loop lengths required to reach more distant, geographically dispersed customers, loops are more expensive to build in rural areas, raising the average cost per loop for equipment, installation, and maintenance.[649] In addition to the cost-related barriers discussed above, competitive carriers deploying loops also face difficulties in acquiring municipal and private rights-of-ways as well as gaining building access from owners of multiunit premises.[650] These additional factors can further affect competitive carriers' ability to sign up customers that need predictability in their business decisions.[651]

206. For fiber-based loops, the cost of construction does not vary significantly by loop capacity, *i.e.*, the per-mile cost of building a DS1 loop does not differ significantly from the cost to construct an OCn loop. The most significant portion of the costs incurred result from deploying the physical fiber infrastructure in the ground, rather than from lighting the fiber optical cable.[652] The ability to recover these construction costs for different loop capacities does, however, vary based on the relevant capacity level of the loop to be provided. Accordingly, a key consideration in our impairment analysis is the loop capacity level at which a competitive entrant can recover its construction costs. Similarly, the ability to overcome other operational barriers to deployment varies based on the capacity of the loop. The record confirms that loop capacity level directly affects the potential revenue stream that can reasonably be obtained to offset construction costs in an economically feasible timeframe.[653] Thus, in addition to the barriers a

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[647] *See, e.g.*, AT&T Comments at 134.

[648] *See, e.g.*, Letter from Douglas A. Dawson, CCG Consulting, (on behalf of 20 "network-based" competitive LECs) to Marlene H. Dortch, Secretary, FCC, CC Docket Nos. 01-338, 96-98, 98-147 at 6-7 (filed July 17, 2002) (submitting survey-based "State Of CLEC Competition") (CCG July 17, 2002 CLEC Survey *Ex Parte* Letter) (demonstrating that for the six major metropolitan areas surveyed the concentration of competitive LEC loop deployment is in the downtown area); Allegiance Comments at 23.

[649] In addition, we note that scale economies may particularly affect small businesses.

[650] *See, e.g.*, AT&T Reply at 174-79 (discussing other barriers linked to the incumbent LECs' historical monopoly that preclude competitive loop deployment independent of cost factors); *see also* NuVox Comments at 74; KMC Duke Aff. at paras. 7-8 (citing proprietary information), Affidavit of Joseph Polito, SNiP LiNK, Inc. (SNiP LiNK Polito Aff.) at paras. 4-7; Sprint Comments at 22; Letter from Ruth Milkman, Counsel for WorldCom, to Marlene H. Dortch, Secretary, FCC, CC Docket Nos. 01-338, 96-98, 98-147 at 2-3 (filed Oct. 25, 2002) (discussing building access barriers) (WorldCom Oct. 25, 2002 Building Access *Ex Parte* Letter); ALTS *et al.* Comments at 56.

[651] *See, e.g.*, AT&T Reply at 175 (describing how it keeps statistics on "breakage," *i.e.*, instances where it initially won a customer but subsequently lost it due to delay in gaining building access to provision the customer); *see also* Sprint Comments at 23 ("Customers will not wait the months required by CLECs to acquire permits, cut streets, install additional equipment, engineer, construct, and test new facilities.").

[652] *See, e.g.*, AT&T Comments at 130; AT&T Reply at 148 (arguing that the cost of loop deployment primarily lies in the structures and rights-of-way, not in the copper or fiber conductor).

[653] *See, e.g.*, WorldCom Comments at 76; Letter from Timothy J. Regan, Senior Vice President – Government Affairs, Corning, to Marlene H. Dortch, Secretary, FCC, CC Docket Nos. 01-338, 96-98, 98-147, Attach. at 32 (filed Nov. 26, 2002) (Corning Nov. 26, 2002 *Ex Parte* Letter); Corning Comments, App. A at 10 (Cambridge Strategic (continued....)

new entrant faces in deploying loops, we consider the revenue potential associated with particular loop capacity,[654] as well as the ability to mitigate construction delays that affect provisioning intervals as keys to determining the degree to which an entrant is impaired in deploying a particular loop capacity.

207. Unlike transport facilities, loops generally do not aggregate multiple customers' traffic. As a result, loop impairment is more closely related to the demands of the individual customer served by such loop. In that regard, customer class distinctions are useful in understanding competitive carriers' decisions and economic abilities regarding deployment of loops typically used to serve customers generally associated with that particular class.

208. Consistent with our impairment framework set out above,[655] our loop analysis considers alternative transmission technologies that are capable of providing transmission to individual customers as alternatives to the incumbent LEC's loop facility. These alternative technologies may use non-wireline platforms to offer other kinds of services to customers, *i.e.*, intermodal competition, such as cable operators providing cable telephony and cable modem service in addition to cable television, or may be used solely to provide telephone and data communications service, such as fixed wireless technologies. As explained above, we will consider whether these alternative technologies permit a requesting carrier to serve the market, either through self-provisioning the necessary transmission capacity to the customer, or by obtaining the transmission capacity on a wholesale basis from other firms deploying that technology.

4. Loop Impairment by Customer Market

209. The record reflects that customers generally associated with the mass market typically use different types of loop facilities than customers generally associated with the enterprise market. We note that very small business customers, like residential customers, typically purchase analog loops, DS0 loops, or loops using xDSL-based technologies. We address the loops provisioned to these customers as part of our mass market analysis. All other business customers – whom we characterize as the enterprise market – typically purchase

(Continued from previous page)

Management Group, *Assessing the Impact of Regulation on Deployment of Fiber to the Home* (2002) (*CSMG Study*)).

