

populated counties generally has remained unchanged for the past 4 years, whereas the average number of competitors in the more densely populated counties declined by 12 percent from an average of 4.9 competitors in the previous year, a 11 percent decline from the year before that, and a 7 percent decline from the *Ninth Report*.<sup>218</sup> In the *Eighth Report*, the difference in the average number of competitors between urban and rural counties was 2.3, while in this report we find that that difference has shrunk 70 percent, to 0.7 competitors.

**Table 9: Rural vs. Urban Competitors Over Time**

	Average Number of Mobile Telephone Competitors				
	12th Report	11th Report	10th Report	9th Report	8th Report
Rural Counties	3.6	3.6	3.7	3.7	3.3
Urban Counties	4.3	4.9	5.5	5.9	5.6

Source: Federal Communications Commission estimates.

106. In addition, using data provided by American Roamer, we find that 99.3 percent of the total US population in rural counties is covered by at least one wireless provider.<sup>219</sup>

107. According to one commenter, overall penetration in rural areas is only slightly lower than in urban areas. Using 2005 FCC data on penetration rates by EA, CTIA estimated that the wireless penetration rate in rural areas is 68 percent, while the rate in urban areas is 75 percent, a difference of 7 percent.<sup>220</sup> According to CTIA, “Publicly available data and aggregated industry data reveal that the wireless industry strives to reach consumers in both urban and rural, underserved regions of the country.”<sup>221</sup>

108. Providers based in rural areas seem to be providing many of the services that nationwide providers do. In the fall of 2006, the National Telecommunications Cooperative Association (“NTCA”) surveyed its members regarding their provision of wireless services.<sup>222</sup> Population density in most NTCA member service areas is extremely rural, between 1 and 5 persons per square mile.<sup>223</sup> Survey respondents indicated that they have invested considerable resources for the provision of wireless service.<sup>224</sup> Of those members providing wireless service, all offer voicemail and caller ID, 96 percent family plans, 85 percent free long distance, 81 percent three-way calling, and 77 percent bonus night and weekend minutes, unlimited calling, and voice activated dialing.<sup>225</sup> CTIA makes a similar finding, saying that “mobile

<sup>218</sup> *Ninth Report*, at 20643; *Tenth Report*, at 15945.

<sup>219</sup> FCC analysis, using American Roamer, July 2007, and Census 2000 population figures.

<sup>220</sup> *CTIA 2007 NOI Comments*, at 5.

<sup>221</sup> *CTIA 2007 NOI Comments*, at 5.

<sup>222</sup> *See 2006 NTCA Wireless Survey*.

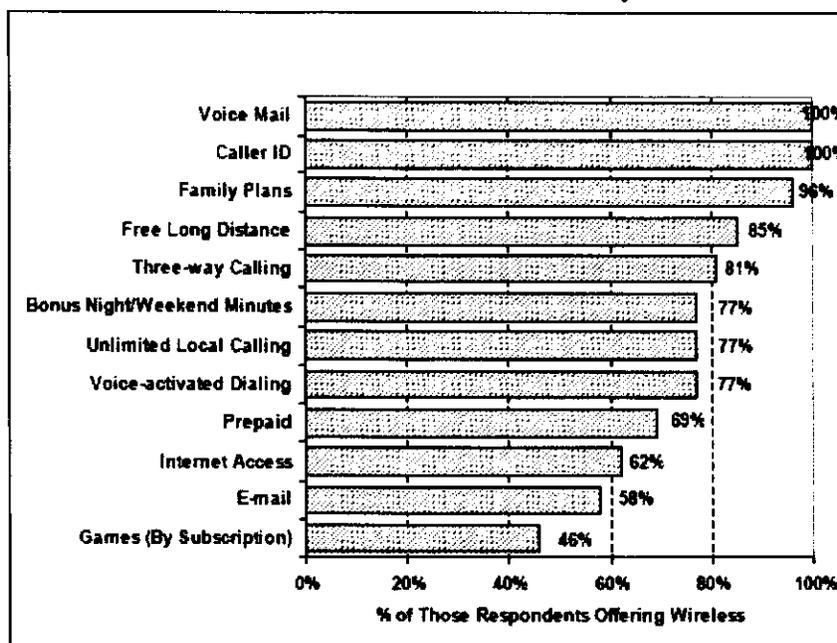
<sup>223</sup> *Id.*, at 4.

<sup>224</sup> *Id.*, at 7.

<sup>225</sup> *Id.*, at 10.

wireless providers across the country – including providers in rural markets – are investing in expanding network capacity to deliver voice and advanced wireless services to consumers in rural areas and tribal lands.”<sup>226</sup>

**Chart 2: Features Offered to Wireless Customers by NTCA Members**<sup>227</sup>



**Note:** Totals exceed 100% as respondents may provide more than one wireless feature.

109. According to the NTCA survey, competition is strong in rural areas, with member providers “facing considerable competition from other carriers—the average respondent indicated that their company competes with between three and five other carriers.”<sup>228</sup>

### 3. Conclusion

110. Based on our rollout analysis, information and statements provided by commenters, and industry reports, we conclude that CMRS providers are competing effectively in rural areas. While it does appear that, on average, a modestly smaller number of operators are serving rural areas than urban areas, this structural difference is not, by itself, a sufficient basis for concluding that CMRS competition is not effective in rural areas. We note that market structure is only a starting point for a broader analysis of the status of competition based on the totality of circumstances, including the pattern of provider conduct, consumer behavior, and market performance as discussed more fully below. Despite the smaller number of mobile operators in rural areas as compared to urban areas, there is no evidence in the record to indicate that this structural difference has enabled providers in rural areas to raise prices above competitive levels or to alter other terms and conditions of service to the detriment of rural consumers. To the contrary, the NTCA survey found that rural providers are rolling out competitive national pricing plans: 70 percent of the NTCA survey respondents said they offered a wireless package that they feel is

<sup>226</sup> CTIA 2007 NOI Comments, at 5.

<sup>227</sup> 2006 NTCA Wireless Survey, at 10.

<sup>228</sup> 2006 NTCA Wireless Survey, at 9.

competitive with those offered by nationwide providers.<sup>229</sup>

#### IV. PROVIDER CONDUCT IN THE MOBILE TELECOMMUNICATIONS MARKET

111. A concentrated market, in conjunction with significant entry barriers, may lessen competition in the market for commercial mobile services in two distinct ways. First, it may increase the likelihood that a group of competing providers will successfully engage in coordinated interaction aimed at raising prices and lowering output. Second, it may enable an individual provider to profitably raise price and lower output unilaterally. However, neither coordinated interaction nor unilateral action to lessen competition is a necessary consequence of market concentration and entry barriers. For example, unilateral or coordinated action to lessen competition may be thwarted or undermined by the presence of one or more maverick providers who have the ability and incentive to expand sales by undercutting the prices of rivals, offering innovative service packages and engaging in aggressive advertising and promotional campaigns.<sup>230</sup> The analysis of provider conduct thus focuses on whether incumbent carriers, given the prevailing market structure, engage in intense price and non-price rivalry or instead compete in a less aggressive manner.

##### A. Price Rivalry

###### 1. Developments in Mobile Telephone Pricing Plans

112. The continued rollout of differentiated pricing plans also indicates a competitive marketplace.<sup>231</sup> In the mobile telephone sector, we observe independent pricing behavior, in the form of continued experimentation with varying pricing levels and structures, for varying service packages, with various handsets and policies on handset pricing. Today all of the nationwide operators, and many smaller operators, offer some version of a national rate pricing plan in which customers can purchase a bucket of minutes to use on a nationwide or nearly nationwide network without incurring roaming or long-distance charges. A more recent example is the introduction and spread of “family plan” packages, in which subscribers sign up for two lines and then have the option of adding additional lines at reduced prices, with all lines sharing the available minutes on the plan jointly.<sup>232</sup> As noted in the *Tenth Report*, all the nationwide carriers also offer some version of a family plan.<sup>233</sup>

113. More recently, a number of operators have been experimenting with “unlimited” calling options. As discussed in the *Eleventh Report*, some U.S. providers, including Alltel (“My Circle”) and T-Mobile (“myFaves”),<sup>234</sup> allow subscribers unlimited free calling to and from a small number of designated numbers, regardless of wireline or wireless carrier.<sup>235</sup> Other providers offer plans that provide for free

<sup>229</sup> *Id.*, at 10.

<sup>230</sup> An example is when AT&T introduced its digital-one-rate plan in May 1998, which was the first plan to include a large quantity of monthly minutes at a fixed rate and no long distance charges when used on the operator’s network. See *Fourth Report*, at 10155, and *Fifth Report*, at 17677-78.

<sup>231</sup> See Section IV.B.6, Mobile Data Services and Applications, *infra*.

<sup>232</sup> See *Tenth Report*, at 15946. One analyst estimated that 54 percent of adult postpaid users, and 81% of all teens (13 to 17 years of age), were on a family plan in 2005. *Yankee Group Reveals Family and Prepaid Plans Continue to Drive Growth in the United States*, News Release, Yankee Group, June 12, 2006.

<sup>233</sup> See *Tenth Report*, at 15946.

<sup>234</sup> According to Robert Dotson, CEO and President of T-Mobile USA, “myFaves is the most successful offering we’ve had in the history of T-Mobile and it is changing the nature of our business. We continue to add high quality customers to our ranks and myFaves is a key reason why.” *T-Mobile USA Adds Almost 1 Million Net New Customers*, CELLULAR-NEWS.COM, Oct. 5, 2007.

<sup>235</sup> *Eleventh Report*, at 10984.

calls only to customers who use the same wireless provider (“on-net” mobile-to-mobile options).<sup>236</sup> A number of smaller and regional carriers, like Leap and MetroPCS, have been offering unlimited local calling plans for years.<sup>237</sup> Now, first among the nationwide carriers, Sprint Nextel has begun offering unlimited calling plans, for a limited time, in select markets.<sup>238</sup> As of May 2007, Sprint Nextel’s bundled plan, Unlimited Access Pack - consisting of unlimited wireless voice, text and data service - was available to residents of the Twin Cities, Philadelphia, San Francisco and Tampa, FL, for \$120 per month.<sup>239</sup> The same bundle with unlimited broadband access (via network cards) is offered for \$150 per month.