[654] In considering potential revenue streams from the various types of loops, it is necessary to factor in the ability to enter into and enforce long-term contracts with customers. We have some evidence that certain states have adopted or are considering regulations that limit the ability of carriers to bind a customer to a long-term local service contract (*i.e.*, longer than one year) and associated termination charges. *See, e.g.*, *Missouri Public Service Commission, Southwestern Bell Telephone Company's Proposed Revisions to PSC Mo. No. 26, Long Distance Message Telecommunications Service Tariff*, Report and Order, Case Nos. TT-2002-227 *et al.* (June 27, 2002) (local service terms in excess of one year will not be permitted); California Public Utilities Commission, *Rules Governing Telecommunications Consumer Protection*, Interim Decision, Rulemaking 00-02-004, Rule 3 (June 6, 2002). To the extent such limitations exist, a carrier's ability to rely on a guaranteed long-term revenue stream from a loop to recover sunk construction costs is adversely affected.

[655] *See supra* Part V.B.

high-capacity loops, such as DS1, DS3, and OCn capacity loops. We address high-capacity loops provisioned to these customers as part of our enterprise market analysis.[656] We first analyze those loops generally provisioned to mass market customers and then analyze the high-capacity loops generally provisioned to enterprise customers.

210. In considering the different customer markets to inform our understanding of competitive carrier loop deployment, we note that our market classifications allow us to conduct our impairment analyses for the various loop types at a more granular level but are not intended to prohibit the use of UNE loops by customers not typically associated with the respective customer market class. For example, business customers typically associated with the enterprise market may require DS0 lines, particularly if they have remote business locations staffed by only a few employees where high-capacity loop facilities are not required.[657] Because a competitive carrier faces the same economic characteristics to serve these customers at their remote locations with a DS0 loop that it faces to serve residential customers served by the same loop type, our customer class distinctions are not intended to preclude a competitive LEC from obtaining an unbundled DS0 loop to serve these business customers. Similarly, a competitive LEC faces the same economic considerations in provisioning a DS1 loop to a large business customer typically associated with the enterprise market that it faces in provisioning that same loop type to a very small business or residential customer typically associated with the mass market. Thus, while we adopt loop unbundling rules specific to each loop type, our unbundling obligations and limitations for such loops do not vary based on the customer to be served.

a. Mass Market Loops

(i) Introduction

211. We conclude that requesting carriers seeking to serve the mass market face varying levels of impairment without unbundled access to the transmission path between the central office and the customer premises depending upon whether the loop used to complete this path consists entirely of copper, or consists of a hybrid of fiber and copper cables, and whether a requesting carrier seeks to offer narrowband or broadband services or both. In fact, for those loops consisting of fiber from the central office to the customer premises, *i.e.*, FTTH loops, we find no impairment on a national basis.[658] Based on our review of the record, which covers the

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[656] We note that through the application of our new impairment standard to high-capacity loops, including impairment analyses based on each particular loop capacity level, we have considered evidence raised by joint petitioners in the High-Capacity Loop and Transport Petition. *See, e.g.*, BellSouth, SBC, and Verizon, Joint Petition for Elimination of Mandatory Unbundling of High-Capacity Loops and Dedicated Transport, CC Docket No. 96-98 (filed Apr. 5, 2001) (High-Capacity Loop and Transport Petition). Because we base our unbundling obligations with respect to high-capacity loops on our findings of impairment and non-impairment according to our new impairment standard, we dismiss the High-Capacity Loop and Transport Petition as moot.

[657] *See, e.g.*, WorldCom Comments at 14.

[658] As discussed more fully below, there is an unbundling obligation for narrowband voice services in one FTTH loop deployment scenario, *i.e.*, overbuild deployment in which an incumbent LEC constructs fiber transmission facilities parallel to or in replacement of its existing copper loop plant. *See infra* Part VI.A.4.a.(v)(b).

current deployment of local loops, technological advancements in incumbent LEC outside plant, and the economic barriers and revenue opportunities facing competitive providers today with regard to loops, we conclude that incumbent LECs must provide, as UNEs pursuant to section 251(c)(3), copper loops, including copper loops conditioned to provide xDSL service. As discussed below, we also require incumbent LECs to provide competitive LECs the ability to line split, which allows two competitive LECs to split the loop so that one carrier can provide narrowband service and the other can provide broadband service.

212. As for our unbundling rules related to broadband, we recognize there are special considerations in crafting unbundling rules for loops used to provide broadband service. Broadband deployment is a critical domestic policy objective that transcends the realm of communications. While the development of broadband infrastructure is a fundamental and integral step in ensuring that consumers are able to fully reap the benefits of the information age, even more broadly, it is vital to the long-term growth of our economy as well as our country's continued preeminence as the global leader in information and telecommunications technologies. The Commission's primary regulatory challenge for broadband is to determine how we can help drive the enormous infrastructure investment required to turn the broadband promise into a reality. This challenge is squarely raised in our consideration of unbundling rules for last-mile facilities.

213. With respect to unbundling obligations for facilities used to provide broadband service, we are charged with determining the potential impact of our rules on advanced services, including those supported by broadband deployment and infrastructure investment, as directed by section 706 of the 1996 Act.[659] For this reason, we craft unbundling rules that provide the right incentives for all carriers, including incumbent LECs, to invest in broadband facilities. Thus, we decline to require unbundling on a national basis of the features, functions, and capabilities of the packetized fiber facilities of incumbent LEC hybrid loops. We require, however, incumbent LECs to provide unbundled access to the time division multiplexing (TDM) features, functions, and capabilities of their hybrid loops on a national basis. Subject to a three-year transition period explained below, we also decline to require incumbent LECs to continue to unbundle the high frequency portion of the loop. Our rules strike the appropriate statutorily required balance between ensuring competitive access and maintaining incentives to invest in next-generation networks.

(ii) Mass Market Loop Types

214. At its most basic level, a local loop that serves the mass market consists of a transmission medium, which almost always includes copper wires of various gauges. The loop may include additional components (*e.g.*, load coils, bridge taps, repeaters, multiplexing equipment) that are usually intended to facilitate the provision of narrowband voice service.