114. While a relatively small number of users subscribe to unlimited calling plans today, one analyst predicts that as many as 20 percent of U.S. wireless users could move to such plans by 2010.<sup>240</sup> Other analysts are less optimistic. One analyst pointed out that several carriers - including Alltel and US Cellular - have experimented with unlimited plans in the past, but all have eliminated them due to “network capacity, repricing of the base, and ARPU cannibalization issues.”<sup>241</sup>

## 2. Early Termination Fees and Contract Terms

115. The *Tenth Report* noted that early termination fees (“ETFs”) are a widespread phenomenon in the marketplace.<sup>242</sup> In November 2006, Verizon Wireless became the first carrier to pro-rate ETFs for new contract customers.<sup>243</sup> Now, a customer who signs up for or renews Verizon Wireless service will not be required to pay a fixed early termination fee if he or she chooses to terminate service before the end of the minimum term. Verizon Wireless’ contract termination fee starts at \$175, and will be reduced \$5 per month for each full month toward the contract’s term that the customer completes. One report suggested that Verizon Wireless’s new ETF policy may put competitive pressure on other providers to follow suit.<sup>244</sup> In fact, in October 2007, AT&T announced that, beginning in early 2008, AT&T customers who choose to exit their contracts early will no longer be required to pay a flat early termination fee.<sup>245</sup> Instead, that fee will be progressively lowered during the term of the contract.<sup>246</sup> AT&T also announced that, beginning in November 2007, customers who change to any one of the company’s “standard wireless” calling plans during the course of their contract, or when they are adding or deleting features or services, will no longer be required to extend their current contract or enter into a new one.<sup>247</sup> In November 2007, both Sprint Nextel and T-Mobile announced plans to implement prorated

<sup>236</sup> *Id.*

<sup>237</sup> See Section VII.A.2, *Wireless Alternatives, infra*, and *Tenth Report*, at 15981.

<sup>238</sup> Tim Horan, *Sprint Trials Unlimited Wireless Bundle At \$120 Per Month*, DAILY DATATIMES -CIBC WORLD MARKETS, Mar. 19, 2007.

<sup>239</sup> Tim Horan, *Sprint Expands Unlimited Plan Offers*, DAILY DATATIMES -CIBC WORLD MARKETS, May 18, 2007.

<sup>240</sup> Olga Kharif, *Sprint's All-You-Can-Talk Offer*, BUSINESSWEEK.COM, Mar. 13, 2007 (citing Jerry Kaufman, president of wireless consultancy Alexander Resources).

<sup>241</sup> Marje Soova, *et al.*, *Leap Wireless International, Inc*, Goldman Sachs, Equity Research, Jan. 9, 2007, at 1.

<sup>242</sup> See *Tenth Report*, at 15946.

<sup>243</sup> *Verizon Wireless Expands the ‘Worry-Free Wireless Guarantee’ It Pioneered*, News Release, Verizon Wireless, Nov. 16, 2006.

<sup>244</sup> *Citing Negative Impact on Industry, Verizon Wireless to Pro-Rate ETFs*, TRDAILY, June 29, 2006.

<sup>245</sup> *AT&T Adds Two More Customer-Friendly Policies*, News Release, AT&T, Oct. 16, 2007.

<sup>246</sup> *Id.* This policy will apply to new and renewing wireless customers who sign one- or two-year service agreements. *Id.*

<sup>247</sup> *Id.*

ETFs in 2008.<sup>248</sup> As of late 2007, AT&T, Verizon Wireless, Sprint Nextel, T-Mobile, and Alltel have all announced various policies that allow customers the option of changing elements of their contracts without requiring a contract extension.<sup>249</sup>

### 3. Prepaid Service

116. In the United States, most mobile telephone subscribers pay their phone bills after they have incurred charges, an approach known as postpaid service. Prepaid service, in contrast, requires customers to pay for a fixed amount of minutes prior to making calls. Although prepaid plans are considered a good way to increase penetration rates, they typically produce lower ARPUs and higher churn rates in comparison to postpaid service.<sup>250</sup> For these reasons, the industry generally has not heavily promoted prepaid offerings in the past.<sup>251</sup> However, the pool of unsubscribed customers qualified for postpaid plans<sup>252</sup> has declined to the point where prepaid offerings, which do not require credit checks, seem more attractive to carriers.<sup>253</sup> In response, some carriers have introduced new prepaid plans, or entire brands.<sup>254</sup> In some cases, they are tailoring their offerings to suit segments of the market that do not want or cannot get a traditional cellular plan, particularly the youth market. In addition, many MVNOs offer prepaid plans rather than standard monthly billing.

117. The result of these efforts has been a significant rise in the percentage of wireless users who subscribe to prepaid plans.<sup>255</sup> According to one analyst, prepaid accounted for roughly 15 percent of major U.S. operators' subscribers<sup>256</sup> at the end of 2006, versus 13 percent at the end of 2005.<sup>257</sup> According to another analyst's survey, 37 percent of the net subscriber adds in the fourth quarter of 2006 were

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<sup>248</sup> *T-Mobile to Introduce More-Flexible Contract Terms for Customers*, News Release, T-Mobile, Nov. 7, 2007; *Sprint Announces New Programs to Deliver Better Customer Experience*, News Release, Sprint Nextel, Nov. 7, 2007.

<sup>249</sup> CTIA, In re: Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, WT Docket No. 07-71, *Written Ex Parte Communication*, Dec. 3, 2007, at 2.

<sup>250</sup> Simon Flannery *et al.*, *Prepaid Takes Share in Quarterly Wireless Survey*, Morgan Stanley, Equity Research, Jan. 17, 2006, at 1; Tracfone Comments, at 2 ("Tracfone's average revenue per user (ARPU) is well below that of other CMRS operators"); Simon Flannery, *et al.*, *Survey Suggests Wireless Growth Remains Robust*, Morgan Stanley, Equity Research, July 14, 2006, at 17 (The prepaid offerings . . . generally show higher churn.)

<sup>251</sup> See *Eleventh Report*, at 10985.

<sup>252</sup> Only about 58 percent of the US population has prime credit. *Diamond in the Rough*, at 4. See, also, Roger Cheng, *Pre-Paid Customers Gain Traction With Wireless Carriers*, MarketWatch, Feb 22, 2006, at 1, citing Todd Rethemeier, an analyst for Soleil Securities Group ("We're running out of good customers in this industry. Do you know anyone who doesn't have a cellphone?").

<sup>253</sup> Roger Cheng, *Pre-Paid Customers Gain Traction With Wireless Carriers*, MarketWatch, Feb 22, 2006, at 1 ("There's greater growth in prepaid," said Sprint Chief Financial Officer Paul Saleh. "That's what's happening in the market. It's really on a fast-growth pace." As a result, the big carriers have increasingly accepted higher credit risks and aggressively pursued the market.").

<sup>254</sup> See *Eleventh Report*, at 10985.

<sup>255</sup> The percentage of total mobile telephone subscribers who use prepaid plans remains significantly lower in the United States than in most of Western Europe. See Table 16: Mobile Market Structure and Performance, *infra*.

<sup>256</sup> These carriers accounted for approximately 96 percent of all subscribers at the end of 2006. See David Janazzo *et al.*, *US Wireless Matrix 1Q07*, Merrill Lynch, Equity Research, May. 21, 2007, at 8 ("*US Wireless Matrix 1Q07*").

<sup>257</sup> *US Wireless Matrix 1Q07*, at 17. In this analysis, the analyst has adjusted prepaid subscribers to include retail prepaid and reseller prepaid. He assumes reseller subscribers are primarily prepaid.

prepaid customers, compared to 27 percent in the fourth quarter of 2005.<sup>258</sup> Among the nationwide carriers,<sup>259</sup> T-Mobile had 15.7 percent of its subscribers on prepaid plans, AT&T Wireless had 13.7 percent, and Verizon Wireless had 6.7 percent.<sup>260</sup>

#### 4. Mobile Data Pricing

118. In addition to making and receiving calls, mobile subscribers can use their cellphones to send text, photo, and video messages, download ringtones and games, browse news and information on web sites, use email, and access other content. During the past year providers continued to use a wide variety of options for pricing handset-based mobile data services that are marketed primarily as an add-on to mobile voice service.<sup>261</sup> These options include subscription to a monthly data package, flat rate pricing for each use or download of an application, and pricing based on kilobytes consumed. The availability of the different pricing options varies by type of application as well as by provider, with providers frequently offering customers a choice of pricing options for a particular application. In addition to allowing customers to purchase particular applications on a stand-alone or *a la carte* basis, carriers also offer certain applications bundled with monthly data packages for cellphones. As in the past, mobile data pricing continues to be characterized by considerable complexity due to the diversity of pricing options.<sup>262</sup>

119. Providers offer mobile subscribers a wide variety of monthly data packages with a recurring monthly fee. The specific content of such mobile data packages varies by provider, and individual providers typically offer multiple tiers of monthly data packages.<sup>263</sup> Some monthly data packages set upper limits on the amount of data usage per month based on kilobytes consumed or the number of times an application is used, while others allow unlimited use of some or all applications.<sup>264</sup> Providers also allow mobile subscribers to use mobile data applications on a “pay-per-use” or “pay-as-you-go” basis, without subscribing to a monthly data package. There are a variety of pay-per-use pricing options, including: (1) a flat fee for each use or download of an application;<sup>265</sup> (2) a per-kilobyte fee;<sup>266</sup>

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<sup>258</sup> Simon Flannery *et al.*, *Robust Wireless Quarter as Prepaid Surges*, Morgan Stanley, Equity Research, Jan. 17, 2007, at 10.

<sup>259</sup> Sprint Nextel does not offer prepaid plans under its own name, but markets prepaid offerings through its subsidiary brand, Boost Mobile.

<sup>260</sup> *US Wireless Matrix IQ07*, at 18. In this analysis, the analyst has adjusted prepaid subscribers to include retail prepaid and reseller prepaid. The analyst assumes reseller subscribers are primarily prepaid.

<sup>261</sup> *Eleventh Report*, at 10986.

<sup>262</sup> *Id.*

<sup>263</sup> See, e.g., AT&T Wireless, *Messaging and MEdia Bundles* (visited June 5, 2007) <[www.wireless.att.com](http://www.wireless.att.com)>; Sprint, *Get Music, TV, Navigation and Messaging – Right on Your Phone* (visited June 5, 2007) <[www.sprint.com](http://www.sprint.com)>; Verizon Wireless, *V CAST Mobile TV Packages* (visited June 5, 2007) <[www.verizonwireless.com](http://www.verizonwireless.com)>.

<sup>264</sup> *Id.*

<sup>265</sup> See, e.g., T-Mobile, *Services* (visited June 5, 2007) <[www.t-mobile.com](http://www.t-mobile.com)> (explaining that subscribers can download various types of games and ringtones for a range of flat fees apiece).

<sup>266</sup> See, e.g., AT&T Wireless, *MEdia™ Net* (visited June 5, 2007) <[www.wireless.att.com](http://www.wireless.att.com)> (noting that the pricing options available for MEdia Net wireless data services include pay-as-you-go for \$0.01 per kilobyte); Sprint, *Get Music, TV, Navigation and Messaging – Right on Your Phone* (visited June 5, 2007) <[www.sprint.com](http://www.sprint.com)> (noting that customers will be charged \$0.03 per kilobyte for usage of Sprint Vision data services unless they purchase a monthly data plan for Sprint Vision or Power Vision).

and (3) deducting from a subscriber's monthly airtime allowance for purchasing and downloading an application.<sup>267</sup> Some providers charge only a flat rate to download an application on a pay-as-you-go basis,<sup>268</sup> while others apply kilobyte-based or airtime charges in addition to a flat rate per application.<sup>269</sup>

120. To encourage subscribers to purchase monthly data packages, providers offer various types of discounts on monthly data packages as compared to pay-as-you-go data usage. For example, customers may be able to avoid incurring kilobyte-based or airtime charges for downloading and using certain applications by subscribing to a monthly data package.<sup>270</sup> In addition, the unit price of sending text messages (or "SMS") and multimedia messages with the purchase of monthly messaging packages is lower than the flat pay-as-you-go rate for such messaging services.<sup>271</sup> Another discount method is to offer a reduced flat rate per application to subscribers who purchase a monthly data package.<sup>272</sup> As noted in the *Eleventh Report*,<sup>273</sup> Telephia Inc. ("Telephia") found that subscribers' propensity to purchase monthly data packages, as opposed to using mobile data applications on a pay-as-you-go basis, varies by type of application. For example, Telephia estimated that subscribers who access the Web via their cellphones are nearly twice as likely to subscribe to monthly data packages as to use a pay-per-use option.<sup>274</sup> According to Telephia, this is because consumers perceive mobile web browsing to be too expensive without using monthly data packages, and want to avoid being surprised by additional charges billed to their monthly cellphone invoices. Similarly, Telephia estimated that MMS users are nearly three times as likely to subscribe to monthly MMS packages as to use the pay-per-use option.<sup>275</sup> Among SMS users,

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<sup>267</sup> See, e.g., Verizon Wireless, *Answers to FAQs* (visited June 5, 2007) <www.verizonwireless.com> (explaining to subscribers that the minutes they use browsing in the Get It Now Shop for a data application and for downloading applications are applied to their monthly airtime allowance, and that if they exceed their allowance minutes while browsing and downloading, they will be charged the same rate as for voice minutes over their airtime allowance).

<sup>268</sup> See, e.g., T-Mobile, *Services* (visited June 5, 2007) <www.t-mobile.com> (explaining that subscribers can download various types of games and ringtones for a range of flat fees apiece).

<sup>269</sup> See, e.g., AT&T Wireless, *Games* (visited June 5, 2007) <www.wireless.att.com> (explaining that some games are charged as a one-time fee for unlimited use, while others are charged as a monthly subscription, and adding that standard data charges will also apply for the kilobytes used in downloading the game to the subscriber's phone); Verizon Wireless, *Answers to FAQs* (visited June 5, 2007) <www.verizonwireless.com> (indicating that subscribers pay per application at the time of download, with each application having a specific pricing option, and that airtime charges also apply while browsing for and downloading applications on their phone).

<sup>270</sup> See, e.g., Sprint, *Get Music, TV, Navigation and Messaging – Right on Your Phone* (visited June 5, 2007) <www.sprint.com> (indicating that customers can avoid being charged \$0.03 per kilobyte for usage of Sprint Vision data services if they purchase a monthly data plan for Sprint Vision or Power Vision); Verizon Wireless, *V CAST Music* (visited June 5, 2007) <www.verizonwireless.com> (indicating that subscribers can avoid airtime charges when browsing, previewing, purchasing, and downloading songs using the V CAST Music application by purchasing a V CAST VPAK subscription).

<sup>271</sup> See, e.g., T-Mobile, *Services* (visited June 5, 2007) <www.t-mobile.com> (offering subscribers the option of purchasing volume-discount priced monthly messaging bundles as an alternative to sending and receiving messages on a pay-as-you-go basis for \$0.15 each).

<sup>272</sup> See, e.g., Sprint, *Get Music, TV, Navigation and Messaging – Right on Your Phone* (visited June 5, 2007) <www.sprint.com> (offering music track downloads for \$0.99 apiece with the purchase of a Sprint Power Vision monthly data package, and warning that customers not subscribed to Power Vision data plan will pay \$2.50 per full track download).

<sup>273</sup> *Eleventh Report*, at 10987.

<sup>274</sup> *Id.*

<sup>275</sup> *Id.*

however, Telephia found that the pay-per-use option and monthly SMS packages were almost equally popular.<sup>276</sup>

121. One notable development in the pricing of mobile data services in the past year is a sequence of price cuts for over-the-air (“OTA”) music downloading services. The *Eleventh Report* noted that both Sprint Nextel and Verizon Wireless began offering their new OTA music downloading services on a pay-per-use basis for a flat rate per song.<sup>277</sup> Sprint Nextel introduced the first OTA downloads of full music tracks in October 2005 for a price of \$2.50 per download, and Verizon responded in January 2006 by offering OTA downloads through its V-Cast music service at a lower rate of \$1.99 per song.<sup>278</sup> More recently, Sprint Nextel cut its download fee to \$0.99 per song from April 2007, matching the prices of iTunes, the leading online music downloading service run by Apple Inc (“Apple”).<sup>279</sup> The authors of a recent economic analysis argue that Sprint Nextel slashed its price for music downloads in anticipation of AT&T’s planned rollout of the Apple iPhone, and interpret this entire sequence of price undercutting for music downloads as an illustration of competitive forces at work.<sup>280</sup>

122. Advertising for cellphones has the potential to become a significant alternative to monthly subscriptions and other charges as a source of revenue from mobile data services. U.S. wireless providers are beginning to consider lowering the price of mobile video, web access and other content for cellphones, and thereby stimulating greater consumer usage of such mobile data services, by carrying cellphone ads.<sup>281</sup> Sprint Nextel began putting banner ads on some mobile web sites in the fall of 2006, and Verizon Wireless has announced its intention to do something similar.<sup>282</sup> AT&T has also announced plans to begin selling advertising on cellphones.<sup>283</sup> In addition, Sprint Nextel has established an arrangement with Internet advertisement broker Ingenio, Inc. for a service that lets businesses bid to be listed when users type a keyword into a Sprint Nextel search application.<sup>284</sup> Under this arrangement, advertisers pay only if a consumer clicks on the link to call them, an advertising business model termed “pay per call.”<sup>285</sup> Alltel recently made a similar search advertising deal with a start-up called JumpTap,

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<sup>276</sup> *Id.*

<sup>277</sup> *Id.*, at 10988.

<sup>278</sup> Marius Schwartz and Federico Mini, *Hanging up on Carterfone: The Economic Case Against Access Regulation in Mobile Wireless*, May 2, 2007, at 8 (“*Economic Case Against Access Regulation*”).

<sup>279</sup> *Id.*, at 8-9. As previously noted, the reduced fee of \$0.99 per song is offered to customers who subscribe to a Sprint Power Vision monthly data plan; customers not subscribed to a Power Vision data plan will pay \$2.50 per full track download. See Sprint, *Get Music, TV, Navigation and Messaging – Right on Your Phone* (visited June 5, 2007) <www.sprint.com>. See also Walter S. Mossberg, *Latest Music Phone Is a Creative Gadget Marred by Big Flaws*, WALL STREET JOURNAL, Mar. 29, 2007 (noting that Sprint is slashing the price of songs sold on its proprietary music service from \$2.49 each to just 99 cents, although the customer has to pay an additional fee each month for a subscription to a monthly data package for the privilege of paying 99 cents per song).

<sup>280</sup> *Economic Case Against Access Regulation*, at 8-9.

<sup>281</sup> Amol Sharma, *What’s New in Wireless*, WALL STREET JOURNAL, Mar. 26, 2007, at R1 (“*What’s New in Wireless*”).

<sup>282</sup> Amol Sharma, *Companies Vie For Ad Dollars On Mobile Web*, WALL STREET JOURNAL, Jan. 17, 2007, at A1 (“*Companies Vie For Ad Dollars On Mobile Web*”); Amol Sharma and Almar Latour, *AT&T Plans Push in Wireless, Ads*, WALL STREET JOURNAL, Jan. 2, 2007, at A3 (“*AT&T Plans Push in Wireless, Ads*”).

<sup>283</sup> *AT&T Plans Push in Wireless, Ads*.

<sup>284</sup> *Companies Vie For Ad Dollars On Mobile Web*.

<sup>285</sup> *Id.*

Inc.<sup>286</sup> One uncertainty surrounding the advertising model is how receptive consumers are to being subjected to marketing on cellphones in exchange for receiving free applications.<sup>287</sup> In a survey conducted in August 2006 asking participants “How willing would you be [on a scale of 1 to 7] to watch advertising on your cellphone if in return you were to receive free applications for your cellphone?,” 51 percent responded that they were not willing at all [rating 1], 12 percent were neutral [4], and only 10 percent responded that they were very willing [7].<sup>288</sup>

123. Aside from handset-based applications, providers offer monthly mobile Internet access packages for data users who access the Internet through laptops or Personal Digital Assistants (“PDAs”). The nationwide carriers continue to price mobile Internet access packages in two principal ways: based on a set amount of megabytes per month or unlimited monthly data use.<sup>289</sup> As noted in previous reports, under the megabyte-based pricing scheme, the monthly rate per package increases with the amount of megabytes included in the package, but the volume discounts provided by larger packages result in a progressively lower price per megabyte.<sup>290</sup>

## **B. Non-Price Rivalry**

124. Service providers in the mobile telecommunications market also compete on many more dimensions other than price, including non-price characteristics such as coverage, call quality, data speeds, and mobile data content. Indicators of non-price rivalry include advertising and marketing, capital expenditures, technology deployment and upgrades, and the provision of mobile data services.

### **1. Technology Deployment and Upgrades**

#### **a. Market-Based Versus Mandated Standards**

125. The subject of technology deployment and upgrades by U.S. mobile telecommunications providers is properly analyzed under the heading of provider conduct because of the Commission’s market-oriented approach to managing spectrum for commercial mobile voice and data services. The Commission has adopted flexible licensing policies instead of mandating any particular technology or network standard. Mobile telephone service providers have the flexibility to deploy the network technologies and services they choose as long as they abide by certain technical parameters designed to avoid radiofrequency interference with adjacent licensees. In contrast, the European Community mandated a single harmonized standard for second-generation mobile telecommunications services (GSM<sup>291</sup>), and has also adopted a single standard for third-generation services (WCDMA<sup>292</sup>).<sup>293</sup> As a

<sup>286</sup> *Id.*

<sup>287</sup> *Id.*; *AT&T Plans Push in Wireless, Ads.*

<sup>288</sup> *Companies Vie For Ad Dollars On Mobile Web.*

<sup>289</sup> See, e.g., AT&T Wireless, *Data Plan Comparison Chart* (visited June 6, 2007) <[www.wireless.att.com](http://www.wireless.att.com)>; Sprint, *Mobile Broadband Connection Plans* (visited June 6, 2007) <[www.sprint.com](http://www.sprint.com)>; T-Mobile, *Internet & E-mail Plans* (visited June 6, 2007) <[www.t-mobile.com](http://www.t-mobile.com)>; Verizon Wireless, *Wireless PC Card Plans* (visited June 6, 2007) <[www.verizonwireless.com](http://www.verizonwireless.com)>.

<sup>290</sup> *Ninth Report*, at 20648.

<sup>291</sup> See Section IV.B.1.b, Background on Network Design and Technology, *infra*.