215. As a general matter, incumbent LECs use two local exchange network configurations to connect customers to their switching systems. First, carriers connect customers

[659] 47 U.S.C. § 157 nt.

directly to a central office via a loop dedicated solely to a particular customer. In this configuration, the local loop consists of a single cable pair – for copper loops, this is often referred to as "home-run copper."[660] For the mass market, carriers can use copper loops to provide both narrowband voice service and broadband xDSL services.[661] Providing broadband service requires the use of special equipment, such as DSLAMs[662] located in the central office (or remote terminals in the incumbent LEC's outside plant) and xDSL modems or other equipment at the customer's premises.

216. Second, incumbent LECs deploy "feeder plant" to a centralized location (referred to as a "remote terminal") where the carrier aggregates "distribution plant," *i.e.*, copper cable pairs that are used to serve individual customers. In this second configuration, then, the local loop portion of the network consists of two parts, *i.e.*, feeder plant and distribution plant.[663] The feeder plant consists of a large number of high-capacity cable pairs to accommodate a large volume of telecommunications traffic. In recent years, carriers have started deploying fiber optic cable in the feeder plant to handle more efficiently the increasing volume of traffic (although some legacy technologies continue to require use of copper feeder plant).[664] By contrast, the distribution plant consists generally of many copper cable pairs, *i.e.*, one direct connection or transmission path to each customer premises.

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660 *See, e.g.*, Letter from Stephen C. Gray, President, McLeodUSA, to William Maher, Chief, Wireline Competition Bureau, FCC, CC Docket Nos. 96-98, 98-147, 01-338, 02-33 at 8 (filed Dec. 18, 2002) (McLeodUSA Dec. 18, 2002 *Ex Parte* Letter). McLeod states that customers are served by "a connected-through copper loop, with a direct analog electrical connection between the customer's network interface and the central office main distribution frame" or one of two types of DLC systems.

661 Subject to certain distance limitations, a carrier can provide various types of xDSL service over a copper loop with appropriate conditioning. We use the term "xDSL" to refer to DSL as a generic transmission technology, as opposed to a specific type of DSL such as ADSL (asymmetric digital subscriber line), HDSL (high-speed digital subscriber line), UDSL (universal digital subscriber line), VDSL (very-high speed digital subscriber line), and RADSL (rate-adaptive digital subscriber line).

662 DSLAMs send the customer's voice traffic to the public, circuit-switched telephone network and the customer's data traffic (combined with that of other xDSL users) to a packet-switched data network. *See Line Sharing Order*, 14 FCC Rcd at 20920, para. 9; *see also* Walter Goralski, ADSL AND DSL TECHNOLOGIES at 252-60 (describing DSLAMs).

663 TELCORDIA NOTES ON THE NETWORK at § 12 (describing LEC distribution networks); AT&T Comments at 184-86; AT&T Reply at 149. We recognize that carriers may categorize their outside plant facilities into three sections, *i.e.*, feeder, distribution, and customer drops. *See* AT&T Reply at 149. For the purposes of our unbundling analysis, we consider customer drops to be part of an incumbent LEC's distribution plant.

664 WorldCom Comments, Joint Declaration of Tom Stumbaugh and David Reilly (WorldCom Stumbaugh/Reilly Joint Decl.) at paras. 8-10; Letter from Leonard G. Ray, Government Relations Committee Chairman, FTTH Council, to Marlene H. Dortch, Secretary, FCC, CC Docket No. 01-338 at 10 (filed Jan. 8, 2003) (FTTH Council Jan. 8, 2003 FTTH Deployment *Ex Parte* Letter) (noting that fiber feeder optimized the network for voice transmission); Letter from Kimberly Scardino, Senior Counsel, WorldCom, to Marlene H. Dortch, Secretary, FCC, CC Docket Nos. 96-98, 98-147, 01-338 at 2 (filed Dec. 12, 2002) (WorldCom Dec. 12, 2002 Next-Generation Networks *Ex Parte* Letter).

217. Carriers use digital line carrier (DLC) systems to aggregate the many copper loops that terminate at a remote terminal location,[665] multiplex such signals onto a fiber or copper feeder loop facility, and transport them to the carrier's central office.[666] These DLC systems may be integrated directly to the carrier's switch (*i.e.*, Integrated DLC systems) or not (*i.e.*, Universal DLC systems).[667] Through the use of feeder loop plant and DLC systems, carriers can reduce the costs of constructing, deploying, and maintaining their outside plant.[668]

218. Although originally deployed to manage voice networks, carriers now use DLC systems to provide both voice and data services. Technological improvements have enabled carriers to use DLC systems to deliver broadband services (*e.g.*, ADSL) in addition to narrowband services.[669] In particular, manufacturers have developed "line cards" that can be

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[665] Although there are different varieties of DLC systems, they typically consist of cross-connect and multiplexing equipment that are housed in remote terminals, which are intended to house a limited amount of equipment. There are three basic types of remote terminals: (1) huts, which are above-ground structures with environmental control capabilities; (2) controlled environmental vaults (CEVs), which are below-ground structures that are accessed through manholes and contain environmental control capabilities; and (3) cabinets, which are above-ground structures that are typically designed as an integrated system. *See Ameritech Corp., Transferor, and SBC Communications, Inc., Transferee, For Consent to Transfer Control of Corporations Holding Commission Licenses and Lines Pursuant to Sections 214 and 310(d) of the Communications Act and Parts 5, 22, 24, 25, 63, 90, 95, and 101 of the Commission's Rules*, CC Docket No. 98-141, Second Memorandum Opinion and Order, 15 FCC Rcd 17521, 17539, para. 34 n.94 (2000) (*Pronto Modification Order*) (describing remote terminals).

[666] Carriers historically deployed local loops on a one-for-one basis, *i.e.*, one direct copper cable pair connecting a customer to the central office. WorldCom Stumbaugh/Reilly Decl. at para. 7. Carriers started using DLC for feeder pair relief in urban areas. *Id.* at para. 9.