<sup>292</sup> *Id.*

<sup>293</sup> Neil Gandal, David Salant, and Leonard Waverman, *Standards in Wireless Telephone Networks*, TELECOMMUNICATIONS POLICY, Vol. 27, 2003 (“*Standards in Wireless Telephone Networks*”). The authors note that, although the European Community backed away from mandating a single standard for third-generation (continued....)

result of the flexibility afforded by the Commission's market-based approach, different U.S. providers have chosen to deploy a variety of different technologies with divergent technology migration paths, and competition among multiple incompatible standards has emerged as an important dimension of non-price rivalry in the U.S. mobile telecommunications market and a distinctive feature of the U.S. mobile industry model.

126. The main advantage of compatibility between competing wireless networks is that greater economies of scale in the production of both terminals and network infrastructure equipment tend to lower the unit cost of handsets, chipsets, and other network equipment.<sup>294</sup> Lower equipment costs, in turn, may promote more rapid adoption of mobile telephone services.<sup>295</sup> In addition, standardization tends to produce greater variety of handsets.<sup>296</sup> However, it has been argued that the Commission's market-based approach to wireless network standards helped encourage the emergence of a promising new wireless network technology (CDMA<sup>297</sup>) that ultimately proved to be superior to the European second-generation wireless standard for high-speed mobile data services.<sup>298</sup> In addition, competition between mobile telephone providers using incompatible wireless network technologies has other advantages that can benefit consumers, including greater product variety and differentiation of services,<sup>299</sup> more technological competition,<sup>300</sup> and greater price competition.<sup>301</sup>

127. The following analysis of technology deployment and upgrades is divided into four parts. (Continued from previous page) \_\_\_\_\_  
services, the absence of a mandate has had little practical effect as all European mobile operators have opted for the same standard and migration path. *Id.*, at 330.

<sup>294</sup> *Id.*, at 329.

<sup>295</sup> See Carl Shapiro and Hal R. Varian, *Information Rules*, Harvard Business School Press, 1999, at 264 (noting that "the Europeans managed to adopt new digital wireless telephone technology more rapidly than in the United States") ("*Information Rules*"); Stephen C. Littlechild, *Mobile Termination Charges: Calling Party Pays Versus Receiving Party Pays*, TELECOMMUNICATIONS POLICY, Vol. 30, No. 5-6, June-July 2006, at 242-277, at 17-18 (finding that "technical concentration," measured as the percent of subscribers on GSM networks, increases mobile penetration).

<sup>296</sup> *Standards in Wireless Telephone Networks*, at 329.

<sup>297</sup> See Section IV.B.1.b, Background on Network Design and Technology, *infra*.

<sup>298</sup> *Standards in Wireless Telephone Networks*, at 328-330; *Information Rules*, at 264; Section IV.B.1.b, Background on Network Design and Technology, *infra*.

<sup>299</sup> *Standards in Wireless Telephone Networks*, at 329-330 (noting, for example, that CDMA networks "have offered more and better data services than were available on GSM networks").

<sup>300</sup> *Id.*, at 330. See also, *Eleventh Report*, at 10993 (noting that the former Cingular was pressured to upgrade its network to WCDMA/HSDPA, rather than the slower, interim WCDMA technology, in an effort to compete with Verizon Wireless's EV-DO network, which offers speeds similar to WCDMA/HSDPA and faster than WCDMA) and 11025-11026 (arguing that this technological competition helped give the United States an edge over Europe with regard to the deployment of high-speed wireless data networks).

<sup>301</sup> *Standards in Wireless Telephone Networks*, at 330. Technological competition may pressure providers to cut rates and provide larger handset subsidies to attract a sufficiently large customer base to ensure their chosen technology survives as a standard. See Simon Flannery *et al.*, *3G Economics a Cause for Concern*, Morgan Stanley, Equity Research, Feb. 1, 2005, at 11 ("*3G Economics a Cause for Concern*"). In addition, use of multiple incompatible wireless network standards may act as a constraint on providers' ability to engage in explicit or tacit coordination that would impair price competition. See Horizontal Merger Guidelines, U.S. Department of Justice and Federal Trade Commission, Apr. 2, 1992, revised Apr. 8, 1997, § 2.11 (noting that standardization of pricing and product variables on which firms could compete may facilitate reaching terms of coordination that would harm consumers).

As background to examining the particular technological choices made by different providers, Section IV.B.1.b provides an introduction to cellular network design and technology and identifies and describes the major digital technologies and associated migration paths. Section IV.B.1.c examines the specific technological choices made by mobile providers that use the same spectrum bands, network design and technologies to offer both voice and data services. Section IV.B.1.d examines the impact of these choices on coverage by technology type. Finally, Sections IV.B.1.e and IV.B.1.f examine the technology deployment decisions of broadband and narrowband data network operators, respectively.

**b. Background on Network Design and Technology**

128. Cellular, PCS, and digital SMR networks use the same basic design. All use a series of low-power transmitters to serve relatively small areas (“cells”), and reuse spectrum to maximize efficiency.<sup>302</sup> In the past, cellular and SMR networks used an analog technology, while PCS networks were designed from the start to use a digital format. Digital technology provides better sound quality and increased spectral efficiency than analog technology. From a customer’s perspective, digital service in the cellular band or SMR bands is virtually identical to digital service in the PCS band. Digital technology is now dominant in the mobile telephone sector, with almost all wireless subscribers using digital service.<sup>303</sup>

129. The two main digital technologies used in the United States are Code Division Multiple Access (“CDMA”) and Global System for Mobile Communications (“GSM”). In addition, there are two other, less-widely used (by subscribers), technologies: integrated Digital Enhanced Network (“iDEN”) and the once-common Time Division Multiple Access (“TDMA”). These four technologies are commonly referred to as Second Generation, or “2G,” because they succeeded the first generation of analog cellular technology, Advanced Mobile Phone Systems (“AMPS”).<sup>304</sup> As discussed in previous reports, in light of industry developments, this report no longer distinguishes between TDMA and GSM networks in its analysis of digital coverage, but considers the two as one migration path towards more advanced digital capabilities. U.S. carriers are in the process of phasing out TDMA.<sup>305</sup> Maps showing mobile telephone digital coverage can be found in Appendix B.

130. Beyond the 2G digital technologies, mobile telephone providers have been deploying

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<sup>302</sup> PCS, digital SMR, and cellular networks are all “cellular” systems since all divide service regions into many small areas called “cells.” Cells can be as small as an individual building or as large as 20 miles across. Each cell serves as a base station for mobile users to obtain connection to the fixed network and is equipped with its own radio transmitters/receivers and associated antennas. Service regions are divided into cells so that individual radio frequencies may be reused in different cells (“frequency reuse”), in order to enhance frequency efficiency. When a person makes a call on a wireless phone, the connection is made to the nearest base station, which connects with the local wireline phone network or another wireless operator. When a person is using a wireless phone and approaches the boundary of one cell, the wireless network senses that the signal is becoming weak and automatically hands off the call to the base station in the next cell. See *Sixth Report*, at 13361, note 55.

<sup>303</sup> See Section VI.B.1, Subscriber Growth, *infra*.

<sup>304</sup> See note 315, *infra*, for a discussion of the cellular analog requirement and its sunset.

<sup>305</sup> AT&T, for example, is planning to discontinue TDMA service by early 2008. Only about 1 percent of AT&T’s traffic runs on its TDMA network, and customers who want to switch to another carrier can do so without termination fees. Tim Horan, *AT&T to Shut Down 18 TDMA Markets by July 15<sup>th</sup>*, CIBC WORLD MARKETS DATATIMES, Jun. 22, 2007. Only 780,000 TDMA customers remain, with two-thirds of those being wholesale. *Record Wireless Subscriber Increase Drives AT&T Third Quarter*, COMMUNICATIONS DAILY, Oct. 24, 2007, at 10. Cincinnati Bell Wireless discontinued its TDMA network in June 2006. Cincinnati Bell, Inc., SEC Form 10-K, filed Mar. 1, 2007, at 5.

next-generation network technologies<sup>306</sup> that allow them to offer mobile data services at higher data transfer speeds and, in some cases, to increase voice capacity.<sup>307</sup> For GSM/TDMA providers, the first step in the migration to next-generation network technologies is General Packet Radio Service (“GPRS” or “GSM/GPRS”), a packet-based data-only network upgrade that allows for faster data rates by aggregating up to eight 14.4 kbps channels.<sup>308</sup> Beyond GPRS, many U.S. GSM/TDMA providers have deployed Enhanced Data Rates for GSM Evolution (“EDGE”) technology, which offers average data speeds of 100-130 kbps. Wideband CDMA (“WCDMA,” also known as Universal Mobile Telecommunications System, or “UMTS”) is the next migration step for GSM providers beyond EDGE and allows maximum data transfer speeds of up to 2 Mbps and average user speeds of 220-320 kbps.<sup>309</sup> Finally, deployment of WCDMA with HSDPA (High Speed Data Packet Access) technology allows average download speeds of 400-700 kbps with burst rates of up to several Mbps.<sup>310</sup> Although WCDMA and WCDMA/HSDPA are not backwards compatible with GPRS/EDGE, wireless modem cards that are compatible with both WCDMA/HSDPA and GPRS/EDGE, and enable handoff between the two types of networks, are available for use with laptop computers.<sup>311</sup>

131. Many CDMA providers have upgraded their networks to CDMA2000 1xRTT (also referred to as “CDMA2000 1X” or “1xRTT”), CDMA2000 EV-DO (evolution-data optimized, “EV-DO”) Revision 0, and EV-DO Revision A (“Rev. A”) technologies. 1xRTT doubles voice capacity and delivers peak data rates of 307 kbps in mobile environments and typical speeds of 40-70 kbps.<sup>312</sup> EV-DO allows maximum data throughput speeds of 2.4 Mbps, while EV-DO Rev. A increases maximum data throughput speeds to 3.1 Mbps.<sup>313</sup> Whereas WCDMA and WCDMA/HSDPA are incompatible with earlier technologies on the GSM migration path, the more advanced technologies on the CDMA migration path are backwards compatible.<sup>314</sup> Deployment of these various technologies is discussed below. Maps showing CDMA and GSM network coverages, as well as Mobile Broadband coverage, can be found in Appendix B.

### c. Technology Choices and Upgrades of Mobile Telephone Providers

132. Of the four nationwide mobile telephone operators, AT&T and T-Mobile use

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<sup>306</sup> For purposes of this report, all of the network technologies beyond 2G that carriers have deployed, as well as those that they plan to deploy in the future, are generally referred to as “next-generation network technologies.” The International Telecommunication Union (“ITU”) has defined 3G network technologies as those that can offer maximum data transfer speeds of 2 megabits per second (“Mbps”) from a fixed location, 384 kbps at pedestrian speeds, and 144 kbps at traveling speeds of 100 kilometers per hour. See *Fifth Report*, at 17695. There is ambiguity among other industry players, however, as to which network technologies constitute 3G and which constitute interim technologies, often labeled “2.5G.” See *Seventh Report*, at 12990 and 13038. Therefore, this report uses a more general label to describe all of the technologies beyond 2G.

<sup>307</sup> See Section IV.B.1.c, Technology Choices and Upgrades of Mobile Telephone Providers, *infra*.

<sup>308</sup> See *Seventh Report*, at 12990. This upgrade is also labeled GSM/GPRS because many GSM/TDMA carriers are upgrading their TDMA markets with GSM and GPRS simultaneously.

<sup>309</sup> *Tenth Report*, at 15951.

<sup>310</sup> *Id.*.

<sup>311</sup> See, e.g., Novatel Wireless, *Products: Merlin U730 Wireless PC Modem Card* (visited May 12, 2006) <[www.novatelwireless.com](http://www.novatelwireless.com)>.

<sup>312</sup> See *Seventh Report*, at 12990; *Ninth Report*, at 20650.

<sup>313</sup> *Id.*

<sup>314</sup> *Standards in Wireless Telephone Networks*, at 328.

GSM/TDMA as their 2G digital technology, Verizon Wireless and Sprint Nextel use CDMA, and Sprint Nextel also uses iDEN on the former Nextel network.<sup>315</sup> The four nationwide mobile operators, together with other U.S. mobile providers, have continued to deploy next-generation network technologies over the past year.

133. The two nationwide CDMA operators, Verizon Wireless and Sprint Nextel, have deployed EV-DO and EV-DO Rev. A network technologies across portions of their networks.<sup>316</sup> Typical, user-experienced download speeds with EV-DO range from 400 to 700 kbps, while upload speeds average 50-70 kbps.<sup>317</sup> The EV-DO Rev. A network upgrade increases average download speeds to 600 kbps to 1.4 Mbps and significantly improves average upload speeds to 350-800 kbps.<sup>318</sup>

134. Since October 2003, Verizon Wireless has launched EV-DO technology in areas of the country covering approximately 210 million people.<sup>319</sup> In June 2007, Verizon Wireless announced that it had upgraded all of this EV-DO network footprint with EV-DO Rev. A technology.<sup>320</sup> With the EV-DO service, subscribers can access the Internet while mobile via a wireless modem card connected to a laptop computer or PDA, or they can download a range of multimedia content and advanced applications on certain mobile handset models. All of the devices sold by Verizon Wireless at the end of 2006 were 1xRTT compatible, and many were EV-DO compatible.<sup>321</sup> As of July 2007, Verizon Wireless was selling EV-DO Rev. A-compatible laptop cards but had not yet made EV-DO Rev. A-compatible handsets commercially available. Verizon Wireless has also stated that it plans to use its AWS licenses for the provision of “advanced wireless broadband services.”<sup>322</sup> In November 2007, the company announced that

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<sup>315</sup> In addition, through February 18, 2008, all operators using cellular spectrum must deploy AMPS, an analog technology, throughout the part of their networks using cellular spectrum. See 47 C.F.R. §§ 22.901, 22.933. In 2002, the Commission decided to eliminate the requirement after a five-year transition period, which ends February 18, 2008. Year 2000 Biennial Regulatory Review – Amendment of Part 22 of The Commission’s Rules to Modify or Eliminate Outdated Rules Affecting The Cellular Radiotelephone Service and Other Commercial Mobile Radio Services, *Report and Order*, 17 FCC Rcd 18401, 18414 (2002).

<sup>316</sup> The Commission noted in the *Ninth Report* that Sprint Nextel altered its technology upgrade strategy in response to competitive pressures from Verizon Wireless by deploying EV-DO rather than waiting for a successor technology to become commercially available. See *Ninth Report*, at 20653.

<sup>317</sup> *Sprint Powers Up Faster Mobile Broadband Network in 10 More Markets, Upgraded Coverage Reaches 60 Million People*, News Release, Sprint Nextel, Dec. 12, 2006; 3G Americas, *3G Technologies* (visited July 3, 2006), <[http://www.3gamericas.com/English/PDFs/3G\\_technology\\_comparison.pdf](http://www.3gamericas.com/English/PDFs/3G_technology_comparison.pdf)> (“3G Technology Comparison”). The maximum peak download speed for EV-DO is 2.4 Mbps. *Id.*

<sup>318</sup> *America’s Largest and Fastest Mobile Broadband Network Just Got Even Larger – Sprint Customers Can Do More, In More Places, And At Fast Speeds*, News Release, Sprint Nextel, June 19, 2007; *Verizon Wireless: 100 Percent of Wireless Broadband Network Now Enhanced with Faster Speeds*, News Release, Verizon Wireless, June 29, 2007. The maximum peak download speed for EV-DO Rev A is 3.1 Mbps. *3G Technology Comparison*.

<sup>319</sup> *Verizon Wireless: 100 Percent of Wireless Broadband Network Now Enhanced with Faster Speeds*, News Release, Verizon Wireless, June 29, 2007. Verizon Wireless has also deployed 1xRTT technology throughout “virtually all” of its network. Verizon Wireless, SEC Form 10-K, filed Mar. 1, 2007, at 5; *Eleventh Report*, at 10992. When EV-DO subscribers travel to other parts of the country where EV-DO networks have not been deployed, they can seamlessly roam on and access Verizon Wireless’s 1xRTT network because the more advanced technologies on the CDMA migration path are backwards compatible. See *Ninth Report*, at 20652.

<sup>320</sup> *Verizon Wireless: 100 Percent of Wireless Broadband Network Now Enhanced with Faster Speeds*, News Release, Verizon Wireless, June 29, 2007.

<sup>321</sup> Verizon Wireless, SEC Form 10-K, filed Mar. 1, 2007, at 6.

<sup>322</sup> Verizon Wireless, SEC Form 10-K, filed Mar. 1, 2007, at 13.

it plans to deploy Long Term Evolution (“LTE”) as its Fourth Generation, or “4G,” network technology, with trials beginning in 2008.<sup>323</sup> LTE will allow faster data rates, lower latency, and global roaming in countries where Vodafone operates.<sup>324</sup>

135. At the end of 2006, Sprint Nextel’s EV-DO network covered 209 million people in 219 communities with populations over 100,000.<sup>325</sup> As of June 2007, Sprint Nextel had deployed EV-DO Rev. A in markets covering 203 million people, and the company plans to upgrade its entire CDMA network to EV-DO Rev. A by the end of 2007.<sup>326</sup> In addition to offering Sprint-branded wireless services over its CDMA network, Sprint Nextel continues to provide Nextel-branded and Boost Mobile prepaid wireless services over the former Nextel iDEN network.<sup>327</sup> Sprint Nextel’s iDEN network provides service in over 300 metropolitan markets in the U.S. and covers approximately 164 million people.<sup>328</sup> In order to offer customers the benefits of both of its networks, and to relieve capacity constraints on its iDEN network, Sprint Nextel has introduced dual-mode handsets that operate on both the CDMA and iDEN platforms.<sup>329</sup>

136. Apart from the two near-nationwide CDMA mobile providers, some of the regional CDMA operators have also begun to deploy EV-DO, including Alltel, Alaska Communications Systems, and Cellular South.<sup>330</sup> At the end of 2006, Alltel had deployed EV-DO to 56 percent of its POPs, or approximately 44 million people, and 1xRTT to 94 percent of its POPs, or approximately 74 million people.<sup>331</sup>

137. At the time of the *Eleventh Report*, AT&T had launched WCDMA/HSDPA technology in 16 cities across the United States.<sup>332</sup> Since that time, AT&T has expanded its WCDMA/HSDPA network to more than 160 markets, including most of the top 100 cities in the United States.<sup>333</sup>

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<sup>323</sup> *Verizon Selects LTE as 4G Wireless Broadband Direction*, News Release, Verizon Wireless, Nov. 29, 2007.

<sup>324</sup> *Id.*

<sup>325</sup> Sprint Nextel, SEC Form 10-K, filed Mar. 1, 2007, at 4 (“*Sprint Nextel 2006 10K*”). Sprint Nextel has also deployed 1xRTT across its entire CDMA network footprint. As noted in the *Ninth Report*, Sprint altered its technology strategy by deploying EV-DO, rather than waiting for a successor technology to become commercially available, in response to competitive pressure from Verizon Wireless’s deployment of EV-DO. *Ninth Report*, at 20652-20653.

<sup>326</sup> *America’s Largest and Fastest Mobile Broadband Network Just Got Even Larger – Sprint Customers Can Do More, In More Places, And At Fast Speeds*, News Release, Sprint Nextel, June 19, 2007; *Sprint Nextel 2006 10K*, at 4.

<sup>327</sup> *Sprint Nextel 2006 10K*, at 1.

<sup>328</sup> *Sprint Nextel 2006 10K*, at 8; Table 10: Mobile Telephone Digital Coverage by Census Block, *infra*.

<sup>329</sup> *Sprint Nextel 2006 10K*, at 4.

<sup>330</sup> See *Eleventh Report*, at 10993.

<sup>331</sup> Alltel, SEC Form 10-K, filed Feb. 20, 2007, at 2; *4Q06 Wireless 411*, at 20.

<sup>332</sup> *Eleventh Report*, at 10993. As noted in the *Tenth Report*, it has been reported that Cingular decided to upgrade its network to WCDMA/HSDPA, rather than the slower, interim WCDMA technology, in an effort to compete with Verizon Wireless’s EV-DO network, which offers speeds similar to WCDMA/HSDPA and faster than WCDMA. See *Tenth Report*, at 15953.

<sup>333</sup> *Cingular Wireless Completes \$86 Million Investment in Las Vegas During 2006 – Delivers Wireless Innovation*, News Release, Cingular Wireless, Jan. 30, 2007. As noted in the *Tenth Report*, prior to its merger with AT&T Wireless Cingular had deployed GSM/GPRS technology across its entire network footprint and had upgraded its data network to EDGE with respect to two-thirds of its covered network POPs. See *Tenth Report*, at 15953, note (continued....)

WCDMA/HSDPA enables mobile broadband access at average user download speeds of 400-700 kbps. AT&T's WCDMA/HSDPA customers can access the Internet while mobile via a laptop computer or PDA with a wireless modem card, or they can download a range of multimedia content and advanced applications on certain mobile handset models.<sup>334</sup> AT&T plans to continue deploying WCDMA/HSDPA throughout a majority of the U.S. markets covered by its network.<sup>335</sup>

138. T-Mobile has a nationwide EDGE network and has announced plans to deploy a 3G next-generation network using the spectrum licenses it acquired in the FCC's 2006 AWS-1 auction.<sup>336</sup> T-Mobile's bundled CMRS/Wi-Fi voice and data services are discussed in detail below.<sup>337</sup>

#### d. Coverage by Technology Type

139. As we did with the number of mobile telephone operators, in this report, we further refine our examination of competition in the mobile telephone sector by compiling a list of census blocks where operators offer digital and next generation technologies. This analysis is performed through a contract with American Roamer, an independent consulting firm that tracks service provision for mobile voice and mobile data services.<sup>338</sup> Under the American Roamer contract, in this report we are able to estimate in which of the roughly 8 million census blocks each provider offers services using digital and next generation technologies, compared to just the roughly 3,200 counties in previous reports. As discussed earlier, by utilizing such a relatively small area to analyze technological availability, census blocks eliminate, to a large degree, the concerns regarding overcounting populations and geographic areas.