[667] Universal DLC systems consist of a "central office terminal" and a "remote terminal," *i.e.*, a DLC system in the carrier's central office terminal mirrors the deployment at the remote terminal. Notes on the Network at § 12.6. By contrast, an Integrated DLC system does not require the use of a central office terminal because the DLC system is integrated into the carrier's switch (thus, the naming convention). *Id.* § 12.7; *see also* Letter from David R. Conn, Deputy General Counsel, McLeodUSA, to Marlene H. Dortch, Secretary, FCC, CC Docket Nos. 96-98, 98-147, 01-338, 02-33 at 8 (filed Nov. 15, 2002) (McLeodUSA Nov. 15, 2002 DLC systems *Ex Parte* Letter); McLeodUSA Dec. 18, 2002 *Ex Parte* Letter at 8; *see also* TELCORDIA NOTES ON THE NETWORK at 2-2 to 2-5 (describing DLC systems).

[668] TELCORDIA NOTES ON THE NETWORK at § 12.6-12.7.

[669] WorldCom Stumbaugh/Reilly Decl. at paras. 9-11 (describing technological developments in DLC systems); AT&T Reply at 152-53 (noting that incumbent LECs can upgrade existing DLC systems by replacing the line cards installed in such systems). In their original form, carriers connected DLC systems to copper transmission facilities that comprised the feeder loop plant. The DLC system would convert analog signals transmitted from the customer's premises to digital signals suitable for transmission over the carrier's network. By the late 1990s, carriers were purchasing "Next Generation Digital Loop Carrier" (NGDLC) systems, which were designed for use with fiber optic cable. In addition to the fiber capability, NGDLC systems have more flexible and remote configuration capabilities than their predecessors and, depending on the manufacturer, they may contain additional features like the ability to provide broadband services. *See* Walter Goralski, ADSL AND DSL TECHNOLOGIES, 273 (1998); NEWTON'S TELECOM DICTIONARY 510 (18th ed. 2002) (defining NGDLC systems as "DLC [that] can receive and aggregate large amounts of bandwidth (higher than T-1)); *see also* Letter from Jim Lamourex, Senior Counsel, SBC, to Marlene H. Dortch, Secretary, FCC, CC Docket No. 01-338 at 1-2 (filed Dec. 12, 2002) (SBC Dec. 12, 2002 *Ex* (continued....)

installed (along with other components) into a DLC system to provide broadband services, or a combination of broadband and narrowband service, to customers served by DLC systems.[670] By deploying this DSLAM functionality in a DLC system, carriers can serve customers whose copper loop facility would otherwise be too long to support the provision of xDSL service.[671] To do so has generally required incumbent LECs deploying this technology to segregate and minimize the traffic in a different way – that is, carriers dedicate a segment of their feeder plant to serving narrowband voice traffic and another segment to serving broadband traffic.[672] The feeder loop plant transporting voice traffic connects to the carrier's switch in its central office (often through intermediate electronics in the central office).[673] By contrast, the feeder loop plant transporting the broadband signal terminates at a packet switch (usually referred to as an "optical concentration device" or OCD) also located in the carrier's central office.[674]

219. In recent years, carriers have started deploying FTTH – that is, using fiber optic cable to replace traditional copper loops. Whereas the use of fiber feeder plant and DLC systems is an augmentation of the existing network and relies on the continued use of copper (albeit to a lesser degree) in the loop plant, FTTH is essentially a broad replacement of the existing loop plant. The use of fiber optic cable requires the deployment of network equipment with different features and capabilities from comparable equipment used for copper cable. As noted above, deployment of FTTH loops – that is, a transmission path consisting entirely of fiber optic cable and associated equipment between the customer's premises and the central office – remains in its infancy.

220. Carriers use different technologies to transport telecommunications over their networks. As digital transmission technologies replaced analog systems, carriers started using

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Parte Letter) (stating that SBC "considers DLC that provides both time slot interchanger and xDSL functionality as NGDLC.").

670 Alcatel Comments at 26; Catena *Comments in* CC Dkt. Nos. 02-33, 95-20, and 98-10, at 5 n.7 (describing Catena's DLC system upgrade); WorldCom Stumbaugh/Reilly Decl. at para. 13; Alcatel Reply at 6; *see Pronto Modification Order,* 15 FCC Rcd at 17523-31, paras. 4-19 (describing SBC's DLC network architecture used to provide broadband service).

671 WorldCom Stumbaugh/Reilly Decl. at para. 13.

672 *Id.* at para. 15; Letter from W. Scott Randolph, Director – Federal Regulatory Affairs, Verizon, to Marlene H. Dortch, Secretary, FCC, CC Docket Nos. 01-337, 01-338, 96-98, 98-147, 02-33 at 10 (filed Sept. 30, 2002) (Verizon Sept. 30, 2002 *Ex Parte* Letter) (submitting diagram showing the use of two parallel feeder loops to provide broadband service through DLC systems).

673 Alcatel Reply at 6 (explaining that voice and data traffic are segregated in the incumbent LEC's central office).

674 AT&T Comments at 187-89; Covad Comments at 65; WorldCom Comments at 108; WorldCom Stumbaugh/Reilly Decl. at para. 13; Letter from Jonathan J. Boynton, Associate Director – Federal Regulatory, SBC, to Marlene H. Dortch, Secretary, FCC, CC Docket No. 01-338 at 5 (filed Jan. 15, 2003) (SBC Jan. 15, 2003 *Ex Parte* Letter); Verizon Sept. 30, 2002 *Ex Parte* Letter at 10. Several parties explain that an OCD is equivalent to a main distribution frame. *See, e.g.,* Covad Comments at 65 (noting that the OCD demultiplexes data transmissions from the fiber feeder and distributes the signal to its next destination).

TDM to combine multiple transmission paths onto a single cable.[675] TDM provides a transmission path by dividing a circuit into time slots and providing a dedicated time slot to an end user for the duration of the call. More recently, carriers have started using packet-switched technologies (*e.g.*, ATM or frame relay) to combine different types of traffic over shared facilities.[676] By using packet-switched technology, carriers can transmit voice, fax, data, video, and other over a single transmission path at the same time.

221. In light of the foregoing, we find that our unbundling rules for local loops serving the mass market must account for these different loop architectures. Therefore, we craft unbundling rules specific to each different loop type. First, we address our unbundling rules for loops consisting of copper pairs of various gauges and associated electronics (*e.g.*, load coils, repeaters, multiplexers), which we refer to as copper loops. Second, we address our unbundling rules for loops consisting of DLC systems that are fed by fiber optic cable, which we refer to as "hybrid loops." Finally, we address our unbundling rules for loops consisting entirely of fiber optic cable, which we refer to as FTTH loops.

(iii) Evidence of Loop Deployment

222. The record indicates that deployment of alternative local loop facilities for the purposes of providing telecommunications services to the mass market has been minimal. The record also indicates, however, that there is evidence that other types of network facilities deployed primarily for other purposes (*e.g.*, cable television systems, satellite technologies) can and are increasingly being modified to support the delivery of narrowband and broadband services, particularly telephony and high-speed Internet access services, to the mass market. As a general matter, while these systems are increasingly being used for the delivery of retail narrowband and broadband services (*e.g.*, telephony and high-speed Internet access services), the record indicates that such systems are not being used currently to provide wholesale local loop offerings that might substitute for access to incumbent LECs' loop facilities.

223. The factual record consists of three parts. First, several parties submitted detailed studies describing local loop deployment and conditions surrounding competitive access to local loops.[677] Second, many parties described their network operations, experiences, and future

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675 *See, e.g.*, Walter Goralski, ADSL AND DSL TECHNOLOGIES 77-98 (1998) (describing differences between packet-switched and circuit-switched networks); Walter Goralski, SONET 99-108 (2d. ed. 2000) (describing T-carrier and different multiplexing techniques).

676 For example, some carriers use packet-switching technology as the building blocks of their networks. *See, e.g.*, NewSouth Comments at 11-13 (describing use of packet-switching technology in its network).

677 *See, e.g.*, BOC UNE Fact Report 2002; Letter from Dee May, Assistant Vice President, Verizon, to Marlene H. Dortch, Secretary, FCC, CC Docket No. 01-338 (filed Oct. 23, 2002) (submitting *UNE Rebuttal Report 2002* commissioned by the BOCs); CCG July 17, 2002 CLEC Survey *Ex Parte* Letter. These studies in turn rely on additional evidence to support their conclusions, such as briefings to the investment community, analyst reports, newspaper articles, and trade industry reports. Some commenters argue that unbundling requirements decrease incumbent LECs' financial rewards from selling future broadband services by increasing the risk of investment, thereby decreasing the amount of investment incumbent LECs will make in broadband infrastructure. *See, e.g.*, Corning Comments at 5-9; HTBC Comments at 28-33, App. A (submitting John Haring and Jeffrey H. Rohlfs, *The*
(continued....)

deployment plans in comments and *ex parte* letters.[678] Finally, the Commission staff has published reports arising from its monitoring of the deployment of advanced telecommunications capability and the development of local competition throughout the country.[679]

224. Relying on these sources, the record shows that incumbent LECs continue to control the vast majority of voice-grade local loops throughout the nation. The Commission staff's recent *Local Telephone Competition December 2002 Report* noted that incumbent LECs served approximately 167.5 million switched access lines, or approximately 88.6 percent of the national market.[680] The record reflects a significant growth in the amount of fiber incumbent LECs are deploying in the local loop, with most of this deployment occurring in the feeder plant rather than the distribution plant. According to some estimates, upwards of 30 percent of incumbent LEC access lines are now supported by the use of mixed fiber-copper loop facilities.[681]

(a) Self-Deployment

225. The record reflects that competitive LECs have not self-deployed alternate copper local loops to provide telecommunications services (or packages of telecommunications and

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Disincentives for ILEC Broadband Deployment Afforded by the FCC's Unbundling Policies (July 16, 2002)); Verizon Comments at 27-32 (submitting Declaration of Alfred E. Kahn and Timothy J. Tardiff); Letter from Matthew J. Tanielian, Vice President – Governmental Relations, ITI – Information Technology Industry Council, to Marlene H. Dortch, Secretary, FCC, CC Docket No. 01-338 (filed Apr. 22, 2002) (HTBC Apr. 22, 2002 *Ex Parte* Letter); Letter from W. W. Jordan, Vice President – Federal Regulatory, BellSouth, to Marlene H. Dortch, Secretary, FCC, CC Docket No. 01-338 (filed Oct. 15, 2002) (BellSouth Oct. 15, 2002 *Ex Parte* Letter). By contrast, other commenters argue that unbundling requirements do not decrease the incentives for BOCs to provide broadband services over fiber-fed loops. *See, e.g.*, AT&T Willig Decl. at paras. 15, 175; Letter From Jason D. Oxman, Vice President and Assistant General Counsel, Covad, to Marlene H. Dortch, Secretary, FCC, CC Docket Nos. 01-338, 96-98, 98-147 (filed Nov. 22, 2002) (Covad Nov. 22, 2002 *Ex Parte* Letter); Covad Murray Reply Decl. at paras. 99-113; Letter from C. Frederick Beckner III, Counsel for AT&T, to Marlene H. Dortch, Secretary, FCC, CC Docket Nos. 01-338, 96-98, 98-147 at 4 (filed Dec. 6, 2002) (AT&T Dec. 6, 2002 *Ex Parte* Letter).