140. As of July 2007, virtually the entire population of the United States live in census blocks where operators offer digital mobile telephone service, using CDMA, GSM/TDMA, or iDEN (including their respective next generation technologies), or some combination of the three.

(Continued from previous page) —————

274. As of the end of 2005, more than 86% of Cingular's subscriber base was equipped with GSM/GPRS devices. Cingular Wireless, SEC Form 10-K, filed Feb. 24, 2006, at 9.

<sup>334</sup> *Eleventh Report*, at 10994. In markets where WCDMA/HSDPA is not available, laptop modem cards that are compatible with both WCDMA/HSDPA and GPRS/EDGE will seamlessly fall back to AT&T's EDGE and GPRS networks, albeit at lower speeds. *Eleventh Report*, at 10994.

<sup>335</sup> AT&T, SEC Form 10-K, Exhibit 13, filed Mar. 1, 2007, at 19.

<sup>336</sup> *Eleventh Report*, at 10994; *T-Mobile USA Secures Rights from FCC for Auctioned Spectrum*, News Release, T-Mobile, Nov. 30, 2006.

<sup>337</sup> See Section VII.B, *Wireless Local Area Networks and Wireless-Wireline Convergence*, *infra*.

<sup>338</sup> See [www.americanroamer.com](http://www.americanroamer.com).

**Table 10: Mobile Telephone Digital Coverage by Census Block**

Technology	POPs in Covered Blocks	% of Total POPs	Square Miles Contained in Those Blocks	% of Total Square Miles
CDMA	279,883,825	98.1%	2,124,475	55.9%
GSM / TDMA	280,350,144	98.3%	2,171,209	57.1%
iDEN	163,637,650	57.4%	151,426	4.0%
<b>Total Digital</b>	<b>283,961,584</b>	<b>99.6%</b>	<b>2,541,139</b>	<b>66.9%</b>

Source: Federal Communications Commission estimates based on data supplied by American Roamer, July 2007.

Notes: POPs are from the 2000 Census, and the square miles include the United States and Puerto Rico.

141. Both CDMA and GSM/TDMA have been launched in census blocks containing 280 million people, or roughly 98 percent of the U.S. population, while iDEN-based service is available in census blocks containing roughly 164 million people, or approximately 57 percent of the U.S. population.

142. Using data supplied by American Roamer from May 2007, we have also calculated the extent of next generation deployment.

**Table 11: Mobile Telephone NextGen Coverage by Census Block**

Technology	POPs in Covered Blocks	% of Total POPs	Square Miles Contained in Those Blocks	% of Total Square Miles
CDMA Path (1xRTT/EV-DO/EV-DO Rev. A)	279,883,825	98.1%	2,124,475	55.9%
GSM Path (GPRS/EDGE/WCDMA/HSDPA)	280,350,144	98.3%	2,171,209	57.1%
<b>Total NextGen</b>	<b>283,954,869</b>	<b>99.6%</b>	<b>2,540,956</b>	<b>66.9%</b>
WCDMA/HSDPA	121,328,725	42.5%	83,429	2.2%
EV-DO/EV-DO Rev. A	232,549,906	81.5%	723,475	19.0%
<b>Total Broadband (EV-DO/WCDMA)</b>	<b>233,817,479</b>	<b>82.0%</b>	<b>729,642</b>	<b>19.2%</b>

Source: Federal Communications Commission estimates based on data supplied by American Roamer, May 2007.

Notes: POPs are from the 2000 Census, and the square miles include the United States and Puerto Rico.

143. CDMA 1xRTT and/or EV-DO, has been launched in census blocks containing 280 million people, or roughly 98 percent of the U.S. population. Similarly, GPRS, EDGE, and/or WCDMA/HSDPA has been launched in census blocks containing 280 million people, or about 98 percent of the U.S. population. EV-DO is now available in census blocks containing 82 percent of the U.S. population, covering 19 percent of the total square miles of the US, while WCDMA/HSDPA is available in census blocks containing 43 percent of the U.S. population, but representing only 2 percent of its land area.

144. We also calculated the number of mobile broadband providers competing to offer service by census block.

**Table 12: Estimated Mobile Broadband Providers  
by Census Block**

Total Number of Providers in a block	Number of Blocks	POPs Contained in Those Blocks	% of Total US POPs	Square Miles Contained in Those Blocks	% of Total US Square Miles
1 or More	4,694,827	233,817,479	82.0%	729,642	19.2%
2 or More	2,880,135	183,774,878	64.0%	209,964	5.5%
3 or More	1,664,014	118,248,249	41.0%	75,831	2.0%

Source: Federal Communications Commission estimates based on data supplied by American Roamer, May 2007 (EV-DO/HSDPA Coverage). Notes: POPs are from the 2000 Census, and the square miles include the United States and Puerto Rico.

145. Roughly 184 million people, or 64 percent of the U.S. population, live in census blocks with two or more mobile telephone operators offering EV-DO or WCDMA/HSDPA technologies, while 118 million people, or 41 percent of the U.S. population, live in census blocks where three or more operators offer such technologies.

#### e. Broadband Data Networks and Technology Deployment

146. In addition to the EV-DO and WCDMA/HSDPA mobile broadband network deployments discussed above, wireless operators in the 2.5 GHz BRS/EBS and 2.3 GHz WCS spectrum have begun rolling out, or have announced plans to deploy, wireless broadband services using Orthogonal Frequency Division Multiplexing (“OFDM”) technologies, including Worldwide Interoperability for Microwave Access (“WiMAX”) and similar technologies. Because OFDM allows signals to pass through buildings and trees, providers can use the technology to offer wireless broadband services without a direct line-of-sight between the transmitter and the end user’s receiver.<sup>339</sup> Many of the services offered using OFDM technology allow customers to access the Internet with portable, “plug-and-play” modem devices connected to a personal or laptop computer, rather than a fixed antenna mounted on a rooftop. Customers can transport these devices to other locations within the provider’s coverage area where a network signal is available and in some cases use them while traveling at high speeds.<sup>340</sup>

147. Clearwire offers wireless high-speed Internet access and VoIP services using OFDM and Time Division Duplex (“TDD”) technology, and spectrum in the 2.5 GHz BRS/EBS band. As of June 2007, the company had launched broadband service in 39 markets, mainly smaller towns and cities, covering approximately 10 million people in portions of 13 U.S. states.<sup>341</sup> In 14 of those markets, Clearwire was offering in-home VoIP telephone service for an additional monthly fee. As of June 30, 2007, the company had 270,000 broadband subscribers.<sup>342</sup> Clearwire’s customers can access the Internet at downstream speeds ranging from 768 kbps to 1.5 Mbps, and upstream speeds around 256 kbps, using a

<sup>339</sup> *Eleventh Report*, at 10995.

<sup>340</sup> *Eleventh Report*, at 10995.

<sup>341</sup> *Richmond First in Virginia to Experience Clearwire Wireless Broadband Service*, News Release, Clearwire, June 5, 2007.

<sup>342</sup> Clearwire, SEC Form 10-Q, filed Aug. 9, 2007, at 18.

portable wireless modem device that connects to a desktop or laptop computer.<sup>343</sup>

148. In June 2007, Clearwire announced a partnership with Direct Broadcast Satellite (“DBS”) companies, DIRECTV and EchoStar, in which the satellite companies will offer Clearwire’s Internet access service to their customers, and Clearwire will sell DBS video services to its broadband subscribers.<sup>344</sup>

149. In July 2007, Clearwire and Sprint Nextel announced a partnership in which the two companies planned to jointly construct a nationwide mobile WiMAX IEEE 802.16e-2005 network using their BRS/EBS spectrum and market service under the brand name Xohm.<sup>345</sup> However, in November 2007, the companies announced that they had mutually agreed to terminate this arrangement, reportedly due to an inability to reach final agreement on the terms of the transaction.<sup>346</sup> Sprint Nextel stated at that time that it plans to deploy a WiMAX network in the future and to launch commercial WiMAX service in the Chicago and Washington, D.C. markets during 2008.<sup>347</sup>

150. AT&T is using its 2.3 GHz WCS spectrum licenses to offer fixed wireless broadband Internet access service in eight U.S. markets, including Juneau, AK, where the company has deployed WiMAX technology.<sup>348</sup> Downstream speeds range from 384 kbps to 1.5 Mbps.<sup>349</sup> As part of the merger commitments made by the company in conjunction with its acquisition of BellSouth, AT&T plans to offer mobile or fixed wireless broadband service to 25 percent of the population covered by its WCS licenses (not including Alaska) by July 21, 2010.<sup>350</sup>

151. Another WCS licensee, Horizon Wi-Com, plans to launch wireless broadband service in the northeastern United States using mobile WiMAX technology.<sup>351</sup> The company announced in June

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<sup>343</sup> Clearwire, *Service Plans* (visited July 6, 2007), <<http://www.clearwire.com/wireless-broadband/getstarted.php>>.

<sup>344</sup> *Clearwire Partners with DIRECTV and EchoStar*, News Release, Clearwire, June 14, 2007.

<sup>345</sup> *Sprint Nextel and Clearwire to Partner to Accelerate and Expand the Deployment of the First Nationwide Mobile Broadband Network Using WiMAX Technology*, News Release, Sprint Nextel, July 19, 2007; *Sprint’s Xohm Will Expand Internet Access*, News Release, Sprint Nextel, Sept. 26, 2007. Each company planned to deploy portions of the network in separate areas of the country, and then enable roaming between the respective territories. Sprint Nextel was planning to build out to areas covering 185 million people, and Clearwire to areas covering 115 million people. The companies announced that they expected to cover 100 million people by the end of 2008. *Id.*

<sup>346</sup> *Sprint Nextel and Clearwire Terminate WiMAX Letter of Intent*, News Release, Sprint Nextel, Nov. 9, 2007.

<sup>347</sup> *Id.*

<sup>348</sup> *AT&T Alascom Delivers New Broadband Internet Choice for Juneau*, News Release, AT&T, Aug. 6, 2007; Kelly Hill, *Big Players Have Big Plans for WiMAX*, RCR WIRELESS NEWS, Oct. 24, 2007 (citing AT&T spokeswoman Jenny Parker). The company has conducted trials or limited deployments of WiMAX or other fixed wireless broadband technologies in a total of 22 markets. *Id.*

<sup>349</sup> *Eleventh Report*, at 10996.

<sup>350</sup> Notice of Written Ex Parte Communication by Joan Marsh, AT&T, “Revised Merger Commitments,” Review of AT&T Inc. and BellSouth Corp. Application for Consent to Transfer of Control, WC Docket No. 06-74, Jan. 4, 2007, at 10. AT&T also agreed to divest its 2.5 GHz BRS/EBS spectrum, and in May 2007, Clearwire completed the acquisition of this spectrum. *Clearwire Completes Acquisition of AT&T Mobile WiMAX Spectrum*, News Release, Clearwire, May 31, 2007.