678 *See, e.g.*, ACS Reply at 5-6 (describing market conditions in Alaska); BellSouth Rely, Reply Declaration of Prof. Robert G. Harris (BellSouth Harris Reply Decl.) at paras. 11-21 (submitting projections and market data related to broadband services); New York State Attorney General Reply at 4, 9-11 (describing competitive entry in New York); Letter from Rebecca H. Sommi, Vice President Operations Support, Broadview Networks, to Marlene H. Dortch, Secretary, FCC, CC Docket Nos. 01-338, 96-98, 98-147 (filed Oct. 16, 2002) (Broadview Oct. 16, 2002 *Ex Parte* Letter); Letter from Jason Oxman, Vice President and Assistant General Counsel, Covad, to William Maher, Chief, Wireline Competition Bureau, FCC, CC Docket No. 01-338 (filed Oct. 15, 2002) (Covad Oct. 15, 2002 Broadband Deployment *Ex Parte* Letter); Letter from Thomas Jones, Counsel for Allegiance, to William Maher, Chief, Wireline Competition Bureau, FCC, CC Docket Nos. 01-338, 96-98, 98-147 at 3-4 (filed Dec. 12, 2002) (Allegiance Dec. 12, 2002 *Ex Parte* Letter).

679 *See Seventh Wireless Report 2002*; *Third Section 706 Report 2002*, 17 FCC Rcd at 2844.

680 *Local Telephone Competition December 2002 Report* at Table 1.

681 Covad Comments at 55 n.105 (citing *Trends in Telephone Service May 2002 Report* at Table 18.3 (21.7% of working telecommunications channels are fiber)); AT&T Reply at 80 (citing *Trends in Telephone Service May 2002 Report* at Table 18.3 (32.5% of working telecommunications channels are fiber)).

other services) to the mass market. Moreover, the record indicates that, in those limited cases where competitors are deploying alternative loop facilities, competitive LECs are using fiber, although such deployment continues to be targeted primarily to serving the enterprise market rather than the mass market. We recognize, however, that potential self-deployment could use existing wireline telephony technologies and facilities or could employ other approaches that bear little or no resemblance to the current network architecture of the incumbent LECs.

226. No party seriously asserts that competitive LECs are self-deploying copper loops to provide telecommunications services to the mass market. Indeed, in the BOC UNE Fact Report 2002, the BOCs provide no evidence that competitive LECs have made any progress towards replicating the incumbent LECs' embedded base of voice-grade copper local loops.[682] Likewise, no competitive LEC claims to have made, let alone attempted to make, such progress. Competitive LECs generally argue that building new local loops to serve the mass market would be prohibitively expensive.[683] Considered as a whole, the record indicates that competitive LECs rely primarily on unbundled local loops to serve the mass market on a nationwide basis.[684]

227. The record demonstrates that current deployment of FTTH for providing telecommunications services to the mass market is still in its infancy.[685] Corning, for example, presents evidence of FTTH deployment to approximately 26,000 homes and asserts that competitive LECs account for 77 percent of this FTTH deployment to date.[686] The record shows further that some competitive LECs are self-deploying fiber transmission facilities primarily to serve business customers in downtown locations.[687] The record also shows that competitive LECs are self-deploying fiber transmission facilities to the mass market in certain circumstances. In particular, competitive LECs are competing in so-called "greenfield" markets, which require entirely new construction of local loops (in addition to the deployment of the necessary switching and other network equipment) to serve new residential communities.[688] According to at least one

682 In their UNE Fact Report, the BOCs rely primarily on intermodal sources to argue that viable alternatives exist to incumbent LEC local loop facilities. We address these arguments below.

683 *See* Covad Comments at 16-18; AT&T Comments at 132.

684 CompTel Reply at 24 (citing statistics compiled by Commission staff showing that competitive LECs serve 23% of the access lines in New York, 14% of the access lines in Texas, and 13% of the access lines in Illinois). Incumbent LECs assert that competitive LECs have deployed on a national basis somewhere between 16 and 23 million loops based on their interpretation of data in E911 databases. *See* BOC UNE Fact Report 2002 at I-5, II-4, and A-2. We note that CompTel's data, among other competitive LECs', are generally closer to those published by the Commission in the *Local Telephone Competition December 2002 Report*.

685 AT&T Reply at 74.

686 Corning Reply at 12 (citing *CSMG Study* at 51). In other studies submitted on the record, Corning estimates that competitive LECs account for 68% of the FTTH deployment nationwide. *See* Corning Nov. 20, 2002 *Ex Parte* Letter at 7.

687 CCG July 17, 2002 CLEC Survey *Ex Parte* Letter at 6 (noting that five competitive LECs are deploying fiber in Chicago and four competitive LECs are deploying fiber in Boston and Portland).

688 BOC UNE Fact Report 2002 at IV-16.

study, non-incumbent LEC providers (*i.e.*, competitive LECs and municipalities) have deployed 90 percent of current FTTH.[689] We also note that the Commission staff's *High Speed Services December 2002 Report* found that parties *other than* incumbent LECs deployed 92 percent of FTTH and fixed wireless service lines.[690]

(b) Intermodal Loops

228. The record presents some evidence that intermodal platforms increasingly support the provision of narrowband and broadband services to the mass market. In particular, the record indicates that cable and wireless technologies are currently being used, and will likely increasingly be used, to provide loop substitutes to support services that compete with incumbent local services.[691]

229. Cable companies have widely deployed local broadband service in the form of high-speed Internet access offered via cable modem service. As of June 2002, cable companies provided more than 9.1 million high speed lines for Internet access to consumers nationwide and the service is available to more than 70 million homes in the nation.[692] Some cable companies also have augmented their networks to enable the provision of two-way voice telephony services.[693] For such services, the cable infrastructure serves as a replacement for loops. At this time, however, deployment of voice telephony by cable companies has been substantially exceeded by the deployment of cable modem service.[694] In their *UNE Fact Report*, the BOCs

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[689] FTTH Council Second Reply at 2.