<sup>351</sup> W. David Gardner, *WiMax Networks Go Live in Nine Northeast Cities*, InformationWeek, June 13, 2007; *Horizon Trials WiMax*, Unstrung, June 12, 2007; *Horizon Wi-Com Selects Navini for Wireless Deployment*, News Release, Navini Networks, Jan. 15, 2007. Horizon Wi-Com purchased its WCS licenses from Verizon in 2006. W. David Gardner, *WiMax Networks Go Live in Nine Northeast Cities*, InformationWeek, June 13, 2007.

2007 that it was conducting WiMAX trials and planned to launch commercial service in nine major U.S. cities – Boston, New York, Buffalo, Philadelphia, Pittsburgh, Baltimore, Washington, Richmond, and Cincinnati – covering a population of approximately 70 million by the end of 2007.<sup>352</sup>

#### f. Narrowband Data Networks and Technology Deployment

152. Among the providers of narrowband mobile data services to enterprise customers, several providers use paging spectrum to operate networks that offer traditional one-way paging services. Some paging providers also operate data networks using narrowband PCS spectrum, which allow them to offer two-way messaging services. Narrowband PCS providers use the ReFLEX technology protocol, which can transmit data at speeds ranging from 3.2 to 25 kbps.<sup>353</sup> USA Mobility's narrowband PCS network uses ReFLEX technology developed by Motorola, Inc. ("Motorola") and covers 90 percent of the U.S. population.<sup>354</sup>

153. In addition, Velocita Wireless operates a two-way data network using 900 MHz SMR spectrum. The network, known as Mobitex, uses packet-switched radio technology to provide always-on, two-way messaging and data delivery, and covers 93 percent of the U.S. business population.<sup>355</sup> In July 2007, United Wireless Holdings, Inc. acquired Velocita Wireless from Sprint Nextel.<sup>356</sup> Space Data is using narrowband PCS spectrum in the 900 MHz band and balloon-borne platforms, called SkySites™, to offer wireless telemetry services to energy and other industrial companies in Texas, Louisiana, Oklahoma, New Mexico, and the Gulf of Mexico.<sup>357</sup>

### 2. Capital Expenditures

154. Capital expenditures, alternatively called "capital spending" or abbreviated to "capex," are funds spent during a particular period to acquire or improve long-term assets such as property, plant, or equipment.<sup>358</sup> In the mobile telephone industry, capex consists primarily of spending to expand and improve the geographic coverage of networks, increase the capacity of existing networks so they can serve more customers, and improve the capabilities of networks (by allowing higher data transmission speeds, for example).<sup>359</sup> One analyst estimated that wireless operators spent approximately \$24.7 billion on capex during 2006, unchanged from the amount spent in 2005, but higher than the 21.4 billion spent in 2004.<sup>360</sup> One analyst attributes this slowdown in capex growth to the "completion of network upgrades,

<sup>352</sup> W. David Gardner, *WiMax Networks Go Live in Nine Northeast Cities*, InformationWeek, June 13, 2007; *Horizon Trials WiMax*, Unstrung, June 12, 2007; *Horizon Wi-Com Selects Navini for Wireless Deployment*, News Release, Navini Networks, Jan. 15, 2007.

<sup>353</sup> See *Tenth Report*, at 15955.

<sup>354</sup> *Id.*; USA Mobility, *Reliability of ReFLEX* (visited July 16, 2007) <<http://www.usamobility.com/pdf/ReFLEXreliability.pdf>>.

<sup>355</sup> *United Wireless Acquires Velocita Wireless, L.P.*, News Release, Velocita Wireless, July 2, 2007.

<sup>356</sup> *United Wireless Acquires Velocita Wireless, L.P.*, News Release, Velocita Wireless, July 2, 2007. United Wireless Holdings is an associate of Mobitex Technology AB, a Swedish-based company that supports the technology on which the Mobitex Network is based. Velocita plans to lease spectrum for its network from Sprint Nextel. *Id.*

<sup>357</sup> Space Data Corp., *Overview of SkySite Network* (visited July 11, 2007) <<http://www.spacedata.net/technology.htm>>; *Tenth Report*, at 15923.

<sup>358</sup> CNNMoney, *Money 101 Glossary* (visited Mar. 20, 2003) <<http://money.cnn.com/services/glossary/c.html>>. There are differing opinions on what constitutes capital spending versus non-capital spending.

<sup>359</sup> *Eighth Report*, at 14818.

better utilization of existing infrastructure, aggressive manufacturer price discounts, sharing of network capacity, and more efficient technologies.”<sup>361</sup>

### 3. Roaming

155. All mobile calling plans specify a calling area – such as a particular metropolitan area, a state, a region, the provider’s entire network, or the entire United States – within which the subscriber can make a call without incurring additional charges. When a subscriber exits this area, or “roams,” he or she may incur additional charges for each minute of use.<sup>362</sup> CTIA reported that “outcollect” roaming revenues<sup>363</sup> for the entire mobile telephone industry decreased again over the past year, from \$3.8 billion in 2005 to \$3.5 billion in 2006, a level not seen since 1998.<sup>364</sup> The contribution of roaming revenues to total service revenues continued its decline, from 4.1 percent in 2004 to 3.3 percent in 2005 to 2.8 percent in 2006, down from over 10 percent seven years ago.<sup>365</sup>

156. Roaming revenues account for a higher percentage of total service revenues for many rural and smaller regional providers than for nationwide carriers.<sup>366</sup> Rural Cellular, for example, derived 29 percent of its total wireless service revenues from roaming in the fourth quarter of 2006, while AT&T derived just 2 percent.

157. In August 2007, the Commission adopted a Report and Order clarifying that automatic roaming is a common carrier obligation for CMRS providers and stating that CMRS carriers are required to provide automatic roaming services to other carriers upon reasonable request and on a just, reasonable, and nondiscriminatory basis under Sections 201 and 202 of the Communications Act.<sup>367</sup> Automatic roaming allows mobile telephone subscribers to place calls while roaming as they do in their home coverage area, by simply entering a phone number and pressing “send.” When a reasonable request is made by a technologically compatible CMRS carrier, a host CMRS carrier must provide automatic roaming to the requesting carrier outside of the requesting carrier’s home market. The common carrier obligation to provide roaming extends to real-time, two-way switched voice or data services that are interconnected with the public switched network and utilize an in-network switching facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls. The Commission also extended the automatic roaming requirement to PTT and text messaging services, and sought comment on whether the roaming obligation should be extended to services that are classified as

(Continued from previous page) \_\_\_\_\_

<sup>360</sup> *4Q06 Wireless 411*, at 67.

<sup>361</sup> Timothy Horan, *et al.*, *U.S. Wireless On Track To Deliver Solid Financial Results*, CIBC World Markets, Equity Research, Sept. 21, 2006, at 21.

<sup>362</sup> The fees that a carrier collects from non-subscribers using its network, including the carriers of such non-subscribers, are called “outcollect” fees, and the fees that a carrier pays for its subscribers to roam on other networks are called “incollect” fees. Margo McCall, *Roaming Feeds Regional Carriers*, WIRELESS WEEK, Mar. 26, 2001, at 23.

<sup>363</sup> CTIA’s measure is one of “outcollect” roamer traffic revenues; in other words, the revenues generated by roamers in the providers’ markets. *Dec 2006 CTIA Survey*, at 88.

<sup>364</sup> See Appendix A, Table A-1, *infra*.

<sup>365</sup> *Id.* This is for the entire 12 month period.

<sup>366</sup> See *4Q06 Wireless 411*, at 39 (Table 27: Roaming Revenues as a Percentage of Total Service Revenues). See also page 34 (“Roaming revenues are an important source of revenues (and EBITDA) for operators in the secondary and rural markets”).

<sup>367</sup> FCC Clarifies That Roaming is a Common Carrier Obligation for Commercial Mobile Radio Service Providers, *News Release*, Federal Communications Commission, Aug. 7, 2007.

information services and services that are not CMRS.

158. Although the Report and Order did not extend the automatic roaming requirement to wireless broadband Internet access service, certain CDMA carriers have already reached roaming deals on a voluntary basis for wireless broadband Internet access service provided over EV-DO networks. As noted in the *Eleventh Report*, in May 2006 Sprint Nextel and Alltel announced a 10-year roaming deal that covers new wireless data services such as wireless broadband access as well as cellphone calls.<sup>368</sup> In June 2007, Alltel announced that its roaming arrangements give its customers access to wireless broadband service through their data-card equipped laptops in the nation's largest population centers, including Boston, Philadelphia, Washington, D.C., Atlanta, Miami, St. Louis, Kansas City, Minneapolis, Dallas, Houston and San Francisco.<sup>369</sup>

#### 4. Advertising and Marketing

159. Firms may engage in advertising and marketing either to inform consumers of available products or services or to increase sales by changing consumer preferences. Mobile telecommunications service is an "experience good,"<sup>370</sup> and in general, advertising for an experience good tends to be persuasive rather than informational in nature.

160. In 2006, advertising spending for wireless telephone services increased 10 percent over the previous year, or roughly \$316 million.<sup>371</sup> Of the top ten advertisers in 2006, AT&T and Verizon<sup>372</sup> showed the greatest percentage growth on spending over the previous year (in part due to merger and acquisition activity), 44 percent and 16 percent, respectively.<sup>373</sup> By comparison, the average increase in spending from 2005 to 2006 for the top ten advertisers was less than one percent.<sup>374</sup>

#### 5. Quality of Service

161. Analysts stress that competition to attract and retain customers puts pressure on providers to improve service quality. According to the senior director of wireless services at J.D. Power and Associates, "Wireless providers have made great strides in improving call quality. With an increasingly competitive environment and an increase in the number of services used in conjunction with a cellphone, carriers that offer superior network quality are more likely to attract new customers and increase customer retention. In fact, improving network quality is a beneficial financial incentive for wireless carriers, as customers experiencing at least one call quality problem are almost four times more likely to definitely switch carriers in the future."<sup>375</sup>

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<sup>368</sup> *Eleventh Report*, at 10998.

<sup>369</sup> *Alltel Extends Wireless Broadband Access for Laptops With Data Cards to Major Metro Areas*, News Release, Alltel Wireless, June 7, 2007.

<sup>370</sup> An experience good is a product or service that the customer must consume before determining its quality. See Dennis W. Carlton and Jeffrey M. Perloff, *Modern Industrial Organization* (3<sup>rd</sup> ed.), Addison, Wellsley, Longman, Inc., 1999, at 484.

<sup>371</sup> *U.S. Advertising Spending Rose 4.6% in 2006, Nielsen Monitor-Plus Reports*, News Release, PRNEWswire, Mar. 19, 2007 ("U.S. Advertising Spending Rose 4.6% in 2006").

<sup>372</sup> These are figures for the corporate parent, not solely the wireless divisions.