[690] *High Speed Services December 2002 Report* at Table 5. In that report, staff found that, as of June 2002, carriers provided 6,120 fiber lines capable of supporting data transmissions over 200 kbps in at least one direction. *See id.* at Table 3.

[691] BOC UNE Fact Report 2002 at IV-8 to IV-14. Current estimates are that only 1.7% of U.S. households rely on other technologies to replace their traditional wireline voice service. Allegiance Reply at 35 n.38.

[692] Cable companies provided 9,172,895 high speed lines for Internet access as of June 30, 2002. *High Speed Services December 2002 Report* at Table 1. *See* Letter from Jason D. Oxman, Vice President and Assistant General Counsel, Covad, to Marlene H. Dortch, Secretary, FCC, CC Docket No. 01-338, Declaration of Stephen Siwek and Su Sun (Covad Siwek/Sun Decl.) at paras. 58-59 (filed Nov. 20, 2002) (Covad Nov. 20, 2002 *Ex Parte Letter*). Some parties estimate that cable modem service is available to two-thirds or more of the homes in the nation. BOC UNE Fact Report 2002 at IV-12 n.59 (estimating that cable modem service is available to 70-75 million homes).

[693] BellSouth Comments at 64 (noting cable companies upgraded to provide voice in Atlanta, Jacksonville, Miami and Louisville); Letter from Florence M. Grasso, Covad, to Marlene M. Dortch, Secretary, FCC, Docket Nos. 01-338, 96-98, 98-147 at 6 (filed Apr. 19, 2002) (Covad Apr. 19, 2002 *Ex Parte* Letter) (noting cable companies spent $55 billion to upgrade their facilities).

[694] As of June 2001, only 1% of all local access lines terminated over coaxial cable facilities. For example, AT&T notes that UNE-P providers in New York alone have as many customers as cable-provided telephony does on a nationwide basis. AT&T Reply at 26.

note that 1.5 million homes[695] subscribe to cable telephony on a nationwide basis. The record indicates that circuit-switched cable telephony has been deployed in portions of 20 states and is now available to about 10 million households in the United States, or about 9.6 percent of the total households in the nation.[696] Because companies originally deployed cable television systems for the provision of a one-way mass media service, retrofitting cable infrastructure to support cable telephony and broadband services requires substantial investment and modification.[697] For those cable operators that have not already augmented their networks to offer cable telephony, which encompasses the majority of the cable networks currently in operation, significant technical and operational issues must still be resolved.[698] Thus, it is difficult to predict at what point cable telephony will be deployed on a more widespread and ubiquitous basis. In addition, the record reflects that a number of cable operators are delaying their deployment of voice telephony until they are able to deploy such services over a packet-switched platform.

230. The record also shows that narrowband local services are widely available through CMRS providers. As discussed in Part IV above, one study estimates that 64.3 million households (*i.e.*, 61 percent of all U.S. households) use wireless phones.[699] The record shows that

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[695] BOC UNE Fact Report 2002 at IV-10. There are approximately 108.3 million households in the nation. *See* Industry Analysis and Technology Division, Wireline Competition Bureau, *Telephone Subscribership in the United States* (Nov. 8, 2002) at Table 1 (*Telephone Subscribership November 2002 Report*).

[696] BOC UNE Fact Report 2002 at II-11, IV-10 (noting that Cox has the capability to offer cable telephony to "75 to 95 percent" of the consumers in Rhode Island).

[697] WorldCom Comments at 35-36, Attach. A at 23, 25-27 (Richard A. Chandler, A. Daniel Kelley, David M. Nugent, *The Technology and Economics of Cross-Platform Competition in Local Telecommunications Markets* (Apr. 4, 2002) (HAI Report)). Although precise numbers are difficult to assemble because much of the necessary information is not publicly available, there is substantial evidence in our record concerning actual and projected completion of cable plant upgrades necessary to provide voice and data services. For example, according to a Yankee Group Report, at the end of 2000, 50% of United States households had cable modem service available and this percentage was predicted to exceed 80% by the end of 2005. BellSouth Comments at 39 (citing *Broadband Access Technology: Whose Number is Up?*, Yankee Group Report (Sept. 19, 2001)). BellSouth offered more recent numbers: at the end of 2001, 70% of United States households had cable modem service available. BellSouth Reply at 48 (citing BellSouth Harris Reply Decl. at para. 9).

[698] For example, potential cable telephony providers must determine how to provide power to the consumer premises equipment (wireline systems utilizing copper facilities already provide power through the same network telephony service is provided, thus ensuring continuous access to telecommunications in the event of power outages) and ensure accurate 911 service. Allegiance Reply at 33. Allegiance notes that incumbent LEC comments rely not on current deployment but on predictions such as whether Comcast will deploy telephony after merger with AT&T and future deployment of IP telephony over cable networks.

[699] *See* BOC UNE Fact Report 2002 at IV-12 (citing *Implementation of Section 6002(B) of the Omnibus Budget Reconciliation Act of 1993*, Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Sixth Report, 16 FCC Rcd 13350, 13381 n.211 (2001) (*Sixth Wireless Report 2001*). Wireless phones are now a mass market consumer device used by some 45% of the United States. *Seventh CMRS Report* at 31. One study estimates that 64.3 million households (*i.e.*, 61% of all U.S. households) use wireless phones. *Id.* By contrast, 103.4 million households (*i.e.*, 95.5% of all U.S. households) own and use wireline (continued....)

CMRS, while continuing to be primarily a complementary technology to wireline narrowband service, is growing as a substitute to wireline narrowband service with about three to five percent of CMRS subscribers using their service as a replacement for *primary* fixed voice wireline service.[700] While this percentage is small, it continues to show increasing growth. Indeed, the Commission recently relied on wireless substitution to support the Track A findings in two section 271 proceedings where residential customers in New Mexico and Nevada had replaced their landline phones with wireless ones.[701] In addition, the record demonstrates that, although promising, wireless CMRS connections in general do not yet equal traditional landline local loops in their quality, their ability to handle data traffic, and their ubiquity.[702] Finally, the record indicates that CMRS is not yet capable of providing broadband services to the mass market – although a growing number of wireless carriers make available Internet access, such access is generally limited to transmissions of 25 to 66 kbps.[703]

231. The record indicates that, at present, fixed wireless and satellite services remain nascent technologies, with limited availability, when used to provide broadband services to the mass market. Although current satellite services may be available in all 50 states, their transmission capabilities remain limited and their mass market services have few subscribers.[704] For example, combined, satellite and fixed wireless provide broadband services to approximately 200,000 customers nationwide.[705] In addition, recent financial difficulties of fixed wireless

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telephones. *Telephone Subscribership November 2002 Report* at Table 1. BellSouth Comments at 64 (arguing wireless is a substitute for wireline).

700 *See Seventh CMRS Report* at 32 n.208; *see also* BOC UNE Fact Report 2002 at IV-12 (citing *Sixth Wireless Report 2001*, 16 FCC Rcd at 13381 n.211).

701 *See Application by SBC Communications Inc., Nevada Bell Telephone Company, and Southwestern Bell Communications Services, Inc., for Authorization to Provide In-Region, InterLATA Services in Nevada,* WC Docket No. 03-10, Memorandum Opinion and Order, 18 FCC Rcd 7196, 7206, para. 18 (2003) (*SBC Nevada 271 Order*); *Application by Qwest Communications International, Inc. for Authorization to Provide In-Region, InterLATA Services in New Mexico, Oregon and South Dakota,* WC Docket No. 03-11, Memorandum Opinion and Order, 18 FCC Rcd 7325, 7336 n.53 (2003) (*Qwest New Mexico 271 Order*); *see also In the Matter of Application of BellSouth Corporation, BellSouth Telecommunications, Inc., and BellSouth Long Distance, Inc., for Provision of In-Region, Interlata Services in Louisiana,* CC Docket No. 98-121, Memorandum Opinion and Order, 13 FCC Rcd 20599, 20606, 20622-23, paras. 11, 29-33 (1998) (*BellSouth Louisiana II 271 Order*) (finding that PCS can be a substitute for wireline service).

702 BellSouth Comments at 41 (stating that wireless is "[not] very effective in transmitting large amount of data at high speed."). AT&T points out, for example, that wireless service is engineered to provide only roughly 70% call completion rate while wireline call completion rates exceed 99%. AT&T Reply at 25; *see also id.* at 162-63.

703 *Seventh CMRS Report* at 53-54. By the end of 2001, approximately eight to ten million people accessed the Internet through their wireless telephones, up from 2 to 2.5 million the year before. *Id.* at 53.

704 *See, e.g.,* WorldCom Comments at 4, 47, Attach. A at 76-78.

705 *See High Speed Services December 2002 Report* at Table 3.

carriers suggest the potential to use such services as substitutes for local loops used to serve the mass market is limited, at least for the short term.[706]

232. Finally, we note that other technologies that can substitute for loops in providing narrowband and broadband service are currently under development. For example, some companies are experimenting with delivering narrowband voice service via power lines.[707] Such technologies have not been deployed beyond an experimental basis (*e.g.*, technical trials) at this time.

(c) Third-Party Offerings

233. The record indicates that no third parties are effectively offering, on a wholesale basis, alternative local loops capable of providing narrowband or broadband transmission capabilities to the mass market.[708] This includes intermodal platforms such as cable and satellite that have no statutory or regulatory obligation comparable to the unbundling requirements of section 251(c).[709] We note that, in their various reports and other submissions, the incumbent LECs have not demonstrated that third parties are offering alternate local loop transmission on a wholesale basis.

(iv) Unbundling Analysis

234. We engage in a balancing test in determining our unbundling requirements for mass market local loops. We recognize, of course, that impairment remains our statutory touchstone. We do not rely exclusively, however, on an impairment analysis to make our unbundling determination. We retain the flexibility under our section 251(d)(2) "at a minimum" authority to consider other factors. We use this flexibility sparingly. However, we believe that the goal of swift and ubiquitous broadband deployment is so important to the United States that we consider the statutory goals outlined in section 706 and how they relate to broadband as additional factors when considering loops. In addition, we also consider the comparative weight of the costs versus benefits of unbundling and the effect of intermodal competition.[710] As explained below, based on our analysis of impairment and evaluation of other factors, we adopt

[706] *See* Sprint Comments at 24-25; *see also* Covad Siwek/Sun Decl. at paras. 49-57 & Schedule 5 (arguing that consumers are not buying satellite broadband because it does not work well in inclement weather, requires unobstructed view of southern sky, and is too expensive); Letter from Florence Grasso, Covad, to Marlene H. Dortch, Secretary, FCC, CC Docket No. 01-338 at 6 (filed Oct. 21, 2002) (Covad Oct. 21, 2002 *Ex Parte* Letter).

[707] *See* Committee on Broadband Last Mile Technology, Computer Science and Telecommunications Board, National Research Council, BROADBAND: BRINGING HOME THE BITS 135-36 (2002).

[708] Covad Comments at 35 (no copper alternative); *see also* Access Integrated Networks Reply at 13; Allegiance Reply at 32-33 (contending that incumbent LEC arguments are based on predictions and speculation rather than actual marketplace conditions).

[709] Covad Comments at 36-37 (arguing cable, wireless satellite and competitive fiber are not capable of providing xDSL quality or ubiquity); *see* AT&T Reply at 95-98, 161-63; WorldCom Reply at 87.

[710] *See supra* Part V.D.