<sup>373</sup> *U.S. Advertising Spending Rose 4.6% in 2006*.

<sup>374</sup> *Id.*

<sup>375</sup> *J.D. Power and Associates Reports: Wireless Call Quality Problems Continue to Decline as the Transition to 3G Networks Takes Hold*, News Release, J.D. Power and Associates, Mar. 15, 2007.

162. Providers continue to rely on a diversified portfolio of strategies for improving their customers' wireless service experience. Network investment remains a key element of this portfolio. Section IV.B.1, *supra*, of this report, as well as similar sections in previous reports, detail the digital and next-generation upgrades that providers have been making to improve the coverage, capacity, and capabilities of their networks, while Section IV.B.2 provides an estimate of total spending by wireless providers on network expansion and improvements. By increasing network coverage and call handling capacity and improving network performance and capabilities, providers' investments in network deployment and upgrades have the potential to result in service quality improvements that are perceptible to consumers, such as better voice quality, higher call-completion rates, fewer dropped calls and deadzones, additional calling features, more rapid data transmission, and advanced data applications. As noted in the *Ninth Report*, one of the principal ways providers have improved network coverage and quality is by increasing the number of cell sites.<sup>376</sup> The *Tenth Report* added that carriers have been deploying micro-cell sites, or antennas that provide coverage in highly localized areas, to improve coverage in locations such as tunnels, airports, and certain neighborhoods, while some carriers have also used devices that amplify cellular signals, called repeaters, to improve indoor coverage in office buildings, shopping malls, and convention centers.<sup>377</sup>

163. According to a 2007 press report, growing demand from business customers has increasingly put pressure on U.S. wireless carriers to improve the coverage of their networks inside office buildings.<sup>378</sup> The report highlights the problem of spotty cellular coverage inside many office buildings, and explains that increasing reliance by businesses on mobile devices even for in-house activity has resulted in a growing need for offices to provide dependable wireless connections and call quality indoors. In response to this demand, the report indicates, U.S. cellular carriers are installing in-building wireless systems that provide network coverage throughout an office building, and in some cases are even covering the cost of the equipment and installation themselves in an effort to hold onto very large business customers. For instance, in September 2007, Sprint Nextel launched a service, called Airave, in which Sprint Nextel subscribers can use femtocell devices to improve indoor coverage.<sup>379</sup> A femtocell is a miniature base station that transmits in the licensed spectrum of the wireless operator offering the device and provides improved coverage within a subscriber's home. It uses the subscriber's home broadband connection for backhaul. The service also allows subscribers to make unlimited wireless calls from their homes without deducting minutes from their monthly service plans.<sup>380</sup>

164. Several of the nationwide carriers have also set up special departments to handle the growing demand from businesses to improve in-building coverage. In addition, other, non-cellular companies specialize in installing in-building systems that work with multiple carriers and with wireless systems other than cellular.<sup>381</sup>

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<sup>376</sup> *Ninth Report*, at 20657-20658.

<sup>377</sup> *Tenth Report*, 15958.

<sup>378</sup> Roger Cheng, *Inside Job*, WALL STREET JOURNAL, May 14, 2007, at R4. For example, the report cites the head of the in-building systems group at AT&T's wireless service as estimating that demand for the group's services has been growing at an annual rate of 10 to 15 percent in recent years.

<sup>379</sup> *Sprint Customers in Select Areas of Denver and Indianapolis Get AIRAVE for Enhanced In-Home Coverage and Unlimited Calling*, News Release, Sprint, Sept. 17, 2007.

<sup>380</sup> *Id.* As of October 2007, Sprint's Airave service was available in Indianapolis and Denver. *Id.*

<sup>381</sup> Roger Cheng, *Inside Job*, WALL STREET JOURNAL, May 14, 2007, at R4. For example, the report cites the head of the in-building systems group at AT&T's wireless service as estimating that demand for the group's services has been growing at an annual rate of 10 to 15 percent in recent years.

165. In addition to investing in their networks, carriers can increase capacity and improve service quality by acquiring additional spectrum. As detailed in Sections III.D and III.E.1 above, carriers have added to their spectrum holdings through the Commission's spectrum auctions, the purchase of licenses in the secondary market, and mergers and acquisitions. However, the *Tenth Report* cautioned that improvements in service quality tend to follow mergers with a lag due to the time it takes to complete the process of network integration.<sup>382</sup> For example, the acquisition of AT&T Wireless in October 2004 provided the former Cingular (now AT&T) with both an additional network of cell sites and significantly more spectrum.<sup>383</sup> As noted in the *Eleventh Report*, the new AT&T had integrated nearly a third of the cell sites in areas where the two networks of the former Cingular and AT&T Wireless had overlapping coverage by the end of 2005, and it expected to substantially finalize network integration by the end of 2006.<sup>384</sup> AT&T has since met this objective, completing its GSM network integration in the third quarter of 2006.<sup>385</sup> AT&T credits the network integration with providing "dramatically improved call quality for Cingular customers throughout the nation."<sup>386</sup>

166. In addition to investing in network infrastructure and acquiring spectrum, providers continue to pursue marketing strategies designed to differentiate their brand from rival offerings based on dimensions of service quality such as superior network coverage, reliability, and voice quality. Verizon Wireless pioneered this brand differentiation strategy with its "Can You Hear Me Now?" advertising campaign,<sup>387</sup> and it continues to use an advertising slogan describing its network as "America's most reliable wireless network."<sup>388</sup> In March 2007, Verizon Wireless also launched its "30-Day Test Drive" promotion letting customers who sign up for a Verizon Wireless calling plan "test drive" the network for 30 days and offering to absorb the cost of their calls if customers are not satisfied with their experience and port their number to another wireless carrier at any time during the 30-day period.<sup>389</sup> Beginning in 2006, AT&T's advertising campaigns have emphasized that it has the fewest dropped calls of any wireless carrier.<sup>390</sup> One expert on consumer issues has interpreted AT&T's advertising blitz as "further evidence that wireless carriers are shifting their marketing focus away from pricing toward network reliability, figuring that consumers are more concerned about calls going through than how much they cost."<sup>391</sup>

167. T-Mobile was the first nationwide provider to differentiate its service through the addition of an interactive "Personal Coverage Check" feature to its web site that enables customers to

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<sup>382</sup> *Id.*

<sup>383</sup> *Eleventh Report*, at 11000.

<sup>384</sup> *Id.*

<sup>385</sup> *Cingular Completes National GSM Network Integration*, News Release, Cingular Wireless, Oct. 3, 2006; *Cingular Reports Record Third-Quarter 2006 Results*, News Release, Cingular Wireless, Oct. 19, 2006.

<sup>386</sup> *Cingular Completes National GSM Network Integration*, News Release, Cingular Wireless, Oct. 3, 2006.

<sup>387</sup> Bruce Mohl, *The Fewest Dropped Calls*, BOSTON GLOBE, Apr. 23, 2006 ("*The Fewest Dropped Calls*").

<sup>388</sup> Verizon Wireless, *America's Most Reliable Wireless Network* (visited June 7, 2007) <[www.verizonwireless.com](http://www.verizonwireless.com)>.

<sup>389</sup> Verizon Wireless, *Test Driver's Manual* (visited June 7, 2007) <[www.verizonwireless.com](http://www.verizonwireless.com)>; *More Real-Life Test Men and Women Test Driving the Verizon Wireless Network*, News Release, Verizon Wireless, Mar. 26, 2007.

<sup>390</sup> *The Fewest Dropped Calls*; AT&T, *Why AT&T* (visited June 7, 2007) <[www.wireless.att.com](http://www.wireless.att.com)>.

<sup>391</sup> *Id.*

check the quality of network coverage where they live and work before they purchase service.<sup>392</sup> T-Mobile's computerized mapping tool allows users to search on any street address or intersection in the United States and get a rating of the signal strength at that location and in the surrounding area. For each search, T-Mobile provides a color-coded map with six shades of coverage ranging from no coverage to the best coverage. According to T-Mobile, the top rating means that calls are rarely dropped.<sup>393</sup> T-Mobile has also made its new interactive maps available on computers in its stores. AT&T Wireless's web site also features a very similar mapping tool for checking the quality of its network coverage at particular locations.<sup>394</sup> Although other carriers provide national or regional coverage maps to customers that show the cities where they provide some level of service, these maps typically provide only a broad overview of a carrier's coverage.

168. Consumer satisfaction surveys afford one means of gauging the effects of operator strategies for improving service quality on customer perceptions of service quality. Survey results and related evidence of customer satisfaction with cellphone service quality are summarized below in the section on mobile telecommunications market performance.<sup>395</sup>

## 6. Mobile Data Services and Applications

169. As described in Section III.B.1, *supra*, mobile telephone providers offer a variety of mobile data services and applications in addition to mobile voice services.<sup>396</sup> The largest segment of the mobile data market consists of handset-based applications marketed to consumers primarily as an add-on to mobile voice service, including text messaging services and various MMS services such as photo messaging, entertainment applications such as ringtones, games, mobile music and video services, and information services such as web-browsing. The services offered in this first market segment are provided largely by mobile telephone operators and, in the case of certain video services, mobile video providers.

170. A second market segment consists of monthly mobile Internet access packages for customers who wish to connect to wireless networks primarily or exclusively for data, rather than voice use, and who typically access the Internet through laptop computers.<sup>397</sup> In the case of both handset-based services and Internet access service for laptops, it is also important to distinguish between mobile data services provided over wireless broadband networks using technologies such as EV-DO or WCDMA/HSDPA, and those provided over slower wireless networks using earlier technologies. As noted in the *Tenth Report*, wireless broadband network technologies enable laptop users to download files, play streaming video and audio, and receive emails at speeds that are comparable to what many

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<sup>392</sup> See *Tenth Report*, at 15959, citing David Kesmodel, *T-Mobile Offers More Details On Coverage to Ease Concerns*, WALL STREET JOURNAL, Apr. 27, 2005; T-Mobile, *Personal Coverage Check* (visited June 7, 2007) <www.t-mobile.com>.

<sup>393</sup> *Tenth Report*, at 15959. More specifically, the top rating means that customers have a 95 percent chance of making a call without it being dropped.

<sup>394</sup> AT&T Wireless, *AT&T Coverage Viewer* (visited December 11, 2007) <www.wireless.att.com>. Like T-Mobile's personal coverage check feature, AT&T Wireless's mapping tool allows users to search on any street address or intersection to get a rating of coverage at that location and the surrounding area, and it provides a color-coded map with five shades of coverage ranging from "no service available" to "best" coverage.

<sup>395</sup> See Section VI.C, Quality of Service, *infra*.

<sup>396</sup> See, e.g., *Eleventh Report*, at 11002-11003, *Eighth Report*, at 14843-14856; *Ninth Report*, at 20659-20661.

<sup>397</sup> In addition to mobile telephone operators who provide mobile Internet access for laptop computers through both broadband and slower-speed data networks, broadband data providers, as described in Section III.B.3, Broadband Data Providers, *supra*, also provide wireless broadband Internet access for laptop computers on a portable basis.